Northern Giant Petrel
Macronectes halli

Petrel Gigante del Norte
Pétrel géant subantarctique

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

Sometimes referred to as
Hall's Giant-Petrel

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TAXONOMY

Order Procellariiformes
Family Procellariidae
Genus *Macronectes*
Species *M. halli*

Bourne and Warham (1966) first described differences in plumage colouration, behaviour and breeding biology between Northern Giant Petrels *Macronectes halli* and Southern Giant Petrels *M. giganteus* [1]. This led to a consensus that these two giant petrel taxa were separate species, although Nunn and Stanley (1998) [2] suggested this split between the two species occurred only recently. Penhallurick and Wink (2004) [3] disagree that these two species are separate, based upon the percentage cytochrome *b* divergence. Conversely, Rheindt and Austin (2005) [4] also defined these two species as separate, as they are sympatric yet morphologically distinct taxa that breed at different times of year. Hybridisation between the two species has been reported at several breeding colonies [5, 6, 7].

CONSERVATION LISTINGS AND PLANS

International

- Agreement on the Conservation of Albatrosses and Petrels – Annex 1 [8]
- 2010 IUCN Red List of Threatened Species – Least Concern (downlisted from Near Threatened in 2009) [9]
- Convention on Migratory Species - Appendix II [10]

Australia

- *Environment Protection and Biodiversity Conservation Act 1999* (*EPBC ACT*) [11]
  - Vulnerable
  - Migratory Species
  - Marine Species
- Recovery Plan for Albatrosses and Giant Petrels (2001) [12]
- Threat Abatement Plan 2006 for the incidental catch (or bycatch) of seabirds during oceanic longline fishing operations [13]
- New South Wales: *Threatened Species Conservation Act 1995* - Vulnerable [14]
- Queensland: Nature Conservation Act 1992 - Vulnerable [15]
- Tasmania: *Threatened Species Protection Act 1995* – Rare [16]
- Victoria: *Fauna and Flora Guarantee Act 1988* - Threatened [17]

Chile

- National Plan of Action for reducing by-catch of seabirds in longline fisheries (PAN-AM/CHILE) 2007 [18]

France

- *Ministerial Order of 14 August 1998 (Arrêté du 14 août 1998)* [19]
  - Listed Protected Species

New Zealand

- *New Zealand Wildlife Act 1953* [20]
- New Zealand Threat Classification System List 2008 – Naturally Uncommon [21]

South Africa

- *Sea Birds and Seals Protection Act, 1973 (Act No. 46 of 1973) (SBSPA)* [22]
- *Sea Birds and Seals Protection Act, 1973 (Act No. 46 of 1973):* Policy on the Management of Seals, Seabirds and Shorebirds: 2007 [23, 24]
- National Plan of Action (NPOA) for Reducing the Incidental Catch of Seabirds in Longline Fisheries (2008) [25]

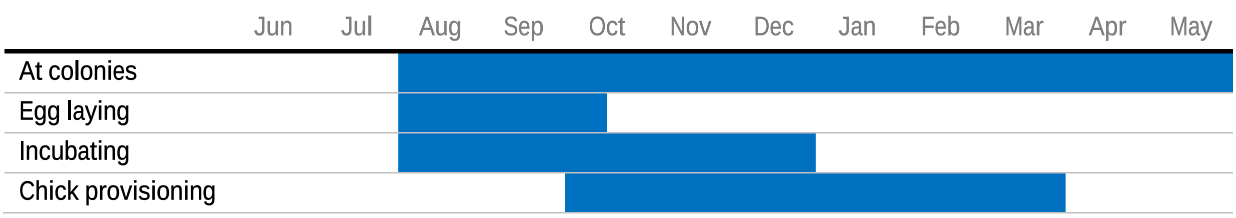
South Georgia (Islas Georgias del Sur)

- *Falkland Island Dependencies Conservation Ordinance 1975* [26]
- FAO International Plan of Action-Seabirds: An assessment for fisheries operating in South Georgia and South Sandwich Islands [27]

