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North Pacific Observer Program 2021 Annual Report

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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) in the halibut and groundfish fisheries off Alaska during 2021.

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 interactions with protected species. Managers use these data to manage groundfish and prohibited species catch within established limits and to document and reduce fishery interactions with protected 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.

The Observer Program is the largest observer program in the country and covers vessels in both partial coverage and full coverage. In the full coverage component of the program, every trip is monitored by 1 or 2 observers and the vast majority of groundfish harvest is covered by this portion of the program. Each year, the Annual Deployment Plan (ADP) describes the science-driven method for deployment of observers on vessels in the partial coverage component of the program (50 CFR 679.51(a)). The ADP specifies the scientific deployment design for the partial coverage fisheries and the selection rate -- the portion of trips that are sampled by observers and EM. 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 and program summary

- In December 2020, NMFS released the final 2021 ADP (NMFS 2020). In 2021, EM was deployed according to trip-selection. Due to limitations on transportation and health mandates associated with COVID-19, observers were deployed according to a port-based trip selection model. Under the port-based trip selection model, observers were deployed on randomly selected trips from specific ports. In addition, this method excluded trips from observation if they did not depart and land within a port that was on the list of observable ports.

- The observable ports were identified as ports where travel and lodging conditions allowed observers to meet and maintain applicable health mandates and advisories for deployment into the commercial fisheries and where there were expected to be enough fishing trips originating and ending in these ports to make it cost effective to place observers in these communities.
- In August 2021, NMFS released an Information Bulletin to announce the expansion of observer deployment for all ports throughout Alaska beginning on 1 September 2021[1]. This change was consistent with the updated NOAA policy on observer waivers, which states that vessels are no longer eligible for release from observer coverage under the Emergency Rule if a fully vaccinated or quarantined/shelter-in-place observer is available.
- Despite the ongoing challenges of COVID-19 in 2021, the agency was able to safely continue most Observer Program operations. There were 378 individual 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 Fisheries Monitoring and Analysis Division (FMA) staff members completed 532 debriefings from Seattle and Anchorage; the majority of debriefings were completed virtually.
- In 2021, observers collected data on board 296 fixed gear and trawl vessels and at 12 processing facilities for a total of 35,769 observer days (32,672 full coverage days on vessels and in plants; and 3,097 partial coverage days on vessels and plants).
- NMFS approved 170 vessels in the 2021 EM selection pool and of these, 125 vessels fished at least 1 trip. In 2021, EM data were collected from 105 unique vessels on a total of 279 trips (195 hook-and-line trips and 84 pot trips)
- Overall, for all federal fisheries off Alaska, 3,747 trips (43.2%) and 423 vessels (44.2%) were monitored by either an observer or EM system in 2021.

Fees and Budget

- The expenditures for observer deployment in 2021 in the partial coverage category was $4,448,612 for 3,193 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 2021 were mailed to 95 processors and registered buyers in January 2022 for a total of $3,169,843 in observer fees (Section 2.1).
- The breakdown in contribution to the 2021 observer fees by species was: 40% Pacific halibut, 35% sablefish, 13% Pacific cod, 12% pollock, and 1% all other groundfish species (Table 2-2).

[1] IB 21-39: Notice of Alaska Observer Requirements for the Partial Coverage Fleet Effective September 1, 2021: https://www.fisheries.noaa.gov/bulletin/ib-21-39-notice-alaska-observer-requirements-partial-coverage-fleet-effective

- In 2021, the average cost per observer sea day in the partial coverage category was $1,393 (based on the cost of $4,448,612 for 3,193 observer days) (Section 2.3.1).
- In 2021, the preliminary average cost per EM sea day in the partial coverage category was $1,896 (based on $1,317,860 adjusted annual cost for 695 reviewed EM sea days). Note that this EM sea day cost will change once the full suite of EM imagery from 2021 are reviewed, as the review cost will increase, but so will the number of EM sea days.

Deployment Performance Review

Previous annual reports have a detailed review of the deployment of observers and EM relative to the intended sampling plan and goals of the Observer Program. This report provides an abbreviated summary of deployment performance in order to give analytical staff the time necessary to work on the Partial Coverage Cost Efficiencies Integrated Analysis that will inform changes to the Observer Program to be implemented in 2024.

Similar to 2020, the changes made throughout 2021 by NMFS in response to changing health and safety conditions created separate time periods for partial coverage observer deployment. In the first time period (1 January – 31 August), deployment was restricted to the list of 14 ports, with the requirement that observers would only embark on trips that departed from and returned to the same port. In the second time period (1 September – 31 December), deployment was from all ports of departure. These time periods applied only to partial coverage observer deployment; the deployment of full coverage observers and EM was largely unaffected by changing health and safety conditions.

Deployment Rates

A summary of the number of vessels and trips in each stratum and realized coverage rates in 2021 are presented below:

Coverage category	Strata		Total vessels	Total trips	Sampled trips	Expected coverage rate	Realized coverage rate	Met expectations?*
Full coverage	Full		118	1,849	1,849	100.0	100.0	Yes
	Trawl EM (BSAI)		46	999	999	100.0	100.0	Yes
Partial coverage	Hook-and-Line	Jan. 1 - Aug 31	242	853	106	15.1	12.4	No - lower than expected
		Sep. 1 - Dec. 31	173	506	88	17.9	17.4	Yes
	Pot	Jan. 1 - Aug. 31	119	558	92	15.0	16.5	Yes
		Sep. 1 - Dec. 31	86	341	70	17.6	20.5	Yes
	Trawl	Jan. 1 - Aug. 31	64	418	83	16.1	19.9	Yes

Coverage category	Strata	Total vessels	Total trips	Sampled trips	Expected coverage rate	Realized coverage rate	Met expectations?*
	Sep. 1 - Dec. 31	25	220	62	21.0	28.2	No - higher than expected
	EM Hook-and-Line	119	656	180	30.0	27.4	Yes
	EM Pot	44	267	76	30.0	28.5	Yes
	Trawl EM (GOA)	34	432	142	33.3**	32.9	Yes
No selection	Zero Coverage	320	1,555	0	0.0	0.0	Yes
	Zero Coverage- EM Research	2	20	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.
**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 33% coverage of shoreside monitoring to collect biological samples and census counts of salmon and halibut PSC.

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 2021, 626 statements were received and reviewed by OLE. Chapter 4 provides an analysis of potential violations, 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 continuing the development of 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 ADP and include the following:

- **Observer trip-selection pools:**
    - Three observer coverage strata defined by gear (hook-and-line, pot, and trawl).
    - 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.
- **Fixed Gear EM Selection Pool**
    - EM selection pool composed of up to 170 fixed gear vessels, which would maintain the size of the EM pool from 2022. If additional funds become available, the number of EM boats could increase by Council's recommendation of 30 additional vessels.
        - If funding were insufficient to accommodate all the vessels that request to participate in the EM selection pool, NMFS would prioritize placement in the EM selection pool based on vessel size, fishing effort, minimizing data gaps, and cost efficiency.
    - 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 and the vessel may be removed from the EM pool.
- **Trawl EM EFP**
    - NMFS recommends continuing the pelagic trawl electronic monitoring (EM) EFP in 2023.
    - NMFS supports increasing the number of participants and continuing efforts to improve processor participation.

In addition to developing 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 that could allow a vessel to have multiple VMPs and therefore allow crossover between the fixed gear EM program and the trawl EM EFP.

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 2021. 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 interactions with protected species. Managers use these data to manage groundfish and prohibited species catch within established limits and to document and reduce fishery interactions with protected species. Scientists use fishery-dependent data to assess fish stocks, provide data for fisheries and ecosystem research and fishing fleet behavior, assess marine mammal interactions with fishing gear, and characterize fishing impacts on habitat.

All vessels and processors that participate in federally managed or parallel groundfish and 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 or EM coverage according to the scientific sampling plan described in the Annual Deployment Plan (ADP) developed by NMFS in consultation with the Council. 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 coverage in the partial coverage category is funded through a system of fees collected 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 Observer Program was restructured and 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)[2]. 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 catcher/processors (81 FR 17403, 29 March 2016). This rule allowed small, non-trawl catcher/processor 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 electronic monitoring (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. This rule also changed observer sampling station inspection requirements in Federal groundfish fisheries and made minor changes to bin monitoring requirements for the Amendment 80 fleet. Effective 14 November 2019. Implemented 1 January 2020.

[2] The final rule for Amendments 86/76 was published in the Federal Register on November 21, 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 action increased the funds available to support observer and EM deployment in the partial coverage category of the Observer Program and increased the likelihood of meeting desired monitoring objectives. Effective 10 August 2020. Implemented 1 January 2021.

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 that are participating in programs that have transferable prohibited species catch (PSC) allocations as part of a catch share program.
- Catcher vessels that are using trawl gear and 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 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 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 amounts 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 Halibut individual fishing quota (IFQ) or Sablefish IFQ (there are no PSC limits for these fisheries).
- Catcher vessels when fishing for 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 2021 ADP (NMFS 2020) 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 2021 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 planning and reporting process for 2022 is described below (note that the process differs from past years):

- **February – May**: NMFS staff compile the annual report for the previous year. In past years, Chapter 3 (the deployment performance review) was prepared by the Observer Science Committee. However, a full evaluation of 2021 deployment (with OSC review) was not completed for this Annual Report, but a summary of anticipated and realized deployment is provided in Chapter 3. Not including a full evaluation of deployment is a temporary situation to facilitate a more comprehensive evaluation of the partial coverage sampling design and cost efficiencies that may be incorporated into the 2024 ADP. The sampling strata and deployment methods deployed in 2022 are anticipated for the 2023 ADP.

- **May – June**: NMFS presents the annual report to the Council (including the Council's Monitoring Committee, Advisory Panel, and Scientific and Statistical Committee) 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 evaluation of the partial coverage sampling design, the next annual report, or other reports or analyses for the Council.

- **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 2021 Annual Deployment Plan and modifications due to COVID-19

In December 2020, NMFS released the final 2021 ADP (NMFS 2020) with the following strata and deployment rates:

- No Selection – 0%
- Trawl vessels not participating in EM – 16%
- Hook-and-line – 15%
- Pot – 15%
- Fixed-Gear EM – 30%
- Trawl EM EFP – 100% at-sea EM; plus: 33% shoreside monitoring in GOA or 100% shoreside monitoring in BS

In 2021, Fixed-Gear EM was deployed according to trip-selection. The Trawl Electronic Monitoring Trip-Selection Pool was 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 trawl EM is compliance monitoring of maximized retention. Catch accounting for the vessel's catch and bycatch was 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.

Due to limitations on transportation and health mandates associated with COVID-19, observers were deployed according to a port-based trip selection model in 2021. Under this approach, observers were deployed on randomly selected trips from specific ports. In addition, this method excluded trips from observation if they did not depart and land within a port that was on the list of observable ports. The observable ports were identified because travel and lodging conditions allowed observers to meet and maintain applicable health mandates and advisories for deployment into the commercial fisheries and because there were 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 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. In statistical terms, prior to COVID-19, all ports were within the sampling frame, whereas only some ports remain in the sampling frame in response to COVID-19.

In August 2021, NMFS released an Information Bulletin to announce the expansion of observer deployment for all ports throughout Alaska beginning on 1 September 2021. This change was consistent with the updated NOAA policy on observer waivers, which states that vessels are no longer eligible for release from observer coverage under the Emergency Rule if a fully

vaccinated or quarantined/shelter-in-place observer is available. This change resulted in an adjustment to the deployment target rates to account for budget that was not used due to the COVID policy. The target deployment rates for several sampling strata were adjusted for trips logged into ODDS starting in September:

- Hook-and-Line was increased from 15% to 18%
- Trawl vessels not participating in EM was increased from 16% to 21%
- Pot was increased from 15% to 18%

1.4. Changes since the 2021 ADP

Although the focus of this Annual Report is on performance in 2021, changes have been made to the partial observer coverage sampling plan that are being implemented in 2022 (Table 1-1). Here we provide a summary of the changes that have been made since the 2021 ADP.

The fixed-gear EM pool in 2022 consists of 171 vessels approved by NMFS. Three vessels that participated in fixed-gear EM during 2021 requested to be removed from EM and were replaced by three vessels new to EM for 2022. The three new vessels were selected using a prioritized list based on: vessel size, fishing effort, minimizing data gaps, and cost efficiency. An additional 7 vessels requested to be in the EM pool but were not approved by NMFS due to the cost inefficiencies of having hardware committed to vessels with very minimal fishing effort. These vessels may be good candidates for mobile EM systems currently being tested.

The deployment rates (rounded to the nearest whole number) for strata in 2022 are as follows:

- No selection – 0%
- Trawl vessels not participating in EFP– 30%
- Hook-and-line – 19%
- Pot – 17%
- Fixed-gear EM – 30%
- Trawl EM EFP–100% at-sea EM; plus: 33% shoreside monitoring in GOA or 100% shoreside monitoring in BS

In 2022, both observers and EM are being deployed using the trip selection model in all ports throughout Alaska.

In response to Council priority to improve cost efficiencies in the partial coverage category and upcoming changes that need to be integrated into the observer program, including the PCTC program and regulations for Trawl EM NMFS has initiated a holistic analysis. The project will take more than one year to make meaningful progress and NMFS proposed to the Partial Coverage Fisheries Monitoring Committee (PCFMAC) and the Council that the 2022 ADP be kept in place for both 2022 and 2023. This will enable staff to have time to design a more

integrated and cost-efficient program for implementation under a new contract in 2024. That proposal was supported by the PCFMAC and Council, with the recognition that it will be especially important to have a 2022 ADP that has the best chance of meeting monitoring objectives, as it will be in place for two years. NMFS met with the PCFMAC in March of 2022 and will continue working with the PCFMAC in 2023 and 2024, with the next meeting scheduled in fall 2022 to discuss potential sampling designs.

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	
2022	Trawl: 30% (28.2) / H&L: 19% (17.2) / Pot: 17% (20.5)	n/a	Fixed gear (H&L and Pot) EM: 30%	100% at-sea EM; 33% shoreside monitoring in GOA and 100% shoreside monitoring in BS	n/a	Vessels <40' LOA and Jig gear	EM Innovation Research 2-4 vessels
2021	Sep. 1 - Dec. 31: Trawl: 21% (22.4) / H&L: 18% (13.4) / Pot: 18% (15.5) Jan. 1 - Aug. 31: Limited waivers	Deployment in all ports Deployment in 13 ports					
2020	Jul. 1 – Dec. 31: Limited waivers Mar. 26 - Jun. 30: Waivers issued due to COVID-19 Jan. 1 – Mar. 25: Trawl: 20% (20.3) / H&L: 15% (15.0) / Pot: 15% (14.7)	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				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’					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 2021

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 ninth 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 2021 that are anticipated to be collected in 2022, as well as the amount of fees collected in 2020 that were obligated to the partial coverage contract to pay for sea days in 2021.

Fee billing statements for 2021 were mailed to 95 processors and registered buyers in January 2022. A total of $3,169,843 in observer fees were billed. At the time of this publication, three processors had not yet paid observer fees totaling $363. In order to collect delinquent fees, three 30-day notices were mailed in April. Additional notices will be mailed as needed. Processors submitting late fee payments were charged a one-time 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 (Table 2-1).

A total authorized transfer from the Observer Fund of $3,040,184 was made to the Alaska Fisheries Science Center (AFSC) to be used to support the observer and EM deployment contracts and the EM review grant in fishing year 2021.

2.2. Fees Collected from 2021, 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.[3]

The observer fee was 1.25% of the ex-vessel value of the groundfish and halibut subject to the fee through 31 December 2020. Beginning 1 January 2021 a fee equal to 1.65% of the ex-vessel

[3] 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

value is assessed on the landings of groundfish and halibut subject to the fee.[4] 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 price for halibut by the headed and gutted weight equivalent. The standard ex-vessel prices used for 2021 fee assessments were published in the *Federal Register* on 18 December 2020 (85 FR 82447).[5] Table 2-2, Table 2-3, and Table 2-4 summarize the observer fees that accrued for 2021.

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 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

[4] Final Rule: Fee Adjustment to 1.65% (85 FR 41424, 10 July 2020). Available online at: 85 FR 41424.
[5] Available online at: 85 FR 82447.

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 the Appendix of this report.

