

[1] "*Sula leucogaster* — Brown Booby  
Glossary SPRAT Profile  
information to assist regulatory considerations, refer to Policy Statements and Guidelines, the Conservation Advice, the Listing Advice and/or the Recovery Plan. EPBC Legal Status and Documents Top EPBC Act Listing Status Listed marine Listed migratory - EPBC Act, CAMBA, JAMBA, ROKAMBA Approved Conservation Advice There is no approved Conservation Advice for this species Listing Advice There is no Listing Advice for this species Adopted/Made Recovery Plans There is no adopted or made Recovery Plan for this species Adopted/Made Threat Abatement Plans Department of the Environment and Energy (2018). Threat Abatement Plan for the impacts of marine debris on the vertebrate wildlife of Australia's coasts and oceans (2018). Canberra, ACT: Commonwealth of Australia. Available from: <http://www.environment.gov.au/biodiversity/threatened/publications/tap/marine-debris-2018>. In effect under the EPBC Act from 21-Jul-2018. Marine Bioregional Plans Department of Sustainability, Environment, Water, Population and Communities (DSEWPac) (2012). Marine bioregional plan for the North Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999. Available from: <http://www.environment.gov.au/topics/marine/marine-bioregional-plans/north>. In effect under the EPBC Act from 27-Aug-2012. Department of Sustainability, Environment, Water, Population and Communities (DSEWPac) (2012). Marine bioregional plan for the North-west Marine Region. Prepared under the Environment Protection and Biodiversity Conservation Act 1999. Available from: <http://www.environment.gov.au/topics/marine/marine-bioregional-plans/north-west>. In effect under the EPBC Act from 27-Aug-2012. Other Commonwealth Documents Top Policy Statements and Guidelines National Light Pollution Guidelines for Wildlife Including Marine Turtles, Seabirds and Migratory Shorebirds (Department of the Environment and Energy, 2020) [Admin Guideline]. Offshore and foraging pelagic seabirds - A Vulnerability Assessment for the Great Barrier Reef (Great Barrier Reef Marine Park Authority (GBRMPA), 2011) [Admin Guideline]. Information Sheets Final Report of the Christmas Island Expert Working Group to the Minister for the Environment Protection, Heritage and the Arts (Department of the Environment, Water, Heritage and the Arts (DEWHA), 2010) [Information Sheet]. Federal Register of Legislative Instruments Marine: Declaration under section 248 of the Environment Protection and Biodiversity Conservation Act 1999 - List of Marine Species (Commonwealth of Australia, 2000c) [Legislative Instrument] Migratory: List of Migratory Species (13/07/2000) (Commonwealth of Australia, 2000b) [Legislative Instrument] Threat Abatement Plan: Instrument under section 270B of the Environment Protection and Biodiversity Conservation Act 1999 to make a Threat Abatement Plan (Commonwealth of Australia, 2018i) [Legislative Instrument] Non-statutory Listing Status IUCN: Listed as Least Concern (Global Status: IUCN Red List of Threatened Species: 2020.2 list) NGO: Listed as Least Concern (The Action Plan for Australian Birds 2010 - non-threatened) Naming Top Scientific name *Sula leucogaster* [1022] Family Sulidae: Pelecaniformes: Aves: Chordata: Animalia Species author (Boddaert, 1783) Infraspecies author Reference Distribution Map Top Distribution map The distribution shown is generalised from the Departments Species of National Environmental Significance dataset. This is an indicative distribution map of the present distribution of the species based on best available knowledge. Some species information is withheld in line with sensitive species policies. See map caveat for more information. Illustrations Top Illustrations Google Images Other Links, Including Superseded Commonwealth Documents Top Commonwealth of Australia (2000b). List of Migratory Species (13/07/2000). F2007B00750. Canberra:

