Grey-headed Albatross

Thalassarche chrysostoma

Albatros à tête grise
Albatros de Cabeza Gris

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

Sometimes referred to as
Grey-headed Mollymawk
Flat-billed Albatross
Flat-billed Mollymawk
Gould's Albatross
Gould's Mollymawk
Grey-mantled Albatross
Grey-mantled Mollymawk

TAXONOMY

Order Procellariiformes
Family Diomedeidae
Genus *Thalassarche*
Species *T. chrysostoma*

This monotypic species was originally described as *Diomedea chrysostoma* (Forster 1785). *Thalassarche* was reinstated at the generic level by Nunn *et al.* in 1996 [1] where the species was placed following Robertson and Nunn (1998) [2]. This classification has been adopted by BirdLife International [3] and ACAP [4].

CONSERVATION LISTINGS AND PLANS

International

- Agreement on the Conservation of Albatrosses and Petrels – Annex 1 [4]
- 2010 IUCN Red List of Threatened Species – Vulnerable [5]
- Convention on Migratory Species - Appendix II (as *Diomedea chrysostoma*) [6]

Australia

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC ACT)* [7]
  - Endangered
  - Listed Migratory Species
  - Listed Marine Species
- Recovery Plan for Albatrosses and Giant Petrels (2001) [8]
- Threat Abatement Plan 2006 for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations [9]

South Australia

- *National Parks and Wildlife Act 1972* – Vulnerable [10]

Tasmania

- *Threatened Species Protection Act 1995* – Endangered [11]

Western Australia

- *Wildlife conservation Act 1950 - Wildlife Conservation (Specially Protected Fauna) Notice 2008 (2)* – Fauna that is rare or is likely to become extinct [12].

Brazil

- National Plan of Action for the Conservation of Albatrosses and Petrels (NPOA - Seabirds Brazil) [13]

Chile

- National Plan of Action for reducing by-catch of seabirds in longline fisheries (PAN-AM/CHILE) 2007 [14]

Falkland Islands (Islas Malvinas)

- *Conservation of Wildlife and Nature Ordinance 1999* [15]
- *Fisheries (Conservation and Management) Ordinance 2005* [16]
- Falkland Islands FAO National Plan of Action for Reducing Incidental Catch of Seabirds In Longline Fisheries 2004 [17]

France

- *Ministerial Order of 14 August 1998 (Arrêté du 14 août 1998*; as *Diomedea chrysostoma)* [18]
  - Listed Protected Species

New Zealand

- *New Zealand Wildlife Act 1953* [19]
- Action Plan for Seabird Conservation in New Zealand; Part A: Threatened Seabirds [20]
- New Zealand Conservation Status 2008 – Nationally Critical [21]

South Africa

- *Sea Birds and Seals Protection Act, 1973 (Act No. 46 of 1973) (SBSPA)* [22]
- *Marine Living Resources Act (Act No. 18 of 1996)*: Publication of Policy on the Management of Seals, Seabirds and Shorebirds: 2007 [23]
- National Plan of Action (NPOA) for Reducing the Incidental Catch of Seabirds in Longline Fisheries 2008 [24]

South Georgia (Islas Georgias del Sur)

- *Falkland Island Dependencies Conservation Ordinance 1975* [25]
- FAO International Plan of Action - Seabirds: An assessment for fisheries operating in South Georgia and South Sandwich Islands [26]

BREEDING BIOLOGY

Thalassarche chrysostoma is a biennially breeding species, although 5.4% and 1% of successful breeders on Marion Island and Bird Island, South Georgia (Islas Georgias del Sur) respectively, attempt to breed annually [27]. Birds return to colonies in early September to early October [28, 29] (Table 1). Laying occurs in October and extends over a period of *c.* 15-20 days, with mean date at most sites *c.* 17-20 October, with little annual variation [28, 29, 30]. Incubation averages 72 -74 days, with most chicks hatching in December [28, 29, 30] and fledging in late April-May when around 116-145 days old [28, 30, 31]. Immature birds begin returning to land when at least three years old, but most commonly at age 6-7 [32]. The average age of first breeding on Campbell Island is 13.5, but can be as early as eight [29]. On Macquarie Island, age of first breeding ranges from 7-10 years [33] and the modal age at first breeding on South Georgia (Islas Georgias del Sur) is 12 years [34].

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

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

BREEDING STATES

Table 2. *Distribution of the global* T. chrysostoma *population among Parties to the Agreement.*

	Australia	Chile	Disputed*	France	New Zealand	South Africa
Breeding pairs	<1%	18%	50%	14%	7%	11%

*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.

BREEDING SITES

Thalassarche chrysostoma breed on six subantarctic islands or archipelagos – South Georgia (Islas Georgias del Sur), Crozet, Kerguelen, Macquarie, Prince Edward, and Campbell, as well as on two island groups off southern Chile – Diego Ramirez and Ildefonso (Figure 1). Approximately half of the global population occurs on South Georgia (Islas Georgias del Sur) (Table 2). The annual breeding population is estimated at *c.* 96,000 pairs (Table 3).

