Wandering Albatross

Diomedea exulans

Albatros viajero/ Albatros errante
Albatros hurleur

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

Sometimes referred to as
Snowy albatross

Photo © Rowan Trebilco

TAXONOMY

Order Procellariiformes
Family Diomedeidae
Genus *Diomedea*
Species *D. exulans*

Debate has long surrounded the taxonomy of the Wandering Albatross which until the early 1980s was thought to be one species: *Diomedea exulans* (Linnaeus 1758). In 1983, Roux *et al*. [1] proposed, based on size and plumage maturation data, that the Wandering-type albatross breeding on Amsterdam Island in the Indian Ocean was a separate species (*Diomedea amsterdamensis*). Later Warham [2] argued that *D. amsterdamensis* should be considered a subspecies of *D. exulans* and also proposed four additional subspecies within the complex: *Diomedea exulans exulans, D. e. chionoptera*, plus two other subspecies later named *D. e. antipodensis* and *D. e. gibsoni* by Robertson & Warham [3]. Following rules of taxonomic precedence, Medway [4] argued that the large, high latitude form should be named *D. e. exulans* (replacing *chionoptera*) while the smaller birds of the Tristan-Gough group be called *D.e. dabbenena* (replacing *exulans*). Robertson & Nunn [5] did not adopt this nomenclature when they elevated the five subspecies to species level (*Diomedea exulans; D. chionoptera; D. amsterdamensis; D. antipodensis* and *D. gibsoni*), however Gales [6] and Croxall & Gales [7] followed Medway's [4] nomenclature and also recognised five species (*Diomedea exulans; D. dabbenena; D. amsterdamensis; D. antipodensis* and *D. gibsoni*). A detailed genetic study by Burg & Croxall [8] showed four distinct taxa: *Diomedea exulans*; *D. dabbenena; D. amsterdamensis* plus *D. antipodensis* and *D. gibsoni* as a single grouping. Most recent publications and ACAP recognise *Diomedea exulans, D. dabbenena* and *D. amsterdamensis* as full species [9, 10, 11, but see 12], however, the treatment of *D. antipodensis* and *D. gibsoni* currently varies between a single species, two subspecies, and two species [e.g. 9, 11, 13, 14]. At the second meeting of the ACAP Advisory Committee in 2006 it was decided that available data did not justify the recognition of *D. antipodensis* and *D. gibsoni* as separate species and therefore these taxa were subsumed under the single name *D. antipodensis* (Antipodean Albatross) [15].

CONSERVATION LISTINGS AND PLANS

International

- Agreement on the Conservation of Albatrosses and Petrels – Annex 1 [16]
- 2008 IUCN Red List of Threatened Species – Vulnerable (since 2000) [17]
- Convention on Migratory Species - Appendix II [18]

Australia

- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC ACT*) [19]
  - Vulnerable
  - Migratory Species
  - Marine Species
- Recovery Plan for Albatrosses and Petrels (2001) [20]
- Threat Abatement Plan 2006 for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations [21]

South Australia

- *National Parks and Wildlife Act 1972* – Vulnerable [22]

Tasmania

- *Threatened Species Protection Act 1995* – Endangered [23]

Victoria

- *Flora and Fauna Guarantee Act 1988* - Threatened [24]

Western Australia

- *Wildlife conservation Act 1950 - Wildlife Conservation (Specially Protected Fauna) Notice 2008 (2)* – Fauna that is rare or is likely to become extinct [25]

Brazil

- National Species List of Brazilian Fauna Threatened with Extinction (*Lista Nacional das Espécies da Fauna Brasileira Ameaçadas de Extinção*) - Vulnerable [26]
- National Plan of Action for the Conservation of Albatrosses and Petrels (NPOA - Seabirds Brazil) [27]

Chile

- National Plan of Action for reducing by-catch of seabirds in longline fisheries (PAN-AM/CHILE) 2007 [28]

Falkland Islands (Islas Malvinas)

- *Conservation of Wildlife and Nature Ordinance 1999* [29]
- *Fisheries (Conservation and Management) Ordinance 2005* [30]
- Falkland Islands FAO National Plan of Action for Reducing Incidental Catch of Seabirds In Longline Fisheries 2004 [31]

France

- *Ministerial Order of 14 August 1998 (Arrêté du 14 août 1998)* [32]
  - Listed Protected Species

New Zealand

- *New Zealand Wildlife Act 1953* [33]
- Action Plan for Seabird Conservation in New Zealand; Part B: Non-Threatened Seabirds [34]

South Africa

- *Sea Birds and Seals Protection Act, 1973 (Act No. 46 of 1973) (SBSPA)* [35]
- *Marine Living Resources Act (Act No. 18 of 1996)*: Publication of Policy on the Management of Seals, Seabirds and Shorebirds: 2007 [36]
- National Plan of Action (NPOA) for Reducing the Incidental Catch of Seabirds in Longline Fisheries 2008 [37]

South Georgia (Islas Georgias del Sur)

- *Falkland Island Dependencies Conservation Ordinance 1975* [38]
- FAO International Plan of Action - Seabirds: An assessment for fisheries operating in South Georgia and South Sandwich Islands [39]

Uruguay

- National Plan of Action for Reducing the Incidental Catch of Seabirds in Uruguayan Fisheries (PAN - Aves Marinas Uruguay) 2007 [40]

BREEDING BIOLOGY

Diomedea exulans is a biennial breeding species, although about 30% of successful and 35% of failed breeders (on average) defer breeding beyond the expected year [41]. The total breeding season just exceeds one year (Table 1). Adults return to colonies in November, about 27 days before laying [42]. Eggs are laid over a period of about 5 weeks during December – January, hatching mostly in March after mean incubation of 78-79 days [42]. On South Georgia (Islas Georgias del Sur), most chicks fledge in December after 278 days in the nest, but about a week less on Crozet Islands [42].

