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Seabird Bycatch Estimates for Alaska Groundfish Fisheries

2016 through 2017

U.S. DEPARTMENT OF COMMERCE

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Introduction

Seabirds are unintentionally caught in commercial fisheries off Alaska; this unintentional catch is referred to as bycatch. Federal law requires bycatch be minimized to the extent practicable, and specific modifications to fishing gear and practices are required by Federal regulation to reduce seabird bycatch. Historically, most seabird bycatch off Alaska occurred in fisheries using demersal longline (i.e., hook-and-line) gear. Compliance with seabird avoidance regulations has decreased seabird bycatch by thousands of birds in fisheries using demersal longline gear off Alaska; however, bycatch of seabirds remains high in the commercial fisheries off Alaska each year.

NOAA's National Marine Fisheries Service (NOAA Fisheries) annually updates estimates of seabirds caught as bycatch in commercial groundfish fisheries operating in Federal waters off Alaska. This annual report details seabird bycatch estimates by gear type for the years 2007 through 2017 and supplements the "Seabird Bycatch and Mitigation Efforts in Alaska Fisheries Summary Report: 2007 through 2015" (Eich et al. 2016). The focus of this report is to add and describe seabird bycatch data for 2016 and 2017. This report presents bycatch estimates from the following gear types: demersal longline, pelagic trawl, non-pelagic trawl, and pot. These estimates do not apply to gillnet, seine, troll, or jig gear.

Albatross are a focal seabird species group for conservation efforts (for more information, see Eich et al. 2016). Short-tailed albatross (*Phoebastria albatrus*) are listed as endangered under the U.S. Endangered Species Act (ESA). On rare occasion, the fisheries using demersal longline gear off Alaska incidentally catch short-tailed albatross. In 2016 and 2017, NOAA Fisheries monitored bycatch of short-tailed albatross to assess compliance with the incidental take limit established by the U.S. Fish and Wildlife Service (USFWS) in its 2015 biological opinion on the effects of the groundfish fisheries of Alaska on endangered short-tailed albatross (USFWS 2015). USFWS anticipated up to six short-tailed albatross could be reported taken bi-annually (every 2 years) as a result of groundfish fishing activities using demersal longline or trawl gear in the Bering Sea and Aleutian Islands (BSAI) and Gulf of Alaska (GOA) fishery management plan (FMP) areas (Figure 1).

In addition to the endangered short-tailed albatross, two other species of albatross forage in waters off Alaska, Laysan (*Phoebastria immutabilis*) and black-footed (*Phoebastria nigripes*) albatross. Laysan and black-footed albatross are listed as birds of conservation concern by the USFWS, which means that without additional conservation efforts, they are likely to become candidates for listing under the ESA (USFWS 2008).

In 2016, NOAA Fisheries established a seabird working group to continually review the best available scientific information for methods to reduce bycatch of albatross and other seabirds in the Federal fisheries off Alaska.

Data Sources and Estimation Methods

Data Sources

Total catch estimates in the groundfish and halibut fisheries off Alaska are generated by the NOAA Fisheries Alaska Region Catch Accounting System (CAS) and are used to manage approximately 600 separate groundfish quotas in the BSAI and GOA. The CAS uses information from multiple data sources to estimate total groundfish and halibut catch, including at-sea discards, and estimates of bycatch of other species and seabirds. Data from the North Pacific Observer Program (Observer Program), dealer landing reports (also known as fish tickets), and at-sea production reports are combined to provide an integrated source for fisheries monitoring and within season decision-making. The Observer Program is operated by the NOAA Fisheries Alaska Fisheries Science Center (AFSC), which trains and oversees deployment of NOAA Fisheries-certified observers (observers) to collect scientific information. At-sea observer data are a key part of the CAS and allow the agency to gain an independent measurement of the amount and types of species caught in the commercial groundfish and halibut fisheries in the BSAI and GOA. Observer data provide a direct

estimate of species composition and weight, as well as a means to calculate catch and bycatch rates for unobserved fishing vessels.

Observers collect biological samples and fishery-dependent information on total catch and interactions with protected species (AFSC 2015, 2016), including fisheries bycatch of seabirds. The data used to estimate seabird mortality were collected by at-sea observers through the Observer Program using a statistically reliable sampling design (NMFS 2015, 2016). Information collected by observers provides the best available scientific information to manage the fisheries and to develop measures to minimize bycatch.

Observers collect data on seabird bycatch as part of their species composition sample. Observers identify each bird in their sample to the most accurate species or species group that they can. Species identification is verified for bird specimens collected through an AFSC-managed necropsy program. This program provides birds collected by observers from bycatch and ship strikes to a vendor to necropsy and verify the species identification. NOAA Fisheries is currently revising previous species identifications based on the necropsy verifications. Future versions of this report will reflect these upcoming changes.

There are known sampling biases in estimating total seabird mortality in some commercial fisheries off Alaska (Gilman et al. 2013; Fitzgerald et al. in prep; and summarized in Eich et al. 2016). For example, in the fisheries using longline gear, seabirds may fall off a hook underwater without being seen by the observer. Seabirds that fall off the hooks alongside the vessel are recorded if they occur within the observer sampling period. On trawl vessels, “cryptic” (i.e., not readily detectable by observers) seabird mortality can occur due to interactions with gear such as net-monitoring equipment (paravanes or third wires) or when seabirds are caught in the net wings and not landed with the fish catch. These mortalities are not included in the estimates reported below. The AFSC is evaluating these additional sources of mortality on trawl vessels, which can be three times the bycatch recorded in standard sampling, to determine the best method to monitor and include them in annual estimates (Fitzgerald et al. in prep).

Estimation Methods

Since 1993, two methods have been used to estimate seabird bycatch for the entire groundfish fisheries.¹ From 1993 through 2006, the AFSC produced the seabird bycatch estimates using a ratio estimator (Fitzgerald et al. 2008; AFSC 2014). Starting in 2007, NOAA Fisheries Alaska Region has produced bycatch estimates using a ratio estimator in the CAS (Cahalan et al. 2014).

In the CAS, observer data are used to create seabird bycatch rates (a ratio of the estimated bycatch to the estimated total catch in sampled hauls). The observed information from the at-sea samples is used to create bycatch rates that are applied to unobserved vessels. For trips that are unobserved, the bycatch rates are applied to industry supplied landings data of retained catch. Expanding on the observer data that are available, the extrapolation from observed vessels to unobserved vessels is based on varying levels of aggregated data (post-stratification). Data are matched based on processing sector (e.g., catcher/processor or catcher vessel), week, target fishery, gear, and Federal reporting area. Further detail on the estimation procedure, including levels of post-stratification, is available in Cahalan et al. (2014, 2010).

At each data run, the CAS produces estimates based on current data sets, which may have changed over time. Data can be updated as a result of observer debriefing, data quality checks, and analysis. Examples of the possible changes in the underlying data are changes in species identification, deletion of data sets where

¹Detailed methods used for seabirds were not published, but the same methods were used for marine mammal bycatch estimation and are published at <http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-167.pdf>. Both methods use the same primary data sources and a ratio estimator; however, the details, including the methods used for post-stratification, varied between the two approaches. To enable a comparison and transition to the CAS, seabird bycatch estimates were produced using both methods for 2004 through 2006 (Fitzgerald 2011a, 2011b). That comparison showed that the CAS seabird bycatch estimates were higher than the previous methods (Fitzgerald et al. in prep) in the fisheries using longline gear by 4.8 percent, 6.1 percent, and 13.6 percent for 2004 through 2006, respectively. For seabird bycatch estimates of fisheries using trawl gear, the CAS was 7.7 percent higher overall than the previous methods. This difference is likely due to improved ability in the CAS to extrapolate to portions of the fishery that are not directly observed.

data collection protocols were not properly followed, and changes in the landing or at-sea production reports where data entry errors were found. The totals in this report include some changes from previous reporting, and reflect the most recent data and estimates of the CAS. Additionally, within this report minor differences in the bycatch numbers may exist due to rounding.

For estimation, analysis, and reporting of seabird bycatch, many of the species categories identified by observers are consolidated into a larger group (Table 1). This includes codes for birds that cannot be identified further than the following species groups: albatross, shearwaters, storm petrel, murre, puffin, murrelet, alcid, and unidentified gulls. For example, in this report the species group “Gull” includes all Laridae except kittiwakes, which are reported separately due to conservation interest (especially for red-legged kittiwakes). Most gulls that observers or the AFSC-managed necropsy program identified to a specific code within this group are glaucous, glaucous-winged, or herring gulls. Gulls that observers or the necropsy program could not identify to a specific code were typically juvenile gulls and were classified as unidentified gulls. Other birds are a group of miscellaneous birds that could be identified as loon, grebe, seaduck, jaeger/skua, or tern. Unidentified birds could be any of the seabird species listed in Table 1 that the observer could not identify.

The Observer Program was originally structured as an interim program with coverage requirements based on groundfish vessel overall length and processing volume. In 2013, the program was restructured and changes were implemented regarding the method to deploy observers, how observer coverage is funded, and which vessels and processors must have some or all of their operations observed (77 FR 70062, November 21, 2012).

The restructured program has two features that affect seabird bycatch estimates. First, the vessel length-based observer coverage requirements were discontinued, and coverage is now based primarily on fishing mode (catcher vessel or catcher/processor). Vessels are either in a full coverage category (catcher/processors, with some exceptions) and take an observer on all trips, or in the partial coverage category (catcher vessels, with some exceptions) and take observers on a random selection of their fishing trips. This was an important change that increased the statistical reliability of data collected by the program. Second, the restructured program expanded observer coverage to previously unobserved fisheries including the Pacific halibut longline fishery. Seabird bycatch data are now available from this fishery, whereas in previous years, small amounts of halibut fishery information were collected when an operator had both halibut and sablefish individual fishing quota.

The seabird bycatch estimates from the CAS provide information on numbers of seabird bycatch per metric ton of catch, but this metric is different from how seabird bycatch rates are typically reported in other regions and countries. For example, the international reporting standard for fisheries using longline gear is seabird bycatch per 1,000 hooks. NOAA Fisheries is developing procedures that will report total effort and bycatch rates consistent with international reporting standards. Preliminary estimates of seabird bycatch per 1,000 hooks for Federal fisheries off Alaska using longline gear provided by Melvin et al. (in review) are included in the summary bycatch report (Eich et al. 2016).

Results and Discussion

This report estimates seabird mortality associated with Federal groundfish (2007 through 2017) and halibut (2013 through 2017) fisheries off Alaska and provides detailed descriptions of bycatch in 2016 and 2017. First, seabird bycatch estimates are provided for all gear types (longline, trawl, and pot) in the combined GOA and BSAI FMP reporting areas (Figure 1) and for each year (Table 2). Second, demersal longline bycatch estimates for the combined BSAI and GOA FMP areas (Table 3) are provided, followed by demersal longline bycatch estimates separated by major FMP area (Table 4 through Table 6). Third, the combined trawl fleet bycatch is shown (Table 7). Fourth, trawl bycatch separated by FMP area (BSAI or GOA) or gear type (pelagic or non-pelagic) is shown (Table 8 through Table 10). Seabird bycatch estimates for the pot

fishery are reported in Table 11. Finally, Table 12 provides seabird bycatch estimates by area, gear, target, and species or species group for 2010 through 2017.