BREEDING BIOLOGY

Macronectes halli are surface-nesting colonial or solitary annual breeders [1]. This species exhibits strong fidelity to their breeding islands and also strong pair bonds, generally mating for life [28]. No differences in seasonal or gender plumages exist, but males are larger with heavier bills [29]. In locations where both giant petrel species breed, *M. giganteus* begin egg laying about six weeks after *M. halli*, which reduces competition given the similarity in diets and foraging ranges [30, 31]. The breeding season generally begins in August when birds arrive at the colonies and lay a single egg between August and early October (Table 1). Both sexes share incubation (59-60 d) and food provisioning duties [29, 30, 32]. Males spent a significantly greater proportion of time incubating on South Georgia (Islas Georgias del Sur) [32] whereas females took a greater proportion of incubation shifts on Marion Island [30]. Chick rearing period on Marion Island was 120.1 ± 4.0 d for male chicks and 114.3 ± 2.5 d for female chicks; female chicks weighed 82% of male chick mass prior to fledging. On South Georgia (Islas Georgias del Sur), female chicks also took 114.3 ± 2.8 d but males took only 109.8 ± 2.1 d to fledge [32]. Age of first breeding is at least 4-11 years; sabbaticals, or non-breeding periods, are common and were recorded at Île de la Possession, Crozet archipelago for 15-40% of adults each year [28].

Table 1. *Breeding cycle of* M. halli.



BREEDING STATES

Table 2. *Distribution of the global* M. halli *population among Parties to the Agreement. Note: percentages based on currently available data.*

	Australia	Disputed*	France	New Zealand	South Africa
Breeding pairs	15%	36%	23%	22%	4%

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

BREEDING SITES

The breeding range of *M. halli* encompasses the subantarctic zone and convergence [1], including South Georgia (Islas Georgias del Sur), Prince Edward Islands, the Crozet and Kerguelen archipelagos, Macquarie Island and the New Zealand islands of Auckland, Campbell, Antipodes and Chatham (Figure 1).

South Georgia (Islas Georgias del Sur) holds the largest *M. halli* breeding population, over one third of the global total (Table 2, Table 3). In the late 1990s, the total breeding population was estimated as 11,210 pairs [33].

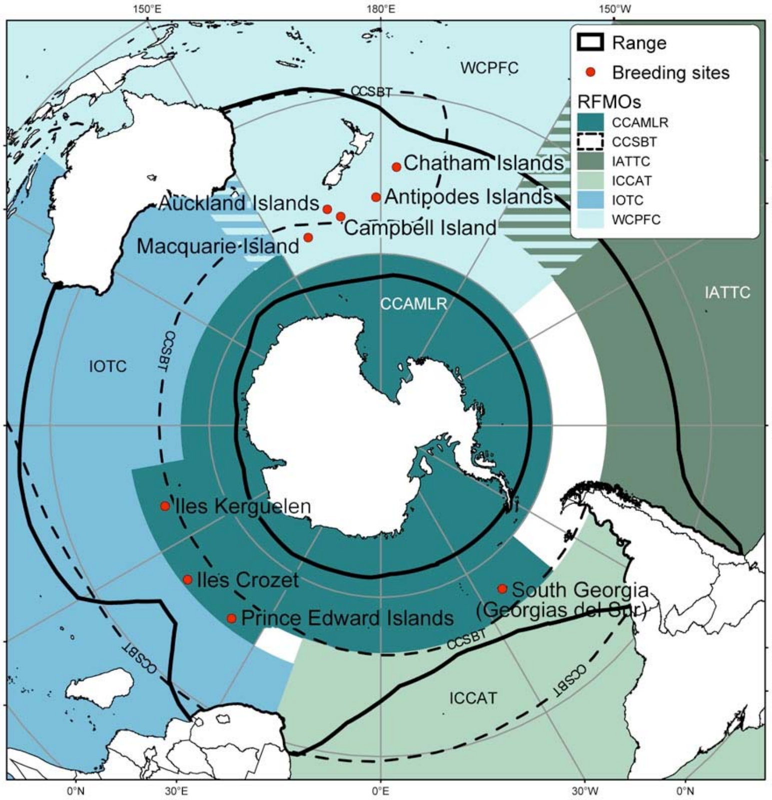


Figure 1. *The approximate range of* M. halli *inferred from satellite-tracking and band recoveries and location of the breeding sites with the boundaries of selected Regional Fisheries Management Organisations (RFMOs) also shown.*