Birds usually return to colonies when 5-7 years old, although they can be as young as 3 years on South Georgia (Georgias del Sur) [43] and as old as 14 years on Crozet Islands [44]. On Crozet Islands, *D. exulans* begin breeding when at least 7 years old (mean age 9.6 years for females and 10.4 years for males for 9 cohorts between 1982 and 1990) [45], and on South Georgia (Georgias del Sur) when at least 8 years old (mean age 10.4 years for females and 10.7 years for males for 1972 – 1980 cohorts) but had decreased by 1.3-1.6 years per decade by 1996 [41].

Table 1. *Breeding cycle of* D.exulans.

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

BREEDING STATES

Table 2. *Distribution of the global* D. exulans *population among Parties to the Agreement.*

	Disputed*	Australia	France	South Africa
Breeding pairs	18%	<1%	38%	44%

*A dispute exists between the Governments of Argentina and the United Kingdom of Great Britain and Northern Ireland concerning sovereignty over the Falkland Islands (Islas Malvinas), South Georgia and the South Sandwich Islands (Islas Georgias del Sur y Islas Sandwich del Sur) and the surrounding maritime areas.

Photo © R. Wanless & A. Angel

BREEDING SITES

Diomedea exulans breed on the French subantarctic island groups of Crozet and Kerguelen, on South Africa's Prince Edward Islands, Australia's Macquarie Island and on South Georgia (Islas Georgias del Sur) (Table 2, Figure 1). The total annual breeding population, based on a combination of published and unpublished data submitted to ACAP in 2007, is estimated at approximately 8,050 pairs (Table 3). This is 5 percent less than the 1998 figure of 8,500 pairs, thought to represent about 28,000 mature individuals and a total population of 55,000 [6]. The three island groups in the Indian Ocean sector (Prince Edward, Crozet and Kerguelen) account for approximately 82% of the global population. Approximately 3,580 pairs, or 44% of the total population, breed on the Prince Edward Islands Group (including Marion Island). At the other extreme, the Macquarie Island population numbers only 5-10 breeding pairs annually.

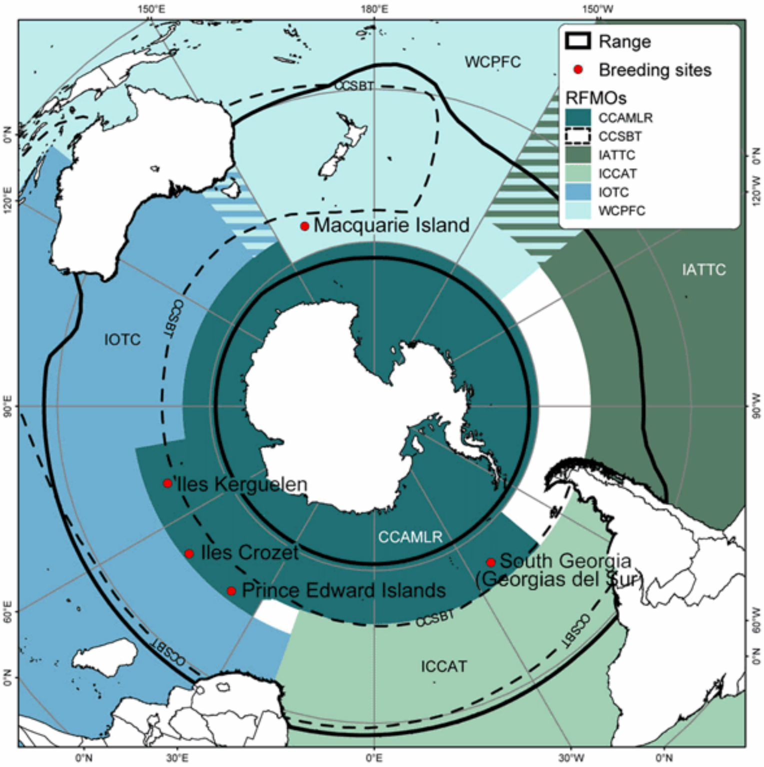

Figure 1. The breeding sites and approximate range of D. exulans. *The boundaries of selected Regional Fisheries Management Organisations (RFMOs) are also shown.*

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 Tasmanian Department of Primary Industries and Water (DPIW) data (Macquarie Island), unpublished British Antarctic Survey (BAS) data (Bird Island), unpublished R.J.M. Crawford and B.M. Dyer, DAAF data (Marion Island), unpublished H. Weimerskirch, Centre National De La Recherche Scientifique (CNRS) Chizé data (Ile de la Possession, Courbet Peninsula, Leygues Island), and published references as indicated.

Breeding site	Jurisdiction	Years monitored	Monitoring method	Monitoring accuracy	Annual Breeding pairs (last census)
Macquarie Island 54° 30'S, 158° 55'E	Australia	1964-2008	A	High	5 (2008)
Total **% of all sites**					**5** **0.1%**
South Georgia (Islas Georgias del Sur) 54° 00'S, 38° 36'W					
Bird Island	Disputed*	1972-2007	A	High	802 (2007)
Albatross Island		1984,2004	A	High	155 (2004) [46]
Annekov Island		1984,2004	A	High	193 (2004) [46]
Prion Island		1984,2004	A	High	43 (2004) [46]
Saddle Island		1984,2004	A	High	40 (2004) [46]
Cape Alexandra		1984,2004	A	High	40 (2004) [46]
Other sites		1984,2004	A	High	147 (2004) [46]
Total **% of all sites**					**1,420** **17.6%**

