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Seabird Bycatch Estimates for Alaska Groundfish Fisheries

2018

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Introduction

Seabirds are unintentionally caught in commercial fisheries and this unintentional catch is referred to as bycatch. Federal law in the US 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. Off Alaska, most seabird bycatch has historically occurred in fisheries using demersal longline (i.e., hook-and-line) gear. Since 2004, seabird bycatch has decreased in fisheries using demersal longline gear off Alaska as a result of good compliance with seabird avoidance regulations (Melvin et al. 2019). While the occurrence of seabird bycatch is now relatively rare given the level of commercial fishing effort off Alaska each year (average of 0.019 birds per 1000 hooks from 2002 through 2015; Melvin et al. 2019), bycatch of seabirds does occur and remains an issue in the Federal fisheries off Alaska.

NOAA's National Marine Fisheries Service (NOAA Fisheries) annually updates estimates of seabirds caught as bycatch in commercial groundfish and halibut fisheries operating in Federal waters off Alaska. This annual report details seabird bycatch estimates by gear type for the years 2010 through 2018 and supplements the "Seabird Bycatch and Mitigation Efforts in Alaska Fisheries Summary Report: 2007 through 2015" (Eich et al. 2016), which has been supplemented previously with data through 2017 (Eich et al. 2018). The focus of this report is to add and describe seabird bycatch data for 2018. This report presents bycatch estimates from the following gear types: demersal longline, pelagic trawl, non-pelagic trawl, and pot¹.

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. On rare occasion, the fisheries using demersal longline gear off Alaska incidentally catch short-tailed albatross. In 2018, 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 Endangered Species Act (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. This group continues to meet annually to review seabird bycatch data and trends and to provide recommendations on bycatch mitigation strategies to the North Pacific Fisheries Management Council.

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

¹ This report does not include estimates of seabird bycatch in fisheries using gillnet, seine, troll, or jig gear because NOAA Fisheries does not have independent observer data from these fisheries. These estimates also do not apply to fisheries that are State of Alaska managed.

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. Starting in 2018, NOAA Fisheries integrated electronic monitoring (EM) into the Observer Program and vessels that fish with demersal longline were able to opt-into an EM sampling strata and take an EM system instead of an observer (NMFS 2017). At-sea monitoring data, from both observers and EM, 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 whereas data from EM provide a direct estimate of species counts that are converted to weight. NMFS uses both of these datasets 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 2017), including fisheries bycatch of seabirds. The Observer Program structures at-sea observer and EM data collection using a statistically reliable sampling design (NMFS 2017). The CAS uses these monitoring data to estimate seabird mortality, as described in the next section. Information collected by observers and EM 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.

As mentioned above, 2018 was the first year that EM was integrated into the Observer Program under regulations. In order to carry an EM system, the vessels must have a NMFS-approved a Vessel Monitoring Plan (VMP) that describes how fishing operations on the vessel will be conducted and how the EM system and associated equipment are configured to meet the data collection objectives, including quantification of seabird bycatch. The VMP specifies that if any seabirds are caught, the vessel operators must hold seabirds up to the camera for 2 to 3 seconds and show certain key parts of the animal, such as the beak, to the hauler view camera². The ability to identify seabird species is similar when using observers and EM, as experts found during the 2016 protocols for displaying seabirds to the camera and the camera picture quality were sufficient as long as fishermen adhered to catch handling these protocols.

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 or camera. 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).

² An example VMP template with the specific seabird handling protocols is available at <https://alaskafisheries.noaa.gov/fisheries/electronic-monitoring>

Estimation Methods

Since 1993, NOAA Fisheries has used two methods to estimate seabird bycatch for the entire groundfish fisheries.³ From 1993 through 2006, the AFSC produced the seabird bycatch estimates using a ratio estimator (Fitzgerald et al. 2008; AFSC 2014). Since 2007, NOAA Fisheries Alaska Region has produced bycatch estimates using a ratio estimator in the CAS (Cahalan et al. 2014).

In the CAS, NMFS uses observer data to create seabird bycatch rates (a ratio of the estimated bycatch to the estimated total catch in sampled hauls). NMFS uses the observed information from the at-sea samples 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 and EM data that are available, the extrapolation from observed vessels to unobserved vessels is based on varying levels of aggregated data (post-stratification). NMFS matches data based on processing sector (e.g., catcher/processor [C/P] or catcher vessel [CV]), 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 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 and EM are consolidated into a larger group (Table 1). This includes codes for birds that are not identifiable 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/skuu, 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 (CV or CP). Vessels are either in a full coverage category (CPs, with some exceptions) and take an

³ Seabird estimation methods were similar to those used for marine mammal bycatch estimation (<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.

observer on all trips, or in the partial coverage category (CVs, 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. (2019) and are also included in the summary bycatch report (Eich et al. 2016).

Results and Discussion

This report estimates seabird mortality associated with Federal groundfish (2010 through 2018) and halibut (2013 through 2018) fisheries off Alaska and provides detailed descriptions of bycatch in 2018. 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), and then separated by harvest sector (CVs) and catcher processors (C/Ps), (Table 7)). Third, the combined trawl fleet bycatch is shown (Table 8). Fourth, trawl bycatch separated by FMP area (BSAI or GOA) and gear type (pelagic or non-pelagic) is shown (Table 9 through Table 11). Seabird bycatch estimates for the pot fishery are reported in Table 12. Finally, Table 13 provides seabird bycatch estimates by area, gear, target, and species or species group for 2010 through 2018.

All Gear Types and Fisheries

The 2018 estimated seabird bycatch for the combined groundfish and halibut fisheries (6,075 birds) was below the 2010 through 2018 annual average of 6,492 birds. Figure 2 depicts estimated seabird bycatch in the groundfish fisheries from 1993 through 2018 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 2018. 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.⁴ Since then, annual seabird bycatch in the fisheries using demersal longline gear has remained below 10,000 birds, dropping as low as 2,100 birds in 2014 (Table 3).

In an analysis of 2018 seabird bycatch prepared for this paper, 68 percent (4,137 birds) of estimated seabird bycatch occurred in the Bering Sea, 20 percent (1,212 birds) in the GOA, and 12 percent (726 birds) in the Aleutian Islands. These proportions are relatively similar to the 2010 through 2017 average proportions (Bering Sea [76 percent]; GOA [16 percent]; and Aleutian Islands [8 percent]; Figure 3).

Consistent with prior years, seabird bycatch estimates in 2018 were dominated by Northern fulmar (*Fulmarus glacialis*; 54 percent; Table 2; Figure 4). Estimated Northern fulmar bycatch (3,290 birds) decreased by 11 percent compared to the average during the time series (2010 through 2017; 3,677 birds per year). Fulmar bycatch has ranged from an estimated 33 percent to 65 percent of the total seabird

⁴ See regulations at 50 CFR part 679.24(e)(2) for more specific requirements.

bycatch from 2010 through 2018. Average annual mortality for Northern fulmar since 2010 has been 3,634 birds (2010 through 2018). When compared to estimates of the total population size of Northern fulmar in Alaska of 1.4 million birds (Denlinger 2006), observed fisheries account for an annual mortality of 0.26 percent. While this mortality is low, local population depletions could occur if the mortality is colony-specific (Hatch et al. 2010).

In 2018, gulls (Family Laridae) were the second most frequently occurring birds in the bycatch (13 percent of total seabird bycatch; Table 2). Gull bycatch in 2018 (782 birds) was 15 percent higher than in 2017 (n = 680 birds) but was 25 percent lower when compared to the 8-year average time series (2010 through 2017; 1,016 birds). Estimated gull bycatch has ranged from 7 percent to 30 percent of the total estimated seabird bycatch from 2010 through 2018. Looking at overall gull bycatch (all gear types, all areas combined) for the last 9 years (2010 through 2018), bycatch levels in 2018 fall directly in middle of the observed bycatch range (Table 2). Of the various gull species, estimates of the total number of breeders in Alaska are 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).

Shearwaters (Family Procellariidae) were the third most frequently occurring birds in the bycatch (13 percent) in 2018 (780 birds). Shearwater bycatch decreased by an estimated 63 percent from 2017 to 2018 and was 20 percent below the time series average from 2010 through 2017 (980 birds). Shearwater bycatch has ranged from 3 percent to 33 percent of the total estimated seabird bycatch from 2010 through 2018. Average annual mortality for shearwaters from 2010 through 2018 has been 957 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).