All Gear Types and Fisheries

The 2016 and 2017 estimated seabird bycatch for the combined groundfish and halibut fisheries (10,361 and 8,448 birds, respectively) was above the 2007 through 2017 annual average of 7,324 birds. Looking at overall bycatch (all gear types, all areas combined) for the last 11 years (2007 through 2017), 2016 was the second highest in this time series, the highest estimated seabird bycatch since 2009; 2017 was fifth highest during the time series (Table 2). Figure 2 depicts estimated seabird bycatch in the groundfish fisheries from 1993 through 2017 using results from the two analytical methods noted above—the AFSC internal analysis for 1993 through 2006 (Fitzgerald et al. 2008) and the CAS for 2007 through 2017. The notable decline in estimated seabird bycatch in 2002 was due to the voluntary deployment of streamer lines as bird deterrents (Melvin et al. 2001) on many demersal longline vessels (for further detail, see Eich et al. 2016). Seabird mitigation measures for longline vessels were implemented by regulations in 2004 and required paired or single streamer lines for vessels larger than 55 feet length overall, which accounted for the vast majority of seabird bycatch.² Since then, annual seabird bycatch in the fisheries using demersal longline gear has remained below 10,000 birds, dropping as low as 2,100 in 2014 (Table 3).

In an analysis of 2016 seabird bycatch prepared for this paper, 91 percent (9,402 birds) of the 2016 estimated seabird bycatch occurred in the Bering Sea, 6 percent (631 birds) in the GOA, and 3 percent (329 birds) in the Aleutian Islands. These proportions are more heavily attributed to the Bering Sea than the 2007 through 2015 average proportions (Bering Sea [76 percent]; GOA [16 percent]; and Aleutian Islands [8 percent]).

In 2017, 67 percent (5,645 birds) of estimated seabird bycatch occurred in the Bering Sea, 18 percent (1,500 birds) in the GOA, and 15 percent (1,303 birds) in the Aleutian Islands. These proportions are similar to the 2007 through 2016 average proportions in the Bering Sea (79 percent) and in the GOA (15 percent). An exception is the proportion of estimated seabird bycatch, which was much higher in 2015 (20 percent) in the Aleutian Islands, relative to the Bering Sea and GOA, versus the 2007 through 2015 average proportion of estimated seabird bycatch (8 percent).

Consistent with prior years, seabird bycatch estimates in 2016 and 2017 were dominated by Northern fulmar (*Fulmarus glacialis*; 53 percent for both years; Table 2). In 2016, estimated Northern fulmar bycatch (n = 5,452 birds) increased by 39 percent above the average during the time series (2007 through 2015—3,925 birds per year). In 2017, estimated Northern fulmar bycatch (n = 4,440 birds) increased by 9 percent above the average during the time series (2007 through 2016, n = 4,077 birds per year). Fulmar bycatch has ranged from an estimated 33 percent to 72 percent of the total seabird bycatch since 2007. Average annual mortality for Northern fulmar since 2007 has been 4,110 birds. When compared to estimates of the total population size in Alaska of 1.4 million birds (Denlinger 2006), observed fisheries account for an annual mortality of 0.29 percent. While this mortality is low, local population depletions could occur if the mortality is colony-specific (Hatch et al. 2010).

In 2016 and 2017, shearwaters (Family Procellariidae) were the second most frequently occurring birds in the bycatch (33 and 25 percent of total seabird bycatch, respectively) (Table 2). Shearwater bycatch was 8.71 times higher in 2016 (n = 3,416 birds) compared to 2015 (n = 392 birds), and the 2016 bycatch was 12.31 times greater than the 3-year average from 2013 through 2015 (n = 277 birds). In 2017, shearwater bycatch decreased by 39 percent compared to 2016 but was 56 percent above the 3-year average from 2014 through 2016 (n = 1,332 birds). Estimated shearwater bycatch has ranged from 3 percent to 35 percent of the total estimated seabird bycatch since 2007. Looking at overall shearwater bycatch (all gear types, all areas combined) for the last 11 years (2007 through 2017), 2016 had the second highest levels, the most since 2007 (n = 3,586 birds). 2017 ranked third highest shearwater bycatch during the time series

² See regulations at 50 CFR part 679.24(e)(2) for more specific requirements.

(2007 through 2017) (Table 2). Average annual mortality for shearwaters since 2007 has been 1,206 birds. The total worldwide population of short-tailed shearwater (*Puffinus tenuirostris*) and sooty shearwater (*Ardenna grisea*) is estimated to be 43 million birds (Denlinger 2006; calculated from Table 2 in Eich et al. 2016).

Gulls (Family Laridae) were the third most frequently occurring birds in the bycatch (7 percent) in 2016 and the fourth most frequently occurring birds in the bycatch (8 percent) in 2017. Gull bycatch has ranged from 7 percent to 30 percent of the total estimated seabird bycatch since 2007. Average annual mortality for gulls from 2007 through 2017 was 1,124 birds (range = 581 to 2,232 birds). Gull bycatch decreased by an estimated 40 percent from 2015 to 2016 and was 12 percent below the 3-year average from 2013 through 2015 (n = 863 birds). The 2016 estimated gull bycatch was the lowest proportion (compared to all other species) since 2007. Of the various gull species, estimates of the total number of breeders in Alaska is roughly 366,100 birds (calculated from Table 1 in Eich et al. 2016 where population numbers were taken from Birds of North America Online – Species Accounts and Kushlan et al. 2002).

In 2017, black-footed albatross (Family Diomedidae) were the third most frequently occurring birds in the bycatch (9 percent). Black-footed albatross bycatch was 3.93 times greater in 2017 (n = 790 birds) compared to 2016 (n = 201 birds) and was 2.79 times greater than the 3-year average from 2014 through 2016 (n = 283 birds). Black-footed albatross bycatch has ranged from 1 percent to 12 percent of the total estimated seabird bycatch since 2007. Average annual mortality for black-footed albatross since 2007 has been 280 birds. Estimates of the approximate population size of black-footed albatross is 61,700 breeding pairs (Naughton et al. 2007).

Albatross

No takes of short-tailed albatross were observed in the groundfish fisheries in 2016 or 2017. The incidental take statement in the 2015 biological opinion on the groundfish fisheries exempts the take of six short-tailed albatross in a 2-year period (USFWS 2015). No observed takes of short-tailed albatross have occurred in the groundfish fisheries (either by demersal longline, trawl, or pot) since December 2014.

In addition to the endangered short-tailed albatross, there is also conservation concern for Laysan and black-footed albatross (USFWS 2008). In 2016, 332 albatross (201 black-footed, 131 Laysan albatross) were estimated to have been caught in the fisheries off Alaska, a decrease of 41 percent compared to the previous 3-year average (2013 through 2015, n = 563 birds). In 2016, Laysan albatross bycatch decreased by 24 percent, compared to the previous 3-year average (2013 through 2015, n = 172 birds). In 2017, 837 total albatross (790 black-footed, 47 Laysan, 0 unidentified, 0 short-tailed) were estimated to have been caught in the fisheries off Alaska, an increase of 87 percent compared to the previous 3-year average (2014 through 2016, n = 448 birds). In 2017, Laysan albatross bycatch decreased by 69 percent, compared to the previous 3-year average (2014 through 2016, n = 150 birds).

The reason for the increase in black-footed albatross bycatch in 2017, mentioned in the previous section, is unknown. The increase was primarily attributed to the sablefish (53 percent, n = 422 birds) and halibut (43 percent, n = 340 birds) fisheries and occurred in the Central Regulatory Area (Statistical Areas 620 and 630, between 147 degrees and 159 degrees W. longitudes) of the Gulf of Alaska. Additional bycatch rate analyses are required to determine if other underlying issues such as ocean conditions, food availability, albatross population abundance or distribution changes in Alaskan waters, or fishery practices are driving this change.

As noted earlier, the 2013 through 2017 bycatch estimates included two sources of seabird mortality that previous years did not include: vessels less than 60 feet length overall in the groundfish fisheries and the entire halibut fishery. Including these smaller vessels and the halibut fishery provide a better estimate of overall albatross bycatch in Alaska. The estimated 2013 through 2017 albatross bycatch in the sablefish fisheries (n = 2,155 birds) surpassed the estimated contribution from the halibut fishery (n = 529 birds). Although albatross habitat overlaps with both the sablefish and the halibut fisheries, albatross spend more time over continental shelf break and slope habitat (Fischer et al. 2009; Suryan et al. 2007), which is most

commonly associated with the sablefish fishery; the halibut fishery generally occurs in shallower water on the shelf. Thus, more interactions between albatross and sablefish vessels would be expected, unless albatross or fisheries shift their distribution in a given year.

Demersal Longline Gear

Based on standard observer sampling protocols, demersal longline gear in Alaska groundfish fisheries accounted for 92 percent of the estimated seabird mortality in 2016 (n = 9,486 birds) and 76 percent of the estimated seabird mortality in 2017 (n = 6,455 birds), which is similar to the average estimated seabird mortality from 2007 through 2015 (88 percent; range 80 to 96 percent).

From 2007 through 2017, most of the demersal longline gear estimated seabird bycatch occurred in the Bering Sea (80 percent) compared to the Aleutian Islands (4 percent) and GOA (16 percent). In fact, most (70 percent) of the total (all gear types) seabird bycatch off Alaska occurred in the Bering Sea fisheries using demersal longline gear (range 55 percent to 86 percent from 2007 through 2017).

Consistent with results for all gear types combined, most 2016 estimated seabird bycatch by demersal longline gear was Northern fulmar (52 percent, n = 4,911 birds); shearwaters (34 percent, n = 3,178 birds); and gulls (8 percent, n = 755 birds) (Table 3). Consistent with results for all gear types combined, most 2017 estimated seabird bycatch by demersal longline gear was Northern fulmar (54 percent, n = 3,475 birds); shearwaters (18 percent, n = 1,154 birds); and black-footed albatross (12 percent, n = 790 birds) (Table 3). From 2007 through 2017, gulls were most commonly the second or third highest in terms of bycatch. However, in 2017, the relative bycatch of gulls was low (n = 679 birds), and the relative bycatch of black-footed albatross was high (n = 790 birds).

Of the demersal longline fisheries that have seabird bycatch, the bulk of recent fishery effort in the Bering Sea occurs in the Pacific cod (*Gadus microcephalus*) demersal longline fleet (Eich et al. 2016). While this fishery accounts for the greatest amount of seabird bycatch (2007 through 2017 average = 79 percent), it captures an average of 11 percent of the total albatross bycatch. However, nearly all of the estimated short-tailed albatross takes that have occurred since 2003 have been in the Pacific cod demersal longline fleet (n = 24 of the total 31 birds). As noted earlier, no endangered short-tailed albatross takes by demersal longline gear were observed in 2016 or 2017 in the Federal fisheries off Alaska.

