Black-footed Albatross
Phoebastria nigripes

Albatros à pieds noirs / Albatros à pattes noires
Albatros de patas negras

CRITICALLY ENDANGERED | **ENDANGERED** | VULNERABLE | NEAR THREATENED | LEAST CONCERN | NOT LISTED

Sometimes referred to as
Black Albatross
Black Gooney
Ka'upu

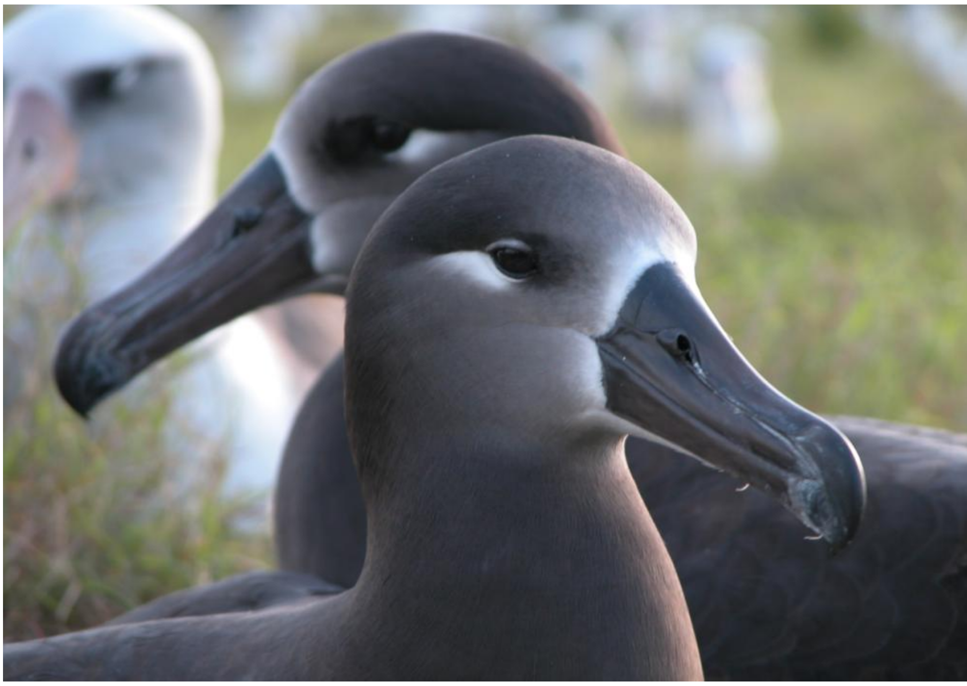

Photo © Maura Naughton, USFWS

TAXONOMY

Order: Procellariiformes
Family: Diomedeidae
Genus: *Phoebastria*
Species: *P. nigripes*

Originally described as *Diomedea nigripes* (Audubon 1839), this species was placed by Mathews (1934) in *Phoebastria* and then back in *Diomedea* in 1948 [1, 2]. Phylogenetic analysis of cyt-*b* gene sequences, supported the former designation of the genus *Phoebastria* [3], a classification that was subsequently adopted by the AOU [4]. There are no recognized subspecies [5], but a recent study based on cyt-b mtDNA revealed significant genetic differentiation between Hawaiian and Japanese breeding populations [6].

CONSERVATION LISTINGS AND PLANS

International

- Agreement on the Conservation of Albatrosses and Petrels – Annex 1 [7]
- 2010 IUCN Red List of Threatened Species – Endangered [8]
- Convention on Migratory Species - Appendix II (listed as *Diomedea nigripes*) [9]
- USA - Canada Convention for the Protection of Migratory Birds [10]
- USA - Mexico Convention for the Protection of Migratory Birds and Game Mammals (family *Diomedeidae* listed) [11]
- USA - Japan Convention for the Protection of Migratory Birds and Birds in Danger of Extinction, and Their Environment (listed as *Diomedea nigripes*) [12]
- USA - Russia Convention Concerning the Conservation of Migratory Birds and Their Environment (listed as *Diomedea nigripes*) [13]
- Japan - China Agreement Protecting Migratory Birds and their Habitats (listed as *Diomedea nigripes*) [14]
- Conservation Action Plan for Black-footed Albatross and Laysan Albatross [15]

Canada

- Migratory Bird Convention Act [16]
- COSEWIC (Committee on the Status of Endangered Wildlife in Canada) - Special Concern [17]
- National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries [18]

China

- Law of the People's Republic of China on the Protection of Wildlife [19]

Japan

- Wildlife Protection and Hunting Law [20]
- Japan's National Plan of Action for Reducing Incidental Catch of Seabirds in Longline Fisheries [21]

Mexico

- Norma Oficial Mexicana NOM-059-ECOL-2001 - Threatened (Amenazada) [22]

Russia

- On the Protection and Use of Wild Animals [19]

Taiwan (Chinese Taipei)

- Taiwan National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries [23]

United States of America

- Migratory Bird Treaty Act - Listed Migratory Bird [24, 25]
- Bird of Conservation Concern [26]
- United States National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries [27]

Hawaii

- Listed as Threatened by the State of Hawaii [28]

BREEDING BIOLOGY

Phoebastria nigripes is a colonial, annual breeding species; adult birds will skip breeding in some years [29]. Birds first arrive at the colonies in mid- to late October and most eggs are laid from mid-November to mid-December (Table 1). The incubation period averages 65–66 days and most eggs hatch between mid-January and mid-February [29]. Young depart the colony during June through mid-July [29, 30]. Each breeding cycle lasts about 8 months. Juvenile birds return to the island at 3–4 years of age [29]. The youngest recorded breeding is at 5 years of age and average age at first breeding is 7 years [29, 31].

Photo © Marc Romano, USFWS

Table 1. *Breeding cycle of* P. nigripes.

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
At colonies												
Egg laying												
Incubating												
Chick provisioning												

BREEDING STATES

Table 2. *Distribution of the global* P. nigripes *population among breeding range states*.

	United States	Japan	Mexico
Breeding pairs	95%	5%	Intermittent

BREEDING SITES

Phoebastria nigripes breeds on oceanic islands across the tropical/subtropical North Pacific Ocean (Figure 1). The low coral islands of the Northwestern Hawaiian Islands (NWHI) are the core of the breeding range supporting >95% of the global breeding population (Table 2 and Table 3). Smaller colonies exist in the Izu and Ogasawara islands of Japan and on the Senkaku Islands [32, 33]. Individual pairs have attempted to breed at Wake Atoll in the central Pacific since 1996, but none have successfully fledged young [34]. The breeding range expanded into the eastern Pacific when individual pairs bred on the Mexican islands of Guadalupe in 1998 and San Benedicto in 2000 [35], however, birds have not bred at either location in recent years (R. W. Henry, University of California, Santa Cruz, pers. comm.). *Phoebastria nigripes* formerly bred on many more islands in the eastern and central Pacific (Figure 1), but colonies on Johnston Atoll, the Northern Mariana Islands, Minami Torishima, Iwo Jima, Nishinoshima, Chichijima Retto (Anijima), and several islands in the Hahajima and Mukojima rettos were extirpated and have not been recolonised (N. Nakamura, Yamashina Institute for Ornithology, pers. comm.) [32, 36]. The total breeding population was estimated to be approximately 61,300 pairs in 2009 (Table 3).

