

# The New England Lagoons as Drought Refuges for Waterbirds

J.M. WHITE

*Department of Ecosystem Management, University of New England, Armidale, N.S.W. 2351*

Present Address: 54 Anglesey Avenue, St. Georges, S.A. 5064

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Coastal wetlands, and to a lesser extent those of the southern tablelands of New South Wales, are commonly assumed to be the principal drought refuges for waterbirds in south-eastern Australia (Frith 1982). As the coastal wetlands decline in area due to increased human population, it is important to identify other drought refuges so that they can be conserved and appropriately managed. Briggs (1977) suggested that the lagoons of the New England

Tablelands might have some value as drought refuges for some species of waterbirds. Her opinion was based on an increase in the numbers of some species during two relatively dry months in the summer of 1974-1975.

I studied the waterbirds on the same four lagoons as Briggs (1977) (Llangothlin, Little Llangothlin, Mother of Ducks and Little Lagoons, Fig. 1) for 42 mo from June 1981 until November 1984. The first 23 mo of my study covered the latter part of a prolonged drought, which began in 1979 and affected most of south-eastern Australia. The results of my study confirm that these lagoons do indeed act as drought refuges. Table 1 shows that Llangothlin or Little Llangothlin, or both, supported either increased numbers or about the mean number of 17 species of waterbirds during the drought. In all, 34 species were recorded on both the lagoons during the drought but those that were present at less than 20 per cent of censuses of both lagoons, or were present in far greater numbers after the drought, have been omitted from Table 1. (It is not claimed that these lagoons are suitable drought refuges for all species that frequent the lagoons during more 'normal' times.) At Little Llangothlin Lagoon the total number of all species of waterbirds present was significantly greater (Student's *t*-test) during the drought than afterwards but the difference was not statistically significant at Llangothlin Lagoon. This non-significant difference is explained by an 'outbreak' of Eurasian Coot (*Fulica atra*) after the drought. (They accounted for up to 67 per cent of the total number of waterbirds in the summer after the drought.) If Eurasian Coot are discounted, the mean total of waterbirds on Llangothlin after the drought falls to 1469, significantly lower than the mean during the drought (2076).

Mother of Ducks and Little Lagoons had their potential water level lowered by drainage between 1975 and 1981 and were dry twice, once for 11 mo, during this study. This precludes meaningful comparisons from being made but, whenever they held water during the drought, there were waterbirds present, including species not recorded by Briggs (1976, 1977).

In all, there are 31 lagoons on the New England Tablelands of N.S.W. (National Topographic Map Series Sheets 9236 and 9237). Two are nature reserves, one a game reserve and one a wildlife refuge; the others are on private property. Most, including those under National Parks and

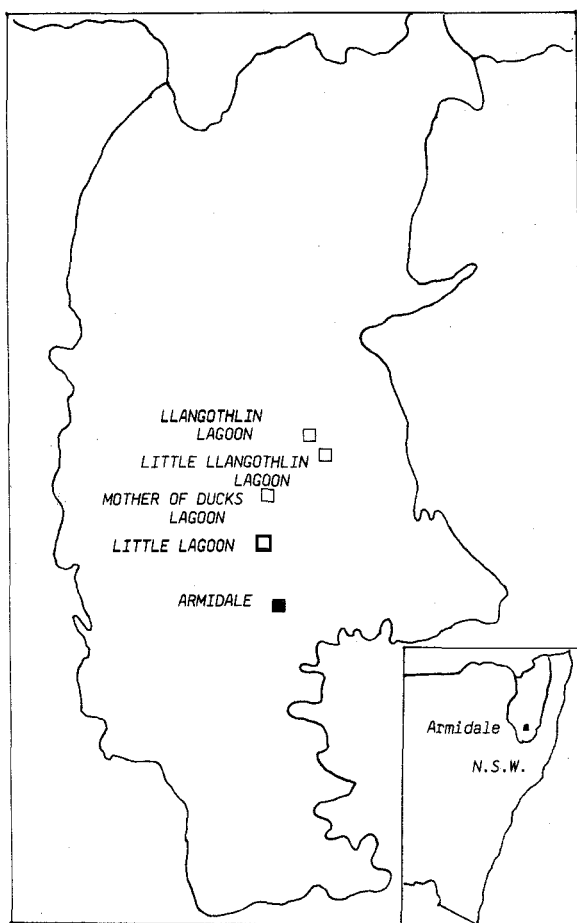


FIGURE 1 The New England Tablelands showing the position of Llangothlin, Little Llangothlin, Mother of Ducks and Little Lagoons.