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

Table 3. *Monitoring methods and estimates of the population size (annual breeding pairs) for each breeding site. Table based on unpublished data (Tasmanian Department of Primary Industries and Water (DPIW) - Macquarie Island; Centre d'Etudes Biologiques de Chizé, Centre National De La Recherche Scientifique (CNRS) - Ile de la Possession; R.J.M. Crawford, Marine & Coastal Management, Department of Agriculture, Forestry and Fisheries (DAFF) and P.G. Ryan, University of Cape Town – Marion Island) and published references as indicated.*

Breeding site location	Jurisdiction	Years monitored	Monitoring method	Monitoring accuracy	Annual breeding pairs (last census)
Macquarie Island 54° 30'S, 158° 55'E	Australia	1977, 1995-2008	A	High	1,793 (2008)
Total % of all sites					1,793 15.2%
South Georgia (Islas Georgias del Sur) 54° 00'S, 38° 36'W	Disputed*	1966-1996, 2005-2007	B, C	Medium	4,310 (1999) [33]
Total % of all sites					4,310 36.5%
Iles Crozet 46° 26'S, 51° 47'E					
Ile de la Possession	France	1980-2007	A	High	458 (2007)
Ile de l'Est	France	1984	F	Unknown	190 (1984) [34]
Ile des Pingouins	France	1984	F	Unknown	165 (1984) [34]
Iles des Apôtres	France	1984	F	Unknown	150 (1984) [34]
Ile aux Cochons	France	1976	F	Unknown	250-300 (1976) [35]
Total % of all sites					1,213-1,263 10.7%
Iles Kerguelen 49° 09'S, 69° 16'E	France	1984-1987, 1994, 1995, 2005-2007	C	Medium	1,400 (1995) [33]
Péninsule Courbet	France	1987	F	Medium	700-800 (1987) [36]
Golfe du Morbihan	France	1987	F	Medium	150 (1987) [36]
Ile Nuageuses	France	1987	F	Medium	20 (1987) [36]
Howe Island	France	1987	F	Medium	25 (1987) [36]
Baie Larose	France	1987	F	Medium	100-150 (1987) [36]
Péninsule Rallier du Baty	France	1987	F	Medium	500-600 (1987) [36]
Total % of all sites					1,400 11.9%
Chatham Islands 44° 00'S, 176°67'E					
The Forty-fours	New Zealand	1976, 1993	C	Medium	2,000 (1993) [37]
Antipodes Islands 49° 75'S, 178° 80'E	New Zealand	1969, 2000	C	High	233 (2000) [38]
Campbell Island 52° 50'S, 169° 00'E	New Zealand	1972-1996	C	High	234 (1996) [39]
Auckland Islands 51° 00'S, 166° 00'E	New Zealand	1972, 2003	A	Low	100 (2003) [40]
Total % of all sites					2,567 21.7%
Prince Edward Islands Marion Island 46° 54'S, 37° 45'E	South Africa	1985, 1987, 1989 - 1995, 1997-2008	A	High	331 (2008)
Prince Edward Island 46° 38'S, 37° 57'E	South Africa	1990, 2002	A	High	133 (2002) [41]
Total % of all sites					464 3.9%
Total for all sites					*c.* 11,800

*see Table 2 footnote

CONSERVATION LISTINGS AND PLANS FOR THE BREEDING SITES

International

Macquarie Island

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

Prince Edward Islands, Iles Crozet and Iles Kerguelen

- Ramsar Convention List of Wetlands of International Importance (inscribed 2007 and 2008) [44]

Australia

Macquarie Island

- Register of Critical Habitat - listed 2002 (*EPBC Act 1999*) [11]
- Register of the National Estate (until February 2012) – listed 1977 (*Australian Heritage Commission Act 1975)* [45]
- National Heritage List – listed 2007 (*EPBC Act 1999*) [11]

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]

France

Iles Crozet and Iles Kerguelen

- National Nature Reserve (*Réserve Naturelle Nationale*) - Décret n°2006-1211 [49]. Specific areas have higher level of protection (Integral Protection Areas, *Aires de Protection Intégrale*): Iles Crozet except Ile de la Possession; 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