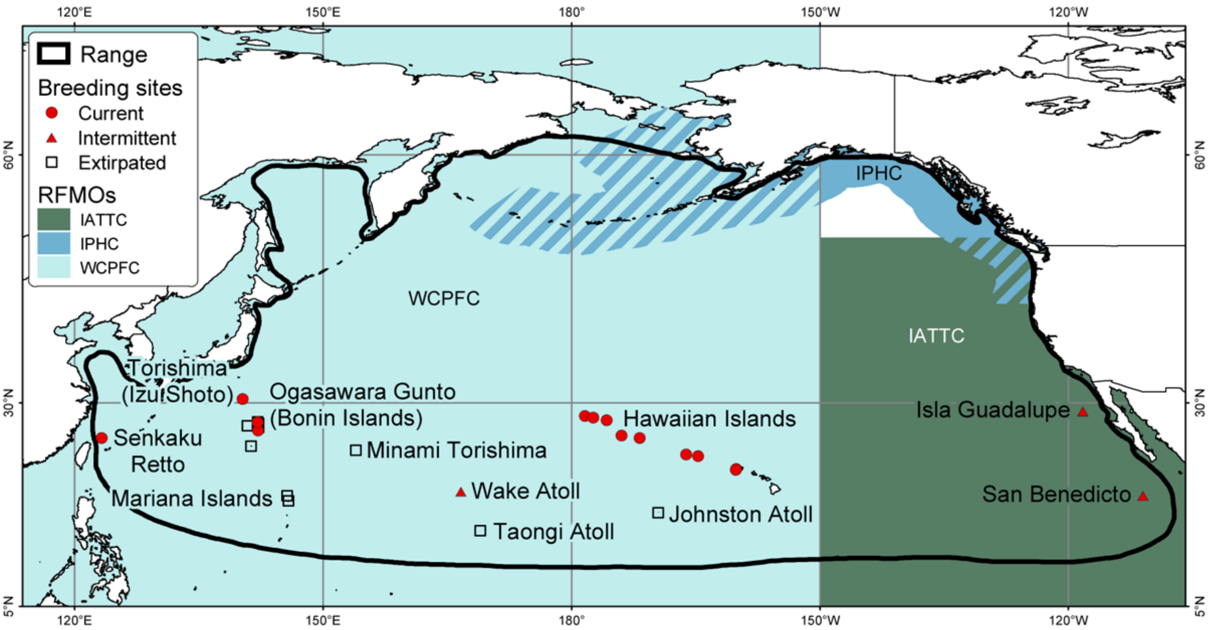

Figure 1. The approximate range of P. nigripes *inferred primarily from shipboard surveys and band recoveries, and to a lesser extent from tracking. The boundaries of Regional Fisheries Management Organizations (RFMOs) are also shown.*

IATTC - Inter-American Tropical Tuna Commission
IPHC - International Pacific Halibut Commission
WCPFC - Western and Central Pacific Fisheries Commission

Table 3. *Monitoring methods and estimates of colony size (annual breeding pairs) for active* P. nigripes *breeding sites. Table based on unpublished data from U.S. Fish and Wildlife Service (Hawaii); H. Hasegawa, Toho University (Torishima); T. Deguchi and N. Nakamura, Yamashina Institute for Ornithology (Ogasawaras); and R. W. Henry, University of California, Santa Cruz (Mexico). (see Glossary for monitoring method and reliability codes).*

Breeding site location	Jurisdiction	Years monitored	Monitoring method	Monitoring reliability	Annual breeding pairs (last census)	
Central Pacific						
Hawaii						
Kure Atoll 23°03' N, 161°56' W	USA	2003–2007	B	Mod	2,380[1]	(2009)
Midway Atoll 28°15' N, 177°20' W	USA	1991–2009	A	High	23,963	(2009)
Pearl and Hermes Reef 27°50' N, 175°50' W	USA	opportunistic	B	Low	6,116[1]	(2003)
Lisianski Island 26°04' N, 173°58' W	USA	opportunistic	B	Low	2,126[1]	(2006)
Laysan Island 25°46' N, 171°45' W	USA	1992–2009[2]	A	High	19,088[2]	(2009)
French Frigate Shoals 23°45' N, 166°10' W	USA	1980–2009	A	High	4,309	(2009)
Necker Island 23°35' N, 164°42' W	USA	opportunistic	B	Low	112[1]	(1995)
Nihoa Island 23°03' N, 161°56' W	USA	opportunistic	B	Low	1[1]	(2007)
Kaula 21°39' N, 160°32' W	USA	opportunistic	B	Low	3[1]	(1993)
Lehua 22°01' N, 160°06' W	USA	opportunistic	A	Med	25	(2007)
Marshall Islands						
Wake Atoll 19°18' N, 166°35' E	USA	opportunistic	A	Med	0	(2008)
Total					**58,123**	
% of all sites					**95%**	
Western Pacific						
Izu Shoto						
Torishima 30°29' N, 140°19' E	Japan	1956-2008	B	High	2,150[1]	(2003)
Ogasawara Gunto (Bonin Islands)						
Mukojima Retto 27°40' N, 142°07' E	Japan		B	High	967[1]	(2006)
Hahajima Retto 26°39' N, 142°10' E	Japan		B	High	11[1]	(2006)
Ryukyu Shoto						
Senkaku Retto 25°45' N, 123°30' E	Japan/PRC/ROC[3]	opportunistic	A, B	Low	56[1]	(2002)
Total					**3184**	
% of all sites					**5%**	
Eastern Pacific						
Isla Guadalupe 29°02' N, 118°17' W	Mexico	2003–2008	A, B	High	0	(2009)
Islas Revillagigedos						
San Benedicto 19°19' N, 110°48' W	Mexico	opportunistic	A, B	Low	0	(2004)
Total					***61,307***	

[1] Estimate of breeding pairs based on a survey of chicks, adjusted for nest failure.

[2] Standardized count of active nests

[3] Senkaku or Diaoyutai Islands are disputed territory: Japan, Peoples Republic of China and Republic of China (Taiwan).