Federal Register of Legislative Instruments. Available from: <http://www.comlaw.gov.au/Details/F2007B00750>. Commonwealth of Australia (2000c). Declaration under section 248 of the Environment Protection and Biodiversity Conservation Act 1999 - List of Marine Species. F2008B00465. Canberra: Federal Register of Legislative Instruments. Available from: <http://www.comlaw.gov.au/Details/F2008B00465>. Commonwealth of Australia (2007h). Environment Protection and Biodiversity Conservation Act 1999 - Listed Migratory Species - Approval of an International Agreement. F2007L02641. Canberra: Federal Register of Legislative Instruments. Available from: <http://www.comlaw.gov.au/Details/F2007L02641>. Department of the Environment and Heritage (2006yi). *Sula leucogaster* in Species Profile and Threats (SPRAT) database. Canberra: DEH. Available from: [http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon\\_id=1022](http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=1022). Newsletters Top EPBC Act email updates can be received via the Communities for Communities newsletter and the EPBC Act newsletter. Caveat Top This database is designed to provide statutory, biological and ecological information on species and ecological communities, migratory species, marine species, and species and species products subject to international trade and commercial use protected under the Environment Protection and Biodiversity Conservation Act 1999 (the EPBC Act). It has been compiled from a range of sources including listing advice, recovery plans, published literature and individual experts. While reasonable efforts have been made to ensure the accuracy of the information, no guarantee is given, nor responsibility taken, by the Commonwealth for its accuracy, currency or completeness. The Commonwealth does not accept any responsibility for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance on, the information contained in this database. The information contained in this database does not necessarily represent the views of the Commonwealth. This database is not intended to be a complete source of information on the matters it deals with. Individuals and organisations should consider all the available information, including that available from other sources, in deciding whether there is a need to make a referral or apply for a permit or exemption under the EPBC Act. Citation: Department of the Environment (2022). *Sula leucogaster* in Species Profile and Threats Database, Department of the Environment, Canberra. Available from: <https://www.environment.gov.au/sprat>. Accessed Tue, 18 Jan 2022 21:54:18 +1100. Where available the sections below provide a biological profile for the species. Biological profiles vary in age and content across species, some are no longer being updated and are retained as archival content. These profiles are still displayed as they contain valuable information for many species. The Profile Update section below indicates when the biological profile was last updated for some species. For information to assist regulatory considerations, please refer to Conservation Advice, the Recovery Plan, Policy Statements and Guidelines. Taxonomy Top Scientific name: *Sula leucogaster* Common name: Brown Booby Other names: Brown or Black Gannet, Common Booby, White-bellied Booby, White-bellied Gannet Conventionally accepted as *Sula leucogaster* (Christidis & Boles 2008). Four subspecies are identified, all of which are similar in appearance (Lindsay 1986; Marchant & Higgins 1990): *Sula leucogaster leucogaster*, which occurs in the Atlantic Ocean *S. l. plotus*, which occurs in the Indian and western Pacific Oceans *S. l. brewsteri*, which occurs in Mexico *S. l. etesiac*, which occurs in western South America. Description Top The smallest of the Sulidae family, the Brown Booby is deep brown in colour on the back, upper breast, upper wing, head and throat. A strong demarcation is seen on the breast with white undersides. Under wings display a distinct white patch to the centre margined by deep brown. The iris may be cream, yellow, grey or deep brown. The bill is creamy-grey and males have a deep blue base (close to the head). Legs and feet are yellow. The average length of the Brown Booby is 65–75 cm with a wingspan of 130–150 cm. Birds weigh from 900–1500 g. (Lindsay 1986; Marchant & Higgins 1990). There is little difference between sexes, though females are slightly larger and have a chrome-yellow base to the bill instead of blue and brighter yellow feet. There is no seasonal variation in plumage. Juveniles and immature birds are also similar with a brownish tinge to white underparts (Lindsay 1986; Marchant & Higgins 1990). At sea, the Brown Booby flies and feeds individually or in flocks, sometimes in large mixed-species flocks, and often travel in extended skeins (a flock in flight). The species breeds colonially and roosts communally with other Brown Boobies or other species (Marchant & Higgins 1990). Australian Distribution Top In Australia, the Brown Booby is found from Bedout Island in Western Australia, around the coast of the Northern Territory to the Bunker Group of islands in Queensland with occasional reports further south in New South Wales (NSW) and Victoria (Marchant &

Higgins 1990). The species is reported further south to Tweed Heads, NSW, and to near Onslow, Western Australia and may be becoming more common in these areas (Atlas 2 2001; Blakers et al. 1984).

**Global Distribution**

The Brown Booby is a very common booby, occurring through all tropical oceans approximately bounded by latitudes 30° N and 30° S. The species is not common in the Indian Ocean east of the Seychelles or in a broad band north-west to south-east through the eastern central Pacific Ocean. The species is considered a vagrant to New Zealand (Marchant & Higgins 1990). Outside of Australian waters, the Brown Booby breeds widely throughout tropical areas (Marchant & Higgins 1990).

