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North Pacific Observer Program 2017 Annual Report

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Contents

Executive Summary

This Annual Report provides information, analysis, and recommendations based on the deployment of observers by the North Pacific Observer Program (Observer Program) during 2017.

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 electronic monitoring (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.

Each year, the Annual Deployment Plan (ADP) describes the science-driven method for deployment of observers on vessels in the partial coverage category (50 CFR 679.51(a)) in the halibut and groundfish fisheries off Alaska. The following year, the agency provides an Annual Report with descriptive information and scientific evaluation the deployment of observers. 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.

Program Summary

- In 2017, approximately 411 individual observers were trained, briefed, and equipped for deployment to vessels and processing facilities operating in the BSAI and GOA groundfish and halibut fisheries.
- Observers collected data on board 418 fixed gear and trawl vessels and at six processing facilities for a total of 41,123 observer days (37,517 full coverage days on vessels and in plants; and 3,606 partial coverage days).
- There were 581 observer debriefings in Seattle, Washington, completed by 27 Fisheries Monitoring and Analysis Division (FMA) staff, 126 debriefings in Anchorage, Alaska, completed by four FMA staff, and 2 debriefings completed in Kodiak, Alaska.
- Through the EM Pre-implementation plan, EM was offered an option for up to 90 hook-and-line vessels and 30 pot vessels. A total of 96 vessels opted into the EM selection pool; 73 fishing predominantly with hook-and-line gear, and 18 fishing predominantly with pot gear.

- The agency continues to find outreach to be a valuable way to share information with fishery participants, to answer their questions, and to get their input on areas of concern and potential solutions. In 2017, NMFS held 12 outreach events in Seattle, Washington; Kodiak and Anchorage, Alaska; Newport, Oregon; and over the phone. In addition, NMFS provided ongoing outreach and coordination meetings with EM service providers and industry participants conducting an exempted fishing permit project to evaluate the feasibility of deck sorting halibut mortality on designated catcher processor vessels in the Bering Sea.

Fees, Budget, and Costs

- The budget for observer deployment in 2017 in the partial coverage category was $4,940,727 and 5,285 days. The budget for 2017 was made up of $3,542,196 in fees (from 2015 landings and carryover funds) and $1,398,531 in federal funds (Section 2.1, Table 2-1).
- Fee billing statements for 2017 were mailed to 107 processors and registered buyers for a total of $3,821,263 in observer fees. (Section 2.1).
- The breakdown in contribution to the 2017 observer fees by species was: 40% halibut, 27% sablefish, 14% Pacific cod, 18% pollock, and 2% all other groundfish species (Table 2-2).
- In 2017, the average cost per observer sea day in the partial coverage category was $935 (based on the cost of $4,940,727 to procure 5,285 observer days) (Section 2.3.2).
- During the first 5 years of the program, the cost for observer days in partial coverage in the North Pacific has been less than most partial coverage, government-contracted observer costs in other regions (Table 2-6).

Deployment Performance Review

A review of the deployment of observers and EM in 2017 relative to the intended sampling plan and goals of the Observer Program is provided in Chapter 3. A set of performance metrics was used to assess the efficiency and effectiveness of observer deployment, with emphasis on the partial coverage category. These metrics provide a method to evaluate the quality of data being collected under the restructured Observer Program. The metrics fall into three broad categories:

- **Deployment Rate Metrics** that evaluated whether achieved sample rates were consistent with intended sample rates (i.e., did we get the coverage rates that we planned to get).
- **Sample Frame Metrics** that quantify differences between the population for which estimates are being made and the sample from which those estimates are derived (i.e., were the trips and vessels that we sampled similar to the rest of the fleet). If the trips and vessels that are sampled (the sample population) are not “representative” of the entire fleet (the whole population), it can result in incorrect conclusions being drawn about the population based on the sample.
- **Sample Size Metrics** analysis to determine whether enough samples were collected to ensure adequate spatial and temporal coverage.

Did We Meet Anticipated Deployment Goals?

Effort Predictions

Based on simulations of 2016 fishing data that were completed for the final 2017 ADP, NMFS expected to observe 3,127 fishing days in 2017. The actual number of observer days in 2017 was 2,591, which was 17% lower than predicted. This was due to less effort than expected in strata with relatively high selection rates (Section 3.6.1 and Fig. 3-1).

Observer Declare and Deploy System (ODDS) Performance

Random selection of trips in the trip selection stratum is facilitated by the ODDS. Users of the system are given flexibility to accommodate their fishing operations; up to three trips may be logged in advance of fishing and trips can be cancelled to accommodate changing plans.

- Logged trips can be either closed (marked as complete) or cancelled. Of the 5,879 total trips logged, 767 were selected, and 136 were cancelled. The cancellation rate for selected trips ranged from 0% for in the tender pot stratum to 40% for the Hook-and-Line Tender and the Trawl Tender strata.
- If a trip is selected for observer coverage and cancelled, then the vessel's next logged trip is automatically selected for coverage. The "inherited" trips impact selection rates and means that final selection rates were greater expected. As the result of the inherit process, selected trips are being delayed and there is a greater number of selected trips later in the year (Section 3.6.2).

Evaluation of At-sea Deployment

- Overall, for all federal fisheries off Alaska, 4,362 trips (37.6%) and 458 vessels (40.3%) were monitored by either an observer or EM (Table 3-5).
- Ten deployment strata were evaluated in 2017, including one full coverage stratum and nine partial coverage strata: six strata defined by gear and tender designation, one EM stratum, one zero coverage stratum, and one zero coverage EM research stratum (Section 3.6.3).
- The EM selection pool has realized coverage rates lower than expected, based on the number of trips where video was reviewed or partially reviewed. However, not all video was reviewed in 2017 because the EM program was in pre-implementation and resources were allocated to higher priority projects. So, this analysis does not include 49 trips for vessels that were equipped with Saltwater EM systems.
- Coverage rates met expected values in the full coverage and four of the six partial coverage strata. However, rates were higher than expected within the pot and trawl strata (Table 3-5). This was the first year in which the coverage rates for trip-selected partial coverage strata differed from expected rates and is likely a result of the inherit process in ODDS (see NMFS recommendations).

A summary of the number of vessels and trips in each strata and realized coverage rates in 2017 are as follows:

Coverage category	Strata	Total vessels	Total trips	Sampled trips	Expected coverage rate	Realized coverage rate	Met expectations?*
Full Coverage	Full	164	3,422	3,422	100.0	100.0	Yes
Partial Coverage	Hook-and-Line	408	2,298	276	11.1	12.0	Yes
	Tender Hook-and-Line	3	4	0	25.0	0.0	Yes
	Pot	104	932	72	3.9	7.7	Higher than expected
	Tender Pot	36	75	4	3.9	5.3	Yes
	Trawl	78	2,090	433	17.6	20.7	Higher than expected
	Tender Trawl	26	69	13	14.3	18.8	Yes
	EM	80	683	142	30.0	20.8	Lower than expected, but not all EM trips were reviewed
No selection	Zero Coverage	396	2,022	0	0.0	0.0	Yes
	Zero Coverage-EM Research	3	36	0	0.0	0.0	Yes

*Coverage levels were within the 95% confidence intervals of the expected value.

Dockside Monitoring

The sampling design used for dockside monitoring in 2017 remained unchanged from previous years. All vessels participating in the BSAI pollock fisheries are in the full coverage category and dedicated plant observers monitor all deliveries to account for salmon bycatch. In the GOA, all pollock trawl catcher vessels are in the partial coverage category and observers deployed on selected trips monitor the delivery at the shoreside processors to obtain counts of salmon caught as bycatch within the trawl pollock fishery and to obtain tissue samples to enable stock of origin to be determined using genetic techniques. When an observed trawl vessel in the GOA delivers its pollock catch to a tender vessel instead of a shoreside processor, the observer is unable to monitor the delivery and collect additional tissue samples. In this situation, the trip would be monitored, but there is no offload monitoring.

A total of 2,329 pollock deliveries to shoreside processors were monitored for salmon in 2017. Of those, 1,980 occurred in ports in the Bering Sea and 349 occurred in ports in the Gulf of Alaska (Table 3-7).

Was the Coverage Representative?

Temporal Patterns

Section 3.7.1 evaluates the possibility for temporal bias in each observed stratum. In 2017, the number of observed trips achieved was never outside of the expected number for any of the tender strata (Fig. 3-3). However, the number of observed trips was outside of the 95% confidence intervals for 60.3% of the year in the hook-and-line stratum, for 94% of the year in the trawl stratum, and for 100% of the year in the pot stratum (Fig. 3-3). In all cases, the observation rate was greater than expected. This is likely a result of the ODDS inherit process, described above, where selected trips were delayed creating a greater number of selected trips later in the year. See NMFS recommendations.

Spatial Representativeness

Overall, the magnitude of the spatial clustering of observed trips was low and does not indicate a large source of bias for the 2017 deployment. For the trawl, hook-and-line, pot tender, and trawl tender stratum the difference from expected was one additional reporting area, which is unlikely to indicate large coverage bias (i.e., clustering) at the reporting area level (Fig. 3-5 and Fig. 3-7). The number of observed trips was lower than expected by 16 trips in area 620 for the trawl strata (Fig. 3-7) and more than expected by 4 trips in areas 518 and 519 for the hook-and-line strata (Fig. 3-5). The pot strata showed spatial clustering, with three reporting areas showing more significant departures in deployment than expected; however, the pot stratum and all three tender strata had a relatively low sample sizes that reduced our ability to make inferences.

Trip Metrics

Section 3.7.3 examined six trip metrics including: the number of NMFS areas visited in a trip, trip duration (days), the weight of the landed catch (in metric tons[t]), the vessel length (m), the number of species in the landed catch, and the proportion (0 to 1) of the landed catch that was due to the most predominant species (pMax). The trip metrics were used to evaluate observer effects to determine if observed trips are similar to unobserved trips (Table 3-9):

- Of the six metrics compared in the tender strata (tender pot and tender trawl) there were no metrics with a low p-value. (Note that the tender hook-and-line stratum was not evaluated because there were no observed trips).
- In the pot stratum, one had low p-value. Observed trips were 11.1% (0.4 days) shorter in duration than unobserved trips.
- In the hook-and-line stratum, four metrics had low p-values. Observed trips in this stratum were 15.9% (0.8 days) shorter in duration, landed 7.6% (0.3) more species, landed catch that was 2.8% more diverse, and landed catch that weighed 17.7% (1.2 t) less than unobserved trips.
- In the trawl stratum, four metrics had low p-values. Observed trips were 10.1% (0.2 days) shorter in duration, landed 15% (0.8) fewer species, landed catch that was 2.4% less diverse, and landed catch that weighed 4.2% (4.2 t) less than unobserved trips.

In most cases the effect size of the metrics with low p-values is small. However, several annual reports have shown a pattern of differences between observed and unobserved trips in both the hook-and-line and trawl strata. NMFS agrees with the OSC that it would be beneficial to further evaluate the performance standards used to evaluate observer effects. The original purpose of this set of indicators was to evaluate the differences between the unobserved and observed trips using the information that is available for the two groups (e.g., total weight of landed catch). These metrics have been useful for evaluating whether the deployment of observers into the sampling strata has resulted in a representative sample of trips. However, an evaluation has not been conducted that relates these metrics to at-sea information. Additionally, the magnitude of the differences (the effect size) has not been evaluated relative to whether differences seen between the two groups are meaningful in the context of the overall data. See NMFS recommendations.

Was There an Adequate Sample Size?

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

The results in 2017 were similar to previous years and illustrated that 1) the likelihood of at least one observation is increased with fishing effort and 2) is also increased with an increase in the selection rate (Fig. 3-12). Given the 2017 sampling rates for the six partial coverage trip-selection strata, the probability of having no observed trips in a NMFS Reporting Areas increases quickly above 0.05 when there are fewer trips in a given stratum and area than the following:

- 23 trips in the hook-and-line stratum.
- 36 trips in the pot stratum.
- 38 trips in the tender pot stratum.
- 13 trips in either the trawl or tender trawl strata.

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 2017, AKD received 1,074 statements filed by observers. Each statement is

evaluated and prioritized, and most are forwarded for investigation. AKD also utilizes observer statements to track compliance trends. Trend analysis helps focus and prioritize enforcement efforts, outreach, education, and compliance assistance.

NMFS Recommendations

Recommendations to Improve the 2019 ADP

Trip-selection Pool

- NMFS recommends that the observer trip selection strata implemented in 2018 remain the same for 2019. This follows the Observer Science Committee (OSC) and the Scientific and Statistical Committee (SSC) recommendation to stabilize the sampling design across years. The recommended observer trip-selection for 2019 are as follows:
    - Trawl.
    - Hook-and-line.
    - Pot.
    - Tender trawl.
    - Tender pot.
- NMFS recommends maintaining a single trawl gear stratum (i.e., NPT and PTR in the stratum). The flexibility of vessels to use both gear types adds considerable ambiguity in the sampling plan design and its assessment that cannot be solved by trawl gear type stratification. The realized rates between non-tender trawl gear types were different for NPT and PTR gear in 2017 (Appendix A); however, these differences are accounted for in estimation through the post-stratification process. If there is continued concern about this issue, the Council's new focus on trawl within the EM workgroup (in particular, ongoing research on new ways to account for salmon) could provide longer-term solutions.
- NMFS recommends that the draft 2019 ADP include evaluation of 1) minimum rates that can be afforded; 2) 15% minimum in all strata (as was implemented in 2018); and 3) gear-specific "hurdle" approach. Following the SSC's comments, the gear-specific hurdle analysis could consider both spatial bias for estimation (e.g., sampling rates in each stratum to reasonably expect three observed trips in each NMFS Area) as well as gaps in biological data that may develop at low sampling rates (e.g., length compositions).
- Within budget constraints, NMFS recommends allocating observer deployment beyond the minimum "hurdle" using the using optimization based on discarded groundfish, Pacific halibut, and Chinook salmon. NMFS will also consider other prohibited species catch (PSC) species (crab and herring).

ODDS

- Chapter 3 of this report highlights several consequences of differential cancellation rates that were observed in ODDS including a temporal bias in the hook-and-line, trawl, and pot strata. NMFS recommends formation an agency sub-group to document the way in which the ODDS currently operates and to describe alternatives for how it can be

improved. In particular, the group could explore ways to improve the linkages between ODDS and *e*Landings and ways to reduce the impact of cancellations of trips selected for observer coverage, while still maintaining flexibility for vessels to plan in advance and accommodate changes in fishing plans.

- NMFS also recommends continuing to automatically release vessels 40-57.5 ft in length from observer coverage if the two previous trips were observed trips (i.e., if two trips in a row were observed and a third trip is selected, then the third trip will be released from coverage).

Performance Metrics:

NMFS recommends evaluating the suite of trip metrics used to evaluate observer effect. In particular, evaluating how they relate to at-sea data collections and, to the extent feasible, providing additional information regarding interpretation of effect sizes and p-values (e.g., consideration of sample sizes).

EM Selection Pool

- Now that EM regulations are in place, NMFS will incorporate the EM selection pool into the 2019 ADP, rather than using an EM Pre-Implementation Plan process that was done in 2017. As such, NMFS recommends that the selection rate for the EM selection pool will be determined through the ADP process.
- NMFS recommends continuing trip-selection in the EM pool where trips will be selected prior to departure, so the vessel will only be required to use the EM system on selected trips.
- We have modified this recommendation from the 2018 ADP based on feedback from the Council regarding logistical and cost considerations. However, NMFS will continue to evaluate the monitoring effect in the EM selection pool and, in the future, may recommend post-selection of trips.
- NMFS intends to incorporate EM data from pot vessels into the CAS System in 2019 so the information can be used for in-season management.
- The number of vessels allocated to the EM selection pool will be based on analysis of EM costs and the amount of available funding that is available.
- If there are insufficient funds to support all the vessels that opt into the EM selection pool, NMFS recommends that priority be given to 1) vessels that are already equipped with EM systems and 2) vessels 40-57.5 ft length overall (LOA) where carrying a human observer has been problematic due to bunk space or life raft limitations.

No Selection Pool

Recognizing the challenging logistics of putting observers on small vessels, NMFS continues to recommend that vessels less than 40 ft be in the no selection pool for observer coverage. The agency recognizes that the Council's next priority for EM research has shifted to trawl vessels, so the evaluation of data collected on fixed-gear less than 40 ft will not begin immediately. However, since there is no monitoring data from this segment of the fleet, NMFS does continue

to recommend that vessels less than 40 ft LOA could be considered for the EM selection pool in the future.

Dockside Monitoring and Tendering

- In 2019, NMFS recommends maintaining the status quo for dockside monitoring. NMFS proposed to continue to collect genetic samples from salmon caught as bycatch in groundfish fisheries to support efforts to identify stock of origin. For vessels delivering to shoreside processors in the GOA pollock fishery the sampling protocol would remain unchanged; trips that are randomly selected for observer coverage would be completely monitored for Chinook salmon bycatch by the vessel observer during offload of the catch at the shoreside processing facility. For trips that are delivered to tender vessels and trips outside of the pollock fishery, salmon counts, and tissue samples would be obtained from all salmon found within observer at-sea samples of the total catch.
- NMFS also recommends that the reconstituted EM workgroup consider longer-term solutions for monitoring salmon bycatch in the trawl fisheries, including tender deliveries.

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 2017. 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 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 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 based on the ex-vessel value of groundfish and halibut. On August 8, 2017, NMFS published a final rule to integrate EM into the Observer Program (82 FR 36991). Beginning in 2019, NMFS will use a portion of the fees collected under Section 313 of the Magnuson-Stevens Act to deploy EM systems on vessels in the EM selection pool of the partial coverage category. The observer fee 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 following regulatory and Fishery Management Plan (FMP) amendments have been implemented since 2013 to 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, March 29, 2016). This rule allowed small, non-trawl catcher/processor that met specific criteria to choose to be in the partial observer coverage category. Effective March 29, 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, May 4, 2016). Effective June 3, 2016.
- A regulatory amendment (81 FR 67113, September 30, 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 October 31, 2016.
- BSAI Amendment 114 and GOA Amendment 104 integrated Electronic Monitoring into the North Pacific Observer Program (82 FR 36991, September 7, 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.

1.1. Observer Coverage Categories and Coverage Levels

1.1.1. Full Coverage

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

- Catcher/processors (with limited exceptions).
- Motherships.
- Catcher vessels participating in programs that have transferable prohibited species catch (PSC) allocations as part of a catch share program.
- Catcher vessels using trawl gear that have requested placement in the full coverage category for all fishing activity in the BSAI for one year; and
- 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 halibut and fixed gear sablefish), and the Central GOA Rockfish Program.

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

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

1.1.2. Partial Coverage

The partial observer coverage category includes the following:

- Catcher vessels designated on a Federal Fisheries Permit when directed fishing for groundfish in federally managed or parallel fisheries, except those in the full coverage category.
- Catcher vessels when fishing for 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 halibut and groundfish fisheries off Alaska. The 2017 ADP (NMFS 2016b) is summarized in Section 1.3.

1.2. Annual Planning and Reporting Process

Amendments 86/76 established an annual process of 1) developing an 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 Annual Deployment Plan (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 2017 ADP is summarized in Section 1.3 of this report.

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

The annual planning and reporting process is described below:

- **February – May**: NMFS staff compile the annual report for the previous year. Chapter 3 (the deployment performance review) is prepared by the Observer Science Committee, which is described in more detail in Chapter 3.
- **May – June**: NMFS presents the annual report to the Council (including the Council's Observer Advisory 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 draft ADP, the next annual report, or other reports or analyses for the Council.
- **June – August**: Using information from the prior year's annual report and Council recommendations, NMFS prepares a draft ADP for the upcoming year.
- **September**: NMFS releases the draft ADP in early September each year to allow review by the Groundfish and Crab Plan Teams. The Council's Observer Advisory Committee also reviews the draft ADP prior to the Council's October meeting and provides written recommendations to the Council.

- **October**: The Council and its Advisory Panel and Scientific and Statistical Committee review the analysis used to prepare the draft ADP as well as Plan Team and Observer Advisory Committee recommendations and any input from the public. NMFS reviews and considers comments made by the Council and its committees, however extensive revisions to the analysis used to prepare the draft ADP are not feasible between October and December.
- **December**: NMFS finalizes the ADP by computing the selection rates for the upcoming year using a refined estimate of the total budget and expected fishing effort. Ideally the final ADP will be released to the public prior to the December Council meeting. NMFS also evaluates whether the Environmental Assessment (EA) prepared for Observer Program Restructuring (NPFMC 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 2015c) 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 2017 Annual Deployment Plan

The 2017 ADP outlined the sampling plan for 2017 (NMFS 2016b). The most important goal of the ADP is to randomize observer deployment in the partial coverage category. Sampling that incorporates randomization is desirable at all levels of the sampling design because 1) sampling theory dictates that randomization at all levels allows for unbiased estimation, and 2) sampling is generally preferential over a census because it is more cost efficient, is less prone to bias than an imperfectly implemented census (one subject to logistical constraints), and can result in greater data quality (Cochran 1977).

Since 2008 the Observer Program has employed a hierarchical (nested) sampling design (Cahalan et al. 2014). Starting in 2013, randomization of samples occurs at all levels of sampling. The ADP sets forth the sampling plan with the goal of randomization of observer deployment at the first level of the sampling design — the trip or vessel level. The other sampling levels, including sampling the haul (or set) for species composition, and sampling individual fish to collect lengths, weights, and tissue samples, are achieved through observer sampling methods described in the observer sampling manual (AFSC 2017).

Stratified random sampling, such as is described in the ADP, requires that sample units (such as trips), be assigned to a single stratum and that within a stratum a single sampling design and estimation process is used. Hence, the partial coverage trip-selection stratum and the full coverage stratum are two separate strata and estimation calculations will reflect this. By definition, each trip must be assigned to a stratum before any fishing occurs, the probability of selection must be based on the stratum, and this probability must be known for all observed and unobserved trips.

In their June 9, 2016 motion, the Council requested that the 2017 ADP should explore defining the selection strata by gear type, tender delivery status, and operational sector such as catcher

vessels or catcher/processors. The 2017 ADP allocated observer effort to at-sea deployments on trips belonging to six strata that were defined by gear type and tender delivery status (trawl, trawl tendered, hook-and-line, hook-and-line tendered, pot, and pot tendered) (Table 1-1).

To determine the 2017 selection rates, NMFS used an anticipated budget of 3,127 days as the basis for generating cost estimates under a variety of sampling rates, stratification schemes, and optimization targets (NMFS 2016c). NMFS and the Council supported a six strata design with an optimal allocation strategy based on discarded groundfish (NMFS 2017b). The selection rates described in the 2017 ADP and programmed into the Observer Declare and Deploy System (ODDS) application were as follows:

- No selection (*zero coverage*) – 0%.
- Hook-and-line (*HAL – No Tender*) – 11%.
- Tender hook-and-line (*HAL - Tender*) – 25%.
- Pot (*POT – No Tender*) – 4%.
- Tender Pot (*POT - Tender*) – 4%.
- Trawl (*TRW – No Tender*) – 18%.
- Tender trawl (*TRW - Tender*) – 14%.

Evaluation of deployment in each strata is described in Chapter 3 (note that the strata naming convention utilized in Chapter 3 is listed above in italics).

NMFS recommended, and the Council supported not granting conditional releases in 2017 because of the expanded opportunity for vessels to participate in the EM selection pool with no requirement to carry an observer in 2017. In addition, based on Council input, ODDS automatically released a trip from observer coverage if the two previous trips were observed trips for vessels 40-57.5 ft length overall (LOA), (i.e., two trips in a row were observed, resulting in the third trip being released from coverage).

Under regulations published in 2016, 31 catcher vessels were placed in the full coverage category for all directed fishing for groundfish using trawl gear in the Bering Sea and Aleutian Islands management area (BSAI) for the 2017 calendar year.

1.4. Changes Since the 2017 ADP

Although the focus of this Annual Report is on performance in 2017, changes have been made to the partial observer coverage sampling plan that are being implemented in 2018 (Table 1-1). Here we provide a summary of the changes that have been made since the 2017 ADP.

Notable changes to observer deployment on vessels in the partial coverage category for 2018 include the specific strata definitions, coverage allocation strategy and associated selection rates, and implementation of the EM selection pool. Based on recommendations from the Council in June 2017, NMFS evaluated additional allocation strategies and the cost of EM in the draft 2018 ADP (NMFS 2017c). Following analysis in the Draft 2018 ADP (NMFS 2017c), NMFS adopted the following stratification scheme with sample sizes allocated according to the 15% plus

optimization based on discarded groundfish, Pacific halibut, and Chinook salmon for the 2018 ADP (NMFS 2017b):

- No Selection – 0%.
- EM – 30%.
- Trawl – 20%.
- Hook-and-line – 17%.
- Pot – 16%.
- Tender trawl – 17%.
- Tender Pot – 17%.

The definition of the "no selection pool" in 2018 is similar to that used in 2015, 2016, and 2017 and includes fixed-gear vessels less than 40 ft LOA, all vessels fishing with jig gear (which includes handline, jig, troll, and dinglebar troll gear), and vessels participating in the NMFS-sponsored EM research and development (R&D). Three vessels volunteered to carry R&D stereo camera equipment and were also included in the no selection pool.

On August 8, 2017, NMFS published a final rule to integrate electronic monitoring (EM) into the North Pacific Observer Program. EM deployment in 2018 was funded through a combination of federal funding and additional sources such as from the National Fish and Wildlife Foundation. NMFS placed 141 vessels in the EM selection pool for 2018, including 69 vessels that are new to using EM and 72 vessels that were previous participants with EM systems already installed.

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. CP = catcher/processor vessel; CV = catcher vessel; H&L = hook-and-line gear; LOA = vessel length overall.

<table>
<tr><th rowspan="2">Year</th><th colspan="6">Partial coverage category</th></tr>
<tr><th colspan="3">Observer trip selection pool
Observer coverage required on all randomly selected trips</th><th>EM trip selection pool
EM required on randomly selected trips</th><th>Observer vessel selection pool</th><th colspan="2">No selection pool
Observer coverage not required</th></tr>
<tr><td>2018</td><td colspan="3">Trawl: 20%; Trawl Tender: 17%; H&L: 17%; Pot: 16%; Tender Pot: 17%</td><td>Fixed gear EM trip selection pool: 30%</td><td rowspan="5">n/a</td><td rowspan="5">Vessels <40’ LOA and Jig gear</td><td>EM Innovation Research</td></tr>
<tr><td>2017</td><td colspan="3">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)</td><td rowspan="5">n/a</td><td>Voluntary EM Pre-implementation ~90 vessels</td></tr>
<tr><td>2016</td><td colspan="3">Trawl: 28% (28.0); H&L: 15% (15.0); Pot: 15% (14.7)</td><td>Voluntary EM Pre-implementation 60 vessels</td></tr>
<tr><td>2015</td><td colspan="3">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’</td><td>Voluntary EM Pre-implementation 12 vessels</td></tr>
<tr><td>2014</td><td colspan="3">All Trawl CVs and H&L/Pot vessels ≥ 57.5’: 16% (15.1)</td><td>H&L/Pot CVs >40’ and <57.5’: 12% (15.6)</td><td>Voluntary EM</td></tr>
<tr><td>2013</td><td colspan="3">All Trawl CVs and H&L/Pot vessels ≥ 57.5’: 14.5% (14.8)</td><td>H&L/Pot CVs >40’ and <57.5’: 11% (10.6)</td><td colspan="2">Vessels <40’ LOA and Jig gear</td></tr>
</table>

2. Fees and Budget

2.1. Budget for Partial Coverage Category in 2017

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 fifth 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 2017 that are anticipated to be collected in 2018, as well as the amount of fees collected in 2017 that were obligated to the partial coverage contract to pay for sea days in 2017.

Fee billing statements for 2017 were mailed to 107 processors and registered buyers in January 2018. A total of $3,821,263 in observer fees will be collected once all bills are paid. At the time of this publication, five processors had not yet paid observer fees totaling $22,695. In order to collect delinquent fees, five 30-day notices were mailed in March. Additional notices will be mailed as needed. Processors or registered buyers submitting late fee payments are charged an administrative fee of $25 plus interest on the observer fees with each notice.

At the direction of the Office of Management and Budget (OMB) under sequestration procedures, an estimated $304,356 (7.9%) in observer fees will be held in the Observer Fund (Table 2-1). NMFS has been informed that these remaining funds will be transferred to the AFSC in fiscal year 2019. Note that the federal fiscal year runs from October 1st through September 30th. Therefore, the total authorized transfer of approximately $3,548,246 to the Alaska Fisheries Science Center (AFSC) will fund the final option of the observer deployment contract in fiscal year 2018 from June 17, 2018 to June 16, 2019.

The sequestration of funds initiated under the 2011 Budget Control Act continues to affect the Observer Fund. In 2017 a total of $3,592,750 in observer fees were collected from May 2016 through February 2017. At the direction of the OMB, under sequestration procedures, $273,930 (7.9%) in 2017 observer fees was held in the Observer Fund. NMFS has been informed that these remaining funds will be transferred to the AFSC in fiscal year 2018.

On May 8, 2017 NOAA made an authorized transfer of $3,159,389 to the AFSC to fund observer deployment contracts. On July 10, 2017, NMFS received an additional $151,606 for observer fees collected from March 2017 through May 2017. On August 11, 2017, NMFS received $231,200 in sequestered funds from the previous year (2016). In fiscal year 2017, a total of $1,398,531 in federal funds was used to fund the observer deployment contract (Table 2-1). In addition, a total of $1,270,792 was carried over from fiscal year 2016 to fiscal year 2017. The carryover funds were used to fund the observer deployment contract in 2017. These additional sources of funding brought the total observer funds available for the 2017 observer deployment contract to $6,211,518.62.

Table 2-1. -- Summary of the fees and federal funding for partial coverage observer sea-days from 2013 to 2017 on contract.

Calendar year	Funding category	Funds sequestered (% of fees received)	Observer fees received	Observer fee collections received late	Prior year sequester funds received	Funds obligated to contract	Observer sea days at the start of the year	Observer sea days purchased during the year	Total observer sea days used during the year
2013	Fees						4,535	1,913	3,533
	Federal Funds					$1,885,166			
2014	Fees	$306,047 (7.2%)	$4,251,451			$3,044,606	2,915	4,368	4,573
	Federal Funds					$1,892,808			
2015	Fees	$350,400 (10.2%)	$3,456,458		$306,047	$3,058,036	2,710	5,330	5,318
	Federal Funds					$2,700,000			
2016	Fees	$231,200 (6.8%)	$3,897,938	$370,915	$350,400	$5,144,983	2,722	5,277	4,677
	Federal Funds					$ 390,800			
2017	Fees	$273,930 (7.9%)	$3,592,750	$151,606	$231,200	$3,542,196	3,322	5,285	2,591
	Federal Funds					$1,398,531			
2018	Fees	$304,356 (7.9%)	$3,852,602*		$273,930	$3,822,176			
	Federal Funds								

* Subject to change depending on a variety of factors including sequestration and actual receipts received.

2.2. Fees Collected from 2017, 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 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.[1]

A fee equal to 1.25% of the ex-vessel value is assessed on the landings of groundfish and halibut subject to the fee. Ex-vessel value is determined by multiplying the standard price for groundfish by the round weight equivalent for each species, gear, and port combination, and the standard price for halibut by the headed and gutted weight equivalent. The standard ex-vessel prices used for 2017 fee assessments were published in the *Federal Register* on December 13, 2016 (81 FR 89904).[2] Table 2-2, Table 2-3, and Table 2-4 summarize the observer fees that accrued for 2017.

[1] 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) and shown on page 2 of an informational bulletin titled "Observer Fee Collection" on the NMFS Alaska Region website at: https://alaskafisheries.noaa.gov/sites/default/files/observerfees.pdf

[2] Available online at: https://www.gpo.gov/fdsys/pkg/FR-2016-12-13/pdf/2016-29895.pdf

Table 2-2. -- Observer fees[3] in 2017 by gear, vessel size category, and species or species group for *all areas combined*.