CONSERVATION LISTINGS AND PLANS FOR THE BREEDING SITES

International

Black-footed Albatross Colonies

- Conservation Action Plan for Black-footed Albatross and Laysan Albatross [15]

Ogasawara Islands, Northwestern Hawaiian Islands, and Archipiélago de Revillagigedo

- UNESCO World Heritage Sites (tentative) [37]

Archipiélago de Revillagigedo Biosphere Reserve

- Ramsar site since 2004 [38]

Japan

Torishima

- Natural Monument [39]
- National Wildlife Protected Area [40]

Ogasawara Islands

- Ogasawara National Park [41, 42]

Mexico

Isla Guadalupe

- Isla Guadalupe Biosphere Reserve [43]

San Benedicto

- Archipiélago de Revillagigedo Biosphere Reserve [43, 44]

United States

Northwestern Hawaiian Islands

- Papahānaumokuākea Marine National Monument (encompassing: Midway Atoll and Hawaiian Islands National Wildlife Refuges, and Kure Atoll Seabird Sanctuary) and Management Plan 2008 [45]
- Regional Seabird Conservation Plan, Pacific Region [46]

Wake Atoll

- Pacific Remote Islands Marine National Monument [47]

POPULATION TRENDS

Northwestern Hawaiian Islands (NWHI)

Populations of all three North Pacific albatrosses were devastated by feather hunters around the turn of the 20th century [48]. In response to this destruction, the Hawaiian Islands Bird Reservation (later renamed the Hawaiian Islands National Wildlife Refuge) was established in 1909. It was unlawful to kill or molest the birds within the Reservation, which extended from Kure to Nihoa (except Midway), but there was little enforcement and feather raids continued in the Hawaiian Islands until at least 1915 [48, 49]. There are no population estimates prior to these exploitations. When Wetmore visited the NWHI in 1923, albatross nesting populations were at their lowest level – approximately 11,500 chicks [36, 50, 51].

The population increased following the cessation of feather hunting, and by 1956–1958, the breeding population had increased to approximately 55,000 pairs [36]. The most recent estimate is approximately 64,200 pairs (Table 3). Most of the recent population data are derived from three islands: Midway Atoll, Laysan Island, and French Frigate Shoals which together support >75% of the global breeding population of *P. nigripes* [52]. The two largest colonies, at Midway Atoll and Laysan Island, comprise >70% of the total breeding population.

The size of the colonies at Laysan, Lisianski, and Pearl and Hermes Reef have declined over the past 50 years but these losses has been offset by increases at Midway, Kure, and French Frigate Shoals (the three NWHI formerly occupied by the military) [36, 50]. Examining the data from the three regularly monitored colonies (Midway, Laysan and French Frigate Shoals) indicates an increase of 0.93% per annum (95% CI 1.00, 0.85) for these three sites between 1998 and 2009 (Figure 2a).

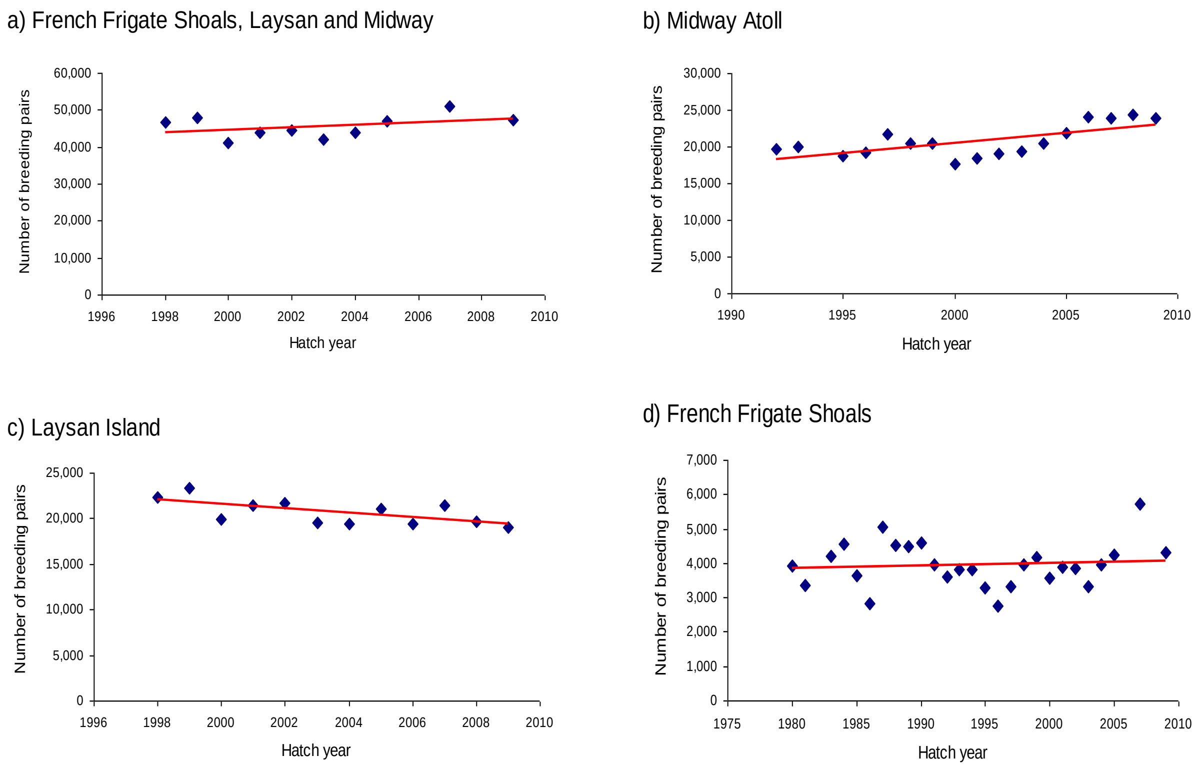

Figure 2. Total counts of P. nigripes *nests at the main breeding colonies (Midway Atoll, Laysan Island and French Frigate Shoals) with a simple linear regression fitted. Figure based on unpublished USFWS data, not to be used without dataholders' permission.*

Midway Atoll

Midway Atoll is the most altered of the NWHI, having sustained continuous human occupation for more than a century, starting with the U.S. Marines and Pacific Cable Company (1903–1952), Pan American Airlines (1935–1947), the U.S. Navy (1939–1997), and finally the U.S. Fish and Wildlife Service (1988–present) [53]. Initially, changes by island residents enhanced the habitat for albatross nesting but military activities associated with World War II and beyond (including base developments that led to loss and degradation of habitat, and large scale albatross control programs intended to increase the safety of aircraft operations), had a negative effect on the size of the albatross colonies [36, 54, 55]. Numbers of all nesting seabirds increased following establishment of the National Wildlife Refuge in 1988.

The size of the *P. nigripes* colony prior to feather hunting are not known but during a 1902 visit Byran [56] noted that "thousands upon thousands" of albatrosses had been killed and based on the number of carcasses, estimated that *P. nigripes* were three times more abundant than *P. immutabilis*. In 1923, Wetmore estimated 2,000 young and the population increased to nearly 20,000 pairs by the early 1940s [36, 51]. The colony size was considerably reduced by 1957 (8,700 pairs) [36] and 1961 (6,900 pairs) [54] after almost two decades of military occupation. There were no more complete colony counts until the USFWS began standardised counts in 1992. Between 1992 and 2009, the nesting population increased at an average annual rate of 1.3% (Table 4); and, has steadily increased since 2000 (Figure 2). Midway Atoll supplanted Laysan Island as the largest colony in 2004.