Trawl Gear

When discussing seabird bycatch attributed to trawl gear, it is important to remember that standard observer sampling does not account for all seabird mortality. This discussion focuses only on the numbers reported, which were generated from the standard observer sample, i.e., birds caught in the net and brought aboard the vessel. A number of efforts are underway to better understand the amount of cryptic mortality related to trawl vessels and how to properly extrapolate that to provide a fleet-wide estimate. Those numbers will be provided pending completion of ongoing research and development.

Seabird mortality related to trawl gear constitutes about 10 percent (range 4 to 17 percent) of the overall estimated 2007 through 2017 seabird bycatch (Table 2 and Table 7). This is consistent with the 2016 and 2017 proportions of estimated seabird bycatch attributed to the fisheries using trawl gear (2016: 6 percent, n = 599 birds; 2017: 16 percent, n = 1,364 birds).

For trawl gear, Northern fulmar again dominate the estimated bycatch of seabirds followed by shearwaters (spp.) and gulls (spp.) (Table 7). There is significant inter-annual variability in bycatch of Northern fulmar (range = 85 to 652 birds, average = 422 birds), shearwaters (range = 1 to 928 birds, average = 209 birds), and gulls (range = 0 to 303 birds, average = 42 birds) between 2007 through 2017.

Most estimated seabird bycatch taken by trawl gear occurs in the BSAI, averaging 92 percent of the trawl seabird bycatch from 2007 through 2017 (Table 8). Only a minimal amount of estimated northern fulmar and black-footed-albatross bycatch is attributed to trawl gear in the GOA from 2007 through 2017 (Table 9). Most 2016 seabird bycatch from trawl gear in Alaska fisheries was Northern fulmar (51 percent, n = 307

birds; Table 7), followed by shearwaters (40 percent, n = 238 birds). Most 2017 seabird bycatch from trawl gear in Alaska fisheries was shearwaters (68 percent, n= 928 birds), followed by Northern fulmar (27 percent, n = 372 birds). An unprecedented estimate of 772 shearwaters was taken in the rockfish fishery in the Aleutian Islands in 2017 (Table 12). Up until 2017, no shearwaters had been reported for the rockfish fishery, and the highest estimate of bycatch of any avian species from 2007 through 2017 was 38 Northern fulmar in 2015. The reasons for these high shearwater estimates in 2017 are unclear.

Albatross bycatch in Alaskan groundfish trawl fisheries is rare. No endangered short-tailed albatross takes by trawl gear have been observed in the Federal fisheries off Alaska. Traditionally, in the pre-2007 bycatch numbers (Fitzgerald et al. 2008) only Laysan or unidentified albatross were observed in fisheries using trawl gear. Only nine Laysan albatross were estimated taken in the BSAI (Table 8) for the period reported here, all of which were taken in 2009. However, at-sea observers have reported Laysan albatross mortalities from gear collisions (primarily third wires) throughout this period (Shannon Fitzgerald, AFSC, unpublished data). The AFSC is designing protocols to capture these reports and extrapolate the mortalities to the fleet. In 2012, a black-footed albatross mortality was observed in the trawl fleet for the first time since monitoring started in 1993, extrapolating to an estimated 60 birds taken for the GOA fleet that year.

No prominent differences exist between seabird bycatch in 2016 versus 2007 through 2015 for pelagic and non-pelagic trawl gear (Table 10). For 2007 through 2017, non-pelagic gear accounted for 71 percent of trawl seabird mortality. Non-pelagic gear had greater estimated seabird bycatch in 2017 (1,254 birds) compared to the 10 previous years reported here, which ranged from 115 to 1,099 birds (average 470 birds) (Table 10). This was in part due to a high estimate of shearwater bycatch (928 birds) that occurred in the non-pelagic trawl fleet in the Aleutian Islands. For 2007 through 2017, seabird bycatch in pelagic gear ranged from 57 to 601 birds (average 203 birds). For 2007 through 2017, all albatross occurred in non-pelagic gear, as did most alcids, shearwaters, and gulls. Only Northern fulmar had higher bycatch in pelagic fisheries in some years (7 of 11 years).

Pot Gear

The pot fishery remains the gear type with the least amount of estimated seabird bycatch (Table 11), representing an average of 2.5 percent of the total seabird bycatch from all gear types from 2007 through 2018 (range 0.4 to 7.4 percent). The 2017 estimated seabird bycatch from pot gear (629 birds) was 7.4 percent of the total from all gear types, which was higher than in previous years (2007 through 2016) and 345 percent higher than the 2007 through 2016 average of 141 birds. Seabird bycatch in pot fisheries occurs primarily in the Bering Sea and GOA with very little bycatch occurring in the Aleutian Islands. In 2016, 66 percent (n = 181 birds) of the seabird bycatch by pot gear was in the Bering Sea, and 34 percent (n = 95 birds) occurred in the GOA. No birds were estimated to have been taken as bycatch by pot gear in the Aleutian Islands in 2016. In 2017, 91 percent (n = 572 birds) of the seabird bycatch by pot gear was in the Bering Sea, and 9 percent (n = 57 birds) occurred in the Aleutian Islands. No birds were estimated to have been taken as bycatch by pot gear in the GOA in 2017.

Only Northern fulmars, shearwaters, gulls, murre, and alcids have been taken as bycatch in pot fisheries. It is likely that the surface and near-surface foragers (Northern fulmars, shearwaters, and gulls) are actually “captured” in pots as a result of collisions with pots on deck during bad weather, or by birds that wander into a pot on deck (as reported by several fisheries observers), and are then in the pot as it is deployed. Diving birds may enter a pot while it is fishing. Some of these birds may be regurgitated from Pacific cod stomachs when the cod are captured. Observers have collected full-sized murre (*Uria* spp.) and tufted puffins (*Fratercula cirrhata*) from Pacific cod stomachs and some seafood processing plants also reported small alcids in cod stomachs (Shannon Fitzgerald, AFSC, unpublished data), so this might be a contributing factor. Observers are not asked to examine the recovered bird specimens to look for signs of being partially digested. Although 2017 had the highest amount of bycatch for this gear type from 2007 through 2017, pot-fishing does not represent a conservation concern for Alaska seabirds. However, if the current increasing trend continues, this may change.

Annual Variation

We are now able to look at eleven years of comparative data: 2007 through 2012 (the six years preceding Observer Program restructuring) and 2013 through 2017 (the five years following restructuring). Table 12 breaks down estimated seabird bycatch by region, gear, and target fishery.

In Table 12, the Bering Sea and Aleutian Islands are combined, which follows standard fishery management practices in Alaska for many species. The BSAI Pacific cod demersal longline fleet had the highest levels of estimated seabird bycatch each year.

Through all years, the GOA demersal longline sablefish fishery had the highest estimated takes of albatross. This is not surprising because the sablefish fishery has a high degree of overlap with black-footed albatross distribution. However, for the first time since halibut observer coverage began in 2013, the halibut fishery had comparable albatross bycatch in 2017. In the pre- versus post-year periods around Observer Program restructuring (i.e., 2007 through 2012 versus 2013 through 2017), the estimated bycatch of Laysan albatross in the BSAI and GOA demersal longline fleets remained about the same with a pre- and post-restructuring average of 147 and 139 birds per year, respectively. This indicates that most of the estimated Laysan albatross bycatch primarily occurred in the groundfish fisheries because the addition of observer coverage on the halibut fleet in 2013 did not noticeably affect the estimated bycatch. The expansion of observer coverage has occurred largely in the GOA, with more demersal longline vessels carrying observers (NMFS 2015, 2016) due to their smaller size and extensive halibut fishery effort. This has affected the estimated bycatch of black-footed albatross, which has pre- and post-restructuring estimates in the BSAI and GOA groundfish and halibut demersal longline fleets of 156 versus 418 birds per year, respectively. For 2007 through 2017, the GOA demersal longline sablefish fishery had the highest estimated takes of black-footed albatross relative to other fisheries.

A variety of factors could influence seabird bycatch and our ability to accurately estimate bycatch, including changes in fishing behavior, implementation of seabird avoidance gear, observer coverage, seabird distribution, population trends, prey availability, and other ecosystem changes. Determining how seabird bycatch numbers and trends are linked to changes in ecosystem components is difficult because many covariates affect seabird bycatch rates, and the relative importance of the different factors is difficult to parse. Fishermen have noted in some years that the birds appear “starved” and attacked baited demersal longline gear more aggressively (AFSC 2014). In 2014, seabird bycatch off Alaska was at its lowest levels from 2007 through 2015 (driven by lower Northern fulmar and gull bycatch), but albatross numbers were still comparable to the 2007 through 2017 annual average of 435 birds. This could indicate poor ocean conditions in the North Pacific as albatross traveled from the Hawaiian Islands to Alaska.

The demersal longline fishery off Alaska typically dominates the overall estimated bycatch trends, although we have previously noted the bias in reported trawl-related mortality estimates (for further detail, see Eich et al. 2016). Fishing effort has been known to shift based on market prices for particular fish species, the available harvest levels of target and non-target fish species, prohibited species limits, and weather. These changes in fishing effort can affect bycatch numbers.

Seabird bycatch is best characterized as having a high degree of inter-annual variability. This could indicate changes in food availability rather than drastic changes in how well the fleet employs mitigation gear. A focused investigation of this aspect of seabird bycatch is needed and could inform management of poor ocean conditions if seabird bycatch rates (reported in real time) were substantially higher than normal.

Large variation in overall seabird bycatch occurred between 2007 and 2017, with the largest change from one year to the next totaling 5,746 birds. The general trend in total seabird bycatch levels over this time series depicted oscillating years of relatively high to relatively low levels of bycatch from 2007 through 2011 (range of 5,001 to 10,747 birds), followed by relative stable low levels from 2012 through 2015 (range of 2,455 to 6,093 birds), before again increasing to higher levels in 2016 (n = 10,361 birds) and 2017 (n = 8,448 birds).

These increases and decreases are largely driven by the demersal longline fisheries. The increased seabird bycatch estimated in the fisheries using demersal longline gear from 2015 to 2016 and 2017 was due to a tremendous increase in shearwaters (from 330 birds in 2015 to 3,178 birds in 2016 and 1,154 birds in 2017) and Northern fulmars (from 2,887 birds in 2015 to 4,911 birds in 2016 and 3,475 birds in 2017). Bycatch of gulls and Laysan albatross in the fisheries using demersal longline gear decreased from 2015 to 2016 and 2017 (gulls from 1,265 birds in 2015 to 755 birds in 2016 and 679 birds in 2017; Laysan albatross from 221 birds in 2015 to 131 birds in 2016 and 47 birds in 2017).