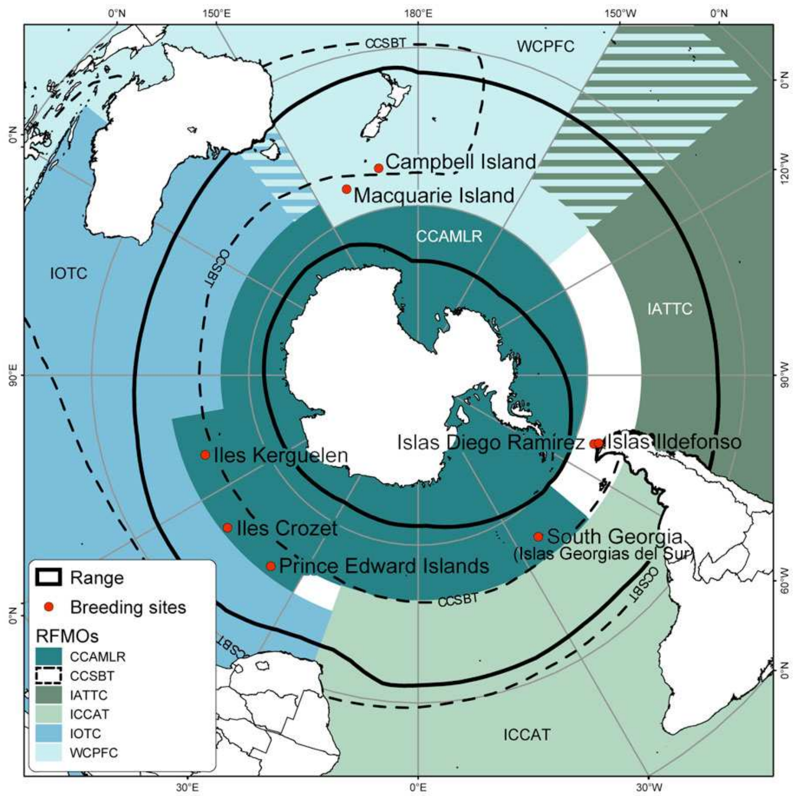

Figure 1. *The location of the main* T. chrysostoma *breeding sites and the species' approximate range. The boundaries of selected Regional Fisheries Management Organisations (RFMOs) are also shown.*

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. *Estimates of the population size (breeding pairs) for each* T. chrysostoma *breeding site. Table based on unpublished data (Tasmanian Department of Primary Industries and Water (DPIW) - Macquarie Island; R.J.M. Crawford and B.M. Dyer, Department of Agriculture, Forestry and Fisheries (DAFF) – Marion Island), and published references as indicated. See Glossary and Notes for explanation of Monitoring method and Monitoring accuracy codes.*

Breeding site location	Jurisdiction	Years monitored	Monitoring method	Monitoring accuracy	Annual breeding pairs (last census)
Macquarie Island 54° 37'S, 158° 51'E	Australia	1995-2008	A	High	94 (2007)
Total **% of all sites**					**94** **<1%**

Islas Diego Ramirez [35]		1981, 2003			
56° 31'S, 68° 43'W					
Isla Gonzalo	Chile	2003	A, D, E	High	4,523 (2003)
Isla Bartolomé		2003	D	High	10,880 (2003)
Islote Santander		2003	D	High	404 (2003)
Islote Ester		2003	D, E	High	577 (2003)
Islote Mendoza		2003	D	High	174 (2003)
Islote Martinez		2003	D	High	69 (2003)
Islote Schlatter		2003	D	High	97 (2003)
Islote Norte		2003	D	High	463 (2003)
Islas Ildefonso					
55° 44'S, 69° 28'W	Chile				
Isla Grande		2003	A	High	8 (2003) [36]
Total					**17,186**
% of all sites					**17.9%**
South Georgia (Islas Georgias del Sur) [37]					
54° 19'S, 36° 49'W					
Main Island, Willis Islands	Disputed*	1985, 2004	A, E	High	5,177 (2004)
Trinity Island, Willis Islands		1985, 2004	A, E	High	3,309 (2004)
Hall Island, Willis Islands		1985, 2004	A, E	High	2,686 (2004)
Bird Island		1991, 2004	A, E	High	5,120 (2004)
Sorn & Bern coast		1985, 2004	A, E	High	1,625 (2004)
Cape North		1986, 2004	A, E	High	488 (2004)
Paryadin Peninsula north		1985, 2004	A, E	High	6,721 (2004)
Jomfruene		1985, 2004	A, E	High	490 (2004)
Paryadin Peninsula south		1985, 2004	A, E	High	22,058 (2004)
Total					**47,674**
% of all sites					**49.8%**
Iles Crozet					
46° 26'S, 51° 47'E					
Ile de la Possession	France	1980-1982	A	High	10 (1982) [38]
Ile de l'Est		1980-1982	A	High	3,750 (1982) [38]
Ile des Pingouins		1980-1982	A	Low	2,000 (1982) [38]
Ilots des Apôtres		1980-1982	A	High	180 (1982) [38]
Total					**5,940**
% of all sites					**6.2%**
Iles Kerguelen					
49° 41'S, 70° 00'E					
Ile de Croÿ	France	1984-1987	A	High	7,860 (1987) [39]
Loranchet Peninsula (Cape Français)		1984-1987	A	High	40-50 (1987) [39]
Total					**7,900**
% of all sites					**8.2%**
Campbell Island 52° 33'S, 169° 09'E	New Zealand	1995-1997	A	High	6,600 (1995-1997) [40]
Total					**6,600**
% of all sites					**6.9%**
Prince Edward Islands					
46°38'S, 37°55'E					
Marion Island	South Africa	1975,1977,1988, 1989,1991-2009	A	High	7,344 (2007)
Prince Edward Island		2002, 2009	A	High	3,000 (2002) [41]
Total					**10,344**
% of all sites					**10.8%**
Total for all sites					***95,748***