Photo © Maura Naughton, USFWS

Laysan Island

Laysan Island was never occupied by the military, but guano mining (1890–1910) and introduced rabbits (1904-1923) greatly altered the habitat [49]. Rabbits nearly denuded the island of all vegetation before they were eradicated in 1923 [49]. Dill estimated 85,000 birds (42,300 pairs) during his visit to Laysan Island in 1911 after the 1908–1910 feather raids, and Bryan who had visited Laysan eight years earlier, stated that conservatively "fully one-half the number of birds of both species of albatross that were so abundant in 1903 have been killed" [57]. Bailey counted only 7,722 nests in 1912 [58]. Feather raids continued at least through 1915 [49] and by May 1923, Wetmore reported only 4,700 large chicks [36, 51] (approximately 8,500 pairs when adjusted for nest loss [50]). The number of nesting pairs at Laysan rebounded with the end of feather hunting and by 1957 the colony had increased to 34,000 pairs [36]. Since then, there have been no observable changes to the amount or quality of the *P. nigripes* nesting habitat on the island but the size of the colony has decreased by almost 40%; the most recent counts indicate between 19,500 and 21,500 pairs (Figure 2c) (U.S. Fish and Wildlife unpublished data) [52]. Standardised counts have been conducted since 1998 and these indicate a continuing slow decline of 1.1% per annum (Table 4).

French Frigate Shoals

The longest time-series of recent population data come from French Frigate Shoals which has been monitored almost continuously since 1980 (no counts in 1982, 2006, 2008) [52]. Compared to Laysan and Midway, French Frigate Shoals is a small colony (<5% of the total breeding population). There were no estimates of colony size prior to exploitation by feather hunting. In 1923, Wetmore counted 405 young [51] (approximately 730 nesting pairs [50]) and by 1957, the colony had increased to 1,500 pairs [36]. The U.S. Navy occupied the atoll during World War II and afterwards the U.S. Coast Guard operated a LORAN Station, until the station was closed in 1979. Administration of the atoll was transferred to the USFWS in 1979 and the number of breeding pairs increased from 3,926 in 1980 to a peak of 5,725 pairs in 2007 [52].

The islands of French Frigate Shoals are low and vulnerable to winter storms and sea level rise. In 1997, after years of erosion, Whale-Skate Island was lost; this represented a significant loss of nesting habitat at the atoll. From 1980–1990, approximately one-third of the atoll's *P. nigripes* had nested on Whale-Skate [52]. Between 1980 and 2009, counts at French Frigate Shoals have fluctuated, but overall the number of breeding pairs is slightly increasing (Table 4). Although the number of active nests declined precipitously between 1987 and 1996 (>5.0% per year, Figure 2d); since 1996, the colony has experienced a moderate increase in numbers (approximately 2% per year; Figure 2d) perhaps due, at least in part, to redistribution of the birds that had nested on Whale-Skate.

Table 4. *Summary of trend data for three* P. nigripes *colonies. Table based on standardized counts of active nests by U.S. Fish and Wildlife Service (unpublished data)* [52].

Breeding Site	Current Monitoring	Trend Years (Hatch Year)	% average change per year [59] (95% Confidence Interval)	Trend	% of population
Central Pacific					
Kure Atoll	No	-	-	Unknown	-
Midway Atoll	Yes	1992 – 2009[1]	1.3 (1.2, 1.3)	Increasing	100%
Pearl and Hermes Reef	No	-	-	Unknown	-
Lisianski Island	No	-	-	Unknown	-
Laysan Island	Yes	1998 – 2009	-1.1 (-1.0, -1.2)	Decreasing	100%
French Frigate Shoals	Yes	1980 – 2009[2]	0.43 (0.41, 0.45)	Increasing	100%
Necker Island	No	-	-	Unknown	-
Nihoa Island	No	-	-	Unknown	-
Kaula	No	-	-	Unknown	-
Lehua	No	-	-	Unknown	-
Wake Atoll	No	-	-	Unknown	-
Western Pacific					
Torishima	Yes	-	In Progress	Unknown	-
Mukojima Retto	Yes	-	-	Unknown	-
Hahajima Retto	Yes	-	-	Unknown	-
Senkaku Retto	No	-	-	Unknown	-
Eastern Pacific					
Isla Guadalupe	Yes	-	-	Unknown	-
San Benedicto	No	-	-	Unknown	-

[1] Midway Atoll – missing data: 1994

[2] French Frigate Shoals – missing data: 1982, 2006, 2008

Table 5. Summary of d*emographic data for* P. nigripes. *Table based on U.S. Fish and Wildlife Service unpublished data* [50] *and published sources as indicated.*

Breeding site	Mean breeding success %/year (±SD, Study period)	Mean juvenile survival %/year; 95% CI (Study period)	Mean adult survival %/year; 95% CI (Study period)
Central Pacific			
Kure Atoll	No data	No data	No data
Midway Atoll	55% ±16% (1992-2001)	No data	In Progress
Pearl and Hermes Reef	No data	No data	No data
Lisianski Island	No data	No data	No data
Laysan Island	40% ±2% (1992-1995)	No data	In Progress
French Frigate Shoals	69% ±11% (1980-2004)	79%; CI 76, 82% [1] (1994-2000) [31]	89%; CI 87, 91% (1994-2000) [31] 92%; CI 91, 93% (1997-2002) [60]
Necker Island	No data	No data	No data
Nihoa Island	No data	No data	No data
Kaula	No data	No data	No data
Lehua	No data	No data	No data
Wake Atoll	No data	No data	No data
Western Pacific			
Torishima	No data	No data	No data
Mukojima Retto	No data	No data	No data
Hahajima Retto	No data	No data	No data
Senkaku Retto	No data	No data	No data
Eastern Pacific			
Isla Guadalupe	No data	No data	No data
San Benedicto	No data	No data	No data

[1] 0-5 years

Photo © James Lloyd

BREEDING SITES: THREATS

By 1997, the military had closed its bases on Kure, Midway, and French Frigate Shoals and management of the islands had been transferred to state and federal wildlife agencies. Many of the threats to the NWHI colonies have been addressed through management actions [46]. All introduced mammals, except house mice (*Mus musculus*) on Midway, have been eradicated from the NWHI. Polynesian rats (*Rattus exulans*) were eradicated from Kure in 1993, as were black rats (*R. rattus*) from Midway in 1997.

Outside of the NWHI, an eradication programme for feral cats (*Felis catus*) at Wake Atoll appears to have been successful [34], and eradication of black rats and Asian rats (*R. tanezumi*) is planned for 2011. Polynesian rats are present on Lehua and black rats on Kaula [15]. Rats are also present at the Japanese sites. While rats have been documented as significant predators of *P. immutabilis* at Kure Atoll, currently, they do not appear to have a negative impact at the Japanese colonies (H. Hasegawa and T. Deguchi, pers. comm.). Goats (*Capra hircus*) significantly altered and degraded habitat on Isla Guadalupe before a successful eradication program was initiated in 2004 and feral cats remain a major threat to nesting and colonising albatrosses (R.W. Henry, pers. comm.). Eradication programmes have been considered or are planned for mammalian predators at all of the sites discussed above. Non-native predators may be a factor inhibiting recolonisation at some historical sites.

