Observed and Estimated Bycatch of Short-tailed Albatross in U.S. West Coast Groundfish Fisheries 2010-2013

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April 2015

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Executive Summary

In accordance with the National Marine Fisheries Service (NMFS) Biological Opinion (BiOp) on Continuing Operation of the Pacific Coast Groundfish Fishery, this document provides an analysis of observed bycatch and fleet-wide take estimates of U.S. Endangered Species Act (ESA)-listed short-tailed albatross (*Phoebastria albatrus*) in all sectors of the west coast groundfish fishery from 2010–2013.

Short-tailed albatrosses are large, pelagic seabirds of the Order Procellariiformes with long narrow wings adapted for soaring just above the water surface. They are the largest of the three species of North Pacific albatrosses and are "continental shelf-edge specialists." Birds breed at 5-6 years of age; 25% of breeding age adults may forego breeding in a given year. Females lay single eggs, and chicks are fed by adults by surface feeding on squid, shrimp, fish, and fish eggs.

Bycatch of short-tailed albatrosses in commercial fisheries continues to be a major conservation concern. From 1983 to 2009, eleven short-tailed albatross were documented in North Pacific groundfish fisheries. From 2010-2014, eight short-tailed albatross mortalities have been observed during commercial fishing activities, six in Alaska, one off Oregon, and one off Japan. On April 11, 2011, a short-tailed albatross mortality was documented in the limited entry sablefish fishery off the Oregon coast.

Following this mortality in one of the Pacific Coast Groundfish Fisheries, the Pacific Fisheries Management Council adopted recommendations for seabird bycatch mitigation, requiring streamer lines be deployed during setting operations on commercial fixed gear vessels 55' (17 m) or greater in length; smaller vessels will not be required to use seabird bycatch avoidance measures under the current council action. Additionally, outreach efforts are increasing seabird bycatch awareness as well as voluntary use of seabird deterrents throughout the U.S. portion of the range of this species.

Annual bycatch estimates varied as a function of hypothetical levels of seabird carcasses dropping off before making it to observer sampling and varying estimates of the global short-tailed albatross population. The existing estimate for the global black-footed albatross population has not been updated since 2009 and could also influence these calculations if there has been a substantial change to that population estimate.

Acknowledgments

The authors gratefully acknowledge the hard work and dedication of observers from the West Coast Groundfish Observer Program and the At-Sea Hake Observer Program, as well as contributions from observer program staff, particularly Kayleigh Somers and Yong-Woo Lee. This document was a joint effort of the Seabird Bycatch Reporting Team, which included at various times and in various roles, Jason Jannot (NWFSC, WCGOP), Vanessa Tuttle (NWFSC, ASHOP), Thomas Good (NWFSC, CBD), Eric Ward (NWFSC, CBD), Robert Suryan (OSU), and Ed Melvin (WA SeaGrant), and Steve Copps (NMFS, West Coast Region).

Introduction and Background

In accordance with the National Marine Fisheries Service (NMFS) Biological Opinion (BiOp) Regarding the Effects of the Continued Operation of the Pacific Coast Groundfish Fishery as governed by Pacific Coast Groundfish Fishery Management Plan and implementing regulations at 50 CFR Part 660 (USFWS 2012, p. 37), this document provides an analysis of observed takes and fleet-wide bycatch estimates of U.S. Endangered Species Act-listed short-tailed albatross (*Phoebastria albatrus*) in U.S. west coast groundfish fishery sectors.

Historically, the short-tailed albatross was probably the most abundant albatross in the North Pacific, with potential breeding sites also in the North Atlantic (Olson and Hearty 2003). Starting before and after the turn of the 20th century, millions of these birds were hunted for feathers, oil, and fertilizer (USFWS 2008). By 1949, no birds were observed breeding and the species was thought to be extinct. The species began to recover during the 1950s, and currently occurs throughout the North Pacific Ocean.

The short-tailed albatross was federally listed as endangered throughout its range, including the United States, on July 31, 2000 (65 FR 147:46643-46654, USFWS 2000). Under the Endangered Species Act, the Short-tailed Albatross Recovery Plan was finalized in September 2008 (USFWS 2008). There have been two 5-year reviews (USFWS 2009, 2014).

Short-tailed albatross Life History

The short-tailed albatross is a colonial, annual breeding species, with each breeding cycle lasting about 8 months. On the main breeding colony on Torishima Island, birds begin to arrive in early October. A single egg is laid in late October to late November, and incubation lasts 64 to 65 days. Hatching occurs in late December through January (Hasegawa and Degange 1982), and chicks begin to fledge in late May into June (Austin 1949). First breeding attempts sometimes occur when birds are five years old, but more commonly when birds are aged six (USFWS 2008).

Today, breeding colonies exist on two small islands in the western Pacific, with 80-85% of the breeding population on Torishima, a Japanese island that is an active volcano. The other breeding colony in the Senkaku Islands is in disputed ownership among China, Japan and Taiwan, making access impossible since 2002.

In 2008, in the hope of re-establishing an inactive colony**,** 10 chicks were translocated to a former colony site on Mukojima, a non-volcanic island, south of Torishima in the Ogasawara (Bonin) Islands. All chicks in this group survived to fledging, and from 2009 through 2012, 15 chicks per year have been moved to Mukojima and reared to fledging. One pair nested on Mukojima in 2012 and 2013, but did not successfully hatch an egg. In May 2014, a nearly fledged chick was discovered at nearby Nakodo-jima (also in the Ogasawara Islands; USFWS 2014). In February 2015, a short-tailed albatross pair was documented on the island; both members of the pair were born on Torishima, and the female was one of the chicks translocated

to Mukojima in 2009. No chick was found with the pair in 2015, but DNA test results now indicate that this pair almost certainly produced the chick discovered at the breeding site in 2014 (Japan Ministry of Environment press release, 26 March, 2015).

In 2011 and again in 2012, a short-tailed albatross pair hatched and successfully reared a chick on Midway Atoll, in the northwest Hawaiian Islands. The hatching in 2011 marked the first confirmed hatching of a short-tailed albatross outside of the islands surrounding Japan in recorded history. Prior to that, observations of eggs and reports from the 1930s suggested that short-tailed albatross may have nested on Midway Atoll in the past. A female-female pair of short-tailed albatross has been suspected at Kure Atoll in the Northwestern Hawaiian Islands, but neither observed egg at this nest has produced chicks, possibly because the eggs are infertile (USFWS 2014).

Short-tailed albatross bycatch

Bycatch of short-tailed albatrosses in commercial fisheries continues to be a major conservation concern, especially for younger age classes (ca. 2/3 of the 18 reported fishing mortalities were < 4 years old; Yamashina Institute for Ornithology and NMFS unpubl. data). The most recent 5-year review (USFWS 2014) reported five short-tailed albatross mortalities observed during commercial fishing activities, three in Alaska, one off Oregon, and one off Japan; since that report, three more mortalities have been reported from Alaskan fisheries (NOAA Information Bulletins 49 and 52; 2014; S. Fitzgerald, pers. comm.).

For the U.S., these were the first observed mortalities of short-tailed albatrosses in over 12 years (since 1998). During that 12-year period (1998-2010), however, there were three reported mortalities in Russian fisheries (2002, 2003, 2006). On April 11, 2011, a short-tailed albatross was killed by a Pacific Coast Groundfish Fishery vessel's longline fishing gear. Specifically, it was killed by a fixed demersal long-line vessel from the limited entry sablefish fishery approximately 65 kilometers off the Oregon coast.

Following the mortality of a short-tailed albatross off the U.S. west coast in 2011, the Pacific Fisheries Management Council (PFMC), which provides oversight to fisheries management in the Pacific, adopted recommendations for seabird bycatch mitigation in November 2013. The mitigation requires that streamer lines be deployed during setting operations on commercial fixed gear vessels 55 feet (17 meters) or greater in length with a safety exception in the event of rough weather (PFMC 2013). Smaller vessels will not be required to use seabird bycatch avoidance measures under the current council action; consequently, voluntary adoption of streamer lines is important to address albatross conservation across the sablefish longline fleet. Research is underway to develop seabird bycatch options in the west coast sablefish fishery for vessels less than 55 feet in length and to confirm the effectiveness of pending new regulations for vessels 55 feet and longer (E. Melvin and R. Suryan, pers. comm.). Additionally, efforts are continuing to increase seabird bycatch awareness and the use of seabird deterrents throughout the range of this species.

Table 1. Reported short-tailed albatross mortalities associated with North Pacific, Russian, Japanese, and West Coast fishing activities since 1983.

Date	Fishery	Observer program	In sample*	Bird age	Location	Source
7/15/1983	Net	No	n/a	4 months	Bering Sea	USFWS (2008)
10/1/1987	Halibut	No	n/a	6 months	Gulf of Alaska	USFWS (2008)
8/28/1995	IFQ sablefish	Yes	No	1 year	Aleutian Islands	USFWS (2008)
10/8/1995	IFQ sablefish	Yes	No	3 years	Bering Sea	USFWS (2008)
9/27/1996	Hook-and-line	Yes	Yes	5 years	Bering Sea	USFWS (2008)
4/23/1998	Russian salmon drift net	n/a	n/a	< 1 year	Bering Sea, Russia	USFWS (2008)
9/21/1998	Pacific cod hook- and-line	Yes	Yes	8 years	Bering Sea	USFWS (2008)
9/28/1998	Pacific cod hook- and-line	Yes	Yes	Sub-adult	Bering Sea	USFWS (2008)
7/11/2002	Russian **	n/a	n/a	3 months	Sea of Okhotsk, Russia	Yamashina Institute of Ornithology (YIO; 2011)
8/29/2003	Russian demersal longline	n/a	n/a	3 years	Bering Sea, Russia	YIO (2011)
8/31/2006	Russian **	n/a	n/a	1 year	Kuril Islands, Russia	YIO (2011)
8/27/2010	Cod freezer longline	Yes	Yes	7-year old	Bering Sea/ Aleutian Islands	NOAA (2010)
9/14/2010	Cod freezer longline	Yes	Yes	3-year old	Bering Sea/ Aleutian Islands	NOAA (2010)
4/11/2011	Sablefish demersal longline	Yes	Yes	1-year old	Pacific Ocean/Oregon	USFWS (2012)
10/25/2011	Cod freezer longline	Yes	Yes	1-year old	Bering Sea	NOAA (2011)
5/24/2013	Longline, seabird bycatch mitigation research	No	n/a	1-year old	Pacific Ocean, Japan	YIO, pers. comm.
9/7/2014	Hook-and-line groundfish	Yes	No	5-year old	Bering Sea/ Aleutian Islands	NOAA Information Bulletin 49 (2014)
9/7/2014	Hook-and-line groundfish	Yes	Yes	Sub-adult	Bering Sea/ Aleutian Islands	NOAA Information Bulletin 52 (2014)
12/16/2014	Hook-and-line groundfish	No***	No	Immature/ sub-adult	Bering Sea/ Aleutian Islands	NOAA Information Bulletin 31 (2015)

* "In sample" refers to whether a specimen was in a sample of catch analyzed by a fisheries observer regarding the type fishery are unknown
** Specifics regarding the type fishery are unknown
** Review of on-board video documented the bird

U.S. West Coast Groundfish Fisheries

The west coast groundfish fishery (WCGF) is a multi-species fishery that utilizes a variety of gear types. The fishery harvests species designated in the Pacific Coast Groundfish Fishery Management Plan (PFMC 2011) and is managed by the Pacific Fishery Management Council (PFMC). Over 90 species are listed in the groundfish FMP, including a variety of rockfish, flatfish, roundfish, skates, and sharks. These species are found in both federal (> 5.6 km off-shore) and state waters (0-5.6 km). Groundfish are both targeted and caught incidentally by trawl nets, hook-&-line gear, and fish pots.

Under the FMP, the groundfish fishery consists of four management components:

The Limited Entry (LE) component encompasses all commercial fishers who hold a federal limited entry permit. The total number of limited entry permits available is restricted. Vessels with an LE permit are allocated a larger portion of the total allowable catch for commercially desirable species than vessels without an LE permit.

The Open Access (OA) component encompasses commercial fishers who do not hold a federal LE permit. Some states require fishers to carry a state-issued OA permit for certain OA sectors.

The Recreational component includes recreational anglers who target or incidentally catch groundfish species. Recreational fisheries are not covered by this report.

The Tribal component includes native tribal commercial fishers in Washington State that have treaty rights to fish groundfish. Tribal fisheries are not included in this report, with the exception of the observed tribal at-sea Pacific hake (*Merluccius productus*) (also known as whiting) sector.