Iles Crozet					
46° 26'S, 51° 47'E					
Ile de la Possession	France	1960,1968-1969,1975-1977, 1981-2008	A	High	349 (2008)
Ile aux Cochons		1976	A	High	1,060 (1998) [6]
Ile de l'Est		1982	A	High	329 (1982) [47]
Iles des Apôtres		1982	A	high	120 (1982) [47]
Total					**1,858**
% of all sites					**23.1%**
Iles Kerguelen					
49° 09'S, 69° 16'E					
Courbet Peninsula	France	1971, 1985, 1987, 1989-1993, 1996-2007	A	Unknown	385 (2007)
Rallier du Baty Peninsula		1987	A	Unknown	750 (1987) [48]
Joffre Peninsula and Is, Howe Is, other islets		1987	A	Unknown	35 (1987) [48]
Nuageuses Is. Baie Larose		1985	A	Unknown	14 (1985) [48]
Leygues Is		1986	Unknown	Unknown	3 (1986)
Total					**1,187**
% of all sites					**14.7%**
Prince Edward Island 46° 38'S, 37° 57'E	South Africa	1984, 2002, 2008	A	High	1,850 (2002) [49]
Marion Island 46° 54'S, 37° 45'E		1975-2008	A	High	1,730 (2007)
Total					**3,580**
% of all sites					**44.5%**
Total for all sites					***8,050***

* see Table 2 footnote

CONSERVATION LISTINGS AND PLANS FOR THE BREEDING SITES

International

Macquarie Island

- UNESCO World Heritage List (inscribed 1997) [50]
- UNSECO Biosphere Reserve - Man and the Biosphere Programme (listed 1977) [51]

Prince Edward Islands, Iles Crozet and Iles Kerguelen

- RAMSAR Convention List of Wetlands of International Importance (inscribed 2007 and 2008) [52]

Australia

Macquarie Island

- Register of Critical Habitat (listed 2002) - *EPBC Act 1999* [53]
- Register of the National Estate (until February 2012, listed 1977) – *Australian Heritage Commission Act 1975* [54]
- National Heritage List (listed 2007) - *EPBC Act 1999* [53]

Tasmania

Macquarie Island

- Nature Reserve - *Nature Conservation Act 2002* [55]
- Macquarie Island Nature Reserve and World Heritage Area Management Plan 2006 [56]
- Macquarie Island Pest Eradication Plan. Part A: Overview - March 2007 [57]

France
Iles Crozet and Kerguelen

- National Nature Reserve - *Décret no 2006-1211* [58]

French Southern Territories (Terres australes et antarctiques françaises, TAAF)
Ilots des Apõtres

- Controlled access areas - *Arrêté 15 du 30 juillet 1985* [59]

South Africa
Prince Edward Islands

- Special Nature Reserve (declared 1995) - *National Environmental Management: Protected Areas Act, 2003 (No. 57 of 2003)* [60]
- Prince Edward Islands Management Plan 1996 [61]

South Georgia (Islas Georgias del Sur)

- South Georgia Environmental Management Plan [62]
- South Georgia: Plan for Progress. Managing the Environment 2006 – 2010 [63]

Bird Island, Albatross Island and Annekov Island

- Specially Protected Areas (SPAs) - South Georgia: Plan for Progress. Managing the Environment 2006 – 2010 [63]

POPULATION TRENDS

Long term population studies have been conducted on all five islands or island groups where *D. exulans* breed (Table 4). All populations have shown a decrease at some stage over the last 25 years. The Indian Ocean populations (Crozet, Kerguelen and Prince Edward Islands) have increased recently, whereas the South Georgia population has shown a continuous decline. The status of the extremely small population on Macquarie Island is currently uncertain, with relative trends in numbers and survival in the past similar to those observed in the Indian Ocean populations, prior to an apparent decline in recent years.

South Georgia (Islas Georgias del Sur)

The Bird Island population, which accounted for approximately 60% of the South Georgia (Islas Georgias del Sur) population in 2004 [46], has been monitored continuously since 1972. Since then, it has been declining at an average rate of 1.4% [64] per year (Table 4). The steady average annual decline of 0.61% between 1972 and 1996 has recently accelerated to c. 4.8% per annum since 1996 [64] (Figure 2). Poncet *et al* (2006) [46] have recorded an overall decrease of *c*. 30% from 1984 to 2004 at Bird Island and at the other 29 breeding sites on South Georgia (Islas Georgias del Sur).

Between 1977 and 1990, breeding success on Bird Island had increased by approximately 1.2% pa, or 15% overall [41]. Between 1991 and 1995 it decreased slightly (median values of 68% vs 71 % for the previous five year period) [41]. Mean success between 1976-2004 at Bird Island was 67%, compared with over 70% between 2000-2002 at Albatross Island, and between 1999-2000 at Prion Island (S. Poncet unpublished, Table 5). Juvenile survival of around 50% is comparable to the other breeding sites [41]. Adult survival, however, is the lowest of all breeding sites at 92.6% (Table 5), down from 94% between 1972-1985 [65]. This decrease in survival rates is contributing to the population decline and is linked to the development of longline fisheries targeting species other than tuna in the mid to late 1990s [41].

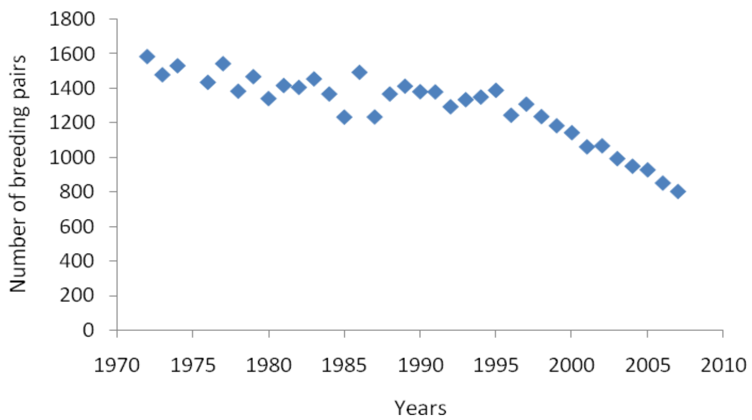

Figure 2. *Population counts of* D. exulans *breeding pairs on Bird Island. Figure based on unpublished BAS data submitted to ACAP in 2007. See text for assessment of population trends.*

Iles Crozet and Kerguelen

The breeding population of *D. exulans* on Ile de la Possession (Iles Crozet) has been one of the most closely monitored of all albatross populations, with long term demographic data collected for a large number of birds. This population decreased steeply during the 1970s (around 7% pa between 1970 and 1976), then more moderately during the early 1980s (1.4 % pa from 1977 to 1985) [66]. By 1986, the population has been reduced by 53.8% from *c.* 500 pairs observed in the late 1960s [66]. Between 1986 and 2004 the population increased steadily at 1.6% (Figure 3, Table 4) [67]. Over the last few years the numbers have been maintained at 300 to 380 pairs (unpublished data, CNRS Chizé Monitoring Database).

