THE RE-ESTABLISHMENT OF MAGPIE GEESE AT BOOL LAGOON, SOUTH AUSTRALIA

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INTRODUCTION

Magpie Geese *Anseranas semipalmata* were once widespread throughout northern and eastern Australia, but are now restricted to the northern areas of the Continent. The Bool Lagoon area was one of the few places in south-eastern Australia where a breeding colony of Magpie Geese was recorded (Frith & Davies 1961).

In 1966 Bool Lagoon was gazetted a Game Reserve and managed by the then Fisheries and Fauna Department of South Australia. A programme commenced in 1968 to re-establish a free-flying population of Magpie Geese on the Reserve. It was initiated as a sister project to the re-introduction of Magpie Geese at Serendip Wildlife Research Station (WRS), Geelong, Victoria. Though the Victorian programme was succeeding, the South Australian project encountered many set-backs at the beginning. However, success was eventually achieved and 320+ geese were living on Bool Lagoon in May 1989.

This paper discusses the re-establishment programme and some ecological aspects of the Magpie Geese at Bool Lagoon.

STUDY SITE AND METHODS

The Bool Lagoon Game Reserve near Naracoorte, South Australia, encompasses 2,690 ha, of which approximately 2,200 ha are wetlands. Adjacent to the Game Reserve is Hack's Lagoon Conservation Park, covering an area of 193 ha. Both lagoons are semi-permanent wetlands. They are fed by Mosquito Creek, which drains a catchment of 1215 km^2, and in the spring their average water-depth is one metre. The lagoons lay on poorly-drained, deep black clays, or ground-water rendzina soils, over marl or limestone. Black organic peaty loam (Blackburn 1964) and fine silt (Shepherd 1964) comprise the surface sediment. Emergent vegetation, in order of abundance, consists of *Baumea arthrophylla, Triglochin procera. Typha domingensis, Phragmites australis* and *Bauma articulata.* The most common submergent aquatic plants are *Myriophyllum* spp. Seventy-five waterbirds have been recorded at the lagoons, and at least 65 are residents or regular visitors (Jaensch 1982). The principal species are Straw-necked Ibis *Threskiornis spinicollis,* Pacific Black Duck *Anas superciliosa* and Grey Teal *Anas gibberifrons.*

The majority of the data now presented were assembled between 1983 and 1987 when the author was the Resident Ranger at Bool Lagoon. The historical distribution of the birds was determined by an examination of published data and unpublished departmental records.

The movements and numbers of Magpie Geese were studied during monthly waterbird counts at the Bool Lagoon complex (Harper 1990) and at *ad hoc* times when the birds were in accessible situations. Counts of nesting geese and family-groups were conducted during general waterbird breeding surveys of Bool Lagoon by foot, boat and airboat between 1983 and 1987.

The water-depth (± 1 cm) and vegetation composition adjacent to some nest sites, and the nests of other waterbirds breeding in the vicinity were recorded. The breeding success of the geese was usually determined many months after nesting; during April and May, when they start to congregate in flocks on Hack's Lagoon. Where possible, the composition of family-groups was determined by studying the interactions between juveniles and adult geese. Eggs collected from nests in the lagoon, for artificial incubation as part of the re-introduction programme, were held next to a light to assess their fertility. Prior to being released, hand-reared goslings were sexed by cloacal examination and banded on the tarsus.

RESULTS

Historical Distribution

Prior to 1900 Magpie Geese bred at Bool Lagoon. However, by 1911 they had vanished from South Australia (Serventy *et al.* 1985). Frith & Davies (1961) stated that shooting and the disturbance caused by land use were probably the major factors attributing to their disappearance from locations such as Bool Lagoon. An examination of historical records for the Bool

Lagoon area (Ruddock 1982) suggests that the decline of Magpie Geese coincided with the resumption, in 1893, of the large pastoral leases of Straun, Moy Hall and Killanoola, that ranged in size from 15,300 ha to 21,500 ha. The area around Bool Lagoon, and on the Mosquito Creek Plain, was subdivided into 50–340 ha properties, resulting in the commencement of cereal-cropping and intensive sheep-grazing.