**Population Information**

Within Australian seas, including Christmas and Cocos-Keeling Islands in the eastern Indian Ocean, the total breeding population was 59 940–73 900 pairs in a 1996–97 survey (Ross et al. 1996b; WBM Oceanics & Claridge 1997). The global population estimate for the species is 200 000 (Birdlife International 2010d).

Within Australia the Brown Booby has declined significantly due to low population recruitment in Swain Reefs, the Great Barrier Reef, toward the southern limit of the known range (Heatwole et al. 1996), at Booby Island where it was known to breed (King 1993) and Bramble Cay. The cause of these declines is unknown.

**Habitat**

The Brown Booby uses both marine and terrestrial habitat. The species occurs in, but is not restricted to, tropical waters of all major oceans, often staying close to breeding islands. The species is known to approach mainland coastlines more than other boobies and has been recorded in coastal waters, harbours and estuaries and near offshore islands but seldom flying over land (Marchant & Higgins 1990). Off north-west Western Australia, Brown Boobies are most abundant 18–36 km from land, but also occur inside and outside these limits. The species is often concentrated where wavelets are about 2 m high (just high enough to break), and sea surface-temperature is less than 25.5 °C (Abbott 1979b). The Brown Booby flies low, seldom higher than 30 m above the sea surface (Marchant & Higgins 1990).

The Brown Booby utilises tropical islands, continental islands, sand cays and atolls for breeding. The Brown Booby nests on the ground in a variety of sites, from rugged rocky terrain (cliffs, steep slopes) on larger islands, to beaches, sand bards, coral rubble and guano flats on cays. The species also readily roosts on artificial structures (such as, navigation beacons, buoys, piles, railings, shipwrecks). Whilst the species does not need sheltering vegetation for breeding, it may be used where present (Marchant & Higgins 1990). Sites may be physically unstable under action of winds, currents and waves. For example, Brown Boobies have been recorded to nest as low as 1 m above high water, as well as sites submerged by above average high tides and storm surges (Marchant & Higgins 1990).

**Life Cycle**

The annual mortality rate of adults is approximately 6% (del Hoyo et al. 1992). Age of first breeding is approximately 2–3 years of age (Marchant & Higgins 1990). A Brown Booby has been recaptured 25 years after banding (ABBBS 2011), which may indicate the species life span.

At some sites, breeding is seasonal, with a peak summer nesting period, but elsewhere the species breeds opportunistically or continuously throughout the year. Individuals form colonies that are usually smaller than other *Sula* species and sometimes in association with Masked Boobies (del Hoyo et al. 1992; Marchant & Higgins 1990). Having bred once, most birds return repeatedly to the same nesting site, although one male has been recorded breeding successively on two different islands in the north-west Pacific (Marchant & Higgins 1990). Breeding within metapopulations is common (O'Neill et al. 1996), but breeding between distant populations has not been recorded in Australia.

Nest materials depend on what is locally available and nest construction may be substantial (of plant remains, twigs, seaweed, bones, feathers, turtle egg-shells, debris) or non-existent on unvegetated cays (Marchant & Higgins 1990). Brown Boobies are vulnerable to predation pressure and disturbance at breeding colonies. Eggs and chicks are especially susceptible to predation by Silver Gulls (*Chroicocephalus novaehollandiae*) (Marchant & Higgins 1990).

In tropical areas, Brown Boobies depend on cool water for feeding, especially when breeding. Cool waters mixing with warm increase nutrient recycling that forms plankton growth and on which fish stocks rely (Lindsay 1986). Breeding failure has been reported on Christmas Island during the El Niño Southern Oscillation, when sea surface-temperature remained high and food supply was poor (Marchant & Higgins 1990).

Clutch size is 1–3 eggs, mostly 2 (Marchant & Higgins 1990; Heatwole et al. 1990). The incubation period is approximately 43 days, with a nestling period of 14–15 weeks. Breeding success varies in the species, most likely due to the availability of food resources. In a study at Christmas Island, 68% of clutches hatched at least one egg, 81% of hatchlings fledged and 58% of clutches produced a fledgling. A study at Ascension Island, however, reported only 10% of clutches succeeding (Marchant & Higgins 1990).

Brown Boobies are recorded as feeding chicks more frequently than other Boobies, up to twice daily, most likely due to their inshore foraging habits (Lindsay 1986). If foraging resources are good, adults take turns in guarding nestlings for the entire nestling period, otherwise only for

the first 5–6 weeks. Chicks can fly and depart the nest at approximately 96–119 days (Marchant & Higgins 1990). It has been suggested that second eggs are laid as 'insurance' against the first egg not hatching or the chick dying early, or as an additional young in years of good food resources when both chicks can be raised successfully (Tershy et al. 2000). However, siblicide has been recorded in this species, in which one chick kills the second chick by competition for food or by forcibly ejecting it from the nest (Tershy et al. 2000).

