Sooty Albatross
Phoebetria fusca

Albatros fuligineux à dos sombe
Albatros oscuro

CRITICALY ENDANGERED | ENDANGERED | VULNERABLE | NEAR THREATENED | LEAST CONCERN | NOT LISTED

Sometimes referred to as
Dark-mantled Sooty Albatross

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TAXONOMY

Order Procellariiformes
Family Diomedeidae
Genus *Phoebetria*
Species *P. fusca*

The genus *Phoebetria* was created by Reichenbach in 1853, but included only one species, *P. fuliginosa.* Although the Sooty Albatross (*P. fusca)* was first collected in 1822 and the similar Light-mantled Albatross (*P. palpebrata*) in 1795, it was not until 1913 that Cushman Murphy revised the genus to include both *P. fusca* and *P. palpebrata* [1]. More recent analyses of complete mitochondrial cytochrome-*b* gene sequences have confirmed the placement of both species within this genus [2].

CONSERVATION LISTINGS AND PLANS

International

- Agreement on the Conservation of Albatrosses and Petrels - Annex 1 [3]
- 2010 IUCN Red List of Threatened Species - Endangered (since 2003) [4]
- Convention on Migratory Species - Appendix II [5]

Australia

- *Environment Protection and Biodiversity Conservation Act* 1999 (*EPBC Act 1999*) [6]
  - Vulnerable
  - Migratory Species
  - Marine Species
- Threat Abatement Plan 2006 for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations [7]
- National Recovery Plan for Albatrosses and Giant Petrels 2001 [8]
- **South Australia:** *National Parks and Wildlife Act 1972* - Vulnerable (as *Diomedea fusca*) [9]
- **Tasmania:** *Threatened Species Protection Act 1995* - Rare [10]
- **Victoria:** *Flora and Fauna Guarantee Act 1988* - Threatened [11]
- **Western Australia:** *Wildlife Conservation Act 1950 - Wildlife Conservation (Specially Protected Fauna) Notice 2008 (2)* - Vulnerable [12]

Chile

- National Plan of Action for reducing by-catch of seabirds in longline fisheries (PAN-AM/CHILE) 2007 [13]

France

- *Ministerial Order of 14 August 1998 (Arrêté du 14 août 1998)* - Listed Protected Species [14]

South Africa

- *Sea Birds and Seals Protection Act, 1973 (Act No. 46 of 1973)* [15]
- *Marine Living Resources Act (Act No. 18 of 1996):* Policy on the Management of Seals, Seabirds and Shorebirds: 2007 [16]
- National Plan of Action for Reducing the Incidental Catch of Seabirds in Longline Fisheries 2008 [17]

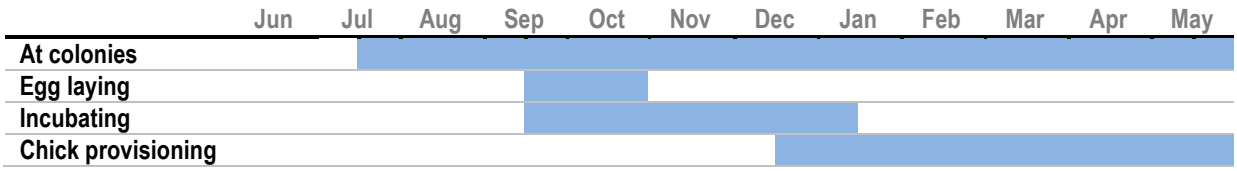
Tristan da Cunha, UK Overseas Territories

- *The Conservation of Native Organisms and Natural Habitats (Tristan da Cunha) Ordinance 2006* [18]

BREEDING BIOLOGY

Phoebetria fusca is a biennial breeder and lays a single egg with no replacement laying. This species nests solitarily or in small colonies or clusters, building pedestal nests along sheltered cliff edges [19, 20]. Birds show high fidelity to nesting colonies and arrive on Marion and Gough Islands and Iles Crozet in late August but one month earlier at the main group of Tristan da Cunha Islands. Egg laying ranges from mid-September to late October (Table 1), although synchronised within each colony, and incubation duties are shared [20]. Eggs hatch in early to mid-December after incubation periods averaging 70-71 days (range 66-71 days on Iles Crozet [19] and 69-73 days on Marion Island [20]); chicks are brooded for an additional 21 days. Chicks fledge in May. On Iles Crozet, the average age of first breeding is 11.8 years [21].