An important aspect of these data is that the Observer Program was restructured in 2013 when observers were placed on vessels less than 60 feet length overall (of all gear types) for the first time and also first began observing in the previously unobserved halibut fishery. The addition of observers to many vessels in the GOA contributed important data for our understanding of seabird bycatch patterns and quantities. Note that in 2014, the year after the halibut fishery was observed for the first time, the overall estimated seabird bycatch in the groundfish and halibut fisheries, for all gear types combined, was the lowest ever at 2,455 birds; although, overall estimated seabird bycatch numbers increased again after 2015.

Further reducing seabird bycatch is quite challenging given the relatively rare nature of bycatch events. Dietrich and Fitzgerald (2010) found in an analysis of 35,148 Pacific cod demersal longline sets from 2004 to 2007 that the most common species caught as bycatch, the Northern fulmar, only occurred in 2.5 percent of all observed sets. Albatross, a focal species for conservation efforts, occurred in less than 0.1 percent of sets. However, given the vast size of the fishery, the total bycatch can add up to thousands of Northern fulmar or hundreds of albatross.

Fisheries

Examining the three fisheries responsible for the majority of seabird bycatch—Pacific cod, sablefish, and halibut demersal longline—the average annual seabird bycatch for 2013 through 2017 was 4,401, 660, and 362 birds per year, respectively. In 2016, the Pacific cod, sablefish, and halibut demersal longline estimated seabird bycatch was 8,607, 438, and 186 birds, respectively (Table 12). In 2017, the Pacific cod, sablefish, and halibut demersal longline, estimated seabird bycatch was 4,496, 736, and 1,068 birds, respectively (Table 12).

Focusing solely on the bycatch of albatross (unidentified, short-tailed, Laysan, and black-footed) in these fisheries, the Pacific cod, sablefish, and halibut fisheries using demersal longline gear average 36, 342, and 106 albatross per year, respectively, for 2007 through 2017 (average for halibut fisheries calculated for 2013 through 2017). Seabird bycatch levels and rates are highly variable among years; however, sablefish has higher estimated albatross bycatch relative to other fisheries. Therefore, future conservation efforts for mitigating albatross bycatch should focus on the sablefish fleet for maximum benefit. The endangered species focus should remain on the Pacific cod fleet, however, with an average estimated mortality (2007 through 2017) of about 2 short-tailed albatross per year. Takes of short-tailed albatross have not been observed in the sablefish fishery since the mid-1990s. The only other fishery with a short-tailed albatross take is the BSAI Greenland turbot fishery in which 2 short-tailed albatross were recorded taken in 2014 (only 1 bird was in the observer sample). When expanded by the CAS, the average estimated mortality (2007 through 2017) across the Greenland turbot fishery is about 1 short-tailed albatross per year.

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References

- Alaska Fisheries Science Center (AFSC). 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 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 at https://www.afsc.noaa.gov/FMA/Manual_pages/MANUAL_pdfs/manual2016_2.pdf.
- AFSC. 2014. Seabird Bycatch Estimates for Alaskan Groundfish Fisheries, 2007–2013. Resource Ecology and Ecosystem Management Division. Unpublished report. Alaska Fisheries Science Center, 7600 Sand Point Way N.E., Seattle, Washington, 98115. Available at http://www.afsc.noaa.gov/REFM/REEM/Seabirds/Seabird%20bycatch%202007%20to%202013_Alaskan%20Gndfish_Dec2014.pdf.
- Birds of North America Online. Accessed September 6, 2016. Species Accounts. Cornell Lab of Ornithology and the American Ornithologists' Union. Available at <http://bna.birds.cornell.edu/bna/species>.
- Cahalan, J., J. Gasper, and J. Mondragon. 2014. Catch sampling and estimation in the Federal groundfish fisheries off Alaska, 2015 edition. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-286, 46 p. Available at <http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-286.pdf>.
- Cahalan, J., J. Mondragon, and J. Gasper. 2010. Catch sampling and estimation in the Federal groundfish fisheries off Alaska. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-AFSC-205, 42 p. Available at <http://www.afsc.noaa.gov/Publications/AFSC-TM/NOAA-TM-AFSC-205.pdf>.
- Denlinger, L.M. 2006. Alaska Seabird Information Series. Unpubl. Rept., U.S. Fish and Wildlife Service, Migratory Bird Management, Nongame Program, Anchorage, AK. Available at https://www.fws.gov/alaska/mbsp/mbm/seabirds/pdf/asis_complete.pdf.
- Dietrich, K. S., and S. M. Fitzgerald. 2010. Analysis of 2004–2007 vessel-specific seabird bycatch data in Alaska demersal longline fisheries. AFSC Processed Rep. 2010-04, 52 p. Alaska Fish. Sci. Cent., NOAA, Natl. Mar. Fish. Serv., 7600 Sand Point Way NE, Seattle WA 98115.
- Eich, A.M., K.R. Mabry, S.K. Wright, and S.M. Fitzgerald. 2016. Seabird Bycatch and Mitigation Efforts in Alaska Fisheries Summary Report: 2007 through 2015. U.S. Dep. Commer., NOAA Tech. Memo. NMFS-F/AKR-12, 47 p. Available at <https://repository.library.noaa.gov/view/noaa/12695>.
- Fischer, K.N., R.M. Suryan, D.D. Roby, and G.R. Balogh. 2009. Post-breeding season distribution of black-footed and Laysan albatrosses satellite-tagged in Alaska: Inter-specific differences in spatial overlap with North Pacific fisheries. *Biological Conservation* 142:751–760.
- Fitzgerald, S. 2011a. Preliminary Seabird bycatch Estimates for Alaskan Groundfish Fisheries, 2007–2010. Available at https://www.afsc.noaa.gov/refm/reem/Seabirds/Seabird%20bycatch%202007%20to%202010_Alaskan%20Gndfish_PrelimReport.pdf.
- Fitzgerald, S. 2011b. Seabird Bycatch Estimation for Alaskan Groundfish Fisheries: Comparative results of two estimation procedures for 2004-2006. Alaska Fisheries Science Center REFM Division, Resource Ecology and Ecosystem Monitoring Program. Unpublished report.

Fitzgerald, S.M., K.D. Dietrich, and A. Wicklund. In prep. Seabird bycatch in Alaska trawl fisheries – A comparison of observer sampling protocols. Unpublished data available from NOAA Fisheries Alaska Fisheries Science Center, shannon.fitzgerald@noaa.gov.

Fitzgerald, S.M., M.A. Perez, and K.S. Rivera. 2008. Summary of seabird bycatch in Alaskan groundfish fisheries, 1993 through 2006. In Boldt, J. (Ed). Ecosystem considerations 2009, Appendix C of the Bering Sea/Aleutian Islands and Gulf of Alaska groundfish stock assessment and fishery evaluation report. Anchorage, AK: North Pacific Management Council. pp. 116–141.

Gilman, E., P. Suuronen, M. Hall, and S. Kennelly. 2013. Causes and methods to estimate cryptic sources of fishing mortality. *Journal of Fish Biology* 83:766–803.

Hatch, S. A., V. A. Gill, and D. M. Mulcahy. 2010. Individual and colony-specific wintering areas of Pacific northern fulmars (*Fulmarus glacialis*). *Canadian Journal of Fisheries and Aquatic Sciences* 67:386–400.

Kushlan, J.A., M.J. Steinkamp, K.C. Parsons, J. Capp, M.A. Cruz, M. Coulter, I. Davidson, L. Dickson, N. Edelson, R. Elliot, R.M. Erwin, S. Hatch, S. Kress, R. Milko, S. Miller, K. Mills, R. Paul, R. Phillips, J. E. Saliva, B. Sydeman, J. Trapp, J. Wheeler, and K. Wohl. 2002. Waterbird Conservation for the Americas: The North American Waterbird Conservation Plan, version 1. Waterbird Conservation for the Americas, Washington, D.C.

Melvin, E.F., K.S. Dietrich, R.M. Suryan, and A. Gladics. In prep. Preliminary analysis of seabird bycatch rates in Alaska longline fisheries. Unpublished raw data. University of Washington, Seattle, WA.

Melvin, E.F., J.K. Parrish, K.S. Dietrich, and O.S. Hamel. 2001. Solutions to seabird bycatch in Alaska's demersal longline fisheries. Project A/FP-7, WSG-AS 01-01, Washington Sea Grant. Available at <https://wsg.washington.edu/wordpress/wp-content/uploads/publications/Solutions-to-seabird-bycatch-in-Alaska's-demersal-longline-fisheries.pdf>. Accessed October 31, 2016.

NMFS (National Marine Fisheries Service). 2016. 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 at <https://alaskafisheries.noaa.gov/sites/default/files/2017finaladp.pdf>.

NMFS (National Marine Fisheries Service). 2015. 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 at <https://alaskafisheries.noaa.gov/sites/default/files/final2016adp.pdf>.

Naughton, M.B, M.D. Romano, T.S. Zimmerman. 2007. A Conservation Action Plan for Black-footed Albatross (*Phoebastria nigripes*) and Laysan Albatross (*P. immutabilis*), Ver. 1.0. Available at <https://www.fws.gov/pacific/migratorybirds/pdf/Albatross%20Action%20Plan%20ver.1.0.pdf>.

Suryan, R.M., K.S. Dietrich, E.F. Melvin, G.R. Balogh, F. Sato, and K. Ozaki. 2007. Migratory routes of short-tailed albatrosses: Use of exclusive economic zones of North Pacific Rim countries and spatial overlap with commercial fisheries in Alaska. *Biological Conservation* 137:450-460.

U.S. Fish and Wildlife Service (USFWS). 2015. Biological Opinion for the Effects of the Fishery Management Plans for the Gulf of Alaska and Bering Sea/Aleutian Islands Groundfish Fisheries and the State of Alaska Parallel Groundfish Fisheries, December 2015. 49 pp. Available at <https://alaskafisheries.noaa.gov/sites/default/files/analyses/usfws-biop-122315.pdf>.

USFWS. 2008. Birds of Conservation Concern 2008. United States Department of Interior, Fish and Wildlife Service, Division of Migratory Bird Management, Arlington, Virginia. 85 pp. Available at <https://www.fws.gov/migratorybirds/pdf/grants/BirdsofConservationConcern2008.pdf>.

