Southern Royal Albatross

Diomedea epomophora

Albatros royal du Sud
Albatros real

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

TAXONOMY

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

Originally considered a polytypic species, *Diomedea epomophora* was split into *D. epomophora* (Southern Royal Albatross) and *D. sanfordi* (Northern Royal Albatross) in 1998 by Robertson and Nunn [1] based on several key morphological differences between the two taxa. Although Penhallurick and Wink (2004) [2] argued that this split was not warranted based on the available molecular data, and although hybridisation between the two taxa can occur, this classification has been recognized by ACAP [3], BirdLife International [4], and several recent field guides of Southern Ocean seabirds [5, 6, 7].

CONSERVATION LISTINGS AND PLANS

International

- Agreement on the Conservation of Albatrosses and Petrels – Annex 1 [3]
- 2008 IUCN Red List of Threatened Species – Vulnerable (since 2000) [8]
- Convention on Migratory Species - Appendix II [9]

Australia

- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC ACT*) [10]
  - Vulnerable (as *D. epomophora epomophora*)
  - Migratory Species
  - Marine Species
- Recovery Plan for Albatrosses and Petrels (2001) [11]
- Threat Abatement Plan 2006 for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations [12]
- **South Australia**: *National Parks and Wildlife Act 1972* – Vulnerable (as *D. epomophora epomophora*) [13]
- **Victoria:** *Flora and Fauna Guarantee Act 1988* - Threatened [14]

Brazil

- National Species List of Brazilian Fauna Threatened with Extinction (*Lista Nacional das Espécies da Fauna Brasileira Ameaçadas de Extinção*) – Vulnerable [15]
- National Plan of Action for the Conservation of Albatrosses and Petrels (NPOA-Seabirds Brazil) 2006 [16]

Chile

- National Plan of Action for reducing by-catch of seabirds in longline fisheries (PAN-AM/CHILE) 2007 [17]

New Zealand

- *Wildlife Act 1953* [18]
- Action Plan for Seabird Conservation in New Zealand; Part A: Threatened Seabirds [19]
- New Zealand Threat Classification System List 2008 – Naturally Uncommon (as *D. epomophora epomophora*) [20]

South Africa

- *Sea Birds and Seals Protection Act, 1973 (Act No. 46 of 1973) (SBSPA)* [21]
- *Marine Living Resources Act (Act No. 18 of 1996)*: Publication of Policy on the Management of Seals, Seabirds and Shorebirds: 2007 [22]
- National Plan of Action (NPOA) for Reducing the Incidental Catch of Seabirds in Longline Fisheries 2008 [23]

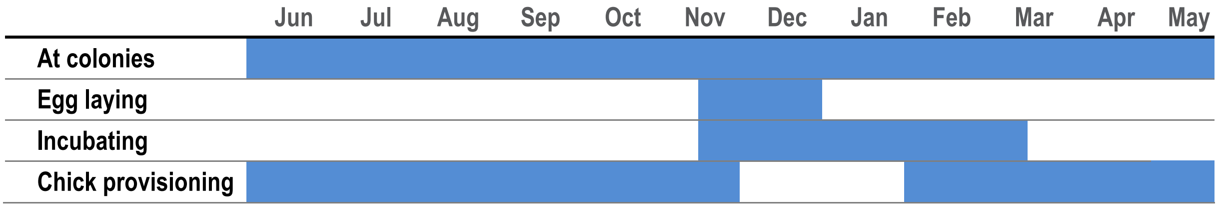
Uruguay

- National Plan of Action for Reducing the Incidental Catch of Seabirds in Uruguayan Fisheries (PAN - Aves Marinas Uruguay) 2007 [24]

BREEDING BIOLOGY

Diomedea epomophora breeds biennially if successful in rearing a chick. Birds return to colonies in October [5]. Eggs are laid from late November to late December (median between 30 November and 5 December) [25]. Incubation takes on average 78.5 ± 2.8 days (range 74-85 days) with chicks hatching in early February to early March (median date 18 February) [25], and fledging in early October to early December after about 241 (range 224-253) days [26] (Table 1). Age of first return to colonies is at least 5 years (Westerskov 1963 in [26]) and age at first breeding is thought to be around 6-12 years of age (P. Moore pers. comm. in [27]).