Table 1. *Breeding cycle of* P. fusca across all sites. See text for site-specific periods.



BREEDING STATES

Table 2. *Distribution of the global* P. fusca *population among Parties to the Agreement*

	UK	France	South Africa
Breeding pairs	62%	20%	18%

BREEDING SITES

Phoebetria fusca breeds on Prince Edward and Marion Islands (South Africa), Iles Kerguelen, Iles Crozet, Ile Amsterdam and Ile Saint Paul (France), as well as Gough and Tristan da Cunha Islands (United Kingdom) which are thought to hold over 60% of the global population (Table 3). Counts vary in accuracy, given difficulties in detecting nests in inaccessible terrain and scanning from a distance. In 1998, the global population was estimated to be about 15,655 breeding pairs on 15 islands or approximately 100,000 individual birds [22]. More recent estimates considered to be of medium or high accuracy are reported for Ile de la Possession (Iles Crozet), Ile Saint Paul, Prince Edward and Marion Islands (Table 3).

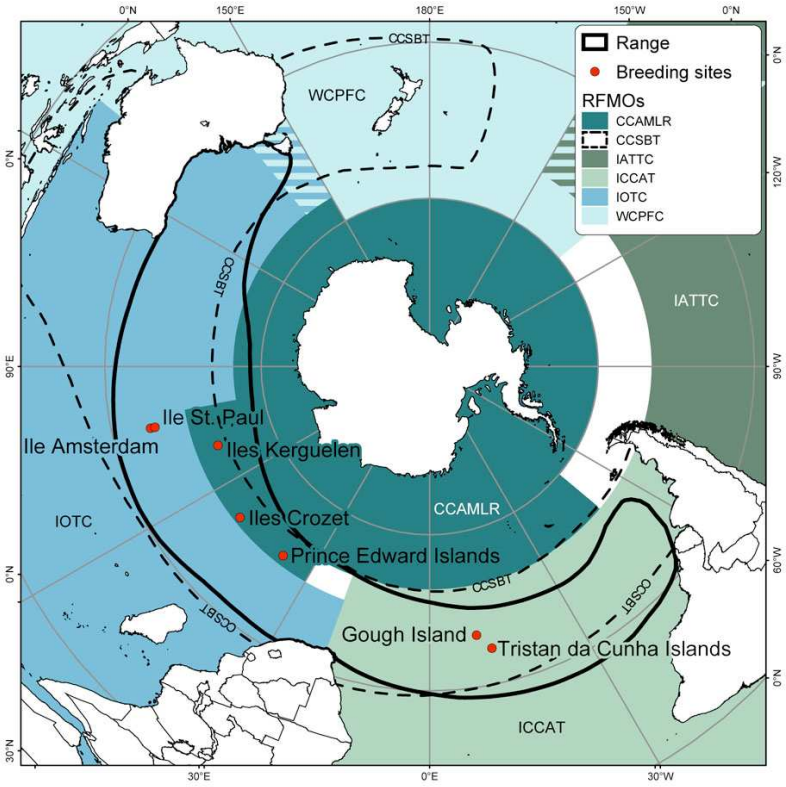


Figure 1. *The location of the breeding sites and approximate range of* P. fusca *with the boundaries of selected Regional Fisheries Management Organisations (RFMO) also shown.*

CCAMLR - Commission for the Conservation of Antarctic Marine Living Resources
CCSBT - Convention for the Conservation of Southern Bluefin Tuna
IATTC - Inter-American Tropical Tuna Commission
ICCAT - International Commission for the Conservation of Atlantic Tunas
IOTC - Indian Ocean Tuna Commission
WCPFC - Western and Central Pacific Fisheries Commission

Table 3. *Monitoring methods and estimates of the population size (annual breeding pairs) for each breeding site. Table based on unpublished data from Centre d'Etudes Biologiques de Chizé, Centre National de la Recherche Scientifique (CNRS) - Ile Amsterdam and Ile Saint Paul; J Cooper, RJM Crawford, BM Dyer, PG Ryan and SL Petersen - Marion and Prince Edward Islands, and published references as indicated.*