Table 6. *Summary of known threats causing population level changes at the breeding sites of* P. nigripes*. Table based on unpublished data and input from J. Klavitter, B. Flint, and B. Zaun, U.S. Fish and Wildlife Service (Hawaii, except Oahu); L. Young, University of Hawaii (Oahu); A. Hebshi, Pacific Air Force and M. Rauzon, Marine Endeavors (Wake); N. Nakamura, T. Deguchi, and H. Hasegawa (Japanese Islands); and B. Tershy and R. W. Henry (Mexico). (see Glossary for codes).*

Breeding site location	Human disturbance	Human take	Natural Disaster	Parasite or Pathogen	Habitat loss or degradation	Predation by alien species	Contamination
Central Pacific							
Kure Atoll	No	No	No	No	Low [2,3]	No	Low
Midway Atoll	No	No	No	No	Low [2,3]	No	Low
Pearl and Hermes Reef	No	No	No	No	Low [2,3]	No	No
Lisianski Island	No	No	No	No	Low [2]	No	No
Laysan Island	No	No	No	No	Low [2]	No	No
French Frigate Shoals	No	No	No	No	Low [2]	No	No
Necker Island	No	No	No	No	No	No	No
Nihoa Island	No	No	No	No	No	No	No
Kaula	Medium [1]	No	No	No	No	No	No
Lehua	No	No	No	No	No	No	No
Johnston Atoll	No	No	No	No	Low [2]	No	No
Wake Atoll	No	No	No	No	Low [2]	No	Unknown
Western Pacific							
Torishima (Izu Shoto)	No	No	High	No	No	No	No
Mukojima Retto	No	No	No	No	No	No	No
Hahajima Retto	No	No	No	No	No	No	No
Senkaku Retto	Unknown	No	No	No	Unknown	Unknown	Unknown
Eastern Pacific							
Isla Guadalupe	Low	No	No	No	No	Yes	No
San Benedicto	No	No	Low	No	No	No	Unknown

[1] Military training exercises at Kaula Rock may be affecting this small colony [15].

[2] Projected sea level rise is probably a low threat in the next decade; however, it is a serious threat to the low-lying islands and atolls of the NWHI and Central Pacific over the next century [15]. Greater than 95% of the global population nest on these low islands.

[3] Non-native plants such as golden crown-beard (*Verbesina encelioides*) and ironwood (*Casuarina equisetifolia*) have degraded nesting habitat. *Verbesina* forms dense stands that limit available nesting habitat and reduce reproductive success. The USFWS is actively working to eradicate this invasive species but this is a long-term and costly endeavour [15, 46].

MARINE DISTRIBUTION

Phoebastria nigripes ranges over most of the North Pacific Ocean, from the Bering Sea (approximately 62ºN) and the Sea of Okhotsk, south to approximately 10ºN (Figure 1); although, occasionally as far south as 4º 30'N [61]. Satellite tracking data suggest that *P. nigripes* utilises a broader range of marine habitats than *P. immutabilis*; frequenting all depth domains, and dispersing more into subtropical and tropical waters. Adults travel to Alaskan waters or to the California Current when provisioning their young [62, 63, 64]; and juveniles may disperse as widely as adults (S. Shaffer, University of California, Santa Cruz, pers. comm.). Satellite-tagged *P. nigripes* that dispersed from their capture location in the central Aleutian Islands travelled extensively south of 45ºN and remained almost entirely east of the International Date Line [65].

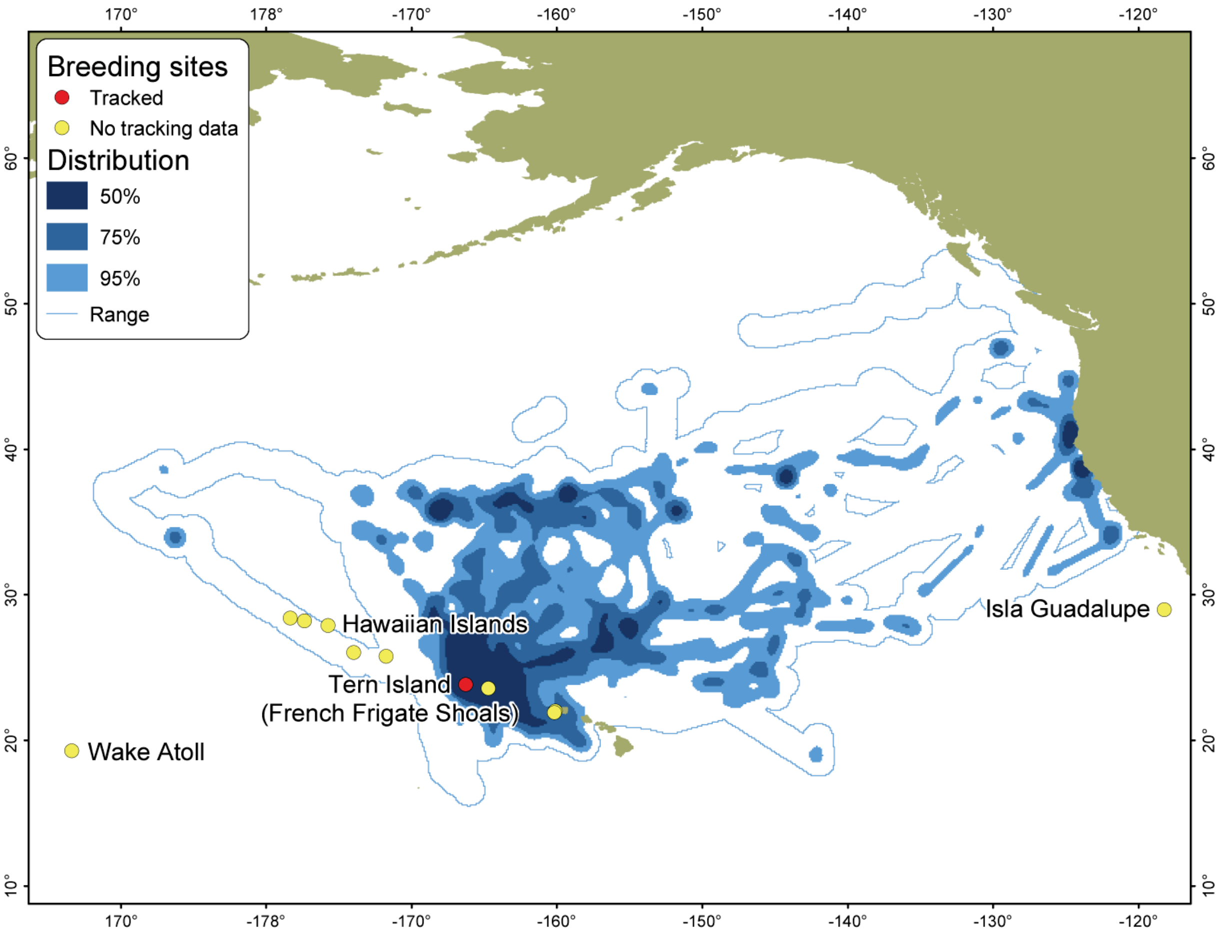

Figure 3. *Satellite-tracking data of breeding adult* P. nigripes*. Map based on data contributed to BirdLife Global Procellariiform Tracking Database by: S. Shaffer, M. Kappes, Y. Tremblay, D. Costa, R. Henry, D. Croll (University of California Santa Cruz) and D. Anderson, J. Awkerman (Wake Forest University).*

