

Short Communications

Little Eagle *Hieraaetus morphnoides* Predation of Silver Gulls *Larus novaehollandiae* at a Colony in South-western Australia

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The Little Eagle *Hieraaetus morphnoides* occurs sparsely throughout Western Australia (Serventy & Whittell 1967; Blakers *et al.* 1984), and is generally associated with waterways in woodlands and open forest (Morris 1976). This eagle is a diurnal predator which hunts visually and rabbits are its preferred food item (Blakers *et al.* 1984). Storr & Johnstone (1988) reported that the Little Eagle is a casual visitor to Penguin Island, which supports the largest breeding colony of Silver Gulls *Larus novaehollandiae* in Western Australia (4000-5000 pairs). These gulls exhibit bimodal egg laying with peaks in late April and August (Wooller & Dunlop 1979).

Predation is common in seabird colonies. Colonial nesting in the Black-headed Gull *L. ridibundus* is thought to have evolved as an anti-predator adaptation (Tinbergen 1967), and should facilitate early detection and mobbing of the predator. The protection afforded by large numbers, however, apparently provides limited benefit to those pairs nesting on the periphery of the colony (Patterson 1965), which may be more apt to be taken by a predator.

This paper documents the predatory behaviour and success of Little Eagles hunting Silver Gulls on Penguin Island during 1988 and assesses their possible impact on the reproductive success of the gulls.

Study site and methods

This study was conducted from March to October 1988 on Penguin Island, Western Australia (32°17'S, 115°41'E), 42 km south-west of Fremantle. The island has a total area of 12.54 ha, being predominantly aeolianitic limestone (Dunlop *et al.* 1988), covered in the centre by a calcareous sand dune of varying depth (Fig. 1). Gull nesting begins earlier, and at greater densities, in the north and south extremes of the island, where they nest under low *Acacia rostellifera* bushes. *Acacia* occurs in lower densities on the central dune and this is the nesting area last occupied by the gulls during each season.

The island was visited for five to six days per week over eight months to study the breeding biology of Silver Gulls. The colony was visited from 0700 to 1600, weather permitting. During this time notes were taken while Little Eagles were present and the behaviour of both species was recorded. The time of day and

duration of the hunt, its success and the type of bird taken were also documented. Means are presented with standard deviations.

Results

A Little Eagle was seen on 32 of the 183 days spent in the

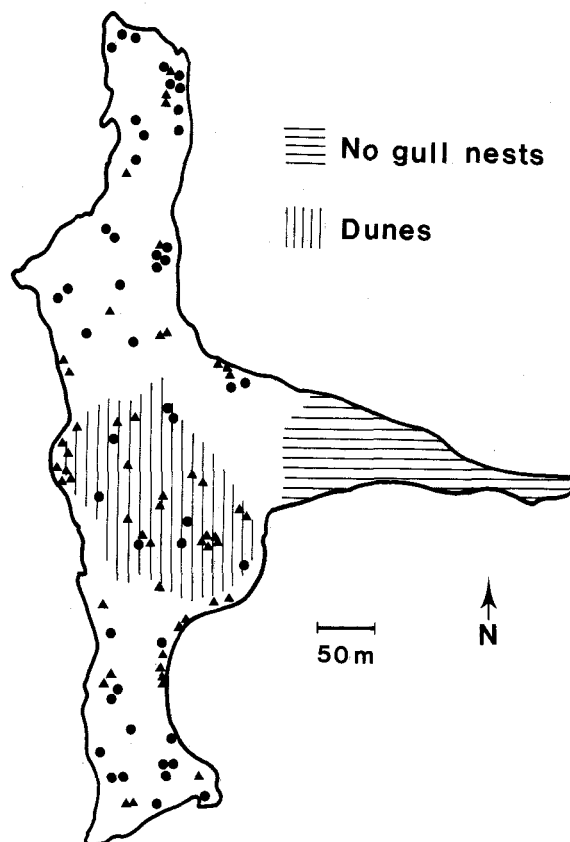


FIGURE 1 Location of kills of adult (●) and juvenile (▲) Silver Gulls made by Little Eagles on Penguin Island, Western Australia, during 1988.

Silver Gull colony (17%). A single Little Eagle appeared twice on 17 of these 32 days. Only three times were two Little Eagles observed together. On these occasions only one bird hunted while the other circled the island approximately 0.5 km from shore. No Little Eagle was resident on the island.

The approach of a Little Eagle was signalled by a silent flight during which all Silver Gulls would leave their nests and fly out over the water. The Silver Gulls usually detected the eagle while it was about 0.5 km from the island. The mean time of the first arrival of a Little Eagle was $1010 (\pm 1.4 \text{ h}, n = 32)$. Second visits generally occurred at $1415 (\pm 1.6 \text{ h}, n = 17)$. The average duration of a visit was $42 \pm 16 \text{ min}$ and $7 \pm 12 \text{ min}$ for first and second visits, respectively.