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 five years of the program to AIS, Inc. in April 2015. A third contract was competed and subsequently awarded for up to five 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 2021, the average cost per observer sea day in the partial coverage category was $1,393 (based on the cost of $4,448,612 for 3,193 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. Similar to 2020, the reimbursable travel costs in 2021 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 addition, the number of observer sea days in 2021 also 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 $1,393 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 2021. 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 full-coverage 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, and
- 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 2021. 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 lists total billed vessels/plants, total billed observer coverage days, total costs, and average costs in the full coverage sector for each year 2014-2021. In 2021, 130 vessels and processing facilities were billed for observer coverage in the full coverage category representing a 16% drop from the 154 that were billed in 2020. This drop continues the trend from 2020 in which there was a 9% drop from 2019. The total invoiced amount in 2021 was $12,305,020, down 16% from the 2020 total of $14,624,445. The total number of observer days represented by these invoices in 2021 was 32,565[6], down 9% from the 2020 total of 39,039 billed full-coverage days. The continued decrease in billed vessels and the decreases in billed coverage days and total costs are in part due to expanded participation in the Electronic Monitoring (EM) EFP by AFA pollock catcher vessels in the BSAI. These full-coverage vessels were exempted from carrying an observer during the EFP. While additional observers were deployed to processors that

[6] This value is lower than the total full coverage deployment days calculated by FMA of 35,769 days (see Chapter 3) because FMA's method of counting total deployment days includes some non-fishing and non-delivery days when the observer was assigned to a vessel or plant that were not billed as days by the full coverage provider.

participated in the EM EFP to collect prohibited species and biological data from observer-exempted vessels participating in the EM EFP, the number of vessels that were exempted from carrying an observer greatly outnumbered these additional observers deployed to processing plants.

Additionally, these decreases can be partially explained by the relaxation of COVID-19-related deployment structures that were in effect in 2020. In general, full coverage deployments tended to be longer in 2020 than in any other year, as observers were deployed to vessels and plants for additional days before and after trips to ensure COVID-19 quarantine protocols could be satisfactorily completed. This resulted in a higher number of billed observer days in 2020 even while the number of billed vessels and plants declined that year due to the EM EFP. By contrast, COVID-related quarantine protocols were relaxed significantly in 2021, and full-coverage deployments tended to revert to the standard of being terminated immediately upon completion of all required sampling duties, with no additional quarantine days. This resulted in decreased full-coverage days in 2021.

The average "fully-loaded" cost per day of observer coverage in the full coverage category in 2020 was $378, up 1% from 2020 when it was $375 and less than 1% change from the 2014-2021 mean. This 'fully-loaded' average combines invoiced amounts for the daily rate per observer day (variable cost) plus all other costs for transportation and other expenses (fixed costs). The overall adherence to the time-series mean in the last two years -- even as travel costs and inflation were generally rising across the economy in general -- is again partially explained by the continued expansion of the EM EFP. As previously noted, the EFP has resulted in fewer full coverage vessel days and more full coverage plant days. Plant observer days tend to be generally cheaper than vessel observer days. Thus these general cost increases are not apparent in the global average.

Figure 2-1 and Figure 2-2 summarize the average costs to fishing vessels and processing facilities in the full coverage category by sector and gear type in 2021. 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 one-time charges to cover airfare, lodging, and logistics.

Figure 2-1 shows the average number of billed observer days, the average fully-loaded cost per day of observer coverage[7], the average daily rate observer providers charged for observer

[7] 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[8], and the average percent of incidental costs (to the fully-loaded cost) per day, per vessel or plant in each vessel type and gear type category[9]. 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/plant was shoreside processors with 454 days per processor, down 6% from 2020's total of 482 days in that sector. As described previously additional days have been covered at processors since 2020 due to the EM EFP; however, fewer observers were deployed into the EFP processors in 2021 than in 2020. Average daily costs for this sector are not provided due to confidentiality rules (only days are shown). It is noteworthy that last year's top sector in terms of average number of full-coverage days was CP/MS vessels using non-pelagic trawl gear, and average days in that sector was down 20% in 2021 (452 days per vessel, compared to 2020's average of 564 days per vessel). This sector consistently has a high number of observer deployment days every year due to 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 the additional quarantine days really added up for this sector, while in 2021 those days were greatly reduced which may partially explain the reduction from 2020. The lowest average number of days per vessel in 2021 was on CVs using non-pelagic trawl gear (20 days, up 5% from 2020's average of 19 days).

The sector with the highest average fully loaded cost per day was non-pelagic trawl catcher vessels at $420 per day (with 12% incidental costs), which represents a 0.2% drop from last year's value of $421 per day in that sector. The lowest rate was for CP/MS using pelagic trawl gear ($369, with 6% incidental costs). The average daily observer rate per vessel or processing facility (not including incidental costs) across all sectors and gear types was $344 in 2021, down 1.4% from approximately $349 in 2020. The highest daily rate was for CVs using pelagic trawl gear ($369) and the lowest daily rate was for CP/MS with pelagic trawl gear ($348).

The average fully-loaded daily rate for vessels and plants across all sectors and gear types was $378, down 0.8% from 2020 when it was $375. The overall average percentage of incidental costs per day to the total cost per day across all gear types and sectors was 8.96%[10] , up from 6.7% in 2020.

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.

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[8] 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 as a simple average of each vessel's annual daily observer rate.

[9] 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.

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

Figure 2-2 shows the estimated average annual incidental and daily observer costs for observer coverage for vessels and processors in 2021. 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 refinement and expansion through the Partial Coverage Fishery Monitoring Advisory Committee and the Alaska Region Electronic Technologies Implementation Plan. An important component of the EM program is evaluating costs. Table 2-7 reflects the costs of the fixed gear EM program in 2021. Much of the cost structure was designed by the Council's 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 2021, the preliminary average cost per EM sea day in the partial coverage category was $1,896 (based on $1,317,860 adjusted annual cost for 695 reviewed EM sea days). Note that this EM sea day cost will change once the full suite of EM imagery from 2021 are reviewed, as the review cost will increase, but so will the number of 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 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.

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 presented in Table 2-5. For example, in 2021, the fully loaded rate was $4,448,612 ÷ 3,193 days = $1,393 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 $344 per day (Table 2-6 and Fig. 2-1). Compared to a partial coverage observer that may be deployed onto multiple vessels for one to five 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. 2-3). 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 does in fact decline 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	$997,845	5,001	4,600	3,316
	Federal Funds				$412,307			
2020	Fees	$2,894,448	($170,772)	$201,178	$4,990,546	2,266	5,784	1,977[11]
	Federal Funds				$1,905,169			
2021	Fees	$3,043,516	($140,267)	$170,798	$1,841,346	3,680[12]	Confidential[13]	3,193[11]
	Federal Funds				$814,654			

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

[12] 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.

[13] This column reflects combined NMFS purchases of travel, guaranteed observer sea days, option observer sea days, and processing plant observer days. In 2021, however, there was carryover in multiple categories and NMFS was not able to roll up at least 3 categories. Therefore the information is confidential.

Table 2-2. -- Observer fees[14] in 2021 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	$205,840	$4,158	$5,381	$5	$431	$215,815
	40 - 57.5	$480,025	$179,950	$22,570	$10	$7,128	$689,684
	>57.5	$563,975	$115,535	$2,615	$0	$4,115	$686,240
	Gear Subtotal	$1,249,840	$299,643	$30,567	$16	$11,673	$1,591,739
Jig	<40	$517	$0	$2	$0	$27	$547
	40 - 57.5	$1,981	$0	$195	$0	$128	$2,305
	Gear Subtotal	$2,498	$0	$198	$0	$156	$2,852
Pot	<40	$0	$11,928	$431	$0	$8	$12,367
	40 - 57.5	$347	$202,833	$16,057	$0	$262	$219,498
	>57.5	$6,068	$598,002	$193,060	$2	$726	$797,857
	Gear Subtotal	$6,414	$812,763	$209,547	$2	$995	$1,029,722
Trawl	40 - 57.5	$0	$0	$2	$3,212	$0	$3,214
	>57.5	$0	$2,196	$167,732	$365,138	$7,250	$542,316
	Gear Subtotal	$0	$2,196	$167,734	$368,350	$7,250	$545,531
Total all gear		**$1,258,752**	**$1,114,602**	**$408,046**	**$368,369**	**$20,075**	**$3,169,843**
Percent by species		**40%**	**35%**	**13%**	**12%**	**1%**	**100%**

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

[14] 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[15] in 2021 by gear, vessel size category, and species or species group in the Gulf of Alaska.[16]

Gear	Vessel length category	Halibut	Sablefish	Pacific cod	Pollock	All other species	Total all species
Hook and Line	<40	$190,007	$4,130	$5,359	$5	$431	$199,933
	40 - 57.5	$399,124	$171,984	$22,559	$10	$7,014	$600,691
	>57.5	$431,282	$110,081	$2,579	$0	$4,030	$547,973
	Gear Subtotal	$1,020,413	$286,195	$30,497	$16	$11,475	$1,348,596
Jig	<40	$517	$0	$2	$0	$27	$547
	40 - 57.5	$1,981	$0	$195	$0	$128	$2,305
	Gear Subtotal	$2,498	$0	$198	$0	$156	$2,852
Pot	<40	$0	$6,463	$0	$0	$8	$6,470
	40 - 57.5	$346	$176,581	$7,595	$0	$213	$184,735
	>57.5	$5,381	$523,065	$40,605	$2	$581	$569,633
	Gear Subtotal	$5,727	$706,109	$48,200	$2	$802	$760,839
Trawl	40 - 57.5	$0	$0	$2	$3,212	$0	$3,214
	>57.5	$0	$2,196	$61,272	$364,874	$7,250	$435,592
	Gear Subtotal	$0	$2,196	$61,274	$368,086	$7,250	$438,806
Total all gear		**$1,028,638**	**$994,499**	**$140,168**	**$368,104**	**$19,683**	**$2,551,092**
Percent by species		**40%**	**39%**	**5%**	**14%**	**1%**	**100%**

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

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

[16] 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[17] in 2021 by gear, vessel size category, and species or species group in the Bering Sea/Aleutian Islands.[18]

Gear	Vessel length category	Halibut	Sablefish	Pacific cod	Pollock	All other species	Total all species
Hook and Line	<40	$15,832	$28	$22	$0	$0	$15,882
	40 - 57.5	$80,901	$7,966	$12	$0	$114	$88,993
	>57.5	$132,693	$5,454	$36	$0	$85	$138,268
	Gear Subtotal	$229,426	$13,448	$70	$0	$198	$243,143
Jig	Gear Subtotal	$0	$0	$0	$0	$0	$0
Pot	<40	$0	$5,466	$431	$0	$0	$5,897
	40 - 57.5	$1	$26,252	$8,462	$0	$49	$34,763
	>57.5	$687	$74,937	$152,455	$0	$145	$228,224
	Gear Subtotal	$687	$106,654	$161,348	$0	$194	$268,883
Trawl	>57.5	$0	$0	$106,460	$264	$0	$106,724
	Gear Subtotal	$0	$0	$106,460	$264	$0	$106,724
Total all gear		**$230,113**	**$120,102**	**$267,878**	**$264**	**$392**	**$618,750**
Percent by species		**37%**	**19%**	**43%**	**0%**	**0%**	**100%**

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

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

[18] 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 2021.

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
2021	$4,448,612	3,193	$1,393

Table 2-6. – Annual observer full coverage sea day costs from 2014 to 2021.

Year	Sum totals					Averages per coverage day		
	Billed vessels and plants	Billed Full Coverage Days	Base daily cost	Incidental costs	Fully- loaded cost	Base daily cost	Incidental costs	Fully-loaded cost
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
2021	130	32,565	$11,202,430	$1,102,590	$12,305,020	$344	$34	$378

Table 2-7. -- Costs of the 2021 Fixed Gear EM Program.

Cost category	One time	Recurring	Amortized	2021 Total	Prior years amortized	Adjusted annual cost
Project Coordination	$48,261	$353,024	$0	$371,286	$0	$401,286
Data Review, Processing, and Analysis[19]	$45	$218,702	$0	$10,747	$0	$218,747
EM Equipment Services	$0	$50,645	$201,535	$252,179	$331,507	$422,458
Field Technical Services	$0	$202,749	$1,887	$204,636	$72,244	$275,370
Project Totals	$48,306	$825,120	$203,422	$838,847	$403,751	$1,317,860

[19] Data review for 2021 fixed gear EM was not yet complete in time for inclusion in the Annual Report. These costs include costs associated with data processing by EM hardware providers and EM review costs through February 28, 2022.

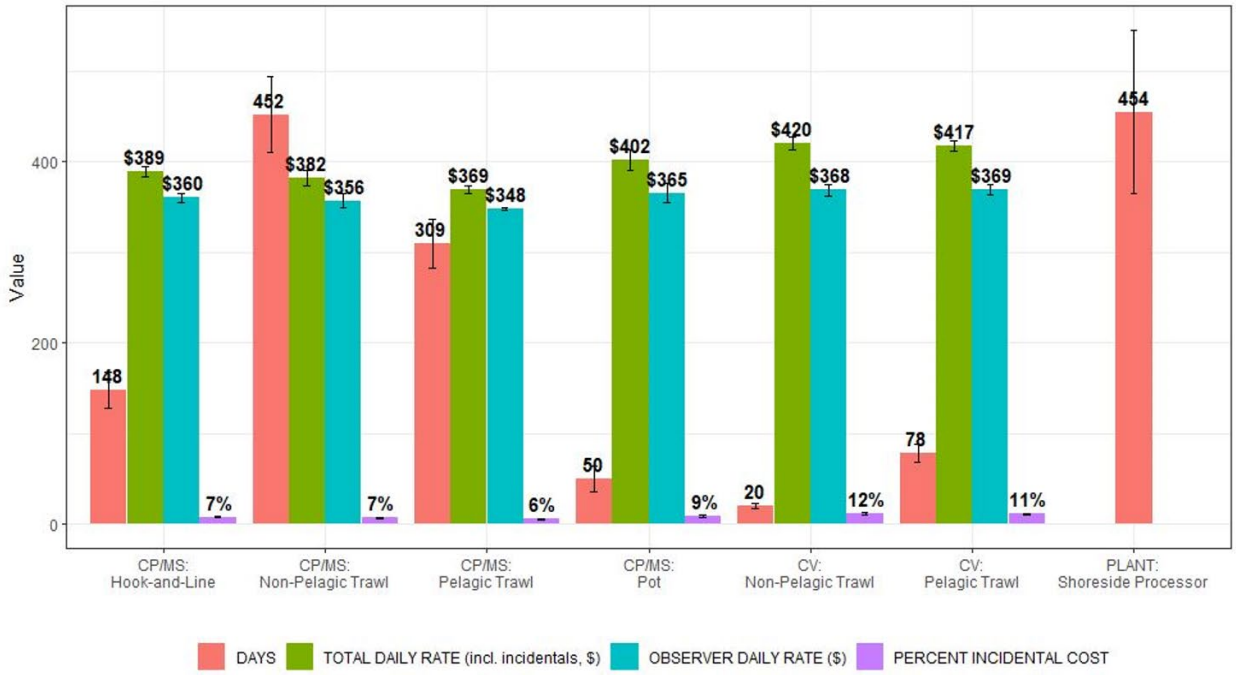

Figure 2-1. -- Average number of full coverage days and average costs per day (including incidental costs), to vessels and processors for observer coverage in the full coverage category in 2021, by gear type and vessel type. Costs for shoreside processors were removed from this analysis to comply with confidentiality rules (fewer than three companies provided observers in 2021; days are shown). Error bars represent mean standard error.

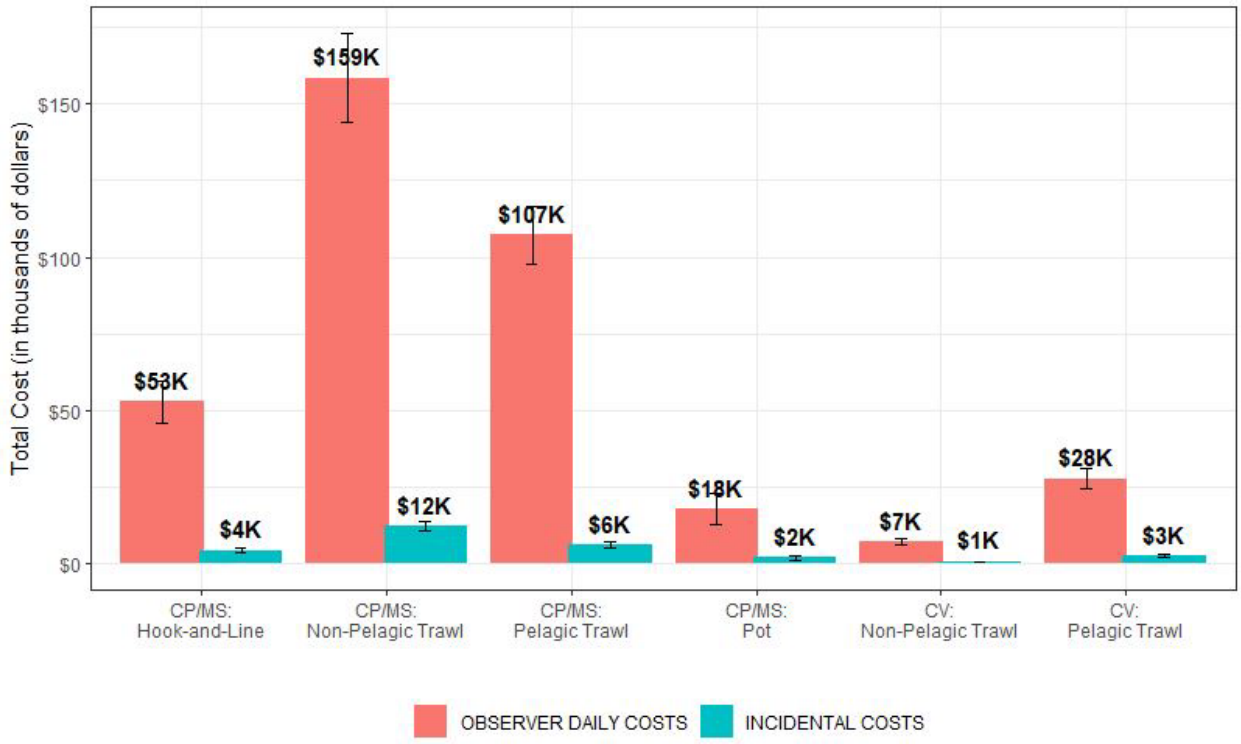

Figure 2-2. -- Average annual cost per vessel of observer coverage for vessels and processors in the full coverage sectors in 2021, by gear type and vessel type. Costs for shoreside processors were removed from this analysis to comply with confidentiality rules (fewer than three companies provided observers in 2021). Error bars represent mean standard error.