Carbon stable isotope ratios ($\delta^{13}C$) suggest that *P. nigripes* forages at more southern latitudes than *P. immutabilis* and that the two species largely utilise distinctly different regions of the North Pacific [66]. *Phoebastria nigripes* favours nutrient-rich waters associated with steep depth gradients and along convergence fronts [62, 67, 68, 69, 70]. Although frequently found over relatively shallow continental shelf waters, they generally occur in areas seaward of the shelfbreak (i.e., deeper than 200m) [62, 63, 68, 69, 70]. *Phoebastria nigripes* are widely dispersed over pelagic areas of the North Pacific and spend most of their time transiting or foraging over abyssal waters, occasionally foraging along the edge of the continental shelf [62, 63, 71, 72] as well as over shallow seamounts [17]. Although they do forage along the shelfbreak [63] it is suggested that other than when they are attracted there by fishing vessels and associated seabird feeding flocks, *P. nigripes* are no more concentrated at the shelfbreak than anywhere else [73].

The species occurs throughout international waters and within the Exclusive Economic Zones (EEZs) of Mexico, the United States, Canada, Russia, Japan, China, North and South Korea, the Federated States of Micronesia, and the Republic of the Marshall Islands (Table 7) [15, 74, 75]. Based on satellite-tracking of birds during the breeding season, the at-sea distribution of *P. nigripes* overlaps predominantly with the Western and Central Pacific Fisheries Commission (WCPFC) area, as well as to a lesser extent with the Inter-American Tropical Tuna Commission (IATTC) and the International Pacific Halibut Commission (IPHC) areas (Figures 1 and 3) [62]. Throughout the non-breeding season, the species tends to concentrate along in the eastern North Pacific Ocean, where it overlaps extensively with the IATTC [76, 77], as well as the IPHC and the WCPFC areas (Figures 1and 4). Satellite tracked fledglings initially disperse northward toward the North Pacific Transition Zone and then travel east and west at latitudes between 35 and 40°N (S. Shaffer, pers. comm.).

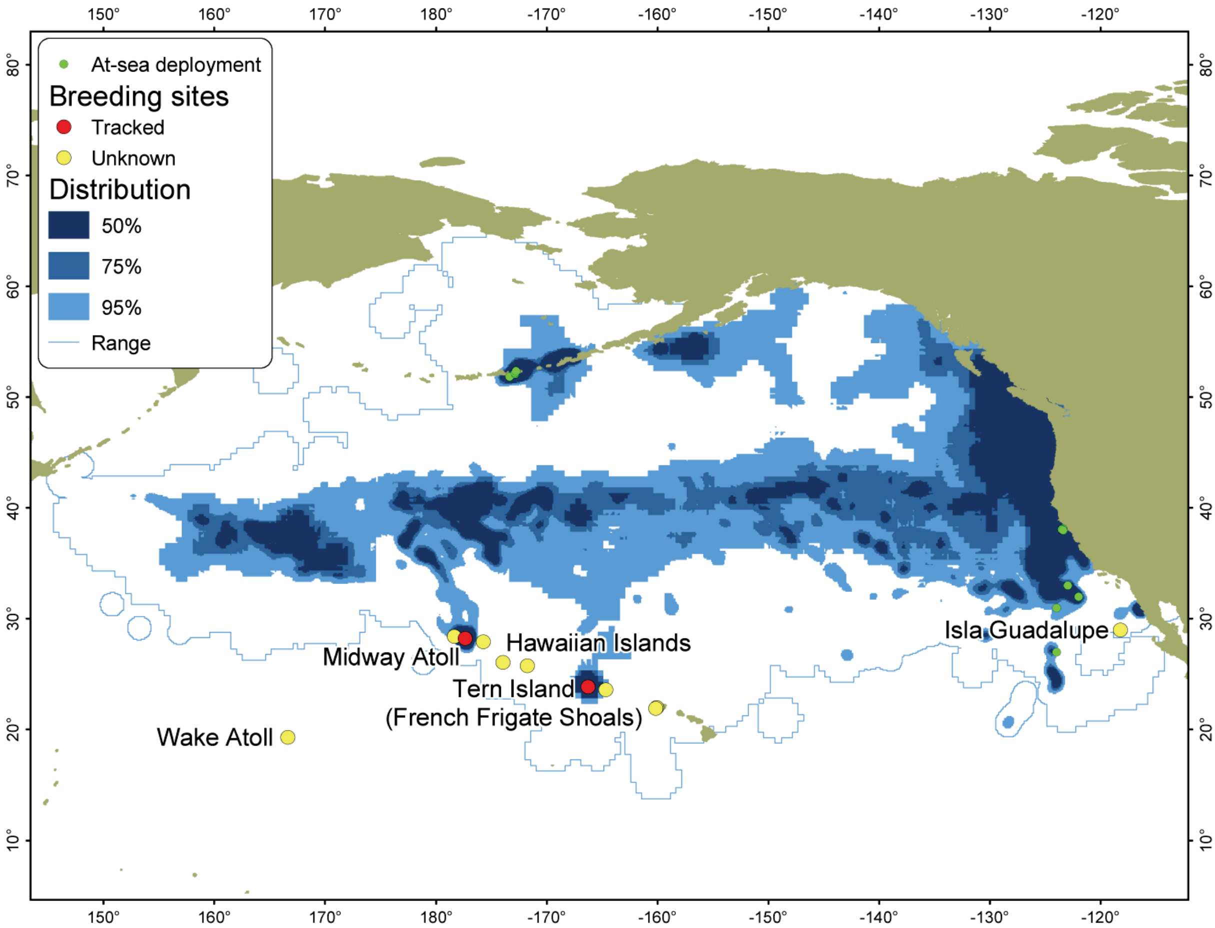

Figure 4. *Satellite-tracking data of non-breeding adults and fledgling* P. nigripes. *Map based on data contributed to BirdLife Global Procellariiform Tracking Database by: S. Shaffer, M. Kappes, Y. Tremblay, D. Costa, R. Henry, D. Croll (University of California Santa Cruz); D. Anderson, J. Awkerman (Wake Forest University); M. Hester, D. Hyrenbach (Oikonos - Ecosystem Knowledge & Duke University); R. Suryan, K. Fischer (Oregon State University); and G. Balogh (U.S. Fish and Wildlife Service).*

Table 7. *Summary of the known ACAP Range States, non-ACAP Exclusive Economic Zones and Regional Fisheries Management Organisations that overlap with the marine distribution of* P. nigripes.

	Breeding and feeding range	Foraging range only	Few records - outside core foraging range
Known ACAP Range States	-	-	-
Non-ACAP Exclusive Economic Zones	Disputed[1] Japan Mexico USA	Canada China Federated States of Micronesia North Korea Republic of the Marshall Islands Russia South Korea	-
Regional Fisheries Management Organisations [2]	WCPFC IATTC	IPHC	-

[1] Senkaku or Diaoyutai Islands are disputed territory: Japan, Peoples Republic of China and Republic of China (Taiwan).

