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**SEABIRD ISLANDS
of the
LORD HOWE GROUP,
NEW SOUTH WALES**



Photo: I. Hutton



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AUSTRALIAN BIRD STUDY ASSOCIATION Inc.



Lord Howe
ISLAND BOARD

The Australian Bird Study Association would like to thank the Lord Howe Island Board for their financial assistance in the publication of this special issue of Corella.

FOREWORD

Seabirds are creatures of the open ocean. Only when breeding do they come ashore to lay eggs. As Lord Howe and its associated islets are the only island group in the Tasman Sea, very large numbers of seabirds breed here annually.

Accounts of Lord Howe's seabirds date back to its discovery in 1788 by sailors on the First Fleet ship *Supply*. Regular visits by naturalists and scientists since that time have documented the birdlife for over 200 hundred years. Some negative impacts have occurred, particularly arising from introduced animals. Cats, pigs and goats were deliberately released onto the Island, while rats and mice were accidental introductions. Many noted Australian ornithologists could not resist visiting Lord Howe Island, including Basset Hull, Etheridge, Hindwood, all of whom helped document some of the drastic changes to bird populations, including the extinction of a number of local species.

In the 1970s, concern over the possible effect of the construction of an airstrip prompted the first detailed surveys of seabirds, conducted by Peter Fullagar *et al.* These surveys raised the alarm over declining Woodhen numbers and prompted the first major restoration project on the island - the captive breeding of the Woodhen. An essential part of the Woodhen's rescue was the removal of feral cats and pigs, followed by banning of domestic cats and tighter control over domestic dogs. Goats were removed from the North Hills in the 1970s, and from the southern mountains in the year 2000. Profound effects followed, with Island residents noting great increases in all bird numbers, including seabirds.

Commencing in the 1980s, Sooty Terns once again began breeding in areas on Lord Howe that had been cleared of feral animals. Red-tailed Tropicbirds, Brown Noddies, Providence Petrels and Black-winged Petrels also increased dramatically in numbers. Two seabird species even recolonised Lord Howe Island from the offshore islets – in 1990, the Black Noddy and Little Shearwater were both discovered breeding on the main island for the first time.

These current seabird surveys will reflect the benefits flowing from the eradication of cats, pigs and goats and the control of dogs on the Island. With external threats to seabirds worldwide (such as long line fishing, exploitation of bait fish, pollution and plastic ingestion), surveys of this type are needed at Lord Howe to monitor local seabird numbers. However, to ensure the best year round results, it is important to encourage and include local residents who observe the birds on a daily basis and have good local knowledge of them.

The increasing population of seabirds around the settlement area has once again been a great joy for island residents and visitors alike. Over the past 30 years, tourism - the lifeblood of the island economy - has become "eco focused" with more and more people coming to enjoy Lord Howe's natural abundance, and particularly the thriving seabird colonies.

It has been my great privilege to live on Lord Howe Island since 1980 to witness and document some of these changes to the Island's birdlife. With a current proposal to eradicate rats and mice from the Island being considered, there is the real prospect of even further benefits to the birdlife of this iconic World Heritage Group of islands.

Ian Hutton
Lord Howe Island



● *Offshore Islands of the Lord Howe Group published in this issue.*

INTRODUCTION

The Lord Howe Group is one of Australia's most significant seabird breeding sites. More than 100 000 seabirds of 14 species breed there, with many colonies being of significant national or global importance.

- The Red-tailed Tropicbird *Phaethon rubricauda* breeds on Lord Howe Island (the main island of the Group) in greater concentrations than perhaps anywhere else in the world.
- The Lord Howe Group is one of only a handful of breeding localities known for the White-bellied Storm-petrel *Fregetta grallaria*.
- The Wedge-tailed Shearwater *Ardenna pacifica*, the species most widely distributed within the Group, nests on the main island as well as on many of the smaller islets.
- The Flesh-footed Shearwater *A. carneipes* breeds in large numbers on the main island, where the population has declined due to mortality from longline fishing (globally) and expanding urbanisation (locally).
- The Little Shearwater *Puffinus assimilis*, in Australian east coast waters, breeds only within the Lord Howe and Norfolk Island groups.
- The Kermadec Petrel *Pterodroma neglecta* breeds within the Lord Howe Group (on Balls Pyramid) in greater numbers than anywhere else within the Australasian region.
- Lord Howe Island is home to the only substantive breeding colony of the globally threatened Providence Petrel *P. solandri*. This species once bred in huge numbers on Norfolk Island but was exterminated between 1790 and 1800, soon after the establishment of a penal settlement. A remnant colony still survives on Phillip Island within the Norfolk Group.
- The Black-winged Petrel *P. nigripennis* and White Tern *Gygis alba* have recently colonised Lord Howe Island.

- The Lord Howe Group is among the southernmost breeding localities for Masked Booby *Sula dactylatra*, Common Noddy *Anous stolidus*, Black Noddy *A. minutus* and Sooty Tern *Onychoprion fuscata*, and the most westerly breeding locality of the Grey Ternlet *Procelsterna cerulea*.

The Lord Howe Group (31°31'S, 159°04'E) is located in the South Pacific Ocean, 780 kilometres north-east of Sydney. The main island (1455 ha) is approximately 12 kilometres long by up to 2.7 kilometres wide, and is in the shape of a crescent, with a coral reef enclosing a lagoon on the western side. The most significant of the surrounding 27 islets and rocks (total area 60 ha) is the Admiralty Group (1 km to the north of the main island) and Balls Pyramid (a 551-metre-high eroded volcanic remnant about 23 km to the south-east).

Seabirds, along with the other remarkable wildlife of the Group, survived and flourished undiscovered and unmolested by humans until late in the 18th century. Previously uncharted, Lord Howe Island was first observed from the deck of the British tender HMS *Supply* on 14 February 1788, on route from Sydney Cove to Norfolk Island. During the return trip the following month, humans landed on the island's shores for the very first time. They were greeted by an abundance of wildlife, including great numbers of land birds and seabirds, many of which displayed little or no fear. Large numbers were harvested with minimal effort to replenish the larders of the visiting ships. Early reports of such bounty soon reached the fledgling penal colony in Sydney Cove, ending the island's period of isolation. Lord Howe Island became a regular stopover for supply ships sailing between Port Jackson and Norfolk Island. Later, whaling ships also called in to reprovision.

Two bird species—the White Gallinule *Porphyrio albus* and White-throated Pigeon *Columba vitiensis*—soon disappeared, and marine turtles stopped hauling out onto the pristine beaches. Because of its large size, the seabird that attracted most early attention was the Masked Booby; both eggs and birds were collected. Masked Boobies once nested amongst the sand dunes on the main island, but are now confined to isolated promontories and offshore islets.



• Red-tailed Tropicbird.

Photo: I. Hutton



• Kermadec Petrel.

Photo: I. Hutton

Seafarers introduced the first exotic animals, with devastating consequences for the native wildlife. Domestic pigs *Sus scrofa* and goats *Capra hircus* were released to provide sustenance for any unfortunates that become marooned on the islands. Pigs preyed on ground-nesting birds, quickly diminishing their populations. Goats trampled the nests and burrows of many seabirds, destroying their fragile breeding habitat.

The establishment of a settlement on Lord Howe Island in 1834 was accompanied by the introduction of more exotic species. Domestic cats *Felis catus* were brought ashore and established feral (or semi-feral) populations. House Mouse *Mus musculus* probably arrived before 1890, and Black Rat *Rattus rattus* landed in 1918 when the damaged ship SS *Makambo* was careened onto the main island to carry out essential repairs. Despite numerous attempts to control rats, this pest has flourished and is now ubiquitous across Lord Howe Island. Small seabirds, such as storm-petrels, are highly vulnerable to predation by rodents; consequently these birds now survive only on smaller islets where rats and mice are absent. Rats are competent swimmers, so it was uncertain, until the surveys reported in this volume of *Corella*, as to whether any of the smaller islets had also been invaded by rats.

The Masked Owl *Tyto novaehollandiae* was deliberately introduced to Lord Howe Island from the 1920s onwards in a failed attempt to control rats. The owls survived and are now in much higher densities than occur on the mainland. Although the owls do take rats and mice, they also kill many species of native birds including the Lord Howe Woodhen *Gallirallus sylvestris*, Providence Petrel, Black-winged Petrel and White Tern. Shooting has been used intermittently to control the owl population, and studies are currently underway to determine the feasibility of eradication.

Harvesting of seabirds and their eggs helped the settlers augment their restricted diet. Muttonbirding (the harvesting of shearwater chicks) and eggng (the harvesting of seabird eggs) became important seasonal cultural events. The main species targeted were Flesh-footed Shearwater and Wedge-tailed Shearwater for chicks, and Sooty Tern for eggs, although chicks of the Providence Petrel (known locally as the Big-Hill Muttonbird) were probably also taken. Masked Boobies nesting in easily accessible sites are also likely to have been targeted.

It was almost 200 years after discovery before the extraordinary collection of flora and fauna within the Lord Howe Group was formally recognised, and legislation implemented to safeguard it. In 1982, in recognition of its outstanding natural beauty and its exceptional biodiversity, the entire Lord Howe Group, along with the surrounding waters and associated coral reefs (a total area of 1463 km²), was placed on the World Heritage List.

“The Lord Howe Group is an outstanding example of oceanic islands of volcanic origin containing a unique biota of plants and animals, as well as the world’s most southerly true coral reef. It is an area of spectacular and scenic landscapes encapsulated within a small land area, and provides important breeding grounds for colonies of seabirds as well as significant natural habitat for the conservation of threatened species.”

“Lord Howe Island is considered to be an outstanding example of an island ecosystem developed from submarine volcanic activity, having a rare diversity of landscapes, flora and fauna (both marine and terrestrial). The high proportion of endemic species provides a superb illustration of independent evolutionary processes at work.”

Today, tourism is the major commercial activity on the island and the economic lifeblood of the local community. Many tourists visit the island specifically to view its unique wildlife, with seabirds often providing the most spectacular and memorable experiences. Approximately two thirds of the main island and all the surrounding islets are managed as a Permanent Park Preserve, which has similar status to that of a national park. The surrounding waters, extending three nautical miles out to sea, were declared a New South Wales Marine Park in 1999. Commonwealth waters between three and 12 nautical miles out (3005 km²) were declared a marine park in 2000. In 2012, the former Lord Howe Island Commonwealth Marine Park was incorporated into the new Lord Howe Commonwealth Marine Reserve, which covers an area of more than 110 000 square kilometres.

Iconic species of the Lord Howe Group include endemics such as the flightless Woodhen (once regarded as one of the rarest birds in the world), and the Lord Howe Phasmid *Dryococelus australis* (a large stick-insect that was feared extinct until live specimens were discovered on Balls Pyramid in 2001).

The Woodhen had undergone a prolonged decline and by the 1970s had been reduced to small remnant populations on the summit of each of the two southern mountains—Mount Gower (875 m) and Mount Lidgbird (777 m). The larger of the two populations, just 22 individuals, was on Mount Gower. Pigs, feral cats and goats were the principal causes of decline. Pigs were eradicated in 1976, cats in 1982, and goats in 1999. Aided by a successful captive breeding program, the Woodhen population has increased dramatically, and now numbers in excess of 250 individuals.



• Juvenile Masked Booby.