*see Table 2 footnote

CONSERVATION LISTINGS AND PLANS FOR THE BREEDING SITES

International

Campbell Island, Prince Edward Islands

- UNESCO World Heritage List (inscribed 1997 and 1998) [42]

Macquarie Island

- UNESCO World Heritage List (inscribed 1997) [42]
- UNESCO Biosphere Reserve - Man and the Biosphere Programme (inscribed 1977) [43]

Prince Edward Islands, Iles Crozet and Iles Kerguelen

- Ramsar Convention List of Wetlands of International Importance (inscribed 2008) [44]

Australia

Macquarie Island

- Register of Critical Habitat - *EPBC Act 1999* (listed 2002) [7]
- Register of the National Estate (until February 2012) – *Australian Heritage Commission Act 1975* (listed 1977) [45]
- National Heritage List – *EPBC Act 1999* (listed 2007) [7]

Tasmania

Macquarie Island

- Nature Reserve - *Nature Conservation Act 2002* (Tasmania) [46]
- Macquarie Island Nature Reserve and World Heritage Area Management Plan 2006 [47]
- Plan for the Eradication of Rabbits and Rodents on Subantarctic Macquarie Island 2007 [48]

Chile

Islas Diego Ramirez and Islas Ildefonso

- None

France

Iles Crozet and Iles Kerguelen

- National Nature Reserves (*Réserve Naturelle Nationale*) - *Décret no 2006-1211* [49]. Specific areas have higher level of protection (Integral Protection Areas, *Aires de Protection Intégrale*), including Ile de l'Est, Ile des Pingouins, Ilots des Apôtres (Iles Crozet), and some islands and coastal areas in Kerguelen.

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

Iles Crozet (some coastal areas of Possession Island); Iles Kerguelen (Sourcils Noir, some islands and coastal parts of Golfe du Morbihan)

- Areas Reserved for technical and Scientific Research (*Zones Réservées à la Recherche Scientifique et Technique)* Arrêté n°14 du 30 juillet 1985 [50] now included in Natural Reserve Management Plan [49]

New Zealand

Campbell Island and Antipodes Islands

- National Nature Reserves - *New Zealand Reserves Act 1977* [51]
- Conservation Management Strategy. Subantarctic Islands 1998-2008 [52]

South Africa

Prince Edward Islands

- Special Nature Reserve (declared 1995*) - National Environmental Management: Protected Areas Act, 2003 (No. 57 of 2003)* [53]
- Prince Edward Islands Management Plan 1996 [54]

South Georgia (Islas Georgias del Sur)

- South Georgia Environmental Management Plan 2000 [55]
- South Georgia: Plan for Progress. Managing the Environment 2006 – 2010 [56]

Bird Island, Willis Island (Main and Trinity Islands), Paryadin Peninsula

- Specially Protected Area (SPA) - South Georgia: Plan for Progress. Managing the Environment 2006 – 2010 [56]

POPULATION TRENDS

Most major populations of *T. chrysostoma* are either declining or the trend is unknown due to lack of regular, comparable surveys (Table 4). At South Georgia (Islas Georgias del Sur), where *c.* 50% of the global population of *T. chrysostoma* breed, the numbers of breeding pairs decreased by at least 1.1% per year based on colony photographs taken in 1985 and 2004 [37]. The decrease was even higher in mixed colonies with *T. melanophrys,* at 2.2% during the same period. The Bird Island population declined by 2.9% per year between 1991 and 2004 [37]. High juvenile mortality in fisheries is thought to have driven this decrease [57].

Numbers have also declined at Campbell Island. Based on photographs taken between 1942 and 1986, the downward trend averaged 3.0% to 4.8% per year at different colonies, and 3.1% to 3.7% a year based on ground counts from 1992 to 1996 (Table 4) [58]. Photopoint comparisons between 1986 and 1997 indicated a decline of 0.85 to 2.9% a year [40]. Photograph counts at the three colonies in 1995-1997 also suggested declines of *c.* 1.5% to 2.1% a year since 1942-1943 [40]. The modelled rate of change for the entire population in the 1990s was -2.8% a year [58]. Environmental changes affecting food availability are suggested to be contributing factors [58].

In contrast, the population on Marion Island increased by 2.5% pa ($p<0.01$) between 1975 and 2007, and by 0.6% ($p<0.01$) from 1988 to 2007 (Figure 2). The 1991 count was discarded from these calculations as Nel *et al.* (2002) [59] suggested that the very low numbers in 1991 were due to an undercount of incubating birds. As with the Campbell and South Georgia (Islas Georgias del Sur) populations however, 16 years of continuous data since 1991 indicate that the Marion Island population has declined at *c.* 0.6% ($p<0.01$) a year between 1992 and 2007 (Table 4).