Before the draining of Bool Lagoon in 1909, the area was a permanent wetland with cutting-grass *Gahnia* sp., reeds and ti tree *Melaleuca* sp. During spring the lagoons would regularly flood out over the cutting-grass and rushes of the Mosquito Creek Plain.

The Re-introduction Programme

The following is a brief summary of the re-introduction of Magpie-Geese to Bool Lagoon.

1969 Eighteen adult geese were obtained from the Northern Territory (NT) and placed in a 2.5 ha enclosure erected on the edge of Hack's Lagoon.

1975 The first successful hatching, and six goslings were hand-reared.

1976 A seven hectare enclosure with a shallow dam was completed. Twenty-five pinioned juvenile geese were obtained from Serendip WRS.

1978 One hundred juvenile geese were obtained from the South Alligator River Region, NT. Forty were pinioned and the rest were released onto the lagoon; 20 survived.

1980 The first recorded nesting of geese on the lagoon, but no young were reared.

1981 Three nests were found on the lagoon and seven young were raised.

1983 Twenty-two birds, hand-reared from eggs obtained from four nests on the lagoon, were released. Forty-five goslings were raised by free-flying birds. The total population was 96.

1984 Thirty-nine hand-reared birds, from eggs obtained from Serendip WRS, were released. Six goslings were raised by free-flying birds.

1985 The water-level at Bool Lagoon was low. Released 271 hand-reared birds, from eggs obtained from the Adelaide River Floodplain, NT. Four goslings were raised by free-flying birds. The total population was 332.

1986 In April the lagoon dried, resulting in a major poisoning of the geese through their ingestion of lead pellets from the lagoon sediment. Eighty carcasses were found, and the population crashed to 180 birds (Harper & Hindmarsh 1990). Released 76 hand-reared birds, from eggs obtained from 11 nests on the lagoon. Twenty-seven goslings were raised by free-flying birds.

1987 The breeding programme was terminated and the feeding of free-flying birds with grain ceased.

1988 Population approximately 280; successful breeding occurred.

1989 Thirty-five goslings were raised. The total population was approximately 320 + geese.

The breeding of pinioned geese held at the lagoon was unsuccessful. The programme prospered only when large numbers of hand-reared juveniles were released onto the lagoon.

Movements

Throughout the year the geese inhabited all of the major vegetation types, except sedgeland dominated by *Baumea arthrophylla.* They were most frequently seen in *Myriophyllum* sp., *Triglochin procera* and *Typha domingensis.* Feeding was seen to occur mainly in the *Myriophyllum* and *Triglochin* dominated habitats.

During years when the lagoon filled, the geese tended to have a consistent pattern of movements between habitats. From August, when the water levels began to rise, until February-March, the geese remained in the centre of the lagoon where *Triglochin, Myriophyllum* and *Typha* were dominant. Breeding occurred in this area. At the end of summer the geese formed large flocks and moved onto areas where mudflats had been exposed, with *Triglochin* the dominant vegetation; e.g. at Hack's Lagoon. The birds were regularly seen digging in the mud amongst *Triglochin* plants, presumably to obtain the tubers. At Bool Lagoon *Triglochin* tubers are frequently eaten by Black Swans *Cygnus atratus* (pers. obs.).

Breeding

At 46 nest-sites, where an assessment of the vegetation type was made, 72% were found where *Typha domingensis* was the dominant plant and 24% where *Phragmites australis* was dominant.

The remaining 4% were found in *Baumea articulata*. Nests were built from the dominant vegetation at the site. Table 1 shows the distribution of 30 nests, from the period 1983–1986, according to the depth of water they were over. They were built over water from 25 to 120 cm deep, with most over depths between 60 and 100 cm.

