AFSC Processed Report 2017-07

NOAA FISHERIES

North Pacific Observer Program 2016 Annual Report

May 2017

This document should be cited as follows:

Alaska Fisheries Science Center and Alaska Regional Office. 2017. North Pacific Observer Program 2016 Annual Report. AFSC Processed Rep. 2017-07, 143 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.

Available at http://www.afsc.noaa.gov/Publications/ProcRpt/PR2017-07.pdf

North Pacific Observer Program 2016 Annual Report

doi:10.7289/V5/AFSC-PR-2017-07

Fisheries Monitoring and Analysis Division
Alaska Fisheries Science Center
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
7600 Sand Point Way NE
Seattle, WA 98115-6349

Sustainable Fisheries Division
Alaska Regional Office
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
709 W. 9th Street
Juneau, AK 99802

May 2017

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 2016.

The Observer Program provides the regulatory framework for National Marine Fisheries Service (NMFS)-certified observers to obtain information necessary to conserve and manage the groundfish and halibut fisheries in the Gulf of Alaska (GOA) and the Bering Sea and Aleutian Islands (BSAI) management areas. Data collected by well-trained, independent observers are a cornerstone of management of the Federal fisheries off Alaska. These data are needed by the North Pacific Fishery Management Council (Council) and NMFS to comply with the Magnuson–Stevens Fishery Conservation and Management Act, the Marine Mammal Protection Act, the Endangered Species Act, and other applicable Federal laws and treaties.

Each year NMFS releases an Annual Deployment Plan (ADP) that describes how NMFS plans to deploy observers to vessels and processors in the partial observer coverage category in the upcoming year. 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 2016, 469 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 500 fixed gear and trawl vessels and at 7 processing facilities for a total of 43,706 observer days (39,029 full coverage days on vessels and in plants; and 4,677 partial coverage days).
- A.I.S., Inc. was able to successfully deploy 83 observers from 33 ports for 4,677 days at sea in the partial coverage category with a minimal number of trips released from coverage.
- There were 643 observer debriefings in Seattle completed by 27 FMA staff, 133 debriefings in Anchorage completed by four FMA staff, and 5 debriefings completed in Kodiak.
- Through the Electronic Monitoring (EM) Pre-implementation plan, EM was offered to all hook-and-line vessels 40-57.5 ft in length. A total of 42 vessels opted-in to the EM selection pool, 24 of which were selected to carry EM systems.
- NMFS held 13 outreach events, which were attended by approximately 50 people in Seattle, Sitka, Kodiak, Anchorage, Petersburg, and Homer**.** The agency found the meetings 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.

Fees, Budget, and Costs

- The budget for observer deployment in 2016 in the partial coverage category was $5,535,781 and 5,277 days. The budget for 2016 was made up of $5,144,982 in fees (from 2015 landings and carryover funds) and $390,800 in federal funds (Section 2.1, Table 2–1).
- Fee billing statements for all landings that occurred in 2016 were mailed to approximately 108 processors in February, 2017, for a total of $3,769,758 (Section 2.1).
- The breakdown in contribution to the 2016 observer fees by species was: 37% halibut, 22% sablefish, 20% Pacific cod, 19% pollock, and 2% all other groundfish species (Table 2–2).
- Since 2013, NMFS has spent $18,346,629 to procure 16,888 observer days for an average cost per observer day of $1,086 per day. In 2016, NMFS spent a total of $5,535,781 to procure 5,277 observer days for an average cost of $1,049 per day (Section 2.3.2).
- During the first 4 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 2–5).
- Deployment costs (equipment and field support) for EM in 2016 were $453,044, which included significant equipment purchases in addition to operational costs. Video review costs were $40,000 for 357 days of video reviewed. Combined, the fully loaded EM daily rate is $493,044 / 357 days = $1,381 per day (Section 2.3.4).
- The EM Workgroup has reviewed additional EM cost information provided by the EM service provider that is broken out between one-time expenses, amortized costs, and recurrent costs. On this basis, the estimated cost of an ongoing program similar to the 2016 EM pre-implementation program would be $191,049/year. Based on the number of sea days in 2016 (357), this would result in an average sea day rate of $535, and $677 per day with video review included (Section 2.3.4).

Deployment Performance Review

A review of the deployment of observers and EM in 2016 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 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?

Costs

Based on simulations of 2014 fishing data that were completed in December 2015, NMFS expected observed fishing effort to be 5,107 days and that was set for the budget in the 2016 ADP. NMFS used 4,677 days, or 92% of the anticipated budget, in 2016 (Section 3.5.1 and Table 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. Once a trip has been completed, logged trips must be closed by a vessel operator.

- ODDS performed as expected with no service interruptions, and 7,143 trips were logged.
- The ODDS selected trips according to the programmed rates in 2016.
- If a trip is selected for observer coverage and cancelled by the user, then the vessel's next logged trip is automatically selected for coverage. The "inherited" trips preserve the *number* of selected trips in the year, but cannot prevent the *delay* of selected trips during the year. Evidence of this delay behavior was found in 2016 (Fig. 3–2).
- Of the 7,143 trips logged, 283 of the total logged trips were cancelled by users (4.0%). However, the user cancellation rate for trips that were selected to be observed was much higher (19.6%), and ranged from 15.8% for Trawl gear to 25.3% for Pot gear (Table 3–2).

Evaluation of Coverage

Fifteen deployment strata were evaluated in 2016, including two full coverage strata, three trip selection strata (Trawl, Hook-and-line, and Pot); no selection; and EM Voluntary 30% and EM Voluntary 100% (2 strata and 4 time periods) in the EM vessel-selection pool (Section 3.6.1).

Observer at-sea deployment

- The program met expected rates of coverage for all of the full coverage and trip-selection strata. In the trip selection strata, the realized (and expected) coverage rates were
    - 15.0% (15.41%) for hook-and-line;
    - 14.7% (15.24%) for pot; and
    - 28.0% (28.31%) for trawl.
- Overall, for all Federal fisheries off Alaska, 6,066 trips (44.3%) and 490 vessels (41.8%) were observed (Table 3–5).

EM selection pool

- In 2016 vessels participating in the EM selection pool were not required to log trips in ODDS, instead there were two selection processes:
    - EM Voluntary 30%: vessels were required to notify NMFS of their intent to fish at least 30 days in advance of each of 4 selection time-periods: Jan-Feb, Mar-Jun, Jul-Oct, and Nov-Dec. Vessels were subject to a 30% chance of selection and if selected, they carried EM for all trips during the time period.
    - EM Voluntary 100%: Vessels that did not notify NMFS 30 days in advance of a time period were automatically selected to carry an EM system, if one was available.
- The EM Voluntary 30% strata met the coverage rate expectations for three out of four fishing periods. In the fourth period (Nov-Dec), no vessels notified NMFS of their intent to fish and thus no vessels were selected (Table 3–5).
- The EM Voluntary 100% strata did not meet expected coverage rates in any fishing period.

Dockside Monitoring

The sampling design used for dockside monitoring in 2016 remained unchanged from previous years. In the GOA, offloads of pollock trawl catcher vessels delivering to shoreside processors were observed 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. In addition to at-sea duties, observers monitor the deliveries of trawl pollock from catcher vessels at shoreside processing plants. In the full-coverage category of the fleet, this task is performed by dedicated plant observers, whereas in partial coverage only trips that are observed at sea are also monitored at the plant.

Results from analysis of dockside monitoring in 2016 include

- A random sample of tissue samples for all pollock deliveries was not achieved, primarily due to tendering activity.
- The impact of this tendering activity was limited, mainly, to the port of King Cove.
- Within King Cove, all of the pollock deliveries from trips in the partial coverage category were tender deliveries and none of these were observed (Table 3–7).

Was the Coverage Representative?

Temporal Patterns

Section 3.7.1 evaluates the possibility for temporal bias in each observed stratum. The number of observed trips achieved was outside of their expected values on 46 days and all of these occurred in the trawl stratum with selection rates higher than expected (0.06%). For comparison, in 2015 this occurred for 0.60% of the year. Results from the exact binomial test suggest that observed rates at the end of the year were within the expectation for all strata. Based on these combined results, there is no evidence of temporal bias in 2016.

Spatial Representativeness

Section 3.7.2 compares the expected number of trips and the observed number of trips in each NMFS Reporting Area and stratum combination. In 2016, some spatial bias occurred in the hook-and-line, pot, and trawl strata. In the pot strata, the bias was limited to NMFS reporting

areas with very low fishing effort (few number of trips) (Fig. 3–10). In other gear types where low sample size was not a problem, the number of observed trips was more than expected in SE Alaska (659) and less than expected in the eastern Aleutian Islands (541) for Hook-and-Line gear (Fig. 3–8) and higher than expected from the central Gulf of Alaska (630) for trawl gear (Fig. 3–12).

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), 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 in three ways:

Are observed trips identical to unobserved trips?

For the first question, tender and non-tendered trips were combined to evaluate an observer effect and some evidence of an observer effect within hook-and-line and trawl strata. Observed trips in the hook-and-line stratum were 0.3 days (6.1%) shorter in duration, occurred on vessels 2.5% longer in length, retained 7.6% more species, and landed catch that weighed 9.6% less than unobserved trips. Observed trips in the trawl stratum were 0.3 days (12.8%) shorter in duration, retained 15.5% fewer species, and landed catch that weighed 10.1% less than unobserved trips (Table 3–9).

Are observed tendered trips identical to unobserved tendered trips?

In 2016, an observer effect was found within trips that delivered to tenders in the trawl stratum. Observed trips in the trawl stratum that delivered to a tender were 87.9% shorter in duration, landed 15.9% fewer species, and landed catch that weighed 69.5% less than unobserved trips that delivered to a tender (Table 3–13).

Are observed non-tender trips identical to unobserved non-tender trips?

Within non-tender trips, some evidence of an observer effect was found in the hook-and-line and trawl strata in 2016. Both strata fished for shorter durations but had similar catches when an observer was present. While an observer effect was present, the magnitude of such biases was small. Nonetheless, the consistent differences in species landed in hook-and-line and areas fished in trawl warrants further examination (Table 3–15).

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. When observer data are used in the Catch Accounting System to estimate catch and bycatch, the information is aggregated (i.e.,“post-stratified”) into groups of fishing activities with similar trip characteristics such as gear, trip targets, and NMFS Reporting Area. If there is no observer data within a particular post-stratum, then bycatch rates from one type of fishing activity are borrowed and used for a different type of fishing activity. For example, if there was no observer data in a particular NMFS Reporting Area, then a bycatch rate from a different area would be used. This could result in biased estimates of bycatch and so 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 2016 were similar to previous years and illustrated that 1) the likelihood of at least one observation is increased with fishing effort and 2) at low observer coverage rates, the probability of no observer data within a NMFS Reporting Area increased (Fig. 3–15). These results 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).

Compliance and Enforcement

The Office of Law Enforcement, Alaska Division (AKD) works closely with the U.S. Coast Guard, Alaska Wildlife Troopers, industry, Observer Program, and observer providers to address incidents that affect observers and observer work environments, safety, and sampling. In 2016, AKD received 1,312 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 2018 ADP

Dockside Monitoring and Tendering

In 2018, NMFS recommends maintaining status quo for dockside monitoring. However, for the past 3 years, NMFS has 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. Chapters 3 and 5 highlight issues that occurred in 2016, which were primarily related to tendering activity, and preliminary assessment of 2017 data indicate that there are continued issues related to tender trips. Therefore, NMFS recommends the Council and NMFS consider longer-term solutions for monitoring Chinook salmon PSC and trawl trips delivering to tenders in the GOA. Longer term solutions could include some, or all, of the following:

- Establishment of an alternative program for obtaining genetic tissues for stock-of-origin estimates given that these have been stable over the past 5 years in the GOA.
- 100% observer coverage on trawl vessels delivering to tenders.
- Plant monitoring of offloads, including tender offloads, combined with EM for compliance monitoring purposes and full retention of all catch (or maximized retention, recognizing some species might still continue to be discarded).

Trip-selection Pool

- Within budget constraints, NMFS recommends that sampling rates be high enough in each stratum to reasonably expect three observed trips in each NMFS Area. Further reductions in future budgets may necessitate consolidation of some strata due to too few observations. Therefore, NMFS recommends that the 2018 ADP include evaluation of 1) 15% coverage rates across all strata and 2) equal coverage rates that can be afforded. These results could be used as benchmarks to evaluate optimization allocations.

ODDS

- Although Chapter 3 of this report found differential cancellation rates in ODDS, a temporal bias in realized trips was not found in 2016. Therefore, NMFS recommends continuing to allow vessels to log three trips in ODDS.
- NMFS also recommends continuing to automatically release vessels 40-57.5 ft in length from observer coverage if the two previous trips were observed trips (i.e., if two trips in a row were observed and a third trip is selected, then the third trip will be released from coverage).
- In the longer term, NMFS recommends 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.

EM Selection Pool

- NMFS is planning to integrate EM into the Observer Program in 2018 and will incorporate the EM selection pool into the 2018 ADP, rather than using a EM Pre-Implementation Plan process. As such, NMFS recommends that the selection rate for the EM selection pool will be determined through the ADP process.
- NMFS does not plan to use observer fees for EM deployment in 2018, but rather will rely on supplementary NMFS funds and any carryover of EM funds from 2017.
- NMFS intends to incorporate EM data from longline vessels into the Catch Accounting System in 2018 so that the information can be used for inseason management. The catch estimation methods for pot data, however, are still in development and will likely continue to be treated as "pre-implementation" while protocols are finalized.
- The Council supported expanding the EM pool in 2018 to accommodate up to 120 longline vessels and up to 45 pot vessels, provided there is funding to support this pool size. If there are insufficient funds to support the expanded size of the EM pool, NMFS recommends 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.

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. However, since there is no monitoring data from this segment of the fleet NMFS also supports the Council's recommendation to develop a discussion paper about incorporating vessels less than 40 ft LOA in the EM selection pool.

1 INTRODUCTION

This annual report provides information, analysis, and recommendations based on deployment of observers in the North Pacific Observer Program (Observer Program) during 2016. 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 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 collect biological samples and fishery-dependent information used to estimate total catch and interactions with protected species.[1] Managers use data collected by observers to manage groundfish and prohibited species catch within established limits and to document and reduce fishery interactions with protected resources. Scientists use observer 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.

All vessels and processors that participate in federally managed or parallel groundfish and halibut fisheries off Alaska are assigned to one of two categories: 1) the full observer coverage category (full coverage), where vessels and processors have at least one observer present for all fishing activity, or 2) the partial observer coverage category (partial coverage), where NMFS determines when and where observer coverage is needed. Since 2013, the Observer Program has deployed observers using established sampling methods to collect reliable data by stationing observers on all vessels and processors in the full coverage category and a statistically reliable sample of fishing vessels in the partial coverage category. The sampling plan for vessels and processors in the partial coverage category is described each year in the Annual Deployment Plan (ADP) developed by NMFS in consultation with the Council. 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.

Funds for deploying observers on vessels in the partial coverage category are provided through a system of fees based on the gross ex-vessel value of retained groundfish and halibut. This observer fee is assessed on all landings by vessels that are not otherwise in full coverage. The system of fees fairly and equitably distributes the cost of observer coverage among all vessels and processors in the partial coverage category.

The current Observer Program was implemented in 2013 when the previous Observer Program was restructured[2] to address sampling issues associated with non-random observer deployment on some vessels and fisheries. At that time, the Observer Program was expanded to include vessels that were previously unobserved, and increased the number of vessels in the full observer

[1] Additional information about the data collected by observers is described in the observer sampling manual (AFSC 2016).

[2] Restructuring of the Observer Program was implemented under Amendment 86 to the Fishery Management Plan for Groundfish of the Bering Sea and Aleutian Islands Management Area and Amendment 76 to the Fishery Management Plan for Groundfish of the Gulf of Alaska (Amendments 86/76). The final rule for Amendments 86/76 was published in the Federal Register on November 21, 2012 (77 FR 70062).

coverage category with the overall goal to improve estimates of catch and bycatch. The Council has recommended several amendments to the Observer Program to clarify and refine which vessels are in the full coverage category and which are in the partial coverage. The following regulatory and FMP amendments have been implemented since 2013 to modify observer coverage requirements for specific groups of vessels under North Pacific 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.

In addition, the Council has been working to integrate Electronic Monitoring (EM) tools into the Observer Program for the fixed gear groundfish and halibut fisheries. The Council's intent is to develop EM as an alternate method of collecting catch and discard information. To help accomplish this goal, the Council established a fixed gear EM Workgroup that provides a forum for all stakeholders, including the commercial fishing industry, agencies, and EM service providers to cooperatively and collaboratively design, test, and develop EM systems through an EM cooperative research program. During this cooperative research phase, vessels that meet the Council's criteria for EM, have been able to volunteer to be in EM pool and carry EM equipment instead of an observer. In March 2017, NMFS published a proposed rule[3] to implement EM as a new component of the fishery research plan.

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.

[3] Available at: https://www.federalregister.gov/documents/2017/03/23/2017-05753/fisheries-of-the-exclusive-economic-zone-off-alaska-integrating-electronic-monitoring-into-the-north

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

Independent estimates of catch, at-sea discards, and PSC are obtained aboard all catcher/processors and motherships in the full observer coverage category. At least one observer on each catcher/processor eliminates the need to estimate at-sea discards and PSC based on industry provided data or 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[4]), and the Central GOA Rockfish Program.

Under the catch share programs, quota share recipients are prohibited from exceeding any allocation, including, in many cases, transferable PSC allocations. All allocations of exclusive harvest privileges create some increased incentive to misreport as compared to open access or limited access fisheries. Transferable PSC allocations 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.

[4] One exception exists, catcher vessels less than 46 ft. LOA using hook-and-line gear to conduct groundfish CDQ fishing may be in the partial coverage category.

- 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 defines and sets the coverage rates for the partial coverage category selection strata (statistical subgroups) (Table 1–1). Strata definitions and their selection rates are then programmed into Observer Declare and Deploy System (ODDS) in cases where the method of deployment for observation or monitoring is by the trip, which is referred to as trip-selection. The requirements associated with the trip-selection pool are defined in regulation at 50 CFR § 679.51(a)(1). The owner or operator of a vessel in the trip-selection pool must notify NMFS of upcoming fishing plans using ODDS. Vessels in the no selection pool are not selected for observer coverage. Additional information about the specific strata and the coverage rates for 2016 were described in the 2016 ADP (NMFS 2015b) are 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 the Council and NMFS plan to assign observer coverage to vessels and processors in the partial observer coverage category in the upcoming year. The ADP provides flexibility to optimize deployment to meet scientifically based estimation needs while accommodating the realities of a dynamic fiscal environment. NMFS's goal is to achieve a representative sample of fishing events, and to do this without exceeding funds available through the observer fee. This is accomplished by the random deployment of observers in the partial coverage category. The 2016 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 scientifically evaluates the deployment of observers and monitoring tools 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 observer 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 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 draft ADP and Plan Team and Observer Advisory Committee recommendations. The Council also seeks input from the public on the draft ADP. The Council may recommend adjustments to observer deployment to prioritize data collection based on conservation and management needs. NMFS will review and consider these recommendations; however, extensive analysis and large-scale revisions to the draft ADP are not feasible between October and December. This constraint is due to the short period before the December Council meeting and practical limitations on planning for deployment (including contracting with an observer provider) and associated processes that need to be in place by January 1.

- December: After final analysis of the Council recommendations, NMFS makes any necessary adjustments to finalize the ADP and release it to the public. 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.[5] 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 2016 Annual Deployment Plan

The 2016 ADP outlined the sampling plan for 2016 (NMFS 2015b). 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

[5] The Supplementary Information Report for the 2014 ADP is on the NMFS Alaska Region website at: https://alaskafisheries.noaa.gov/fisheries/observer-program.

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 now 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 the observer sampling methods that are described in the observer sampling manual (AFSC 2016).

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 8, 2015 Motion, the Council requested that the 2016 ADP should explore defining the selection strata by gear type, FMP area and possibly operational sector such as catcher vessels or catcher/processors. The 2016 ADP allocated observer effort to at-sea deployments on trips belonging to three strata that were defined by gear type (trawl, hook-and-line, and pot) (Table 1–1).

To determine the 2016 selection rates, NMFS used an anticipated budget of 5,107 days as the basis for generating cost estimates under a variety of sampling rates, stratification schemes, and optimization targets (NMFS 2015c). NMFS and the Council selected three strata design with sample size allocation based on a blended optimal allocation strategy (NMFS 2016b). The selection rates described in the 2016 ADP and programmed into ODDS were as follows:

- Trawl – 28%.
- Hook-and-line – 15%.
- Pot –15%.

Evaluation of deployment in each of the selection pools is described in Chapter 3.

NMFS recommended and the Council supported not granting conditional releases in 2016 because of the expanded opportunity for vessels to participate in the EM selection pool with no requirement to carry an observer in 2016. 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 LOA, (i.e., two trips in a row were observed, resulting in the third trip being released from coverage).

The Council recommended and NMFS agreed to continue to allow trawl catcher vessels participating in the BSAI trawl limited access sector to volunteer for full observer coverage and carry an observer at all times while fishing in the BSAI in 2016.

1.4 Changes Since the 2016 ADP

Although this Annual Report is focused the 2016 Observer Program, changes have been made to the partial observer coverage sampling plan that are being implemented in 2017 (Table 1–1). Here we provide a summary of the changes that have been made since the 2016 ADP.

Notable changes to observer deployment on vessels in the partial coverage category for 2017 include the specific strata definitions, associated selection rates, and further expansion of participation in EM cooperative research and the EM selection pool. Based on recommendations from the Council in June 2016, NMFS evaluated two additional changes to the strata definitions for the 2017 ADP: 1) different treatment of trips from vessels delivering to tender vessels and those that do not deliver to tender vessels and 2) separate treatment of catcher/processors in the partial coverage category (NMFS 2016a). Following analysis in the Draft 2017 ADP (NMFS 2016c), the NMFS and Council adopted the following stratification scheme with sample sizes allocated according to an optimization based on discarded groundfish for the 2017 ADP (NMFS 2016b):

- ***Trawl:*** All catcher vessels in the partial coverage category fishing trawl gear and not delivering to tenders. ***18% selection rate.***
- ***Hook-and-line:*** All vessels in the partial coverage category that are greater than or equal to 40 ft LOA fishing hook-and-line gear and not delivering to tenders. ***11% selection rate.***
- ***Pot:*** All vessels in the partial coverage category that are greater than or equal to 40 ft LOA fishing pot gear and not delivering to tenders. ***4% selection rate***
- ***Trawl vessels delivering to tenders:*** All catcher vessels in the partial coverage category that are greater than or equal to 40 ft LOA fishing trawl gear and delivering tenders. ***14% selection rate.***
- ***Hook-and-line vessels delivering to tenders:*** All vessels in the partial coverage category that are greater than or equal to 40 ft LOA fishing hook-and-line gear and delivering tenders. ***25% selection rate.***
- ***Pot vessels delivering to tenders:*** All vessels in the partial coverage category that are greater than or equal to 40 ft LOA fishing pot gear and delivering to tenders. ***4% selection rate.***

The definition of the "no selection pool" in 2017 is similar to that used in 2015 and 2016 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 EM Selection Pool. The EM Selection Pool has been expanded since 2016. For 2017 the Council recommended expanding the number of vessels to 90 hook-and-line vessels and 30 pot vessels. To date there have been 72 hook-and-line vessels and 18 pot vessels for a total of 91 fixed-gear vessels that have volunteered to participate in the EM selection pool to carry EM systems as described in the

2017 EM Pre-Implementation Plan[6]. Five vessels volunteered to carry stereo camera equipment and were also included in the no selection pool.

On September 30, 2016, NMFS published a final rule (81 FR 67114), effective October 31, 2016, to allow 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. For 2018 and all future years, the deadline to request placement in the full observer coverage category is October 15th of the prior year. A deadline of October 15th allows the vessels placed in the full coverage category to be removed from the anticipated fishing effort estimates used to set observer coverage selection rates in the ADP in future years.

[6] Available at: http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/Final2017EMPre-impPlan.pdf

Table 1–1. -- The changes in the Observer Program sampling design, including definition of sampling strata, selection pools, and observer coverage categories in each year from 1990 to the present. The observer coverage rates set through the Annual Deployment Plan are noted in black 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>Full observer coverage category</th><th colspan="3">Partial observer coverage category</th></tr>
<tr><th>Full selection pool
Observer coverage required on all trips</th><th>Trip selection pool
Observer coverage required on all randomly selected trips</th><th>Vessel selection pool
Randomly selected vessels required to carry an observer for all trips in a time period</th><th>No selection pool
Observer coverage not required</th></tr>
<tr><td>2017</td><td>Regulatory full ≥ 100%</td><td>Trawl: 18% | Trawl Tender: 14% | H & L: 11% | H & L Tender: 25% | Pot: 4% | Pot Tender: 4%</td><td rowspan="4">N/A</td><td rowspan="5">Vessels <40’ LOA and Jig gear</td></tr>
<tr><td>2016</td><td rowspan="4">Regulatory full | Opt-in Full</td><td>Trawl: 28% (28.0) | H & L: 15% (15.0) | Pot: 15% (14.7)</td></tr>
<tr><td>2015</td><td>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></tr>
<tr><td>2014</td><td>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></tr>
<tr><td>2013</td><td>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>Vessels <40’ LOA and Jig gear</td></tr>
<tr><td colspan="5">Observer Program Restructure</td></tr>
<tr><td>1990 - 2012[7]</td><td>Regulatory Full ≥ 100%</td><td colspan="3">Vessels self-selected coverage (i.e., choose when to take an observer)
• 30% of fishing days by gear/quarter and at least one trip per fishery.
• CVs ≥ 60’ and < 125’ LOA targeting groundfish
• Other CPs and processing plants when not required 100%.</td></tr>
</table>

[7] Coverage requirements are generalized based on requirements implemented prior to 2013.

2 FEES AND BUDGET

2.1 Budget for Partial Coverage Category in 2016

Section 313(d) of the Magnuson-Stevens Fishery Conservation and Management Act authorizes the creation of the North Pacific Fishery Observer Fund ("Observer Fund") within the U.S. Treasury. This was the fourth year (2013-2016) that fees were collected from the partial coverage fleet. The following section provides information on the amount of fees that are anticipated to be collected in 2017 based on revenues from landings in 2016, as well as the amount of fees collected in 2016 that were obligated to the partial coverage contract to pay for observer sea days in 2016.

Fee billing statements for 2016 were mailed to 108 processors in January 2017. All but eight bills were paid in full by February 15. A total of $3,769,758 in observer fees will be collected once all bills are paid. At the time of this publication, three processors had not yet paid observer fees totaling $177,391. In order to collect delinquent fees, eight 30-day notices were mailed in March and five 60-day notices were mailed in April 2017. Ninety-day notices will be mailed as needed. Processors submitting late fee payments were charged an administrative fee of $25 plus interest on the observer fees with each notice.

The sequestration of funds initiated under the 2011 Budget Control Act continues to affect the Observer Fund. At the direction of the Office of Management and Budget under sequestration procedures, an estimated $244,696 (6.8%) in 2016 observer fees is being 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, 2016 NOAA made an authorized transfer of $3,176,622 to the Alaska Fisheries Science Center (AFSC) to fund observer deployment contracts. On June 1, 2016, NMFS received $350,400 in sequestered funds from the previous year, and on August 11, 2016, NMFS received an additional $370,915 in late observer funds. In addition, a total of $1,247,044 was carried over from the 2015 Fiscal Year (FY15) to FY16. The carryover funds were used to fund the observer deployment contract in 2016. These additional sources of funding brought the total observer funds available for the 2016 observer deployment contract to $5,144,981 (Table 2-1).

In 2016, the Council requested[8] an additional $1.4M in funding from NMFS to account for the decline in groundfish prices and resulting shortage in fee collection revenues, as well as an anticipated decreases in supplemental funds provided by NMFS. In a response from NMFS, Assistant Administrator Eileen Sobeck stated that NMFS is facing challenges with the budget available to support observer programs and EM and that NMFS would not be able to provide funding for sea days but was able to provide $1.8M to support efforts to implement EM in the fixed gear fisheries. [9]

[8] Letter from Council to NMFS regarding funding available at: https://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/07July_SobeckObserverletter.pdf

[9] Response from NMFS to Council available at: http://npfmc.legistar.com/gateway.aspx?M=F&ID=27475173-7d5a-4982-8240-b0651306ca7b.pdf

2.2 Fees Collected from 2016, 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 all landings accrued 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 accrued against the Federal TAC are included in the fee assessment.[10]

A fee equal to 1.25% of the ex-vessel value[11] 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 2016 fee assessments were published in the Federal Register on December 15, 2015 (80 FR 77606).[12]

Tables 2-2 to Table 2-4 summarize the observer fees that accrued for 2016.

[10] 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.

[11] The Council has the authority set the observer fee up to 2%.

[12] Available online at: https://alaskafisheries.noaa.gov/sites/default/files/80fr77606.pdf.

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

Year	Funding category	Funds at the start of the calendar year (carry over of observer fees)	Observer fees received during the calendar year	Funds obligated to contract during the calendar year	Observer days on the contract at the start of the calendar year	Observer days purchased during the calendar year	Total observer days used in calendar year
2013	Fees				4,535	1,913	3,533
	Federal Funds	NA[13]		$2,115,166			
2014	Fees		$4,251,452	$3,044,606	2,915	4,368	4,573
	Federal Funds	NA		$1,892,808			
2015	Fees	$1,206,846	$3,458,715	$3,058,036	2,710	5,330	5,318
	Federal Funds	NA		$2,700,232			
2016	Fees	$1,247,045	$3,897,937[14]	$5,144,981	2,722	5,277	4,677
	Federal Funds	NA		$390,800[15]			
2017	Fees		$3,769,758[16]	$3,769,758[17]	3,322		
	Federal Funds	NA					

[13] Not applicable - NMFS funds are required to be spent in the fiscal year in which they are obligated, whereas observer fees can be carried over from one fiscal year to the next.

[14] Fees received during the calendar year are comprised of $3,176,622 in 2015 observer funds received on May 8, 2016, $350,400 in sequestered funds from previous years received on June 1, 2016, and $370,915 in late observer funds received on August 11, 2016.

[15] End of year funds from AFSC and AKR that were obligated to the partial coverage contract.

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

[17] Projected funds that will be put onto the contract once all the funds have been received, minus any outstanding non-payments.