Breeding success and adult and juvenile survival have also increased since 1985 after a period of reduced adult, and to a lesser extent juvenile survival in the 1970s [66, 68]. Although demographic data are lacking for Iles Kerguelen, the population trend has followed a similar pattern to that at Crozet [68]. The Courbet Peninsula population declined from *c.* 500 pairs in 1971 to *c.* 200 pairs in 1987, and then recovered to over 300 pairs in 1996, reaching 385 breeding pairs in 2007 (unpublished data, CNRS Chizé).

The slow upward trend for both island groups is a reflection of improved adult survival and recruitment attributed to the Japanese long-line southern bluefin tuna *Thunnus* spp. fishery in the Indian Ocean moving away from the islands [68].

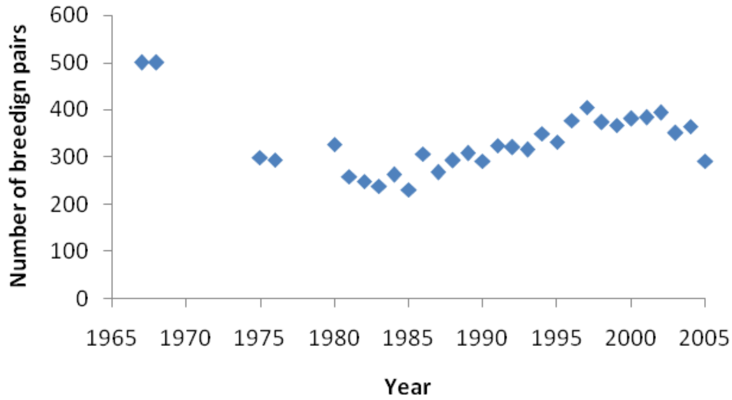

Figure 3. *Population counts of* D. exulans *breeding pairs on Ile de la Possession, Crozet Archipelago. Figure based on Delord* et al. *2008* [67]*. See text for assessment of population trends.*

Prince Edward and Marion Island

The numbers of *D. exulans* breeding pairs on Marion Island have also decreased from the mid 1970s to mid 1980s (at -1.5% pa) and then increased through the 1990s at c. 5.5% pa [69], but this rate of increase has not been sustained in recent years. Instead, the population has been declining at an average of 1.5% per year [64] between 1998 and 2007 (Figure 3). The overall average rate of population increase since 1975 has been less than 0.5% per year [64] (Table 5).

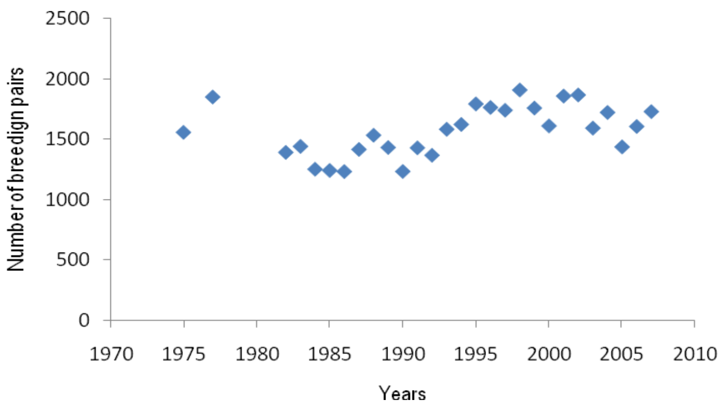

Figure 3. *Population counts of* D. exulans *breeding pairs on Marion Island. Figure based on unpublished J. Cooper, RJM Crawford, B M Dyer, PG Ryan and SL Petersen data submitted to ACAP in 2007. See text for assessment of population trends.*

Breeding success on Marion Island has fallen from an average of 74.6% between 1985 and 2001 [70] to 67.7% for 2002-2007 (Table 5). Juvenile survival has been estimated, but rates are not directly comparable with other islands because of the inclusion of different age classes in analyses. Adult survival since 1985 (to 2001) has been calculated at 94.2% [70]. Long term census data has not been collected on Prince Edward Island.

Table 4. *Summary of population trend data for the main* D. exulans populations.

Breeding site	Current Monitoring	Trend Years	% average change per year [64] (95% Confidence Interval)	Trend	% of population
Macquarie Island	yes	1964-2008	-	Variable	100%
		1965-1984	-9.32% (-7.79, -10.85)	Declining	100%
		1984-1999	6.25 (4.17, 8.33)	Increasing	100%
		1999-2008	-4.27 (0.16, -8.70)	Uncertain	100%
South Georgia					
Bird Island	yes	1972-2007^	-1.38 (-1.42, -1.30)	Declining	100%
		1972-1996^	-0.61 (-0.47, -0.75)	Declining	100%
		1996-2007	-4.77 (-5.10, -4.44)	Declining	100%
Albatross Island	no	1984, 2004	-	-	-
Annekov Island	no	1984, 2004	-	-	-
Crozet Islands					
Ile de la Possession	yes	1969-1985^	-3.0 (-4.6, -1.4) [67]	Declining	100%
		1986-2004	1.6 (0.6, 2.6) [67]	Increasing	100%
Ile aux Cochons	no	-	-	-	-
Ile de l'Est	no	-	-	-	-
Iles des Apôtres	no	-	-	-	-
Kerguelen Islands					
Courbet Peninsula	yes	1971-2007	-	Currently Declining?	100%
Rallier du Baty Peninsula	no	-	-	-	-
Prince Edward Island	no	-	-	Unknown	-
Marion Island	yes	1975-2007^	0.41 (0.29, 0.53)	Increasing	100%
		1998-2007	-1.50 (-0.99, -2.01)	Declining	100%