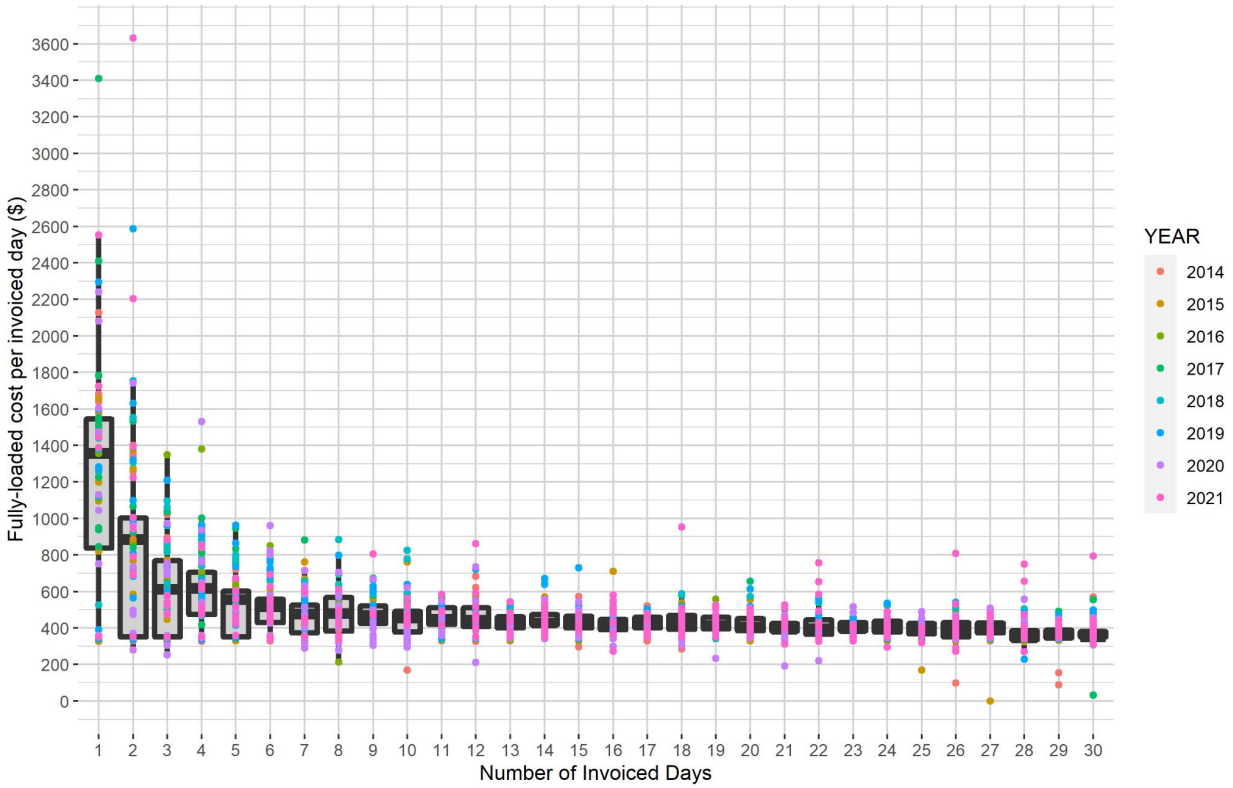

Figure 2-3. -- Relationship between the fully loaded cost per invoiced day for full observer coverage as a function of the number of days invoiced, which is a proxy for the duration of the deployment. The fully-loaded cost per day is calculated as the invoice total divided by the number of days on the invoice.

3. Descriptive Information

3.1. Deployment Summary

In past years, Chapter 3 (the deployment performance review) was prepared by the Fishery Monitoring Science Committee. However, a full evaluation of 2021 deployment (with FMSC review) was not completed for this Annual Report, and instead a summary of anticipated and realized deployment is provided in this chapter (Table 3-1). Not including a full evaluation of deployment is a temporary situation to facilitate work on evaluating sampling design and cost efficiencies that may be incorporated into the 2024 ADP. Additionally, changes in sampling strata and deployment methods are not anticipated for the 2023 ADP. The NMFS plans to publish the full 2021 Deployment Performance Review as a stand-alone tech memo after analyses for the 2024 ADP have been completed.

In December 2020, NMFS released the final 2021 ADP (NMFS 2020). Due to limitations on transportation and health mandates associated with COVID-19, observers were deployed on randomly selected trips according to a port-based trip selection model in 2021. The port-specific deployment method excluded trips from observation if they did not depart and land within a port that was on the list of observable ports.

The observable ports were identified because travel and lodging conditions allowed observers to meet and maintain applicable health mandates and advisories for deployment into the commercial fisheries and because there were 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 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. In statistical terms, prior to COVID-19, all ports were within the sampling frame, whereas only some ports remained in the sampling frame in response to COVID-19.

Target deployment rates were as follows:

- Hook-and-Line - 15.13%.
- Pot - 15.04%.
- Trawl vessels not participating in EM - 16.12%.

The programmed rates for the ODDS differed from the ADP target monitoring rates in order to account for monitoring waivers (NMFS 2020). Initially, the ‘sample frame adjusted rate’ was estimated as the selection rate required of trips within the sample frame in order to achieve the target monitoring rate for all trips. The ODDS programmed rates resulted after an additional adjustment to the sample frame rate accounted for anticipated waivers due to other logistic limitations of deployment under COVID-19 safety protocols. Consequently, the ODDS was programmed at the beginning of the year to randomly select logged trips at a rate of 23.35% in

the *HAL* stratum, 29.92% in the *POT* stratum, 19.29% in the *TRW* stratum. These programmed rates were expected to result in the target monitoring rates listed above.

In August 2021, NMFS released an Information Bulletin to announce the expansion of observer deployment for all ports throughout Alaska beginning on 1 September 2021. This change was consistent with the updated NOAA policy on observer waivers, which states that vessels are no longer eligible for release from observer coverage under the Emergency Rule if a fully vaccinated or quarantined/shelter-in-place observer is available. The ODDS programmed rates therefore had to be updated as the sample frame adjustment was no longer required. Combined with estimates of the remaining budget, remaining fishing effort, and deployment costs, new target deployment rates were assigned to the observer sampling strata with the intention of achieving the yearly monitoring rates originally set in the 2021 ADP by the end of the year.

Target deployment rates were adjusted as follows:

- Hook-and Line - 17.9%.
- Pot - 17.6%.
- Trawl vessels not participating in EM - 21.0%.

Other adjustments to the ODDS trip selection rates were required to achieve these monitoring rates. Waivers could still be given if the observer provider could not assign an observer who had quarantined for 14 days with only 3 days of notice to a trip, or if the provider or observers did not feel safe with the vessel's quarantine status. Beginning 1 September, selection rates in the ODDS were programmed to randomly select logged trips at a rate of 19.70% in the *HAL* stratum, 19.40% in the *POT* stratum, and 21.00% in the *TRW* stratum. These programmed rates were expected to result in the second set of target monitoring rates listed above, for trips that occurred on or after 1 September.

Following the 2021 ADP, ODDS was programmed to randomly select logged trips at a rate of 30% in the *EM HAL* and *EM POT* strata. Because no waivers were expected in EM, the target monitoring rate (and programmed rate) for these strata was constant at 30%.

3.1.1. At-Sea Deployments Rate Summary

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).

The 2021 Observer Program had 13 different deployment strata to be evaluated (Table 3-1). 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 catcher/processor 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 catcher vessels fishing for pollock under the Exempted Fishing Permit (EFP). There were three partial coverage EM strata: *EM HAL*, *EM*

POT, and *EM TRW EFP*. There were six partial coverage observed strata, defined by gear and time period: *HAL*, *POT*, and *TRW* for each time period beginning 1 January and 1 September. 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 100% coverage in the *Full* observed stratum, and 100% coverage in the full coverage *EM TRW EFP* stratum (Table 3-1). The program achieved perfect compliance with both zero coverage strata (Table 3-1). 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 expected 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. Coverage rates were lower than expected for *HAL* during the first time period. Coverage rates were higher than expected for *TRW* in the second time period (Table 3-1).

In combination across all strata, coverage levels, and fishery monitoring tools, 3,747 trips (43.2%) and 423 vessels (44.2%) were successfully monitored among all fishing in federal fisheries of Alaska in 2021 (Table 3-1).

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

Table 3-1 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 that are not, or are no longer, considered when deploying observers on trips (e.g., FMP area and vessel length). Table 3-2 and Table 3-3 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 3-2 and Table 3-3 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.

3.2. Total Catch and Discards and Amount of Catch Monitored

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 3-4 and Table 3-5 for 2021. 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[20].

In Table 3-4 and Table 3-5, 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.

[20] 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.

These tables can also be used to compare the proportion of catch that occurred in full coverage or the partial coverage categories or the proportion of catch that was monitored for trips in partial coverage. For example:

- In the BSAI and GOA combined, 93.4% of pelagic trawl catch was on trips in the full coverage category and 6.6% was on trips in partial coverage. All partial coverage trips were in the GOA and 27.2% of their catch was monitored;
- In the BSAI and GOA combined, 94.9% of non-pelagic trawl catch was on trips in full coverage category and 5.1% was on trips in partial coverage. Partial coverage trips occurred in both the BSAI and GOA with 44.0% and 20.6% of their catch monitored, respectively.

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 2021 as well as prior years[21].

Discarded Pacific halibut in the IFQ fishery

New for this report are biased-corrected estimates of Pacific halibut discarded in the IFQ halibut fishery. In 2022, NMFS published a 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 (Cahalan and Gasper 2022). This solution has been implemented starting in 2021 and is included in the estimates of directed halibut fishery discard.

3.3. Electronic Monitoring Video Review

This section provides metrics on the results of the EM video review, including information on EM system reliability and image quality. Similar to recent years, video that was collected in 2021 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.

3.3.1. EM Data from fixed gear vessels

NMFS approved 169 vessels in the 2021 EM selection pool. Of these, 125 vessels fished at least 1 trip but not all vessels were randomly selected to turn on their EM system. In 2021, there were more overall trips in EM than 2020, with a substantial increase in pot gear trips. There were 279 trips selected or inherited in 2021 from those 125 vessels, which include 195 longline trips and 84 Pot Gear Trips. The information presented here summarizes key points from the PSMFC.

Data reported here is what is available up to the time of the report as reviewed by or on 4/14/2022. As of that date, PSMFC reviewed 248 total EM trips from 93 unique vessels for selected trips from 2021. PSMFC completed reviews of hard drives for 2021 that contained

[21] Available online at: Monitored Catch Tables.

12,882 hauls (e.g., sensor and video completeness). Of the 12,882 hauls, 4,431 hauls 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. Video review was slowed down in 2021 due to severe staffing issues and not getting many applicants for PSMFC reviewer job postings. Although there were 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.

3.3.2. 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. Key findings from 2021 include the following:

- Sensor data was complete on 92% of the trips for 2021, which follows a decreasing trend from 94% of the trips in 2019 and 93% for 2020.
- Video was complete for 82% of trips for 2021, 80% of the trips for 2020, 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 2021, 92% 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, these gaps generally 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 aging 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).

3.3.3. Image Quality

Of the 4,431 hauls reviewed in 2021, 51% of video was high quality, 25.9% was medium quality, and 23.2% was low quality or unusable. Data quality decreased in 2021 due to pot gear data issues as pot hauls are a single pot, and there was a higher percentage of overall pot cod effort in 2021. 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.

3.3.4. 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.

- Video review rates for trips targeting Pacific halibut and sablefish ranged from 0.51 to 0.75 minutes of review per minute of video. Review rates for fixed longline, snap gear and string pot in the halibut fishery are similar (about 0.64 minutes of review per minutes of video). Sablefish longline review rates for string pots and fixed longline are somewhat similar (0.82 and 0.61) while sablefish snap longline review is a little faster (0.51).
- 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 about 0.97, and pots were at 1.27.

3.3.5. 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.

- 136 EM selected trips had associated problems logged by a video reviewer in 2021 as compared to 155 EM selected trips in 2020 that had logged problems. This decrease is a notable trend, and is a hopeful sign that continued improvements are effective.
- In 2021, 90 selected longline trips and 46 pot trips had associated logged problems during video review.

EM Video Review - Logged Problems: In 2021, 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 43 trips. Pot gear had this occur at a high rate than Longline gear in 2021 as of the 46 EM selected Pot Gear trips this issue was recorded a total of 17 times. (36.9% of all Pot Gear trips) 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. Such issues must be self-reported to the EMSP, and may allow for repairs prior to data loss. 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 2021, there were 42 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 are incomplete, hydraulic sensor, and other system problems. This was almost double the amount reported in 2020. This increase is a positive step to improve overall program success.

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.

3.3.6. 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.
- Crab identification to species was identified as an issue in 2021. Crab on EM vessels are never in hand, and must be assigned a group code such as king crab unidentified, or tanner crab unidentified. This is particularly an issue in pot gear trips. CAS estimates crab using rates derived from at-sea observer data in these situations.
- 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. Work is ongoing to create new gear codes, and have discrete reporting by the various gear types.
- 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. 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.

3.3.7. 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 in the future:

- 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, and continued in 2022. 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 2021 a total of 44 vessels did not fish, which is an increase from the 38 vessels that had EM systems and did not fish in 2020. EM systems on boats that did not fish 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).
- Logbooks must be keypunched into data storage systems, and incorporated for stock assessments and other needs.

3.3.8. 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, 71 vessels in 2021, and 80 vessels in 2022. 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.

Preliminary analysis of the trawl EM program was presented to the Scientific and Statistical Committee (SSC) of the NPFMC at the February 2022 NPFMC meeting. The SSC recognized the importance of industry and NMFS collaboration in this program. The SSC provided feedback on additional elements to include in the initial review analysis, which will be presented at the June 2022 NPFMC meeting.

3.4. Observer Training and Debriefing

In 2021, the COVID-19 pandemic still posed many challenges for observers, observer providers, the commercial fishing industry, and NMFS. In spite of those challenges, the Observer Program was able to monitor, with either observers or EM, 43% of fishing trips for all the federal fisheries off Alaska, supporting the fishing communities and the U.S. economy. In 2021, observers collected data on board 296 fixed gear and trawl vessels and at 12 processing facilities for 35,769 observer days (32,672 full coverage days on vessels and in plants; and 3,097 partial coverage days on vessels and plants).

During the 2021 fishing year, approximately 378 individual observers were trained, briefed, and equipped for deployment to vessels and processing facilities operating in the BSAI and GOA groundfish and halibut fisheries. Thanks to the framework established the previous year, in 2021 the Program continued to use a virtual environment for most training and briefing operations.

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 156 new observers to deploy in 2021 in addition to the 222 prior observers who attended a briefing of some type (Table 3-6). Portions of FMA's 3-week observer training class were attended by observer providers, FMA staff, and NOAA Fisheries Office of Law Enforcement.

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, or a combination of methods. The hybridized model for mid-cruise protocols

developed the previous year continued to be utilized in 2021 with some vessels 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, 164 in Dutch Harbor, 8 in Kodiak, and 29 in Seattle. Completing these 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.

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. In 2021, all 532 debriefings were completed virtually by twenty FMA staff located in the Seattle and Anchorage offices.

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 USCG 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 2021 specifically, curriculum focused on the 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.

To limit the potential for COVID-19 transmissions, we continued to hold all briefings and specialized trainings virtually and limited in-person interactions solely to the last week of the three-week trainings. It was recognized that hands on safety and Fish and Crab Identification is vital for new observer trainees, justifying this important hands on interaction. FMA's strategy allowed for continuity of observer deployments and safeguarding those deploying to Alaska fishing communities. Fully operating in the second year of the COVID-19 pandemic, 2021 still proved productive for the FMA Division. Highlights of this success can be found at the AFSC's year in review at https://www.fisheries.noaa.gov/alaska/2021-alaska-fisheries-science-center-year-review#fisheries-monitoring-and-analysis.