Nests with eggs were found every month from August to December, with most being found from September to November. Of 28 nests found during the major waterbird breeding period at Bool Lagoon, 17 were located in the vicinity of the nests of other species. Ten were near the nests of the Sacred Ibis *Threskiornis aethiopica* and Straw-necked Ibis, four near the nests of the Black Swan, and three near ibis and Black Swan nests. One nest of the Magpie Goose was found amongst eight nests of the Black Swan in a 30 m diameter bed of *Typha*.

Table 1. The distribution of 30 nests of Magpie Geese relative to the depth of water at the sites.

Water-depth (cm)	No. of nests
25	1
50	1
60	7
70	3
80	3
100	10
110	2
120	3

Table 2. The sizes of 39 clutches of eggs of the Magpie Goose at Bool Lagoon.

Clutch size	No. of nests
7	3
8	3
9	7
10	6
11	4
12	4
13	2
14	4
15	2
16	1
17	1
19	1
20	1

Table 3. A comparison of the first and second clutch sizes of the same six nests of the Magpie Goose at Bool Lagoon.

First clutch	Second Clutch
12*	10
15*	12
11	11
10	11
10	8
16	17
(Mean 12.3)	(Mean 11.5)

* Eggs collected and artificially incubated

Table 4. The number of juvenile Magpie Geese within each of 23 family-groups containing juveniles.

Juveniles	Family-groups
1	2
2	6
3	5
4	3
5	2
6	1
7	1
10	2
11	1

Table 5. The number of adult Magpie Geese in 16 breeding groups, and the mean number of juveniles raised.

Adults	Breeding groups	Juveniles (mean)
2	5	4.6
3	9	5.3
4	2	4.5

Table 2 shows the number of eggs found in nests in which laying had ceased. The number varied from seven to 20 (mean 11.4). Six nests were found to have been used twice in the same season, and it is likely that the same family-group relaid eggs in the same nest because the number of birds at each nest was the same for both clutches. However, the birds were not individually identified, even though the majority of the population had been banded. Table 3 compares the sizes of the first and second clutches in which

laying had ceased. There is little difference between the mean clutch sizes of the first and second layings.

Immediately after they had moved from the centre of the lagoon at the end of summer, 23 family-groups were surveyed for the number of juvenile geese successfully raised (Table 4). The number of juveniles with each family-group varied from one to 11 (av. four). Table 5 compares the number of adults in 16 breeding-groups with the mean number of juveniles in each. The number of adults in each group varied from two to four, with three being most common. However, breeding success between the different groups was very similar.

Of the 206 eggs collected for artificial incubation, 18 were infertile, giving a fertility rate of 92.3%. From these eggs, 99 geese were hand-reared and released onto the lagoon, of which 55% were female and 45% male.

DISCUSSION

By comparing the ecology of Magpie Geese in northern Australia, where they breed on seasonally-flooded plains (Frith & Davies 1961), to the historical description of Bool Lagoon and the Mosquito Creek Plain, it is probable that Magpie Geese formerly bred on the regularly-flooded Mosquito Creek Plain and utilised the permanent wetlands of Bool Lagoon as a summer refuge.

Frith & Davies (1961) found that the mean number of eggs per nest on the Adelaide River Plain (NT) was 7.3, whereas at Bool Lagoon it was 11.4. The lack of evidence of predation of the nests at Bool Lagoon, compared to 77% complete or partial predation observed by Frith & Davies (1961), might explain the difference in the mean clutch sizes. However, the supplementary feeding of the geese during the period of their re-introduction to Bool Lagoon may have influenced their clutch sizes. Another reason for the high clutch sizes (16–20 eggs) at the lagoon may be the result of two nesting family-groups that each consisted of a male and three females.

With the encouraging breeding results since the major population crash in 1986, due to lead-poisoning, and the prohibition on the use of lead-shot by hunters at the lagoon since 1987, the possibility of the Magpie Geese establishing a sustainable population at Bool Lagoon is promising.

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