These four components are further subdivided into sectors based on gear type, target species, permits and other regulatory factors. This report includes data from the following sectors:

Limited Entry (LE) sectors
Beginning in 2011, an Individual Fishing Quota (IFQ) program for the LE bottom trawl fleet and the at-sea Pacific hake fleet was implemented, under the West Coast Groundfish Trawl Catch Share Program.

- IFQ fishery (formerly LE bottom trawl and at-sea Pacific hake, 2002-2010): This sector is subdivided into the following components due to differences in gear type and target strategy:
  - Bottom trawl: Bottom trawl nets are used to catch a variety of non-hake groundfish species. Catch is delivered to shore-based processors.
  - Midwater non-hake trawl: Midwater trawl nets are used to target midwater non-hake species. Catch is delivered to shore-based processors.
  - Pot: Pot gear is used to target groundfish species, primarily sablefish (*Anoplopoma fimbria*). Catch is delivered to shore-based processors.
  - Hook-and-line: Longlines are primarily used to target groundfish species, mainly sablefish. Catch is delivered to shore-based processors.

- LE California halibut (*Paralichthys californicus*) trawl: Bottom trawl nets are used to target California halibut by fishers holding both a state California halibut permit and an LE federal trawl groundfish permit. Catch is delivered to shore-based processors.
- Shoreside Pacific hake trawl: Midwater trawl nets are used to catch Pacific hake. Catch is delivered to shore-based processors.
- At-sea Pacific hake trawl: catcher-processors and motherships use midwater trawl nets to catch Pacific hake. Catcher vessels deliver unsorted catch to a mothership, where the catch is sorted and processed on board, whereas catcher-processors catch and process at-sea. This component also includes the at-sea processing component of the tribal sector. The at-sea tribal sector operates catcher vessels within defined geographic boundaries in waters off northern Washington. Tribal catch is primarily delivered to a mothership for processing at sea.

- LE fixed gear (non-nearshore): This sector is subdivided into two components due to differences in permitting and management:
  - LE sablefish endorsed season: Longlines and pots are used to target sablefish. Catch is generally delivered to shore-based processors.
  - LE sablefish non-endorsed: Longlines and pots are used to target groundfish, primarily sablefish and thornyheads (*Sebastolobus* spp.). Catch is delivered to shore-based processors or sold live at the dock.

Open Access (OA) Federal sectors

- OA fixed gear (non-nearshore): Fixed gear, including longlines, pots, fishing poles, stick gear, etc. is used to target non-nearshore groundfish. Catch is delivered to shore-based processors.

Open Access (OA) state sectors

- OA ocean (*Pandalus jordani*) trawl: Trawl nets are used to target ocean (pink) shrimp. Catch is delivered to shore-based processors.
- OA California halibut trawl: Bottom trawl nets are used to target California halibut by fishers holding a state California halibut permit. Catch is delivered to shore-based processors.
- Nearshore fixed gear: A variety of gear, including longlines, pots, fishing poles, stick gear, etc. are used to target nearshore rockfish and other nearshore species managed by state permits in Oregon and California. Catch is delivered to shore-based processors or sold live.

A summary of the permits, gear used, target groups, vessel length range, fishing depth range, and management of fishery sectors and sub-sectors in U.S. west coast groundfish fisheries that have had documented short-tailed and black-footed albatross bycatch is presented in Appendix A.

NWFSC Groundfish Observer Program

The NWFSC Groundfish Observer Program observes commercial sectors that target or take groundfish as bycatch; its goal is to improve estimates of total catch and discard by observing commercial sectors of groundfish fisheries along the U.S. west coast. The observer program has two units: the West Coast Groundfish Observer Program (WCGOP) and the At-Sea Hake

Observer Program (A-SHOP). The WCGOP Program was established in May 2001 by NOAA Fisheries (a.k.a., National Marine Fishery Service, NMFS) in accordance with the Pacific Coast Groundfish Fishery Management Plan (50 CFR Part 660) (50 FR 20609). This regulation requires all vessels that catch groundfish in the US EEZ from 3-200 miles offshore carry an observer when notified to do so by NMFS or its designated agent. Subsequent state rule-making has extended NMFS's ability to require vessels fishing in the 0-3 mile state territorial zone to carry observers. At-sea hake vessels have carried observers since the late 1970s, including carrying two observers per vessel starting in 2000. The NWFSC assumed responsibility for the A-SHOP from the Alaska Fisheries Science Center in 2001.

The WCGOP and A-SHOP units observe distinct sectors of the groundfish fishery. The WCGOP observes the following sectors: IFQ shore-based delivery of groundfish and Pacific hake, LE and OA fixed gear, and state-permitted nearshore fixed gear sectors. The WCGOP also observes several state-managed fisheries that incidentally catch groundfish, including California halibut trawl and ocean (pink) shrimp trawl fisheries. The A-SHOP observes the at-sea Pacific hake IFQ fishery, which catches and processes at-sea, including: catcher-processors and motherships (also motherships that receive tribal catch). Details on how fisheries observers operate in both the IFQ (Catch Share) and Non-IFQ (Non-Catch Share) sectors can be found at: http://www.nwfsc.noaa.gov/research/divisions/fram/observation/index.cfm.

Albatross Bycatch in West Coast Groundfish Fisheries

The primary objective of this report is to provide estimates of bycatch of the ESA-listed short-tailed albatross (and black-footed albatross for use as in proxy bycatch calculations) in observed U.S. West Coast federally permitted groundfish fisheries from 2010–2013. Previous reports (Jannot et al. 2011 and reports on the NWFSC Protected Species Reports webpage http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_products/protected_species.cfm) have provided data on estimated bycatch of seabirds including short-tailed albatross in U.S. west coast commercial fisheries, which were derived from the WCGOP and A-SHOP data.

Groundfish Fishery Sectors with Albatross Bycatch

Several groundfish fishing sectors have had documented albatross bycatch since the WCGOP began data collection in 2002. The sectors documenting black-footed albatross takes from 2010-2013 (this report) were similar to those documented in a previous assessment (2002-2009; Jannot et al. 2011). The sectors in which albatross takes were documented from 2010-2013 include: limited entry fixed gear primary sablefish fishery, open access fishery, the Catch shares (IFQ) fishery, and the at-sea hake fishery (see appendix A for summaries of these fisheries/sectors.

Amount and Extent of Short-tailed Albatross Take

The Biological Opinion (BiOp) Regarding the Effects of the Continued Operation of the Pacific Coast Groundfish Fishery (PCGF) (USFWS 2012, pp. 33-34) stated that:

> "The USFWS anticipates a yearly average of one short-tailed albatross could be taken as a result of this proposed action. The incidental take is expected to be in the form of short-tailed albatross killed from longline hooks or trawl cables. The USFWS anticipates an unknown percent of incidental take of short-tailed albatross will be difficult to detect for the following reasons: 1) animals that become hooked on gear may fall off wounded or dead before observed and bird strikes of cables may result in injured or dead birds that are not captured in the trawl nets, and thus not observed; and 2) due to potential noncompliance with reporting. However, the expected level of take of short-tailed albatross can be anticipated by loss of a surrogate species, black footed albatross. A relationship of anticipated take can be made as both species use the same habitat within the action area and are subjected to the same threats. Estimated black footed albatross take is based on landing (fishing effort) and observer recorded take.
>
> The extent of take of short-tailed albatross will be assessed by documented takes and by assessing effects to a surrogate species (black-footed albatross). The extent of take of the short-tailed albatross documented by either approach is expected to be within the limits defined in the effects analysis in this biological opinion (i.e., a yearly average take of one short-tailed albatross). As actual levels of take are expected to vary from year to year, the average take average should not exceed two over a two-year period. A floating two year period beginning at the time this BO is signed [12 Nov 2012] will be used to quantify the two-year actual take average. Take estimates based on the surrogate species approach will be based on a two-year reporting period that will be established by the Pacific Coast Groundfish and Endangered Species Workgroup. The first update of estimate take will occur before the end of 2015."

This first biennial report represents the fulfillment of the take estimate requirement and associated reporting requirements.

Methods

Data Sources

Data sources for this analysis include onboard observer data from the WCGOP and A-SHOP and landing receipt data, referred to as fish tickets, which is obtained from the Pacific Fisheries Information Network (PacFIN).

Observer Data

A list of fisheries, coverage priorities and data collection methods employed by WCGOP in each observed fishery can be found in the Catch Shares (IFQ) and Non-Catch Shares (Non-IFQ)

WCGOP manuals (NWFSC 2015a, b). A-SHOP information and documentation on data collection methods can be found in the A-SHOP observer manual (NWFSC 2015c).

The sampling protocol employed by the WCGOP is primarily focused on the discarded portion of catch. To ensure that the recorded weights for the retained portion of the observed catch are accurate, haul-level retained catch weights recorded by observers are adjusted based on trip-level fish ticket records. This process is described in detail on the WCGOP Data Processing webpage (http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_processing.cfm). Data processing was applied prior to the analyses presented in this report. For a complete list of groundfish species defined in the Pacific Coast Groundfish Fishery Management Plan see PFMC (2011).

Fish Ticket Data

For bycatch estimation, the landed amount of a particular fish species or species group is used as the effort metric. Thus, the retained landing information from fish tickets is crucial for fleet-wide total bycatch estimation for all sectors of the commercial groundfish fishery on the U.S. west coast. Fish ticket landing receipts are completed by fish-buyers in each port for each delivery of fish by a vessel. Fish tickets are trip-aggregated sales receipts for market categories that may represent single or multiple species. Fish tickets are issued to fish-buyers by a state agency and must be returned to the agency for processing. Fish tickets are designed by the individual states (Washington, Oregon, and California) with slightly different formats by state. In addition, each state conducts species-composition sampling at the ports for numerous market categories that are reported on fish tickets. Fish ticket and species-composition data are submitted by state agencies to the PacFIN regional database. Annual fish ticket landings data for 2010-2013, with state species composition sampling applied, were retrieved from the PacFIN database in 2014 and subsequently divided into various sectors of the groundfish fishery. Observer and fish ticket data processing steps are described in detail on the WCGOP website under Data Processing Appendix (http://www.nwfsc.noaa.gov/research/divisions/fram/observer/data_processing.cfm/). All data processing steps specific to this report are described in the bycatch estimation methods section below.

Documented Short-tailed Albatross Bycatch

For the years 2010-2013, one short-tailed albatross take was documented April 2011 in the West Coast groundfish fisheries. The floating two year period over which observed short-tailed albatross takes must average less than two/year began in November 2012. The data available at the time of this report runs through December 2013, thus the full two year period for actual short-tailed albatross bycatch has yet to be assessed.

Estimation of Black-footed Albatross Bycatch

We used a deterministic approach to estimate bycatch of black-footed albatross in all west coast groundfish fisheries for which observer data are available. Using this approach, the total number

of observed takes for black-footed albatross was stratified spatially and seasonally and summarized in relation to observed catch. For fishery sectors in which there was less than 100% observer coverage (all but Catch Shares) or in which not all observed hauls were monitored for protected resources, observed takes were then expanded to the fleet-wide level based on total fleet catch or landings. Bycatch estimates were only provided when the coinciding strata-specific coefficient of variation (CV) was less than 80%. These techniques and the information used in their development and implementation are described in further detail below.

Designation of 'take' interactions

WCGOP and A-SHOP observers record a variety of fishery interactions with seabirds. A standard system for recording interactions is used by both observer programs and includes a variety of interaction categories: killed by gear, killed by propeller, previously dead, lethal removal (trailing gear), lethal removal (not trailing gear), entangled in gear (trailing gear), entangled in gear (not trailing gear), feeding on catch, deterrence used, boarded vessel, sighting only, other, and unknown. Take designations differed for species listed under the ESA as threatened or endangered and for species that are not ESA-listed. Section 3 of the ESA specifies the term 'take' to mean 'harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct' (16 USC 1532). Any interaction encompassing the ESA definition with an ESA-listed seabird species (*i.e.*, a short-tailed albatross) was identified as a take. For seabirds not listed under the ESA, takes were designated for all interactions that were documented as mortality or were anticipated to have resulted in mortality after a review of recorded observer data and notes by a seabird expert. This designation was informed by specific details in observer notes recorded at the time of the interaction. Observers typically detail the nature of the injury and changes in the animal's behavior following its release. Birds documented to have exhibited bleeding, broken bones, or lost feathers were identified as takes; birds that did not fly away or return to normal behavior within a few minutes of the interaction were also considered to be takes.

