

MONTAGU ISLAND PENGUIN CENSUS

NOVEMBER 1992

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INTRODUCTION

Fullagar (1973) reported that no census of Little Penguins *Eudyptula minor* breeding on Montagu Island¹ had been attempted. He thought their number probably was between one thousand and ten thousand pairs. This statement was subsequently interpreted to mean that the size of the population was about five thousand pairs (e.g. Lane 1979).

A census is understood to be the counting of all individuals. In practice, a census is rarely possible but an approximation can be obtained by appropriate sampling methods. The sampling of a breeding population of Little Penguin has to take into account the prolonged breeding season of this species caused by asynchronous laying (see Stahel & Gales 1987; Marchant & Higgins 1990). Therefore, to obtain a census of the whole breeding population, it is necessary to know (a) how many pairs have completed breeding at the time of a census, (b) how many pairs have still to breed, and (c) how many pairs are to rear more than one brood in that season. Unfortunately, breeding data have not been collected at Montagu Island. Hence, the timing of our census was based on information from Phillip Island (Cullen *et al.* 1992), which suggested the peak of the season's breeding activities would be in November.

A transect method was used to survey the distribution of penguin breeding sites. This technique has been used in the past to survey seabird colonies including those of breeding Little Penguins (e.g. Harris & Norman 1981).

METHODS

A trial transect was surveyed in March 1992 to determine a suitable method and to find out the approximate time required to cover the island. Before starting the census, 19 parallel transects, c. 100 m apart, were marked west to east on colour aerial photographs of Montagu Island (scale c.1:2200). The transects (Fig. 1) were placed to avoid three plots used for studies on breeding shearwaters *Puffinus* spp. (see Fullagar *et al.* 1991). Also, using the experience gained in March, a data sheet was prepared to record, at intervals of 1 metre, information on Little Penguin nest sites, vegetation, topographical features and shearwater burrows (see Appendix 1). The search width was 1 metre each side of the transect. A larger search width had proved to be unmanageable. Transects started and finished at or close to high water mark, except where it was clear no penguins could nest, and were laid out using features recognizable from the aerial photographs.

A survey team consisted of two searchers and a recorder. A 50 m tape was used to position the transect data. Two teams operated in a leap-frog fashion with a 'path-finder' working ahead on the transect orientation. Searching was only conducted in daylight.

¹ The official spelling is Montague Island, but we prefer to use the traditional name used throughout a century of Lighthouse occupation and consistent with Hindwood (1969).

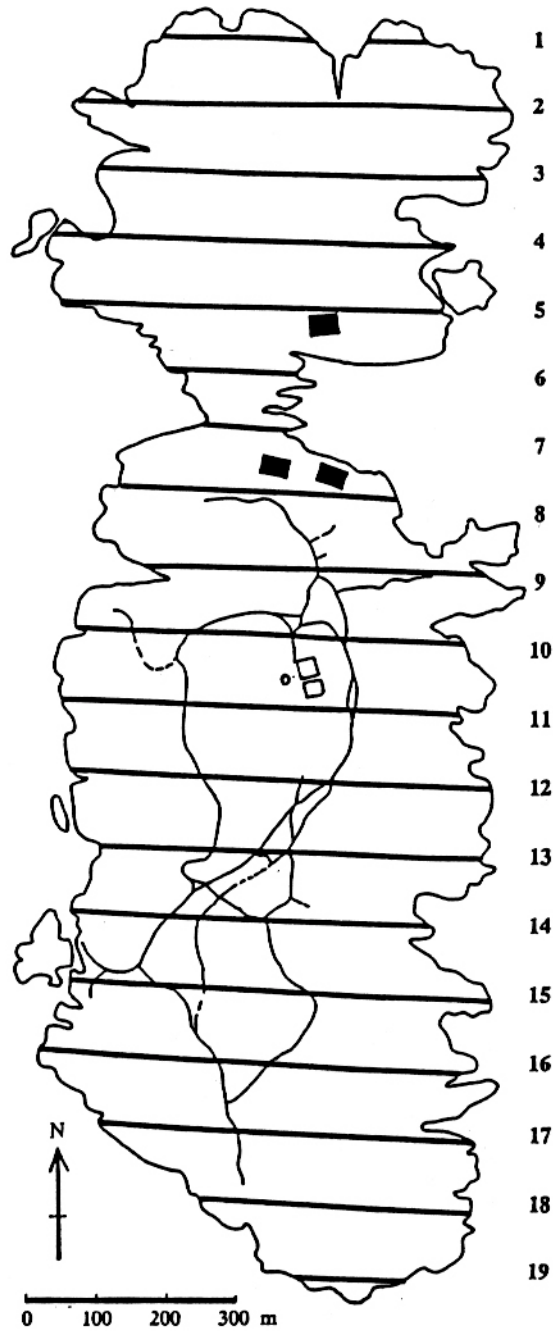


FIGURE 1. Transects for surveying the Little Penguin breeding population.