Photo: I. Hutton

The Lord Howe Phasmid was once common on the main island but no longer occurs there. Fortunately, a small population, focused on a single bush, still survives tenuously on Balls Pyramid. To safeguard the species from extinction, captive populations have been established at Melbourne Zoo and elsewhere. Despite some initial challenges, the captive population is now flourishing. Reintroduction to the main island, however, will not be feasible until rats and mice have been removed.

Following the successful eradication of pigs and cats four seabird species have increased their populations on the main island—Sooty Tern, Black-winged Petrel, Wedge-tailed Shearwater and Providence Petrel. The Little Shearwater has recolonised the main island since 1990. Two additional species—Black Noddy and White Tern—have also colonised Lord Howe Island. The noddy was suspected of previously breeding on Balls Pyramid and the arrival of the tern appears to be related to the presence of plantings of Norfolk Island Pine *Araucaria heterophylla*.

The White-bellied Storm-petrel and Kermadec Petrel formerly bred on the main island but are now restricted to the offshore islets. These species are highly sensitive to predation by rodents. The diminutive Storm-petrel is no match for a rat, which is capable of dispatching both adults and young. Unlike other Procellariiformes on Lord Howe Island, the Kermadec Petrel nests on the surface rather than in burrows, where its young are fully exposed and vulnerable to attacks from rats. These two seabirds are likely to return to breed on the main island once rats and mice have been eradicated. Planning for the eradication of exotic rodents is currently underway, with both rats and mice likely to be removed within the next few years. The resultant reduction in predation of eggs, chicks and adults will benefit seabirds and land birds alike.

Suppression of seabird numbers, whether by rats or some other threatening process, causes a significant reduction in the influx of marine-derived nutrients in the form of faeces, regurgitations, failed eggs and corpses. Such changes can profoundly affect the health and condition of forest ecosystems, as has occurred on Norfolk Island following the extirpation of the Providence Petrel. Restoration of seabird populations on Lord Howe Island will not only benefit the seabirds themselves, but it will also improve the ecological health of the island's plant communities and increase their resilience to other stressors.

Regardless of the recovery of many seabird populations on Lord Howe Island, the smaller surrounding islets retain their importance as safe, secure breeding sites for some species. Despite their significance, most islets within the Lord Howe Group have seldom been visited, and most of the seabirds breeding there have never before been surveyed. The surveys reported in this volume of *Corella* provide the first comprehensive account of the diversity, distribution and abundance of seabirds breeding on islets within the Lord Howe Group. Two islets—Balls Pyramid and Gower Island (off the southern tip of Mount Gower)—were omitted from the recent surveys due to safety considerations. As always, the accessibility of islands is highly dependant on weather and sea conditions. Hopefully, others will take up the challenge to visit these islets to address gaps in our knowledge.



• Australasian Seabird Group loading equipment on Mutton Bird Island.

Photo: I. Hutton

Funding for the surveys was provided by the Australian Government through a grant aimed primarily at assessing the potential threats present on each vegetated islet within the Lord Howe Group. Surveys to identify the presence of weeds and rodents were extended to include estimates of seabird distribution and abundance. The seabird surveys were undertaken in collaboration with the Australasian Seabird Group (ASG) of BirdLife Australia. The ASG has worked with various government agencies to develop a cost-effective means of conducting scientifically robust surveys of seabirds in difficult environments. This collaboration has provided island managers with sound baseline data from which future changes in seabird populations, vegetation communities and emerging threats can be assessed. It is hoped that similar collaborations can be developed in all Australian states and territories.

Further Reading:

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Nicholas Carlile and David Priddel
Office of Environment and Heritage

SEABIRD ISLANDS

No. 256

Roach Island, Lord Howe Group, New South Wales

Location: 31°29'57"S, 159°04'07"E; 1100 metres north of Lord Howe Island, 580 kilometres east of Port Macquarie, New South Wales, in the South Pacific Ocean. Roach Island is one of a group of islands to the north of Lord Howe Island known as the Admiralty Islands, which also includes Tenth of June Island, South Island, Noddy Island, Sugarloaf Island and North Rock.

Status: The entire Lord Howe Group is inscribed on the World Heritage List. Roach Island is part of the Permanent Park Preserve administered by the Lord Howe Island Board. Permission from the Board is required to land on the island.

Description: Roach Island (14.5 ha) is the largest of the Admiralty Islands. It is aligned north-west to south-east with a north-east spur. An elevated area of 11.9 hectares rises to 84 metres at the western extremity of the island, and includes a sloping plateau of 6.2 hectares where there are areas of deep soil. The island is composed mostly of tuff dissected by basalt dykes, one of which has eroded into a sea-tunnel that undercuts the island at its narrowest point. The eastern slopes are precipitous and rocky, whereas the western slopes are less steep and contain areas of soil.

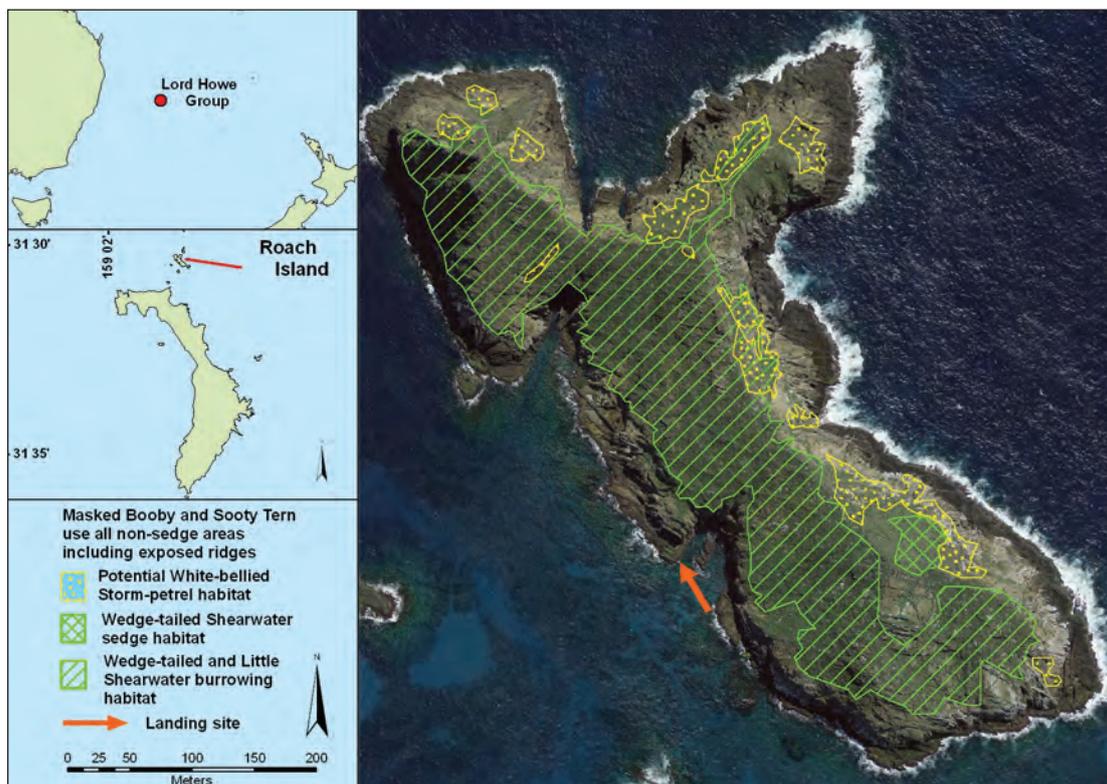
The vegetation is dominated by Coast Tussock-grass *Poa poiformis* and extensive areas of scrambling Native Wandering Jew *Commelina cyanea*, with a large patch (1500 m²) of Leafy

Flat Sedge *Cyperus lucidus* on the southern end of the main ridge. Shrubs of Sallywood *Lagunaria patersonia*, Tea-tree *Melaleuca howeana*, Boobialla *Myoporum insulare* and Grey Bark *Drypetes deplanchei* occur below the protected ridges that fall away to the north, and grow as stunted individuals elsewhere on steep slopes. Other vegetation, including exotic (*) species, comprised:

Achyranthes aspera, *Carpobrotus glaucescens*, *Coprosma prisca*, *Lepidium howei-insulae*, **Polycarpon tetraphyllum*, **Portulaca oleracea*, *Senecio howeanus*, *Tetragonia tetragonioides*, **Digitaria sanguinalis*, *Sporobolus virginicus*, **Ipomoea cairica*, *Jasminum didymum* and *Parsonsia howeana*.

Landing: In favourable seas onto rocks within an eroded dyke approximately midway along the western shore.

Ornithological History: The first recorded visit by an ornithologist was from Hull¹ on 16 October 1907 to collect seabird eggs. Eighteen Little Shearwaters *Puffinus assimilis* were collected by Bell² on 24 June 1914. The Australian Museum landed a team in 1922 to collect specimens, images and information for a permanent seabird display in Sydney³. Hindwood² visited for observations on 14 November 1936. McKean and others commenced banding birds there on 22 November 1959⁴, and revisited in November 1962 and on 15



• Roach Island, Lord Howe Group, NSW.



• Roach Island from the south.

September 1963. Dorward landed on 23 June 1963 to study the Masked Booby *Sula dactylatra*⁴. Fullagar and others were the first ornithologists to stay on the island overnight, on 23–24 February and 2–4 March 1971⁵. They recorded the species present, estimated population sizes and banded birds. Records of the Australian Bird and Bat Banding Scheme (ABBBS) identify additional visits for which there are no published records: Hitchcock in February 1961, Rogers in December 1968, Disney in November 1969, Shick in September 1973, Fullagar and Shick in February 1974, Miller in March 1979 and April 1980, Bateman in October 1979, Beaumont in December 1980 and January, February and April 1981, and Hutton in April 1994 and December 2001. During a day visit in October 2001, O'Neill⁶ estimated the number of incubating Sooty Terns *Onychoprion fuscatus*. Roach Island has been visited seasonally by locals since early settlement to harvest seabird eggs and shearwater fledglings. A single person could collect as many as 2400 Sooty Tern eggs in a single day⁶. Harvesting of eggs and chicks declined during the latter half of last century and is now prohibited.

Carlile and Bower led a survey team that visited the island on 14–15 December 2009 (6 persons), 21–22 February 2010 (4 persons), 18–20 May 2010 (2 persons), and 17 August 2011 (2 persons). The findings of these surveys are described below.

Breeding Seabirds and Status

Phaethon rubricauda Red-tailed Tropicbird—On Roach Island, this species nests on cliffs that are largely inaccessible, consequently estimating breeding numbers is problematic. In February 2010, parents returning to feed nestlings were counted from four vantage points along the main ridge. Each count lasted five minutes and was repeated on three occasions. The total number of nest sites visited by adult birds was seven. This is likely to be an underestimate as not all cliff-faces could be scanned. No previous count of this species on Roach Island has been undertaken.