Little Eagle hunting patterns varied within the eight-month period. Early in the Silver Gull nesting season, when only adult birds were present, the Little Eagle would repeatedly soar 300 m above the colony. All Silver Gulls whose nests were under the Little Eagle's flight path would lift from their nests, thereby creating a 'wave' of birds in flight as the Little Eagle traversed the colony. The Little Eagle would begin flapping flight just prior to diving at the Silver Gulls, usually from a height of about 100 m. After 316 observed dives by the Little Eagle, 47 adult Silver Gull carcasses were found. This hunting success rate of 15% may be an under-estimate if the Little Eagle removed the carcass but this was not observed. Carcasses were surrounded by a large number of feathers, so locating them was not difficult. In all cases, the flight and leg muscles, and digestive tract of the adult carcass had been removed by the Little Eagle. Measurements of the adult carcasses (Wooller & Dunlop 1981) revealed that 29 (62%) of the 47 Silver Gulls killed were females. Adults were generally struck by the Little Eagle as they emerged from their nests under bushes. Thirty-nine adults were killed in dense bush habitat, while only eight were taken in open habitats.

The hunting pattern of Little Eagles was markedly different when Silver Gull chicks were abundant (Fig. 2). Significantly more chicks were taken from open habitats ($n = 40$) than adults ($\chi^2 = 37.3, d.f. = 1, P < 0.001$). Rather than soaring over the island a number of times, the Little Eagle would land on open ground (the beaches and in the central dunes) and forage on foot under dense bushes of approximately one metre in height. These foraging bouts generally occurred in localised areas where a number of carcasses were found within a 10 m radius ($n = 12$). Of the 52 young Silver Gull carcasses found, 43 (83%) were mobile young approximately 14-21 days old. All other carcasses found were of chicks less than two weeks old. When the Little Eagle was hunting Silver Gull chicks, adult activity was disturbed if the Little Eagle was within 10 m of a nest; otherwise adults remained concealed in the *Acacia*. The carcasses of chicks and mobile young were

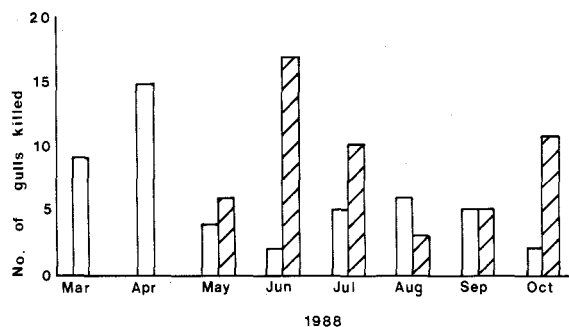


FIGURE 2 The numbers of adult (open bars) and juvenile (hatched bars) Silver Gulls killed by Little Eagles on Penguin Island, Western Australia, in each month from March to October 1988.

located by mapping areas of localised Little Eagle mobbing by adult Silver Gulls. The carcasses of young chicks resembled those of adult kills.

At the end of the Silver Gulls' nesting season in November, the Little Eagles were no longer observed to hunt at Penguin island.

Discussion

The risk of predation appears to be one of the proximate factors causing coloniality in birds (Wiklund & Andersson 1980). A number of studies have examined avian predation in larid colonies, but these have dealt mainly with nocturnal predation by owls (Nisbet 1975; Hunter *et al.* 1976; Southern *et al.* 1982; Nisbet & Welton 1984; Jehl & Chase 1987). Only Jehl and Chase (1987) gave a detailed account of diurnal hunting by Golden Eagles *Aquila chrysaetos* in a nesting colony of California Gulls *L. californicus*.

If predation is an important selective force affecting nesting gulls it should act on both their habitat selection and breeding synchrony (Jehl & Chase 1987). Although habitat selection is species-specific and affected by local conditions (Jehl & Mahoney 1987), it has been widely reported that the peripheral nests of gulls suffer higher rates of predation, and hence lower breeding success, than nests located centrally within a colony (Buckley & Buckley 1980). On Penguin Island, the majority of Silver Gull chicks were preyed upon in open habitats, such as beaches and central dunes. In contrast, most adults were taken by Little Eagles from dense nesting areas where vegetation was thicker than in the open habitat areas.