All the California Current system seabirds (breeding or transitory) are highly mobile and require an abundant food source to support their high metabolic rates (Ainley et al. 2005). Because of these shared characteristics, the abundance of most seabird species along the U.S. west coast is influenced by the same physical and biological factors, *e.g.*, oceanic productivity and prey availability (Tyler et al. 1993, Ainley et al. 2005). Specifically, the seasonal and latitudinal distribution of seabirds is defined by the intensity of coastal upwelling, which delivers nutrient rich water and supports higher prey biomass in surface waters accessible to seabirds (Tyler et al. 1983). On the US west coast, upwelling is most intense south of Cape Blanco, OR (42˚ 50' N latitude) (Bakun et al. 1974, Barth et al. 2000), which supports a large percentage of the nesting sites of locally breeding seabirds (Tyler et al. 1993). The location of stable nesting sites reflects oceanographic conditions that support long-term food availability (Tyler et al. 1993). Transient species to the California Current system are also most abundant in areas of strong upwelling intensity and high productivity (Briggs and Chu 1986, Hyrenbach et al. 2002).

In addition to varying by latitude, both coastal upwelling and the distribution of seabirds also vary by season. Three distinct oceanic seasons have traditionally been defined for the US west coast: the Upwelling, Oceanic, and Davidson Current seasons (Ford et al. 2004). The Upwelling

season coincides with late spring and summer, when northerly winds transport surface waters southward and away from the coast. The distribution of breeding species in summer largely reflects the location of nesting colonies, which are most prevalent adjacent to the central and northern portion of the California Current system (Tyler et al. 1993, Ford et al. 2004). However, during this time, breeders are outnumbered by visiting species, which are attracted by greater oceanic productivity and prey abundance associated with upwelling. Commonly observed visiting species in summer include the black-footed albatross (*Phoebastria nigripes*) (Tyler et al. 1993). In the fall (Oceanic season), northerly winds and upwelling intensity decrease, and sea surface temperature reaches its annual maximum. Several species that nest further south in Mexico and southern California move northward during the fall and then, as winter approaches, these species again return south and breeders from boreal nesting colonies become more abundant, particularly off of California (Tyler et al. 1993). The winter months along the west coast are characterized by warmer water delivered by the Davidson current and reduced levels of primary production (Davidson Current season). Seabird abundance during this time is generally low (Tyler et al. 1993).

Based on the above information, we developed a stratification scheme for black-footed albatross based on findings from aerial and boat surveys synthesized by Tyler et al. (1993) and Guy et al. (2013). Latitudinal strata were defined in accordance with the gradient in upwelling intensity north and south of Cape Blanco, OR (42˚ 50' N latitude) (Bakun et al. 1974, Barth et al. 2000). Three seasonal strata were also defined to coincide with the seasonal trends in upwelling and seabird abundance: winter (January-April), summer (May-August), and fall (September-December). For this report, data are summarized for the entire West Coast and on an annual basis.

Hook and line sector bycatch estimates

Once the data had been stratified, a ratio estimator was used (Cochran 1977) to expand observed bycatch amounts to the fleet-wide level. This method has been widely used in discard estimation (Stratoudakis et al. 1999, Borges et al. 2005, Walmsley et al. 2007). It relies heavily on the assumption that bycatch is proportional to some metric or proxy of fishing effort, such as fishery landings (Rochet and Trenkel 2005). In some cases, such as rare events, bycatch might vary nonlinearly or even be unrelated to the ratio estimator denominator. Black-footed albatross are encountered so rarely by the groundfish fishery that it is difficult to assess whether the number of bycatch events is indeed linked to levels of fishing effort. The assumption that bycatch is proportional to fishing effort has not been tested and could bias results if invalid. Bycatch estimates produced using ratio estimators should be considered with caution. When the CV for strata-specific bycatch estimates exceeded 80%, estimates were not included in final report tables. This threshold was designated based on the frequency distribution of CVs produced for all species under various stratification schemes. This evaluation revealed a definitive break in the distribution of bycatch estimate CVs at 80%. CVs between 10% and 80% are still extremely high and exceed the level of variance that is typically considered acceptable. CVs were large because of a variety of factors, including the excess of zero-valued observations in the data and observer coverage rates in some fishery sectors. Of the variables used to estimate bycatch, CVs were most closely tied to the level of variance in the number of observed takes, the numerator of bycatch ratios.

Bycatch ratios were computed by each sector-year-latitude-season as the number of takes divided by the weight of the landings from observed trips. Bycatch ratios were then expanded to the fleet-wide level based on the total landings from each sector. The denominator used in bycatch ratios differed considerably by fishery sector because of differences in target species and fishing behavior. In addition, variation in sampling protocols by the A-SHOP and WCGOP require that this general approach is applied in slightly different ways during bycatch estimation. The sections below provide more specific details regarding bycatch estimation methodology for each program and fishery sector.

At-sea hake (A-SHOP) bycatch estimates

Observers on at-sea hake vessels take a random sample of unsorted catch, including both retained and discarded catch. With two observers onboard each vessel, nearly 100% of tows are sampled. However, because of the large volume of catch from each tow, it is only possible to sample approximately 50% of the total catch weight. When a sample is collected, all species within it are weighed and recorded. The resulting data are expanded to the tow level and then to the fleet level to summarize catch as a whole.

A-SHOP bycatch data for seabirds is primarily recorded during species composition sampling. Seabirds are small enough to make it below deck where the observer samples the catch and are recorded only if they happen to be included in the observer's random species composition sample. Seabird bycatch recorded in a species composition sample is expanded to the haul level. This can result in the observation of one seabird expanding to two, depending on the observed sample size for that haul. However, since every vessel is observed and close to 100% of the fleet's tows are sampled, the bycatch expansion to the entire at-sea sector is quite small.

It should be recognized that some incidental seabird interactions resulting in mortality could occur when this fishery's trawl gear is being set or due to collision with the trawl door warp wires while the vessel is fishing. These interactions would be unobserved, as observers do not monitor the setting or fishing of the gear.

To estimate total seabird bycatch in the at-sea hake fishery, all of the sampled tows were used in our analysis. Once the bycatch estimate of seabirds was expanded within each sampled tow, the estimate was then expanded to the entire fleet. This method for calculating seabird bycatch is the same as the method used to calculate fish bycatch in the at-sea hake sector.

For seabirds, the total number of takes during each tow was calculated using the following formula:

$$Y_t = y_t \cdot \frac{W_t}{w_t}$$

where:

Y_t = the total number of takes in tow t
y_t = the number of observed takes in the species composition sample of tow t
W_t = the weight of the total catch in tow t

w_t = the weight of the sampled catch in tow t

The total number of takes of each seabird species in the at-sea hake fleet was then calculated using the following formula:

$$B = \sum Y_t + \sum Y\left(1 - \frac{N_u}{N_T}\right)$$

where:

B = the total estimated bycatch for that species
Y = the number of seabirds in composition samples
N_u = number of hauls sampled for species composition
N_T = total number of hauls

Seabird bycatch data do not contain the necessary replicates for calculating within-tow variation. The only source of uncertainty that could have been evaluated for fleet-wide seabird bycatch estimates was that associated with the variance between tows. Since nearly 100% of tows were sampled, this variation was quite small and not useful for uncertainty.

For both WCGOP and A-SHOP, observers record opportunistic data on seabird gear or vessel interactions outside of species composition sampling, when possible. These are essentially records of seabird takes that were noted by the observer on occasions when they were either informed of an interaction by the crew or happened to observe an interaction while on deck. These opportunistic data are excluded from fleet-wide estimates, as they are not randomly sampled; they are summarized for 2010-2013 in Table 3 below. Opportunistic seabird data from the A-SHOP, the only time when black-footed albatross are recorded as takes, is available beginning in 2007; opportunistic data from earlier years is currently only available in paper form and have not yet been electronically compiled for reporting.

West Coast Groundfish Observer Program (WCGOP) bycatch estimates

Individual fishing quota (IFQ) fisheries using bottom or midwater trawl, hook and line, or pots are required to carry an observer on 100% of fishing trips. Therefore, black-footed albatross bycatch totals from these fisheries are a complete census of actual takes and no fleet-wide expansion is necessary.

The WCGOP stated target coverage rate (*i.e.*, pre-observation) for non-IFQ sectors are as follows (defined as the percentage of landings from observed trips):

- Limited Entry Sablefish: 25-30%
- Limited Entry Daily Trip Limits: 10%
- Open Access Fixed Gear: 5%
- OA ocean shrimp trawl: 15%
- State nearshore fisheries: 7-10%
- California halibut fishery: 3-5%

Realized coverage rates (*i.e.*, post-observation) vary around the target coverage rate for a variety of reasons including (but not limited to) resource availability, logistics, safety, and fishing effort.

The WCGOP plans to maintain historic coverage rates in these sectors. Historic coverage rates by year can be found on the NWFSC Observer Program webpage.

Fisheries observers monitor and record catch data on commercial fishing vessels by following protocols in the WCGOP manual (NMFS 2013). Observer sampling focuses on discarded catch and supplements existing fish ticket landing receipt data to inform weights of retained catch. Observers generally sample 100% of tows/sets made during a trip. On trawlers, the total weight of discarded catch is estimated, and the discarded catch is then sampled for species composition. The species composition sample could represent either a census or a subsample of all discarded catch. On fixed gear vessels (hook-and-line and pot gears), observers sample total catch (both retained and discards, similar to at-sea hake observer sampling methodology) and sample anywhere from 30 to 100% of the catch from each set.

The only available proxy of total fishing effort in these sectors is landed catch. Logbooks are not currently available in these sectors. Bycatch rates are therefore computed as the number of observed takes divided by the total weight of retained catch in metric tons. Bycatch rates are computed from all observed tows/sets, and this rate is then expanded to the fleet-wide level using landed catch weight from fish tickets.

Because seabirds are small and blend in easily with fish catch, seabirds might not be fully accounted for in the sampled portion of the catch alone. Seabirds are often encountered while the observer is conducting species composition sampling. It is therefore necessary to expand the bycatch of seabirds within a tow/set prior to computing bycatch rates.

For data from trawl trips, the seabird bycatch is expanded to the tow level using the following equations. First, the total weight of the subsample is computed as:

$$v_k = \sum_s u_{ks}$$

where:

u_{ks} = the observed weight of species s in the subsample of catch category k
v_k = the weight of the subsample from catch category k

A sampling ratio (S_k) is then calculated to determine the proportion of the catch category that was sampled:

$$S_k = v_k / w_k$$

where:

w_k = the total weight of catch category k

The tow-level expanded weight of species s in catch category k is calculated by dividing the species weight in the subsample by the sampling ratio:

$$U_{ks} = u_{ks} / S_k$$

where:

U_{ks} = the weight of species s in catch category k

Tallying the weight (U_{ks}) of species *s* across all catch categories *k* within a tow provides the total weight of the species discarded.

For data from fixed-gear trips, the following equation is used to calculate the weight of retained and discarded catch of each species in a set:

$$U_s = u_s \frac{H}{h}$$

where:

U_s = the calculated weight of species *s* in the set
u_s = the observed weight of species *s* in the subsample
H = the total number of hooks in a set
h = the number of hooks sampled in a set

As an example, suppose an observer monitors 1,400 hooks of a longline set of 2,812 hooks. From the 1,400 sampled hooks, the observer records the take of one western gull. That one seabird take is expanded to the entire set according to the equations above and the total bycatch of gulls in this set is two western gulls. These steps are applied only to seabirds sampled in a species composition sample. If a seabird falls outside of the sampled portion of the catch, that seabird is observed and noted as opportunistic data; however, it is not included when calculating bycatch estimates. A summary of black-footed albatross takes estimated from observations recorded inside the species composition sample is included in Table 2 (see Results). A summary of black-footed albatross takes estimated from observations recorded outside of the species composition sample is included in Table 2 for full disclosure and to provide perspective on all seabird bycatch observed.