Albatross

No takes of short-tailed albatross were observed in the groundfish fisheries in 2018. The incidental take statement in the 2015 biological opinion on the groundfish fisheries exempts the take (either by demersal longline or trawl) of six short-tailed albatross in a 2-year period (USFWS 2015). No observed take of short-tailed albatross has occurred in the groundfish fisheries (either by demersal longline, trawl, or pot) since December 2014.

No takes of short-tailed albatross were observed in the halibut fisheries in 2018. The incidental take statement in the 2018 biological opinion on the halibut fisheries exempts the take of two short-tailed albatross in a 2-year period (USFWS 2018). No observed take of short-tailed albatross has occurred in the halibut fisheries since 1987. Of note is that prior to the restructuring of the observer program in 2013, the halibut fisheries had no at-sea coverage. Since 2013, at-sea coverage occurs on halibut vessels $\geq 40'$ LOA.

In addition to the endangered short-tailed albatross, there is also conservation concern for Laysan and black-footed albatross (USFWS 2008). In 2018, 643 albatross (300 black-footed albatross, 285 Laysan albatross, 58 unidentified albatross; Figure 5) were estimated to have been caught in the fisheries off Alaska; an increase of 33 percent compared to the 2010 through 2017 average (482 birds). Laysan albatross bycatch was 6 times higher in 2018 than in 2017 (47 birds), and was 80 percent higher than the 2010 through 2017 average (159 birds). Laysan albatross bycatch has ranged from less than 1 percent to 5 percent of total estimated seabird bycatch since 2010. The reason for the increase in Laysan albatross bycatch is unknown. Laysan albatross bycatch was found in both demersal longline (192 birds) and trawl gear (93 birds) in 2018.

Black-footed albatross were the fourth most frequently occurring birds in the bycatch (5 percent) in 2018. Black-footed albatross bycatch was 62 percent lower in 2018 (300 birds) compared to 2017 (790 birds). However, black-footed albatross bycatch estimates in 2017 were extremely high (3.93 times greater in 2017 compared to 2016 [201 birds]). The estimated bycatch of black-footed albatross in 2018 was 4 percent less than the 2010 through 2017 average (313 birds). Black-footed albatross bycatch has ranged from 1 percent to 9 percent of the total estimated seabird bycatch from 2010 through 2018. Estimates of

the approximate population size of black-footed albatross is 61,700 breeding pairs (Naughton et al. 2007).

As noted earlier, the 2013 through 2018 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 2018 albatross bycatch in the sablefish fisheries (2,887 birds) surpassed the estimated contribution from the halibut fishery (789 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 83 percent of the estimated seabird mortality in 2018 (5,046 birds), which is similar to the average estimated seabird mortality from 2010 through 2017 (87 percent; range 76 to 96 percent).

From 2010 through 2018, most of the demersal longline gear estimated seabird bycatch occurred in the Bering Sea (78 percent) when compared to the Aleutian Islands (2 percent) and GOA (20 percent). In fact, most (68 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 2010 through 2018).

Consistent with results for all gear types combined, most 2018 estimated seabird bycatch by demersal longline gear was Northern fulmar (55 percent; 2,794 birds); gulls (15 percent; 781 birds); and shearwaters (13 percent; 641 birds; Table 3; Figure 6). However, in 2018, total bycatch of these species was comparatively lower when compared to the 2010 through 2017 times series average.

Estimates of seabird bycatch were also analyzed to compare C/Ps and CVs. In the BSAI, 96 percent of the total estimated seabird bycatch for vessels using demersal longline gear occurred on C/Ps in 2018 (3,875 birds). This is the same percentage as the 2010 through 2017 time series average (4,751 birds; range of 1,427 to 8,831 birds). Northern fulmar, shearwaters, and gulls accounted for 93 percent of total estimated bycatch for C/Ps in 2018 (2,640; 583; 503 birds, respectively). On CVs, Laysan albatross accounted for 131 of the 142 total estimated seabirds caught as bycatch in the BSAI in 2018. Approximately three times as many Laysan albatross were caught in 2018 compared to the 2010 through 2017 average (39 birds; Table 7).

In the GOA, 95 percent of total estimated seabird bycatch for vessels using longline gear occurred on CVs in 2018 (980 birds). This is a higher proportion compared to the 2010 through 2017 average (717 birds; 37 percent). Black-footed albatross, gulls, and Northern fulmar were the three most prevalent seabird bycatch species for CVs in 2018 (294; 243; 146 birds, respectively; Table 7). The difference in proportion of seabird bycatch attributed to CVs and C/Ps in the BSAI and GOA is most likely a reflection of the differences in the fisheries primarily targeted in these regions. In the BSAI, longline fisheries primarily target Pacific cod (*Gadus microcephalus*), while in the GOA, longline fisheries primarily targeted halibut, sablefish, and Pacific cod.

Of the demersal longline fisheries that have seabird bycatch, the bulk of recent fishery effort in the Bering Sea occurs in the Pacific cod demersal longline fleet (Eich et al. 2016). While this fishery accounts for the greatest amount of seabird bycatch (2010 through 2018 average = 68 percent), it captures an average of 7 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 (24 of the total 31 birds). As noted earlier, no endangered short-tailed albatross takes by demersal longline gear were observed in 2018 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 11 percent (range 4 to 16 percent) of the overall estimated 2010 through 2018 seabird bycatch (Table 2 and Table 8). This is consistent with the 2018 proportion of estimated seabird bycatch attributed to the fisheries using trawl gear (16 percent, 978 birds).

For trawl gear, Northern fulmar again dominate the estimated bycatch of seabirds in 2018 followed by storm petrels, shearwaters, and gulls (Table 8). There is substantial inter-annual variability in bycatch of Northern fulmar (average of 363 birds; range of 85 to 503 birds), shearwaters (average of 184; range of 1 to 928 birds), and gulls (average of 7 birds; range of 0 to 57 birds) from 2010 through 2018 (Figure 7). This year (2018) was the first year in the current time series that storm petrel (Family Hydrobatidae) bycatch occurred in this fishery. An estimated 197 birds were taken from the Atka mackerel BSAI non-pelagic trawl fishery.

Most estimated seabird bycatch taken by trawl gear occurs in the BSAI, averaging 90 percent of the trawl seabird bycatch from 2010 through 2018 (Table 9). Only a minimal amount of estimated Northern fulmar and black-footed-albatross bycatch is attributed to trawl gear in the GOA from 2010 through 2018 (Table 10).

Albatross bycatch in Alaska groundfish trawl fisheries is generally rare. No endangered short-tailed albatross takes by trawl gear have been observed in the Federal fisheries off Alaska. 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. An unprecedented estimate of 93 Laysan albatross were taken in the rockfish fishery in the BSAI in 2018 (Table 13). From 2010 through 2017, no Laysan albatross were reported for any trawl fishery. The reasons for this high Laysan albatross estimate in 2018 are unclear. Prior to 2007, only Laysan or unidentified albatross were observed in fisheries using trawl gear (Fitzgerald et al. 2008). However, at-sea observers have reported Laysan albatross mortalities from gear collisions (primarily third wires) throughout the period reported here (Shannon Fitzgerald, AFSC, unpublished data). The AFSC is designing protocols to capture these reports and extrapolate the mortalities to the fleet.

No prominent differences exist between seabird bycatch in 2018 versus 2010 through 2017 for pelagic and non-pelagic trawl gear (Table 11). For 2010 through 2018, non-pelagic gear accounted for 82 percent of trawl seabird mortality. Non-pelagic gear had greater estimated seabird bycatch in 2018 (936 birds) compared to the eight previous years reported here with the exception of estimated bycatch in 2017 (1,254 birds). This was in part due to a high estimate of Northern fulmar bycatch (403 birds) that occurred in the non-pelagic trawl fleet in the BSAI. For 2010 through 2018, seabird bycatch in pelagic gear ranged from 42 to 232 birds (average of 114 birds). For 2010 through 2018, bycatch of all albatross occurred in non-pelagic gear, as did most alcids, shearwaters, and gulls.

Less than 6 percent of the total estimated seabird bycatch from trawl fisheries from 2010 through 2018 occurred on CVs (333 birds). As such, a comparison analysis of CVs to C/Ps was not done for this gear type.

Pot Gear

The pot fishery remains the gear type with the least amount of estimated seabird bycatch (Table 12), representing an average of 2.5 percent of the total seabird bycatch from all gear types from 2010 through 2018 (range 0.4 to 7.4 percent). The 2018 estimated seabird bycatch from pot gear (51 birds) was 0.8

percent of the total from all gear types, which was lowest since 2012 (0.3 percent). Seabird bycatch in pot fisheries occurs primarily in the BSAI with very little bycatch occurring in the GOA. In 2018, all estimated seabird bycatch by pot gear occurred in the BSAI. No birds were estimated to have been taken as bycatch by pot gear in the GOA in 2018.

