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BREEDING SUCCESS OF THE AUSTRALIAN PELICAN *Pelecanus conspicillatus* ON LAKE EYRE SOUTH IN 1990

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A large colony of pelicans bred on three islands in Lake Eyre South during early 1990. A maximum of 90 000 chicks fledged from an estimated 104 000 eggs laid. The chicks which hatched late in the season experienced a greater mortality than the chicks which hatched early. Banding the young was a useful tool for determining nestling survivorship and appeared to have a minimal effect on the mortality of late-hatched young.

INTRODUCTION

Australian Pelicans *Pelecanus conspicillatus* are large piscivorous birds endemic to Australasia. In Australia the usual feeding and breeding grounds of the Australian Pelican are in the estuaries, rivers and lakes of the coastal regions (Blakers *et al.* 1984) but periodically they migrate to the arid inland to capitalize on favourable conditions there. Heavy local rains or floods in the Cooper or Diamantina River systems occasionally fill large lakes facilitating the breeding of fish and fish-eating birds in this otherwise dry environment. Colonies of approximately 4 000 pairs were recorded from Lake Eyre North in 1977 and 1984 (Lane 1984) and one of 1 000 pairs in 1974 (Blakers *et al.* 1984). Pelicans have also bred at several other inland lakes (Vestjens 1977; Marchant and Higgins 1990). The largest recorded pelican breeding colony was 50 000 to 100 000 nests at

Cawndilla Lake, in New South Wales, in 1921 (Chapman 1963). Pelicans typically lay two eggs and require an assured fish supply and undisturbed nest site for three months to raise their chicks (Vestjens 1977).

In early 1990 an exceptionally large colony of pelicans bred on a series of three islands in Lake Eyre South (137°20′E, 29°24′S), South Australia (Fig. 1). The lake had filled from local runoff following heavy rains in March 1989. Pelican chicks were banded and the fledging success of this colony was investigated as part of a broader study concerning the ecology of pelicans in the Lake Eyre basin.

METHODS

The breeding colony of pelicans was discovered on 11 March 1990 after large congregations of feeding pelicans were noticed in a remote section of Lake Eyre South. Detailed observations were made on the condition and development of the chicks as well as potential predators or scavengers of the eggs or chicks on 18 days in the subsequent three months. The islands, which were submerged when the lake was full, protruded approximately one metre from the lake surface in March 1990 and at this stage their total area was approximately five hectares.

Population estimates of the colony were achieved using a combination of techniques. Adults were not counted because they spent much of the time feeding at considerable distances from the breeding islands and they often did not return until after dark. When the colony was discovered most of the chicks on Island 1 were nearly fledged. These chicks had congregated into dense crèches which moved off towards the water when approached by the observers. The nests, which were barely more than unadorned scrapes in the sand, were difficult to distinguish as they had been trampled by the young. Population estimates of this colony were based on the estimation of chicks alone. However, most nests on Islands 2 and 3 contained eggs, or naked or downy hatchlings and hence were easier to distinguish. In areas where it was possible to discern discreet nests a density of approximately one nest per square metre was estimated, which is comparable with that calculated at other localities (MacGillivary 1923; Lansell 1940; Vestjens 1977). From the ground, nests appeared to be evenly distributed throughout the 3.5 hectares of Islands 2 and 3 combined. An aerial survey of the islands on 6 May gave an undisturbed view of the distribution of chicks on the islands which confirmed this observation. The populations on these islands were therefore estimated by calculating how many nests were present. Island 1 was occupied by a second group of pelicans in May following the dispersal of the first chicks. The eggs and young were individually counted in this small colony.

