

COSEWIC Assessment and Status Report

on the

Short-tailed Albatross *Phoebastria albatrus*

in Canada



**THREATENED
2013**

COSEWIC
Committee on the Status
of Endangered Wildlife
in Canada



COSEPAC
Comité sur la situation
des espèces en péril
au Canada

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Short-tailed Albatross — James Lloyd (adult); Christina Weir (juvenile).

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COSEWIC Assessment Summary

Assessment Summary – November 2013

Common name

Short-tailed Albatross

Scientific name

Phoebastria albatrus

Status

Threatened

Reason for designation

This species came close to extinction following decades of feather harvesting at its breeding colonies in the North Pacific. Since the end of the feather harvest, the population has increased significantly, although still well below historic numbers. The breeding population is, however, virtually restricted to two islands, one of which contains 85% of the breeding birds. The small breeding range makes the species highly susceptible to human activities or stochastic events.

Occurrence

British Columbia, Pacific Ocean

Status history

Designated Threatened in November 2003. Status re-examined and confirmed in November 2013.



COSEWIC Executive Summary

Short-tailed Albatross *Phoebastria albatrus*

Wildlife Species Description and Significance

The Short-tailed Albatross is the largest North Pacific seabird and, like all albatrosses, is adapted for long-distance oceanic travel. The species was hunted for its feathers and came close to extinction in the 1940s as a result, but is now recovering because of careful management by Japanese biologists. Before the feather harvest, Short-tailed Albatrosses were common off the coasts of the eastern Pacific, but are now rare non-breeding visitors (immatures or adults not actively breeding) primarily to continental shelf areas off British Columbia (1-10 birds, mostly juveniles, observed each year since 1995).

Distribution

The species breeds regularly on only two Japanese islands. Torishima, the site of the original surviving breeders, supports about 85% of the breeding population. Minamijima, in the Senkaku Islands, which are the focus of a territorial dispute between Japan, China and Taiwan, supports about 15%. In recent years (2010-2012), a single pair has bred twice at Midway Atoll, Hawaii and there was a failed breeding attempt at Mukojima Island, Japan where re-introductions have been done. Adults forage at sea within 1000 km of colonies while breeding, but non-breeding adults and immatures wander widely across the North Pacific. The highest concentrations of non-breeders are along the Aleutian Islands and in the southern Bering Sea. Small numbers (likely <30 birds of all ages) occur in Canadian waters off British Columbia each year.

Habitat

The primary breeding sub-colony on Torishima Island is on a steep, sparsely vegetated volcanic ash slope. Other sub-colonies used on Torishima provide more vegetated and stable ground. On Minami-kojima birds breed on a rocky terrace. At sea, this species wanders widely but foraging concentrations are in areas where upwelling and currents boost productivity. Non-breeders most often forage in the seas over continental shelves and shelf canyons, or near narrow passes between islands. Wind is an important factor affecting at-sea distribution; the species has a high wing-loading (body mass to wing area ratio) and therefore requires strong winds to assist long-distance travel.

Biology

The diet is not well known but squid, fish and larger crustaceans are likely the primary food. Scavenging of dead floating animals and at fishing vessels is common. This species has delayed maturity (most begin breeding when six or more years old), low reproductive output (a single egg is laid with each breeding attempt; mature adults do not breed each year) and a long life (50+ years). Breeding success (proportion of eggs laid that resulted in fledged chicks) at Torishima Island averaged 60% from 1979 to 2000 and increased to 66% from 2001 to 2011; within the island, the highest breeding success was at the more stable and vegetated sub-colony (75%; 1979-2011). Annual survival is estimated to be 90% for immatures (0-4 years old), 96% in subadults (5-8 years old) and 97% in adults (9+ years old).

Population Sizes and Trends

Before the feather harvest (1880s to 1940s), the global population was estimated to be in the millions (possibly 5 million birds). Only about 40 birds were alive at the time Torishima was recolonized in 1950. The population in 2012 is estimated to be 3,400-3,500 birds (with a high proportion of immatures and young adults) and is undergoing continued exponential growth of about 7.5% per year. Annual sightings of non-breeders in Alaska, the U.S. west coast and British Columbia are rising at similar rates. In the 2011-2012 breeding season, Torishima had 512 pairs (estimated to represent a total population of 3,000 birds) and Minami-kojima an estimated 80-100 pairs (representing 400-500 birds in total).

Threats and Limiting Factors

Torishima Island, where 85% of the population breeds, is an active volcano that has had three major eruptions over the past 130 years. The main breeding site on this island is also steep, unstable and subject to landslides. Mortality from fisheries bycatch, particularly longline fisheries, is considered a potential threat to this recovering population, as is oil pollution. This species also carries high loads of toxic contaminants, notably organochlorines (PCBs, DDT, dioxin and their derivatives) and mercury. There is evidence that some of these pollutants occur in high concentrations in marine food-webs off the Canadian and U.S. west coasts. Short-tailed Albatrosses also ingest plastic objects found at sea. These can cause internal damage to adults and their chicks and are known to release organochlorine toxins.

Protection, Status, and Ranks

Globally, the species is listed as Critically Endangered by the IUCN. The colony at Torishima is well protected but the Minami-kojima colony is in the hotly disputed Senkaku archipelago. There are effective measures to reduce bycatch in U.S. and Canadian fisheries, but there seems to be little effort to protect these birds from bycatch in Japanese, Russian and international waters. In Canada, the species is listed as Threatened on Schedule 1 of the federal *Species at Risk Act*. In the U.S. the species is listed as Endangered throughout its range under the *Endangered Species Act*, and in Japan it is listed as a Natural Monument and a Special Bird for Protection.

TECHNICAL SUMMARY

Phoebastria albatrus

Short-tailed Albatross

Albatros à queue courte

Range of occurrence in Canada (province/territory/ocean): British Columbia; Pacific Ocean

Demographic Information

<p>Generation time (usually average age of parents in the population; indicate if another method of estimating generation time indicated in the IUCN guidelines (2008) is being used)</p> <p>Generation time (average age of parents of the current cohort) estimated as 16.8 years. The generation time is likely to increase as the population age structure changes and stabilizes.</p>	17 yrs
<p>Is there an [observed, inferred, or projected] continuing decline in number of mature individuals?</p> <p>Breeding numbers at the main colony (Torishima) are increasing by 7.5% per year and the colony on Minami-kojima is thought to be growing at a similar rate. Annual sightings of non-breeders (immatures and adults not currently breeding) in Alaska, the U.S. west coast and British Columbia are rising at similar rates.</p>	No
<p>Estimated percent of continuing increase in total number of mature individuals within [5 years or 2 generations]</p> <p>Population doubling time estimated to be 9.5 years.</p>	7.5% increase per year expected for at least next 20 years, possibly longer
<p>Observed percent increase in total number of mature individuals over the last three generations.</p> <p>Increase from 50 birds in 1961 to 1702 birds in 2012.</p>	3304%
<p>Projected percent increase in total number of mature individuals over the next three generations.</p> <p>Exponential growth is expected to continue for at least the next 20 years and could continue for the next 51 years (three generations) given that the breeding population will remain well below the carrying capacity of the original colonies and assuming that other factors do not limit population growth. Potentially a 7.5% increase per year for 51 years.</p>	> 3000%
<p>Estimated percent increase in total number of mature individuals over any [three generation] period, over a time period including both the past and the future.</p> <p>The population has increased by more than 3000% over the last three generations and exponential growth is expected to continue for at least 20 years, but possibly longer, so similar increases expected into the future.</p>	> 3000%
<p>Are the causes of the decline clearly reversible and understood and ceased?</p> <p>Near-extinction in 1940s due to feather harvesting on colonies, but since the end of the hunt there has been a significant increase in the population.</p>	Causes are understood, reversible and have mostly ceased
<p>Are there extreme fluctuations in number of mature individuals?</p>	No

Extent and Occupancy Information

Estimated extent of occurrence in Canada	423 260 km ²
Taken as the entire Canadian EEZ in the Pacific	
Area of occupancy in Canada	423 260 km ²
Although there is evidence that these albatrosses do cluster in some marine areas, their high mobility and ability to forage as they move indicates that the area of at-sea occupancy should remain the same as the area of occurrence.	
Index of area of occupancy (IAO) at primary breeding colonies (Always report 2x2 grid value).	12 to 16 km ²
Calculated for the three Japanese colonies. The Hawaiian breeding site was not included because only a single pair has bred at this site and continuity is uncertain.	
Is the population severely fragmented?	No
Number of locations* Currently four islands support breeders (continuity is uncertain at one), but 85% are on Torishima, where risk of volcanic eruption. Within Canadian waters non-breeders are widely distributed and almost continuously mobile – threats might occur anywhere in the area of occupancy.	Maximum of 4 on breeding colonies, unknown and potentially large number in marine habitat
Is there an [observed, inferred, or projected] continuing decline in extent of occurrence?	No
Is there an [observed, inferred, or projected] continuing decline in index of area of occupancy?	No
Is there an [observed, inferred, or projected] continuing decline in number of populations? Globally the species has one widespread population	N/A
Is there an [observed, inferred, or projected] continuing decline in number of locations*?	No
Is there an inferred, or projected continuing decline in quality of habitat? Habitat quality on breeding islands is probably stable or improving. Habitat quality in Canada could be affected by increased risk of oil spills from increased shipping and oil exports from British Columbia ports in the next 10 years, but not likely to reduce population growth in the near future.	No
Are there extreme fluctuations in number of populations?	No
Are there extreme fluctuations in number of locations*?	No
Are there extreme fluctuations in extent of occurrence?	No
Are there extreme fluctuations in index of area of occupancy?	No

Number of Mature Individuals (in each population)

Population	No. Mature Individuals
Each breeding season, some mature adults remain at sea and do not breed. The proportions of total mature adults to active breeding pairs was estimated by H. Hasegawa (2011-2012 season) for Torishima.	
Torishima, Japan – 512 breeding pairs + 226 non-breeding adults	1250

Minami-kojima (Senkaku Islands) – 80-100 pairs (90 midpoint) extrapolated as for Torishima	220
Midway Atoll – 1 pair	2
Mukojima (Ogasawara Islands)	2
One failed breeding attempt where re-introductions have been made.	
Total based on the colony extrapolations above	1474
Total based on population model	1702
The total population (including immatures) is estimated to be 3,400-3,500 birds. A deterministic population model showed the 2011-2012 global population as 1702 breeding adults and 1739 non-breeders for a total of 3441 birds (USFWS 2012).	
Number of mature adults using Canadian waters each year	2
In the past 10 years it is likely that fewer than 30 birds per year visited Canadian waters and 2 (5%) would be mature birds. This number is expected to increase as the population increases.	

Quantitative Analysis

Probability of extinction in the wild:	0%
Population modelling by Finkelstein <i>et al.</i> (2010) showed no risk of extinction in 50-100 years based on current conditions and a range of likely threats.	

Threats (actual or imminent, to populations or habitats)

Volcanic eruption on primary colony where 85% of the breeding population occurs
Fisheries bycatch is a potential threat if deterrents are not in place and as population increases
Oil pollution
Pollution from organochlorine contaminants and toxic metals
Ingestion of plastic at sea

Rescue Effect (immigration from outside Canada)

Status of outside population(s)?	Increasing by about 7% per year
Is immigration known or possible?	N/A
The species does not breed in Canada	
Would immigrants be adapted to survive in Canada?	N/A
Is there sufficient habitat for immigrants in Canada?	Yes – applies only to non-breeding visitors
About 1% of the foraging time of the global population is currently spent in Canadian waters. Marine habitat in Canada is not limiting the species here.	
Is rescue from outside populations likely?	N/A

Data-Sensitive Species

Is this a data-sensitive species?	No
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Status History

COSEWIC: Designated Threatened in November 2003. Status re-examined and confirmed in November 2013.

Additional Sources of Information (see reference list for full citations):

USFWS. 2008. Short-tailed Albatross Recovery Plan. U.S. Fish & Wildlife Service, Anchorage, AK. [Very detailed review of threats and recovery options for the global population.]

Environment Canada. 2008. Recovery Strategy for the Short-tailed Albatross (*Phoebastria albatrus*) and the Pink-footed Shearwater (*Puffinus creatopus*) in Canada.

Status and Reasons for Designation

Status: Threatened	Alpha-numeric code: D2
Reasons for designation: This species came close to extinction following decades of feather harvesting at its breeding colonies in the North Pacific. Since the end of the feather harvest, the population has increased significantly, although still well below historic numbers. The breeding population is, however, virtually restricted to two islands, one of which contains 85% of the breeding birds. The small breeding range makes the species highly susceptible to human activities or stochastic events.	

Applicability of Criteria

Criterion A (Decline in Total Number of Mature Individuals): Does not meet criterion. Population has been steadily increasing since the 1950s. This increase is expected to continue for at least 20 years or possibly longer.
Criterion B (Small Distribution Range and Decline or Fluctuation): Does not meet criterion. Extent of occurrence (EO) above thresholds. Index of area of occupancy (IAO) on the breeding islands is below 5000 km ² and there are < 5 locations, but no continuing declines in EO, IAO, area, extent or quality of habitat that could result in population reductions, or declines in number of locations or populations or number of mature individuals. Similarly, there are no extreme fluctuations in EO, IAO, number of locations or populations or number of mature individuals.
Criterion C (Small and Declining Number of Mature Individuals): Does not meet criterion. Population is below 2500 mature individuals, but no declines. Population has been increasing since the 1950s and this is expected to continue for at least 20 years or more.
Criterion D (Very Small or Restricted Population): Meets Threatened D2. Breeding population has a very restricted IAO (12 to 16 km ²) and occurs in < 5 locations, thus making it prone to the effects of human activities or stochastic events.
Criterion E (Quantitative Analysis) : Does not meet criterion. Probability of extinction in the next 50 - 100 years is 0%.

PREFACE

There has been considerable research and conservation planning focused on Short-tailed Albatrosses since the last COSEWIC report (COSEWIC 2003). In Japan, researchers have continued monitoring the main colony at Torishima Island, worked to establish a new breeding colony on Mukojima Island (first egg laid in 2011-2012 but infertile) and undertaken new research on contaminants. In 2011 and again in 2012, a single pair bred successfully at a new site on Midway Atoll, Hawaii. There have been new data on the bird's distribution at sea and marine habitat, based on analysis of sighting records and the deployment of satellite tracking devices on 130 individuals. These new analyses and techniques give better insights into the use of Canadian waters off British Columbia by Short-tailed Albatrosses. The listing in 2000 of this species as Endangered throughout its range by the U.S. Fish and Wildlife Service led to considerable research on quantifying and mitigating mortality in fisheries bycatch. The bycatch threat also triggered population modelling and risk analyses. The U.S. listing led to a thorough international review of the species' biology, population trends and threats culminating in an international recovery strategy (USFWS 2008). This document also forms the basis for the SARA-compliant Canadian recovery strategy (Environment Canada 2008).



COSEWIC HISTORY

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list. On June 5, 2003, the *Species at Risk Act* (SARA) was proclaimed. SARA establishes COSEWIC as an advisory body ensuring that species will continue to be assessed under a rigorous and independent scientific process.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) assesses the national status of wild species, subspecies, varieties, or other designatable units that are considered to be at risk in Canada. Designations are made on native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fishes, arthropods, molluscs, vascular plants, mosses, and lichens.

COSEWIC MEMBERSHIP

COSEWIC comprises members from each provincial and territorial government wildlife agency, four federal entities (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biodiversity Information Partnership, chaired by the Canadian Museum of Nature), three non-government science members and the co-chairs of the species specialist subcommittees and the Aboriginal Traditional Knowledge subcommittee. The Committee meets to consider status reports on candidate species.

DEFINITIONS (2013)

Wildlife Species	A species, subspecies, variety, or geographically or genetically distinct population of animal, plant or other organism, other than a bacterium or virus, that is wild by nature and is either native to Canada or has extended its range into Canada without human intervention and has been present in Canada for at least 50 years.
Extinct (X)	A wildlife species that no longer exists.
Extirpated (XT)	A wildlife species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A wildlife species facing imminent extirpation or extinction.
Threatened (T)	A wildlife species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A wildlife species that may become a threatened or an endangered species because of a combination of biological characteristics and identified threats.
Not at Risk (NAR)**	A wildlife species that has been evaluated and found to be not at risk of extinction given the current circumstances.
Data Deficient (DD)***	A category that applies when the available information is insufficient (a) to resolve a species' eligibility for assessment or (b) to permit an assessment of the species' risk of extinction.