Vessel length category	Halibut	Sablefish	Pacific cod	Pollock	All other groundfish	Total all species
HOOK AND LINE						
< 40	$266,661	$32,405	$5,394	$31	$914	$305,405
40 - 57.5	$575,347	$325,402	$17,783	$94	$8,480	$927,106
> 57.5	$676,477	$516,440	$3,330	$6	$7,322	$1,203,575
Gear Subtotal	$1,518,486	$874,247	$26,506	$131	$16,716	$2,436,087
JIG						
< 40	$341		$36	$1	$72	$450
40 - 57.5	$959		$213	$1	$276	$1,449
> 57.5	$937					$937
Gear Subtotal	$2,237		$249	$2	$348	$2,836
POT						
< 40			$149		$23	$172
40 - 57.5	$424	$21,065	$28,709	$3	$194	$50,395
> 57.5	$2,157	$139,047	$263,600	$30	$1,446	$406,280
Gear Subtotal	$2,581	$160,112	$292,459	$33	$1,663	$456,847
TRAWL						
40 - 57.5		$15	$4	$12,641	$5	$12,665
> 57.5		$8,400	$202,935	$661,610	$39,885	$912,829
Gear Subtotal		$8,415	$202,939	$674,250	$39,890	$925,494
TOTAL ALL GEAR						
	$1,523,304	**$1,042,773**	**$522,152**	**$674,416**	**$58,617**	**$3,821,263**
PERCENT BY SPECIES						
	40%	**27%**	**14%**	**18%**	**2%**	**100%**

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

[3] 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[4] in 2017 by gear, vessel size category, and species or species group in the *Gulf of Alaska*.[5]

Vessel length category	Halibut	Sablefish	Pacific Cod	Pollock	All other groundfish	Total all species
HOOK AND LINE						
< 40	$207,564	$30,273	$5,380	$31	$858	$244,106
40 - 57.5	$489,509	$314,387	$17,707	$94	$8,305	$830,002
> 57.5	$533,567	$499,713	$2,865	$6	$7,108	$1,043,259
Gear Subtotal	$1,230,640	$844,373	$25,953	$131	$16,271	$2,117,367
JIG						
< 40	$341		$36	$1	$72	$450
40 - 57.5	$959		$112	$1	$276	$1,349
> 57.5	$937					$937
Gear Subtotal	$2,237		$149	$2	$348	$2,736
POT						
< 40			$149		$23	$172
40 - 57.5	$424	$21,065	$15,804	$3	$116	$37,412
> 57.5	$2,157	$81,875	$81,489	$30	$1,398	$166,948
Gear Subtotal	$2,581	$102,940	$97,442	$33	$1,536	$204,532
TRAWL						
40 - 57.5		$15	$4	$12,641	$5	$12,665
> 57.5		$8,399	$84,981	$661,261	$39,885	$794,525
Gear Subtotal		$8,414	$84,985	$673,901	$39,890	$807,190
TOTAL ALL GEAR						
	$1,235,458	**$955,727**	**$208,528**	**$674,067**	**$58,044**	**$3,131,825**
PERCENT BY SPECIES						
	39%	**31%**	**7%**	**22%**	**2%**	**100%**

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

[4] The unpaid portion of the observer fees are included. Administrative fees and interest charged for late fee payment are not included.
[5] 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[6] in 2017 by gear, vessel size category, and species or species group in the *Bering Sea/Aleutian Islands*.[7]

Vessel length category	Halibut	Sablefish	Pacific cod	Pollock	All other groundfish	Total all species
HOOK AND LINE						
< 40	$59,097	$2,132	$13		$56	$61,299
40 - 57.5	$85,838	$11,014	$76		$176	$97,104
> 57.5	$142,911	$16,727	$465		$214	$160,316
Gear Subtotal	$287,846	$29,874	$554		$446	$318,719
JIG						
40 - 57.5			$100			$100
Gear Subtotal			$100			$100
POT						
40 - 57.5			$12,905		$79	$12,983
> 57.5		$57,172	$182,112		$48	$239,332
Gear Subtotal		$57,172	$195,016		$127	$252,315
TRAWL						
> 57.5		$1	$117,954	$349		$118,304
Gear Subtotal		$1	$117,954	$349		$118,304
TOTAL ALL GEAR						
	$287,846	**$87,046**	**$313,624**	**$349**	**$573**	**$689,439**
PERCENT BY SPECIES						
	42%	**13%**	**45%**	**<1%**	**<1%**	**100%**

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

[6] The unpaid portion of the observer fees are included. Administrative fees and interest charged for late fee payment are not included.
[7] The Bering Sea/Aleutian Islands includes Pacific halibut regulatory areas 4A, 4B, 4C, and 4D; and sablefish regulatory areas Bering Sea and Aleutian Islands.

2.3. Costs

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 onboard 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 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 the Observer Declare and Deploy System (ODDS) which allows vessel owners to register, edit, and close fishing trips. This application was developed with independent modules for FMA management and the observer coverage services provider, which includes the ODDS call center, 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 constituents.

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 Bering Sea - Aleutian Islands (BSAI) Amendment 86 and Gulf of Alaska (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.

Electronic Monitoring (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 Alaskan fisheries. In April 2014, the Council convened an EM Workgroup to develop alternatives for EM in the small hook-and-line fleet. Several FMA staff participated in the workgroup and have a lead role in planning and executing coordinated research activities that will advance the science of EM and increase efficiencies in interpreting resulting data. In 2017 a total of $2,108,540 in NMFS funds were obligated towards EM in Alaska. Additional funds were also provided by the National Fish and Wildlife Foundation (NFWF) in support of EM deployment.

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.

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.

The observer coverage for the first two years (2013 and 2014) of the program was procured through a 2-year contract awarded to AIS Inc. A second contract was awarded for the subsequent 5 years of the program to AIS, Inc. in April 2015.

Table 2-1 provides a summary of funds obligated and observer days used since 2013.

In 2017, the average cost per observer sea day in the partial coverage category was $935 (based on the cost of $4,940,727 to procure 5,285 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. 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.

The average annual cost per sea day in partial coverage have ranged between $935 and $1,083 since 2013 (Table 2-5). Much of this variation is associated with travel costs in Alaska, which are likely to be higher per trip than other regions of the country. For comparison, information on the average cost per sea day from other regions of the country is provided in Table 2-6. During the first 5 years of the program, the cost for observer days in partial coverage in the North Pacific has been less than most partial coverage, government-contracted observer costs in other regions. Future Annual Reports will continue to provide information and funds spent, days procured, and the average cost per day under the FMA Observer contract and other observer programs across the country.

Table 2-5. -- Average annual observer coverage sea day costs from 2013 to 2017.

Year	Number of observer sea days purchased	Average sea day cost
2013	1,913	$986
2014	4,368	$1079
2015	5,526	$1083
2016	5,277	$1049
2017	5,285	$935

Table 2-6. -- Observer coverage sea day costs for comparable observer programs across the country. Data were provided by each regional program.

		Observer coverage categories and sea day cost			
Program	Year	Federal contract	Coverage type	Direct industry funding	Coverage type
Alaska	2014	$1,079	Partial	$371	Full
	2015	$1,083	Partial	$375	Full
	2016	$1,049	Partial	$383	Full
	2017	$935	Partial	$385	Full
Northeast	2014	$1,200	Partial	$675	Full
	2015	$1,227	Partial	$675	Full
	2016	$1,227	Partial	$700	Full
West Coast	2016	*		$500	
Southeast	2016	$1,500-1,600	Partial	NA	
Pacific	2016	$530-650	Full	NA	

*Contract is administered by the Pacific States Marine Commission and costs are not available to NMFS.

2.3.3. Costs for Full Coverage

The costs associated with the full coverage category are paid by the commercial fishing industry directly to permitted 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, and recruiting. There are currently five active permitted observer providers in Alaska.

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

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

The invoice data were used to calculate the average cost of observer coverage in the full coverage category for 2017. 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 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.

The total cost billed to 170 vessels and processing facilities for observer coverage in the full coverage category in 2017 was $14,931,140. The total number of observer days as reported by observer providers and included in these invoices was 38,791. Based on this information, the average cost per day of observer coverage in the full coverage category in 2017 was $385. This 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 average cost per day in 2017 compares with an average cost of $383 in 2016 and $375 in 2015.

Figure 2-1 summarizes the average costs to fishing and processing vessels in the full coverage category by sector and gear type in 2017. These sector and gear type categories are fixed gear catcher/processors, trawl catcher/processors, and trawl catcher vessels. Invoice data for hook-and-line and pot catcher/processors are combined into a fixed gear category to protect confidentiality. Shoreside processors that take deliveries of Bering Sea pollock are in the full observer coverage category, however, they are not included in Figure 2-1 to protect confidentiality. 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.

Figure 2-1, part (a) shows the average number of observer days per vessel in the three vessel categories, the average cost per day of observer coverage, and the average daily rate observer providers charged for observer coverage. The average daily observer rate (variable costs only) was $345.15 (up from approximately $343.68 in 2016) and was similar across all gear and sector categories. Figure 2-1, part (b) shows the estimated average variable and fixed costs for observer coverage for vessels and processors. Variable costs equal the product of the daily rate for an observer and the number of days of observer coverage. Fixed costs equal total invoiced expenses minus the variable costs and are primarily costs of transporting observers to and from their stations. Across gear and sector categories fixed costs as a percentage of total costs are similar at approximately 10%. More information about the comparison of costs per observer day for full and partial coverage is described in Section 2.4.3.

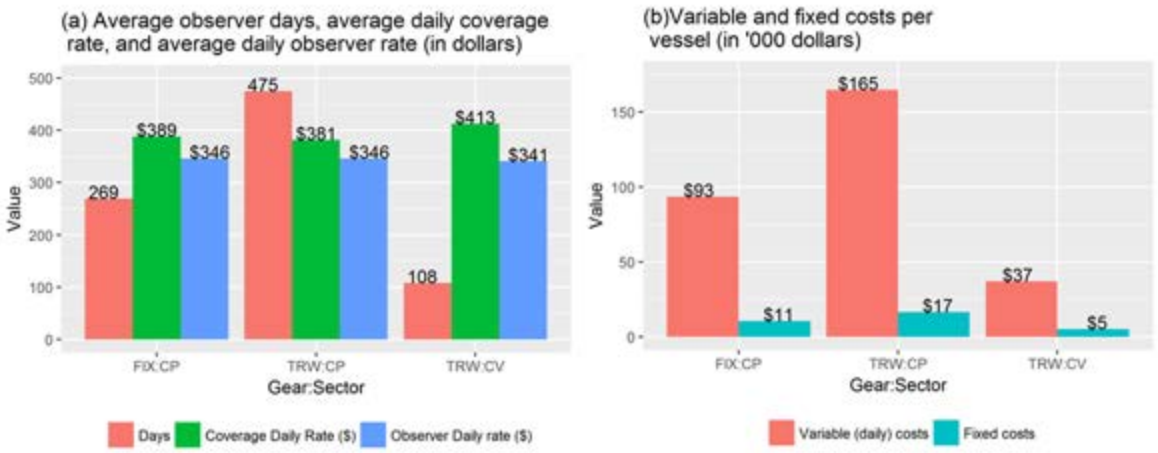


Figure 2-1. -- Full coverage costs by variable costs (a, b) and fixed costs (b) to vessels and processors for observer coverage in the full coverage category in 2017, by gear type (FIX = fixed gear which includes hook-and-line and pot gear, TWL = trawl) and sector (CP = catcher processor, CV = catcher vessel, note the costs for shoreside processing sector is excluded from this figure for confidentiality).

2.3.4. Costs for Electronic Monitoring

The Council has tasked NMFS with implementing EM technology for the purposes of catch estimation on fixed gear vessels 40-57 ft in length and actively participates in its development through the EM Workgroup and EM Pre-Implementation plans. An important component of the new EM program is evaluating costs. In 2016, a simplified fully-loaded daily rate was calculated for the EM program that included significant equipment purchase in addition to operational costs and video review. Combined, the fully loaded EM daily rate in 2016 was $493,044 / 357 days = $1,381 per day. At the time of publication of this report, full-loaded EM costs estimates for 2017 were not available. NMFS will provide updated EM cost information as soon as it is available.

Tracking the overall funds spent on EM deployment has been difficult due to various sources of funding (NMFS and NFWF) and how those funds are administered. NMFS funds are used to pay for a grant with the Pacific States Marine Fisheries Commission (PSMFC), which in turn uses the funds to award a contract with an EM service provider to purchase and install EM systems, and provide field support for vessels participating in the EM selection pool. Video review is done by PSMFC. Additional funding provided by the NFWF has also been used to pay for equipment, and these funds are administered directly by the grant recipient and NFWF outside of the PSMFC grant or contract process. Despite the challenges inherent in funding and developing a voluntary EM program in Alaska, the program has benefitted greatly from supplementary NMFS funds and additional NFWF funding. In the future, NMFS will likely have a contract for EM that would allow for better tracking of annual EM deployment costs.

In preparation for the May 2018 EM Workgroup meeting additional cost information was provided by the EM service provider Archipelago Marine Research Ltd. (AMR). In their cost

analysis of the 2017 EM program, AMR divided the estimated costs between one-time expenses (as with a pilot program), amortized costs (for infrastructure, equipment, and capacity building, where the benefit extends over several years and the cost is proportioned among each of those years), and recurrent costs. On this basis, AMR estimates that the cost of an ongoing program similar to the 2017 EM pre-implementation program would be approximately $478,526/year. Based on the number of sea days in 2017 (706), this would result in an average sea day rate of $677 per day (without video review included).

In the future, EM costs will be 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 April 22, 2015. 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 June 16, 2019. NMFS has engaged with the Acquisition and Grants Office (AGO) to begin the process for renewal of the contract. Considerable preparatory work is required to complete the necessary steps toward issuing a new request for proposals (RFP). AGO anticipates a pre-solicitation notice will be published April 2018 and award will be made on or about April 2019.

In 2017, AGO attended OAC meetings and held an “Industry Week” for the new observer and Electric Monitoring (EM) contracts. Question and answer sessions took place at those meeting to develop a Performance Work Statement (PWS) encompassing both observer and EM services. The drafted PWS was published on Federal Business Opportunities (FBO) to collect all comments from industry and responses were published December 15, 2017 (see https://www.fbo.gov/index?s=opportunity&mode=form&id=65498648f2b641a8c1e148d338b24e5a&tab=core&_cview=1). Since the closing of the comment and answer period, FMA and AGO

have decided to separate the two requirements into two separate contracts. Furthermore, notices for EM services may be published on FBO at a later date.

2.4.2. Full Coverage

NMFS has implemented regulations that govern the terms of observer deployment (e.g., limiting deployment the duration, setting minimum qualifications, requiring specific experience for observers assigned to certain deployments, etc.). Efficiencies could potentially be gained by increasing competition, reducing constraints, or increasing efficiency of activities supported by NMFS.

The majority of business is conducted by three of the five 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. Increasing the proportion of time spent at sea 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.

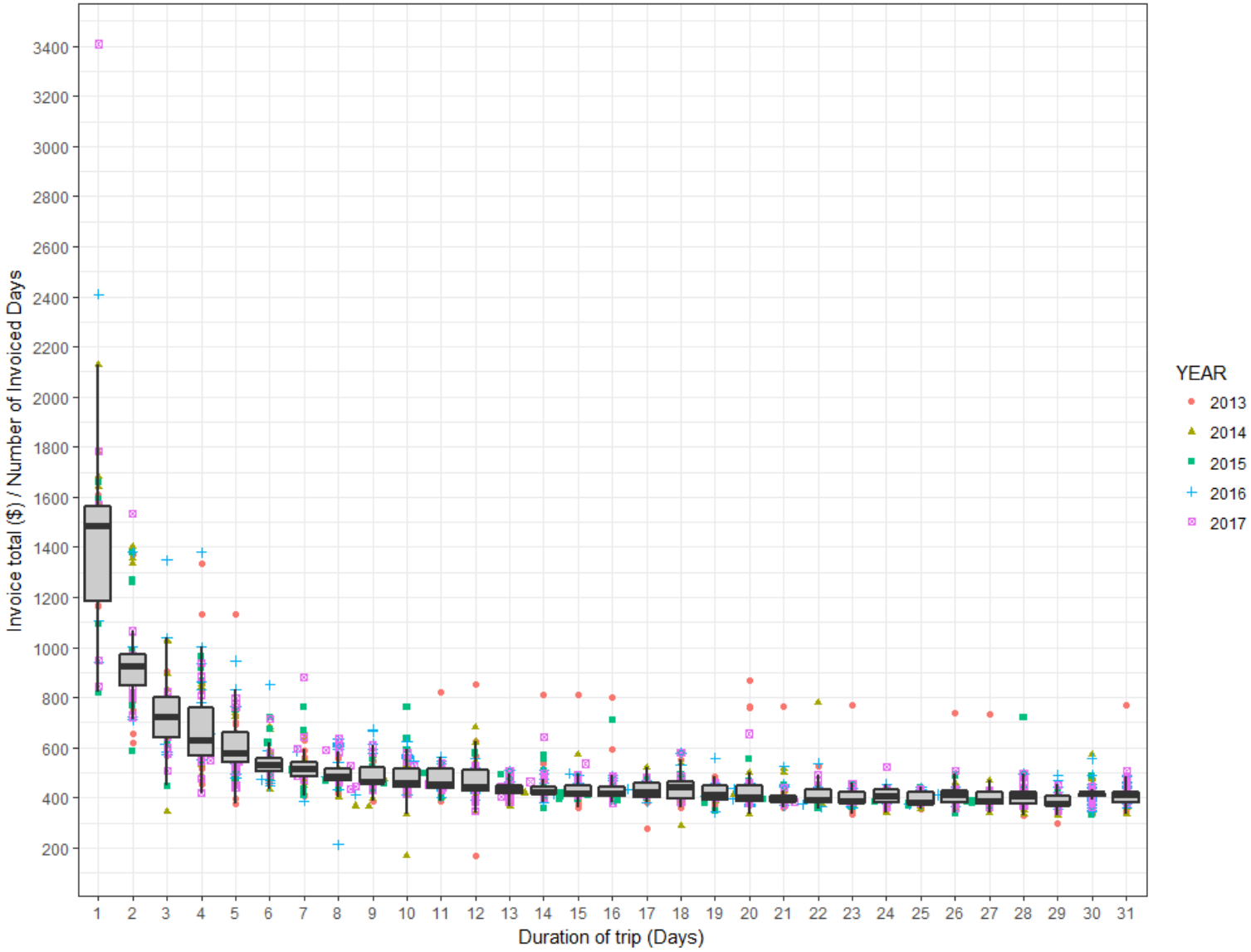
- Observers in the partial coverage category are often deployed out of many small, remote port locations which increases travel and lodging costs.
- Observers in the partial coverage category are often only deployed on a vessel for one trip which is significantly shorter (1 to 5 days) than the typical 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 show in Table 2-5. For example, in 2016, the fully loaded rate was $5,535,781 ÷ 5,277 days = $1,049 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 $383 per day. Compared to a partial coverage observer that may be deployed onto multiple vessels for 1-5 days at a time, an observer deployed onto a full coverage vessel boards once and may stay on that vessel for a month or more. Assuming the costs of paying an observer for a day and maintaining an observer provider infrastructure are constant, the fixed costs are likely to be dominated by travel and temporary housing. These fixed costs as a proportion of the total cost for an observer deployment will decline with increased deployment duration. Therefore, the fully loaded rate of an observer day will also decline with an increase in the number of invoiced days for a given vessel in a given month. We can illustrate this phenomenon using the full coverage invoice database maintained by FMA. The per-day base rate for observer coverage per permitted provided 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.

Figure 2-2. -- Relationship between the fully loaded cost per day for full observer coverage as a function of the duration of the trip.



3. Deployment Performance Review

3.1. Introduction

Each year the Alaska Fisheries Science Center's (AFSC) Fisheries Monitoring and Analysis (FMA) Division establishes an ad hoc Observer Science Committee (OSC) for the North Pacific Observer Program. The OSC provides scientific advice in the areas of regulatory management, natural science, mathematics, and statistics as they relate to observer deployment and sampling in the groundfish and halibut fisheries of the Bering Sea and Aleutian Islands (BSAI) and the Gulf of Alaska (GOA). OSC members have analytical and scientific expertise relating to observer sampling of groundfish and halibut fisheries of the BSAI and GOA and the use of the resulting data. If possible, the OSC is represented by at least one member of the AFSC/FMA (Observer Program) Division, one member of the AFSC/Stock Assessment and Multispecies Assessments Program, one member of the Alaska Regional Office, Sustainable Fisheries Division (SF), and one member of the International Pacific Halibut Commission (IPHC).

This chapter contains the OSC review of the deployment of observers in 2017 relative to the intended sampling plan and goals of the 2017 Annual Deployment Plan (ADP) (NMFS 2016a). This review identifies where possible biases exist and provides recommendations for further evaluation, including potential improvements to the observer deployment process that should be considered during the development of the 2019 ADP.

The goal of the Observer Program is to achieve a random deployment of observers and EM into fisheries to collect representative data used to estimate catch and bycatch, assess stock status, collect fishery-dependent biological information used in population and ecosystem modeling efforts, and make salmon bycatch stock-of-origin determinations, among other objectives. Therefore, this evaluation focuses on the randomization of observer deployments into primary sampling units, and how departures from a random sample affect data quality. Although this report includes evaluations of EM deployment, current evaluation of this tool is limited in scope due to its pre-implementation status in 2017.

3.2. The Sampling Design of the Observer Program

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

Within a stratum, observers are deployed randomly to either vessels for a predetermined period of time (termed vessel-selection), or to individual fishing trips (termed trip-selection). In both cases, this initial deployment to the fishery is the first level of the sampling hierarchy and defines the primary sampling unit (PSU; either vessel-periods or individual trips). The list of all PSUs in a stratum defines the sampling frame and should equate to the population of interest for that

sampling stratum (e.g., all trips taken by trawl vessels fishing in the Alaska Exclusive Economic Zone). In cases where the sampling frame (list of PSUs) for a stratum does not include all the elements of the stratum (i.e., where some fishing occurs in the stratum but is not captured by the sample frame), the resulting information from sampling may not represent the population of trips. The magnitude and direction of the bias will depend on how different the fishing activities in the sample frame are from actual fishing activity.

For each observed trip, if all hauls cannot be sampled for logistical reasons, hauls are randomly selected to be sampled. This is the next level in the hierarchy; the secondary sampling units are defined as hauls within a trip. Randomization of haul selection is designed to allow observers to record and transmit data, attend to other non-sampling responsibilities, and to allow observers time to sleep and eat. Haul selection is determined using the random sampling tables and random break tables provided by NMFS. For each haul, fishing location and effort (e.g., number of hooks) are recorded, while marine mammal and seabird interactions are primarily recorded on randomly selected hauls.

For the randomly selected hauls for each trip, a random sample of the catch is collected and data from those samples are used to determine the species composition and amount of discarded catch. These samples of catch within each haul are the tertiary sampling units, the third level of the sampling hierarchy. While observers are trained to collect multiple large samples of catch, the number and size of samples taken from each haul will depend on the vessel configuration, fishing operations, and diversity of catch.

At the fourth level of the sampling hierarchy, a predetermined number of individual fish of predetermined species is randomly selected from the species composition sample and measured. Lastly, at the fifth sampling level, a random selection of fish is used to collect otoliths, reproductive maturity assessments, stomach contents, genetic tissues and other biological specimens. The number and species of fish selected for measurement and biological specimen collection is specified each year by the AFSC's stock assessment scientists. Sampling rates for genetic tissue collection by observers (e.g., 1 of 10 Chinook salmon caught as bycatch) are set each year by the AFSC's Auke Bay Laboratories.

In summary, the overall sample design used by the Observer Program is a stratified design where within each stratum, NMFS randomly selects primary units (vessels or trips) to be monitored. Within each selected trip, hauls are randomly selected to be further sampled, and marine mammal and seabird interaction data are collected. From each selected haul, a random sample of the catch is collected to obtain species composition and disposition data. From within each species composition sample, individual fish are randomly selected and measured. Finally, from these measured fish, additional fish are randomly selected for the collection of biological specimens. More information on the sampling design used by observers and the relationship between the sample design and catch estimation can be found in Cahalan et al. (2014) and the 2017 Observer Sampling Manual (AFSC 2016). The focus of this report is deployment related and the resulting evaluation is at the trip level of the sampling hierarchy.

Each year, the sampling design of the observer program is translated into an ADP. The ADP details how the sampling design will be implemented by the observer program. A summary of the 2017 ADP can be found in Section 1.3.

3.3. Performance Review Objectives

The following items from the 2017 ADP have been identified as objectives for evaluation in this report:

1. Deploy for the planned number of sea-days. This objective will be considered to be met if the actual number of sea-days expended falls within the range of values from simulated sampling provided in the 2017 ADP. The Observer Program's budget was expected to cover 3,121 days in 2017.

2. Deploy at the coverage rates specified in the 2017 ADP. Following the 2017 ADP, the ODDS was programmed to randomly select logged trips at a rate of 17.57% in the *TRW - No Tender* stratum, 11.09% in the *HAL - No Tender* stratum, 3.88% in the *POT - No Tender* stratum, 14.29% in the *TRW - Tender* stratum, 25% in the *HAL - Tender* stratum, 3.92% in the *POT - Tender* stratum, and 30% in the EM stratum. Partial coverage rates are expected to fall between upper and lower bounds of the expected value from the 0.025 and 0.975 quantiles of a binomial distribution (i.e., a 95% confidence interval), under a randomized deployment scheme.

3. Collect tissue samples from Chinook and chum salmon as specified in the 2017 Observer Sampling Manual to support the goal of collecting genetic samples from salmon caught as bycatch in groundfish fisheries to identify stock of origin. The sampling protocol established in the 2014 ADP (NMFS 2013) was used in 2017. Under this protocol, observers on vessels delivering to shoreside processors in the GOA trawl pollock fishery monitor the offload to enumerate salmon bycatch and obtain tissues for genetic analysis from the salmon bycatch. For trips that are delivered to tender vessels and trips outside of the pollock fishery, observers obtain salmon counts and tissue samples from all salmon found within at-sea samples of the total catch.

4. Minimize the number of conditional releases from observer coverage issued. The NMFS aimed to not grant conditional releases or temporary exemptions to vessels subject to observer coverage. It was expected that no conditional releases would be granted in 2017.

5. Randomize deployment of observers into the partial coverage category of fishing activities. This randomization is used to collect observer and EM samples that are representative of the entire fishing fleet (observed and monitored trips are equivalent to unobserved and unmonitored trips within a stratum). Evaluation of this objective is focused on the randomization of observer and EM deployments into primary sampling units, and how departures from a random sample affect data quality.

3.4. Observer Deployment Performance Metrics

Performance metrics have been developed to assess whether the trip-selection process (through the implementation of the 2017 ADP) provides a representative sample of fishing trips in the North Pacific in 2017. These metrics reflect four mechanisms that can impact the quality of the data: sample frame discrepancies, non-response, differences in trip characteristics, and sample size.

The performance metrics used in this evaluation are as follows:

1. Deployment rates for each stratum: This is the basic level of evaluation for comparing targeted and achieved sampling rates, where sampling strata are partitions of the entire population about which we want to make inferences (e.g., generate estimates of catch). Implementation challenges can be identified in this step, such as: sample frame inadequacy, selection biases, and issues with sample unit definitions. Specifically, this section assesses the following:

    A. Sample rates and number of samples relative to intended values.
    B. Quantification of under- and over-coverage rates (sample frame discrepancies). Over-coverage of a population occurs when the sample frame includes elements that are not part of the target population. When these elements are included in the random sample, effort (time, cost) is expended needlessly. Under-coverage results from having a sample frame that does not include a portion of the target population which can lead to biased data if that portion of the population differs from the population included in the sample frame.
    C. Non-response rates. Non-response occurs when randomly selected elements (trips or vessels) are not actually sampled. If these trips or vessels have different fishing behavior (e.g., catch, areas fished) than the rest of the population, the data collected will not represent the entire fleet (non-response bias).

2. Representativeness of the sample: Randomized sampling is a method used to ensure that the results of sampling reflect the underlying population. Departures from randomization can lead to non-representative data and hence potential bias in estimates of the parameters of interest. A randomized sample design is expected to achieve a rate of observed events that is similar across both space and time. Representativeness of the sample was divided into three separate components:

    A. Temporal representativeness
        i. Effort plots: plots of expected and actual observed effort over time. Areas where these two lines deviate from each other are indicative of periods with differential realized sample rates (and potential temporal bias).

B. Spatial representativeness
   i. Maps: Maps provide a visual depiction of the spatial distribution of observer coverage relative to effort in each partial coverage stratum, as well as where low or high coverage rates occurred.
   ii. Probability of selecting a sample and observing a fewer or greater number of trips within an area than would be expected given the implemented sample rates. These data are used to identify departures from anticipated sampling rates.

C. Representativeness of trip characteristics
   i. Consistency of trip characteristics for observed and unobserved portions of the stratum. These metrics are based, in part, on the availability of data for both observed and unobserved fishing activities; for example, data that are reported for all trips on landing reports. Attributes tested in this report include:
      - Trip duration (days).
      - Vessel length (feet).
      - The number of NMFS Areas visited during the trip.
      - The amount of landed catch (metric tons).
      - The number of species in the landed catch (also known as species richness).
      - The proportion of the total landed catch that was due to the most prevalent species (pMax, an inverse a measure of species diversity where an increase in pMax indicates a decline in diversity).

3. Adequacy of sample size: A well-designed sampling program will have a sample large enough to reasonably ensure that the characteristics of interest in the entire target population are represented in the data. Whether the sample size collected was adequate was determined through an examination of the probability of deploying observers at the implemented rate and having no observer coverage in one or more cells (e.g., defined by NMFS Reporting Area and strata).

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

3.5. Changes to This Report from Last Year

3.5.1. Strata Definitions and Deployment Methods

In 2016, observers were deployed through trip-selection into three gear-based strata with separate selection rates: trawl gear (*TRW*; 28.31%), hook-and-line gear (*HAL*; 15.41%), and pot gear (*POT*; 15.24%; NMFS 2015a). In 2017, these gear-based strata were divided on the basis of whether the vessel was delivering to a tender, resulting in the six partial coverage strata mentioned previously in this report. The decision to stratify by tendering status was made in an

attempt to address differences in operation characteristics (e.g., trip length) and logistics, after the results of permutation tests suggested that tender trips differ from non-tender trips (NMFS 2017a, Faunce et al. 2017).

Vessel-selection was not used as a selection method for either observers or EM systems in 2017. In 2016, vessel-selection was used only to select vessels for EM coverage, and the year was divided into four separate selection time periods (NPFMC 2016a). In 2017, trip-selection was used to select EM trips, and the year was not divided into separate time periods (NPFMC 2017).

The year 2017 was the third year of the NMFS Pre-Implementation of Electronic Monitoring (EM) Cooperative Research (NPFMC 2017). In 2016, EM pre-implementation was limited to hook-and-line vessels, and 58 vessels opted into the program. The Final 2017 Electronic Monitoring Pre-Implementation Plan developed by the EM Working Group (EMWG) (hereafter EMWG Plan) allowed for up to 90 hook-and-line vessels and 30 pot vessels to participate in EM pre-implementation in 2017 (NPFMC 2017). The 2017 Annual Deployment Plan included 96 vessels that opted into EM: 73 fishing predominantly with hook-and-line gear, and 18 fishing predominantly with pot gear (NMFS 2016b).

3.5.2. Methodological Changes

The results in this report are presented in largely the same way as in previous years. One difference is that coverage maps for the *HAL - No Tender*, *POT - No Tender*, and *TRW - No Tender* strata of 2017 are presented next to coverage maps for the *HAL*, *POT*, and *TRW* strata of 2016 to allow a comparison of coverage patterns between years. In contrast to previous years' reports, coverage maps that show the proportion of trips covered in each NMFS area have been excluded in favor of coverage maps that use the hypergeometric distribution to show whether the coverage rate observed in each NMFS area was within expected levels. This was done for clarity, since presenting coverage in this way incorporates both the observed and expected coverage rates.

3.6. Evaluation of Deployments in 2017

The deployment of observers into the 2017 federal fisheries in Alaska is evaluated at the level of the deployment stratum because each stratum is defined by a different sampling rate or by a different monitoring method (e.g., observers and EM). In this document, trips in the EM stratum are considered successfully monitored if at least some video was reviewed from a trip. The rationale for defining monitored trips this way is that it is most similar to the way in which trips in other strata are considered observed (i.e., irrespective of whether or not haul information or usable species composition data were collected).

