

WEDGE-TAILED SHEARWATERS ON MUDJIMBA ISLAND, QUEENSLAND: NUMBERS AND BREEDING SUCCESS

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Mudjimba Island has recently been included in the Maroochy River Conservation Park. One of the factors influencing the decision was that the island's Wedge-tailed Shearwater *Puffinus pacificus* colony may be the only viable colony remaining in south-east Queensland and one of only two colonies that inhabit mainland islands in Queensland. The colony was first described by Lane and Battam (1984, 1985) after they visited the island in February 1984. They estimated a breeding population of between 1 500 and 2 000 breeding pairs. This paper presents an estimate of approximately 2 700 burrows for the 1997/98 season; breeding rates of approximately 37 per cent for the 1996/97 and 1997/98 seasons; and a breeding success rate of about 84 per cent at fledgling stage for the 1997/98 season.

INTRODUCTION

First described by Lane and Battam (1984, 1985) after they visited the island in February 1984 Mudjimba Island supported a breeding population of between 1 500 and 2 000 breeding pairs. As discussed by Dyer (1998) Lane and Battam's estimate was based on a count of burrows and burrow occupancy was established by inspecting those burrows where the chamber could be reached by hand. They found that 30 per cent of burrows contained chicks. Breeding population estimates based on burrow counts can be misleading as not all active burrows represent breeding pairs (Dyer and Hill 1992; Dyer 1999). This paper presents breeding activity for the 1996/97 and 1997/98 seasons and a population estimate for the 1997/98 season.

STUDY AREA

Mudjimba Island (26°37'S, 153°07'E) is a 1.1 hectare island (Lane and Battam 1985) based on sedimentary Myrtle Creek sandstone (Willmott and Stevens 1988) and rises to approximately 20 metres at its highest point. The relatively even west to east rising slope drops away sharply with near perpendicular cliffs on the eastern side (Fig. 1). A rocky esplanade surrounds the central vegetated area, and a wave cut platform on the eastern side extends sub-tidally via rocky reefs to a sandy bottom at a depth of approximately 15 metres (Dyer 1998). Island access is difficult, helicopter being the only reliable means of getting ashore.

Since 1948 the island has been inhabited intermittently. In 1993 the private lease of the island was relinquished. Mudjimba Island became vacant Crown land under the jurisdiction of the Department of Lands until 1998 when the Queensland Environmental Protection Agency (EAP; previously the Department of Environment and Heritage) assumed responsibility for the island as part of the Maroochy River Conservation Park.

METHODS

Burrow census

Designed to eliminate the influence of different sized sampling units, the ratio method for estimating populations from stratified sample counts was used to provide a population estimate. This method also provides increased precision by assessing the density for each sample area (Cochran 1977; Norton-Griffiths 1978). To establish the areas of the island and of each transect, an aerial photograph adjusted to scale by the Department of Natural Resources (DNR) was used. From this, a sketch map was digitised. In order to align the sample size with the

area of the island, areas used in analyses were taken from the digitised map (Fig. 1). The transects represented 11 per cent of the vegetated area of the island.

On 21 December 1997 data were collected within 4 metres by 10 metres contiguous quadrats along transects of varying length (see Fig. 1). Burrows per quadrat were counted and the contents of a sub-sample of burrows were determined using a burrowscope, a black and white camera that relays images to a monitor screen outside burrows (Dyer and Hill 1991; Dyer and Aldworth 1998).

Burrow occupancy

The island was visited on five occasions during the 1996/97 and 1997/98 breeding seasons. Burrow occupancy for the 1996/97 season was recorded in January 1997, and for the 1997/98 season in December 1997 and April 1998 (Table 2).

Distribution of nesting habitat

A vegetation survey was performed by a local botanist to ascertain the extent of the weed invasion problem.

RESULTS

Burrow census

The census of 21 December 1997 found no burrows within the two most westerly transects. The total number of burrows on the island was estimated as $2\,737 \pm 987$ (Table 1). The variance (approx. 36%) could be attributed to the clumped distribution of burrows.

Burrow occupancy

The first trip during the 1996/97 breeding season showed that a few birds were present on the island late in August. Contrary to expectations, there was little evidence of Wedge-tailed Shearwater breeding activity on Mudjimba Island in mid-November 1996, but in late January 1997, 37 per cent of burrows had evidence of breeding activity; 60 per cent of which contained an unaccompanied chick estimated to be less than a week old and 40 per cent containing an adult incubating an egg, or an unaccompanied egg (Table 2).