Fregatta grallaria White-bellied Storm-petrel—This species is restricted to rock cavities that are too small to be used by any of the larger Procellariiformes, either among rock piles or in eroding basalt dykes and other rock layers. Nocturnal surveys, comprising 10-minute periods of searching with a spotlight interspersed with five minutes of listening in darkness, were

conducted in December 2009 (2 hours) and February 2010 (1 hour). A total of 25 and 20 White-bellied Storm-petrels, respectively, were seen. In February 2010, seven nests with adults on eggs were located within a defined search area (1350 m²) of rocky habitat. Extrapolation of the observed density of nests (0.0052 per m²) over the entire expanse of potential rocky habitat (8195 m²) gave an island-wide estimated of 43 nests. Searches of all additional dykes and isolated rock piles located six more incubating individuals, giving a total population in February 2010 of 49 pairs for the island. In 1971, Fullagar⁵ located 12 nests over three nights but estimated the total population for the island to be more than 1000 pairs. The two different estimates suggest a severe decline between 1971 and 2010. However, the availability of suitable breeding habitat on Roach Island is severely limited, and it is likely that the earlier estimate was overly optimistic and that the population of White-bellied Storm-petrels on Roach Island has always been small.

Ardenna pacifica Wedge-tailed Shearwater—Although mostly on the plateau, this species nests over much of the island, either in short burrows, rock cavities, excavated alcoves that provide only minimal protection from the elements, or in the open between clumps of vegetation. In December 2009, the plateau was surveyed for nesting birds. Nine transects (each 50 x 4 m) indicated a density (\pm s.d.) of 0.25 (\pm 0.11) birds per square metre. A single transect (30 x 4 m) within an area on the plateau dominated by sedge (1459 m²) recorded a much higher density (0.43 birds per m²), with both surface and sub-surface nesting. Together these observed densities indicate a population of 15 735 (\pm 6705) pairs on the plateau. No count of nesting birds was made outside the plateau on the steeper rocky slopes (3.5 ha) because the terrain here was unsafe to traverse. General observations by Fullagar and others in 1971⁵ suggested the population to be 12 500 pairs, although no systematic surveys were conducted. Together, these two estimates suggest that the size of the population of Wedge-tailed Shearwater on Roach Island has changed little during the last 40 years.

Puffinus assimilis Little Shearwater—This species is restricted to the plateau, in rocky areas outside the area of sedge. They nest mostly in rock crevices that are inaccessible to Wedge-tailed Shearwater, which arrive to begin breeding when the Little Shearwater is still provisioning nestlings. Little Shearwaters were recorded on the ground at night in February 2010. In May, individuals were found in deep soil burrows on the plateau where Wedge-tailed Shearwaters nest, but there was no subsequent evidence that they bred there successfully. In August 2011, a survey of the plateau using transects (50 x 4 m, $n = 6$) found a density (\pm s.d.) of 0.018 (\pm 0.007) birds per square metre. We estimate the population for the island to be 1053 pairs (\pm 415). In 1971, a 'rough estimate' by Fullagar⁵ was 4000 pairs, but because of the limited extent of habitat it is unlikely that there were ever this many.

Pterodroma nigripennis Black-winged Petrel—In February 2010, two pairs were observed engaged in aerial courtship, and two individuals were seen leaving the island during daylight. Both departing birds ruffled their feathers extensively while lifting off from the ground, suggesting they may have been nesting, but no nests were found. The population on Lord Howe Island is expanding and this species may now be colonising Roach Island, as they have not been recorded here previously⁷.



• *Roach Island from the east. Viewed from the summit of Tenth of June Island. The North Hills of Lord Howe Island are in the middle background and Mount Gower and Mount Lidgbird are on the far left.*
Post-image processing by Eric Woehler

Sula dactylatra Masked Booby—This species nests on open, flat areas, predominantly on the ridges and west- and south-facing slopes. In December 2009, we counted 284 active nests. The Masked Booby has a protracted breeding season with laying documented from May⁸ to January⁹. Weekly data on the number of active nests from a previous study of Masked Booby on Lord Howe Island⁸ was used to determine the proportion of the total nests present during the breeding season. At the time of the December survey 11.5 percent of the total nests were remaining from the season. We estimate from this that approximately 2500 pairs may have bred on Roach Island in 2009/10. Fullagar and others estimated that hundreds of Masked Booby were nesting or roosting on this island in February 1971⁵, toward the end of the breeding season⁸. Without a more accurate estimate of the numbers of nests, it is not possible to determine how the population has changed over the past 40 or so years.

Anous stolidus Common Noddy—In December 2009 and February 2010 this species was nesting on shrubs scattered across the western slopes and cliffs of Roach Island. The precipitous nature of this habitat precluded an accurate assessment of their population. From the number of nests seen and the extent of nesting habitat, we estimated that 10–100 pairs may have bred on the island. In 1940, Hindwood², estimated there to be 100 breeding pairs.

Procelsterna cerulea Grey Ternlet—The breeding season for this species had concluded before the December 2009 survey and only a few adult birds and the occasional fledgling were observed.

Onychoprion fuscatus Sooty Tern—This was the most widespread and abundant species breeding on Roach Island. In December 2009, six quadrats (each 20 x 20 m) were laid out on the plateau where there was a high density of nests containing young aged from downy pullus to near-fledged chicks. Ten minutes later, after parents and chicks had resumed their territorial positions, all live chicks were counted by walking through the quadrat faster than the ‘runners’ could disperse. The mean density of

chicks (\pm s.d.) was 0.22 (\pm 0.07) per square metre, or a total of 13 538 (\pm 4070) individuals on the plateau. No count of nesting birds was made outside the plateau on the rocky slopes because the terrain here was unsafe to traverse.

In 1936, Hindwood² reported that Sooty Terns nested over half the elevated portion of the island at a ‘liberal estimate’ of one pair per square yard, giving an approximate population of 50 000 pairs. Such high nesting densities were neither recorded during our survey nor during surveys of this species on Lord Howe Island⁶, and are likely to be an overestimate. O’Neill⁶ surveyed the plateau of Roach Island during the incubation period in 2001 and recorded densities of 0.35 (\pm 0.27) birds per square metre, from which she estimated a breeding population of 21 800 (\pm 16 450) pairs. This was substantially higher than our estimate, but would have included eggs lost prior to hatching, which we were too late to census.

Factors Affecting Status

Human trampling could have significant impact on burrowing species due to the fragility of the skeletal soils on Roach Island. Tourism, although permitted under licence, is very limited due to the difficulty of access and the need for calm sea conditions to allow safe landings. Visits to conduct scientific studies occur infrequently, but inappropriate burrow disturbance can lead to problems, as any small burrow or cavity that is inadvertently enlarged will be no longer suitable for use by the smaller species such as White-bellied Storm-Petrel due to competition from larger species.

Buff-banded Rails *Gallirallus philippensis* were breeding on the island in 2011 but there was no evidence of widespread damage and their impact may not extend beyond scavenging abandoned eggs. Predation of near-fledged Wedge-tailed Shearwaters by a single migratory Swamp Harrier *Circus approximans* (possibly subspecies *gouldi* from New Zealand) occurs annually from March to May (D. Hiscox, pers. comm.) but its impact on the shearwater population is likely to be negligible.

Other Seabirds Recorded

A cumulative period of six hours of spotlighting over three visits recorded two pairs of Providence Petrels *Pterodroma solandri* (in May 2010), but no other additional species.

Other Vertebrates Recorded

Both the Lord Howe Island Skink *Oligosoma lichenigera* and Lord Howe Island Gecko *Christinus guentheri* were present on Roach Island. Peanut-flavoured Waxtags (Pest Control Research Ltd, Christchurch, New Zealand) deployed between December 2009 and May 2010 did not indicate the presence of rodents. Similarly, there was no evidence that the Grass Skink *Lampropholis delicata* or Bleating Tree Frog *Litoria dentata*, now present on Lord Howe Island, have established on Roach Island. No microchiropteran activity was noted during any of the nocturnal spotlighting, nor during an overnight audio survey using an Anabat™ detector in December 2009¹⁰.

Banding

Data for all banding records (first banding 22 November 1959):

Phaethon rubricauda—Two adults and three nestlings with no recoveries.

Fregatta grallaria—54 adults and two nestlings with no recoveries.

Ardena pacifica—95 adults with no recoveries.

Puffinus assimilis—168 adults with no recoveries.

Sula dactylatra—121 adults and 89 nestlings with 11 recoveries at or near the banding place and four away: Valla Beach, New South Wales, 587 kilometres and 15 months later; North Stradbroke Island, Queensland, 706 kilometres and 10 years later; Moindou, New Caledonia, 1235 kilometres and 13 months later; and Little Boydong Cay, Queensland, 2767 kilometres and 7 months later.

Anous stolidus—15 adults and nine nestlings with no recoveries.

Procelsterna cerulea—two nestlings with no recoveries.

Onychoprion fuscatus—602 adults and 4534 nestlings with 17 recoveries at or near the banding place and four away: Tea Gardens, New South Wales, 663 kilometres and three months later; North Stradbroke Island, Queensland, 709 kilometres and one month later; Maroochydoore, Queensland, 791 kilometres and one month later; and Wawa Strait Leyte, Philippines, 5900 kilometres and four years later.

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Acknowledgements

Surveys of Roach Island would not have been possible without the co-operation and assistance of the Lord Howe Island Board, Lord Howe Island Environmental Tours and BirdLife Australia. Alison Derry, Sarah Jacob, Lisa O'Neill, Chris Powell and Martin Schulz (Australasian Seabird Group) participated in the surveys. Sue Bower (Lord Howe Island Board) provided details of the vegetation of the island and, along with Ian Hutton, participated in the 2009 survey. The ABBBS provided data pertaining to banding and recovery records. The surveys were funded by the Commonwealth Government Threatened Species Recovery Implementation Program.

Date compiled: 26 August 2011.

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SEABIRD ISLANDS

No. 257

Tenth of June Island, Lord Howe Group, New South Wales

Location: 31°29'43"S, 159°04'13"E; one kilometre to the north of Lord Howe Island, 580 kilometres east of Port Macquarie, New South Wales, in the South Pacific Ocean; 110 metres north of Roach Island, the largest of the Admiralty Islands.

Status: The entire Lord Howe Group is inscribed on the World Heritage List. Tenth of June Island is part of the Permanent Park Preserve administered by the Lord Howe Island Board. Permission from the Board is required to land on the island.

Description: Tenth of June Island (1.9 ha) is a jagged, steep rock rising to 79 metres, with 1.1 hectares of elevated land. The island is long and thin with its main axis orientated north-south. It is comprised of volcanic tuff with pockets of shallow soil on some slopes and ledges. The sparse vegetation, limited principally to the southern ridge and steep western slope, is dominated by Coast Tussock-grass *Poa poiformis* with patches of Saltwater Couch *Sporobolus virginicus*. A few Sallywood *Lagunaria patersonia* shrubs survive below the ridge on the south-western side. Other vegetation, including exotic (*) species, comprised:

Achyranthes aspera, *Carpobrotus glaucescens*,
Commelina cyanea, *Lepidium howei-insulae*,
**Polycarpon tetraphyllum*, *Senecio howeanus*, **Sonchus oleraceus* and *Jasminum didymum*.

Landing: In favourable seas, onto rocks on the eastern or western shore, below the saddle of the main ridge. Access to

the summit requires a steep, exposed climb commencing on the western shore and is best attempted with a fixed rope.