Banding of pelican chicks commenced on Island 2 on 15 April 1990 by which time over half of the chicks had fledged and left the islands. Remaining chicks were quietly corralled in groups of 200–500 individuals by parties of 5–15 experienced

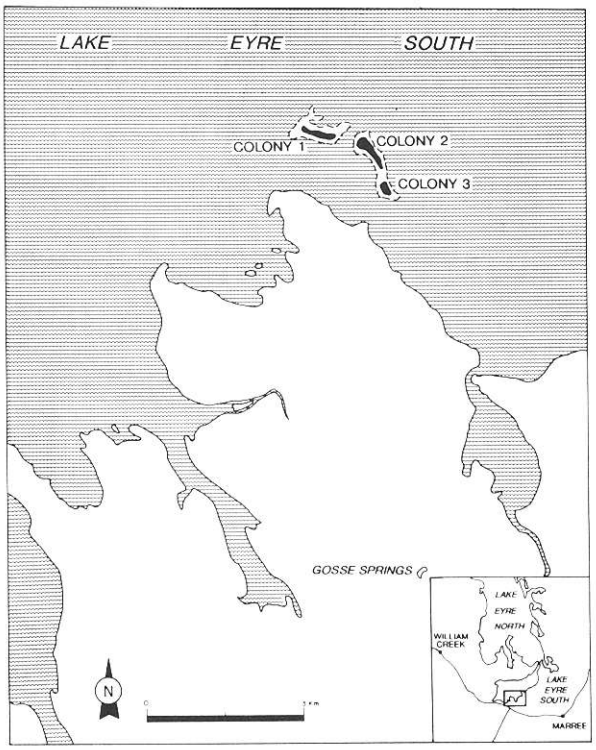

Figure 1. *Location of Pelican colonies.*

bird banders. Many of the larger chicks on the island flew off or escaped to the water when approached, leaving only unfledged birds for banding. The smallest of these chicks were conveniently drafted off the back of the walking flock, due to their slower walking pace, and were left near their nest site. Following banding with Australian National Parks and Wildlife Service steel bands, the remaining chicks were quickly released and they returned to the colony. Care was taken not to harass crèches of very young chicks, or disturb the colony during periods of stress, such as the heat of the day or when the chicks were fed in the late afternoon or evening.

A count was made of the numbers of dead pelicans and unhatched eggs left on the islands and the adjacent mainland when the colony had disbanded in August 1990. Another separate count was made of the dead chicks on Island 1 in April 1990 following the departure of the first group of chicks which hatched there. Results from Islands 2 and 3 were pooled because these islands were joined by a sand spit as the lake dried and significant transfer of chicks between these islands was noted. Any carcasses found on the mainland were assumed to have come from Islands 2 and 3. The islands were subdivided into manageable sections which were methodically censused. All carcasses were checked for bands and assigned to one of five age classes: naked hatchlings, downy chicks, feathered chicks, juveniles near the point of flying and adults.

RESULTS

The breeding pelican population on Lake Eyre was estimated at 100 000 to 104 000 birds depending on whether the second group to lay on Island 1 were laying a second clutch (Table 1). No predators were detected on the islands and scavenging was detected only on abandoned eggs which were eaten by corvids in June and July 1990. Although dingoes were regularly sighted on the mainland adjacent to the islands, they did not prey on flightless chicks which had reached the mainland, or the carcasses of starved chicks which died there. Therefore, the number of dead pelicans recorded from the islands gives a reasonably accurate indication of the true numbers of young which perished. However, because an undetermined number of eggs were eaten by corvids and a small number of infertile eggs or small chicks may have been concealed in sand or possibly eaten by other pelicans and hence overlooked, the overall reproductive success from laying to fledging is an overestimate.

Mortality from the first island colonized (Island 1) was negligible. Only seven dead chicks from the initial flock of 30 000 were found (Table 1) although others were undoubtedly trampled into the sand or washed away from the island. A smaller subsequent colony on this island was less successful and 538 dead chicks and 3 150 unhatched eggs were counted (Table 1). One hundred live chicks were recorded on this island on 5 May bringing the total to 3 788 eggs laid in this second colony. Islands 2 and 3 which supported a composite of different aged cohorts had a more variable success rate. When the disbanded colony was censused in August it was apparent that most of the carcasses were fresh, judging by their weight and form. Only a few of the carcasses had become flatter and lighter and were partially buried by sand and hence had been lying on the island for several months. Therefore, most of the carcasses were birds which hatched late in the season while the earlier chicks enjoyed a success rate similar to the first colony on Island 1. From an estimated 70 000 birds which nested on Islands 2 and 3, 8 772 dead chicks were counted (Table 1). The measured mortality for the entire colony was 9 317 chicks, which suggests that a maximum of 90 per cent of the eggs laid on the islands produced chicks which successfully fledged and left the area, assuming that each pair of adults produced two eggs.