Also shown are:

tracks present at the time of the survey,

location of the old Light Station, and, in black,

plots used for annual shearwater studies.

The transects were completed between 17 and 26 November, in the following order: 18; 19; 17; 15; 13; 11; 9; 7; 5; 3; 1; 2; 8; 10; 14; 16; 12; 6; and 4. This order was determined by a desire to ensure an initial coverage at 200 m intervals should weather conditions prevent a full survey being completed. Transects 1 and 19 were rocky and, upon inspection, were found to be areas unsuitable for nesting penguins.

Penguin nests were detected by thorough searching of vegetation and cavities. Runways leading to sites outside transects were ignored. Typically, penguin nest sites were located by finding chicks or adults or by signs of occupation such as runways leading to a nest and 'whitewash' from cloacal discharge. The ages of chicks were determined according to the key of Stahel & Gales (1987 pp. 73-74).

It was often difficult to determine the exact status of an unoccupied site. Some sites were considered to be no more than areas where penguins had rested; these were termed 'camp-sites'. Other sites had been more obviously used by nesting penguins. However, it was often not feasible to distinguish between sites recently occupied and older sites that may not have been used for nesting in the present season. Also, the criteria to be used for this distinction were difficult to standardize between searchers.

Some penguins occupied burrows, usually in shearwater colonies. Some burrows could not be checked for contents because they proved to be too long. In the absence of recognizable calls from the inhabitants, penguin burrows were distinguished by presence of 'whitewash' and entrances wider than those of shearwater burrows. Occasionally, burrows were inspected that bore signs of use by rabbits *Oryctolagus cuniculus*.

Penguin landing sites were surveyed. Their intensity of use was visually assessed from 'whitewash' signs, leading to a distinction of three categories, viz. prime, major and minor. For several sites these assessments were confirmed by counts of birds coming ashore at dusk.

Montagu Island often is referred to as having a South Island and a North Island, as it is in this report, although in reality it is not divided even at high tide.

RESULTS

The total number of Little Penguin sites found along the 19 transects was 261, of which 95 were considered 'camp sites', and a further 65 were of uncertain status or, at least, appeared not to have been recently used for nesting (Table 1). However, some of these other sites were likely to be nests that would be used in the near future (see Discussion).

Little Penguins generally lay a clutch of two eggs with incubation starting from the laying of the second egg (Marchant & Higgins 1990). Some penguins were laying or had recently completed clutches at the time of the census (Table 2). At a few sites, adults were present in day-time, which might be indicative of birds about to lay (Table 1). There was no evidence of adult penguins having commenced moult.

TABLE 1. Status of Little Penguin sites on 17 Transects.

<u>Nest sites</u>	
Adult(s) only present	8
Egg(s) present	22
Chick(s) present	56
Chick(s) recently fledged	9
Too deep to examine	6
<i>Total</i>	<i>101</i>
<u>Other sites</u>	
Uncertain status	50
Not recently used	15
'Camp-sites'	95
<i>Total</i>	<i>160</i>

TABLE 2. Penguin nests with eggs.

One egg - no adult	4
Two eggs - no adult	*5
One egg with adult	1
Two eggs with adult	9
One egg and a chick, with adult	3

*Including 3 sites with egg predation.

TABLE 3. Penguin nests with chicks.

Age classes of chicks according to Stahel & Gales (1987).

Nests with adults present indicated in brackets.

Two nests with unaged dead chicks omitted.

Age	One Chick	Two Chicks	Total Chicks
Day old	4 ¹ (3)	-	4
1 week	3 (3)	3 (2)	9
2 weeks	1	-	1
3 weeks	1	2	5
4 weeks	3	3 (1)	9
8 weeks	11	8	27
>8 weeks	12 (1)	6 (1)	24

¹ Includes 3 nests with an unhatched egg.

Chicks were found at 59 sites (Table 3). The ages of these chicks and the presence of recently laid eggs indicated a wide spread of laying dates. At nine sites it was considered that chicks had already fledged (Table 1). At six sites it was obvious that birds were present but they were beyond reach in deep burrows (Table 1).