3.6.1. Evaluating Effort Predictions

Each year the NMFS sets an annual budget in terms of observer days. Therefore, how close anticipated observed effort is to actual invoiced effort in each ADP is a function of how well the NMFS predicts effort and how well the NMFS achieves its sampling rate. The observer day budget for 2017 was set at 3,121 days in the 2017 ADP (NMFS 2016b). Based on simulations

using 2016 fishing data conducted a year in advance of deployment for the 2017 ADP, the FMA predicted it would observe 3,127 fishing days at the end of 2017. In 2017, the FMA paid for 2,591 observer days, which was 17 % lower than predicted (Fig. 3-1). This can partially be explained by the fact that the stratum-specific effort predicted in the 2017 ADP (NMFS 2016b) was higher than actual effort by 40.1% in the *TRW - No Tender* stratum and 24.4% in the *TRW - Tender* stratum, and lower than actual effort by 34.7% in the *POT - No Tender* stratum and 7.6% in the *POT - Tender* stratum (Table 3-1). The *TRW - No Tender* and *TRW - Tender* strata had the highest programmed selection rates at 17.57% and 14.29%, respectively, compared to 3.88% and 3.92% in the *POT - No Tender* and *POT - Tender* strata, respectively. Therefore, there was less effort than expected in strata with relatively high selection rates and more effort than expected in strata with relatively low selection rates.

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

The random selection of trips is made by the ODDS. The ODDS generates a random number according to the pre-determined rates and assigns each logged trip to either “selected to be observed” (selected) or “not selected to be observed” (not selected) categories. The NMFS observer provider has access to all selected trip information necessary to schedule observer logistics. Up to three trips may be logged in advance of fishing to provide industry users with flexibility to accommodate their fishing operations.

Logged trips have different dispositions. When initially logged, they are considered pending, and can be either closed or cancelled. Whether these changes can be made by the user (person logging the trip) or must be made by the observer provider (or NMFS) depends on whether or not the trip is selected to be observed, the stratum the trip belongs to, and the timing of the activity. Trips can be closed (marked as complete) by the ODDS user after the planned trip departure date by either entering the dates of the trip and the port processor of the landing, or by selecting from a list of pre-populated landing reports. For partial coverage strata subject to observation, the observer provider is given 72 hours for an observer to board the vessel prior to the trip start. While a trip may be entered into ODDS that is scheduled to start earlier than 72 hours from the time of entry, if selected for observer coverage, the observer provider can opt to delay the start of the trip up to, but not exceeding 72 hours from the time of trip entry. This helps protect the observer provider from the high cost of deploying an observer with little notice. The vessel operator is protected as well by guaranteeing the assigned observer to the vessel up to 48 hours past the planned start of the fishing trip. This rule helps ensure that an observer is available to the boat in case of unforeseen events such as weather. If, however, the trip start date and time has passed by more than 48 hours, then the observer provider can cancel the trip and release the observer from the vessel and trip, and the vessel would need to log a new trip with a new 72-hour notice in place prior to fishing. These ‘forced cancellations’ are not present in trips that are not selected for observation, since the logging, closing, or cancellation of the trip is entirely under vessel control. The vessel operator may change the dates of a logged trip regardless of selection status prior to, or in lieu of cancellation. However, trips that have not been closed at the end of the calendar year are automatically cancelled by the ODDS to prevent 2017 ODDS trips from affecting the deployment rates set for the 2018 ADP.

The number of trips logged in the ODDS in 2017 and their dispositions is summarized in Table 3-2 through Table 3-4. The forced cancellation rate by users and by the ODDS is summarized for selected trips in each stratum (Table 3-2). Of the 5,879 total trips logged, 767 were selected, and 136 were cancelled: 0 by ODDS (0%) and 136 by users (2.3%). The user cancellation rate for selected trips ranged from 0.0% for *POT - Tender* to 40.0% for *HAL - Tender* and *TRW - Tender*.

The flexibility offered by the ODDS means that the outcome of random selection is known to the vessel operator for up to three logged trips in advance of fishing. In the case where ODDS users disproportionately cancel selected trips, one would expect observed coverage to be lower than the programmed selection rates. To reduce this potential bias, ODDS is programmed to automatically select the vessel's next logged trip if a previously selected trip was cancelled by the user. Although these "inherited" trips preserve the *number* of selected trips in the year, they cannot prevent the *delay* of selected trips during the year. Therefore, the potential for temporal bias is still present. The percentages of selected trips from either inherits or waivers are found in Table 3-3. The relative percentage of selected trips that inherited their final selected-status due to a previous cancelation ranged from 0.0% for *HAL - Tender* to 66.7% for *POT - Tender* (Table 3-3). It should be noted that no trips (inherited or otherwise) were selected in the *HAL-Tender* stratum. The stratum with the next-lowest rate of inherited selections was the *TRW - No Tender* stratum at 12.3%. The number of waived trips (i.e., trips given a "pass" on their required observer coverage by the NMFS) was low, with the highest level occurring in the *HAL - No Tender* stratum at 1.8% (Table 3-3).

The extent to which trip-selections are changed from the time they are entered can be determined by comparing the rate of trip observation expected from 1) random selection of all logged trips (initial random selection) and 2) random selection of remaining trips after cancellations, waivers, and inherited trips (Table 3-4). In any case, the proportion of trips selected to be observed should fall within what would be expected given the binomial distribution (since each trip is either selected or not selected). The rates obtained (%, with associated p-value based on the binomial distribution) in the initial selection process were 11.18% (p-value = 0.897) for the *HAL - No Tender* stratum, 31.25% (p-value = 0.567) for the *HAL - Tender* stratum, 4.63% (p-value = 0.233) for the *POT - No Tender* stratum, 2.27% (p-value = 0.497) for the *POT - Tender* stratum, 18.73% (p-value = 0.154) for the *TRW - No Tender* stratum, and 18.87% (p-value = 0.112) for the *TRW - Tender* stratum (Table 3-4). This means that there is no evidence that the ODDS was not selecting trips according to the programmed rate. The final selection rate after trips were closed, cancelled, or waived was 14.07% (p-value < 0.001) for the *HAL - No Tender* stratum, 25.00% (p-value = 1.000) for the *HAL - Tender* stratum, 7.00% (p-value < 0.001) for the *POT - No Tender* stratum, 9.09% (p-value = 0.016) for the *POT - Tender* stratum, 20.95% (p-value < 0.001) for the *TRW - No Tender* stratum, and 22.81% (p-value = 0.015) for the *TRW - Tender* stratum (Table 3-4).

Differences between the initial and final selection rates were present among all but one partial coverage stratum in 2017. The only exception was the *HAL - Tender* stratum, in which four trips were logged and none were selected. For strata in which there were differences, a separation

between initial and final selection rates tended to appear early and then persist throughout the remainder of the year (Fig. 3-2).

The fact that the final selection rates for most strata were greater than the initial selection rates results from the fact that cancelled trips that were originally selected for coverage are preserved through the inherit process, while cancelled trips that were not originally selected for coverage are not. These patterns are consistent with the hypothesis that trips selected for coverage are being delayed, and cancellation of selected trips results in a greater number of selected trips later in the year as the result of the inherit process. Various degrees of separation between the initial and final selection rates have been observed since the implementation of the restructured Observer Program (NMFS 2014, NMFS 2015b, NMFS 2016a, NMFS 2017a).

In addition to the inherit process, the lack of linkage between the ODDS and *e*Landings contributes to the differences between programmed selection rates in ODDS and trips that are ultimately observed. Currently, ODDS provides users with a list of Report IDs from *e*Landings from which to close their logged trips, and *e*Landings has been updated to prompt the entry of ODDS trip numbers. However, these data are not validated, or error checked, making them unreliable in their current state. This linkage between the logged (ODDS) trip (with its selection probability) and its associated landing information is necessary to evaluate potential improvements in deployment efficiency within the partial coverage fleet.

3.6.3. Evaluation of Deployment Rates

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

At-sea Deployments

The 2017 Observer Program had 10 different deployment strata to be evaluated. There was one full coverage stratum; it included trips taken both by vessels that were required to have full coverage (e.g., American Fisheries Act [AFA] vessels) and those fishing in the BSAI that opted into full coverage. There were nine partial coverage strata: six strata defined by gear and tender designation, one EM stratum, one zero coverage stratum, and one zero coverage EM research stratum.

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 met expected rates of coverage in all full and zero coverage strata (Table 3-5). Partial coverage rates were expected to fall between upper and lower bounds of the expected value from the 0.025 and 0.975 quantiles of a binomial distribution (i.e., a 95% confidence interval). If coverage levels were within the 95% confidence intervals, then there was no evidence that coverage levels

differed from the expected rates. Coverage rates were consistent with expected values in four of the six partial coverage strata, but were higher than expected within the *POT - No Tender* and *TRW - No Tender* strata (Table 3-5). This was the first year in which there was evidence that coverage rates for trip-selected partial coverage strata differed from expected rates. The coverage rate for EM is based on information provided from the Pacific States Marine Fisheries Commission (PSMFC) that is available to analysts in the AFSC database. In 2017, the PSMFC did not review 49 trips for boats that were equipped with EM systems from the provider Saltwater, so the information available for analysis does not reflect the entire EM fleet. This exclusion was done at the direction of NMFS, so that resources could be allocated to higher priority projects. The coverage rate for vessels with EM systems from the provider Archipelago Marine Research was 20.8%, based on trips with video reviewed as of March 30th, 2018. The coverage achieved by EM is presented by gear type in Table 3-6.

Evaluation of the coverage achieved by the program as a whole is complicated somewhat by whether monitored EM trips are combined with observed trips. In 2017, EM data were not used in catch accounting. Therefore, the most accurate depiction of data collection from the North Pacific Observer Program is to consider EM trips equivalent to zero-coverage. Under this evaluation, 4,220 trips (36.4%) and 407 vessels (36.4%) were observed among all fishing in federal fisheries of Alaska (Table 3-5. If EM trips are included, 4,362 trips (37.6%) and 458 vessels (40.3%) were covered (Table 3-5).

Coverage Rates for Dockside Monitoring

Observers were assigned to monitor deliveries of walleye pollock (*Gadus chalcogrammus*). The objective of this monitoring was to obtain a count of the number of salmon caught as bycatch and to obtain tissue samples for genetic analysis from these fish in each observed pollock delivery. There have been many iterations of the sampling design used to obtain genetic samples from salmon bycatch for the purposes of stock of origin (Faunce 2015). The sampling design used for this objective in 2017 remained unchanged from that used since 2011; all deliveries of walleye pollock that are observed at sea were also observed dockside. While all Bering Sea pollock trips and deliveries are observed, this is not the case in the GOA (NMFS 2015c). For this analysis, pollock deliveries are defined as any delivery where the predominant species is pollock in *e*Landings.

Given the design, the level of dockside observation of walleye pollock deliveries should be 100% in the full coverage category, but evaluations of the partial coverage category are more elusive. As a matter of policy, no tender deliveries are observed. While it may seem intuitive that the expected coverage rate for deliveries within the *TRW - No Tender* stratum should be equal to the programmed trip selection rate of 17.57%, this assumption is likely untrue because observers are not deployed into the pollock fishery but into the entire trawl fishery, and the relationship between the number of deliveries and trips is not expected to be constant, especially when measured across ports. Therefore, we present the dockside observation rates for the *TRW – No Tender* stratum (Table 3-7), but do not include any formal statistical tests.

Bycatch estimates of Chinook salmon in the GOA are estimated using methods described in Cahalan et al. (2015). In the event that a delivery cannot be monitored (e.g., the case in a tendered delivery or non-pollock delivery), then estimation of bycatch comes by applying salmon bycatch rates to landed catch. Estimates of stock of origin from salmon bycatch are produced by the Auke Bay Laboratories of the AFSC (e.g., Guthrie et al. 2017).

3.7. Sample Quality

3.7.1. Temporal Patterns in Trip-Selection

The cumulative number of fishing trips in each stratum was multiplied by the stratum-specific selection rate to obtain the expected number of observed trips. Under the assumption that there is no temporal bias in observer coverage, 2.5% of values should be larger than the upper 95% confidence limit and 2.5% should be smaller than the lower limit. In 2017, the number of observed trips achieved was never outside of the expected number for any tender stratum (Fig. 3-3). The number of observed trips achieved was outside of the 95% confidence intervals for 60.3% of the year for the *HAL - No Tender* stratum, 94.0% of the year for the *TRW - No Tender* stratum, and 100.0% of the year for the *POT - No Tender* stratum (Fig. 3-3). In all cases, there was evidence that the observation rate was greater than expected. These values are not directly comparable to previous years, as expectation in previous years was only calculated on days for which there were trips, rather than all days of the year. However, it is clear that observation rates were outside of the 95% confidence intervals for more days in 2017 than 2016 (Faunce et al. 2017, NMFS 2017a). Results from the exact binomial test suggest no evidence that observation rates at the end of the year differed from expected rates for the *HAL - Tender* (expected rate = 0.250, realized rate = 0.000, p-value = 0.578), *POT - Tender* (expected rate = 0.039, realized rate = 0.053, p-value = 0.541), and *TRW - Tender* (expected rate = 0.143, realized rate = 0.188, p-value = 0.300) strata. Despite being outside of the 95% confidence intervals for portions of the year, there was also no evidence that observation rates at the end of the year differed from expected rates for the *HAL - No Tender* stratum (expected rate = 0.111, realized rate = 0.120, p-value = 0.163). There was evidence that observation rates at the end of the year did not meet expectations for the *TRW - No Tender* (expected rate = 0.176, realized rate = 0.207, p-value < 0.001) or *POT - No Tender* (expected rate = 0.039, realized rate = 0.077, p-value < 0.001) strata.

3.7.2. Spatial Patterns in Trip-Selection

Under a strictly random selection of trips and with a large enough sample size, the spatial distribution of observed trips should reflect the spatial distribution of all trips. The hypergeometric distribution can be used to describe the results of sampling from a population of items (fishing trips) with different characteristics (NMFS Area fished). The expected number of trips based on this distribution is the sample rate multiplied by the number of trips that fished in an area (observed and unobserved). Using this method, we compared the expected number of trips and the observed number of trips in each NMFS Reporting Area and stratum combination (Fig. 3-4). Note that in most cases, the sampling result is close to the expected result; larger differences tend to be associated with lower numbers of trips within a NMFS Area. The *HAL -*

Tender stratum is excluded from Figure 3-4, since all *HAL - Tender* trips occurred within one NMFS Area (659), and none were selected, making the hypergeometric distribution inapplicable for evaluating spatial patterns of coverage for this stratum.

The hypergeometric distribution was also used to assess whether our results are within our expectations or are unusual given the fishing patterns of the fleet and our sampling rates. Using landings data, we calculated the probability of observing the number of trips we did, or a more unexpected number of trips, within a stratum and NMFS area. This calculation uses the sampling rate and the distribution of trips across NMFS Reporting Areas. This evaluation does not test whether the resulting coverage rate in a NMFS Area for a stratum is equal to the stratum selection rate, but instead tests whether the actual coverage rate (realized rate) in a NMFS Area for a stratum is unexpected compared to the stratum-wide realized observation rate. For the purposes of the following discussion, NMFS Areas with an unexpected number of trips (probability of our result is less than 0.05) are considered “low-p” areas.

The HAL - No Tender Stratum

Given that there were 18 NMFS Areas fished in the *HAL - No Tender* stratum, we would expect there to be one low-p area (0.05 × 18 = 0.9). There were two (NMFS Areas 518 and 519) where the actual coverage for each was higher than expected by four trips. The percent of trips observed among NMFS Areas in this stratum ranged from 0% to 24.1% (median = 10.1%). The probability of these coverage rates or rates that deviated further from expected values is depicted in Figure 3-5. These results mean that, in 2017, there was evidence of some clustering of observed trips among NMFS Areas that was different from expected in the *HAL - No Tender* stratum. There were no consistent spatial patterns in trip clustering between the *HAL* stratum in 2016 and the *HAL - No Tender* stratum in 2017.

The POT - No Tender Stratum

Given that there were 14 NMFS Areas fished in the *POT - No Tender* stratum, we would expect there to be one low-p area (0.05 × 14 = 0.7). There were three NMFS Areas where number of observed trips was greater than expected (NMFS Areas 518 and 650 by two trips, NMFS Area 610 by eight trips). The percent of trips observed among NMFS Areas in this stratum ranged from 0% to 18.2% (median = 5.4%). The probability of these coverage rates or rates that deviated further from expected values is depicted in Figure 3-6. These results mean that, in 2017, there was some evidence of clustering of observed trips among NMFS Areas that was different from expected in the *POT - No Tender* stratum. However, it should be noted that the *POT - No Tender* stratum had a relatively low sample size, with only 72 trips observed in 2017. There were no consistent spatial patterns in trip clustering between the POT stratum in 2016 and the *POT - No Tender* stratum in 2017.

The TRW - No Tender Stratum

Given that there were six NMFS Areas fished in the *TRW - No Tender* stratum, we would expect there to be no low-p areas (0.05 × 6 = 0). There was one NMFS Area where the number of observed trips was less than expected (NMFS Area 620, by 16 trips). The percent of trips

observed among NMFS Areas in this stratum ranged from 18.6% to 36.4% (median = 20.7%). The probability of these coverage rates or rates that deviated further from expected values is depicted in Figure 3-7. These results mean that, in 2017, there was some evidence of clustering of observed trips among NMFS Areas that was different from expected in the *TRW - No Tender* stratum. There were no consistent spatial patterns in trip clustering between the *TRW* stratum in 2016 and the *TRW - No Tender* stratum in 2017.

The HAL - Tender Stratum

Given that there was only one NMFS Area (659) fished in the *HAL - Tender* stratum, and none of the four trips fished were selected for coverage, the hypergeometric distribution was not used for evaluating spatial patterns of coverage for this stratum. A map of coverage rates is not included for this stratum. The *HAL - No Tender* and *HAL - Tender* strata were combined into the *HAL* stratum for 2018.

The POT - Tender Stratum

Given that there were seven NMFS Areas fished in the *POT - Tender* stratum, we would expect there to be no low-p areas for this stratum ($0.05 \times 7 = 0$). There was one NMFS Area where the number of trips observed was greater than expected (NMFS Area 519, by one trip). The percent of trips observed among NMFS Areas in this stratum ranged from 0% to 20% (median = 0%). The probability of these coverage rates or rates that deviated further from expected values is depicted in Figure 3-8. These results mean that, in 2017, there was some evidence of clustering of observed trips among NMFS Areas that was different from expected in the *POT - Tender* stratum.

The TRW - Tender Stratum

Given that there were four NMFS Areas fished in the *TRW - Tender* stratum, we would expect there to be no low-p areas for this stratum ($0.05 \times 4 = 0$). There was one NMFS Area where the number of observed trips was greater than expected (NMFS Area 610, by one trip). The percent of trips observed among NMFS Areas in this stratum ranged from 0% to 20% (median = 0%). The probability of these coverage rates or rates that deviated further from expected values is depicted in Figure 3-9. These results mean that, in 2017, there was some evidence of clustering of observed trips among NMFS Areas that was different from expected in the *TRW - Tender* stratum.

3.7.3. Trip Metrics

This section is focused on answering one question related to the deployment of observers: are observed trips similar to unobserved trips? A permutation test (a.k.a., randomization test) was used to answer this question. This test evaluates the question “How likely is the difference we found if these two groups have the same distribution (in the metric we are comparing)?” Permutation tests compare the actual difference found between two groups to the distribution of many differences derived by randomizing the labels defining the two groups (e.g., observed and unobserved). Difference values in the permutation test were calculated by subtracting the mean metric value for the “No” condition from the mean metric value for the “Yes” condition. For

example, the difference between vessel lengths in a permutation test for an observer effect would be the mean value for unobserved trips subtracted from the mean value for all observed trips. By randomizing group assignments, the combined distribution of randomized differences represents the sampling distribution under the null hypothesis that the two groups are equal. In this report 1,000 randomized trials are run for the permutation test. The p-value from the test is calculated as the number of randomized trials with greater absolute differences than the actual difference divided by the number of randomized trials. Similar to the other statistical tests used in this report, low p-values (< 0.05) indicate rare events and provide evidence against the hypothesis of equality. In an attempt to improve clarity, although five values are calculated in the test; 1) the difference between groups, 2) the mean difference between groups from randomized trials, 3) #1 expressed as a percentage of the mean value of the metric being tested, 4) #2 expressed as a percentage of the mean value of the metric being tested, and 5) the p-value of the test, only values 1, 3 and 5 are presented.

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

Are observed trips similar to unobserved trips?

This comparison is the basis for examining if there is an observer effect (i.e., differential behavior when observed compared to when not observed) within partial coverage trips. Sample sizes for this test are presented in Table 3-8.

Of the six metrics compared in the *HAL - No Tender* stratum, four had low p-values. Observed trips in this stratum were 15.9% (0.8 days) shorter in duration, landed 7.6% (0.3) more species, landed catch that was 2.8% more diverse, and landed catch that weighed 17.7% (1.2 t) less than unobserved trips (Table 3-9). Of the six metrics compared in the *POT - No Tender* stratum, one had low p-values. Observed trips in this stratum were 11.1% (0.4 days) shorter in duration than unobserved trips (Table 3-9). Of the six metrics compared in the *POT - Tender* stratum, there were no metrics with low p-values (Table 3-9). Of the six metrics compared in the *TRW - Tender* stratum, there were no metrics with low p-values (Table 3-9). Of the six metrics compared in the *TRW - No Tender* stratum, four had low p-values. Observed trips in this stratum were 10.1% (0.2 days) shorter in duration, landed 15% (0.8) fewer species, landed catch that was 2.4% less diverse, and landed catch that weighed 4.2% (4.2 tons) less than unobserved trips (Table 3-9).

The permutation test was not performed for *HAL - Tender* trips, since no trips in this stratum were selected to be observed. A visual depiction of individual results of this permutation test for the non-tender strata is given in Figure 3-10 for illustration purposes.

Gear, tender, and observed status combinations

One of the first analyses presented in the 2013 Annual Report was a comparison of trip durations for combinations of observed and tendered status by stratum (Faunce et al. 2014). The rationale for this plot and focus on this metric was because of the concern that tendered trips were longer than non-tendered trips and therefore were being avoided for observer coverage. Frequency distributions showed that tendered trips had a long right tail compared to non-tendered trips, and that there were few observed trips in that long right tail (Faunce et al. 2014; Fig. 14). The OSC concluded that there were no major differences between observed and unobserved tendered trips based on the fact that there were observed trips (however few) in those long duration tendered trips. Since 2013, permutation tests have replaced these frequency plots. However, these permutation tests do not visually map the data for observed and tendered states together. To accomplish this, a plot of the trip durations for these states is included as Figure 3-11. From these plots it appears that observed trips in 2017 were of similar duration as unobserved trips.

3.8. Adequacy of the Sample Size

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

Over the course of an entire year, some NMFS Areas have low fishing effort and as a result have a relatively high probability of being missed by the simple random sampling represented by observer deployments. The fishing effort data for each stratum and the number of observed trips over the course of 2017 was used to illustrate their combined effect on the probability of a NMFS Area containing observer data using the hypergeometric distribution (Fig. 3-12). From this figure it can be seen how 1) the likelihood of at least one observation is increased with fishing effort and 2) is also increased with an increase in the selection rate. Given our sampling rates in the 6 partial coverage trip-selection strata, the probability of having no observed trips in a NMFS Reporting Areas increases quickly above 0.05 when there are fewer than 23 trips in the *HAL - No Tender* stratum, 36 trips in the *POT - No Tender* stratum, 38 trips in the *POT - Tender* stratum, 13 trips in the *TRW - No Tender* stratum, and 13 trips in the *TRW - Tender* stratum in a given area. Including additional factors such as week, gear, and target will decrease the number of trips with the same characteristics and hence increase the probabilities of obtaining no observer data of that character (post-strata of the CAS).

3.9. Responses to Council and SSC Comments

The SSC has requested that a specific section with responses to SSC comments be provided in the written report, as is done for SAFE documents. This section addresses comments (in italics) made by the Council and the SSC in response to the presentation of the 2016 Annual Report made at the June 2017 Council meeting.

The Council offered the following comments:

Evaluate pelagic trawl and non-pelagic trawl trips for evidence of an observer effect.

A preliminary evaluation of the differences between gear types is provided in Appendix A.

The SSC offered the following recommendations to the Observer Program:

Sampling of Chinook salmon in the GOA pollock trawl fishery should focus on estimating the actual amount of salmon PSC taken in portions of this fishery, rather than collecting an unbiased sample of tissues for genetics. Even if the genetic stock composition of Chinook is biased, the sample may still be an unbiased representation of the stock composition of the entire PSC due to overlap in areas fished and/or complete mixing of Chinook stocks over large areas of the GOA. The SSC agrees with the NMFS longer-term recommendation to explore plant monitoring of offloads, including tender offloads, combined with EM for compliance monitoring to address the issue of PSC estimation and tissue sampling.

The objective of observing a representative sample of pollock deliveries for the purposes of obtaining an unbiased sample of genetic tissues was dropped from the objectives of the 2018 observer program in recognition that the observer program is unable to conduct this task for tendered deliveries.

Although there is strong evidence of bias in unobserved trips relative to observed trips, and some vessels conducting an entire fishing season without carrying an observer the NMFS longer-term recommendation for 100% coverage of trawl vessels delivering to tenders may be impractical and may not be necessary. Beyond longer-term improvement of methods to monitor offloads of tenders, a shorter-term analysis should be conducted to examine the magnitude of bias caused by tendering activities relative to the overall magnitude and precision of discard or PSC that is being monitored for compliance by management.

The magnitude of bias caused by tendering activity is likely to be small, given the few number of trips that are tendered (Table 3-5). In order to minimize any bias that might be present, gear-based partial coverage strata were separated by tender status in 2017. We cannot directly compare the bycatch rate between observed and unobserved trips, as we have no at-sea information from unobserved trips to create an equivalent bycatch rate. Quantifying the bias resulting from unobserved trips being different from observed trips is therefore problematic. We support the NMFS recommendation of exploring longer-term solutions to this issue.

Linkage between information provided on the performance review in Chapter 3 and the fishery information provided in Chapter 4 is unclear. Additional explanation of this linkage (i.e., how

does performance relate to the estimated quantities in each fishery) should be provided in the introduction to Chapter 4.

The descriptive information provided in Chapter 4 was originally requested by industry and does not drive stratification and other aspects of deployment, the results of which are detailed in Chapter 3. With this Annual Report, the National Marine Fisheries Service (NMFS) has removed some of the tables from Chapter 4 and made the information available online. Chapter 4 includes an explanation why the proportion of catch weight observed for a subset of fishing activity should not be expected to equal the deployment rates specified in the ADP and which are evaluated in Chapter 3.

The SSC is unclear about the statement that "some video" was used as the hurdle in assessing whether video from a trip could be used in estimation and evaluation of the EM program. We encourage use of a specific, justifiable quantity to judge adequacy of video data for use in directed harvest and PSC estimation.

In the 2016 Annual Report analysts considered a trip monitored if data were derived from review of video. This definition was the most generous definition of EM monitored we could derive, since it does not consider specific quantity of data collected. This is comparable to the definition of an observed trip, which also does not consider the quantity or quality of data collected by an observer. However, NMFS recognizes that since EM is a new data collection method, there is interest in understanding the quality of the video and the reliability of EM systems. This information is included in Section 4.3 and Appendix B.

The SSC requested that the following analyses be added to the list of analytical tasks:

As identified in previous reports, the SSC encourages additional progress toward resolving the calculation of mean weight of halibut discarded by the IFQ halibut fleet.

The OSC notes that this project is underway. It is outside the scope of OSC tasks related to the Annual Report.

The SSC requests that the list of observer program analytical tasks continue to include addressing issues with estimation of discards in the directed halibut fishery as detailed in our June 2016 report and IPHC public comments made at that meeting. We also ask that a table of the prevalent PSC species contributing to discards be included in the next Annual Report.

The OSC notes that this project is underway. It is outside the scope of OSC tasks related to the Annual Report. A table of PSC species falls outside the scope of this chapter, but summaries of PSC bycatch are available on NMFS' Alaska Region website.[8]

While the SSC greatly appreciates that the development of variances for use in planning of deployments and stock assessment is ongoing, we strongly urge the analysts to initiate a

[8] Online catch reports are available on NMFS' Alaska Region website at https://alaskafisheries.noaa.gov/fisheries-catch-landings.

comparison of the likely magnitude of bias that has been detected between observed and unobserved trips with the overall magnitude and precision of discard or PSC that is being monitored for compliance by management. This comparison can be used to determine if remaining trip-related bias is worth addressing through changes to the observing system, or is small enough in magnitude to be deemed "good enough" relative to management objectives. The SSC also notes that these types of comparisons will be necessary given the nature of current constraints on observer deployment (e.g., funding of higher sampling rates and practical need for further stratification). It may be helpful to perform these analyses at the post-stratified levels used for catch accounting (e.g., pelagic and non-pelagic trawl) in order to better identify specific sources of bias.

It is not known whether the differences between observed and unobserved measures of retained catch, NMFS Areas, etc. in Chapter 3 directly translate to bias in PSC estimates. It is unclear to the OSC how such an analysis would be conducted. Further clarification and conversation with the SSC would help the OSC in the future on this issue.

3.10. OSC Recommendations to Improve Data Quality

3.10.1. Recommendations from the 2016 Annual Deployment Review

The Observer Science Committee made the following recommendations in its 2016 review of observer deployment to be considered in developing the 2018 ADP (NMFS 2017b). Following each italicized recommendation is the outcome of that recommendation.

The Observer Science Committee's Recommendations to improve the 2018 ADP were as follows:

1. *The OSC reiterates its 3-year recommendation that the NMFS improve the linkages between ODDS and eLandings (OSC recommendation for 2013, 2014, 2015 version of this Review).*

A voluntary field in *e*Landings for the ODDs trip number was created in 2016; however, this has not completely solved the problem and the OSC has additional recommendations in this report.

2. *The OSC reiterates its 2-year recommendation that the NMFS explore ways to reduce the impact of cancellations on the number of trips selected for observer coverage in the ODDS. This may be accomplished in a variety of ways that include, but are not limited to the following: reducing the number of trips that can be logged in advance (OSC recommendation from the 2014 and 2015 version of this Review), and/or reducing the incentive or ability to cancel trips selected for observer coverage or electronic monitoring.*

The Council and NMFS support changes to ODDS to address the impact of trip cancellations and this project is currently on the list of analytical priorities. Major changes to ODDS programming must be complete by the start of each calendar year. NMFS will consider the additional changes for 2019. Implementation would require programming changes to both ODDS and CAS.

3. *The OSC recommends an alternative model of monitoring salmon bycatch be explored in the partial coverage fleet. Salmon bycatch in some fisheries constrains the catch of target species. Salmon are relatively rare in catches and are difficult to detect by observers or cameras. These factors can lead to imprecise catch estimates. For 3 years of deployment performance review, the observer program has been unsuccessful in achieving its goal of obtaining an unbiased sample from the pollock trawl fleet for enumerating salmon bycatch and determining stock of origin (see section on Coverage Rates for Dockside Monitoring in this report). A solution is to require full retention of salmon and full monitoring at the point of delivery. This solution could be achieved by prohibiting vessels that deliver to tenders from discarding salmon at sea, monitoring those vessels and associated tenders for compliance with electronic monitoring, and observing or monitoring all tender deliveries at the plant.*

For the 2018 ADP, NMFS did not include full shoreside accounting of salmon in the GOA as a monitoring objective. The methods for monitoring salmon bycatch in the partial coverage fleet have remained unchanged: shoreside offloads from observed catcher vessel trips continue to be 100% monitored, while catch from catcher vessels delivering to tenders is monitored at sea. In the longer term, the 2016 annual report recommended considering broader solutions for monitoring Chinook salmon PSC for trawl trips delivering to tenders in the GOA.