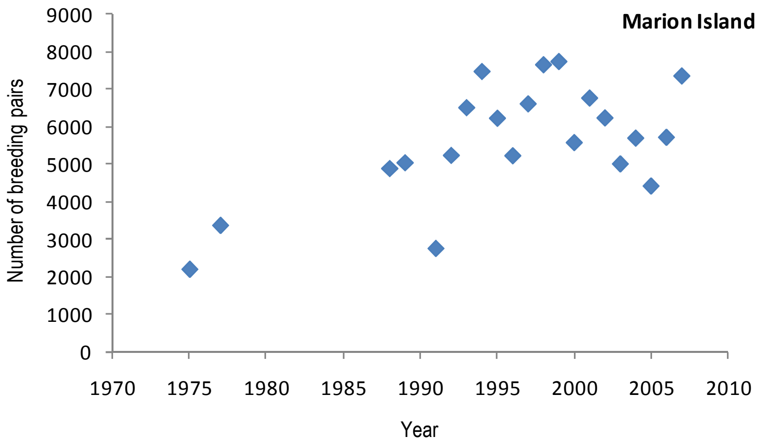

Figure 2. *Counts of the total number of breeding pairs of* T. chrysostoma *on Marion Island. Figure based on Nel* et al. *(2002)* [59] *and unpublished R.J.M. Crawford, DAFF and P.G. Ryan, University of Cape Town data, not to be used without the data holder's permission.*

The small population on Macquarie Island was stable between 1995 and 2007 (Figure 3), and likely to have been since the mid-1970s [33, 60]. It had the highest mean breeding success as well as juvenile and adult survival rates compared to the larger populations, but the study periods are not always directly comparable between islands (Table 5).

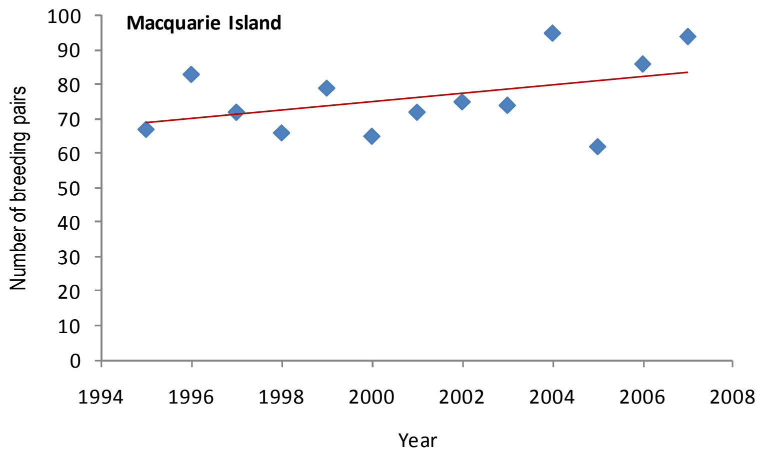

Figure 3. *Counts of the total number of breeding pairs of* T. chrysostoma *on Macquarie Island with a simple regression line fitted (r^2 =0.2). Figure based on Terauds* et al. *2005* [60] *and unpublished DPIW data, not to be used without the data holder's permission.*

Table 4. *Summary of population trend data for* T. chrysostoma. *Table based on unpublished DPIW data (Macquarie Island), R.J.M. Crawford, DAFF and P.G. Ryan, University of Cape Town data (Marion Island), and published references as indicated.*

Breeding site	Current Monitoring	Trend Years	% average change per year (95% CI) [61]	Trend	% of population for which trend calculated
Macquarie Island	Yes	1995-2007	1.5 (-0.2, 3.2)	Stable	100%
Islas Diego Ramirez	No	-	-	Unknown	-
Islas Ildefonso	No	-	-	Unknown	-
South Georgia (Islas Georgias del Sur)	?	1985-2004	-1.1 & -2.2[1] [37]	Declining	100%
Bird Island	?	1991-2004	-2.9 [37]	Declining	100%
		1975-1991	-1.8 [34]	Declining	100%
Iles Crozet	?	-	-	Unknown	-
Iles Kerguelen	?	-	-	Unknown	-
Campbell Island	?	1942-1997	-1.5 to -2.1 [40]	Declining	100%
		1986-1997	-0.85 to -2.9 [40]	Declining	100%
		1942-1986	-3.0[2], -3.4[3], -4.8[4] [58]	Declining	each colony *c.* 10%
		1992-1996	-3.7[2], -3.1[3], -3.6[4] [58]	Declining	each colony *c.* 10%
Prince Edward Islands					
Marion Island	?	1992-2007	-0.6 (-0.5, -0.8)	Declining	100%
		1988-2007[5]	0.62 (0.60, 0.64)	Increasing	100%
		1975-2007[6]	2.5 (2.4, 2.6)	Increasing	100%
Prince Edward Island	?	-	-	Unknown	-

[1] Mixed colonies with *T. melanophrys*
[2] Hooker's Finger Colony 2
[3] Hooker's Finger Colony 3
[4] Courrejolles Isthmus
[5] Missing data: 1990, 1991
[6] Missing data: 1976, 1978-1987, 1990, 1991

Table 5. Summary of d*emographic data for* T. chrysostoma. *Table based on unpublished DPIW data (Macquarie Island); British Antarctic Survey (BAS) data (Bird Island); R.J.M. Crawford, DAFF and P.G. Ryan, University of Cape Town data (Marion Island), and published references as indicated.*

Breeding site	Mean breeding success %/year (Study period)	Mean juvenile survival %/year (Study period)	Mean adult survival %/year (Range; Study period)
Macquarie Island	57 ±11 SD (1994-2007) [62] 72.3 ±11.5 SD (1978-1985) [33]	37.7 ±3.7 SE (1983-2007) [62] 33.6 ±4.6 SE (1977-2001)[1] [60]	97.3 ±0.8 SE (1983-2007) [62] 96.7 ±1.1 SE (1977-2001) [60]
Islas Diego Ramirez	No data	No data	No data
Islas Ildefonso	No data	No data	No data
South Georgia (Islas Georgias del Sur)			
Bird Island	35 ±5 SE (1989-2005)[2] 34 ±4 SE (1976-2005)[3] 39.2 ±4.0 SE (1976-1992) [34]	35.5[3] - 35.6[2] (1959-1964)[4] [57] 4.4[2] - 8.3[3] (1976-1981)[4] [57] 1.0[2] - 3.3[3] (1982-1986)[4] [57] 18.6 (1976-1981)[5] [57] 19.1 (1982-1986) [5] [57]	93.5 (88-100; 1977-2001)[3] 94.7 ±0.8SE (1977-1988) [34]
Iles Crozet	No data	No data	No data
Iles Kerguelen	No data	No data	No data
Campbell Island	40 ±20 SD (1984, 1987, 1989, 1991-1994, 1996) [58]	16.2 ±6.6 SD (1976-1988)[1] [58] 23.5 ±2.0 SE (1975-1989)[6] [58] 94 ±1 SE (1975-1989)[7] [58]	95.3 ±0.9 SE (1984-1995) [58]
Prince Edward Islands			
Marion Island	49.6 ±5.3 SD (1997-2007)	No data	93 (1998-2005)

[1] To first resight/recapture
[2] Colony B
[3] Colony E
[4] Survival to recruitment
[5] Survival to age 5
[6] Aged 0-5 years
[7] Aged 6-20 years

BREEDING SITES: THREATS

Currently, few land-based threats exist which could be considered to cause population level changes at any of the breeding sites of *T. chrysostoma* (Table 6).

Table 6. *Summary of known threats causing population level changes at the breeding sites of* T. chrysostoma*. Table based on data submitted to the ACAP Breeding Sites Working Group in 2008. See Glossary and Notes section for explanation of threat level.*

Breeding site	Human disturbance	Human take	Natural disaster	Parasite or pathogen	Habitat loss or degradation	Predation (alien species)	Contamination
Macquarie Island	no	no	no	no	Low [a]	no	no
Islas Diego Ramirez	no	no	no	no	no	no	no
Islas Ildefonso	no	no	no	no	no	no	no
South Georgia (Islas Georgias del Sur)	no	no	no	no	no	no	no
Iles Crozet	no	no	no	no	no	no	no
Iles Kerguelen	no	no	no	no	no	Low [b]	no
Campbell Islands	no	no	no	no	no	no [c]	no
Prince Edward Islands	no	no	no	no	no	no	no

[a] The large increase in European rabbit *Oryctolagus cuniculus* numbers since 1999 has led to an extensive destruction of habitat and soil erosion at nesting sites [47, 48]. An eradication programme which also targets rodents commenced in 2010 [48] but had to be abandoned due to exceptionally poor weather. It will recommence in 2011.

[b] Feral cats *Felis catus* are thought to impact on *T. chrysostoma* colonies at Loranchet Peninsula.

[c] Studies in 1984 found no evidence of Norway rats *Rattus norvegicus* preying on eggs or chicks of *T. chrysostoma* (Taylor 1986 in [20]).

FORAGING ECOLOGY AND DIET

Thalassarche chrysostoma feed by surface-seizing, but can dive down to 6 m [63, 64]. Although most diving occurs in daylight [64], a considerable proportion of prey can be ingested at night [65]. Although *T. chrysostoma* are considered infrequent ship followers, presence of large skeletal remains and tails of Patagonian toothfish *Dissostichus eleginoides* in the diet at some, but not all sites, suggests some degree of interaction with longline fisheries operating in the vicinity [66].

Diet composition is variable with locality and year. In general, ommastrephid cephalopods predominate on South Georgia (Islas Georgias del Sur) [65, 67, 68], Iles Kerguelen [66], Iles Crozet [69], and Campbell Island [70], whereas fish are the main prey items at Prince Edward Islands [71, 72]. Penguin carrion also features in the diet of birds from the Indian Ocean sector [28, 66, 69, 72].