^ missing data: Bird Island 1975; Marion Island 1976, 1978-1981; Ile de la Possession 1969-1974, 1978

Macquarie Island

The discovery of numerous albatross bones in a cave on the west coast of the island suggests that prior to Macquarie Island being used as a sealing base in the 1800s the *D. exulans* population was much larger than the current 5-10 annual breeding pairs [71, 72]. This extremely small population has approached extinction at least twice in the last 100 years [71, 72]. A long term demographic study began in 1994 but data extracted from historical logbooks going back to 1964 suggests numbers of breeding pairs have fluctuated considerably since the 1960s, with a maximum of 28 in 1968 and minimum of 2 in 1985 [72] (Figure 4). After a period of decline during the 1970s and early 1980s (at 9.32% pa between 1965 and 1984 [64], Table 4), the population recovered at an average of 6.25% per year between 1984 and 1999 [64] (Table 4). However, given the high variability in counts, the underlying trend since 1999 is not clear-cut, with no significant increase or decline (Table 4).

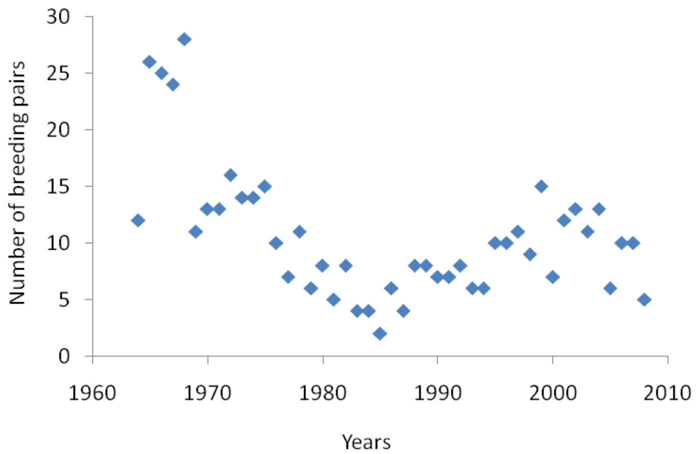

Figure 4. *Population counts of* D. exulans *breeding pairs on Macquarie Island. Figure based on Terauds* et al. *2006* [72] *and unpublished DPIW data. See text for assessment of population trends.*

Breeding success data have been collected continuously since 1964 and varies from 29 to 100%, currently averaging 63.5% ([72] and unpublished DPIW data). Most chicks that fledged between 1955 and 1994 were banded, and all chicks and most unbanded adults have been banded since 1995 [72]. Juvenile survival has varied significantly between 1955 and 1998, but has been increasing in most years since 1979 [72]. Recent estimates place juvenile survival at 45.9% (Table 5). As for the Atlantic Ocean sites, the population fluctuations have been underpinned by changes in (mostly) juvenile survival which coincided with changes in bluefin tuna long-line fishing effort in the Southern Ocean [71, 72]. Adult survival has been more stable than juvenile survival in the same period and latest estimates of 95.3% [72] are the highest of any breeding site (but note the different time periods).

Table 5. *Demographic data for the main* D. exulans *breeding sites. Table based on unpublished DPIW data (Macquarie Island), S. Poncet, unpublished (South Georgia/Islas Georgias del Sur) submitted to ACAP in 2007 and published references as indicated.*

Breeding site	Mean breeding success (±SD; Years)	Mean juvenile survival (±SE; Years)	Mean adult survival (±SD; Years)
Macquarie Island	63.5% (±16.9; 1964-2006)	45.9% (±3.5; 1955-2004)[1] [72]	95.3% (±0.6 SE; 1955-2004)[72]
South Georgia (Islas Georgias del Sur)			
Bird Island	67.0% (±1.0 SE;1976-2004)	48.9-52.4% (1972-1993)[2] [29]	92.6% (1976-2000)
Albatross Island	72.0% (2000-2002)	No data	No data
Prion Island	74.0% (1999,2000)	No data	No data
Iles Crozet			
Ile de la Possession [66]	68.5% (±11.2; 1966-1993) 73.6% (±0.7; 1981-2005) [67]	38.2% (±13.9 SD; 1966-1993)[2]	93.1% (±1.8; 1966-1995)
Iles Kerguelen	(1999-2008)	(1999-2008)	(1999-2008)
Marion Island	74.6% (±4.2; 1985-2001) [70] 67.7% (±12.3; 2002-2007)	89.9% (±0.4; 1988-2000)[3] [70]	94.2% (±0.8; 1985-2001) [70]
Prince Edward Island	No data	No data	No data

[1] survival to first resighting
[2] survival to 5 years of age
[3] survival to 10 years of age

BREEDING SITES: THREATS

All breeding sites of *D. exulans* are legally protected and access is restricted.

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

Breeding site	Human disturbance	Human take	Natural disaster	Parasite or Pathogen	Habitat loss or degradation	Predation by alien species	Contamination
Macquarie Island	No	No	No	No	No [a]	No [a]	No
South Georgia	No	No	No	No	? [b]	No [c]	No [d]
Prince Edward Island	No	No	No	No	No	No	No
Marion Island	No	No	No	No	No	No [c]	No
Iles Crozet							
Ile de la Possession	No	No	No	No	No	No	No
Ile aux Cochons	No	No	No	No	No [e]	Low [c]	No
Ile de l'Est	No	No	No	No	No [e]	No	No
Iles Kerguelen							
Rallier du Baty Peninsula	No	No	No	No	No [e]	Low [c]	No
Courbet Peninsula	No	No	No	No	No [e]	Low [c]	No
Joffre Peninsula	No	No	No	No	No [e]	Low [c]	No
Howe Island	No	No	No	No	No [e]	No	No
Baie Larose	No	No	No	No	No [e]	Low [c]	No

[a] Cats *Felis catus* have been removed from Macquarie Island by 2000, and the eradication of rabbits and rodents is planned for 2010 [57].