That 62% of adult Silver Gulls killed by Little Eagles were female may suggest that their diurnal nest attentiveness was greater than that demonstrated by male Silver

Gulls (*cf.* 76% female California Gulls to Golden Eagles [Jehl & Chase 1987]). Nesting under the cover of *Acacia* bushes may incur both advantages (i.e. concealment from a visual predator) and disadvantages (i.e. longer time required for predator detection and escape, possible entanglement). It appears, however, that the advantages of nesting in dense vegetation and in close proximity to other nests may outweigh the disadvantages, because these areas are colonised first and have higher nest success rates than those on the edge of the colony and in the open, central dune (Meathrel unpubl. data). This contrasts with California Gulls which prefer open nesting habitat facilitating early predator detection and escape flight (see Jehl & Mahoney [1987] for discussion). Differences in breeding success, nest density and colonisation rates suggest that gulls nesting in the 'periphery' — in this case, along beaches and dunes — may not be able to compete with earlier breeders for peak nesting areas, possibly as a reflection of age or inexperience (Ryder 1975).

Nisbet (1975) suggested that if avian predation on a colony of larids is important, synchronised laying and hatching dates should result. The Silver Gull's protracted breeding season of eight months in Western Australia provided Little Eagles with an unusually prolonged opportunity to exploit this colony. The earliest nesting adults were particularly vulnerable as they were the only avian prey available on the island. The shift from adults to mobile chicks once they became available indicates a greater degree of vulnerability to predation among the younger age-class, especially in an open habitat. It may be that not all chick carcasses were found if the eagle consumed the entire chick. Blakers *et al.* (1984) reported that Little Eagles may hawk to catch and eat prey on the wing, a behaviour not seen by me.

Overall, predation by Little Eagles probably did not greatly affect the total reproductive output of Silver Gulls on Penguin Island in 1988. Only 0.5-0.6% of nesting adult gulls, and approximately 0.7% of chicks, fell prey to eagles.

References

- Blakers, M., Davies, S.J.J.F. & Reilly, P.N. (1984). *The Atlas of Australian Birds*. RAOU and Melbourne Univ. Press, Melbourne.
- Buckley, F.G. & Buckley, P.A. (1980). Habitat selection in marine birds. In: *Behaviour of Marine Animals, Vol. 4: Marine Birds* (eds J. Burger, B.L. Olla & H.E. Winn) pp. 69-112. Plenum Press, New York.
- Dunlop, J.N., Klomp, N.I. & Wooller, R.D. (1988). Seabird islands. Penguin Island, Shoalwater Bay, Western Australia. *Corella* **12**, 93-98.
- Hunter, R.A., Ross, H.A. & Ball, A.J.S. (1976). A laboratory simulation of predator-induced incubation interruption using Ring-billed Gull eggs. *Can. J. Zool.* **54**, 628-633.
- Jehl, J.R., Jr. & Chase III, C. (1987). Foraging patterns and prey selection by avian predators: a comparative study in two colonies of California Gulls. *Studies in Avian Biology*, **10**, 91-101.
- Jehl, J.R., Jr. & Mahoney, S.A. (1987). The roles of thermal environment and predation in habitat choice in the California Gull. *Condor* **89**, 850-862.
- Morris, F.T. (1976). *Birds of Prey of Australia: a Field Guide*. Lansdowne Editions, Melbourne.
- Nisbet, I.C.T. (1975). Selective effects of predation in a tern colony. *Condor* **7**, 221-226.
- Nisbet, I.C.T. & Welton, M.J. (1984). Seasonal variations in breeding success of Common Terns: consequences of predation. *Condor* **86**, 53-60.
- Patterson, I.J. (1965). Timing and spacing of broods in the Black-headed Gull (*Larus ridibundus*). *Ibis* **107**, 433-459.
- Ryder, J.P. (1975). Egg-laying, egg size and success in relation to immature plumage of Ring-billed Gulls. *Wilson Bull.* **87**, 534-542.
- Serventy, D.L. & Whittell, H.M. (1967). *Birds of Western Australia* 4th edn. Lamb Publications, Perth.
- Southern, L.N., Patton, S.K. & Southern, W.L. (1982). Nocturnal predation on *Larus* gulls. *Colonial Waterbirds* **5**, 169-172.
- Storr, G.M. & Johnstone, R. E. (1988). Birds of the Swan coastal plain and adjacent seas and islands. *Rec. W. Aust. Mus. Suppl.* **28**.
- Tinbergen, N. (1967). Adaptive features of the Black-headed Gull *Larus ridibundus* L. *Proc. Int. Orn. Congr.* **14**, 43-59.
- Wiklund, C.G. & Andersson, M. (1980). Nest predation selects for colonial breeding among Fieldfares *Turdus pilaris*. *Ibis* **122**, 363-366.
- Wooller, R.D. & Dunlop, J.N. (1979). Multiple laying by the Silver Gull, *Larus novaehollandiae* Stephens, on Carnac Island, Western Australia. *Aust. Wildl. Res.* **6**, 325-335.
- Wooller, R. D. & Dunlop, J.N. (1981). The use of a single external measurement for determining sex in a population of Silver Gulls, *Larus novaehollandiae*. *Aust. Wildl. Res.* **8**, 679.