During chick-rearing on South Georgia (Islas Georgias del Sur), cephalopods dominate the diet in most years, with *Martialia hyadesi* usually the most important species but replaced by *Kondakovia longimana* and *Galiteuthis glacialis* in some years [65, 67, 73]. Fish can also dominate the diet, and in a 1994 study this prey type accounted for 60% of mass [67]. *Champsocephalus gunnari*, *Magnisudis prionosa*, *Muraenolepis microps*, *Pseudochaenichthys georgianus* and lanternfish *(Myctophidae)* were the main prey. The fish component was different in 1986 when it comprised only 14% of the diet by mass, with southern lampreys *Geotria australis*, lanternfish, and *Patagonotothen guntheri* dominating the samples [67]. In total, 17 taxa of fish were identified from the 1986 and 1994 study [67]. *Geotria australis* was also an important prey species in other years when the fish component accounted for 12-25% of the diet [73]. However, during chick rearing in 2000, when sea surface temperatures were unusually warm close to South Georgia (Islas Georgias del Sur), *T. chrysostoma* fed predominantly on crustaceans (61% - 76% by mass, compared to 16% and 2% in 1986 and 1994 respectively [67]), with cephalopods accounting for 16% of the diet and fish comprising only 6% [73, 74]. Antarctic Krill *Euphausia superba* dominated the crustacean component of the diet in all years [65, 73, 74]. Salps and jellyfish, which degrade more rapidly than other taxa, could also be a common but underestimated prey item [65].

During chick-rearing at Ile de Croÿ (Kerguelen Archipelago) in 1994 squid comprised 52% of the diet by fresh mass (76% of occurrence), followed by penguin flesh (28% of fresh mass, 26% of occurrence), fish (16% fresh mass, 53% of occurrence), and crustaceans and other organisms (2% fresh mass) [66]. The most common squid prey was *Todarodes* sp., found in 63% of samples. Overall, the cephalopod component of the diet was diverse (20 taxa, based on accumulated beaks), with juvenile ommastrephid squids accounting for the majority (71%) of beaks [66]. Patagonian toothfish was the main fish prey [66]. Crustaceans were a minor but common food item (58% of occurrence). Antarctic Krill and an amphipod *Themisto gaudichaudii* were the most common crustacean prey. *Thalassarche chrysostoma* breeding on Iles Crozet in 1982 also fed mainly on squid (up to 91% of the diet by mass, mostly *M. hyadesi* and *K. longimana*), and fish, followed by crustaceans and carrion (mostly penguin species) [28, 69].

Squid (mainly *M. hyadesi)* was also the major component of the diet (over 98% by fresh mass) on Campbell Island in February 1997. The amount of neritic fish material was negligible [70]. *Micromesistius australis*, a shoaling fish, was present in 80% of samples collected from chicks (n=10), and dominated by fresh mass in 20% of samples [70].

In contrast to other localities, during chick rearing at the Prince Edward Islands, fish comprised 44% - 77% of the diet by total mass (59% of samples) in 1985 and 1987, and 59% of the solid fraction in 1998, followed by cephalopods (17% - 46% of total mass and 64% of samples in 1985 and 1987, 32% of solid fraction in 1998), crustaceans (average of 3% total mass and 15% of samples in 1985 and 1987, 3% of solid fraction in 1998), penguin carrion (average of *c.* 3% of total mass in 1985 and 1987, 3% of samples) and other material (average of *c.* 2% of total mass in 1985 and 1987) [71, 72, 75]. In 1998, 70% of samples contained crustaceans, 90% contained fish, and cephalopods occurred in 97% of samples [71, 75]. *Kondakovia longimana* and *Histioteuthis eltaninae* were the most common squid species based on analysis of all beaks in 1985 and 1987 [72]. In 1998, *K. longimana* was most the common cephalopod, followed by *M. hyadesi* and *H. eltaninae,* while *Magnisudis prionosa* dominated the fish component and decapod shrimps (mostly *Pasiphaea scotia*), together with *T. gaudichaudii* were the most frequently occurring crustaceans [71, 75].

MARINE DISTRIBUTION

Thalassarche chrysostoma has a circumpolar distribution over cold subantarctic and Antarctic waters [28, 66, 70, 71, 74, 76, 77]. At Iles Kerguelen, Campbell Island and South Georgia (Islas Georgias del Sur), the species is principally an oceanic forager, concentrating in the Antarctic Polar Frontal Zone and associated oceanic upwellings [66, 67, 70, 78, 79]. However, in years of low *M. hyadesi* availability, chick-rearing birds from South Georgia (Islas Georgias del Sur) forage mainly in Antarctic shelf-slope waters around the South Shetland Islands and the Antarctic Peninsula [65, 73, 74]. Prey biogeography also indicates some neritic foraging around Iles Kerguelen [66] and Campbell Island [70] during chick rearing. On Marion Island, incubating birds foraged in the Sub-tropical Frontal Zone and the Subantarctic Zone in association with what are most likely eddies [71, 75]. In contrast, during chick rearing, foraging was concentrated in the Subantarctic and Polar Frontal Zones to the south-west of the island, also in association with eddies (Figure 3) [71, 75].