[b] There has been extensive habitat loss and degradation at South Georgia (Islas Georgias del Sur) due to activities of Antarctic Fur Seal *Arctocephalus gazella* (J. Croxall pers. comm.).

[c] Predation by cats occurs on Kerguelen and on Ile aux Cochons. Rats are found on Iles Kerguelen, Ile de la Possession and South Georgia (Islas Georgias del Sur), while house mice *Mus musculus* are present on Marion Island, Ile de la Possession, Ile aux Cochons and Iles Kerguelen but there is no evidence of impact on *D. exualns* from either species at any of the sites.

[d] A few birds have been reported with oil contamination (UK reports to CCAMLR).

[e] Rabbits on Ile aux Cochons and Ile de l'Est (Iles Crozet) as well as on Rallier du Baty Peninsula, Courbet Peninsula, Joffre Peninsula and Howe Island (Iles Kerguelen) cause browsing damage to the vegetation, and reindeer on Courbet Peninsula, Joffre Peninsula and at Baie Larose browse and trample the habitat but these impacts have not been reported to affect the *D. exulans* populations to a large degree.

FORAGING ECOLOGY AND DIET

Diomedea exulans are mostly diurnal feeders [73], taking most prey by surface seizing [74]. *Diomedea exulans* are well known for following fishing vessels, sometimes in large groups and vigorously competing for fisheries discards. Fish and cephalopods are the main components of the *D. exulans* diet, with a wide variety of species caught or scavenged (*c.* 50 squid species and *c*. 10 fish species) [75, 76, 77, 78, 79, 80, 81, 82]. Patagonian toothfish *Dissostichus eleginoides* is the primary fish species in the diet, potentially obtained as discarded offal [80].

The *D. exulans* diet on Bird Island, South Georgia (Islas Georgias del Sur), is perhaps the best documented. During brood-guard period, in March-April (2000), fish dominated the diet by mass (45.6%) and occurred in 66.6% of samples, with Patagonian toothfish the main species in terms of mass (34.3%, in 11.1% of samples). Cephalopods contributed 32% by mass (66.6% of samples), *Kondakovia longimana* alone making up 30.1% of total mass in 11.1% of samples [77]. Crustaceans, mostly krill *Euphasia superba*, were also important, comprising 12.4% of total diet by mass in 33.3% of samples, with jellyfish (Scyphozoa) providing 9.9% of diet by mass in 22.2% of samples [77].

During chick-rearing in May-July (1999-2000), a study comparing inter-annual variation in foraging preferences found that fish also dominated the diet by mass in both years (53.1 – 84.4% in 83 – 100% of samples). Patagonian toothfish was again the most important species (43.4% in 1999, 63.1% in 2000), with cephalopods (predominantly *K. longimana*) accounting for 11.3% (2000) to 42.1% (1999) of diet and occurring in 50-83% of the samples. Compared with the brood-guard period however, crustaceans and jellyfish were very rare, with carrion a minor item at around 4% of total mass collected [78].

Squid (mainly *Moroteuthis ingens*) were the preferred food source (72.4% of fresh mass in 91.7% of samples) of *D. exulans* on Ile de la Possession during chick-rearing (July), and fish (mostly *D. eleginoides*) accounted for 24.3% of the diet (41.7% of samples), with carrion a minor item at 3.3% [79]. On Marion Island *D. exulans* also mostly consumed cephalopods (58.6% by mass, 96% of samples), and fish (36.5% by mass, 60% of samples) [81]. Analysis of dietary material from Macquarie Island revealed 18 cephalopod species (some likely to have been ingested secondarily) but no fish remains [83].

MARINE DISTRIBUTION

This wide ranging species has a circumpolar distribution, and both breeding and non-breeding birds have very large foraging ranges (Figures 5 and 6). Satellite tracking data indicate that breeding birds forage at very long distances from colonies (up to 4,000 km) and that foraging strategies change throughout the breeding season [84].

During early incubation, *D. exulans* from Crozet, Kerguelen and Prince Edward Islands forage over pelagic waters between the Antarctic continent and subtropical latitudes [68, 84, 85]. Males breeding on Crozet forage in the Kerguelen shelf area, but not females [68]. Females forage further from the islands and in warmer waters [79, 84, 85, 86]. During late incubation and early post-hatching, foraging is reduced to the edge of the island shelf in close proximity to the breeding grounds [85, 86]. During early chick rearing, the foraging ranges of Marion and Crozet birds (*c*. 1000 km apart) are almost totally non-overlapping [70]. During later stages of chick-rearing, *D. exulans* forage in short trips close to the colony in neritic waters, or in long trips far from the colony in oceanic waters to the north [79, 85, 86].

Non-breeding and juvenile birds remain north of 50°S between subantarctic and subtropical waters with a significant proportion crossing the Indian Ocean to wintering grounds around the southern and eastern coast of Australia [87, 88].

Breeding *D. exulans* from South Georgia (Islas Georgias del Sur) range widely between southern Brazil (25°S) and the Antarctic Peninsula (68°S), and between waters off Tristan de Cunha (19°W) to the Patagonian Shelf in the west and up to 85°W off the Pacific coast off southern Chile [78, 89], almost entirely in waters deeper than 1000m [90]. During the brooding period however, (March to Mid-May), foraging trips are mostly restricted to the South Georgia shelf and shelf-slope areas [89]. From May to October, chick rearing adults of both sexes spread out to upwelling areas over the outer slope of the Patagonian Shelf [89, 91]. Just like their counterparts in the Indian Ocean, females tend to focus on the more northerly areas, particularly east of the mouth of Rio de la Plata and east of Peninsula Valdez. Males are more common in the south, along the southern boundary from Diego Ramirez to Burdwood Bank. There is substantial overlap but males are rare north of Rio de la Plata and females seldom venture into the south western sector between Staten Island and Diego Ramirez [91]. The southern Patagonian Shelf is utilised by non-breeding birds also, and hence is an important foraging area all year round [92].

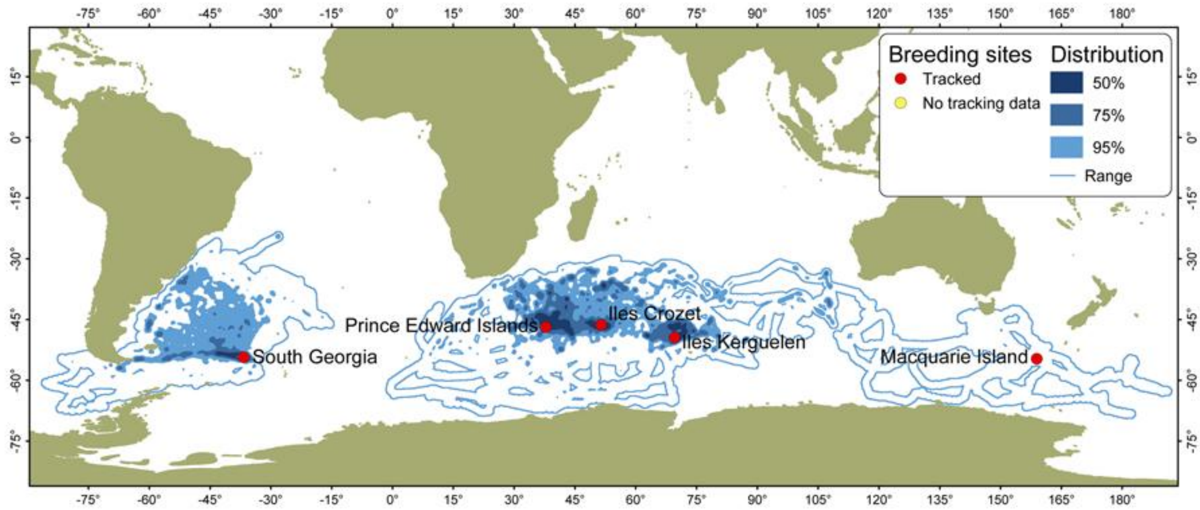

Figure 5. T*racking data from breeding adults (Number of tracks = 66 GPS and 464 PTT). Map based on data contributed to the BirdLife Global Procellariiform Tracking Database.*

Outside the breeding season, recoveries and limited satellite tracking data indicate initial dispersal across the South Atlantic Ocean to areas off South Africa on the coastal shelf, shelf-slope and adjacent oceanic, followed by migration across the Indian Ocean to winter in south-eastern Australian waters [89].

Given the small size of the population, few *D. exulans* from Macquarie Island have been tracked. Breeding females during incubation foraged north of Macquarie Island in waters surrounding southern Tasmania. Males foraged in the open waters of the Southern Ocean, south of 50° S and mirroring the spatial segregation seen in other populations. Juvenile and subadult birds were concentrated in lower latitudes north and east of Macquarie Island in Pacific waters, the south east coast of Australia and the New Zealand waters. A single adult tracked during the winter non breeding dispersal showed a circumpolar distribution (R. Alderman pers. comm.; DPIW unpublished data).

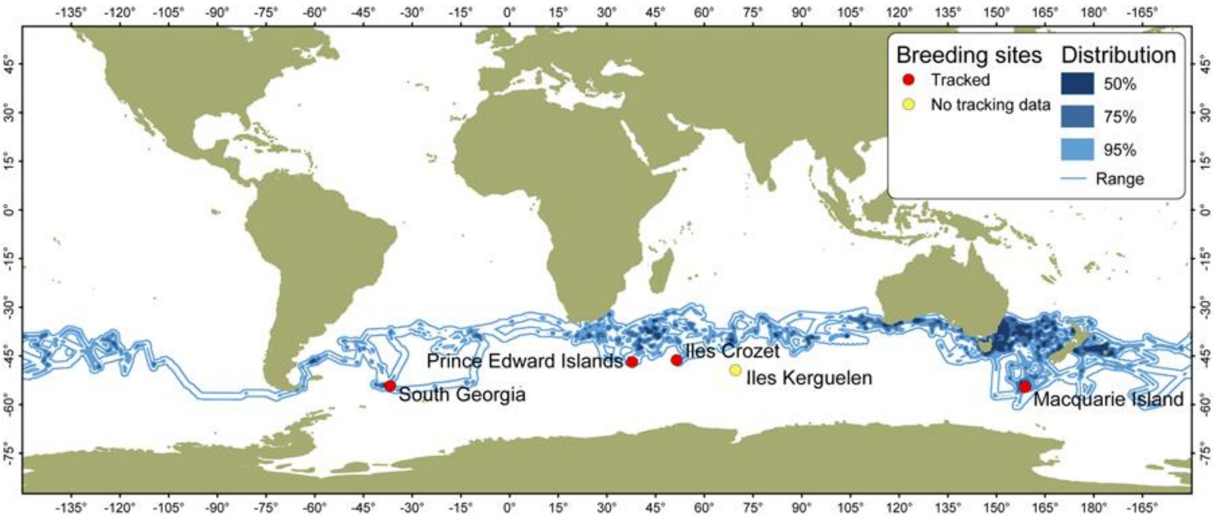

Figure 6. *Satellite-tracking data of juveniles and non-breeding adults (Number of tracks = 17). Map based on data contributed to the BirdLife Global Procellariiform Tracking Database.*

Diomedea exulans overlap with 10 Regional Fisheries Management Organisations but principally the WCPFC, CCAMLR, CCSBT, SWIOFC (South-West Indian Ocean Fisheries Commission), and SIOFA (Southern Indian Ocean Fisheries Agreement) which encompass or are close to the breeding sites (Figure 1; Table 7). The species also overlaps with IOTC, ICCAT, IATTC and SEAFO (South-East Atlantic Fisheries Organisation). SEAFO, SWIOFC and SIOFA are aimed at ensuring the long-term conservation and sustainable use of fishery resources other than tuna and .are principally responsible for trawl and artisanal fisheries. SEAFO also manages some pelagic species like the Patagonian toothfish (*Dissostichus eleginoides*). Consultations are also currently underway to establish the South Pacific Regional Fisheries Management Organisation (SPRFMO) that would cover both pelagic and demersal fisheries in the region (predominantly discrete high seas stocks and those stocks which straddle the high seas and the EEZs of coastal states) and which overlap with *D. exulans*.