During the incubation stage of breeding in late December 1997, 44 per cent of burrows were occupied. Virtually all birds were incubating an egg. Four burrows had an

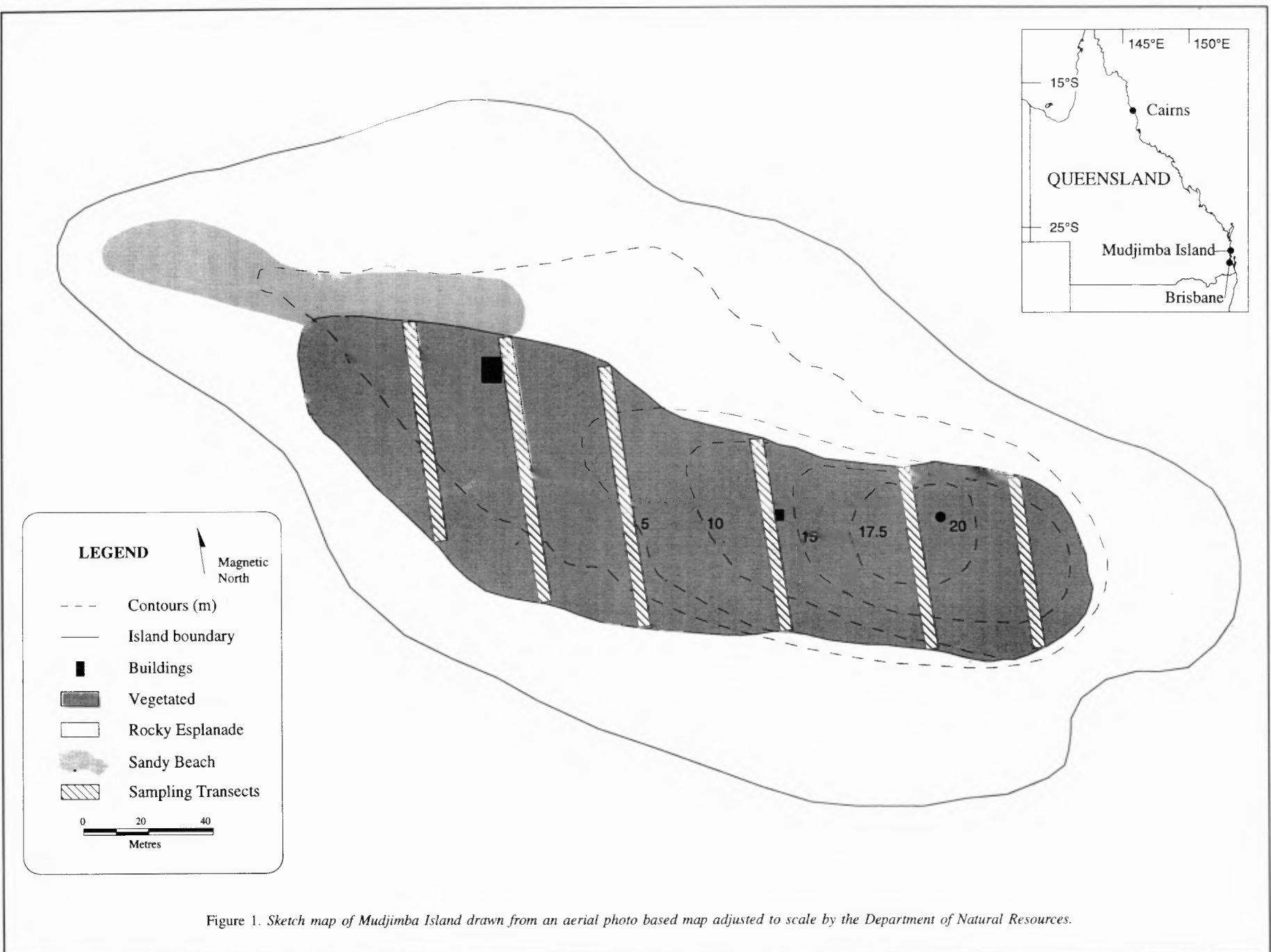


Figure 1. Sketch map of Mudjimba Island drawn from an aerial photo based map adjusted to scale by the Department of Natural Resources.

TABLE 1

Areas of sample transects and number of burrows per transect. The vegetated area of the island, mean burrow density and estimated number of burrows is also shown.

Transect	Burrows	Transect area (m ²)
1 (East)	42	277.4
2	134	326.9
3	61	322.2
4	62	238.1
5	0	225.1
6 (West)	0	209.8
Total	229	1 599.5
Vegetated Area		14 640 m ²
Mean Burrow Density		0.187 m ²
Estimated No. Burrows (±SE)		2 737 ± 987

unaccompanied egg (one broken) and, in three burrows, it was not possible to tell whether or not the bird was incubating an egg. In late April, 37 per cent of burrows contained a fledgling, ten of which still had some down around the head and neck.

Based on the 1997/98 season's burrow census and occupancy rates, it was established that the breeding population consisted of approximately 1 204 (44% of 2 737) breeding pairs and that this breeding population successfully produced about 1 013 (37% of 2 737) fledglings. This represents a success rate to fledgling stage of approximately 84 per cent.

TABLE 2

Dates of visits to Mudjimba Island and results of breeding status investigations.