3.5. Outreach

While regular communication is a standard component of our operations between the AFSC, AKR, OLE, the NPFMC, and industry constituents, this section highlights noteworthy situations with elevated communications. All were completed virtually in 2021 due to the COVID-19 pandemic.

In the second year of the Exempted Fishing Permit for electronic monitoring in the Bering Sea and Gulf of Alaska pollock fisheries for catcher vessels using pelagic trawl gear, there continued to be substantial coordination and collaboration between the FMA, AKRO, Office Of Law Enforcement, Alaska Groundfish Data Bank, United Catcher Boats, Aleutian East Borough, Pacific States Marine Fisheries Commission, Archipelago Marine Research, and observer providers. Bi-monthly meetings were held with all entities discussing issues or complications that occurred providing input to inform the regulatory development process. It is anticipated that this will become a regulated program in 2024. This project has continued to required extensive staff time and effort to oversee the communication with observers, observer data collections, data management, and flow of data processing. More extensive details for this project are outlined in the Trawl EM section of this document.

Observer providers are vital in the contribution to the management and successful deployment of observers in the Alaska fisheries. Deploying observers in Alaskan fisheries continued to be challenging in 2021 due to the COVID-19 pandemic, with regularly changing mandates and restrictions, not only by location, but also within various fishing companies, vessels and plants. The observer provider's diligence for managing this was critical. On an annual basis, FMA generally meets with the observer providers in the fall. Historically these meetings have focused on program policies, OLE matters, recruitment and retention of observers, etc. In 2021, FMA held two meetings, June and November, with providers. June's meeting specifically address observer provider concerns regarding observer recruitment and retention and an overall anticipated observer shortage. The November meeting's focus was directed specifically on the 2022 training season, logistics for the in-person cold water survival training for all 2022 observers, debriefing strategy once in-person operations commence, the Nation Emergency Measures expiration in March 2022, and OLE updates. These meetings are beneficial to keep lines of communication open, discussion solutions to the challenges, and support them to provide continuous and safe observer coverage to Alaskan fishing fleets.

Table 3-1. -- Number of total vessels (*V*), sampled vessels (*v*), total trips (*N*), and sampled trips (*n*) for each stratum in 2021. 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	118	118	1,849	1,849	100.0	100.0			
EM TRW EFP	46	46	999	999	100.0	100.0			
Full Coverage Total	149	149	2,848	2,848		100.0			
Partial coverage EM: Jan. 1 - Dec. 31									
EM HAL	119	81	656	180	30.0	27.4	24.1	31.0	Yes
EM POT	44	33	267	76	30.0	28.5	23.1	34.3	Yes
EM TRW EFP	34	29	432	142	33.3	32.9	28.5	37.5	Yes
Partial coverage observed: Jan. 1 – Aug. 31									
HAL	242	71	853	106	15.1	12.4	10.3	14.8	No - lower than expected
POT	119	43	558	92	15.0	16.5	13.5	19.8	Yes
TRW	64	33	418	83	16.1	19.9	16.1	24.0	Yes
Partial coverage observed: Sep. 1 - Dec. 31									
HAL	173	63	506	88	17.9	17.4	14.2	21.0	Yes
POT	86	44	341	70	17.6	20.5	16.4	25.2	Yes
TRW	25	22	220	62	21.0	28.2	22.3	34.6	No - higher than expected
Gear-based Total	533	307	4,251	899		21.1			
Zero coverage: Jan. 1 - Dec. 31									
Zero Coverage	320	0	1,555	0	0.0	0.0			
Zero EM Research	2	0	20	0	0.0	0.0			
Total	**956**	**423**	**8,674**	**3,747**		**43.2% Trips; 44.2% Vessels**			

Table 3-2. -- Number of vessels (V), total trips (N), monitored trips (n)[1], and percent of trips monitored (%) in 2021 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[2]	HAL									18	129	129	100.0
	Full	NPT									37	423	423	100.0
	Full	POT									5	26	26	100.0
	Full	PTR									49	1,031	1,031	100.0
	EM TRW EFP (Full)	PTR									46	999	999	100.0
	EM HAL	HAL					6	19	5	26.3	6	14	4	28.6
	EM POT	POT					1	2			6	37	17	45.9
	HAL	HAL					12	61	7	11.5	23	61	7	11.5
	HAL	POT					2	2			2	4	1	25.0
	POT	HAL					2	2						
	POT	POT					7	63	10	15.9	41	176	27	15.3
	TRW	NPT									28	78	13	16.7
	TRW	PTR									1	1		
	Zero	HAL	31	170										
	Zero	POT	3	27										
	BSAI Subtotal		32	196			19	145	22	15.2	208	2,972	2,674	900

[1]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.

[2]Full coverage in this table includes vessels in both the Regulatory and Voluntary Full Coverage strata described in Ch. 3.

Table 3-3. -- Number of vessels (V), total trips (N), monitored trips (n)[1], and percent of trips monitored (%) in 2021 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[2]	HAL									4	8	8	100.0
	Full	NPT									25	137	137	100.0
	Full	POT									3	6	6	100.0
	Full	PTR									27	135	135	100.0
	EM HAL	HAL					81	469	130	27.7	37	164	43	26.2
	EM HAL	POT					9	21	8	38.1	7	15	5	33.3
	EM POT	HAL					17	34	8	23.5	5	11	3	27.3
	EM POT	POT					23	113	21	18.6	18	116	33	28.4
	EM TRW EFP (Partial)	PTR									34	432	142	32.9
	HAL	HAL					177	825	120	14.5	106	442	63	14.3
GOA	HAL	POT					12	33	7	21.2	24	57	4	7.0
	POT	HAL					14	28	6	21.4	28	83	8	9.6
	POT	POT					37	185	38	20.5	73	480	87	18.1
	TRW	NPT									35	222	47	21.2
	TRW	PTR					1	18	4	22.2	30	484	115	23.8
	Zero	HAL	285	1,310										
	Zero	JIG	8	19			6	13						
	Zero	POT	8	35										
	Zero EM Research	HAL					2	20						
	Zero EM Research	POT					1	7						
	GOA Subtotal		290	1,353			272	1,645	316	19.2	234	2,425	744	30.7
Total Unique			314	1,542			277	1,762	335	19.0	365	5,370	3,417	63.5

[1]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.

[2]Full coverage in this table includes vessels in both the Regulatory and Voluntary Full Coverage strata described in Chapter 3.

Table 3-4. -- Monitored catch[1] (metric tons), total catch, and percent monitored (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in 2021 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**	1,732	1,861	**93%**	2,425	15,581	**16%**				4,157	17,442	**24%**
	Discard	712	736	**97%**	1,478	9,553	**15%**				2,189	10,289	**21%**
Jig	**Retained**				0	29	**0%**				0	29	**0%**
	Discard												
Non-Pelagic Trawl	**Retained**	28,654	28,654	**100%**	1,228	5,767	**21%**	5,062	5,062	**100%**	34,944	39,483	**89%**
	Discard	4,747	4,747	**100%**	98	667	**15%**	694	694	**100%**	5,539	6,108	**91%**
Pot	**Retained**	476	476	**100%**	2,414	12,482	**19%**				2,889	12,958	**22%**
	Discard	24	24	**100%**	100	602	**17%**				124	626	**20%**
Pelagic Trawl	**Retained**	1,327	1,327	**100%**	26,253	96,726	**27%**	12,518	12,518	**100%**	40,098	110,571	**36%**
	Discard	90	90	**100%**	191	557	**34%**	60	60	**100%**	340	706	**48%**

[1]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 3-5. -- Monitored catch[1] (metric tons), total catch, and percent monitored (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in 2021 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**	68,416	68,416	**100%**				312	1,836	**17%**	68,728	70,252	**98%**
	Discard	10,350	10,350	**100%**				165	2,100	**8%**	10,514	12,450	**84%**
Jig	**Retained**												
	Discard												
Non-Pelagic Trawl	**Retained**	283,067	283,067	**100%**	21,953	21,953	**100%**	5,849	13,183	**44%**	310,869	318,203	**98%**
	Discard	26,840	26,840	**100%**	1,652	1,652	**100%**	164	476	**34%**	28,655	28,967	**99%**
Pot	**Retained**	2,816	2,816	**100%**				2,120	13,159	**16%**	4,937	15,976	**31%**
	Discard	44	44	**100%**				49	405	**12%**	93	449	**21%**
Pelagic Trawl	**Retained**	626,356	626,356	**100%**	120,683	120,683	**100%**	601,652	601,692	**100%**	1,348,691	1,348,732	**100%**
	Discard	3,066	3,066	**100%**	1,074	1,074	**100%**	936	936	**100%**	5,077	5,077	**100%**

[1]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 3-6. -- Number of observer training classes and number of observers trained/briefed from 8 November 2020 to 19 November 2021.

Training classes	Number of classes	Number of observers trained/briefed
3 week training	10	176
3-day annual	29	217
2-day briefing	1	1
1-day briefing	30	192
Lead Level 2	7	35
Fish and Crab ID Training	20	176
Total	**87**	**797**

4. 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 (FMA) of the Alaska Fisheries Science Center, the fishing industry, and other partners in 2021. It is concerned with reports of potential and prosecuted law violations associated with fishing under Federal jurisdiction in the U.S. Exclusive Economic Zone off Alaska. This chapter is broadly organized into separate sections that define law enforcement terminology (Section 4.1), describe the partners (Section 4.2), explain what constitutes a potential maritime violation (Section 4.3), provide a thorough explanation of what activities are reported under a specified statement heading (Section 4.4), overview the analysis method (Section 4.5) and results (Section 4.6), discuss considerations to improve enforcement (Section 4.7), detail outreach and compliance assistance efforts (Section 4.8), and an overview of OLE's enforcement operations and enforcement actions taken (Section 4.9).

4.1. Terminology

Assignment: Sometimes referred to as an observer assignment. A combination of observer and a unique vessel or plant. It is the unit of measure for analysis of some statement types.

Complaint: A report of a potential violation. Complaints can be reported to enforcement at any time. Complaints might come from observers, the FMA, 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 FMA, typically during debriefing. There are multiple statement headings used to categorize potential violations. A single statement may report one or multiple occurrences of the same potential violation, or it may report occurrences of different violation types falling under the same category. A statement was previously 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 that 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.

4.2. Enforcement & Partners in Alaska

4.2.1. 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's role in protecting fishery 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.

OLE maintains a strong partnership with FMA, and this chapter would not be possible without collaboration and staff from both divisions of NOAA. FMA staff train and debrief fisheries observers and video reviewers, maintain electronic databases and generate analyses of resulting data. OLE assists FMA by providing training and outreach and education materials to observers, discussing compliance concerns with debriefers, and helping to interpret data related to potential law violations. 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 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 the development of observer training and outreach to industry and to guide enforcement operations.

4.2.2. U.S. Coast Guard

It is a high USCG priority to promote fishermen 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.

NOAA Fisheries 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 conduct an independent review of major safety items upon boarding a vessel and the FMA reports any potential safety violations directly to the USCG for review on a case-by-case basis. 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.

4.2.3. Alaska Wildlife Troopers

OLE and the Alaska Wildlife Troopers (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 2021, OLE Enforcement Officers were deployed to the Patrol Vessel *Stimson* for a multi-week patrol 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.

4.3. What are potential maritime law violations?

The unit of measurement of suspected violations is the statement, and this report is concerned with those arising from Fisheries Observers. 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 forwards reports of suspected

violations (termed 'statements') to OLE for investigation. Statements are unique to the observer and vessel or processing plant they were deployed to and are assigned a category and target fishery. Statements contain a record of the number of occurrences for each potential violation that happened during a period of time. The number of occurrences can be the same or far exceed the number of violations. For example, a failure to conduct safety drills potential violation may be recorded once during a 90-day period the observer was on a large catcher processor vessel, resulting in one statement with one occurrence. Conversely, a potential violation of failure to notify the observer prior to bringing fish on board may be recorded for each haul during a three-day period the observer was on a partial coverage vessel, resulting in several occurrences for the one statement.

OLE works closely with the FMA 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 is completed. Statements are forwarded to OLE and/or the USCG, and some become "cases" that are pursued further by OLE. 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 and makes subsequent adjustments to training, outreach, and operations.

4.4. Types of Statements

4.4.1. OLE Priority: Inter-Personal Statements

This group of statement categories covers those issues that impact the observer in a personal way, and are the highest priority for OLE. Intimidation, Coercion, Hostile Work Environment Statements: Statements are written in this category when issues arise during the deployment that creates an environment that adversely impacts the 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.

Disruptive/Bothersome Behavior - Conflict Resolved: Statements are written in this category when issues arise between observers and crew during the deployment that creates 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 within this category may result in OLE contact with involved parties, help inform OLE outreach efforts to industry groups, and provide records that inform future enforcement actions.

Harassment - Assault and Harassment - Sexual Statements: Statements in this category document issues of physical violence or threats thereof; or sexual harassment/assault that occurred during observer deployments. These issues tend to be under-reported.

4.4.2. OLE Priority: Safety and Duties Statements

Interference/Sample Biasing: These statements are written when issues occur that compromise the integrity of observer data. Examples include pre-sorting the catch by the crew before the observer has the chance to collect a sample, or running fish too fast over a flow scale for a sample to be collected.

Safety - NMFS: These statements are recorded when safety issues arise that do not fall under the specified USCG statement types. An example is crew stacking boxes in an area that blocks the exit from an observer sample station.

4.4.3. Coast Guard Statements

These statements document marine casualties, potential MAR-POL incidents, and potential violations of USCG equipment and monthly safety drill requirements. They are applicable across all observer deployments and are shared with the USCG in various forms.

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 statement type is applicable to all observer deployments. FMA responds to marine casualty incidents immediately when they occur through an established emergency in-season communication chain that includes on-call FMA staff, observer providers and the partial coverage contractor, USCG personnel, and any additional agencies that may be involved such as local emergency response teams when applicable. In addition, the FMA maintains a 'weekly safety spreadsheet' that is shared with the Coast Guard, and each incident is documented in a detailed statement at the end of each cruise. The level of detail in the statement text tends to be good for this statement type, 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' categories).

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.

Safety - USCG - Fail to Conduct Drills: 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 because in partial coverage sectors trips tend to be short and observer deployments usually do not span an entire calendar month.

MAR-POL/Oil Spill: These statements document instances of dumping pollutants at sea in potential violation of MAR-POL regulations (including lost pots or gear), or of oil spills/leaks. The statement type is applicable to all observer deployments.

4.4.4. Limited Access Programs Statements

This group of statement categories include statements that record potential violations of regulations specific to limited access privilege program (LAPP) fisheries.

American Fisheries Act (AFA) Statements: These statements document potential violations relating to cameras, sample stations, gear, flow scales, sorting, etc. as specified in AFA regulations. The applicability of this statement category is therefore limited to full coverage Catcher Processor / Mothership (CP/MS) trawl vessels participating in AFA and CDQ fisheries, and full coverage catcher vessel (CV) trawl vessels and full coverage shore-based processors participating in the AFA fishery.

Amendment 80 (A80) Statements: These statements document potential violations relating to bin monitoring requirements, cameras, sample stations, flow scales, and other operational requirements specific to Amendment-80 regulations. This statement category also documents potential violations in the CDQ fishery by vessels in the Amendment-80 program. An important note is that the applicability of this statement category is *not* limited to vessels fishing in the A80 management program. Statements may be written under this category for vessels participating in CDQ, Open Access, or Rockfish Program (RPP) fisheries in the BSAI or GOA when sample station or other issues usually associated with A80 vessels arise (e.g., AFA vessels fishing sideboard yellowfin sole).

Rockfish Program (RPP) Statements: These statements document potential violations that are specific to the Central GOA Rockfish Program. Applicability is limited to trawl CVs and CPs that participate in those fisheries.

IFQ Retention Statements: These statements document potential violations of regulations pertaining to IFQ species retention such as minimum size requirements or mandatory retention.

Catcher Processor Longline Statements: Statements in this category document potential violations relating to flow scales, 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.

4.4.5. Protected Resource and Prohibited Species Statements

This group of statement categories include 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). 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. Generally, these statement categories are applicable to all groundfish sectors with some exceptions.

Amendment 91 Salmon: These statements document 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 CV's in the BSAI AFA sector, and CP/MS pelagic trawl vessels in the BSAI.

Gulf of Alaska Salmon: These statements document 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.

Marine Mammal - Harassment: This statement category is used when marine mammals are harassed, potentially in violation of Marine Mammal Protection Act regulations.

Marine Mammal - Feeding: This statement category is used when marine mammals are intentionally fed in violation of Marine Mammal Protection Act regulations.

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).

Halibut Deck Sorting: This statement category began in 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.

Prohibited Species - Retaining: These statements document unlawful retention of prohibited species.