Auckland Islands, Campbell Islands, and Antipodes Islands

- National Nature Reserve - *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 [55]
- South Georgia: Plan for Progress. Managing the Environment 2006 – 2010 [56]

Bird Island, Albatross Island and Annekov Island

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

POPULATION TRENDS

The population of *M. halli* has shown both decreases and dramatic increases across their breeding range. At many sites, however, census data are infrequent and/or of low accuracy, preventing detailed assessments of population trends. On Ile de la Possession (Crozet Archipelago), the population increased from 150 to 560 breeding pairs between 1966 and 1980 [28], declined during the 1980s, increasing again in the late 1990s and decreasing since 1998 [57] (Table 4). On Bird Island, South Georgia (Islas Georgias del Sur) the breeding population increased by 60% between 1978 and 1996 [33]. These increases are likely a result of increases in fur seals *Arctocephalus* spp. (a source of carrion) numbers and increased pelagic food sources such as waste available from commercial fishing operations [28, 58]. Large increases have been reported since the mid 1990s on Macquarie Island (Figure 2, Table 4). However, the breeding population on Marion Island has fluctuated since 1985 (Figure 3), with a period of annual increase of 3.9% until 1998, followed by a decline of 9.2% until 2005 (Table 4). Since then, the breeding population appears to be recovering at 24.8% per annum although the overall long term linear trend is a decrease of c. 0.5% between 1985 and 2008 (Table 4). Until 1999, the long term trend was for an increase of 3.4% per year (breeding population) since 1977 [59]. Conversely, the at-sea abundance of *M. halli* in the Prydz Bay area of East Antarctica has apparently decreased by 75% since 1980/81 [60].

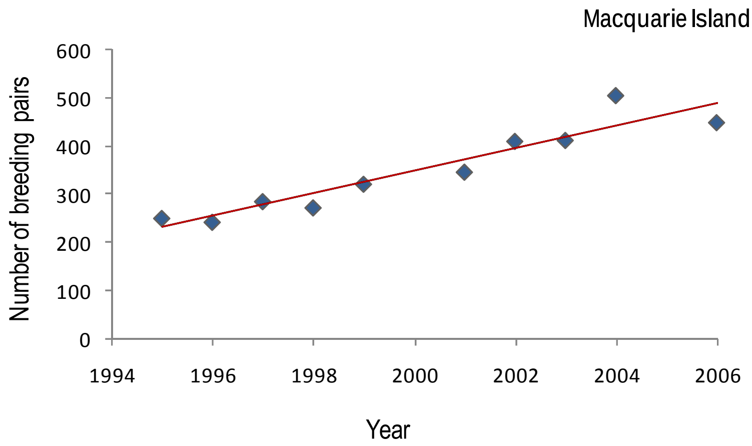


Figure 2. *Counts of nesting pairs in a subsample of total population with a simple regression line fitted. Figure based on unpublished DPIW data, not to be used without data holders' permission.*

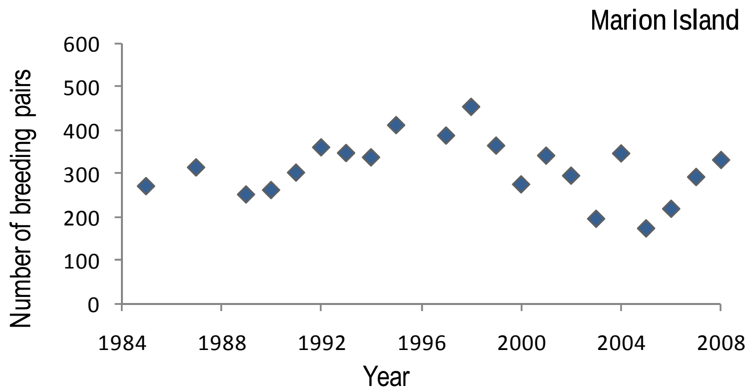


Figure 3. *Counts of nesting pairs on Marion Island. Figure based on unpublished John Cooper, Robert JM Crawford, Bruce M Dyer, Peter G Ryan and Samantha L Petersen data. Not to be used without data holders' permission.*

Northern (left) and Southern (right) Giant Petrels fighting over a carcass. Photo © Jacob González-Solís