Table 2–2. -- Observer fees[18] in 2016 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	$244,051	$24,575	$5,430	$29	$1,164	$275,248
40 - 57.5	$524,708	$268,235	$17,310	$123	$8,252	$818,629
>57.5	$625,899	$513,130	$4,570	$1	$8,908	$1,152,509
Gear Subtotal	$1,394,658	$805,941	$27,309	$154	$18,324	$2,246,385
JIG						
<40	$464		$396	$29	$109	$999
40 - 57.5	$885	$33	$1,073	$47	$396	$2,434
>57.5			$6	$3		$9
Gear Subtotal	$1,350	$33	$1,475	$79	$506	$3,442
POT						
<40			$399		$39	$438
40 - 57.5			$32,959	$3	$140	$33,102
>57.5		$21,670	$302,168	$70	$2,008	$325,916
Gear Subtotal		$21,670	$335,526	$73	$2,187	$359,455
TRAWL						
40 - 57.5			$117	$11,069	$2	$11,188
>57.5		$14,186	$375,620	$704,427	$55,055	$1,149,287
Gear Subtotal		$14,186	$375,736	$715,496	$55,057	$1,160,475
TOTAL ALL GEAR						
	$1,396,008	**$841,829**	**$740,047**	**$715,801**	**$76,073**	**$3,769,758**
PERCENT BY SPECIES						
	37%	**22%**	**20%**	**19%**	**2%**	**100%**

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

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

Table 2–3. -- Observer fees[19] in 2016 by gear, vessel size category, and species or species group in the *Gulf of Alaska*.[20]

Vessel length category	Halibut	Sablefish	Pacific cod	Pollock	All other groundfish	Total all species
HOOK AND LINE						
<40	$192,660	$22,286	$5,429	$29	$1,103	$221,508
40 - 57.5	$441,876	$258,746	$17,300	$123	$8,046	$726,092
>57.5	$482,453	$493,076	$4,541	$1	$8,602	$988,674
Gear Subtotal	$1,116,990	$774,108	$27,270	$154	$17,752	$1,936,273
JIG						
<40	$464		$396	$29	$109	$999
40 - 57.5	$885	$33	$673	$47	$394	$2,031
>57.5			$6	$3		$9
Gear Subtotal	$1,350	$33	$1,075	$79	$503	$3,039
POT						
<40			$399		$39	$438
40 - 57.5			$22,924	$2	$136	$23,062
>57.5			$117,528	$69	$1,796	$119,393
Gear Subtotal			$140,852	$71	$1,971	$142,893
TRAWL						
40 - 57.5			$117	$11,069	$2	$11,188
>57.5		$14,184	$108,315	$702,877	$55,043	$880,419
Gear Subtotal		$14,184	$108,431	$713,946	$55,045	$891,607
TOTAL ALL GEAR						
	$1,118,340	**$788,324**	**$277,627**	**$714,250**	**$75,271**	**$2,973,812**
PERCENT BY SPECIES						
	38%	**27%**	**9%**	**24%**	**3%**	**100%**

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

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

[20] 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[21] in 2016 by gear, vessel size category, and species or species group in the *Bering Sea/Aleutian Islands*.[22]

Vessel length category	Halibut	Sablefish	Pacific cod	Pollock	All other groundfish	Total all species
HOOK AND LINE						
<40	$51,390	$2,289			$61	$53,740
40 - 57.5	$82,832	$9,489	$10		$206	$92,537
>57.5	$143,446	$20,054	$29		$306	$163,835
Gear Subtotal	$277,668	$31,832	$40		$572	$310,112
JIG						
40 - 57.5			$400		$3	$403
Gear Subtotal			$400		$3	$403
POT						
40 - 57.5			$10,035	$1	$4	$10,040
>57.5		$21,670	$184,640	$1	$212	$206,523
Gear Subtotal		$21,670	$194,675	$2	$216	$216,562
TRAWL						
>57.5		$2	$267,305	$1,549	$12	$268,868
Gear Subtotal		$2	$267,305	$1,549	$12	$268,868
TOTAL ALL GEAR						
	$277,668	**$53,505**	**$462,419**	**$1,551**	**$803**	**$795,946**
PERCENT BY SPECIES						
	35%	**7%**	**58%**	**<1%**	**<1%**	**100%**

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

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

[22] 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 Programmatic Costs

The Fisheries Monitoring and Analysis Division (FMA) at the Alaska Fisheries Science Center 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 off Alaska. FMA staff are responsible for training, briefing, debriefing, and oversight of observers who collect catch data onboard fishing vessels and at shoreside processing plants and for quality control/quality assurance of the data provided by these observers. FMA currently has a total of 48 staff located in: Seattle, WA (41); Anchorage, AK (4); Kodiak, AK (2); and Dutch Harbor, AK (1). The AFSC allocates a budget to FMA each fiscal year. Note that the Federal fiscal year runs from October 1st through September 30th. In fiscal year 2016, FMA was allocated and spent $7,758,548 (which includes $2,108,540 in EM funding) in Federal appropriations in support of the following activities.

FMA Division Leadership and Coordination 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 have an understanding of their responsibilities and priorities. Staff also provide advice to support policy development, decision-making, and regulatory and program development by NMFS, the Council, and other regional and national bodies. They also provide guidance and advice on policy issues, monitoring programs, and related topics at the regional, national, and international level.

Fishery-dependent Data Analysis and Interpretation 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.

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.

In-season Operations activities 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, staff provide data entry support and verification for all non-electronic data submissions and provide technical support to the ODDS call center.

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.

Debriefing and Quality Control ensures 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. 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.

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 provide 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.

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. In 2016 FMA filled a long-standing vacancy in the Kodiak field office, bringing the total number of FMA staff in Kodiak to two.

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.

Observer Gear Inventory and Deployment staff ensure there is sufficient gear inventory to supply the observers deployed throughout the year. They also ensure the field offices in Anchorage, Dutch Harbor, and Kodiak have sufficient gear to supplement observer needs and provide for losses or the exchange of observer gear during deployment. In addition, staff develop inventory control systems and policies to maintain safety equipment, ensure sampling equipment readiness, and monitor equipment losses.

Partial Coverage Deployment and Funding ensures the infrastructure and contracts are in place to meet the observer deployment requirements of BSAI Amendment 86 and GOA Amendment 76. Staff provide oversight of the fishery observer services provider contract, serving as the primary point of contact for the contracted provider and FMA. They coordinate with NOAA's Acquisition and Grants Office to develop future Requests for Proposals. Staff also 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. In 2016 a total of $390,800 in NMFS funds were spent on partial observer coverage deployment.

Electronic Monitoring (EM) was formed as a unique activity within FMA 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 2016 a total of $2,108,540 in NMFS funds were spent on EM in Alaska. Additional funds were also provided by the National Fish and Wildlife Foundation (NFWF) in support of EM deployment.

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). NMFS receive legal guidance on the FAR through NOAA contract attorneys and AGO staff.

The detailed costs on the Federal contract are protected by confidentiality as they contain competitive information. NMFS has been advised that it can only release information on the

amount of services (observer days) after the contract is awarded and services have been procured.

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.

In 2016, a total of $5,535,781 ($ 5,144,981 in observer fees and $390,800 in Federal funds) was used to purchase 5,277 observer days. The fee proceeds were transferred to the AFSC on May 8, 2016, and a modification to the contract was issued to allocate these fees to sea days. At the close of 2016, NMFS had used 4,677 observer days and carried 3,322 observer days already procured with observer fees and Federal funds into 2017 (Table 2-1).

Estimated Cost per Observer Sea Day for Partial Coverage

The observer coverage under the first two years of the program fell under a 2-year contract awarded to AIS Inc. A second contract was awarded for the next 5 years of the program to A.I.S., Inc.in April 2015. The detailed breakdown between daily rate and travel is confidential and NMFS has been advised that it can only release information on the amount of services (observer days) after services have been procured. Table 2-1 provides a summary of funds spent and the number of days procured since 2013.

In 2016, the average cost per observer day was $1,049 (based on the cost of $5,535,781 to procure 5,277 observer days). The average cost per observer 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 must recoup their total costs and profit through the daily rate, which includes the 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.

During the first 4 years of the program, the partial coverage costs in the North Pacific have been less than most partial coverage, government-contracted observer costs in other regions (Table 2–5). This is particularly notable given the large geographic expanse of the Observer Program and associated travel costs in Alaska, which are likely to be higher per trip than other regions of the country. In 2016, partial coverage trips started in 33 different ports and at 2 stationary floating processors. Trips ended in 29 different ports and at 3 stationary floating processors. Future Annual Reports will continue to provide information and funds spent, days procured, and the average cost per day under the new contract. NMFS anticipates that the average cost per observer day is likely to be reasonably stable over the next 5 years and not vary dramatically from average costs we have seen thus far in the program.

Table 2–5. -- Observer coverage sea day costs for comparable observer programs across the country. Data were provided by each regional program.

Program	Sea day cost	
	Federal contract	Direct industry funding
Alaska	$1,049	$383
Northeast	$1,227	$1,241
Southeast	$1,500-1,600	NA
West Coast	*	$500
Pacific	$530-650	NA

*Contract is administered by the Pacific States Marine Fisheries 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 certified observer providers. This cost structure is sometimes referred to as "pay as you go." The services carried out by observer providers include paying observers, deploying observers to vessels and shoreside processors, recruiting, training and debriefing. There are currently five active certified providers in Alaska.

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

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

The invoices data were used to calculate the average cost of observer coverage in the full coverage category for 2016. The observer invoice data are confidential under section 402(b)(1) of the MSFMCA. 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.

There was a total number of 38,534 observer days reported in the invoices. The total cost billed to 179 vessels and processing facilities for observer coverage in the full coverage category in 2016 was $14,760,720. Based on this information, the average cost per day of observer coverage in the full coverage category in 2016 was $383. 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 2016 compares with an average cost of $375 in 2015, $367 in 2013, and $371 in 2014.

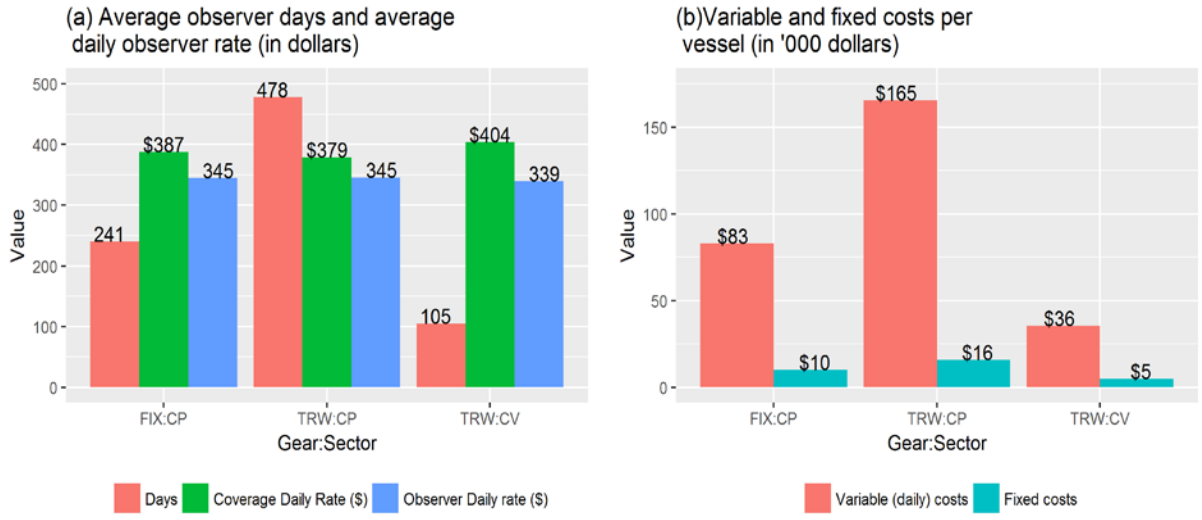


Figure 2–1. -- Full coverage costs by variable costs (a, b) and fixed costs (b) to vessels and processors for observer coverage in the full coverage category in 2016, by gear type (FIX = fixed gear which includes hook & line and pot gear, TWL = trawl) and sector (CP=catcher processor, CV = catcher vessel, note the costs for shoreside processing sector is excluded from this figure for confidentiality).

Figure 2–1 summarizes the average costs to fishing and processing vessels in the full coverage category by sector and gear type in 2016. 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: 1) the average number of observer days per vessel in the three vessel gear and sector categories;[23] 2) the average cost per day of observer coverage;[24] and 3) the average daily rate observer providers charged for observer coverage.[25] The average daily observer rate (variable costs only) was $343.68 (up from approximately $340 in 2015), and was similar across all gear and sector categories. Figure 2–1, part (b) shows the estimated average

[23] The average number of observer days per vessel is calculated by dividing total observer days in each vessel gear and sector category by the total number of vessels in that category.

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

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

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

2.3.4 Costs for Electronic Monitoring

The Council has tasked NMFS with implementing EM 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. A simplified fully-loaded daily rate can be calculated for the EM program in 2016. In 2016 the deployment costs (equipment and field support) for EM were $453,044[27], which included significant equipment purchase in addition to 2016 operational costs. Video review costs were $40,000 for 357 days of video reviewed. Combined, the fully loaded EM daily rate is $493,044 / 357 days = $1,381 per day.

During the April 2017 EM Workgroup meeting additional cost information was provided by the EM service provider Archipelago Marine Research Ltd. (AMR) in which they broke out 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, according to AMR, the cost of an ongoing program similar to the 2016 EM pre-implementation program would be approximately $191,049/year. Based on the number of sea days in 2016 (357), this would result in an average sea day rate of $535, and $677 per day with video review included.

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 National Fish and Wildlife Foundation (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. Under a regulated program NMFS will most likely have a single contract for both observers and EM that would allow for better tracking of annual EM deployment costs. In summary, future 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.

[26] Calculated as total fixed costs divided by the total cost of coverage.

[27] Pers. Comm. with Howard McElderry, AMR, Ltd.

2.4 Cost Savings and Efficiencies

2.4.1 Partial Coverage

The new 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. The new contract has several components designed to improve efficiency and reduce costs. For example, the new contract requires that a partially observed sea day, or day that begins after 1200 (noon) and 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 Federal appropriations. 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 in discussions with the Acquisition and Grants Office (AGO) to begin planning for renewal of the contract. Considerable preparatory work is required to complete the necessary steps toward issuing a new request for proposals (RFP), particularly given the potential to expanded scope of the contract to encompass EM.

The anticipated schedule to develop the RFP is as follows:

- May 24, 2017 – AGO will attend the OAC meeting, propose their plan for incorporating input on the development of the contract RFP, and get feedback.
- May-September – NMFS will prepare a draft Statement of Work for the contract.
- End September/beginning October – AGO is planning an "Industry Week" (publicized in the Federal Register and on FedBizOpps), where they will try to solicit input from the public on the draft Statement of Work. Contingent on funding, AGO is tentatively planning to travel to Alaska ports and overlap their visit with the Council meeting. All questions that are put to them at the outreach meetings will be published as Questions and Answers.
- Oct 2017 – AGO will work with NMFS to incorporate public input into a final Statement of Work.
- Spring 2018 – AGO will release the final RFP.
- Early 2019 – intended date to have the contract awarded.

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 four NMFS-certified observer providers. This pool is down from a high of 10 certified providers in 1991. It is NMFS' understanding that the pool was reduced due to competition, so it is uncertain if a new provider could be competitive, or if the impact would result in substantial increases in efficiency.

In March 2016, NMFS received an observer provider permit application from A.I.S., Inc. to become an observer provider for operations requiring full observer coverage in the North Pacific groundfish fisheries. In August 2016, NMFS determined that all applicable requirements had been met, and A.I.S., Inc. was issued a North Pacific observer provider permit. This brings the number of North Pacific permitted observer providers in the full coverage category to five.

2.4.3 Comparing Cost Efficiencies Between Full and Partial Coverage Categories

There are several factors that impact the costs in partial coverage, particularly when compared to costs in full coverage.

- 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 certified 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.
- 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 equates to greater efficiency and lower costs per day, while lower coverage costs equate to lower efficiency and greater costs per day.
- Partial coverage observers deploy out of many small, remote port locations which increases travel and lodging costs.
- The average trip duration for partial coverage observers is significantly shorter (1 to 5 days) than 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 the partial coverage contract in 2016, was $5,535,781 ÷ 5,277 days = $1,049 per day. This calculation is appropriate for partial coverage since all 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. For this reason full coverage costs per day are poorly compared to partial coverage costs. For a more detailed comparison, see section 2.4.3 of the 2015 Annual Report (NMFS 2016a).

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 practical, analytical and scientific expertise relating to the observer sampling of groundfish and halibut fisheries of the BSAI and GOA and/or 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 2016 relative to the intended sampling plan and goals of the 2016 Annual Deployment Plan (ADP) (NMFS 2015b). 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 2018 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. 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.

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. By grouping similar fishing activities into strata and sampling appropriately to those groupings, logistics of sampling is increased and variance of resulting estimates is decreased. Sampling strata are defined in the ADP, and all fishing activities must be contained in one, and only one, stratum.

Within each of the strata, observers are deployed randomly to either vessels for a predetermined time period (termed vessel-selection), or to individual 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 strata (for example all trips taken by trawl vessels fishing in the Alaska EEZ). 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 sampling may be biased. The magnitude and direction of the bias will depend on how different the sample frame is 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 is 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 are randomly selected from the species composition sample and measured. Lastly, at the fifth sampling level, a random selection of fish are 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 Resource Ecology and Fisheries Management Division (REFM). Sampling rates for genetic tissue collection by observers (e.g., 1 of 10 Chinook salmon caught as bycatch) are set each year by the Auke Bay Laboratory of the AFSC.

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 (in vessel-selection, all trips are monitored), 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 2016 Observer Sampling Manual (AFSC 2015).

3.3 Observer Deployment Performance Metrics

Performance metrics have been developed to assess whether the trip- and/or vessel-selection process (through the implementation of the 2016 ADP) provides a representative sample of the

catch in the North Pacific in 2016. These metrics reflect four mechanisms that can impact the quality of the data: sample frame discrepancies, non-response, trip differences, and sample size. The sampling frame consists of the portion of the population available for sampling. In cases where the vessel is the sampling unit, sample frame discrepancies (i.e., under- and over-coverage of the sample frame) were used to quantify the differences between the sampled population (i.e., observed vessels) and the population for which estimates (inferences) are made (e.g., all vessels that fished), as well as to identify possible mechanisms of bias. Non-response assessments are made to quantify the differences between the selected sample (selected trips or vessels expected to be observed) and the actual observed sample that may lead to bias in the resulting data.

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 strata are subgroups or partitions of the entire population from which estimation and inference is desired. Implementation challenges can be identified in this step, such as: sample frame inadequacy (vessel-selection only), selection biases, and issues with sample unit definitions (e.g., tender trips). Specifically, this section assesses the following:
    a. Sample rates and number of samples relative to intended values.
    b. (Vessel-selection strata only) Quantification of under- and over-coverage rates (sample frame discrepancies). Over-coverage of a population occurs when the sample frame includes elements (trips or vessels) 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. (Vessel-selection strata only) 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 estimators of parameters of interest. A randomized sample design is expected to achieve a rate of observed events that is similar across both space and time. The hypergeometric distribution is used to construct several of these metrics. Based on a sample taken from a population with known characteristics (e.g., trips that occurred in a NMFS Reporting Area), this distribution describes the probability of selecting sample units (e.g., trips) with specific characteristics (e.g., NMFS Reporting Area). 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. Attributes 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. This determination was made through an examination of the probability of deploying observers at the implemented rate and having no observer coverage in certain cells (e.g., defined by NMFS Reporting Area and strata).

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.

3.4 Changes to This Report from Last Year

3.4.1 Strata Definitions and Deployment Methods

Observers in 2015 and 2016 were deployed into fishing events through trip-selection, the random selection of fishing trips as they were entered into an online application (also available by phone) known as ODDS. In 2015 there were two principal deployment strata based on vessel size: hook-and-line and pot gear catcher vessels 40-57.5 ft in length overall (LOA) were termed the *t* stratum, and larger fixed gear catcher vessels in addition to trawl gear vessels and three catcher-processors were termed the *T* stratum. The *t* stratum had selection rates of 12% while the *T* stratum had a selection rate of 24% (Faunce et al. 2016, NMFS 2016a). In 2016 observers were deployed 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). Since 2013, nearly all catcher-processor vessels have been subject to full coverage at the primary sampling unit.

The year 2016 was the second year of the NMFS 'Pre-Implementation' of Electronic Monitoring (EM) Cooperative Research (NPFMC 2016a). The Final 2016 EM Pre-Implementation Plan developed by the EM Workgroup (hereafter EM Plan) is similar to the EM Plan for 2015 in that it defines the desired number and type of vessels, selection process, and sample-size for EM. Therefore the EM Plan defines the sampling design for EM vessels. Similar to 2015, the NMFS incorporated the EM Workgroup sample design into its ADP for 2016. This was accomplished by predicting the number and type of vessels that would be included in the EM Plan and subsequently developing coverage rates and strata for human observer coverage based on the remaining vessels and fishing activity (NMFS 2015b). In this way the inclusion of vessels into the EM Plan superseded their inclusion in the sampling design of the NMFS through the ADP. This is expected to change as EM in 2018 will be under a regulated program and part of the ADP.

The EM Plan for 2016 was to expand the number of vessels that participate in EM from 15 in 2015 to 58, and limit participation to volunteer longline vessels 40 to 57.5 ft in length. EM systems (defined as packages that contain multiple cameras, GPS, hydraulic line sensors and a control box) were deployed onto vessels according to a vessel-selection design consisting of four time periods: Jan-Feb, Mar-Jun, Jul-Oct, and Nov-Dec. Vessel-selection was last used for deploying observers in the 2014 ADP (NMFS 2013). This method involves selecting for observation a subset of vessels that are anticipated to fish during each time period. The ability to achieve a target number of observed vessels in vessel-selection within each time period is hindered by the difficulty identifying a complete sampling frame, which should include all the elements of the population of interest. A complete sampling frame for vessel-selection would consist of a list of vessels that actually fish in each time period. In trip-selection, only vessels that intend to fish log trips into ODDS. Consequently, the trip-selection sampling frame for the observer program is equal to the target population. However in vessel-selection, without a similar notification system informing NMFS of their intent to fish, a method was needed to generate the sampling frame.

EM-eligible vessels were determined in the following manner according to the Final 2016 EM Pre-Implementation Plan (NPFMC 2016a). NMFS sent a letter to what it believed were all hook-and-line vessels 40-57.5 ft LOA (the equivalent of the *t* stratum in the 2015 ADP), and requested that vessels indicate their interest in being in the EM pool by July 27, 2015. The subset of vessels that expressed interest in EM participation by the first deadline in July was sent a second letter. This second letter informed recipients that unless NMFS received their notification to "opt-out" of EM participation by November 20, 2015, they would be included in the group of EM vessels with no probability of carrying an observer on any trips for the calendar year. In addition, the letter specified that vessels participating in EM must notify NMFS of their intent to fish at least 30 days in advance of each of the selection periods for 2016. Hence, a list of vessels anticipated to fish was available to NMFS prior to each selection period (i.e., a sampling frame was created), and a random sample was made from this list to select vessels for observation. Random selections were made by assigning each vessel in the list a random number, placing those vessels in ascending order by their random number, and selecting the first v vessels where v is the number of vessels in the list multiplied 0.30 (the selection rate) rounded to the nearest whole number. In this way, vessels that followed the instructions set out by the pre-implementation plan were subject to a 30% chance of selection.

For vessels that did not notify NMFS 30 days in advance of a time period, NMFS underwent a different selection process. A vessel was subject to either 100% or 0% selection by either notifying NMFS after 30 days prior to each selection period or failing to notify NMFS prior to fishing (NPFMC 2016a). In the former case, the vessel was automatically selected to carry EM if a camera system was available (100% selection). If a camera system was not available, then the vessel would not be selected to carry EM (0% selection). If a vessel simply failed to notify NMFS prior to fishing, that vessel had no chance of being selected (0% selection).

The deployment performance of the 2016 EM sampling design was difficult to evaluate for several reasons. First, the selection process used for EM in 2016 effectively created two EM selection strata with additional time periods to evaluate that were not specified in the 2016 ADP. While the 2016 ADP simply specified three gear-based stratum in partial coverage, the selection process set up by the EM Workgroup and employed by NMFS created eight new strata to evaluate (two selection rates × four time periods). Since the EM participation was voluntary in 2016, vessel owners could contact NMFS at any time throughout the year to be removed from participation and were returned to the human observer pool. In this way a vessel could be in multiple selection strata during an EM time period. In addition, the selection process involved both random and non-random elements, the latter of which is nearly impossible to evaluate without making certain assumptions that will now be described. The number of vessels anticipated to fish in the EM Voluntary category was derived from the Final 2016 EM Pre-Implementation Plan (NPFMC 2016a). Vessels that followed the notification rules were considered "within the sampling frame" for that time period, were selected for EM coverage at a 30% rate, and were considered the Voluntary 30% EM stratum. Vessels that missed the 30-day cutoff prior to the start of the time period but still wanted to volunteer for EM were selected at a 100% rate if equipment was available. Correspondence with the observer program indicates that EM systems were installed on all late-notifying vessels. Therefore we categorized all late notifying vessels as belonging to the EM Voluntary 100% stratum. Vessels that requested EM, but failed to notify NMFS of their fishing plans had no chance of being selected and monitored. In a regulatory program, these vessels would have been referred to OLE. Here we assume that these vessels represent a special case of late-notification vessels that would have been given a camera if one was available had they complied with the voluntary agreement. For this reason, we considered 'failure to notify' vessels as part of the EM Voluntary 100% stratum. Finally, we considered any vessel successfully monitored if some EM video data had been received and reviewed within a time period by the Pacific States Marine Fisheries Commission. Although it is nearly impossible to truly gauge what would constitute the expected number of EM deployments given the sampling design, for the purposes of evaluation we have made the assumption that the desired number of vessels observed was equal to the number of vessels that fished multiplied by 30% following the EM Pre-Implementation Plan for 2016.

3.4.2 Methodological Changes

The results of the current year and the prior year versions of the Annual Deployment Review are now compared. Spatial coverage maps have been improved. Summaries of vessel-selection strata were generated in tables following the 2014 Annual Report (vessel-selection was not used in the 2015 ADP). However, in an attempt to improve clarity these data are now depicted visually and one table has been moved to an appendix for reference.

3.5 Evaluation of Deployment in 2016

The deployment of observers into the 2016 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 tool (e.g., observers and EM). Since a mix of selection methods was used in EM deployments, the results of each are evaluated separately. This is necessary because time periods within each EM selection period have expected outcomes in accordance with the selection rate. In this document, EM strata are considered successfully monitored if at least some video was reviewed from a trip. In summary tables these vessels are considered 'observed'. However, to avoid confusion, the term 'monitored' is used hereafter to refer to EM trips with video data, and 'observed' refers to trips containing some data from human observation.

3.5.1 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 2016 was set at 5,107 days in the 2016 ADP (NMFS 2015b). Based on simulations using 2015 fishing data conducted a year in advance of deployment for the 2016 ADP, the FMA predicted it would observe 4,900 fishing days at the end of 2016. In 2016, the FMA paid for 4,677 observer days, which was 8.4 % lower than predicted (Fig. 3–1). This can partially be explained by an overestimation of trip days in the *TRW* stratum by 581 days (7.5% fewer than predicted) in the 2016 ADP (Table 3–1; NMFS 2015b). For comparison, in 2015 the expended budget was 3.6% less than predicted in the 2015 ADP (NMFS 2014a).

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

Random selection of trips in the trip-selection stratum is facilitated by the ODDS. The ODDS generates a random number according to 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 logged they are considered pending, and can be either closed or cancelled. Permissions depend on whether or not the trip is selected to be observed, the strata 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 in one of two methods: by entering the dates of the trip and the port processor of the landing, or by selecting from a list of pre-populated landing reports. Trips can also be cancelled (marked as incomplete) in two ways. First, in 2016, some vessels were granted by NMFS to voluntarily be 100% observed while trawl fishing in the BSAI FMP. These 100% voluntary observed trips were automatically selected and closed upon entry by the ODDS, so no cancellations are possible by the users. Second, for most partial coverage strata, 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 + 48 hours has passed, 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 2016 ODDS trips from affecting the deployment rates set for the 2017 ADP.

The number of trips logged in the ODDS in 2016 and their disposition is summarized in Table 3–2, Table 3–3, and Table 3–4. Due to the nature of trip cancellations, the cancellation rate by users and by the ODDS is summarized only for selected trips in each stratum (Table 3–2). Of the 7,143 trips logged, a total of 286 trips were cancelled, including 3 by ODDS (0.04%) and 283 by users (4.0%). However, the user cancellation rate for trips that were selected to be observed was much higher (19.6%), and ranged from 15.8% for Trawl gear to 25.3% for Pot gear (Table 3–2).

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, observer coverage is expected to be less 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 total valid trips that were selected from the inherit process ranged from 9.3% for Declared Gear - Trawl to 18.6% for Declared Gear - Pot gear (Table 3–3). In contrast only between 0.0 and 3.5% of the total trips after cancellations were waived (i.e., given a "pass" on their required observer coverage by NMFS) among gear selection strata (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 rate obtained in the initial selection process was 15.88% for the *HAL* stratum, 14.27% for the *POT* stratum, and 28.39% for the *TRW* stratum (Table 3–4). These values were well within the range of values expected from a binomial distribution (exact binomial test p-values = 0.483, 0.341, and 0.933 for *HAL*, *POT*, and *TRW* respectively; Table 3–4). This means that the ODDS was selecting trips according to the programmed rate. The final selection rate after trips were closed, cancelled, or waived was 17.72% for the *HAL* stratum, 14.42% for the *POT* stratum, and 29.55% for the *TRW* stratum (exact binomial test p-values =

0.003, 0.462, and 0.170 for *HAL*, *POT*, and *TRW* respectively; Table 3–4). The fact that the final selection rates were greater than the initial selection rates (especially for *HAL* and to a lesser extent *TRW*) 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.

Differences in the initial and final selection rates were present among gear based strata during 2016. Deviations were most evident in the longline gear stratum during May, in the Pot gear stratum during February, and in the trawl fishery during February and again in September and December (Fig. 3–2). In the longline and trawl strata, the final selection rate eclipsed that of the initial selection rate and remained the higher rate through the remainder of the year. 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. It is important to remember that ODDS only provides the *expectation* as to what levels of observer coverage levels should be resulting from actual fishing events. The 2016 ODDS provided users with a list of Report IDs from eLandings from which to close their logged trips, and eLandings has been updated to facilitate ODDS trip numbers. While these improvements help bridge the gap between intended and realized trip data sets, these data are not currently validated or error checked, making them unusable in their current state. This linkage between the trip stratum (with its selection probability) and the landing information is necessary to evaluate potential improvements in deployment efficiency within the partial coverage fleet.

3.6.1 Evaluation of Deployment Rates

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

At-sea Deployments

The 2016 Observer Program had 15 different deployment strata to be evaluated. There are two deployment strata to evaluate in full coverage; trips belonging to vessels defined in regulation (e.g., AFA, termed regulatory full coverage), and those made by vessels that volunteered to carry full observer coverage when fishing in the BSAI (termed voluntary full coverage). Deployment strata in the partial coverage category include: the *TRW*, *HAL*, and *POT* strata in the trip-selection pool, *EM Voluntary 30%* and *EM Voluntary 100%* (2 strata x all time periods) in the vessel-selection pool, and the zero-selection pool which also included 3 vessels participating in EM innovation research (hereafter simply EM research; Chilton et al. 2016).

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. Evaluations of the partial coverage category are slightly more complicated. Following the 2016 ADP, the ODDS was programmed to randomly select logged trips at a rate of 28.31% in the *TRW* stratum, 15.41%

in the *HAL* stratum, and 15.24% in the *POT* stratum. These rates were the expected rates of observer coverage in these strata. Following the EM Plan, EM was anticipated to be installed on 30% of vessels in each of four time periods, but were always or never installed on vessels under certain conditions. 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 (aka a 95% "confidence bound") since deployment in strata under trip- or vessel-selection were randomized. Coverage levels were considered to have met expected goals if the actual value was equal to one of the upper or lower confidence bounds, or fell within them.

The program met expected rates of coverage for all of the full coverage and trip-selection strata (Table 3–5). These results are similar to those found in 2014 and 2015 (Faunce et al. 2015, NMFS 2015a, Faunce et al. 2016, NMFS 2016a). The trip-selection processes for observing full coverage and partial coverage trips have consistently been shown to achieve the desired rates of coverage when measured over the entire year. Vessel-selection strata were evaluated based on the number of vessels monitored rather than coverage rates as was done for trip-selection strata. Given the total number of vessels that fished and the selection rate, the number of vessels observed in each time period within the EM Voluntary 30% stratum was within the expected bounds while the number of vessels observed within the EM Voluntary 100% stratum were not (Table 3–5). These results are discussed in more detail in the next section of this Review. Evaluation of the entire program is complicated somewhat by whether monitored EM vessels are considered equivalent of observed vessels. When EM vessels with at least some video reviewed are considered equivalent to observed vessels, 6,142 trips (44.8%) and 514 vessels (43.9%) were observed among all fishing in Federal fisheries of Alaska (Table 3–5). However, in 2016 EM data were not used in catch accounting. Therefore, a more accurate depiction of data collection from the North Pacific Observer Program would be to consider EM vessels equivalent to zero-coverage vessels. Under this evaluation, 6,066 trips (44.3%) and 490 vessels (41.8%) were observed among all fishing in Federal fisheries of Alaska (Table 3–5).