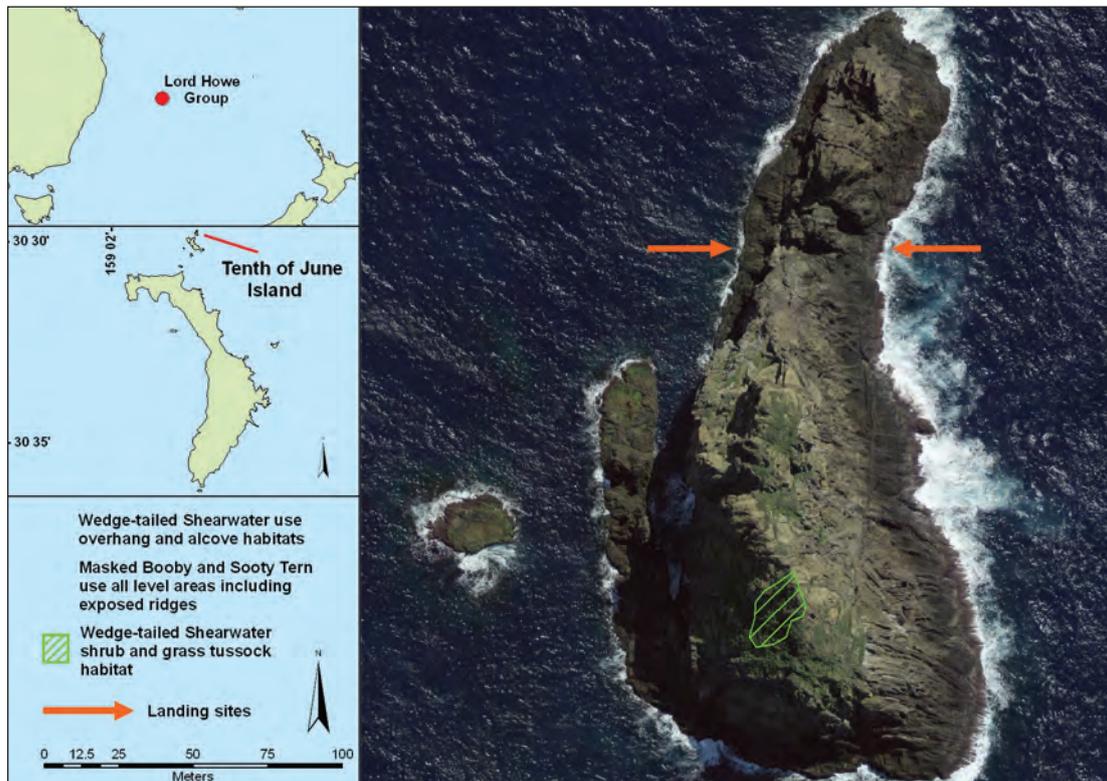
Ornithological History: Carlile led a survey team on the first recorded ornithological visits on 13 December 2009 and 18 May 2010, each of two hours duration.

Breeding Seabirds and Status

Phaethon rubricauda Red-tailed Tropicbird—This species nests on cliffs; the steep terrain and difficulty of access making accurate surveys problematic. A total of 12 birds was observed in rock cavities, presumably incubating eggs at this time¹. We estimate the breeding population of Red-tailed Tropicbird on this island to be 10–100 pairs.

Ardeana pacifica Wedge-tailed Shearwater—This species nests on the upper south-western slope in alcoves excavated in shallow soil, and under shrubs and tussocks. Isolated nests also occur at high elevations among clumps of vegetation or in rock cavities. A direct count of 70 birds incubating eggs in accessible areas in December 2009 indicates the minimum size of the breeding population of Wedge-tailed Shearwater on this island.

Sula dactylatra Masked Booby—The steep slopes and narrow ridge provide limited nesting opportunities for this species. Three nests with chicks and a single incubating adult were present in December 2009. The Masked Booby has a protracted



• Tenth of June Island, Lord Howe Group, NSW



• Tenth of June Island from the south. Viewed from Roach Island. Access to the upper slopes is along the west-facing ridge.

breeding season with laying documented from May² to January¹. Weekly data on the number of active nests from a previous study of Masked Booby on Lord Howe Island² were used to determine the proportion of the total nests present during the breeding season. In mid-December 11.5% of the total nests for the season would still have been occupied. Using this figure, we estimated that approximately 35 pairs may have bred on the Tenth of June Island in 2009/10.

Anous stolidus Common Noddy—In December 2009, this species was nesting in the stunted Sallywood on the south-western slope of the island but, due to the precipitous cliffs, exact counts were not possible. It was estimated that 10–100 pairs may have bred here.

Procelsterna cerulea Grey Ternlet—Five fledglings were observed at nest sites along the shoreline, but other pairs had finished breeding before the December 2009 survey. It is estimated that 10–100 pairs of Grey Ternlet may have bred on the island.

Onychoprion fuscata Sooty Tern—This tern occupied most elevated ledges and was the most numerous seabird breeding on the island. In December 2009, 288 young of all ages were counted on the upper south-western slope and along accessible ledges. Assuming each young represents a breeding pair, we estimate the breeding population of Sooty Tern to be at least 288 pairs.

Factors Affecting Status

The Tenth of June Island is rarely visited, with only occasional landings by Lord Howe Island residents on sea kayaks during calm seas. The difficulty of access to the upper slopes makes disturbance to breeding seabirds unlikely. It is suspected that the Buff-banded Rail *Gallirallus philippensis* frequents this island from nearby Roach Island, but its activities are probably limited to scavenging abandoned eggs.

Other Vertebrates Recorded

Despite the apparent presence of suitable habitat, there is no evidence that the White-bellied Storm-Petrel *Fregetta grallaria* breeds on the Tenth of June Island. No burrows were found in December 2009. No birds were seen flying over the island in February 2010 when efforts to land on the island to survey



• Tenth of June Island from the west. Access across from east to west is through the saddle in the main ridge. Access to the upper slopes is alongside the curved basalt dyke near the southern end of the island.

for incubating adults were thwarted by rough seas. Extensive searches in May 2010 failed to find any evidence of fledglings. Similarly, no Little Shearwater *Puffinus assimilis* were observed flying over the island and none were found during the survey in May 2010.

Both the Lord Howe Island Skink *Oligosoma lichenigera* and Lord Howe Island Gecko *Christinus guentheri* were recorded on the Tenth of June Island. Peanut-flavoured Waxtags (Pest Control Research Ltd, Christchurch, New Zealand) deployed between December 2009 and May 2010 did not detect the presence of rodents.

Other Seabirds Recorded

No other seabirds were recorded.

Banding

No banding has been conducted on the Tenth of June Island.

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The surveys of this island would not have been possible without the co-operation and assistance of the Lord Howe Island Board, Lord Howe Island Environmental Tours and BirdLife Australia. Alison Derry, Sarah Jacob and Martin Schulz (Australasian Seabird Group) participated in the surveys. Sue Bower (Lord Howe Island Board) participated in the December 2009 survey and provided details of the vegetation of the island. The surveys were funded by the Commonwealth Government Threatened Species Recovery Implementation Program.

Date compiled: 8 August 2010.

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SEABIRD ISLANDS

No. 258

South Island, Lord Howe Group, New South Wales

Location: 31°30'08"S, 159°04'22"E; one kilometre to the north of Lord Howe Island, 580 kilometres east of Port Macquarie, New South Wales, in the South Pacific Ocean; 50 metres south-west of Roach Island, the largest of the Admiralty Islands.

Status: The entire Lord Howe Group is inscribed on the World Heritage List. South Island is part of the Permanent Park Preserve administered by the Lord Howe Island Board. Permission from the Board is required to land.

Description: South Island (1.4 ha) is a sharply elevated, circular landmass with a north-east ridge extending, like a handle, down to sea level. The area of elevated land (0.8 ha) rises to a plateau (0.4 ha) 38 metres above sea level, before sloping away to the south. The island is composed of volcanic tuff, and the vegetation is dominated by Coast Tussock-grass *Poa poiiformis* with patches of Saltwater Couch *Sporobolus virginicus* and Leafy Flat Sedge *Cyperus lucidus*. No shrubs occur on the island but other vegetation, including exotic (*) species, comprised:

Achyranthes aspera, *Carpobrotus glaucescens*, *Commelina cyanea*, *Lepidium howei-insulae*, **Polycarpon tetraphyllum*, **Portulaca oleracea*, *Senecio howeanus*, *Sesuvium portulacastrum*, **Sonchus oleraceus*, *Sporobolus virginicus* and *Tetragonia tetragonioides*.

Landing: In favourable seas, onto rocks on the northern shore mid-way along the north-east ridge, the exact location dependant on sea conditions. Access to the plateau is via the north-eastern tip.

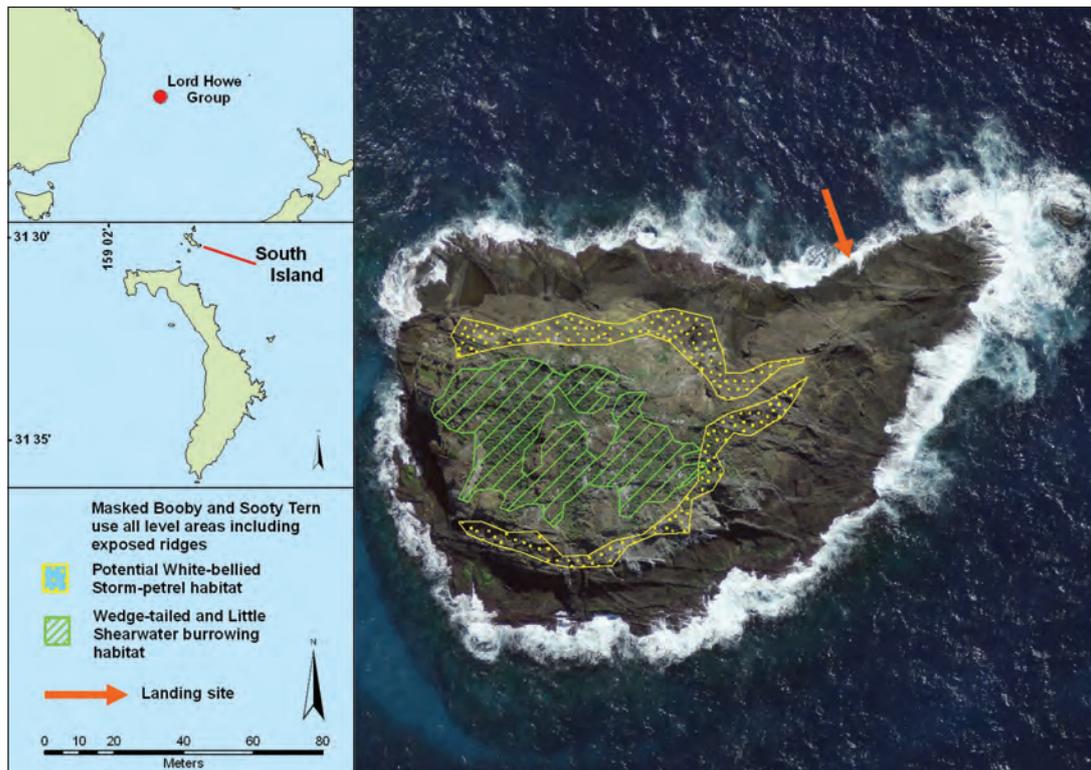
Ornithological History: There are no recorded visits to this island until Carlile and others made two brief daytime visits, of one hour each, on 13 December 2009 and 18 May 2010.

Breeding Seabirds and Status

Fregetta grallaria White-bellied Storm-petrel—In May 2010, a single fledgling was located in a rock crevice. This diminutive seabird is restricted to nesting in rocky habitat containing cavities that are inaccessible by larger species. From the extent of potential habitat it is unlikely that the population exceeds more than a few breeding pairs.