The distributions of 101 nest sites and 160 other sites have been plotted on 50 m sections along the transects (Fig. 2). Sections of transects suitable for penguin nesting combined to form a total of 5880 m, resulting in a searched area of 11 760 m². The area of Montagu Island inhabitable for penguins was calculated as 588 000 m². Therefore, the number of penguin sites in use at the time of the census, based on simple proportions, was calculated to be 5050 (SE = 41). This sets the minimum estimate for the total number of breeding pairs on the island in the 1992 breeding season.

There were 60 penguin landing sites on Montagu Island at the time of the census (Fig. 2). Counts confirmed that 200 to 300 birds came ashore at dusk at prime sites, 50 to 100 at major sites, and only 20 to 50 at minor sites. This suggests that between 3660 and 6650 penguins returned to the island on a given night during the census. Given the population estimate these numbers could be achieved by adults returning to the island every one to three nights - a result consistent with previous studies of Little Penguins at a similar stage of the breeding season (e.g. Stahel & Gales 1987; Klomp & Wooller 1991).

DISCUSSION

NESTING SITES

The results of the survey show that there are no vegetated areas of significant size that do not harbour breeding penguins. Contrary to their usual practice (see Marchant & Higgins 1990), few penguins use burrows on Montagu Island. In the sample of 166 sites, only 18 (11%) were in burrows and more than half of these were in areas of shearwater colonies. All other penguin nest sites were hidden by thick vegetation, often with Mat-rush *Lomandra longifolia* or Kikuyu *Pennisetum clandestinum* as a dominant component. In instances where other species dominated in the vegetation, a Mat-rush tussock was often singled out for a nest site. Low vegetation on rocky substrate did not often provide suitable conditions, nor did areas of dense Bracken *Pteridium esculentum* or Blady Grass *Imperata cylindrica*. Such areas are restricted in occurrence, so most of the island provides potential nesting sites.

During the searching it was observed that areas dominated by tall Mat-rush with or without Tussock-grass *Poa labillardieri* provided relatively easy access for penguins, as the birds can move between and around the bases of the tussocks even when the overhead canopy is tangled by Kikuyu or twiners. In contrast, in areas dominated by Kikuyu, penguins have to walk over the grass and in doing so create walkways between 'hummocks', which in turn provide shelter if birds are successful in penetrating the rank grass. Inside such hummocks the stems may leave sufficient space for a penguin to form a nest site. That nesting amongst Kikuyu is not without danger was made clear by two dead adult penguins found entangled in rank stems, and by a chick, still alive, but with one foot virtually severed by an old blade of grass tightly wound around its ankle.

The relative lack of burrow-using penguins means that for protection many nest sites are dependant on the cover afforded by vegetation. This leaves much of the colony vulnerable to natural disasters such as drought and fire. Any removal of vegetative cover, for instance following herbicide treatment, should be scheduled to avoid the breeding and moulting seasons of the penguins.