Table 1 Species and species group categories used in this 2018 annual report¹ and the individual species included in the grouping.

| Species/species Group | Includes | Classification |
|------------------------------|--|---|
| Short-tailed Albatross | n/a | <i>Phoebastria albatrus</i> |
| Laysan Albatross | n/a | <i>Phoebastria immutabilis</i> |
| Black-footed Albatross | n/a | <i>Phoebastria nigripes</i> |
| Unidentified Albatross | Short-tailed, Laysan, or black-footed | n/a |
| Northern Fulmar | n/a | <i>Fulmarus glacialis</i> |
| Shearwaters | Unidentified shearwater | <i>Ardenna</i> or <i>Puffinus</i> spp. |
| | Sooty shearwater | <i>Ardenna grisea</i> |
| | Short-tailed shearwater | <i>Puffinus tenuirostris</i> |
| | Unidentified dark shearwater | <i>A. grisea</i> or <i>P. tenuirostris</i> |
| | Unidentified procellarid | Procellariiformes |
| Storm Petrel | Unidentified storm petrel | <i>Oceanodroma</i> spp. |
| | Fork-tailed storm petrel | <i>O. furcata</i> |
| | Leach's storm petrel | <i>O. leucorhoa</i> |
| Gull | Unidentified gull | Family Laridae |
| | Herring gull | <i>Larus argentatus</i> |
| | Glaucous gull | <i>Larus hyperboreus</i> |
| | Glaucous-winged gull | <i>Larus glaucescens</i> |
| | Slaty-backed gull | <i>Larus schistisagus</i> |
| | Gull hybrid | Family Laridae |
| Kittiwake | Black-footed kittiwake | <i>Rissa tridactyla</i> |
| | Red-legged kittiwake | <i>Rissa brevirostris</i> |
| Murre | Unidentified murre | <i>Uria</i> spp. |
| | Thick-billed murre | <i>Uria lomvia</i> |
| | Common murre | <i>Uria aalge</i> |
| Puffin | Unidentified puffin | <i>Fratercula</i> spp. |
| | Horned puffin | <i>F. corniculata</i> |
| | Tufted puffin | <i>F. cirrhata</i> |
| | Rhinoceros auklet | <i>Cerorhinca monocerata</i> |
| Auklet | Unidentified murrelet or auklet murrelet | Several genera <i>Brachyramphus</i> spp. and others |
| | Auklet | <i>Aethia</i> spp. and others |
| Other Alcid | Unidentified alcid | <i>Alcidae</i> |
| | Guillemot, unidentified | <i>Cephus</i> spp. |
| Cormorant | Unidentified cormorant | Family Phalacrocoracidae |
| | Pelagic cormorant | <i>Phalacrocorax pelagicus</i> |
| | Red-faced cormorant | <i>Phalacrocorax urile</i> |
| Other Birds | Miscellaneous birds – could include: | |
| | Loon | Family Gaviidae |
| | Grebe | Family Podicipedidae |
| | Seaduck | Family Anatidae |
| | Jaeger/skua | Family Stercorariidae |
| | Tern | Family Sternidae |
| Unidentified Seabird | All of the above | |

¹ A complete list of the species and species group categories used by the North Pacific Observer Program is available in the Observer Sampling Manual (AFSC 2015, 2016).

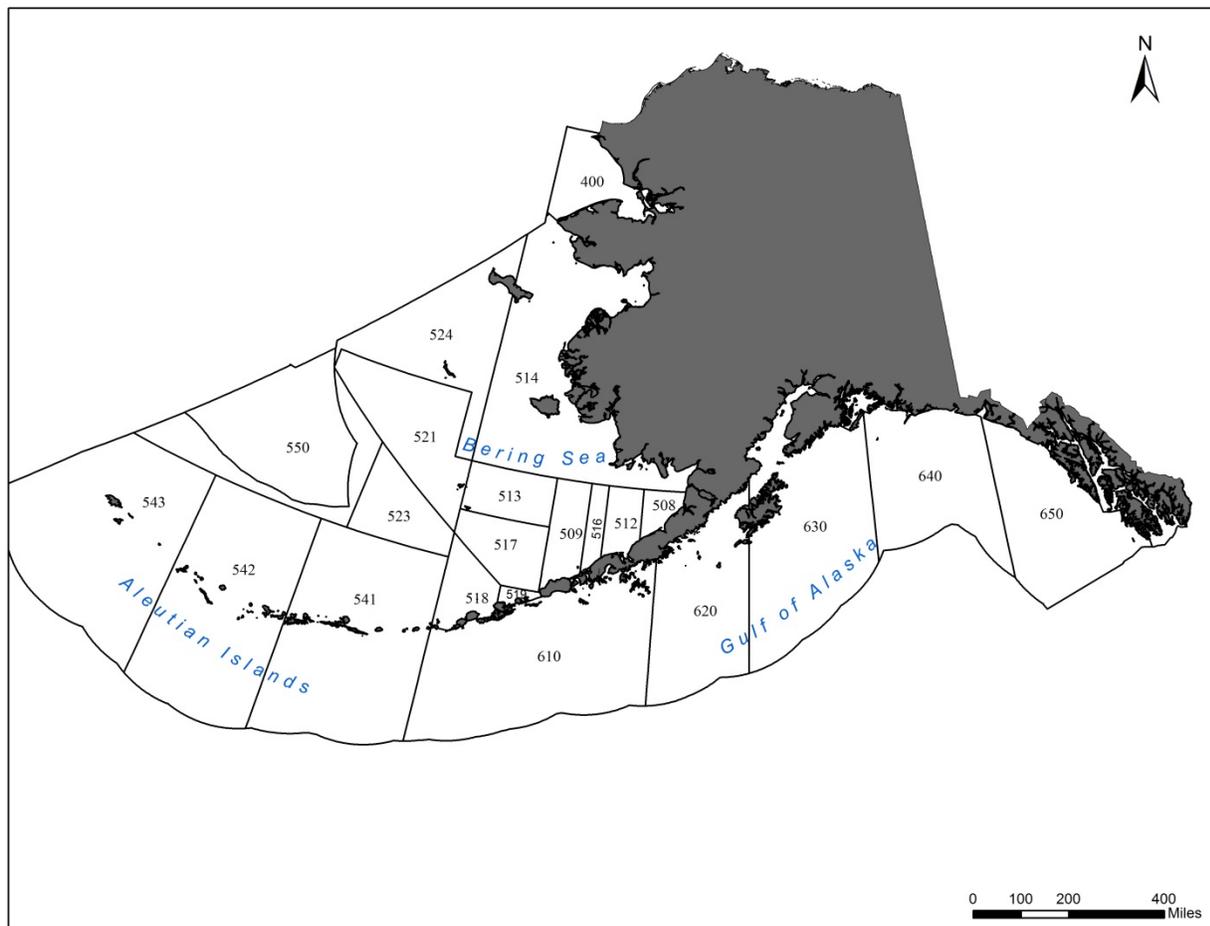


Figure 1 Boundary areas of Bering Sea, Aleutian Islands, and Gulf of Alaska reporting areas. Aleutian Islands includes areas 541 through 543, Bering Sea includes areas north of the Alaska Peninsula, and Gulf of Alaska include areas south of the Alaska Peninsula.

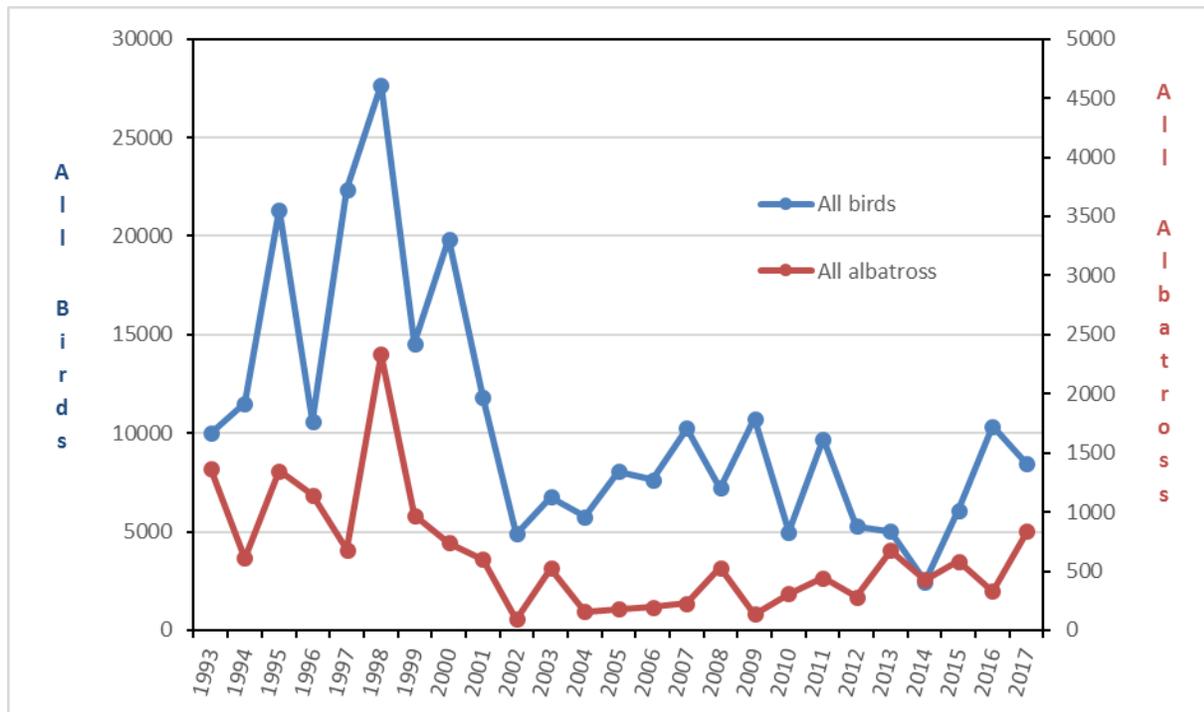


Figure 2 Seabird bycatch in Alaska groundfish fisheries (demersal longline, trawl, and pot) from 1993 through 2017, noting bycatch estimates for all birds (left indices) and for albatrosses only (right indices). Note the difference in scale. Different data analysis methodologies were used (data from 1993 through 2006 are described in Fitzgerald et al. 2008; data from 2007 through 2017 are from the CAS). The Observer Program was restructured for deployments beginning in 2013 where most catcher/processors had 100 percent coverage, most catcher vessels (regardless of length overall) were randomly selected, and the Pacific halibut fleet was incorporated into the program.