Ardenna pacifica Wedge-tailed Shearwater—This species prefers to nest in deep burrows but will nest in the open when the soil is too shallow to excavate burrows. In December 2009, a survey of the entire island found 177 incubating birds, none of which were in deep burrows.

Puffinus assimilis Little Shearwater—In May 2010, individuals of this species were engaged in nocturnal courtship flights over



• South Island, Lord Howe Group, NSW.

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HALIAEETUS <i>leucogaster</i>	White-bellied Sea-Eagle: 13,20,22, 42,45,70.	NINOX <i>connivens</i> <i>novaeseelandiae</i> <i>rufa</i> <i>strenua</i>	Barking Owl: 7. Southern Boobook: 7,29. Rufous Owl: 11. Powerful Owl: 32.
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HIERAAETUS <i>morphnoides</i>	Little Eagle: 15,25,31,33.	ONCHYPRION <i>anaethetus</i> <i>fuscata</i>	Bridled Tern: 48*. Sooty Tern: 79,83,87,89,91,93,95, 98.
HIRUNDO <i>neoxena</i>	Welcome Swallow: 36.	PACHYCEPHALA <i>pectoralis</i>	Golden Whistler: 76*.
JABIRU <i>mycteria</i>	Jabiru: 65.	PARDALOTUS <i>striatus</i>	Striated Pardalote: 48*.
LARUS <i>argentatus</i> <i>delawarensis</i> <i>dominicanus</i> <i>novaehollandiae</i>	Herring Gull: 5. Red-billed Gull: 5. Kelp Gull: 24*,76*. Silver Gull: 5.	PELAGODROMA <i>marina</i>	White-faced Storm-petrel: 20,21, 43,44,70.
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LICHENOSTOMUS <i>fuscus</i> <i>penicillatus</i>	Fuscous Honeyeater: 76*. White-plumed Honeyeater: 76*.	PHAETHON <i>rubricauda</i> 76*,79,83,86,92,94.	Red-tailed Tropicbird:
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<i>strigoides</i>	Tawny Frogmouth: 29.	STERNULA	
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• South Island from the north. Lord Howe Island is in the background, with Mount Lidgbird and Mount Gower on the left and the Northern Hills on the right.



• South Island from the north-northwest showing the entire vegetated section of the island. Viewed from Roach Island.

the island, and several birds were found in burrows. The extent of potential nesting habitat is estimated at approximately 0.3 hectares.

Sula dactylatra Masked Booby—This species nests on open flat areas, preferring elevated sites for take-offs and landings. In December 2009, we counted 20 active nests. The Masked Booby has a protracted breeding season with laying documented from May¹ to January². Weekly data on the number of active nests from a previous study of Masked Booby on Lord Howe Island¹ was used to determine the proportion of the total nests present during the breeding season. In mid-December only 11.5 percent of the nests expected in a season are occupied. Using this figure, we estimated that approximately 170 pairs may have bred on South Island in 2009/10.

Procelsterna cerulea Grey Ternlet—Adults of this species were seen roosting on the island in December 2009 but their breeding season had already concluded, so breeding was not confirmed.

Onychoprion fuscatus Sooty Tern—This was the most numerous seabird breeding on South Island. In December 2009, we counted 360 young of all ages. No incubating birds were observed. We estimated the minimum total population for the island, based on a single chick representing a breeding pair, to be 360 pairs.

Factors Affecting Status

South Island is occasionally visited by residents of Lord Howe Island arriving by sea kayak, but disturbance of seabirds is unlikely. The remains of a Buff-banded Rail *Gallirallus philippensis* were found during the December 2009 survey indicating that some egg predation is likely, but this would be limited mostly to abandoned eggs.

Other Seabirds Recorded

No other seabirds were observed.

Other Vertebrates Recorded

Both the Lord Howe Island Skink *Oligosoma lichenigera* and Lord Howe Island Gecko *Christinus guentheri* were recorded. No alien vertebrates were detected.

Banding

No banding has been attempted on this island.

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Acknowledgements

The surveys of this island would not have been possible without the co-operation and assistance of the Lord Howe Island Board, Lord Howe Island Environmental Tours and BirdLife Australia. Alison Derry, Sarah Jacob and Martin Schulz (Australasian Seabird Group) participated in the surveys. Sue Bower, Lord Howe Island Board, participated in the December 2009 survey and provided details of the vegetation of the island. The surveys were funded by the Commonwealth Government Threatened Species Recovery Implementation Program.

Date compiled: 26 August 2011.

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SEABIRD ISLANDS

No. 259

Sugarloaf Island, Lord Howe Group, New South Wales

Location: 31°30'15"S, 159°04'05"E; one kilometre to the north of Lord Howe Island, 580 kilometres east of Port Macquarie, New South Wales, in the South Pacific Ocean; 230 metres south of Roach Island, the largest of the Admiralty Islands.

Status: The entire Lord Howe Group is inscribed on the World Heritage List. Sugarloaf Island is part of the Permanent Park Preserve administered by the Lord Howe Island Board. Permission from the Board is required to land on the island.

Other Name: Sugarloaf.

Description: Sugarloaf Island (1.1 ha) is a dome-shaped island of volcanic tuff, with 0.56 hectares of elevated land surrounded by a wide rock platform. The plateau (0.30 ha) rises 31 metres above sea-level and contains pockets of soil dominated by Coast Tussock-grass *Poa poiformis* and dense patches of Saltwater Couch *Sporobolus virginicus*. Other plants include Leafy Flat Sedge *Cyperus lucidus* and two introduced species: Pigweed *Portulaca oleracea* and Prairie Grass *Bromus catharticus*.

Landing: A shallow landing site onto rocks on the northwest perimeter is possible only in calm seas. The plateau is accessible from the north-west point, up a steep basalt dyke.

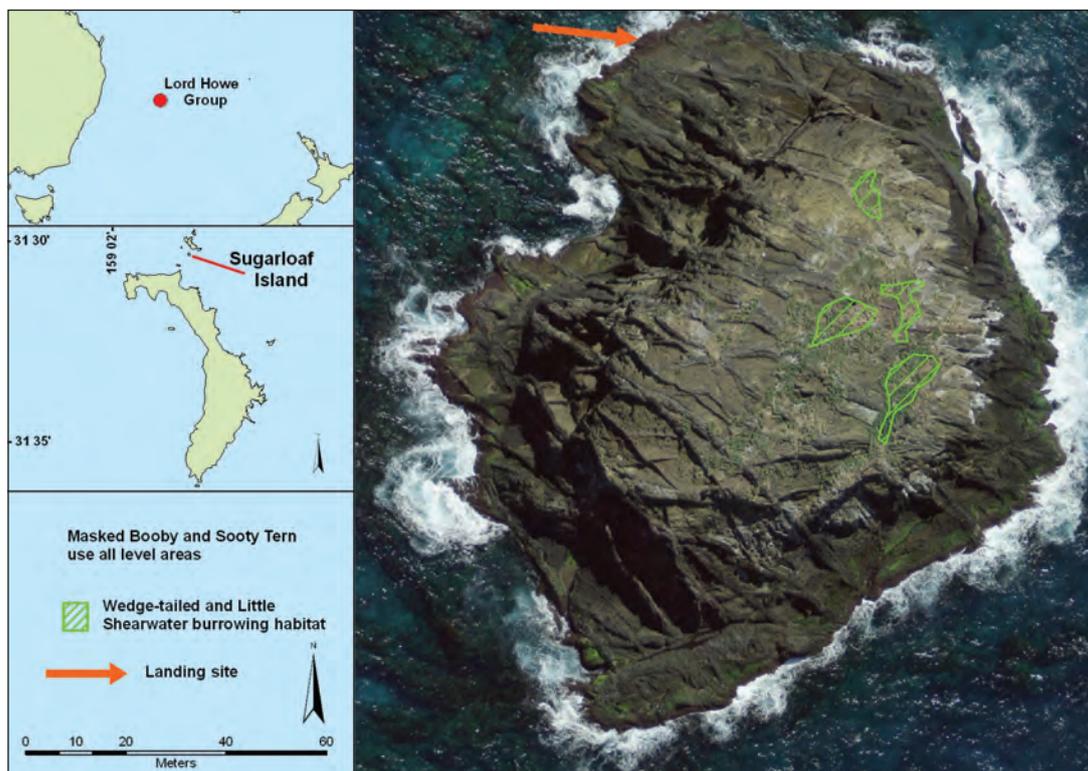
Ornithological History: There are no recorded visits to this island until Carlile and two others visited for approximately one hour on 22 February 2010. The island was also observed from nearby islands: Soldiers Cap on 13 December 2009 and 20 May 2010, and Roach Island on 18–20 May 2010.

Breeding Seabirds and Status

Ardenna pacifica Wedge-tailed Shearwater—In February 2010, 335 burrows and nesting cavities were counted, many containing chicks. Assuming an occupancy rate similar to that in other colonies (typically 45–55%)^{1,2,3} we estimate a population of approximately 168 pairs on the island.

Puffinus assimilis Little Shearwater—In May 2010, Little Shearwaters were observed flying above Sugarloaf Island at night, suggesting that they probably nest there. This species is generally restricted to burrows with rocky entrances that are too small to be accessed by Wedge-tailed Shearwaters. The extent of such habitat on the island is approximately 990 square metres.

Sula dactylatra Masked Booby—Nests of this species were dispersed across the vegetated areas of the island. In December 2009, we observed 12 active nests. The Masked Booby has a



• Sugarloaf Island, Lord Howe Group, NSW.



• Sugarloaf Island from the north with the landing site in the foreground on the right. Viewed from Roach Island.



• Sugarloaf Island from the south-west. Viewed from Lord Howe Island.

protracted breeding season with laying documented from May⁴ to January⁵. Weekly data on the number of active nests from a previous study of Masked Booby on Lord Howe Island⁴ was used to determine the proportion of the total nests present during the breeding season. The number of nests found in mid-December represent 11.5% of the total nests for the season. Using this figure, we estimated that approximately 100 pairs may have bred on Sugarloaf Island in 2009/10.

Onychoprion fuscata Sooty Tern—This species was observed breeding on Sugarloaf Island in December 2009, but sea conditions prevented us landing. Consequently, there is no assessment of population size.

Factors Affecting Status

Sugarloaf Island is rarely, if ever, visited. It is likely that the Buff-banded Rail *Gallirallus philippensis* frequents this island from Roach Island but its predation would probably be limited to abandoned eggs.

Other Seabirds Recorded

No other seabirds were recorded.

Other Vertebrates Recorded

The Lord Howe Island Skink *Oligosoma lichenigera* was the only other vertebrate recorded on the island.

Banding

No banding has been attempted on Sugarloaf Island.

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Acknowledgements

Surveys of Sugarloaf Island would not have been possible without the co-operation and assistance of the Lord Howe Island Board and Lord Howe Island Environmental Tours. Lisa O'Neill and Chris Powell (Australasian Seabird Group) participated in the surveys. The survey was funded by the Commonwealth Government Threatened Species Recovery Implementation Program.

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SEABIRD ISLANDS

No. 260

Soldiers Cap, Lord Howe Group, New South Wales

Location: 31°30'32"S, 159°03'47"E; 190 metres off the north-eastern point of Lord Howe Island, 580 kilometres east of Port Macquarie, New South Wales, in the South Pacific Ocean.