Table 4. *Summary of population trend data for* M. halli. *Table based on unpublished DPIW and J. Cooper, R.J.M. Crawford, B.M. Dyer, P.G Ryan and S.L. Petersen data.*

Breeding site	Current Monitoring	Trend Years	% average change per year [61] (95% Confidence Interval)	Trend	% of population
Macquarie Island	Yes	1997- 2008[1]	+4.8 (4.2, 5.4)	Increasing	100
		1995-2006[2]	+6.9 (6.1, 7.7)	Increasing	*c.* 30
South Georgia (Islas Georgias del Sur)	?	-	-	Unknown	-
Iles Crozet Possession Island	Yes	1980-2005	-0.0004 (-1.3, -1.1) [57]	No trend	100
		1980-1993	-5.8 (-2.9, -8.4) [57]	Declining	100
		1993-1998	+14.0 (5.9, 22.1) [57]	Increasing	100
		1998-2005	-2.9 (-7.9, 2.1) [57]	Declining	100
Iles Kerguelen	?	-	-	Unknown	-
Chatham Islands	?	-	-	Unknown	-
Antipodes Islands	?	-	-	Unknown	-
Campbell Island	?	-	-	Unknown	-
Auckland Islands	?	-	-	Unknown	-
Prince Edward Islands Marion Island		1985-2008[3]	- 0.5 (-0.1, -0.8)	Declining	100
	Yes	1985-1998[3]	+3.9 (3.0, 4.7)	Increasing	100
		1998-2005	-9.2 (-7.5, -10.9)	Declining	100
		2005-2008	+24.8 (32.0, 17.6)	Increasing	100

[1] Missing data: 1998, 2000, 2002-2007
[2] Missing data: 2000, 2005
[3] Missing data: 1986, 1988, 1996

Average breeding success increased from 53.6 ±12.5% (1983-2001) on Marion Island [30] to 74.1% ±13.5% in more recent years (2003 - 2007) (Table 5). Mean adult survival has been reported at between 88% and 93% [28, 30, 32]. Juvenile survival has not been examined at any breeding site (Table 5).

Table 5. *Demographic data for the breeding sites of* M. halli. *Table based on unpublished data (DPIW – Macquarie Island; British Antarctic Survey (BAS) – Bird Island; R.J.M. Crawford, Marine & Coastal Management, DAFF, and P.G. Ryan, University of Cape Town – Marion Island) and published references as indicated.*

Breeding site	Mean breeding success (±SD/range; Years)	Mean juvenile survival	Mean adult survival
Macquarie Island	66% (53-72%, 1994-1999) 67.0% (±7.9%, 1977-2007)	No data	No data
South Georgia (Islas Georgias del Sur) Bird Island	63% (44-86%; 1979-2005) 73.1% (±18.3%; 1978-1981) [32]	No data	88-93% (1979-1981) [32]
Iles Crozet Ile de la Possession	53.3% (±3.5; 1981-2005) [57]	No data	92.3%* [28]
Iles Kerguelen	No data	No data	No data
Chatham Islands	No data	No data	No data
Antipodes Islands	No data	No data	No data
Campbell Island	No data	No data	No data
Auckland Islands	No data	No data	No data
Prince Edward Islands Marion Island	53.6% (±12.5%; 1984-2001) [30] 74.1% (±13.5%, 2003-2007)	No data	88% (1987/88, 2002/03) [30]

* Recorded as 7.7% mortality

BREEDING SITES: THREATS

Several land-based threats to *M. halli* have been documented, but currently none are considered to have the scope or severity to cause population level changes. Human disturbance at breeding sites near research stations or visitation to breeding sites could result in a decrease in breeding success or even abandonment of the colony [13]. Introduced animals such as cats *Felis catus* and Black rats *Rattus rattus* have caused mortality in eggs and chicks at Macquarie Island in the past; however, cats were eradicated in 2000. An eradication programme which targets *R. rattus* and *Mus musculus* (as well as European rabbits *Oryctolagus cuniculus,* which damage the breeding habitat), commenced in 2010 [48] but had to be abandoned due to exceptionally poor weather. It will recommence in 2011.