4. *The OSC has three recommendations concerning future at-sea coverage rates for observers (and potentially monitoring):*
    a. *We reiterate our recommendation from last year that sampling rates in future ADPs be high enough in each stratum to maximize the probability of achieving three observed trips in each of the NMFS Areas (under funding constraints). Based on the results of the draft 2017 ADP, the best design for achieving this goal would have been a strict three gear stratification. The results of this Review reinforce the results of simulated sampling evaluations of 2014 data that showed that most observer data gaps disappeared or were severely minimized at deployment rates greater than or equal to 15% (relative to a 50% probability of a post-strata being empty; NMFS 2015c, p. 98). It must be noted that the total number of observer days afforded by the Agency for the 2017 ADP has resulted in ODDS selection rates in most strata that are below those shown to result in spatial and temporal bias in past versions of this report regardless of the optimized allocation used. The comparatively low coverage rates in 2017 compared to 2013-2016 will affect our ability to interpret the results of the analyses in this Review with much certainty since power of test is a function of sample size.*

The comparatively low sampling rates afforded by the 2017 budget did result in difficulties from an analytic standpoint. For instance, it becomes increasingly difficult to rely on differences detected (or not detected) by the permutation test when sample sizes are low. The budget for 2018 allows for an estimated 4,394 observer days (NMFS 2017b), a 41% increase from the

3,121 days allowed for in 2017 (NMFS 2016b, this report). The selection rates for all partial coverage strata in the 2018 ADP are above 15% (NMFS 2017b).

b. The OSC recommends that future ADPs include in each proposed sampling design sample allocation that is proportional to fishing effort (equal rates among strata). This should be accomplished by adopting a 'hurdle model' approach to sample allocation in future ADPs, whereby if the total sample size (observer days) is insufficient to observe all strata at a 15% coverage rate of trips, then allocation of observer days among strata defaults to proportional to effort (all strata get equal coverage rates).

The 'hurdle model' was not used in the 2017 ADP, but was adopted for the 2018 ADP. The programmed selection rates in the 2017 ADP were above 15% for some partial coverage strata, and below 15% for others (NMFS 2016b, this report). However, the 'hurdle model' or '15% + Optimization' model was used to determine coverage rates in the 2018 ADP (NMFS 2017b).

c. The OSC recommends that the SSC and Council request NMFS reinstate its funding for observer deployment in the North Pacific at levels necessary to ensure a minimum of 15% coverage among all strata in upcoming ADPs. If the critical 15% coverage rate is surpassed among all strata combined, then sampling days afforded in excess of this amount may be allocated among strata according to an optimization algorithm.

NMFS has not committed to funding observer deployment in the North Pacific. However, funding levels for the 2018 ADP were adequate to provide deployment rates above the recommended hurdle threshold.

3.10.2. Recommendations to Improve Data Quality and Guide the 2019 ADP

1. The OSC has three recommendations regarding the ODDS, its relationship to *e*Landings, and the effect of cancellations on achieved coverage:
    a. The OSC reiterates its 4-year recommendation that the NMFS improve the linkages between ODDS and *e*Landings (OSC recommendation for 2013, 2014, 2015, 2016 version of this Review).
    b. OSC reiterates its 3-year recommendation that the NMFS explore ways to reduce the impact of cancellations on the number of trips selected for observer coverage in the ODDS (OSC recommendation from the 2014, 2015, and 2016 version of this Review). This may be accomplished in a variety of ways that include, but are not limited to the following: reducing the number of trips that can be logged in advance, and/or reducing the incentive or ability to cancel trips selected for observer coverage or electronic monitoring, since the ability to change dates is already facilitated.
    c. This is the first year in which the OSC recommends that NMFS form an agency sub-group to document the way in which the ODDS currently operates and to

describe alternatives for how it can be improved, particularly in regards to points a and b and whether technical improvements to ODDs could address these issues.

2. The OSC has two recommendations concerning stratification:
    a. The OSC recommends that the strata be kept the same between the 2018 and 2019 ADPs. These strata are as they were in 2017, with the exception of combining the *HAL - No Tender* and *HAL - Tender* strata into one HAL stratum. The OSC makes this recommendation both to preserve stability in methods across years, and because further stratification would likely decrease sample size within some strata to undesirably small sizes, as was seen with the *HAL - Tender* stratum in 2017.
    b. The OSC provided evaluation of the Council's request to explore differences between NPT and PTR gear. Based on this evaluation, which considers factors pertinent to stratification, the OSC to recommend against stratifying trawl trips by pelagic and non-pelagic gear types. The supporting analysis for this recommendation can be found in Appendix A.

3. The OSC has two recommendations concerning future at-sea coverage rates for observers (and potentially monitoring):
    a. We reiterate our recommendation from last year that sampling rates in future ADPs be high enough in each stratum to maximize the probability of achieving three observed trips in each of the NMFS Areas.
    b. The OSC recommends that future ADPs include, as one option, a sample design in which strata are selected at the same rate. Although this design could be considered a baseline used for making comparisons to other proposed designs, under some scenarios, this option may be recommended.

4. The OSC recommends that the performance standards used to evaluate observer effects in the Annual Report be reassessed by the OSC. The performance standards were developed in 2013 with the restructuring of the Observer Program and have yet to be reviewed. The original purpose of this set of indicators was to evaluate the differences between the unobserved and observed population of trips using available information for the two groups; information that can be directly measured in both groups (e.g., total weight of landed catch). These metrics have been useful for evaluating whether the deployment of observers into the sampling strata has resulted in a representative sample of trips. However, an evaluation has not been conducted that relates these metrics to at-sea information. Additionally, the magnitude of the differences (the effect size) has not been evaluated relative to whether differences seen between the two groups are meaningful in the context of the overall data. We recommend evaluating the suite of metrics in context with how they relate to at-sea data collections and, to the extent feasible, provide additional information regarding interpretation of effect sizes and p-values (e.g., consideration of sample sizes).

Table 3-1. -- Comparison between predicted and actual trip days for partial coverage strata in 2017. Predicted values come from the 2017 Annual Deployment Plan (ADP).

Strata	Predicted number of trip days in ADP	Actual number of trip days	% Difference from predicted
TRW - No Tender	8,310	4,980	-40.1
HAL - No Tender	12,661	11,978	-5.4
POT - No Tender	2,768	3,728	34.7
TRW - Tender	828	626	-24.4
HAL - Tender	32	9	-71.9
POT - Tender	707	761	7.6
Total	25,306	22,082	-12.7

Table 3-2. -- Trip cancellation rates in the ODDS for 2017. A trip is cancelled by the system if the user did not identify whether fishing had occurred by the end of the year. "Paper" indicates that a trip was logged when the ODDS was not available.

Strata	Random number outcomes	Logged (*a*)	Cancelled by system (*b*)	Trips remaining (*c* = *a*-*b*)	Cancelled by user (*d*)	Paper	% User cancellation (*d*/*c* * 100)
HAL - No Tender	Not Selected	2,162				0	
	Selected	272	0	272	64	0	23.5
HAL - Tender	Not Selected	11				0	
	Selected	5	0	5	2	0	40.0
POT - No Tender	Not Selected	885				0	
	Selected	43	0	43	9	0	20.9
POT - Tender	Not Selected	129				0	
	Selected	3	0	3	0	0	0.0
TRW - No Tender	Not Selected	1,796				0	
	Selected	414	0	414	49	0	11.8
TRW - Tender	Not Selected	129				0	
	Selected	30	0	30	12	0	40.0
Total		5,879	0	5,879	136	0	2.3

Table 3-3. -- Number of remaining trips after cancellation in each trip-selection strata (*TRW - No Tender*, *HAL - No Tender*, *POT - No Tender*, *TRW - Tender*, *HAL - Tender*, and *POT - Tender*) that were selected using the initial random number generator (Random Number Selection) and those that remained after user manipulation (Total Final Selected). The relative impact of waivers in trip-selection is also shown (% Reduction of Selected Trips due to Waivers) **Not from random numbers.

Strata	Total trips	Random number selection (*r*)	Inherited selection** (*i*)	Randomly selected but waived (*w*)	Total final selected (*T*=*r*+*i*-*w*)	% Selected from inherits ((*i*/*T*)*100)	% Reduction of selected trips due to waivers (*w*/(*T*+*w*)*100)
HAL - No Tender	1,890	208	63	5	266	23.7	1.8
HAL - Tender	12	3	0	0	3	0.0	0.0
POT - No Tender	829	34	21	0	58	36.2	0.0
POT - Tender	99	3	6	0	9	66.7	0.0
TRW - No Tender	1,986	365	51	0	416	12.3	0.0
TRW - Tender	114	18	8	0	26	30.8	0.0

Table 3-4. -- Number of logged trips in each partial coverage stratum (*TRW - No Tender*, *HAL - No Tender*, *POT - No Tender*, *TRW - Tender*, *HAL - Tender*, and *POT - Tender*) that were selected using the initial random number generator (Random Selection Only) and those that remained after user manipulation (Final Expected). The relative impact of waivers in trip-selection is also shown (No Waivers).

Strata	Trip disposition	Selected trips	Total trips	Actual selection (%)	Programmed selection (%)	p-value (H_0: Actual = Programmed)
HAL - No Tender	Initial Random Selection, *a*	272	2,434	11.18	11.09	0.897
	After Cancellations, *b* (*a*-*b*)	208	1,890	11.01	11.09	0.942
	With Inherits, *c* (*a*-*b*+*c*)	271	1,890	14.34	11.09	0.000
	After Waivers, *d* (*a*-*b*+*c*-*d*)	266	1,890	14.07	11.09	0.000
HAL - Tender	Initial Random Selection, *a*	5	16	31.25	25.00	0.567
	After Cancellations, *b* (*a*-*b*)	3	12	25.00	25.00	1.000
	With Inherits, *c* (*a*-*b*+*c*)	3	12	25.00	25.00	1.000
	After Waivers, *d* (*a*-*b*+*c*-*d*)	3	12	25.00	25.00	1.000
POT - No Tender	Initial Random Selection, *a*	43	928	4.63	3.88	0.233
	After Cancellations, *b* (*a*-*b*)	34	829	4.10	3.88	0.719
	With Inherits, *c* (*a*-*b*+*c*)	58	829	7.00	3.88	0.000
	After Waivers, *d* (*a*-*b*+*c*-*d*)	58	829	7.00	3.88	0.000
POT - Tender	Initial Random Selection, *a*	3	132	2.27	3.92	0.497
	After Cancellations, *b* (*a*-*b*)	3	99	3.03	3.92	1.000
	With Inherits, *c* (*a*-*b*+*c*)	9	99	9.09	3.92	0.016
	After Waivers, *d* (*a*-*b*+*c*-*d*)	9	99	9.09	3.92	0.016
TRW - No Tender	Initial Random Selection, *a*	414	2,210	18.73	17.57	0.154
	After Cancellations, *b* (*a*-*b*)	365	1,986	18.38	17.57	0.345
	With Inherits, *c* (*a*-*b*+*c*)	416	1,986	20.95	17.57	0.000
	After Waivers, *d* (*a*-*b*+*c*-*d*)	416	1,986	20.95	17.57	0.000
TRW - Tender	Initial Random Selection, *a*	30	159	18.87	14.29	0.112
	After Cancellations, *b* (*a*-*b*)	18	114	15.79	14.29	0.594
	With Inherits, *c* (*a*-*b*+*c*)	26	114	22.81	14.29	0.015
	After Waivers, *d* (*a*-*b*+*c*-*d*)	26	114	22.81	14.29	0.015

Table 3-5. -- Number of total vessels (*V*), sampled vessels (*v*), total trips (*N*), sampled trips (*n*) for each stratum and observer deployment method (vessel and trip-selection) in 2017. The Expected, Minimum Expected, and Maximum Expected Coverage columns are expressed as percentages of the total number of trips taken within each stratum. Fleet totals are reported with and without Electronic Monitoring (EM) data since EM were not used for catch estimation in 2017.

Coverage	Strata	V	v	N	n	% Observed or monitored by deployment method	Expected coverage	Minimum expected coverage	Maximum expected coverage	Meets expectations?
Full	FULL	164	164	3,422	3,422	100.0	100.0			Yes
Partial	*HAL - No Tender*	408	175	2,298	276	12.0	11.1	10.7	13.4	Yes
Partial	*POT - No Tender*	104	49	932	72	7.7	3.9	6.1	9.6	No
Partial	*TRW - No Tender*	78	70	2,090	433	20.7	17.6	19.0	22.5	No
Partial	*HAL - Tender*	3	0	4	0	0.0	25.0	0.0	60.2	Yes
Partial	*POT - Tender*	36	4	75	4	5.3	3.9	1.5	13.1	Yes
Partial	*TRW - Tender*	26	8	69	13	18.8	14.3	10.4	30.1	Yes
Gear-based Total		541	285	5,468	798	14.6				
Partial	EM	80	51	683	142	20.8	30.0	17.8	24.0	No
Partial	Zero Coverage	396	0	1,986	0	0.0	0.0			Yes
Partial	Zero Coverage EM Research	3	0	36	0	0.0	0.0			Yes
Zero Coverage Total		399	0	2,022	0	0.0				
Total Fleet (with EM coverage)	Total	1136	458	11,595	4,362	37.6% Trips; 40.3% Vessels				
Total Fleet (without EM coverage)	Total	1136	407	11,595	4,220	36.4% Trips; 35.8% Vessels				

Table 3-6. -- The total number of EM trips (*N*) and the number monitored (*n*), separated by gear type

Gear	N	n	% Monitored
HAL	488	113	23.2
POT	194	29	14.9

Table 3-7. -- The number of *TRW - No Tender* pollock deliveries by port and coverage category. IFP: Inshore Floating Processor, Hbr: Harbor.

FMP	Coverage category	Port	Total deliveries (*N*)	Observed deliveries (*n*)	% Observed
Bering Sea	Full	Akutan	796	796	100.0
Bering Sea	Full	Dutch Hbr.	803	803	100.0
Bering Sea	Full	IFP	306	306	100.0
Bering Sea	Full	King Cove	75	75	100.0
Total	Full		1,980	1,980	100.0
Gulf of Alaska	Partial	Akutan	246	42	17.1
Gulf of Alaska	Partial	IFP	81	14	17.3
Gulf of Alaska	Partial	Kodiak	1,180	243	20.6
Gulf of Alaska	Partial	Sand Point	180	50	27.8
Total	Partial		1,687	349	20.7

Table 3-8. -- Number of trips by observation status in the 2017 trip-selection strata.

Strata	Observed	Unobserved
HAL - No Tender	276	2,022
POT - No Tender	72	860
TRW - No Tender	433	1,657
HAL - Tender	0	4
POT - Tender	4	71
TRW - Tender	13	56

Table 3-9. -- Results of permutation tests between observed and unobserved trips in the 2017 trip-selection strata. OD: Observed difference (Observed - Unobserved).

Strata	Metric	NMFS areas	Days fished	Vessel length (ft)	Species landed	pMax species	Landed catch (t)
HAL - No Tender	Observed difference	-0.016	-0.823	0.646	0.277	-0.024	-1.224
	OD (%)	-1.400	-15.877	1.202	7.642	-2.779	-17.670
	p-value	0.540	< 0.001	0.374	0.037	0.007	< 0.001
POT - No Tender	Observed difference	-0.004	-0.442	0.665	0.041	0.002	-5.258
	OD (%)	-0.352	-11.072	0.886	2.187	0.240	-17.870
	p-value	1.000	0.044	0.847	0.753	0.530	0.154
POT - Tender	Observed difference	0.123	1.958	-3.447	-0.944	0.003	-11.354
	OD (%)	10.874	19.294	-4.854	-32.615	0.350	-13.733
	p-value	1.000	0.610	0.760	0.267	0.190	0.835
TRW - Tender	Observed difference	-0.071	0.861	-2.953	0.624	0.008	139.241
	OD (%)	-6.751	9.489	-4.721	13.199	0.848	68.902
	p-value	0.582	0.761	0.468	0.394	0.380	0.097
TRW - No Tender	Observed difference	-0.019	-0.250	-1.194	-0.768	0.023	-4.247
	OD (%)	-1.780	-10.147	-1.392	-15.044	2.358	-4.183
	p-value	0.192	0.005	0.179	< 0.001	< 0.001	0.048

Figure 3-1. -- Actual paid sea-days in 2017 (dotted line) in relation to the range of potential budgetary outcomes estimated in December 2016 for the Final 2017 Annual Deployment Plan (vertical bars).

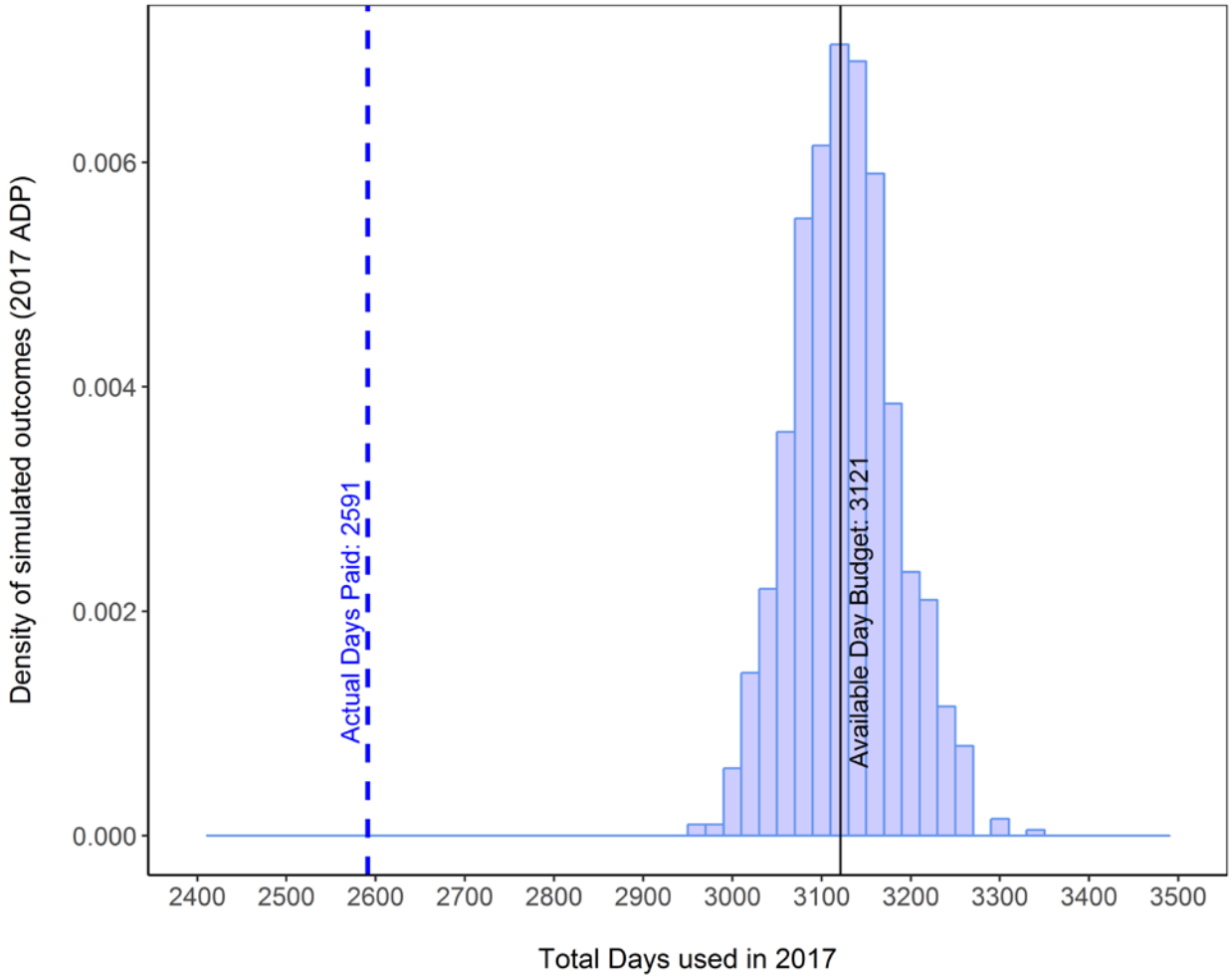


Figure 3-2. -- Rate of selected trips logged into ODDS organized by original date entered for all trips (grey line and grey text), and final date considering only non-cancelled trips (black line and black text). The programmed selection rate is depicted as the dotted line. Grey shaded areas denote the range of coverage rate corresponding to the 95% confidence intervals expected from the binomial distribution. The final coverage rates were higher than if trip dates had not been altered and/or cancelled.

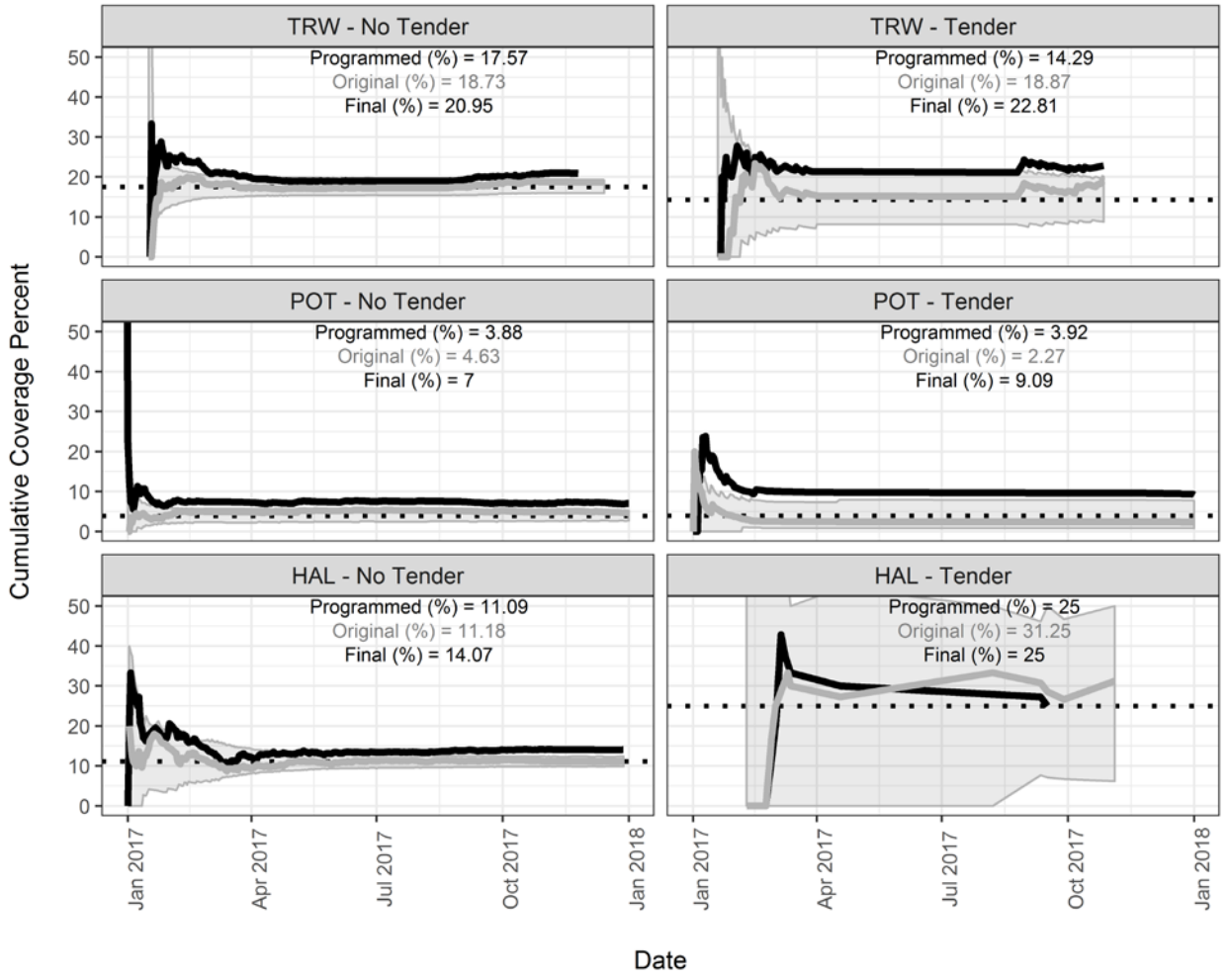


Figure 3-3. -- Cumulative number of trips observed during 2017 (black line) compared to the expected range of observed trips (shaded area) given fishing effort and sampling rates. Dates where the observed number of trips is outside of expected (less or more than the range; OOE) are depicted as tick marks on the horizontal x-axis. The results of tests that the observed rate derived from a binomial distribution sampled at the selection rate are denoted as p-values.

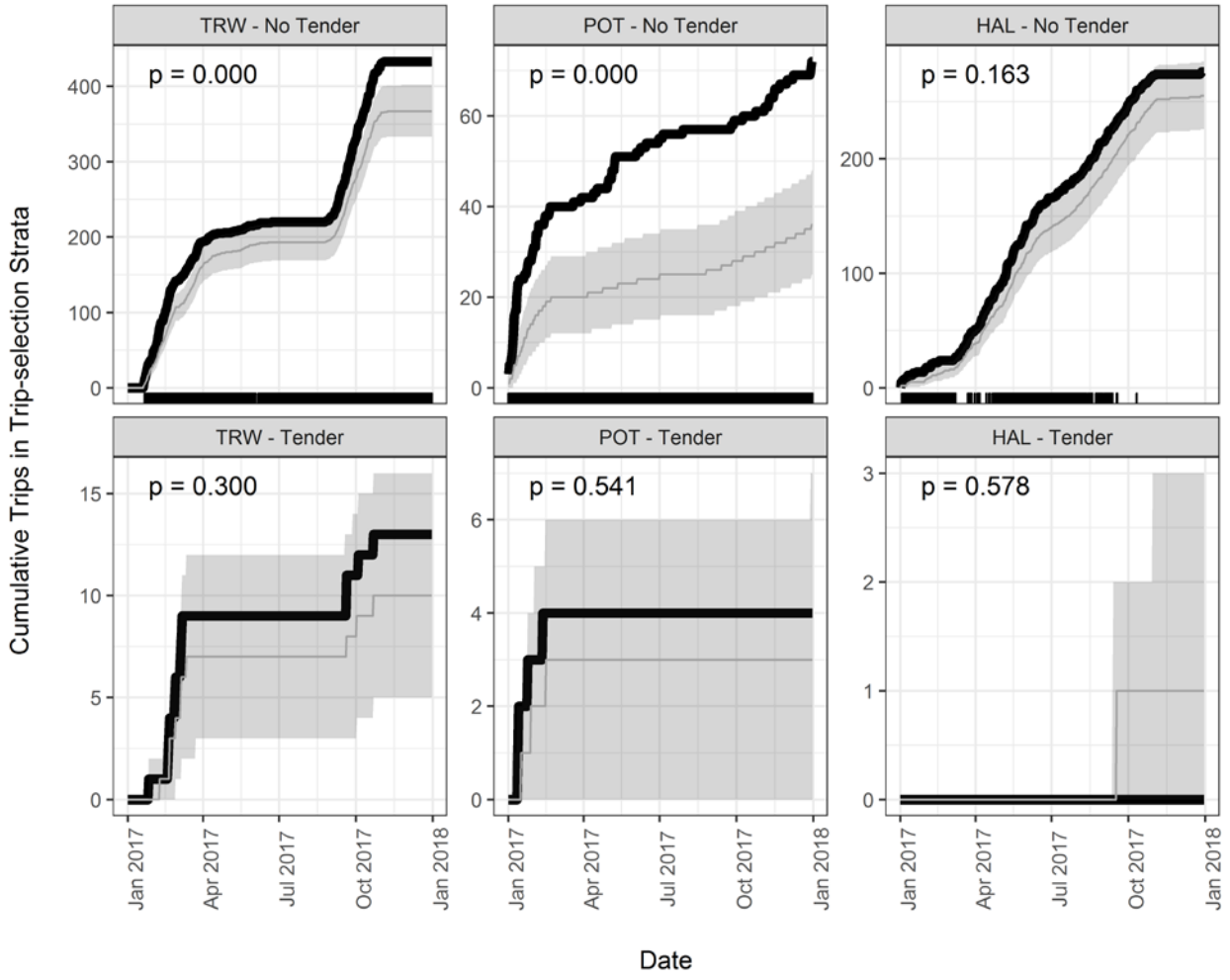


Figure 3-4. -- Comparison plots depicting the number of observed sample units compared to the number of expected observed sample units for each partial coverage stratum. Each point on a plot represents a NMFS Area. The darker the point, the more unusual the result.

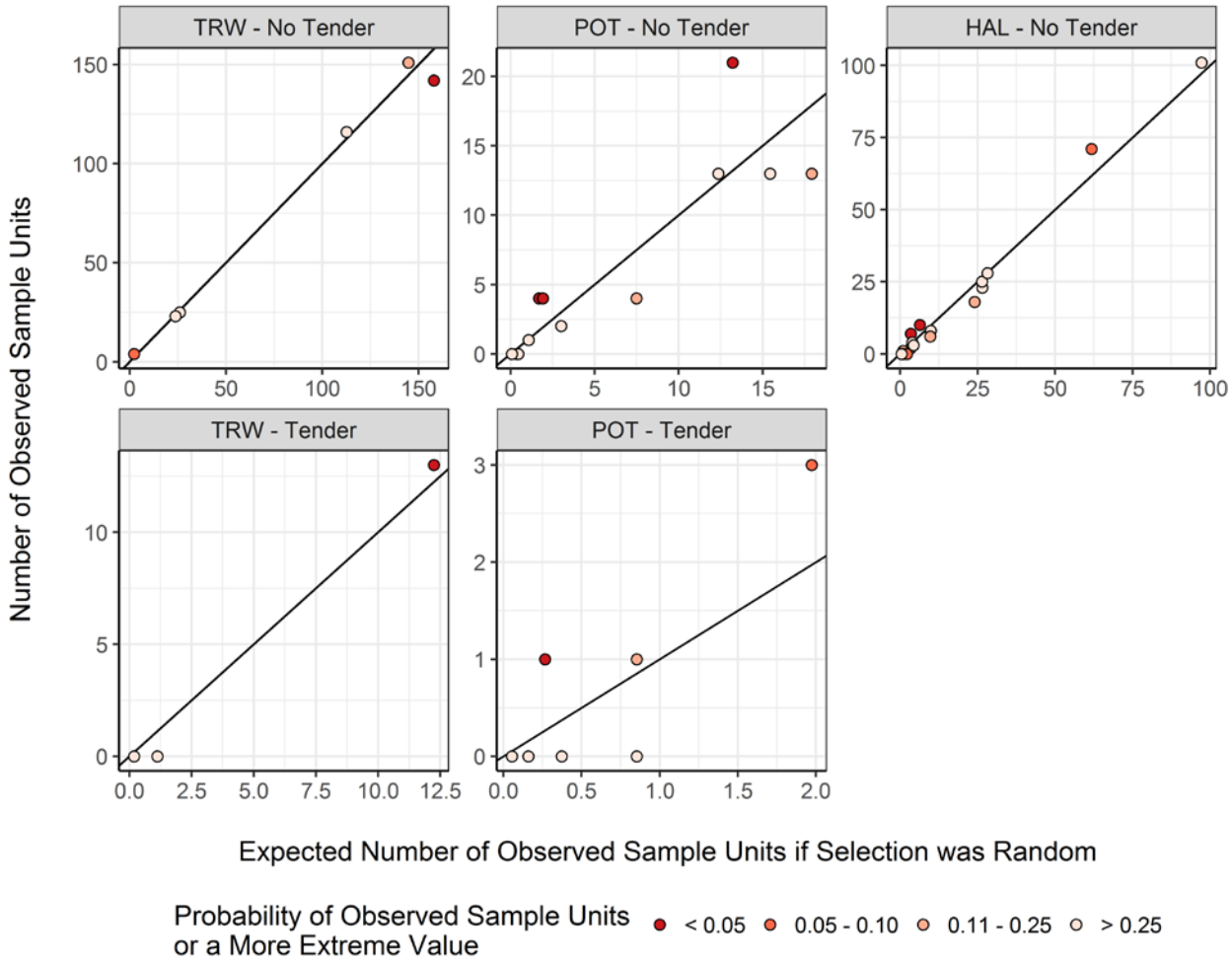


Figure 3-5. -- Probability of observing the realized or more extreme outcome (coverage rate) in a NMFS Reporting Area in the HAL stratum (2016) and HAL - No Tender stratum (2017). Reporting Areas where unlikely outcomes occurred are shaded in darker colors.