Only Northern fulmars, shearwaters, gulls, murres, 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 murres (*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.

Annual Variation

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 2010 through 2018 (driven by lower Northern fulmar and gull bycatch), but albatross numbers were still comparable to the 2010 through 2018 annual average of 503 birds. This could indicate poor ocean conditions in the North Pacific as albatross traveled from their nesting grounds (Hawaiian Islands for black-footed and Laysan albatross) 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 2010 and 2018, with the largest change from one year to the next totaling 4,704 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 in 2010 to 2011 (4,996 and 9,700 birds, respectively), 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 (10,361 birds) and then decreasing in 2017 (8,448 birds) and again in 2018 (6,075 birds; Figure 2).

These increases and decreases are largely driven by the demersal longline fisheries. The decreased seabird bycatch estimated in the fisheries using demersal longline gear from 2017 to 2018 was due to a decrease in Northern fulmar (from 3,475 birds to 2,794 birds) and shearwaters (from 1,154 birds to 641 birds). However, bycatch of gulls and Laysan albatross in the fisheries using demersal longline gear increased from 2017 to 2018 (gulls from 680 birds to 781 birds and Laysan albatross from 47 birds to 192 birds).

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 already 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 2010 through 2017 was 4,522, 717, and 231 birds per year, respectively. In 2018, the Pacific cod, sablefish, and halibut demersal longline estimated seabird bycatch was similar with 4,209, 506, and 256 birds, respectively (Table 13).

Focusing solely on the bycatch of albatross (unidentified, short-tailed, Laysan, and black-footed), the Pacific cod, sablefish, and halibut fisheries using demersal longline gear average 39, 365, and 83 albatross per year, respectively, for 2010 through 2018 (average for halibut fisheries calculated for 2013 through 2018). 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 (2010 through 2018) 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 (2010 through 2018) across the Greenland turbot fishery is less than 1 short-tailed albatross per year.

Acknowledgments

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Figures

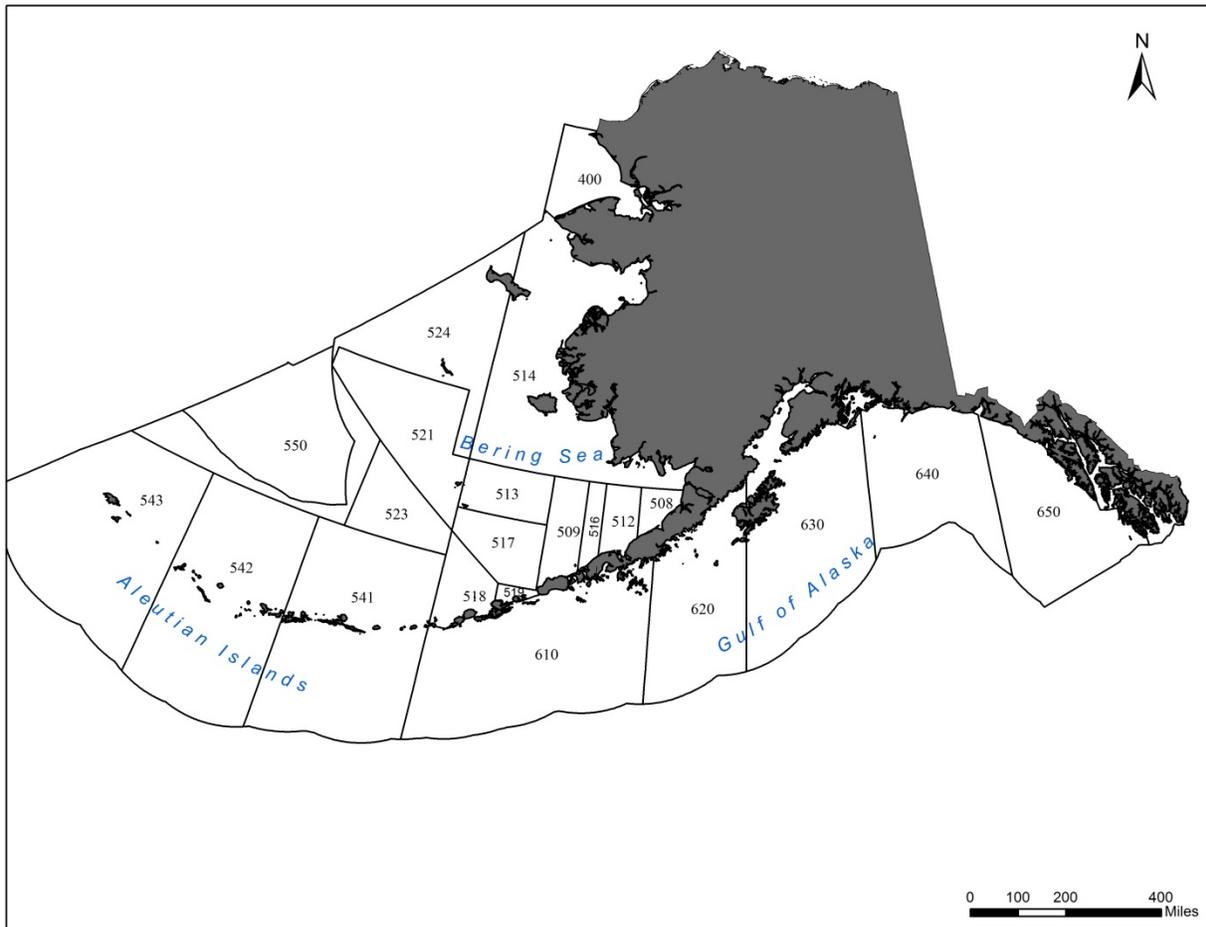


Figure 1 Boundary areas of Bering Sea, Aleutian Islands, and Gulf of Alaska reporting areas. Aleutian Islands includes areas 541 through 543, Bering Sea includes areas north of the Alaska Peninsula, and Gulf of Alaska includes areas south of the Alaska Peninsula.

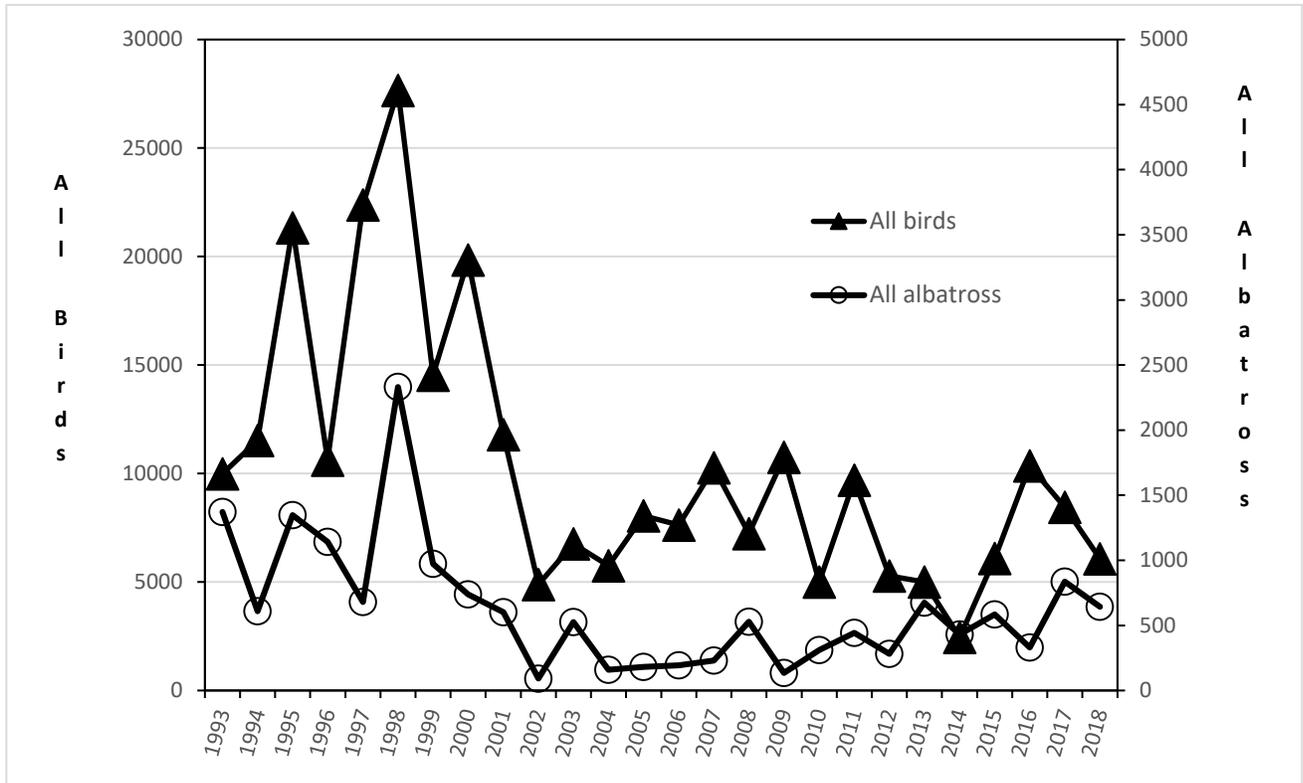


Figure 2 Seabird bycatch in Alaska groundfish fisheries (demersal longline, trawl, and pot) from 1993 through 2018 and halibut fisheries from 2013 through 2018, noting bycatch estimates for all birds (left indices; black triangles) and for albatrosses only (right indices; hollow circles). Note the difference in scale. Different data analysis methodologies were used (data from 1993 through 2006 are described in Fitzgerald et al. 2008; data from 2007 through 2018 are from the CAS). The Observer Program was restructured for deployments beginning in 2013 where most C/Ps had 100 percent coverage, most CVs (regardless of length overall) were randomly selected, and the Pacific halibut fleet was incorporated into the program.

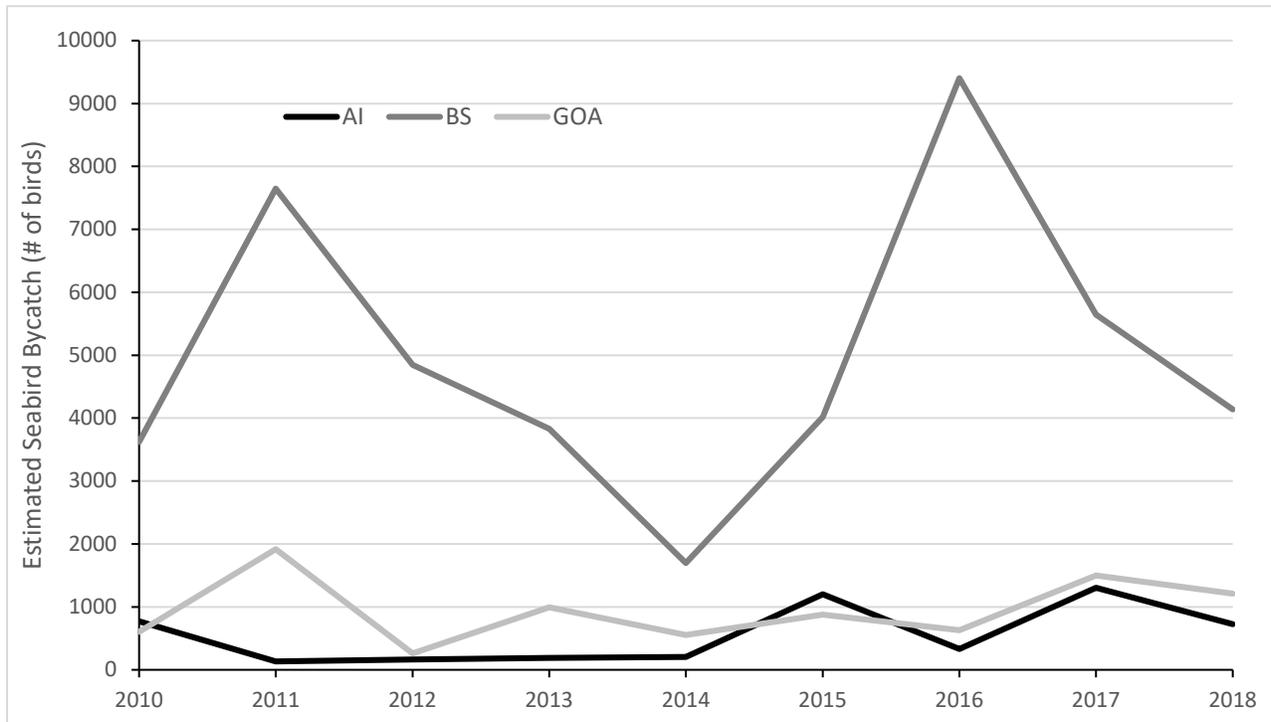


Figure 3 Estimated seabird bycatch in Alaska groundfish and halibut fisheries from 2010 through 2018, separated by region (Aleutian Islands [AI], Bering Sea [BS], and Gulf of Alaska [GOA]; halibut fisheries 2013 through 2018 only).

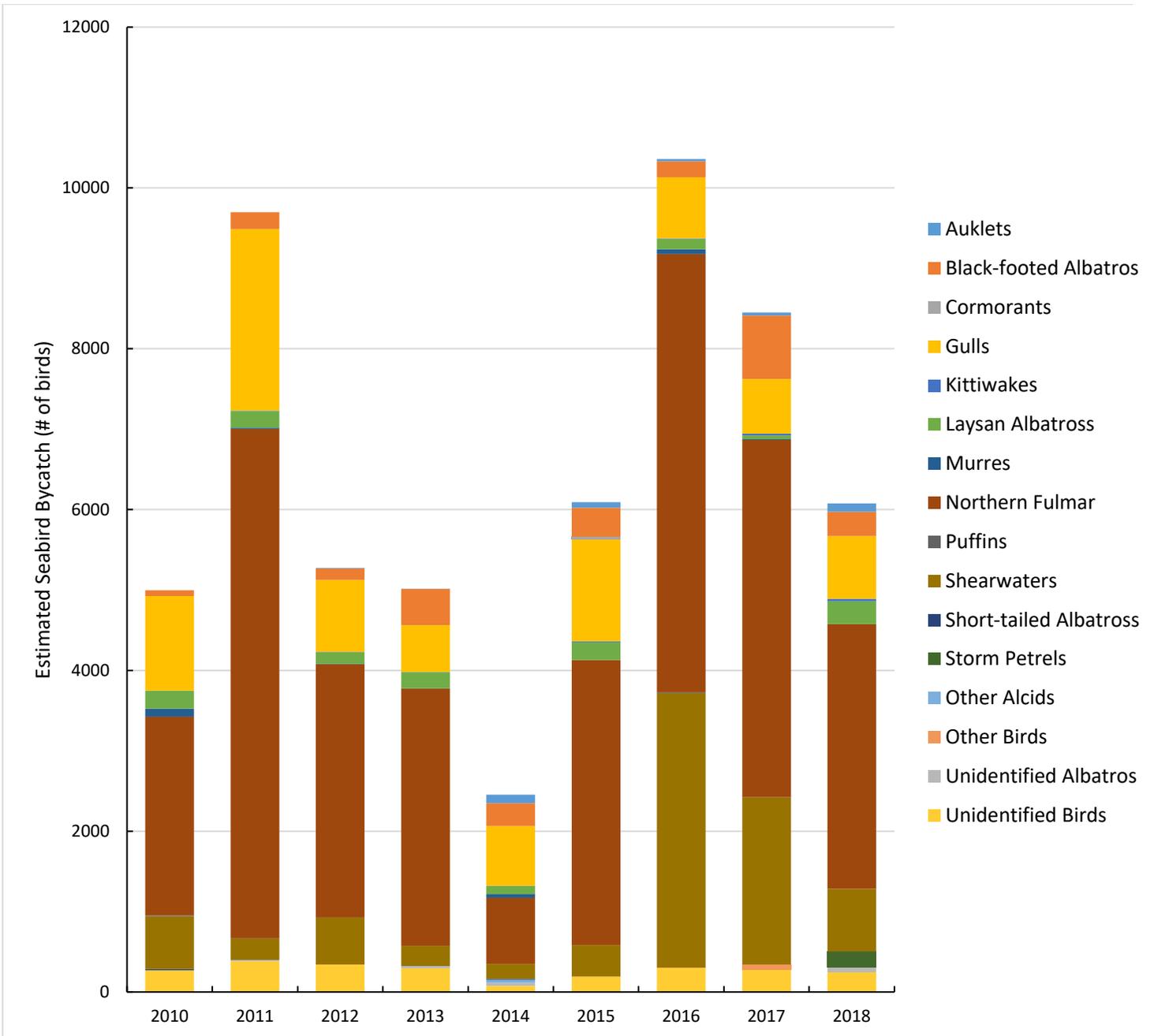


Figure 4 Estimated proportions of species / species groups of seabird bycatch in Alaska groundfish and halibut fisheries from 2010 through 2018 (halibut fisheries 2013 through 2018 only).

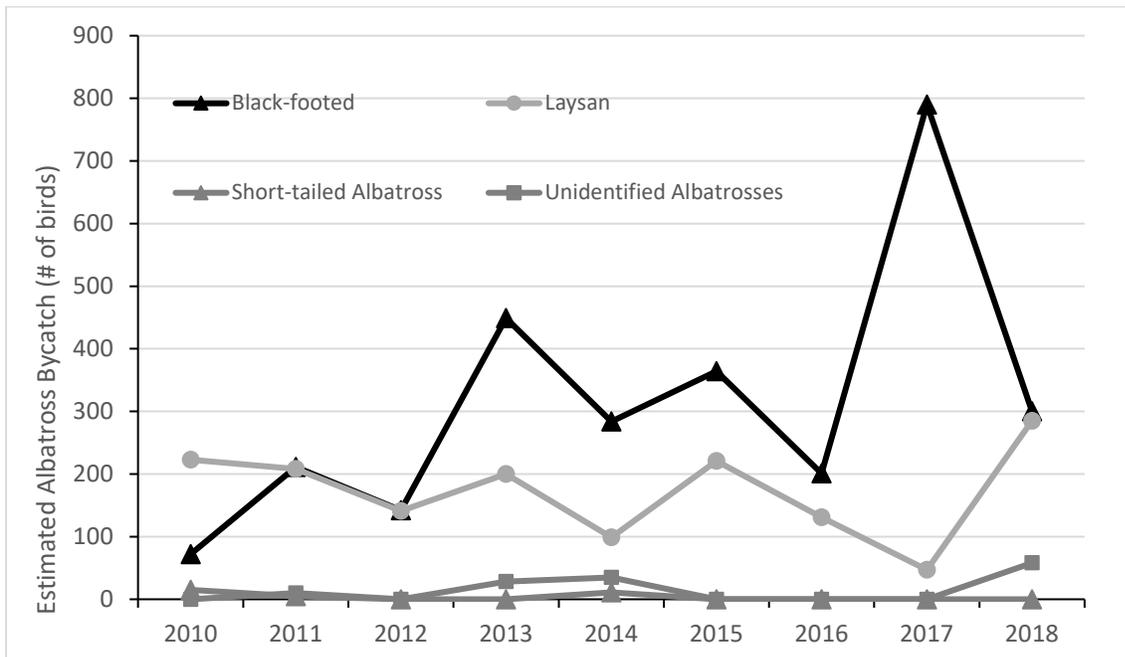


Figure 5 Estimated albatross bycatch in Alaska groundfish and halibut fisheries from 2010 through 2018 (halibut fisheries 2013 through 2018 only). Black-footed albatross denoted by black triangles, Laysan albatross by gray circles, short-tailed albatross by charcoal squares.

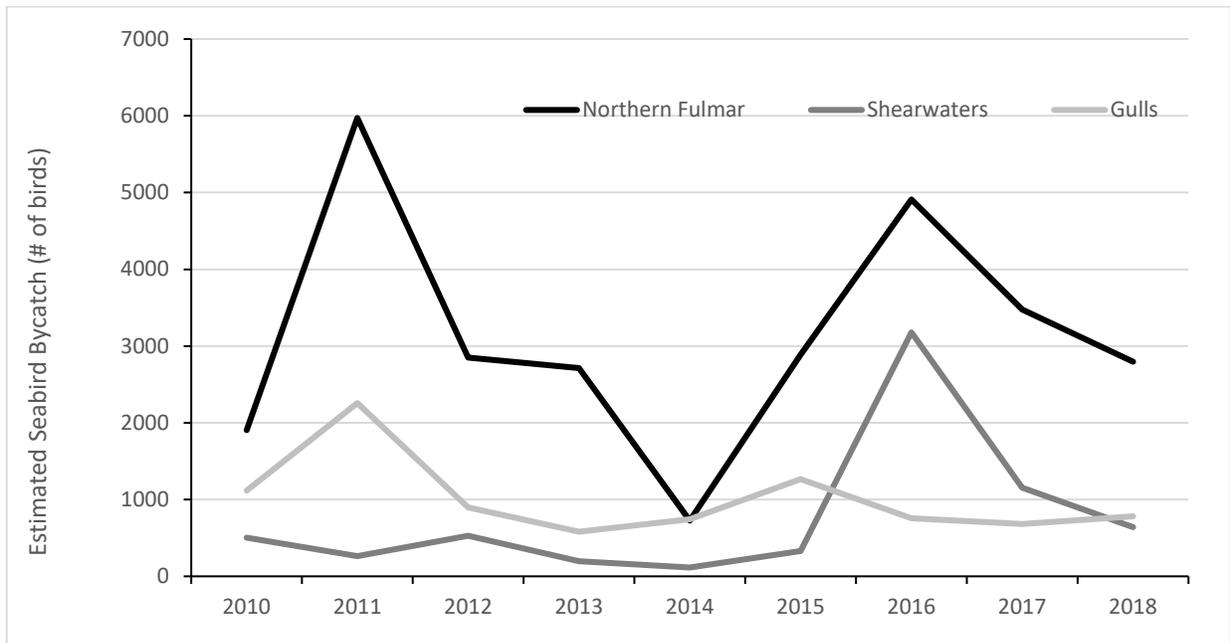


Figure 6 Estimated seabird bycatch of Northern fulmar, shearwaters, and gulls in Alaska demersal longline groundfish and halibut fisheries, all fishery management plan areas combined, from 2010 through 2018 (halibut fisheries 2013 through 2018 only).

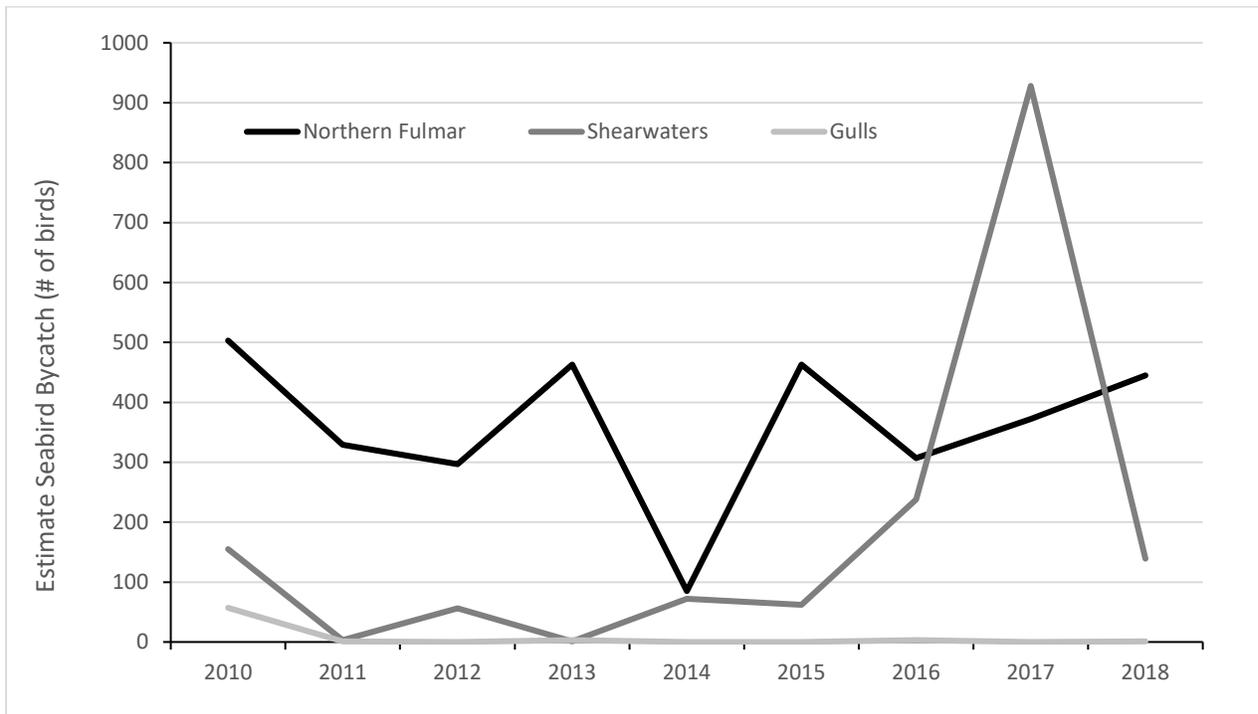


Figure 7 Estimated seabird bycatch of Northern fulmar, shearwaters, and gulls in Alaska trawl fisheries, all fishery management plan areas combined, from 2010 through 2018.

Tables

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 procellariid	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>Cepphus</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 2017).

Table 2 Total estimated seabird bycatch in Alaska Federal groundfish and halibut fisheries, all gear types and fishery management plan areas combined, 2010 through 2018. Halibut fisheries 2013 through 2018 only. The Observer Program was restructured in 2013.

Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
Unidentified Albatrosses	0	10	0	28	35	0	0	0	58	15
Short-tailed Albatross	15	5	0	0	11	0	0	0	0	3
Laysan Albatross	223	208	141	200	99	221	131	47	285	173
Black-footed Albatross	72	211	142	449	284	364	201	790	300	313
Northern Fulmar	2,472	6,337	3,148	3,197	822	3,546	5,452	4,441	3,290	3,634
Shearwaters	657	264	585	253	187	392	3,416	2,082	780	957
Storm Petrels	0	0	0	0	0	0	0	0	197	22
Gulls	1,176	2,258	898	584	742	1,265	758	680	782	1,016
Kittiwakes	0	6	5	3	4	12	5	22	30	10
Murres	102	14	6	3	47	0	58	10	0	27
Puffins	9	0	0	0	0	0	10	0	0	2
Auklets	0	0	7	4	107	69	29	36	103	39
Other Alcids	0	0	0	0	39	0	0	0	5	5
Cormorants	0	0	0	0	0	31	0	0	0	3
Other Birds	0	0	0	0	0	0	0	63	0	7
Unidentified Birds	270	387	343	295	78	193	301	279	245	266
Grand Total	4,996	9,700	5,275	5,016	2,455	6,093	10,361	8,450	6,075	6,492

Table 3 Summary of estimated seabird bycatch in the Alaska demersal longline groundfish and halibut fisheries, all fishery management plan areas combined, 2010 through 2018. Halibut fisheries 2013 through 2018 only.

Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
Unidentified Albatrosses	0	10	0	28	35	0	0	0	58	15
Short-tailed Albatross	15	5	0	0	11	0	0	0	0	3
Laysan Albatross	223	208	141	200	99	221	131	47	192	162
Black-footed Albatross	72	211	82	449	284	364	201	790	300	306
Northern Fulmar	1,904	5,972	2,851	2,714	726	2,887	4,911	3,475	2,794	3,137
Shearwaters	502	261	529	195	115	330	3,178	1,154	641	767
Gulls	1,119	2,257	898	581	742	1,265	755	680	781	1,009
Kittiwakes	0	6	5	3	4	12	5	22	30	10
Murres	0	0	6	0	0	0	0	9	0	2
Puffins	9	0	0	0	0	0	10	0	0	2
Auklets	0	0	7	0	6	11	0	0	0	3
Other Alcids	0	0	0	0	0	0	0	0	5	1
Cormorants	0	0	0	0	0	28	0	0	0	3
Unidentified Birds	267	387	323	295	78	187	295	279	245	262
Grand Total	4,111	9,317	4,842	4,465	2,100	5,305	9,486	6,456	5,046	5,682

Table 4 Estimated seabird bycatch in the Aleutian Islands area demersal longline groundfish and halibut fisheries, 2010 through 2018. Halibut fisheries 2013 through 2018 only.

Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
Unidentified Albatrosses	0	0	0	0	22	0	0	0	0	2
Laysan Albatross	121	12	77	109	50	150	69	14	59	73
Black-footed Albatross	0	5	0	12	7	19	0	0	0	5
Northern Fulmar	111	21	7	31	55	882	16	167	2	144
Shearwaters	13	42	16	0	68	23	0	128	0	32
Gulls	176	22	12	24	0	37	4	0	0	31
Unidentified Birds	17	0	0	9	0	0	0	10	4	4
Grand Total	438	102	112	185	202	1,111	89	319	65	291

Table 5 Estimated seabird bycatch in the Bering Sea area demersal longline groundfish and halibut fisheries, 2010 through 2018. Halibut fisheries 2013 through 2018 only.

Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
Unidentified Albatrosses	0	0	0	0	13	0	0	0	0	1
Short-tailed Albatross	15	5	0	0	11	0	0	0	0	3
Laysan Albatross	16	30	48	21	17	30	18	33	105	35
Black-footed Albatross	9	2	0	1	9	2	0	0	0	3
Northern Fulmar	1,738	5,132	2,825	2,567	641	1,917	4,792	2,978	2,641	2,803
Shearwaters	489	157	514	195	47	301	3,158	999	584	716
Gulls	662	1,650	835	420	586	941	602	372	510	731
Kittiwakes	0	6	5	3	4	12	5	22	30	10
Murres	0	0	6	0	0	0	0	9	0	2
Puffins	9	0	0	0	0	0	10	0	0	2
Auklets	0	0	7	0	0	0	0	0	0	1
Other Alcids	0	0	0	0	0	0	0	0	5	1
Unidentified Birds	250	377	290	279	78	154	277	268	78	228
Grand Total	3,188	7,359	4,530	3,486	1,406	3,357	8,862	4,681	3,953	4,536

Table 6 Estimated seabird bycatch in the Gulf of Alaska area demersal longline groundfish and halibut fisheries, 2010 through 2018. Halibut fisheries 2013 through 2018 only. The Observer Program was restructured in 2013.

Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
Unidentified Albatrosses	0	10	0	28	0	0	0	0	58	11
Laysan Albatross	85	166	17	69	32	41	44	0	28	54
Black-footed Albatross	63	204	82	436	269	343	201	790	300	299
Northern Fulmar	54	818	19	117	31	88	103	331	152	190
Shearwaters	0	62	0	0	0	5	20	27	57	19
Gulls	281	585	51	137	157	287	149	308	271	247
Auklets	0	0	0	0	6	11	0	0	0	2
Cormorants	0	0	0	0	0	28	0	0	0	3
Unidentified Birds	0	9	33	7	0	33	19	0	164	29
Grand Total	483	1,854	202	794	495	836	536	1,456	1,030	854

Table 7 Estimated seabird bycatch in Alaska demersal longline groundfish and halibut fisheries, by catcher processors (CP) and catcher vessels (CV), 2010 through 2018. Halibut fisheries 2013 through 2018 only.

Region	Harvest Sector	Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
BSAI	CP	Unidentified Albatrosses	0	0	0	0	17	0	0	0	0	2
		Short-tailed Albatross	15	5	0	0	11	0	0	0	0	3
		Laysan Albatross	109	39	87	86	30	95	52	9	33	60
		Black-footed Albatross	9	4	0	12	0	8	0	0	0	4
		Northern Fulmar	1,837	5,130	2,826	2,572	646	2,713	4,740	2,675	2,640	2,864
		Shearwaters	495	174	528	195	64	309	3,158	1,084	583	732
		Gulls	816	1,657	837	425	579	951	589	372	503	748
		Kittiwakes	0	6	5	3	4	12	5	22	30	10
		Murres	0	0	6	0	0	0	0	9	0	2
		Puffins	9	0	0	0	0	0	10	0	0	2
		Auklets	0	0	7	0	0	0	0	0	0	1
		Other Alcids	0	0	0	0	0	0	0	0	5	1
		Unidentified Birds	263	377	289	270	76	153	277	246	81	226
		Total	3,553	7,392	4,585	3,563	1,427	4,241	8,831	4,417	3,875	4,655
	CV	Unidentified Albatrosses	0	0	0	0	18	0	0	0	0	2
		Laysan Albatross	29	3	37	45	37	85	35	38	131	49
		Black-footed Albatross	0	3	0	1	16	13	0	0	0	4
		Northern Fulmar	13	23	6	25	49	85	68	470	3	82
		Gulls	23	15	10	19	7	27	17	0	7	14
		Puffins	7	24	1	1	51	16	0	43	1	16
Unidentified Birds		4	1	1	18	1	0	0	32	0	6	
Total		76	69	55	109	179	226	120	583	142	173	
GOA	CP	Unidentified Albatrosses	0	6	0	0	0	0	0	0	0	1
		Laysan Albatross	26	80	6	0	9	5	1	0	4	15
		Black-footed Albatross	10	3	0	14	7	3	28	31	7	11
		Northern Fulmar	25	103	9	6	7	14	20	127	6	35