Breeding site location	Jurisdiction	Years monitored	Monitoring method	Monitoring accuracy	Annual breeding pairs (last census)
Iles Crozet					
46° 26'S, 51° 47'E					
Ile de la Possession		1980-2006	A	High	114 (2006) [23]
Ile de l'Est	France	1984	F	High	1,300 (1984) [24]
Ile aux Cochons		1976	F	Low	400-500 (1976) [25]
Ile des Pingouins		1984	F	Low	250 (1984) [24]
Ilots des Apôtres		1984	F	Low	20-30 (1984) [24]
Total					**2,084-2,264**
% of all sites					***c.* 15.8%**
Iles Kerguelen					
49° 09'S, 69° 16'E	France	1985-1987	A	High	3-5 (1987) [26]
Total					**3-5**
% of all sites					***c.* < 0.1%**
Iles Amsterdam					
37° 50'S, 77° 31'E	France	2003	F	High	474 (2003)
Ile Saint Paul					
38° 43' S 77° 32' E		2005	A	High	12-14 (2005)
Total					**486-488**
% of all sites					***c.* 3.7%**

Marion Island 46° 54'S, 37° 45'E	South Africa	1965; 1974-1976; 1986-1987; 1996-2005, 2009	A	Medium	1,283 (2009)
Prince Edward Island 46° 38'S, 37° 57'E		2001-2002, 2009	A	High	1,210 (2009)
Total					**2,493**
% of all sites					**18.8%**
Tristan da Cunha 37° 03'S, 12° 13'E					
Gough Island	UK	1974-2001	F	Low	< 5,000 (2001) [27]
Inaccessible Island		2000	F	Medium	> 500 (2000) [28]
Nightingale Islands		1974	F	Unknown	100-200 (1974) [29]
Stoltenhoff Island		1974	F	Unknown	25-50 (1974) [29]
Tristan Island		1974	F	Unknown	2,000-3,000 (1974) [29]
Total					**7,625-8,750**
% of all sites					***c.* 61.7%**
Total					***13,345 (12,691-14,000)***

CONSERVATION LISTINGS AND PLANS FOR THE BREEDING SITES

International

Prince Edward Islands, Iles Crozet, Iles Kerguelen, Ile Amsterdam and Ile Saint Paul

- Ramsar Convention List of Wetlands of International Importance (Prince Edward Islands inscribed 2007, others in 2008) [30]

Gough Island and Inaccessible Island

- UNESCO Natural World Heritage List - Gough Island Nature Reserve inscribed in 1995, extended to include Inaccessible Island in 2004 [31]
- Ramsar Convention List of Wetlands of International Importance [30]

France

Iles Crozet, Iles Kerguelen, Ile St Paul and Ile d'Amsterdam

- National Nature Reserve (*Réserve Naturelle Nationale*) - Décret n°2006-1211 [32]. Specific areas have higher level of protection (Integral Protection Areas, *Aires de Protection Intégrale*): Iles Crozet except Ile de la Possession; Ile Saint Paul; some islands and coastal areas in Kerguelen.

French Southern Territories (Terres Australes et Antarctiques Françaises, TAAF)

Iles Crozet (some costal areas of Possession Island) ; Iles Kerguelen (Sourcils Noir, some islands and coastal parts of Golfe du Morbihan); Ile d'Amsterdam (Entrecasteaux, Plateau des Tourbières).

- Areas Reserved for Technical and Scientific Research (*Zones Réservées à la Recherche Scientifique et Technique)* Arrêté n°14 du 30 juillet 1985 [33], now included in Natural Reserve Management Plan [32].

South Africa

Prince Edward Islands

- Special Nature Reserve - *Environment Conservation Act (No. 73 of 1989),* declared in 1995 [34]
- Prince Edward Islands Management Plan 1996 [35]

Tristan da Cunha, UK Overseas Territories

Gough Island, Inaccessible Island

- Nature Reserve – *The Conservation of Native Organisms and Natural Habitats (Tristan da Cunha) Ordinance 2006* [18]
- Gough Island Management Plan 1994 [36]
- Inaccessible Island Nature Reserve Management Plan 2001 [37]

POPULATION TRENDS

Limited information is available to determine population trends for *P. fusca,* but declines have been reported at all sites where repeated surveys have been carried out (Table 4). On Ile de la Possession (Iles Crozet), the breeding population declined by 58% between 1980 and 1995 [38] and by 82% between 1980 and 2006 at an average rate of -4.2% per year [23] (Figure 2). The breeding population on Marion Island declined by 25% between 1990 and 1998, or about -2.6% per year [39] (Figure 3). Between 1987 and 2005 the rate of decline averaged -4.9% per year ($p<0.01$) (Table 4). On Gough Island, the breeding population declined 60% between 1972 and 2000, or about -3.2% per year [27]. These population decreases are generally considered to be the result of low survival of adult and immature birds [24] caused by at-sea mortality associated with fisheries, particularly longline fishing vessels [22, 23, 38].