Status: The entire Lord Howe Group is inscribed on the World Heritage List. Soldiers Cap is part of the Permanent Park Preserve administered by the Lord Howe Island Board. Permission from the Board is required to land on the island.

Description: Soldiers Cap (0.8 ha) is the smallest islet of the Lord Howe Group that supports vegetation. It has an elevated area of 2780 square metres and is composed of volcanic tuff dissected by basalt dykes, one of which provides access to the summit. The sloping plateau of 550 square metres reaches an elevation of 44 metres and is dominated by Coast Tussock-grass *Poa poiiformis* with patches of Saltwater Couch *Sporobolus virginicus*. On the northern and western ends of the plateau, clumps of Sallywood *Lagunaria patersonia* survive as low shrubs. Other vegetation, including introduced species (*), comprised:

Carpobrotus glaucescens, *Lepidium howei-insulae*,
**Portulaca oleracea*, *Sesuvium portulacastrum* and
**Sonchus oleraceus*.

Landing: Landing on the southern shore within a sheltering reef is possible in favourable seas. Access to the summit requires a steep, exposed climb up a basalt dyke on the island's

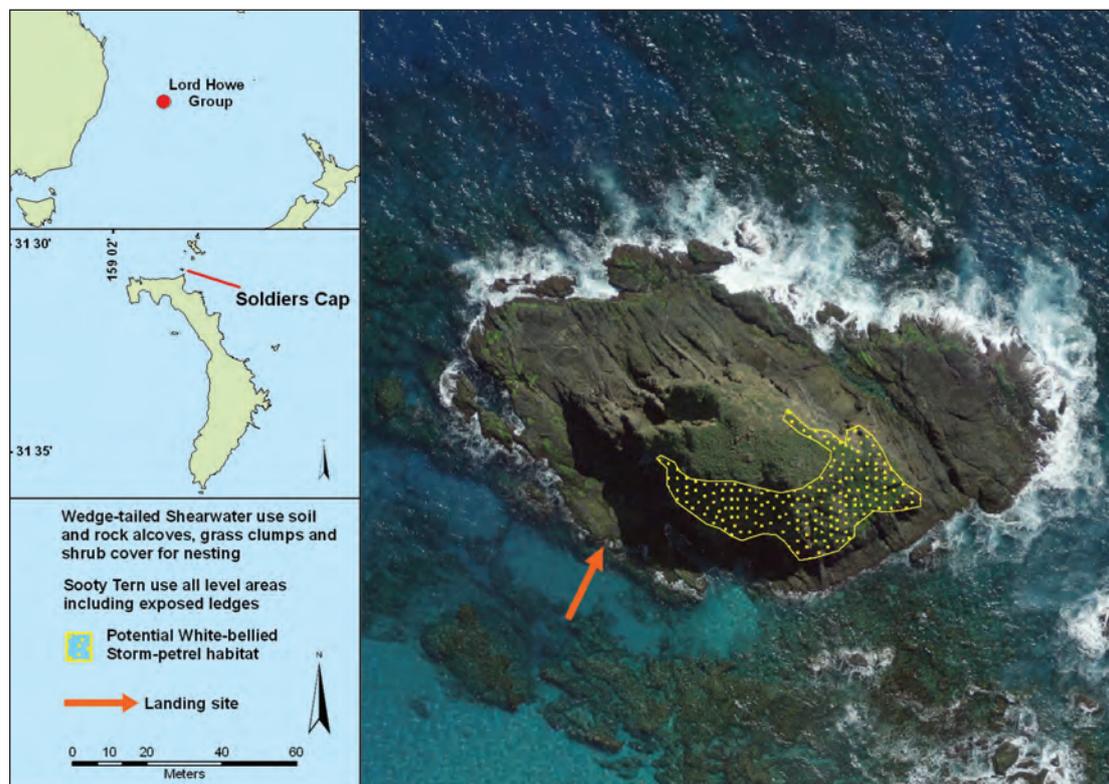
north-western corner followed by a scramble through a thicket of Sallywood on a very steep slope, and is best attempted with a fixed rope.

Ornithological History: The only previous recorded visit was made by Hindwood¹ on 2 November 1936. Carlile led a survey team on three brief visits of up to one hour each on 13 December 2009, 22 February and 20 May 2010.

Breeding Seabirds and Status

Phaethon rubricauda Red-tailed Tropicbird—In February 2010, a single adult was observed from sea level exiting a rock cavity, presumably where it was nesting. This is the only evidence of this species breeding on the island.

Fregetta grallaria White-bellied Storm-petrel—This species is the smallest of the Procellariiformes breeding within the Lord Howe Group and is restricted, by competition for nest sites, to rock cavities that larger shearwaters cannot access. A search of accessible habitat during February 2010 located two adults incubating eggs in rock crevices on the southern perimeter of the plateau. A follow-up survey in May 2010 found the two eggs abandoned, along with a third nearby. This is the first record of White-bellied Storm-petrel nesting on Soldiers Cap. From the limited extent of potential nesting sites it is unlikely that the population exceeds six breeding pairs.



• Soldiers Cap, Lord Howe Group, NSW.



• *Soldiers Cap from the south. Viewed from the Northern Hills of Lord Howe Island.*

Ardenna pacifica Wedge-tailed Shearwater—The skeletal soils on the plateau preclude extensive burrowing, thereby limiting the Wedge-tailed Shearwater to nest in soil alcoves or rock crevices, and under vegetation. In December 2009, a direct count of incubating birds indicated a breeding population of 35 pairs. There is no previous estimate of the numbers of Wedge-tailed Shearwater breeding on Soldiers Cap.

Anous stolidus Common Noddy—This species was nesting in shrubs on the island in December 2009 and February 2010, but the precipitous nesting habitat precluded an accurate assessment of their population size. Based on direct counts and the extent of habitat available we estimated that 10–100 pairs breed on Soldiers Cap.

Procelsterna cerulea Grey Ternlet—Breeding by this species within the Lord Howe Group had concluded before the first survey (December 2009), consequently nesting was not observed. The extent of potential nesting habitat (narrow ledges on steep cliffs) on Soldiers Cap may support up to 10 breeding pairs.

Onychoprion fuscata Sooty Tern—This species nested across the plateau of the island and on some ledges. In December 2009, we counted 85 young, ranging from near-fledged chicks to downy pulli. Assuming each young represented one breeding pair, we estimated the total breeding population of Sooty Tern on Soldiers Cap to be at least 85 pairs. No previous estimate exists for this species on this island.

Factors Affecting Status

Soldiers Cap is close to the main island, and is occasionally visited by residents of Lord Howe Island, but the difficulty of access to the upper slopes makes disturbance of breeding seabirds unlikely. The Buff-banded Rail *Gallirallus philippensis* probably frequents this island from Lord Howe Island, but its activities are likely to be restricted to scavenging abandoned eggs.

Other Seabirds Recorded

No other seabirds were recorded.



• *Soldiers Cap from the east.*

Other Vertebrates Recorded

In contrast to other vegetated islands we visited within the Lord Howe Group^{2,3,4}, we found no reptiles on Soldiers Cap. The absence of reptiles suggests that Ship Rat *Rattus rattus* or House Mouse *Mus musculus* may be present, as both of these mammals occur on nearby Lord Howe Island; however none were detected.

Banding

No banding has been conducted on Soldiers Cap.

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Acknowledgements

The surveys of Soldiers Cap would not have been possible without the co-operation and assistance of the Lord Howe Island Board, LHI Environmental Tours and BirdLife Australia. Alison Derry, Sarah Jacob, Lisa O'Neill and Chris Powell (Australasian Seabird Group) participated in the surveys. Sue Bower, (Lord Howe Island Board) participated in the December 2009 survey and provided details of the vegetation of the island. The surveys were funded by the Commonwealth Government Threatened Species Recovery Implementation Program.

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SEABIRD ISLANDS

No. 261

Mutton Bird Island, Lord Howe Group, New South Wales

Location: 31°32'26"S, 159°06'26"E; 1200 metres north-east of Mutton Bird Point, Lord Howe Island, 580 kilometres east of Port Macquarie, New South Wales, in the South Pacific Ocean.

Status: The entire Lord Howe Group is inscribed on the World Heritage List. Mutton Bird Island is part of the Permanent Park Preserve administered by the Lord Howe Island Board. Permission from the Board is required to land on the island.

Other Name: Inaccessible Island

Description: Mutton Bird Island (3.8 ha), viewed most commonly from the eastern shore of Lord Howe Island, appears as a sharp-sided dome, but the 77-metre high island is actually 'tadpole' shaped with the 'head' forming the dome. The island has an elevated area of 2.7 hectares with a plateau (1.1 ha) sloping away to the south-west. Extensive ledges occur on each side of the north-east to south-west ridge, the 'tail'. The island is composed of igneous breccia dissected by basalt dykes, and supports only skeletal soils.

The island is dominated by Coast Tussock-grass *Poa poiformis* with patches of Leafy Flat Sedge *Cyperus lucidus*, and scrambling native Wandering Jew *Commelina cyanea*. Occasional clumps of wind-sheared shrubs, Tea-tree *Melaleuca howena* and Sallywood *Lagunaria patersonia*, survive on the steep cliffs. Other vegetation, including exotic (*) species, comprised:

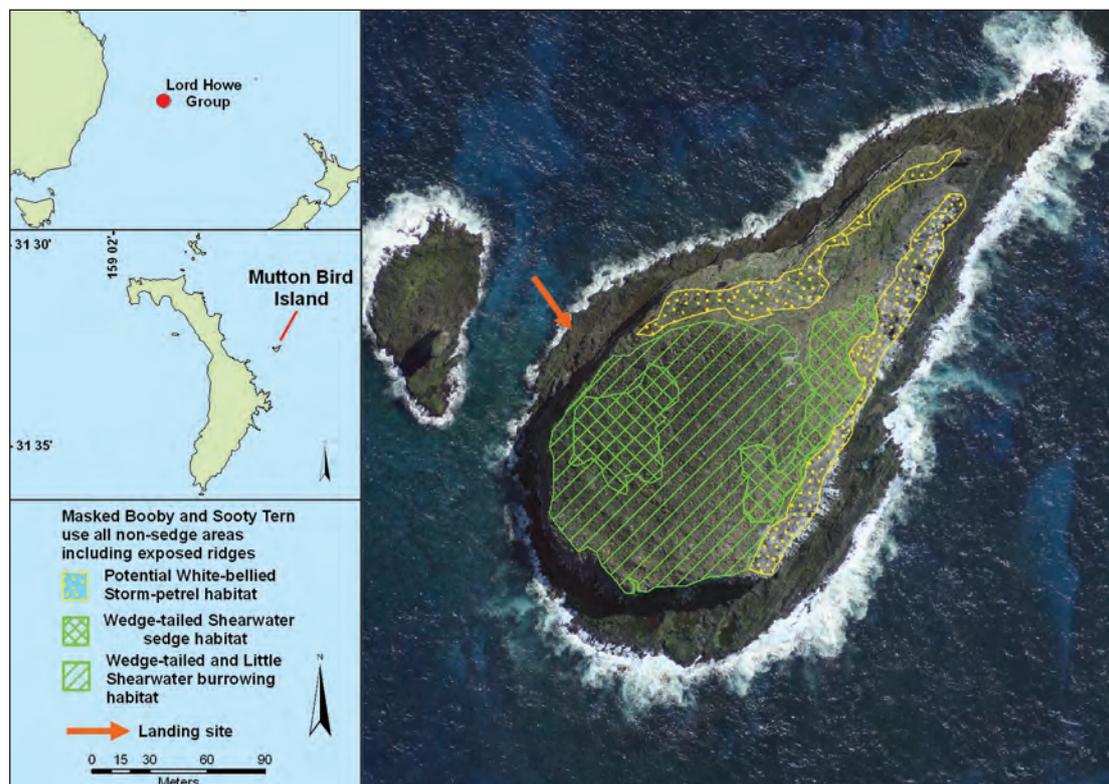
Achyranthes aspera, *Lepidium howei-insulae*, **Polycarpon tetraphyllum*, **Portulaca oleracea*, *Senecio howeanus*, **Solanum nigrum*, **Sonchus oleraceus*, *Tetragonia tetragonioides*, **Digitaria sanguinalis*, *Sporobolus virginicus*, **Ipomoea cairica*, *Canavalia rosea* and *Tylophora biglandulosa*.