Region	Harvest Sector	Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
		Shearwaters	0	32	0	0	0	3	0	0	5	4
		Gulls	134	33	12	18	9	27	14	52	28	36
		Auklets	0	0	0	0	4	9	0	0	0	1
		Cormorants	0	0	0	0	0	8	0	0	0	1
		Unidentified Birds	0	4	13	5	0	4	0	0	0	3
		Total	195	261	40	43	36	73	63	210	50	107
	CV	Unidentified Albatrosses	0	3	0	28	0	0	0	0	58	10
		Laysan Albatross	59	86	11	69	23	36	43	0	24	39
		Black-footed Albatross	52	201	81	423	262	340	173	759	294	287
		Northern Fulmar	29	715	10	110	24	74	84	205	146	155
		Shearwaters	0	30	0	0	0	2	19	27	51	14
		Gulls	147	552	39	119	147	260	135	256	243	211
		Auklets	0	0	0	0	2	2	0	0	0	0
		Cormorants	0	0	0	0	0	20	0	0	0	2
		Unidentified Birds	0	6	20	2	0	29	18	0	164	27
		Total	287	1,593	161	751	458	763	472	1,247	980	746

Table 8 Estimated seabird bycatch for Alaska groundfish fisheries using pelagic and non-pelagic trawl gear combined, all fishery management plan areas combined, 2010 through 2018.

Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
Laysan Albatross	0	0	0	0	0	0	0	0	93	10
Black-footed Albatross	0	0	60	0	0	0	0	0	0	7
Northern Fulmar	503	329	297	463	85	463	307	372	445	363
Shearwaters	155	3	56	1	72	62	238	928	139	184
Storm Petrels	0	0	0	0	0	0	0	0	197	22
Gulls	57	1	0	3	0	0	3	0	1	7
Murres	102	14	0	3	47	0	45	1	0	24
Auklets	0	0	0	4	66	0	0	0	103	19
Cormorants	0	0	0	0	0	3	0	0	0	0
Other Birds	0	0	0	0	0	0	0	63	0	7
Unidentified Birds	3	0	0	0	0	6	6	0	0	2
Grand Total	820	347	413	474	270	534	599	1,364	885	635

Table 9 Estimated seabird bycatch for the Alaska groundfish Bering Sea and Aleutian Islands fishery management plan area, pelagic and non-pelagic trawl gear combined, 2010 through 2018.

Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
Laysan Albatross	0	0	0	0	0	0	0	0	93	10
Northern Fulmar	383	302	297	320	65	463	307	328	262	303
Shearwaters	155	3	56	1	72	62	238	928	139	184
Storm Petrels	0	0	0	0	0	0	0	0	197	22
Gulls	57	1	0	3	0	0	3	0	1	7
Murres	102	14	0	3	47	0	45	1	0	24
Auklets	0	0	0	4	66	0	0	0	103	19
Cormorants	0	0	0	0	0	3	0	0	0	0
Other Birds	0	0	0	0	0	0	0	63	0	7
Unidentified Birds	3	0	0	0	0	6	6	0	0	2
Grand Total	700	320	353	331	250	534	599	1,320	795	578

Table 10 Estimated seabird bycatch for the Alaska groundfish Gulf of Alaska fishery management plan area, pelagic and non-pelagic trawl gear combined, 2010 through 2018.

Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
Black-footed Albatross	0	0	60	0	0	0	0	0	0	7
Northern Fulmar	121	27	0	143	20	0	0	44	182	60
Grand Total	121	27	60	143	20	0	0	44	182	67

Table 11 Estimated seabird bycatch for the Alaska groundfish pelagic (P) and non-pelagic (N) trawl gear types across all fishery management plan areas, 2010 through 2018.

Species/ Species Group	Gear	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
Laysan Albatross	N	0	0	0	0	0	0	0	0	93	10
	P	0	0	0	0	0	0	0	0	0	0
Black-footed Albatross	N	0	0	60	0	0	0	0	0	0	7
	P	0	0	0	0	0	0	0	0	0	0
Northern Fulmar	N	435	115	207	340	34	351	223	263	403	263
	P	69	214	90	123	51	112	84	109	42	99
Shearwaters	N	133	0	44	0	69	56	229	928	139	178
	P	22	3	12	1	3	6	9	0	0	6
Storm Petrels	N	0	0	0	0	0	0	0	0	197	22
	P	0	0	0	0	0	0	0	0	0	0
Gulls	N	57	0	0	0	0	0	0	0	1	6
	P	0	1	0	3	0	0	3	0	0	1
Murre	N	102	0	0	0	44	0	39	0	0	21
	P	0	14	0	3	3	0	6	1	0	3
Auklets	N	0	0	0	0	66	0	0	0	103	19
	P	0	0	0	4	0	0	0	0	0	0
Cormorants	N	0	0	0	0	0	0	0	0	0	0
	P	0	0	0	0	0	3	0	0	0	3
Other Birds	N	0	0	0	0	0	0	0	63	0	7
	P	0	0	0	0	0	0	0	0	0	0
Unidentified Birds	N	0	0	0	0	0	0	0	0	0	0
	P	3	0	0	0	0	6	6	0	0	2
Grand Total	N	727	115	311	340	213	407	491	1,254	936	533
	P	94	232	102	134	57	127	108	110	42	114

Table 12 Estimated seabird bycatch for pot vessels fishing groundfish in Alaska Federal waters, all fishery management plan areas combined, 2010 through 2018. The Observer Program was restructured in 2013.

Species/ Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Ann Avg.
Northern Fulmar	65	37	0	20	11	197	234	593	51	134
Shearwaters	0	0	0	57	0	0	0	0	0	6
Murres	0	0	0	0	0	0	13	0	0	1
Auklets	0	0	0	0	35	58	29	36	0	18
Other Alcids	0	0	0	0	39	0	0	0	0	4
Unidentified Birds	0	0	20	0	0	0	0	0	0	2
Grand Total	65	37	20	77	85	255	276	629	51	165

Table 13 Estimated seabird bycatch in Alaska by groundfish and halibut fishery target, 2010 through 2018. Halibut fisheries 2013 through 2018 only.

Region	Gear	Target	Species/Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Grand Total	Ann Avg.	
BSAI	Demersal Longline	Greenland Turbot	Gulls	17	0	0	0	0	0	0	0	0	17	2	
			Kittiwakes	0	0	0	0	0	0	0	9	0	9	1	
			Laysan Albatross	0	5	0	0	0	0	0	0	0	3	8	1
			Northern Fulmar	170	499	354	65	55	17	82	130	73	1,445	161	
			Shearwaters	4	38	40	60	0	55	174	14	0	385	43	
			Short-tailed Albatross	0	0	0	0	6	0	0	0	0	6	1	
			Unidentified Birds	11	0	15	5	0	0	0	0	0	31	3	
			Total	202	542	409	130	61	72	256	153	76	1,901	211	
		Halibut	Black-footed Albatross	0	0	0	0	16	0	0	0	0	16	2	
			Gulls	0	0	0	14	0	0	17	0	0	31	3	
			Laysan Albatross	0	0	0	17	0	18	0	38	131	204	23	
			Northern Fulmar	0	0	0	0	0	0	68	468	0	536	60	
			Shearwaters	0	0	0	0	0	0	0	43	0	43	5	
			Unidentified Birds	0	0	0	19	0	0	0	32	0	51	6	
			Total	0	0	0	50	16	18	85	581	131	881	98	
		Pacific Cod	Auklets	0	0	7	0	0	0	0	0	0	7	1	
			Black-footed Albatross	9	0	0	0	0	0	0	0	0	9	1	
			Gulls	733	1,644	834	413	586	941	589	372	511	6,623	736	
			Kittiwakes	0	6	5	3	4	12	5	13	30	78	9	
			Laysan Albatross	42	28	34	4	12	38	12	9	30	209	23	
			Murres	0	0	6	0	0	0	0	9	0	15	2	
			Northern Fulmar	1,652	4,633	2,478	2,502	582	2,690	4,658	2,542	2,569	24,306	2,701	
			Puffins	9	0	0	0	0	0	10	0	0	19	2	
			Shearwaters	492	125	490	135	44	243	2,984	1,071	584	6,168	685	
			Short-tailed Albatross	15	5	0	0	5	0	0	0	0	25	3	
			Other Alcids	0	0	0	0	0	0	0	0	5	5	1	
			Unidentified Albatrosses	0	0	0	0	12	0	0	0	0	12	1	
			Unidentified Birds	249	378	275	263	78	151	277	247	81	1,999	222	
			Total	3,201	6,819	4,129	3,320	1,323	4,075	8,535	4,263	3,810	39,475	4,386	