Within Australia, breeding locations and maximum numbers of pairs (unless stated as nests or birds) are (Marchant & Higgins 1990; QPWS 2002a):

State	Site(s)	Maximum number of pairs
Australian External Territory	Christmas Island	5000
	Cocos-Keeling Island	75–100
Western Australia	Bedout Island	9576 ± 1150
	Lacepede Island, West Island	7370
	Lacepede Island, Middle Island	10 300
	Adele Island	7500 ± 940
	White Island	4000–5000
	Ashmore Reef - East, West and Middle Island	2–10
Northern Territory	Ellis Island	unspecified
Queensland	Rocky Island	10 000–15 000
	Manowar Island, Gulf of Carpentaria	1400
	West Fairfax Island	1000
	East Fairfax Island	3000
	East Hoskyn Island	450
	Gannett Cay	542
	Price Cay	316
	Frigate Cay	344
	Stapleton Island	1000
	Unnamed Cay (Tydeman Cay)	1400
	Unnamed Cay (Davie Cay)	800
	Willis Group, Mid Islet	141 nests
	Magdelaine Island, South-east Cay	263 nests
	Chilcott Island	208 nests
	Brodie Island	124 nests
	MacLennan Cay	1500
	Moulter Cay	3000
	Unnamed Cay (on Ashmore Banks No. 2)	500
	Raine Island	7600
	Bramble Cay, Marion Reef and Eva Island, Dianna Bank (Sandy Cay), Herald Group (South-west and North-east Cays), Diamond Island (South-west, East and Mid Islets), Flinders Group (Cay A), Lihou Reef (One, Eight and Nine Cays, Turtle Islet), Mellish Reef (Herald's Beacon Islet), Frederick Reef (North Reef Cay), Kenn Reef (South-west Projection Cay), Saumarez Reef (South-west Cay), Wreck Reef (Porpoise Cay, Bird Islet) and Cato Island	unspecified
	Coringa Group, South-west Islet, Georgina Island, Paget, Carola Cay, Ashton Rock, Sand Island, Distant Cay, Dinner Island, Bell Cay, Bylund Cay, Horseshoe Reef (No. 1), Black Rock, Cordelia Rocks (West), Riptide Cay, Ridge Island, Bacchi Cay, Thomas Cay and Anne Island	Less than 100 nests/pairs

The Brown Booby generally feeds in inshore waters (del Hoyo et al. 1992) in both shallow and deep water, and in areas of rough water where water masses converge (Marchant & Higgins 1990). The diet is comprised mainly of flying-fish, squid and some other cephalopods, as well as mullet (*Mugil* spp.) and anchovy (*Engraulis* spp.) (Blaber et al. 1995; Marchant & Higgins 1990). Prey is usually caught by plunge-diving and the species can also snatch prey off the surface of water. Kleptoparasitism (stealing of food or resources from other animals), mostly by females, has been observed (del Hoyo 1992). Brown Boobys sometimes feed in flocks, in association with other seabirds, or in association with cetaceans (Marchant & Higgins 1990).

**Movement Patterns**

Adult Brown Boobys leave nesting islands when not breeding, presumably for better foraging opportunities. Elsewhere, however, the pattern of movement away from islands is not understood (Marchant & Higgins 1990). Most recorded movements are of young birds dispersing along north-south routes, to areas of the Coral Sea and the Pacific Ocean. Individuals from Swain Reefs have been recovered around the Solomon Islands and eastern Papua New Guinea (PNG); those from the Capricorn Group have been recorded along the east coast of Queensland and eastern PNG; those from Raine Island have been recovered from south-east PNG, east of the Torres Strait and out in the Pacific Ocean (Dobbs 1998). Those from Rocky and Manowar Islands have been recorded from within the Gulf of Carpentaria. Long-distance movements also occur between islands in the north Pacific Ocean with distances greater than 5500 km achieved (Marchant & Higgins 1990). Young birds eventually return to natal areas to breed (Marchant & Higgins 1990).

**Survey Guidelines**

Brown Boobies can be confused for the dark morph of the Red-footed Booby (*Sula sula*), especially juveniles (Lindsay 1986; Marchant & Higgins 1990).