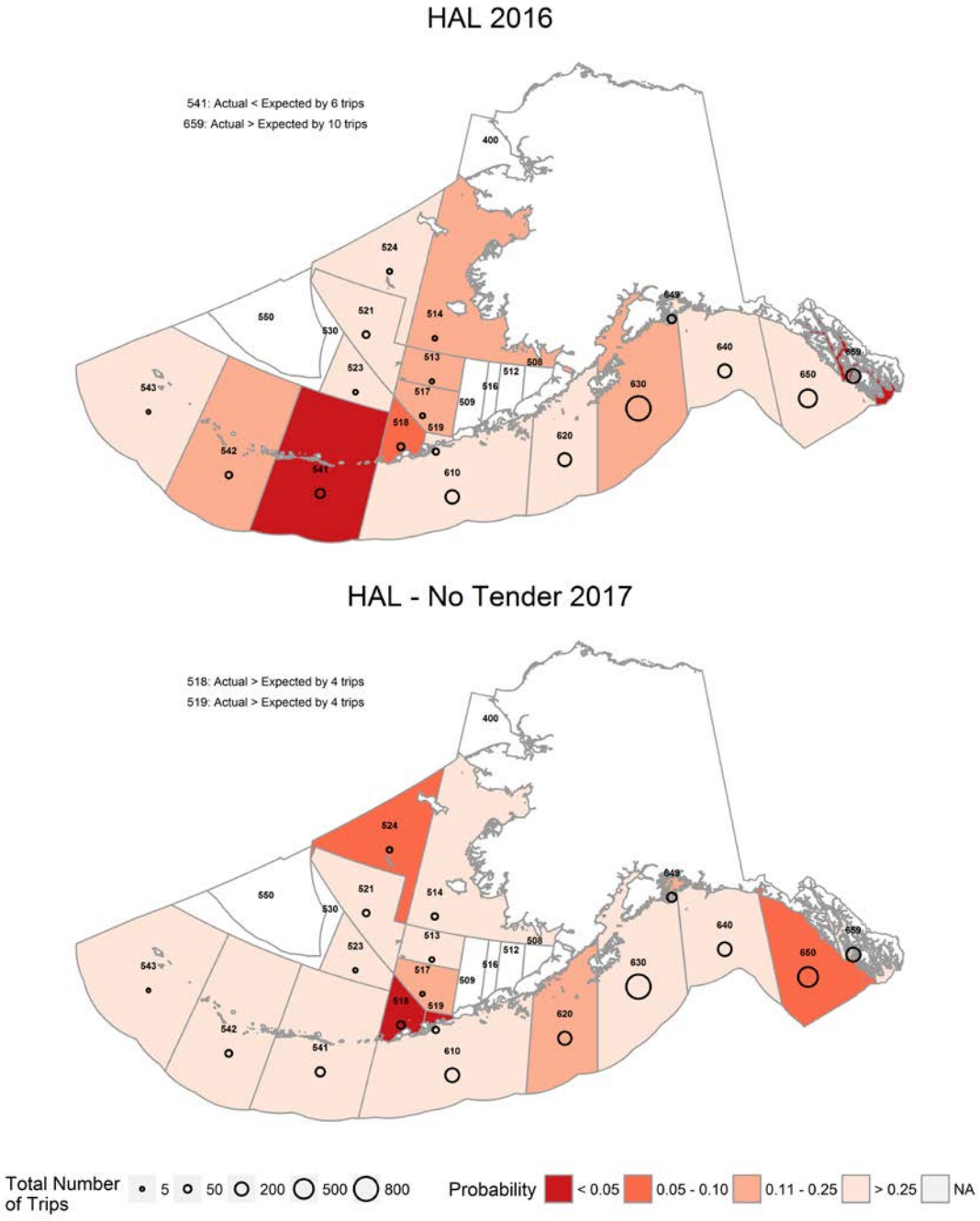


Figure 3-6. -- Probability of observing the realized or more extreme outcome (coverage rate) in a NMFS Reporting Area in the *POT* stratum (2016) and *POT - No Tender* stratum (2017). Reporting Areas where unlikely outcomes occurred are shaded in darker colors.

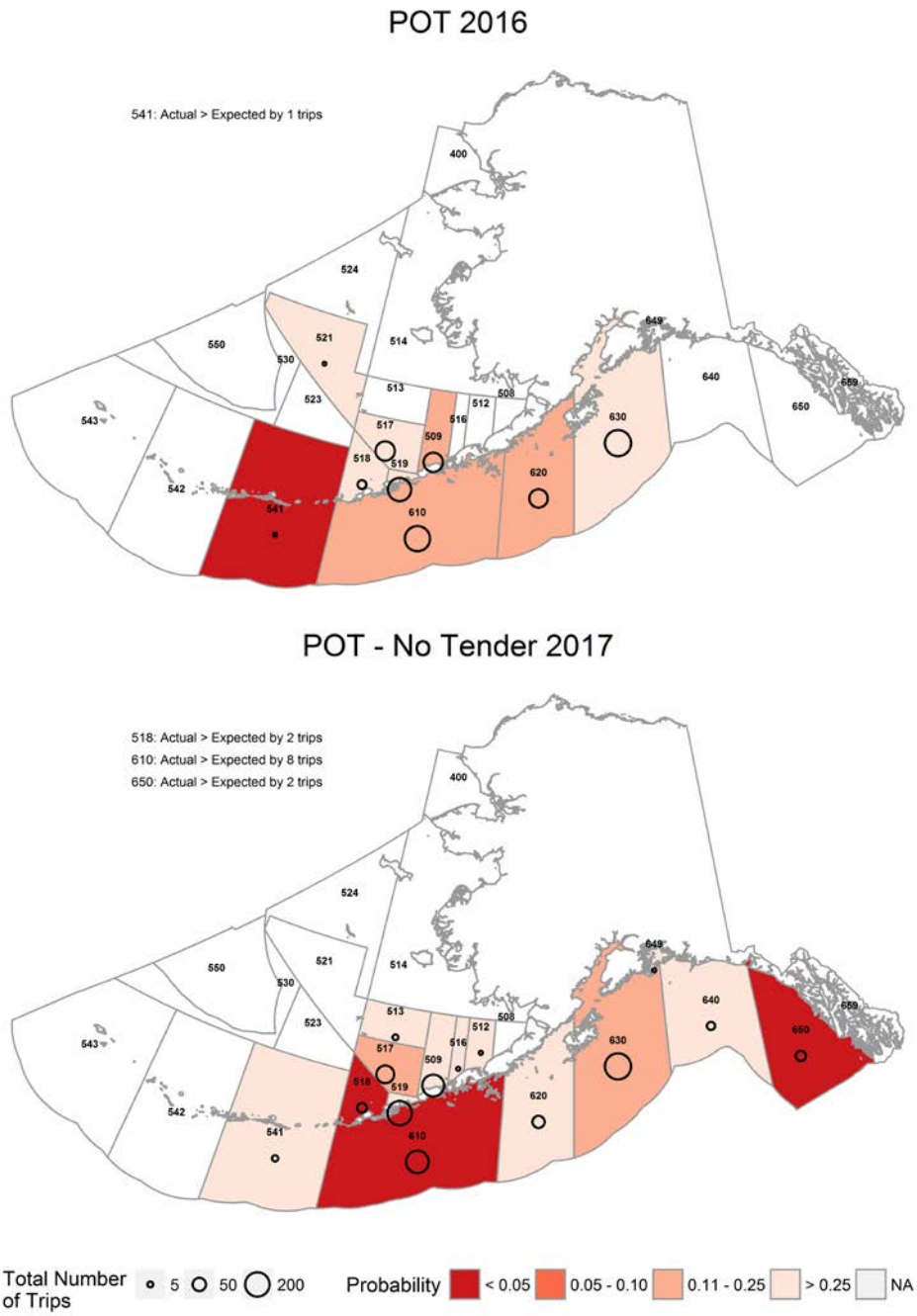


Figure 3-7. -- Probability of observing the realized or more extreme outcome (coverage rate) in a NMFS Reporting Area in the *TRW* stratum (2016) and *TRW - No Tender* stratum (2017). Reporting Areas where unlikely outcomes occurred are shaded in darker colors.

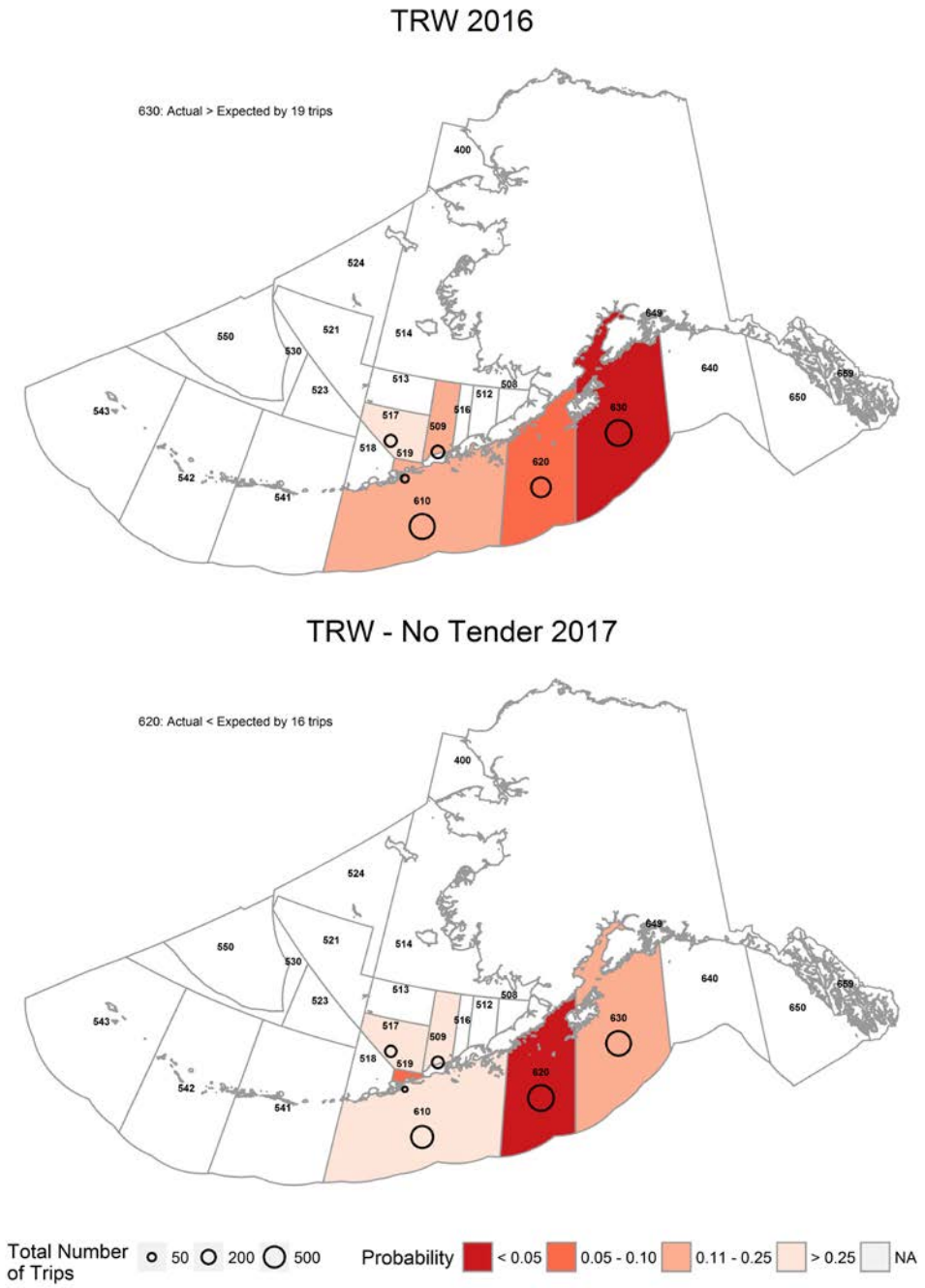


Figure 3-8. -- Probability of observing the realized or more extreme outcome (coverage rate) in a NMFS Reporting Area in the *POT - Tender* stratum. Reporting Areas where unlikely outcomes occurred are shaded in darker colors.

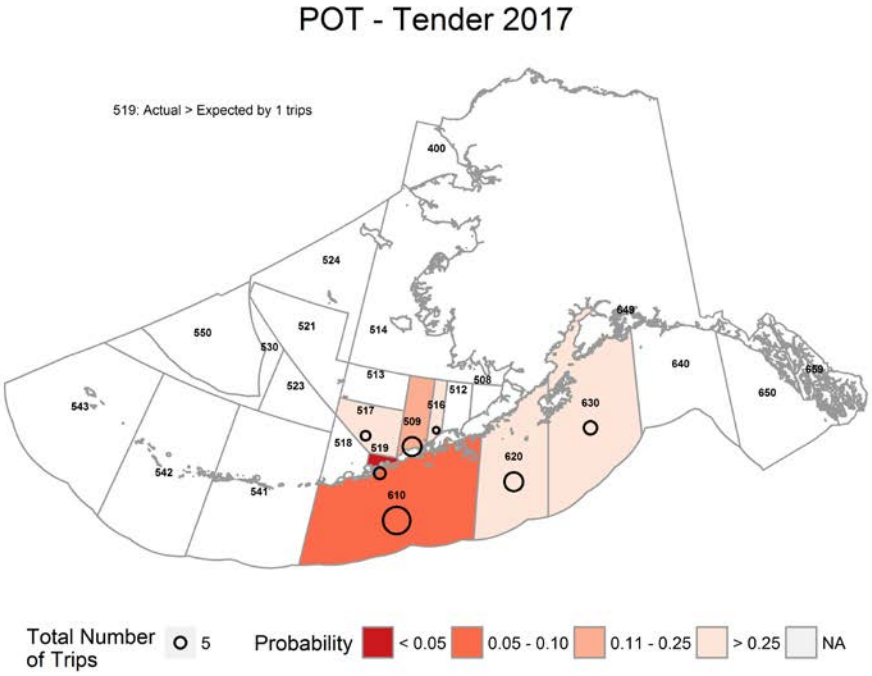


Figure 3-9. -- Probability of observing the realized or more extreme outcome (coverage rate) in a NMFS Reporting Area in the *TRW - Tender* stratum. Reporting Areas where unlikely outcomes occurred are shaded in darker colors.

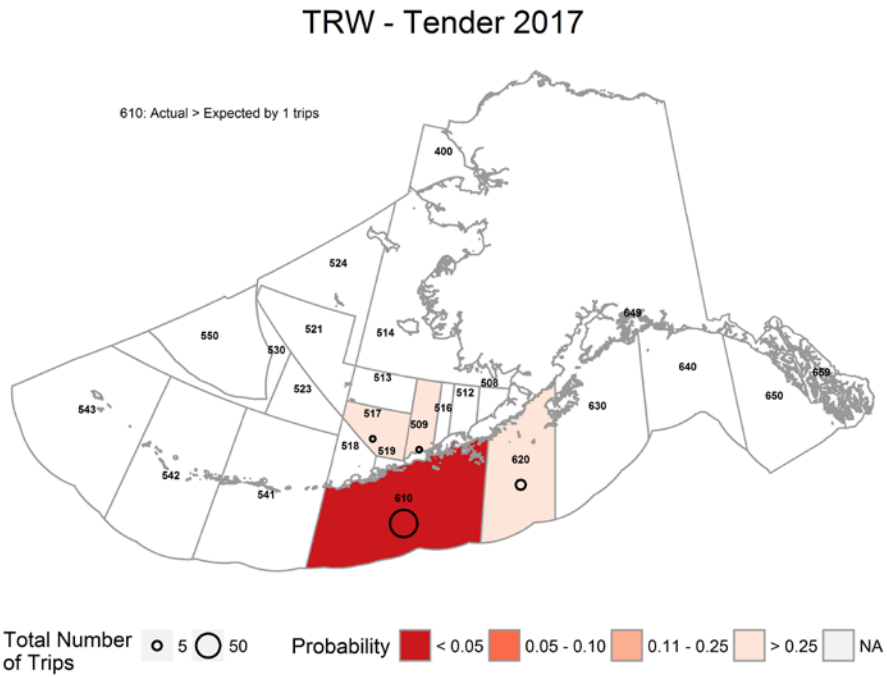


Figure 3-10. -- Example of results from permutation tests depicting percent differences between observed and unobserved trips for each strata in the partial coverage category. Grey bars depict the distribution of differences between observed and unobserved trips where the assignment of observed status has been randomized (this represents the sampling distribution under the null hypothesis that observed and unobserved trips are the same). The vertical line denotes the actual difference between observed and unobserved trips. Values on the x-axis have been scaled to reflect the relative (%) differences in each metric. The p-value for each test is denoted in the upper left corner. Low p-values are reason to reject the null hypothesis and conclude that there is an observer effect. Results from all permutation tests can be found in the Tables section of this report.

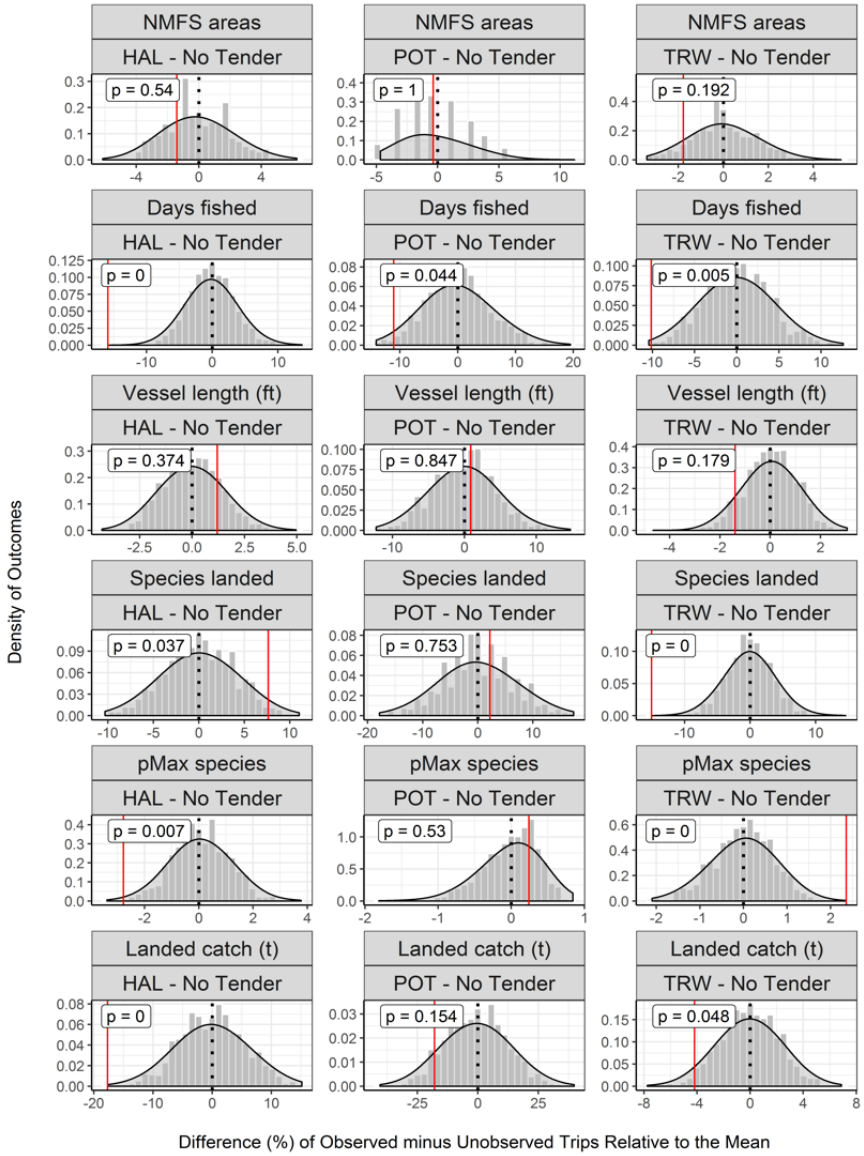


Figure 3-11. -- Distribution of trip durations for vessels in the partial coverage category by gear and observation status. Observed trips are depicted as transparent white bars overtop of solid black bars for unobserved trips. Trip durations where both observed and unobserved status exist are depicted in gray (This is not the same as a stacked bar chart, in which the height of the bar would reflect observed and unobserved on top of one another- this plot has each observation status in front of the other).

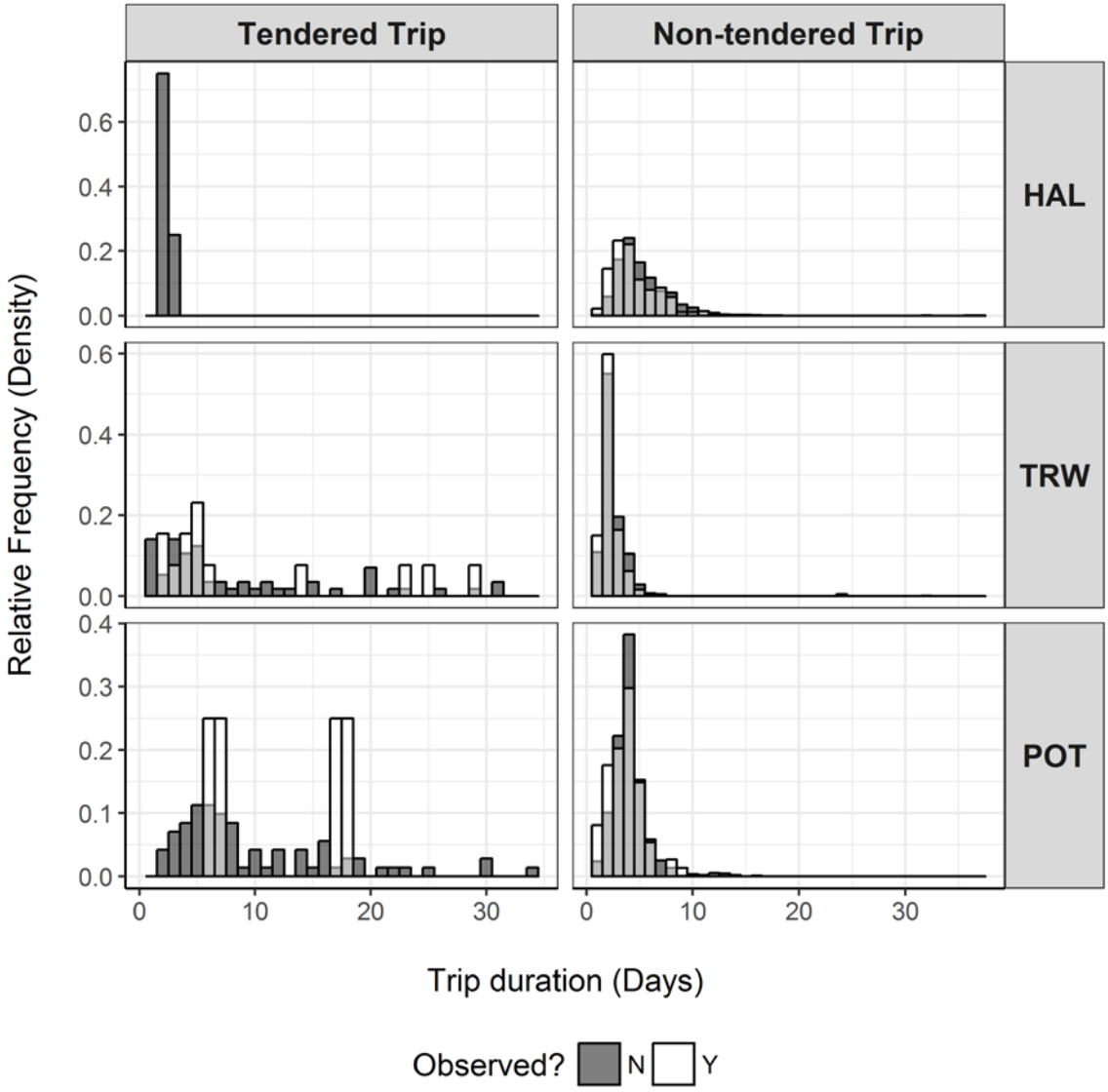
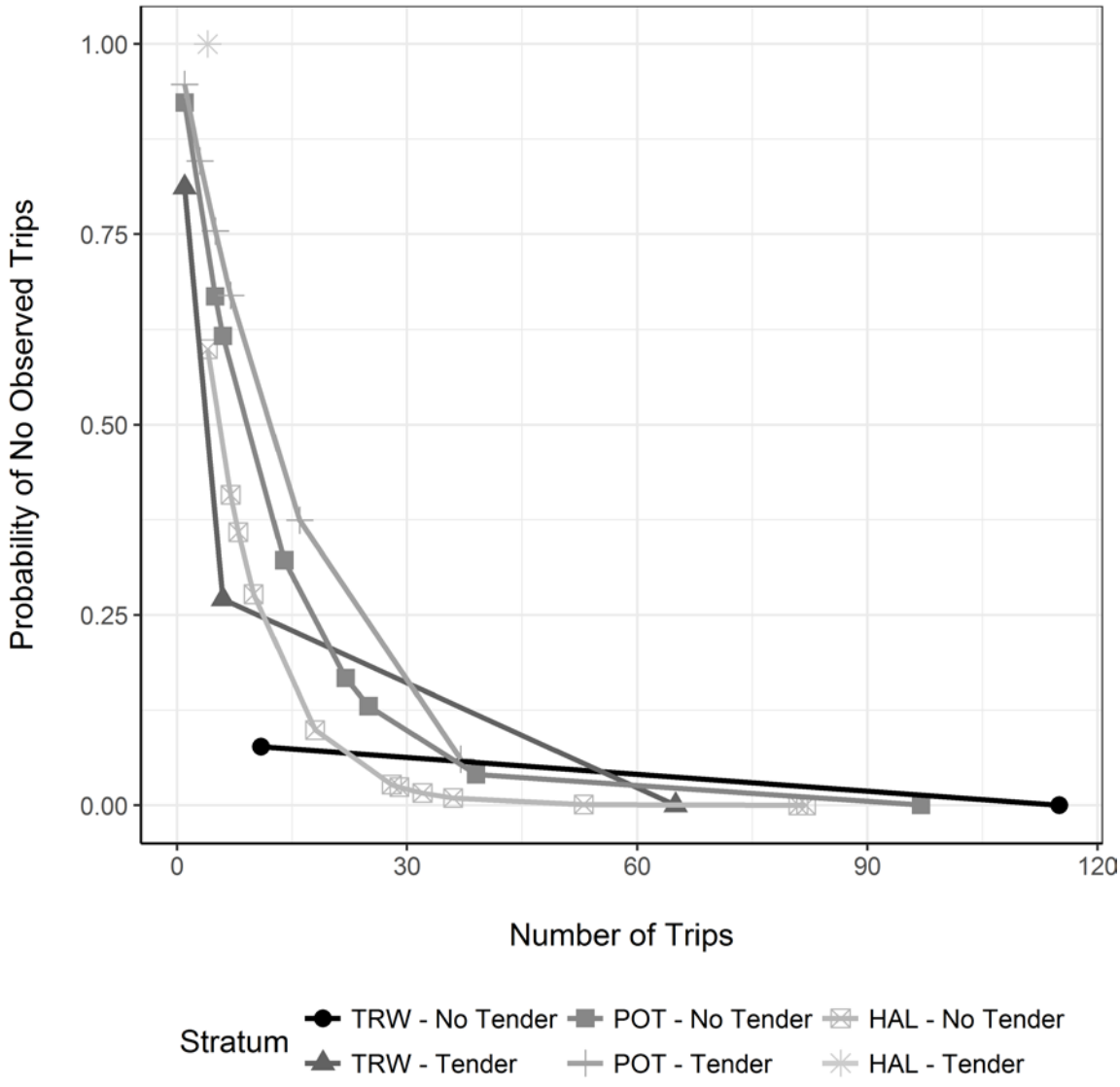


Figure 3-12. -- Probability of observing no trips in a NMFS Area and stratum given fishing effort and sampling rate. The x-axis has been truncated to increase resolution at low levels of fishing effort. The likelihood of having no observer data decreases with increasing total fishing effort and selection rate. The selection rate is 17.57% in the *TRW - No Tender* stratum, 11.09% in the *HAL - No Tender* stratum, 3.88% in the *POT - No Tender* stratum, 14.29% in the *TRW - Tender* stratum, 25% in the *HAL - Tender* stratum, and 3.92% in the *POT - Tender* stratum.



4. Descriptive Information

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

In Chapter 3, Table 3-5 provides trip and vessel counts based on coverage type and strata. However, the Council has previously requested a summary of trip and vessel counts based on criteria which are not, or are no longer, considered when deploying observers on trips (e.g., FMP area and vessel length). Table 4-1 and Table 4-2 provides 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 observed trips and the total number of trips, where observed trips reflect trips with an observer. The percent of trips observed is also included in Table 4-1 and Table 4-2. For the percent of trips in the EM strata that were monitored, in 2017, please see Table 3-5.

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

The zero selection pool presented in Table 4-1 and Table 4-2 has been simplified and does not distinguish between vessels and trips in zero coverage because they fished jig gear or were catcher vessels less than 40 ft LOA and vessels that were in the zero selection pool because of participation in EM research in 2017. For trip and vessel information on this stratum at a finer resolution please see Table 3-5.

4.2. Total Catch and Discards and Amount of Catch Observed

The ADP does not assign observer coverage by fisheries (because the fishery is not able to be identified before fishing occurs), instead observers are deployed to trips and vessels across all fisheries. However, there has been interest in comparing observer coverage across resulting fisheries, so this section includes summaries of observed and total catch by area, gear type, and sector. The total catch of groundfish and halibut (retained and discarded) was summarized from the NMFS Catch Accounting System (CAS) in Table 4-3 and Table 4-4 for 2017. 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 observed 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 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 observed. 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 observed, the proportion of trips observed, 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 fisheries, and lack of independence between the coverage rates within a sampling stratum[9].

In Table 4-3 and Table 4-4, the table columns titled "Observed" indicate catch that occurred on trips where an observer was present. Catch on vessels with EM coverage and video review are not included in the observed column at this time. Once EM data are integrated into the catch estimation process, catch on vessels in the EM strata will be included in the observed catch. The columns titled "Total" represents estimates of all catch from all trips regardless of whether it was observed. 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.

In previous versions of the Annual Report, additional tables containing retained and discard catch information in the Gulf of Alaska (GOA) and Bering Sea/Aleutian Islands (BSAI) broken down by species were included. As were tables containing a time series of the percentage of retained catch on observed trips in each area by sector and gear. These tables are no longer included in the Annual Report, however, the information is available online.[10]

[9] More trips observed in one subpopulation (fishery) equates to fewer observed trips in the other subpopulations since all the trips across the different subpopulations must add to the total number of trips selected.

[10] Available at: https://alaskafisheries.noaa.gov/fisheries/observer-program

Table 4-1. -- Number of vessels (V), total trips (N), observed trips (n), and percent of trips observed (%, with observer coverage) in 2017 in each FMP area (BSAI and GOA) by strata, gear type (hook and line (HAL), nonpelagic trawl (NPT), pot, pelagic trawl (PTR), and jig), and vessel length category (based on length overall, in feet) for the full and partial coverage category.

			Vessel length category											
			< 40'				40-57.4'				≥ 57.5'			
Area	Strata	Gear	V	N	n	%	V	N	n	%	V	N	n	%
BSAI	EM Voluntary	HAL					2	6	0	0.0	6	8	0	0.0
	EM Voluntary	POT									4	42	0	0.0
	FULL	HAL									28	326	326	100
	FULL	NPT									46	618	618	100
	FULL	POT									5	43	43	100
	FULL	PTR									93	2,173	2,173	100
	HAL - No Tender	HAL					23	138	19	13.8	31	99	10	10.1
	POT - No Tender	POT					2	37	4	10.8	49	425	28	6.6
	POT - Tender	POT					1	1	0	0.0	12	19	1	5.3
	TRW - No Tender	NPT									25	171	35	20.5
	TRW - Tender	NPT									1	1	0	0.0
	ZERO Coverage[1]	HAL	67	580	0	0.0								
	ZERO Coverage	JIG					1	4	0	0.0				
	BSAI Subtotal		67	580	0	0.0	26	186	23	12.4	242	3,925	3,234	82.4

Table 4-2. -- Number of vessels (V), total trips (N), observed trips (n), and percent of trips observed (%, with observer coverage) in 2017 in each FMP area (BSAI and GOA) by strata, gear type (hook and line (HAL), nonpelagic trawl (NPT), pot, pelagic trawl (PTR), and jig), and vessel length category (based on length overall, in feet) for the full and partial coverage category.