For the purpose of computing the denominator of a bycatch ratio (the observed landed weight), the weight of all retained species must be further adjusted so that the observed total trip pounds of retained fish in a catch category (as recorded by the observer) matches the total trip pounds on the fish ticket(s). Doing so ensures that the observed landings are comparable to unobserved landings when expanding bycatch estimates to the entire fleet. To match the total trip pounds, the weight of each observer retained catch category is scaled up or down by the ratio of fish ticket and observer trip weight for that category. The following equation is used to calculate the adjustment factor for this process:

$$A_{mtk} = \frac{r_{mtk}}{\sum_k r_{mtk}}$$

where:

r_{mtk} = the observed retained weight (lbs.) in catch category *k* in tow/set *t* on trip *m*
A_{mtk} = the adjustment factor used for catch category *k* in tow/set *t* on trip *m.*

The equation used to adjust the retained weight recorded by the observer is:

$$r'_{mtk} = A_{mtk} \cdot L_{mk}$$

where:

r'_{mtk} = the adjusted retained weight (lbs) in catch category *k* in tow/set *t* on trip *m*
L_{mk} = the retained weight (lbs) in catch category *k* for trip *m* recorded on the fish ticket(s).

When a catch category in the WCGOP data cannot be matched to a fish ticket catch category, the WCGOP data are not adjusted. Catch categories found only on the fish tickets are distributed across the observed tows using the proportion of the observed catch per tow divided by the total observed catch per trip using the following equation:

$$P_{mt} = \sum_{k}\sum_{s} r_{mtks} \Big/ \sum_{t}\sum_{k}\sum_{s} r_{mtks}$$

$$L_{mtk} = P_{mt} \cdot L_{mk}$$

where:

P_{mt} = the proportion of the observed retained catch in tow t in trip m
L_{mtk} = the total retained weight in catch category k for tow t in trip m recorded on the fish ticket(s)

Once this adjustment has been completed and seabird takes have been expanded to the tow/set level, bycatch ratios are computed from all observed trips within stratum i and year j as:

$$R_{ij} = \frac{\sum_{t} y_{ijt}}{\sum_{t} x_{ijt}}$$

where:

y_{ijt} = the number of takes in stratum i and year j in trip t
x_{ijt} = metric tons of retained catch in stratum i and year j in trip t

The variance of R_{ij} was approximated by using the following equation (Cochran 1977):

$$Var(R_{ij}) = \frac{1-f_{ij}}{n_{ij}}\left(\frac{\bar{y}_{ij}}{\bar{x}_{ij}}\right)^2\left(\frac{s^2(y_{ij})}{\bar{y}^2_{ij}} + \frac{s^2(x_{ij})}{\bar{x}^2_{ij}} - 2\left(\frac{\sum_{t}(y_{ijt}-\bar{y}_{ij})(x_{ijt}-\bar{x}_{ij})}{\bar{y}_{ij}\bar{x}_{ij}}\right)\right)$$

where:

$\bar{y}_{ij}$ and $\bar{x}_{ij}$ = the means of y_{ijt} and x_{ijt}
$s^2(y_{ij})$ and $s^2(x_{ij})$ = the variances of y_{ijt} and x_{ijt}
f_{ij} = the finite population correction factor, defined as the proportion of the retained (landed) catch that is observed
n_{ij} = the number of trips in stratum i and year j

Note that $Var(R_{ij})$ could not be calculated when $\bar{y}_{ij} = 0$ or $\bar{x}_{ij} = 0$ for all trips and should be used with extreme caution when R_{ij} is equal to one. One advantage in using this estimator is that it does not assume independence of the numerator and denominator. The finite population correction factor, f_{ij}, was used to account for the added precision associated with sampling a relatively large portion of the groundfish fleet (Arkin and Colton 1970).

Once a bycatch rate was calculated from the data for observed trips, it was then expanded to the entire fleet using the total landed catch weight from fish tickets. The fleet-wide bycatch estimate and the variance of the bycatch estimate were calculated as follows:

$$B_{ij} = T_{ij} R_{ij}$$
$$Var(B_{ij}) = T_{ij}^2 \cdot Var(R_{ij})$$

where:

B_{ij} = the bycatch estimate in stratum i and year j
T_{ij} = the weight of the landed catch in stratum i and year j

A lognormal approximation (Burnham et al. 1987) was then used to calculate confidence intervals using the following formulas:

$$C_{ij} = \exp\left(z_{\alpha/2} \sqrt{\ln(1 + cv(B_{ij})^2)} \right)$$
$$L_{lower_{ij}} = \frac{B_{ij}}{C_{ij}}$$
$$L_{upper_{ij}} = B_{ij} \cdot C_{ij}$$

where:

$z_{\alpha/2}$ = the quantile from the standard normal distribution corresponding to significance of α
$cv(B_{ij})$ = the coefficient of variation of B_{ij}
L_{ij} = the lower and upper bounds of the confidence interval in stratum i and year j

The advantage in using this approximation is that it captures the skewed nature of the distribution and avoids calculating lower bounds less than zero. The CV for B_{ij} was quite large in most cases and regularly exceeded 10%. Strata-specific bycatch estimates with a CV of more than 80% were excluded from our evaluation and are not provided in report tables. Uncertainty in these estimates was too great to be considered useful in bycatch quantification. All other summary information is included for these estimates, including the level of observer coverage, number of takes, bycatch ratio, and bycatch ratio standard error (Tables 2). Coefficients of variation between 10 and 80% are still considered to be extremely large and underscore that bycatch estimates produced using the current methodology should be considered with caution.

The total number of takes in each year was calculated by summing bycatch estimates from all strata with a CV of less than 80%. The variance for each year was also calculated by summing the variance estimates from all strata with a CV less than 80%. This assumed independence of strata-specific bycatch and variance estimates.

The specific species included in landed catch weight used in the bycatch ratio denominator and fleet-wide expansion factor differed depending on the targeting behavior in each sector. For the LE and OA fixed gear sectors, retained sablefish weight was used as the auxiliary variable. Retained weights of California halibut and pink shrimp were used in analyses of the California halibut and pink shrimp sectors, respectively. For the state-permitted commercial nearshore sector, bycatch rates and bycatch estimates were computed using the retained weight of nearshore target species as a proxy of fishing effort.

In all cases where multiple species where included in the auxiliary variable, any retained weights that were recorded by the observer but that did not appear on fish tickets were excluded when computing the bycatch ratio. This was necessary to prevent double-counting associated with differences in the species codes used by observers and processors. For instance, observers typically record rockfish catch at the species level; however, processors often group, weigh, and record multiple species of rockfish under a grouped species code such as NUSP – northern unspecified slope rockfish. In some cases, this difference in species coding prevents observer and fish ticket weights from matching and adjusting properly. Species coding on fish tickets varies considerably between processors and over time, and it is not possible to make assumptions regarding which individual observer-recorded species likely coincide with species grouping codes on fish tickets. Instead, by using only the retained groundfish weight from fish tickets in bycatch ratio denominators, we prevent double-counting of retained weights. This is not a factor when using a single species in the denominator, such as sablefish in the fixed gear sectors, as any retained weights in observer and fish ticket data that share the same species code will match and adjust properly.

Sensitivity Analyses

Once base estimates had been computed, a sensitivity analysis was conducted to evaluate how bycatch might differ from base estimates if the observed bycatch rate from the observer data were smaller than the actual rate in the unobserved or unmonitored fleet. In other words, if bycatch of black-footed albatross was somehow minimized while the observer was onboard and monitoring the vessel, to what extent would our bycatch estimates have been underestimated? To evaluate this question, we considered four sensitivity alternatives in which bycatch rates applied to the unobserved portion of the fleet were increased by 10, 50, 100 and 300%. For the WCGOP data, this meant increasing bycatch rates applied to landings from entire trips that were not observed but not to tows or samples within a trip, as all black-footed albatross interactions were assumed known from observed trips. A similar analysis was not conducted for seabirds in the at-sea hake sector because there are no obvious reasons why the unsampled portion of the catch would contain a disproportionately larger quantity of seabirds, given that the acquisition of a random sample is the responsibility of the observer.

Estimation of Short-tailed Albatross Bycatch by Proxy

Because short-tailed albatross takes have been too rare to accurately quantify fleet-wide bycatch levels in Pacific coast groundfish fisheries, we are using black-footed albatross as a surrogate or proxy species to estimate the annual mortality rate of short-tailed albatross by the WCGF (see also USFWS 2004a, NMFS 2011). Black-footed albatross are similar to short-tailed albatross in size and feeding behaviors, as well as their patterns of distribution documented in surveys and via telemetry studies, making them a reasonable proxy for the much less common short-tailed albatross (USFWS 2012). Black-footed albatross are much more common than short-tailed albatross; observed takes of this species in the West Coast Groundfish Fisheries (both fixed gear

and trawl) from 2002-2009 ranged from 0 to 48 per year, and fleet-wide expanded estimates for black-footed albatross bycatch ranged from 0 to 91 individuals per year (Jannot et al. 2011).

Even with 100% observer coverage in some sectors, all interactions might not be recorded because animals that become hooked on gear may fall off while the gear is in the water, and thus not be observed (Ward et al. 2004, Gilman et al. 2005). These "drop-offs," along with post-hooking mortality, are often referred to as "unseen mortality." Previous modeling efforts (USFWS 2004a, NMFS 2011) included a correction factor of 31% for drop-offs citing studies of pelagic longline fisheries (Ward et al. 2004, Gilman et al. 2005). Ward et al. (2004) demonstrated that drop-off rates in pelagic longline fisheries may underestimate seabird mortality by as much as 45% on the portions of a set that have soaked the longest. At present, drop-off rates for demersal longline fisheries have not been estimated for West Coast Groundfish Fisheries or for demersal longline fisheries in general (S. Fitzgerald, pers. comm.). In addition, although the At-Sea Hake Observer Program deploys fishery observers on nearly 100% of fishing trips and an average of 45% of the annual catch is observed (Jannot et al., 2011), monitoring is focused on the ship factory, but cable-strike related mortality is not monitored. This protocol, where only seabirds captured in the trawl's cod end can be encountered and quantified, can underestimate seabird bycatch. In similarly observed fisheries, such as the Bering Sea pollock (catcher-processor) fishery, observers underestimated seabird mortality due to net entanglements by a factor of 7 and from cable interactions by a factor of 3.5 (Melvin et al., 2011; Fitzgerald,unpubl. data). To take into account uncertainty in this factor, a range of drop-off adjustments from 0 to 45%, including the 31% used previously (USFWS 2004, NMFS 2011) is presented here to bracket estimates of short-tailed albatross incidental take.

The short-tailed albatross annual take (T_{STAL}) estimate for the West Coast groundfish fisheries is calculated as follows (following the approach of NMFS 2011):

$T_{STAL} = M_{BFAL} \times A \times N_{STAL}$

Where:

M_{BFAL} = Fishing mortality of surrogate species (black-footed albatross) = (annual mean estimated number of black-footed albatross mortalities in West Coast groundfish fisheries) + (annual mean estimated number of black-footed albatross mortalities in West Coast groundfish fisheries * drop-off adjustment) / black-footed albatross global population estimate

A = correction factor to account for differences in distribution between the species

N_{STAL} = short-tailed albatross global population estimate

When previously applied in Hawaiian fisheries, the at-risk area fraction (**A**) was a multiplier that accounted for the fraction of the short-tailed albatross range that overlaps with the fisheries of interest. In the case of the Hawaiian longline fisheries, the black-footed albatross range completely overlapped with the fishery in question, whereas the short-tailed albatross range did not, so the at-risk fraction (0.245) was simply derived by dividing the Hawaiian longline fisheries area by the short-tailed albatross range area. In the case of Pacific coast groundfish fisheries, black-footed and short-tailed albatross ranges overlap with the West Coast groundfish

fisheries to a similar extent, and both species are traveling distances to enter the area, thus no multiplier is used to account for differences between the species. The equation for estimating short-tailed albatross bycatch via the proxy method thus becomes:

$T_{STAL} = M_{BFAL} \times N_{STAL}$.

Results

Documented Short-tailed Albatross Bycatch

The lone documented short-tailed albatross take from 2010-2013 was observed in the Limited Entry sablefish fishery in April 2011. There were no recorded takes documented by West Coast groundfish fisheries observer programs from 2002-2009; the rarity of this event precludes expansion of observed takes using fishing effort data from observer programs.

Observed Black-footed Albatross Bycatch

The following commercial groundfish fishery sectors had observed black-footed albatross bycatch during 2010–2013:

- Limited Entry fixed gear primary sablefish
- Open Access fixed gear
- IFQ fishery (Catch Shares) - hook and line
- Limited Entry fixed gear daily trip limits
- At-sea Hake catcher processors

Table 2. Observed takes of black-footed albatross in U.S. west coast groundfish fishery sectors (2010-13). These randomly sampled takes appeared in the observer species composition sample from the haul and have been expanded to the haul, which can result in fractions of a bird. Black-footed albatross numbers (#, minimum #, maximum #) in this table were used to expand to the fleet and estimate error (Y_{BFAL} in Table 4).