* Formerly described as "Vulnerable" from 1990 to 1999, or "Rare" prior to 1990.

** Formerly described as "Not In Any Category", or "No Designation Required."

*** Formerly described as "Indeterminate" from 1994 to 1999 or "ISIBD" (insufficient scientific information on which to base a designation) prior to 1994. Definition of the (DD) category revised in 2006.



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The Canadian Wildlife Service, Environment Canada, provides full administrative and financial support to the COSEWIC Secretariat.

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Short-tailed Albatross

Phoebastria albatrus

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WILDLIFE SPECIES DESCRIPTION AND SIGNIFICANCE

Name and Classification

Class Aves, Order Procellariiformes, Family Diomedidae, *Phoebastria albatrus* (Pallas, 1769). The type specimen for *Phoebastria albatrus* was collected off Kamchatka, Russia by Georg Steller in the 1740s and described in 1769 by P.S. Pallas in *Spicilegium Zoologicum* (American Ornithologists' Union 1998-2011). This species, along with the other three North Pacific albatross species (Black-footed Albatross *P. nigripes*, Laysan Albatross *P. immutabilis* and Waved Albatross *P. irrorata*), was moved from the genus *Diomedea* to *Phoebastria* following genetic studies (Nunn *et al.* 1996, American Ornithologists' Union 1998-2011). This taxonomic arrangement was recently confirmed by nucleotide sequencing of mitochondrial cytochrome b gene (Penhallurick and Wink 2004).

Short-tailed Albatross is the most commonly used English name, but the species is also known as Steller's Albatross (American Ornithologists' Union 1998-2011; Tickell 2000, Fitter 2008).

Morphological Description

The Short-tailed Albatross has a large body with long narrow wings adapted for soaring just above the ocean (Figure 1). The large bill, a distinguishing characteristic across age classes, is pink and hooked with a bluish tip. The sexes are alike in appearance across age classes, with no seasonal variation in plumage (Harrison 1983, Fitter 2008). Adults are characterized by a white back, pale-yellow head and back of neck, black and white wings, white tail with a black fringe, and pale legs and feet. First-year juveniles are wholly chocolate brown, closely resembling the juvenile Black-footed Albatross, but can be distinguished by their large bright pink bill (Figure 1). Immatures have colouration intermediate between that of juveniles and adults, gradually becoming whiter with age from 2-10 years (Tickell 2000).



Figure 1. Adult (left) and juvenile (right) Short-tailed Albatrosses. Photo credits: adult on Eastern Island, Midway Atoll, March 2007- James Lloyd (Wikipedia – GNU Free Documentation Licence); juvenile at sea in Canadian waters, British Columbia, July 2012 – Christina Weir (Archipelago Marine Research).

In this report, the term non-breeders refers to immature birds and adults not currently involved in breeding (either those taking a year off breeding or those studied outside the breeding season). All of the Short-tailed Albatrosses recorded in Canadian waters are non-breeders and in the past 10 years about 5% of the known-age birds seen in Canada (details below) were mature (adult plumage).

Males are slightly larger than females and body dimensions are: body length 84-91 cm, wingspan 2.13-2.35 m, mass 5.1-7.5 kg, bill length 129-141 mm (Fitter 2008).

Population Spatial Structure and Variability

All living birds are assumed to be descendants of about 40 birds that recolonized Torishima Island in the 1950s; there are therefore no known genetic sub-populations. There are no barriers to movement affecting the birds that frequent Canadian waters. Immature birds are more likely to be found off British Columbia than adults (Kenyon *et al.* 2009; see below).

Designatable Units

There are no sub-specific forms in this species. The entire population appears to have descended from survivors from one breeding colony at Torishima Island, off Japan. Therefore only one designatable unit, *Phoebastria albatrus*, is considered in this report.

Special Significance

The Short-tailed Albatross was considered extinct in the 1940s as a result of 70 years of feather harvesting (Austin 1949, Tickell 2000). The population is now slowly recovering as a result of intensive management at colonies and in marine areas (Hasegawa and DeGange 1982, Hasegawa 1984, USFWS 2008).

Archaeological evidence suggests that this species was once the most abundant nearshore albatross off North America. The species occurs prominently in middens at coastal archaeological sites from California through British Columbia to the Aleutian Islands (Yesner 1976, McAllister 1980, Crockford 2003). In addition to being a source of food for pre-contact Aboriginal people (Yesner 1976, McAllister 1980), the long limb bones of these albatrosses provided valued raw material for whistles, drinking tubes, and awls while other bones were used for fish hooks (Crockford 2003). No Aboriginal Traditional Knowledge was available at the time the report was compiled.

DISTRIBUTION

Global Range

Short-tailed Albatrosses once ranged throughout most of the North Pacific Ocean and Bering Sea, and modern records show the same at-sea distribution (Piatt *et al.* 2006, USFWS 2008). Historically, breeding colonies of Short-tailed Albatrosses were known from at least nine sites, all within the subtropical western North Pacific (Figure 2; Hasegawa 1984, USFWS 2008). These include the Izu, Bonin, Daito, Senkaku and western volcanic groups of Japan, and Agincourt Island and the Pescadore Islands of Taiwan (ACAP 2008, USFWS 2008). It is possible that other, undocumented, nesting colonies may have also existed (Hasegawa and DeGange 1982).

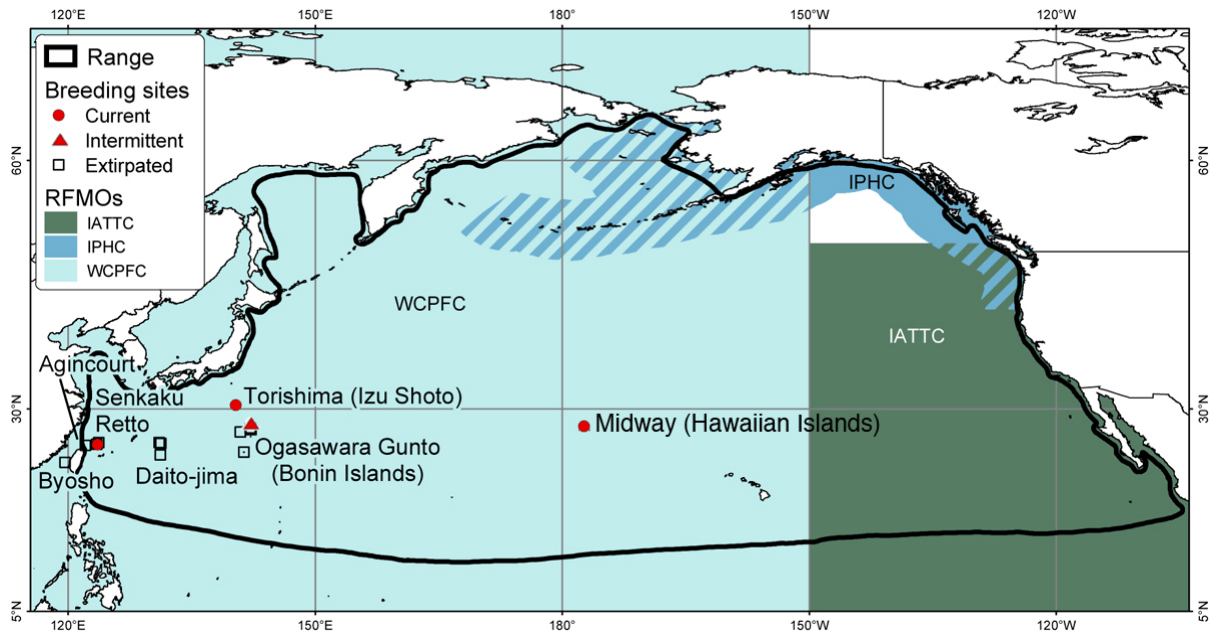


Figure 2. Range map of the Short-tailed Albatrosses showing at-sea range (black line), extirpated colonies (open black squares), three sites currently used for breeding (red circles) and Mukojima Island where re-introduced birds began breeding in 2012 (red triangle). Also shown are the Regional Fishery Management Organizations (RFMOs) which overlap with the bird's range: IATTC - Inter-American Tropical Tuna Commission; IPHC - International Pacific Halibut Commission; WCPFC - Western and Central Pacific Fisheries Commission. Map from ACAP (2008) and USFWS (2008) modified to include recent changes in colony use.

Currently, the species nests on three islands with a single failed breeding attempt at a fourth island (Figure 2; USFWS 2008). The bulk of the population (around 85%) nests on three sub-colonies (see habitat section below) on Torishima Island (Izu group, Japan) where the survivors of the feather harvest were found breeding in 1950. In 1971, 12 probably breeding adult Short-tailed Albatrosses were discovered on Minami-kojima Island in the Senkaku group, one of the former breeding sites, and breeding was confirmed there in 1988 (Hasegawa 1984, Tickell 2000). The Senkaku Islands (known as Diaoyu Islands in China and Tiaoyutai Islands in Taiwan) are the focus of a three-way territorial dispute between Japan, China and Taiwan. This colony has been difficult to monitor but is now estimated to number 80-100 pairs (H. Hasegawa, pers. comm. 26 September 2012). A single pair, raised on Torishima Island, bred successfully in 2011 and again in 2012 on Eastern Island, Midway Atoll, Hawaii (J. Klavitter, Midway Atoll National Wildlife Refuge, USFWS, pers. comm. 12 September 2012), but there was no egg laid in the 2012-2013 season.

In 2000, Japanese newspapers reported a pair with an egg, which failed to hatch, on Yomejima Island, within the Ogasawara (Bonin) Islands (USFWS 2008). From 2008 to 2012, 70 nestlings from Torishima were translocated to Mukojima Island in the Ogasawara Islands in an effort to establish a new breeding colony (Deguchi *et al.* 2012, 2013; Jacobs *et al.* 2012). Short-tailed Albatrosses began visiting the site in increasing numbers, with at least two pairs performing courtship activities. In November 2012, one pair (made up of one bird hand-reared on Mukojima and a naturally reared bird from Torishima) was seen with an egg, which was incubated but failed (Deguchi *et al.* 2013). Successful breeding is expected soon.

Early naturalists thought that the species might breed on the Aleutian Islands in Alaska (USFWS 2008). Although the waters around these islands are popular foraging areas for non-breeding adults and immatures (Piatt *et al.* 2006, Suryan *et al.* 2006, 2007), and there are numerous archaeological records from the area (Yesner 1976), there is no evidence that the species bred there (USFWS 2008).

The marine range of the Short-tailed Albatross extends through most of the North Pacific Ocean and north into the Bering Sea, with a few observations from the Sea of Okhotsk and the East China Sea (Figures 2-4; USFWS 2008). The species occurs throughout international waters and within the Exclusive Economic Zones (EEZ) of Mexico, the United States (U.S.), Canada, Russia, Japan, China, Taiwan, North and South Korea, the Federated States of Micronesia, and the Republic of the Marshall Islands (USFWS 2008). Historically, before the feather harvest, the species was considered common year-round throughout this range (Sanger 1972, USFWS 2008). The current (post-1950) distribution, based on at-sea sightings from vessels (McDermond and Morgan 1993, Piatt *et al.* 2006) and satellite tracking of tagged birds (Suryan *et al.* 2006, 2007, 2008, O'Connor 2013), shows the same pattern, with the highest concentrations around the Japanese nesting colonies during the breeding season (December through April) and concentrations of immature birds and non-breeding adults along the Aleutian Island chain and the southern Bering Sea (Figures 3 and 4). The highest concentrations occur along the edges of continental shelves and marine canyons (Figure 4; Piatt *et al.* 2006). In the eastern North Pacific, individual birds have been reported from Alaska through to the Baja Peninsula, Mexico (USFWS 2008).

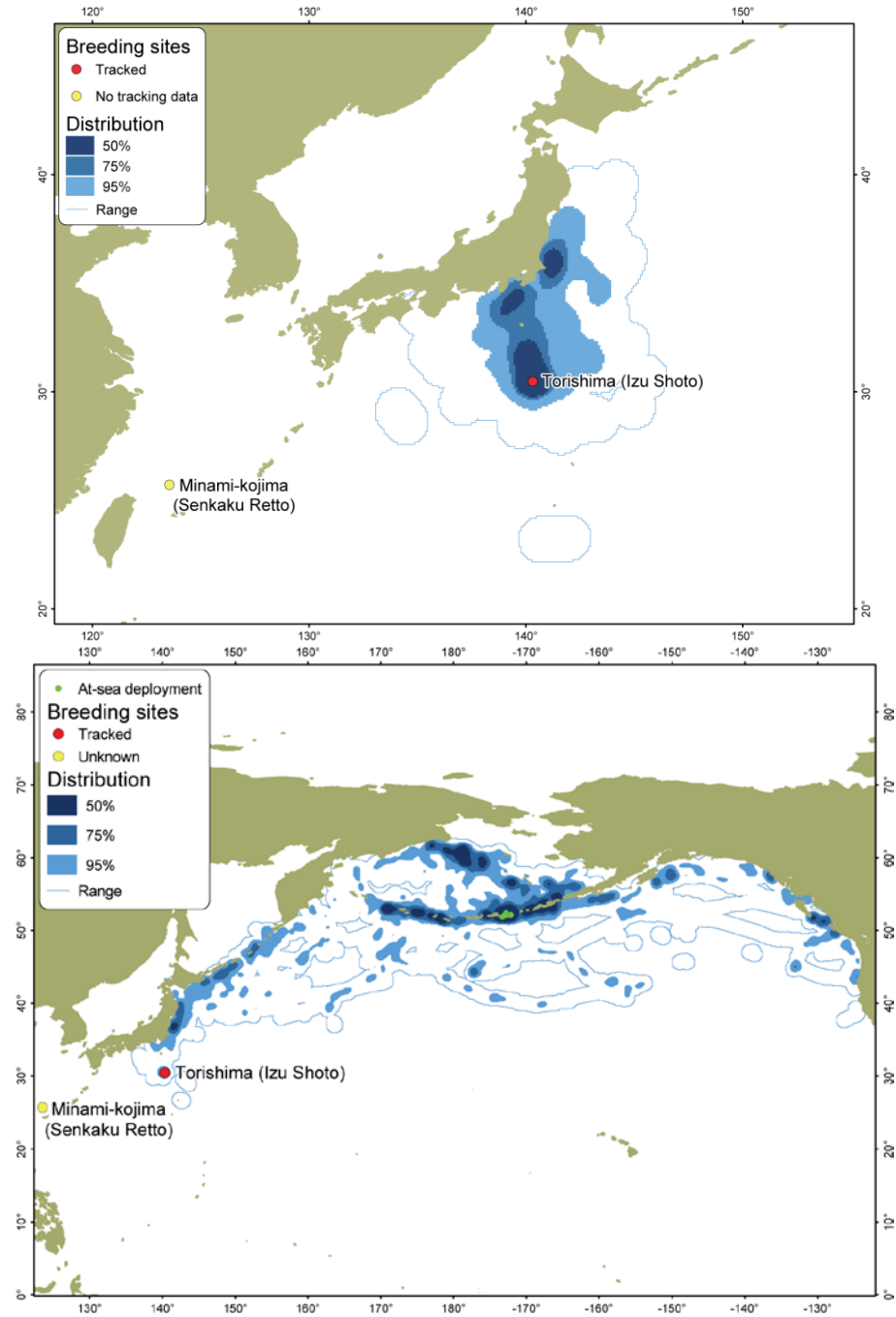


Figure 3. Distribution at sea of Short-tailed Albatrosses based on movements of tagged birds tracked by satellite or global positioning tags (from ACAP 2008). Upper map: data from 16 breeding adults in 2006 and 2007. Lower map: data from birds that were tagged at two locations; on Torishima island, where breeding, non-breeding and post-breeding birds ($n = 23$) were tagged between 2006-2008; and near Seguam Pass, Alaska where non-breeding birds were tagged from 2003-2006 ($n = 12$). Kernel density distributions show the 50%, 75% and 95% utilization distributions of the tagged birds. Maps based on data submitted to the BirdLife Global Procellariiform Tracking Database.