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



BREEDING STATES

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

	New Zealand
Breeding pairs	100%

BREEDING SITES

Diomedea epomophora is a New Zealand endemic (Table 2), breeding only on Campbell Island (99% of the population) and in the Auckland Islands (Figure 1; Table 3). The total breeding population was estimated to be approximately 13,000 pairs in 1996, equivalent to a total population of about 50,000 individuals [28]. In 2006-2008 (three breeding seasons), eight hybrids of *D. epomophora* x *D. sanfordi* were reported to breed with *D. sanfordi* at Taiaroa Head, on the South Island of New Zealand (L. Perriman, pers. comm.).

Table 3. *Estimates of the population size (annual breeding pairs) for the main* D. epomophora *breeding sites. Table based on unpublished P. Moore, New Zealand Department of Conservation (DOC) data and published references as indicated.*

Breeding site location	Jurisdiction	Years monitored	Monitoring method	Monitoring accuracy	Annual breeding pairs (last census)
Campbell Island 52° 33' S, 169° 09' E	New Zealand	1958, 1969,1976-1983,1995, 1996, 2005-2008	A	High	7,800 (2008)
Auckland Islands 51° 00'S, 166° 00'E	New Zealand				
Adams Island		1991	?	?	15 (1991) [28]
Auckland Island		1989	?	?	2 (1989) [28]
Enderby Island		1954,1963,1966, 1968,1973, 1974, 1981, 1987, 1988, 1992-2009	A	High	69 (2001) [27]

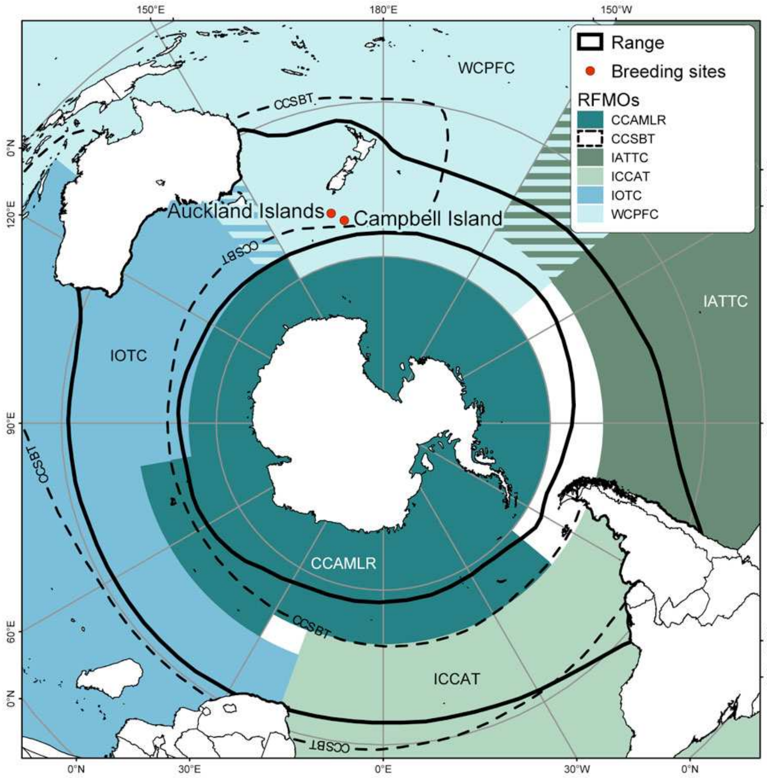


Figure 1. *The location of the main breeding sites and approximate range of* D. epomophora *with the boundaries of selected Regional Fisheries Management Organisations (RFMO) also shown.*

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

CONSERVATION LISTINGS AND PLANS FOR THE BREEDING SITES

International

Auckland Islands, Campbell Island

- UNESCO World Heritage List (inscribed 1998) [29]

New Zealand

Auckland Islands, Campbell Island

- National Nature Reserve – *New Zealand Reserves Act 1977* [30]
- Conservation management strategy: subantarctic islands 1998-2008 [31]

POPULATION TRENDS

The main population of *D. epomophora* on Campbell Island is thought to be recovering following a major reduction due to human settlement and introduced mammals [19]. Farming activities ceased in 1931 and cattle, sheep, cats and rats have all since been removed. However, in the absence of regular and comparable counts, trends are difficult to interpret in a biennially breeding species, with census numbers 23% higher in 1996 than in 1995, probably a result of differing survey effort [32] (Figure 2). A recent comprehensive census in 2005-2008 found nearly 8,000 nests per year, suggesting a stabilising population (P. Moore pers. comm.). Similarly, monitoring of two study plots suggested an increase since the mid 1980s to 1999 followed by a levelling off by 2005-2009 (P. Moore pers. comm.).