Year	Sector	Gear	#	Minimum #	Maximum #
2010	Limited Entry Sablefish	Hook & Line	28.31	17	28.31
2010	OA Fixed Gear[1]	Hook & Line	1.86	1	1.86
2011	Catch Shares	Hook & Line	4	4	4
2011	LE Fixed Gear DTL	Hook & Line	7	5	7
2011	Limited Entry Sablefish	Hook & Line	22.41	13	22.41
2012	Catch Shares	Hook & Line	3	3	3
2012	Limited Entry Sablefish	Hook & Line	35.02	26	35.02
2013	Limited Entry Sablefish	Hook & Line	12	12	12

[1] The CV for this year and sector exceeded 80% and is excluded from bycatch expansions in Table 4.

Black-footed albatross mortalities were also documented outside of the observer sample in both the A-SHOP and WCGOP; these data were not included in the expanded annual bycatch estimates for each fishery sector but are included here for completeness.

Table 3. Takes of black-footed albatross (2010-2013) that were opportunistically observed in U.S. west coast groundfish fishery sectors. Opportunisitc takes are not randomly sampled and therefore were not used to calculate bycatch estimates.

Year	Sector	Gear	Interaction	# takes
2010	Catcher Processor	Midwater Trawl	Gear interaction	1
2010	Catcher Processor	Midwater Trawl	3rd wire, paravane or warp cable contact	2
2010	Limited Entry Sablefish	Hook and Line	Killed by gear	2
2011	Catcher Processor	Midwater Trawl	Gear interaction	3
2011	Catcher Processor	Midwater Trawl	3rd wire, paravane or warp cable contact	2
2011	Catch Shares	Hook and Line	Killed by gear	1
2011	LE Entry Fixed Gear DTL	Hook and Line	Killed by gear	4
2011	Limited Entry Sablefish	Hook and Line	Killed by gear	5
2012	Catcher Processor	Midwater Trawl	3rd wire, paravane or warp cable contact	1
2012	Catch Shares	Hook and Line	Killed by gear	1
2012	Limited Entry Sablefish	Hook and Line	Killed by gear	3
2013	Catcher Processor	Midwater Trawl	3rd wire, paravane or warp cable contact	2
2013	Limited Entry Sablefish	Hook and Line	Killed by gear	1

Estimation of Short-tailed Albatross Bycatch by Proxy

Estimates of annual (2010-2013) short-tailed albatross bycatch using expanded annual estimates of black-footed albatross as a proxy ranged from < 1.0 STAL in 2013 to > 4.0 STAL in 2011. Annual estimates for a given year varied considerably, depending on the assumed drop-off rates used, which ranged from 0 to 45%, and whether we used the smaller (Table 4a) or greater (Table 4b) short-tailed albatross population estimate (N_{STAL}). The most recent (2012-2013) two-year averages of these calculations ranged from 1.35 to 2.0 for the lower STAL population estimate (Table 4a) and 1.45 to 2.15 for the higher STAL population estimate (Table 4b).

Table 4. Annual short-tailed albatross bycatch estimates (T_{STAL}) using black-footed albatross bycatch as a proxy. Annual estimates (90% lower C.I. – 90% upper C.I.) of black-footed albatross bycatch (Y_{BFAL}) presented for the most recent four years of available data (2010-2013). Annual fishing mortality of black-footed albatross (M_{BFAL}) calculated as proportional mortality to global BFAL population (N=254,234; NMFS 2011) from west coast groundfish fisheries (90% lower C.I. – 90% upper C.I.). M_{BFAL} estimates incorporate assumed drop-off rates (0%, 27%, 31%, 45%) discussed in the short-tailed albatross risk assessment from west coast groundfish fisheries (Ford et al. 2012). Table 4a shows global estimates of short-tailed albatross (N_{STAL}) from a deterministic population model (P. Sievert) using lower population growth rate for some colonies; Table 4b shows global estimates of short-tailed albatross (N_{STAL}) from a deterministic population model (P. Sievert) using more optimistic population growth rate for some colonies (see Methods).

a)

Year	Y_{BFAL} [1]	$M_{BFAL\ (0\%)}$	N_{STAL}	T_{STAL}

2010	107 (62.8 - 183.7)	0.0004 (0.0003 - 0.0007)	**2940**	**1.3 (0.8 – 2.2)**
2011	215 (95.7 - 471.4)	0.0009 (0.0004 – 0.0019)	**3181**	**2.8 (1.2 -6.1)**
2012	138 (97.1 - 187.6)	0.0006 (0.0004 – 0.0008)	**3441**	**1.9 (1.4 – 2.6)**
2013	51 (29.5 - 89.3)	0.0002 (0.0001 – 0.0004)	**3820**	**0.8 (0.5 – 1.4)**
Year	**Y_{BFAL}**	**$M_{BFAL\ (27\%)}$**	**N_{STAL}**	**T_{STAL}**
2010	107 (62.8 - 183.7)	0.0006 (0.0003 - 0.0010)	**2940**	**1.6 (1.0 – 2.8)**
2011	215 (95.7 - 471.4)	0.0011 (0.0005 – 0.0024)	**3181**	**3.5 (1.6 - 7.8)**
2012	138 (97.1 - 187.6)	0.0007 (0.0005 – 0.0010)	**3441**	**2.5 (1.7 – 3.3)**
2013	51 (29.5 - 89.3)	0.0003 (0.0002 – 0.0005)	**3820**	**1.0 (0.6 – 1.8)**
Year	**Y_{BFAL}**	**$M_{BFAL\ (31\%)}$**	**N_{STAL}**	**T_{STAL}**
2010	107 (62.8 - 183.7)	0.0006 (0.0003 - 0.0010)	**2940**	**1.7 (1.0 – 2.9)**
2011	215 (95.7 - 471.4)	0.0011 (0.0005 – 0.0025)	**3181**	**3.7 (1.6 - 8.0)**
2012	138 (97.1 - 187.6)	0.0007 (0.0005 – 0.0010)	**3441**	**2.5 (1.8 – 3.4)**
2013	51 (29.5 - 89.3)	0.0003 (0.0002 – 0.0005)	**3820**	**1.0 (0.6 – 1.8)**
Year	**Y_{BFAL}**	**$M_{BFAL\ (45\%)}$**	**N_{STAL}**	**T_{STAL}**
2010	107 (62.8 - 183.7)	0.0006 (0.0004 - 0.0011)	**2940**	**1.9 (1.1 – 3.2)**
2011	215 (95.7 - 471.4)	0.0013 (0.0006 – 0.0028)	**3181**	**4.0 (1.8 - 8.9)**
2012	138 (97.1 - 187.6)	0.0008 (0.0006 – 0.0011)	**3441**	**2.8 (2.0 – 3.8)**
2013	51 (29.5 - 89.3)	0.0003 (0.0002 – 0.0005)	**3820**	**1.2 (0.7 – 2.0)**

b)

Year	**Y_{BFAL}**	**$M_{BFAL\ (0\%)}$**	**N_{STAL}**	**T_{STAL}**
2010	107 (62.8 - 183.7)	0.0004 (0.0003 - 0.0007)	**3201**	**1.4 (0.8 – 2.4)**
2011	215 (95.7 - 471.4)	0.0009 (0.0004 – 0.0019)	**3463**	**3.0 (1.4 -6.7)**
2012	138 (97.1 - 187.6)	0.0006 (0.0004 – 0.0008)	**3747**	**2.1 (1.5 – 2.9)**
2013	51 (29.5 - 89.3)	0.0002 (0.0001 – 0.0004)	**4055**	**0.8 (0.5 – 1.5)**
Year	**Y_{BFAL}**	**$M_{BFAL\ (27\%)}$**	**N_{STAL}**	**T_{STAL}**
2010	107 (62.8 - 183.7)	0.0006 (0.0003 - 0.0010)	**3201**	**1.8 (1.0 – 3.0)**
2011	215 (95.7 - 471.4)	0.0011 (0.0005 – 0.0024)	**3463**	**3.9 (1.7 - 8.5)**
2012	138 (97.1 - 187.6)	0.0007 (0.0005 – 0.0010)	**3747**	**2.7 (1.9 – 3.6)**
2013	51 (29.5 - 89.3)	0.0003 (0.0002 – 0.0005)	**4055**	**1.1 (0.6 – 1.9)**
Year	**Y_{BFAL}**	**$M_{BFAL\ (31\%)}$**	**N_{STAL}**	**T_{STAL}**
2010	107 (62.8 - 183.7)	0.0006 (0.0003 - 0.0010)	**3201**	**1.8 (1.1 – 3.1)**
2011	215 (95.7 - 471.4)	0.0011 (0.0005 – 0.0025)	**3463**	**4.0 (1.8 - 8.7)**
2012	138 (97.1 - 187.6)	0.0007 (0.0005 – 0.0010)	**3747**	**2.8 (1.9 – 3.8)**
2013	51 (29.5 - 89.3)	0.0003 (0.0002 – 0.0005)	**4055**	**1.1 (0.6 – 1.9)**
Year	**Y_{BFAL}**	**$M_{BFAL\ (45\%)}$**	**N_{STAL}**	**T_{STAL}**
2010	107 (62.8 - 183.7)	0.0006 (0.0004 - 0.0011)	**3201**	**2.0 (1.2 – 3.5)**
2011	215 (95.7 - 471.4)	0.0013 (0.0006 – 0.0028)	**3463**	**4.4 (2.0 - 9.7)**
2012	138 (97.1 - 187.6)	0.0008 (0.0006 – 0.0011)	**3747**	**3.1 (2.2 – 4.2)**
2013	51 (29.5 - 89.3)	0.0003 (0.0002 – 0.0005)	**4055**	**1.2 (0.7 – 2.1)**

[1] **Y_{BFAL}** for 2010 do not include the open access fishery sector, which had a CV > 80%.

Several factors influence the calculations presented here, including the global population estimates for both black-footed and short-tailed albatrosses and the assumption of the drop-off rate. The global black-footed albatross population estimate has not been updated since 2009, which would influence estimates of M_{BFAL}, particularly if there has been a substantial change to that population estimate. The global short-tailed albatross population estimate varies considerably as a function of assumptions about a breeding colony that has not been visited since 2002; this would influence estimates of T_{STAL}. The assumed drop-off rates are bracketed broadly intentionally, and the non-zero rates may be considerable overestimates of the actual rates. As noted previously (Ford et. 2012), estimates of carcass drop-off rates do not exist for demersal long-line fisheries, and borrowing rates from pelagic longline fisheries may be inappropriate. Deriving drop-off rates for demersal longline fisheries would reduce uncertainty currently associated with the assumed rates that are so influential for these calculations.

While previous estimates (Ford et al. 2012) were based on the same assumed drop-off rates and black-footed albatross global population estimate, the calculations were conducted using black-footed albatross mortality averaged over 2002-2009 and one recent global short-tailed albatross population estimate. The overall estimates ranged from 0.6 to 0.90, depending on the assumed drop-off rate. Moreover, both 2002 and 2009 had fleet-wide black-footed albatross bycatch estimates of zero, which resulted in an 8-year average of 43.8 birds/year rather than the 53.3 birds/year which would result from averaging years 2003-2008.

The calculations presented here, which vary considerably depending on global black-footed and short-tailed albatross population estimates as well as drop-off assumptions, approach, and in some cases exceed, take thresholds outlined in the biological opinion. The impending streamer line regulations are the most obvious avenue to reduce bycatch in black-footed albatross, which would, in turn, reduce estimates of short-tailed albatross bycatch. Additional recommendations may emerge from the Endangered Species Working Group following this initial biennial reporting cycle.

Other Short-tailed Albatross Interactions

There were interactions of short-tailed albatross with vessels in some commercial groundfish fishery sectors that were observed during 2010–2013 (Table 5). These ranged from opportunistic sightings made from observers during the course of their duties to observations of individuals feeding on catch. None of these observations resulted in short-tailed albatross takes.

Table 5. Short-tailed albatross interactions with U.S. west coast groundfish fishery vessels (2010-13) that did not result in a take.