Data on the demographic parameters for this species are very limited for most sites (Table 5). Breeding success ranges from 19% on Marion Island [20] to 65.4% on Ile de la Possession (Iles Crozet) [23]. Adult and juvenile survival rates are known only for Ile de la Possession [38].

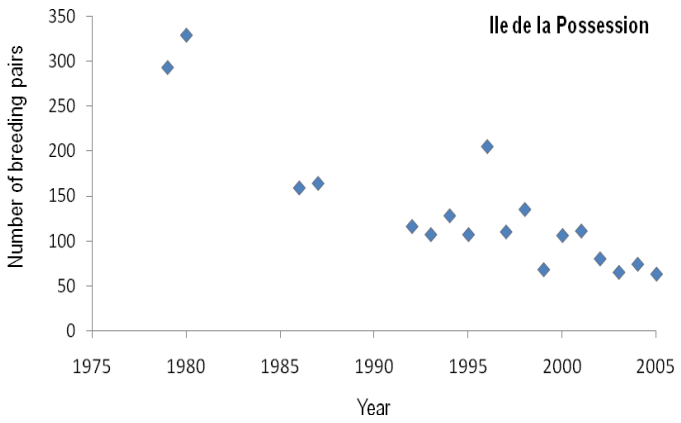


Figure 2. *Counts of nesting pairs at Ile de la Possession, Iles Crozet. Based on Delord* et al. *2008 [23].*

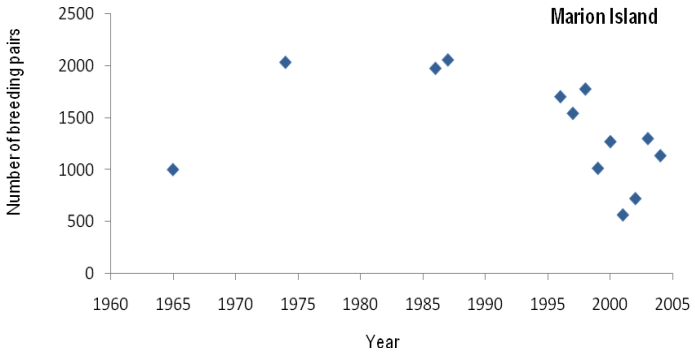


Figure 3. *Counts of nesting pairs at Marion Island. Based on Crawford* et al. *2003 [39] and unpublished data from RJM Crawford, DEAT and PG Ryan, University of Cape Town. Data not to be used without data holders' permission.*

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Table 4. *Summary of population trend data for* P. fusca. *Based on unpublished Marion Island data from J Cooper, RJM Crawford, BM Dyer, PG Ryan and SL Petersen and published references as indicated.*

Breeding site	Current Monitoring	Trend Years	% average change per year (95% CI) [40]	Trend	% of population
Iles Crozet					
Ile de la Possession	Yes	1980-2006	-4.2 (-5.2, -3.1) [23]	Declining	100%
Ile de l'Est	No	-	-	Unknown	-
Ile aux Cochons	No	-	-	Unknown	-
Ile des Pingouins	No	-	-	Unknown	-
Ile des Apôtres	No	-	-	Unknown	-
Iles Kerguelen	No	-	-	Unknown	-
Ile Amsterdam	Yes	-	-	Unknown	-
Ile Saint Paul	No	-	-	Unknown	-
Marion Island	Yes	1990-1998	-2.5%[41]	Declining	?
		1987-2005	-4.9 (-4.6, -5.1)	Declining	100%
Prince Edward Island	Yes?	-	-	Unknown	-
Tristan da Cunha					
Gough Island	Yes	1972-2000	-3.2% [27]	Declining	?
Inaccessible Island	?	-	-	Unknown	-
Nightingale Islands	?	-	-	Unknown	-
Stoltenhoff Island	?	-	-	Unknown	-
Tristan Island	?	-	-	Unknown	-