[2] see Figure 1 and text for list of acronyms

FORAGING ECOLOGY AND DIET

Phoebastria nigripes forages either singly or in groups (occasionally in the 100's) [78, 79] taking prey by surface-seizing, and occasionally by partially submerging. They feed upon carrion, including birds [80], and readily scavenge fisheries offal [81]. Although they do forage at night, *P. nigripes* captures most prey during the day [82]. Diet information comes primarily from chick regurgitation samples collected in Hawaiian colonies (1978-1980) [80]; and from stomach samples of birds killed in North Pacific driftnets [83].

Oil formed 10% (by volume) of the stomach contents of chicks from Hawaii. When oil was excluded, chick diet consisted of approximately 50% fish, 32% squid, and 5% crustacean (by volume). The main food items were flying fish eggs (*Exocoetidae*); and squid (*Ommastrephida*) [80].

Phoebastria nigripes scavenged extensively from driftnets (while the fishery was in operation), primarily on neon flying squids (*Ommastrephes bartrami*) and Pacific pomfrets (*Brama japonica*), which accounted for approximately 67% and 18% (by mass), respectively. Other items, thought to be consumed before becoming entangled in nets were primarily squids from the families *Gonatidae* (*Berryteuthis anonychus*, *Gonatopsis borealis*, *Gonatus* sp.), *Cranchiidae* (*Galiteuthis phyllura, Leachia dislocata*, *Taonius pavo*), *Onychoteuthidae* (*Onychoteuthis borealijaponicus*), and *Octopoteuthidae* (*Octopoteuthis deletron*); all occurred at rates higher than 5% frequency of occurrence [83].

MARINE THREATS

Fisheries bycatch is a noted source of mortality for *P. nigripes* in the North Pacific Ocean [50, 84, 85]. The development of pelagic longline fisheries for tuna and billfish in the early 1950s, and the pelagic driftnet fishery in the late 1970s added a new mortality source for the species [50, 85]. An estimated 4,400 *P. nigripes* were killed in high seas squid and large-mesh driftnet fisheries in 1990 [84]. The large number of seabirds and other marine animals caught by driftnets resulted in a United Nations high-seas driftnet moratorium (UNGA Resolution 46/215) [86] that led to the closure of the fishery in 1992. The fishery closure resulted in a significant reduction in mortality of *P. nigripes* [50]. Although these fisheries killed significantly more *P. immutabilis* than *P. nigripes*, the impact was greater on *P. nigripes* given its smaller population size. Overall, the high seas driftnet and pelagic longline fisheries have been the most important sources of anthropogenic mortality for these species over the past 50 years [50].

In contrast to the now inactive high seas driftnet fishery, pelagic longline fisheries continue and are currently considered the primary threat to *P. nigripes* and *P. immutabilis* [50, 85]. Fleets from the United States, Japan, Korea, and Taiwan operate in the North Pacific [87] and albatrosses have likely been incidentally killed in these fisheries since at least 1951 [50]. The total impact of the pelagic longline fisheries on *P. nigripes* will only be known once seabird bycatch data becomes available for all fisheries incurring bycatch mortality.

Estimates of the number of albatrosses killed annually as a result of fisheries interactions are uncertain due to a paucity of data. Bycatch numbers have been estimated from data that are available for a relatively small subset of the North Pacific fisheries: high seas driftnet (international), pelagic longline (USA), and demersal longline (Canada, USA) [50] and trawl (USA). Arata *et al*. [50] compiled the existing information and estimated total bycatch for the period from 1951 to 2005. Their estimates indicated a bimodal distribution; bycatch estimates generally ranged between 6,000–10,000 birds per year, but peaked in 1961 and 1988 with 15,290 and 16,215 birds, respectively. The peak in 1988 was due to the combined effect of pelagic driftnet and pelagic longline fisheries, while the 1961 peak was due solely to longline fishing effort [50].

In recent years, U.S. North Pacific longline fleets have implemented seabird deterrence measures that have reduced seabird bycatch in longline gear. The bycatch of *P. nigripes* in the Hawaii-based pelagic longline fishery has decreased from over 1,300 birds taken annually in 1999 and 2000 to less than 100 in 2007 [88]. The annual bycatch from other fisheries (trawl and demersal longline) off Alaska was estimated at 82 *P. nigripes* (50–136; 95% CI) from 2002 through 2006 (S. Fitzgerald, NOAA, pers. comm.). Bycatch in the halibut fisheries is unknown.

Taiwan's estimates of seabird bycatch in its longline fisheries in the Pacific Ocean, based on observer trips from 2002 to 2006, indicate that one of the areas with highest bycatch occurred between 25° to 40°N [89], where the bycatch sample consisted of *P. nigripes* and *P. immutabilis* (Yu-Min Yeh, Nanhua University, Chia-Yi, pers. comm.) . Mexican longline fisheries have reported take of *P. immutabilis* [90] and *P. nigripes* may also be vulnerable.

Various methods have been used to better understand the impacts of fisheries bycatch on *P. nigripes*. Bycatch data from observed fisheries were used to extrapolate and estimate levels of bycatch for fisheries where observer data were not available. This assessment indicated that population declines may occur as a result of cumulative bycatch of *P. nigripes* across all longline fleets in the North Pacific [85]. A modeling analysis of adult survival rates during the period 1997–2002 indicated population-level impacts on *P. nigripes* were likely correlated with longline fishing [60].

High levels of organochlorine contaminants [91, 92, 93] and mercury [66] have been documented in *P. nigripes*. Mean PCB levels were one or two orders of magnitude higher than those of southern albatrosses [93] and concentrations of PCBs and DDE in *P. nigripes* increased over the last decade [66]. One study found birds sufficiently contaminated to be at risk from eggshell thinning and decreased egg viability, enough to reduce productivity by 2–3% [94]. Another study found significant associations between high mercury and organochlorine concentrations and altered immune function in *P. nigripes* [95]. Diet is thought to be the primary route of exposure [66].

Over the past 30 years, there have been several oil spills in the vicinity of the large albatross colonies in the NWHI [96]. Oiled albatrosses have been recorded at the colonies but the number of affected birds is relatively small and the source of the oil is unknown [97]. Given the vast at-sea distribution of both species, they could be encountering oil anywhere in the North Pacific.

North Pacific albatrosses ingest a wide variety of plastics and there have been several studies investigating the effects of plastic ingestion on Laysan albatross chick survival [98, 99, 100]. *Phoebastria nigripes* chicks have a lower incidence and abundance of plastic than *P. immutabilis* chicks, and contain higher amounts of plastic fibre that is suspected to be derived from fishing gear [84, 98].