**Threats**

**Predation**

The Brown Booby has historically been susceptible to predation by humans. In certain parts of Australia, eggs, chicks and some adults were, or still are, taken for food (Marchant & Higgins 1990; WBM Oceanics & Claridge 1997). On Bramble Cay, the colony was severely depleted by harvesting of eggs and chicks (Elvish & Walker 1991). Boobys have been caught on baited hooks in the Great Barrier Reef (O'Neill 2002 pers. comm.), where it feeds on trawl discards (Blaber et al. 1995). In addition, commercial fishing could potentially affect prey availability. Human visitation or disturbance of breeding sites may also impact on the species via an increase in the numbers of gulls (usually due to foodscraps) and hence increased predation pressure (Walker 1988). Increases in numbers of tourists visiting the Great Barrier Reef and advances in vessel technology are also likely to lead to an increasing demand for visitation to seabird islands in this region (Stokes et al. 1996;

WBM Oceanics & Claridge 1997). Other predators that have impacted on the Brown Booby include the Bramble Cay Melomys (*Melomys rubicola*) on Bramble Cay and the Black Rat (*Rattus rattus*) on South-west Coringa Islet in the Coral Sea (Environment Australia 2001g; Marchant & Higgins 1990). A rat eradication program from 1985–91 on South-west Coringa Islet appears to have been successful, with no further evidence of rats found on the island (Environment Australia 2001g). The Land Crab (*Birgus latro*) may also predate on the species and has been recorded taking eggs and chicks on Christmas Island and Cocos-Keeling Island (Marchant & Higgins 1990). The Silver Gull (*Chroicocephalus novaehollandiae*), Buff-banded Rail (*Gallirallus philippensis*), and possibly frigatebirds (*Fregata* spp.) and the Nankeen Night Heron (*Nycticorax caledonicus*) take unattended eggs and small chicks on Raine Island (Marchant & Higgins 1990). The Silver Gull is a major predator of eggs and chicks at East Fairfax Island and surrounding regions, and also at Adele Island in Western Australia (Coate 1997; Walker 1988).

**Disturbance**  
Some areas of Christmas Island utilised by the Brown Booby have most likely been affected by settlement, associated disturbance and predation, and settling of dust from a phosphate drying plant (Stokes 1988). Historically, some colonies which declined due to human activities, such as guano mining, have recovered with the cessation of these activities (Marchant & Higgins 1990).

**Pollution**  
As a deep, pursuit plunging diver, the Brown Booby is predicted by Dann and Jessop (1994) to be at risk from oil pollution.

**Climate Change**  
Climate change and associated changes in weather, ocean currents and sea levels may have a dramatic impact on this species, since its nests on low islands can be inundated by high tides (Coate 1997; Marchant & Higgins 1990). Reduction in food availability, possibly associated with El Niño, has been implicated in breeding population declines at Swain Reefs (Heatwole et al. 1996) and Christmas Island (Marchant & Higgins 1990).

**Marine Bioregional Plans**  
Marine bioregional plans have been developed for four of Australia's marine regions - South-west, North-west, North and Temperate East. Marine Bioregional Plans will help improve the way decisions are made under the EPBC Act, particularly in relation to the protection of marine biodiversity and the sustainable use of our oceans and their resources by our marine-based industries. Marine Bioregional Plans improve our understanding of Australia's oceans by presenting a consolidated picture of the biophysical characteristics and diversity of marine life. They describe the marine environment and conservation values of each marine region, set out broad biodiversity objectives, identify regional priorities and outline strategies and actions to address these priorities. Click here for more information about marine bioregional plans.

The Brown Booby has been identified as a conservation value in the North-west (DSEWPaC 2012y) and North (DSEWPaC 2012x) marine regions. See Schedule 2 of the North-west Marine Bioregional Plan (DSEWPaC 2012y) and the North Marine Bioregional Plan (DSEWPaC 2012x) for regional advice. Maps of Biologically Important Areas have been developed for brown booby in the North (DSEWPaC 2012x) and North-west (DSEWPaC 2012y) marine regions and may provide additional relevant information. Go to the conservation values atlas to view the locations of these Biologically Important Areas. The "species group report card - seabirds" for the North-west (DSEWPaC 2012y) and North (DSEWPaC 2012x) marine regions provide additional information.

**Management Documentation**  
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Management documents relevant to the Brown Booby can be found at the start of the profile.