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* D. exulans.

	Resident/ Breeding and feeding range	**Foraging range only**	**Few records - outside core foraging range**
Known ACAP Range States	Australia Disputed [1] France South Africa	Brazil Chile New Zealand Uruguay	-
Exclusive Economic Zones of non-ACAP countries	-	Namibia	-
Regional Fisheries Management Organisations [2]	WCPFC CCAMLR CCSBT SIOFA SWIOFC	IOTC IATTC ICCAT SEAFO SPRFMO	-

[1] See Table 2 footnote

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

MARINE THREATS

The major threat affecting *D. exulans* (as with many other albatross and petrel species) is incidental mortality in long-line fishing operations. The growth of the southern bluefin tuna long-line fishery in the Southern Ocean until the mid 1980s and subsequent development of the Patagonian toothfish long-line fishery coincided with the steady decline of *D. exulans* populations at Crozet, Kerguelen and Marion Island [68, 69]. Although the increased adult survival and upward trends in the Crozet population since the 1980s are thought to be related to the tuna fishery moving further away from the colony [68], there is still a high degree of overlap with long-line fisheries in the region [93], and recovery is hindered by low juvenile survival [88]. Juvenile birds forage mainly in subtropical Indian Ocean waters where the tuna long-line fishery has expanded in recent times [68, 88].

Diomedea exulans overlap with longline fisheries throughout the year and will be impacted by even low bycatch rates due to their small population size, but rates and risk of incidental mortality can be affected by seasonal variation in albatross distribution and fishing effort [93]. For instance, *D. exulans* from Marion Island showed high spatial overlap with the local Patagonian toothfish long-line fishery during early chick rearing, and this was especially true for males, as females foraged more to the north and hence interacted more with tuna long-line fisheries [86]. During late chick-rearing and the non-breeding period, Marion Island and Crozet populations overlap spatially within areas of intense tuna long-line fishing effort south of South Africa [86] where bycatch rates are high [93]. Non breeding birds foraging in warmer waters show the highest spatial overlap with tuna fisheries [86].

The recent development of new long-line fisheries throughout the length of the South American coastal shelf-slope has also greatly increased interactions with the South Georgia (Islas Georgias del Sur) populations. During chick rearing, *D. exualns* potentially interact with Patagonian toothfish fisheries on the Patagonian shelf and around Sough Georgia (Islas Georgias del Sur), and with the oceanic long-line tuna fishery in the south Atlantic oceanic waters (30-60° W and south of 30°) [78]. Females are more likely to interact with the pelagic tuna fishery [78, 89] and juveniles and dispersing adults are likely to encounter longliners outside the western south Atlantic, e.g. off the coast of Brazil and Uruguay where this species has been reported as bycatch [94]. Outside the breeding season, birds from the Atlantic sector are also at risk from southern bluefin tuna long-line fishing operations off south Africa (shelf, shelf slope and adjacent oceanic areas) and in the Tasman sea, off eastern and southern New Zealand, because of their circumpolar migrations [68, 95, 96].

Chicks are also vulnerable to accumulation of anthropogenic marine debris and fishery-related debris such as secondary ingestion of discarded hooks [86].

KEY GAPS IN SPECIES ASSESSMENT

Diomedea exulans is one of the most comprehensively studied albatross species. Extensive time series data are available for all island groups, and demographic parameters are also well documented. Monitoring should be continued to clarify population trends and consolidate our knowledge of survival and production rates and their relationship with fisheries interactions. In addition, up-to-date census data from several sites at Iles Crozet and Kerguelen would allow a more accurate estimate of the current global population of this species.

There is an urgent need to improve our understanding of the movements and distribution of immature birds in relation to long-line fisheries, especially in international subtropical waters where a large tuna fishery has recently expanded [88]. This will be aided by a 3 year programme dedicated to satellite tracking of immatures and juveniles which commenced in 2007 (H. Weimerskirch pers. comm.). The areas where there is a significant overlap between *D. exulans* and fisheries/RFMOs but where effective mitigation and observer programmes are not in place also need to be confirmed.

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COMPILED BY

Wiesława Misiak
ACAP Secretariat

CONTRIBUTORS

Rachael Alderman
DPIW, Tasmania, Australia

John Croxall
BirdLife International

Henri Weimerskirch
Centre d'Etudes Biologiques de Chizé, Centre National De La Recherche Scientifique (CEBC - CNRS), France

Mark Tasker
Vice-Chair, ACAP Advisory Committee

ACAP Taxonomy Working Group
Contact: Michael Double
Mike.Double@aad.gov.au

ACAP Breeding Sites Working Group
Contact: Richard Phillips
raphil@bas.ac.uk

ACAP Status and Trends Working Group
Contact: Rosemary Gales
Rosemary.Gales@dpiw.tas.gov.au

ACAP Bycatch Working Group
Contact: Barry Baker
barry.baker@latitude42.com.au

BirdLife International,
Global Seabird Programme
Contact: Cleo Small
Cleo.Small@rspb.org.uk

Maps: Frances Taylor

Satellite Tracking Data contributors: John Croxall, Richard Phillips, Andy Wood (British Antarctic Survey), Henri Weimerskirch (Centre d'Etudes Biologiques de Chizé), Rosemary Gales, Rachael Alderman (Department of Primary Industries and Water (DPIW, Tasmania), Deon Nel, Peter Ryan (Percy FitzPatrick Institute), Christopher Robertson (Department of Conservation, New Zealand), David Nicholls (Chisholm Institute), M.D. Murray, E.C. Butcher.

RECOMMENDED CITATION

Agreement on the Conservation of Albatrosses and Petrels. 2009. ACAP Species assessment: Wandering Albatross *Diomedea exulans*. Downloaded from http://www.acap.aq on 10 September 2009.

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 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.