Table 2 Total estimated seabird bycatch in Alaska Federal groundfish and halibut fisheries, all gear types and fishery management plan areas combined, 2007 through 2017. Halibut fisheries 2013 through 2017 only. The Observer Program was restructured in 2013.

| Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Ann Avg |
|--------------------------|---------------|--------------|---------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------|--------------|
| Unidentified Albatrosses | 17 | 0 | 0 | 0 | 10 | 0 | 28 | 35 | 0 | 0 | 0 | 8 |
| Short-tailed Albatross | 0 | 0 | 0 | 15 | 5 | 0 | 0 | 11 | 0 | 0 | 0 | 3 |
| Laysan Albatross | 13 | 226 | 80 | 223 | 206 | 141 | 197 | 99 | 221 | 131 | 47 | 144 |
| Black-footed Albatross | 200 | 302 | 56 | 71 | 223 | 142 | 449 | 284 | 364 | 201 | 790 | 280 |
| Northern Fulmar | 4,701 | 3,332 | 7,757 | 2,476 | 6,343 | 3,149 | 3,195 | 822 | 3,546 | 5,452 | 4,440 | 4,110 |
| Shearwaters | 3,586 | 1,224 | 620 | 659 | 263 | 586 | 253 | 187 | 392 | 3,416 | 2,082 | 1,206 |
| Storm Petrels | 1 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| Gulls | 1,216 | 1,550 | 1,268 | 1,176 | 2,232 | 899 | 581 | 742 | 1,265 | 758 | 679 | 1,124 |
| Kittiwakes | 10 | 0 | 16 | 0 | 6 | 5 | 3 | 4 | 12 | 5 | 22 | 8 |
| Murres | 6 | 6 | 13 | 102 | 14 | 6 | 3 | 47 | 0 | 58 | 10 | 24 |
| Puffins | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 2 |
| Auklets | 0 | 3 | 0 | 0 | 0 | 7 | 4 | 107 | 69 | 29 | 36 | 23 |
| Other Alcids | 0 | 0 | 105 | 0 | 0 | 0 | 0 | 39 | 0 | 0 | 0 | 13 |
| Cormorants | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 3 |
| Other Birds | 0 | 0 | 136 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 | 18 |
| Unidentified Birds | 514 | 541 | 696 | 270 | 388 | 343 | 291 | 78 | 193 | 301 | 279 | 354 |
| Grand Total | 10,264 | 7,228 | 10,747 | 5,001 | 9,690 | 5,278 | 5,004 | 2,455 | 6,093 | 10,361 | 8,448 | 7,324 |

Table 3 Summary of estimated seabird bycatch in the Alaska demersal longline groundfish and halibut fisheries, all fishery management plan areas combined, 2007 through 2017. Halibut fisheries 2013 through 2017 only. The Observer Program was restructured in 2013.

| Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Ann Avg |
|--------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Unidentified Albatrosses | 17 | 0 | 0 | 0 | 10 | 0 | 28 | 35 | 0 | 0 | 0 | 8 |
| Short-tailed Albatross | 0 | 0 | 0 | 15 | 5 | 0 | 0 | 11 | 0 | 0 | 0 | 3 |
| Laysan Albatross | 13 | 226 | 71 | 223 | 206 | 141 | 197 | 99 | 221 | 131 | 47 | 143 |
| Black-footed Albatross | 200 | 302 | 56 | 71 | 223 | 82 | 449 | 284 | 364 | 201 | 790 | 275 |
| Northern Fulmar | 3,678 | 2,761 | 7,000 | 1,904 | 5,978 | 2,852 | 2,712 | 726 | 2,887 | 4,911 | 3,475 | 3,535 |
| Shearwaters | 2,861 | 1,211 | 574 | 504 | 260 | 530 | 195 | 115 | 330 | 3,178 | 1,154 | 992 |
| Gulls | 914 | 1,481 | 1,186 | 1,119 | 2,231 | 899 | 578 | 742 | 1,265 | 755 | 679 | 1,077 |
| Kittiwakes | 10 | 0 | 10 | 0 | 6 | 5 | 3 | 4 | 12 | 5 | 22 | 7 |
| Murres | 5 | 6 | 13 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 9 | 4 |
| Puffins | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 2 |
| Auklets | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 6 | 11 | 0 | 0 | 2 |
| Cormorants | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | 3 |
| Unidentified Birds | 498 | 541 | 652 | 267 | 388 | 323 | 291 | 78 | 187 | 295 | 279 | 345 |
| Grand Total | 8,196 | 6,528 | 9,562 | 4,112 | 9,307 | 4,845 | 4,453 | 2,100 | 5,305 | 9,486 | 6,455 | 6,395 |

Table 4 Estimated seabird bycatch in the Aleutian Islands area demersal longline groundfish and halibut fisheries, 2007 through 2017. Halibut fisheries 2013 through 2017 only. The Observer Program was restructured in 2013.

| Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Ann Avg |
|--------------------------|------------|------------|------------|------------|------------|------------|------------|------------|--------------|-----------|------------|------------|
| Unidentified Albatrosses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 2 |
| Laysan Albatross | 11 | 51 | 26 | 122 | 12 | 76 | 108 | 50 | 150 | 69 | 14 | 63 |
| Black-footed Albatross | 0 | 0 | 0 | 0 | 5 | 0 | 12 | 7 | 19 | 0 | 0 | 4 |
| Northern Fulmar | 62 | 97 | 120 | 110 | 21 | 7 | 31 | 55 | 882 | 16 | 167 | 143 |
| Shearwaters | 53 | 39 | 10 | 13 | 42 | 16 | 0 | 68 | 23 | 0 | 128 | 36 |
| Gulls | 31 | 19 | 36 | 175 | 22 | 12 | 23 | 0 | 37 | 4 | 0 | 33 |
| Unidentified Birds | 5 | 1 | 1 | 17 | 0 | 0 | 8 | 0 | 0 | 0 | 10 | 4 |
| Grand Total | 162 | 207 | 193 | 437 | 102 | 111 | 182 | 202 | 1,111 | 89 | 319 | 283 |

Table 5 Estimated seabird bycatch in the Bering Sea area demersal longline groundfish and halibut fisheries, 2007 through 2017. Halibut fisheries 2013 through 2017 only. The Observer Program was restructured in 2013.

| Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Ann Avg |
|--------------------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| Unidentified Albatrosses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 1 |
| Short-tailed Albatross | 0 | 0 | 0 | 15 | 5 | 0 | 0 | 11 | 0 | 0 | 0 | 3 |
| Laysan Albatross | 2 | 7 | 14 | 16 | 30 | 48 | 19 | 17 | 30 | 18 | 33 | 21 |
| Black-footed Albatross | 18 | 7 | 5 | 9 | 2 | 0 | 1 | 9 | 2 | 0 | 0 | 5 |
| Northern Fulmar | 2,520 | 1,811 | 6,726 | 1,740 | 5,143 | 2,826 | 2,565 | 641 | 1,917 | 4,792 | 2,977 | 3,060 |
| Shearwaters | 2,776 | 1,172 | 564 | 491 | 157 | 515 | 195 | 47 | 301 | 3,158 | 999 | 943 |
| Gulls | 422 | 1,339 | 829 | 664 | 1,653 | 836 | 418 | 586 | 941 | 602 | 372 | 787 |
| Kittiwakes | 10 | 0 | 10 | 0 | 6 | 5 | 3 | 4 | 12 | 5 | 22 | 7 |
| Murres | 5 | 6 | 13 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 9 | 4 |
| Puffins | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 2 |
| Auklets | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 1 |
| Unidentified Birds | 444 | 267 | 463 | 250 | 378 | 290 | 275 | 78 | 154 | 277 | 268 | 286 |
| Grand Total | 6,197 | 4,609 | 8,624 | 3,194 | 7,374 | 4,533 | 3,476 | 1,406 | 3,357 | 8,862 | 4,680 | 5,119 |

Table 6 Estimated seabird bycatch in the Gulf of Alaska area demersal longline groundfish and halibut fisheries, 2007 through 2017. Halibut fisheries 2013 through 2017 only. The Observer Program was restructured in 2013.

| Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Ann Avg |
|--------------------------|-------|-------|------|------|-------|------|------|------|------|------|-------|---------|
| Unidentified Albatrosses | 17 | 0 | 0 | 0 | 10 | 0 | 28 | 0 | 0 | 0 | 0 | 5 |
| Laysan Albatross | 0 | 168 | 31 | 85 | 164 | 17 | 69 | 32 | 41 | 44 | 0 | 59 |
| Black-footed Albatross | 182 | 295 | 51 | 63 | 216 | 82 | 436 | 269 | 343 | 201 | 790 | 266 |
| Northern Fulmar | 1,096 | 853 | 154 | 54 | 814 | 19 | 116 | 31 | 88 | 103 | 331 | 333 |
| Shearwaters | 32 | 0 | 0 | 0 | 61 | 0 | 0 | 0 | 5 | 20 | 27 | 13 |
| Gulls | 461 | 123 | 320 | 280 | 555 | 51 | 137 | 157 | 287 | 149 | 308 | 257 |
| Auklets | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 11 | 0 | 0 | 2 |
| Cormorants | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | 3 |
| Unidentified Birds | 48 | 274 | 188 | 0 | 9 | 33 | 7 | 0 | 33 | 19 | 0 | 56 |
| Grand Total | 1,836 | 1,713 | 744 | 482 | 1,829 | 202 | 793 | 495 | 836 | 536 | 1,456 | 993 |

Table 7 Estimated seabird bycatch for Alaska groundfish fisheries using pelagic and non-pelagic trawl gear combined, all fishery management plan areas combined. The Observer Program was restructured in 2013.

| Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Ann Avg |
|------------------------|-------|------|-------|------|------|------|------|------|------|------|-------|---------|
| Laysan Albatross | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Black-footed Albatross | 0 | 0 | 0 | 0 | 0 | 60 | 0 | 0 | 0 | 0 | 0 | 5 |
| Northern Fulmar | 652 | 537 | 633 | 503 | 329 | 297 | 463 | 85 | 463 | 307 | 372 | 422 |
| Shearwaters | 726 | 13 | 41 | 155 | 3 | 56 | 1 | 72 | 62 | 238 | 928 | 209 |
| Storm Petrels | 1 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| Gulls | 303 | 9 | 82 | 57 | 1 | 0 | 3 | 0 | 0 | 3 | 0 | 42 |
| Kittiwakes | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Murres | 2 | 0 | 0 | 102 | 14 | 0 | 3 | 47 | 0 | 45 | 1 | 19 |
| Auklets | 0 | 3 | 0 | 0 | 0 | 0 | 4 | 66 | 0 | 0 | 0 | 7 |
| Other Alcids | 0 | 0 | 105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| Cormorants | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |
| Other Birds | 0 | 0 | 136 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 | 18 |
| Unidentified Birds | 16 | 0 | 44 | 3 | 0 | 0 | 0 | 0 | 6 | 6 | 0 | 7 |
| Grand Total | 1,700 | 606 | 1,056 | 820 | 347 | 413 | 474 | 270 | 534 | 599 | 1,364 | 744 |

Table 8 Estimated seabird bycatch for the Alaska groundfish Bering Sea and Aleutian Islands fishery management plan area, pelagic and non-pelagic trawl gear combined. The Observer Program was restructured in 2013.

| Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Ann Avg |
|-----------------------|--------------|------------|--------------|------------|------------|------------|------------|------------|------------|------------|--------------|------------|
| Laysan Albatross | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Northern Fulmar | 562 | 498 | 633 | 383 | 302 | 297 | 320 | 65 | 463 | 307 | 328 | 378 |
| Shearwaters | 726 | 13 | 41 | 155 | 3 | 56 | 1 | 72 | 62 | 238 | 928 | 209 |
| Storm Petrels | 1 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| Gulls | 303 | 9 | 82 | 57 | 1 | 0 | 3 | 0 | 0 | 3 | 0 | 42 |
| Kittiwakes | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Murres | 2 | 0 | 0 | 102 | 14 | 0 | 3 | 47 | 0 | 45 | 1 | 19 |
| Auklets | 0 | 3 | 0 | 0 | 0 | 0 | 4 | 66 | 0 | 0 | 0 | 7 |
| Other Alcids | 0 | 0 | 105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| Cormorants | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |
| Other Birds | 0 | 0 | 136 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 | 18 |
| Unidentified Birds | 16 | 0 | 44 | 3 | 0 | 0 | 0 | 0 | 6 | 6 | 0 | 7 |
| Grand Total | 1,610 | 567 | 1,056 | 700 | 320 | 353 | 331 | 250 | 534 | 599 | 1,320 | 695 |