Coverage Rates in Vessel-Selection (Voluntary EM)

Vessel selection data were visually depicted by two themes that included: 1) evaluations of the sampling frame (i.e., how many vessels were anticipated to fish, how many volunteered to fish, and how many actually fished), and 2) evaluations of the realized sample (i.e., how many vessels were expected to be monitored, how many vessels were expected to be selected to be monitored, and how many vessels were actually monitored). The results of the anticipated number of vessels that would notify NMFS prior to fishing, the actual number of vessels that notified NMFS prior to fishing, and the actual number of vessels that notified NMFS prior to fishing and actually fished are depicted in Fig. 3–3. The number of vessels anticipated to fish in the Final 2016 Electronic Monitoring Pre-Implementation Plan was always greater than the number of vessels that actually fished within a given time period, but these two metrics shared similar trends among time periods with the greatest values were during Mar-Jun and lowest values during Nov-Dec.

The data in Figure 3–3 (raw values are in the Appendix A) were also used to quantify under- and over-coverage rates (sample frame discrepancies). Over-coverage of a population occurs when the sample frame includes elements (trips or vessels) 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. Over- and under-coverage rates in the vessel-selection sampling frame are not additive since the former is a percentage of the sampling frame, and the latter is a percent difference from the true frame (i.e., the list of vessels that actually fished). Over-coverage rates were 0 for all time periods (Table 3–6, Row 1). If being selected for coverage has no effect on the likelihood that a vessel fishes in Federal waters, we would expect that the percentage of vessels that were in the selection frames and did not fish to be approximately equal to the percentage of vessels that were in the selection frame and were selected for coverage and did not fish. A comparison of Rows 1 and 3 of Table 3–6 shows that this was the case for the voluntary EM strata in 2016. These results are a significant improvement over the vessel-selection process in 2014, when over-coverage rates were between 39.6 and 65.2% (Faunce et al. 2015, NMFS 2015a). The element of the EM vessel-selection design that asked participants to identify their intent to fish prior to each time period, and use this as a selection frame, ensured that the NMFS did not deploy EM systems on vessels that did not fish. However, similar to 2014, there were vessels that belonged to vessel-selection strata, fished, but did not have any chance of being observed. Under-coverage rates in 2016 ranged between 0 and 100% (Table 3–6, Row 2). This larger value occurred because there was only one vessel that fished the Nov-Dec time period (Table 3–6, Rows 1 and 2). Under coverage in 2014 ranged from 29.6 to 63% among time periods and was also largest during the Nov-Dec time period (Faunce et al. 2015, NMFS 2015a). Participation by fishers in vessel-selection appears less successful during the Nov-Dec time period. While only one EM vessel in 2016 fished during this time, it represented the entire stratum, had no chance of being selected, and no data was obtained.

The dual selection process for EM in 2016 resulted in more vessels selected for coverage than planned by the EM Workgroup. Fig. 3–4 shows how the number of vessels selected for coverage was increased by the EM Voluntary 100% vessels, and that all of these were successfully monitored. One vessel that had been selected to be monitored during the Mar.-Jun. time period had EM data reviewed two weeks into the next time period. It is assumed that the EM equipment was not removed prior to the start of fishing by this vessel in the Jul-Oct time period. This resulted in one extra vessel having EM data reviewed than was selected for coverage during Jul-Oct (Fig. 3–4). In a regulated EM program, it is questionable whether this data would be reviewed (or paid for) since it would likely not be used in catch accounting.

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 genetic samples 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 2015a). The sampling design used for this objective in 2016 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 eLandings (i.e., CAS assigned trip target = B or P = pollock). However, because trip target cannot be easily assigned for tender trips, our evaluation of this deployment objective is conducted at the level of the each delivery.

Given the design, the level of dockside observation of walleye pollock deliveries should be 100% in the full coverage category, and within acceptable tolerance of the deployment rate of 28.31% in the partial coverage category (since all trawl catcher vessels in partial coverage participating in this fishery are within the *TRW* stratum). Unbiased estimates of salmon stock of origin should arise from samples of individual fish obtained from samples of pollock deliveries given randomization protocols. However, a random sample of pollock deliveries is not always possible from the partial coverage fleet because of tendering activity (NPFMC 2016b). This activity occurs when a vessel delivers caught fish to a tender and that tender vessel then delivers the fish to a shoreside processing plant. Since tender vessels can provide fuel and food, it is possible that a catcher vessel can remain at sea on a single trip for the entire season. If that trip were logged into ODDS and not selected, the vessels' entire season activity would not be observed (it is also possible the vessels' entire season activity is observed).

The relative impact of tendering activity can be illustrated by comparing the observer coverage rates by port for all pollock deliveries to those without tender deliveries. As expected, all pollock deliveries were observed in full coverage. In contrast, the chance that the coverage rate achieved in partial coverage resulted from a random deployment at the expected rate (28%) was extremely small (Percent observed = 19.6%; exact binomial test p-value < 0.001; Table 3–7). When tendered deliveries of pollock were removed, this probability did not increase despite an increase in the percent observed (Percent observed = 24.5%; p-value < 0.001; Table 3–7). All of the pollock deliveries in the port of King Cove from the partial coverage category were tender deliveries and none of these were observed (Table 3–7).

The results of dockside monitoring from 2016 represent the third year in which the observer program failed to obtain a random sample of partial-coverage trawl deliveries due to tendering activity. Over the past 3 years, tendering activity in this class of deliveries has changed from predominantly to exclusively within the port of King Cove (Faunce et al. 2015, NMFS 2015a, Faunce et al. 2016, NMFS 2016a, this report). However, while a random sample under expected rates was achieved for non-tender partial coverage pollock deliveries from King Cove in 2015, in 2016 zero deliveries out of 322 were observed from King Cove (Table 3–7). These results have impacts for both in-season management of bycatch caps and the collection of genetic samples. Bycatch estimates of Chinook salmon in the GOA are estimated using methods described in Cahalan et al. (2014). In the event that a delivery cannot be monitored (e.g., the case in a tendered 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 Laboratory of the AFSC (e.g., Guthrie et al. 2017).

It is clear after 3 years of consistent results that the observer methods to monitor salmon bycatch are not achieving their goal of achieving a representative sample from all pollock trawl deliveries in the fleet. This is especially problematic since Chinook salmon bycatch in the trawl fishery are fully utilized and error tolerance is low.

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; acceptable bounds on the number of observed trips were defined as the 0.025 and 0.975 quantiles from the normal approximation of the binomial distribution (the 95% "confidence bounds"). Under the assumption that there is no temporal bias in observer coverage, 2.5% of values should be larger than upper bound and 2.5% should be smaller than the lower expected bounds. The number of observed trips achieved was outside of their expected values on 46 days and all of these occurred in the *TRW* stratum with selection rates higher than expected (0.06%; Fig. 3-5). For comparison, in 2015 this occurred for 0.60% of the year (Faunce et al. 2016, NMFS 2016a). Results from the exact binomial test suggest that observed rates at the end of the year were within the expectation for all strata (*HAL* stratum expected rate = 0.15, realized rate = 0.15, p-value = 0.57; *POT* stratum expected rate = 0.15, realized rate = 0.15, p-value = 0.61; *TRW* stratum expected rate = 0.28, realized rate = 0.28, p-value = 0.75; Fig. 3–5). Based on these combined results, there is no evidence of temporal bias in 2016.

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 selected trips should reflect the spatial distribution of all trips. The hypergeometric distribution was used to calculate the probability of observing a minimal number of trips within a stratum and NMFS area given the sampling rate and the distribution of trips across NMFS Reporting Areas based on landings data. The expected number of trips based on this distribution is the number of trips selected divided by the total number of trips (= sample rate) multiplied by the number of trips that fished in an area (observed and unobserved). 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 resulting coverage rate in a NMFS Area for a stratum is unexpected compared to the stratum-wide realized observation rate.

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. 3–6). The shade of the data points in Figure 3-6 indicates whether the point is unusual (higher or lower than expected). Darker data points indicate an observed number of trips or vessels that is increasingly unlikely given randomized observer deployment. For the purposes of discussion, Areas with probabilities less than 0.05 are considered "low-p" areas.

The HAL stratum

Given that there were 18 NMFS Areas fished in *HAL*, we would expect there to be $0.05 \times 18 = 1$ low-p area for this stratum. There were two. The percent of trips observed among NMFS Areas in this stratum ranged from 0% to 20.4% (median = 14.7%, Fig. 3–7). The probability of these coverage rates or rates that deviated further from expected values is depicted in Figure 3–8. These results mean that there was some clustering of observed trips among NMFS Areas that was different from expected. Some spatial bias appears to have occurred in the *HAL* stratum.

The POT stratum

Given that there were 9 NMFS Areas fished in *POT*, we would expect there to be $0.05 \times 9 = 0$ low-p areas for this stratum. There was one. The percent of trips observed among NMFS Areas in this stratum ranged from 0% to 100% (median = 15.1%, Fig. 3–9). The probability of these coverage rates or rates that deviated further from expected values is depicted in Figure 3–10.

These results mean that there was some clustering of observed trips among NMFS Areas that was different from expected. Some spatial bias appears to have occurred in the *POT* stratum.

The TRW stratum

Given that there were 6 NMFS Areas fished in *TRW*, we would expect there to be $0.05 \times 6 = 0$ low-p areas for this stratum. There was one. The percent of trips observed among NMFS Areas in this stratum ranged from 22.8% to 29.8% (median = 25.8%, Fig. 3–11). The probability of these coverage rates or rates that deviated further from expected values is depicted in Figure 3–12. These results mean that there was some clustering of observed trips among NMFS Areas that was different from expected. Some spatial bias appears to have occurred in the *TRW* stratum.

3.7.3 Trip Metrics

This section is focused on answering four questions related to the deployment of observers: 1) are observed trips identical to unobserved trips, 2) are tendered trips identical to non-tendered trips, 3) are observed tendered trips identical to unobserved tendered trips, and 4) are observed non-tender trips identical to unobserved non-tender trips.

Permutation tests (a.k.a., randomization tests) were used to answer each question. Each test evaluates the question "How likely is the difference we found given 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 all permutation tests 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 a tendering effect would be the mean value for non-tendered trips subtracted from the mean value for tendered 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 each 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 to reject the null hypothesis of equality. In an attempt to improve clarity, although five values are calculated in each 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 tests, and 5) the p-value of the test, only values 1, 3 and 5 are presented in relevant tables.

Six trip metrics were examined in each permutation test. These metrics include: the number of NMFS Areas visited in a trip, trip duration (days), the weight of the landed catch (t), the vessel length (ft), the number of species in the landed catch, and the proportion (0 to 1) of the landed catch that was due 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.

Since there are six metrics within each permutation test, and each is evaluated to be unusual if the p-value is < 0.05, we would expect by random chance to have $0.05 \times 6 = 0.3$ (= 0) tests to have low p-values.

Are observed trips identical 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 all partial coverage trips. Sample sizes for this test are presented in Table 3–8.

Of the six metrics compared in the *HAL* stratum, four had low p-values. Observed trips in this stratum were 6.1% (0.3 days) shorter in duration, occurred on vessels 2.5% (1.4 ft) longer in length, landed 7.6% (0.3) more species, and landed catch that weighed 9.6% (0.7 tons) less than unobserved trips (Table 3–9).

Of the six metrics compared in the *POT* stratum, one had low p-values. Observed trips in this stratum landed 8.2% (0.2) fewer species than unobserved trips (Table 3–9).

Of the six metrics compared in the *TRW* stratum, three had low p-values. Observed trips in this stratum were 12.8% (0.3 days) shorter in duration, landed 15.5% (0.8) fewer species, and landed catch that weighed 10.1% (8.4 tons) less than unobserved trips (Table 3–9).

A visual depiction of individual results of this permutation test is given in Figure 3–13 for illustration purposes. Based on these results, we conclude that observer effects were present in the *HAL* and *TRW* strata at the sampling rates achieved in 2016.

Are tender trips identical to non-tender trips?
This comparison is the basis for examining if there is a tendering effect (i.e., differential trip characteristics when vessels use tenders compared to when they do not) under the null hypothesis tendered and non-tendered trips are the same. Sample sizes for this test are presented in Table 3–10. Permutation tests were not evaluated for this question in *HAL* since there were only 3 tendered trips in this stratum.

Of the six metrics compared in the *POT* stratum, four had low p-values. Trips in this stratum that delivered to a tender were 38.4% (1.4 days) longer in duration, occurred on vessels 16.7% (11.7 ft) shorter in length, landed 39.2% (0.8) more species, and landed catch that weighed 42.6% (13.6 tons) more than trips that did not deliver to a tender (Table 3–11).
Of the six metrics compared in the *TRW* stratum, five had low p-values. Trips in this stratum that delivered to a tender occurred in 8.2% (0.1) fewer areas, were 27.9% (0.7 days) longer in duration, occurred on vessels 30.3% (24.7 ft) shorter in length, landed 17% (0.9) fewer species, and landed catch that was 7.1% less diverse than trips that did not deliver to a tender (Table 3–11).

A tendering effect was evident in 2016 in *POT* and *TRW*; trips that delivered to a tender were not the same as trips that did not deliver to a tender.

Are observed tendered trips identical to unobserved tendered trips?
The finding that tendered trips are different from non-tendered trips necessitates separate examination of an observer effect within tendered and non-tendered 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 tendered trips. Sample sizes for this test are presented in Table 3–12. Permutation tests were not evaluated for this question in *HAL* since there were only 3 unobserved and 0 observed tendered trips in this stratum.

Of the six metrics compared in the *POT* stratum, one had low p-values. Observed trips in this stratum that delivered to a tender occurred in 16.2% (0.2) more areas than unobserved trips that delivered to a tender (Table 3–13).

Of the six metrics compared in the *TRW* stratum, three had low p-values. Observed trips in this stratum that delivered to a tender were 87.9% (2.9 days) shorter in duration, landed 15.9% (0.7) fewer species, and landed catch that weighed 69.5% (59.0 tons) less than unobserved trips that delivered to a tender (Table 3–13).

From the above results, we conclude that there is evidence of an observer effect within trips that delivered to tenders in the *TRW* stratum in 2016.

Are observed non-tendered trips identical to unobserved non-tendered 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 non-tendered trips. Sample sizes for this test are presented in Table 3–14.

Of the six metrics compared in the *HAL* stratum, three had low p-values. Observed non-tendered trips in this stratum were 6% (0.3 days) shorter in duration, occurred on vessels 2.5% (1.4 ft) longer in length, and landed 7.5% (0.3) more species than unobserved non-tendered trips (Table 3–15).

Of the six metrics compared in the *POT* stratum, there were no metrics with low p-values (Table 3–15).

Of the six metrics compared in the *TRW* stratum, two had low p-values. Observed non-tendered trips in this stratum occurred on vessels 3.2% (2.7 ft) longer in length and landed 14.2% (0.8) fewer species than unobserved non-tendered trips (Table 3–15).

For comparison, this analysis was performed by gear type in 2014 but not in 2015. In those tests, *HAL* landed 14.4% less catch and 9.1% more species when observed than when unobserved (Faunce et al. 2015, NMFS 2015b). Landing reports from hook-and-line gear trips may be under-reporting species, or observed trips are occurring differentially in some fisheries with greater diversity, since under-reporting of species has been repeatedly found. Consistent differences between observed and unobserved trips from trawl vessels in 2014 and 2016 were also evident.

Trawl trips in 2014 fished in 4.2% fewer areas and had trips that were 8.4% shorter in duration than unobserved trips (Faunce et al. 2015, NMFS 2015a). It appears that trawl vessels fish in fewer areas when observed than when unobserved; however, the nature of this potential bias has yet to be explored. Taken together, it appears that while an observer effect was present within the *HAL* and *TRW* strata in 2016, the magnitude of such biases is small. Nonetheless, the consistent differences in species landed in *HAL* and areas fished in *TRW* warrants further examination. The fact that both strata fished for shorter durations but had similar catches is evidence of an observer effect within non-tendered *HAL* and *TRW* trips in 2016.

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, NMFS 2014b). 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 3–14. While tendered trips can be as long as a month, there appears to be a lack of observed tendered trips within trawl gear. Whether this is due to an observer effect through intentional manipulation of trips (facilitated by the flexibility in ODDS and the current trip definitions, or by vessel behavior in the *TRW* pollock partial coverage fleet), the structure of the data (observed trips and trips with VMS are shortened since all unobserved non-VMS deliveries to a tender are lumped into the same trip), or simply low sample size is unknown.

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 Catch Accounting System post-stratifies data into groups of fishing activities with similar trip characteristics such as gear, trip targets, and NMFS Area (Cahalan et al. 2014). At low numbers of trips and low sampling rates, the probability of no 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 2016 was used to illustrate their combined effect on the probability of a NMFS Area containing observer data using the hypergeometric distribution (Fig. 3–15). 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 3 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 18 trips in the *HAL* stratum, 19 trips in the *POT* stratum, and 9 trips in the *TRW* 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 Response to 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 address comments made by the SSC (in italics) in response to the presentation of the 2015 Annual Report made at the June 2016 Council meeting.

The SSC offered the following comments and recommendations to the Council:
The SSC agrees with all of the recommendations of the Observer Science Committee (OCS) and NMFS, some of which are mentioned and expanded on below.

The analysts were very responsive to SSC comments made on the 2014 Annual Report and provided a section in the 2015 report to specifically address each SSC comment made. The SSC appreciates this attention to our recommendations and logging of responses by the analysts.

Thank you.

The SSC agrees with the analysts' choice of permutation tests for assessing differences between attributes of observed and unobserved trips. This method of statistical testing is appropriate for assessing potential bias in realized observer deployments. However, we note that the outcomes of the permutation tests depend on the assumption that data arise from a random sample, which in some instances may not be the case.

We appreciate the input of the SSC on these tests. The permutation tests used in this Review are a special application that does not depend on the assumption that data arise from a random sample. The permutation tests used in this Review contain the entire population of trips where the observed group is the sample. The goal of the permutation test is to assess whether or not the sample is representative of the total population.

As stated previously by the SSC concerning the 2017 Annual Deployment Plan, we agree with the analysts' decision to change stratification to three gears (trawl, pot, hook-and-line) instead of two vessel lengths. Trip selection will continue as the sole basis for random assignment of observers to vessels in 2016.
Six trip-selection strata (3 gears by tendering activity) were incorporated into the 2017 ADP.

The SSC continues to recommend that sampling issues and bias that arise with tendered trips be addressed. We realize that regulatory action may not be practical to implement and agree with the analysts' decision to place tendered trips in a separate stratum for estimation. We look forward to seeing how this approach to stratification will address the potential for bias in the draft Annual Deployment Plan for 2017.

The OSC recommended that tendering activity be incorporated into stratum definitions to be declared by fishers before a trip began for the 2017 ADP. Based on this input and support from the SSC, NMFS and the Council adopted a deployment design with six strata (3 gears × tendering activity) for the 2017 ADP. In a preliminary assessment of deployment, from January 1 to March 8th 2017, there were 128 potential trip logging errors reported by FMA to OLE. Of these trip logging errors, 106 indicated that the type of tender trip was entered incorrectly. For context, the highest number of reported trip logging errors since trip-selection began has been 136 for the entire year (2015). There were no changes to the way trips are entered between years. In 2016, tendering activity within the trawl pollock fleet was almost exclusively within the port of King Cove and none of these trips were observed. Results and an evaluation of trip logging and observation rates from 2017 will be included in the 2017 Annual Deployment Review that is scheduled to be presented to the Council in June of 2018.

The report detailed continuing problems associated with trip cancellation in the Observer Declare and Deploy System (ODDS). We agree with the recommendation of the OSC to allow the date of a logged trip to be changed rather than cancelling the trip as way to perhaps reduce temporal bias due to delay in observed trips.

We agree with the SSC on this issue and continue to recommend this be addressed.

The SSC continues to recommend that methods to link data from the ODDS to the e-Landings system be developed.

We agree with the SSC on this issue and continue to recommend this be addressed. There has been a slow (but steady) effort by the NMFS to nudge industry towards greater participation in providing these data. Data entry fields to facilitate greater linkage now exist in both ODDS and eLandings, but their completion in eLandings remains voluntary, and in ODDS is not rigorously enforced (manual entry is allowed). Due to discrepancies in ODDS number and Report ID data in both systems, analyses that require matching landings data with trips selected for observing will continue to rely on using fuzzy matching or other algorithms that make similar assumptions or bypass the linking fields entirely.

Continuing work to improve the sampling design and to provide estimates of variance needs to consider the linkage between the sampling design (i.e., level of stratification and sampling rate) and the needs of management (e.g., precision and accuracy needed for estimation of PSC or discards in particular areas and/or fisheries).

OSC members are participating in this ongoing work. However, this issue is beyond the scope of the Annual Deployment Performance Review.

The SSC expressed concern about continuing delays in the release of collected observer fees by the Treasury and the Office of Management and Budget (OMB). These delays have the potential to negatively impact observer provider contracting and thereby adversely impact data collection and strata coverage. We join the OSC in recommending that the Council re-emphasize to NMFS leadership that the timeliness of OMB's release of fees collected from harvesters and processors is important to the success of the partial coverage program.

While we agree with the SSC in their concern, this issue was not recommended by the OSC since it is beyond the scope of the Annual Deployment Performance Review.

The SSC offered the following recommendations to the Observer Program
Evaluate performance relative to the success of observer deployments. Specifically, improve the system for logging complaints by observers so that differences in trip metrics associated with trips where there were observer complaints versus those without complaints can be evaluated.

While some progress has been made on redesigning the infrastructure pertaining to potential violations reported by observers and the OLE, this project remains largely stalled due to a lack of resources; currently there are more than 13 projects listed as analytical priorities for the observer program by the Council. Staff are fully tasked to other projects that include electronic monitoring, maintenance of observer program data architecture, calculating variance, etc.

As a potential deterrent to issues with compliance, consider publishing a list of vessels that are repeat offenders of specific complaints as logged by observers.

This is beyond the scope of the Observer Science Committee. We understand that this has been forwarded to the observer program and to the Office of Law Enforcement.

The SSC requested that the following analyses be added to the list of analytical tasks:
Many of these recommendations are beyond the scope of this review by the Observer Science Committee. Below we have limited our comments to those which are relevant to observer and EM deployment.

Address issues with estimation of discards in the directed halibut fishery as detailed in issue #1 of public comment from the IPHC.

Use data from the 100% observer coverage fleets to conduct simulations with various levels of sampling rate to assess practical constraints to precision and accuracy of partially observed fisheries, with particular attention paid to estimation of rare events and PSC.

While this is beyond the scope of this document, some of this work has already been completed and can be found in Cahalan et al. (2015a).

Once estimates of variance are available, discuss and evaluate the potential for development of accuracy and precision objectives for key estimated quantities with stock assessment authors.

While this is beyond the scope of this document, draft variance estimates were presented to the SSC in June, 2015 and have been published elsewhere (Cahalan et al. 2015b). Work is ongoing

to program variance calculations into the catch accounting system to make them available for assessment authors on an annual basis.

Non-representativeness of the observed trips relative to all fishing (as evidenced by the permutation test results) is a problem for simple interpretation of the variance estimates being

developed. The potential for bias in the expectations and/or variance estimates will remain as long as there are nonrandom differences in the properties of the observed and unobserved trips and this should be evaluated.

We agree. This report evaluates whether there are nonrandom differences in the properties of the observed and unobserved trips (see section on Trip Metrics in this report).

Report on the full workflow from strata-level observer data collection to information support for fishery stock assessments.

While this is beyond the scope of this Annual Deployment Performance Review, the workflow of catch estimation can be found in Cahalan et al. (2014). The workflow for biological data collection is found in annual North Pacific Fishery Observer Manuals (e.g., AFSC 2016)

3.10 OSC Recommendations to Improve Data Quality

The Observer Science Committee made the following recommendations in its 2015 review of observer deployment to be considered in developing the 2017 ADP (NMFS 2016b). Following each italicized recommendation is the outcome of that recommendation.

3.10.1 Recommendations from the 2016 Annual Deployment Review

The Observer Science Committees recommendations to improve the 2017 ADP are as follows:

The OSC recommends that tendered vessels be addressed differently in future ADPs. In any proposed solution to this issue, particular attention must be paid to ensure the safety of observers.

- *Tendered trips should be evaluated as separate strata in future ADPs.*
- *There is not a way to identify the duration of fishing trips made by catcher boats delivering to tenders without an observer or VMS on-board. The OSC recommends that NMFS and Council address this data gap. The OSC supports the continued expansion and implementation of tLandings.*

The OSC reiterates our 2014 recommendation that the expansion of the pool of partial coverage catcher processors warrants their treatment as separate strata in future ADPs.

The Draft 2017 ADP analyzed the performance of alternative sampling designs defined by gear and tender or non-tender deliveries, and partial coverage catcher-processor strata (Faunce 2016, NMFS 2016c). The designs were evaluated using gap analysis (i.e., exploring situations where no observer data would be available). The gap analysis was used to determine which sampling designs would have a 50% probability of having at least one and three observed trips. The gaps associated with each design were compared to provide a relative ranking of sampling designs. The gap analysis found that gear and tender/non-tender stratification scheme more often outperformed the gear and partial coverage catcher-processor stratification scheme for inclusion in the 2017 ADP (Faunce 2016, NMFS 2016c).

Three observed trips are needed to calculate variance. The OSC recommends that sampling rates in future ADPs be high enough in each stratum to maximize the probability of achieving three observed trips in each NMFS Area. In simulated sampling evaluations of 2014 data, 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). In 2015, selection rates in the t stratum were 12%, and an actual observation rate of 11.2% was achieved. At this level of coverage numerous NMFS Areas without any observer coverage resulted. The temporal bias present in the T stratum in 2014 when selection rate was 15% was no longer present in 2015 when selection rates were set at 24%.

The selection rate that can be afforded in the coming year depends on the amount of fishing that is expected to occur and the available budget. The budget for 2017 was set so that the ADP was economically solvent without Federal Funds through June 16, 2020, given stable fee collection funding each year and a fixed travel budget. The ADP deployment budget set for 2017-2019, while promoted as stable, represents a 33.2% decline from the number of days observed in 2016 (4,677) due to a reduction in Federal funding for observer deployment. Sample allocations among strata were set following optimization routines based on discarded catch, retained catch, and a blend, or compromise of discard and retained optimal designs (Faunce 2016). The NMFS selected the design defined by gear by tender stratification and optimal allocation based on discarded catch. Resulting selection rates were programmed into ODDS for 2017 (anticipated number of observed trips provided for context): Hook-and-Line Non-Tender trips - 11.1% (288), Hook-and-Line Tender trips - 25% (2), Pot trips - 3.9% (32), Pot Tender trips 3.9% (6), Trawl trips 17.6% (433), Trawl Tender trips 14.3% (24) (NMFS 2016b).

The OSC recommends that NMFS should work with its partial coverage contractor and the OAC to explore the possibility of eliminating the ability to cancel a trip in ODDS, since the ability to change dates is already facilitated.

This recommendation was not pursued by the NMFS.

3.10.2 Recommendations to Improve Data Quality and Guide the 2018 ADP

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).

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.

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.

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.

    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 OSC recommends that the SSC and Council request NMFS HQ 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.

Table 3–1. -- Comparison between predicted and actual trip days for partial coverage strata in 2016. Predicted values come from the 2016 Annual Deployment Plan (ADP).

Strata	Predicted number of trip days in ADP	Actual number of trip days	% Difference from predicted
POT	4,403	4,622	4.97
HAL	13,144	13,493	2.66
TRW	7,773	7,192	-7.47
Total	25,320	25,307	-0.05

Table 3–2. -- Trip cancellation rates in the ODDS for 2016. 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)
BSAI Cod 100% Voluntary Coverage	Selected	141				0	
Declared Gear - Longline	Not Selected	2,394				0	
Declared Gear - Longline	Selected	452	1	451	108	0	23.9
Declared Gear - Pot gear	Not Selected	1,141				0	
Declared Gear - Pot gear	Selected	190	0	190	48	0	25.3
Declared Gear - Trawl	Not Selected	2,023				0	
Declared Gear - Trawl	Selected	802	0	802	127	0	15.8
Total		7,143	3	7,140	283	0	4.0

Table 3–3. -- Number of remaining trips after cancellation in each trip-selection strata (*TRW*, *HAL*, and *POT*) 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)
Declared Gear - Longline	2,274	343	73	13	403	18.1	3.1
Declared Gear - Pot gear	1,158	142	31	6	167	18.6	3.5
Declared Gear - Trawl	2,518	675	69	0	744	9.3	0.0

Table 3–4. -- Number of logged trips in each trip-selection strata (*TRW*, *HAL*, and *POT*) 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 (H0: Actual = Programmed)
Declared Gear - Longline	Initial Random Selection, *a*	452	2,846	15.88	15.41	0.483
Declared Gear - Longline	After Cancellations, *b* (*a*-*b*)	343	2,274	15.08	15.41	0.684
Declared Gear - Longline	With Inherits, *c* (*a*-*b*+*c*)	416	2,274	18.29	15.41	0.000
Declared Gear - Longline	After Cancellations, with Inherits and Waivers, *d* (*a*-*b*+*c*-*d*)	403	2,274	17.72	15.41	0.003
Declared Gear - Pot gear	Initial Random Selection, *a*	190	1,331	14.27	15.24	0.341
Declared Gear - Pot gear	After Cancellations, *b* (*a*-*b*)	142	1,158	12.26	15.24	0.004
Declared Gear - Pot gear	With Inherits, *c* (*a*-*b*+*c*)	173	1,158	14.94	15.24	0.806
Declared Gear - Pot gear	After Cancellations, with Inherits and Waivers, *d* (*a*-*b*+*c*-*d*)	167	1,158	14.42	15.24	0.462
Declared Gear - Trawl	Initial Random Selection, *a*	802	2,825	28.39	28.31	0.933
Declared Gear - Trawl	After Cancellations, *b* (*a*-*b*)	675	2,518	26.81	28.31	0.097
Declared Gear - Trawl	With Inherits, *c* (*a*-*b*+*c*)	744	2,518	29.55	28.31	0.170
Declared Gear - Trawl	After Cancellations, with Inherits and Waivers, *d* (*a*-*b*+*c*-*d*)	744	2,518	29.55	28.31	0.170

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 2016. When trip-selection is used as the Deployment Method, the Expected, Minimum Expected, and Maximum Expected Coverage columns are expressed as percentages. When vessel-selection is used as the Deployment Method, the Expected, Minimum Expected, and Maximum Expected Coverage columns are numbers of vessels. Fleet totals are reported with and without Electronic Monitoring (EM) since EM data were not used for catch estimation in 2016.