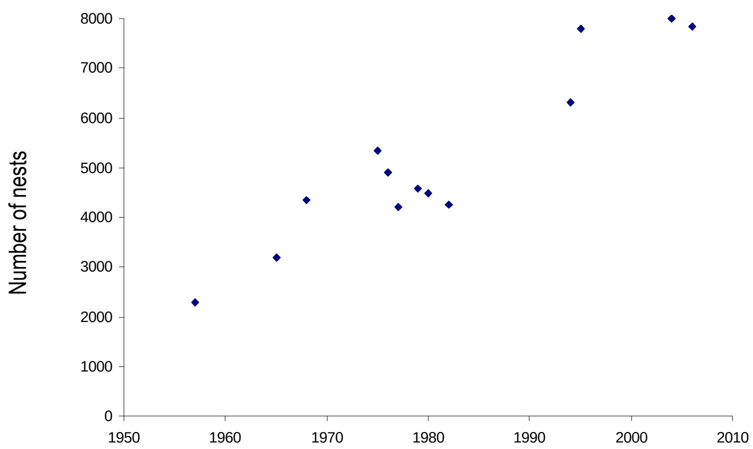


Figure 2. *Number of* D. epomophora *nests on Campbell Island, 1958-2008. From Moore* et al. *1997* [32] *and P. Moore unpublished data.*

The species was extirpated from Enderby Island by human exploitation by about 1868 [33]. Following recolonization in the 1950s the population has grown steadily until 2001, with the removal of rabbits, sheep and cattle between 1991 and 1993 assisting this recovery (Figure 3) [27]. Recent counts on the island in 2002-2008 have fluctuated from 52 to 66 nests annually (L. Chilvers unpublished data). The status of colonies on nearby Adams and Auckland Islands is not known; previous estimates were 15 and 2 pairs respectively [28].

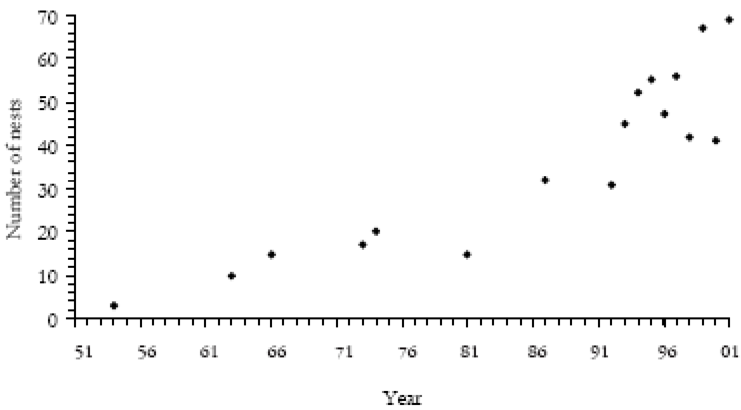


Figure 3. *Number of* D. epomophora *nests on Enderby Island, 1954-2001. From Childerhouse* et al. *2003* [27].

Table 4. *Summary of population trend data for* D. epomophora*. Table based on P. Moore and L. Chilvers unpublished data and published references as indicated.*

Breeding site	Current monitoring	Trend Years	% average change per year	Trend	% of population for which trend calcualted
Campbell Island	Yes	1988-1999 1999-2009	-	Increasing? [19, 32] Stable	100% 100%
Auckland Islands					
Adams Island	?	-	-	Unknown	100%
Auckland Island	?	-	-	Unknown	100%
Enderby Island	?	1954-2001	-	Increasing [27]	100%
		2002-2009	-	Stable	100%

Demographic data are currently being analysed after a comprehensive five year survey for banded birds on Campbell and Enderby Islands. Preliminary survival data are shown in Table 5.