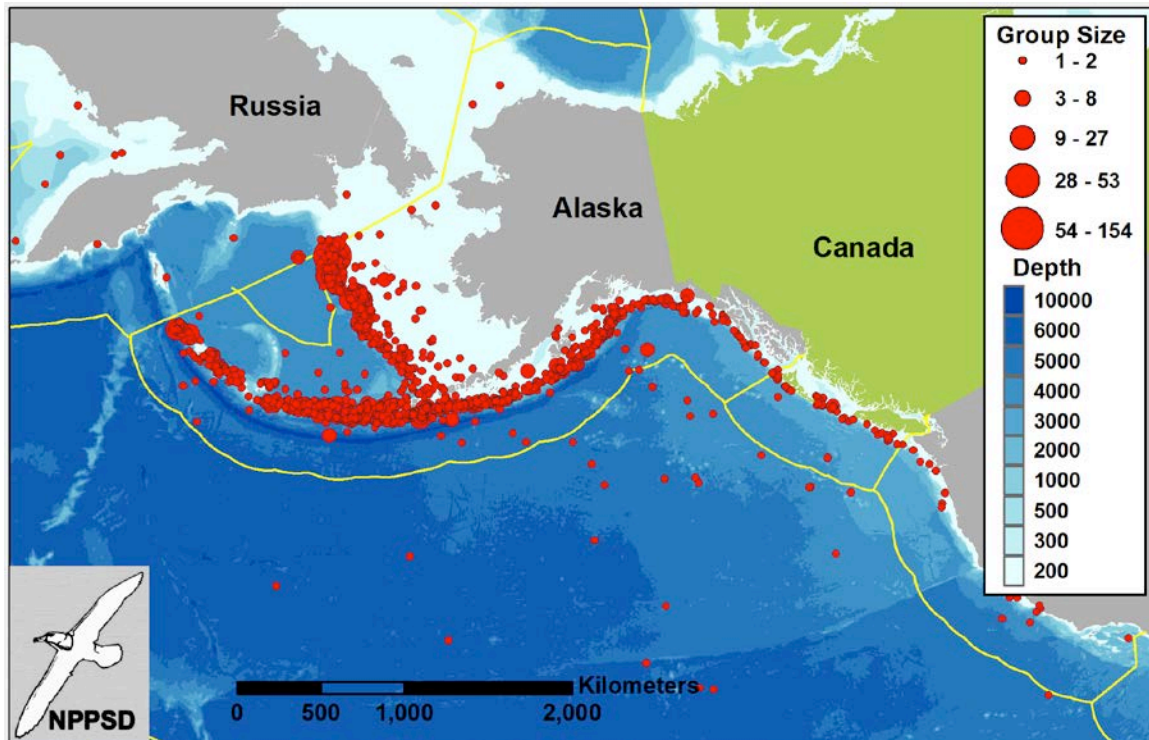


Figure 4. Sightings of Short-tailed Albatrosses in the North Pacific, 1940–2012 (1583 sightings including 2692 birds). Note the tight spatial association of albatrosses with the continental shelf edges in the Gulf of Alaska and Bering Sea, and on both sides of the Aleutian archipelago. The largest groups were located near the great canyons on the western Bering shelf. Data from the North Pacific Pelagic Seabird Database (from Piatt *et al.* 2006, updated by G. Drew, US Geological Survey). Yellow lines show the Exclusive Economic Zones (EEZs).

Canadian Range

In Canada, Short-tailed Albatrosses occur as regular non-breeding visitors off the coast of British Columbia. Archaeological evidence suggests that this species was once common off British Columbia (McAllister 1980, Crockford 2003). The archaeological remains (predominantly from ca. 3000 years B.P. to European contact, ca. 1770; Crockford 2003) are concentrated at sites on the outer coast (mainly Haida Gwaii and west Vancouver Island) with the exception of a sizable sample from the Victoria area in southeastern Vancouver Island (Table 1). This distribution likely reflects the prehistoric at-sea distribution of the albatrosses in British Columbia waters. The presence of 127 bones from the Victoria area (Maple Bank and Esquimalt Lagoon) suggests that this species regularly ventured into the Strait of Juan de Fuca, unless these bones were trade items from the outer coast.

Table 1. Occurrence of bones identified as Short-tailed Albatross (STAL) in historical and prehistoric middens on the British Columbia coast (from Crockford 2003).

Area and Site		STAL bones		No. of identified bones - all bird species
		No. of bones identified	% of all bird bones	
Area 1: Haida Gwaii and North & Central Coasts				
A101	Boardwalk/Digby Island, North Coast	1	0.4	227
A102	McNichol Creek, North Coast	0	0	37
A103	Namu, Central Coast	0	0	957
A104	Ellen Island, Haida Gwaii	16	20.5	78
A105	Second Beach/Graham I., Haida Gwaii	1	2.6	38
A106	Kunghit Haida, Haida Gwaii	37	1.4	2647
A107	Kunghit Haida, Haida Gwaii	1	0.1	915
A108	Kunghit Haida, Haida Gwaii	7	1.8	398
A109	Kunghit Haida, Haida Gwaii	3	3.4	89
A110	Kunghit Haida, Haida Gwaii	4	3.5	142
A111	Kunghit Haida, Haida Gwaii	4	1.3	313
A112	Kunghit Haida, Haida Gwaii	1	6.3	16
A113	Kunghit Haida, Haida Gwaii	1	2.6	38
A114	Kunghit Haida, Haida Gwaii	2	6.3	32
A115	Kunghit Haida, Haida Gwaii	1	5.6	18
A116	Kunghit Haida, Haida Gwaii	2	3.5	58
A117	Kunghit Haida, Haida Gwaii	0	0	405
A118	Hotsprings Island, Haida Gwaii	0	0	"few birds"
A119	Cohoe Creek, Haida Gwaii	0	0	"few birds"
Area 2: South Coast Outside (Vancouver Island West, Queen Charlotte Strait)				
A201	Yuquot village	1846	31.5	5864
A202	Kupti village	1	0.5	195
A203	Hesquiat village	676	45.0	1503
A204	Ma'apiath cave	18	1.4	1110
A205	Chesterman Beach/Cox Bay	1	0.8	124
A206	Little Beach	Present	-	No data
A207	Benson Island	8	17.4	46
A208	Aguilar Point village	Present	-	No data
A209	Nitinat Lake Narrows	1	3.1	32
A210	Shoemaker Bay	0	0	723

Area and Site		STAL bones		No. of identified bones - all bird species
		No. of bones identified	% of all bird bones	
Area 3: South Coast Inside (Vancouver Island East, Gulf Islands, Lower Mainland)				
A301	Esquimalt Lagoon	2	1.6	129
A302	Maple Bank, Victoria	125	2.3	5335
A303	Glenrose	0	0	49
A304	St. Mungo	0	0	247
A305	Tsable River	0	0	343
A306	Buckley Bay	0	0	337
A307	Departure Bay	0	0	105
A308	Pender Island	1	0.5	183
A309	Echo Bay	0	0	135
A310	Hopetown	0	0	1365

Historical records (ca. 1770 to 1950) of Short-tailed Albatrosses from British Columbia are sparse (summarized by Campbell *et al.* 1990). In the late 19th century, the species was reported by Kermode (1904) as “tolerably common on both coasts of Vancouver Island, but more abundant on the west coast”. In April 1894, he found it quite common near Cape Beale at the mouth of Barkley Sound, southwest Vancouver Island. In 1889 (exact date unknown), two specimens were obtained in the Strait of Juan de Fuca off Victoria and prepared as display mounts (Campbell *et al.* 1990). A bird was found dead on a beach at Esquimalt on 4 June 1893 (Macoun and Macoun 1909, cited by Campbell *et al.* 1990). The Short-tailed Albatross then “completely disappeared from the British Columbia coast” (McAllister 1980), and was not recorded again until the late 1950s (Campbell *et al.* 1990).

Modern sighting records of the species in or near British Columbia waters have been collated by K. Morgan (Canadian Wildlife Service, Sidney, B.C.) and are summarized in Appendix 1 and Figures 5 and 6. See details below (Search Effort) on the limitations of the sighting data from British Columbia. There is a possibility that some of the records might be repeat sightings of the same bird (e.g., records 82-85 of a juvenile in July 2012 – see Appendix 1; K. Morgan pers. comm.). Of the 36 records with recorded age class, 7 (19.4%) were adults, 8 (22.2%) were subadults or immature, and 21 (58.3%) were juveniles (in their first year). In the past 10 years, with improved recording of age classes, 5% of the known-age birds were mature, with adult plumage (Figure 5, Appendix 1). Most records (79%) occur from June through November (Figure 5).

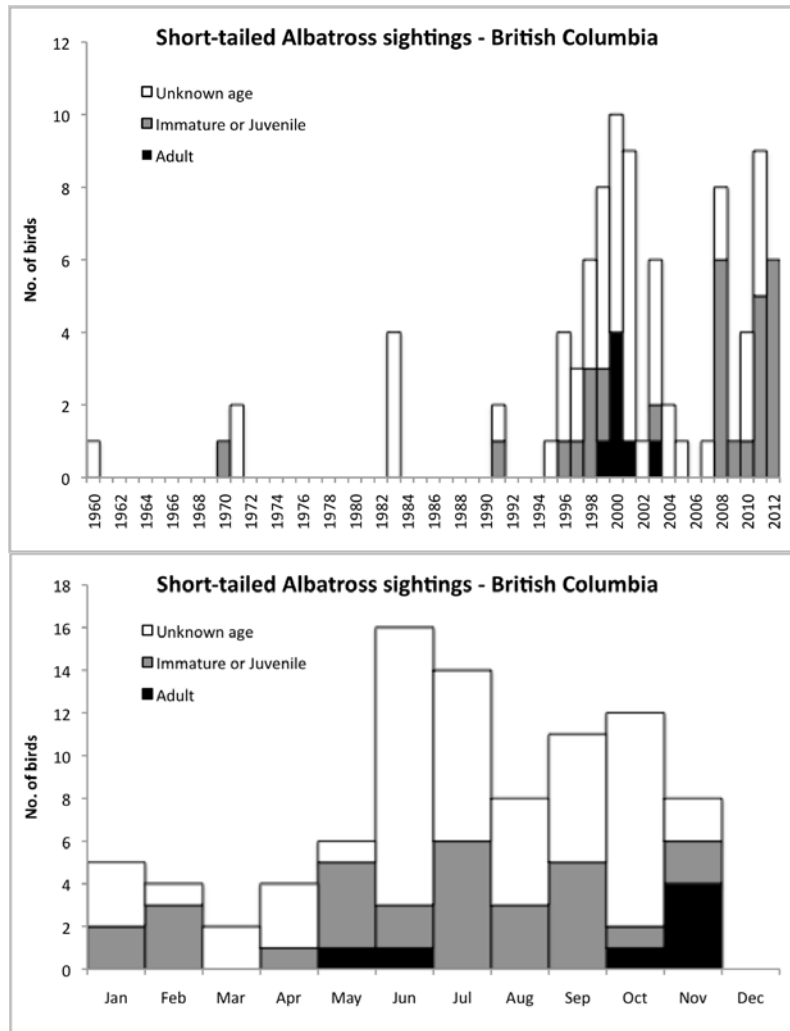


Figure 5. Breakdown of sightings of Short-tailed Albatrosses in or near British Columbia waters, by year (upper graph) and by month (lower graph). Most sightings were opportunistic and not based on systematic surveys (see text). Data from K. Morgan, Canadian Wildlife Service (Appendix 1).

Sightings from vessels and the tracks from 10 Short-tailed Albatrosses carrying satellite tags show similar distributions and concentrations off British Columbia (Figure 6). Short-tailed Albatrosses tend to concentrate along the edge of the continental shelf, particularly off northwest Haida Gwaii and Vancouver Island. Additional concentrations are evident at Dixon Entrance (off northwest Haida Gwaii), at the southern end of Hecate Strait (off southern Haida Gwaii), in Queen Charlotte Strait in the vicinity of the Scott Islands off northwestern Vancouver Island, and off the mouth of the Strait of Juan de Fuca (see also mapped sightings off this strait on the U.S. side of the border in USFWS 2012). The albatrosses are infrequently located in the open ocean beyond the continental shelf, and the tracks of tagged birds suggest that those individuals were in transit (rapid direct flight) and not actively foraging (slower and more contorted paths). No modern sightings or satellite locations have been reported for the sheltered waters of Georgia Strait, Strait of Juan de Fuca and Puget Sound.

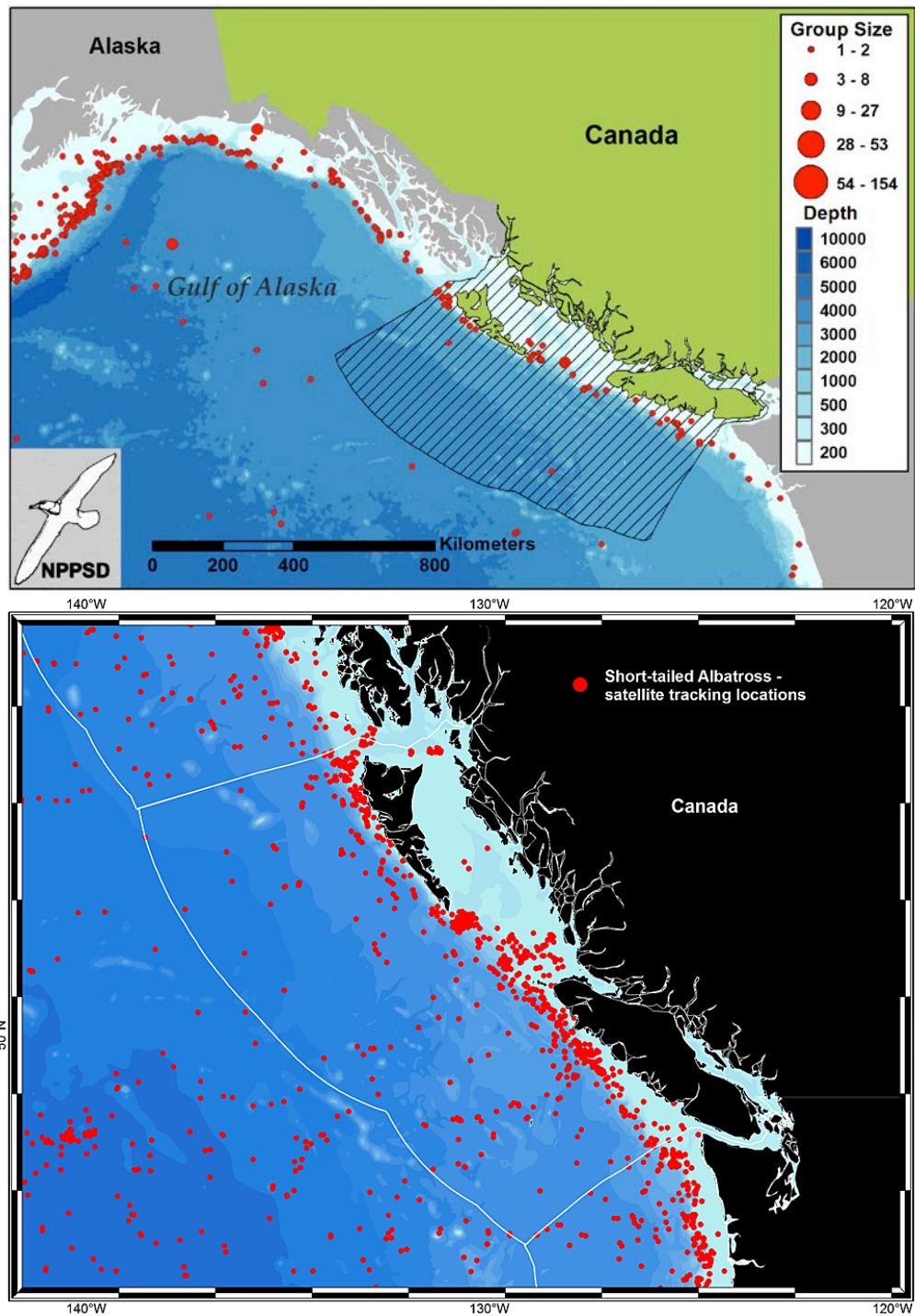


Figure 6. Locations of Short-tailed Albatrosses recorded in and near British Columbia waters since 1960. Upper: sightings of Short-tailed Albatrosses from vessels (data from the North Pacific Pelagic Seabird Database, including the data in Appendix 1 of this report, plotted by G. Drew, U.S. Geological Survey). Lower: Satellite tracking locations of 10 Short-tailed Albatrosses (from R. Suryan, Oregon State University). The Exclusive Economic Zone is shown in each map.