Coverage	Strata	Deployment method	Time period	*V*	*v*	*N*	*n*	% Observed by deployment method	Expected coverage	Minimum expected coverage	Maximum expected coverage	Meets expectations?
Full	Regulatory	Trip-Selection	Year	170	170	4,579	4,579	100.0	100.0			Yes
Full	Voluntary	Trip-Selection	Year	23	23	137	137	100.0	100.0			Yes
Full Coverage Total		Trip-Selection	Year	172	172	4,716	4,716	100.0				
Partial	HAL	Trip-Selection	Year	466	244	2,655	398	15.0	15.4	13.7	16.4	Yes
Partial	POT	Trip-Selection	Year	113	73	1,261	185	14.7	15.2	12.8	16.7	Yes
Partial	TRW	Trip-Selection	Year	85	82	2,738	767	28.0	28.3	26.3	29.7	Yes
Gear-based Total		Trip-Selection	Year	595	365	6,654	1,350	20.3				
Partial	Zero Coverage	Trip-Selection	Year	418	0	2,079	0	0.0	0.0			Yes
Partial	Zero Coverage EM Research	Trip-Selection	Year	3	0	30	0	0.0	0.0			Yes
Zero Coverage Total		Trip-Selection	Year	421	0	2,109	0	0.0				

Coverage	Strata	Deployment method	Time period	*V*	*v*	*N*	*n*	% Observed by deployment method	Expected coverage	Minimum expected coverage	Maximum expected coverage	Meets expectations?
Partial	EM Voluntary 100%	Vessel-Selection	Mar-Jun	7	4	26	16	57.1	7			No
Partial	EM Voluntary 100%	Vessel-Selection	Jul-Oct	9	5	25	6	55.6	9			No
Partial	EM Voluntary 100%	Vessel-Selection	Nov-Dec	1	0	10	0	0.0	1			No
Partial	EM Voluntary 30%	Vessel-Selection	Jan-Feb	4	2	22	11	50.0	1	0	3	Yes
Partial	EM Voluntary 30%	Vessel-Selection	Mar-Jun	28	10	93	33	35.7	8	4	13	Yes
Partial	EM Voluntary 30%	Vessel-Selection	Jul-Oct	16	6	51	10	37.5	5	1	9	Yes
EM Voluntary Total		Vessel-Selection	Year	42	24	227	76	57.1				
Total Fleet (with EM coverage)	Total			1,172	514	13,706	6,142	44.8% Trips; 43.9% Vessels				
Total Fleet (without EM coverage)	Total			1,172	490	13,706	6,066	44.3% Trips; 41.8% Vessels				

Table 3–6. -- Vessel-selection rates in EM Voluntary strata expressed as percentages (all rate formulations multiplied by 100). See Appendix A for explanation of the abbreviations.

Row	Metric	Jan-Feb	Mar-Jun	Jul-Oct	Nov-Dec
1	Error in 30% selection frame due to over-coverage (% of sample frame); fN/F	0.0	0.0	0.0	0.0
2	Error in 30% selection frame due to under-coverage (% of true frame); f0/f*	0.0	20.0	38.5	100.0
3	Error due to non-response: selected and did not fish; vN/vS	0.0	0.0	0.0	0.0
4	Error due to non-response: Selected, fished, and not observed; (vF-v)/vF	0.0	0.0	-10.0	0.0
5	Percent chance of random selection if in 30% selection frame and fished; vS_30/fY	50.0	35.7	37.5	0.0
6	Percent chance of selection if not in 30% selection frame and fished; vS_100/f0	0.0	57.1	40.0	0.0
7	Percent coverage planned; vT/f*	50.0	31.4	30.8	100.0
8	Percent coverage achieved; v/f*	50.0	40.0	42.3	0.0

Table 3–7. -- The number of pollock deliveries by observation and tendering status. The '% Observed' column is the percent of all deliveries observed (including tendered deliveries), while the '% Observed Non-tendered' is the percent of non-tendered deliveries observed. For partial coverage, the p-values for 'Deliveries Observed' and 'Deliveries Observed Non-tendered' show the probability that the achieved rates came from random deployment at the expected rate (28%). IFP: Inshore Floating Processor, Hbr: Harbor.

FMP	Coverage category	Port	Total deliveries (*N*)	Observed deliveries (*n*)	% Observed	p-value deliveries observed	% Tender deliveries	% Observed non-tendered	p-value deliveries observed non-tendered
Bering Sea	Full	Akutan	751	751	100.0		0.0	100.0	
Bering Sea	Full	Dutch Hbr.	806	806	100.0		0.0	100.0	
Bering Sea	Full	IFP	339	339	100.0		0.0	100.0	
Bering Sea	Full	King Cove	79	79	100.0		0.0	100.0	
Bering Sea	Full	Sand Point	5	5	100.0		0.0	100.0	
Total	Full		1,980	1,980	100.0		0.0	100.0	
Gulf of Alaska	Partial	Akutan	158	47	29.7		1.9	30.3	
Gulf of Alaska	Partial	Dutch Hbr.	7	4	57.1		0.0	57.1	
Gulf of Alaska	Partial	IFP	29	2	6.9		0.0	6.9	
Gulf of Alaska	Partial	King Cove	322	0	0.0		97.5	0.0	
Gulf of Alaska	Partial	Kodiak	1,097	315	28.7		0.0	28.7	
Gulf of Alaska	Partial	Sand Point	560	58	10.4		21.2	12.9	
Total	Partial		2,173	426	19.6	< 0.001	20.1	24.5	< 0.001

Table 3–8. -- Number of trips by observation status in the 2016 trip-selection strata.

Strata	Observed	Unobserved
HAL	398	2,257
POT	185	1,076
TRW	767	1,971

Table 3–9. -- Results of permutation tests between observed and unobserved trips in the 2016 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	Observed difference	0.0	-0.3	1.4	0.3	0.0	-0.7
HAL	OD (%)	1.3	-6.1	2.5	7.6	-0.5	-9.6
HAL	p-value	0.522	0.027	0.030	0.013	0.521	0.037
POT	Observed difference	0.0	-0.1	0.5	-0.2	0.0	-2.0
POT	OD (%)	2.1	-1.5	0.6	-8.2	0.2	-6.3
POT	p-value	0.234	0.706	0.809	0.033	0.243	0.428
TRW	Observed difference	0.0	-0.3	0.3	-0.8	0.0	-8.4
TRW	OD (%)	-2.9	-12.8	0.4	-15.5	2.6	-10.1
TRW	p-value	0.019	< 0.001	0.691	< 0.001	< 0.001	< 0.001

Table 3–10. -- Number of trips by tendered status in the 2016 trip-selection strata.

Strata	Tendered	Non-tendered
HAL	3	2,652
POT	132	1,129
TRW	272	2,466

Table 3–11. -- Results of permutation tests between tendered and non-tendered trips in the 2016 trip-selection strata. Results for *HAL* have been omitted due to low sample sizes. OD: Observed Difference (Tendered - Non-tendered).

Strata	Metric	NMFS areas	Days fished	Vessel length (ft)	Species landed	pMax species	Landed catch (t)
POT	Observed difference	0.0	1.4	-11.7	0.8	0.0	13.6
POT	OD (%)	0.5	38.4	-16.7	39.2	-0.2	42.6
POT	p-value	0.856	< 0.001	< 0.001	< 0.001	0.400	< 0.001
TRW	Observed difference	-0.1	0.7	-24.7	-0.9	0.1	2.3
TRW	OD (%)	-8.2	27.9	-30.3	-17.0	7.1	2.8
TRW	p-value	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.477

Table 3–12. -- Number of tendered trips by observation status in the 2016 trip-selection strata.

Strata	Observed	Unobserved
HAL	0	3
POT	14	118
TRW	122	150

Table 3–13. -- Results of permutation tests between observed and unobserved tendered trips in the 2016 trip-selection strata. Results for *HAL* have been omitted due to low sample sizes. OD: Observed Difference (Observed tendered - Unobserved tendered).

Strata	Metric	NMFS areas	Days fished	Vessel length (ft)	Species landed	pMax species	Landed catch (t)
POT	Observed difference	0.2	-0.3	-4.6	-0.5	0.0	-21.8
POT	OD (%)	16.2	-5.1	-7.7	-19.6	0.7	-49.7
POT	p-value	0.034	0.820	0.279	0.161	0.229	0.155
TRW	Observed difference	0.0	-2.9	0.5	-0.7	0.0	-59.0
TRW	OD (%)	0.3	-87.9	0.8	-15.9	0.0	-69.5
TRW	p-value	1.000	< 0.001	0.516	0.001	0.868	< 0.001

Table 3–14. -- Number of non-tendered trips by observation status in the 2016 trip-selection strata.

Strata	Observed	Unobserved
HAL	398	2,254
POT	171	958
TRW	645	1,821

Table 3–15. -- Results of permutation tests between observed and unobserved non-tendered trips in the 2016 trip-selection strata. OD: Observed Difference (Observed non-tendered - Unobserved non-tendered).

Strata	Metric	NMFS areas	Days fished	Vessel length (ft)	Species landed	pMax species	Landed catch (t)
HAL	Observed difference	0.0	-0.3	1.4	0.3	0.0	-0.6
HAL	OD (%)	1.3	-6.0	2.5	7.5	-0.5	-9.2
HAL	p-value	0.506	0.029	0.029	0.017	0.557	0.056
POT	Observed difference	0.0	0.0	0.5	-0.1	0.0	0.2
POT	OD (%)	1.0	0.4	0.6	-5.4	0.2	0.7
POT	p-value	0.731	0.917	0.828	0.201	0.408	0.928
TRW	Observed difference	0.0	-0.1	2.7	-0.8	0.0	-1.6
TRW	OD (%)	-2.6	-2.1	3.2	-14.2	2.3	-1.9
TRW	p-value	0.052	0.437	0.002	< 0.001	0.003	0.456

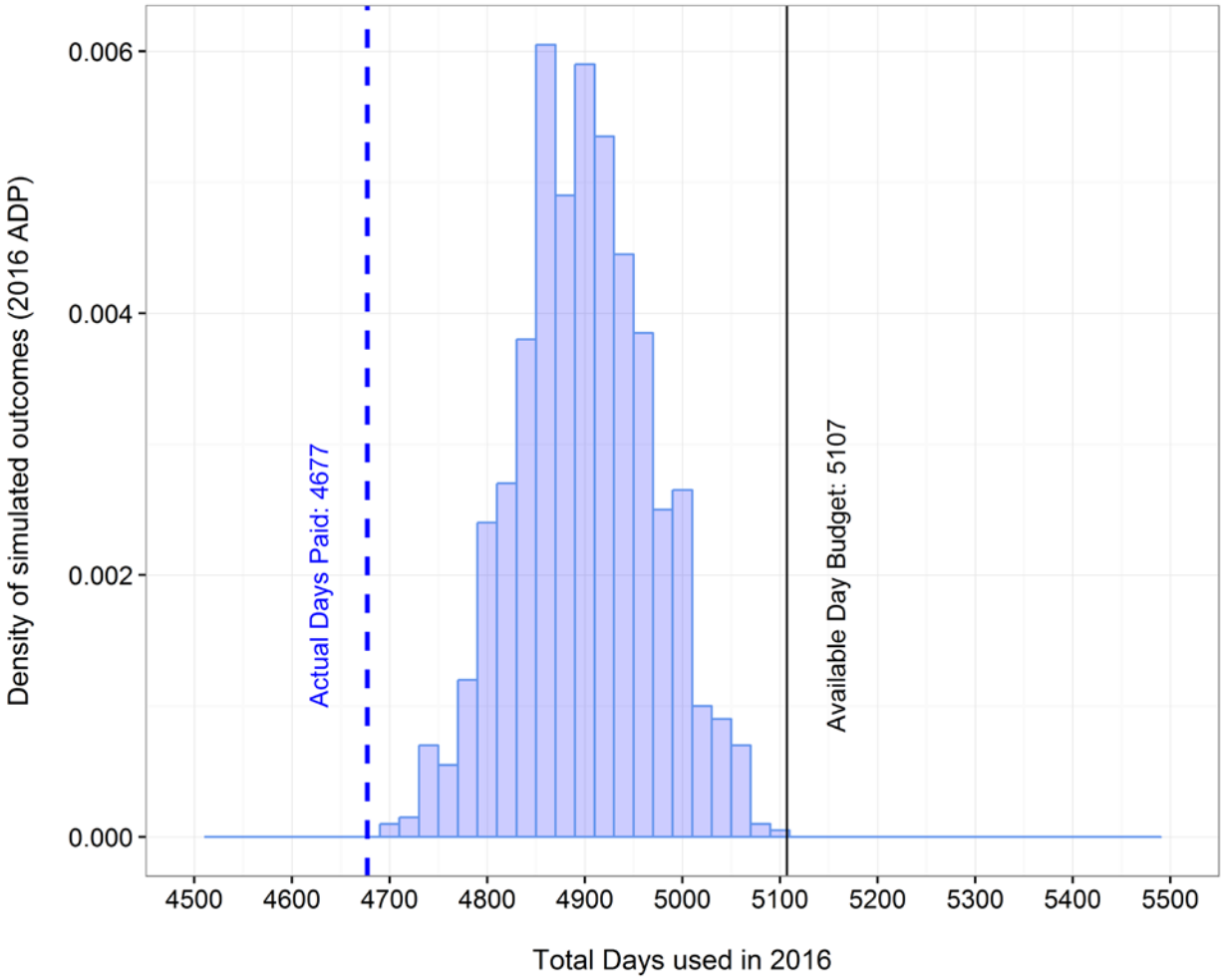


Figure 3–1. -- Actual paid sea-days in 2016 (dotted line) in relation to the range of potential budgetary outcomes estimated in December 2015 for the Final 2016 Annual Deployment Plan (vertical bars).

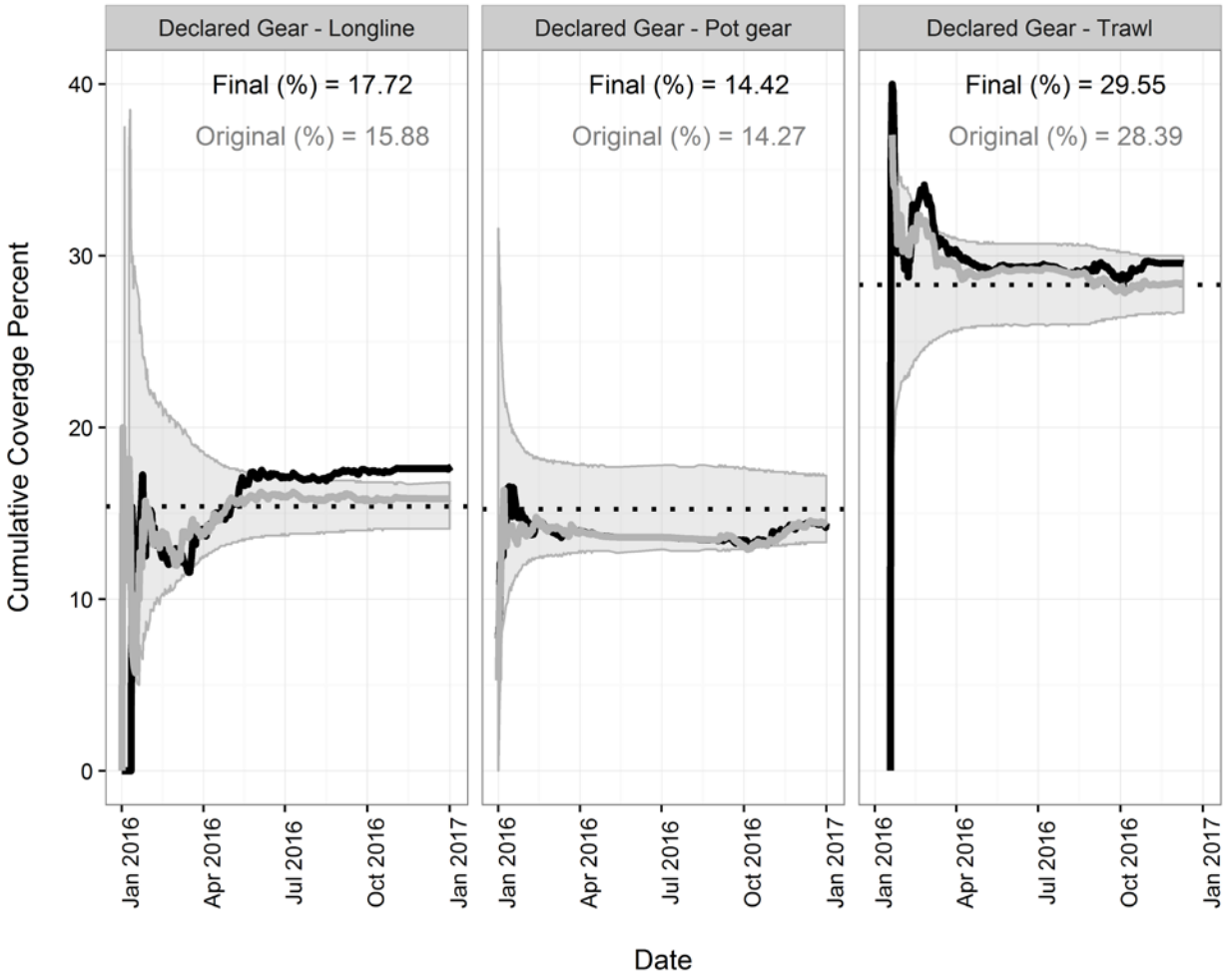


Figure 3–2. -- Rate of selected trips logged into ODDS organized by original date entered for all trips (grey line and grey text), and final date considering only non-cancelled trips (black line and black text). The programmed selection rate is depicted as the dotted line. Grey shaded areas denote the 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.

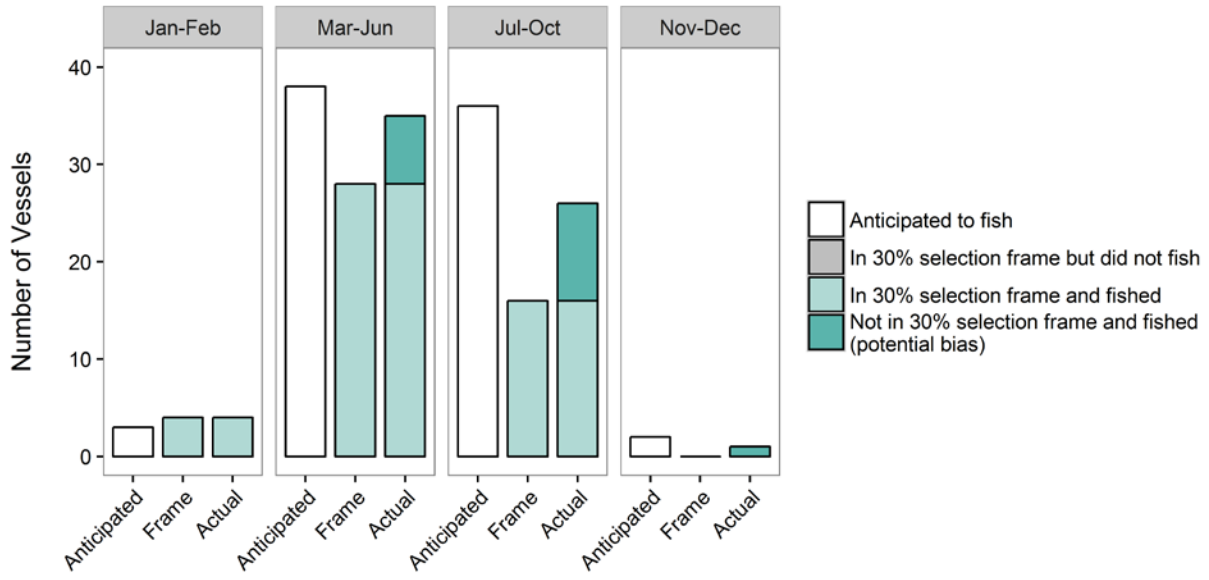


Figure 3–3. -- For each EM Voluntary vessel-selection time period, we compare the number of vessels anticipated to fish in the 2016 Annual Deployment Plan (white bars), the number of vessels in the 30% selection frame that fished or not (light teal and grey bars, respectively), and the number of vessels that fished but were not in the 30% selection frame (dark teal bars), which represents a source of potential bias. The data used to generate this figure are found in Appendix A.

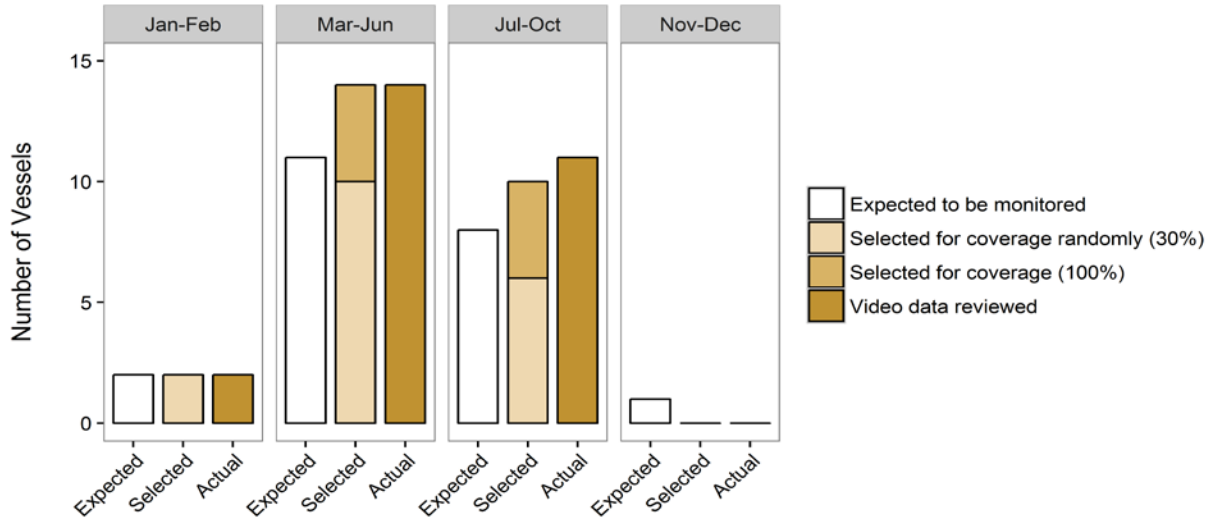


Figure 3–4. -- For each EM Voluntary vessel-selection time period, we compare the expected number of vessels to be monitored (30% of the vessels in the 30% selection frame, white bars), the number of vessels selected for coverage randomly at a 30% rate (light gold bars) or at a 100% rate because they notified NMFS after the 30-day cutoff (medium gold bars), and the number of vessels for which video data was reviewed (dark gold bars). The data used to generate this figure are found in Appendix A.

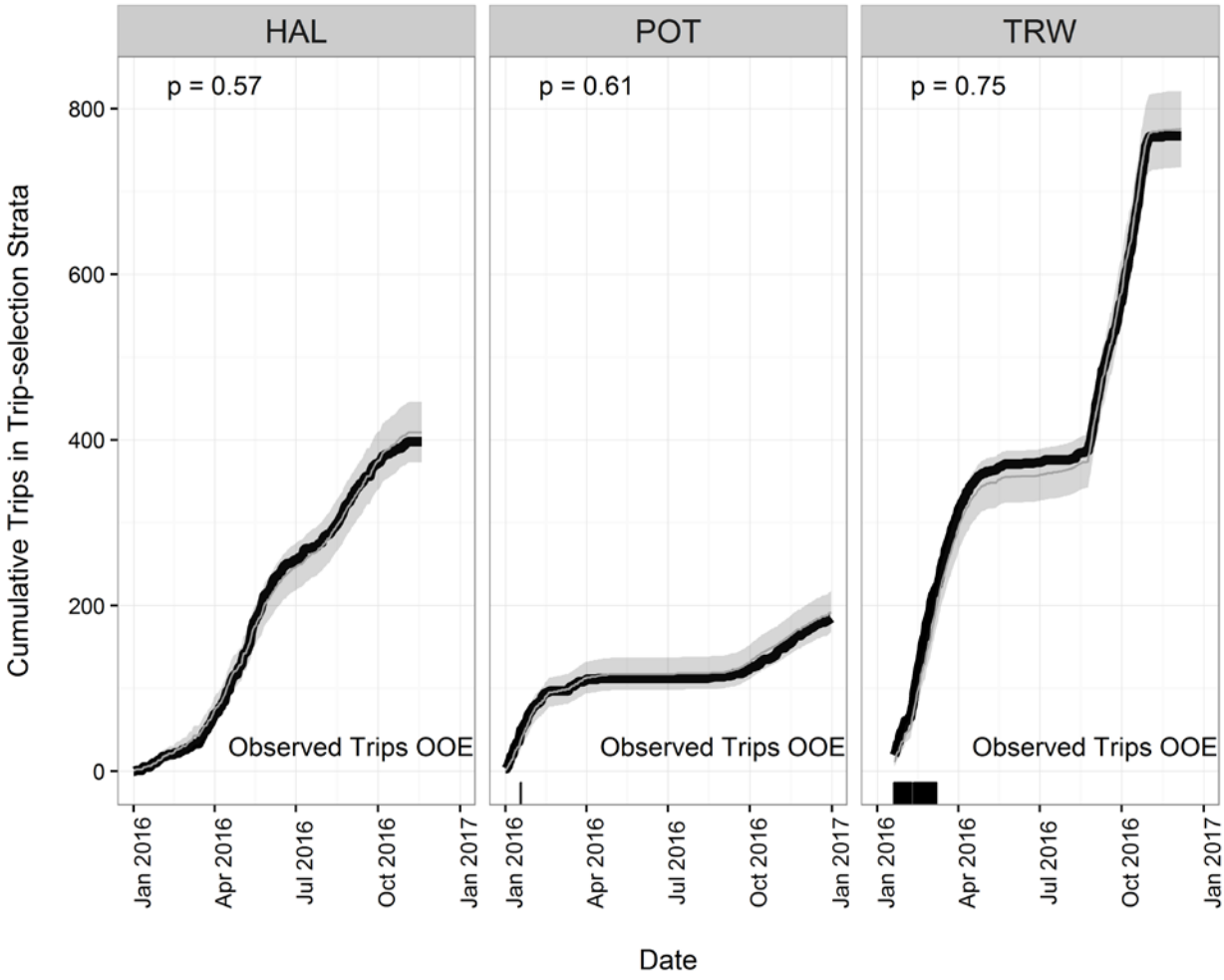


Figure 3–5. -- Cumulative number of trips observed during 2016 (black line) compared to the expected range of observed trips (shaded area) given fishing effort and sampling rates. Dates where the observed number of trips is outside of expected (less or more than the range; OOE) are depicted as tick marks 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.

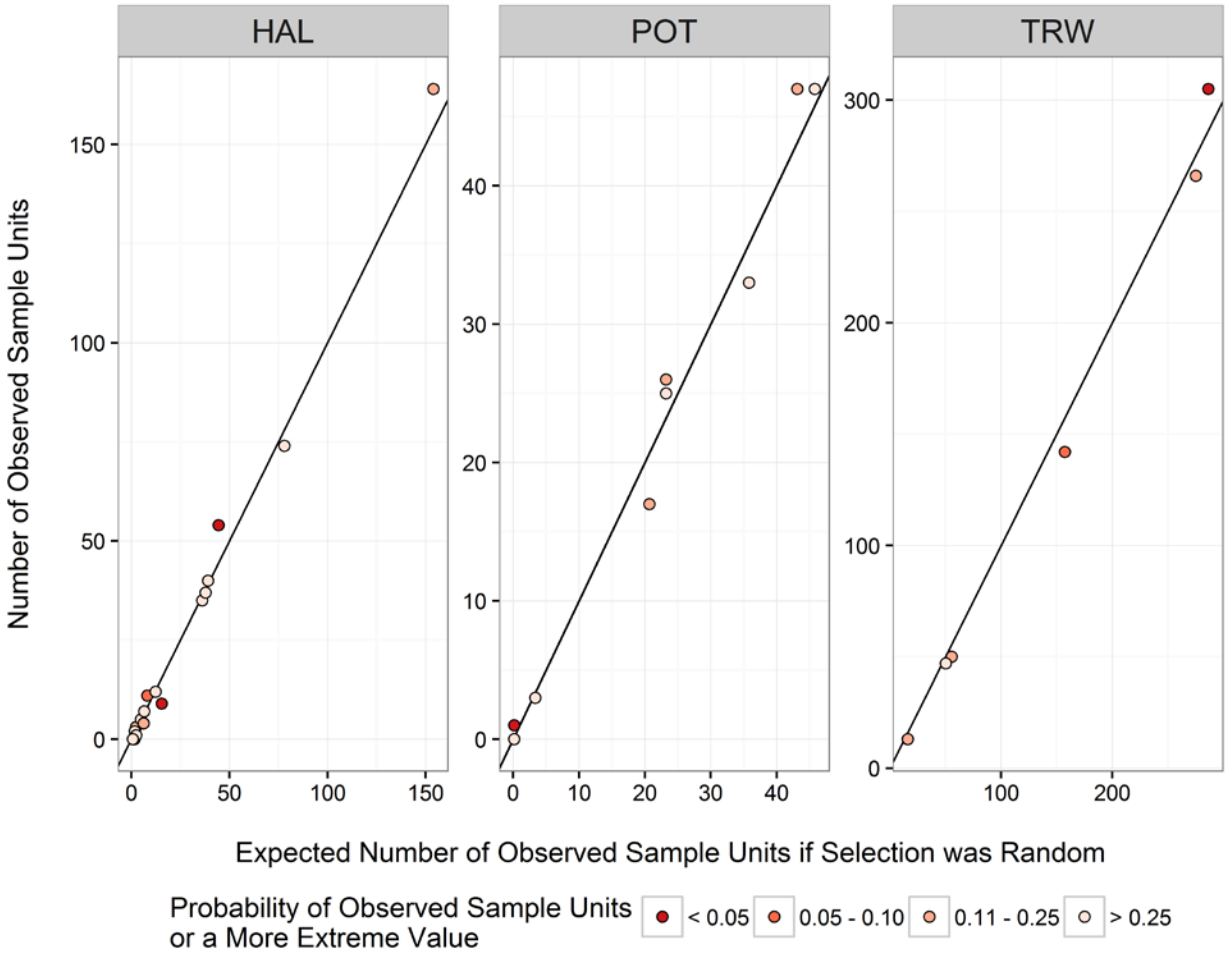


Figure 3–6. -- Comparison plots depicting the number of observed sample units compared to the number of expected observed sample units for each partial coverage stratum. Each point on a plot represents a NMFS Area. The darker the point, the more unusual the result.

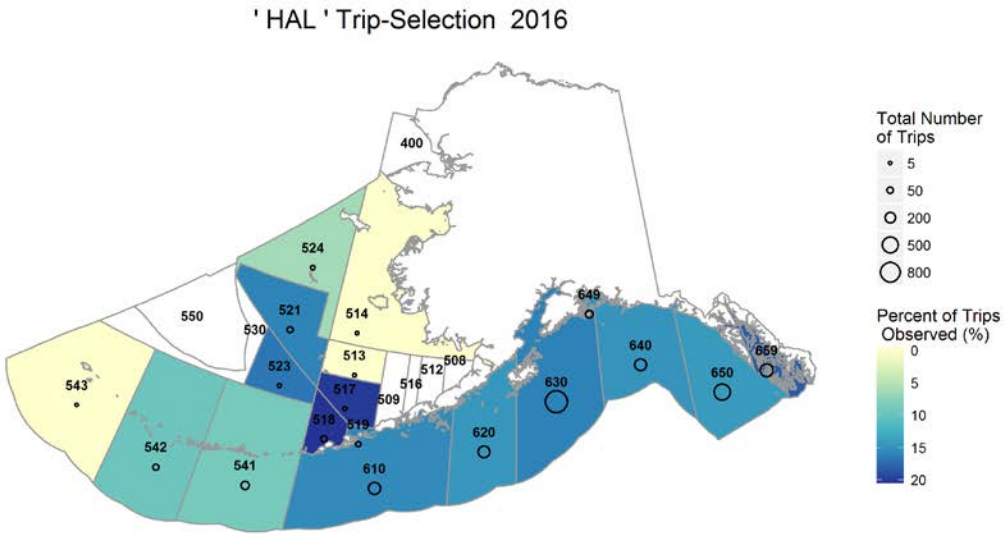


Figure 3–7. -- Percent of trips observed by NMFS Reporting Area in the *HAL* stratum. For reference, the programmed rate in the *HAL* stratum was 15.41%.