Seabirds - Avoidance Measures: These statements 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).

Seabirds - Harassment: These statements document activity that may cause harm to a seabird or may disrupt a seabird's normal behavior. This activity includes but is not limited to feeding seabirds, throwing objects at seabirds, cutting seabirds, and striking seabirds.

4.4.6. All Other Statement Types

This is a catch-all category group, and as such, applicability can vary between categories.

Contractor Problems: These statements document potential violations by the observer provider or contractor. This category is applicable to all observers.

Failure to Notify: These statements document instances when the observer is not notified in a timely manner or at all of fish being brought onboard, delivery, or other notice required by regulations. The category is applicable to all observer deployments.

Inadequate Accommodations: These statements document instances where food and accommodations provided to the observer may not meet the standards outlined in regulation. The category is applicable to all observer deployments.

IR/IU: These statements 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).

Miscellaneous Violations: This is a catch-all category for statements written for potential issues that do not fit into any of the other categories. Topics include observer coverage issues and gear issues, among others.

Reasonable Assistance: These statements instances when 'reasonable assistance' is not provided to the observer by the crew to complete their required sampling duties. This category tends to be broad and can encompass a variety of issues related to this.

Record Keeping and Reporting: This category documents instances of logbook or landings inaccuracies and misreporting.

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. It also includes observers being denied access to reports, logbooks, and other documents necessary for an observer to complete their duties. The restricted access may or may not present a safety issue; if it does then a "Safety-NMFS" statement may also be recorded.

4.5. Data Analysis Methods

4.5.1. Changes from prior reports

This section describes the methods used to summarize observer statement data that accounts for differences in the amount of fishery monitoring and fishing to enable fair comparisons between fishery sectors based on different factors. The factors chosen for this analysis are those that are easily identifiable within the observer database for each observer assignment (i.e., a combination of observer and a vessel or processing plant). Table 4.1 lists the factors and a description of each factor. The order and appearance of figures has changed to be consistent and easier to read. The figure depicting "OLE Priority: Interpersonal" per 1,000 days was removed since the unit of measurement for this statement reporting is the observer assignment.

4.5.2. Data Preparation

Databases containing observer statements were queried to include only those statements that occurred during 2021 using the "first occurrence date" field.

The field 'total days deployed' was calculated as the difference between the embark and disembark fields in observer logistics databases for each observer assignment. All analyzed factors – with one exception - are captured in the haul or delivery data recorded by the observer

or the logistics data recorded by the observer provider/contractor: vessel type, gear type, NMFS region, and coverage type (Full or Partial as per ADP definitions). Management program code is not recorded in these data, but was obtained from the Alaska Region's eLogbook and eLandings data and matched to 2021 observer data using cruise, permit, haul and delivery dates, and landing report ID when applicable.

For each day in which a unique combination of factors (factor combinations) were recorded in the observer's haul, delivery, or logistics data, that day was counted as a "deployed 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/MS vessel 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 (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 observer assignment. Therefore, in order to estimate the number of occurrences within each factor combination it was necessary to allocate the number of occurrences recorded for the entire observer/ vessel/plant combination to each factor combination. This was accomplished by first determining the proportion of days within the observer assignment belonging to each factor, and multiplying the total number of occurrences by this weighted proportion. This yielded a new value for the number of occurrences for each factor combination called 'occurrence weights'. Following the earlier example with deployed days, if 80% of the deployment days for an observer vessel/plant assignment were FULL COVERAGE + CP/MS + Non-Pelagic Trawl + BSAI + A80, and the observer recorded a statement for this vessel/plant assignment with 10 occurrences, then 80% (8) of the occurrences are allocated to the FULL COVERAGE + CP/MS + Non-Pelagic Trawl + BSAI + A80 factor combination, while the remaining 20% (2 occurrences) are allocated to the other factor combinations that may have occurred on that observer vessel/plant assignment.

4.5.3. Rate Calculation Method

The methods have been contained in Observer Annual Reports since 2019 (AFSC and AKRO 2019).

To calculate the first rate (occurrences per 1000 deployed days), the occurrence weights were summed for each factor combination, within each statement category. The final rate for each factor combination was calculated as the sum of all occurrence weights divided by the sum of all deployed days for each factor combination:

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

The rate of occurrences per vessel/plant combination was also calculated for the statement category *OLE Priority: Inter-Personal* because these potential crimes affect a person (thereby defining the unit of measure). Here, a single occurrence may be enough to generate enforcement action.

To calculate this second rate, an observer assignment was considered to be associated with a given factor combination if the observer recorded any haul or delivery data within the factor combination. Every observer 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), the number of occurrences were weighted for each factor combination as already described. The rate per observer assignment was then calculated as the sum of all occurrence weights divided by the sum of all observer assignments for each factor combination:

$$R_2 = \left(\frac{\sum Occurrence\ weights}{\sum Observer+Vessel/PlantCombinations}\right).$$

Although in both rate calculations the number of incidents were correctly allocated to the appropriate value of effort (days or observer assignments), data summaries do not attempt to correct for potential under-reporting of statement categories (for example OLE Priority Statements).

Lastly, the overall rates of occurrences per 1,000 deployed days and occurrences per observer/vessel/plant assignment were also calculated broadly for each statement category, without any factor group allocation. These rates are calculated simply by dividing the total number of occurrences in each statement category across all factor groups by a) the total number of deployed days across all factor groups (times 1,000, for occurrences per 1,000 deployed days), and b) the total number of observer/vessel/plant assignments across all factor groups (occurrences per vessel/plant assignment).

4.5.4. Data summaries

Two data summaries were produced to enable rapid comparison of rates across factors. In the first (Table 5-2) we present the total sample size for each factor combination in terms of observer assignments, deployed days, the number of statements written, and the number of occurrences. These give the total numerator and denominator terms for rate calculations although these are not adjusted for each statement category. The resulting rates for each statement category are also included.

Historically the raw number of observer statements over time has been compared in this chapter. The second summary (Table 5-3) attempts to present similar information over the course of two years (comparing the current year's values to last year's values) in terms of total statements, total occurrences, rates of occurrences per 1,000 days (our preferred metric) and per observer/vessel/plant assignment, and the percent of factor groups with at least one occurrence. This last value is useful to describe how widespread a particular violation type may be across

factor groups. For 2021 there were 35 factor groups included in this analysis (those with fewer than 3 distinct observer/vessel/plant assignments were filtered out, for confidentiality), so for 2021 this metric is calculated for each statement type as the number of factor groups that had at least one occurrence divided by 35. Higher values for this metric indicate more widespread potential problems whereas low values indicate this statement may only occur in very specific situations.

4.5.5. Data confidentiality

Efforts were made to protect the identity of individual observers or vessels. In cases where there were fewer than three observer vessel/plant assignments deployed for a factor combination in 2021, that data was excluded from the analyses and data summaries.

4.6. Results

Summaries of the statements, occurrences, and rates for each factor combination and statement category are presented in Table 4.2. The most observer/vessel combinations were within the partial coverage longline IFQ fishery in the Gulf of Alaska (GOA; 172) while the number of total observers and statements were within the full coverage non-pelagic trawl A80 category of the Bering Sea and Aleutian Islands (BSAI). The greatest number of occurrences was within the full coverage pelagic trawl AFA of the BSAI. These results are intuitive, since partial coverage fisheries with many participants will result in many observer/vessel combinations, but the amount of time on each deployment may be small. The fact that the greatest number of statements was within the factor combination with the greatest number of deployed days is also not surprising as these might be expected to be correlated. The greatest number of occurrences being within the AFA factor group may be due to the nature of regulations pertaining to individual hauls - these statements pertain to the proper use of cameras, sample stations, gear, flow scales, sorting, etc.

Table 4.2 also contains summary rates for each broad statement category for each factor group. The full coverage CP POT CDQ BSAI factor combination was notable since it was associated with the greatest OLE Priority occurrences per observer/vessel combination and per 1,000 days. Further clarity of the nature of these and other rates for each statement category are presented in Figure 4-1, Figure 4-2, Figure 4-3, Figure 4-4, Figure 4-5, and Figure 4-6.

4.7. Discussion and Considerations to Improve Compliance

OLE prioritizes response to any activity that may pose a threat to an observer and their data. Reports of potential violations involving rape, sexual assault, sexual harassment, assault, intimidation, coercion, hostile work environment, and safety are of such high importance, that enforcement operations are developed to focus on these statement types.

4.7.1. Trends in reporting

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.

OLE Priority - Inter-Personal

Figure 4-1 details the rate of occurrences per vessel/plant assignment for potential violations involving assault, sexual harassment/assault, and intimidation/coercion/hostile work environment. These data include reports that were resolved by vessel management precluding enforcement actions. It also includes situations where there was some sort of disruptive or bothersome behavior that was resolved onboard. In 2021, there were no occurrences of assault reported by observers.

The highest occurrences of sexual harassment occurred in the CP/MS PTR BSAI AFA sector at a rate of 0.28 per assignment and the CP/MS PTR BSAI CDQ sector at a rate of 0.19 per assignment. The reported offenders in the sexual harassment cases were all crew members. These rates are high due to a large case that involved more than one victim and is currently under investigation.

Cases of sexual harassment also occurred in the processing plants. In the PLANT BSAI AFA sector, the rate of occurrences per assignment was 0.09. For the PLANT sector, there were more occurrences of observers being the reported offender than plant workers. The investigations involving observer-on-observer sexual harassment remain ongoing.

According to Figure 4-1, the highest rate of potential violations involving intimidation, coercion, and hostile work environment was in the PLANT BSAI AFA sector with a rate of 0.23 occurrences per assignment. The majority of these complaints involved observer-on-observer harassment, none of which was resolved in the field. The next highest rate was in the CP/MS PTR BSAI AFA sector. The majority of these occurrences involved vessel personnel; a few occurrences did involve conflict between observers. There were no reported attempts to resolve the events at sea.

Rates for the Disruptive/Bothersome Behavior - Conflict Resolved are found in Figure 4-1. The highest rate in this category was in the CP/MS POT BSAI CDQ sector with a rate of 2.5 occurrences per assignment. At face value, a high rate of conflict resolved may seem positive, as conflicts do arise and it is best that they be resolved at sea before enforcement needs to take formal punitive action. However, in this sector, the burden fell to an observer to resolve conflicts at sea when it should be a mutual endeavor.

OLE Priority - Safety and Duties

According to Figure 4-2, CP/MS POT BSAI OA had the highest rate of interference/sample biasing with a rate of 27.8 occurrences per 1,000 deployed days. Occurrences in this category included tampering with observer gear and interference with an observer's sampling duties that had the potential to impact the observer's data. Any potential negative effects of this interference on data quality was mitigated because the observer communicated quickly and effectively with NMFS staff members.

The second-highest rate of interference/sample biasing was in the CV NPT BSAI OA sector. There were 19.2 occurrences of interference/sample biasing per 1,000 deployment days in this sector.

Figure 4-2 also depicts the rate of occurrences per 1,000 deployment days for general safety. There are multiple sectors that need to be highlighted, as there are similarities in the complaints across all of these sectors. The CP/MS POT BSAI CDQ had the highest rate at 83.6 occurrences per 1,000 deployed days. CV POT GOA IFQ was the second highest at 40.8 occurrences per 1,000 deployed days. The CV NPT BSAI OA sector had 19.2 occurrences per 1,000 deployment days in 2021. CV POT GOA OA had a rate of 24.7 occurrences per 1,000 deployment days. There was an egregious case involving a vessel from the CV NPT BSAI OA that was forwarded to another agency for investigation. Due to the details of complaints in this sector, OLE has recommended to their partners, both the USCG and the Alaska Wildlife Troopers, to be on the lookout for vessels in this sector with the goal of improving safe conditions. Other complaints involving safety included multiple occurrences of no wheel watch being maintained, unsafe work areas, and there were several occurrences of possible drug and alcohol use by crew.

Coast Guard

Figure 4-3 depicts the rate of occurrences per 1,000 deployed days under the USCG statement category. The CV POT GOA OA sector had the highest rate of marine casualty issues at a rate of 24.7 occurrences per 1,000 deployed days and the highest rate of MARPOL/Oil spill issues at a rate of 37 occurrences per 1,000 deployed days. The most common occurrence under the marine causality category is an injury that requires medical treatment. Fishing operations can be dangerous and injuries can occur when the crew is hauling up gear, especially when they feel pressure to quickly reset the pots. Discharge of garbage at sea is more common than oil spills in this sector and is generally seen across all sectors.

Limited Access Programs

According to Figure 4-4, the CP/MS PTR GOA RPP sector had the highest rate of Amendment 80 statements, at 75.4 occurrences per 1,000 deployed days. The majority of potential violations in this sector involved the flow scale. There were multiple occurrences of flow scale inaccuracies, many due to dirty hauls affecting the flow scale sensors. There were also multiple occurrences of flow scale tests repeatedly failing; a flow scale failure in and of itself is not a violation, however, it is a violation for the flow scale to exceed a maximum percent error of 3% and to allow 24 hours to elapse between flow scale tests. Also, in this sector, there were multiple occurrences of bin monitoring cameras failing. The majority of these occurrences were self-reported and the vessel switched to bin monitoring option 1 (see 50 CFR 679.28(i)(1)(i)). However, when the vessels switched to bin monitoring option 1, additional violations occurred such as not notifying the observer before going into the holds while the observer was still conducting their sampling duties. This behavior can negatively impact an observer's data if an observer cannot be sure that there were no attempts to bias the sample before it came out of the tanks. Additionally, there were several occurrences of loose fish on deck that were not immediately transferred to the hold, and several occurrences of hauls being physically mixed.

Protected Resources and Prohibited Species

Figure 4-5 details the rate of occurrences per 1,000 deployed days within the Protected Resources and Protected Species category group. Under the seabird avoidance statement type,

the CV HAL GOA OA sector had the highest rate of occurrences at 454.5 per 1,000 deployed days. There were multiple occurrences where the vessel operators were made aware of the seabird deterrent requirement by an observer but the vessel operator declined its use. Some reasons that vessel operators declined to use the seabird avoidance gear were due to the belief that the gear did not work, the gear could get caught in the propeller, it was dark outside, or there were no birds around. Vessel operators who need seabird avoidance gear can stop by the nearest OLE office to request some.

According to Figure 4-5, the PLANT GOA OA sector had a rate of 98.4 occurrences of issues pertaining to Gulf of Alaska salmon per 1,000 deployed days. The vast majority of these occurrences were due to salmon not being properly sorted; sometimes it was unclear which vessel salmon came from. Observers noted that the sorting belts had so much fish on them that it was nearly a foot deep, making it difficult for sorters to find the salmon. Observers also noted that there were often only two or three sorters on the line.

Figure 4-5 also depicts the rate of issues relating to the Halibut Deck Sorting program. The greatest potential violation rate was 13.8 per 1,000 deployed days in the CP/MS NPT BSAI CDQ sector. This sector includes the same vessels from CP/MS NPT BSAI A80, CP/MS NPT BSAI OA, CP/MS NPT GOA OA, and CP/MS NPT GOA RPP sectors. Some of the occurrences in this category include failure of the video monitoring equipment- specifically the deck cameras, fish being run in the factory while the observer was still on deck, fish being run in the factory while deck sorting was still occurring, and exceeding the allowed time to deck sort. Many of these occurrences were immediately reported to the vessel operator by the observer or noticed, self-reported to OLE by industry, and resolved by the vessel operator.

All Other Statement Types

Figure 4-6 depicts the rate of occurrences per 1,000 deployed days of statement types within the All Other Statement Types category. The PLANT GOA OA sector had the highest rate of failure to notify the observer at 218 occurrences per 1,000 deployed days. In the review of these occurrences, it was clear that a lack of communication was a common theme. Observers need to know the estimated size and timing of an offload in order to establish a proper sampling protocol. Although observers repeatedly asked to be notified of offloads in a timely manner, they were often given less than 10 minutes or no prior notice. When observers are unable to assess the expected delivery to develop an adequate random sampling design, data quality is compromised.

According to Figure 4-6, the CV POT GOA OA sector had the highest rate of failure to provide reasonable assistance to observers at a rate of 703.7 occurrences per 1,000 deployed days and of record keeping and reporting issues at a rate of 469.1 per 1,000 deployed days. Failure to provide reasonable assistance may negatively impact an observer if, for example, an observer is trying to collect a sample but cannot do so due to being ignored by the crew. This may result in the loss of data or affect the observer's sample design. Similarly, record-keeping and reporting issues, such as the recording of inaccurate haul data, may also result in the loss of observer data.

4.7.2. Comparison of 2020 to 2021

Table 4-3 summarizes the observer statements, occurrences, and occurrence rates by type from 2021, and compares these values to those from 2020. Here we highlight five widespread statement categories and discuss their trends from 2020 to 2021.

First, in the *"Disruptive/Bothersome Behavior - Conflict Resolved"* category, 51.4% of all factor groups had at least one occurrence. This indicates that the ability to resolve conflicts amicably at sea was widespread across fishing activities.