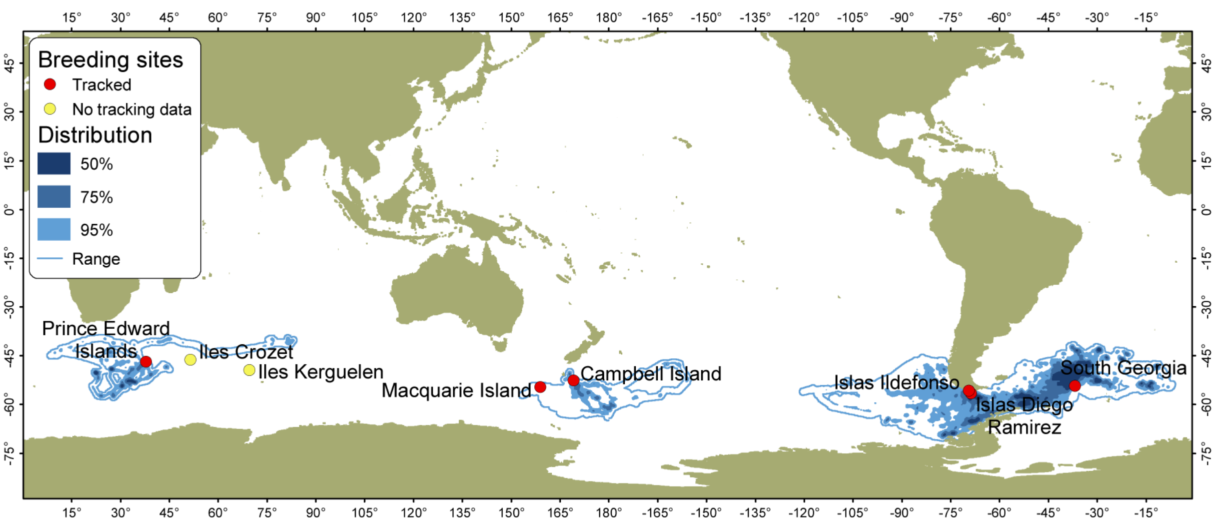

Figure 3. *Satellite-tracking data from breeding adult* T. chrysostoma *(Number of tracks = 386 PTT). Map based on data contributed to the BirdLife Global Procellariiform Tracking Database*.

Data on at-sea distribution of non-breeding *T. chrysostoma* are published only from Bird Island, South Georgia (Islas Georgias del Sur), and indicate dispersal throughout all southern oceans (Figure 4) [80]. Birds tracked during an 18-month non-breeding season either remained in the southwest Atlantic and adjacent areas, extending their breeding season range, or made return migrations to winter in specific areas of the southwest Indian Ocean [80]. A third strategy was to complete one or more global circumnavigation in an easterly direction, especially by males, foraging in staging areas of the Atlantic, Indian and Pacific Oceans along the way [80]. Females were more likely to have a restricted range [80]. During winter, distribution shifts north to between 39-51°S [81].

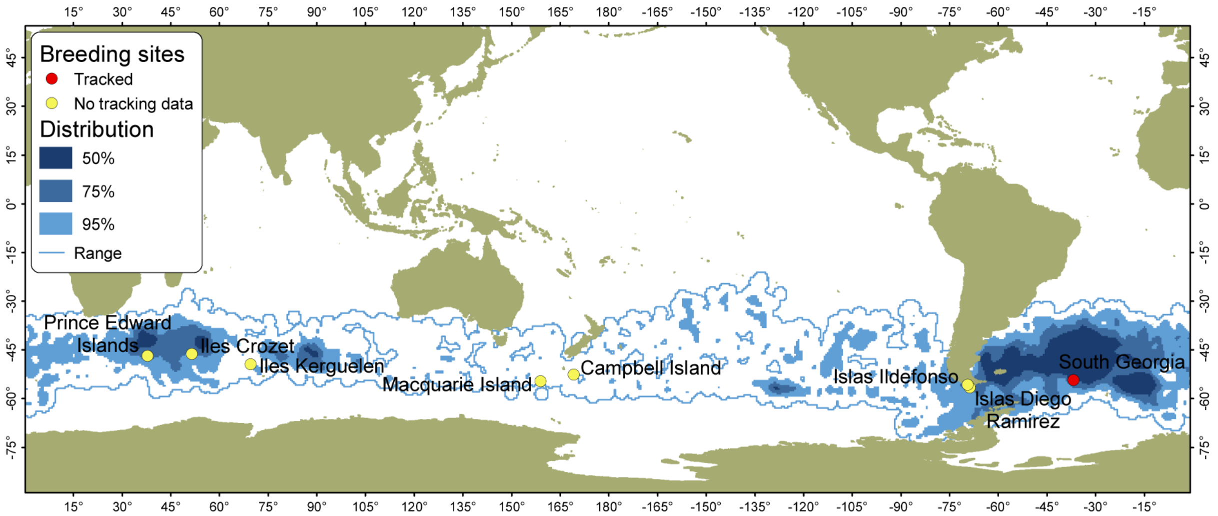

Figure 4. *Tracking data from non-breeding adult* T. chrysostoma *(Number of tracks = 6 PTT + 22 GLS). Map based on data contributed to the BirdLife Global Procellariiform Tracking Database*.