			Vessel length category											
			< 40'				40-57.4'				≥ 57.5'			
Area	**Strata**	**Gear**	**V**	**N**	**n**	**%**	**V**	**N**	**n**	**%**	**V**	**N**	**n**	**%**
GOA	EM Voluntary	HAL					54	348	0	0.0	22	131	0	0.0
	EM Voluntary	JIG					1	1	0	0.0				
	EM Voluntary	POT					1	12	0	0.0	15	140	0	0.0
	FULL	HAL									10	28	28	100
	FULL	NPT									35	211	211	100
	FULL	PTR									20	54	54	100
	HAL – No Tender	HAL					260	1,307	153	11.7	140	788	98	12.4
	HAL– No Tender[2]	POT					2	3	1	33.3	5	12	1	8.3
	HAL – Tender	HAL					2	3	0	0.0	1	1	0	0.0
	POT – No Tender	POT					18	137	7	5.1	46	334	33	9.9
	POT – Tender	POT					8	25	2	8	18	31	1	3.2
	TRW - No Tender	NPT									42	375	48	12.8
	TRW - No Tender	PTR					1	36	5	13.9	58	1,546	346	22.4
	TRW – Tender	NPT									24	47	9	19.1
	TRW – Tender	PTR									9	22	4	18.2
	ZERO Coverage	HAL	322	1,362	0	0.0	2	27	0	0.0	1	9	0	0.0
	ZERO Coverage	JIG	10	30	0	0.0	9	20	0	0.0				
	ZERO Coverage	POT	1	8	0	0.0								
	GOA Subtotal		329	1,399	0	0.0	336	1,916	167	8.7	261	3,660	813	22.2
	TOTAL UNIQUE		387	1,962	0	0.0	343	2,081	187	9	406	7,552	4,033	53.4

[1] Zero Coverage in this table includes vessels in both the Zero Coverage (fishing jig gear or vessels less than 40 ft LOA) and Zero Coverage EM Research strata described in Ch. 3.
[2] On trips where more than one gear type is fished, the predominate gear type that will be used is selected in ODDS and determines the strata for the trip.

Table 4-3. -- Observed catch (metric tons), total catch, and percent observed (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in 2017 in the Gulf of Alaska. Empty cells indicate that no catch occurred.

	CATCHER/PROCESSOR			CATCHER VESSEL			CATCHER VESSEL: ROCKFISH PROGRAM		
	Observed	Total	%	Observed	Total	%	Observed	Total	%
HOOK AND LINE									
Retained	6,191	6,274	99%	1,507	20,461	7%			
Discarded	2,170	2,188	99%	866	13,123	7%			
JIG									
Retained				0	29	0%			
Discarded									
NON-PELAGIC TRAWL									
Retained	33,628	33,628	100%	3,327	32,003	10%	6,540	6,540	100%
Discarded	5,781	5,781	100%	424	5,014	8%	316	316	100%
POT									
Retained				481	12,937	4%			
Discarded				15	289	5%			
PELAGIC TRAWL									
Retained	805	805	100%	37,631	177,350	21%	3,819	3,819	100%
Discarded	4	4	100%	319	1,583	20%	57	57	100%

Table 4-4. -- Observed catch (metric tons), total catch, and percent observed (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in 2017 in the Bering Sea/Aleutian Islands. Empty cells indicate that no catch occurred.

	CATCHER/PROCESSOR			MOTHERSHIP			CATCHER VESSEL		
	Observed	Total	%	Observed	Total	%	Observed	Total	%
HOOK AND LINE									
Retained	139,183	139,244	100%				222	2,271	10%
Discarded	29,359	29,375	100%				123	1,282	10%
JIG									
Retained							0	13	0%
Discarded									
NON-PELAGIC TRAWL									
Retained	323,323	323,323	100%	40,002	40,002	100%	16,934	30,685	55%
Discarded	20,015	20,015	100%	3,669	3,669	100%	630	1,284	49%
POT									
Retained	5,980	5,980	100%				1,547	25,591	6%
Discarded	209	209	100%				24	351	7%
PELAGIC TRAWL									
Retained	615,587	615,587	100%	119,145	119,145	100%	594,296	594,296	100%
Discarded	3,110	3,110	100%	163	163	100%	2,084	2,084	100%

4.3. Electronic Monitoring Video Review

During 2017, video that was collected from vessels participating in the EM Pre-implementation program was sent to Pacific States Marine Fisheries Commission (PSMFC) for review. The infrastructure was not yet developed to transfer these data to NMFS to incorporate the information into catch estimation for inseason management of the fisheries. However, the data from the EM were used to develop video review protocols, inform NMFS and the Council about the reliability and data quality of EM and develop catch estimation methods. Since collection of EM data is new, the EM Workgroup requested that NMFS include metrics on the results of the video review as part of the Annual Report to be able to track reliability and image quality.

EM data was collected on a total of 143 trips in 2017. At the time of publication of this report, PSMFC had completed video review 76 trips and 2,954 hauls. The PSMFC preliminary report is included in Appendix B.

Video and Sensor Completeness

During an EM trip there can be times when either the sensors or video data are not captured and there are gaps in the EM information. Video reviewers at PSMFC assessed the completeness of the video and sensor data during each trip and haul. The 2017 results are presented in Appendix Table B-3 and key finding include the following:

- Sensor data was complete on 93% of the trips.
- Video was complete on 66% of the trips. However, in many cases 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 were being brought onboard.
- Of the 2,954 hauls reviewed, 2857 (97%) had complete video during the entire period when catch was bring brought onboard and sorted.

Image Quality

- The majority (81%) of the video was high quality (Appendix Table B- 3).
- Of the hauls with medium-quality video (Appendix Table B- 3), intermittent gaps in the video, water spots, and glare caused most of the video degradation.
- Low image quality was mostly a factor of water spots on the lens.

4.4. Observer Training and Debriefing

During the 2017 fishing year, approximately 411 individual observers were trained, briefed, and equipped for deployment to vessels and processing facilities operating in the Bering Sea and GOA groundfish and halibut fisheries. These observers collected data on board 418 fixed gear

and trawl vessels and at six processing facilities for a total of 41,123 observer days (37,517 full coverage days on vessels and in plants; and 3,606 partial coverage days).[11]

New observer candidates are 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 102 new observers to deploy in 2017 in addition to the 309 prior observers who attended a briefing of some type (Table 4-5). Portions of FMA's 3-week observer training class were attended by observer providers, members from the Alaska Seafood Cooperative, the Chinese Bureau of Fisheries, and NOAA General Counsel.

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. Mid-cruise debriefings can be completed in person, over the phone, electronically, or via fax. In 2017 there were 4 mid-cruise debriefings in Anchorage, 153 in Dutch Harbor, 14 in Kodiak, and 16 in Seattle.

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. There were 126 debriefings in Anchorage completed by four FMA staff, 2 in Kodiak, and 581 debriefings in Seattle completed by 27 FMA staff. Many observers deploy multiple times throughout the year and debrief after each contract, followed by a briefing for re-deployment. Since observers are required to attend more than one briefing annually, the total number of briefings and debriefings for 2017 does not represent a count of individual observers.

Depending on their performance and assessment during debriefing, observers must attend a 1-day, 2-day, an annual briefing, or a fish and crab identification training. In rare cases when an observer has demonstrated major deficiencies in meeting program expectations, they may be required to attend another 3-week training. Regardless of their required training as the result of debriefing, all returning observers are required to 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, and U.S. Coast Guard (USCG) safety lectures and discussions. Additionally, observers are required to demonstrate their understanding and proficiency by passing an exam on seabird identification, and successfully completing various in-class activities.

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

In 2017, the briefing curriculum focused the Pacific halibut decksorting EFP, randomization of halibut condition assessments, and professionalism in the workplace. In the later portion of 2017, the annual briefing was reformatted which decoupled the annual briefing and the fish and crab identification training. The annual briefing is completed prior to any deployment in a calendar year, while the fish and crab identification training is required to be completed once in a 12-month period. This allows focus on classroom instruction for observer sampling materials and other programmatic updates, flexibility for observers to attend fish and crab trainings while waiting to debrief, and increased capacity in the annual briefings to meet provider and industry needs.

Prior to being deployed on NOAA surveys and fishing vessels, North Pacific observers, AFSC staff, and visiting scientists must fulfill a requirement for cold-water survival training. All staff responsible for providing safety training to observers are required to attend a USCG approved Marine Safety Instructor course, have experience at sea, and complete regular refresher and co-trainings. In 2017, FMA staff cross-trained with the NWFSC's At-sea Hake Observer Program to share information and learn from the experience of another observer program and offered the safety training to numerous AFSC sea going staff.

The result of 2017 for debriefings and trainings was overall a very successful and productive year for the FMA Division.

Table 4-5. -- Number of observer training classes and number of observers trained/briefed from November 15, 2016 to November 9, 2017.[12]

Training classes	Number of classes	Number of observers trained/briefed
3-week training	8	118
4-day briefing	15	286
3-day annual	6	36
2-day briefing	3	3
1-day briefing	50	322
Fish and Crab ID	11	68
TOTAL	93	833

[12] These dates were selected based on observers being trained in late November/December to deploy at the beginning of the fishing year in January, i.e. counting observers trained from December to December would not have represented the actual number trained for deployments in the 2017 fishing year.

4.5. Availability of Lead Level 2 Observers

In June 2017, the Council recommended changes to modify the training and experience requirements for an observer to obtain a non-trawl lead level 2 (LL2) deployment endorsement. NMFS published a proposed to modify these requirements on December 27, 2017 (82 FR 61243) with comments invited through January 26, 2018. A final rule is in development and will be published in the Federal Register later this year. Additional information about the availability of non-trawl LL2 observers is available in the Regulatory Impact Review prepared for this regulatory amendment, which is available at https://www.regulations.gov/docket?D=NOAA-NMFS-2017-0071.

5. Compliance and Enforcement

5.1. Enforcement Partners in Alaska

This chapter provides information about observer reported compliance data and the cooperative relationship between the NOAA Office for Law Enforcement's (OLE), Alaska Division (AKD) and the North Pacific Groundfish and Halibut Observer Program (Observer Program).

Observer monitoring and compliance roles are identified in the Magnuson-Stevens Act and implementing regulations. Observers are expected to accurately record sampling data, write complete reports, and report any observations of suspected violations relevant to the conservation of marine resources. The Observer Program documents and reports to AKD compliance information relevant to marine resources; safety; and observer deployment, accommodations, assistance, and work environment. Prior to deployment, observers are trained in compliance monitoring.

Observers can play an important compliance assistance role onboard vessels by communicating with operators about safety concerns and potential violations. Observers are not required to communicate potential violations to vessel operators, and they are not experts in all areas of regulation. They are encouraged to work with vessel operators if it will not impact their data quality, data collection, or work environment. **Strong rapport between crew and observers can contribute to a positive compliance assistance relationship.**

5.1.1. NOAA Office for Law Enforcement

The NOAA Office of Law Enforcement (OLE) mission is to support resource management by enforcing the laws and regulations that protect living marine resources. Central to this mission is the OLE role in protecting observers and their ability to collect scientific data used to manage marine resources. Reports of assault, sexual harassment, interference/sample bias, intimidation, coercion, hostile work environment and safety are among the highest OLE and the Alaska Division of OLE (AKD) investigative priorities. OLE priorities are available on the web at: www.nmfs.noaa.gov/ole/priorities/priorities.html.

The AKD maintains a strong partnership with the Observer Program. AKD Agents and Officers frequently engage with industry and the Observer Program to support outreach, education, and compliance assistance. Agents and officers in the field respond to industry questions about Observer Program requirements and participate in outreach meetings to discuss fishery management programs.

AKD dedicates a full-time liaison contractor in Seattle to support Observer Program compliance reporting. Duties of the liaison include: receive, organize, and distribute compliance statements; provide resources and support to observers who have been victimized; develop and edit manuals, reports, and training materials; provide training to Observer Program staff and observers; serve as liaison with Observer Program staff; distribute AKD outreach materials to industry; provide observer related administrative and investigative support to agents and officers.

AKD maintains a full-time liaison Special Agent. Duties include: provide resources and support to observers who have been victimized; conduct and assist with complex observer-related investigations, liaison with Observer Program staff, provide agency analysis on observer-related topics, provide compliance monitoring portions of observer training and program staff updates, attend meetings and outreach events, and assist industry to comply with fishery management regulations.

In August 2017, AKD and the USCG Fish School hosted a week-long training for new AKD enforcement officers. An Observer Program staff member provided training on the importance of the observer's role and observer duties. Standing Together Against Rape (STAR), an Alaska victim advocacy organization, provided prevention and victim support training. AKD's observer liaison agent and contractor engaged the group in role playing scenarios and provided training on victim crimes and investigations.

5.1.2. U.S. Coast Guard

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

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

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

The USCG may receive requests to assist the AKD or Observer Program to help evaluate safety concerns. In coordination with AKD and/or the Observer Program, 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.

5.1.3. Alaska Wildlife Troopers

The AKD and the Alaska Wildlife Troopers (AWT) collaborate under a Joint Enforcement Agreement which provides AWT authority to enforce observer and data protections under the Magnuson-Stevens Act. AKD and AWT work together to investigate observer complaints and to conduct patrols and at-sea or dockside boardings. During joint and independent agency patrols,

interaction with observers is encouraged to allow reporting opportunities and to develop a trust relationship. During 2017, AWT and AKD conducted multiple joint vessel patrols utilizing State vessels.

5.2. Reports of Potential Violations

The AKD works closely with the Observer Program and observer providers to address incidents that affect observer safety, sampling, and work environments. Every statement received from the Observer Program is evaluated and prioritized. Then, AKD Officers and Agents investigate the most egregious complaints to identify if violations have occurred and to determine the appropriate level or response. Many first offences and low-level infractions may be handled as compliance assistance or through issuance of warning.

AKD also utilizes observer compliance data to track compliance trends. Trend analysis helps the AKD focus and prioritize enforcement efforts. Table 5-1 and the following figures summarizes Observer Program statements received. Note: where two observers are present, two statements may have been generated for the same event.

5.2.1. Highest Priority Violations

OLE has zero tolerance for sexual harassment, sexual violence, rape, intimidation, hostile work environment, or coercion directed towards observers. In 2016, there were 14 reports of sexual harassment and 1 report of assault; compared to 7 reports or sexual harassment and 3 of assault in 2017. While the overall numbers have declined, reported numbers are not indicative of the total rate of harassment or assault.

Many sexual crimes go unreported. It is difficult for victims to report unwanted sexual contact, advances, or behavior of a sexual nature for many reasons: sexual behavior tends to be difficult to discuss in the first place; observers may worry about impacts to their work environment, profession, or lost days on the job; and victims may fear being blamed, blame themselves, initially minimize what happened to them, or simply decide to deal with it later or not at all. Additionally, observers often know their harasser personally and may be reluctant to report because they don’t want to impact the offender’s job and dependents. (Fig. 5-1)

5.2.2. Full Coverage Sector

Limited Access

In the AFA pollock fishery, there were four more complaints in 2017 than in 2016. The majority of these complaints involved the mixing of hauls. The majority of mixed hauls complaints were not physical mixing, rather the crew failed to reset the flowscale before a new haul began. Failures to conduct flowscale tests in a timely manner were also reported.

In the Amendment 80 fishery, there were 10 more complaints in 2017 than in 2016. The majority of complaints involved flowscale inaccuracies due to overloading or dirty sensors. Failures to conduct flowscale tests in a timely manner and multiple complaints of crew using the observer sampling station were also reported.

The catcher processor longline sector had multiple complaints involving the accuracy and timeliness of the flowscale test and failure to notify observers prior to the test. Complaints involving IFQ retention - specifically vessels failing to retain legal-sized IFQ species or failing to retain Pacific cod and rockfish as required - decreased by more than half. (Fig. 5-2)

Salmon Bycatch in the Bering Sea

In the AFA pollock fishery, there was a slight decrease in the number of complaints involving salmon bycatch. The complaints received involved multiple occurrences of salmon passing the sorting point, no sorters present, failure to place all salmon in the salmon storage bin and removing salmon from the salmon storage bin before the observer had an opportunity to count and sample.

5.2.3. Partial Coverage Sector

Salmon Bycatch in the Gulf of Alaska

There was a slight increase of complaints regarding salmon bycatch in the Gulf of Alaska. Some complaints include observers witnessing salmon discard at sea, inconsistent salmon numbers (observer numbers vs. shoreside processor), failure to sort all salmon at the shoreside processors, and at sea discard of catch before the observer had an opportunity to sample or to determine if salmon were in the catch.

Observer Coverage

There was a significant increase of reports involving observer coverage in 2017. Many of the complaints involved a vessel delivering to a location different from what was logged into ODDS and logging a shoreside or tender delivery and delivering opposite of what was logged. There were also multiple complaints involving failure to log trips. AKD addressed 61 of these reports through outreach, compliance assistance, or enforcement action. The remainder are ongoing (complex cases), dismissed, or no violation.

Table 5-1. -- Observer Program complaints received by AKD by coverage sector and subject matter in 2016 compared to 2017.

Statement type	Full coverage		Partial coverage		Total	
	2016	2017	2016	2017	2016	2017
OLE Priority						
Harassment - Assault	0	3	1	0	1	3
Harassment - Sexual	12	6	2	1	14	7
Interference/Sample Bias	30	28	14	3	44	31
Intimidation/Coercion/Hostile Work Environment	41	24	11	3	52	27
Disruptive/Bothersome Behavior - Conflict Resolved	31	20	8	1	39	21
Safety – NMFS	47	40	12	8	59	48
TOTAL OLE Priority	161	121	48	16	209	137
Limited Access Programs						
AFA	21	25	N/A	N/A	21	25
Amendment 80	70	80	N/A	N/A	70	80
Catcher Processor Longline	47	29	N/A	N/A	47	29
Rockfish Program	3	1	N/A	N/A	3	1
IFQ Retention	6	1	32	16	38	17
Total Limited Access Programs	147	136	32	16	179	152
Protected Resources and Prohibited Species						
Gulf of Alaska Salmon Bycatch	N/A	N/A	47	50	47	50
Bering Sea Pollock Salmon Bycatch	100	79	N/A	N/A	100	79
Marine Mammal	0	3	1	1	1	4
Seabird (majority is gear related)	14	1	22	14	36	15
Prohibited Species – Mishandling and Retention	80	73	19	21	99	94
Total Protected Resources and Prohibited Species	194	156	89	86	283	242
All Other Complaint Types						
Contractor Problems	7	7	N/A	N/A	7	7
Failure to Notify	50	59	20	16	70	75
Inadequate Accommodations	11	6	2	2	13	8
IR/IU	19	47	41	23	60	70
Miscellaneous Violations	10	6	10	5	20	11
Reasonable Assistance	32	36	20	9	52	45
Record Keeping and Reporting	156	122	327	198	483	320
Restrict Access	2	3	1	1	3	4
Observer Coverage	N/A	N/A	88	242	88	242
Total All Other Complaint Types	287	286	509	496	796	782
GRAND TOTAL	789	702	678	614	1467	1316

Figure 5-1. -- Observer Program Priority statements received by AKD by subject matter in 2016 and 2017.

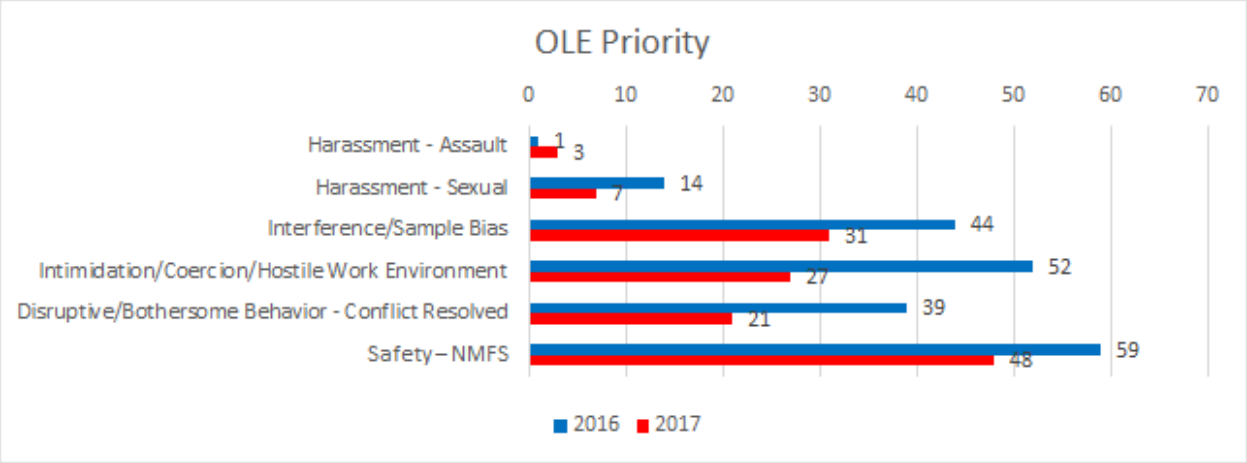


Figure 5-2. -- Observer Program Limited Access Program statements received by AKD by subject matter in 2016 and 2017.

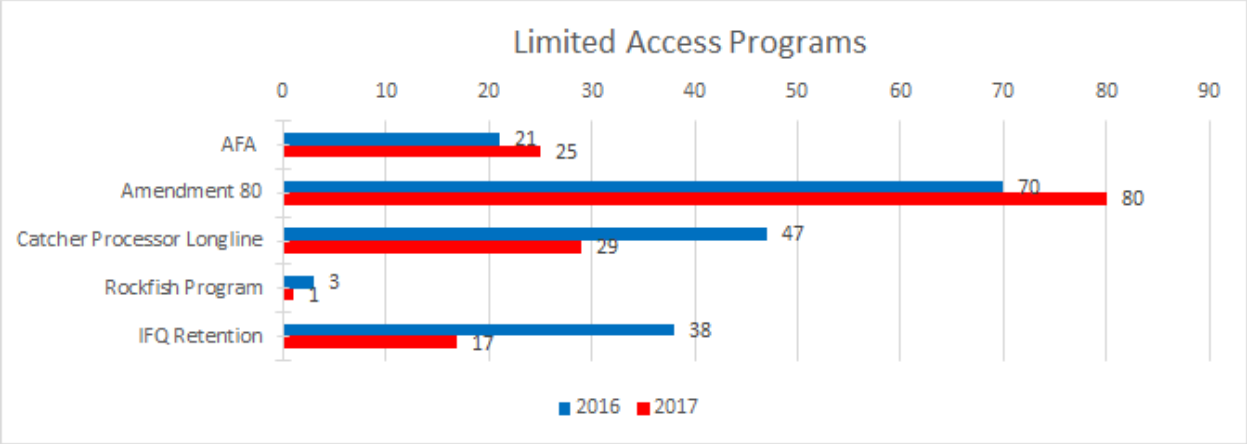


Figure 5-3. -- Observer Program Protected Resources and Prohibited Species statements received by AKD by subject matter in 2016 and 2017.

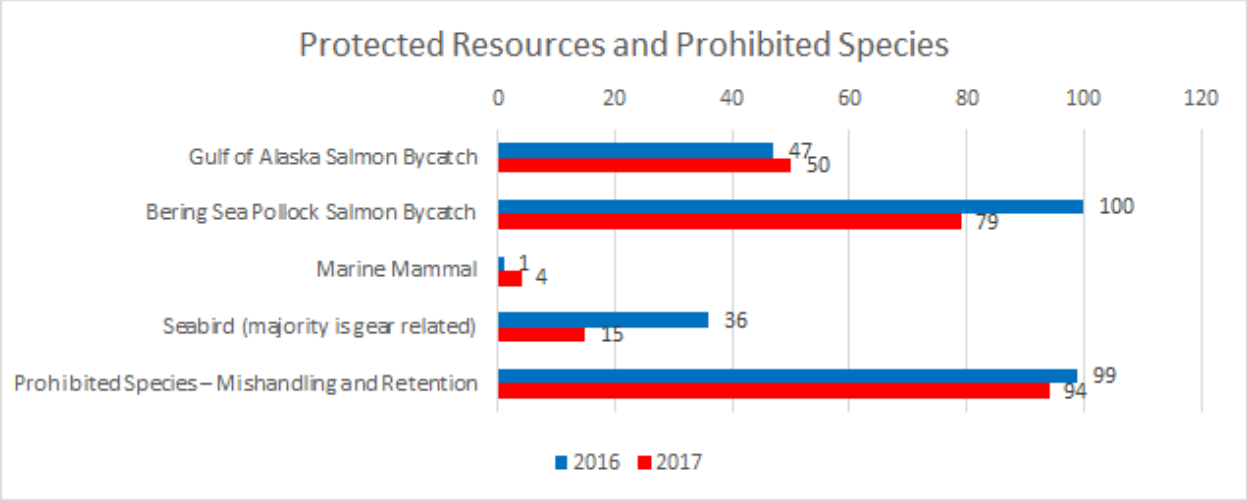
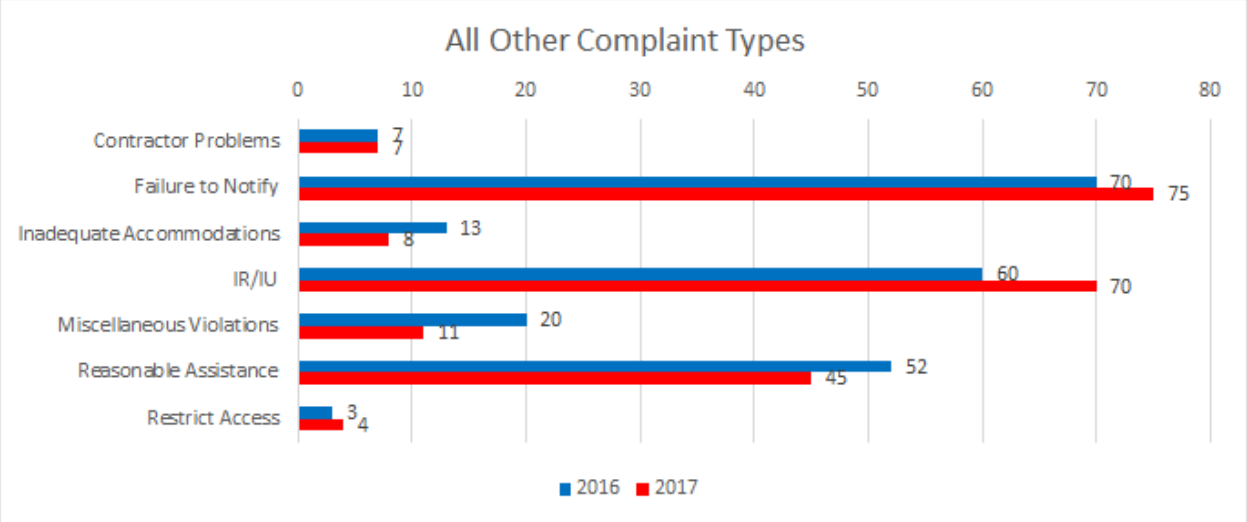


Figure 5-4. -- All other Observer Program statements received by AKD by subject matter in 2016 and 2017.



5.3. Compliance Assistance

Compliance Assistance letters were created for the following complaint types for issuance upon receipt of complaints indicating minor offences or mitigated violations: Failure to Notify, IFQ Retention, IR/IU, Prohibited Species Mishandling, Recordkeeping and Reporting, Reasonable Assistance, and Seabird Avoidance; 247 outreach letters were issued for these complaint types in 2017. Multiple complaints and outreach letters were often combined into a single incident if the complaint involved the same vessel and operator. Letters were mailed via certified mail or delivered by an OLE agent or officer.

Not every complaint under the associated category received an outreach letter. In some instances, a Written Warning or Summary Settlement was determined more appropriate based on the vessel history and specifics of the complaint. Other complaints were determined no violation.

Collaborative meetings were also held between the Observer Liaison Agent and many vessel company representatives. During meetings, complaints involving the company's vessels were discussed as well as approaches improve compliance. A consistent concern during these meetings was the desire for strong communication between observers and vessels operators/crew to assist in resolving issues. Based on a meeting with the Observer Liaison Agent, Glacier Fish Co. made several changes to improve interaction and communications with observers. Based on communications with observers this has resulted in improve working relationships between crew and observers.

Table 5-2. -- Complaints received for selected category and number of outreach letters sent out in 2017.

Complaint type	Number of complaints received	Number of compliance assistance letters issued
IFQ Retention	17	13
Seabird Avoidance	15	12
Prohibited Species Mishandling	92	35
Failure to Notify	75	42
IR/IU	70	37
Reasonable Assistance	45	27
Record Keeping and Reporting	320	81

5.4. Enforcement Actions

Based on complaints from 2017, AKD conducted a pulse operation in Dutch Harbor in March 2018 that targeted 315 individual complaints involving 95 vessels and shoreside processors. While some vessels were not encountered during the operation, 195 complaints were resolved, or were investigation furthered during the 2-week operation. Concurrent to the ground operation in Dutch Harbor, two AKD enforcement officers were deployed on the Patrol Vessel *Stimson* for a joint patrol with the Alaska Wildlife Troopers. During this time, 10 observer-related cases were resolved including some concerns from deployed observers.

In 2017, AKD closed 177 cases as compliance assistance; compliance assistance includes letters documenting minor violations and verbal warnings delivered by an agent or officer in the field.

AKD also issued 8 written warnings and 7 summary settlements; 106 observer reported incidents are still under investigation. Table 5-3 summarizes statuses.

Table 5-3. -- The table below records statements and resulting incidents. 'Enforcement Action taken' includes all civil and criminal prosecutions, summary settlements, written warnings, and compliance assistance; 'Closed' includes information only and lack of resources incidents. Many info only incidents involved observer and operator communication resulting in voluntary compliance at sea.

Statements	**Incidents**	
1,074 Statements received and reviewed in 2017	445 Incidents forwarded to agents and officers	106 Ongoing
		192 Enforcement Action Taken
		147 Closed - No OLE Action
Excludes the 242 observer coverage complaints received from Agency staff	Multiple statements are often combined into a single incident if the same vessel, operator, or company is involved. Ongoing includes cases submitted to General Counsel.	

*As of April 10, 2018

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

AK1202525 FV *Arcturus*: On October 31, 2016, a case involving sexual harassment of an NMFS observer was dismissed. The Agency appealed this decision; the subject was reissued a penalty and paid the $12,500 for sexual harassment of a NMFS observer.

AK1605973; Trident Seafoods Corporation – Company and individual were charged under the Magnuson-Stevens Act for putting forth delivery practices for observed vessels with the purpose of lowering salmon bycatch numbers, impeding the observers from collecting samples and resulting in a biasing of the observers sampling procedures and a biasing of the observed data provided to NMFS. A Written Warning was issued.

AK1503888; FV *Hula Girl* – Owner/operator was charged under the Northern Pacific Halibut Act (Halibut Act) for failing to register an anticipated fishing trip with the Observer Declare and Deploy System prior to embarking on the fishing trip. An $8,000 Notice of Violation was issued.

6. Outreach

Outreach efforts continued throughout 2017 to provide information about the Observer Program and its ongoing effort for quality data collection and management of Alaska fisheries. This report focuses specifically on the outreach activities that were conducted in the fall of 2016 (in preparation for the 2017 fishing year) and throughout the 2017 calendar year. The outreach meetings were held in various locations in Oregon, Washington, Alaska, and via telephone (Table 6-1) with a variety of information distributed at the meetings (Table 6-2).

Assorted agency staff contributed to the numerous outreach events including NMFS (Observer Program, Sustainable Fisheries, and Acquisition and Grants), the OLE, and the USCG. Attendees at the meetings included: staff from Alaska and Departments of Fish Game, the International Pacific Halibut Commission, observer service providers, EM service providers, fisheries observers, processor companies, the Alaska Seafood Cooperative, vessel owners and operators, and other industry representatives. The continued participation and feedback provided at these meetings is always appreciated.