Table 5. *Summary of demographic data for* P. fusca *breeding sites.*

Breeding site	Mean breeding success (±SD; study period)	Mean juvenile survival (±SD; study period)	Mean adult survival (±SD; study period)
Iles Crozet			
Ile de la Possession	58.3% (±18.2%; 1967-95) [38] 65.4% (±2.7% SE; 1981-2005) [23]	22.4% (±11.7%; 1967-95) [38]	89.8% (±0.5%; 1967-95) [38]
Ile de l'Est	No data	No data	No data
Ile aux Cochons	No data	No data	No data
Ile des Pingouins	No data	No data	No data
Ile des Apôtres	No data	No data	No data
Iles Kerguelen	No data	No data	No data
Ile Amsterdam	No data	No data	No data
Ile Saint Paul	No data	No data	No data
Marion Island	19% (±8.4%; 1974-76) [20]	No data	No data
Prince Edward Island	No data	No data	No data
Tristan da Cunha			
Gough Island	No data	No data	No data
Inaccessible Island	No data	No data	No data
Nightingale Islands	No data	No data	No data
Stoltenhoff Island	No data	No data	No data
Tristan Island	No data	No data	No data

BREEDING SITES: THREATS

Threats at the breeding sites of *P. fusca* are poorly known due to the inaccessibility of nests and lack of monitoring at most sites (Table 6).

Table 6. *Summary of known threats causing population level changes at the breeding sites of* P. fusca. *Table based on information submitted to the ACAP Breeding Sites Working Group in 2008.*

Breeding site	Human disturbance	Human take	Natural disaster	Parasite or pathogen	Habitat loss or degradation	Predation (alien species)	Contamination
Iles Crozet							
Ile de la Possession	no	no	no	no	no	no [a]	no
Ile de l'Est	no	no	no	no	no	no	no
Ile aux Cochons	no	no	no	no	no	no [a]	no
Ile des Pingouins	no	no	no	no	no	no	no
Ile des Apôtres	no	no	no	no	no	no	no
Iles Kerguelen	no	no	no	no	no	no [a]	no
Ile Amsterdam	no	no	no [b]	Low [c]	no	Low [a]	no
Ile Saint Paul	no	no	no [b]	no	no	no	no
Marion Island	no	no	no	no	no	no [a]	no
Prince Edward Island	no	no	no	no	no	no	no
Tristan da Cunha							
Gough Island	no	no	no	no	no	no [a]	no
Inaccessible Island	no	no	no	no	no	no	no
Nightingale Islands	no	no	no	no	no	no	no
Stoltenhoff Island	no	no	no	no	no	no [a]	no
Tristan Island	no	no	no	no	no	no	no

[a] Cats *Felis catus* and mice *Mus musculus* are present on Ile aux Cochons, rats (*Rattus rattus* and *R. norvegicus*) and mice are found on Ile de la Possession, while cats, Black rats *R. rattus* and mice occur on Iles Kerguelen, but there is no evidence of impact on *P. fusca* from any of these species at these sites. However, both cats and Black rats are known to impact the species sufficiently to cause population level changes on Amsterdam Island. House mice and Black rats are present on Tristan Island, with house mice also found on Marion and Gough Islands. Although neither species has been documented to prey upon *P. fusca* at Marion or Tristan Islands, recently there has been an isolated report of a chick killed in its nest by mice on Gough Island (J Cooper, pers. comm.).

[b] Repeated fires on Iles Saint Paul and Amsterdam may have resulted in loss of vegetation for cover and nest construction at breeding sites [42].

[c] Both the infectious bacterium *Erysipelas* and avian cholera *Pasteurella multocida* may have caused mortality in chicks as well as adults on Amsterdam Island [43].

FORAGING ECOLOGY AND DIET

Phoebetria fusca, like other albatrosses, feeds mainly by surface-seizing. Squid, fish, crustaceans and carrion all feature prominently in the diet, although proportions of each vary between years and locations. On Iles Crozet, over 95% of regurgitated food samples were squid as represented by frequency of occurrence [19]; similar results were reported on Marion Island [44]. Scavenging behaviour was suggested based on identification of several squid taxa which are known to float after death [19, 44]. This species depends upon seabird carrion more than other albatrosses, including dead penguins and small petrels [44, 45]. *Phoebetria fusca* follows fishing boats to scavenge offal at least occasionally [19, 22, 46]. Adults make a combination of long commuting flights early in the incubation period, looping searching flights later in incubation and linear searching during chick brooding [47]. Based on their dark plumage, it has been suggested that both *Phoebetria* species feed nocturnally [19]. However, data from leg-mounted temperature loggers showed that *P. fusca* made frequent landings and take-offs during the day which probably represents foraging activity [48]. Dietary differences between males and females or between seasons are currently unknown.