Given its circumpolar distribution, *T. chrysostoma* overlaps with all major southern hemisphere Regional Fisheries Management Organisations (Figure 1, Table 7), including those aimed at ensuring the long-term conservation and sustainable use of fishery resources other than tuna: SWIOFC (South-West Indian Ocean Fisheries Commission), SIOFA (Southern Indian Ocean Fisheries Agreement), and SEAFO (South-East Atlantic Fisheries Organisation), as well as the yet to be established South Pacific Regional Fisheries Management Organisation (SPRFMO). Breeding *T. chrysostoma* from Macquarie Island spent 12% of foraging time in CCMALR waters, and just under one-quarter of foraging time within the Australian EEZ surrounding Macquarie Island [76].

Table 7. *Summary of the known Range States and Regional Fisheries Management Organisations that overlap with the marine distribution of* T. chrysostoma.

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

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

MARINE THREATS

Thalassarche chrysostoma is predominantly an oceanic species and is therefore less likely to encounter local longline fisheries targeting Patagonian toothfish in shelf seas, although breeding birds are killed in these fisheries [79]. An average of 0.018 birds/1000 hooks (31 birds) were reported caught on longliners targeting Patagonian toothfish in Kerguelen waters between 1993 and 1997, and comprised 3.2% of all birds observed killed even though this species accounted for only 0.4% of birds attending the vessels [82]. In 2001/2002 and 2002/2003, 15 and 11 individuals respectively were recorded in bycatch in the French EEZ around Kerguelen (out of 24,722 birds of all species killed in total) and 21 and 0 individuals respectively around Crozet (1,946 birds killed in total) [83]. During the first year of the sanctioned Patagonian toothfish fishery around the Prince Edward Islands in 1996/1997, 126 *T. chrysostma* (mostly adult males) were killed; when fishing effort moved further away from the islands and line setting was restricted to night only, incidental mortality decreased to between 0-3 individuals per year in 1997/1998-1999/2000 [84].

An average of 0.8% of the seabird bycatch observed between 1999-2001 (n = 901) onboard Argentine longline fishing vessels (targeting toothfish and kingclip *Genypterus blacodes*) along the Patagonian shelf comprised *T. chrysostoma* [85]. However, due to the large variation between years, the total annual seabird bycatch levels may be in the thousands, with 10,000 birds of all species estimated killed by longliners between 1999 and 2001 [85].

In the toothfish fishery around South Georgia (Islas Georgias del Sur), (CCAMLR subarea 48.3), 23 *T. chrysostoma* were reported killed between 1996 and 2006 (2.2% of total recorded mortalities), however, only two individuals were captured in 2000-2006 (6.9% of total recorded mortalities) [26]. Eight individuals were recorded killed (2.3% of total) in the icefish trawl fishery from 1999 to 2006 [26].

Thalassarche chrysostoma was caught in large numbers by tuna fisheries south of Africa (84 reported by Japanese observers in 1992-1996) [86], around Australia (up to 409 per year in 1989-1995) [87, 88], with immatures and adults also recorded from New Zealand waters [89]. Since 1998 however, *T. chrysostoma* have not been reported killed in New Zealand trawl and longline fisheries [90, 91]. Outside of EEZs, due to its circumpolar distribution, *T. chrysostoma* is potentially vulnerable to Southern Ocean pelagic fisheries worldwide [79]. The extensive use of the Subtropical Convergence and Subantarctic Zones by incubating birds from Marion Island, especially females, bring them into contact with intense Southern bluefin tuna *Thunnus maccoyii* longline fishing activity in international waters (40-45°) [75]. Although the main pelagic foraging areas of *T. chrysostoma* from Macquarie Island do not overlap with identified areas of high fishing activity [92], birds are exposed to higher fishing activity when transiting though CCAMLR waters and areas south of New Zealand [60].

No plastic particles were noted in food samples collected on the Prince Edward Islands in 1985 and 1987 [72], although Ryan (1988) [93] did record their low incidence in regurgitated pellets. In comparison, plastic litter items were found in 10% of samples taken on Marion Island in 1998 [75].

KEY GAPS IN SPECIES ASSESSMENT

Regular and standardised surveys on some of the main breeding sites are needed to establish population trends, especially for the Chilean islands where census activity is very recent, and the two French subantarctic islands where population estimates are more than two decades old. The trend on Campbell Island since 1997 is also unknown.

All demographic data are lacking for Iles Crozet and Kerguelen as well as for Islas Diego Ramirez which hold large breeding populations. Data from Campbell Island are over a decade old, as are estimates of juvenile survival from South Georgia (Islas Georgias del Sur). Juvenile survival on the Prince Edward Islands is unknown. There is no information on diet of Diego Ramirez birds, although it has been well studied in most other populations.

More information on distribution at sea outside the breeding season for all age classes and most populations, and on interactions with high seas fisheries is also urgently needed.

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RECOMMENDED CITATION

Agreement on the Conservation of Albatrosses and Petrels. 2010. ACAP Species assessment: Grey-headed Albatross *Thalassarche chrysostoma*. Downloaded from http://www.acap.aq on 1 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) Threat Level
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.