An Estimation of the Population Density of Shearwaters Breeding on Broughton Island, New South Wales

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The density of breeding burrows in shearwater colonies on Broughton Island is assessed. The field census methods used are described and estimates of burrow densities are given.

Introduction

A number of islands off the coast of New South Wales support large numbers of seabirds during breeding seasons and these populations have been well documented (see Fullagar 1973, 1976; Gibson 1976; Gray and Gwynne 1974; Holmes 1976 a,b; Lane 1973, 1974 a,b, 1975 a, 1976 a,b,c,d; McKean and Fullagar 1976; Morris 1974, 1975, 1976). Because of the irregularity and short duration of visits by ornithologists to these islands most studies have of necessity been restricted in scope concentrating on banding aspects, mapping of known colonies and general observations. The exception is Cabbage Tree Island, the seabird population of which has been intensively studied over the years, in particular the Gould Petrel *Pterodroma leucoptera* (D'Ombrain 1943, 1964, 1970; Hindwood and Serventy 1941 and Fullagar 1976), Lion Island, New South Wales (Hersey 1959; Lane 1974a) and Mutton Bird Island, New South Wales (Swanson and Merritt 1974). As no previous attempt has been made to assess the population of shearwaters breeding on Broughton Island, an examination of the densities of burrows found in several shearwater colonies is made, in an attempt to obtain an accurate estimate on the breeding population of shearwaters.

Field Methods

Most census methods generally adopt a square grid or similar model, however, in this instance a circular grid with a total area of 314.2 m^2 was employed for easy field work and sampling.

Burrows were counted within a radius of a ten metre length of rope, rotating the rope until the whole area had been covered.

Sample plots were randomly selected within a colony and all burrows were counted irrespective of occupancy by avian or terrestrial species (e.g. rabbits).

Because of the danger of burrow destruction in soft soil, sampling had to be restricted to the better vegetated areas.

Results

In October 1977, while on a visit to Broughton Island, 12 plots covering some 3770 m^2 were sampled from three separate colonies.

The location and extent of these shearwater colonies have been outlined in an earlier paper by Lane (1976 a).

Burrow density/m^2 and standard deviation S were calculated for each individual colony and for the whole area covered, and are presented in Table 1.

The total area of each colony was estimated by walking through the colony, and by extrapolation the total number of burrows was calculated.

Although sample size was relatively low, the estimated number of burrows calculated for the total sampling area ranged from about 15 000 to 29 000 with a mean of 22 000, and the mean total number of burrows found on the Island is estimated to be in the order of 34 000.

TABLE 1

Burrow density in shearwater colonies on Broughton Island

	Burrow Density per m^2	Standard Deviation S	Estimated Colony Area in m^2	Estimated Number of Burrows
Colony A	0.247	0.124	16 000	3 952
Colony B	0.356	0.092	50 000	17 800
Colony C	0.355	0.057	3 000	1 065
Total Sampling Area	0.331	0.10	69 000	22 817

Because of the occupancy by other burrowing animals (rabbits, which may have a symbiotic relationship) and the non-occupancy of burrows by shearwaters it is further estimated that only 40% of all burrows were occupied by shearwaters.

Discussion and Conclusion

In some parts of the colonies inspected, dense vegetation was found to completely cover and obscure the burrows and, although not checked, the lack of fresh soil usually piled at the entrance of burrows sugested that these may not have been occupied.

Plant succession may play a significant role in the ecology of nesting shearwaters on Broughton Island, determining the location, extent and longevity of a colony.

Lane (1976 a) briefly commented on the effects and regularity of grassfires. This is thought to favour some dominant plant species (e.g. bracken), the growth rate of which could eventually become a limiting factor for the shearwaters. The effect of occasional fires may vary, on Bowen Island Lane (1976 e) indicated that burning had opened up areas formerly consisting of dense vegetation rather unsuitable to shearwater nesting. After a fire, grass regrowth had provided a limited nesting habitat. On the other hand on Mutton Bird Island Swanson (1976) recorded the severe effect on breeding areas following destruction of the vegetation by fire.

On other islands off the coast where burrow sites are unavailable and dense vegetation occurs, some shearwaters have also been found to nest among the dense vegetation, in crevices, under rock ledges and occasionally on the more exposed cliff edges (Lane 1974 b, 1975 a, Holmes 1976 b, personal observation).

The three islands (Little Broughton, Inner Rock and North Rock) fringing Broughton Island, have been estimated to support a breeding shearwater population of 8 000 pairs (Lane 1976 b,c,d).

In the overall Broughton Island complex the estimated total number of breeding shearwaters is likely to be in the vicinity of 22 000 pairs.

Acknowledgements

I wish to thank the people who assisted with the field work.

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