Table 5. *Demographic data for the main* D. epomophora *breeding sites*. Table based on R. Barker (adult survival rates) and P. Moore unpublished data and published references as indicated.

Breeding site	Mean breeding success ±SD	Mean juvenile survival	Mean adult survival ±SE
Campbell Island	62.1 ±13.1% (1964-1966, 1969) [25] 64.7 ± 15.1% (1943-1973) [32] 75.7 ± 6.7% (1986-1995) [32] 77.7 ± 1.8% (1995-1998) 68.4 ± 4.5 % (2005-2008)	No data	90.3 ± 2.1 (1962-1972) 93.5 ± 0.8 (1995-1999)
Auckland Islands			
Adams Island	No data	No data	
Auckland Island	No data		
Enderby Island	max 74 ±7.8% (1996-1998) [1] [27]		94.9 ± 0.8 (1993-2001)

[1] survey of nests for presence of chicks on 29 July 1996, 30 September 1997, and August 1998

BREEDING SITES: THREATS

There are currently few land based threats to *D. epomophora* that would result in population level changes. All breeding sites are legally protected.

Table 6. *Summary of known threats causing population level changes at the breeding sites of* D. epomophora*. Table based on unpublished DOC data submitted to the ACAP Breeding Sites Working Group in 2008.*

Breeding site	Human disturbance	Human take	Natural disaster	Parasite or Pathogen	Habitat loss or alteration	Predation (alien species)	Contamination
Campbell Island	No [a]	No	No	No	No [b]	No [c]	No
Auckland Islands							
Adams Island	No [a]	No	No	No	No	No [c]	No
Auckland Island	No [a]	No	No	No	No	No [c]	No
Enderby Island	No [a]	No	No	No	No [b]	No [c]	No

[a] Some birds are known to abandon nests when visited or handled [19].

[b] Feral sheep and cattle on Campbell Island, and feral cattle on Enderby Island caused some nest disturbance in the past [19]. The spread of the *Dracophyllum* scrub on both Islands may reduce breeding habitat in the future [19].

[c] Adams and Enderby Islands are free of introduced mammals. Feral cats, *Felis catus* and especially feral pigs *Sus scrofa,* may take eggs and chicks on Auckland Island, probably limiting the recovery of *D. epomophora* on this island [19]. Norway rats, *Rattus norvegicus,* were reported to kill chicks on Campbell Island (Taylor 1986 in [19]) but were eradicated in 2003. There was however an unusual predation incident of nesting albatrosses on Campbell Island by a New Zealand sea lion *Phocarctos hookeri* in 2005 [34].

FORAGING ECOLOGY AND DIET

The diet of *D. epomophora* is known from regurgitations of fledglings and adults on Campbell Island from 1974-1977 and 1990-1997 [35]. Cephalopods (17 families), fish, and tunicates (mostly Salpidae) were the main food items by estimated biomass. Although *Moroteuthopsis ingens* was the most important cephalopod species in terms of biomass (44.3%), followed by *Kondakovia longimana* (22.1%), *Histioteuthis atlantica* and *Taonius* sp. were the most frequently consumed (25.5% and 23.1% of beaks respectively), with *M. ingens* also common (18.9%) [35]. The fish component of the diet is not as well documented due to lack of recognisable remains and difficulty with species identification. Intact specimens or well preserved otholiths included mostly fisheries targets such as Hoki *Macruronus novaezelandiae* [35]. Plastics and pumice were also present.

Food is considered to be obtained mainly by scavenging of dying or moribund prey, from fishing vessels and to a limited extent, by active predation [35].

MARINE DISTRIBUTION

Band recoveries from *D. epomophora* indicate a circumpolar distribution, generally between 30-55°S, predominately around New Zealand, south eastern Australia and southern South America [36]. Juveniles were mostly found in western South America, immatures in eastern South America, and adults in New Zealand [36].

During incubation, breeding birds from Campbell Island foraged mostly within 1250 km of the colonies over shallow (<1500 m deep) shelf and shelf break waters of the Campbell Plateau north to southern New Zealand and over the Chatham Rise, commuting directly to locally productive sites [37, 38] (Figure 4). Analysis of squid species consumed by *D. epomophora* corroborates available tracking data and indicates foraging chiefly over the shelf break rather than in oceanic waters or south of the Antarctic Polar Front [35].