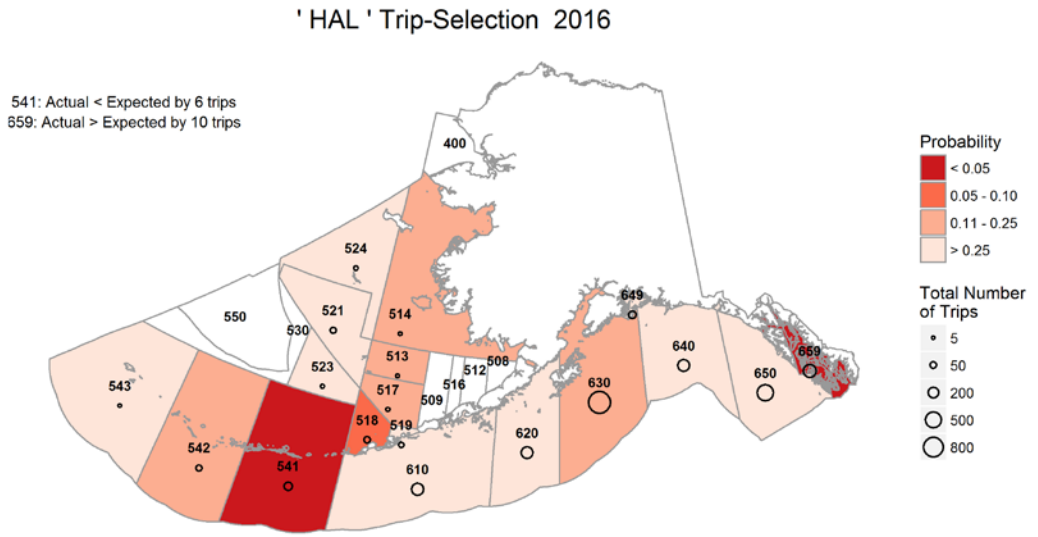


Figure 3–8. -- Probability of observing the realized or more extreme outcome (coverage rate) in a NMFS Reporting Area in the *HAL* stratum. Reporting Areas where unlikely outcomes occurred are shaded in darker colors.

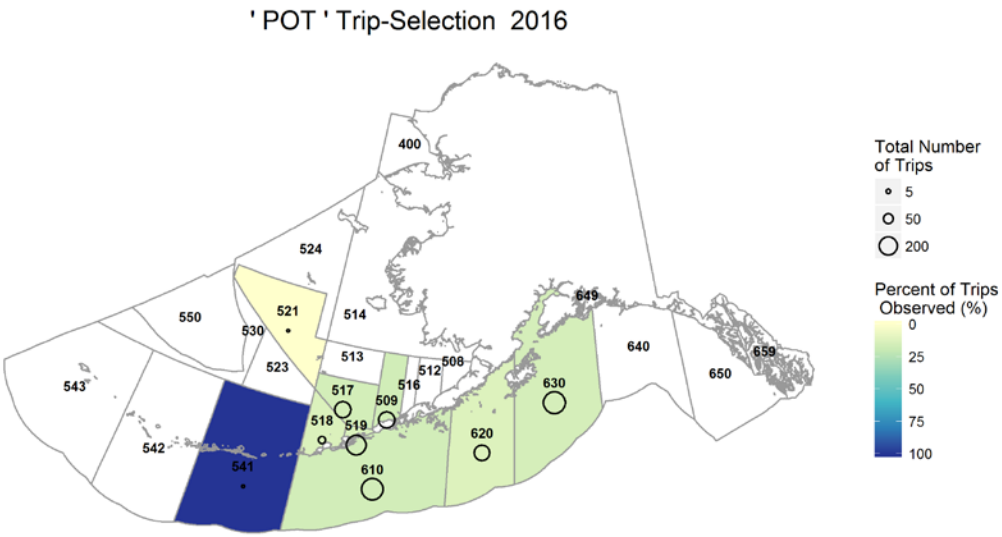


Figure 3–9. -- Percent of trips observed by NMFS Reporting Area in the *POT* stratum. For reference, the programmed rate in the *POT* stratum was 15.24%.

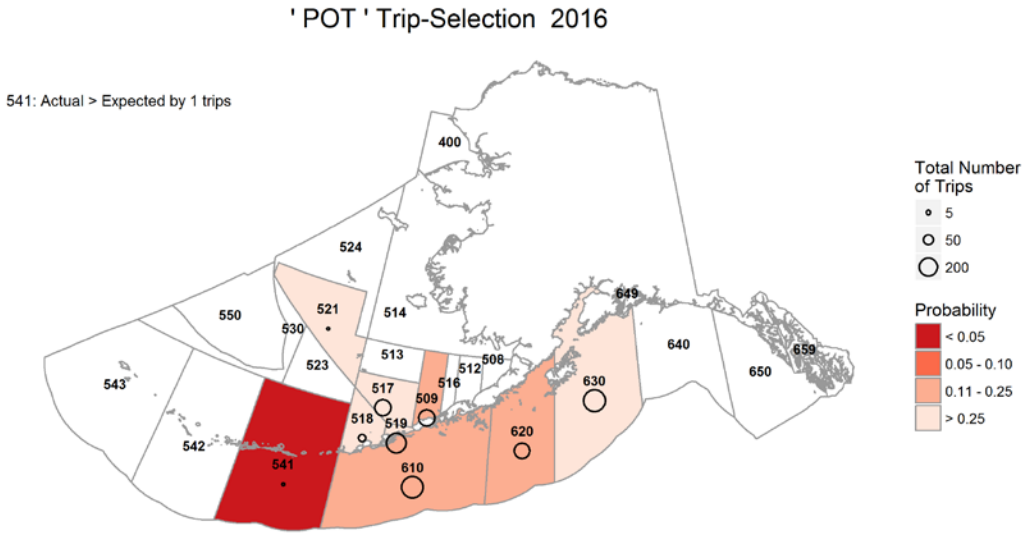


Figure 3–10. -- Probability of observing the realized or more extreme outcome (coverage rate) in a NMFS Reporting Area in the *POT* stratum. Reporting Areas where unlikely outcomes occurred are shaded in darker colors.

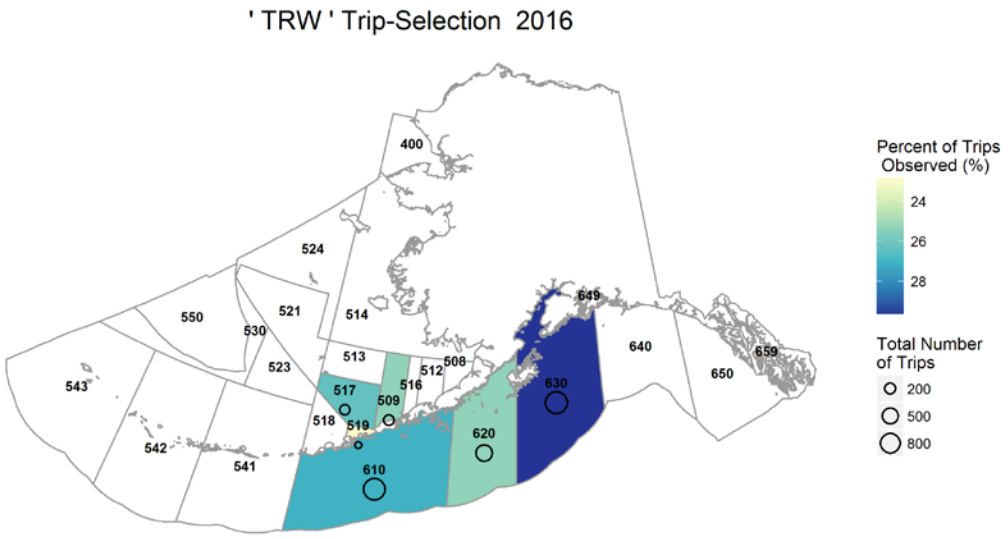


Figure 3–11. -- Percent of trips observed by NMFS Reporting Area in the *TRW* stratum. For reference, the programmed rate in the *TRW* stratum was 28.31%.

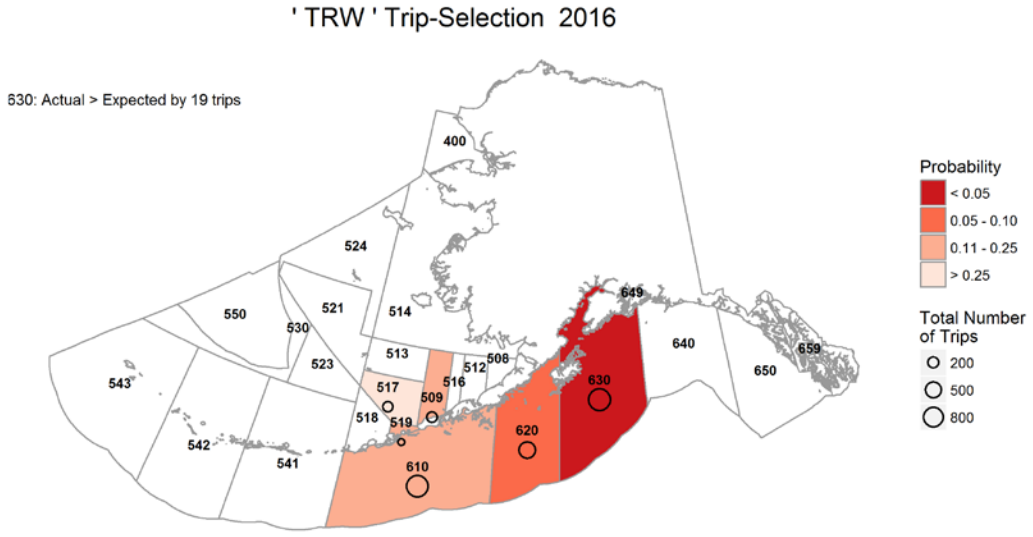


Figure 3–12. -- Probability of observing the realized or more extreme outcome (coverage rate) in a NMFS Reporting Area in the *TRW* stratum. Reporting Areas where unlikely outcomes occurred are shaded in darker colors.

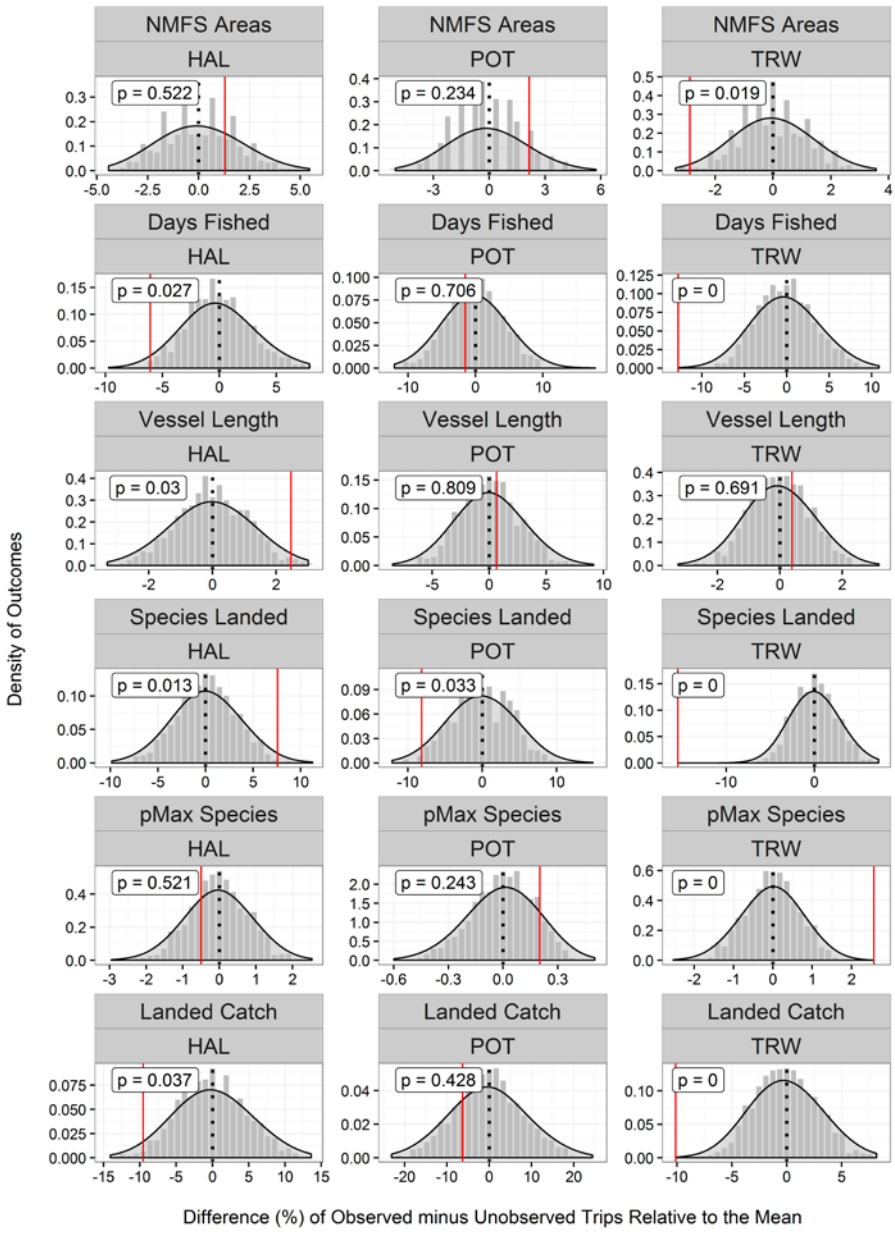


Figure 3–13. -- Example of results from permutation tests depicting percent differences between observed and unobserved trips for each stratum in the partial coverage category of the 2016 ADP. In each panel, the grey bars depict the distribution of differences between observed and unobserved trips where 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 corresponding 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.

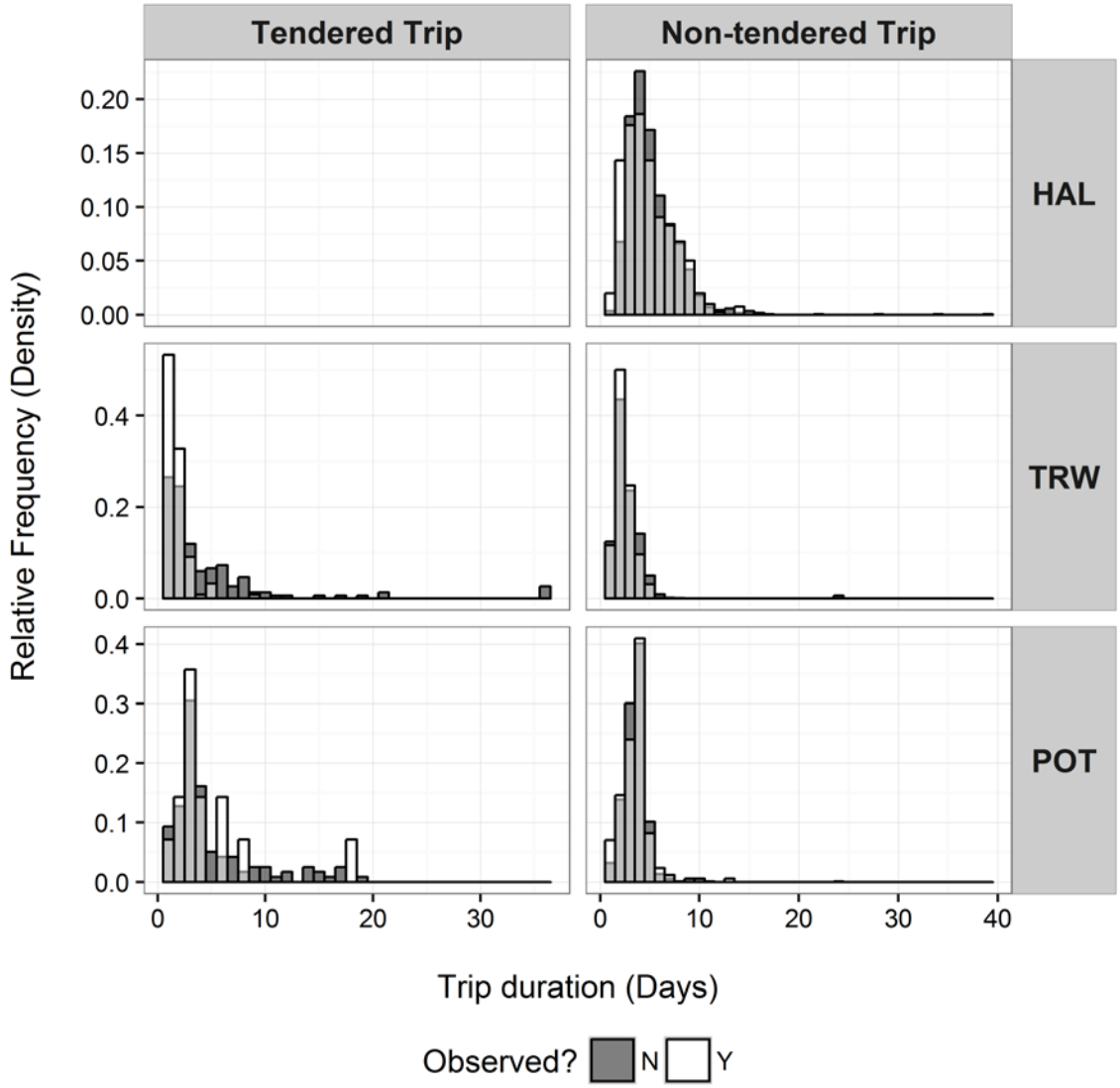


Figure 3–14. -- Distribution of trip durations for vessels in the partial coverage category by gear and observation status. Observed trips are depicted as transparent white bars overtop of solid black bars for unobserved trips. Trip durations where both observed and unobserved status exist are depicted 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).

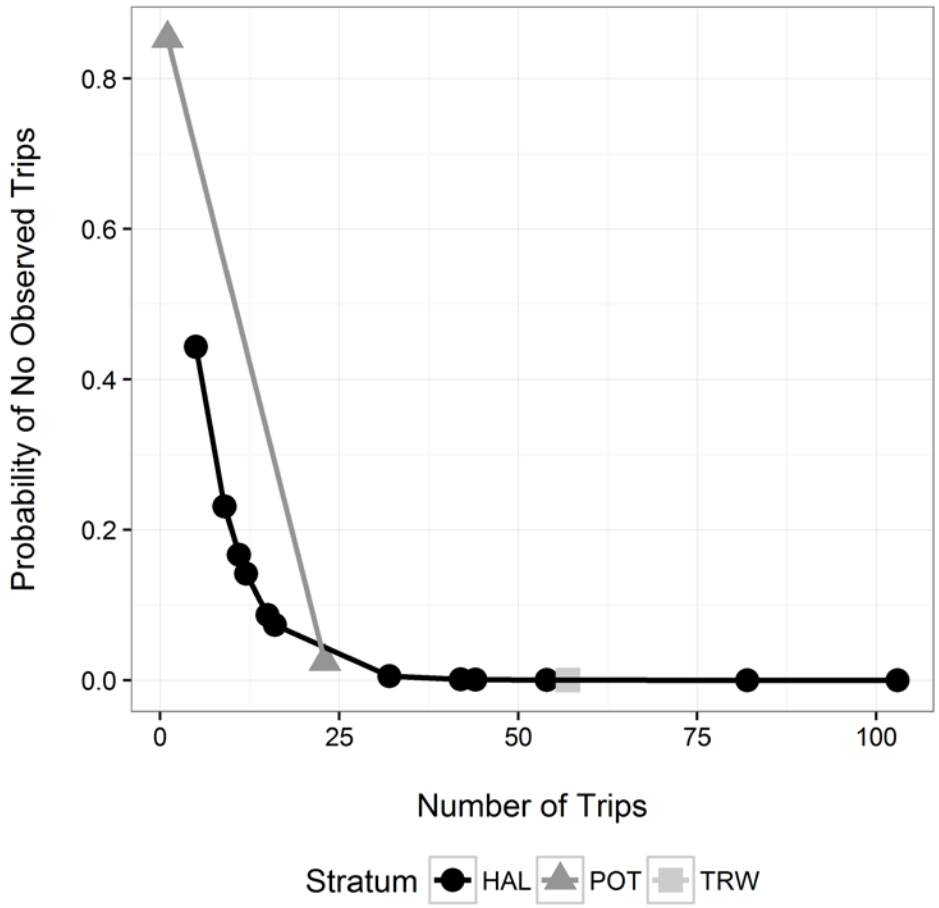


Figure 3–15. -- Probability of observing no trips in a NMFS Area and stratum given fishing effort and sampling rate. The x-axis has been truncated to increase resolution at low levels of fishing effort (note there are only 2 POT and 1 TRW data points on this scale). The likelihood of having no observer data decreases with increasing total fishing effort and selection rate. The selection rate is 28.31% in the *TRW* stratum, 15.41% in the *HAL* stratum, and 15.24% in the *POT* 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, strata, deployment method, and time period. However, the Council has also requested a summary of trip and vessel counts based on criteria which are not, or are no longer, considered when deploying observers on trips (for example, FMP area and vessel length). Table 4–1 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 may reflect trips with a human observer or trips made by vessels with EM coverage and at least some video was reviewed.

The zero selection pool presented in Table 4–1 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 2016. In the BSAI, full coverage includes vessels in both the regulatory full coverage as well as voluntary full coverage strata whereas in the GOA, full coverage on reflects vessels in the regulatory full coverage stratum. Likewise, the EM voluntary stratum has been simplified in Table 4–1 and aggregates vessels and trips regardless of the selection rate they were subject to or the time period in which they participated. See Table 3–5 for trip and vessel information on strata at the finer resolution.

Also included in Table 4–1 is the percent of trips that were observed, by FMP area, strata, gear type, and vessel length category. Although EM coverage was based on vessel-selection in 2016, the percent observed in this table reflects the number of observed trips out of the total number of trips. To see the percent observed by the deployment method used in this stratum, please see Table 3–5.

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

4.2 Total Catch and Discards and Amount of Catch Observed

Total catch of groundfish and halibut (retained and discarded) was summarized by gear and area for 2016 (Table 4–2 through Table 4–8) from the NMFS catch accounting system. The ADP does not deploy observers into fisheries (because the fishery is not defined before fishing occurs) and instead deploys to trips and vessels across all fisheries. However there is interest in comparing observer coverage across resulting fisheries defined by area and gear type. This section includes these comparisons for the metric of catch weight derived from the Catch Accounting System (CAS). Catch estimation methods are described in detail in Cahalan et al. 2014.

The table columns titled "Observed" indicate catch that occurred on trips[28] 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[29], is presented 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.

The retained and discard catch information in the Gulf of Alaska (GOA) and Bering Sea/Aleutian Islands (BSAI) presented in Table 4–4 to Table 4–8 show data from Table 4–2 broken down by species (definitions for species groupings can be found in Appendix B). The catch of each species is simply the summation of the amount of catch for that species by each sector and gear type. This is not the same as a "fishery" and instead shows the total catch of that species across all fisheries using a particular gear type.

A time series showing the percentage of retained catch on observed trips is presented for the GOA (Table 4–9) and BSAI (Table 4–10). These tables compile information from Table 4–2 and Table 4–3 in this report and from comparable tables in each of the preceding Observer Program Annual Reports.

Halibut that are incidentally caught in federally managed groundfish trawl, hook-and-line, and pot fisheries are required by regulations to be discarded, regardless of whether the fish is living or dead. Halibut bycatch is tracked in the groundfish fisheries using prohibited species catch (PSC) limits. PSC limits are applied to specific target fisheries, gear types, and seasons. In the halibut IFQ fishery there is a length retention requirement of 32 inches below which fish must be discarded.

To increase the survival of incidentally caught halibut that are released, regulations require that halibut be returned to the sea following careful release methods. However, despite careful handling, some fish die from being caught and handled and the probability of mortality depends on the target fishery and gear. For example, there is higher survival of discarded halibut caught with longline gear than that caught with trawl gear. The Council uses viability (injury and condition) data collected by observers to generate halibut discard mortality rates (DMRs) in Alaskan groundfish fisheries.[30] Halibut mortalities, the product of DMR and PSC, accumulate over the course of the season, and once the specified limit is reached for a given fishery, that fishery must be closed. For the in-season application of DMRs by management, DMRs are specified based on projections from historic DMR estimates. The International Pacific Halibut Commission (IPHC) also uses DMRs in halibut stock assessments,

[28] Trips for catcher/processors are generally defined as when a vessel leaves port to when the vessels enters port. Trips for catcher vessels are defined as the time period between when a vessel started fishing and all fish were offloaded (including split deliveries).
[29] Note that IPHC use net weight when reporting on catch limits and biomass for halibut. The conversion of halibut from round weight to net weight is: Net Weight = Round Weight x 0.75.
[30] Modifications to DMR Calculation Procedures - Aggregation and Estimation Methods. Available at http://npfmc.legistar.com/gateway.aspx?M=F&ID=34847078-2ed2-4d3c-85a5-73e26235c1d5.pdf

however they apply annual estimates of DMRs to account for past discard mortality. A DMR of 0.16 is used for halibut discards in the halibut fishery (also called “wastage”).

DMRs are not applied to raw observer data prior to expansion to the entire fishery. Therefore, in order to present observed and unobserved catch, the data in this chapter are presented without DMRs. As such, these data represent total catch - not total mortality; it is important to recognize that not all of the halibut that were discarded would have died.

There are reasons for caution when interpreting the results for halibut in the halibut IFQ fishery in Table 4–2 through Table 4–8. As with all longline data observer collections, observers collect fish weights used to estimate the mean weight per fish from the unsorted (retained and discarded) catch. Because there is a minimum size limit for retention of halibut in the halibut IFQ fishery, smaller halibut (less than 32 inches) are required to be discarded while larger halibut are required to be retained. Hence, estimating the total weight of discarded halibut by applying the mean weight of halibut from observer data may overestimate the mean weight of discarded halibut and underestimate the weight of retained halibut in the halibut IFQ fishery. The impact of differences in average weights on the final discard estimates is not yet known. However in 2016, the Observer Program modified selection of halibut for viability sampling, which includes obtaining a length estimate, to be a step in randomized biological sampling. This change to the sampling protocol will likely facilitate the evaluation of average weights of retained and discarded halibut.

Table 4–1. -- Number of vessels (V), total trips (N), observed trips (n), and percent of trips observed (%, with human observer or EM coverage) in 2016 in each FMP area (BSAI and GOA) by strata, gear type (hook-and-line (HAL), pot, non-pelagic trawl (NPT), pelagic trawl (PTR), and jig), and vessel length category (based on length overall, in feet) for the partial coverage category. Vessels and trips may be counted more than once in a vessel length category if a vessel is in more than one strata, fishes in more than one FMP area, or utilizes more than one gear type. A count of total unique vessels and unique trips by vessel length category are also included as "BSAI Subtotal", "GOA Subtotal", and "Total Unique." These unique counts may be less than the sum of the vessels or trips within each column.

			Vessel length category											
			<40'				40-57.4'				≥57.5'			
	Strata	Gear	V	N	n	%	V	N	n	%	V	N	n	%
BSAI	Full[1]	HAL									31	1,058	1,058	**100.0**
	Full	NPT									48	926	926	**100.0**
	Full	POT									4	67	67	**100.0**
	Full	PTR									99	67	67	**100.0**
	EM Voluntary[2]	HAL					2	2	0	**0.0**	1	2	0	**0.0**
	HAL	HAL					23	158	15	**9.5**	38	108	19	**17.6**
	POT	POT					3	38	2	**5.3**	45	489	76	**15.5**
	TRW	NPT									24	278	72	**25.9**
	ZERO Coverage[3]	HAL	66	586	0	**0.0**								
	ZERO Coverage	JIG					2	13	0	**0.0**				
	BSAI Subtotal		66	586	0	**0.0**	28	211	17	**8.1**	237	5,257	4,547	**86.5**
GOA	Full[1]	HAL									11	72	72	**100.0**
	Full	NPT									41	289	289	**100.0**
	Full	PTR									8	23	23	**100.0**
	EM Voluntary	HAL	1	2	0	**0.0**	38	187	76	**40.6**	1	15	0	**0.0**
	EM Voluntary	POT					1	20	0	**0.0**				
	HAL	HAL					289	1,418	183	**12.9**	167	999	190	**19.0**
	POT	POT					18	143	15	**10.5**	57	594	92	**15.5**
	TRW	NPT					1[5]	1	0	**0.0**	55	670	162	**24.2**
	TRW	PTR					1	29	6	**20.7**	67	1,823	546	**30.0**
	ZERO Coverage	HAL	333	1,330	0	**0.0**	2	10	0	**0.0**	2	21	0	**0.0**
	ZERO Coverage	JIG	14	56	0	**0.0**	21	87	0	**0.0**	1	1	0	**0.0**
	ZERO Coverage	POT	1	11	0	**0.0**								
	GOA Subtotal		341	1,399	0	**0.0**	354	1,894	280	**14.8**	271	4,434	1,345	**30.3**
	TOTAL UNIQUE[4]		**396**	**1,980**	**0**	**0.0**	**363**	**2,093**	**295**	**14.1**	**414**	**9,633**	**5,847**	**60.7**

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

[2] EM Voluntary in this table includes vessels in both the EM Voluntary 30% and EM Voluntary 100% strata described in Ch. 3.

[3] 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.

[4] The total unique vessel count in this table is 1 vessel greater than shown in Table 3-5 because 1 vessel updated its vessel length mid-year and is counted in two vessel length categories.

		Vessel length category											
		<40'				40-57.4'				≥57.5'			
Strata	Gear	V	N	n	%	V	N	n	%	V	N	n	%

[5] This is 1 vessel less than 57.5' LOA that fished trawl gear. Since 2013, it has been in the trip selection, large vessel trip selection, and trawl strata.

Table 4–2. -- Observed catch (metric tons), total catch, and percent observed (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in 2016 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	5,119	5,202	**98%**	2,342	20,281	**12%**			
Discarded	2,082	2,112	**99%**	1,420	13,760	**10%**			
JIG									
Retained				0	173	**0%**			
Discarded									
NON-PELAGIC TRAWL									
Retained	24,917	24,917	**100%**	3,970	34,257	**12%**	13,008	13,008	**100%**
Discarded	2,505	2,505	**100%**	531	5,936	**9%**	381	381	**100%**
POT									
Retained				2,089	16,771	**12%**			
Discarded				82	644	**13%**			
PELAGIC TRAWL									
Retained	900	900	**100%**	49,960	170,735	**29%**	1,380	1,380	**100%**
Discarded	1	1	**100%**	352	1,147	**31%**	19	19	**100%**

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 2016 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	138,489	138,999	**100%**				325	2,245	**14%**
Discarded	30,626	30,635	**100%**				195	2,129	**9%**
JIG									
Retained							0	47	**0%**
Discarded									
NON-PELAGIC TRAWL									
Retained	344,354	344,354	**100%**	29,260	29,260	**100%**	18,289	35,138	**52%**
Discarded	23,138	23,138	**100%**	1,861	1,861	**100%**	1,047	2,122	**49%**
POT									
Retained	7,629	7,629	**100%**				3,478	23,430	**15%**
Discarded	183	183	**100%**				79	657	**12%**
PELAGIC TRAWL									
Retained	609,617	609,626	**100%**	118,408	118,408	**100%**	588,071	588,071	**100%**
Discarded	2,187	2,187	**100%**	52	52	**100%**	986	986	**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 2016 by catcher/processors in the Gulf of Alaska. Empty cells indicate that no catch occurred. See Appendix B for species grouping definitions.

