Breeding of the White-bellied Sea-Eagle in the Gippsland Lakes Region of Victoria, Australia

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Introduction

The White-bellied Sea-Eagle *Haliaeetus leucogaster* ranges from India eastward across southern Asia to the Philippines and southward through Malaysia, Indonesia, New Guinea, the Bismark Archipelago, the Solomon Islands and Australia (including Tasmania). In Australia it occurs along much of the coasts and penetrates inland along some of the major waterways. In Victoria the largest numbers occur around the coastal lakes in the eastern half of the State and along the Murray River with small numbers present at some of the other large inland water bodies.

Some information is available on the timing of major events in the breeding cycle of the White-bellied Sea-Eagle in Victoria (Favaloro 1944, Fleay 1948) but little has been published on its breeding success anywhere in Australia. This paper presents data on the breeding cycle and productivity of thirteen pairs of sea-eagles nesting in the Gippsland Lakes region (excluding Lake Tyers) of Victoria (Figure 1).

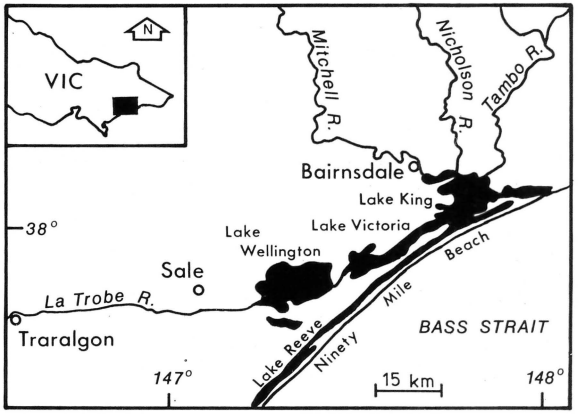

Figure 1. Gippsland Lakes region of Victoria.

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Methods

A large portion of the White-bellied Sea-Eagle population in the Gippsland Lakes region was studied during four breeding seasons (1978-81). During the first year (1978) censuses from the ground located nine nesting territories and another four were found in 1979. Because the contents of all known nests were visible from a single-engine aircraft, two aerial censuses were made during each year (1979-1981, inclusive). Productivity data were collected during each census and in 1979 and 1980 special ground trips into each nesting territory yielded data on the nesting habitat and nest site characteristics (Emison and Bilney 1982).

During this study we considered that a nest was active (nesting attempt) if an adult bird was in an incubating posture on the nest. Successful or productive nests were those which fledged young, and unsuccessful nests were active nests that failed to produce fledglings. If an adult pair was consistently present but no nesting activity was detected in a territory where we previously had recorded nesting, we considered the territory to be occupied but inactive.

In addition to the thirteen nesting territories censused during this study there were at least nine other areas in the Gippsland Lakes region where sea-eagles recently nested or where we consistently saw adult pairs. However, these were not routinely censused and data on them were used only to assist in estimating the nesting population of White-bellied Sea-Eagles in the Gippsland Lakes region (between 20 and 25 pairs).

Results

The thirteen nesting territories censused during this study (1971-81) provided data on: 37 nesting attempts (29 successful and eight unsuccessful); ten occupied but inactive territories; and one known nesting territory where, during the 1980 season, no adults were present. Nine of the ten inactive territories were occupied by pairs of adults. The other inactive territory was temporarily occupied by only a single adult after the adult male had been illegally shot in the territory in late June 1981. However, by November 1981, two adult birds were consistently seen in the territory suggesting that the female had attracted a new mate.

The reasons for failure to rear young in eighteen occupied territories were either because the adults did not lay eggs (ten territories), the clutches did not hatch (seven territories) or the adults deserted their single young following disturbance by photographers at the nest (one territory).

The average productivity of the White-bellied Sea-Eagle in the Gippsland Lakes region over the four year period was 1.3 young/successful nest, 1.1 young/active nest and 0.8 young/occupied territory (Table 1). Production figures were higher for 1978 than for the subsequent three years, but we believe this was because 1978 was the first year we found nests (so nesting activity had to be occurring at every nest) rather than an actual difference in productivity. Productivity changed little from 1979 through 1981, and there was little difference between the productivity of the territories less than one kilometre from one of the

Year	Occupied Territories	Active Nests	Successful Nests	% Occupied Territories Successful	% Active Nests Successful	Active Nests with Fledglings 0	1	0-2 2	Young Fledged	Fledglings per Occupied Territory	Fledglings per Active Nest	Fledglings per Successful Nest
1978	9	9	8	89	89	1	5	3	11	1.2	1.2	1.4
1979	13	11	8	62	73	3	5	3	11	0.8	1.0	1.4
1980	12	8	6	50	75	2	4	2	8	0.7	1.0	1.3
1981	13	9	7	54	78	2	5	2	9	0.7	1.0	1.3