Landing: Requires favourable seas, and is onto rocks on the western to north-western side, the location dependant on the prevailing conditions, with nearby Sail Rock providing some protection. A campsite, sheltered from falling rocks, is available in a shallow cave on the northern shore. Access to the plateau is from the southern shore and requires a steep, exposed climb best attempted with a fixed rope.

Ornithological History: Mutton Bird Island is seldom visited. Hindwood¹ remarked that the island was difficult to access and did not attempt a landing. The first and only recorded ornithological survey was led by Carlile with a single overnight visit (15–16 December 2009) lasting 18 hours.

Breeding Seabirds and Status

Phaethon rubricauda Red-tailed Tropicbird—This species nests on cliffs that are largely inaccessible, consequently estimating breeding numbers is problematic. During December, when this species is typically incubating eggs², only two birds were



• Mutton Bird Island, Lord Howe Group, NSW



• Mutton Bird Island from the north.

seen; both landed on cliff faces, presumably visiting nests. The breeding population of Red-tailed Tropicbirds on Mutton Bird Island was probably 1–10 pairs.

Fregatta grallaria White-bellied Storm-petrel—No survey of breeding pairs was possible in December 2009 because egg laying had not yet commenced³. However, potential nesting habitat similar to that used by this species on nearby Roach Island³ (rock piles and eroding basalt dykes) occurred along the ledges on each side of the ‘tail’. Spotlighting from the rock platform below (three operators for 1 hour; 10-minute periods of searching followed by five minutes of listening with no light), recorded more than 20 flying individuals. From this behaviour it is suspected that this species breeds here.

Ardenna pacifica Wedge-tailed Shearwater—This species nests in short burrows or rock cavities, under overhangs, or in the open between clumps of vegetation. The area of the plateau dominated by tussock-grass (0.7 ha) was surveyed for incubating birds using four transects (each 30 x 4 m), which together indicated a density (\pm s.e) of 0.35 ± 0.16 nests per square metre. Within the two sedge-dominated areas (2500 and 2200 m²) a single transect (30 x 4 m) found the density of incubating birds to be 0.16 nests per square metre. From these data we calculate 3114 ± 1430 pairs nesting within the sloping plateau. In addition, a direct count of incubating birds in cavities and overhangs on the steeper slopes (0.5 ha) recorded 57 individuals, although this is likely to be an under-estimate due to some parts of the island being inaccessible. Thus, the total population for the island is about 3200 (\pm 1460) pairs. In 1971, Fullagar and others⁴ suggested that Mutton Bird Island probably supported about 5000 pairs of Wedge-tailed Shearwater, based on land area and their knowledge of nesting densities on other islands.

Puffinus assimilis Little Shearwater—Being a winter-breeding species, Little Shearwater were not present during the December survey. However, potential nesting habitat (0.7 ha), similar to that on Roach Island (the main breeding location for this species within the Lord Howe Group²), is present on Mutton Bird Island and it is likely that this species also breeds here^{1,4}. As on Roach Island, the Little Shearwater would be limited to using small burrows or cavities that restricted the entry of the larger Wedge-tailed Shearwater.

Pterodroma neglecta Kermadec Petrel—The only site within the Lord Howe Group where this species is known to breed is Balls Pyramid, where it nests on sheltered ledges². During a nocturnal spotlight survey of Mutton Bird Island a single Kermadec Petrel was observed. Approximately 30 minutes after sunset, it made two passes across the upper slopes of the north-east portion of the island before flying onto the slope and disappearing from view. Given the time of year, the observed behaviour could indicate an adult returning to provision a chick at the nest⁵. However, a subsequent search of all accessible areas within this part of the island during daylight failed to find any evidence of nesting. The possibility that this species is breeding on the island warrants further investigation.

Sula dactylatra Masked Booby—This species nests on large, flat areas on the main ridge or the west-facing sloping plateau. In December 2009, we counted 42 active nests. The Masked Booby has a protracted breeding season with laying documented from May⁶ to January². Weekly data on the number of active nests from a previous study of Masked Booby on Lord Howe Island⁶ was used to determine the proportion of the total nests present during the breeding season. At the time of the December survey 11.5% of the total nests were remaining from the season. Assuming the timing of breeding is similar between years, we estimate that 365 pairs of Masked Boobies may have bred on Mutton Bird Island in 2009/10. In February 1971, Fullagar and others⁴ made observations from a boat and estimated at least 90 adults nesting or roosting.

Anous stolidus Common Noddy—This species was nesting on the island in December 2009 but the precipitousness of the nesting habitat precluded an accurate assessment of population size. It is estimated that 10–100 pairs breed on the island.

Procelsterna cerulea Grey Ternlet—At the time of the survey, the breeding season for this species was nearing its conclusion, and only a few fledglings were present among the adult birds.

Onychoprion fuscata Sooty Tern—This species is both widespread and common on the island, and breeds on flat areas. Inspection of ledges on the steeper slopes (5349 m²) produced a count of 160 young, ranging in age from downy pulli to near-fledged chicks. In contrast, only flying young and a few near-fledged birds were present on the plateau, with nesting apparently



• Mutton Bird Island (and Sail Rock) from the west.

occurring earlier here than anywhere else within the Lord Howe Group^{3, 7, 8}. Consequently, we were unable to reliably estimate the size of the breeding population. However, the habitat on the plateau is similar, in terms of geology, vegetation and seabird communities to that of nearby Roach Island. Assuming that the breeding productivity of Sooty Terns on the plateau was similar to that on Roach Island³ (0.22 ± 0.07 young per m^2) and each fledgling represents one breeding pair, we cautiously estimate that the total breeding population of Sooty Tern on Mutton Bird Island may be 2000–3000 pairs.

Factors Affecting Status

The possible presence of Kermadec Petrel on Mutton Bird Island warrants further investigation. The only breeding location for this species within the Lord Howe Group is Balls Pyramid, some 28 km distant. Previously, Kermadec Petrel also bred on the southern mountains of Lord Howe Island¹, where it suffered predation by feral Cats *Felis catus*⁹ and possibly Ship Rats *Rattus rattus*. The isolation of Mutton Bird Island and the difficulty of access ensure minimal impact from humans.

Other Seabirds Recorded

Black-winged Petrels *Pterodroma nigripennis* were seen flying past the island in pairs in the late afternoon but did not land. A total of three hours of spotlighting from the shoreline up to the cliffs recorded no additional species.

Other Vertebrates Recorded

The Lord Howe Island Skink *Oligosoma lichenigera* was present. No microchiropterans were observed during nocturnal spotlighting and no activity was recorded overnight using an AnaBat™ bat detector¹⁰. No alien vertebrates were detected.

Banding

No banding has been undertaken on Mutton Bird Island.

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The survey of Mutton Bird Island would not have been possible without the co-operation and assistance of the Lord Howe Island Board and BirdLife Australia. Alison Derry and Martin Schulz (Australasian Seabird Group) participated in the survey. Sue Bower (Lord Howe Island Board) provided details of the vegetation of the island and, along with Hank Bower and Ian Hutton, participated in the survey. The survey was funded by the Commonwealth Government Threatened Species Recovery Implementation Program.

Date compiled: 26 August 2011.

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SEABIRD ISLANDS

No. 262

Blackburn Island, Lord Howe Group, New South Wales

Location: 31°32'05"S, 159°03'35"E; 710 metres off the western shore of Lord Howe Island, 580 kilometres east of Port Macquarie, New South Wales, in the South Pacific Ocean.

Status: The entire Lord Howe Group is inscribed on the World Heritage List. Blackburn Island is part of the Permanent Park Preserve administered by the Lord Howe Island Board. Landing is allowed, but permission from the Board is required to stay overnight on the island.

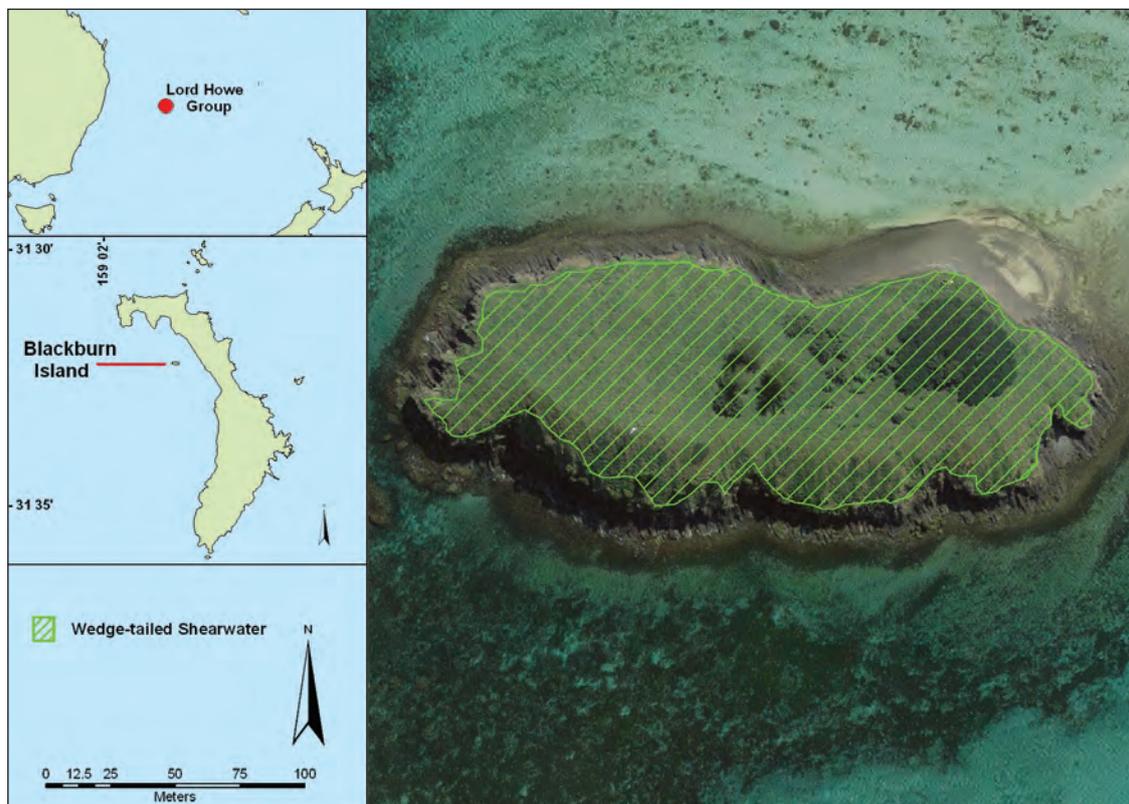
Other Names: Rabbit Island, Goat Island.