	GULF OF ALASKA CATCHER/PROCESSORS											
	HOOK AND LINE			JIG			NON-PELAGIC TRAWL			POT			PELAGIC TRAWL		
	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%
Deepwater Flatfish (GOA)															
Retained	8	8	**100%**				6,638	6,638	**100%**						
Discarded	48	49	**98%**				792	792	**100%**				<1	<1	**100%**
Pacific Halibut															
Retained															
Discarded	810	822	**98%**				343	343	**100%**						
Other Groundfish															
Retained	<1	<1	**100%**				561	561	**100%**				<1	<1	**100%**
Discarded	108	108	**100%**				203	203	**100%**				<1	<1	**100%**
Pacific Cod															
Retained	4,619	4,622	**100%**				583	583	**100%**						
Discarded	124	124	**100%**				58	58	**100%**						
Walleye Pollock															
Retained	30	30	**100%**				550	550	**100%**				45	45	**100%**
Discarded	2	2	**100%**				66	66	**100%**						
Rockfish															
Retained	43	49	**87%**				14,748	14,748	**100%**				855	855	**100%**
Discarded	166	170	**98%**				628	628	**100%**				1	1	**100%**
Sablefish (Black Cod)															
Retained	275	348	**79%**				385	385	**100%**						
Discarded	54	58	**93%**				98	98	**100%**						
Shallow-water Flatfish (GOA)															
Retained							1,382	1,382	**100%**						
Discarded	13	13	**99%**				25	25	**100%**						
Skates															
Retained	144	145	**99%**				70	70	**100%**						
Discarded	713	719	**99%**				196	196	**100%**						
Sharks															
Retained															
Discarded	44	47	**93%**				96	96	**100%**						

Table 4–5. -- Observed catch (metric tons), total catch, and percent observed (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in 2016 by catcher vessels in the Gulf of Alaska. Empty cells indicate that no catch occurred. See Appendix B for species grouping definitions.

	GULF OF ALASKA CATCHER VESSELS														
	HOOK AND LINE			JIG			NON-PELAGIC TRAWL			POT			PELAGIC TRAWL		
	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%
Deepwater Flatfish (GOA)															
Retained	<1	1	**6%**				1,707	14,574	**12%**	<1	<1	**3%**	165	640	**26%**
Discarded	13	121	**11%**				264	1,067	**25%**	<1	3	**15%**	8	13	**62%**
Pacific Halibut															
Retained	1,042	8,657	**12%**	0	4	**0%**									
Discarded	839	7,874	**11%**				222	1,566	**14%**	22	153	**14%**	19	22	**87%**
Other Groundfish															
Retained	1	3	**24%**				237	400	**59%**	17	153	**11%**	45	168	**27%**
Discarded	27	257	**10%**				115	408	**28%**	42	355	**12%**	8	28	**30%**
Pacific Cod															
Retained	206	3,105	**7%**	0	126	**0%**	1,950	14,195	**14%**	2,069	16,598	**12%**	80	317	**25%**
Discarded	42	373	**11%**				10	28	**35%**	12	94	**13%**			
Walleye Pollock															
Retained	3	57	**5%**	0	9	**0%**	186	2,346	**8%**	3	20	**14%**	49,573	169,090	**29%**
Discarded	2	28	**7%**				28	232	**12%**	1	10	**15%**	201	651	**31%**
Rockfish															
Retained	109	815	**13%**	0	34	**0%**	12,085	12,406	**97%**	0	<1	**0%**	1,452	1,704	**85%**
Discarded	56	491	**11%**				139	1,568	**9%**	3	17	**17%**	114	332	**34%**
Sablefish (Black Cod)															
Retained	965	7,463	**13%**	0	<1	**0%**	295	452	**65%**				3	29	**11%**
Discarded	69	673	**10%**				9	80	**11%**	1	7	**17%**	<1	3	**12%**
Shallow-water Flatfish (GOA)															
Retained	0	<1	**0%**				429	2,079	**21%**	0	<1	**0%**	10	109	**9%**
Discarded	1	8	**11%**				27	182	**15%**	1	5	**14%**			
Skates															
Retained	15	178	**9%**				89	811	**11%**				8	50	**16%**
Discarded	222	2,611	**9%**				65	594	**11%**	<1	<1	**16%**	1	2	**54%**
Sharks															
Retained	0	3	**0%**				<1	3	**9%**				3	8	**36%**
Discarded	149	1,324	**11%**				33	592	**5%**	<1	1	**18%**	21	117	**18%**

Table 4–6. -- Observed catch (metric tons), total catch, and percent observed (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in 2016 by catcher/processors in the Bering Sea/Aleutian Islands. Empty cells indicate that no catch occurred.

	BERING SEA/ALEUTIAN ISLANDS CATCHER/PROCESSORS														
	HOOK AND LINE			JIG			NON-PELAGIC TRAWL			POT			PELAGIC TRAWL		
	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%
Atka Mackerel															
Retained	<1	<1	**100%**				50,340	50,340	**100%**				37	37	**100%**
Discarded	5	5	**100%**				307	307	**100%**	<1	<1	**100%**	2	2	**100%**
Flatfish (BSAI)															
Retained	1	1	**100%**				179,365	179,365	**100%**	10	10	**100%**	1,899	1,899	**100%**
Discarded	2,051	2,051	**100%**				6,577	6,577	**100%**	115	115	**100%**	726	726	**100%**
Pacific Halibut															
Retained															
Discarded	2,418	2,426	**100%**				2,240	2,240	**100%**	6	6	**100%**	83	83	**100%**
Other Groundfish															
Retained	4	4	**100%**				19	19	**100%**	7	7	**100%**	282	282	**100%**
Discarded	1,616	1,616	**100%**				2,385	2,385	**100%**	60	60	**100%**	520	520	**100%**
Pacific Cod															
Retained	126,430	126,896	**100%**				34,953	34,953	**100%**	7,605	7,605	**100%**	2,179	2,179	**100%**
Discarded	2,562	2,562	**100%**				305	305	**100%**				1	1	**100%**
Walleye Pollock															
Retained	5,785	5,785	**100%**				33,267	33,267	**100%**	7	7	**100%**	602,698	602,707	**100%**
Discarded	716	716	**100%**				7,890	7,890	**100%**	1	1	**100%**	106	106	**100%**
Rockfish															
Retained	67	76	**88%**				30,548	30,548	**100%**				2,212	2,212	**100%**
Discarded	92	92	**100%**				606	606	**100%**	<1	<1	**100%**	519	519	**100%**
Sablefish (Black Cod)															
Retained	84	117	**72%**				263	263	**100%**				12	12	**100%**
Discarded	63	63	**100%**				5	5	**100%**				1	1	**100%**
Turbot															
Retained	993	993	**100%**				14,398	14,398	**100%**				125	125	**100%**
Discarded	700	700	**100%**				1,492	1,492	**100%**	1	1	**100%**	35	35	**100%**
Skates															
Retained	5,125	5,127	**100%**				1,200	1,200	**100%**				169	169	**100%**
Discarded	20,360	20,362	**100%**				1,317	1,317	**100%**	<1	<1	**100%**	164	164	**100%**
Sharks															
Retained													3	3	**100%**

	BERING SEA/ALEUTIAN ISLANDS CATCHER/PROCESSORS														
	HOOK AND LINE			JIG			NON-PELAGIC TRAWL			POT			PELAGIC TRAWL		
	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%
Discarded	42	42	**100%**				15	15	**100%**				30	30	**100%**

Table 4–7. -- Observed catch (metric tons), total catch, and percent observed (%) of groundfish and halibut retained and discarded in 2016 by catcher vessels delivering to motherships in the Bering Sea/Aleutian Islands. Empty cells indicate that no catch occurred.

	BERING SEA/ALEUTIAN ISLANDS CATCHER VESSELS DELIVERING TO MOTHERSHIPS														
	HOOK AND LINE			JIG			NON-PELAGIC TRAWL			POT			PELAGIC TRAWL		
	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%
Atka Mackerel															
Retained							3,652	3,652	**100%**				13	13	**100%**
Discarded							18	18	**100%**				<1	<1	**100%**
Flatfish (BSAI)															
Retained							13,909	13,909	**100%**				150	150	**100%**
Discarded							1,017	1,017	**100%**				8	8	**100%**
Pacific Halibut															
Retained															
Discarded							220	220	**100%**				2	2	**100%**
Other Groundfish															
Retained							1	1	**100%**				2	2	**100%**
Discarded							225	225	**100%**				8	8	**100%**
Pacific Cod															
Retained							8,408	8,408	**100%**				350	350	**100%**
Discarded							74	74	**100%**				<1	<1	**100%**
Walleye Pollock															
Retained							1,182	1,182	**100%**				117,860	117,860	**100%**
Discarded							76	76	**100%**						
Rockfish															
Retained							1,923	1,923	**100%**				25	25	**100%**
Discarded							28	28	**100%**				5	5	**100%**
Sablefish (Black Cod)															
Retained							1	1	**100%**				<1	<1	**100%**
Discarded							<1	<1	**100%**						
Turbot															
Retained							110	110	**100%**				7	7	**100%**
Discarded							115	115	**100%**				<1	<1	**100%**
Skates															

	BERING SEA/ALEUTIAN ISLANDS CATCHER VESSELS DELIVERING TO MOTHERSHIPS											
	HOOK AND LINE			JIG			NON-PELAGIC TRAWL			POT			PELAGIC TRAWL		
	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%
Retained							73	73	**100%**				<1	<1	**100%**
Discarded							88	88	**100%**				25	25	**100%**
Sharks															
Retained															
Discarded													4	4	**100%**

Table 4–8. -- Observed catch (metric tons), total catch, and percent observed (%) of groundfish and halibut retained and discarded in 2016 by catcher vessels delivering shoreside in the Bering Sea/Aleutian Islands. Empty cells indicate that no catch occurred.

	BERING SEA/ALEUTIAN ISLANDS CATCHER VESSELS DELIVERING TO SHORESIDE														
	HOOK AND LINE			JIG			NON-PELAGIC TRAWL			POT			PELAGIC TRAWL		
	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%
Atka Mackerel															
Retained				0	<1	**0%**	<1	<1	**39%**	<1	1	**20%**	16	16	**100%**
Discarded	<1	<1	**19%**				14	86	**16%**	1	8	**10%**	1	1	**100%**
Flatfish (BSAI)															
Retained							5	10	**47%**	<1	1	**15%**	425	425	**100%**
Discarded	<1	1	**8%**				307	575	**53%**	3	15	**22%**	208	208	**100%**
Pacific Halibut															
Retained	306	1,975	**16%**												
Discarded	90	646	**14%**				198	404	**49%**	3	23	**15%**	20	20	**100%**
Other Groundfish															
Retained	<1	1	**17%**	0	<1	**0%**	1	3	**26%**	7	59	**12%**	250	250	**100%**
Discarded	11	176	**6%**				171	325	**53%**	61	543	**11%**	334	334	**100%**
Pacific Cod															
Retained	7	20	**35%**	0	47	**0%**	18,045	34,684	**52%**	3,410	23,192	**15%**	2,180	2,180	**100%**
Discarded	12	368	**3%**				49	100	**49%**	4	44	**10%**	2	2	**100%**
Walleye Pollock															
Retained	<1	<1	**100%**				230	428	**54%**	<1	1	**9%**	584,474	584,474	**100%**
Discarded	<1	1	**28%**				180	303	**59%**	2	13	**15%**	147	147	**100%**
Rockfish															
Retained	3	26	**10%**	0	<1	**0%**	<1	<1	**22%**	0	<1	**0%**	623	623	**100%**
Discarded	7	51	**14%**				2	4	**45%**	1	3	**19%**	176	176	**100%**
Sablefish (Black Cod)															
Retained	7	221	**3%**				0	<1	**0%**	61	177	**34%**	5	5	**100%**
Discarded	1	14	**6%**							1	2	**46%**	1	1	**100%**

	BERING SEA/ALEUTIAN ISLANDS CATCHER VESSELS DELIVERING TO SHORESIDE														
	HOOK AND LINE			JIG			NON-PELAGIC TRAWL			POT			PELAGIC TRAWL		
	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%	Observed	Total	%
Turbot															
Retained	1	1	**60%**	0	<1	**0%**	<1	1	**30%**	0	<1	**0%**	44	44	**100%**
Discarded	9	33	**28%**				39	123	**32%**	2	6	**33%**	14	14	**100%**
Skates															
Retained	1	1	**77%**				8	12	**68%**				52	52	**100%**
Discarded	62	830	**8%**				88	201	**44%**				63	63	**100%**
Sharks															
Retained													2	2	**100%**
Discarded	3	9	**30%**				<1	<1	**100%**				21	21	**100%**

Table 4–9. -- Observed catch (metric tons), total catch, and percent observed (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in the Gulf of Alaska from 2013-2016.

	GULF OF ALASKA RETAINED CATCH								
	CATCHER/PROCESSOR			CATCHER VESSEL			CATCHER VESSEL:ROCKFISH PROGRAM		
	Observed	Total	%	Observed	Total	%	Observed	Total	%
HOOK AND LINE									
2013	3,770	3,916	**96%**	2,966	30,129	**10%**			
2014	6,388	6,605	**97%**	3,406	25,594	**13%**			
2015	5,944	6,174	**96%**	3,418	24,983	**14%**			
2016	5,119	5,202	**98%**	2,342	20,280	**12%**			
JIG									
2013				0	522	**0%**			
2014				0	1,099	**0%**			
2015				0	204	**0%**			
2016				0	173	**0%**			
NON-PELAGIC TRAWL									
2013	24,976	24,976	**100%**	5,807	43,968	**13%**	8,129	8,423	**97%**
2014	40,326	41,792	**96%**	3,404	45,998	**7%**	10,222	10,527	**97%**
2015	30,218	30,226	**100%**	4,762	34,832	**14%**	9,701	9,701	**100%**
2016	24,917	24,917	**100%**	3,970	34,257	**12%**	13,008	13,008	**100%**
POT									
2013				335	16,968	**2%**			

	GULF OF ALASKA RETAINED CATCH								
	CATCHER/PROCESSOR			CATCHER VESSEL			CATCHER VESSEL:ROCKFISH PROGRAM		
	Observed	Total	%	Observed	Total	%	Observed	Total	%
2014				3,021	20,290	**15%**			
2015				3,794	18,266	**21%**			
2016				2,089	16,771	**12%**			
PELAGIC TRAWL									
2013				12,996	83,226	**16%**	2,044	2,044	**100%**
2014	1,817	1,817	**100%**	19,340	130,608	**15%**	1,930	2,068	**93%**
2015	631	631	**100%**	38,719	157,037	**25%**	2,916	2,916	**100%**
2016	900	900	**100%**	49,960	170,735	**29%**	1,380	1,380	**100%**

Table 4–10. -- Observed catch (metric tons), total catch, and percent observed (%) of groundfish and halibut retained and discarded in the groundfish and halibut fisheries in the Bering Sea/Aleutian Islands from 2013-2016.

	BERING SEA/ALEUTIAN ISLANDS RETAINED CATCH								
	CATCHER/PROCESSOR			MOTHERSHIP			CATCHER VESSEL		
	Observed	Total	%	Observed	Total	%	Observed	Total	%
HOOK AND LINE									
2013	131,540	133,671	**98%**				290	3,904	**7%**
2014	133,899	135,458	**99%**				365	4,489	**8%**
2015	141,782	142,409	**100%**				405	2,851	**14%**
2016	138,489	138,998	**100%**				325	2,245	**14%**
JIG									
2013							0	40	**0%**
2014							0	3	**0%**
2015							0	24	**0%**
2016							0	47	**0%**
NON-PELAGIC TRAWL									
2013	374,998	375,027	**100%**	23,599	23,599	**100%**	29,285	38,016	**77%**
2014	374,177	374,229	**100%**	19,630	19,630	**100%**	26,145	35,486	**74%**
2015	336,931	336,931	**100%**	23,313	23,313	**100%**	16,449	27,402	**60%**
2016	344,354	344,354	**100%**	29,260	29,260	**100%**	18,289	35,138	**52%**
POT									
2013	6,793	6,793	**100%**				764	23,848	**3%**
2014	7,627	7,627	**100%**				3,829	27,681	**14%**
2015	7,989	7,991	**100%**				5,106	21,670	**24%**
2016	7,629	7,629	**100%**				3,478	23,430	**15%**
PELAGIC TRAWL									
2013	579,526	579,633	**100%**	111,181	111,230	**100%**	543,883	553,028	**98%**
2014	580,677	580,818	**100%**	111,734	111,734	**100%**	551,484	560,423	**98%**
2015	597,752	597,752	**100%**	115,258	115,258	**100%**	577,884	577,957	**100%**
2016	609,617	609,626	**100%**	118,408	118,408	**100%**	588,071	588,071	**100%**

4.3 Electronic Monitoring Video Review

During 2016, video that was collected from vessels participating in the Electronic Monitoring (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. The results of the video review were discussed in the Public Review draft of the Analysis to Integrate EM into the Observer Program (NPFMC 2016c) but at that time the document was written, the video review for the entire 2016 fishing year had not yet been completed. Since then, PSMFC completed the video review and provided a Final Report of the 2016 season to the EM Workgroup during their March, 2017, meeting in Kodiak, Alaska. 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. The entire PSMFC final report is included in Appendix C and summarized here.

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 2016 results are presented in Appendix Table C-3 and key finding include the following:

- Sensor data was complete on 95% of the trips.
- Video was complete on 47% 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.
- In general, video data was less likely to be complete on the first trip of a vessel than for subsequent trips (Appendix Fig. C-1).
- Of the 557 hauls, 416 (75%) had complete video during the entire period when catch was bring brought onboard and sorted.
- Only 1 haul was missing video for the entire haul.
- 63 hauls (11%) had gaps in the video during the catch being brought onboard. However 58 of these gaps occurred on a single hook-and-line Pacific cod vessel where there was a problem with the software in the EM system that caused 1 minutes gaps to occur every hour during recording. Once the software was updated, the problem did not occur again. If the hauls with the software issue were excluded, then less than 1% of the hauls were missing video during the catch coming onboard.
- 66 hauls (12%) had missing video during the time period after hooks and catch was brought onboard but before the crew had finished sorting and handling catch. In these situations, video reviewers were able to count all the catch but could be missing information on the disposition of the catch. In these cases, an assumption was made that catch was retained and not discarded later.

Image Quality

- The majority (80%) of the video was high quality (Appendix Table C-3).
- Of the hauls with medium quality video (Appendix Table C-3), night lighting and water spots caused most of the video degradation. An additional factor in medium quality video was intermittent gaps in the video described above in video and sensor completeness.
- Low image quality video was caused when video from one or more of the cameras was missing, so video reviewers had to rely on wide-angle deck-camera(s), which do not provide a close-up view of the catch coming up on the line.

4.4 Observer Training and Debriefing

For the 2016 fishing year, approximately 469 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 500 fixed gear and trawl vessels and at seven processing facilities for a total of 43,706 observer days (39,029 full coverage days on vessels and in plants; and 4,677 partial coverage days).

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 134 new observers to deploy in 2016 (Table 4–11). Portions of FMA's 3-week observer training class were attended by two representatives from the Alaska Seafood Cooperative to gain a better understanding of observer data collection requirements with particular focus on data collection for the halibut deck sorting Exempted Fishing Permit.

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 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 2016 there were 17 mid-cruise debriefings in Anchorage, 159 in Dutch Harbor, 24 in Kodiak, and 39 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 133 debriefings in Anchorage completed by four FMA staff, 5 in Kodiak, and 643 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 2016 does not represent a count of individual observers.

Depending on their performance and debriefing assessment, observers must attend a 1-day, 2-day, or 4-day briefing. 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 4-day briefing class prior to their first deployment each calendar year. These briefings provide observers with annual updates regarding their responsibilities for the current fishing season. Additionally, observers are required to demonstrate their understanding and proficiency by passing exams on fish, crab and bird identification, and successfully completing various in-class activities.

In 2016, the 4-day briefing curriculum focused on improvements to catcher vessel trawl sampling protocols and improving collection guidelines for halibut sampling in addition to generalized updates. In the latter portion of 2016, the trainings and briefings also incorporated a specialized training for exempted fishing permits (EFP) that was granted to conduct a feasibility study to reduce halibut mortality on designated non-pelagic trawl catcher processor vessels in the Bering Sea.

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 U.S. Coast Guard (USCG) approved Marine Safety Instructor course, have experience at sea, and complete regular refresher and co-trainings. In 2016, 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.

In 2016, the NMFS Office of Science and Technology hired a contractor to conduct a comprehensive observer safety program review of all observer programs across the country including a review of the North Pacific Observer Program. The review is intended to examine all aspects of safety and health impacting observers in each region. Specifically, the review focused on seven areas including safety reporting, communications, practices and policies, training, regulations, equipment, and international observers. A contractor leading the review conducted a site visit to Seattle in December 2016 and a follow-up field office site visit to Anchorage, Kodiak, and Dutch Harbor in April 2017. A final report will be available in 2017.

4.5 Availability of Lead Level 2 Observers

In October, 2016, the Council initiated analysis of a set of regulatory alternatives to address the potential for shortages of lead level 2 (LL2) observers for deployment on freezer longline vessels. NMFS prepared an Initial Regulatory Impact Review Draft Analysis[31] examining the impacts of the proposed alternatives including specific information regarding LL2 observer availability.

Table 4–11. -- Number of observer training classes and number of observers trained/briefed from November 30, 2015 through November 10, 2016[32]

Training classes	Number of classes	Number of observers trained/briefed
3-week training	8	134
4-day briefing	22	361
2-day briefing	2	2
1-day briefing	52	327
TOTAL	**84**	**824**

[31] The Regulatory Impact Review is available at: http://npfmc.legistar.com/gateway.aspx?M=F&ID=b168e4f2-4e9e-47d3-a1a2-691463a308cc.pdf.

[32] The 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 through December would not have represented the actual number trained for deployment in the 2016 fishing year.

5 COMPLIANCE AND ENFORCEMENT

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 Observer Program (Observer Program).

The observer monitoring and compliance role is 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. Prior to deployment, observers are trained in compliance monitoring. Observers and the Observer Program document and report to AKD compliance information relevant to marine resources; safety; and observer deployment, accommodations, assistance, and work environment.

Although observers are not required to communicate potential violations to vessel operators, nor are they trained to recognize all violation types, they can play an important compliance assistance role by communicating with vessel operators about safety concerns and potential violations. Observers are encouraged to work with vessel operators if it will not impact their data quality, data collection, or work environment. Strong rapport with onboard observers can contribute to this compliance assistance relationship.

5.1 Enforcement Partners in Alaska

5.1.1 NOAA Office for Law Enforcement

The AKD maintains a strong partnership with the Observer Program. The OLE mission is to support resource management by enforcing the laws and regulations that protect living marine resources. AKD works to protect observers and their ability to collect the scientific data used to manage Alaska marine resources. Reports of assault, sexual harassment, interference/sample bias, intimidation, coercion, hostile work environment and safety are among the highest OLE investigative priorities.

AKD Agents and Officers frequently engage with industry and the Observer Program to support outreach, education, and compliance assistance. Agents and officers in all field offices respond to industry questions about compliance with Observer Program requirements and participate in outreach meetings to discuss fishery management programs. In 2016, the AKD recorded 2,082 hours of dedicated support for the Observer Program including outreach, education, and compliance assistance. This total does not capture investigations or outreach and compliance assistance conducted during routine enforcement boardings and contacts.

The AKD dedicates a full-time liaison contractor to observer training, support, and compliance reporting in Seattle. Duties of the liaison include: receiving, organizing, and distributing compliance statements; providing resources and support to observers who have been victimized; developing and editing manuals, reports, and training materials; providing training to Observer Program staff and observers; serving as liaison with Observer Program staff; distributing AKD

outreach materials to industry; and providing observer related administrative and investigative support to agents and officers.

The AKD maintains a full-time liaison Special Agent. Duties of the Special Agent include the following: providing resources and support to observers who have been victimized, conducting and assisting with complex observer related investigations, serving as a liaison with Observer Program staff, providing agency analysis on observer related topics, providing observer training and program staff updates, attending meetings and outreach events, and assisting with industry compliance.

During the spring of 2016, the AKD and the USCG Fish School hosted a week-long training for AWT, USCG boarding officers, and new AKD enforcement officers. An Observer Program staff member provided a day of training and introduced students to observer roles and challenges. 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, which helps promote safety at sea.

The USCG may receive requests to assist AKD or Observer Program to help evaluate safety concerns. In coordination with the 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 together under an Enforcement Agreement that authorizes AWT joint authority under the Magnuson Act. Enforcement Officers and the AWT frequently work together during investigations, patrols, and at-sea or dockside

boardings to investigate observer complaints. During patrols, interactions with observers are encouraged to allow reporting opportunities and to develop trust relationships.

The AWT and AKD conducted multiple joint patrols utilizing State vessels. Vessel patrols allowed law enforcement to conduct at-sea boardings and to detect violations. The PV *Stimson* was also used to assist in removing an observer from a vessel (this was the single complaint involving threat of assault in 2016). In addition to patrols, 70 observer-related incidents were investigated by the AWT.

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. Each statement received by the AKD is evaluated and prioritized. OLE priorities are available on the web at: www.nmfs.noaa.gov/ole/priorities/priorities.html.

AKD Officers and Agents investigate complaints to identify if a violation has occurred and to determine the appropriate level of response. Many first offences and low level infractions may be handled by compliance assistance or issuance of a warning. The AKD also utilizes observer compliance data to track compliance trends. Trend analysis helps the AKD to focus and prioritize enforcement efforts.

The AKD received 1,312 new statements in 2016 and created 622 observer-related incidents (Table 5–1). All other statements were either combined with the 622 new incidents or combined with previously existing incidents. The AKD closed 66 incidents as compliance assistance provided; and issued 31 written warnings, 1 fix-it ticket, and 16 summary settlements. There are 420 incidents still under ongoing investigation. In addition, AKD forwarded 70 incidents to the AWT for investigation under the Joint Enforcement Agreement.

Table 5–1. -- Summary of statements and resulting incidents for 2016 (as of April 2017). 'Enforcement Action taken' includes all civil and criminal prosecutions, summary settlements, compliance assistance, and warnings; 'Closed' includes information only, lack of evidence, and lack of resources incidents.

Statements	**Incidents**	
1,312 statements received and reviewed in 2016	622 new incidents forwarded to agents and officers	420 ongoing
		125 enforcement action taken
	554 existing incidents with one or more statements added	561 Closed
		70 referred to AWT
Excludes the 89 complaints received from Agency staff	*Multiple statements are often combined into a single incident if the same vessel, operator, or company is involved*	

5.2.1 Sexual Harassment, Hostile Work Environment, and Interference

Statements involving sexual harassment more than doubled in 2016; there were 6 in 2015 compared with 14 in 2016. This increase is unacceptable and law enforcement will not tolerate harassment of any kind. The AKD has responded to all complaints of sexual harassment, and in some cases engaged law enforcement partners to pursue violations. The AKD has worked diligently to earn the trust of observers; trust can reduce impediments to disclosure by making it comfortable for observer victims to report. While increased victimization is unacceptable, increased reporting may also suggest additional trust between the observer community and the AKD, law enforcement partners, and the Observer Program.

Industry must also take proactive steps to provide observers safe and hostile-free work environments. For example, Glacier Fish and Clipper Seafoods proactively worked with employees, observers, and the AKD to reduce the number of harassment complaints within their fleets. The AKD encourages other vessel companies to collaborate with the Observer Program, observer providers, and the AKD to ensure observers are able to complete their duties free of harassment of interference.

The increase in observer statements in the above categories is alarming and the AKD has redoubled enforcement, outreach, and engagement with law enforcement partners. The AKD began observer focused 'pulse' operations in 2016 and 2017. Officers are embarking more frequently with the USCG, Alaska State Troopers, and other federal partners to increase contacts at sea and in remote areas. The addition of AKD field officers over the last 2 years (currently 14 total), will continue to increase response and provided greater visibility to observers and industry.

Sexual harassment, assault, intimidation, and interference remain the top priorities for enforcement. In 2016, the category "Harassment - Intimidate/Interfere/Hostile Work Environment" was split into two categories: "Interference/Sample Bias" and "Intimidation /Coercion/Hostile Work Environment". This distinction was important to help differentiate between observer impacting and data impacting allegations. In 2016, there was significant change to statement categories and accompanying observer and observer staff training. With these changes and additional AKD personnel in the field, the AKD hopes that observers are more comfortable reporting incidents. Some incidents involve more than one statement from different observers - this occurs most often when two or more observers are witness to the same event. Each observer is asked to write a separate statement.

The AKD added a new category in 2016 for: "Disruptive/Bothersome Behavior - Conflict Resolved". This category is meant to capture incidents where observers and industry successfully resolved conflict in the field without the need for enforcement action. The AKD received 39 statements under this category.

In 2016, the AKD received 42 statements involving Interference/Sample Bias and 52 statements of Intimidation/Coercion/Hostile Work Environment totaling 94 complaints. For comparison, there were 62 comparable statements in 2015. This suggests an increase in behavior that negatively impacted observers and observer data.

The AKD and the Observer Program identified observer interference and sample biasing in the pollock partial coverage trawl fishery. The AKD and the Observer Program reviewed evidence that trawl vessel operators delivering to Western Gulf of Alaska processors altered behavior to lower salmon bycatch count estimates. The AKD and the Observer Program received several statements from observers and fishery participants indicating that vessel operators in the partial coverage trawl pollock fleet frequently asked observers (after sampling at-sea) whether or not they had salmon in their sample. After fishing was completed, if there were no salmon encountered at sea, the vessel would deliver to a tender vessel, thereby ensuring that the delivery could not be monitored by the observer and a zero bycatch rate would be applied in bycatch estimation. In many cases the 'tender' vessel was at the dock or anchored close to the shoreside processor. If however, the observer did encounter a salmon in at-sea samples, then the vessel would deliver dockside so that the a dockside monitoring 'census' value would be used in estimation under the assumption that this value would be lower than a bycatch rate applied to the total weight of the delivery using normal extrapolation estimates. This resulted in lower salmon bycatch reporting to NMFS. The case was forwarded to NOAA General Counsel, Enforcement Section, which issued a Written Warning to the shoreside processor directing the behavior. The Written Warning cited the plant for interfering and biasing observer sampling procedures, and for impeding an observer from collecting samples, from making observations, or from otherwise performing their duties. The case is pending final adjudication.

5.2.2 Observer Safety

The AKD has seen an increase in reports alleging safety concerns; 55 statements were received in 2016 compared to 40 in 2015. Reports in 2016 include failure to maintain a lookout/wheel watch, stacking products in the factory, open watertight doors during inclement weather, ammonia leaks, and unsafe conditions. Many of these safety issues were resolved through education and compliance assistance while others are still under investigation. Two summary settlements were issued for failure to maintain a lookout. Where two observers are present, two statements are sometimes generated for the same event.

5.2.3 Observer Coverage

Potential violations related to observer coverage are reported to the AKD by the FMA staff. In 2016, 89 potential violations were received involving 69 distinct vessels in partial coverage. For comparison, in 2015, 139 potential violations were received involving 86 vessels. While the majority of the potential violations in 2016 involved failure to log a trip as required, other observer coverage issues included reporting incorrect gear type and fishing on a cancelled trip.