TABLE 1

Population size, nesting times and mortality for the different stages of the 1990 pelican colony in Lake Eyre South.

Island	Estimated number of eggs laid	Estimated laying period (1990)	Number of carcasses or unhatched eggs (in brackets) counted
1	30 000	January	7
2	40 000	Feb.–April	8 772 (114)
3	30 000	March–April	
1	3 788	April–May	538 (3 150)
TOTAL	103 788		9 317 (3 264)

TABLE 2

Percentage of young in different age classes in 4 315 of the carcasses on Islands 2 and 3.

Age class	No. of carcasses	Percentage of total carcasses
Addled Eggs	95	2.2
Naked Hatchlings	108	2.5
Downy Chicks	811	18.8
Feathered Chicks	1 126	26.1
Nearly Fledged Juveniles	2 175	50.4
Adults	0	0.0

The mortality of different aged chicks was calculated from a random sample of just under half of the carcasses or Islands 2 and 3 (Table 2). Over three-quarters of the dead chicks were over two months of age, and most of these were nearly fully fledged. Hatchlings and addled eggs were scarce and no dead adult birds were found on the islands.

A total of 4 014 juvenile pelicans were banded. Direct banding mortality was limited to 15 birds which succumbed to heat exhaustion amongst a group of coralled chicks. A total of 1 684 individuals, or 43 per cent of the young birds banded on Islands 2 and 3, were retrieved as carcasses.

DISCUSSION

The pelican colony which nested in Lake Eyre South in 1990 was amongst the largest and most sucessful Australian Pelican colony ever recorded. Most other reported colonies have contained less than 1 000 birds and on many occasions 100 per cent mortality has been recorded (Marchant and

Higgins 1990). Shortage of food, interference from man, or natural disturbance such as floods, have destroyed entire colonies. Therefore the successful fledging of up to 90 000 chicks was a phenomenal success.

This study indicates that fledging success from the early stages of the Lake Eyre pelican colony was much greater than for later-hatched birds. Starvation was probably the major cause of death and some chicks were apparently orphaned by adult birds leaving the lake. This may be the reason for the predominance of large chicks among the dead. A similar scenario was noticed when only 227 young from 4 500 Pied Cormorant eggs survived when food supplies diminished for a colony breeding at Shag Island, Port Broughton, in 1966 (Waterman, unpubl. data).

Banding was a useful method of determining survival of later-hatched chicks, but the number of live recoveries subsequent to this study, and hence the value of the banding programme, was diminished because only the less successful later stages of the colony were banded. In contrast, only 17 dead chicks from a total of 1 900 banded pelicans were recorded from the Coorong in 1985 when the first chicks to hatch were banded (Waterman, unpubl. data). Therefore, in order to maximize the success of a banding operation in pelicans, and probably most other colonial birds, the first chicks to hatch should be targetted for banding.

The benefits of banding the early chicks must be balanced against the disruptive influence on other parts of the colony. If the first chicks in the Lake Eyre South colony had been banded it is possible that thousands of unhatched eggs and naked young may have been exposed to the hot summer sun and a high mortality rate may have resulted. Therefore, particularly with large compact colonies with different aged young, a compromise must be struck between optimal time for banding and minimum impact on the colony.

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CORRIGENDA — *Corella* 16(3)

Birds killed on a primary road in southern New South Wales, B. J. Lepschi.

p. 75 — Methods, lines 9 and 10; 'May 1990' to read 'March 1990'.

p. 75 — insert: 'Figure 1, Study area showing survey route.'

p. 77 — insert: 'Figure 2, Cummulative distribution and numbers of birds found dead along survey route during 1988 and 1990. Shading represents total roadkills less mortalities of Australian Magpie.

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