Description: Blackburn Island (2.4 ha) is sheltered within the lagoon on the western side of Lord Howe Island. The island is aligned east-west and rises to a height of 32 metres. It is comprised of basalt rock with skeletal soil. The elevated portion of the island (1.9 ha) is dominated by the introduced Rhodes Grass *Chloris gayana*. The island supports a number of canopy species including a large Banyan Fig *Ficus macrophylla* (0.1 ha), Sallywood *Lagunaria patersonia*, Kentia Palm *Howea forsteriana* and introduced Norfolk Island Pine *Araucaria heterophylla*. Additionally, Bullybush *Cassinia tenuifolia* and Hopbush *Dodonaea viscosa* survive from a planting of 100 seedlings in 2001 (Christopher Haselden pers. comm.). Other vegetation, including exotic (*) species, comprised:

Achyranthes aspera, *Commelina cyanea*, **Portulaca oleracea*, **Solanum nigrum*, **Bromus catharticus*, *Cynodon dactylon*, *Poa poiiformis*, *Sporobolus virginicus*, *Melaleuca howeana*, **Ipomoea cairica*, *Canavalia rosea* and *Tylophora biglandulosa*.

Landing: Landing is onto a sandy beach at the north-east end of the island.

Ornithological History: Blackburn Island is easily accessible from Lord Howe Island and has had numerous visits by ornithologists. The first published visit was in 1907 by Hull¹, who found Wedge-tailed Shearwaters *Ardenna pacifica* clearing out their burrows. Hindwood visited on 12 November 1936² to collect Wedge-tailed Shearwaters. In August 1957, Pizzey found a single Little Shearwater *Puffinus assimilis* on an egg³. Fullagar and others visited in February 1971 and captured a Little Shearwater ashore by day, but an evening visit on 5 August 1971 found no evidence of the species breeding here⁴. Records from the Australian Bird and Bat Banding Scheme (ABBBS) of visits not recorded elsewhere are: McKean in December 1959, Hitchcock in February 1961, Swanson in October 1973 and Hutton in April 1994. Carlile and others sampled Wedge-tailed Shearwaters here on the 29 April 2005 as part of a study into plastic ingestion in seabirds⁵.



• Blackburn Island, Lord Howe Group, NSW



• Blackburn Island from the east. Viewed from Windy Point, Lord Howe Island.

Carlile and others visited the island for 18 hours on 10–11 December 2009, two hours on both 20 February and 17 May 2010, and 17 hours on 4–5 August 2010.

Breeding Seabirds and Status

Ardenna pacifica Wedge-tailed Shearwater—This species nests in all vegetated areas of the island. During much of the breeding season it can be seen from Lord Howe Island circling and landing on Blackburn Island from mid-afternoon onwards. In December 2009, three transects (total length 256 m) were laid running north-south across the vegetated portion of the island. Incubating birds were counted within two metres either side of the centre line (total area surveyed 1024 m²); 418 were recorded, nesting either in burrows (16%), under shrubs and grass tussocks (20%), or in the open (61%). A further 19 nests, all on the surface, were counted from a transect under the Banyan Fig (140 m²). In total, we estimate the breeding population (\pm s.e) to be 7517 pairs (\pm 649). Based on the density of chicks, Fullagar⁴ estimated the population to be 3000 pairs, less than half the current estimate.



• Wedge-tailed Shearwater surface nesting on Blackburn Island.

Puffinus assimilis Little Shearwater—This species was recorded incubating an egg on Blackburn Island in mid-August 1957³. We found no evidence of their presence during a day visit in May or during an overnight visit in August 2010. From surveys on Roach Island⁶ it is known that the Little Shearwater is restricted to burrowing sites where the larger Wedge-tailed Shearwater cannot gain access. Such habitat could not be found during our surveys.

Factors Affecting Status

Blackburn Island is subject to both regulated and unregulated visits by tourists and island residents. A track from the beach to the summit, with a diversion through the Banyan Fig, is regularly traversed by tourists. The absence of unformed tracks suggests that visitors largely keep to the track provided, ensuring minimal disturbance to breeding birds.

Previously, damage to nesting sites by goats may have detrimentally affected seabird populations⁴. The thick cover of exotic Rhodes Grass supports the highest density of nesting Wedge-tailed Shearwaters known from any of the smaller islands within the Lord Howe Group^{6, 7, 8}. However, fire from a lightning strike could devastate seabird populations were it to occur during the breeding season. Within the Permanent Park Reserve the use of fire is restricted to fuel stoves.

Buff-banded Rails *Gallirallus philippensis* are present but their impact is probably limited to scavenging abandoned eggs.

Other Seabirds Recorded

Nocturnal surveys, comprising 10-minute periods of searching with a spotlight interspersed with five minutes of listening in darkness, were conducted in December 2009 (2.5 hours) and August 2010 (1.5 hours). We recorded two White-bellied Storm-petrels *Fregatta grallaria*, five Black-winged Petrels *Pterodroma nigripennis* and numerous Sooty Terns *Onychoprion fuscatus* in the air. None appeared to land.



• Blackburn Island from the north. Viewed from Signal Point, Lord Howe Island

Other Vertebrates Recorded

The Lord Howe Island Skink *Oligosoma lichenigera* and Lord Howe Island Gecko *Christinus guentheri* were present on the island. An Anabat™ survey overnight in December 2009 failed to record any microbat activity⁹. No alien vertebrates were detected.

Banding

First banding—9 December 1959.

A. pacifica—184 adults and 272 nestlings with two recoveries from breeding along the Lord Howe Island lagoon foreshore 11 and 14 years later.

P. assimilis—one adult with no recoveries.

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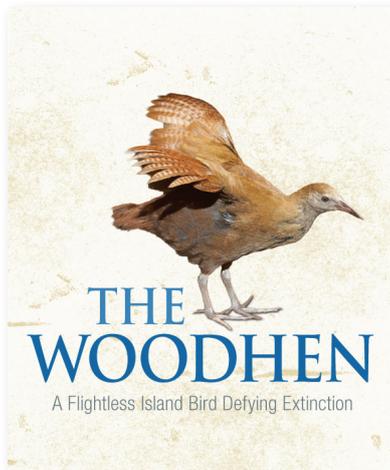
Surveys of Blackburn Island would not have been possible without the co-operation and assistance of the Lord Howe Island Board, Lord Howe Island Marine Parks Authority, Lord Howe Island Environmental Tours, and BirdLife Australia. Alison Derry, Sarah Jacob, Lisa O'Neill, Chris Powell and Martin Schulz (Australasian Seabird Group) participated in the surveys. Sue Bower, Lord Howe Island Board, provided details of the vegetation of the island. The ABBBS provided data pertaining to banding and recovery records. Survey costs were met by the Commonwealth Government's Threatened Species Recovery Implementation Program.

Date compiled: 26 August 2011.

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Book Review



The Woodhen: A Flightless Island Bird Defying Extinction

Clifford B. Frith. 2013. CSIRO Publishing. Hardback, numerous colour photographs and illustrations, 240 pp. ISBN 9780643108707. RRP \$59.95.

The Woodhen is the engrossing story of human recklessness that pushed a unique island flightless bird species to the brink of extinction with only 15 individual birds known to still exist in 1980. The book tells the fascinating story of the foresight of a few enlightened scientists and subsequent management actions that have increased the population to what is now probably a secure status.

Clifford Frith has, however, delved far beyond just documenting the human intervention to try and save the endemic Lord Howe Island Woodhen. The first third of the text has superbly told the story of the discovery of the island, its use by seafarers and early settlement to the development of

Lord Howe Island as a modern tourism destination. And, of course, he has outlined the Island's ecology and its wildlife. He also very astutely diverts the reader's attention away from the subject bird species to discuss the Woodhen's place among the world's rails and the evolution of flightlessness – the very cause of the inability of the species to cope with humans and introduced predators.

The remainder of the book is devoted to the demise of the LHI Woodhen population and its resurrection. The recovery was achieved by the risky removal of birds from their mountain-top rainforest stronghold to a captive breeding facility and the expertise of an aviculturist to successfully breed progeny for release back to the wild, where the primary predators had been removed.

The book also discusses the post-captive-breeding monitoring of the released birds and their successful reestablishment in the lowland and mountain slopes of the Island.

For three years in the mid 1980's, I was involved in the scientific monitoring of the successful reintroduction of Woodhens to the lowlands of Lord Howe Island. I had the honour of initiating the capture and banding of the post captive-breeding population and the training of the scientific monitoring team, led by Bob Harden, to capture and band Woodhen to improve monitoring techniques. So I was delighted to accept the offer to review Clifford Frith's documentation of the story of the Lord Howe Island Woodhen. It is a wonderful account of the trials and tribulations of the Woodhen and those that were entrusted with ensuring its survival. I commend this superbly told story and historical account, as an inspiration to all that have an interest in active intervention to enhance the survival of threatened species.

Jeff Hardy
Ermington, NSW



• Lord Howe Group from the north.

Photo: I. Hutton

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Manuscripts relating to any form of avian research will be considered for publication. Field studies are preferred particularly where identification of individual birds, as by banding, has formed an integral part of the study. Some broad areas of research which do not necessarily require individual identification include morphometric analyses, techniques, species diversity and density studies as well as behavioural investigations. Behavioural, plumage and breeding studies can be conducted in captivity but must provide basic ornithological knowledge rather than avicultural interest.

Manuscripts are classified as either major articles (more than 1,500 words) or minor articles (500 to 1,500 words). Minor articles need no summary. Shorter notes relating to almost any aspect of ornithology are welcomed but must adhere to the aims of the Association. Species lists or sightings which are not discussed in relation to historical evidence or scientific parameters are not suitable for publication in *Corella*. Authors proposing to prepare Seabird Island items should contact the Assistant Editor, Seabird Islands, and obtain a copy of the guidelines.

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Manuscripts:

A guide to the format required for tables, figures and manuscripts can be attained by reference to a recent edition of the journal and more specifically to the Publication Style found on the ABSA website.

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All pages of the manuscript must be numbered consecutively, including those containing references, tables and captions to illustrations, the latter placed in after the text. No underlining and no abbreviations should be used within the text.

The *Style Manual for Authors, Editors and Printers* (6th edition 2002; John Wiley & Sons Australia, Ltd.) is the guide for this journal. Spelling generally follows the Macquarie Dictionary.

Nomenclature and Classifications follow:

Christidis, L. and Boles, W. E. (2008). 'Systematics and Taxonomy of Australian Birds'. (CSIRO: Collingwood, Victoria).

Proper nouns, particularly place and bird names must commence with a capital letter.

Headings are as follows:

HEADING – capitals and bold (e.g. **RESULTS**)

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Bell, H. L. and Ferrier, S. (1985). The reliability of estimates of density from transect counts. *Corella* 9: 3-13.

Jones, J. C. (1983). 'Sampling Techniques in Ornithology.' (Surrey Beatty and Sons: Chipping Norton, NSW.)

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The recommended format is an .xls file but tables created in Word are acceptable. These should normally have a maximum size of one page but larger tables can be accommodated, if necessary.

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