Table 6. *Summary of known threats causing population level changes at the breeding sites of* M. halli*. Table based on 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 degradation	Predation by alien species	Contamination
Macquarie Island	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	no	no
Chatham Islands	no	no	no	no	no	no	no
Antipodes Islands	no	no	no	no	no	no	no
Campbell Island	no	no	no	no	no	no	no
Auckland Islands	no	no	no	no	no	no	no
Prince Edward Islands	no	no	no	no	no	no	no

FORAGING ECOLOGY AND DIET

Giant petrels are regarded as the main scavengers in subantarctic and Antarctic waters but are also predators [62, 63, 64]. Regarded as aggressive opportunists, *M. halli* may take prey by surface-seizing, yet also employ surface-diving and pursuit plunging to 2 m [65]. Regurgitations from chicks on Marion Island revealed penguin carrion as the most important dietary component but also included seal carrion, small burrowing petrels, fish and cephalopods [63]. On Bird Island, South Georgia (Islas Georgias del Sur), regurgitations from recently-fed chicks included fur seal and penguin carrion (mainly adult Macaroni *Eudyptes chrysolophus*), krill, squid and birds such as small burrowing petrels [65]. Other dietary items include whale carrion, dead albatross chicks, ship offal and kelp [28]. Male chicks at South Georgia (Islas Georgias del Sur) were fed more than female chicks [6]. Adult males and females at South Georgia [65] and Marion Island [63] were observed to show segregation in foraging behaviour, likely to reduce intraspecific competition. Males tended to show more flexible foraging between coastal and pelagic habitats, probably taking advantage of seal carrion availability, whereas females were consistently more pelagic [66, 67, 68, 69]. Interspecific competition with *M. giganteus* resulting from similar diets is reduced by the six week difference in breeding phenology and some spatial segregation in foraging areas [58, 66, 69]. *Macronectes halli* breeding appears to be timed to take advantage of abundant carrion from the seal pupping season, an important food source during chick brooding [31, 32, 58, 68]. However, in sympatric areas, competition at carcasses between the two species is very common.

MARINE DISTRIBUTION

Macronectes halli are pelagic and circumpolar, generally found between 30-64°S, but the extent is imprecise given the difficulty in distinguishing *M. halli* from *M. giganteus* [28] at sea. In summer, they range in subantarctic to Antarctic open oceans and in winter to early spring throughout subtropical seas to 28°S [13, 66]. Young birds tend to disperse great distances from the breeding colonies, often with an eastward movement likely due to prevailing westerly winds (Figure 4) [70, 71]. Chicks from Crozet and Kerguelen Islands disperse on the whole edge of Antarctica during the first months after fledging (H. Weimerskirch, unpublished data). Adults stay relatively close to colonies during chick rearing (Figure 5) [32, 70]. Band recoveries are insufficient to draw conclusive statements regarding wintering areas and oceanic movements [57, 72, 73].