Habitat	Occupied Territories	Active Nests	Successful Nests	% Occupied Territories Successful	% Active Nests Successful	Active Nests with Fledglings 0	1	0-2 2	Young Fledged	Fledglings per Occupied Territory	Fledglings per Active Nest	Fledglings per Successful Nest
Tall Open-Forest	11	10	10	91	100	0	7	3	13	1.2	1.3	1.3
Open-Forest & Open-Forest to Woodland	21	17	12	57	71	5	5	7	19	0.9	1.1	1.6
Scrub	7	7	5	71	71	2	5	0	5	0.7	0.7	1.0
Pasture	8	3	2	25	67	1	2	0	2	0.2	0.7	1.0

Distance from Coastal Lakes	Occupied Territories	Active Nests	Successful Nests	% Occupied Territories Successful	% Active Nests Successful	Active Nests with Fledglings 0	1	0-2 2	Young Fledged	Fledglings per Occupied Territory	Fledglings per Active Nest	Fledglings per Successful Nest
Less than 1 km	32	27	20	63	74	7	13	7	27	0.8	1.0	1.4
More than 2 km	15	10	9	60	90	1	6	3	12	0.8	1.2	1.3
Totals *	47	37	29			8	19	10	39			
Means *				62	78					0.8	1.1	1.3

* Same for all three categories

Table 1
Productivity of White-bellied Sea-Eagles in the Gippsland Lakes region by year, habitat type and distance from the coastal lakes.

coastal lakes and the productivity of the territories between 2 and 20 km away from one of these coastal lakes (Table 1). However, production of young varied markedly in relation to the type of habitat in which the territory was located. Thus pairs of sea-eagles whose territories were in pastures with scattered large trees fledged only 0.2 young/occupied territory, whereas sea-eagles nesting in the remnant stands of secluded, dense, tall open-forest fledged 1.2 young/occupied territory (Table 1).

Although the precise timing of major events in the breeding cycle of the White-bellied Sea-Eagle in the Gippsland Lakes region was not determined during our study, the following data were obtained: adults in incubating posture or eggs in nests were seen between July and October (inclusive), with the peak of egg-laying probably being late July and early August; chicks were seen in nests from September to December with the peak of hatching being during September; and the first fledged young were seen in November, with the peak of fledging being late November and early December.

Factors possibly influencing sea-eagle numbers

Previous results (Emison and Bilney 1982) suggest that the clearing of native forests from the perimeters of the large Gippsland lakes in the past has resulted either in the loss of sea-eagle nests or in some pairs attempting to nest in sub-optimal habitats. It seems certain that more clearing (particularly for resort development) of nesting habitat will occur because seven out of the thirteen nesting territories in our study are on private land (see Emison and Bilney 1982 for more details). It is apparent from our results that once most of the native vegetation was been removed from a territory it seldom produces fledged young, even if the large nesting trees are left intact.

The censuses of nest sites during the breeding seasons indicated that seven clutches of eggs (19% of all active nests) failed to hatch. Many populations of Bald Eagles *Haliaeetus leucocephalus* in the northern hemisphere have declined because of egg-shell thinning caused by organochlorine pesticides (notably DDT) in the environment (Sprunt 1969) and the closely related White-bellied Sea-Eagle may be equally as susceptible. Organochlorine pesticides are still being imported and used in Australia and are probably responsible for the high incidence of egg-shell thinning presently occurring in the population of Peregrine Falcons *Falco peregrinus* in Victoria (Olsen and Olsen 1979, Pruett-Jones et al. 1981). Although we do not know if the losses of some or all of the sea-eagle eggs are attributable to egg-shell thinning, it does seem essential that clutch failure be examined in more detail to ascertain causal factors. Such an examination should also look at the possibility of food chain contamination by heavy metals, particularly mercury. Recent work in the Gippsland Lakes region by Glover et al. (1980) has shown that mullet, which are eaten by sea-eagles, have relatively high concentrations of mercury in their livers, particularly when the lakes are in flood. The concentration of mercury shown in European Carp *Cyprinus carpio* in Lake Wellington has also been shown to be high (Smith 1976). Mercury has been implicated in the population declines and breeding failures of other raptors, notably the White-tailed

Adult White-bellied Sea-Eagle in the Gippsland Lakes region.

Plate 20

Photo: A. Withers

Sea-Eagle *Haliaeetus albicilla* in Sweden and elsewhere (Newton 1979).

The introduction and range expansion of the European Carp in Victoria may have allowed some of the sea-eagles in the Gippsland Lakes region to have recently established successful territories near swamps and rivers that are far from the system of large coastal lakes. The large numbers of carp which now occur in some of these waters may be providing a more abundant and, possibly more stable, food source than previously existed. Examination of the food chain of the sea-eagle may elucidate some of the reasons why, according to local residents, some sea-eagle pairs have only recently established nesting territories along these swamps and rivers.

Comparisons with other sea-eagle populations

The averages of 1.1 young fledged per active nest and 1.3 young fledged per successful nest obtained during this study are similar to results of comparable surveys of the closely related Bald Eagle in Alaska 1.1 and 1.5 young (White et al. 1971) and in Florida 1.1 and 1.6 young (McEwan and Hirth 1979). However, in the Gippsland Lakes region we never recorded more than two eggs in a clutch whereas the Bald Eagle occasionally lays three eggs.