Extent of Occurrence and Area of Occupancy

Most at-sea surveys that have reported Short-tailed Albatrosses off British Columbia are conducted aboard ships-of-opportunity or are reports from fisheries observers (Kenyon *et al.* 2009; K. Morgan pers. comm. 2013). Survey effort has been inconsistent from year to year on a spatial and temporal scale. As a result, it is difficult to delineate the exact range and the relative abundance of the species off the British Columbia coast. In those marine areas where the species has not been recorded, as well as for areas that have not been surveyed, it is not possible to definitely say that the areas are not used by Short-tailed Albatrosses. The few tracks of satellite-tagged birds made off British Columbia suggest that the entire extent of Canada's Exclusive Economic Zone (EEZ) might be used at some time by these birds (Figure 6).

Thus the area of occupancy (AO) for the Short-tailed Albatross in Canada is equivalent to the extent of occurrence (EO), and is estimated to be 423 260 km² from the boundary of Canada's EEZ in the Pacific to the British Columbia coast, including areas of the species' historical range (Dixon Entrance, Hecate Strait, Queen Charlotte Sound, Juan de Fuca Strait and coastal inlets). The same AO and EO were given in the earlier status report for this species (COSEWIC 2003). Although there is evidence that these albatrosses do cluster in some marine areas, their high mobility and ability to forage anywhere as they move indicates that AO should remain the same as EO.

The index of area of occupancy (IAO) was determined for the three breeding islands in Japan because this is the smallest area essential to the survival of this species. The site on the Hawaiian Islands was not included because continuity at this site is uncertain. Based on a 2 km X 2 km grid, the IAO is between 12 and 16 km². The rationale for this is that at a minimum the birds breed on three islands, which would result in an IAO of 12 km². There are, however, two distinct sub-colonies on Torishima, which could each fall into an IAO square. These, in addition to the breeding birds on the remaining two small islands at a single IAO square each, would result in a maximum IAO of 16 km².

Search Effort

Of the 85 sighting records of Short-tailed Albatrosses in or near British Columbia waters, 39 (45.9%) were from the North Pacific Pelagic Seabird Database, which includes some sightings by the Canadian Wildlife Service (Kenyon *et al.* 2009; Appendix 1). A further 7 sightings (8.2%) were from recent CWS surveys, 33 (38.8%) were from fisheries observers (International Pacific Halibut Commission [IPHC] and Archipelago Marine Research), 4 (4.7%) were from Canadian Coast Guard and Department of Fisheries and Oceans personnel and 2 (2.4%) were from other individual observers. Between 1982 and 2010 the Canadian Wildlife Service conducted 67 002 vessel transects off the coast (generally 5-minute observation periods) covering 107 563 km (41 384 km²) (Kenyon *et al.* 2009; K. Morgan pers. comm.). Most of the records off British Columbia were opportunistic sightings by fisheries observers; there has only been one sighting in this region during the IPHC observers' standardized seabird counts, even though these observations from late May through early September cover most of the peak months for sighting this species off British Columbia (Geernaert 2011).

Overall, it is impossible to provide any precise measure of search effort at sea off British Columbia for this species. The increase in sightings off British Columbia over the past 30 years (Figure 5) is in accordance with the well-documented increase in the species' population, but there has also been an increase in fisheries observer effort since the 1990s, which possibly also contributed to the increase in sightings. Trends in sightings corrected for observer effort come from the standardized IPHC surveys with the data from all regions (Alaska, British Columbia and U.S. west coast) combined—see below.

To date, 130 Short-tailed Albatrosses have been tagged with satellite-tracking devices to plot their movements at sea (R. Suryan, pers. comm. 9 October 2012). These devices were fitted to breeding birds at the colony on Torishima Island, Japan, fledglings at Torishima and Mukojima islands, and non-breeding birds captured off the Aleutian Islands (Suryan *et al.* 2006, 2007, 2008, USFWS 2008, Suryan and Fischer 2010, O'Connor 2013). None of the adult albatrosses tagged at Torishima have been located off British Columbia and 10 of the mixed-aged sample caught in the Aleutians occurred in B.C. waters, but some tagged birds might have reached this area after losing their tags (R. Suryan, pers. comm. 9 October 2012). The 10 tagged individuals found off British Columbia were all immature (≤ 3 years old) and were tracked in 2003, 2006 and 2009-2012 (O'Connor 2013). Two types of devices have been used: Argos Platform Transmitter Terminal (PTT) that were filtered to improve accuracy, and Global Positioning System (GPS) locators that provide finer resolution information on where birds are located (six GPS positions per day). Both types show similar locations of albatrosses off British Columbia (R. Suryan, pers. comm. 9 October 2012).

HABITAT

Habitat Requirements at Breeding Colonies

Short-tailed Albatrosses are colonial breeders that typically nest on isolated, windswept, offshore islands with restricted human access (Tickell 2000). Historically, the species seemed to prefer level, open areas adjacent to tall clumps of grass for nesting. Nests are scoops in the ground, lined with and built up by grass. The major colony is on Torishima Island, a near-circular volcanic cone 5 km² in area and 2.4 km across (Tickell 2000). Three sub-colonies are currently used on Torishima Island. The original and most populous site (Tsubame-zaki) is on a sparsely vegetated steep slope of loose volcanic soil (Hasegawa and DeGange 1982, Hasegawa 1984, Tickell 2000). Since 1981, a protective berm has been built on the ashy slope and native plants have been transplanted into the colony, in order to stabilize the remaining nesting habitat. An alternate sub-colony has also been established on the northwest slope of Torishima by luring birds with decoys and speakers broadcasting Short-tailed Albatross calls. This is a well-vegetated site (Hatsu-zaki) that is less likely to be impacted by lava flow, mud slides, or erosion (Tickell 2000, USFWS 2008). A third sub-colony has arisen naturally above the cliffs of the Tsubame-zaki slope (H. Hasegawa, pers. comm.).

The second Japanese colony is on Minami-kojima in the Senkaku group. This is a rocky, steep-sided islet 0.46 km² in area. The albatrosses nest among rocks and sparse bushes on a broad rocky terrace on the slope of the major pinnacle (Tickell 2000). There is no known threat of volcanic activity at this site.

On Eastern Island, Midway Atoll the lone breeding pair is nesting on coral sand with a mix of native bunch-grass, non-native grasses and the introduced daisy *Verbesina encelioides* (J. Klavitter, Midway Atoll National Wildlife Refuge, USFWS, pers. comm. 31 October 2012). The nest site is approximately 40 m from the high tide mark.

Marine Habitat Requirements

The widespread occurrence of this species' bones in coastal archaeological sites suggested a nearshore distribution, allowing access by Aboriginal hunters in canoes and kayaks (Yesner 1976, McAllister 1980, Hasegawa and DeGange 1982, Crockford 2003), but modern data suggest more complex habitat relationships. Wind, coastal currents, upwelling and sea-floor topography are all key features of their at-sea distribution and foraging niche. In general, both adults and immature birds tend to forage predominantly at the edges of continental shelves and shelf canyons, to a lesser extent over shallow shelf waters and least of all in the deep open ocean.

This species spends much of its life in the windier regions of the ocean, which supports energetically sustainable long-distance foraging flights (Tickell 2000, Suryan *et al.* 2008). This species has an exceptionally high wing-loading, which puts additional emphasis on using wind for long-distance movements (Suryan *et al.* 2008). With the exception of the new Midway breeding site, all the known and historical breeding colonies were close to (<1000 km) productive foraging sites in the Kuroshio and Oyashio coastal current systems (USFWS 2008). Average wind speeds in this region are moderate, but still higher than those prevalent at the colonies of the other North Pacific albatrosses (mainly in the Hawaiian and Galapagos archipelagos; Suryan *et al.* 2008). Non-breeding Short-tailed Albatrosses do venture into less windy marine areas near continental shelves, compared to windier open oceans nearby, but only where these areas offer high productivity and profitable foraging (Suryan *et al.* 2008).

Analysis of at-sea sightings (Piatt *et al.* 2006) and satellite tracking data (Suryan *et al.* 2006, 2007, 2008, Suryan and Fischer 2010, O'Connor 2013) both show that the densest aggregations of non-breeding Short-tailed Albatrosses are along the Aleutian Islands and the shelf edge in the Bering Sea (Figures 3 and 4). In these regions the strongest habitat associations are with strong coastal currents (e.g., between islands in the Aleutian chain) and the seas over continental shelf edges or major shelf canyons. Foraging sites were positively associated with high chlorophyll-a concentrations, strong chlorophyll gradients, wind speed, depth (less than the abyssal depths) and depth gradients; all features characteristic of continental shelf edges and upwelling areas (Suryan *et al.* 2006). Stable isotope analysis of Short-tailed Albatross tissues shows that this species forages at a relatively high trophic level (see diet below). The isotopes reflect a higher proportion of dietary nutrients derived from neritic (e.g., carbon-rich upwelled water) than oceanic (carbon depleted) water (Suryan and Fischer 2010). Piatt *et al.* (2006) concluded that the concept of the Short-tailed Albatross being a nearshore species, as suggested by the archaeological record, is simplistic and the species is more accurately considered to be a continental shelf-edge specialist.

The sparse data from Canadian waters, based on sightings of birds and the tracks of a few satellite-tracked individuals (Figure 6), indicate that the habitat used here is similar to that used in areas of higher concentrations. Off British Columbia, sightings and satellite-tracked locations are concentrated along the continental margins and at the outer entrances to major inland waterways (Dixon Entrance, southern Hecate Strait, Queen Charlotte Sound and near the mouth of the Strait of Juan de Fuca; Figure 6). Continental shelf edges and tidally affected waterway entrances off British Columbia are known to be areas with consistent upwelling of nutrients (Thomson 1981), leading to high marine productivity and concentrations of top predators (Denman *et al.* 1981, Mackas and Galbraith 1992, Mackas *et al.* 1997). Major continental shelf canyons, such as those at the mouth of the Strait of Juan de Fuca and off Vancouver Island are associated with strong upwelling, high nutrient concentrations and high productivity (Allen *et al.* 2001) that in turn support high concentrations of seabirds (Burger 2003).

Habitat Trends

Torishima experienced major eruptions, ash falls and lava flows in 1902, 1939 and 2002 (Finkelstein *et al.* 2010). Landslides and erosion in the unstable ash threaten the sites where most of the birds nest (Tickell 2000, USFWS 2008). Nonetheless, due to the low numbers relative to historical abundance, the terrestrial nesting habitat does not appear to be limiting at this time. The number breeding on the main colony, Torishima Island (512 nesting pairs in 2011-2012), is nowhere near the 85 000-100 000 pairs thought to have nested there before the feather harvest (Tickell 2000). Most of its former island colonies have not yet been re-occupied. The species is also almost certainly not near the carrying capacity of its marine habitat (USFWS 2008).

BIOLOGY

Life Cycle and Reproduction

Short-tailed Albatrosses are monogamous, and most adult birds with surviving mates breed annually. Individuals that lose a mate may require 1-5 years to form a new pair bond and nest successfully again, based on data from Laysan Albatrosses (Finkelstein *et al.* 2010). In general, birds hatched on Torishima return to the same island to breed (natal philopatry) and breeding pairs return to nearly identical nest sites each year (nest site fidelity).

On Torishima, individuals begin arriving at the breeding colony in October and begin courtship and nest building. Egg laying occurs from late October through early November (Tickell 2000). A single egg is laid; incubation is shared by both parents and lasts for 64-65 days. Eggs are not replaced if destroyed (Austin 1949). Hatching occurs from late December through early January. By late May or early June, chicks are almost fully grown and adults begin abandoning the colony. Chicks fledge soon after the adults leave and do not return until they are two to five years old as prospecting non-breeders (Hasegawa and DeGange 1982). The colonies are deserted by mid-June (Tickell 2000). There is no detailed information on breeding activities on Minami-kojima, but they are likely to be similar to those on Torishima.

For the Torishima colony, the average age of first breeding is estimated to be 6 years (13% of banded birds began breeding at age 5 years and 42% at age 6; Finkelstein *et al.* 2010). This is younger than for other albatross species, and may result from the low density of individuals in the colony, compared with historically high breeding densities. For their population models, Finkelstein *et al.* (2010) took the annual probability of breeding to average 0.55 (bounds 0.1-0.7) for immature birds (5-8 years old) and 0.88 (bounds 0.45-0.95) for adults (9+ years).

Since 1976, the average annual breeding success (the percent of eggs laid that result in a fledged chick) has been 55% (Finkelstein *et al.* 2010). The breeding success has improved to 66% in the past decade (2001-2011), partly as a result of re-vegetation and erosion control at the Tsubame-zaki sub-colony (Hasegawa 2012; H. Hasegawa pers. comm.). Breeding success at the new Hatsu-zaki sub-colony on Torishima, that offers more stable and better vegetated terrain, averages 75% (Hasegawa 2012). The two breeding attempts on Eastern Island, Midway Atoll were both successful (J. Klavitter, pers. comm.). There are no data on breeding success at Minami-kojima Island in the Senkaku group.

Survival

For modelling population dynamics of the Torishima colony, Finkelstein *et al.* (2010) used these average age-dependent annual survival rates: egg to fledge 0.551 (variance 0.015); immatures (fledge to 4 years) 0.900 (variance 0.003); subadults (5-8 years) 0.955 (variance 0.001); adults (9+ years) 0.970 (variance 0.0005). Longevity is not documented, although individuals may live to be 45 years (Fitter 2008) and the population model parameters used by Finkelstein *et al.* (2010) indicate that about 11% of the population would survive to 50 years.

Generation time (average age of parents of the current cohort) was estimated as 16.8 years by M. Finkelstein (UC Santa Cruz, pers. comm.) based on data collected for the U.S. Short-tailed Albatross Recovery Plan (Finkelstein *et al.* 2010). The generation time is likely to increase as the population age structure changes and stabilizes. In other albatross species, estimated generation time averaged 24.2 years (range 15-30 years, for 13 other albatross species; P. Sievert in COSEWIC 2003).

Little information is available on the causes of natural mortality in Short-tailed Albatrosses. Losses of eggs or chicks through desertion, storms, interference from other albatrosses, accidental egg puncturing, disease, parasites and the rolling of eggs from nests are known or potential, but unquantified, sources of mortality (Hasegawa and DeGange 1982, Tickell 2000, USFWS 2008). Harrison (1979) suggests that sharks may get some hatch-year birds after they have fledged. Adults and chicks are known to have died after becoming entangled in bushes or other similar vegetation (Austin 1949). Crows (*Corvus* sp.) were known to take chicks on Torishima during the feather harvest era (Austin 1949) but are no longer found on the island (USFWS 2008). A chick was taken by a Steller's Sea Eagle (*Haliaeetus pelagicus*) on Torishima in the 1960s but this is considered a rare event and not a major threat (USFWS 2008).

Physiology and Adaptability

This species is well adapted to tolerate an extensive range of weather and sea conditions, ranging from ice edges in the northern Bering Sea to sub-tropical conditions off Hawaii and the Japanese islands where they breed.

Foraging Ecology and Diet

These albatrosses feed mainly by surface-seizing. They forage singly or in groups (occasionally up to hundreds at intense food concentrations; Piatt *et al.* 2006). They are most active by day but will feed at night (Hasegawa and DeGange 1982, Suryan *et al.* 2007).

The diet of birds at sea is not well known, but at-sea observations and isotope analyses indicate foraging on higher trophic levels (likely squid, fish and larger crustaceans; Hasegawa and Degange 1982, Suryan and Fischer 2010). Prey likely to be taken in the Bering Sea include mid-water dwelling squid, which would become available to albatrosses when they float to the surface after dying, or migrating upwards (USFWS 2008). Prey delivered to nestlings includes squid (especially the Japanese Common Squid *Todarodes pacificus*), shrimp, fish (including bonitos *Sarda* sp., flying fish Exocoetidae and sardines Clupeidae), eggs of flying fish and crustaceans (Austin 1949, Hasegawa and DeGange 1982, Tickell 2000). The species has been reported to scavenge salmon from shallow estuaries and discarded blubber and offal at whaling operations (Hasegawa and DeGange 1982, Tickell 2000). They readily scavenge offal and discards at fishing vessels, including fisheries targeting Sablefish (*Anoplopoma fimbria*), Pacific Cod (*Gadus macrocephalus*), Pacific Halibut (*Hippoglossus stenolepis*), and Pollock (*Theragra chalcogramma*) (Melvin *et al.* 2001). Fisheries offal, discards and longline bait now probably constitute a notable portion of the caloric intake of these birds (USFWS 2008).

Dispersal and Migration

Recent satellite tracking of individuals of all age classes has revealed that breeding adults generally confine their foraging to within 1000 km of the Torishima colony, but non-breeding birds of all ages range along the Pacific Rim from southern Japan to northern California (Suryan *et al.* 2006, USFWS 2008, O'Connor 2013; see Figures 3, 4 and 6). Tagged juveniles (<1 year old) travel twice as far per day (mean $245 \pm \text{SE } 8$ km) as older birds (133 ± 8 km), and one- and two-year-olds are more likely than older birds to be found off the west coast of Canada and the U.S. (Suryan *et al.* 2006, 2007, O'Connor 2013). This matches the prevalence of immature birds in the sighting data off British Columbia (Appendix 1; Figure 5).

Based on the satellite tracking data analysed by Suryan *et al.* (2007) it appears that the global population of Short-tailed Albatross spends about 1% of the year or less in Canadian waters. None of the 11 adults or subadults tagged in Japan was recorded off British Columbia (n = 1009 tracking days) and only 2% of the time (n = 293 tracking days) of three birds tagged in the Aleutian Islands was spent in the Canadian EEZ. O'Connor (2013) found that time in Canadian waters by a few birds accounted for only 1.7% of the overall tracked time for 41 satellite-tagged immature birds tracked year-round. The ACAP (2008) analysis of satellite tracking data similarly shows the British Columbia coast as a little-used part of the species range (Figure 3). Out of 130 birds fitted with satellite tags by 2012, 10 (7.7%) had been reported in British Columbia waters (Figure 6). R. Suryan (pers. comm. September 2012) cautions that a few tagged birds might have lost their tags and still reached this coast unobserved. The use of British Columbia waters by this species will obviously increase as the global population rises.

Interspecific Interactions

Based on analyses of stable carbon and nitrogen isotopes and spatial distributions at sea, the primary foraging domains of Short-tailed Albatrosses appear similar to those of Black-footed Albatrosses, which differ from those of Laysan Albatrosses (Suryan and Fischer 2010, Guy *et al.* 2013). Within the Pacific Basin there is spatial segregation: Short-tailed Albatrosses are more likely to range north into the Bering Sea whereas Black-footed Albatrosses range farther southeast and Laysan Albatrosses range to the southwest of the North Pacific (Suryan and Fischer 2010).

Given the greatly depleted current population of Short-tailed Albatrosses and the reduced populations of Black-footed Albatrosses (Hyrenbach and Dotson 2003, Arata *et al.* 2009) it seems highly unlikely that interspecific competition between these species affects their foraging success or population dynamics. No other potential competitors have been identified.

Genetic Diversity

The genetic consequences of going through a severe population bottleneck within the last century are not known and have not been investigated (USFWS 2008).

POPULATION SIZES AND TRENDS

Sampling Effort and Methods

Albatross populations are estimated and monitored from counts of breeding adults at colonies. Counts of Short-tailed Albatrosses at Torishima Island were made sporadically from 1950 to 1973 but annually from 1976 to the present (USFWS 2008, H. Hasegawa, pers. comm. September 2012). Counts at Minami-kojima Island in the disputed Senkaku group have been infrequent (e.g., chick counts in 2000-2001 and 2001-2002 seasons) and mostly done from aircraft. No surveys have been made there since these islands were closed to researchers by the Japanese government in 2004 (H. Hasegawa, pers. comm., September 2012).

Only a portion of the total population comes ashore in any breeding season; most immatures and even some breeding adults remain at sea year-round. For their population modelling, Finkelstein *et al.* (2010) estimated that no immatures (<5 years old), 55% of subadults (5-8 years old) and 88% of adults (9+ years old) were likely to breed.

Abundance

The global population of the species is in the range of 3400 to 3500 birds; a deterministic population model showed the 2011-2012 global population as 1702 breeding adults and 1739 non-breeders for a total of 3441 birds (USFWS 2012). During the most recent 2011-2012 breeding season, Hasegawa (2012) reported 512 pairs on Torishima (882 birds counted but not all were breeding) producing 353 fledged young. The original and most populous site (Tsubame-zaki) had 403 breeding pairs while a second site on the northwest slope of Torishima (Hatsu-zaki) had 102 pairs. A third sub-colony above the cliffs of the Tsubame-zaki slope supported 7 pairs in 2011-2012 (H. Hasegawa, pers. comm.). The post-season total population of Torishima birds was estimated to be about 3000 individuals of all ages (Hasegawa 2012).

There have been no recent censuses on Minami-kojima (Senkaku Islands). Assuming that population growth since the last visits in 2001-2002 was similar to that of Torishima, H. Hasegawa (pers. comm. September 2012) estimated that the current breeding population on Minami-kojima was 80-100 nesting pairs for a total population of 400-500 individuals.

It is possible to make only crude estimates of the numbers of Short-tailed Albatrosses visiting Canadian waters annually. Satellite-tagged birds tend to spend relatively little time within the Canadian EEZ (reviewed above) and ship-board observers report fewer than 10 birds per year (Figures 4, 5 and 6). In the past 10 years it is likely that fewer than 30 birds per year visited Canadian waters and 2 (5%; see above) would be mature birds. Applying the known rate of overall population increase (7.5% per year; see below) to this crude estimate gives an estimate of 393 birds occurring in Canadian waters over the past three generations (51 years; since 1961) of which 20 would be mature birds.

Fluctuations and Trends

Tickell (2000) speculated that 50-60 birds (likely immature birds remaining at sea) survived the last feather harvest in the 1940s and about 40 of these were alive when Torishima was recolonized in 1950. By the mid-1950s there were at least 12 breeding pairs. This population initially increased slowly, but with increasing numbers of offspring recruiting to the breeding population and with improvements to the breeding habitat the population underwent exponential growth (USFWS 2008, Hasegawa 2012; Figure 7). Since 1980, the Torishima population has had a growth rate of about 7.5% per year, indicating a doubling time of 9.5 years, and is estimated to reach 1000 pairs (ca. 6000 individuals) in 2020 (Hasegawa 2012). Human interventions (stabilizing the ground and vegetation at the Tsubame-zaki sub-colony and luring birds to the more stable Hatsu-zaki sub-colony) have contributed to this growth. Exponential growth in the Japanese breeding populations is expected to continue for at least 20 years (H. Hasegawa, unpubl. data). If the 2011-2012 population (1702 birds or 851 pairs) continues to increase at 7.5% per year, the breeding population in three generations (51 years) would reach 34 000 pairs (a 40-fold increase). For comparison, during their recovery after feather harvesting, between 1923 and 2005, Laysan Albatrosses increased from an estimated 18 000 pairs to 590 000 pairs, and Black-footed Albatrosses from 18 000 pairs to 61 000 pairs (Arata *et al.* 2009).

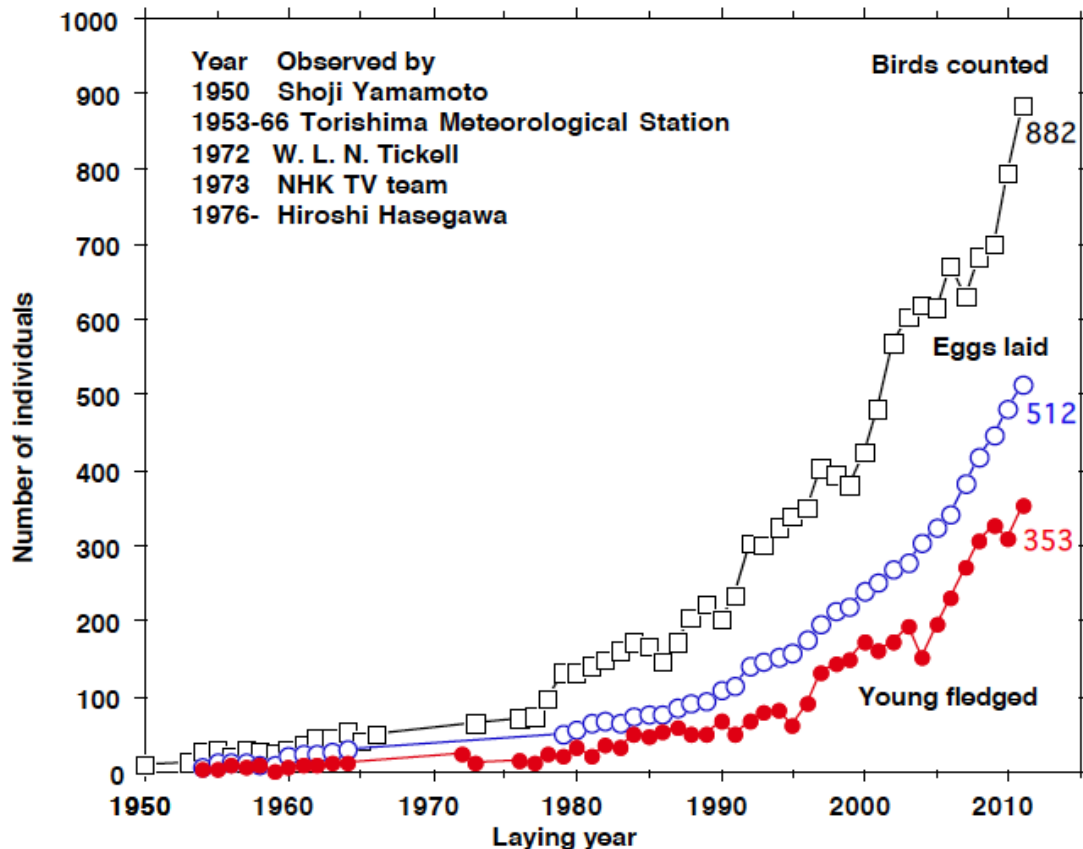


Figure 7. Growth of the Short-tailed Albatross population on Torishima Island, Japan following rediscovery. Graph courtesy of H. Hasegawa (Toho University, Tokyo, Japan).

It is important to know how the trends in the global population affect the numbers of birds likely to be found outside the breeding areas and especially in the Canadian EEZ. Geernaert (2011) provides counts of Short-tailed Albatrosses from 2002-2011 during standardized seabird counts at halibut hauls made in the International Pacific Halibut Commission (IPHC) monitoring region (mostly Alaskan waters but also including Washington, Oregon, British Columbia, and the southeastern Bering Sea). Observers make snapshot counts of all seabirds within a 50 m radius of the stern of the vessel (Geernaert 2011). The number of such counts remained consistent through the 10 years (range 1218-1284 counts per year yielding 6-30 Short-tailed Albatrosses per year). The mean number of Short-tailed Albatrosses per count increased by 9.7% per year across the 10-year period (Figure 8A). Only one of the 204 albatrosses in this systematic sample was off British Columbia (the rest were off Alaska or in the Bering Sea), so the relevance of this trend to the species' use of the British Columbia coast is uncertain.

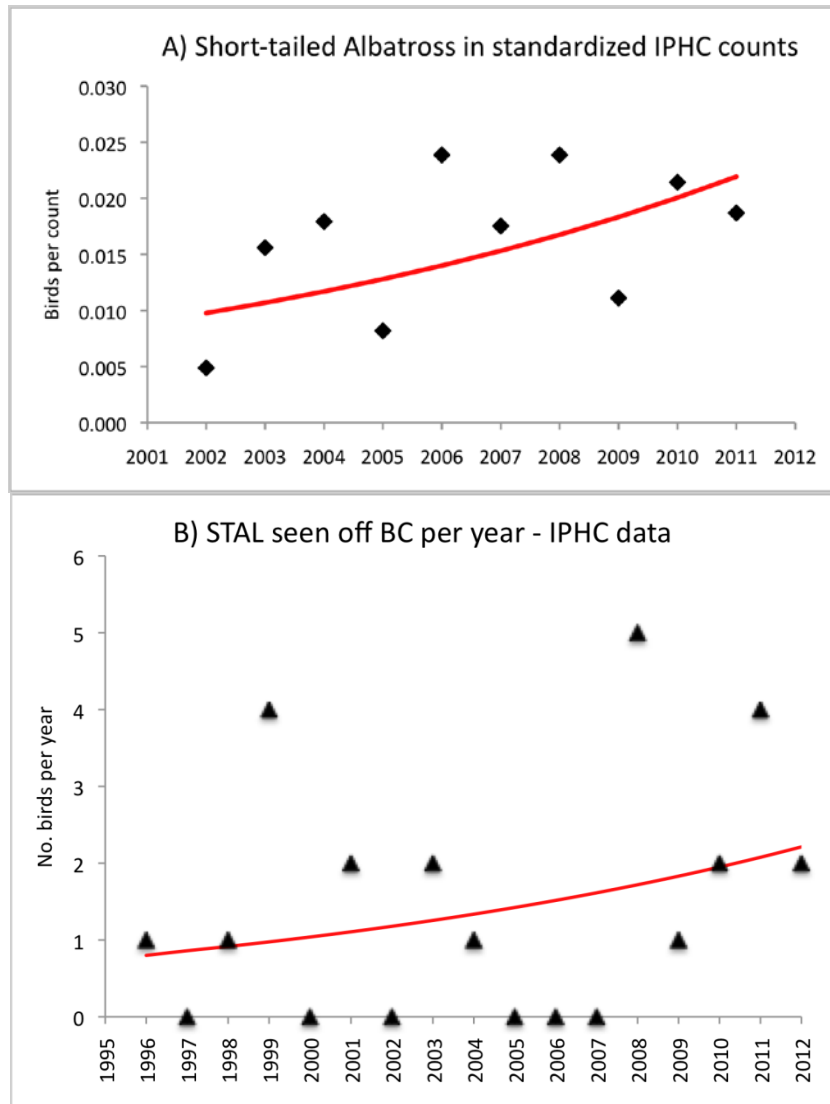


Figure 8. Analyses of trends in Short-tailed Albatross (STAL) sightings by International Pacific Halibut Commission (IPHC) observers. The upper graph (A) shows trends in standardized post-haul counts in all halibut fisheries (AK, BC, WA, OR & CA; plotted using data from Geernaert 2011). The trend line shows 9.7% annual increase, and was calculated as follows: counts were log transformed (using natural logarithms Ln) and the percentage change per year was calculated as $1 - e^{\text{slope}}$ using the slope of the Ln transformed counts across years. The lower graph (B) shows trends in incidental observations (not in standardized count periods) made per year by IPHC observers within British Columbia waters (data from Appendix 1 and Geernaert 2011). Because of zero values in some years the trend line could not be calculated as above and instead the trend line (6.5% annual increase) was obtained by finding the value of $1 - e^{\text{slope}}$ which best fit a linear regression across years.

Sightings off British Columbia have increased in number and regularity since 1990; birds have been reported in almost every year since then but there is not a consistent increase in the number seen each year (Figure 5). It is difficult to control for observer effort because most of the albatrosses in the past 10 years were opportunistic sightings reported by fisheries observers and there has been variable observer effort and skills in identifying albatrosses over the years. Taking only the data from the IPHC observers, where survey effort has remained relatively constant over the years, the incidental sightings have increased by about 6.5% per year (Figure 8B). This is a relatively crude estimate based on few sightings, but the sum of all evidence indicates that the continued increase in the global population will continue to yield greater numbers of non-breeding Short-tailed Albatrosses frequenting the British Columbia coast. Given that the population is still in a phase of exponential growth there is no demographic reason to expect the proportion of non-breeders to breeders to decline. The trends in the Torishima breeding population should therefore reflect trends in the total population.

Rescue Effect

At this stage there seem to be no genetic or population barriers affecting this species, and the rescue effects might only be needed if breeders at one colony were to be eliminated. Researchers are currently trying to increase the number of breeding colonies to reduce this risk (see next section below).

THREATS AND LIMITING FACTORS

Number of Sites

Currently, the species breeds regularly only on two islands (Torishima and Minamijima) with additional recent breeding attempts on two other islands (Mukojima and Eastern Island, Midway Atoll). Torishima Island is an active volcano that has erupted several times in the past century (details below) and there is concern, in general, over the high concentration of the species at this one island. To reduce the risk on Torishima Island, breeding adults raised at the unstable Tsubame-zaki site have been lured to a new sub-colony at the more stable Hatsu-zaki site on the same island (USFWS 2008). It seems likely that successful breeding will begin in the near future at a third Japanese colony on Mukojima in the Ogasawara Islands (see above). The colony on Minamijima in the Senkaku group was re-colonized naturally. It is premature to speculate on whether the one pair now breeding on Midway Atoll will lead to a viable colony.

Population modelling by Finkelstein *et al.* (2010) suggests that the species will likely persist under current conditions for 50-100 years or more even if breeding is restricted to Torishima Island. They note, however, that additional colonies are valuable in reducing risks from future threats (e.g., introduced predators, disease, complete loss of Torishima due to massive eruptions). They conclude that “a stable and protected second population is paramount to the continued survival of short-tailed albatrosses”.

Volcanic Eruptions

Torishima experienced major eruptions, ash falls and lava flows in 1902, 1939 and 2002 (Finkelstein *et al.* 2010), all of which occurred outside the breeding season. Finkelstein *et al.* (2010) assessed the risks to the species of volcanic eruption. With the probability of eruption set at the known historical level (2.2% per year), population models using current demographic data show a relatively minor effect on the population growth rate (λ reduced from 1.064 to 1.059) and the population would continue to grow rapidly (Finkelstein *et al.* 2010). Even following an eruption in January, at the height of adult nest attendance, the population would rebound within 10 years. Population growth would only become negative if volcanic eruptions occurred on average four times every 10 years. The main factor protecting the global population against volcanic eruptions is that only about 25% of the birds (all ages) are likely to be on the island at any one time (Finkelstein *et al.* 2010). This study concluded that chronic mortality (e.g., from fisheries bycatch) had a much stronger effect on population dynamics than any likely impacts from volcanic eruptions. Nevertheless, Finkelstein *et al.* (2010) support the efforts to establish breeding sites on more stable islands in order to reduce risk from other unforeseen impacts.

Chronic Threats – Population Modelling Predictions

The population risk modelling undertaken by Finkelstein *et al.* (2010) showed that the population growth rate is three times more sensitive to changes in chronic mortality than to changes in the frequency of volcanic eruptions. With the probability of eruption set at 2.2% per year (see above) the current population growth rate implies that added annual mortality (above that caused by natural factors) is around 0.8%. The population will decline when added chronic mortality is between 5 and 6% (Finkelstein *et al.* 2010). Modelling by Zador *et al.* (2008a) indicates that the recovery goals of the international Short-tailed Albatross Recovery Team (USFWS 2008) will be significantly delayed if added chronic mortality exceeds 2.5%.

Fisheries Bycatch

Mortality resulting from interactions with fisheries is a threat to this species (Suryan *et al.* 2007, USFWS 2008, Zador *et al.* 2008a,b, Finkelstein *et al.* 2010). Albatrosses, along with many other seabird species, are attracted to fishing vessels by the availability of bait, spilled catch or offal. Birds drown as a result of taking baited hooks in longline fisheries or if entangled in other gear and can suffer fatal injuries from collisions with cables behind vessels (for simplicity this is all considered as “bycatch” here). The impacts are particularly acute for albatrosses because of their low reproductive capacity, delayed maturation and strong pair bonds (widowed breeders might take 1-5 years to find a new mate and resume breeding). The loss of one parent will usually doom a chick at the nest.

Globally, Short-tailed Albatrosses are most at risk from longline fisheries, although drift-net and trawl net fisheries also pose a lesser threat (USFWS 2008, 2012; Zador *et al.* 2008a,b). Fifteen Short-tailed Albatrosses are known to have died as a result of fisheries bycatch since 1983 (USFWS 2012), but this is only a portion of the actual mortality as observers miss some mortality and observer coverage is low in some fisheries, notably those in Russian and Japanese waters (USFWS 2008). Of the 15 documented deaths, 11 (73%) were in the Bering Sea or Aleutian Islands and others in the Gulf of Alaska (1), Russian waters (2), and one off the coast of Oregon; no bycatch mortality has been reported from British Columbia (USFWS 2012). Eight birds were aged one year or less, four were immatures 1-5 years old and 3 were adults ≥ 5 years old. Out of 13 mortalities where fishing gear was documented, 11 (85%) were from hook and line (mainly longline groundfish) fisheries and two (15%) from net fisheries (USFWS 2012). To date, no Short-tailed Albatrosses are known to have died as a result of trawl fisheries (Zador *et al.* 2008a), but over 1000 seabirds of other species were killed by trawlers in Alaska in 2002-2004 and this fishery killed at least 313 Laysan Albatrosses in 2000-2004 (USFWS 2008). This mortality is an underestimate of the true impact because seabirds injured from collisions with trawl cables are thought to later die without being included in mortality estimates. One Short-tailed Albatross is known to have died in a salmon drift-net in Russia, but few observers monitor the drift-net and gill-net fisheries in Russia and Japan and mortality is likely higher than the data suggest (USFWS 2008).

No Short-tailed Albatross is known to have died in the pelagic longline fishery for swordfish and tuna but tens of thousands of Black-footed Albatrosses and Laysan Albatrosses were killed from 1977 to 2000 in this fishery before the introduction of tight restrictions and the use of avoidance gear (USFWS 2008, Arata *et al.* 2009). The most recent (2001-2005) estimates of bycatch mortality of Black-footed Albatrosses, mainly in pelagic longline fisheries, are in the range of 3000-8000 birds annually (Arata *et al.* 2009). The continuing high mortality of albatrosses in the pelagic longline fishery is troubling, because Short-tailed Albatrosses do sometimes occur in the areas used by these fisheries. Unlike the Canadian and U.S. neritic (groundfish) longline fishery, the international pelagic fishery has fewer bycatch mitigation programs and no scientific observers on vessels to provide accurate measures of bycatch mortality (Arata *et al.* 2009). In the Southern Oceans longline bycatch is linked to significant reductions in the populations of several albatross species and other pelagic seabirds (Barbraud *et al.* 2012, Croxall *et al.* 2012). As the Short-tailed Albatross population increases there will inevitably be mortality from pelagic longline fisheries that might affect population growth.

The development and use of avoidance techniques, often driven by the fishers themselves, has led to a huge reduction in seabird bycatch around the world, especially in longline fisheries (Løkkeborg 2011). For example, streamers or “tori lines” behind the vessel led to reductions in bycatch of seabirds by 88-100% in the Gulf of Alaska longline fishery (Melvin *et al.* 2001).

There are no records of Short-tailed Albatrosses killed as fisheries bycatch off British Columbia (Smith and Morgan 2005, Fisheries and Oceans Canada 2012a). One Short-tailed Albatross was killed in 2011 in the sablefish demersal fishery off Oregon (USFWS 2012), but no other deaths are recorded from the U.S. west coast fisheries (Washington, Oregon and California; Jannot *et al.* 2011, USFWS 2012). Black-footed Albatrosses, however, are frequently killed by demersal longline fisheries for groundfish in both British Columbia and the U.S. west coast (Smith and Morgan 2005, Jannot *et al.* 2011, Fisheries and Oceans Canada 2012a, Guy *et al.* 2013). Bycatch mortality of Black-footed Albatrosses or unidentified albatrosses in longline fisheries off British Columbia was estimated to be 85 birds per year (range 25-128) in 2006-2009 (Fisheries and Oceans Canada 2012a). This mortality is occurring despite the regulated use of streamers and other deterrents in all longline fisheries since 2005 (see next paragraph). Given that Short-tailed Albatrosses have overlapping foraging habitats with Black-footed Albatrosses, it seems inevitable that small numbers of Short-tailed Albatrosses will also be killed as bycatch in Canadian waters as their population increases in future years. If Black-footed Albatrosses are a reliable proxy, it seems unlikely that, under current conditions, Canadian bycatch will have a significant impact on long-term population growth of Short-tailed Albatrosses. This could change if the use of deterrents is reduced.

Canada has a National Plan of Action (NPOA) for reducing incidental catch of seabirds in longline fisheries (Fisheries and Oceans Canada 2007). This follows the principles and provisions of the 2011 International Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries (IPOA-Seabirds) developed by United Nations Food and Agriculture Organization (FAO). Canada is an active participant in this initiative, with programs to improve the monitoring of seabird bycatch and to apply avoidance measures to reduce bycatch (Fisheries and Oceans Canada 2012a). Deployment of deterrents (“tori line” streamers above the baited lines, weighted groundlines, thawed bait, and other methods) has been a mandatory requirement for fishing licences for all longline fisheries since 2002-2005, depending on the fishery (R. Tadey, Department of Fisheries and Oceans, pers. comm. March 2013). Compliance monitoring is primarily done with aircraft (generally one or more flights per week) and there have been successful prosecutions of vessel masters who failed to comply with these regulations (M. Gilchrist, Department of Fisheries and Oceans, pers. comm. April 2013).

Monitoring of fisheries bycatch is shifting towards electronic video monitoring as catches are hauled aboard, and currently bycatch is estimated from audits covering approximately 10% of the video imagery from a fishing trip (Fisheries and Oceans Canada 2012a). Video monitoring does not record the setting of the longlines (R. Tadey, DFO, pers. comm., March 2013), and is therefore likely to underestimate bycatch because this is when most birds take the baited hooks. In addition, there could be a high rate of drop-offs (dead birds falling off the lines before being brought onboard and hence not recorded), possibly as high as 45% for albatrosses (USFWS 2012).

At the current population size (ca. 3400 birds) bycatch mortality of 5-6% would be equivalent to 15-18 albatrosses, assuming that fisheries observers were on 10% of vessels (USFWS 2008). Actual observations of bycatch mortality have been much lower than this in the Alaskan fisheries where most of the concern is focused, but data are lacking from Japanese and Russian waters where these birds spend much of their time (USFWS 2008). An analysis prompted by the bycatch death of a Short-tailed Albatross off Oregon concluded that continued operations of the U.S. West Coast Pacific Groundfish fishery would result in 0.8 Short-tailed Albatrosses killed per year (90% confidence limits taking into account likely rates of unseen mortality: 0.30-1.90 birds per year; USFWS 2012). This estimate was made using the much higher bycatch rates of Black-footed Albatrosses in this fishery as a proxy (observed mortality 0-91 birds per year; estimated total mortality 0-91 birds per year), which share many foraging habitat preferences to Short-tailed Albatrosses (Guy *et al.* 2013). The estimated bycatch mortality of Black-footed and unidentified albatrosses off British Columbia (85 birds per year; range 25-128) overlaps the higher end of the U.S. West Coast groundfish mortality. As a crude extrapolation, therefore, we might expect one to two Short-tailed Albatrosses to be killed per year by British Columbia groundfish fisheries under current conditions and population size.

Overall, the continued exponential growth of the breeding population at Torishima and the low rates of mortality at fisheries with onboard observers suggest that fisheries bycatch is not presently having a significant impact on this species (USFWS 2008, 2012). This might change as the population grows and more birds are exposed to fisheries. The estimated loss of tens of thousands of Black-footed and Laysan Albatrosses in the pre-2000 pelagic longline fishery for tuna and swordfish (Arata *et al.* 2009) is an indication of the potential impacts if vigilance and avoidance measures are relaxed. The Canadian Recovery Strategy for the Short-tailed Albatross recommends improved monitoring of compliance and effectiveness of bycatch deterrents off British Columbia (Environment Canada 2008), and similar suggestions are being proposed in the Canadian Black-footed Albatross management plan (K. Morgan, Canadian Wildlife Service, pers. comm., March 2013).

Pollution and Contamination

As upper-trophic level feeders, albatrosses are susceptible to bioaccumulation of organochlorines and other lipid-soluble industrial and agricultural pollutants. Pollutant levels and risks to Short-tailed Albatrosses have been reviewed in detail by USFWS (2008) and a brief summary is given here, updated with recent data. Relatively few measures of pollutants and metals have been made of Short-tailed Albatross tissues but inferences can be made by comparison with other North Pacific albatrosses. The diet and foraging niche of Short-tailed Albatrosses are most similar to those of Black-footed Albatrosses (Suryan and Fischer 2010), but where comparisons are possible the contaminant levels in Short-tailed Albatrosses are generally lower than those of Black-footed Albatrosses (USFWS 2008).

Levels of organochlorine contaminants (DDT pesticide residues, polychlorinated biphenyl [PCB] congeners, dioxins, and furans) are higher in North Pacific albatrosses (Black-footed and Laysan) than in albatross species from the Southern Oceans (Guruge *et al.* 2001, Tanabe *et al.* 2004, Finkelstein *et al.* 2006). Concentrations of PCBs and DDT by-products in these albatrosses were similar to those of aquatic birds from highly polluted waters, such as the Great Lakes and parts of the Japanese coast. Concentrations of DDE in eggs of Black-footed Albatrosses from Midway Atoll were about half the level at which eggshell-thinning is expected, but eggs of Laysan Albatrosses were well below this threshold (Auman *et al.* 1997). High levels of persistent organochlorines (POPs) were found in eggs of both Short-tailed and Black-footed Albatrosses from Torishima Island, relative to those in other offshore seabirds from the northern hemisphere (Tanabe *et al.* 2004, Kunisue and Tanabe 2008). POPs were also found in muscle tissues of Short-tailed Albatrosses. Kunisue *et al.* (2006) measured dioxins and related compounds (DRCs) in eggs, nestlings and adults of these two species at Torishima. Although the samples from Short-tailed Albatrosses were small (1 egg, 1 nestling and 2 adults) the study did find elevated concentrations of DRCs in all samples, higher than those in other oceanic birds sampled off California and the Canadian Arctic, and in aquatic birds from Japan, Canada and the Great Lakes. Levels of DRCs in eggs of these two albatross species exceeded toxicity thresholds for other bird species. It is not yet known, however, what levels of organochlorines are toxic to albatrosses (USFWS 2008). Kunisue and Tanabe (2008) suggest that biochemical alterations within the embryonic tissues might reduce toxicity of DRCs in albatrosses.

Ikemoto *et al.* (2005) measured concentrations of 18 trace elements in abandoned Short-tailed Albatross eggs from Torishima Island. These eggs were found to have levels of mercury (mean 1.1 µg/g dry mass) that were more than double those normally found in seabirds (<0.5 µg/g dry mass) and close to levels where egg hatchability is affected and bird behaviour becomes abnormal (1.5-1.8 µg/g dry mass). Mercury levels in Black-footed Albatross eggs from Torishima were even higher (mean 3.4 µg/g dry mass) and all samples were within the avian toxicity range. Other studies cited by Ikemoto *et al.* (2005) suggest that the mercury might be in very stable (less toxic) compounds within albatross tissues. Levels of other potentially toxic elements measured in eggs of both albatrosses by Ikemoto *et al.* (2005), including chromium, manganese, cadmium and lead, were comparable or lower to those in eggs of other seabirds.

Finkelstein *et al.* (2006) found that organochlorine contaminants (PCBs and DDT derivatives) and mercury levels were 370-460% higher in Black-footed Albatrosses that frequented the west coast of North America (including off British Columbia) than in Laysan Albatrosses from the same breeding site (Midway Atoll) that foraged in more oceanic waters. Furthermore, the levels of PCBs and DDE (derived from DDT) in both species were 130-360% higher in 2000-2001 than levels measured at the same colony in 1992-1993. This indicates alarming increases in the uptake of these toxins by albatrosses (and other higher trophic level predators). Although some of these pollutants originate in Asia, the data also suggest rising contaminant levels along the Canadian and U.S. west coasts.

Overall, there is reason for concern at the high levels of organochlorines and mercury in the tissues of North Pacific albatrosses, including the few samples from Short-tailed Albatrosses. There is compelling evidence that the two species that forage close to continental coasts (Black-footed and Short-tailed) have higher concentrations of pollutants than the more oceanic Laysan Albatross.

Oil Pollution

All seabirds are highly vulnerable to oil spilled at sea, whether from large “catastrophic” spills (e.g., Exxon Valdez) or from frequent small spills (“chronic” pollution) such as release of oily bilge-water, leaks from ships, or spills from refuelling stations. Risks of both types of oil spill are high off British Columbia (O’Hara and Morgan 2006,). Off British Columbia the preferred foraging grounds on the edge of the continental shelf (Figure 6) are close to major routes used by large numbers of tankers and other shipping. Of particular concern in the near future is the proposed shipping of liquefied natural gas (LNG) and diluted bitumen from Kitimat on the northern British Columbia coast and proposed increased shipping of diluted bitumen via Burnaby (Vancouver). The National Energy Board of Canada has approved several LNG export projects from Kitimat totalling over 240 million tonnes of LNG over 20 years. The gas itself is unlikely to affect albatrosses but the increased shipping raises risks of fuel spills from vessels. Kitimat is also the terminus of the proposed “Northern Gateway” pipeline for exporting Alberta bitumen (National Energy Board and Canadian Environmental Assessment Agency 2013). Tankers and other vessels leaving Kitimat or nearby ports will have to pass through places where Short-tailed Albatrosses are known to concentrate their foraging, either at Dixon Entrance north of Haida Gwaii or the mouth of Hecate Strait to the south (Figure 6). Proposals to double the Trans-Mountain Pipeline from Alberta to Burnaby (Metro Vancouver) (National Energy Board 2013) would greatly increase tanker traffic through areas off western Vancouver Island where Short-tailed Albatrosses tend to be found. At present, shipping of LNG seems likely to begin within the next 10 years but acceptance of the two proposed oil pipeline developments remains uncertain.

Transport Canada has carried out surveillance of oily discharges in marine waters off British Columbia under the Canadian National Aerial Surveillance Program (NASP) since the early 1990s. Surveillance is concentrated along shipping routes and port areas. It is carried out in conspicuously marked red aircraft with the objective of providing a deterrent against illegal discharge. Serra-Sogas *et al.* (2008) reported a general pattern of decreasing to stable discharge detection rates with increasing surveillance over the period from 1993-2006. O'Hara *et al.* (2009) found reductions in the proportion of oiled bird carcasses and beaches since the onset NASP surveillance, suggesting a deterrence effect west of Vancouver Island around Barkley Sound, which is one of several locations where there have been numerous sightings of Short-tailed Albatrosses. O'Hara *et al.* (2013) examined the relationship between discharge detection rates and surveillance effort over the period from 1997-2006 in three marine regions of B.C. There was evidence for a deterrence effect in the Georgia Strait, limited evidence in the region west of Vancouver Island, and no evidence for the region north of Vancouver Island. The latter two areas had considerably less surveillance effort than that for Georgia Strait over the time period studied; however, beginning in 2007, surveillance in all regions intensified with the introduction of more sophisticated equipment and longer-range aircraft. Deterrence over this more recent period has not been assessed.

If the current moratorium on offshore oil exploration in British Columbia is lifted, some of the areas where drilling is likely to occur (Queen Charlotte Sound, Hecate Strait and off the north and northwest coast of Vancouver Island) overlap areas known to be frequented by this species (Figure 6). There are no indicators that the moratorium will be lifted soon. If the moratorium is lifted and if proposed oil exploration receives the same public hearings as the current proposal for the Northern Gateway pipeline, then drilling is unlikely to occur within the next 10 years.

Ingested Plastic Debris

Plastic debris drifting at sea is now a global problem and is particularly dense in parts of the North Pacific (Barnes *et al.* 2009). Birds mistakenly ingest plastic objects as food and this can cause problems with obstruction, internal lacerations, reduced gut efficiency and release of toxins from the plastic. Albatrosses in particular ingest large amounts of plastic that can be regurgitated to chicks, often with fatal or sub-lethal deleterious impacts (Sievert and Sileo 1993, Auman *et al.* 1997). Plastic ingested by seabirds releases PCBs and organochlorines (Colabuono *et al.* 2010). Yamashita *et al.* (2011) showed that levels of PCBs in the Short-tailed Shearwater (*Puffinus tenuirostris*) were significantly correlated with the amount of ingested plastic. This shearwater feeds in some of the same areas as the Short-tailed Albatross. Short-tailed Albatrosses are known to ingest plastic and will sometimes pass large amounts on to their chicks. The occurrence of regurgitated plastic has increased at the Torishima colony since the 1990s (H. Hasegawa cited in USFWS 2008). The impacts of ingested plastic on this species are not known, but the continued increase of plastic in the North Pacific is a concern. Surface-feeding seabirds sampled off British Columbia almost all have numerous pieces of plastic in their stomachs although the source of the plastic in these wide-ranging birds is unknown (Blight and Burger 1997, Avery-Gomm *et al.* 2012).

Introduced Predators on Colonies

Black Rats (*Rattus rattus*) were introduced to Torishima Island at some point during human occupation, and now inhabit much of the island, including the albatross nesting slope (Tickell 2000). The same rat species is also found on Mukojima (Croxall *et al.* 2012). Although it is suspected that they may prey on eggs or hatchling albatrosses, no direct evidence of rat predation has been observed (Hasegawa 1984, Tickell 2000). Domestic Cats (*Felis catus*) were present on Torishima during the feather harvest, but have not been seen there since 1973 (Tickell 2000).

Parasites and Disease

Short-tailed Albatrosses, in common with most seabirds, host several species of chewing lice, but there is no evidence that these parasites cause significant impacts (Tickell 2000). Before the decimation of the Torishima colony, tick infestations apparently contributed to chick mortality, but this has not been a problem there in recent years (Tickell 2000). Although the small and highly concentrated breeding population is vulnerable to pathogens, such as avian influenza and West Nile virus, there is no evidence that these currently affect the species (USFWS 2008).

Summary of Likely Population Impacts of Threats

Despite exposure to the possible threats listed here, the population of the Short-tailed Albatross has experienced exponential growth for over 30 years and this is expected to continue for another decade or two. The current population is well below the historical carrying capacity of the island colonies and the expansion of breeding birds on Torishima and into new colonies is continuing at a steady pace. A catastrophic eruption of Torishima, while still likely to have a significant short-term impact, is now thought to be a less severe threat than previously believed (Finkelstein *et al.* 2010). The limited number of breeding sites remains a concern. The entire population currently breeds regularly on only two islands (Torishima and Minami-kojima), but regular breeding seems likely to commence at a third island (Mukojima) and the single-pair colony at Midway Island might also expand.

A large oil spill could have a devastating impact if it occurred at a major feeding concentration, but at present these albatrosses seem to be widely dispersed throughout the year (Piatt *et al.* 2006), making a population-threatening spill unlikely. Introductions of new predators to the few breeding colonies could be catastrophic but the Japanese authorities limit human access to these colonies and the rodents currently on Torishima and Mukojima do not presently seem to affect the albatrosses. Ingestion of plastics is troublesome and likely to cause some mortality but there is no evidence of current population impacts.

Bycatch mortality from longline and other fisheries, regarded as the greatest current threat, is likely to rise as the albatross population increases and more birds are exposed to fisheries. Although this remains a troubling and avoidable threat, the current levels of bycatch mortality are well below those likely to have significant population impacts. Provided that fisheries maintain the most effective deterrents (and ideally expand their use in Russian and Japanese waters), this threat is likely to remain within tolerable limits. This could rapidly change if some new poorly regulated fishery were to arise in the North Pacific, as shown by the massive impacts of unregulated Patagonia toothfish (*Dissostichus eleginoides*) fisheries on Southern Ocean albatrosses (Croxall *et al.* 2012).

The biggest unknowns are the continuing exposure to chemical contaminants—several species of upper-trophic-level waterbirds have been brought close to extinction as a result of organochlorine uptake.

The IUCN Threats Assessment Worksheet was applied to the Short-tailed Albatross (Appendix 2). The assessment focused on threats in Canadian waters but considered also threats across the species range. Threats assessed as Low were identified for six categories: energy production and mining (oil and gas); transportation and service corridors (shipping); biological resource use (fisheries bycatch); human intrusions and disturbance (risk of conflict in the disputed Senkaku/Diaoyu islands); pollution (chemical and plastic); and geological events (volcanic eruption on Torishima Island). The cumulative threat assessment was Medium.

PROTECTION, STATUS AND RANKS

Legal Protection and Status

The international and national (nine countries) status and levels of protection covering this species are summarized by ACAP (2008). The U.S./Japan Recovery Team has members from three countries and its recovery plan (USFWS 2008) deals with problems, status, laws and recovery goals across the species' range.

In Canada, the species is covered under the *Migratory Bird Convention Act* and is listed as Threatened in Schedule 1 of the *Species at Risk Act* (SARA). The SARA-compliant Recovery Strategy is completed (Environment Canada 2008) and is consistent with the objectives of the U.S./Japan recovery plan (USFWS 2008). Studies to determine if a designation of Critical Habitat in Canada is necessary and other recovery objectives have not yet been completed and are behind schedule.

Non-Legal Status and Ranks

The following are the status ranks allocated to the Short-tailed Albatross by NatureServe (2012):

- Global Status: G1 (Global Conservation Status Rank, Critically Imperilled; last reviewed: 29 October 2008)
- Rounded Global Status: G1 - Critically Imperilled
- National Status (Canada): N1N (National Status, Critically Imperilled – Non-breeding; 15 November 2011)
- Provincial status (British Columbia): S1N (Subnational Status, Critically Imperilled – Non-breeding)
- National Status (U.S.): NNA (National Status, conservation status rank is not assessed)
- State status: Alaska S1N; California S1; Hawaii: S1; Washington (SNA)

The Short-tailed Albatross is listed by IUCN (2012) as vulnerable (VU). It is listed in Appendix I of the Convention on International Trade in Endangered Species Protection Status (CITES).

The species is included in the international Agreement on the Conservation of Albatrosses and Petrels (ACAP 2008), which is a multilateral agreement that seeks to conserve albatrosses and petrels. ACAP came into force in February 2004 and currently has 13 member countries (but not Canada) and covers 30 species of albatrosses, petrels and shearwaters.

The species is assessed as High Conservation Concern by Wings Over Water: Canada's Waterbird Conservation Plan (Milko *et al.* 2003).

Habitat Protection and Ownership

Away from its Japanese breeding colonies the species wanders through international waters and the EEZs of Mexico, the U.S., Canada, Russia, Japan, China, Taiwan, North and South Korea, the Federated States of Micronesia, and the Republic of the Marshall Islands (USFWS 2008).

Canada has a new national framework for establishing Marine Protected Areas (Fisheries and Oceans Canada 2011) and Canada and British Columbia are currently negotiating several marine protected areas in the Pacific. It is unclear at present what benefits these MPAs might provide for Short-tailed Albatrosses. Commercial and recreational fishing and vessel traffic are still allowed in most of the ones likely to be visited by Short-tailed Albatrosses.

The Bowie Seamount MPA (Sgaan Kinghlas), established in 2008, encompasses a complex of three offshore submarine volcanoes, 15,000 km² in area, located 180 km west of Haida Gwaii (Figure 9A). The sea floor rises from a depth of 3,000 metres to within 24 metres of the surface. Upwelling associated with this seamount does enrich the surface ecosystem, which should attract foraging seabirds, although data on birds at the site are sparse (Canessa *et al.* 2003).

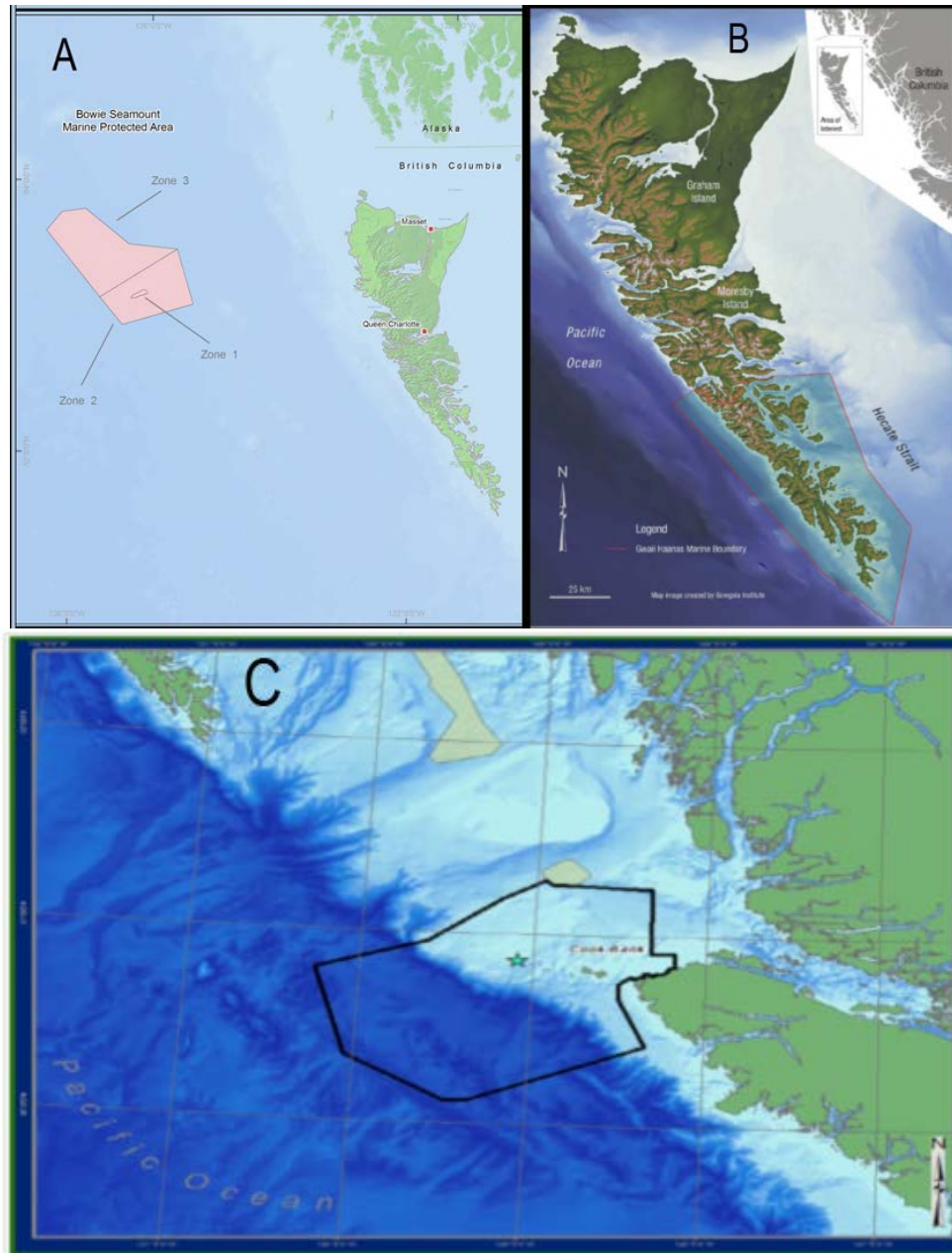


Figure 9. Marine protected areas which might benefit Short-tailed Albatrosses in British Columbia. A: Bowie Sea Mount Marine Protected Area; B: Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site; C: the boundary of the proposed Scott Islands Marine National Wildlife Area, which is being used for consultation and planning by Environment Canada.

The Gwaii Haanas National Marine Conservation Area Reserve and Haida Heritage Site were established in 2010 under the *Canada National Marine Conservation Areas Act* (Parks Canada 2011). The marine protected area extends about ten kilometres offshore and encompasses approximately 3,400 km² of the Hecate Strait and Queen Charlotte Shelf marine regions (Figure 9B). The outer parts of this area are used by visiting Short-tailed Albatrosses (Figure 6), but there are no special measures in place here for this species (P. Nantel, Parks Canada, pers. comm.)

Plans for the proposed Scott Islands Marine National Wildlife Area are well advanced in 2012 (A. Stadel, Environment Canada, pers. comm., October 2012). The current proposal (subject to revision) is to use the *Canada Wildlife Act* to establish a National Wildlife Area (NWA) encompassing about 11,900 km² of marine habitat around the Scott Islands, including extensive areas of continental shelf and shelf edge (Figure 9C; Fort *et al.* 2007). The primary focus is to protect foraging habitats of key seabird species breeding on Triangle Island, but the proposed area is also frequented by Short-tailed Albatrosses, based on both sighting and satellite-tracking data (Fort *et al.* 2007). Restrictions on human activities and the level of environmental protection will not be finalized until the NWA is proclaimed, but reducing bycatch mortality and improving the effectiveness of mitigation measures from longline fishing activities have been identified as important.

Other proposed marine protected areas that might be approved soon are in shallower and more sheltered waters and less likely to provide habitat protection to Short-tailed Albatrosses. These include the Hecate Strait/Queen Charlotte Sound Glass Sponge Reef Proposed Marine Protected Area and the Race Rocks Proposed Marine Protected Area in the Strait of Juan de Fuca (Fisheries and Oceans Canada 2012b).

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BIOGRAPHICAL SUMMARY OF REPORT WRITER

Alan Burger is a wildlife consultant and Adjunct Associate Professor in Biology at the University of Victoria. He completed a PhD in 1980 at the University of Cape Town. He has worked on seabirds for over 35 years in South Africa, sub-Antarctic Marion Island, Newfoundland, British Columbia, Alaska and the Seychelles. Some of his earliest field research involved five species of albatrosses on Marion Island. He has published over 110 peer-reviewed journal papers and book chapters. His research interests and publications cover diving and foraging ecology, time and energy budgets, spatial distribution and oceanography of seabirds, breeding biology, effects of oil spills on seabirds, and conservation. In the 1990s he led a team studying the distribution and predator-prey relationships of seabirds in the shelf ecosystem off Vancouver Island. For the past 20 years much of his research and consulting has focused on the Marbled Murrelet. Alan also works as a naturalist/lecturer for Aurora Expeditions in the Antarctic, Arctic and Russian Far East. Despite diligent searching during voyages through the Kuril Islands and Kamchatka in 2008 and 2011 he has not yet seen a Short-tailed Albatross.

COLLECTIONS EXAMINED

No collections were examined for this report

Appendix 1. Sighting records of Short-tailed Albatrosses in or near British Columbia waters since the 1950s (provided by K. Morgan, Canadian Wildlife Service, Institute of Ocean Sciences, Sidney, BC).

No.	Date	No. of birds	Age class*	Source**
1	11 Jun 1960	1	ND	Kenyon <i>et al.</i> (2009)
2	3 May 1970	1	SA	Kenyon <i>et al.</i> (2009)
3	24 Jun 1971	1	ND	Kenyon <i>et al.</i> (2009)
4	26 Jun 1971	1	ND	Kenyon <i>et al.</i> (2009)
5	8 Oct 1983	1	ND	Kenyon <i>et al.</i> (2009)
6	13 Oct 1983	1	ND	Kenyon <i>et al.</i> (2009)
7	14 Oct 1983	1	ND	Kenyon <i>et al.</i> (2009)
8	15 Oct 1983	1	ND	Kenyon <i>et al.</i> (2009)
9	30 Jul 1991	1	ND	Kenyon <i>et al.</i> (2009)
10	21 Sep 1991	1	JU	Kenyon <i>et al.</i> (2009)
11	2 Sep 1995	1	ND	Kenyon <i>et al.</i> (2009)
12	23 Feb 1996	1	ND	Kenyon <i>et al.</i> (2009)
13	22 Oct 1996	1	SA	Kenyon <i>et al.</i> (2009)
14	1 Jul 1996	2	ND	Kenyon <i>et al.</i> (2009)
15	15 May 1997	1	JU	Kenyon <i>et al.</i> (2009)
16	11 Sep 1997	1	ND	Kenyon <i>et al.</i> (2009)
17	17 Nov 1997	1	ND	Kenyon <i>et al.</i> (2009)
18	24 Mar 1998	1	ND	Kenyon <i>et al.</i> (2009)
19	27 Apr 1998	1	ND	Kenyon <i>et al.</i> (2009)
20	7 May 1998	1	JU	Kenyon <i>et al.</i> (2009)
21	16 Jun 1998	1	ND	Kenyon <i>et al.</i> (2009)
22	10 Aug 1998	1	JU	Kenyon <i>et al.</i> (2009)
23	23 Aug 1998	1	JU	Kenyon <i>et al.</i> (2009)
24	17 Jan 1999	1	ND	Kenyon <i>et al.</i> (2009)
25	19 Jan 1999	1	JU	Kenyon <i>et al.</i> (2009)
26	12 Apr 1999	1	ND	Kenyon <i>et al.</i> (2009)
27	8 May 1999	1	AD	Kenyon <i>et al.</i> (2009)
28	12 May 1999	1	ND	Kenyon <i>et al.</i> (2009)
29	9 Jun 1999	1	ND	Kenyon <i>et al.</i> (2009)
30	17 Jun 1999	1	ND	Kenyon <i>et al.</i> (2009)

No.	Date	No. of birds	Age class*	Source**
31	25 Jul 1999	1	JU	Kenyon <i>et al.</i> (2009)
32	2 Jul 2000	1	ND	Kenyon <i>et al.</i> (2009)
33	27 Aug 2000	1	ND	Kenyon <i>et al.</i> (2009)
34	8 Sep 2000	1	ND	Kenyon <i>et al.</i> (2009)
35	25 Sep 2000	1	ND	Kenyon <i>et al.</i> (2009)
36	30 Oct 2000	1	ND	Kenyon <i>et al.</i> (2009)
37	30 Oct 2000	1	ND	Kenyon <i>et al.</i> (2009)
38	10 Nov 2000	3	AD	Kenyon <i>et al.</i> (2009)
39	11 Nov 2000	1	AD	Kenyon <i>et al.</i> (2009)
40	9 Jul 2001	1	ND	Kenyon <i>et al.</i> (2009)
41	21 Aug 2001	1	ND	Kenyon <i>et al.</i> (2009)
42	25 Aug 2001	1	ND	Kenyon <i>et al.</i> (2009)
43	2 Sep 2001	1	ND	Kenyon <i>et al.</i> (2009)
44	10 Oct 2001	1	ND	Kenyon <i>et al.</i> (2009)
45	14 Oct 2001	1	AD	Kenyon <i>et al.</i> (2009)
46	27 Oct 2001	1	ND	Kenyon <i>et al.</i> (2009)
47	27 Oct 2001	1	ND	Kenyon <i>et al.</i> (2009)
48	10 Nov 2001	1	ND	Kenyon <i>et al.</i> (2009)
49	15 Oct 2002	1	ND	Kenyon <i>et al.</i> (2009)
50	27 Apr 2003	1	ND	Kenyon <i>et al.</i> (2009)
51	8 Aug 2003	1	JU	Kenyon <i>et al.</i> (2009)
52	15 Jun 2003	1	ND	Kenyon <i>et al.</i> (2009)
53	17 Jun 2003	1	ND	Kenyon <i>et al.</i> (2009)
54	22 Jun 2003	1	ND	Kenyon <i>et al.</i> (2009)
55	23 Jun 2003	1	AD	Kenyon <i>et al.</i> (2009)
56	11 Jan 2004	1	ND	Kenyon <i>et al.</i> (2009)
57	6 Jul 2004	1	ND	Kenyon <i>et al.</i> (2009)
58	18 Sep 2005	1	ND	Kenyon <i>et al.</i> (2009)
59	5 Jun 2007	1	ND	Kenyon <i>et al.</i> (2009)
60	7 Jan 2008	1	JU	Kenyon <i>et al.</i> (2009)
61	22 Jun 2008	1	JU	RCF
62	24 Jun 2008	1	ND	IPHC

No.	Date	No. of birds	Age class*	Source**
63	31 Jul 2008	1	ND	IPHC
64	3 Sep 2008	1	JU	DFO
65	10 Sep 2008	1	SA	IPHC
66	2 Nov 2008	2	IM	IPHC
67	18 Jul 2009	1	SA	IPHC
68	20 Feb 2010	1	JU	CWS
69	5 Jan 2010	1	ND	AMR
70	9 Aug 2010	1	ND	IPHC
71	10 Aug 2010	1	ND	IPHC
72	8 Mar 2011	1	ND	AMR
73	18 Apr 2011	1	JU	AMR
74	13 May 2011	1	JU	AMR
75	12 Jun 2011	1	SA	IPHC
76	15 Jun 2011	1	ND	IPHC
77	23 Jun 2011	1	ND	IPHC
78	23 Jul 2011	1	ND	IPHC
79	7 Sep 2011	1	JU	AMR
80	10 Sep 2011	1	JU	AMR
81	19 Feb 2012	2	1J, 1SA	AMR
82	29 Jul 2012	1	JU	AMR
83	26 Jul 2012	1	JU	AMR
84	29 Jul 2012	1	JU	IPHC
85	29 Jul 2012	1	JU	IPHC

* Age classes: AD - adult; IM - immature; JU - juvenile (first year); SA - subadult; ND - no data available.

**Sources: AMR - Archipelago Marine Research; CWS - Canadian Wildlife Service (M. Bentley); DFO - Department of Fisheries and Oceans (K. Rutherford); IPHC - International Pacific Halibut Commission (via T. Geernaert); RCF - Raincoast Conservation Foundation (C. Fox).

Appendix 2. IUCN Threats Assessment Worksheet applied to Short-tailed Albatross, *Phoebastria albatrus*.

Overall Threat Impact Calculation Help:		Level 1 Threat Impact Counts			
		Threat Impact		high range	low range
		A	Very High	0	0
		B	High	0	0
		C	Medium	0	0
		D	Low	6	6
Calculated Overall Threat Impact:		Medium		Medium	
Assigned Overall Threat Impact:		C = Medium			
Overall Threat Comments		This population is experiencing exponential population growth so threats don't seem to be impacting current growth, but as the population increases more birds will be exposed to threats from fisheries bycatch. Accumulation of organochlorides and other pollutants is a present and increasing threat and some of this comes from BC waters. If oil exports and increased shipping from BC ports go ahead this will increase the threat of oiling - tankers and other shipping will pass through favoured foraging sites north and south of Haida Gwaii and off the west coast of Vancouver Island. Threats from outside Canadian waters were also considered here.			

Threat	Impact (calculated)	Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
1 Residential & commercial development	Negligible	Negligible (<1%)	Negligible (<1%)	Insignificant/Negligible (Past or no direct effect)	
2 Agriculture & aquaculture	Negligible	Negligible (<1%)	Slight (1-10%)	Low (Possibly in the long term, >10 yrs/3 gen)	
2.4 Marine & freshwater aquaculture	Negligible	Negligible (<1%)	Slight (1-10%)	Low (Possibly in the long term, >10 yrs/3 gen)	Possible impacts from aquaculture in the future but likely to be minor.
3 Energy production & mining	D Low	Restricted (11-30%)	Moderate (11-30%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	
3.1 Oil & gas drilling	D Low	Restricted (11-30%)	Moderate (11-30%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	Threat from offshore oil exploration if current moratorium lifted in BC. Colony at Minami-kojima in disputed Senkaku/Diaoyu islands is surrounded by potential offshore oil fields.
3.3 Renewable energy	Not Calculated (outside assessment timeframe)	Small(1-10%)	Slight (1-10%)	Low (Possibly in the long term, >10 yrs/3 gen)	Offshore wind farms could affect this species in Hecate Strait

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
4	<u>Transportation & service corridors</u>	D	Low	Restricted (11-30%)	Moderate (11-30%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	
4.3	Shipping lanes	D	Low	Restricted (11-30%)	Moderate (11-30%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	Currently threatened by busy shipping lanes off continental shelf; much higher risk if increased oil exports (Kitimat & Burnaby) allowed. Elsewhere, increased shipping between Asia and North America will increase threats from oil spills, especially off the Aleutian Islands where these birds aggregate.
5	<u>Biological resource use</u>	D	Low	Restricted (11-30%)	Moderate (11-30%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	
5.4	Fishing & harvesting aquatic resources	D	Low	Restricted (11-30%)	Moderate (11-30%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	Bycatch from longline fisheries is a present and future threat off BC and most other waters occupied by this species
6	<u>Human intrusions & disturbance</u>	D	Low	Small (1-10%)	Slight (1-10%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	
6.2	War, civil unrest & military exercises	D	Low	Small (1-10%)	Slight (1-10%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	Colony at Minami-kajima (~15% of breeding population) is in disputed Senkaku/Diaoyu islands where there is a threat of armed conflict between Japan and China.
7	<u>Natural system modifications</u>		Negligible	Negligible (<1%)	Negligible (<1%)	Insignificant/Negligible (Past or no direct effect)	
8	<u>Invasive & other problematic species & genes</u>		Negligible	Negligible (<1%)	Negligible (<1%)	Low (Possibly in the long term, >10 yrs/3 gen)	
8.1	Invasive non-native/alien species		Negligible	Negligible (<1%)	Negligible (<1%)	Low (Possibly in the long term, >10 yrs/3 gen)	Possible threats from introduced predators at Japanese colonies but these are closely supervised.
9	<u>Pollution</u>	D	Low	Restricted (11-30%)	Moderate (11-30%)	High (Continuing)	
9.1	Household sewage & urban waste water		Negligible	Negligible (<1%)	Slight (1-10%)	High (Continuing)	Effluent that reaches outer coast could contribute to pollutant loads of albatrosses.
9.2	Industrial & military effluents	C	Medium	Restricted (11-30%)	Serious (31-70%)	High (Continuing)	Albatrosses from N Pacific known to carry high loads of organochlorines and other pollutants
9.4	Garbage & solid waste	D	Low	Restricted (11-30%)	Slight (1-10%)	High - Moderate	Ingestion of plastic effluent is widespread in albatrosses and can sometimes impact chicks and adults.
9.5	Air-borne pollutants	C	Medium	Restricted (11-30%)	Serious (31-70%)	High (Continuing)	Some of the pollutants ingested by albatrosses are carried on winds from Asia and N America
9.6	Excess energy						

Threat		Impact (calculated)		Scope (next 10 Yrs)	Severity (10 Yrs or 3 Gen.)	Timing	Comments
10	<u>Geological events</u>	D	Low	Restricted (11-30%)	Moderate (11-30%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	
10.1	Volcanoes	D	Low	Restricted (11-30%)	Moderate (11-30%)	High (Continuing)	About 2% p.a. probability of main colony Torishima (Japan) erupting
10.2	Earthquakes/ts unamis		Negligible	Negligible (<1%)	Negligible (<1%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	Storm surges threaten the new Midway breeding site and possibly other future low-lying colonies.
10.3	Avalanches/landslides	D	Low	Restricted (11-30%)	Moderate (11-30%)	Moderate (Possibly in the short term, < 10 yrs/3 gen)	Landslides frequently affect portions of the Torishima colony
11	<u>Climate change & severe weather</u>		Not Calculated (outside assessment timeframe)	Unknown	Unknown	Low (Possibly in the long term, >10 yrs/3 gen)	
11.1	Habitat shifting & alteration		Not Calculated (outside assessment timeframe)	Unknown	Unknown	Low (Possibly in the long term, >10 yrs/3 gen)	Likely to be some changes in marine prey productivity & distribution but impacts unknown.

Classification of Threats adopted from IUCN-CMP, Salafsky *et al.* (2008).