TABLE 1 Mean number of waterbirds (when present), standard deviation, frequency of occurrence (*f*), and Student's *t*-value for the difference between means in drought and post-drought conditions on Llangothlin and Little Llangothlin Lagoons.

| Species                                              | Llangothlin Lagoon |             |          |              |             |          |                   |             | Little Llangothlin Lagoon |             |          |              |             |          |          |             |
|------------------------------------------------------|--------------------|-------------|----------|--------------|-------------|----------|-------------------|-------------|---------------------------|-------------|----------|--------------|-------------|----------|----------|-------------|
|                                                      | Drought            |             |          | Post-drought |             |          | <i>t</i>          | <i>d.f.</i> | Drought                   |             |          | Post-drought |             |          | <i>t</i> | <i>d.f.</i> |
|                                                      | $\bar{X}$          | <i>s.d.</i> | <i>f</i> | $\bar{X}$    | <i>s.d.</i> | <i>f</i> |                   |             | $\bar{X}$                 | <i>s.d.</i> | <i>f</i> | $\bar{X}$    | <i>s.d.</i> | <i>f</i> |          |             |
| Black Swan<br><i>Cygnus atratus</i>                  | 60                 | 53          | 1.0      | 103          | 46          | 1.0      | 3.3*              | 61          | 136                       | 121         | 1.0      | 114          | 45          | 1.0      | 0.9      | 50          |
| Pacific Black Duck<br><i>Anas superciliosa</i>       | 749                | 311         | 1.0      | 367          | 243         | 1.0      | 5.5*              | 61          | 144                       | 150         | 0.91     | 66           | 99          | 0.81     | 2.1*     | 42          |
| Grey Teal<br><i>Anas gibberifrons</i>                | 497                | 336         | 0.97     | 167          | 161         | 0.95     | 5.2*              | 59          | 209                       | 217         | 0.85     | 23           | 22          | 0.50     | 4.5*     | 35          |
| Australasian Shoveler<br><i>Anas rhynchos</i>        | 93                 | 104         | 0.82     | 35           | 38          | 0.92     | 2.9*              | 54          | 39                        | 42          | 0.69     | 6            | 7           | 0.25     | 3.6*     | 27          |
| Maned Duck<br><i>Chenonetta jubata</i>               | 26                 | 28          | 0.61     | 33           | 24          | 1.0      | 0.9               | 46          | 28                        | 33          | 0.38     | 0            | 0           | 0.0      | —        | —           |
| Eurasian Coot<br><i>Fulica atra</i>                  | 66                 | 101         | 0.69     | 985          | 813         | 0.86     | 5.2* <sup>1</sup> | 46          | 181                       | 210         | 0.58     | 46           | 37          | 0.62     | 2.9*     | 29          |
| Purple Swamphen<br><i>Porphyrio porphyrio</i>        | 352                | 281         | 0.97     | 396          | 310         | 1.0      | 0.6               | 60          | 54                        | 50          | 0.58     | 91           | 138         | 0.94     | 1.1      | 34          |
| Latham's Snipe<br><i>Gallinago hardwickii</i>        | 11                 | 15          | 0.56     | 2            | 0.9         | 0.21     | 1.8               | 25          | 2                         | 1.4         | 0.05     | 4            | 0           | 0.06     | —        | —           |
| Pacific Heron<br><i>Ardea pacifica</i>               | 23                 | 44          | 0.62     | 3            | 1.5         | 0.21     | 2.2*              | 27          | 15                        | 13          | 0.61     | 3            | 2           | 0.31     | 1.3      | 25          |
| White-faced Heron<br><i>Ardea novaehollandiae</i>    | 8                  | 6           | 0.82     | 7            | 6           | 0.92     | 0.6               | 52          | 8                         | 6           | 0.58     | 2            | 3           | 0.44     | 3.5*     | 26          |
| Straw-necked Ibis<br><i>Threskiornis spinicollis</i> | 151                | 177         | 0.74     | 27           | 35          | 0.58     | 3.6*              | 41          | 41                        | 45          | 0.61     | 16           | 36          | 0.43     | 1.5      | 27          |
| Sacred Ibis<br><i>Threskiornis aethiopia</i>         | 20                 | 21          | 0.67     | 5            | 6           | 0.25     | 3.2*              | 31          | 7                         | 8           | 0.22     | 1            | 0           | 0.06     | —        | —           |
| Glossy Ibis<br><i>Plegadis falcinellus</i>           | 33                 | 27          | 0.31     | 14           | 18          | 0.08     | 1.5               | 12          | 15                        | 7           | 0.14     | 0            | 0           | 0.0      | —        | —           |
| Intermediate Egret<br><i>Egretta intermedia</i>      | 18                 | 16          | 0.54     | 3            | 3           | 0.54     | 4.2*              | 32          | 4                         | 4           | 0.42     | 2            | 0           | 0.06     | —        | —           |
| Masked Lapwing<br><i>Vanellus miles</i>              | 40                 | 22          | 0.95     | 36           | 19          | 1.0      | 0.8               | 59          | 15                        | 16          | 0.22     | 5            | 3           | 0.86     | 1.6      | 20          |
| Black-winged Stilt<br><i>Himantopus himantopus</i>   | 35                 | 50          | 0.77     | 14           | 13          | 0.58     | 2.2*              | 42          | 49                        | 58          | 0.58     | 0            | 0           | 0.0      | —        | —           |
| Whiskered Tern<br><i>Chlidonias hybrida</i>          | 50                 | 58          | 0.21     | 96           | 85          | 0.21     | 1.4               | 16          | 14                        | 10          | 0.31     | 46           | 58          | 0.31     | 1.2      | 14          |
| Total birds <sup>2</sup>                             | 2076               | 907         |          | 2330         | 1114        |          | 0.9               | 61          | 699                       | 572         |          | 334          | 236         |          | 3.3*     | 50          |
| Total (less Coot)                                    |                    |             |          | 1469         | 589         |          | 3.2*              | 61          |                           |             |          |              |             |          |          |             |