The general timing of events in the breeding cycle of the White-bellied Sea-Eagle population in the Gippsland Lakes region appears to be up to one month later than that of the population which occurs in

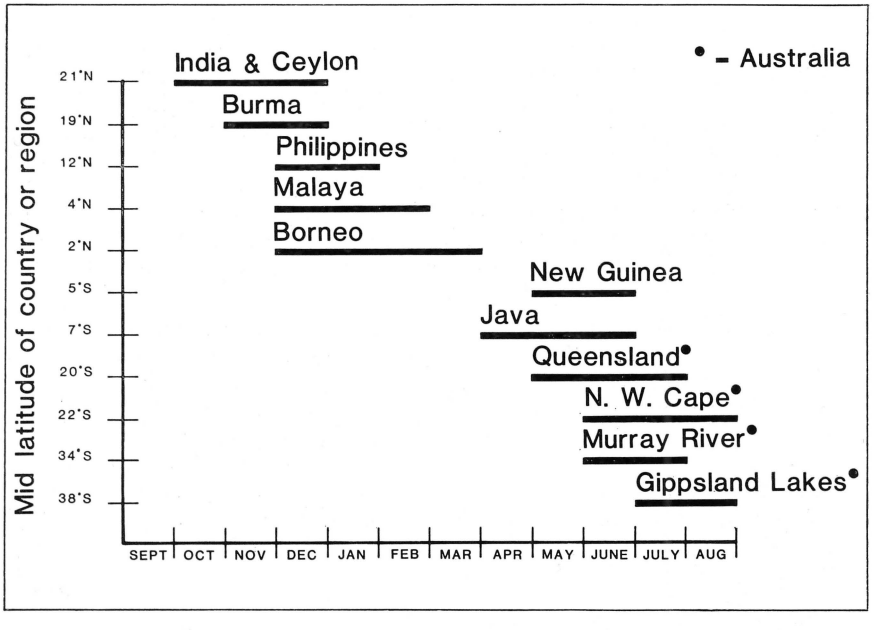

Figure 2. Months during which most egg-laying occurs in eleven countries or regions throughout the range of the White-bellied Sea-Eagle. All dates on egg-laying come from Brown and Amadon (1968) except those for the Murray River (Favaloro 1944) and the Gippsland Lakes region (this study).

Nest and chick of the White-bellied Sea-Eagle in the Gippsland Lakes region.
Plate 21 Photo: A. Withers

north-western Victoria along the Murray River between Mildura and the South Australian border (Favaloro 1944). In fact, comparison of dates when most egg-laying occurs in White-bellied Sea-Eagle populations in other parts of its range in the southern hemisphere, shows that the laying dates gradually become later progressively from the equator southward (Figure 2). The main months for egg-laying are also quite different between the White-bellied Sea-Eagle populations in the northern hemisphere where eggs are laid mainly from October through March and populations in the southern hemisphere where eggs are mainly laid from April through August (Figure 2).

It would be interesting to compare production rates from our study area, which contains one of the more southerly populations of White-bellied Sea-Eagles, with those from populations further north. However, there is little comparative productivity data available on populations of White-bellied Sea-Eagles elsewhere in the world. Even the body weight (3.9 kg) of a female White-bellied Sea-Eagle from the Gippsland Lakes region (the only female weighed during our study) is significantly heavier than those, presumably from the more northerly populations, given for this species (weights of females are 2.475 to 2.800 kg) by Brown and Amadon (1968).

Conclusions

It is estimated that there are between 20 and 25 active White-bellied Sea-Eagle nesting territories in the Gippsland Lakes region. Thirteen of these territories have been monitored during three or four consecutive April through August.

years and their productivity is similar to that of the closely related Bald Eagle in North America. Habitat destruction on the periphery of the coastal lakes is a contributing factor to the loss of sea-eagle nests and, in partially cleared areas, some pairs attempt to nest but usually fail. These losses may have been partially offset by sea-eagles recently establishing nesting territories in suitable habitat away from the coastal lakes, possibly in response to the introduction of the European Carp into the swamps and rivers. Concern is also expressed about the number of clutches of eggs which did not hatch; the need to examine the possibility of reproductive failure because of pesticide or heavy metal contamination is emphasized.

Acknowledgements

We are grateful to R. Chatto, R. Medling and A. Withers for their assistance in the field, to F. I. Norman and P. W. Menkhorst for comments on drafts of the manuscript, and to R. and K. Hussey for their expert piloting of the aircraft around nest sites. We are indebted to the following local residents who provided information on the White-bellied Sea-Eagle: F. Bennett, C., J. and P. Blandford, D. Brownlow, A. Burbidge, P. Bury, G. Freeman, N. Hawkes, R. Hoggard, D. Hollands, A. Roberts, J. Robinson, R. and J. Rodwell, R. Scholfield, R. Semmens, N. and M. Stuckey, D. Ward, G. Whadcoat and D. Young.

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The Bird Observers Club is most grateful for a generous grant from the Ministry for Conservation, Victoria, towards the cost of the colour print in this issue.