Table 9 Estimated seabird bycatch for the Alaska groundfish Gulf of Alaska fishery management plan area, pelagic and non-pelagic trawl gear combined. The Observer Program was restructured in 2013.

| Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Ann Avg |
|------------------------|-----------|-----------|----------|------------|-----------|-----------|------------|-----------|----------|----------|-----------|-----------|
| Black-footed Albatross | 0 | 0 | 0 | 0 | 0 | 60 | 0 | 0 | 0 | 0 | 0 | 5 |
| Northern Fulmar | 91 | 39 | 0 | 121 | 27 | 0 | 143 | 20 | 0 | 0 | 44 | 44 |
| Grand Total | 91 | 39 | 0 | 121 | 27 | 60 | 143 | 20 | 0 | 0 | 44 | 50 |

Table 10 Estimated seabird bycatch for the Alaska groundfish pelagic (P) and non-pelagic (N) trawl gear types across all fishery management plan areas. The Observer Program was restructured in 2013.

| Species/Species Group | Trawl | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Ann Avg |
|------------------------|-------|------|------|------|------|------|------|------|------|------|------|------|---------|
| Laysan Albatross | N | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Black-footed Albatross | N | 0 | 0 | 0 | 0 | 0 | 60 | 0 | 0 | 0 | 0 | 0 | 5 |
| | P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Northern Fulmar | N | 101 | 248 | 333 | 435 | 115 | 207 | 340 | 34 | 351 | 223 | 263 | 241 |
| | P | 552 | 290 | 300 | 69 | 214 | 90 | 123 | 51 | 112 | 84 | 109 | 181 |
| Shearwaters | N | 705 | 0 | 38 | 133 | 0 | 44 | 0 | 69 | 56 | 229 | 928 | 200 |
| | P | 21 | 13 | 3 | 22 | 3 | 12 | 1 | 3 | 6 | 9 | 0 | 8 |
| Storm Petrels | N | 0 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 4 |
| | P | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Gulls | N | 294 | 0 | 79 | 57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 |
| | P | 9 | 9 | 3 | 0 | 1 | 0 | 3 | 0 | 0 | 3 | 0 | 3 |
| Kittiwakes | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | P | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| Murre | N | 0 | 0 | 0 | 102 | 0 | 0 | 0 | 44 | 0 | 39 | 0 | 17 |
| | P | 2 | 0 | 0 | 0 | 14 | 0 | 3 | 3 | 0 | 6 | 1 | 3 |
| Auklets | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 66 | 0 | 0 | 0 | 6 |
| | P | 0 | 3 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 1 |
| Other Alcids | N | 0 | 0 | 105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 |
| | P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Cormorants | N | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | P | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 0 |
| Other Birds | N | 0 | 0 | 133 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 | 18 |
| | P | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Unidentified Birds | N | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 |
| | P | 16 | 0 | 37 | 3 | 0 | 0 | 0 | 0 | 6 | 6 | 0 | 6 |
| Grand Total | N | 1100 | 292 | 704 | 727 | 115 | 311 | 340 | 213 | 407 | 491 | 1254 | 541 |
| | P | 601 | 315 | 352 | 94 | 232 | 102 | 134 | 57 | 127 | 108 | 110 | 203 |

Table 11 Estimated seabird bycatch for pot vessels fishing groundfish in Alaska Federal waters, all fishery management plan areas combined. The Observer Program was restructured in 2013.

| Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Ann Avg |
|-----------------------|------------|-----------|------------|-----------|-----------|-----------|-----------|-----------|------------|------------|------------|------------|
| Northern Fulmar | 371 | 34 | 125 | 69 | 37 | 0 | 20 | 11 | 197 | 234 | 593 | 154 |
| Shearwaters | 0 | 0 | 5 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 | 6 |
| Gulls | 0 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 |
| Murres | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 1 |
| Auklets | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 58 | 29 | 36 | 14 |
| Other Alcids | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 0 | 0 | 0 | 4 |
| Unidentified Birds | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 2 |
| Grand Total | 371 | 94 | 130 | 69 | 37 | 20 | 77 | 85 | 255 | 276 | 629 | 186 |

Table 12 Estimated seabird bycatch in Alaska by groundfish and halibut fishery target, 2007 through 2017. Halibut fisheries 2013 through 2017 only. The Observer Program was restructured in 2013.

| Region | Gear | Target | Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Grand Total | Ann Avg | | | | | | | | | |
|--------|-------------------|------------------|--------------------------|------------|------------|------------|------------|------------|------------|------------|-----------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|---------------|--------------|---|
| BSAI | Demersal Longline | Greenland Turbot | Short-tailed Albatross | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 6 | 1 | | | | | | | | | |
| | | | Laysan Albatross | 2 | 0 | 10 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | 2 | | | | | | | | |
| | | | Northern Fulmar | 243 | 247 | 548 | 170 | 499 | 354 | 65 | 55 | 17 | 82 | 130 | 2,410 | 219 | | | | | | | | | |
| | | | Shearwaters | 119 | 0 | 69 | 4 | 38 | 40 | 60 | 0 | 55 | 174 | 14 | 573 | 52 | | | | | | | | | |
| | | | Gulls | 0 | 0 | 4 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 2 | | | | | | | | | |
| | | | Kittiwakes | 10 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 23 | 2 | | | | | | | | | |
| | | | Unidentified Birds | 0 | 0 | 4 | 11 | 0 | 15 | 5 | 0 | 0 | 0 | 0 | 35 | 3 | | | | | | | | | |
| | | | Total | 374 | 247 | 639 | 202 | 542 | 409 | 130 | 61 | 72 | 256 | 153 | 3,085 | 280 | | | | | | | | | |
| | | Halibut | Laysan Albatross | | | | | | | | | 14 | 0 | 18 | 0 | 38 | 70 | 6 | | | | | | | |
| | | | Black-footed Albatross | | | | | | | | | 0 | 16 | 0 | 0 | 0 | 16 | 1 | | | | | | | |
| | | | Northern Fulmar | | | | | | | | | 0 | 0 | 0 | 68 | 468 | 536 | 49 | | | | | | | |
| | | | Shearwaters | | | | | | | | | 0 | 0 | 0 | 0 | 43 | 43 | 4 | | | | | | | |
| | | | Gulls | | | | | | | | | 11 | 0 | 0 | 17 | 0 | 28 | 3 | | | | | | | |
| | | | Unidentified Birds | | | | | | | | | 15 | 0 | 0 | 0 | 32 | 47 | 4 | | | | | | | |
| | | | Total | | | | | | | | | 40 | 16 | 18 | 85 | 581 | 740 | 67 | | | | | | | |
| | | Other Species | Laysan Albatross | | | | | | | | | 4 | 0 | 0 | 0 | 0 | 4 | 0 | | | | | | | |
| | | | Northern Fulmar | | | | | | | | | 3 | 0 | 0 | 0 | 3 | 6 | 1 | | | | | | | |
| | | | Unidentified Birds | | | | | | | | | 0 | 0 | 3 | 0 | 0 | 3 | 0 | | | | | | | |
| | | | Total | | | | | | | | | 7 | 0 | 0 | 0 | 3 | 13 | 1 | | | | | | | |
| | | Pacific Cod | Unidentified Albatrosses | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 12 | 1 | | | | | | | |
| | | | Short-tailed Albatross | | | | | | | | | 0 | 0 | 0 | 15 | 5 | 0 | 2 | | | | | | | |
| | | | Laysan Albatross | | | | | | | | | 3 | 25 | 4 | 41 | 28 | 34 | 4 | 19 | | | | | | |
| | | | Black-footed Albatross | | | | | | | | | 18 | 7 | 5 | 9 | 0 | 0 | 4 | | | | | | | |
| | | | Northern Fulmar | | | | | | | | | 2,322 | 1,640 | 6,253 | 1,653 | 4,644 | 2,479 | 2,501 | 582 | 2,690 | 4,658 | 2,542 | 31,964 | 2,906 | |
| | | | Shearwaters | | | | | | | | | 2,710 | 1,211 | 504 | 494 | 126 | 491 | 135 | 44 | 243 | 2,984 | 1,071 | 10,013 | 910 | |
| | | | Gulls | | | | | | | | | 436 | 1,358 | 845 | 734 | 1,648 | 835 | 413 | 586 | 941 | 589 | 372 | 8,757 | 796 | |
| | | | Kittiwakes | | | | | | | | | 0 | 0 | 5 | 0 | 6 | 5 | 3 | 4 | 12 | 5 | 13 | 53 | 5 | |
| | | | Murres | | | | | | | | | 5 | 6 | 13 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 9 | 39 | 4 | |
| | | | Puffins | | | | | | | | | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 19 | 2 |
| | | | Auklets | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 7 | 1 | |
| | | | Unidentified Birds | | | | | | | | | 445 | 268 | 460 | 249 | 379 | 275 | 263 | 78 | 151 | 277 | 247 | 3,092 | 281 | |
| | | | Total | | | | | | | | | 5,939 | 4,515 | 8,089 | 3,204 | 6,836 | 4,132 | 3,319 | 1,323 | 4,075 | 8,535 | 4,263 | 54,230 | 4,930 | |
| | | | Rockfish | Gulls | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 5 | 0 | | | | | | |
| | | Total | | | | | | | | | | 0 | 0 | 0 | 0 | 0 | 5 | 0 | | | | | | | |