Date island visited	No. of burrows inspected	Findings
28.8.96	None	<ul style="list-style-type: none"> Few signs of digging A little fresh guano Some footprints One Shearwater call heard
14.11.96	104	<ul style="list-style-type: none"> Fewer footprints than previous trip No fresh guano No calls Nil occupancy
24.1.97	178	<ul style="list-style-type: none"> 37 per cent of burrows inspected were occupied (i.e. adult and egg or chick; or egg or chick alone) 60 per cent of occupied burrows had an unaccompanied chick estimated <one week old 40 per cent of burrows inspected were occupied by an adult bird incubating egg or unaccompanied egg
21.12.97	85	<ul style="list-style-type: none"> 44 per cent of burrows inspected were occupied by an adult bird Virtually all occupied burrows had a bird incubating an egg 5 per cent of burrows had an egg only, one of which was broken
20.4.98	170	<ul style="list-style-type: none"> 37 per cent of burrows inspected were occupied with a fledgling 16 per cent of fledglings had down

Distribution of nesting habitat

Introduced flora have taken over much of Mudjimba Island including some areas of the slope. From personal observation it appears that these plant species, particularly

Prickly Pear *Opuntia stricta* and Lantana *Lantana camara*, may exclude burrowing and appear to have impinged on the nesting area identified by Lane and Battam (1985). Lane and Battam (1984) describe the Shearwaters as burrowing over 'most of the slope'.

DISCUSSION

Differences in population estimates between the 1983/84 (Lane and Battam 1985) and 1997/98 (this study), could be attributed to the different estimates of vegetated area used in the calculations. The higher range of the Lane and Battam's (1985) estimate (2 000 assuming a breeding pair per active burrow), however, falls within the standard error of the current estimate of 2 737 ± 987 burrows. It thus appears that the colony has remained relatively stable for at least 14 years.

Whilst Lane and Battam (1985) mentioned areas of Lantana and Tuckeroo *Cupaniopsis anacardioides* this was not stated to be a major problem. It is reasonable to assume that Lane and Battam would have mentioned the Prickly Pear problem if it was as rampant then as it is now. They found birds over 'most of the slope' whereas birds are currently precluded from burrowing over substantial areas of the slope by Prickly Pear and Lantana. For example, only four burrows were found in a quadrat with these species whilst the neighbouring quadrat, devoid of these plants, had 30 burrows. Birds do, however, burrow over more than 50 per cent of the slope. Further monitoring and mapping of vegetation and burrow distribution is needed to quantify the degree of the problem.

Based on an incubation phase of 53–54 ± 1 days (Roberts *et al.* 1975) and the fact that virtually all chicks found were less than a week old on 24 January 1997, the majority of eggs were likely to have been laid in the last week of November. Dyer and Hill (1992) found little difference in incubation rate between short and long burrows on Heron Island but found a lower incubation rate in short (<0.6 m) on Erskin Island. Even though burrows that could not be reached by hand constituted 14 per cent of Lane and Battam's sample on Mudjimba Island, the breeding status was relatively similar (30 per cent in February 1984, 37 per cent in January 1997, and 37 per cent in April 1998).

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INTERESTING BREEDING RECORD OF SOOTY OWL *Tyto tenebricosa*

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LOCATION

The site is located on the Bobo River, a tributary of the Nymboida River in northern New South Wales. The forest is an ecotone of wet sclerophyll forest and rainforest with a number of large hollow-bearing trees.

PREFERRED HABITAT

The dense vegetation and the interchange between wet sclerophyll and rainforest gullies provide perfect habitat for the Sooty Owl *Tyto tenebricosa*. Its distribution ranges from just north of Brisbane south along the coastal side of the Great Dividing Range to Melbourne. The Sooty Owl is a true rainforest bird, restricted to the wetter forested country of eastern Australia, with territories of about 200 to 800 ha (Blakers *et al.* 1984). Sooty Owls are generally considered uncommon and are rarely sighted within the dense, dimly-lit forest they inhabit. Dietary information is limited but suggests that the species preys on a range of terrestrial and arboreal mammals of small to moderate size such as Sugar Gliders and Common Ringtail Possums (Blakers *et al.* 1984). They are also known to take bandicoots, antechinus and dunnarts.

OBSERVATION

On 7 April 1997 one adult and two young birds were heard calling in forests near the Bobo River. The young birds were located through their begging calls, to a large Sydney Blue Gum *Eucalyptus saligna*. They seemed very

keen to be fed. The adult bird, however, would not come to the tree, keeping instead to the denser vegetation. It also kept making the bomb whistle call which is characteristic of the species. At the time it was assumed that these young were a very early clutch from this year.

A week later the location was again visited and imitation bomb whistle calls were made to provoke a response. The two young birds started their begging calls. No adult birds were heard or sighted. The two young birds came in very close and were observed using a spotlight and binoculars. We were surprised to observe that the birds had dark plumage. This indicated that these birds were last years' young and were much older than we first thought.

These observations suggest that at least one of the parents was still feeding the young after ten months (which is no doubt well after fledging, although the age at which Sooty Owls fledge has not been accurately documented). This time of ongoing parental care by the Sooty Owl has never been documented before. Further detailed studies are needed on this topic.

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