1. Number significantly greater at Llangothlin after the drought. 2. Includes species that do not appear above in table.

\* Significant at  $P = 0.05$ .

Wildlife Service jurisdiction, have had their potential water level altered. Some are *quasi* permanent, some occasionally hold water and others rarely or never hold water. Observations at Mother of Ducks and Little Lagoons show that those in the second category still have some potential as drought refuges. Briggs (1977) advocated restoring some of the lagoons to their original level. I strongly support this recommendation, especially for Little Llangothlin Lagoon. Llangothlin is at about its original level. There are plans to restore part of Mother of Ducks Lagoon but the restoration of the whole lagoon should be considered.

During the next drought a survey should be made to assess the value, as refuges, of as many of the other lagoons as possible. Also, as many as possible of those lagoons that have been wholly or partially drained should be restored.

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## Foot-tapping by Juvenile Bridled Terns *Sterna anaethetus*: A Form of Communication?

H.D.V. PRENDERGAST

Manor House, Bagber, Sturminster Newton, Dorset DT10 2EY, England

I.M. TAYLOR

69 Tyson Street, Ainslie, ACT 2602

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The three main types of non-vocal sounds of birds are those made by the tail feathers, wing feathers and the bill (reviews by Welty 1979; Manson-Bahr 1985). Welty (1979) also mentions the sounds made by several members of the grouse family (Tetraonidae), which stamp their feet on the ground in courtship, and van Tyne & Berger (1976) state that kiwis *Apteryx* spp. stamp their feet 'when annoyed'. However, we know of no example of foot-tapping similar to the one described here.

During a visit to Tryon Island, Queensland (22°15'S, 151°47'E) in January 1985, we heard continual soft tapping sounds after dark at ground level, below the tree canopy of *Pisonia grandis* and *Pandanus tectorius*. We eventually realised that these sounds were being made by juvenile (entirely downy) Bridled Terns *Sterna anaethetus* as they stamped their feet on the fallen branches and leaves on which they perched.

We could find no evidence that the birds were being irritated by insects despite a thorough examination of their immediate surroundings by torchlight. The birds showed no signs of distress and no unusual preening or pecking was noted. This suggests that annoyance by biting insects or ectoparasites was not the cause of this behaviour.

During the night, foot-tapping seemed to increase considerably in frequency, but ceased or was only occasional in daylight. Curious about this behaviour, we counted tapping sounds made by one chick a few metres from our campsite.

Our counts ( $n = 38$ ; Fig. 1), made between 18-24 January 1985 (during which time the chick remained on the same perch), show a marked trend through the course of the day. Mean counts/min from sunrise to sunset and from sunset to sunrise were 9.4 and 64 respectively; tapping frequency was lowest in the morning and early afternoon and began to increase in the late afternoon. The highest count was 112 taps/min at 0400 h. Most taps, especially at night, consisted of a rapid double strike of one foot against the perch (counted as two taps). The relatively high mid-morning counts of 18 and 19 taps/min (Fig. 1) coincided with the only two occasions on which the chick was agitated; on one occasion an adult was flying overhead and both chick and adult were calling.

If the function of foot-tapping was to maintain communication with the parent birds, it would explain why the frequency of tapping was so much greater at night when visual contact between chick and adult was impaired (the latter, when present, roosted about 4 m above the chick in the trees). We found a tapping chick more difficult to locate than a vocalising chick and if a ground predator had similar difficulty, it might deter the predator from a lengthy search.

Why there should be a gradual increase in foot-tapping frequencies during the afternoon when there is still ample light is not clear. This hypothesis also fails to explain the function of foot-tapping when both parents are absent. Perhaps the proximity of other chicks merits future inves-