Year	Sector	Gear	Interactions	#	Min #	Max #
2010	Limited Entry Sablefish	Pot	Sighting Only	2	2	2
2010	Limited Entry Sablefish	Hook and Line	Sighting Only	4	4	4
2010	Limited Entry Trawl	Bottom Trawl	Feeding on catch	3	3	3
2010	Limited Entry Trawl	Bottom Trawl	Sighting Only	6	6	6

2010	OA Fixed Gear	Pot	Sighting Only	1	1	1
2010	Pink Shrimp	Shrimp Trawl	Sighting Only	1	1	1
2011	Catch Shares	Bottom Trawl	Feeding on catch	4	3	5
2011	Catch Shares	Bottom Trawl	Sighting Only	33	29	78
2011	Catch Shares	Pot	Sighting Only	2	2	2
2011	Limited Entry Sablefish	Pot	Sighting Only	2	2	2
2011	Limited Entry Sablefish	Hook and Line	Sighting Only	1	1	1
2011	Shoreside Hake	Midwater Trawl	Feeding on catch	1	1	1
2011	Shoreside Hake	Midwater Trawl	Sighting Only	2	2	2
2012	Catch Shares	Bottom Trawl	Feeding on catch	3	3	3
2012	Catch Shares	Bottom Trawl	Sighting Only	8	8	8
2012	Catch Shares	Pot	Feeding on catch	2	1	2
2012	Catch Shares	Pot	Sighting Only	2	2	2
2012	Catch Shares	Hook and Line	Sighting Only	3	3	3
2012	Limited Entry Sablefish	Hook and Line	Sighting Only	1	1	1
2012	Shoreside Hake	Midwater Trawl	Feeding on catch	2	2	2
2012	Shoreside Hake	Midwater Trawl	Sighting Only	1	1	1
2013	Catch Shares	Bottom Trawl	Feeding on catch	3	3	4
2013	Catch Shares	Bottom Trawl	Sighting Only	13	13	13
2013	Shoreside Hake	Midwater Trawl	Feeding on catch	1	1	1
2013	Shoreside Hake	Midwater Trawl	Sighting Only	1	1	1

Additional information relevant to the BiOp/RPMs and Conservation Measures

In the November 21, 2012 Biological Opinion on Continuing Operation of the Pacific Coast Groundfish Fishery, the USFWS believes the following reasonable and prudent measures (RPMs) are necessary and appropriate for NMFs to minimize take of short-tailed albatross:

RPM 1: NMFS shall minimize the risk of short-tailed albatross interacting with hooks and lines. Because short-tailed albatross are caught and killed by baited hooks in longline fisheries, minimization measures shall be employed to reduce the likelihood that they will attack the baited hooks.

T&C 1 for RPM 1: NMFS shall promulgate regulations to mandate the use of streamer lines in the commercial longline fishery of the Pacific Coast Groundfish Fishery for non-tribal vessels 55' length or greater. NMFS shall encourage the continuation of the voluntary efforts for smaller vessels to use streamer lines. Regulations shall be developed by NMFS for compliance and should follow the Alaska streamer line regulations for Federal waters. Regulations shall be implemented as soon as practical, but initiation of implementation shall not exceed a two-year period after issuance of this biological opinion. NMFS shall continue to provide assistance to the Tribes with implementation of streamer use on tribal vessels, and shall encourage and assist with the development of Tribal regulations requiring streamer use as information and resources become available.

This T&C is expected to be the starting place for an adaptive management process that shall continue to implement RPM 1. It is expected that new information and research shall reveal new or improved methods of reducing bycatch of short-tailed albatross that are safe and effective for the Fishery to use. If during the adaptive management process it is determined that this T &C should be updated, the BO shall be amended, as appropriate.

NMFS has proposed regulations to mandate the use of streamer lines in the commercial longline fishery of the Pacific Coast Groundfish Fishery for non-tribal vessels 55' length or greater (79 FR 53401, September 9, 2014). NMFS has also encouraged the continuation of the voluntary efforts for smaller vessels to use streamer lines through outreach to ports.

Preliminary results from sea trials with host fishermen in the West Coast sablefish longline fishery suggest that, regardless of vessel size, Alaskan-style streamer line specifications are:

- *Likely to prevent albatross mortalities on vessels using longlines without floats*
- *Unlikely to prevent albatross mortalities on vessels using longlines with floats*
- *Approximately 50% of west coast longline vessels use floats on their longlines. (E. Melvin and R. Suryan, pers. comm.)*

Preliminary results from analysis of West Coast longline sablefish observer data (T. Good, unpubl. data) suggest that night setting using civil twilight to define night can reduce albatross bycatch by an order of magnitude. Analyses of night setting in 2013 Alaska longline groundfish and Pacific halibut observer data found the same extent of reduction (E. Melvin pers. comm).

T&C 2 for RPM1: NMFS shall ensure delivery of training workshops on vessel instructions for proper use of streamer lines. Additional topics that shall be covered in training include:

(1) Status of short-tailed albatross population and observations of the species in the vicinity of the Pacific Coast Groundfish Fishery fishing area.

(2) Short-tailed albatross notification requirements (see T&C 2 for RPM 3).

(3) Disposition of short-tailed albatross specimens (see T&C 1 for RPM 4).

Washington Sea Grant and Oregon State University have conducted outreach activities (E. Melvin, pers. comm.), including:

- *Developing and mailing a four page flyer and the albatross ID card to all owners of sablefish limited entry quota (Winter 2014)*
- *Gathering data on fleet characteristics via a revised fleet survey instrument (2013 and 2014)*
- *Launching a website on seabird bycatch focused on the WC sablefish longline fleet (Winter 2014)*
- *Meeting with a wide variety of sablefish fishery stakeholders in the course of 13 port visits (Spring 2013)*
- *Hosting meeting with longline fishermen in Westport, WA, Astoria, Newport, Charleston, and Port Orford, OR and Eureka and Fort Bragg, CA in 2014 and presenting seabird bycatch information to the Makah Tribe at their 2014 Fisheries Meeting*

- *Hosting meetings with longline fishermen in Astoria, Newport, Charleston, and Port Orford, OR to share results of research done in collaboration with volunteer host fishers on adapting streamer lines to the West Coast sablefish fishery (March, 2015)*
- *Presenting displays on albatross conservation at several public marine science events (2013 and 2014)*
- *Actively strengthening and advertising the free streamer line program funded by NMFS Northwest Region. Through this effort, hundreds of streamer lines were put in the hands of longline fishermen throughout the west coast; the Quinault Tribe made streamer lines mandatory in 2014, while 16 of 24 longline vessels in the Makah fleet and all Quileute fleet are using streamer lines voluntarily.*

RPM 2. NMFS shall establish a multi-stakeholder, Pacific Coast Groundfish and Endangered Species Working Group as an advisory body to the NMFS and USFWS for the purposes of reducing risk to short-tailed albatross. This group will work toward eliminating data gaps and facilitate adaptive management to minimize and avoid take of short-tailed albatross.

T&C 1 for RPM 2: NMFS shall develop and lead a Pacific Coast Groundfish and Endangered Species Workgroup. Working group development shall entail:

(1) NMFS shall identify preliminary membership for a Pacific Coast Groundfish and Endangered Species Workgroup (PCGW) within eight months of opinion issuance.

(2) Within three months of opinion issuance, NMFS shall invite PFMC and USFWS to provide points of contact, participate in the Pacific Coast Groundfish and Endangered Species Workgroup, and help develop terms of reference for the workgroup (see 4. below). NMFS shall request response within six months of opinion issuance.

(3) The Pacific Coast Groundfish and Endangered Species Workgroup shall at a minimum convene on a biennial basis to consider all new information (see T&C 3 for RPM 3).

(4) The PCGW members shall recommend and NMFS shall adopt the final terms of reference for the PCGW, ideally within 12 months of opinion issuance. These terms shall document the purpose and structure of the group, the basis for key recommendations, staff points of contact and their roles and responsibilities, resources needed to accomplish the workgroup purpose, and a breakdown of anticipated work schedules (e.g., for biennial reporting and completing a future consultation following a PCGW recommendation to reinitiate).

(5) Recommendations shall be made available to NMFS, USFW and PFMC.

NMFS has identified membership for a Pacific Coast Groundfish and Endangered Species Workgroup (PCGW), invited PFMC and USFWS to provide points of contact, participated in the Pacific Coast Groundfish and Endangered Species Workgroup, and helped develop terms of reference for the workgroup. The Pacific Coast Groundfish and Endangered Species Workgroup will convene in May 2015 to consider all new information.

T&C 2 for RPM 2: With NMFS as lead, the Pacific Coast Groundfish and Endangered Species Workgroup shall be an advisory group responsible for review of new information and developing recommendations regarding changes to the Pacific Coast Groundfish Fishery

that shall reduce risk of harm to short-tailed albatross. Example recommendations may include developing new analyses or reports, changes to sampling protocols, additional conservation measures to implement, updating species risk assessments, and advise if reinitiation is warranted.

This process is in compliance with the June 14, 2012, Memorandum of Understanding (MOU) between NMFS and USFWS to promote the conservation of migratory bird populations (NMFS and USFWS 2012, pages 3, 8 -10).

NMFS is leading the Pacific Coast Groundfish and Endangered Species Workgroup as an advisory group responsible for reviewing of new information and developing recommendations regarding changes to the Pacific Coast Groundfish Fishery that shall reduce risk of harm to short-tailed albatross. The Pacific Coast Groundfish and Endangered Species Workgroup will convene in May 2015 to consider all new information.

RPM 3: NMFS shall monitor and report all observed, reported and estimated take, based on the surrogate approach, of short-tailed albatross interactions with longline fishing vessels and gear, and report on the efficacy of avoidance and minimization measures.

T&C 1 for RPM 3: NMFS shall update the Pacific Coast Groundfish Observer Program to include specific guidance for endangered or threatened species, namely:

(1) Include the requirement to prioritize monitoring of the deployment of longline gear to document the efficacy of the streamer lines in minimizing interactions with short-tailed albatrosses.

NMFS records the deployment of longline gear and the use of various types of seabird avoidance gear, including: None, Single Streamer Line, Double Streamer Lines, Weights, Night Setting, and Other (w/Comments) as well as the performance of longline gear. NMFS is analyzing these data to assess the impact of voluntary streamer line use to date in preparation for assessing the impact of streamer line use regulations once they are place. WCGOP has had discussions with Washington Sea Grant about training observers to assess efficacy of streamer lines by monitoring bird strikes during setting, but this would require additional protocols and special training beyond the scope of current observer training.

(2) Biological sampling- interactions: update to include requirements for disposition of short-tailed albatross specimens (see T&C 1 for RPM 4 & Disposition of specimens).

NWFSC has worked closely with NOAA West Coast Region staff and the USFWS to come up with the protocol for reporting and delivering STAL takes to the proper authorities. Observers/debriefers are instructed to contact Observer Program staff immediately, should a STAL take occur. Observer Program staff are then required to contact USFWS and coordinate the release of the carcass to a USFWS representative.

(3) Derelict gear - collect data on all gear lost at seas, including gear type, location of the loss, and if loss from vessel or at sea.

The type and amount of lost gear is recorded by observers and entered into the WCGOP database. The exact location of the loss is not recorded; however, it is assumed that any loss occurs between the start and end positions of the set. Beginning in 2015, the WCGOP is tracking incidents of lost gear that is later retrieved.

(4) NMFS shall provide the USFWS an opportunity to review and approve updated observer instructions prior to implementation.

All Observer training manuals are available for review at the following website: http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_collection/training.cfm . The NWFSC Observer Program would appreciate any input USFWS might have regarding seabird sampling protocols. Potential changes to seabird sampling protocols will be forwarded to the USFWS representative on the PFMS ESA Working Group.

(5) The results of endangered species monitoring, including monitoring of derelict gear, shall be used by NMFS in a biennial report (see T&C 3 for RPM 3 below).

NMFS is using endangered species monitoring and monitoring of derelict gear in its biennial report.

T&C 2: Implement regulation changes that require mandatory notification by fishers to USFWS Law Enforcement (see next paragraph for contact information by state) and NMFS' Sustainable Fisheries Division, Assistant Regional Administrator (206-526-6150) when take of an endangered or threatened seabird occurs. Regulations should also specify that if an observer is on board, they shall complete notification requirements.

See T&C 1 for RPM 3 (2) above.

T&C 3: NMFS shall complete a biennial report to be submitted to State Supervisor, USFWS, 2600 SE 98th Ave, Suite 100, Portland, OR 97266, and to the Pacific Coast Groundfish and Endangered Species Workgroup. The report shall include any pertinent new information and document effects of the Pacific Coast Groundfish Fishery on endangered or threatened species:

(1) NMFS shall include the following data when monitoring predicted fishery interactions in order to provide fleet-wide short-tailed albatross take estimates on a biennial basis.

i. Current available data from short-tailed albatross telemetry work.