The goals of the late fall 2016 and early 2017 public outreach meetings were to provide information about the Observer Program, vessel responsibilities, electronic monitoring (EM), the continued objective of collection quality data, and management of those data. The late fall 2017 public outreach meetings focused on the new partial coverage and electronic monitoring contract solicitation process and implementation of EM into catch accounting. Specifically, FMA staff and staff from the Acquisition and Grants Office (AGO) held a public outreach session in conjunction with the October 2017 North Pacific Fishery Management Council Meeting in Anchorage, Alaska. This outreach session provided an opportunity for industry constituents to speak directly with staff from AGO the regarding questions and input on the partial coverage and EM contract solicitation. In addition to presentations, meetings provided an opportunity for a question and answer session. An assortment of questions were discussed including: vessel monitoring plans, the types of data collected and how those data are ultimately used, observer coverage rates, EM logistics and costs, EM vessels and integration into ODDS, and how the government process for Request for Proposals works. This year also encouraged pre-cruise meetings with the Kodiak trawl fleet to improve observer sampling and observer access to fish with the ultimate goal of increasing data quality from this fleet.

Throughout this year, there was extensive coordination and collaboration between the FMA, AKRO and the Alaska Seafood Cooperative regarding the management and implementation of the 2017 exempted fishing permit to conduct a feasibility study to reduce halibut mortality on designated non-pelagic trawl catcher processor vessels in the Bering Sea (Halibut EFP). In addition to weekly phone and in-person discussions, in preparation for the 2018, FMA staff conducted inspections for Deck Safety Plan inspections on every vessel participating in the 2018 EFP. These were extremely productive meetings, fostering a continued dialogue between the agency and industry on best practices for sustainable fisheries management.

A unique outreach opportunity was afforded to an FMA staff member and a North Pacific Observer to present at a VIP outreach event at the 2017 SeaWeb Seafood Summit on board the

catcher processing vessel *Alaska Ocean*. They spoke to multiple groups regarding the Observer Program, the responsibilities of an observer working on a commercial processor targeting pollock, and the successfully managed fishery.

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The observer providers continue to be an integral contributor to the overall success of observer deployments in Alaska fisheries. Their daily interactions with members of the commercial fishing communities and management of observer logistics support the success of the Observer Program and fisheries management in Alaska.

NMFS plans to continue providing outreach meetings to interested communities. The advances in technologies affords the ability to connect with remote communities and the use of teleconferences and presentations over the internet. The combination of remote meetings (e.g., using Web-Ex and phone) and periodic in-person visits provides valuable interaction and communication between NMFS and the fishery members.

Table 6-1. -- Outreach activities related to the Observer Program in fall of 2016 and throughout 2017.

Date	Location	Description
November 17, 2016	Seattle, WA	Pacific Marine Expo
December 21, 2016	Phone	Aleutian East Boroughs
January 22, 2017	Kodiak, AK	Kodiak Trawl Fleet Meeting-Improving access to observer sampling, on site pre-cruises
April 6, 2017	Anchorage, AK	EM Public Hearing
April 18, 2017	Seattle, WA	EM Public Hearing
April 19, 2017	Newport, OR	EM Public Hearing
May 10, 2017	Seattle, WA	Freezer Longline Coalition Symposium
June 4, 2017	Seattle, WA	Seafood Summit Outreach Event
August 22, 2017	Kodiak, AK	Kodiak Trawl Fleet Meeting-Improving access to observer sampling
October 4, 2017	Anchorage, AK	Observer Services and EM comment session in conjunction with NPFMC meeting
December, 2017	Seattle, WA	EFP Meetings- Review Deck Safety Plan Inspections and Program Outreach
August 31, 2017	Kodiak, AK	Presentation to NOAA OLE
Throughout Year	Phone	Periodic EM Service Provider Outreach Calls
Throughout Year	Phone	Bi-weekly meetings with Amend 80 for Halibut Decksorting EFP

Table 6-2. -- Summary of the outreach information distributed on the Observer Program in 2017.

Handout type	How distributed	Link
What is a North Pacific Groundfish Observer?	Handout at meetings; available online	http://www.afsc.noaa.gov/FMA/PDF_DOCS/What%20is%20a%20NPG%20Observer%20small%206-6-14.pdf
North Pacific Groundfish Observer Program	Handout at meetings; available online	http://www.afsc.noaa.gov/FMA/PDF_DOCS/NPG%20observer%20program%20brochure%20small%206-6-14.pdf
Observer Program Frequently Asked Questions	Handout at meetings; available online	https://alaskafisheries.noaa.gov/sites/default/files/observer_prog_faq.pdf
Observer Declare and Deploy (ODDs) Frequent Asked Questions	Handout at meetings; available online	https://chum.afsc.noaa.gov:7104/apex/wwv_flow_file_mgr.get_file?p_security_group_id=1437919156609270&p_flow_id=140&p_fname=ODDS%20FAQ%20Non-EM.pdf
Adding Observer Declare and Deploy Systems-ODDS- trip number to eLandings	Handout; available online	https://elandings.atlassian.net/wiki/display/doc/Adding+Observer+Declare+and+Deploy+System+-ODDS-+trip+number+to+elandings
Electronic Monitoring Proposed Rule	Handout; available online	https://www.federalregister.gov/documents/2017/03/23/2017-05753/fisheries-of-the-exclusive-economic-zone-off-alaska-integrating-electronic-monitoring-into-the-north
Electronic Monitoring Equipment Specifications	Handout; available online	https://alaskafisheries.noaa.gov/sites/default/files/2018_em_system_specifications.pdf
Electronic Monitoring (EM) 2017 Pre-Implementation Plan	Handout at meetings; available online	https://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/Final2017EMPre-impPlan.pdf
2017 Annual Deployment Plan	Handout at meetings; available online	https://alaskafisheries.noaa.gov/sites/default/files/2017finaladp.pdf
2016 Annual Report	Handout at meetings; available online	https://www.afsc.noaa.gov/Publications/ProcRpt/PR2017-07.pdf
Rockfish Sampling Improving Packet	Distributed to vessel owners participating in Rockfish Program and Observers	Available from observer program
Observer Fee Collection	Handout at meetings; available online	https://alaskafisheries.noaa.gov/sites/default/files/observerfees.pdf
Request for Information for Observer and Electronic Monitoring contracts	Available online	https://www.fbo.gov/index?s=opportunity&mode=form&id=65498648f2b641a8c1e148d338b24e5a&tab=core&_cview=1

7. NMFS Recommendations

7.1. Recommendations to Improve the 2019 ADP

Trip-selection Pool

- NMFS recommends that the observer trip selection strata implemented in 2018 remain the same for 2019. This follows the OSC and SSC recommendation to stabilize the sampling design across years. The recommended observer trip-selection for 2019 are as follows:
    - Trawl.
    - Hook-and-line.
    - Pot.
    - Tender trawl.
    - Tender Pot.
- NMFS recommends maintaining a single trawl gear stratum (i.e., NPT and PTR in the stratum). The flexibility of vessels to use both gear types adds considerable ambiguity in the sampling plan design and its assessment that cannot be solved by trawl gear type stratification. The realized rates between non-tender trawl gear types were different for NPT and PTR gear in 2017 (Appendix A); however, these differences are accounted for in estimation through the post-stratification process. If there is continued concern about this issue, the Council's new focus on trawl within the EM workgroup (in particular, ongoing research on new ways to account for salmon) could provide longer-term solutions.
- NMFS recommends that the draft 2019 ADP include evaluation of 1) minimum rates that can be afforded; 2) 15% minimum in all strata (as was implemented in 2018); and 3) gear-specific "hurdle" approach. Following the SSC comments, the gear-specific hurdle analysis could consider both spatial bias for estimation (e.g., sampling rates in each stratum to reasonably expect three observed trips in each NMFS Area) as well as gaps in biological data that may develop at low sampling rates (e.g., length compositions).
- Within budget constraints, NMFS recommends allocating observer deployment beyond the minimum "hurdle" using the using optimization based on discarded groundfish, Pacific halibut, and Chinook salmon. NMFS will also consider other PSC species (crab and herring).

ODDS

- Chapter 3 of this report highlights several consequences of differential cancellation rates that were observed in ODDS including a temporal bias in the hook-and-line, trawl, and pot strata. NMFS recommends formation an agency sub-group to document the way in which the ODDS currently operates and to describe alternatives for how it can be improved. In particular, the group could explore ways to improve the linkages between ODDS and *e*Landings and ways to reduce the impact of cancellations of trips selected for

observer coverage, while still maintaining flexibility for vessels to plan in advance and accommodate changes in fishing plans.

- NMFS also recommends continuing to automatically release vessels 40-57.5 ft in length from observer coverage if the two previous trips were observed trips (i.e., if two trips in a row were observed and a third trip is selected, then the third trip will be released from coverage).

Performance metrics:

NMFS recommends evaluating the suite of trip metrics used to evaluate observer effect. In particular, evaluating how they relate to at-sea data collections and, to the extent feasible, providing additional information regarding interpretation of effect sizes and p-values (e.g., consideration of sample sizes).

EM Selection Pool

- Now that EM regulations are in place, NMFS will incorporate the EM selection pool into the 2019 ADP, rather than using an EM Pre-Implementation Plan process that was done in 2017. As such, NMFS recommends that the selection rate for the EM selection pool will be determined through the ADP process.
- NMFS recommends continuing trip-selection in the EM pool where trips will be selected prior to departure, so the vessel will only be required to use the EM system on selected trips.
- We have modified this recommendation from the 2018 ADP based on feedback from the Council regarding logistical and cost considerations. However, NMFS will continue to evaluate the monitoring effect in the EM selection pool and, in the future, may recommend post-selection of trips.
- NMFS intends to incorporate EM data from pot vessels into the CAS in 2019 so the information can be used for inseason management.
- The number of vessels allocated to the EM selection pool will be based on analysis of EM costs and the amount of available funding that is available.
- If there are insufficient funds to support all the vessels that opt into the EM selection pool, NMFS recommends that priority be given to: 1) vessels that are already equipped with EM systems; and 2) vessels 40-57.5 ft length overall (LOA) where carrying a human observer has been problematic due to bunk space or life raft limitations.

No Selection Pool

Recognizing the challenging logistics of putting observers on small vessels, NMFS continues to recommend that vessels less than 40 ft be in the no selection pool for observer coverage. The agency recognizes that the Council's next priority for EM research has shifted to trawl vessels, so the evaluation of data collected on fixed-gear less than 40 ft will not begin immediately. However, since there is no monitoring data from this segment of the fleet, NMFS does continue to recommend that vessels less than 40 ft LOA could be considered for the EM selection pool in the future.

Dockside Monitoring and Tendering

- In 2019, NMFS recommends maintaining status quo for dockside monitoring. NMFS proposed to continue to collect genetic samples from salmon caught as bycatch in groundfish fisheries to support efforts to identify stock of origin. For vessels delivering to shoreside processors in the GOA pollock fishery the sampling protocol would remain unchanged; trips that are randomly selected for observer coverage would be completely monitored for Chinook salmon bycatch by the vessel observer during offload of the catch at the shoreside processing facility. For trips that are delivered to tender vessels and trips outside of the pollock fishery, salmon counts and tissue samples would be obtained from all salmon found within observer at-sea samples of the total catch.
- NMFS also recommends that the reconstituted EM workgroup consider longer-term solutions for monitoring salmon bycatch in the trawl fisheries, including tender deliveries.

7.2. Update to previous recommendations

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

Topic	NMFS recommendations	Current status
No selection pool	2015 Annual Report: Recognizing the challenging logistics of putting observers on small vessels, NMFS recommended that vessels less than 40 ft length overall (LOA) be in the no selection pool for observer coverage.	Since the 2013 ADP, NMFS has been placing vessels less than 40 ft LOA in the No selection pool.
	2014-2016 Annual Reports: NMFS recommended that vessels less than 40 ft LOA be considered for testing of electronic monitoring since NMFS has no data from this segment of the fleet.	In December 2016, at the recommendation of the EM Workgroup, the Council requested a discussion paper about incorporating vessels <40 ft LOA in the EM selection pool. This project is on the list of analytical projects related to the Observer Program, but no staff have been assigned to work on this project yet. In February 2018, the Council reviewed a discussion paper of EM prioritization. The Council recommended that development of EM on trawl vessels as higher priority than implementation of EM on fixed gear vessels <40 ft LOA.
EM Selection Pool	2014 and 2015 Annual Reports: NMFS recommended continuing to allow hook-and-line and pot vessels < 57.5 ft LOA where taking an observer is problematic an opportunity to 'opt-in' to the EM selection pool to participate in the EM cooperative research under the EM pre-implementation plan developed by the EM workgroup.	This recommendation was implemented in 2016. The vessels were required to follow procedures outlined in the Final EM Pre-Implementation Plan. Vessels participating in the EM selection pool in 2016 were not required to carry an observer for the entire year and vessels were not required to log trips in ODDS. Starting in 2018, NMFS integrated EM into the Observer Program and starting to incorporate the EM selection pool into the 2018 ADP, rather than using an EM Pre-implementation Plan process.
	2016 Annual Report and Draft 2018 ADP: NMFS supported the Council's request to expand the size of the EM pool. The final number of vessels was based on analysis of EM costs and available funding. If there were insufficient funds to support the expanded size of the EM pool, NMFS recommended prioritizing deployment on longline vessels over expanding the number of pot vessels in the EM pool, until EM data from pot vessels can be used in catch estimation. If there are insufficient funds to deploy EM systems on all vessels in the longline sector, NMFS recommends that priority be given to vessels that are already equipped with EM systems and vessels 40-57.5 ft length overall (LOA) where carrying a human observer is problematic due to bunk space or life raft limitations.	In 2018, there was sufficient funding to accommodate the 141 vessels that requested EM.

Observer trip Selection – strata definitions	Draft 2018 ADP: NMFS recommended sampling strata based on gear and tender. The Council did not support a separate stratum for hook-and-line vessels delivering to tenders, because there are so few instances of this activity.	In the 2018 ADP, Hook-and-line vessels delivering to tenders were combined with the Hook-and-line vessels delivering shoreside for a single Hook-and-line stratum. This was due to the small number of tender deliveries for this gear type.
	2015 Annual Report: NMFS recommended evaluating two additional strata for the 2017 ADP: • Separate strata for vessels delivering to tenders. Based on analyses in this report and that from 2014, NMFS continues to see differences in the characteristics of tendering and non-tendering vessels. Establishing a separate stratum (or strata) for vessels delivering to tenders would enable NMFS to adjust sampling rates to provide the necessary data to manage fisheries. • Separate strata for partial coverage catcher-processors. Given the potential expansion in the number of catcher-processors in partial coverage in 2016, establishing a separate stratum (or strata) for partial coverage vessels would enable NMFS to adjust sampling rates.	In the 2017 ADP, the stratification scheme was based on gear and tender deliveries. Based on the analysis of alternative deployment strategies NMFS did not recommend implementing a separate stratum for partial coverage catcher-processors.
	2014 Annual Report: NMFS recommended that the 2016 ADP should explore defining strata to deploy observers by gear (e.g. fixed gear, and trawl gear) and FMP area (BSAI, GOA)	Strata definitions based on gear (hook-and-line, pot, and trawl) was implemented starting in 2016.
Observer trip Selection – allocation strategy	2016 Annual Report: NMFS recommended that sampling rates be high enough in each stratum to reasonably expect three observed trips in each NMFS Area and that the ADP include evaluation of 1) 15% coverage rates across all strata and 2) equal coverage rates that can be afforded	In the 2018 ADP, NMFS implemented an observer deployment allocation strategy of 15% plus optimization based on discarded groundfish and halibut and Chinook.
Dockside Monitoring and Tendering	2017 Annual Report: NMFS recommended maintaining status quo for dockside monitoring. However, for the past 3 years, NMFS had been unsuccessful in achieving its goal of obtaining an unbiased sample from the GOA pollock trawl fleet for enumerating salmon bycatch and determining stock of origin, which were primarily related to tendering activity. Therefore, NMFS recommended the Council and NMFS consider longer-term solutions for monitoring Chinook salmon PSC and trawl trips delivering to tenders in the GOA.	In the 2018 ADP, NMFS clarified the agency's objectives for collecting genetic samples from salmon PSC to identify stock of origin. The sampling protocol for vessels delivering to shoreside processors in the GOA pollock fishery is that when trips that are randomly selected for observer coverage those trips will be completely monitored for Chinook salmon bycatch by the vessel observer during offload of the catch at the shoreside processing facility. For trips that are delivered to tender vessels and trips outside of the pollock fishery, salmon counts, and tissue samples will be obtained from all salmon found within observer at sea samples of the total catch. Therefore, there is no expectation that offloads to tender vessels will be monitored.

		In addition, the Council has recognized evaluation of alternative sampling methods for salmon on CGOA Rockfish trawl CVs as one of its EM priorities. This may provide longer-term solutions to the dockside monitoring and tendering issues.
Vessel Selection	2014 Annual Report: Based on the 2013 and 2014 Annual Reports, NMFS recommended that participants in the vessel selection category be placed in the trip selection category.	This recommendation was implemented in 2015. Vessels that were in vessel selection were placed in the small-vessel trip selection strata in the 2015 and subsequent ADPs. Although, the EM Workgroup implemented vessel-selection for EM boats in 2016.
Trip Identifier	2014 Annual Report: NMFS staff will consider and identify the best approach to develop a trip identifier tied to landing data to provide linkage between ODDS and eLandings and improve data analysis. Identification of tender trips through electronic reporting on tenders (via tLandings) would also facilitate analysis.	NMFS implemented modifications to the eLandings system that enables the ODDS trip number to be voluntarily be entered on a groundfish landing reports in eLandings starting in 2016. Identification of tender trips has also been improved by requiring vessels delivering to tenders to identify whether they plan to do a tender delivery trip by checking a box in ODDS and by requiring tenders to use tLandings to report landing reports.
ODDS	2015 Annual Report: Allow vessels to log three trips in ODDS.	In the 2014 Annual report, NMFS recommended evaluating changes to ODDS to address temporal bias exhibited in 2013 and 2014. The 2015 annual report found differential cancellation rates in ODDS, and this led the OSC to recommend a change in cancellation policy be explored. However, a temporal bias in realized trips was not found in 2015 and NMFS did not change the ability for vessels to log 3 trips and cancel trips in ODDS.
	2016 Annual Report: In the longer term, NMFS recommended making changes to ODDS to allow changing the dates for observed trips, rather than cancelling and inheriting observed trips, while maintaining the order of the trips.	The recommended changes to ODDS have not yet been completed and there are logistical issues that make these changes challenging to implement. However, in 2017 we are seeing broader impacts of the trip inheriting process in ODDS (see chapter 3) and therefore have further recommendations for making changes to the application (see Section 7.1).
Conditional Releases	Draft 2016 ADP: NMFS recommended not granting conditional releases or temporary exemptions to vessels subject to observer coverage.	Starting in 2016, NMFS discontinued all conditional releases and temporary exemptions to vessels subject to observer coverage and mitigated the impact of observers on vessels through the EM pre-implementation plan. Qualifying vessels that volunteered for EM participation are not required to carry an observer.
	2015 ADP: Automatically release vessels 40-57.5 ft in length from observer coverage if the two previous trips were observed trips (i.e., if two trips in a row were observed and a third trip is selected, then the third trip will be released from coverage).	NMFS implemented this recommendation in the 2015 ADP in response to the Council's motion on the draft 2015 ADP. The "three in a row" release policy was continued under the 2016-2018 ADPs.

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

Other recommendations:

At their June 2014 meeting, the Council's SSC recommended that:

> *In addition to sample size needs for spatial and temporal coverage, develop accuracy and precision objectives for catch, PSC, and bycatch.*

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

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Appendix A – Preliminary Evaluation of Differences Between Pelagic and Non-pelagic Trawl Trips

At its June 2017 meeting, the Council requested that NMFS evaluate whether there is evidence of an observer effect in either pelagic trawl (PTR) or non-pelagic trawl (NPT) gear fished by partial coverage vessels. The recommendation followed an OAC request for the evaluation, including a discussion about the "pros and cons" of separate observer deployment strata for those two gear types.

One concern identified is vessels selected for observer coverage being directed to fish for pollock in order to avoid the at-sea sampling of salmon PSC that is done on non-pollock trips in the Gulf of Alaska. This type of activity can only occur when pollock is open for directed fishing but would result in a vessel avoiding an at-sea sample for salmon by taking a pollock trip when observed. Such behavior would result in higher observer coverage in PTR gear since it is used to target pollock. For example, salmon accounting for observed vessels fishing with NPT gear is based on highly variable at-sea samples, whereas observed vessels fishing for pollock (usually using PTR gear) usually have salmon accounted for during the offload at the shoreside processing plant. In management situations where salmon PSC caps are a concern, industry may choose to fish such that their offload is primarily pollock thus obtaining a shoreside count of salmon PSC. Conversely, if halibut PSC limits are a management concern, industry may direct more observed vessels to fish with NPT gear to obtain a larger sample of fishing activity with that gear type.

The Council motion was unclear whether their concern was also related to observer effects within each trawl gear type. A brief response to this concern is also provided in our response to the Council request for information.

Background

Pelagic trawl gear and NPT gear are equated to different styles of fishing, with NPT gear associated with bottom contact and PTR gear typically fished in the water column. While this is often the case, both gear types can be fished on the bottom. Most vessels fishing PTR gear under partial coverage regulations are targeting pollock, while NPT gear targets species such as Pacific cod and flatfish with a generally higher catch of halibut PSC and lower catch of salmon PSC.

The 2017 Annual Deployment Plan separates trawl strata by tender status, not by whether the gear being used is pelagic or non-pelagic. The CAS post-stratifies observer and landings data based on whether the trip is recorded as NPT or PTR on the landing report ("fish tickets") or in the observer data. In both cases, the vessel operator is reporting the gear type being used to the observer (usually through the logbook) or through *e*Landings. Although the gear information is "self-reported", regulations at, 50 CFR 679.2 (definitions) define pelagic and non-pelagic trawl gear to be of certain configurations (e.g., floats, mesh configurations, line configurations).

The primary use for PTR gear is to target mid-water pollock and rockfish (in the rockfish program which is full coverage). Since 2013 approximately 90% of the partial coverage category

PTR landings had a catch composition of at least 95% pollock, which falls into the CAS "pelagic" pollock target (suggesting mid water tows). Nearly all of the remaining landings were in the "bottom" pollock target category, which is based on the pollock being the predominant species retained (but less than 95% of the retained catch). Of note is that mixed gear trips, where the vessel fishes both pelagic and non-pelagic gear during a trip, are not uncommon (Appendix Table A- 1). Since 2011, the proportion of trips with a pollock target using NPT gear in the partial coverage trawl stratum has been stable with an annual average of approximately 12%. Since 2013 there are no apparent trends in the proportion of observed trips using NPT or PTR gear within the pollock target.

The two gear types are also associated with differing fishery management issues, with salmon bycatch being the primary issue for the pollock pelagic trawl fishery and halibut PSC being of concern for the non-pelagic trawl fishery. Being a relatively rare species, salmon are accounted for shoreside when an observer is onboard and the vessel is not delivering to a tender. These counts are extrapolated to unobserved trips. In contrast, halibut discard estimates are only based on data collected by observers at sea and extrapolated from observed to unobserved trips.

Appendix Table A- 1. -- Number of total trips (N) and observed trips (n) for all trawl trips, separated by whether the vessel used pelagic gear (PTR), non-pelagic gear (NPT), or both gear types during that trip.

Gear	N	n	% Observed
PTR	1565	354	22.6
NPT	555	91	16.4
NPT & PTR	39	1	2.6

Evaluation

In evaluating this issue, we considered it in context with the ADP and the potential ramifications on NMFS ability to estimate catch in these fisheries. To this point, there are a couple important high-level issues to consider:

- The type of "observer effect".
- CAS estimation procedures.
- The occurrence of mixed gear NPT/PTR trips.
- The underlying incentives associated with manipulating observer coverage and how these relate to the deployment plan.
- Bias introduced by a mis-specified sampling frame.

Sampling rates between the two-gear types and within the trawl sampling strata were compared for this report. The realized rates for non-tender trawl gear types were 16.4% of trips observed for NPT and 22.6% of trips observed for PTR gear, respectively (Appendix Table A-1). However, note that there should not be an expectation that these rates would equal the trawl deployment rate for 2017 set in ODDs of 17.57%, nor a deployment rate adjusted for trip cancelations (20.7%, this report). There are several factors that contribute to this apparent inconsistency, including number of trips selected (sample size), variability due to random chance, the ratio of number of trips in each of the trawl gear types, and lack of independence between the two coverage rates (as more trips are selected of one type, fewer of the other type will be selected, contributing to the total number selected).

Observer effect: within a gear type

The observer effect issue (i.e., a vessel behaving differently when an observer onboard) is an inherent problem with any at-sea observer program. In the context of the Annual Deployment Plan, stratification is used to group similar types of fishing trips together in order to control variance and for logistical reasons. Stratification is not a tool that can be used to correct for "observer effects" within trawl gear (assuming the observer effect exists and is resulting in biased estimates). In short, we would still require representative sampling within each stratum, and simply establishing a new strata in the ADP would not change this reality. Gear-specific sampling strata would not reduce a vessel operator's ability to change behavior based on observer coverage. Further, since NPT and PTR gear are somewhat fluid within the fishery, gear strata would create incentives for vessels to declare a gear type in an effort to obtain a certain coverage rate, but then fish a different gear type than declared for coverage, which would undermine the sample design, increase variance, and potentially result in biased estimates of bycatch due to over or under-representation of trips among strata.

Observer effect: PTR versus NPT deployment allocation

Hence, the use of the CAS post-strata to account for any differences in realized coverage rates between PTR and NPT gear. In general, CAS post strata are defined by gear type and trip target for both PSC and groundfish discards. Discard estimates in these post-strata are based on the available observer information, which is derived from samples of fishing activity. Unrepresentative sampling problems could arise if observer coverage was manipulated such that the sample of observed trips does not include certain fishing activities that are in the unobserved fleet. However, in the current situation, the vessel is choosing a different fishing target when observed in order to avoid having at-sea samples used for estimation of salmon bycatch; that is not to say the vessel is fishing differently for pollock than unobserved vessels.

The post-stratification procedures in CAS are an estimation tool that is used to balance the sample so that subgroups within the sample are contributing to the estimates appropriately. In this case, the CAS estimation procedures group trips within the trawl stratum to NPR and PTR post-strata, and hence if one group has a higher realized sample rate than the other, the final estimates for each group will not be biased.

Specification of a new stratification scheme within trawl gear in the ADP would not change a vessel's ability to choose a gear type or fishing target, nor will it mitigate unrepresentative fishing activities. Moreover, CAS uses post-stratification methods to account for both NPT and PTR gear activities, which is a more appropriate method of dealing with the variability associated with each gear type than an ambiguous sampling strata definition.

Other issues with trawl gear stratification

There are a number of other reasons stratification of the sampling plan by NPT and PTR is not recommended:

- Each fishing trip needs to be assigned to one (and only one) stratum so that selection rates for that stratum can be used to determine whether a trip was to be observed. Hence vessels would need to be assigned to the stratum in ODDS and assigned an observer at the stratum-specific rate. For this to occur, they would need to indicate the gear type they intended to fish before they leave port. There is no regulatory requirement that the vessel actually fish that gear, nor would this always be known at the time of logging a trip. For example, a fishery closure may occur, and the vessel would switch gear types to operate in a different fishery. A consequence of this is the very problem that stratification is intended to solve would occur: realized deployment would be different from programmed rates specified in the ADP. In addition, since stratification would no longer be grouping similar trips (due to gear changes after assignment to a strata), variance of the estimates will increase.
- A number of vessels fish both NPT and PTR gear on the same trip, requiring them to be their own stratum. There were 39 trips in 2017 that uses both NPT and PTR gear (Appendix Table A- 1).
- Incentives can change over time. During years of high halibut catch, the incentive may switch from a desire to avoid salmon to one that prioritizes halibut.
- The concern over potentially differential sampling rates within the trawl stratum appears due to a perceived salmon accounting issue. This can best be addressed through changes to salmon accounting methods rather than by a change to the stratification definitions.

Conclusion

The OSC do not recommend stratification by type of trawl gear (i.e., NPT and PTR strata). The flexibility of vessels to use both gear types adds considerable ambiguity in the sampling plan design and its assessment that cannot be solved by trawl gear type stratification. The realized rates between non-tender trawl gear types were different for NPT and PTR gear in 2017; however, these differences are accounted for in estimation through the post-stratification process. If there is continued concern about this issue, the Council's new focus on trawl within the EM workgroup (in particular, ongoing research on new ways to account for salmon) could provide longer-term solutions.

Appendix B – Electronic Monitoring Video Review Results

Alaska Pre-Implementation Electronic Monitoring Preliminary Report for the 2017 Season

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Introduction

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

A 2017 pre-implementation plan[13] for EM was developed by a working group of the NPFMC. The goals of pre-implementation are to determine the efficacy of EM for catch accounting of retained and discarded catch and to identify key decisions that will need to be made in order to integrate EM systems into the Observer Program. Results of the pre-implementation work are being used to inform future council decisions.

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

In 2017, EM pre-implementation was included in the NMFS Annual Deployment Plan.[14] EM systems were deployed on small boat longline and pot vessels targeting sablefish (*Anoplopoma fimbria*), Pacific cod (*Gadus macrocephalus*) and Pacific halibut (*Hippoglossus stenolepis*). EM systems were provided and installed by Archipelago Marine Research (AMR) and reviewed by PSMFC. This report details EM data collected during pre-implementation in 2017.

[13] Available at: https://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/Final2017EMPre-impPlan.pdf
[14] Available at: https://alaskafisheries.noaa.gov/sites/default/files/2017finaladp.pdf

Methods

Vessel Participation

Vessels were selected for participation in the pre-implementation program from a pool of volunteer vessels. Vessels made landings in ports including Homer, Kodiak, Sand Point, and Sitka. For each of four time periods (Jan.-Feb., Mar.-Jun., Jul.-Oct. and Nov.-Dec.), participants were selected randomly from the pool to carry EM equipment.

Electronic Monitoring Systems

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

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

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

Effort Logs

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

Electronic Monitoring Video Review

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

The start and end locations, dates, and times of all trips and hauls were annotated. For string pot gear, the entire line of pots was considered a single haul whereas for single pot gear each individual pot was considered a haul. Other metadata such as the vessel information, ports, and fishery were either recorded by the hardware or annotated by the reviewer.

Reviewers recorded whether a streamer line, used as a seabird deterrent, was present or absent for each longline gear trip.

Reviewers recorded whether sensor and video data were complete for each haul based on the quantitative data from the sensor readings. Reviewers also assessed data quality and image quality for each haul. “Data Quality” was defined as the overall ability of the reviewer to

effectively quantify and accurately identify catch data. Data quality could be impacted by a diversity of factors such as the image quality, catch handling, and camera angles or operation. Reviewers also gave specific ratings of the image quality and reasons for decreases in image quality (e.g., water spots on the camera, night lighting, etc.).

Species and counts of catch were recorded for a subset of hauls for single pot gear and longline gear. String pot gear was reviewed in its entirety. For single pot gear, catch was reviewed for every third haul. For longline gear, catch was initially reviewed for all hauls but subsequently review rules were changed and two of every three hauls were reviewed. Catch was defined as anything seen by an EM reviewer, excluding free-moving marine birds and mammals alongside the vessel. Video reviewers were trained by a PSMFC staffer working with the North Pacific Observer Program on Alaska species reporting conventions. The reviewers were instructed to record species to the lowest identifiable taxonomic level or grouping as required by the Alaska region.

Catch that was kept on the vessel (excluding use as bait or food) was considered retained; otherwise, catch was recorded as discarded[15]. Discards included marine organisms that fell off or out of fishing gear before it came onboard the vessel, or that were free-floating on the surface. For cases where the video stopped recording before catch handling was completed, fish that were onboard at the time of the video ending were reported as retained.