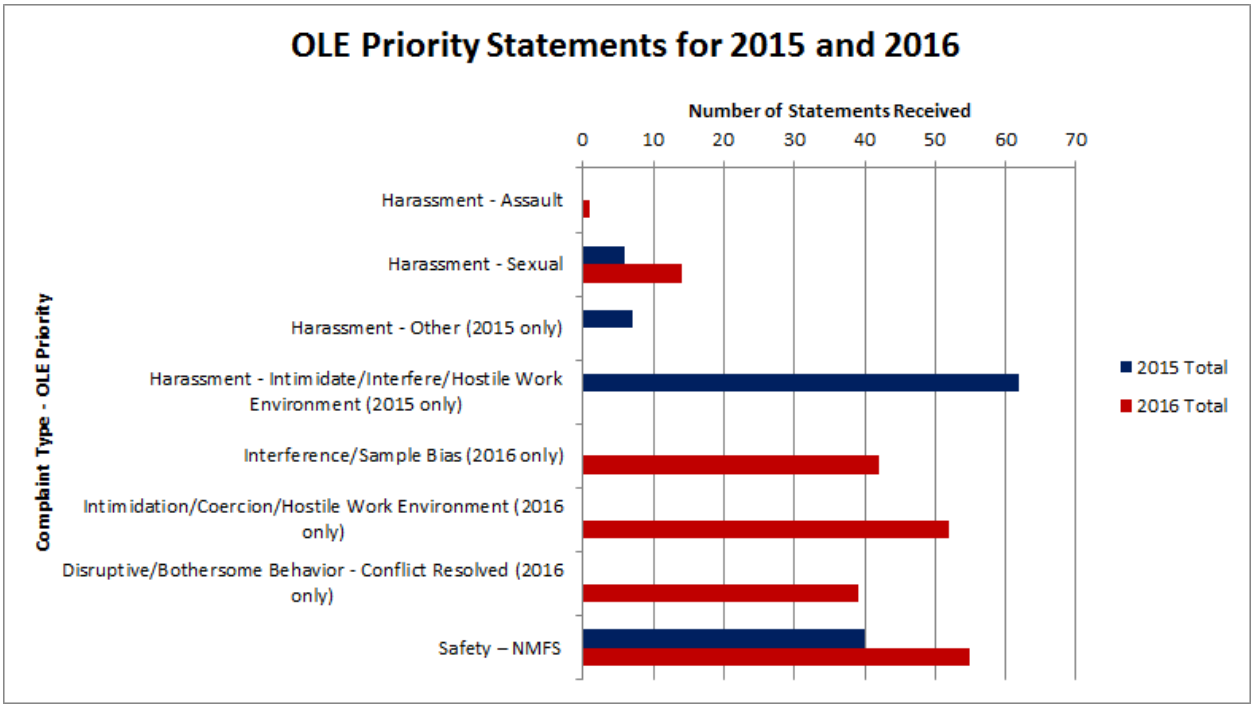
Table 5–2 and Figure 5–1 summarize the Observer Program statements for 2016 and 2015 in partial and full coverage (Note: in the full coverage fleet, two observers are often present and two statements may be generated for the same event). When comparing the numbers between full and partial coverage it is important to recognize that number of observer days is very different in each of those categories; there were 4,677 days of observer coverage in partial coverage and 39,029 days of observer coverage in full coverage (on vessels and in plants).

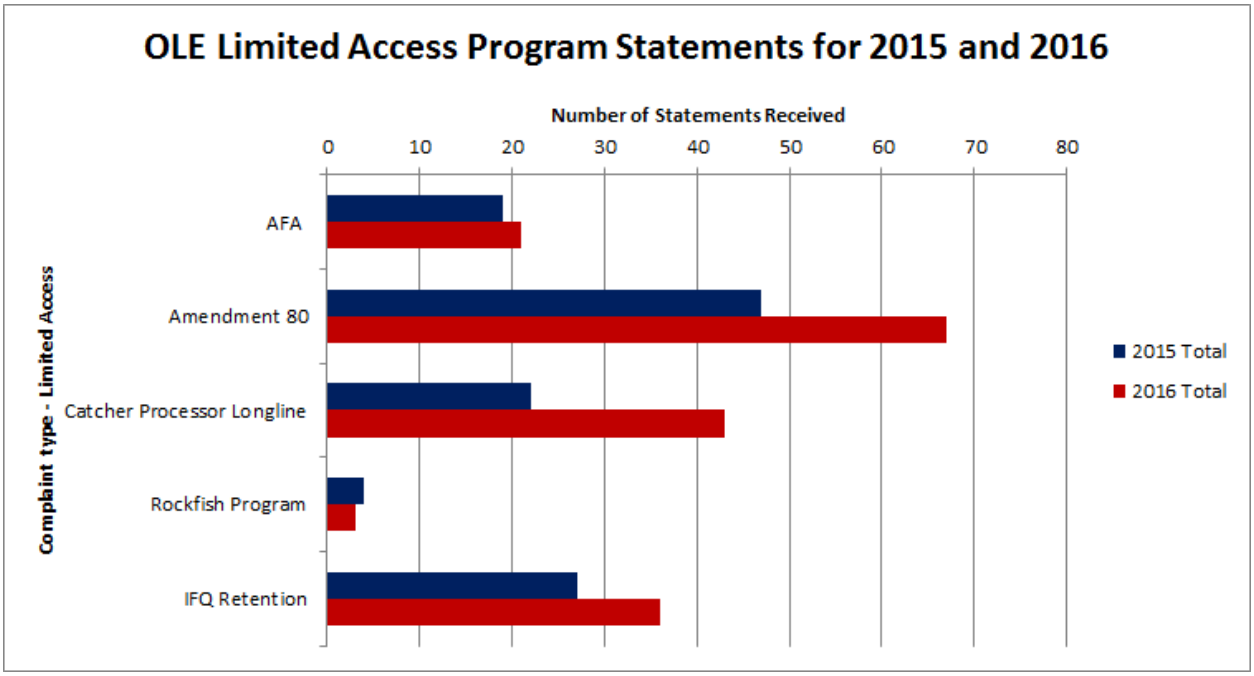
Table 5–2. -- Observer Program complaints received by AKD by coverage sector and subject matter in 2015 compared to 2016. Cells with an asterisk (*) indicate that the compliant type was not tracked in that year.

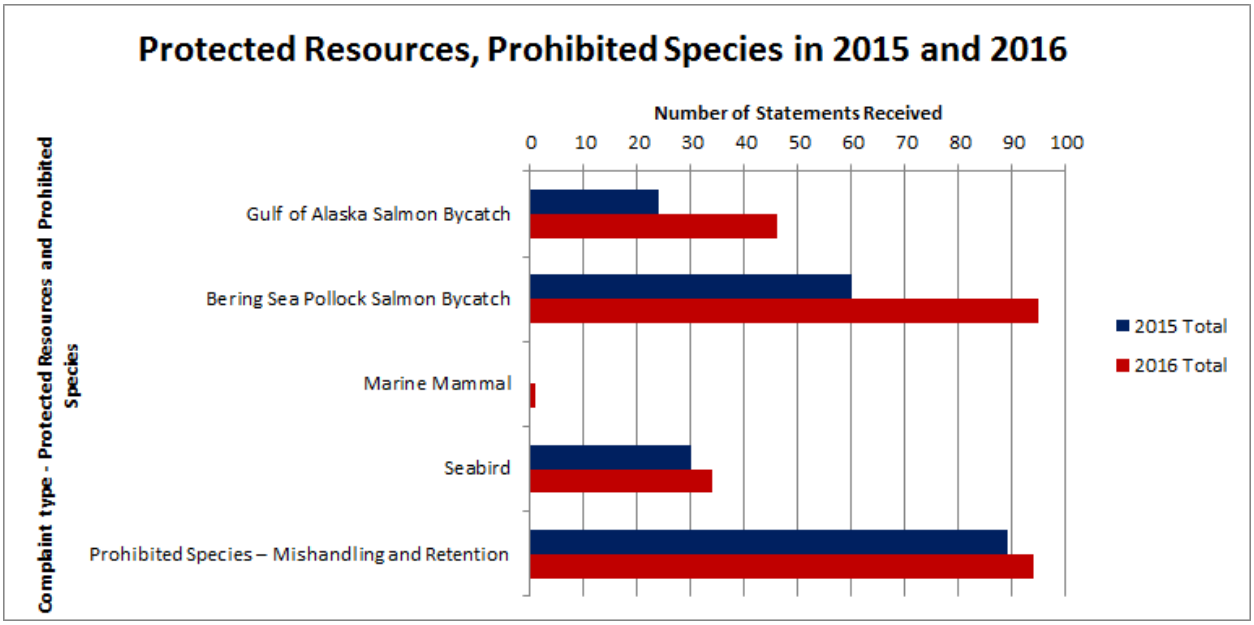
STATEMENT TYPE	FULL COVERAGE		PARTIAL COVERAGE		TOTAL	
	2015	2016	2015	2016	2015	2016
OLE Priority						
Harassment - Assault	0	0	0	1	0	1
Harassment - Sexual	6	12	0	2	6	14
Harassment - Other	7	*	0	*	7	*
Harassment - Intimidate/Interfere/Hostile Work Environment	49	*	13	*	62	*
Interference/Sample Bias	*	30	*	12	*	42
Intimidation/Coercion/Hostile Work Environment	*	41	*	11	*	52
Disruptive/Bothersome Behavior - Conflict Resolved	*	31	*	8	*	39
Safety – NMFS	29	43	11	12	40	55
TOTAL OLE Priority	91	157	24	46	115	203
Limited Access Programs						
AFA	19	21	0	0	19	21
Amendment 80	47	67	0	0	47	67
Catcher Processor Longline	22	43	0	0	22	43
Rockfish Program	4	3	0	0	4	3
IFQ Retention	3	5	24	31	27	36
TOTAL Limited Access Programs	95	139	25	31	119	170
Protected Resources and Prohibited Species						
Gulf of Alaska Salmon Bycatch	0	0	24	46	24	46
Bering Sea Pollock Salmon Bycatch	60	95	0	0	60	95
Marine Mammal	0	0	0	1	0	1
Seabird (majority is gear related)	6	12	24	22	30	34
Prohibited Species – Mishandling and Retention	61	76	28	18	89	94
TOTAL Protected Resources and Prohibited Species	127	183	76	87	203	270

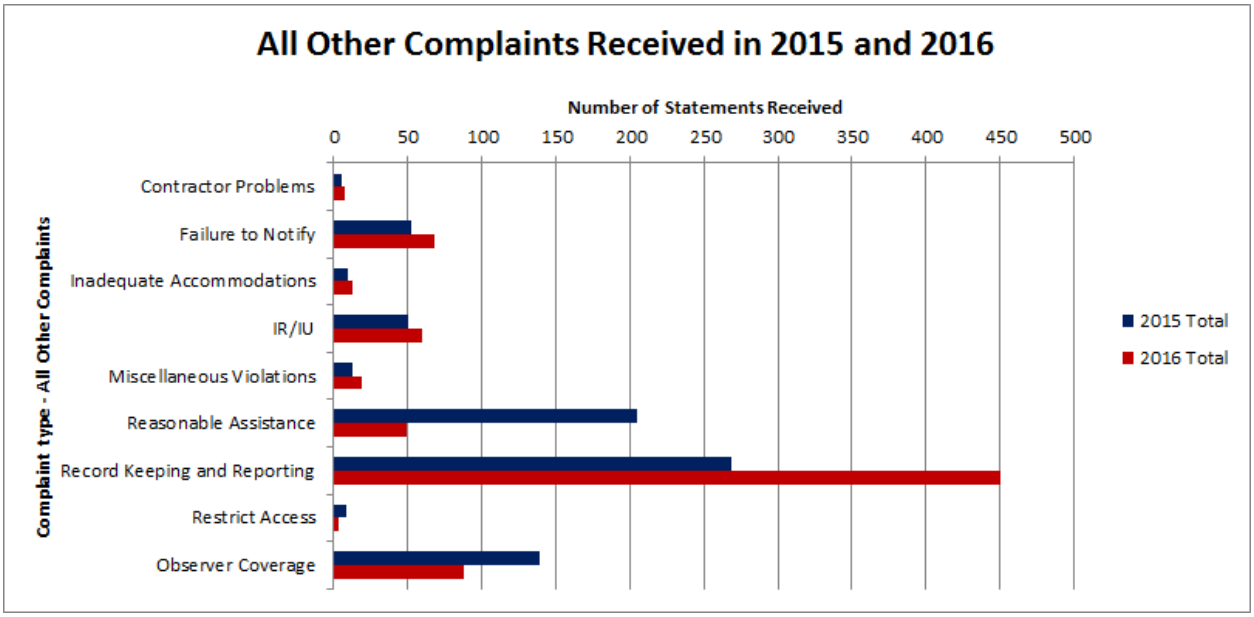
STATEMENT TYPE	FULL COVERAGE		PARTIAL COVERAGE		TOTAL	
	2015	2016	2015	2016	2015	2016
All Other Statement Types						
Contractor Problems	5	7	0	0	5	7
Failure to Notify	35	48	17	20	52	68
Inadequate Accommodations	7	11	3	2	10	13
IR/IU	25	18	25	42	50	60
Miscellaneous Violations	10	9	3	10	13	19
Reasonable Assistance	28	30	17	19	205	49
Record Keeping and Reporting	140	150	129	300	269	450
Restrict Access	3	2	6	1	9	3
Observer Coverage	0	0	139	88	139	88
TOTAL All Other Statement Types	253	275	399	482	752	757
GRAND TOTAL	566	755	463	648	1189	1400

Figure 5–1. -- Observer Program statements received by the AKD by subject matter in 2015 and 2016.






Protected Resources, Prohibited Species in 2015 and 2016
Number of Statements Received
0 10 20 30 40 50 60 70 80 90 100
Complaint type - Protected Resources and Prohibited Species
Gulf of Alaska Salmon Bycatch
Bering Sea Pollock Salmon Bycatch
Marine Mammal
Seabird
Prohibited Species – Mishandling and Retention
2015 Total
2016 Total


All Other Complaints Received in 2015 and 2016
Number of Statements Received
0 50 100 150 200 250 300 350 400 450 500
Complaint type - All Other Complaints
Contractor Problems
Failure to Notify
Inadequate Accommodations
IR/IU
Miscellaneous Violations
Reasonable Assistance
Record Keeping and Reporting
Restrict Access
Observer Coverage
2015 Total
2016 Total

5.3 Outreach

After conducting an analysis of industry reported data and observer complaints, the AKD created an outreach letter for the catcher processor fleet addressing four major compliance categories: Interference, Prohibited Species Mishandling, Record Keeping and Reporting, and Observer Safety. This letter went out via Information Bulletin #37 on March 30, 2016, and was also handed out to individual vessels during routine boardings. Several additional outreach letters were developed for distribution during 2017.

The AKD Observer Program liaison office has worked directly with advocate organizations and industry members to assist in developing training programs and outreach for fisheries workers. The AKD invites interested industry members to contact the AKD to request assistance.

The AKD's liaison contractor attended the Pacific Marine Expo with a Supervisory Enforcement Officer, two Enforcement Officers, and a communications specialist from OLE Headquarters. The team interacted with approximately 150 people seeking regulatory information, mainly related to observer requirements.

The AKD's liaison Special Agent attended the International Fishery Observer and Monitoring Conference (IFOMC) and presented on sexual harassment response and victim impact.

5.4 NOAA General Counsel - Settlement Agreements

The settlement agreements below are examples of cases initiated from observer and/or Observer Program complaints.

AK1305027; FV *Aleutian Sable* – Owner and operator were charged eight counts under the Magnuson-Stevens Act for failing to maintain a wheel watch; harassing observers with the purpose or effect of interfering with the observers' work performance, or otherwise creating an intimidating, hostile or offensive environment; failing to notify the observers at least 15 minutes before fish were brought on board; and retaining Individual Fishing Quota (IFQ) halibut on board the vessel in excess of the total amount of unharvested IFQ halibut applicable to the vessel category and Regulatory Area. The case was settled for $78,045.50.

AK1500564; FV *Alaskan Leader* – Individual was charged under the Magnuson-Stevens Act for tampering with an observer's personal effects without the express consent of the observer. The case was settled for $1,800.

AK1202525; FV *Arcturus* - Individual was charged under the Magnuson-Stevens Act for harassing an observer by conduct that had sexual connotations, had the purpose or effect of interfering with the observer's work performance, or otherwise created an intimidating, hostile, or offensive environment. A $17,500 NOVA was issued. The Respondent requested an administrative hearing, which resulted in a finding of no violation by the administrative law judge. NOAA General Counsel, Enforcement Section, appealed that decision to the NOAA Administrator, who found that the Administrative Law Judge had applied an incorrect legal standard in support of her finding of no harassment. The Administrator's order requested an additional briefing. The Agency has filed its opening brief and Respondent's brief is due May 19.

6 OUTREACH

Outreach efforts to disseminate information about the Observer Program and its ongoing objective for quality data collection and management continued throughout 2016. This report focuses specifically on the outreach activities that were conducted in the fall of 2015 (in preparation for the 2016 fishing year) and throughout the 2016 calendar year. The outreach meetings were held in various locations in Washington, Alaska, and via telephone (Table 6-1) with a variety of information disseminated at the meetings (Table 6-2).

The outreach events involved contributions from a variety of agency staff including: NMFS (Observer Program and Sustainable Fisheries), the Office of Law Enforcement, and the U. S. Coast Guard. Attendees at the meetings included: staff from Alaska Department of Fish Game, the International Pacific Halibut Commission, and A.I.S., Inc.; vessel owners and operators; staff from processors companies; and industry representatives. NMFS would like to recognize the participation and feedback provided at these meetings; it is always appreciated.

The goals of the late fall 2015 and early 2016 public outreach meetings were to provide information about the Observer Program, vessel responsibilities, EM, the objectives of quality collection of data and management, and changes to the conditional release policy. The late fall 2016 public outreach meetings focused on the transition to the 2017 Annual Deployment Plan, limited funding resulting in reduced selection rates in partial coverage, and the incorporation of the EM selection pool for the upcoming 2017 fishing year. Specifically, NMFS highlighted the incorporation of the ODDs trip number in to eLandings, the progression of the EM pre-implementation plan, the deployment of EM systems to vessels and costs. In addition to presentations, each meeting provided an opportunity for a question and answer session. An assortment of questions were discussed including: how observers sample, the types of data collected and how those data are ultimately used, observer coverage rates, EM logistics and costs, cancelled trips, USCG inspections, the observer fee program, and the safety logistics of deploying observers to tendering vessels. Additionally, some industry members expressed support of the increased coverage on trawl vessels.

This year also afforded a couple of unique outreach opportunities. In March, NMFS staff were provided a tour of a processing facility in Kodiak facilitated by the Alaska Groundfish Data Bank. This provided agency staff with a behind-the-scenes tour of the plant and led to insightful discussions regarding the potential for salmon sampling at processing plants in the Gulf of Alaska. Subsequent to the outreach meeting in Sitka, the Alaska Longline Fishmerman's Association coordinated a tour of the FV *Cherokee* that was equipped with an EM system (Fig. 6–1). In September, U.S. Congressional Staff visited Juneau were given a tour of the FV *Americanus*, a local fishing vessel that was equipped with an EM system.

The observer providers continue to be an integral contributor to the overall success of observer deployments in the Alaskan 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.

A total of about 50 people attended the outreach events related the Observer Program in 2016 and there has been a general trend of decreased public attendance at the outreach meetings since 2013. Despite this trend, NMFS plans to continue providing outreach meetings to interested communities and may increase the use teleconferences and presentations over the internet with tools such as WebEx. These technologies allow NMFS to use resources efficiently to communicate with fishing communities. 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 participants.

Figure 6–1. -- EM tour on the FV *Cherokee*. Photo credit: Alicia M. Miller, NOAA/NMFS/AKR.

Table 6–1. -- Outreach activities related to the Observer Program in fall of 2015 and throughout 2016.

Date	Location	Description
September 29, 2015	Letter	Outreach Letter to Vessel Owners, Operators and Managers regarding record keeping and reporting
November 5, 2015	Homer, AK	Public Outreach Meeting
November 18-20, 2015	Seattle, WA	Pacific Marine Expo
November 20, 2015	Seattle, WA	Alaska Independent Tendering Association Annual Meeting
December 2, 2015	Phone	Webex outreach meeting on Observer Program for processors and vessels to discuss changes to ODDS and eLandings.
December 9, 2015	Anchorage, AK	Public outreach meeting at NPFMC Meeting
December 10, 2015	Petersburg, AK	Public outreach meeting
March 3, 2016	Sitka, AK	Public outreach meeting
March 28, 2016	Letter	Letter to catcher processor owners and operators and cooperative managers regarding compliance and Observer Program related matters.
March 31-April 2, 2016	Kodiak, AK	ComFish 2016 Public outreach meeting;
May 15, 2015	Seattle, WA	Fishermen's Safety Fair sponsored by Seattle Fishermen's Memorial
May 26, 2016	Seattle, WA	Freezer Longline Coalition Symposium
June 6, 2016	Kodiak, AK	Outreach meeting with Alaska Groundfish Data Bank, members of the fishing community and processors to discuss, GOA sampling and rockfish offloads.
November 17-19, 2016	Seattle, WA	Pacific Marine Expo
December 21, 2016	Phone Call	Aleutians East Borough

Table 6–2. -- Summary of the outreach information distributed on the Observer Program in 2016.

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
Summary of the restructured North Pacific Groundfish and Halibut Observer Program	Handout at meetings; available online	https://alaskafisheries.noaa.gov/sites/default/files/observer-prog-summary2016.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.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 (EM) Implementation Plan	Handout at meetings; available online	http://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/EM2016Pre-impPlanJan16.pdf
2016 Annual Deployment Plan	Handout at meetings; available online	https://alaskafisheries.noaa.gov/sites/default/files/final2016adp.pdf
2016 Annual Report	Handout at meetings; available online	https://alaskafisheries.noaa.gov/sites/default/files/2015observerprogramannualreport.pdf
Partial coverage contacts	laminated card handed; out at meetings	
Outreach Letter to Catcher processor owners and Operators and Coop Managers	Handout at meetings; available online	https://alaskafisheries.noaa.gov/sites/default/files/infobulletins/2016cpooutreachletter.pdf
Outreach Letter to Vessel Owners, Operators and Managers regarding record keeping and reporting	Handout at meetings; available online	https://alaskafisheries.noaa.gov/sites/default/files/infobulletins/2015_rrletter.pdf
Message from Eileen Sobeck regarding at-sea monitors and observers	Handout at meetings; available online	http://www.nmfs.noaa.gov/aboutus/leadership/oct_2015_leadership_message_observers.html
Observer Fee Collection	Handout at meetings; available online	https://alaskafisheries.noaa.gov/sites/default/files/observerfees.pdf

7 NMFS RECOMMENDATIONS

7.1 Recommendations to Improve the 2018 ADP

Dockside Monitoring and Tendering

In 2018, the National Marine Fisheries Service (NMFS) recommends maintaining status quo for dockside monitoring. However, for the past 3 years, NMFS has been unsuccessful in achieving its goal of obtaining an unbiased sample from the Gulf of Alaska (GOA) pollock trawl fleet for enumerating salmon bycatch and determining stock of origin. Chapters 3 and 5 highlight issues that occurred in 2016, which were primarily related to tendering activity, and preliminary assessment of 2017 data indicate that there are continued issues related to tender trips. Therefore, NMFS recommends the North Pacific Fishery Management Council (Council) and NMFS consider longer-term solutions for monitoring Chinook salmon prohibited species catch (PSC) and trawl trips delivering to tenders in the GOA. Longer-term solutions could include some, or all, of the following:

- Establishment of an alternative program for obtaining genetic tissues for stock-of-origin estimates given that these have been stable over the past 5 years in the GOA.
- 100% observer coverage on trawl vessels delivering to tenders.
- Plant monitoring of offloads, including tender offloads, combined with EM for compliance monitoring purposes and full retention of all catch (or maximized retention, recognizing some species might still continue to be discarded).

Trip-selection pool

- Within budget constraints, NMFS recommends that sampling rates be high enough in each stratum to reasonably expect three observed trips in each NMFS Area. Further reductions in future budgets may necessitate consolidation of some strata due to too few observations. Therefore, NMFS recommends that the 2018 Annual Deployment Plan (ADP) include evaluation of: 1) 15% coverage rates across all strata and 2) equal coverage rates that can be afforded. These results could be used as benchmarks to evaluate optimization allocations.

ODDS

- Although Chapter 3 of this report found differential cancellation rates in the Observer Declare and Deploy System (ODDS), a temporal bias in realized trips was not found in 2016. Therefore, NMFS recommends continuing to allow vessels to log three trips in ODDS.
- NMFS also recommends continuing to automatically release vessels 40-57.5 ft in length from observer coverage if the two previous trips were observed trips (i.e., if two trips in a row were observed and a third trip is selected, then the third trip will be released from coverage).
- In the longer term, NMFS recommends 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.

EM selection pool

- NMFS is planning to integrate EM into the Observer Program in 2018 and will incorporate the EM selection pool into the 2018 ADP, rather than using an EM Pre-Implementation Plan process. As such, NMFS recommends that the selection rate for the EM selection pool will be determined through the ADP process.
- NMFS does not plan to use observer fees for EM deployment in 2018, but rather will rely on supplementary NMFS funds and any carryover of EM funds from 2017.
- NMFS intends to incorporate EM data from longline vessels into the Catch Accounting System in 2018 so that the information can be used for inseason management. The catch estimation methods for pot data, however, are still in development and will likely continue to be treated as "pre-implementation" while protocols are finalized.
- The Council supported expanding the EM pool in 2018 to accommodate up to 120 longline vessels and up to 45 pot vessels, provided there is funding to support this pool size. If there are insufficient funds to support the expanded size of the EM pool, NMFS recommends 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.

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. However, since there is no monitoring data from this segment of the fleet, NMFS also supports the Council's recommendation to develop a discussion paper about incorporating vessels less than 40 ft LOA in the EM selection pool.

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 recommends that vessels less than 40 ft 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 and 2015 Annual Reports: NMFS recommended that vessels less than 40 ft 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.
EM Selection Pool	2014 and 2015 Annual Reports: NMFS recommends 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.
Trip Selection	2015 Annual Report: NMFS recommends maintaining three sampling strata defined by gear (pot, hook-and-line, and trawl) for the 2017 ADP and continuing to evaluate the optimal allocation to determine deployment rates in each stratum. Within budget constraints, NMFS recommends that sampling rates be high enough in each stratum to reasonably expect three observed trips in each NMFS Area.	Strata definitions based on gear was implemented starting in 2016.
	2015 Annual Report: NMFS recommends evaluating 2 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.	Based on the analysis of alternative deployment strategies, the draft 2017 ADP recommended, and the Council supported, a stratification scheme based on gear and tender deliveries. NMFS did not recommend implementing a separate stratum for partial coverage catcher-processors.

	• 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.	
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.
Conditional Releases	Draft 2016 ADP: NMFS recommends 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 and 2017 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 new 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. This regulated process has replaced an interim policy.

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 2016 and 2017 ADPs, NMFS compared alternative sampling designs by simulated observer deployments and estimating the relative precision of total retained and discarded groundfish. The alternative designs were 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.

8 LITERATURE CITED

AFSC (Alaska Fisheries Science Center). 2016. 2017 Observer Sampling Manual. Fisheries Monitoring and Analysis Division, North Pacific Groundfish Observer Program. AFSC, 7600 Sand Point Way N.E., Seattle, Washington, 98115. Available online at https://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2017.pdf.

AFSC. 2015. 2016 Observer sampling manual. Fisheries Monitoring and Analysis Division, North Pacific Groundfish Observer Program. AFSC, 7600 Sand Point Way N.E., Seattle, Washington, 98115. Available online at https://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2016_2.pdf.

AFSC. 2014. 2015 Observer Sampling Manual. Fisheries Monitoring and Analysis Division, North Pacific Groundfish Observer Program. AFSC, 7600 Sand Point Way N.E., Seattle, Washington, 98115. Available online at http://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2015.pdf.

Cahalan, J., J. Mondragon, and J. Gasper. 2014. Catch Sampling and Estimation in the Federal Groundfish Fisheries off Alaska: 2015 Edition. NOAA Tech. Memo. NMFS-AFSC-286, 46 p. Available online at: http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM- AFSC-286.pdf.

Cahalan J., J. Gasper, and J. Mondragon. 2015a. Catch estimation in the federal trawl fisheries off Alaska: a simulation approach to compare the statistical properties of three trip-specific catch estimators. Can J. Fish. 72(7):1024:1036.

Cahalan, J., J. Gasper, and J. Mondragon. 2015b. Evaluation of design-based estimators in federal groundfish fisheries off Alaska. In: G.H. Kruse, H.C. An, J. DiCosimo, C.A. Eischens, G.S. Gislason, D.N. McBride, C.S. Rose, and C.E. Siddon (eds.), Fisheries Bycatch: Global Issues and Creative Solutions. Alaska Sea Grant, University of Alaska Fairbanks. http://doi.org/10.4027/fbgics.2015.09.

Chilton, L., P. Tyhurst, P. Packer, S. Romain, C. Rose, J. Sagmiller, and F. Wallace. 2016. AFSC Observer Program's EM innovation project: Progress Report for 2016. Fisheries Monitoring and Analysis Division, North Pacific Groundfish Observer Program. AFSC, 7600 Sand Point Way N.E., Seattle, Washington, 98115. Available online at https://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/EM%20Innovation%20ProgressReportEMWGNov2016.pdf.

Cochran, W. G. 1977. Sampling techniques. John Wiley and Sons, Inc. New York. 428 p.

Faunce, C. H. 2016. Alternative sampling designs for the 2017 annual deployment plan of the North Pacific Observer Program, U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-338, 33 p.

Faunce, C. H. 2015a. Evolution of observer methods to obtain genetic material from Chinook salmon bycatch in the Alaska pollock fishery. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-288, 28 p.

Faunce, C. H. 2015b. An initial analysis of alternative sample designs for the deployment of observers in Alaska, U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-307, 33 p.

Faunce, C., J. Gasper, J. Cahalan, S. Lowe, and R. Webster. 2016. Deployment performance review of the 2015 North Pacific Groundfish and Halibut Observer Program. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-322. 54 p.

Faunce, C., J. Gasper, J. Cahalan, S. Lowe, R. Webster, and T. A'mar. 2015. Deployment performance review of the 2014 North Pacific Groundfish and Halibut Observer Program. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-302, 55 p.

Faunce, C., J. Cahalan, J. Gasper, T. A'mar, S. Low, F. Wallace, and R. Webster. 2014. Deployment performance review of the 2013 North Pacific Groundfish and Halibut Observer Program. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-281, 74 p.

Guthrie, C.M. III, Hv. T. Nguyen, and J. R. Guyon. 2016. Genetic stock composition analysis of the Chinook salmon bycatch samples from the 2014 Gulf of Alaska trawl fishery, 32 p. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-291. At http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-311.pdf

Hill, M.O. 1973. Diversity and evenness: A unifying notation and its consequences. Ecology 61: 225-236.

NMFS (National Marine Fisheries Service). 2016a. North Pacific Groundfish and Halibut Observer Program 2015 Annual Report. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available online at https://alaskafisheries.noaa.gov/sites/default/files/2015observerprogramannualreport.pdf.

NMFS. 2016b. 2017 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available online at: https://alaskafisheries.noaa.gov/sites/default/files/2017finaladp.pdf

NMFS. 2016c. Draft 2017 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available online at: https://alaskafisheries.noaa.gov/sites/default/files/draft_2017adp.pdf

NMFS. 2015a. North Pacific Groundfish and Halibut Observer Program 2014 Annual Report. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. 101106 p. plus appendices. Available online at http://alaskafisheries.noaa.gov/sites/default/files/annualrpt2014sustainablefisheries/observers/annualrpt2013.pdf.

NMFS. 2015b. 2016 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available online at: https://alaskafisheries.noaa.gov/sites/default/files/final2016adp.pdf.

NMFS. 2015c. Supplement to the Environmental Assessment for Restructuring the Program for Observer Procurement and Deployment in the North Pacific. NMFS, Alaska Regional Office, Juneau. May 2015. Available online at https://alaskafisheries.noaa.gov/sites/default/files/analyses/finalea_restructuring0915.pdf.

NMFS 2014a. 2015 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available online at https://alaskafisheries.noaa.gov/sites/default/files/final2015adp.pdf.

NMFS 2014b. North Pacific Groundfish and Halibut Observer Program 2013 Annual Report. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available online at https://alaskafisheries.noaa.gov/sites/default/files/annualrpt2013.pdf.

NMFS. 2013. 2014 Annual Deployment Plan for Observers in the Groundfish and Halibut Fisheries off Alaska. National Oceanic and Atmospheric Administration, 709 West 9th Street. Juneau, Alaska 99802. Available online at: http://alaskafisheries.noaa.gov/sustainablefisheries/observers/adp2014.pdf.