Continuing satellite tagging of younger age classes of short-tailed albatrosses has provided more details about disparate marine habitats of adult and juveniles. Juvenile birds range widely throughout the North Pacific rim, and some individuals also spent time in the oceanic waters between Hawaii and Alaska (Deguchi et al. 2014). Juvenile and younger sub-adult birds (up to 2 years old) range much more widely than the adult birds, inhabiting the Sea of Okhotsk, a broader region of the

Bering Sea, and the west coast of North America (O'Connor 2013). While short-tailed albatross are most concentrated in the Aleutian Islands and Bering Sea (primarily outer shelf) regions of Alaska, subadults appear to be distributed along the west coast of the U.S. more than has been previously reported (see Figure 3 in USFWS 2014).

ii. NMFS Groundfish observer program's data on all observed short-tailed albatross vessel and gear interactions and information on injured and killed short-tailed albatross.

NMFS is including all observed interactions of short-tailed albatross from the WCGOP and A-SHOP in its biennial report.

iii. Any additional reports by other NMFS managed fisheries operating in the action area of short-tailed albatross vessel and gear interactions and information on injured and killed short-tailed albatross.

Other NMFS-managed fisheries in the action area may include salmon, coastal pelagics, highly migratory species, and halibut. We are unaware of any reports by other NMFS-managed fisheries operating in the action area of short-tailed albatross vessel and gear interactions and information on injured and killed short-tailed albatross.

iv. Pacific Coast Groundfish Fishery fishing effort.

A report has been compiled summarizing fishing effort in the U. S. Pacific Coast Groundfish Fisheries (2002-2013) by NOAA Fisheries' West Coast Groundfish Observer Program (Somers et al. 2015).

v. NMFS Groundfish observer program's data on all observed black-footed albatross vessel and gear interactions and information on injured and killed black-footed albatross. This is to continue the use of this species as an analytical surrogate for short-tailed albatross.

NMFS is including all observed interactions of black-footed albatross from the WCGOP and A-SHOP in its biennial report.

(2) NMFS shall report on the type and spatial and temporal characteristics of derelict gear observed while implementing the fisheries. This includes gear lost while fishing and other observed derelict gear at sea.

While there has been no documented harm to short-tailed albatross from derelict gear and there is no information on the extent of derelict gear in the action area, NMFS observers do record gear lost or captured during fishing activities. The WCGOP has summarized this information for 2010-2013, and it is presented in Appendix B.

(3) NMFS shall report on vessel operator training efforts.

NMFS is conducting vessel operator training through Washington Sea Grant and Oregon State University port outreach efforts. See T&C 2 for RPM1 above.

T&C 4: NMFS shall update the BA's risk assessment for short-tailed albatross as recommended by the Pacific Coast Groundfish and Endangered Species Workgroup or when reinitiation of consultation is required.

If necessary, NMFS will update the BA's risk assessment for short-tailed albatross.

T&C 5: NMFS shall consult with the working group to consider methods for accounting for take of short-tailed albatross in unobserved fisheries.

Unobserved fisheries include Tribal (non-hake) fisheries, state fisheries not listed above, non-regulated fisheries, recreational, and research fisheries.

NMFS is not aware of any reports of short-tailed albatross takes in Tribal (non-hake) fisheries, non-regulated fisheries, and recreational fisheries.

NMFS scientists report no observed short-tailed albatross takes during the 2010-2013 reporting period in the NMFS groundfish surveys (B. Horness, pers. comm.) or the acoustic hake research cruises (S. Deblois, pers. comm.).

T&C 6: NMFS should not drop below current levels of observer coverage unless an analysis has been completed that shows lower levels of observer coverage is acceptable for estimating harm to black-footed or short-tailed albatross.

The A-SHOP and the WCGOP IFQ fisheries currently have 100% observer coverage and therefore provide a near complete census of black-footed and short-tailed albatross interactions with the fishery. The WCGOP is conducting analyses to assess effects of less than 100% observer coverage levels on albatross bycatch estimates. These analyses are expected to be completed in late 2015. Observer coverage rates can be found at: http://www.nwfsc.noaa.gov/research/divisions/fram/observation/xls/WCGOP_Coverage_YearsObserved02-13_2015.01.07.xlsx

RPM 4: NMFS shall facilitate the salvage of short-tailed albatross carcasses taken by longline fishing vessels. Because of their rarity and unique life history traits, every effort should be made to retain short-tailed albatross carcasses for scientific and educational purposes.

T&C 1: NMFS shall disseminate instructions for disposition of live, injured, sick or dead STAL to fishers.

(1) If a dead, injured, or sick short-tailed albatross individual is located, call USFWS 503-- 231-6179 for handling and disposition instructions. If an observer is on board,

they shall be responsible for the disposition of dead, injured, or sick birds, otherwise the boat captain shall be responsible.\

(2) Care should be taken in handling sick or injured specimens to ensure effective treatment and in the handling of dead specimens to preserve biological material in the best possible state for later analysis of cause of death. In conjunction with the care of sick or injured short-tailed albatross or preservation of biological materials from a dead animal, the boat captain or observer has the responsibility to carry out instructions provided by USFWS to ensure that the specimen is not unnecessarily disturbed.

(3) Live birds must be retained in a safe location. Release overboard shall occur if it looks normal and exhibits all of the following traits: the bird is capable of holding its head erect, and the bird responds to noise and motion stimuli; the bird breathes without noise; the bird can flap both wings, and it can retract the wings to a normal folded position on the back; and the bird is capable of elevating itself to stand on both feet, with its toes pointed in the proper direction (forward); and it is dry.

(4) Injured or sick albatross are to be retained in a safe location.

(5) Dead short-tailed albatross must be frozen immediately, with identification tags attached directly to the carcass, and a duplicate identification tag attached to the bag or container holding the carcass. Ideally, the specimen should be frozen at -40 degrees Fahrenheit. Identification tags must include all of the following information: species, date of mortality, name of vessel, location (latitude and longitude) of mortality, observer or captain's name (or both), and any band numbers and colors if the specimen has any leg bands. Leg bands must remain attached to the bird.

(6) If the bird is retained alive or dead, it must be surrendered as soon as possible as directed by the USFWS.

NMFS is facilitating the salvage of short-tailed albatross carcasses taken by longline fishing vessels. See T&C 1 for RPM 3 (2) above.

Conservation Recommendations from Biological Opinion

The conservation recommendations for short-tailed albatross in the Biological Opinion (USFWS 2012, p. 39) included:

1. Calculating observer coverage level within the Pacific Coast Groundfish Fishery that will provide adequate data to predict harm to *black-footed albatross* within a reasonable tolerance.
2. Calculating observer coverage level within the Pacific Coast Groundfish Fishery that will provide adequate data to predict harm *to short-tailed albatross* within a reasonable tolerance.
3. Keeping observer coverage for the Pacific Coast Groundfish Fishery at or above a level that allows adequate data collection to accurately predict harm of short-tailed albatross.

The A-SHOP and the WCGOP IFQ fisheries currently have 100% observer coverage and therefore provide a near complete census of black-footed and short-tailed albatross interactions with the fishery. The WCGOP is conducting analyses to assess effects of less than 100% observer coverage levels on albatross bycatch estimates. These analyses are expected to be completed sometime in late 2015.

Observer coverage rates are at: http://www.nwfsc.noaa.gov/research/divisions/fram/observation/xls/WCGOP_Coverage_YearsObserved02-13_2015.01.07.xlsx.

References

Ainley, D., L. Spear, C. Tynan, J. Barth, S. Pierce, R. G. Ford, and T. Cowles. 2005. Physical and biological variables affecting seabird distributions during the upwelling season of the northern California Current. Deep Sea Research Part II: Topical Studies in Oceanography 52: 123-143.

Bakun, A., D. McLain, and F. Mayo. 1974. The mean annual cycle of coastal upwelling off western North America as observed from surface measurements. Fishery Bulletin 72: 843-844.

Barth, J., S. Pierce, and R. Smith. 2000. A separating coastal upwelling jet at Cape Blanco, Oregon and its connection to the California Current System. Deep Sea Research Part II: Topical Studies in Oceanography 47: 783-810.

Borges, L., A. R. Zuur, E. Rogan, and R. Officer. 2005. Choosing the best sampling unit and auxiliary variable for discards estimations. Fisheries Research 75: 29-39.

Briggs, K. and E. Chu. 1986. Sooty shearwaters off California: distribution, abundance and habitat use. Condor 88: 355-364.

Cochran, W. G. 1977. Sampling Techniques. John Wiley & Sons, New York.

Deguchi, T., R. M. Suryan, K. Ozaki, J. F. Jacobs, F. Sato, N. Nakamura, and G. R. Balogh. 2014. Early successes in translocation and hand-rearing of an endangered albatross for species conservation and island restoration. Oryx 48:195-203.

Ford, M. J., M. A. Bellman, S. Copps, C. K. Emmons, J. Drake, T. P. Good, R. G. Gustafson, M. B. Hanson, G. Hanshew, E. E. Holmes. 2012. Risk assessment of U.S. West Coast groundfish fisheries to threatened and endangered marine species. Report of the National Marine Fisheries Service, Northwest Fisheries Science Center. Seattle, Washington.

Ford, R., D. Ainley, J. Casey, C. Keiper, L. Spear, and L. Ballance. 2004. The biogeographic patterns of seabirds in the central portion of the California Current. Marine Ornithology 32: 77-96.

Guy, T.J., S.L. Jennings, R.M. Suryan, E.F. Melvin, M.A. Bellman, D.J. Anderson, L.T. Ballance, B.A. Blackie, D.A. Croll, T. Deguchi, T.O. Geernaert, R.W. Henry, M. Hester, K.D. Hyrenbach, J. Jahncke, K. Ozaki, J. Roletto, F. Sato, S.A. Shaffer, W.J. Sydeman, and J.E. Zamon. 2013. Fisheries Research 147: 222-234.

Hasegawa, H. and DeGange, A. 1982. The short-tailed albatross *Diomedea albatrus*, its status, distribution and natural history. American Birds 6(5): 806-814.

Hyrenbach, K., P. Fernandez, and D. J. Anderson. 2002. Oceanographic habitats of two sympatiric North Pacific albatross. Marine Ecology Progress Series 233: 283-301.

Jannot J., E. Heery, M. Bellman, and J. Majewski . 2011. Estimated bycatch of marine mammals, seabirds, and sea turtles in the US west coast commercial groundfish fishery, 2002-2009. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Melvin, E. F., K.S. Dietrich, S. Fitzgerald, and T. Cardoso. 2011. Reducing seabird strikes with trawl cables in the pollock catcher-processor fleet in the eastern Bering Sea. Polar Biol. 34: 215–226.

NMFS (National Marine Fisheries Service). 2011. Biological Assessment: Continued Operation of the Hawaii-based Pelagic Longline Fisheries. Sustainable Fisheries Division, Pacific Islands Regional Office, National Marine Fisheries Service, Honolulu, Hawaii. July 12, 2011. 73 p.

NMFS (National Marine Fisheries Service). 2012. Continuing Operation of the Pacific Coast Groundfish Fishery - Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Section 7(a)(2) "Not Likely to Adversely Affect" Determination. PCTS Number: NWR-2012-876. 194 p.

NWFSC (Northwest Fisheries Science Center). 2015a. West Coast Groundfish Observer Program 2015 Catch Shares Training Manual. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd. East, Seattle, Washington, 98112. Online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_collection/training.cfm [accessed February 2015].

NWFSC (Northwest Fisheries Science Center). 2015b. West Coast Groundfish Observer Program 2015 Non-Catch Share Training Manual. West Coast Groundfish Observer Program. NWFSC, 2725 Montlake Blvd. East, Seattle, Washington, 98112. Online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_collection/training.cfm [accessed February 2015].

NWFSC (Northwest Fisheries Science Center). 2015c. Observer Sampling Manual. Fishery Resource Analysis and Monitoring, At-Sea Hake Observer Program. NWFSC, 2725 Montlake Blvd. East, Seattle, Washington 98112. Online at: http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_collection/manuals/A-SHOP_Manual_2014.pdf [accessed February 2015].

O'Connor, A. J. 2013. Distributions and fishery associations of immature short-tailed albatrosses *Phoebastria albatrus*, in the North Pacific. M.S. Thesis, Oregon State University, Corvallis, Oregon. 73 p.

Olson, S.L. and P.J. Hearty. 2003. Probable extirpation of a breeding colony of Short-tailed Albatross (*Phoebastria albatrus*) on Bermuda by Pleistocene sea-level rise. Proc. Nat. Acad. Sci. 100: 12825-12829.