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

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

Results

Fifty-three longline and pot vessels participated in the 2017 pre-implementation EM project. Some vessels participated in more than one fishery. EM data was collected on 55 halibut trips, 43 Pacific cod trips, and 45 sablefish trips containing a total of 12,467 hauls (Appendix Table B- 1). The data spanned 259 halibut sea days, 185 Pacific cod sea days, and 262 sablefish sea days for a total of 706 sea days with trips averaging 4.9 days across all fisheries.

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

As of the time this report was prepared, 76 out of the total 143 trips had the haul and catch data reviewed. All haul and catch data presented in the report includes reviewed trips only. A final report will be provided after review of all trips is complete.

Effort Log

A complete logbook was submitted with the video data for 118 of the 143 trips (83%; Appendix Table B- 2). The remaining 25 trips had no logbook submitted.

Data quality

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

About half of longline trips and about a third of longline hauls had video gaps during fishing activity; most often these gaps resulted from video ending before catch handling ended or from intermittent gaps in video coverage. Both of these issues suggest technical problems relating to the set-up of the EM system. Some of the specific problems noted by reviewers were incorrect sensor settings and the video set to shut off too soon after the haul was completed; these issues were reported to AMR technicians and resolved during the course of the year. In general, video data was somewhat more likely to be incomplete on the first trip that a boat took with an EM system (Appendix Table B- 1). PSMFC has been working with AMR on changes to the EMI software that will allow quantification of the lengths of these time gaps. Currently this data is sufficient for investigating gaps in an individual trip, but some complications remain in summarizing the data at a fleet level.

Video was complete for all pot trips. The lack of gaps, compared to longline, is likely due to the shorter hauls (primarily a single pot) which make the likelihood of overlap with an intermittent gap less likely.

Data quality was rated as high or medium for 98% of the 2,594 reviewed hauls. The Pacific cod fishery had the highest proportion of hauls of medium or low quality. The most common reason for low data quality was water spots, followed by intermittent gaps in video coverage, dirty cameras, and glare.

Review Rate

Review rate for halibut and sablefish target fisheries ranged from 0.29 minutes of review per minute of video to 0.85 minutes of review per minute of video (Appendix Table B- 4). The review rate in the Pacific cod fishery was slower and close to real time (e.g., one hour of catch handling could be reviewed in just under an hour) for longline and longer than real time for pots.

Pacific cod longline hauls tended to have a larger variety of species caught, as well as being the only fishery where stern hauling was conducted. Stern haulers were more difficult to review due to a side view of the line (as opposed to a top down view), as well as poor lighting on the line at night. Single pot review rate was higher because catch is sorted for the majority of the review time (as opposed to other fisheries where the time between pots or skate knots can be reviewed at a higher speed).

Seabird Deterrents

Streamer lines are used as deterrents to seabirds on longline vessels. In 2017, 70% of trips were confirmed to have used a streamer line. For 29% of trips, no streamer line was used, while in the remaining > 2% of trips the presence or absence of a streamer line could not be determined.

Catch summary

Since total catch accounting is the goal for EM in the Southeast Alaska fixed gear sectors, all species of retained or discarded marine organisms were reported and summarized to the target fishery level (Appendix Table B- 6). Video reviewers identified a high proportion of retained and discarded catch to species. Exceptions were generally species groups that are known to be problematic, such as shortspine and longspine thornyheads, shortraker and rougheye rockfishes, and arrowtooth and Kamchatka flounders. There were also a small proportion of rockfish that were recorded as "Rockfish – unidentified", "Rockfish, Dark unidentified", or "Rockfish – Small Red unidentified".

For most discarded species, the majority of discards were discarded after interaction with the vessel or a crew member (Appendix Table B- 6). Interactions included the crew member throwing the fish overboard after the fish came onboard; a crew member shaking the line or manipulating the hook to release the fish before the fish came onboard; or the fish hitting the vessel and falling back into the water while no crew was attending the line.

Pacific halibut

Reviewers recorded the method of release and the condition of each individual halibut at the time of release. These release methods and condition ratings were identical to those used by the observer program with the addition of three new release methods after consulting with the observer program: "Hand release", "Other careful release" and "Other non-careful release". The majority (90%) of Pacific halibut were released carefully using the "Hook twisting and shaking" method (Appendix Table B- 7 and Appendix Table B- 8). The next largest release method (2%) was the "Hand Release" method.

Most halibut were judged to have minor damage at the time of release, of those that could be assessed (44%; Appendix Table B- 9). Without corresponding release condition data from onboard the vessel, it is not possible to test how well a video reviewer can assess halibut release condition from EM data. A release condition was not possible to capture for 51% of the discarded halibut across all fisheries. A halibut was given a release condition of "unknown" if the video reviewer could not observe both sides of the fish and the injuries could not be observed clearly at point of release.

Appendix Table B- 1. -- Summary of EM monitored fishing activity for 2017.

	Halibut Target		Pacific Cod Target		Sablefish Target			All Fisheries
	Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot	
Vessels	23	18	5	8	19	4	1	**53**
Trips	29	26	23	20	34	6	5	**143**
*Reviewed Trips**	13	9	17	19	16	1	1	**76**
Hauls	249	154	11,420	243	249	97	55	**12,467**
Reviewed Hauls	78	52	2,489	225	89	10	11	**2,954**
Sea Days	162	97	105	80	177	48	37	**706**
Average Trip Length (Days)	5.6	3.7	4.6	4.0	5.2	8.0	7.4	**4.9**

Appendix Table B- 2. -- Logbook submissions.

	Halibut Target		Pacific Cod Target		Sablefish Target				
Effort Log Completed	Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot	**Total**	**%**
Yes	21	22	17	19	30	6	3	**118**	**83%**
No	8	4	6	1	4	0	2	**25**	**17%**
Total	**29**	**26**	**23**	**20**	**34**	**6**	**5**	**143**	**100%**

Appendix Table B- 3. -- Data quality including video and sensor completeness, data quality, and image quality.

Trip Level Data Quality

	Halibut Target		Pacific Cod Target		Sablefish Target			
Video Complete	Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot	**Total**
Number of trips	6	4	17	9	12	1	1	**50**
Percent of trips	*46%*	*44%*	*100%*	*47%*	*75%*	*100%*	*100%*	***66%***
Sensor Data Complete								
Number of trips	11	9	17	17	15	1	1	**71**
Percent of trips	*85%*	*100%*	*100%*	*89%*	*94%*	*100%*	*100%*	***93%***

Haul Level Data Quality

	Halibut Target		Pacific Cod Target		Sablefish Target			
Haul Video Completeness (number of hauls)	Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot	**Total**
Video complete - Entire haul recorded	51	39	2,489	176	81	10	11	**2,857**
Intermittent gaps in video	12	-	-	13	2	-	-	**27**
Video ends before catch handling ends	12	1	-	34	4	-	-	**51**
Video starts after haul start	3	6	-	2	2	-	-	**13**
1+ cameras not working	-	6	-	-	-	-	-	**6**
Catch Video Completeness (number of hauls)								
Complete - All catch recorded	71	50	2,488	208	89	9	11	**2,926**
Incomplete	7	2	1	17	-	1	-	**28**
Data Quality from Video (Number of Hauls)								
High	67	47	2,310	155	85	5	11	**2,680**
Medium	8	5	175	54	4	5	-	**251**
Low	3	-	3	15	-	-	-	**21**
Unusable	-	-	1	1	-	-	-	**2**
No Video	-	-	-	-	-	-	-	**-**
Image Quality (Number of Hauls)								
High	56	39	2,133	92	72	-	10	**2,402**
Medium	18	13	313	117	17	9	1	**488**
Low	4	-	43	15	-	1	-	**63**
Unusable	-	-	-	1	-	-	-	**1**
No Video	-	-	-	-	-	-	-	**-**
Primary Reason for Medium Image Quality (Number of Hauls)								
Banding/Scrambling/Color	-	-	-	5	-	-	-	**5**
Glare	1	-	55	17	4	-	-	**77**
Dirty Cameras	2	-	47	13	-	-	-	**62**
Night Lighting	2	-	12	29	8	-	1	**52**
Obstruction	-	-	-	-	1	-	-	**1**
Water Spots	5	3	14	49	2	9	-	**82**
Poor Camera Angles	-	4	28	-	-	-	-	**32**
Video completeness	-	6	-	-	1	-	-	**7**
Intermittent Gaps in Video	8	-	157	4	1	-	-	**170**
Primary Reason for Low Image Quality (Number of Hauls)								
1+ cameras not working	1	-	-	-	-	-	-	**1**
Glare	-	-	6	-	-	-	-	**6**
Dirty Cameras	-	-	7	1	-	-	-	**8**
Out of focus	-	-	-	1	-	-	-	**1**
Water Spots	-	-	29	8	1	-	-	**38**
Intermittent Gaps in Video	3	-	1	5	-	-	-	**9**

Appendix Table B- 4. -- Data quality including video and sensor completeness, data quality, and image quality Review rate by target fishery. Review of both retained and discarded catch included.

	Halibut Target		Pacific Cod Target		Sablefish Target		
	Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot
Haul Count	78	52	2489	225	89	10	11
Average Sort Min/Haul	190	123	3	118	217	193	117
Average Review Min/Haul	95	77	4	110	137	164	33
Average Review Min/Sort Min	0.55	0.65	1.25	1.01	0.62	0.85	0.29

Appendix Table B- 5. -- Presence of streamer lines on EM monitored trips.

	Halibut Target		Pacific Cod	Sablefish Target		
Streamer Line Status	Fixed Hook Longline	Snap Longline	Snap Longline	Fixed Hook Longline	Snap Longline	**Total**
Streamer Line Present	22	16	12	25	5	**80**
No Streamer Line	6	10	8	8	1	**33**
Unknown	1	0	0	1	0	**2**
Percent Trips with Streamer Line	***76%***	***62%***	***60%***	***74%***	***83%***	***70%***

Appendix Table B- 6. -- Counts of retained and discarded catch in the sablefish, halibut, and Pacific cod fisheries.

Sablefish target																
		Fixed hook longline					Snap longline					String ot				
		Retained	Discarded			Unknown	Retained	Discarded			Unknown	Retained	Discarded			Unknown
	Species		Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard	
Rockfish and Thornyheads	Rockfish - unidentified															
	Rockfish, Black															
	Rockfish, Canary															
	Rockfish, Dark unidentified	1														
	Rockfish, Dusky (was Light Dusky)															
	Rockfish, Northern															
	Rockfish, Quillback	6														
	Rockfish, Red Banded	5	71													
	Rockfish, Redstripe															
	Rockfish, Rosethorn															
	Rockfish, Silvergray															
	Rockfish, Small Red unidentified	13	4	2					2				1			
	Rockfish, Tiger															
	Rockfish, Yelloweye	125			1											
	Rougheye	53	2													
	Rockfish, Shortraker	81	106	1												
	Rockfish,Shortraker/Rougheye unid.	754	157	11								7	16		2	
	Rockfish, Shortraker/Rougheye Total	888	265	12								7	16		2	
	Rockfish, Longspine Thornyhead		1													
	Rockfish, Shortspine Thornyhead	934	56	8			56	1					1			
	Rockfish, Thornyhead unidentified	3,867	1,259	65		1	221	4	5			4	13		13	
	Rockfish, Thornyheads Total	4,801	1,316	73			277	5	5			4	14		13	
Sablefish		27,576	1,061	176			1,843	13	4			1,931				
Pacific halibut		1,180	1,405	7												
Pacific cod		12	2													
Lingcod		18	2													

Sablefish target																
		Fixed hook longline					Snap longline					String ot				
		Retained	Discarded			Unknown	Retained	Discarded			Unknown	Retained	Discarded			Unknown
Species			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard	
	Flatfish - unidentified		8										5			
Flatfish	Flounder, Arrowtooth	5	17		1											
	Flounder, Kamchatka		6													
	Flounder, Kam/Arrow - unid.	4	178	4	8								11		11	
	Flounder, Kam/Arrow Total	9	201	4	9								11		11	
	Sole, Dover	3	14										39		13	
	Sole, Flathead		2													
	Sole, Petrale															
	Sole, Rock Sole unidentified															
	Pollock (Walleye Pollock)	1														
	Grenadier (Rattail), Giant	1	248	14				1								
	Grenadier, (Rattail) - unident	12	10,135	320	14		1	851	26	85			38		1	
	Flatnose, Pacific (Codling)		2													
	Greenling - unident															
	Ratfish, Spotted		7													
	Ronquil/Searcher - unident															
	Roundfish - unident	(1)	9	15			2	95	11		1				2	
	Sculpin - Myoxocephalus unident															
	Sculpin - unidentified												2			
	Sculpin, Bigmouth															
	Sculpin, Great															
	Sculpin, Irish Lord - unident															
	Sculpin, Red Irish Lord															
	Sculpin, Yellow Irish Lord															
	Fish head /lips or parts	4	18													
Other Fish	Fish - unidentified			4				7								
	Shark, Pacific Sleeper															
Shark	Shark, Spiny Dogfish			8	1											
	Ray, (Skate) - unident		6	1				2								
	Skate - Soft Snout unident	1	362	10				12								
	Skate - Stiff Snout unident															
	Skate, Alaska															
	Skate, Aleutian		7													
Skate	Skate, Bering															

Sablefish target																
		Fixed hook longline					Snap longline					String ot				
		Retained	Discarded			Unknown	Retained	Discarded			Unknown	Retained	Discarded			Unknown
	Species		Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard	
	Skate, Big		7													
	Skate, Longnose		175	1												
	Skate, Roughtail		76	2												
	Crab - unidentified		1										3			
	Crab, King - unident															
	Crab, King, Couesi												1			
Crab	Crab, Tanner - Unident	3	16										19			
	Bryozoans/Coral Unid	7	96	2				9					2			
Coral	Coral, Red Tree		8													
	Invertebrate - unident	18	208					21								
	Sand Dollars, Urchins												6			
	Sea Anemone unident		1													
	Sea Whip, Sea Pen - unidentified		78					10								
	Snail - unident		2										32			
	Snail, Empty Shell															
	Sponge - unidenti															
	Seaworm - unident															
	Octopus - unidentified															
	Starfish - unidentified	2	52					3					6			
	Starfish, Basket		2										12			
	Starfish, Brittle	1	86					42					3			
Invertebrate	Starfish, Sunstar		39					1					1			
	Albatross, Black-footed		2													
	Fulmar, Northern					1										
Bird	Gull - unidentified		5													
Misc. - rocks, mud, garbage, etc.		1	50										5			

Pacific Cod Target											
Species		Single Pot					Snap Longline				
		Retained	Discarded			Unknown	Retained	Discarded			Unknown
			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard	
Rockfish and Thornyheads	Rockfish - unidentified						2	1			
	Rockfish, Black	4	28				7	5			
	Rockfish, Canary										
	Rockfish, Dark unidentified	7	1			1	11	3			
	Rockfish, Dusky	82	1				5	3			
	Rockfish, Northern	1									
	Rockfish, Quillback	4						5			
	Rockfish, Red Banded	1					33				
	Rockfish, Redstripe										
	Rockfish, Rosethorn										
	Rockfish, Silvergray						1				
	Rockfish, Small Red unident	1					3	1	3		
	Rockfish, Tiger						1				
	Rockfish, Yelloweye	4					106	4		14	
	Rockfish, Rougheye (RE)						3				
	Rockfish, Shortraker (SR)						1				
	Rockfish, SR/RE unid.						19	8	1		
	Rockfish, *SR/RE* Total						23	8	1		
	Longspine Thornyhead										
	Shortspine Thornyhead										
	Thornyhead unident										
	Thornyheads Total										
Sablefish		1	2			1	28	421	3		
Pacific halibut			119			1	1,000	5,919	60		
Pacific cod		28,156	83			159	37,440	502	269	91	1
Lingcod			5				69	9	2		
Flatfish	Flatfish - unidentified		6				5	141	9		
	Flounder, Arrowtooth		24				7	172	2	4	
	Flounder, Kamchatka						1	2			
	Flounder, Kam/Arrow -unid.		37			2	104	938	8	55	
	Flounder, Kam/Arrow Total		61				112	1,112	10	59	
	Sole, Dover							1			
	Sole, Flathead		9				3	92			
	Sole, Petrale										
	Sole, Rock Sole unidentified		1					8			
Other Fish	Pollock (Walleye Pollock)	324	8			2	743	189	9		

Pacific Cod Target											
Species		Single Pot					Snap Longline				
		Retained	Discarded			Unknown	Retained	Discarded			Unknown
			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard	
	Grenadier (Rattail), Giant										
	Grenadier, (Rattail) - uniden							2			
	Flatnose, Pacific (Codling)										
	Greenling - unidentified		10			1		4			
	Ratfish, Spotted							1			
	Ronquil/Searcher - unident							5	1		
	Roundfish - unidentified	1	22			5	47	129	47		
	Sculpin - Myoxocephalus unident		47			2		48	1		
	Sculpin - unidentified	3	131			12	5	1,380	7		
	Sculpin, Bigmouth							1			
	Sculpin, Great		51					93			
	Sculpin, Irish Lord - unident		436			17	1	417			
	Sculpin, Red Irish Lord							19			
	Sculpin, Yellow Irish Lord		240			1	3	1,894	2		
	Fish head /lips or parts							8			
	Fish - unidentified						3	14	10		1
Shark	Shark, Pacific Sleeper (Mud)							7			
	Shark, Spiny Dogfish						59	1,216	1		
Skate	Ray, (Skate) - unidentified						1	163	21		
	Skate - Soft Snout unident		1				8	1,216	13		
	Skate - Stiff Snout unident						8	68	2		
	Skate, Alaska							421			
	Skate, Aleutian							58			
	Skate, Bering							1			
	Skate, Big						148	1,617	18		
	Skate, Longnose						131	1,283	17		
	Skate, Roughtail										
Crab	Crab - unidentified		9			2		2			
	Crab, King - unidentified										
	Crab, King, Couesi										
	Crab, Tanner - Unidentified		107					2			
Coral	Bryozoans/Coral Unid						3	5			
	Coral, Red Tree							2			
Invertebrate	Invertebrate - unidentified		44			47		97	1		
	Sand Dollars, Sea Urchins	5	236			65					
	Sea Anemone - unidentified		3				1	156	1		

Pacific Cod Target

Species		Single Pot					Snap Longline				
		Retained	Discarded			Unknown	Retained	Discarded			Unknown
			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard	
	Sea Whip,Sea Pen - unident		2			1		408			
	Snail - unidentified	5	942			200		6			
	Snail, Empty Shell							1			
	Sponge - unidentified							9			
	Seaworm - unidentified		1								
	Octopus - unidentified	124	25	1		23	6	2	5	4	1
	Starfish - unidentified		39			6		58			
	Starfish, Basket		35			2		29			
	Starfish, Brittle										
	Starfish, Sunstar		536			22	5	1,422	17		
Bird	Albatross, Black-footed							1			
	Fulmar, Northern							1			
	Gull - unidentified							16			
Misc. -rocks, mud, garbage, etc.			58			7	3	119	2		

Pacific Halibut Target

Species		Fixed Hook Longline					Snap Longline				
		Retained	Discarded			Unknown	Retained	Discarded			Unknown
			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard	
Rockfish and Thornyheads	Rockfish - unidentified	9									
	Rockfish, Black	3					1				
	Rockfish, Canary										
	Rockfish, Dark unident	7	2								
	Rockfish, Dusky	5									
	Rockfish, Northern										
	Rockfish, Quillback	120	7				62	3			
	Rockfish, Red Banded	198	11				12	1			
	Rockfish, Redstripe										
	Rockfish, Rosethorn										
	Rockfish, Silvergray	7	3				1				
	Rockfish, Small Red unident	12	8	5			1		1		
	Rockfish, Tiger	59	2	1			1				
	Rockfish, Yelloweye	323	9				156	2	1		
	Rockfish Rougheye (RE)	132	5								

Pacific Halibut Target											
Species		Fixed Hook Longline					Snap Longline				
		Retained	Discarded			Unknown	Retained	Discarded			Unknown
			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard	
	Rockfish Shortraker (SR)	38	6				1				
	Rockfish, SR/RE unid.	771	91	8			7				
	Rockfish, *SR/RE* Total	941	102	8			8				
	Longspine Thornyhead										
	Shortspine Thornyhead	124	8	1			6				
	Thornyhead unident	705	144	8			69	4			
	Thornyheads Total	829	152	9			75	4			
Sablefish		6,993	606	43			135	28	1		
Pacific halibut		4,172	2,662	37			1,674	1,376	20		
Pacific cod		556	79	6	6		125	24	5	173	
Lingcod		64	98	4			43	64	2		
Flatfish	Flatfish - unidentified	2	12	3				1			
	Flounder, Arrowtooth		2								
	Flounder, Kamchatka										
	Kam/Arrow - unid.	21	300	4			4	64	1	30	
	Flounder, Kam/Arrow Total	21	302	4			4	64	1	30	
	Sole, Dover		18								
	Sole, Flathead		1								
	Sole, Petrale										
	Sole, Rock Sole unident		1					1			
Other Fish	Pollock (Walleye Pollock)	5	5							1	
	Grenadier (Rattail), Giant		3								
	Grenadier, (Rattail) - unidentified		2,113	15							
	Flatnose, Pacific (Codling)										
	Greenling - unident										
	Ratfish, Spotted	2	207	1				12			
	Ronquil/Searcher - unident										
	Roundfish - unident	1	19	2				2	3		
	Sculpin - Myoxocephalus unident	9	41					15			
	Sculpin - unidentified	1	48					35	1	4	
	Sculpin, Bigmouth										
	Sculpin, Great										
	Sculpin, Irish Lord - unident							1			
	Sculpin, Red Irish Lord										
	Sculpin, Yellow Irish Lord										
	Fish head /lips or parts	1	9					1			
	Fish - unidentified		2	3					1		

Pacific Halibut Target											
Species		Fixed Hook Longline					Snap Longline				
		Retained	Discarded			Unknown	Retained	Discarded			Unknown
			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard			Interacted w/ Vessel or Crew	Drop-off	Utilized Onboard	
Shark	Shark, Pacific Sleeper							3			
	Shark, Spiny Dogfish	2	703	14			1	886	17		
Skate	Ray, (Skate) - unident		5	1				6	3		
	Skate - Soft Snout unident	5	701	10			3	27	1		
	Skate - Stiff Snout unident		14	1				1	2		
	Skate, Alaska										
	Skate, Aleutian		2								
	Skate, Bering										
	Skate, Big		157	9			2	144	12		
	Skate, Longnose	8	469	7			12	81			
	Skate, Roughtail										
Crab	Crab - unidentified							2			
	Crab, King - unident										
	Crab, King, Couesi										
	Crab, Tanner - Unident		1					1			
Coral	Bryozoans/Coral Unid	1	12					3			
	Coral, Red Tree		15								
Invertebrate	Invertebrate- unident	2	6	1				10			
	Sand Dollars, Sea Urchins		76	12				31	6		
	Sea Anemone - unident	34	25								
	Sea Whip, Sea Pen - unident										
	Snail - unidentified		41					37	1		
	Snail, Empty Shell							1			
	Sponge - unidentified		1								
	Seaworm - unidentified										
	Octopus - unidentified	1	3								
	Starfish - unidentified		120	15				38	1		
	Starfish, Basket		15					35	1		
	Starfish, Brittle		1								
	Starfish, Sunstar	4	98	4				32	1		
Bird	Albatross, Black-footed		1								
	Fulmar, Northern										
	Gull - unidentified		3								
Misc. - rocks, mud, garbage, etc.		6	88					41	2		

Appendix Table B- 7. -- Pacific halibut counts for each type of discard, release method, and release condition for the three target fisheries.

			Halibut Target		Pacific Cod Target		Sablefish Target		
Discard Type	**Release Method**	**Release Condition**	Fixed Hook Longline	Snap Longline	Single Pot	Snap Longline	Fixed Hook Longline	Snap Longline	String Pot
General	Crucifying	Dead/Sand Fleas/Bleeding	3	-	-	-	-	-	-
		Minor	1	-	-	-	-	-	-
		Severe	1	-	-	-	-	-	-
		Unknown	4	-	-	-	11	-	-
	Cut the gangion	Minor	1	1	-	2	-	-	-
		Unknown	1	-	-	2	-	-	-
	Gaff	Dead/Sand Fleas/Bleeding	4	-	-	-	2	-	-
		Moderate	10	1	-	-	-	-	-
		Severe	1	-	-	-	-	-	-
		Unknown	52	-	-	-	8	-	-
	Hand release	Minor	38	171	-	4	2	-	-
		Moderate	-	3	-	-	-	-	-
		Unknown	4	9	-	16	1	-	-
	Hit the roller	Minor	11	15	-	6	2	-	-
		Moderate	3	-	-	2	-	-	-
		Unknown	42	7	-	32	34	-	-
	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	24	3	-	9	4	-	-
		Minor	1,223	744	-	2,121	657	-	-
		Moderate	6	2	-	5	1	-	-
		Unknown	1,123	258	-	3,471	597	-	-
		No Selection	1	-	-	-	-	-	-
	No Selection	Dead/Sand Fleas/Bleeding	-	-	1	-	-	-	-
		Minor	-	-	37	-	-	-	-
		Unknown	-	-	74	-	-	-	-
	Other non-careful release	Minor	4	14	-	8	-	-	-
		Unknown	4	21	-	10	2	-	-
	Unknown	Dead/Sand Fleas/Bleeding	-	-	-	1	-	-	-
		Minor	2	8	-	58	3	-	-
		Unknown	7	48	-	79	2	-	-
Damaged	Crucifying	Dead/Sand Fleas/Bleeding	8	-	-	-	23	-	-
	Cut the gangion	Dead/Sand Fleas/Bleeding	1	-	-	-	-	-	-
	Gaff	Dead/Sand Fleas/Bleeding	6	-	-	-	5	-	-
	Hand release	Dead/Sand Fleas/Bleeding	1	24	-	2	-	-	-
	Hit the roller	Dead/Sand Fleas/Bleeding	11	-	-	-	4	-	-
	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	63	26	-	85	44	-	-
		Severe	-	-	-	1	-	-	-
		Unknown	1	-	-	3	-	-	-
	No Selection	Dead/Sand Fleas/Bleeding	-	-	7	-	-	-	-
	Other non-careful release	Dead/Sand Fleas/Bleeding	-	9	-	1	2	-	-
	Unknown	Dead/Sand Fleas/Bleeding	-	2	-	1	1	-	-
Predated	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	1	9	-	-	-	-	-
	Other non-careful release	Dead/Sand Fleas/Bleeding	-	1	-	-	-	-	-
DropOffAboveWater	Hook twisting and shaking	Minor	-	-	-	1	-	-	-
	No Selection	No Selection	32	19	-	56	6	-	-
DropOffBelowWater	No Selection	No Selection	5	1	-	3	1	-	-
TOTAL			**2,699**	**1,396**	**119**	**5,979**	**1,412**	**-**	**-**

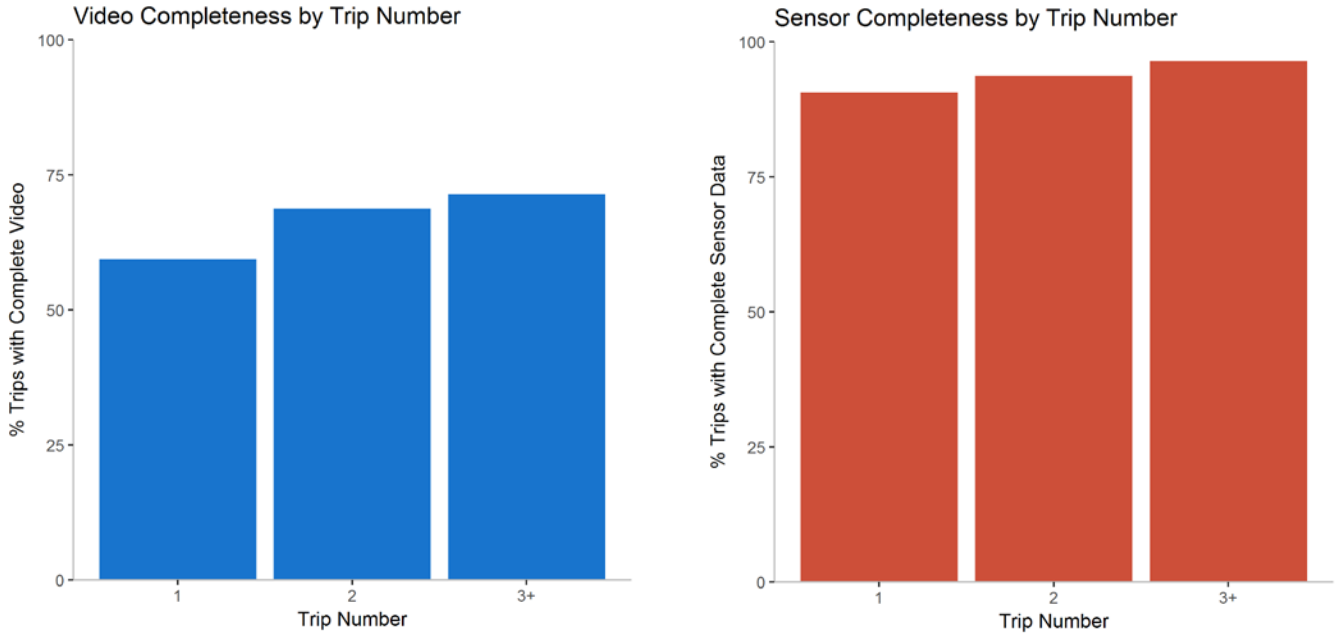
Appendix Table B- 8. -- Pacific halibut counts for each release method by target fishery.

	Pacific Halibut Target				Pacific Cod Target				Sablefish Target		All Fisheries	
	Fixed Hook Longline		Snap Longline		Single Pot		Snap Longline		Fixed Hook Longline			
Release Method	Count	%	Count	%	Count	%	Count	%	Count	%	**Total**	**% of total**
Crucifying	17	1%	-	> 1%	-	> 1%	-	> 1%	34	2%	**51**	**> 1%**
Cut the gangion	3	> 1%	1	> 1%	-	> 1%	4	> 1%	-	> 1%	**8**	**> 1%**
Gaff	73	3%	1	> 1%	-	> 1%	-	> 1%	15	1%	**89**	**1%**
Hand release	43	2%	207	15%	-	> 1%	22	> 1%	3	> 1%	**275**	**2%**
Hit the roller	67	2%	22	2%	-	> 1%	40	1%	40	3%	**169**	**1%**
Hook twisting and shaking	2,442	90%	1,042	75%	-	> 1%	5,696	95%	1,303	92%	**10,483**	**90%**
No Selection	37	1%	20	1%	119	100%	59	1%	7	> 1%	**242**	**2%**
Other non-careful release	8	> 1%	45	3%	-	> 1%	19	> 1%	4	> 1%	**76**	**1%**
Unknown	9	> 1%	58	4%	-	> 1%	139	2%	6	> 1%	**212**	**2%**
Grand Total	**2,699**		**1,396**		**119**		**5,979**		**1,412**		**11,605**	

Appendix Table B- 9. -- Pacific halibut counts for each release condition by target fishery.

	Pacific Halibut Target				Pacific Cod Target				Sablefish Target		All Fisheries	
	Fixed Hook Longline		Snap Longline		Single Pot		Snap Longline		Fixed Hook Longline			
Release Condition	Count	%	Count	%	Count	%	Count	%	Count	%	**Total**	**% of total**
Dead/Sand Fleas/Bleeding	122	5%	74	5%	8	7%	99	2%	85	6%	388	3%
Minor	1,280	47%	953	68%	37	31%	2,200	37%	664	47%	5,134	44%
Moderate	19	1%	6	> 1%	-	> 1%	7	> 1%	1	> 1%	33	> 1%
Severe	2	> 1%	-	> 1%	-	> 1%	1	> 1%	-	> 1%	3	> 1%
Unknown	1,238	46%	343	25%	74	62%	3,613	60%	655	46%	5,923	51%
No Selection	38	1%	20	1%	-	> 1%	59	1%	7	> 1%	124	1%
Grand Total	**2,699**		**1,396**		**119**		**5,979**		**1,412**		**11,605**	

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



U.S. Secretary of Commerce
Wilbur Ross

Assistant Secretary of Commerce for Oceans and Atmosphere and Acting Under Secretary of Commerce for Oceans and Atmosphere
RDML Tim Gallaudet (ret.)

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