NPFMC (North Pacific Fishery Management Council). 2016a. Final 2016 electronic monitoring pre-implementation plan. Available online at https://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/2016EMPre-impPlanFinal0116.pdf

NPFMC. 2016b. Deployment of Observers on Catcher Vessels Delivering to Tender Vessels Discussion Paper. 40 p. Available online at http://npfmc.legistar.com/gateway.aspx?M=F&ID=c130d627-a423-4e25-bcc9-4216939d5d61.pdf.

NPFMC. 2016c. Initial Review Draft Environmental Assessment/ Regulatory Impact Review/ Initial Regulatory Flexibility Analysis for Proposed Amendments to the Fishery Management Plans for Groundfish of the Bering Sea and Aleutian Islands Management Area and Groundfish of the Gulf of Alaska: Analysis to Integrate Electronic Monitoring into the North Pacific Observer Program. September 2016. Available at https://npfmc.legistar.com/View.ashx?M=F&ID=4673155&GUID=39654047-3907-4C3C-8721-1E739C6C0AE7

NPFMC. 2011. Environmental Assessment/Regulatory Impact Review/Initial Regulatory Flexibility Analysis for Proposed Amendment 86 to the Fishery Management Plan for Groundfish of the Bering sea/Aleutian Islands Management Area and Amendment 76 to the Fishery Management Plan for Groundfish of the Gulf of Alaska: Restructuring the Program for Observer Procurement and Deployment in the North Pacific. March 2011. 239 p. plus appendices. Available online at http://alaskafisheries.noaa.gov/analyses/observer/amd86_amd76_earirirfa0311.pdf.

Wall, J., R. French, and R. Nelson Jr. 1981. Foreign fisheries in the Gulf of Alaska, 1977-78. Mar. Fish. Rev. 43:20-35.

9 LIST OF AUTHORS

Chapter 3 was written and reviewed by the **Observer Science Committee:**
Craig Faunce, Alaska Fisheries Science Center (AFSC)
Jane Sullivan, Alaska Sea Grant Fellow (SG) with Alaska Regional Office (AKRO)
Steve Barbeaux, AFSC
Jennifer Cahalan, AFSC/Pacific State Marine Fisheries Commission
Jason Gasper, AKRO
Sandra Lowe, AFSC
Ray Webster, International Pacific Halibut Commission

All other sections of the document were prepared and written by:
Mona Ash, Alaska Fisheries Science Center (AFSC)
Craig Faunce, AFSC
Ben Fissel, AFSC
Jason Gasper, AKRO
Nathan Lagerwey, NOAA Office of Law Enforcement (OLE)
Brian Mason, AFSC
Alicia Miller, AKRO
Claire Minelga, TDEC contractor in support of OLE
Jennifer Mondragon, AKRO
Chris Rilling, AFSC
Gwynne Schnaittacher, AFSC
Jaclyn Smith, OLE
Jane Sullivan, SG with AKRO
Lisa Thompson, AFSC
Cathy Tide, AKRO

APPENDIX A – DETAILS OF VESSEL-SELECTION OUTCOMES IN THE EM STRATA

This appendix provides more detail of the raw data that are presented in Figure 3-3 in Chapter 3.

Appendix Table A–1. -- The number of vessels that fall under specific criteria within the EM Voluntary vessel-selection strata.

Row	Metric	Jan-Feb	Mar-Jun	Jul-Oct	Nov-Dec
1	Anticipated to fish (Final 2016 EM Pre-Implementation Plan)	3	38	36	2
2	In 30% selection frame (Notified will fish); F	4	28	16	0
3	In 30% selection frame and fished; fY	4	28	16	0
4	In 30% selection frame and did not fish; fN	0	0	0	0
5	Not in 30% selection frame and fished (potential bias); f0	0	7	10	1
6	Active (fished = true frame); f* = f0 + fY	4	35	26	1
7	Expected to be monitored; vT = 0.30 x f*	2	11	8	1
8	Selected for coverage randomly (30%); vS_30	2	10	6	0
9	Selected for coverage (100%); vS_100	0	4	4	0
10	Selected for coverage (Total); vS = vS_30 + vS_100	2	14	10	0
11	Selected but did not fish; vN	0	0	0	0
12	Selected and fished; vF = vS - vN	2	14	10	0
13	Video data reviewed; v	2	14	11	0

APPENDIX B – SPECIES GROUPINGS

This appendix provides the definitions of the species groupings that were used in total catch and discard tables in Chapter 4. The groupings were done to simplify the tables and are based on categories that make sense from a management standpoint.

Appendix Table B–1. -- Description of the individual species that were combined into species groups in the Gulf of Alaska for Table 4-4 and Table 4-5.

Deep water flatfish	**Other groundfish**	**Rockfish**	**Shallow water flatfish**	**Skates**	**Sharks**
Arrowtooth flounder	Atka Mackerel	Dusky	Alaska plaice	Alaska	Other sharks
Deepsea sole	Octopus	Northern	Butter sole	Aleutian	Salmon shark
Dover sole	Sculpin	Other rockfish	English sole	Big	Sleeper shark
Flathead sole	Squid	Pacific Ocean Perch	Other flounder	Longnose	Spiny dogfish
Greenland Turbot		Rougheye	Rock sole	Other skates	
Kamchatka flounder		Shortraker	Sand sole	Whiteblotched	
Rex sole		Thornyheads	Starry flounder		
			Yellowfin sole		

Appendix Table B–2. -- Description of the individual species that were combined into species groups in the Bering Sea/Aleutian Island for Table 4-6, Table 4-7, and Table 4-8.

Flatfish	**Other groundfish**	**Rockfish**	**Skates**	**Sharks**	**Turbot**
Alaska plaice	Octopus	Northern	Alaska	Other sharks	Arrowtooth flounder
Butter sole	Sculpin	Other rockfish	Aleutian	Salmon shark	Greenland turbot
Dover sole	Squid	Pacific Ocean Perch	Big	Sleeper shark	Kamchatka flounder
English sole		Rougheye	Longnose	Spiny dogfish	
Flathead sole		Shortraker	Other skates		
Other flounder		Thornyheads	Whitebloched		
Petrale sole					
Rock sole					
Starry flounder					
Yellowfin sole					

APPENDIX C - ELECTRONIC MONITORING VIDEO REVIEW RESULTS

Alaska Pre-Implementation Electronic Monitoring Final Report for the 2016 Season

Aileen Smith, Dave Colpo, and Courtney Donovan
Pacific States Marine Fisheries Commission
205 SE Spokane Street, Suite 100
Portland, OR 97202

NOTE: This report was originally presented in March, 2017 during an EM Workgroup meeting (see https://www.npfmc.org/observer-program/ for more information on the EM Workgroup).

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) has established the intent to incorporate EM as a tool of the North Pacific Observer Program for the fixed gear groundfish and halibut fisheries. The intent is to develop EM as a tool for collecting catch estimation data.

A pre-implementation plan for EM has been developed by a working group of 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 be need to made in order to integrate EM systems into the Observer Program. Results of the pre-implementation work will be 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 2016, the NPFMC EM pre-implementation plan[33] deployed EM systems on small boat longline 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 2016.

Methods

Vessel Participation

Vessels were selected for participation in the pre-implementation program from a pool of volunteer vessels.

[33] The 2016 EM Pre-Implementation plan is available online at: https://www.npfmc.org/wp-content/PDFdocuments/conservation_issues/Observer/EM/2016EMPre-impPlanFinal0116.pdf

Vessels made landings in ports including Homer, Kodiak, Seward, and Sitka. For each of four time periods (Jan-Feb, Mar-Jun, Jul-Oct & 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 past the last point when pressure was above the trigger threshold. Initially video recording continued for half an hour after the threshold but this was not always adequate to cover all sorting so the time was increased to two hours.
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).

AMR support staff reviewed video clips from each vessel after the data retrieval to assess video quality, camera placement, and system function. Adjustments to the installation were made as necessary.

Effort Logs

Effort logs developed by AMR were distributed to all of the participating vessels. Images of effort logs were transmitted to PSMFC and entered into an excel spreadsheet.

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 and times of all trips and hauls were annotated. Other metadata such as the vessel information, ports, and fishery were either recorded by the hardware or annotated by the reviewer.
Reviewers recorded whether a streamer line, used as a seabird deterrent, was present or absent for each 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 confidence and image quality for each haul. “Data Confidence” was defined as the overall ability of the reviewer to effectively quantify catch data. Data confidence 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 all hauls (unless video was missing). 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 Groundfish Observer Program (NPGOP) on Alaska species reporting conventions. The reviewers were instructed to record species to the lowest identifiable taxonomic level regardless of the groupings requested by the EM working group.
Catch that was kept on the vessel (excluding use as bait or food) was considered retained; otherwise, catch was

recorded as discarded[34]. 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

Twenty-five longline vessels participated in the 2016 pre-implementation EM project. EM data was collected on 34 halibut trips, 12 Pacific cod trips, and 31 sablefish trips containing 230, 160 and 167 hauls respectively (Appendix Table C-1). Some vessels participated in more than one fishery. The data spanned 165 halibut sea days, 49 Pacific cod sea days, and 143 sablefish sea days for a total of 357 sea days with trips averaging 4.9, 4.1, and 4.6 days respectively.

Effort Log

Seventy-two of the 77 trips (94%) had a complete logbook submitted with the video data (Table C-2). Five (6%) had no logbook submitted.

Data Quality

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

About half of trips and about a third of hauls had video gaps during fishing activity, but in only one case was video missing for an entire haul. Incomplete video generally resulted from video ending before catch handling ended (47% of hauls with incomplete video) or from intermittent gaps in video coverage (42% of hauls with incomplete video). 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 Fig. C-1). The current EMI software does not allow PSMFC to quantify the length of video gaps, however AMR is currently working on changes that will allow this quantification.

Data confidence was rated as high or medium for 98% of the 557 reviewed hauls. The Pacific cod fishery had a higher proportion of hauls of medium or low quality (39% and 4% respectively), than the halibut fishery (5% medium and >1% low quality hauls) or the sablefish fishery (7% medium and 2% low quality hauls). All of the hauls with low confidence were due to image quality.

[34] 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.

Review Rate

Review rate was similar in the halibut and sablefish target fisheries: approximately half of real time (Appendix Table C-4; e.g.,one hour of catch handling time could be reviewed in just under 30 minutes). 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).

Pacific cod hauls tended to have a larger variety of species caught, as well as being the only fishery where stern hauling was conducted. Stern haulers were more difficult to review due to a side view of the line (as opposed to a top down view), as well as poor lighting on the line at night.

Seabird Deterrents

Streamer lines are used as deterrents to seabirds on longline vessels. In 2016, 77% of trips were confirmed to have used a streamer line (Appendix Table C-5). For 14% of trips no streamer line was used, while in the remaining 8% 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 SE AK longline sector, all species of retained or discarded marine organisms were reported and summarized to the target fishery level (Table C-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 7 rockfish that were recorded as “Rockfish – unidentified”, 6 that were recorded as “Rockfish, Dark unidentified” and 70 that were recorded as “Rockfish – Small Red unidentified” out of the total 17,150 recorded rockfish.

For most discarded species, the majority of discards were discarded after interaction with the vessel or a crew member (Appendix Table C-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. Seventeen percent of the sablefish discards in the sablefish fishery occurred with no interaction with the vessel or crew (dropped off 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 (88%) of Pacific halibut were released carefully using the “Hook twisting and shaking” method (Appendix Tables C-7 and C-8). The next largest release method (5%) was the “Hand Release” method.

Most halibut were judged to have minor damage at the time of release (56%; Table C-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 40% of the discarded halibut in all three fisheries. A halibut would be 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 C-1. -- Summary of EM monitored fishing activity for 2016.

Data Summary	Longline Halibut	Longline Pacific Cod	Longline Sablefish	All Fisheries
Vessels	17	3	12	**25**
Trips	34	12	31	**77**
Hauls	230	160	167	**557**
Sea Days	165	49	143	**357**
Average Trip Length	4.9	4.1	4.6	**4.6**

Appendix Table C-2. -- Logbook submissions.

Effort Log Completed	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total	Percent Total
Yes	32	10	30	**72**	**94%**
No	2	2	1	**5**	**6%**
Total	34	12	31	**77**	**100%**

Appendix Table C-3. – Video and sensor completeness, data confidence, and image quality by trip and haul.

Trip Level Data Quality

Video Complete	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total
Number of trips	14	4	18	**36**
Percent of trips	*41%*	*33%*	*58%*	***47%***
Sensor Data Complete				
Number of trips	34	9	30	**73**
Percent of trips	*100%*	*75%*	*97%*	***95%***

Haul Level Data Quality

Haul Video Completeness (number of hauls)	Longline Halibut	Longline Pacific Cod	Longline Sablefish	Total
Video complete - Entire haul recorded	177	97	142	**416**
Intermittent gaps in video coverage	2	55	2	**59**
Video ends before catch handling ends	46	4	16	**66**
Video starts after haul start	5	3	7	**15**
No video		1		**1**
Catch Video Completeness (number of hauls)				
Complete - All catch brought onboard was recorded	227	101	166	**494**
Incomplete - Part of catch not recorded	3	59	1	**63**
Data Confidence from Video (Number of Hauls)				
High	217	90	153	**460**
Medium	12	63	11	**86**
Low	1	6	3	**10**
Unusable				
No Video		1		**1**
Image Quality (Number of Hauls)				
High	202	97	147	**446**
Medium	27	45	17	**89**
Low	1	17	3	**21**
Unusable				
No Video		1		**1**
Primary Reason for Medium Image Quality (Number of Hauls)				
Banding/Scrambling/False Color	2			**2**
Glare			3	**3**
Dirty Cameras	3	2		**5**
Night Lighting	5	5	1	**11**
Obstruction			3	**3**
Water Spots	6	11	8	**25**
Intermittent Gaps in Video Coverage	11	27	2	**40**
Primary Reason for Low Image Quality (Number of Hauls)				
One or more cameras not working		11	3	**14**
Intermittent Gaps in Video Coverage	1	6		**7**

Appendix Table C-4. -- Review rate by target fishery. Review of both retained and discarded catch included.

	Longline Halibut	Longline Pacific Cod	Longline Sablefish
Haul Count	230	160	167
Average Sort Min/Haul	143	117	219
Average Review Min/Haul	64	107	103
Average Review Min/Sort Min	0.48	0.93	0.48

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

Streamer Line Status	Longline Halibut	Longline Pacific Cod	Longline Sablefish	
Streamer Line Present	29	9	27	**65**
No Streamer Line	4	1	0	**12**
Unknown	1	2	4	**7**
Percent Trips with Streamer Line	85%	75%	87%	**77%**

Appendix Table C-6. -- Counts of video recorded retained and discarded catch.

	Longline Halibut					Longline Pacific Cod					Longline Sablefish				
	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*	
Sablefish	3,482	785	29	-	-	10	176	1	-	1	44,977	1,731	351	-	2
Pacific halibut	11,647	10,338	219	-	-	210	4,184	26	-	1	861	2,183	28	-	1
Pacific cod	870	381	10	663	-	37,779	465	186	-	1	92	12	1	6	-
Lingcod	209	227	4	-	-	3	25	1	-	-	10	1	1	-	-
Flatfish					-										
Flatfish - unidentified	-	1	2	-	-	-	159	3	-	2	-	7	-	-	-
Flounder, Arrowtooth	*17*	*81*	-	*26*	-	*5*	*202*	*1*	*2*	-	*16*	*178*	*3*	*3*	-
Flounder, Kamchatka	*3*	*1*	-	*3*	-	-	*8*	-	-	-	*1*	*4*	-	-	-
Flounder, Kamchatka/Arrowtooth - unid	*51*	*254*	*10*	*83*	-	*7*	*500*	*7*	-	-	*	*347*	*5*	*98*	-
Flounder, Kamchatka/Arrowtooth Total	71	336	10	112	-	12	710	8	2	-	13	529	8	101	-
Sole, Dover	-	2	-	-	-	-	-	-	-	-	-	13	-	-	-
Sole, Flathead	-	1	-	-	-	*	120	1	-	1	-	2	-	-	-
Sole, Petrale					-										
Sole, Rock Sole unidentified	-	2	-	-	-	-	1	-	-	-	-	-	-	-	-
Other Fish					-										
Pollock (Walleye Pollock)	1	2	-	-	-	1,181		14	-	-	-	-	-	-	-
Grenadier (Rattail), Giant	-	8	1	-	-	-	-	-	-	-	5	1,897	96	83	-
Grenadier, (Rattail) - unidentified	1	115	6	1	-	-	1	-	-	-	103	11,967	478	1,636	-
Flatnose, Pacific (Codling)					-										
Greenling - unidentified	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Ratfish, Spotted	2	76	-	-	-	-	2	-	-	-	-	6	-	-	-
Ronquil/Searcher - unidentified	2	2	-	-	-	-	17	-	-	-	-	-	-	-	-
Roundfish - unidentified	-	2	4	-	-	10	70	12	-	1	-	28	21	-	-
Sculpin - Myoxocephalus unidentified	2	45	-	9	-	-	41	2	-	-	-	-	-	-	-
Sculpin - unidentified	4	897	1	56	-	3	2,634	8	-	2	-	-	-	-	-
Sculpin, Bigmouth	-	1	-	-	-	-	1	1	-	-	-	-	-	-	-
Sculpin, Great	-	50	1	2	-	1	100	-	-	-	-	-	-	-	-
Sculpin, Irish Lord - unidentified	-	73	-	5	-	-	78	-	-	-	-	-	-	-	-
Sculpin, Red Irish Lord	-	29	-	2	-	-	14	-	-	-	-	-	-	-	-
Sculpin, Yellow Irish Lord	-	236	-	5	-	3	905	-	-	-	-	-	-	-	-
Fish head /lips or parts	1	16	-	-	-	-	7	-	-	-	4	102	1	-	-
Fish - unidentified	-	1	4	-	-	6	57	2	-	-	-	1	1	-	-

** The count recorded as retained and later discarded for this species exceeded the number that were recorded as initially retained resulting in a negative number; this type of error can occur if one of the fish is either identified at a different taxonomic level, misidentified, or not recorded. The number retained is considered to be zero.*

Appendix Table C-6 -- Continued.

Species	Longline Halibut					Longline Pacific Cod					Longline Sablefish				
	Retained	Discarded			Unknown	Retained	Discarded			Unknown	Retained	Discarded			Unknown
		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	-	3	1	-	-	-	3	-	-	-	-	-	-	-	-
Rockfish, Black	83	8	-	-	-	34	1	-	-	-	1	-	-	-	-
Rockfish, Canary	23	2	1	-	-	1	-	-	-	-	-	1	-	-	-
Rockfish, Dark unidentified	1	5	-	-	-	-	-	-	-	-	-	-	-	-	-
Rockfish, Dusky (was Light Dusky)	30	23	-	-	-	4	8	-	-	-	15	4	-	-	-
Rockfish, Northern					-										
Rockfish, Quillback	299	85	3	-	-		20	1	-	-	-	-	-	-	-
Rockfish, Red Banded	235	51	1	-	-	4	1	-	-	-	8	55	1	-	-
Rockfish, Redstripe	-	-	-	-	-	-	-	-	-	-	1	-	-	-	-
Rockfish, Rosethorn	1	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Rockfish, Silvergray	15	14	-	-	-	13	1	-	-	-	-	1	-	-	-
Rockfish, Small Red unidentified	5	18	5	-	-	10	1	-	-	-	20	6	5	-	-
Rockfish, Tiger	10	-	-	-	-	1	1	-	-	-	-	-	-	-	-
Rockfish, Yelloweye	1,116	320	9	-	-		7	-	-	-	88	8	-	-	-
Rockfish, Rougheye	*79*	*18*	*1*	-	-	*15*	-	-	-	-	*472*	*185*	*6*	-	-
Rockfish, Shortraker	*65*	*159*	*8*	-	-	*9*	*2*	-	-	-	*629*	*150*	*8*	-	-
Rockfish, Shortraker/Rougheye unid.	*226*	*52*	*3*	-	-	*33*	*1*	-	-	-	*984*	*208*	*23*	-	-
Rockfish, Shortraker/Rougheye Total	370	229	12	-	-	57	3	-	-	-	2,085	543	37	-	-
Rockfish, Longspine Thornyhead					-										
Rockfish, Shortspine Thornyhead	*246*	*12*	*1*	-	-	*2*	-	-	-	-	*1,734*	*361*	*23*	-	-
Rockfish, Thornyhead unidentified	*797*	*113*	*8*	-	-	*1*	-	-	-	-	*6,118*	*1,569*	*136*	-	-
Rockfish, Thornyheads Total	1,043	125	9	-	-	3	-	-	-	-	7,852	1,930	159	-	-

Appendix Table C-6 -- Continued.

Species	Longline Halibut					Longline Pacific Cod					Longline Sablefish				
	Retained	Discarded			Unknown	Retained	Discarded			Unknown	Retained	Discarded			Unknown
		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*	
Shark															
Shark, Pacific Sleeper (Mud)	-	38	12	-	-	-	5	-	-	-	-	-	-	-	-
Shark, Spiny Dogfish	2	4,717	13	1	-	-	237	4	-	-	3	1,228	22	-	-
Skate					-										
Ray, (Skate) - unidentified	-	1	2	-	-	1	17	5	-	-	-	-	-	-	-
Skate - Soft Snout unidentified	1	253	-	-	-	7	287	2	-	-	1	155	2	1	-
Skate - Stiff Snout unidentified	-	-	-	-	-	-	6	-	-	-	-	-	-	-	-
Skate, Alaska	-	15	-	-	-	-	45	-	-	-	-	10	-	-	-
Skate, Aleutian	-	47	-	-	-	6	35	-	-	-	-	14	1	-	-
Skate, Bering	-	2	-	-	-	-	32	-	-	-	-	-	-	-	-
Skate, Big	*	609	24	-	-	312	706	10	-	1	-	12	1	-	-
Skate, Longnose	1	985	5	-	-	263	447	9	-	-	-	214	4	-	-
Skate, Roughtail	-	1	-	-	-	-	-	-	-	-	1	162	-	-	-
Crab					-										
Crab - unidentified (Family Unknown)	1	1	-	-	-	-		-	-	-	-	1	-	-	-
Crab, King - unidentified	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-
Crab, King, Couesi	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Crab, Tanner - Unidentified	-	1	-	-	-	-	-	-	-	-	-	16	1	-	-
Coral					-										
Bryozoans/Coral Unid	-	12	1	-	-	-	3	-	-	-	13	53	1	-	-
Coral, Red Tree	-	6	-	-	-	-	1	-	-	-	-	3	-	-	-
Invertebrate					-										
Invertebrate - unidentified	-	22	1	-	-	-	96	2	-	-	1	51	1	-	-
Sand Dollars, Sea Urchins	-	95	1	-	-	-	9	-	-	-	-	2	-	-	-
Sea Anemone - unidentified	-	32	-	-	-	-	84	-	-	-	-	10	-	-	-
Sea Whip, Sea Pen - unidentified	-	16	-	-	-	2	697	3	-	-	2	224	-	-	-
Snail - unidentified	-	78	-	-	-	-	5	2	-	-	-	-	-	-	-
Snail, Empty Shell	-	-	-	-	-	-	4	-	-	-	-	-	-	-	-
Sponge - unidentified	-	4	-	-	-	-	1	-	-	-	-	4	-	-	-
Seaworm - unidentified	-	-	-	-	-	-	-	-	-	-	-	87	2	-	-
Octopus - unidentified	3	39	7	-	-	13	8	19	-	-	1	5	1	1	-
Starfish - unidentified	-	84	6	-	-	2	62	2	-	-	-	13	2	-	-
Starfish, Basket	-	43	1	-	-	1	8	-	-	-	3	79	-	-	-
Starfish, Brittle	-	6	-	-	-	-	-	-	-	-	1	533	2	-	-
Starfish, Sunstar	4	1,078	31	-	-	4	3,028	193	-	4	3	25	-	-	-
Bird					-										
Albatross, Black-footed	-	4	-	-	-	-	-	-	-	-	-	-	-	-	-
Fulmar, Northern	-	-	-	-	-	-	2	-	-	-	-	-	-	-	-
Gull - unidentified	-	-	-	-	-	-	-	-	-	-	-	2	-	-	-
Misc. - rocks, mud, garbage, etc.	4		-	-	-	-	174	1	-	-	6	119	2	-	-

** The count recorded as retained and later discarded for this species exceeded the number that were recorded as initially retained resulting in a negative number; this type of error can occur if one of the fish is either identified at a different taxonomic level, misidentified, or not recorded. The number retained is considered to be zero.*

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

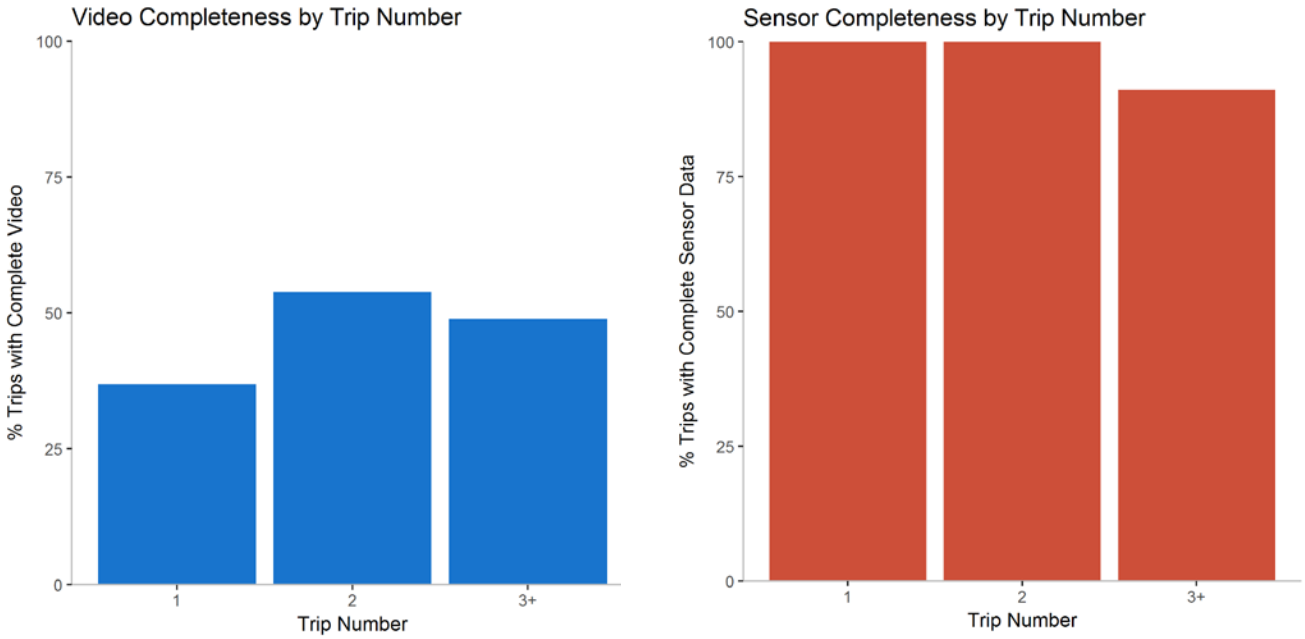
Discard Type	Release Method	Release Condition	Longline Halibut	Longline Pacific Cod	Longline Sablefish
General	Crucifying	Minor	0	0	1
		Moderate	0	0	1
		Severe	1	0	0
		Unknown	2	0	4
	Cut the gangion	Dead/Sand Fleas/Bleeding	2	0	0
		Minor	21	4	4
		Moderate	0	1	0
		Unknown	7	13	2
	Gaff	Dead/Sand Fleas/Bleeding	1	0	3
		Moderate	49	0	1
		Severe	3	1	0
		Unknown	184	0	30
	Hand release	Dead/Sand Fleas/Bleeding	4	0	0
		Minor	479	4	90
		Moderate	0	0	1
		Severe	1	0	0
		Unknown	175	8	11
	Hit the roller	Dead/Sand Fleas/Bleeding	2	0	0
		Minor	42	1	6
		Moderate	17	0	0
		Unknown	45	17	35
	Hook straightening	Minor	20	0	0
		Unknown	15	0	1
	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	44	33	14
		Minor	5680	2053	1064
		Moderate	25	18	8
		Severe	9	2	1
		Unknown	3024	1895	768
	Other careful release	Minor	1	0	1
		Unknown	2	2	0
	Other non-careful release	Minor	28	10	17
		Moderate	4	8	1
		Severe	0	1	0
		Unknown	38	38	5
	Unknown	Dead/Sand Fleas/Bleeding	5	0	0
		Minor	20	8	8
		Moderate	0	2	0
		Unknown	84	58	20
Damaged	Cut the gangion	Dead/Sand Fleas/Bleeding	6	0	0
	Gaff	Dead/Sand Fleas/Bleeding	9	0	21
	Hand release	Dead/Sand Fleas/Bleeding	30	0	6
	Hit the roller	Dead/Sand Fleas/Bleeding	0	0	1
	Hook straightening	Minor	2	0	0
	Hook twisting and shaking	Dead/Sand Fleas/Bleeding	239	5	56
		Minor	4	0	0
		Moderate	1	0	0
		Severe	2	0	0
		Unknown	4	1	0
	Other careful release	Dead/Sand Fleas/Bleeding	1	0	0
	Other non-careful release	Dead/Sand Fleas/Bleeding	6	0	2
	Unknown	Dead/Sand Fleas/Bleeding	0	1	0
DropOffAboveWater	No Selection	No Selection	205	24	25
DropOffBelowWater	No Selection	No Selection	14	2	3
TOTAL			**10,557**	**4,210**	**2,211**

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

Release Method	Longline Halibut		Longline Pacific Cod		Longline Sablefish		All Fisheries	
	Count	%	Count	%	Count	%	Total	% of total
Crucifying	3	> 1%			6	> 1%	9	> 1%
Cut the gangion	36	> 1%	18	> 1%	6	> 1%	60	> 1%
Gaff	246	2%	1	> 1%	55	2%	302	2%
Hand release	689	7%	12	> 1%	108	5%	809	5%
Hit the roller	106	1%	18	> 1%	42	2%	166	1%
Hook straightening	37	> 1%			1	> 1%	38	> 1%
Hook twisting and shaking	9,032	86%	4,007	95%	1,911	86%	14,950	88%
No Selection	219	2%	26	1%	28	1%	273	2%
Other careful release	4	> 1%	2	> 1%	1	> 1%	7	> 1%
Other non-careful release	76	1%	57	1%	25	1%	158	1%
Unknown	109	1%	69	2%	28	1%	206	1%
Grand Total	**10,557**		**4,210**		**2,211**		**16,978**	

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

Release Condition	Longline Halibut		Longline Pacific Cod		Longline Sablefish		All Fisheries	
	Count	%	Count	%	Count	%	Total	% of total
Dead/Sand Fleas/Bleeding	349	3%	39	1%	103	5%	491	3%
Minor	6,297	60%	2,080	49%	1,191	54%	9,568	56%
Moderate	96	1%	29	1%	12	1%	137	1%
Severe	16	> 1%	4	> 1%	1	> 1%	21	> 1%
Unknown	3,580	34%	2,031	48%	876	40%	6,487	38%
No Selection	219	2%	27	1%	28	1%	274	2%
Grand Total	**10,557**		**4,210**		**2,211**		**16,978**	



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

Acting Administrator of National Oceanic and Atmospheric Administration and Under Secretary of Commerce
Benjamin Friedman

Acting Assistant Administrator for Fisheries
Sam Rauch

May 2017

www.alaskafisheries.noaa.gov

OFFICIAL BUSINESS

National Marine Fisheries Service
Alaska Fisheries Science Center
7600 Sand Point Way N.E.
Seattle, WA 98115-6349