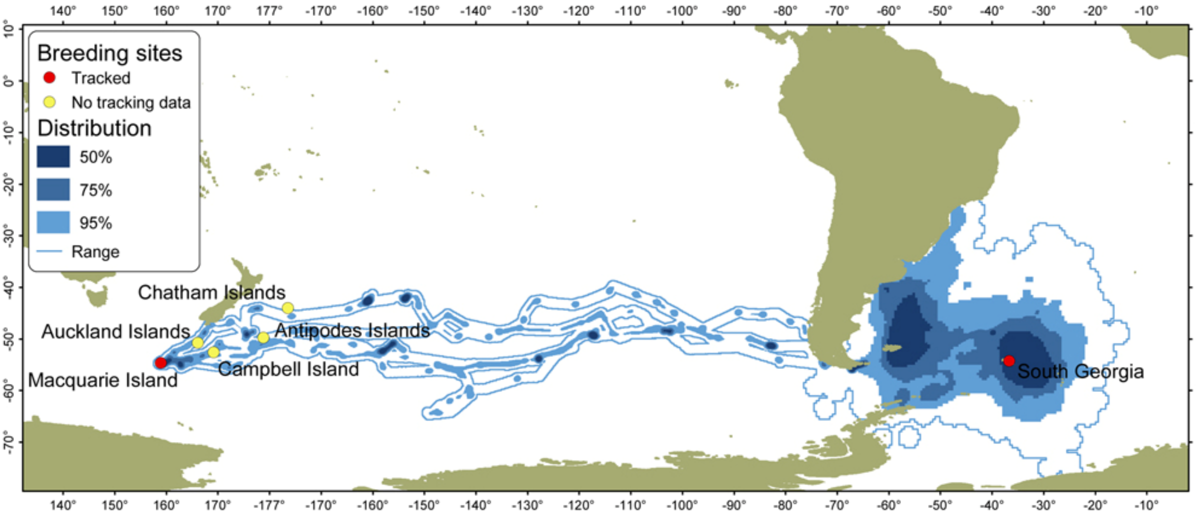


Figure 4. *Satellite-tracking data of non-breeding* M. halli (Number of tracks =36). *Map based on data contributed to the BirdLife Global Procellariiform Tracking Database* [74].

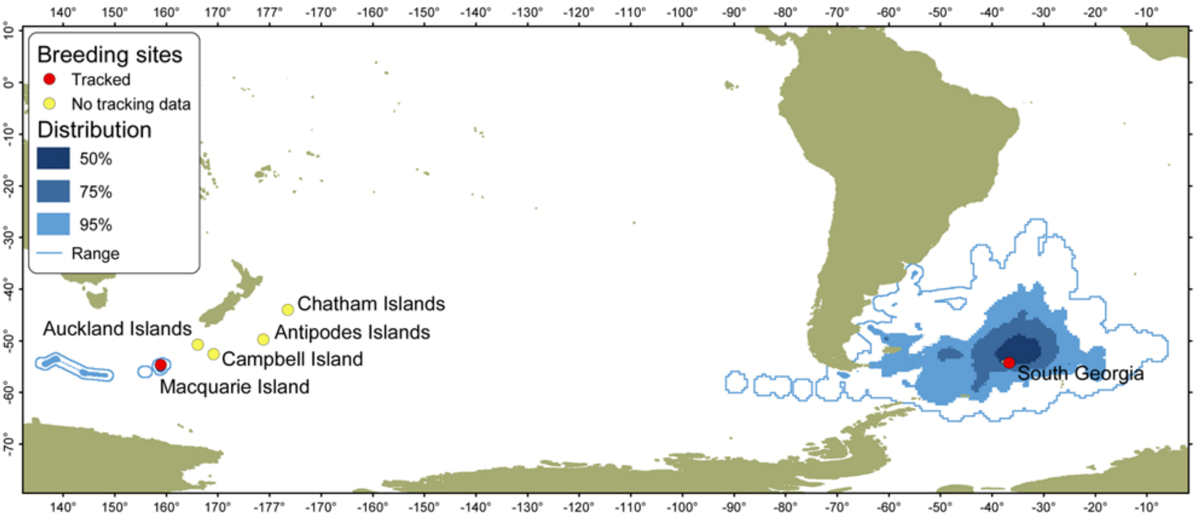


Figure 5. *Tracking data of breeding M. halli (Number of tracks =103). Map based on data contributed to the BirdLife Global Procellariiform Tracking Database* [74].

Due to its circumpolar distribution, *M. halli* overlaps with all major Regional Fisheries Management Organisations (Table 7), including SWIOFC (South-West Indian Ocean Fisheries Commission), SIOFA (Southern Indian Ocean Fisheries Agreement), and SEAFO (South-East Atlantic Fisheries Organisation) and the yet to be established South Pacific Regional Fisheries Management Organisation (SPRFMO) as well as those shown in Figure 1. Recently fledged *M. halli* from Macquarie Island fitted with satellite transmitters were found to spend significant time in open waters within the jurisdiction of CCSBT, WCPFC, IATTC and SPRFMO, whereas adult birds spent little time in RFMO waters except those under CCAMLR jurisdiction [71].