Photo © Anthony Santos

KEY GAPS IN SPECIES ASSESSMENT

Standardised counts at the three Hawaiian colonies (Midway, Laysan and French Frigate Shoals) provide a very precise and accurate reflection of the annual breeding effort at these three colonies, which support >75% of the breeding population. The other colonies in the NWHI are surveyed opportunistically, usually late in the season, and accurately assessing trends for colony size at these sites are not possible. Standardised, early season counts of colonies at Kure, Pearl and Hermes Reef, and Lisianski, at c.10 year intervals, would provide valuable information for all of the large NWHI colonies (>95% of the breeding population).

There is a critical need for targeted, standardised, documented data collection to accurately assess albatross status and trends, and to evaluate the relative effects of all threats [15]. To address this need, USFWS initiated a new monitoring programme in 2005 at Midway, Laysan and French Frigate Shoals, based on mark and recapture of uniquely marked individuals. This will provide annual estimates of adult survival, the proportion of adults that skip nesting in a given year, and reproductive success. Juvenile survival rates remain an important data gap.

The colony at Laysan Island has decreased in size over the past 50 years by almost 40%. Although, this loss has been balanced by increases at the Midway and French Frigate Shoals colonies, understanding the causal factors for the decline could provide valuable insight for future management and conservation. Investigations at the colony and at-sea are needed.

Currently, fisheries bycatch is the greatest known source of mortality for *P. nigripes*, yet only a small fraction of the nations' commercial fleets fishing in the North Pacific monitor and report seabird bycatch. Characterisation of the North Pacific fishing fleets (*e.g.,* gear, vessel size/configuration, target species, spatial/temporal distribution of effort, type of bycatch monitoring, mitigation required/used, and management authority) and bycatch monitoring for all fleets that potentially catch albatrosses, is needed.

Considerable data on habitat utilisation at sea have been collected over the past three to four decades by ships of opportunity, and in more recent years via satellite and GPS tracking. Most of the tracking data for breeding birds have been obtained from the relatively small colony at Tern Island (French Frigate Shoals). Over the past few years, fledglings (2006–2009) and breeding adults (2007-2009) were tagged at Midway Atoll (S. Shaffer, pers. comm.). Comparison of marine distribution and habitat utilisation by birds from the two colonies will provide valuable insight into whether colony specific differences exist. Tracking birds from Laysan Island could potentially provide insight into the cause of the decreasing trend for this colony.

In order to effectively protect *P. nigripes*, there is a recognised need to integrate at-sea survey results with satellite and GPS tracking data, to derive a more complete understanding of its spatio-temporal use of the North Pacific Ocean [15]. Through the integration of all marine distributional data, associations with oceanographic features could be characterised and mapped at a basin-wide level. These maps, overlaid with seasonal fishing effort data, would provide range states with valuable tools to identify high-risk areas and high-risk fisheries.

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RECOMMENDED CITATION

Agreement on the Conservation of Albatrosses and Petrels. 2010. *Species assessments:* Black-footed Albatross *Phoebastria nigripes.* Downloaded from http://www.acap.aq on 16 September 2010.

GLOSSARY AND NOTES

(i) Years.
The "split-year" system is used. Any count (whether active nests with eggs, breeding pairs, or chicks) is reported as the year in which the chick hatched; i.e. the second half of the split year, (e.g., eggs laid in 2007, chicks hatched and fledged in 2008, counts reported as 2008).

If a range of years is presented, it should be assumed that the monitoring was continuous during that time. If the years of monitoring are discontinuous, the actual years in which monitoring occurred are indicated.

(ii) Methods Rating Matrix (based on NZ rating system)

METHOD
A Counts of nests with eggs (Errors here are detection errors (the probability of not detecting a bird despite its being present during a survey), the "nest-failure error" (the probability of not counting a nesting bird because the nest had failed prior to the survey, or had not laid at the time of the survey) and sampling error).
B Counts of chicks and extrapolation (Errors here are detection error, sampling and nest-failure error. The latter is probably harder to estimate later in the breeding season than during the incubation period, due to the tendency for egg- and chick-failures to show high interannual variability compared with breeding frequency within a species).
C Counts of nest sites (Errors here are detection error, sampling error and "occupancy error" (probability of counting a site or burrow as active despite it's not being used for nesting by birds during the season).
D Aerial-photo (Errors here are detection errors, nest-failure error, occupancy error and sampling error (error associated with counting sites from photographs), and "visual obstruction bias" - the obstruction of nest sites from view, always underestimating numbers).
E Ship- or ground- based photo (Errors here are detection error, nest-failure error, occupancy error, sampling error and "visual obstruction bias" (the obstruction of nest sites from view from low-angle photos, always underestimating numbers)
F Unknown
G Count of eggs in subsample population
H Count of chicks in subsample population and extrapolation (chicks x breeding success - no count of eggs)

RELIABILITY
1 Census with errors estimated
2 Distance-sampling of representative portions of colonies/sites with errors estimated
3 Survey of quadrats or transects of representative portions of colonies/sites with errors estimated
4 Survey of quadrats or transects without representative sampling but with errors estimated
5 Survey of quadrats or transects without representative sampling nor errors estimated
6 Unknown

(iii) Population Survey Accuracy
High Within 10% of stated figure;
Medium Within 50% of stated figure;
Low Within 100% of stated figure (e.g. coarsely assessed via area of occupancy and assumed density)
Unknown

(iv) Population Trend
Where calculated, trend analyses were run in TRIM software using the linear trend model with stepwise selection of change points (missing values removed) with serial correlation taken into account but not overdispersion.

(v) Productivity (Breeding Success)
Defined as proportion of eggs that survive to chicks at/near time of fledging unless indicated otherwise

(vi) Juvenile Survival
defined as:

1 Survival to first return/resight;
2 Survival to x age (x specified), or
3 Survival to recruitment into breeding population
4 Other
5 Unknown

(vii) Threats

A combination of scope (proportion of population) and severity (intensity) provide a level or magnitude of threat. Both scope and severity assess not only current threat impacts but also the anticipated threat impacts over the next decade or so, assuming the continuation of current conditions and trends.

		Scope (% population affected)			
		Very High (71-100%)	High (31-70%)	Medium (11-30%)	Low (1-10%)
Severity (likely % reduction of affected population within ten years)	Very High (71-100%)	**Very High**	**High**	**Medium**	**Low**
	High (31-70%)	**High**	**High**	**Medium**	**Low**
	Medium (11-30%)	**Medium**	**Medium**	**Medium**	**Low**
	Low (1-10%)	**Low**	**Low**	**Low**	**Low**

(viii) Maps

The tracking maps shown were created from platform terminal transmitter (PTT) and global-positioning system (GPS) loggers. The tracks were sampled at hourly intervals and then used to produce kernel density distributions, which have been simplified in the maps to show the 50%, 75% and 95% utilisation distributions (i.e. where the birds spend x% of their time). The full range (i.e. 100% utilisation distribution) is also shown. Note that the smoothing parameter used to create the kernel grids was 1 degree, so the full range will show the area within 1 degree of a track. In some cases the PTTs were duty-cycled: if the off cycle was more than 24 hours it was not assumed that the bird flew in a straight line between successive on cycles, resulting in isolated 'blobs' on the distribution maps. It is important to realise that these maps can only show where tracked birds were, and blank areas on the maps do not necessarily indicate an absence of the particular species.