PFMC (Pacific Fishery Management Council). 2011. Pacific Groundfish Fishery Management Plan for the California, Oregon, and Washington Groundfish Fishery. Pacific Fishery Management Council, Portland, OR. Online at: http://www.pcouncil.org/wp-content/uploads/GF_FMP_FINAL_Dec2011.pdf.

PFMC (Pacific Fisheries Management Council). 2013. Decision summary document, November 1-6, 2013. Pacific Fisheries Management Council. Portland, Oregon. 6 pp.

Rochet, M. J. and V. M. Trenkel. 2005. Factors for the variability of discards: assumptions and field evidence. Canadian Journal of Fisheries and Aquatic Sciences 62: 224-235.

Somers, K. A., J. E. Jannot, J. Hastie, Y. W. Lee, J. McVeigh, and C. E. Whitmire. 2015. Fishing Effort in the 2002-2013 U.S. Pacific Coast Groundfish Fisheries. West Coast Groundfish Observer Program. National Marine Fisheries Service, NWFSC, 2725 Montlake Blvd E., Seattle, WA 98112.

Stratoudakis, Y., R. Fryer, R. Cook, and G. Pierce. 1999. Fish discarded from Scottish demersal vessels: estimators of total discards and annual estimates for targeted gadoids. ICES Journal of Marine Science 56: 592-605.

Tyler, W., K. Briggs, D. Lewis, and R. Ford. 1993. Seabird distribution and abundance in relation to oceanographic processes in the California Current System. Pages 48-60 in K. Vermeer, K. T. Briggs, K. H. Morgan, and D. Siegel-Causey, editors. The status, ecology, and conservation of marine birds in the North Pacific. Canadian Wildlife Service Special Publication, Ottawa.

USFWS (U.S. Fish and Wildlife Service). 2004. Biological Opinion on the Effects of the Reopened Shallow-Set Sector of the Hawaii Longline Fishery on the Short-tailed Albatross (Phoebastria albatrus), October 2004. Honolulu, HI. FWS 1-2-1999-F-02.2. 129 p.

USFWS (U.S. Fish and Wildlife Service). 2008. Short-tailed Albatross Recovery Plan. U.S. Fish and Wildlife Service. Anchorage, AK. 105 pp. Available online at: http://ecos.fws.gov/docs/recovery_plan/090520.pdf.

USFWS (U.S. Fish and Wildlife Service). 2009. Short-tailed albatross (*Phoebastria albatrus*) 5-Year review: Summary and evaluation. Fish and Wildlife Service, Anchorage, AK. 78 p.

USFWS (U.S. Fish and Wildlife Service). 2012. Biological opinion regarding the effects of the continued operation of the Pacific Coast Groundfish Fishery as governed by the Pacific coast Groundfish Management Plan and Implementing Regulations at 50 CFR Part 660 by the National Marine Fisheries Service on California Least Tern (*Sterna antillarum browni*), Southern Sea Otter (*Enhydra lutris nereis*), Bull trout (*Salvelinus confluentus*), Marbled Murrelet (*Brachyramphus marmoratus*), and Short-tailed Albatross (*Phoebastria albatrus*). FWS Reference Number OlEOFW00-2012-F-0086. Fish and Wildlife Service, Portland, Oregon, 48 p.

USFWS (U.S. Fish and Wildlife Service). 2014. Short-tailed albatross (*Phoebastria albatrus*) 5-Year review: Summary and evaluation. Fish and Wildlife Service, Anchorage, AK. 43 p.

Walmsley, S., R. Leslie, and W. Sauer. 2007. Bycatch and discarding in the South African demersal trawl fishery. Fisheries Research 86: 15-30.

Appendix A. Description of U.S. West Coast Groundfish Fisheries

A description of permits, gears used, target groups, vessel length range, fishing depth range, and management of fishery sectors and sub-sectors in U.S. West Coast groundfish fisheries. For brevity, management descriptors are generalized for the given time period and are not meant to be complete and comprehensive. For more details see: http://www.nwfsc.noaa.gov/research/divisions/fram/observation/data_products/.

							Management	
Sector	**Sub-Sector**	**Permits**	**Gear(s)**	**Target(s)**	**Length (m)**	**Depths (m)**	**2002-2010**	**2011-2013**
Limited Entry (LE) Trawl		Federal LE permit[1] with trawl endorsement	Bottom Trawl, after Jan 1, 2011 also Hook & Line and Pot gear	Species assemblages	11-29	Wide range	Cumulative two-month trip limits; depth-based closures; 14-23% observer coverage	Individual Fishing Quotas (IFQ); 100% observer coverage
	LE California Halibut	CA Halibut permit[2] and LE permit with trawl endorsement	Bottom Trawl	California halibut[5]	9-22	< 55	Cumulative two-month trip-limits; depth-based closures; 3-23% observer coverage	IFQ; 100% observer coverage
At-Sea Hake	Mothership-Catcher Vessel (MSCV)	LE permit with MSCV endorsement	Midwater Trawl	Pacific hake[6]	26-45[4]	53-460[4]	Seasonal quotas for target and bycatch species of concern; 100% observer coverage	IFQ; Seasonal; 100% observer coverage
	Catcher-processors (CP)	LE permit with CP endorsement	Midwater Trawl	Pacific hake	82-115	60-570	Same as At-Sea Hake MSCV	IFQ; Seasonal; 100% observer coverage
	Tribal	(none)	Midwater Trawl	Pacific hake		53-460	Tribal; 100% observer coverage	
Shoreside Hake		LE permit with trawl endorsement	Midwater Trawl	Pacific hake	17-29	Wide range	Same as At-Sea Hake MSCV; electronic monitoring	IFQ; Seasonal; 100% observer coverage

Table 1. continued

Sector	Sub-Sector	Permits	Gear(s)	Target(s)	Length (m)	Depths (m)	Management 2002-2013
Non-Nearshore Fixed Gear	Sablefish endorsed	LE permit with fixed gear endorsement and sablefish quota	Longlines, Pots	Sablefish[7]	11-32	> 145	Sablefish tier quotas; seven month season; 9-27% observer coverage
	Sablefish non-endorsed (a.k.a. Zero Tier)	LE permit with fixed gear endorsement w/o sablefish quota	Longlines, Pots	Sablefish, rockfish[8] and flatfish[9]	5-18	> 145	Trip limits; 1-12% observer coverage
	Open Access	(none)	Longlines, Pots	Sablefish and other groundfish	3-30	> 64	Trip limits; 1-6% observer coverage
Open Access (OA) California Halibut		CA Halibut permit[2]	Bottom Trawl	California halibut	9-22	< 55	Most fishing occurs within CA waters in the California Halibut Trawl Grounds where minimum mesh sizes, seven month season, and minimum size requirements hold; 1-16% observer coverage
Nearshore Fixed Gear[3]		CA or OR state nearshore permits and endorsements	Variety of hand lines, pot gear, stick gear, rod and reel	Rockfish, Cabezon[10], Greenlings[11]	3-15	< 110 (usu. < 55 in OR waters)	Federal and CA or OR state nearshore regulations; area closures; two-month trip limits; minimum size limits; 2-8% observer coverage
Pink Shrimp		WA, OR, or CA state pink shrimp permit	Shrimp trawl	Pink shrimp[12]	11.5-33	91-256	WA, OR, or CA state pink shrimp regulations; Bycatch Reduction Devices required; trip limits on groundfish landed; 4-14% observer coverage

[1]a.k.a., LE permit; all LE permits are issued by Federal agency (NOAA).
[2]Issued by the state of California.
[3]The state of WA does not conduct a nearshore fishery.
[4]Average values for catcher vessels delivering catch to motherships.
[5] *Paralichthys californicus*
[6]*Merluccius productus*
[7]*Anoplopoma fimbria*
[8]*Sebastes* spp.
[9] Pleuronectiformes
[10]*Scorpaenichthys marmoratus*
[11]Hexagrammidae
[12]*Pandalus jordani*

Appendix B. Summary of derelict gear reported by the West Coast Groundfish Observer Program in the U.S. West Coast Groundfish Fisheries

			Observed				Fleetwide Targeted Species or Groups Retained (mt)	% Landings Observed	Hauls with Lost Gear	% Observed Hauls with Lost Gear	Hauls Recovering Gear	% Observed Hauls Recovering Gear
Sector	**Gear**	**Year**	**Trips**	**Hauls**	**Vessels**	**Retained Target Species (mt)**						
Limited Entry Trawl	Bottom Trawl	2010	347	2614	83	4020	22321	18%	0	0%	87	3%
Catch Shares	Bottom and Midwater Trawl	2011	1110	9087	71	17256	17355	99%	3	0%	399	4%
	Bottom Trawl	2012	1072	8895	66	17107	17214	99%	0	0%	362	4%
		2013	1179	9930	68	18615	18666	100%	2	0%	298	3%
	Hook and Line	2011	92	622	11	336	336	100%	6	1%	2	0%
		2012	30	498	8	241	241	100%	6	1%	0	0%
		2013	18	153	4	85	85	100%	1	1%	0	0%
	Midwater Trawl	2012	8	23	4	194	194	100%	0	0%	0	0%
		2013	13	36	4	209	209	100%	0	0%	0	0%
	Pot	2011	227	1515	17	817	817	100%	52	3%	0	0%
		2012	258	1701	19	740	740	100%	88	5%	1	0%
		2013	93	1078	10	473	473	100%	34	3%	0	0%
Shoreside Hake	Midwater Trawl	2011	913	1701	26	90249	90249	100%	0	0%	17	1%
		2012	715	1565	24	65288	65288	100%	0	0%	1	0%
		2013	946	1725	25	96868	96868	100%	1	0%	8	0%
LE Sablefish	Hook and Line	2010	143	756	21	340	1290	26%	7	1%	1	0%
		2011	98	673	23	241	1147	21%	5	1%	1	0%
		2012	88	532	17	227	1055	22%	7	1%	0	0%

		2013	57	351	18	166	736	23%	6	2%	0	0%
	Pot	2010	43	314	7	142	509	28%	9	3%	0	0%
		2011	22	227	3	137	372	37%	3	1%	0	0%
		2012	19	351	5	101	297	34%	5	1%	0	0%
		2013	14	49	3	41	283	14%	3	6%	0	0%
OA Fixed Gear	Fixed Gear	2010	105	173	60	30	993	3%	2	1%	2	1%
		2011	122	184	64	37	590	6%	6	3%	0	0%
		2012	69	123	42	19	334	6%	3	2%	0	0%
		2013	47	78	30	10	179	6%	1	1%	0	0%
LE Fixed Gear DTL	Fixed Gear	2010	226	470	38	34	361	9%	7	1%	0	0%
		2011	201	426	38	52	534	10%	8	2%	1	0%
		2012	128	252	26	16	348	5%	2	1%	0	0%
		2013	124	248	22	18	346	5%	2	1%	0	0%
Nearshore	*Fixed Gear*	*2010*	*253*	*327*	*82*	*20*	*392*	*5%*	*38*	*12%*	*0*	*0%*
		2011	*349*	*454*	*89*	*24*	*411*	*6%*	*6*	*1%*	*0*	*0%*
		2012	*385*	*526*	*98*	*32*	*398*	*8%*	*2*	*0%*	*0*	*0%*
		2013	*353*	*454*	*104*	*28*	*428*	*6%*	*10*	*2%*	*1*	*0%*
OA CA Halibut	*Bottom Trawl*	*2010*	*34*	*111*	*6*	*2*	*69*	*3%*	*0*	*0%*	*1*	*1%*
		2011	*48*	*204*	*13*	*12*	*80*	*16%*	*0*	*0%*	*8*	*4%*
		2012	*27*	*77*	*7*	*4*	*56*	*6%*	*0*	*0%*	*1*	*1%*
		2013	*29*	*81*	*5*	*4*	*69*	*6%*	*0*	*0%*	*2*	*2%*
LE CA Halibut	*Bottom Trawl*	*2010*	*	*	*	*	*	*	*	*	*	*
Pink Shrimp	*Shrimp Trawl*	*2010*	*126*	*1654*	*51*	*2383*	*20357*	*12%*	*1*	*0%*	*8*	*0%*
		2011	*186*	*2579*	*57*	*4104*	*29460*	*14%*	*3*	*0%*	*18*	*1%*
		2012	*200*	*2733*	*64*	*3988*	*29325*	*14%*	*0*	*0%*	*9*	*0%*
		2013	*153*	*1916*	*67*	*3300*	*31551*	*10%*	*1*	*0%*	*6*	*0%*