MARINE DISTRIBUTION

The pelagic distribution of *P. fusca* is mainly between 30°S and 60°S in the southern Indian and Atlantic Oceans, with a southern limit of *c.* 65°S near Antarctica and a northern limit of *c.* 20°S [19, 20]. Adults move north in winter from sub-Antarctic to subtropical seas [49], whereas immature birds tend to remain in subtropical seas year round [50]. In Crozet Islands, immature birds also remain in subtropical seas, and non-breeding adult birds disperse throughout Indian Ocean, regularly foraging in Great Australian Bight (H. Weimerskirch, unpublished data).The species infrequently disperses eastward to the Tasman Sea and New Zealand waters [1].

The distribution overlaps with several major southern hemisphere Regional Fisheries Management Organisations (Table 7, see also Figure 1), including SWIOFC (South-West Indian Ocean Fisheries Commission), SIOFA (Southern Indian Ocean Fisheries Agreement), SEAFO (South-East Atlantic Fisheries Organisation), and the yet to be established South Pacific Regional Fisheries Management Organisation (SPRFMO).

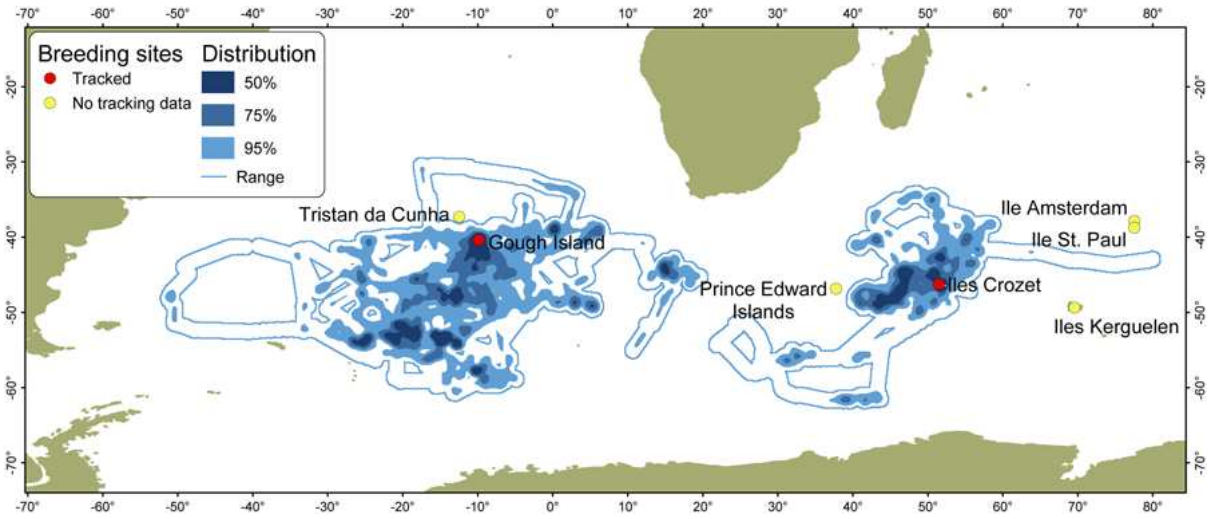

Figure 4. *Satellite-tracking data from breeding* P. fusca *(Number of tracks = 32). Map based on data contributed to the BirdLife Global Procellariiform Tracking Database.*