| Region | Gear | Target | Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Grand Total | Ann Avg |
|--------|-------|---------------------|--------------------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|--------------|------------|
| | | Sablefish | Unidentified Albatrosses | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 0 | 0 | 0 | 23 | 2 |
| | | | Laysan Albatross | 3 | 33 | 25 | 97 | 9 | 90 | 109 | 54 | 123 | 75 | 0 | 618 | 56 |
| | | | Black-footed Albatross | 0 | 0 | 0 | 0 | 7 | 0 | 13 | 0 | 21 | 0 | 0 | 41 | 4 |
| | | | Northern Fulmar | 13 | 20 | 45 | 26 | 21 | 0 | 30 | 58 | 92 | 0 | 0 | 305 | 28 |
| | | | Shearwaters | 0 | 0 | 0 | 6 | 35 | 0 | 0 | 71 | 27 | 0 | 0 | 139 | 13 |
| | | | Gulls | 17 | 0 | 17 | 88 | 28 | 13 | 12 | 0 | 37 | 0 | 0 | 212 | 19 |
| | | | Unidentified Birds | 4 | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 1 |
| | | | Total | 37 | 53 | 87 | 223 | 100 | 103 | 164 | 206 | 300 | 75 | 0 | 1,348 | 123 |
| | Trawl | Arrowtooth Flounder | Northern Fulmar | 0 | 0 | 28 | 0 | 0 | 150 | 8 | 0 | 221 | 0 | 0 | 407 | 37 |
| | | | Shearwaters | 23 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 23 | 2 |
| | | | Total | 23 | 0 | 28 | 0 | 0 | 150 | 8 | 0 | 221 | 0 | 0 | 430 | 39 |
| | | Atka Mackerel | Northern Fulmar | 10 | 27 | 160 | 84 | 29 | 8 | 0 | 0 | 92 | 0 | 0 | 410 | 37 |
| | | | Shearwaters | 682 | 0 | 38 | 75 | 0 | 44 | 0 | 0 | 0 | 184 | 156 | 1,179 | 107 |
| | | | Storm Petrels | 0 | 44 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 44 | 4 |
| | | | Unidentified Birds | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 1 |
| | | | Total | 692 | 71 | 205 | 159 | 29 | 52 | 0 | 0 | 92 | 184 | 156 | 1,640 | 149 |
| | | Flathead Sole | Northern Fulmar | 0 | 0 | 34 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 3 |
| | | | Total | 0 | 0 | 34 | 0 | 34 | 3 |
| | | Pacific Cod | Laysan Albatross | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 1 |
| | | | Northern Fulmar | 0 | 151 | 14 | 139 | 0 | 0 | 0 | 0 | 0 | 57 | 0 | 361 | 33 |
| | | | Gulls | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 1 |
| | | | Total | 7 | 151 | 23 | 139 | 0 | 0 | 0 | 0 | 0 | 57 | 0 | 377 | 34 |
| | | Pollock | Northern Fulmar | 552 | 289 | 300 | 69 | 214 | 90 | 123 | 51 | 112 | 84 | 109 | 1,993 | 181 |
| | | | Shearwaters | 21 | 13 | 3 | 22 | 3 | 12 | 1 | 3 | 6 | 9 | 0 | 93 | 8 |
| | | | Storm Petrels | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| | | | Gulls | 9 | 9 | 3 | 0 | 1 | 0 | 3 | 0 | 0 | 3 | 0 | 28 | 3 |
| | | | Kittiwakes | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 1 |
| | | | Murres | 2 | 0 | 0 | 0 | 14 | 0 | 3 | 3 | 0 | 6 | 1 | 29 | 3 |
| | | | Auklets | 0 | 3 | 0 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 7 | 1 |
| | | | Cormorants | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 | 0 | 3 | 0 |
| | | | Other Birds | 0 | 0 | 3 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 0 |
| | | | Unidentified Birds | 16 | 0 | 35 | 3 | 0 | 0 | 0 | 0 | 6 | 6 | 0 | 66 | 6 |
| | | | Total | 601 | 314 | 350 | 94 | 232 | 102 | 134 | 57 | 127 | 108 | 110 | 2,229 | 203 |
| | | Rock Sole | Northern Fulmar | 0 | 0 | 9 | 0 | 0 | 49 | 112 | 0 | 0 | 92 | 0 | 262 | 24 |
| | | | Gulls | 287 | 0 | 79 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 366 | 33 |
| | | | Murres | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 2 |
| | | | Auklets | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 66 | 0 | 0 | 66 | 6 |

| Region | Gear | Target | Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Grand Total | Ann Avg | |
|--------|--------------------|-----------------|--------------------------|------------------------|--------------|------------|------------|-----------|-----------|------------|------------|------------|------------|------------|--------------|--------------|-----------|
| | | | Other Birds | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 63 | 69 | 6 | |
| | | | Unidentified Birds | 0 | 0 | 2 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| | | | Total | 287 | 0 | 87 | 24 | 0 | 49 | 112 | 66 | 0 | 92 | 63 | 780 | 71 | |
| | | Rockfish | Northern Fulmar | 0 | 31 | 7 | 34 | 0 | 0 | 0 | 0 | 0 | 38 | 0 | 0 | 110 | 10 |
| | | | Shearwaters | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 772 | 772 | 70 |
| | | | Total | 0 | 31 | 7 | 34 | 0 | 0 | 0 | 0 | 0 | 38 | 0 | 772 | 882 | 80 |
| | | Yellowfin Sole | Northern Fulmar | 0 | 0 | 81 | 57 | 59 | 0 | 77 | 14 | 0 | 74 | 219 | 581 | 53 | |
| | | | Shearwaters | 0 | 0 | 0 | 58 | 0 | 0 | 0 | 69 | 56 | 45 | 0 | 228 | 21 | |
| | | | Gulls | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 5 | |
| | | | Murres | 0 | 0 | 0 | 78 | 0 | 0 | 0 | 44 | 0 | 39 | 0 | 161 | 15 | |
| | | | Other Alcids | 0 | 0 | 105 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 105 | 10 | |
| | | | Other Birds | 0 | 0 | 127 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 127 | 12 | |
| | | | Total | 0 | 0 | 313 | 250 | 59 | 0 | 77 | 127 | 56 | 158 | 219 | 1,259 | 114 | |
| | | Pot | Pacific Cod | Northern Fulmar | 92 | 34 | 36 | 69 | 0 | 0 | 20 | 11 | 197 | 139 | 580 | 1,178 | 107 |
| | Murres | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 13 | 1 | |
| | Auklets | | | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 35 | 19 | 29 | 36 | 119 | 11 | |
| | Unidentified Birds | | | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 0 | 20 | 2 | |
| | Total | | | 92 | 34 | 36 | 69 | 0 | 20 | 20 | 46 | 216 | 181 | 616 | 1,330 | 121 | |
| | Sablefish | | Northern Fulmar | 0 | 0 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 19 | 2 | |
| | | | Shearwaters | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | |
| | | | Total | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 13 | 24 | 2 | |
| GOA | Demersal Longline | | Halibut | Laysan Albatross | | | | | | | 0 | 0 | 19 | 0 | 0 | 19 | 2 |
| | | | | Black-footed Albatross | | | | | | | 51 | 33 | 0 | 0 | 340 | 424 | 39 |
| | | Northern Fulmar | | | | | | | | | 0 | 19 | 41 | 59 | 120 | 239 | 22 |
| | | Shearwaters | | | | | | | | | 0 | 0 | 0 | 0 | 27 | 27 | 2 |
| | | Gulls | | | | | | | | | 75 | 99 | 144 | 42 | 0 | 360 | 33 |
| | | Total | | | | | | | | | 126 | 151 | 204 | 101 | 487 | 1,069 | 97 |
| | | Pacific Cod | Unidentified Albatrosses | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 1 |
| | | | Laysan Albatross | 0 | 0 | 9 | 9 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 26 | 2 | |
| | | | Black-footed Albatross | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 8 | 0 | 30 | 28 | 76 | 7 | |
| | | | Northern Fulmar | 59 | 791 | 115 | 35 | 8 | 19 | 8 | 12 | 11 | 25 | 147 | 1,230 | 112 | |
| | | | Gulls | 15 | 71 | 38 | 147 | 36 | 25 | 27 | 50 | 33 | 17 | 58 | 517 | 47 | |
| | | | Auklets | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 11 | 0 | 0 | 17 | 2 | |
| | | | Unidentified Birds | 0 | 220 | 162 | 0 | 0 | 33 | 7 | 0 | 5 | 0 | 0 | 427 | 39 | |
| | | | Total | 74 | 1,082 | 324 | 201 | 54 | 77 | 42 | 84 | 60 | 72 | 233 | 2,303 | 209 | |
| | | Sablefish | Unidentified Albatrosses | 17 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | 0 | 0 | 45 | 4 | |
| | | | Laysan Albatross | 0 | 168 | 22 | 76 | 164 | 17 | 69 | 24 | 22 | 44 | 0 | 606 | 55 | |

| Region | Gear | Target | Species/Species Group | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | Grand Total | Ann Avg |
|--------|-------|---------------------|------------------------|--------------|------------|------------|------------|--------------|------------|------------|------------|------------|------------|------------|--------------|------------|
| | | | Black-footed Albatross | 182 | 295 | 51 | 53 | 216 | 82 | 385 | 228 | 343 | 171 | 422 | 2,428 | 221 |
| | | | Northern Fulmar | 1,037 | 62 | 39 | 19 | 806 | 0 | 108 | 0 | 36 | 19 | 64 | 2,190 | 199 |
| | | | Shearwaters | 32 | 0 | 0 | 0 | 61 | 0 | 0 | 0 | 5 | 20 | 0 | 118 | 11 |
| | | | Gulls | 446 | 53 | 282 | 133 | 519 | 26 | 35 | 8 | 111 | 90 | 250 | 1,953 | 178 |
| | | | Cormorants | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | 28 | 3 |
| | | | Unidentified Birds | 48 | 54 | 26 | 0 | 9 | 0 | 0 | 0 | 28 | 19 | 0 | 184 | 17 |
| | | | Total | 1,762 | 632 | 420 | 281 | 1,775 | 125 | 625 | 260 | 573 | 363 | 736 | 7,552 | 687 |
| | Trawl | Arrowtooth Flounder | Northern Fulmar | 7 | 0 | 0 | 121 | 0 | 0 | 143 | 0 | 0 | 0 | 0 | 271 | 25 |
| | | | Total | 7 | 0 | 0 | 121 | 0 | 0 | 143 | 0 | 0 | 0 | 0 | 271 | 25 |
| | | Rockfish | Black-footed Albatross | 0 | 0 | 0 | 0 | 0 | 60 | 0 | 0 | 0 | 0 | 0 | 60 | 5 |
| | | | Northern Fulmar | 83 | 39 | 0 | 0 | 27 | 0 | 0 | 20 | 0 | 0 | 44 | 213 | 19 |
| | | | Total | 83 | 39 | 0 | 0 | 27 | 60 | 0 | 20 | 0 | 0 | 44 | 273 | 25 |
| | Pot | Pacific Cod | Northern Fulmar | 279 | 0 | 82 | 0 | 37 | 0 | 0 | 0 | 0 | 95 | 0 | 493 | 45 |
| | | | Shearwaters | 0 | 0 | 0 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 | 57 | 5 |
| | | | Gulls | 0 | 60 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 60 | 5 |
| | | | Auklets | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 38 | 0 | 0 | 38 | 3 |
| | | | Other Alcids | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 39 | 0 | 0 | 0 | 39 | 4 |
| | | | Total | 279 | 60 | 82 | 0 | 37 | 0 | 57 | 39 | 38 | 95 | 0 | 687 | 62 |



U.S. Department of Commerce
Wilbur Ross, Secretary

National Oceanic and Atmospheric Administration
Tim Gallaudet, Acting Administrator

National Marine Fisheries Service
Chris Oliver, Assistant Administrator for Fisheries

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