The *"Intimidation, coercion hostile work environment"* category of statements were reported widely. Sixty percent of factor groups had at least one occurrence and there was a 55% increase in reports of this violation type per assignment from 2020 to 2021. In general, across all sector groups, there were fewer reports of attempts to resolve intimidation, coercion, and hostile work environments at sea than seen in previous years.

Safety-NMFS issues were also widespread. Sixty percent of all factor groups reportedly had at least one occurrence of a potential safety violation. Overall, the occurrence rate of potential violations in this category decreased 10% from 2020 levels, indicating that outreach efforts may have had some effect. One notable positive change was that in 2020, there was a high rate of occurrences of unsafe work conditions in the PLANT GOA OA sector, and in 2021, this rate was reduced.

Observer statements in the *"Marine Casualty"* category were widely reported. Although sixty-nine percent of factor groups had at least one occurrence, that value was down 12% from 2020. Additionally the overall occurrence rate per 1,000 days decreased by 15% from 2020. Both of these are positive trends over time. However, the fact that Marine Casualty occurrences are still as widespread as they are suggests that observer and vessel safety at sea must remain a top priority focus of the FMA, OLE, and USCG.

"*Record keeping and reporting"* was the most widespread statement type having been reported in 83% of all factor groups. Total occurrences decreased slightly, by 3% since 2020, but overall occurrence rates were still the highest of all statement types.

From the trends indicated from these five categories we conclude that conflicts are inevitable and frequently occur at sea, record keeping and reporting issues continue to be widespread, and statements pertaining to safety is an industry-wide issue. It is important to emphasize safety as repetitious fishing efforts can lead to complacency.

4.8. Outreach and Compliance Assistance

4.8.1. Outreach Letters and Meetings with Industry

In January 2021, multiple outreach letters were sent to the vessel company representatives, coop managers, and plant managers to remind them of the regulatory requirements applicable in general and to their specific sector. They are as follows:

- All sectors received the following outreach letters:
    - "Observer Work Environment" which emphasized the importance of ensuring observers were able to work in a safe environment free from rape, sexual assault, sexual harassment, or any other form of harassment; and
    - "Impacts to Observer Data" which emphasized the requirements for vessels and plants to not interfere with an observer's duties or bias their samples and to provide reasonable assistance as needed.
- All catcher processors received an outreach letter titled "CP Operational Requirements" which discussed the requirements applicable to catcher processors such as at-sea scale requirements, sampling station requirements, and video monitoring system requirements.
- Catcher processors engaged in the Amendment 80 fishery received an outreach letter reminding them of the catch monitoring requirements when fishing in both the BSAI and the GOA.
- Catcher processors authorized to engage in the halibut deck sorting program received an outreach letter reminding them of the requirements that need to be met to deck sort halibut such as having video monitoring, contacting NMFS to arrange a pre-cruise meeting, and having an approved deck safety plan. This letter also emphasized the specific prohibitions applicable to the halibut deck sorting program.
- Catcher vessels, through the applicable coop managers, were issued outreach letters covering general catcher vessel requirements such as marine mammal interactions, prohibited species catch handling, IR/IU retention requirements, vessel monitoring system requirements, and general responsibilities when carrying observers.

Multiple meetings were held between OLE and vessel company representatives or coop managers. These meetings were strictly voluntary and provided an opportunity for industry and OLE to collaborate to address current issues detected in the fishing fleets in general and in specific sectors. A total of 26 meetings were held throughout the year; some companies choose to have two meetings to address issues every 6 months.

4.8.2. Observer Safety and Professionalism

In 2021, there were 14 individual observers who reported other observers for different forms of harassment. Many of these complaints occurred at shoreside processing facilities. Observer-on-observer harassment is a disturbing trend as it is important for observers to support one another and work together. This is a topic of discussion during observer training.

During the course of different investigations, OLE received several reports that observers were engaging in sexual relations with crew members. Observer providers are required to have a policy in place that addresses sexual relations with crew. Sexual relations with crew can be viewed as a conflict of interest and may negatively impact data collection. OLE did not receive any reports of observers coming back to the vessels intoxicated, which has been a complaint in previous years.

4.9. Enforcement Operations and Actions

4.9.1. Enforcement Operations

OLE officers and agents conducted two pulse operations in Dutch Harbor and focused on high priority investigations involving observer safety, sexual assault and sexual harassment of observers, interference/sample biasing of observer data, operational requirements, and other violations that impact observer duties and the resource. The first enforcement operation in February started with a total of 59 incidents containing 219 individual statements detailing potential violations; a total of 50 target vessels or shoreside processing facilities were identified. Over the course of approximately 4 weeks, out of the 219 initial statements, 37 were resolved with compliance assistance, 10 summary settlements were issued, and 29 Written Warnings were issued. A total of 25 statements were closed due to a lack of evidence or were unfounded. A total of 91 of the 219 statements remain open and ongoing. One case of two statements was forwarded to General Counsel for prosecution. Three additional cases involving the safety of observers were initiated. One case involving suspected forced labor was initiated and referred to another agency.

The second pulse operation in August and September resulted in a total of 143 individual complaints. At the end of the operation, 73 complaints were furthered and pending enforcement action; 61 were closed, and nine remain open.

4.9.2. Compliance Assistance, Written Warnings, Summary Settlements, Cases Forwarded for Prosecution

Table 4.4 details the status of statements and the incidents created from the statements.

There were 53 cases consisting of 202 statements that did not rise to the level where formal enforcement action was necessary. Some of these cases involved single isolated occurrences of a violation that was resolved when the observer alerted vessel management to it, or was caught and rectified by vessel personnel. Other occurrences involved single isolated occurrences of unwanted behavior that stopped upon request or was resolved to the reporting observer's satisfaction by vessel or plant management. In these instances where formal enforcement action was not taken, OLE personnel did follow up with observers to ensure they felt safe and that they were satisfied with how vessel/plant management resolved the issue they reported. OLE personnel also followed up with industry to discuss how to prevent future occurrences.

There were 11 cases consisting of 41 separate statements resolved through the issuance of Written Warnings. Written Warnings were issued for safety violations, prohibited species retention, failure to adhere to Amendment 91 bycatch handling requirements, hostile work environment, interference with observer's duties or samples, restricted access, failure to notify the observer of fish being brought onboard, and failure to provide reasonable assistance.

There were 11 cases consisting of 23 separate statements resolved through the issuance of Summary Settlements. Summary Settlements were issued for hostile work environments, failure to adhere to Am91 salmon bycatch handling requirements, safety violations, failure to provide adequate accommodations, prohibited species mishandling, and record-keeping and reporting violations.

Three cases, consisting of five individual statements, were forwarded for prosecution. One of these cases involved the sexual harassment of an observer. Another case, which actually occurred at the end of 2020, involved the assault of an observer. Two cases involved IFQ retention violations, and the fifth case involved failure to maintain a proper wheel watch.

4.9.3. NOAA General Counsel - Enforcement Decisions, Orders and Enforcement Actions

The following enforcement actions were taken during 2021:

- AK1701779; **FV *Seafisher*** – Crewman Iakopo Jake Vae was charged under the Magnuson-Stevens Act with forcibly assaulting and sexually harassing a fisheries observer onboard the vessel. A $24,000 superseding NOVA was issued.
- AK1708652; **FV *Vaerdal*** - Crew member Justin Williams was charged under the Magnuson-Stevens Act with sexually harassing a fisheries observer onboard the vessel. A $24,000 NOVA was issued.
- AK2005521; **FV *Legacy*** - Crew member Tausagi Tusi was charged under the Magnuson-Stevens Act with forcibly assaulting a fisheries observer onboard the vessel. A $72,000 NOVA was issued.
- AK1802015; **FV *Alaskan Lady*** - In an Initial Decision, Administrative Law Judge Susan Biro found crewman Eliman S. Bah liable, and imposed a civil penalty of $20,000, for sexually harassing an observer in violation of the Magnuson-Stevens Fishery Conservation and Management Act. Specifically, Judge Biro found that Bah harassed the observer both by conduct that had sexual connotations, as well as by otherwise creating an intimidating, hostile, or offensive environment. The Judge's decision followed a two-day hearing that occurred on September 1-2, 2021.
- AK2100828; Terry Fisher – Crewman was charged under the Magnuson Stevens Act with one count of harassing a female fisheries observer on board a vessel. A $24,000 NOVA was issued.

Table 4-1. -- Description of factors used in rate calculations. Each factor is used in unique combinations to calculate rates.

Factor	Values	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)
NMFS Region	BSAI	Bering Sea/Aleutian Islands
	GOA	Gulf of Alaska
Gear Type	HAL	Hook-and-Line
	NPT	Non-Pelagic Trawl
	POT	Pot (single, strung, or slinky)
	PTR	Pelagic Trawl
Management Program	A80	Amendment-80
	AFA	American Fisheries Act
	CDQ	Community Development Quota
	IFQ	Individual Fishing Quota
	OA	Open Access
	RPP	Central GOA Rockfish Program (formerly Rockfish Pilot Program)

Table 4-2. -- Deployment days and statement occurrence rates for the unique fishery factor combinations in 2021. Abbreviations follow Table 4.1. Bars indicate relative value compared to other values within that statement category group (column) 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 Proirity: 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	Manag-ment 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	OA	GOA	4	86	0.9	1.7	0	0	0	5.4	0	0	14.8
			CDQ	BSAI	23	486	4.5	15.7	0.062	3.0	0.3	3.3	16.0	5.3	4.4
			IFQ	BSAI	3	37	1.0	7.6	0	0	0	13.7	0	3.2	187.6
			OA	BSAI	51	2777	33.3	294.1	0.036	0.7	0.2	5.9	22.1	19.9	57.1
		NPT	A80	BSAI	167	9478	193.4	856.9	0.293	5.2	8.7	12.1	17.4	36.2	10.8
			CDQ	BSAI	71	1339	26.2	90.5	0.127	6.7	1.0	12.3	17.5	19.3	10.8
			OA	BSAI	56	1483	38.0	86.2	0.193	7.3	1.6	23.8	10.0	11.7	3.8
				GOA	22	685	8.0	26.5	0.067	2.1	0.5	2.3	3.6	14.8	15.2
			RPP	GOA	16	395	8.0	28.7	0.195	7.9	1.1	1.6	27.4	30.6	3.9
		POT	CDQ	BSAI	6	209	5.9	53.2	2.500	71.8	83.6	13.1	0	0	86.1
			IFQ	GOA	3	126	0	0	0	0	0	0	0	0	0
			OA	BSAI	7	144	2.1	5.8	0	0	31.4	8.8	0	0	0
		PTR	A80	BSAI	3	10	0.2	0.6	0	0	0	8.3	41.6	6.2	7.8
			AFA	BSAI	88	4869	97.6	1065.1	0.487	8.8	11.4	19.7	1.5	118.3	59.1
			CDQ	BSAI	51	1245	19.4	88.9	0.258	10.6	14.9	9.9	3.2	7.9	24.9
			RPP	GOA	3	46	1.1	4.6	0.232	15.1	0	0	75.4	0	9.5
	CV	NPT	OA	BSAI	25	423	5.4	12.3	0.152	9.0	0	3.0	0.4	6.9	9.7
			RPP	GOA	40	372	16.1	30.6	0.087	9.4	13.7	10.9	0.4	31.1	16.7
		PTR	AFA	BSAI	99	4302	51.6	249.7	0.083	1.9	2.1	4.4	3.2	2.3	44.1
			OA	GOA	3	8	0.1	0.3	0	0	0	0	5.2	0	31.3
			RPP	GOA	51	368	18.5	27.8	0.049	6.9	10.6	8.0	2.2	11.2	36.8
	PLANT		AFA	BSAI	85	3962	79.7	202.5	0.367	7.9	14.0	2.4	5.6	4.2	17.1
			OA	BSAI	18	674	9.5	42.7	0.019	0.5	47.5	1.5	1.2	5.1	7.6
				GOA	43	1219	26.9	360.8	0.058	2.0	1.3	0.4	0.9	101.8	189.5
PARTIAL	CV	HAL	OA	GOA	9	44	3.0	29.0	0.111	22.7	0	0	0	454.5	181.8
			IFQ	BSAI	14	156	1.3	7.4	0	0	0	12.8	0	0	34.8
				GOA	172	1065	58.6	172.3	0.058	9.4	7.1	13.5	44.3	16.5	70.9
		NPT	OA	BSAI	9	52	4.5	4.5	0	0	38.5	19.2	0	19.2	10.3
				GOA	32	117	14.4	36.6	0.094	25.6	38.5	0	0	44.7	204.0
		POT	IFQ	BSAI	9	38	6.0	6.0	0	0	0	26.3	26.3	26.3	78.9
				GOA	104	746	40.6	167.3	0.019	2.7	51.5	22.2	41.4	0.5	105.9
			OA	BSAI	16	127	1.0	1.0	0	0	0	0	0	0	7.9
				GOA	11	81	6.5	102.0	0	0	24.7	61.7	0	0	1172.8
		PTR	OA	GOA	64	340	24.4	52.2	0.016	2.9	27.9	5.9	0	20.9	95.9
	PLANT		OA	GOA	6	344	2.0	76.0	0	0	0	0	0	0	220.9

Table 4-3. -- Summary of observer statements, occurrences, and occurrence rates by type from 2021, with year-over-year percent change from 2020 (YOY). Abbreviations follow Table 4.1. Bars as per Table 4.2. Maximum values in each column are highlighted in yellow and red for easy reference.

OLE Category	Statement Type	Total Statements		Total Occurrences		Occurrences per Vessel/Plant Assignment		Occurrences per 1000 Days		% of factor groups with at least 1 occurrence	
		n	% change YOY	n	% change YOY	Rate	% change YOY	Rate	% change YOY	Value	change YOY
OLE PRIORITY: INTER-PERSONAL	Disruptive/Bothersome Behavior - Conflict Resolved	31	↗ 20.5%	78	↘ -2.6%	0.076	↗ 4.9%	2.18	↘ -17.2%	51.4%	↘ -3.4%
	Harassment-Assault	0	↓ -100.0%	0	↓ -100.0%	0.000	↓ -100.0%	0	↓ -100.0%	0.0%	↘ -9.0%
	Harassment - Sexual	18	↓ -50.0%	55	↓ -150.0%	0.054	↓ -131.8%	1.54	↓ -185.5%	28.6%	↘ -0.5%
	Intimidation, coercion, hostile work environment	36	↗ 20.0%	87	↑ 51.4%	0.085	↑ 54.9%	2.44	↑ 44.5%	60.0%	↗ 5.2%
OLE PRIORITY: SAFETY AND DUTIES	Interference/Sample Biasing	20	↑ 28.6%	101	↗ 6.5%	0.098	↗ 13.3%	2.83	↘ -6.8%	54.3%	↗ 9.1%
	Safety-NMFS	63	↓ -43.2%	256	↗ 3.0%	0.249	↗ 10.1%	7.17	↘ -10.7%	60.0%	↗ 1.9%
COAST GUARD	MARPOL/Oil Spill	37	↗ 5.1%	107	↓ -52.9%	0.104	↓ -41.7%	3.00	↓ -74.6%	57.1%	↗ 8.8%
	Safety-USCG-Equipment	7	↓ -133.3%	7	↓ -133.3%	0.007	↓ -116.3%	0.20	↓ -166.5%	14.3%	↗ 4.6%
	Safety-USCG-Fail to Conduct Drills	37	↑ 52.6%	61	↑ 67.2%	0.059	↑ 69.6%	1.71	↑ 62.5%	34.3%	↘ -23.8%
	Safety-USCG-Marine Casualty	125	↗ 6.7%	208	↘ -1.0%	0.202	↗ 6.4%	5.83	↘ -15.3%	68.6%	↘ -12.1%
LIMITED ACCESS PROGRAMS	AFA	23	↓ -53.3%	50	↑ 34.2%	0.049	↑ 39.0%	1.40	↗ 24.9%	25.7%	↗ 12.8%
	Amendment 80	53	↘ -15.2%	219	↘ -1.9%	0.213	↗ 5.6%	6.13	↘ -16.3%	20.0%	↗ 0.6%
	Catcher Processer Longline	2	↑ 81.8%	25	↑ 74.0%	0.024	↑ 75.9%	0.70	↑ 70.3%	5.7%	↘ -0.7%
	IFQ Retention	24	↓ -242.9%	160	↓ -162.3%	0.156	↓ -143.2%	4.48	↓ -199.5%	14.3%	↘ -5.1%
	Rockfish Program	1	↑ 100.0%	1	↑ 100.0%	0.001	↑ 100.0%	0.03	↑ 100.0%	8.6%	↗ 8.6%
PROTECTED RESOURCE & PROHIBITED SPECIES	Amendment 91 salmon	34	↑ 29.2%	191	↓ -38.4%	0.186	↓ -28.3%	5.35	↓ -58.1%	20.0%	↗ 0.6%
	Gulf of Alaska Salmon	22	↘ -4.8%	137	↗ 18.0%	0.133	↗ 23.9%	3.84	↗ 6.3%	14.3%	↘ -1.8%
	Halibut Deck Sorting	15	↗ 16.7%	58	↓ -28.9%	0.056	↘ -19.5%	1.62	↓ -47.2%	14.3%	↘ -5.1%
	Marine Mammal-Feeding	20	↘ -5.3%	691	↓ -144.2%	0.672	↓ -126.4%	19.35	↓ -178.8%	25.7%	↗ 3.1%
	Marine Mammal-Harassment	3	↓ -50.0%	5	↓ -66.7%	0.005	↓ -54.5%	0.14	↓ -90.3%	17.1%	↗ 10.7%
	Prohibited Species - Mishandling	27	↑ 27.0%	147	↗ 1.3%	0.143	↗ 8.5%	4.12	↘ -12.7%	57.1%	↗ 5.5%
	Prohibited Species - Retaining	3	↑ 40.0%	14	↑ 87.5%	0.014	↑ 88.4%	0.39	↑ 85.7%	8.6%	↘ -1.1%
	Sample Bias-Marine Mammals	1	↑ 100.0%	1	↑ 100.0%	0.001	↑ 100.0%	0.03	↑ 100.0%	8.6%	↗ 8.6%
	Seabird-Avoidance Measures	2	↓ -100.0%	30	↓ -100.0%	0.029	↓ -85.4%	0.84	↓ -128.4%	5.7%	↗ 2.5%
	Seabird-Harassment	3	↓ -50.0%	4	↓ -33.3%	0.004	↘ -23.6%	0.11	↓ -52.3%	8.6%	↗ 5.3%
ALL OTHER STATEMENT TYPES	Contractor Problems	25	↓ -78.6%	38	↓ -52.0%	0.037	↓ -40.9%	1.06	↓ -73.6%	45.7%	↗ 13.5%
	Failure to Notify	26	↑ 31.6%	309	↘ -21.2%	0.301	↘ -12.3%	8.65	↓ -38.4%	28.6%	↓ -29.5%
	Inadequate Accomodations	18	↘ -5.9%	71	↘ -22.4%	0.069	↘ -13.5%	1.99	↓ -39.8%	31.4%	↗ 5.6%
	IR/IU	8	↓ -60.0%	66	↓ -288.2%	0.064	↓ -259.9%	1.85	↓ -343.4%	17.1%	↘ -8.7%
	Miscellaneous Violations	12	↓ -33.3%	30	↓ -233.3%	0.029	↓ -209.0%	0.84	↓ -280.7%	25.7%	↘ -3.3%
	Reasonable Assistance	25	↗ 7.4%	184	↘ -5.7%	0.179	↗ 2.0%	5.15	↘ -20.8%	51.4%	↘ -3.4%
	Record Keeping and Reporting	89	↗ 2.2%	792	↘ -3.0%	0.770	↗ 4.5%	22.18	↘ -17.6%	82.9%	↗ 2.2%
	Restricted Access	8	↘ -14.3%	71	↗ 15.5%	0.069	↗ 21.6%	1.99	↗ 3.5%	34.3%	↗ 14.9%