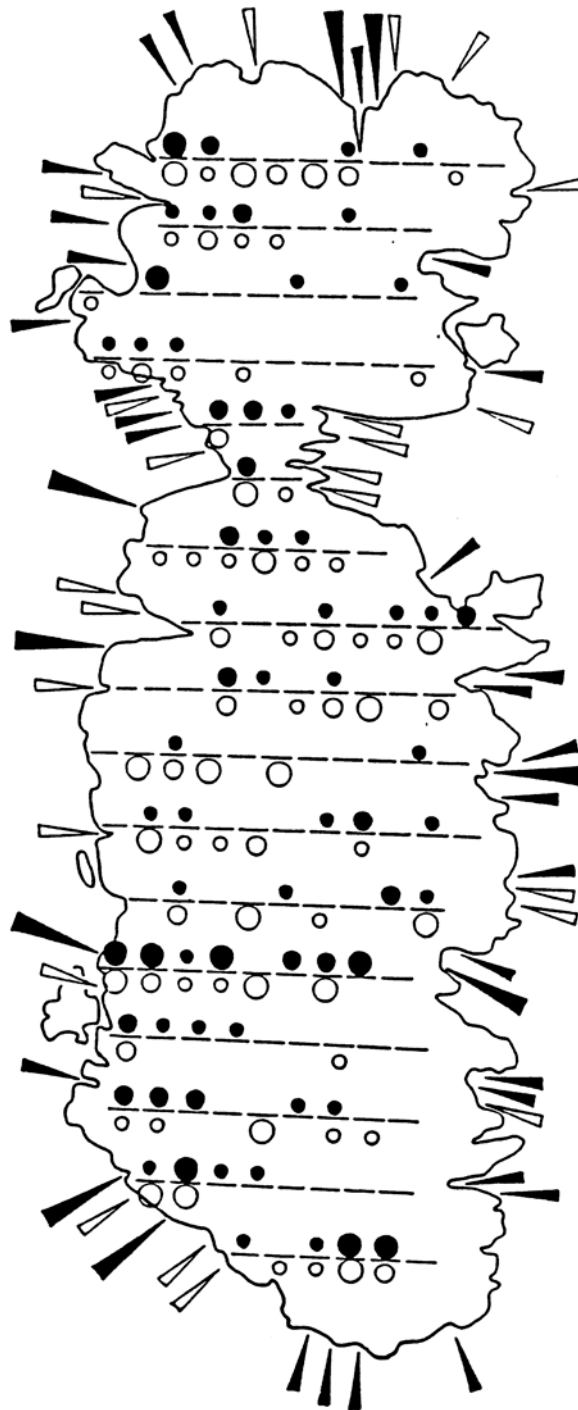


FIGURE 2. Distribution of Little Penguin sites on Montagu Island.

- ● ● 1, 2 and 3 or more nest sites per 50 m of transect
- ○ ○ 1, 2 and 3 or more other sites per 50 m of transect
- ▲ ▲ ▲ Prime, major and minor landing sites

DISTRIBUTION AND POPULATION SIZE

Despite the widespread distribution, nest sites are not spread uniformly. Concentrations of nest sites on North Island occur in the north-west and down the edge along the west and south-west edges (see Fig. 2). This correlates well with many landing sites along this section. Moreover, the low densities within the interior suggest that few penguins travel far from the landing sites, as recorded in other studies (Stahel & Gales 1987; Klomp & Wooller 1991).

On South Island large concentrations occur in the south and south-west, which correlates with the presence of 10 well-used landing sites in that area (Fig. 2). The distribution of nest sites in the north-eastern and the central eastern parts of South Island also can be explained by the presence of important landing sites. However, in contrast with North Island, a sizeable breeding population is also present on the central parts of South Island. This occurrence points to the importance of tracks in providing access to the interior.

The population estimate of 10 100 breeding birds derived from this study, despite it being consistent with the number of penguins returning each night, can only portray the situation at the time of the census. In considering the 1992 breeding season as a whole, it is clear from our observations that chicks had already fledged from some nests, while at other nests there were adults that had recently laid or were likely to lay shortly. At dusk copulations were frequently observed and these were recorded up to the time of the completion of the survey. The known incidence of double-brooding in the Little Penguin is low (Marchant & Higgins 1990).

The total number of nest sites used in the season could be estimated if we had the means of determining how many pairs had already fledged young and how many pairs were yet to lay in the remainder of the 1992 breeding season. On present knowledge we cannot predict these proportions for Montagu Island. Therefore an estimate of total breeding population cannot be determined. Nevertheless, the figure obtained confirms that the island supports a very large population of the Little Penguin, as suggested by Lane (1979). Indeed, the Montagu Island population ranks as one of the largest in the range of the species (see Marchant & Higgins 1990).

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APPENDIX 1. Data sheet for recording transect information.



MONTAGU ISLAND PENGUIN SURVEY NOVEMBER 1992

Transect N°: Sheet N°: Date:
 Searchers: N: S: Recorders: Veg.: Other:
 Distance from start of transect: m.

0	Little Penguins		Rock	Veg. cover (%)	Lomandra	Pteridium	Poa	Phragmites	Imperata	Pennisetum	Zoyzia	Isolopis	Other grasses	Acetosa	Delairea	Kennedia	Other twiners	Other herbs	Shrubs	Shearwaters	Slope: angle	direction	Notes		
	eggs N	chicks S																						eggs S	chicks N
5																									
10																									
15																									
20																									
25																									
30																									
35																									
40																									
45																									
50																									

Chick age:
 a Head not supported (-day 1)
 b Eyes not fully open (-day 7)
 c Down cover incomplete (-day 14)
 d Feet dark grey (-day 21)
 e Egg tooth present (-day 28)
 f Down cover general (-day 56)
 g Absent or head/neck only (57+ days)
 000 Empty nest

Cover scale:
 p present
 n numerous
 c codominant
 d dominant

Other grasses:
 E *Eragrostis*
 P *Polygona*
 A *Sporobolus africanus*
 V *Sporobolus virginicus*
 B *Stenotaphrum*
 S *Stipa*
 T *Themeda*
 Other:

Other twiners:
 D *Dipogon*
 I *Ipomoea*
 M *Marsdenia*
 S *Stephania*
 Other:

Other herbs:
 C *Commelina*
 I *Isotoma*
 P *Phytolacca*
 N *Solanum nigrum*
 U *Urtica*
 Other:

Shrubs:
 B *Breyntia*
 V *Solanum vescum*
 W *Westringia*
 Other: