SHORT COMMUNICATIONS

OBSERVATIONS OF DEFENCE OF THE NEST AGAINST HUMANS BY AUSTRALIAN SPECIES OF *FALCO*

There is little reference in the literature to the reaction of falcons to human intruders at the nest site. Brown and Amadon (1969) mention reactions of eight of thirty-seven species. Of these *F. hypoleucos* and *F. peregrinus* occur in Australia. Anon. (1976) briefly discussed four of the six Australian species (*F. longipennis, F. subniger, F. hypoleucos* and *F. berigora*). Our observations were made during more than 200 visits to eyries of Peregrine Falcons in Australia and a number of visits to those of other species, in the course of studies into breeding biology and food habits (e.g. Olsen and Olsen 1979; Olsen *et al.* 1979a).

Falco peregrinus Peregrine Falcon

Brown and Amadon (1968:855) note that 'the female is almost invariably very aggressive to human intruders or dogs near the nest site, and frequently violent, striking the intruder with her wing or drawing her claws through the fur of dogs at high speed'. All eyries containing eggs or young that we have visited were defended. However, attempts to strike appeared to be made with the feet, not with the wing.

Typical defence for the duration of our visit involved wide sweeps and shallow stoops (Fig. 1) while the characteristic 'kak-kak-kak' was uttered. Most Falcons landed periodically. On most occasions both sexes attacked, the female usually, but not always, being more aggressive. One eyrie was defended by the male only. Nearly vertical stoops sometimes replaced the more usual wide sweeps particularly when the male was the chief defender.

The persistence and closeness of the attacks varied. When a pair had eggs or young, defence was greatest. Non-breeding pairs in and outside the breeding season sometimes defended their site but usually did not. Some individuals were more likely to strike a person than others. Peregrines at sites that were visited a number of times during the breeding season became more aggressive. Nestlings can give several calls including a 'chitter' and a 'kak' similar to those made by adults; these elicited the most intense aggression from parents that we observed. During our study the two breeding pairs with the weakest nest defence had single eggs. Clark and Peakall (1977) described similar behaviour in Eleanora's Falcon *Falco eleanorae*. Three or more intruders elicited less defensive behaviour than did one or two. However the three occasions when people were struck (receiving cuts and bruises to the head) involved three or more people. If one faced the Falcons when they attacked, they were always deterred (Olsen and Olsen 1978) and it was inexperienced people who were struck, unexpectedly from the side and from behind.

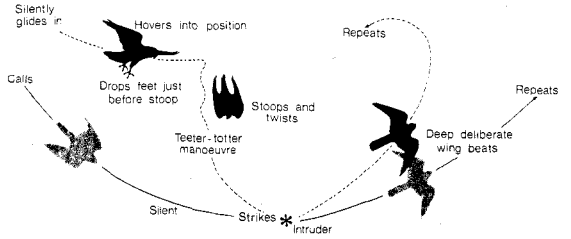

Figure 1. Pattern of defence against human intruders in four Australian Falcons. Dashed line = Australian Kestrel and Black Falcon; Solid line = Peregrine Falcon and Australian Hobby. Hovering into position only in the Australian Kestrel. The 'teeter-totter manoeuvre' (Balgooyen 1976) is a twisting of less than 180° about the long axis of the body.

Many of the more aggressive Falcons allowed very close approach to the site by humans before attacking, possibly because they saw people daily. One such pair, the most aggressive, was not detected for some time because it was so unobtrusive. Castings are collected at its eyrie monthly, which may have exacerbated the defence of these birds. In our experience, Falcons less used to humans often intercepted intruders at a greater distance from the nest site but defended less intensely than those more used to man.

At one eyrie a newly fledged female defended the nest site upon our approach like an adult until the adult female arrived and then began to behave like many newly fledged Peregrines. She chased and stooped at the parents while they tried to defend the nest site.

At ten eyries the female reacted to our presence by 'eechipping' (R. W. Nelson unpubl. data) a call usually used in courtship and intraspecific aggression.

Falco longipennis Australian Hobby

Anon. (1976) states that 'Little Falcons defend the nest noisily and fiercely when it is molested'. Three occupied nests we visited were defended in a similar manner to that used by Peregrines, with wide sweeping stoops and the typical 'kak-kak-kak' of falcons (Fig. 1) but all three pairs sat near the nest quietly before the tree was climbed; so observers visiting only the base of the tree would not have been attacked. Both sexes defended the site and no humans were struck.

Falco hypoleucos Grey Falcon

Grey Falcons are said not to defend their nests (Anon.

1976; Brown and Amadon 1968). We have not visited active nests of Grey Falcons but J. Kershaw (pers. comm.) has seen them defend and N. Favaloro (pers. comm.) has filmed these Falcons defending the site from man.

Falco subniger Black Falcon

Calaby (*in* Frith 1969) and Anon. (1976) state that Black Falcons do not defend the nest. We climbed to seven eyries and six of these seven pairs defended their young; the seventh had four eggs. When we approached, the Falcons flew away and stayed very high, sometimes at a distance, until the tree was climbed. They then began defending. This behaviour, as with Australian Hobbies, may have led to the belief that the Falcons do not defend. Their behaviour was very different from that of Peregrines. Females were the chief defenders and no humans were struck.

These Black Falcons attacked differently from most Peregrines and Australian Hobbies because they did so silently, the only sound being made by the wings as they pulled out of the dive, and because most attacks were nearly vertical stoops, not shallow passes.

Falco berigora Brown Falcon

Anon. (1976:134) states that 'the pair usually do not defend the nest'. This has been so at most eyries that we have visited. The Falcons generally circled or landed at a distance, often uttering an unfalcon-like 'squawk'. J. Jolly (pers. comm.) visited an eyrie near Port Lincoln, where the pair defended like Peregrines, although he considered this rare.

As with Peregrines, frequent visits to an eyrie can result in stronger defence. A pair, nesting near Canberra, was visited every three days for seven weeks. They sat in a tree at a distance at first and gradually became more aggressive until, by the end of the nestling period, the female was stooping to within three metres and the male to within four metres of the climber. This defence occurred only when the young gave distress calls while being handled.

Their method of attack differed from that of the other Falcons in being very buoyant. Although they often hovered into position, as Kestrels sometimes do, the stoop was not vertical but rather sweeping, without the speed of the Peregrine or Australian Hobby.

Falco cenchroides Australian Kestrel

Defence of the nest is not mentioned in the literature on this species. In our experience they generally do not defend. A pair, visited every two days during the breeding season in 1977, at first perched about seventy metres away as the tree was being climbed. By the ninth visit both birds were stooping close to the climber, the female striking him repeatedly on the head and face. The female also followed us, stooping, for about fifty metres as we left. Attacks were nearly vertical stoops (Fig. 1) without vocalizations. Partly because the attacks were silent, the climber was struck many times. Unlike defence by Peregrines, it was often impossible to determine when the Kestrel was going to strike; so evasive action could not be taken.

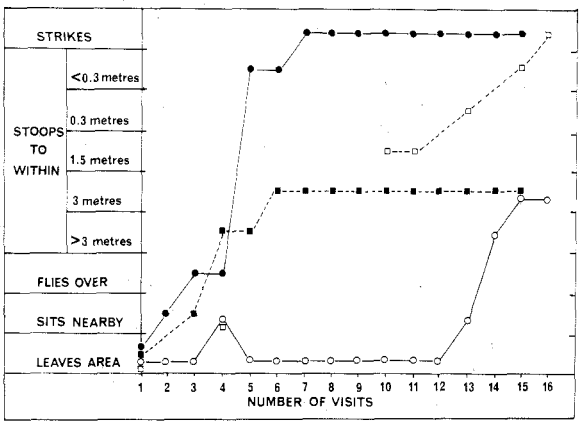

Figure 2. Change in intensity of defence by Australian Kestrels in relation to the number of visits to the nest. Closed symbols = 1977; open symbols = 1978; circles = different females each year; squares = same male both years. Young first began to 'kak' on Visit 6 in 1977 and on Visit 7 in 1978.

In 1978 the same male (color banded) and a different female used the tree. The male hunted 500 metres from the nest and was absent during most visits. When he was present and the young called while being handled, he began defending as intensely as at the end of the 1977 season. The new female left the area of the nest site during our first visits. The intensity of attack by both birds increased until the female was approaching to within three metres like the male in 1977 and the male was striking like the 1977 female (Fig. 2), although with such intensity that he could not be deterred by shouting or waving of arms. Not only had he become more aggressive than the female of the previous year but in both years a generally non-aggressive species had become more aggressive than any falcon that we have observed.

DISCUSSION

The biological value of defending the nest from humans probably varies with circumstances. Aggressive attacks may deter intruders but they also make nests easier to find and may imperil the adults.

Peregrines defend their site against predators (e.g. Wedge-tailed Eagles *Aquila audax* [Olsen *et al.* 1979b]) and man. Brown Falcons and Australian Kestrels appear to defend just as strongly against predators like Wedge-tailed Eagles but not against man. The fact that the latter two will defend if enough visits are made suggests that the tendency to attack humans is there but less strongly than in some other falcons or that it is overridden by fear or both. In our experience Brown Falcons and Australian Kestrels are no more fearful of man

when they are away from the nest than the Peregrine. This suggests that a greater fear of humans is not the sole reason for the difference. The defensive response was closely linked with the distress calls of the young in all species. The calls increased the intensity of defence in Peregrines and determined whether a brood would be defended or not in the Brown Falcons that we visited regularly.

Defence by Australian Kestrels and Black Falcons was very similar, being nearly vertical and silent. These two species have lighter wing loadings than the Peregrine (pers. obs.) and can pull out of a stoop closer to an object or the ground given a similar rate of descent.

In the Australian Kestrel defence is similar to that described by Balgooyen (1976) for the American Kestrel *Falco sparverius* (although the American Kestrel usually defends with greater intensity, J. Olsen, pers. obs.). Both of these Kestrels are thought to belong to a single super-species (Brown and Amadon 1969). Peregrines, worldwide, all appear to use a similar pattern of attack against man (e.g. Craighead 1956; Cade 1960; Beebe 1960).

ACKNOWLEDGEMENTS

We wish to thank R. W. Nelson, M. Brooker, N. Mooney and J. Jolly for reading the manuscript.

REFERENCES

ANON. 1976. Reader's Digest Complete Book of Australian Birds. Sydney: Reader's Dig. Serv.

BALGOOYEN, T. G. 1976. Behaviour and ecology of the American Kestrel *Falco sparverius* L. in the Sierra Nevada of California. Univ. Calif. Publ. Zool. 103.

BEEBE, F. 1960. The marine Peregrines of the Northwest Pacific Coast. Condor 62: 145-189.

BROWN, L. H., and D. AMADON, 1968. Hawks, Eagles and Falcons of the World. New York: McGraw Hill.

CADE, T. J. 1960. Ecology of the Peregrine and Gyrfalcon populations in Alaska. Univ. Calif. Publ. Zool. 63.

CLARK, A. C., and D. B. PEAKALL 1977. Organochlorine residues in Eleanora's Falcon *Falco eleanorae,* its eggs and its prey. Ibis 119: 353-358.

CRAIGHEAD, J. J., and F. C. CRAIGHEAD, Jr. 1956. Hawks, Owls and Wildlife. Harrisburg: Stackpole.

FRITH, H. J., (Ed.). 1969. Birds in the Australian High Country. Syndey: Reed.

OLSEN, P., and J. OLSEN. 1978. Alleviating the impact of human disturbance on the breeding Peregrine Falcon. Corella 2: 1-7.

—, —. 1979. Eggshell thinning in the Peregrine, Falcon, *Falco peregrinus* (Aves: Falconidae), in Australia. Aust. Wildlife Res. 6: 217-226.

—, W. VESTJENS and J. OLSEN. 1979a. Observations on the diet of the Australian Kestrel, *Falco cenchroides* Emu 79: 133-138.

OLSEN, J., P. OLSEN and J. JOLLY. 1979b. Observations on interspecific conflict in the Peregrine *Falco peregrinus* and other Australian falcons. Aust. Bird Watcher 8: 51-57.

JERRY OLSEN, *RMB 1705, Sutton, NSW 2620.*
PENNY OLSEN, *Division of Wildlife Research, CSIRO, PO Box 84, Lyneham, ACT 2602.*
16 May 1979.

THE EFFECTS OF CONTROLLED BURNING ON SOME BIRDS OF THE UNDERSTOREY IN KARRI FOREST

Controlled burning of accumulated litter in the State Forests of Western Australia is designed to reduce the possibility of much hotter wildfires. The effects of fire on forest wildlife are only partly understood (Christensen and Kimber 1975, Proc. ecol. Soc. Aust. 9: 85-106) and this paper presents information on some of the birds present before and after a burn.

Birds were caught in mist-nets on the Eastern Break Road in the Treen Brook State Forest near Pemberton in south-western Australia during May 1978 and again in May 1979. In the intervening spring the understorey was deliberately burned, which reduced its foliage from about eighty to twenty-five per cent. The main large trees in the area were Karri *Eucalyptus diversicolor* with smaller numbers of Jarrah *E. marginata* and Marri *E. calophylla* and an understorey dominated by *Casuarina decussata* and *Bossiaea laidlawiana.*

Table I shows that the species and number of birds caught after the burn were remarkably similar to those caught in the preceding year, particularly if allowance is made for the slight difference in catching effort between years. This Table only presents those birds caught and a fuller list of all birds observed will be published elsewhere (Milewski in prep.). Little can be inferred about those species for which only one or two individuals were caught but a number of trends are apparent in more numerous species.

Almost all birds caught were insectivores, most of them apparently unaffected by fire. Although there is a general reduction in abundance of invertebrates after fire, some groups are much more severely affected than others and some insects increase in abundance shortly after a burn (Springett 1976, Aust. J. Ecol. 1: 77-82; Hindmarsh and Majer 1977, Res. Pap. 31, Forests Dept. West. Aust.). The smaller number of fairy-wrens after the burn may result from a reduction in the insects that they eat or from the loss of a dense understory. Conversely, the increased numbers of Black-faced Cuckoo-shrikes and Rufous Treecreepers may be because the more open vegetation after the burn favoured their foraging habits.

A most interesting observation concerned the six individuals, representing five species, that were banded in 1978 and caught in the same area in 1979. If note is