Diomedea epomophora overlaps with most Regional Fisheries Management Organisations, but principally the WCPFC, CCSBT, IATTC and ICCAT (Figure 1; Table 7). 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). New Zealand, Chile and Argentina are the principal Range States for *D. epomophora* (Figure 2; Table 7).

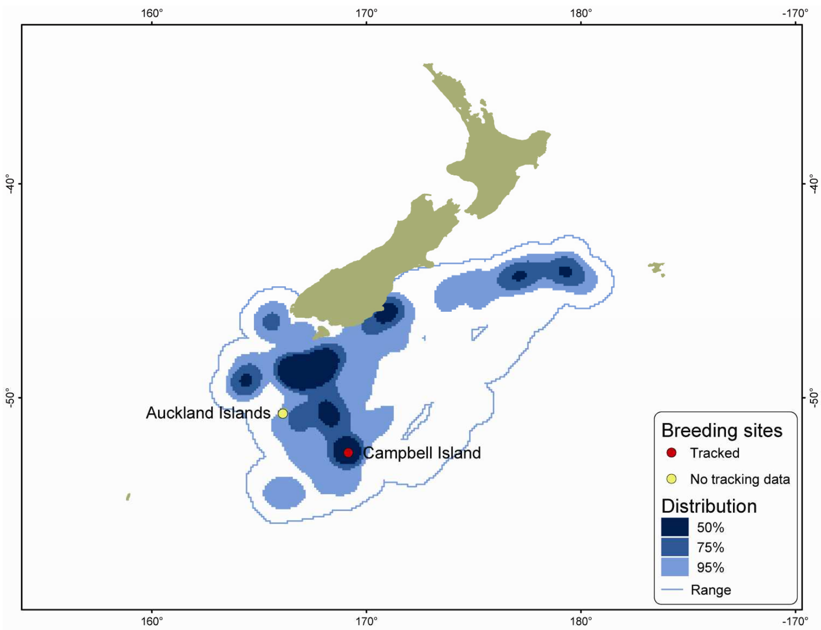


Figure 4. *Satellite-tracking data of breeding* D. epomophora *(Number of tracks = 7). Map based on data contributed to BirdLife Global Procellariiform Tracking Database.*

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. epomophora.

	Breeding and feeding range	Foraging range only	Few records - outside core foraging range
Known ACAP Range States	New Zealand	Australia Argentina Disputed [1] Chile Uruguay	Brazil France South Africa UK
Non-ACAP Exclusive Economic Zones	-	-	-
Regional Fisheries Management Organisations [2]	WCPFC CCSBT SPRFMO [3]	IATTC ICCAT	IOTC SEAFO SIOFA SWIOFC CCAMLR

[1] 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.
[2] See Figure 1 and text for list of acronyms
[3] Not yet in force

MARINE THREATS

Diomedea epomophora have been caught in longline and trawl fishery operations around New Zealand, Australia, Argentina, Uruguay and Chile [36, 39, 40, 41, 42], as well as by Japanese tuna longliners on the high seas (Uozumi 1998, Kiyota and Minami 2001 in [36]). Although reported bycatch numbers of *D. epomophora* in New Zealand fisheries have been relatively low [41, 43, 44], with 14 individuals observed killed in surface longlines and trawls between 1998 and 2004, observer coverage in this period was less than 5% of total fishing effort [43]. Similarly, mortalities observed in the Argentine longline fleet along the Patagonian Shelf between 1999 and 2001 comprised on average 1.4% (0 – 6.1%) of the 901 seabirds caught in total. However, the estimated annual seabird bycatch in this fishery may be in the thousands [42].

Fish hook and plastic ingestion has been reported in the single study documenting the diet of *D. epomophora* [35].

KEY GAPS IN SPECIES ASSESSMENT

Although some population data are available for this species, survival rates of juveniles are not known and recent data on adult survival is lacking. Diet and the movement and distribution of non breeding birds also require further research. A greater understanding of the overlap with fishing operations and extent of incidental capture of *D. epomophora* on the high seas and in waters around southern South America is also urgently needed.

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RECOMMENDED CITATION

Agreement on the Conservation of Albatrosses and Petrels. 2009. ACAP Species assessment: Southern Royal Albatross *Diomedea epomophora*. Downloaded from http://www.acap.aq on 2 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).

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.