**Species Profile References**  
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Canberra: DEWHA. Available from: <http://www.environment.gov.au/resource/north-marine-bioregional-plan-bioregional-profile-description-ecosystems-conservation>. Department of the Environment, Water, Heritage and the Arts (DEWHA) (2008b). North-West Marine Bioregional Plan: Bioregional Profile: A Description of the Ecosystems, Conservation Values and Uses of the North-West Marine Region. Canberra: DEWHA. Available from: <http://www.environment.gov.au/coasts/mbp/publications/north-west/bioregional-profile.html>. Department of the Environment, Water, Heritage and the Arts (DEWHA) (2009m). The East Marine Bioregional Plan, Bioregional Profile: A Description of the Ecosystems, Conservation Values and Uses of the East Marine Region. Available from: <http://www.environment.gov.au/resource/east-marine-bioregional-plan-bioregional-profile-description-ecosystems-conservation-values>. Dobbs, K. (1998). Movements of seabirds banded at Raine Island, northern Great Barrier Reef, Australia, 1978-1997. Unpublished report to Raine Island Corporation and the Queensland Department of Environment. Elvish, R. & T. A. Walker (1991). Seabird islands No. 211: Bramble Cay, Great Barrier Reef, Queensland. *Corella*. 15:109-111. Environment Australia (2001g). Coringa-Herald National Nature Reserve & Lihou Reef National Nature Reserve Management Plan. Environment Australia, Canberra. Heatwole, H., J.P. O'Neill, M. Jones & M. Preker (1996). Long-term population trends for seabirds in the Swain Reefs, Queensland. In: CRC Reef Research Technical Report. 12. Available from: <http://www.ref.crc.org.au/publications/techreport/TechRep12.shtml>. Heatwole, H., P. Abbott & M. Jones (1990). Egg-size and clutch-size of the Brown Booby *Sula leucogaster*, at Swains Reef, Great Barrier Reef. *Corella*. 14:51-52. International Union for Conservation of Nature (IUCN) (2010). IUCN Red List of Threatened Species. Version 2010.4. Available from: <http://www.iucnredlist.org>. King, B.R. (1993). The status of Queensland seabirds. *Corella*. 17:65-92. Lindsay, T. (1986). The Seabirds of Australia. Angus and Robertson, Sydney. Marchant, S. & P.J. Higgins (1990). Handbook of Australian, New Zealand and Antarctic Birds. Volume One - Ratites to Ducks. Melbourne, Victoria: Oxford University Press. O'Neill, P. (2002). Personal communication. O'Neill, P., H. Heatwole, M. Preker & M. Jones (1996). Populations, movements and site fidelity of Masked and Brown Boobies on the Swain Reefs, Great Barrier Reef, as shown by banding recoveries. CRC Reef Research Technical Report. 11. Queensland Parks and Wildlife Service (QPWS) (2002a). Coastal Bird Atlas, Queensland Parks and Wildlife Service, Rockhampton, Qld (curators: P. O'Neill and R. White). Queried 16 April 2002. Ross, G.J.B., K. Weaver & J.C. Grieg (1996b). The Status of Australia's Seabirds: Proceedings of the National Seabird Workshop, Canberra, 1-2 November 1993. Canberra: Biodiversity Group, Environment Australia. Stokes, T. (1988). A review of the birds of Christmas Island, Indian Ocean. Australian National Parks and Wildlife Service Occasional Paper. Stokes, T., K. Hulsman, P. Ogilvie & P. O'Neill (1996). Management of human visitation to seabird islands of the Great Barrier Reef Marine Park region. *Corella*. 20:1-13. Tershy, B.R., D. Breese & D.A. Croll (2000). Insurance eggs versus additional eggs. Do Brown Boobies practice obligate siblicide?. *The Auk*. 117(3):817-820. Walker, T.A. (1988). Population of the Silver Gull *Larus novaehollandiae* on the Capricorn and Bunker Islands, Great Barrier Reef. *Corella*. 12:113-118. Available from: [http://www.gbrmpa.gov.au/corp\\_site/info\\_services/publications/seabirds/index.html](http://www.gbrmpa.gov.au/corp_site/info_services/publications/seabirds/index.html). WBM Oceanics & G. Claridge (1997). Guidelines for managing visitation to seabird breeding islands. Townsville, Queensland: Great Barrier Reef Marine Park Authority. Available from: [http://www.gbrmpa.gov.au/corp\\_site/info\\_services/publications/seabirds/index.html](http://www.gbrmpa.gov.au/corp_site/info_services/publications/seabirds/index.html)