Table 4-4. -- Status of Statements and Incidents. The status 'Ongoing' typically involves complex investigations while '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'. A statement may be closed as 'info only' if the observer and vessel operator's communication about a potential violation results in voluntary compliance at sea or if the potential was self-reported.

<table>
<tr><th>Statements</th><th>Incidents</th><th>Statuses</th></tr>
<tr><td rowspan="6">626 Statements received and reviewed in 2021

72 statements did not document an actual violation

554 statements were forwarded to agents and officers</td><td rowspan="6">204 new incidents created (502 statements)

52 statements were added to 17 open incidents</td><td>47 Ongoing (108 statements)</td></tr>
<tr><td>3 Forwarded for prosecution (5 statements)</td></tr>
<tr><td>11 Written Warnings issued (41 statements)</td></tr>
<tr><td>11 Summary Settlements issued (23 statements)</td></tr>
<tr><td>53 Compliance assistance provided (202 statements)</td></tr>
<tr><td>96 Closed - No OLE Action (175 statements)</td></tr>
<tr><td>Excludes 61 Observer Coverage potential violations reported by Agency Staff.</td><td colspan="2">Multiple statements are often combined into a single incident if the same vessel, operator, or company is involved.</td></tr>
</table>

*As of 4/15/2022

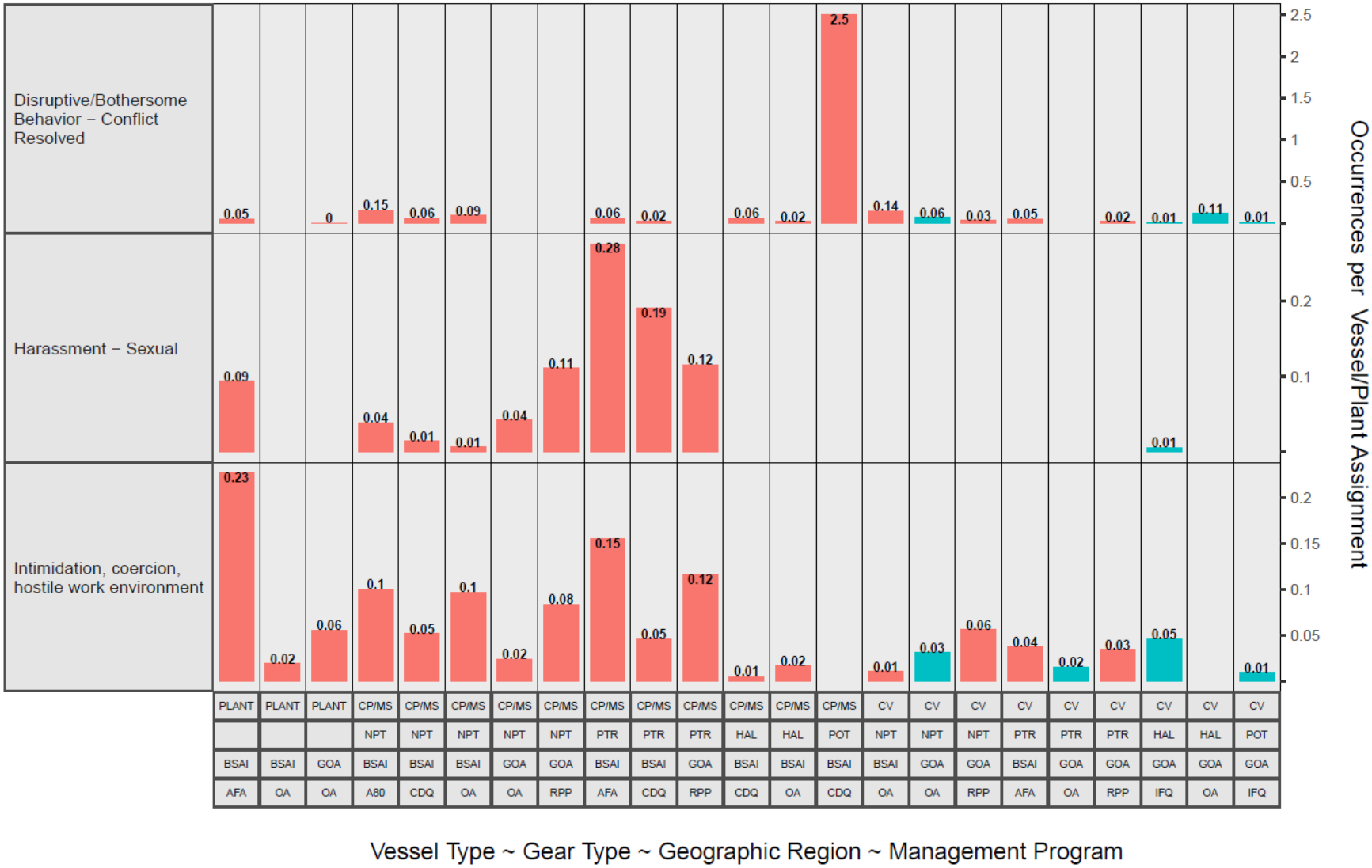

Figure 4-1. -- Rate of occurrences per vessel/plant assignment of statement types within the "OLE Priority: Inter-Personal" category group, by each factor combination where they occurred. All charts start at zero. Red = Full Coverage. Blue = Partial Coverage.

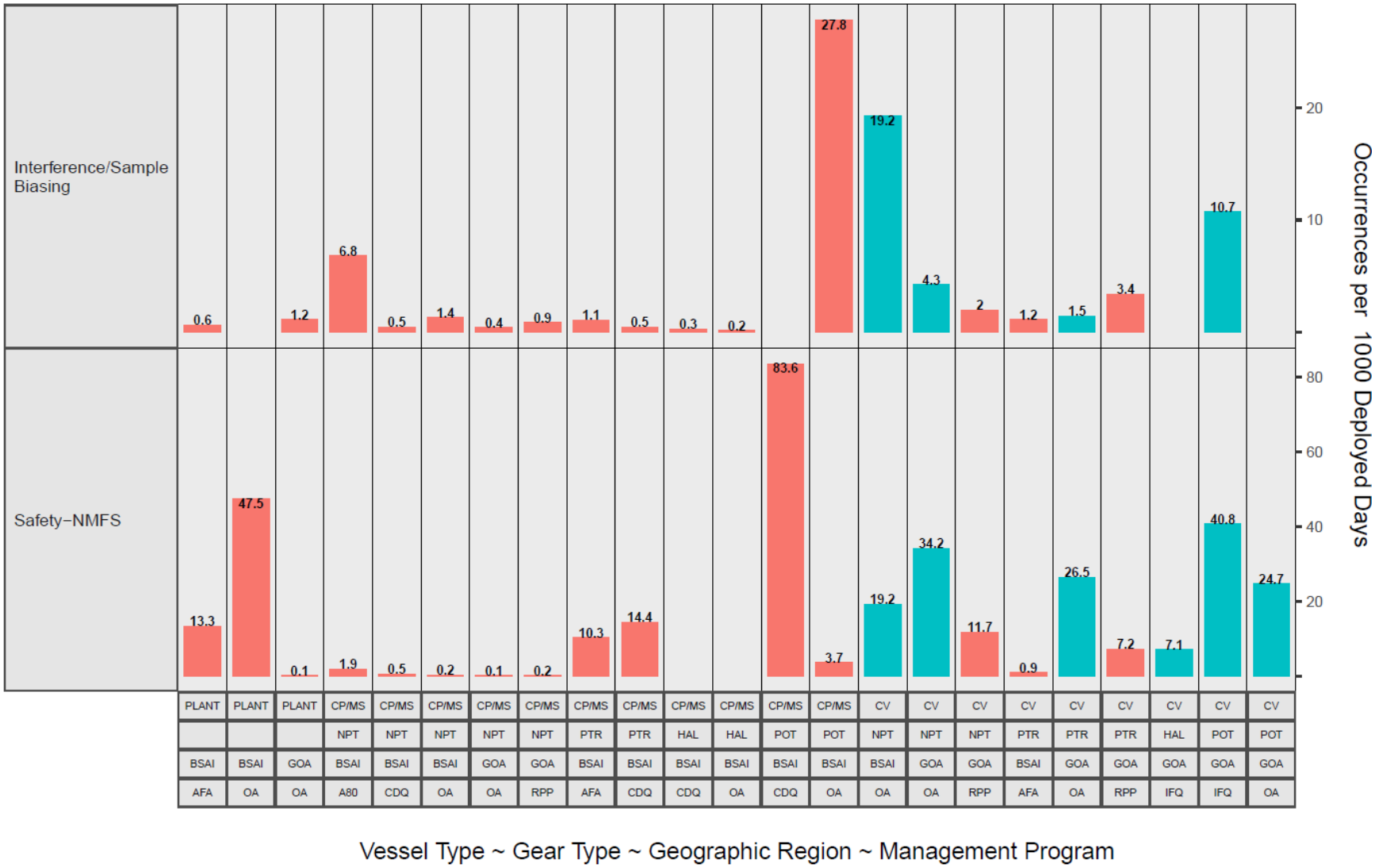

Figure 4-2. -- Rate of occurrences per 1,000 deployed days of statement types within the "OLE Priority: Safety and Duties" category group, by each factor combination where they occurred. All charts start at zero. Red = Full Coverage. Blue = Partial Coverage.

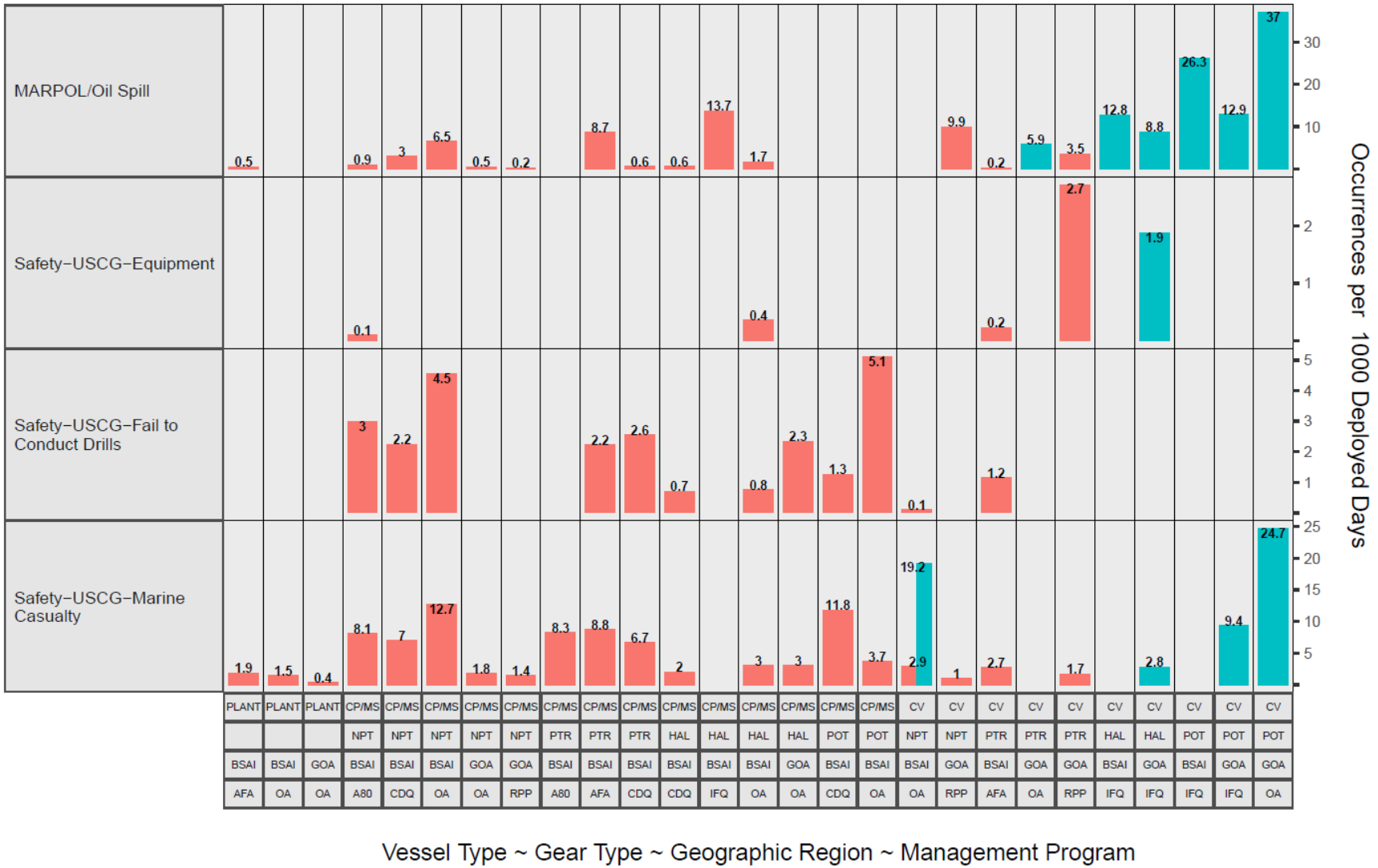

Figure 4-3. -- Rate of occurrences per 1,000 deployed days of statement types within the "Coast Guard" category group, by each factor combination where they occurred. All charts start at zero. Red = Full Coverage. Blue = Partial Coverage.