Region	Gear	Target	Species/Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Grand Total	Ann Avg.		
		Rockfish	Gulls	0	0	0	5	0	0	0	0	0	5	1		
			Total	0	0	0	5	0	0	0	0	0	0	5	1	
		Sablefish	Black-footed Albatross	0	7	0	13	0	21	0	0	0	0	0	41	5
			Gulls	90	28	13	12	0	37	0	0	0	0	0	180	20
			Laysan Albatross	96	9	90	110	54	123	75	0	0	0	0	557	62
			Northern Fulmar	28	21	0	30	58	92	0	0	0	0	0	229	25
			Shearwaters	6	35	0	0	71	27	0	0	0	0	0	139	15
			Unidentified Albatrosses	0	0	0	0	23	0	0	0	0	0	0	23	3
			Unidentified Birds	6	0	0	0	0	0	0	0	0	0	0	6	1
			Total	226	100	103	165	206	300	75	0	0	0	0	1,175	131
		Other Species	Northern Fulmar	0	0	0	0	0	0	0	0	0	3	0	3	0
			Unidentified Birds	0	0	0	0	0	0	0	3	0	0	0	3	0
	Total		0	0	0	0	0	0	0	3	0	3	0	6	1	
	Trawl	Arrowtooth Flounder	Northern Fulmar	0	150	8	0	221	0	0	0	0	0	379	42	
			Total	0	150	8	0	221	0	0	0	0	0	0	379	42
		Atka Mackerel	Auklets	0	0	0	0	0	0	0	0	0	0	54	54	6
			Northern Fulmar	84	29	8	0	0	92	0	0	0	0	221	434	48
			Shearwaters	75	0	44	0	0	0	0	184	156	139	139	598	66
			Storm Petrels	0	0	0	0	0	0	0	0	0	0	197	197	22
			Total	159	329	68	0	442	92	184	156	156	611	611	2,041	227
		Pacific Cod	Northern Fulmar	139	0	0	0	0	0	0	57	0	0	0	196	22
			Total	139	0	0	0	0	0	0	57	0	0	0	196	22
		Pollock	Auklets	0	0	0	4	0	0	0	0	0	0	0	4	0
			Cormorants	0	0	0	0	0	0	3	0	0	0	0	3	0
			Gulls	0	1	0	3	0	0	0	3	0	0	0	7	1
			Murres	0	14	0	3	3	0	6	0	6	1	0	27	3
			Northern Fulmar	69	214	90	123	51	112	84	112	84	109	42	894	99
Shearwaters			22	3	12	1	3	6	9	6	9	0	0	56	6	
Unidentified Birds	3		0	0	0	0	6	6	6	6	0	0	15	2		
Total	94		232	102	134	57	127	108	108	127	110	42	1,006	112		

Region	Gear	Target	Species/Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Grand Total	Ann Avg.		
		Rock Sole	Auklets	0	0	0	0	66	0	0	0	0	66	7		
			Gulls	0	0	0	0	0	0	0	0	0	1	1	0	
			Murres	24	0	0	0	0	0	0	0	0	0	0	24	3
			Northern Fulmar	0	0	49	112	0	0	92	0	0	0	0	253	28
			Other Birds	0	0	0	0	0	0	0	0	63	0	0	63	7
			Total	24	0	49	112	66	0	92	63	1	407	45		
		Rockfish	Auklets	0	0	0	0	0	0	0	0	0	49	49	49	5
			Laysan Albatross	0	0	0	0	0	0	0	0	0	93	93	93	10
			Northern Fulmar	34	0	0	0	0	0	38	0	0	0	0	72	8
			Shearwaters	0	0	0	0	0	0	0	0	0	772	0	772	86
			Total	34	0	0	0	38	0	772	142	0	986	109		
		Yellowfin Sole	Gulls	57	0	0	0	0	0	0	0	0	0	0	57	6
			Murres	78	0	0	0	44	0	39	0	0	0	0	161	18
			Northern Fulmar	57	59	0	77	14	0	74	219	0	0	0	500	56
			Shearwaters	58	0	0	0	63	56	45	0	0	0	0	222	25
	Total		250	59	0	77	121	56	158	219	0	940	105			
	Pot	Pacific Cod	Auklets	0	0	0	0	35	19	29	36	0	0	119	13	
			Murres	0	0	0	0	0	0	13	0	0	0	13	1	
			Northern Fulmar	65	0	0	20	11	197	139	580	51	0	0	1,063	118
			Unidentified Birds	0	0	20	0	0	0	0	0	0	0	0	20	2
Total			65	0	20	20	46	216	181	616	51	1,215	135			
Sablefish		Northern Fulmar	0	0	0	0	0	0	0	0	13	0	0	13	1	
		Total	0	0	0	0	0	0	0	0	13	0	13	1		
GOA	Demersal Longline	Halibut	Black-footed Albatross	0	0	0	51	33	0	0	340	69	493	55		
			Gulls	0	0	0	75	99	144	42	0	0	0	360	40	
			Laysan Albatross	0	0	0	0	0	19	0	0	0	6	25	3	
			Northern Fulmar	0	0	0	0	19	41	59	121	0	0	240	27	
			Shearwaters	0	0	0	0	0	0	0	0	27	50	77	9	
			Total	0	0	0	126	151	204	101	488	125	1,195	133		
		Pacific Cod	Auklets	0	0	0	0	6	11	0	0	0	0	0	17	2
			Black-footed Albatross	10	0	0	0	8	0	30	28	0	0	0	76	8

Region	Gear	Target	Species/Species Group	2010	2011	2012	2013	2014	2015	2016	2017	2018	Grand Total	Ann Avg.	
			Gulls	147	36	25	27	50	33	17	58	213	606	67	
			Laysan Albatross	9	0	0	0	8	0	0	0	0	0	17	2
			Northern Fulmar	35	8	19	8	12	11	25	147	15	280	31	
			Shearwaters	0	0	0	0	0	0	0	0	7	7	1	
			Unidentified Albatrosses	0	10	0	0	0	0	0	0	0	10	1	
			Unidentified Birds	0	0	33	7	0	5	0	0	164	209	23	
			Total	201	54	77	42	84	60	72	233	399	1,222	136	
		Sablefish	Black-footed Albatross	53	204	82	385	228	343	171	423	232	2,121	236	
			Cormorants	0	0	0	0	0	28	0	0	0	28	3	
			Gulls	134	549	26	35	8	111	90	250	57	1,260	140	
			Laysan Albatross	76	166	17	69	24	22	44	0	22	440	49	
			Northern Fulmar	19	810	0	109	0	36	19	64	137	1,194	133	
			Shearwaters	0	62	0	0	0	5	20	0	0	87	10	
			Unidentified Albatrosses	0	0	0	28	0	0	0	0	58	86	10	
	Unidentified Birds	0	9	0	0	0	28	19	0	0	56	6			
	Total	282	1,800	125	626	260	573	363	737	506	5,272	586			
	Trawl	Arrowtooth Flounder	Northern Fulmar	121	0	0	143	0	0	0	0	133	397	44	
			Total	121	0	0	143	0	0	0	0	133	397	44	
		Rockfish	Black-footed Albatross	0	0	60	0	0	0	0	0	0	60	7	
			Northern Fulmar	0	27	0	0	20	0	0	44	50	141	16	
			Total	0	27	60	0	20	0	0	44	50	201	22	
	Pot	Pacific Cod	Auklets	0	0	0	0	0	38	0	0	0	38	4	
			Northern Fulmar	0	37	0	0	0	0	95	0	0	132	15	
Other Alcids			0	0	0	0	39	0	0	0	0	39	4		
Shearwaters			0	0	0	57	0	0	0	0	0	57	6		
Total			0	37	0	57	39	38	95	0	0	266	30		



U.S. Department of Commerce
Wilbur Ross, Secretary

National Oceanic and Atmospheric Administration
Tim Gallaudet, Assistant Secretary of Commerce
for Oceans and Atmosphere and Deputy NOAA
Administrator

National Marine Fisheries Service
Chris Oliver, Assistant Administrator for Fisheries

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www.fisheries.noaa.gov/region/alaska

OFFICIAL BUSINESS

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