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 Northern Giant Petrels.*

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

[1] See Table 2 footnote

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

MARINE THREATS

The most serious threat to *M. halli* is commercial fishing activities in the Southern Ocean. Longline fishing for Patagonian toothfish *Dissostichus eleginoides* is of particular concern as this demersal fishery tends to be restricted to shelf areas around subantarctic breeding islands of albatrosses and petrels. Although some in this fishery use sanctioned measures to reduce seabird mortality, much activity is still illegal, unregulated and unreported (IUU), thus difficult to regulate or control. Potentially 7-16% of the breeding *M. halli* population may have been killed by longline operations around Prince Edward Island in 1996-2000 [75]. Females may have a higher mortality in this fishery as they tend to have larger pelagic ranges and longer foraging trips than males; additionally, females have greater overlap between foraging territory and longline fishing areas [66]. Trawl fisheries may also injure or kill *M. halli* through collisions with netsonde cables and trawl warps [13].

Other marine threats may include ingestion of or entanglement in marine debris (both plastic and fishery-related) [76], fouling from oil spills and shooting by commercial fishing vessels to reduce stealing of baits [63]. Contamination by pollutants through dietary sources is also a potential concern, with relatively high concentrations of hexachlorobenzenes (HCB) and mercury and increasing dichlorodiphenyl-dichloroethylene (DDE) concentrations in this species [77]. Compared to other seabirds, *M. halli* had high levels of lead, mercury and selenium in their feathers and other tissues [78, 79].

KEY GAPS IN SPECIES ASSESSMENT

Data on *M. halli* are lacking in key areas including the diet, foraging areas and genetic profiles of breeding sub-populations. Long-term monitoring is necessary to detect or confirm population trends; however, it is logistically difficult to survey all breeding sites and to determine trends when variable proportions (15-40%) of adults take breeding sabbaticals [29]. Detailed demographic studies are necessary to understand potential importance of at-sea threats, particularly as varying levels of interaction with different threats may have implications for sex ratios of populations, given the high degree of sexual segregation in foraging. Additionally, the extent and effects of at-sea threats such as plastic debris ingestion and pollutant levels are currently unknown [13].

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PHOTOGRAPHS

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RECOMMENDED CITATION

Agreement on the Conservation of Albatrosses and Petrels. 2010. ACAP Species assessments: Northern Giant Petrel *Macronectes halli.* Downloaded from http://www.acap.aq on 13 October 2010.

GLOSSARY AND NOTES

(i) Years.

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

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

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

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

METHOD

A Counts of nesting adults (Errors here are detection errors (the probability of not detecting a bird despite its being present during a survey), the "nest-failure error" (the probability of not counting a nesting bird because the nest had failed prior to the survey, or had not laid at the time of the survey) and sampling error).

B Counts of chicks (Errors here are detection error, sampling and nest-failure error. The latter is probably harder to estimate later in the breeding season than during the incubation period, due to the tendency for egg- and chick-failures to show high interannual variability compared with breeding frequency within a species).

C Counts of nest sites (Errors here are detection error, sampling error and "occupancy error" (probability of counting a site or burrow as active despite it's not being used for nesting by birds during the season).

D Aerial-photo (Errors here are detection errors, nest-failure error, occupancy error and sampling error (error associated with counting sites from photographs), and "visual obstruction bias" - the obstruction of nest sites from view, always underestimating numbers).

E Ship- or ground- based photo (Errors here are detection error, nest-failure error, occupancy error, sampling error and "visual obstruction bias" (the obstruction of nest sites from view from low-angle photos, always underestimating numbers)

F Unknown

G Count of eggs in subsample population

H Count of chicks in subsample population and extrapolation (chicks x breeding success - no count of eggs)

RELIABILITY

1 Census with errors estimated

2 Distance-sampling of representative portions of colonies/sites with errors estimated

3 Survey of quadrats or transects of representative portions of colonies/sites with errors estimated

4 Survey of quadrats or transects without representative sampling but with errors estimated

5 Survey of quadrats or transects without representative sampling nor errors estimated

6 Unknown

(iii) Population Survey Accuracy

High Within 10% of stated figure;

Medium Within 50% of stated figure;

Low Within 100% of stated figure (eg coarsely assessed via area of occupancy and assumed density)

Unknown

(iv) Population Trend

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

(v) Productivity (Breeding Success)

Defined as proportion of eggs that survive to chicks at/near time of fledging unless indicated otherwise

(vi) Juvenile Survival

defined as:

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

(vii) Threats

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

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

(viii) Maps

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