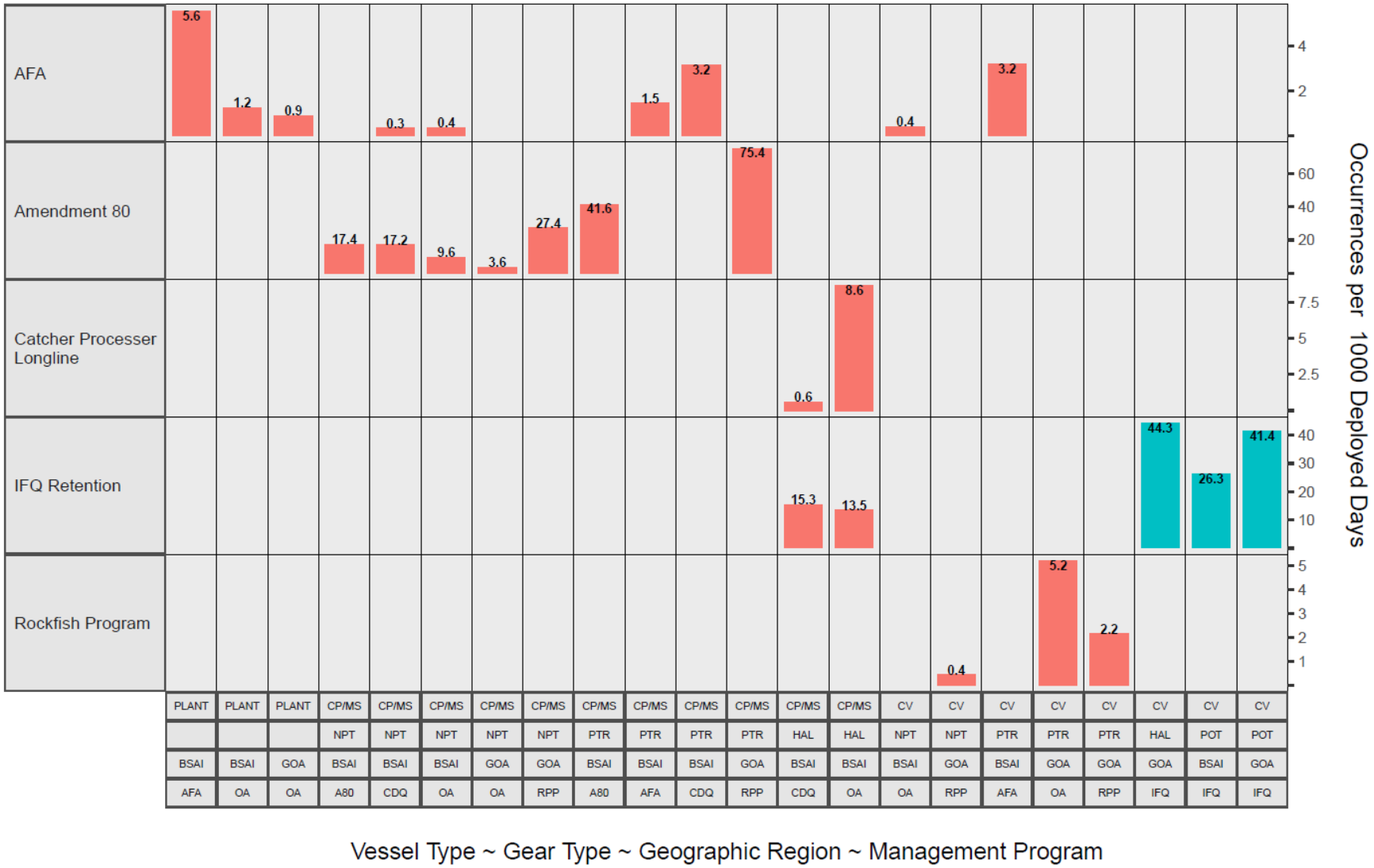

Figure 4-4. -- Rate of occurrences per 1,000 deployed days of statement types within the "Limited Access Programs" category group, by each factor combination where they occurred. All charts start at zero. Red = Full Coverage. Blue = Partial Coverage.

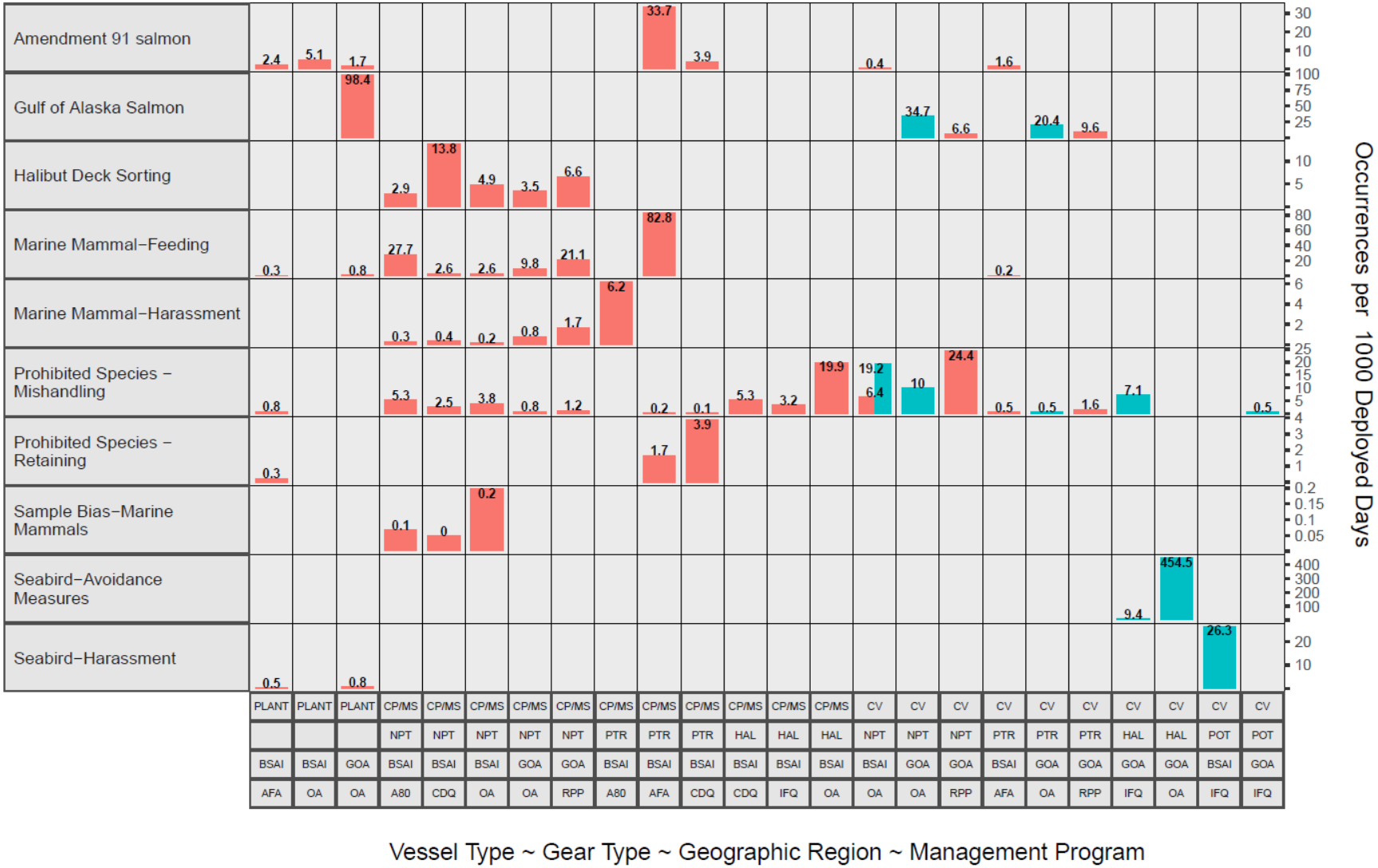

Figure 4-5. -- Rate of occurrences per 1,000 deployed days of statement types within the "Protected Resources and Prohibited Species" category group, by each factor combination. All charts start at zero. Red = Full Coverage. Blue = Partial Coverage.

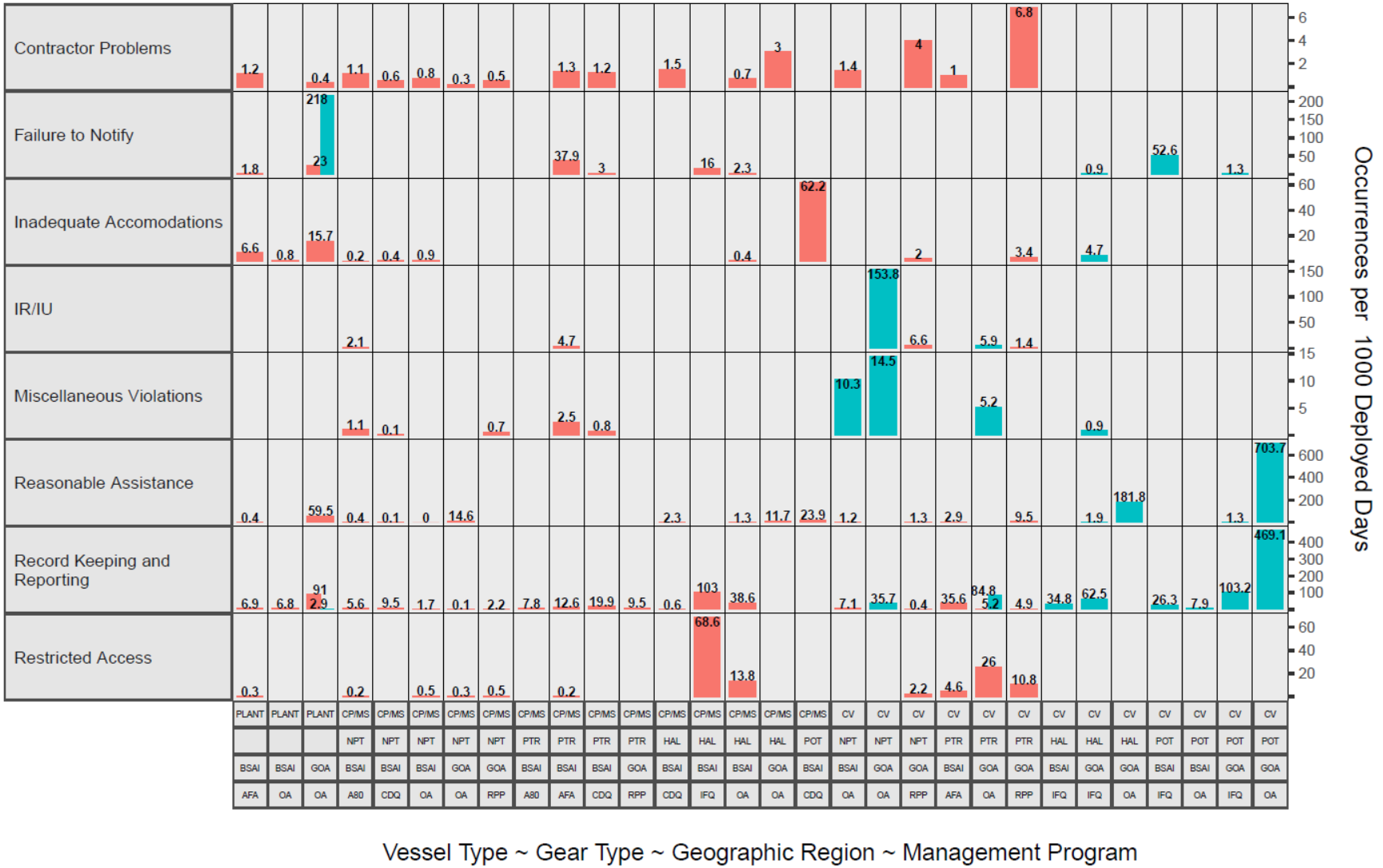

Figure 4-6. -- Rate of occurrences per 1,000 deployed days of statement types within the "All Other Statement Types" category group, by each factor combination where they occurred. All charts start at zero. Red = Full Coverage. Blue = Partial Coverage.

5. NMFS Recommendations

5.1. NMFS recommends the following for the 2023 and 2024 ADPs:

NMFS recommends continuing the development of 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 ADP and include:

- **Observer trip-selection pools:**
    - Three observer coverage strata defined by gear (hook-and-line, pot, and trawl).
    - 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.
- **Fixed Gear EM Selection Pool**
    - EM selection pool composed of up to 170 fixed gear vessels, which would maintain the size of the EM pool from 2022. If additional funds become available, the number of EM boats could increase by Council's recommendation of 30 additional vessels.
        - If funding were insufficient to accommodate all the vessels that request to participate in the EM selection pool, NMFS would prioritize placement in the EM selection pool based on vessel size, fishing effort, minimizing data gaps, and cost efficiency.
    - 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 and the vessel may be removed from the EM pool.
- **Trawl EM EFP**
    - NMFS recommends continuing the pelagic trawl electronic monitoring (EM) EFP in 2023.

    - NMFS supports increasing the number of participants and continuing efforts to improve processor participation.

In addition to developing 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 that could allow a vessel to have multiple VMPs and therefore allow crossover between the fixed gear EM program and the trawl EM EFP.

6. Citations

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Appendix – Electronic Monitoring Innovation Project (EMIP) Summary for 2021

Introduction and Project Background

The primary focus of the EM Innovation Project (EMIP), spearheaded by the AFSC's Fisheries Monitoring and Analysis Division (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 2021, regular deployment and maintenance of research camera systems was not feasible due to the pandemic. The team scaled down deployment of experimental systems and focused on using existing data to develop new algorithms built on previous chute and longline deployments. 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, cataloged 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 develop and train the machine vision algorithms and models needed for the project. The project team then tests the algorithms and models 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 and EMI deployed systems. 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 in 2020 and 2021 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 species identifications on trawl vessels

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. Images of fish passing through the chute were annotated by the CW's EM provider (Saltwater). Chute video and annotations were then transferred 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. A key finding was that categorization models from Alaska collections and the 2021 *Cape Windy* collections did not provide very accurate species identifications. In order to address this issue research was conducted into Domain Adaptation, a field of analysis tools and models to adjust for discrepancies between collections from differing sources. Chute video analysis was a collaboration with the Southeast Fisheries Science Center, which is also pursuing chute applications. Future development and deployment improvements aim to include better matching between chute video and observer collections, facilitate comparisons, and focused collections of identified images for particular species. The trawler deployment also provided real-world tests of these tools for any fishery where they could be useful.

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

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, our partners at UWEE developed computer vision models and algorithms for the detection, tracking and classification of longline fisheries imagery. Running the algorithms and models it is possible to determine fish detections in an image frame, identify those detections to a species classification, and track an individual fish from the waterline to the vessel. These detections, classifications and tracks provide a means to count the catch by species in a given haul or trip. Previously developed models to estimate the length of each catch were based on

previous years' deployments for stereo camera imagery. While results were promising the deployment of stereo camera systems was deemed too cumbersome and unmanageable to deploy and maintain. It was decided to move towards single camera systems, similar to existing EM systems, and develop length estimation models for these monocular camera systems instead. Early development results for monocular image length estimation have been comparable to those of stereo image length estimation for Pacific halibut, length estimation has not been developed or assessed for other species to date due to lack of appropriate data. 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.

In 2021 the project continued to focus on improving the EM Innovation Rail system, primarily focusing the automated analysis algorithms used to extract meaningful catch accounting data from the collections. Deployments continued on two volunteer industry longline vessels during 2021, using IP cameras similar to the standard EM collections from the same fleet to ensure complementary testing data for single camera algorithms.

For one of vessel deployments in 2021, 10,000 frames from six hauls were annotated for training.

These annotations provide multiple backgrounds and weather and lighting conditions for the algorithm to learn from and improve upon.

Iterative development of the detection, tracking and classification models continues based on continued testing results. These models were ported from a Linux environment to a windows environment to enable broader end user adoption. Application development is focused on building deployable applications and functional systems for wider research release and future operational integration. EMI team members and NOAA collaborators tested the detection, tracking and classification models for two distinct uses:

1. Assessment of multi-species detection on commercial fishing vessels of species and count for the purpose of catch accounting. Nine complete hauls from commercial volunteer collections were tested using the single camera algorithms for detection of a fish on the line, tracking of that fish and disposition, and classification to species. Detection and tracking proved robust testing on this data set, with a 99% rate of accurate detection of an object on the line and a 78% accuracy in complete tracking of each event with tracking affected more strongly by region of interest selection by the analyst. Classification to species needed more refinement and the research data set continues to be labeled to include more rare species.

2. Assessment of detection of large sharks caught as bycatch in the commercial fisheries EM program. The detection model was trained using shark images from commercial fishing collected by vendor cameras due to the low numbers of the rare species caught in research derived images. Once additional imagery had been trained in, the detection algorithm performed well with 99% of fish events detected.

The EMI team continues work assessing images from slinky pot gear on IFQ sablefish vessels for potential machine vision applications. The 2021 collection 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

UWEE developed models to detect and track salmon bycatch from plant belt imagery. New video data was collected from a plant in Kodiak during rockfish deliveries. A faster and more accurate salmon detector model was developed late in the year and will be applied to the 2021 rockfish video in 2022. 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. Genetic samples were used to confirm identifications. 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. 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 2021 and sampling protocols were adapted to address issues with distribution of sampling kits introduced by the COVID-19 pandemic.

In 2021, the software application was updated to run in a windows environment to facilitate broader use with detailed instruction for training new models for different species

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