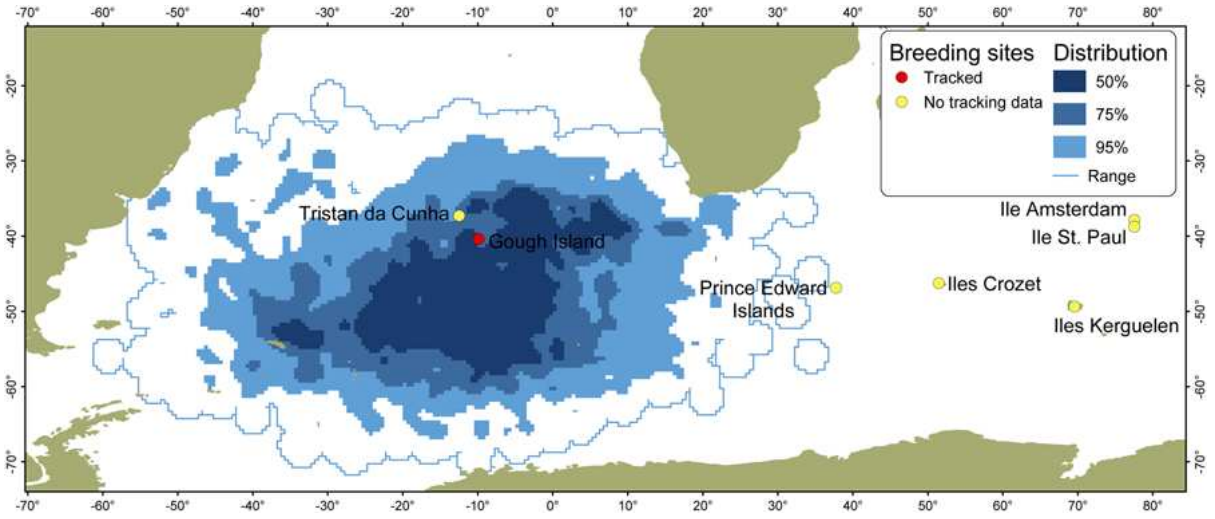

Figure 5. *Satellite-tracking data from non-breeding* P. fusca *from Gough Island (Number of tracks = 21). Map based on data contributed to the BirdLife Global Procellariiform Tracking Database.*

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

	Resident/ Breeding and feeding range	Foraging range only	Few records - outside core foraging range
Known ACAP Range States	France South Africa UK	Australia Uruguay	Argentina New Zealand Chile Brazil
Exclusive Economic Zones of non-ACAP countries	-	-	Mauritius Madagascar Mozambique Namibia
Regional Fisheries Management Organisations [1]	ICCAT CCAMLR CCSBT IOTC SIOFA SEAFO SWIOFC	-	WCPFC SPRFMO

[1] See Figure 1 and text for list of acronyms

MARINE THREATS

The primary threat to *P. fusca* is mortality associated with fisheries, specifically longlining, and is likely to be the reason behind population decreases [22, 23, 38]. An estimated maximum of 161 *P. fusca* per year was caught by the Japanese tuna fleet in the Australian Fishing Zone 1989-1995 [51]. However, because of the pelagic nature of this species, it is likely that proportionally higher numbers are killed on the high seas than in Exclusive Economic Zone fisheries [22]. These birds forage in subtropical seas frequented by Asian longline fishing vessels and consequently come under threat as bycatch. Lack of band returns indicates a lack of observers in these feeding areas rather than a low mortality rate [23, 38]; however, the first documented band recovery of this species was reported from a Taiwanese longline vessel [23].

Little information exists on the potential effects of contaminants, oil spills or marine debris. Some plastic debris is present in stomach contents and pellets [52].

KEY GAPS IN SPECIES ASSESSMENT

Population dynamics at most colonies remain unknown, particularly breeding frequency, adult and fledgling survival rates, recruitment of juveniles into breeding colonies, natal philopatry and longevity. Repeated and standardised surveys at key breeding sites are critical, particularly at Gough and Tristan da Cunha Islands. Finally, more information is required on movements and foraging distribution of both adults and fledglings, particularly during the non-breeding period, as well as the extent of overlap with fisheries, and incidental mortality rates.

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RECOMMENDED CITATION

Agreement on the Conservation of Albatrosses and Petrels. 2010. ACAP Species assessments: Sooty Albatross *Phoebetria fusca.* Downloaded from http://www.acap.aq on 6 October 2010.

GLOSSARY AND NOTES

(i) **Years**.

The "split-year" system is used. Any count (whether breeding pairs or fledglings) made in the austral summer (e.g. of 1993/94) is reported as the second half of this split year (i.e. 1994).

The only species which present potential problems in this respect are *Diomedea* albatrosses, which lay in December-January, but whose fledglings do not depart until the following October-December. In order to keep records of each breeding season together, breeding counts from e.g. December 1993-January 1994 and productivity counts (of chicks/fledglings) of October-December 1994 are reported as 1994.

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 nesting adults (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 (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 (eg coarsely assessed via area of occupancy and assumed density)

Unknown

(iv) Population Trend

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 satellite-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.