LETTERS

J. Raptor Res. 28(2):118–119

FLUSH-HUNTING AND NEST ROBBING BY PEREGRINE FALCONS

Between 0610–1000 H on 25 November 1992, we observed the hunting behavior and interactions of an adult pair of peregrine falcons (*Falco peregrinus*) and their two fledged nestlings, in a steep-walled gorge on the lower Orange River, South Africa (28°S, 20°E). The young were still dependent on their parents for food, most of which was provided by the adult male.

At 0824 H the adult female was observed making an aerial transfer of food to the juvenile male. The prey appeared to be a half-grown rock pigeon (*Columba guinea*) squab. At 0827 H the adult female flew about 50 m to a rock pigeon nest, situated on a grass tussock on an open ledge about 20 m above the floor of the gorge, on the north wall. She removed a nestling, flew to a nearby perch and ate it. While raiding the nest, the peregrine was attacked by an adult rock pigeon. By 0833 H the adult female falcon had finished eating the squab, and returned to the now empty pigeon nest. She was again attacked by the pigeon, which actually landed on the peregrine's back and dislodged her from the ledge. The falcon fell backwards, turned and caught the pigeon, which managed to break free and fly down the gorge The peregrine chased the pigeon for about 200 m before it found cover among some large boulders in the river bed At 0835 H the peregrine female was seen to visit the pigeon nest for the third time. Again the pigeon defended its nest, but this time the falcon was able to grab and hold on to its attacker, and flew with the pigeon to a ledge 30 m upstream, where she killed it, plucked it and fed on it until 0947 H, when she flew out into the gorge and passed the remains of the pigeon to the juvenile male.

At 1115 H on 7 May 1993, ARJ watched a female peregrine at the same site land at a ledge where she was mobbed by two rock pigeons. The falcon tried to catch one of these pigeons and chased it down the gorge for about 200 m before flying back to perch on the cliff. At 1420 H the peregrine flew from a perch about 100 m upriver and landed at the same ledge, and had been perched there for about 5 min before she was again attacked by a pigeon which she caught, apparently very easily, without leaving the ledge. Although the hunting falcon was not seen to rob a pigeon nest at the ledge where this incident took place, this may have occurred sometime previously.

Large falcons, and especially peregrines, feed mostly on flying birds, which are caught in aerial chases. Observations of nest robbing by large falcons are infrequent in the literature (W. Fischer 1967, *Der Wanderfalk,* Ziemsen, Wittenburg; R.B. Treleaven 1981, *Br. Birds* 74:97; J.L.B. Albuquerqué 1984, M.S. thesis, Brigham Young Univ., Provo, UT U.S.A.; A.J. van Zyl 1991, *Gabar* 6:68), although nestling birds (mostly of ground-nesting species) sometimes are identified from remains gathered at nesting and roosting sites (D.A. Ratcliffe 1980, The peregrine falcon, T. & A.D Poyser, Calton, U.K.; R. Mearns 1983, *Bird Study* 30:81–90). In contrast, records of common kestrels (*F. tinnunculus*) robbing nests are quite frequent (e.g., D.W. Yalden 1980, *Bird Study* 27:235–238; F. van der Merwe 1986, *Promerops* 176:12–13; R.A. Pettifor 1990, *An. Behav.* 39:821–827; A.J. van Zyl 1991; S.K. Woolley 1992, *Br. Birds* 85:188). Kestrels are relatively slow, active-search hunters, which may account for the higher number of incidents of nest robbing reported for this species than for fast, pursuit-hunting falcons.

Given that a nest full of young birds is probably not a typical search image for these high-speed, aerial hunters, we are drawn to speculate on the conditions under which a peregrine might discover and utilize such a food source. African peregrines (*F. p. minor*) apparently "flush-hunt" on their nest cliffs relatively frequently (K. Hustler 1983, *Ostrich* 54:161–171; W. Tarboton 1984, *Raptor Res.* 18:131–136; ARJ pers. obs.). This hunting technique can involve the systematic searching of areas of the cliff, either from a perch or from the air, in order to locate, flush and then chase birds perched on the cliff. Falcons that flush-hunt regularly may be more likely to find nestling birds and prey on them than those that do not. We suspect that the frequency with which falcons flush-hunt may increase in situations where cliff-dwelling prey species are abundant in a pair's hunting range or, at the other extreme, where the frequency with which potential prey fly past cliff sites is low. The former conditions probably occur at the seabird colonies on the western Pacific islands, where flush-hunting by immature peregrines has also been reported (C.M. White cited in Tarboton 1984), and at temperate sea cliffs, where flush-hunting has been observed (A. Parker 1979, *Br. Birds* 72 104–114) and nest robbing at a gull colony has been recorded (R.B. Treleaven 1981, *Br. Birds* 74:97). The latter conditions may prevail at lower latitudes (see A.R. Jenkins 1991, *Gabar* 6:20–24), and flush-hunting has been observed in Argentina (C.M. White cited in Tarboton 1984), southern Brazil (Albuquerqué 1984) and Mexico (D.V. Lanning *et al.* 1977, *Nat. Geog. Res.* 18:377–388), as well as in tropical Africa.

In the first incident described here, the adult male peregrine made at least 17 hunting attempts at flying prey during

the morning observation period, all within a 1-km stretch of the river gorge, and was successful on four (23.5%) occasions. The pair obviously was not subject to a low availability of flying prey. They were exploiting a prey base that was spatially concentrated in a short length of river gorge, and temporally concentrated by a common activity peak in the early morning. This prey base consisted of an abundance of aerial insectivores and other species found in close association with the river or the cliffs of the river gorge. Rock pigeons, and presumably their nests, were numerous in the gorge. We suspect that nest robbing is a fairly frequent occurrence in this pair.

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J Raptor Res. 28(2):119–120

CANNIBALISM OF A YOUNG BARN OWL (*Tyto alba*) BY ITS PARENTS

Cannibalism occurs fairly frequently in broods of many raptor species (C. Ingram 1959, *Auk* 76:218–226; C.H. Stinson 1979, *Evolution* 33:1219–1225; J.K. Terres 1980, Aud. Soc. Encycl. North Am., Alfred A. Knopf, New York, NY U.S.A.). This behavior is adaptive in predatory species in times of food shortages, severe weather conditions, and disturbance at the nest, and contributes to their individual fitness. Cannibalism among barn owls (*Tyto alba*) has been reported (D.S. Bunn et al. 1981, The barn owl, Buteo Books, Vermillion, SD U.S.A.; B.A. Colvin 1984, Ph.D. diss., Bowling Green, OH U.S.A.; G.M. Lenton 1984, *Ibis* 126:551–575; Marti 1992, Barn owl, Birds of North Am., *Acad Nat. Sci., Phila.* 1:1–15), although it occurs less frequently than is popularly believed (D.S. Bunn et al. 1981). When food is abundant, nestling barn owls have been observed to share food with their younger siblings (C.D. Marti 1989 *Wilson Bull.* 101:132–134); however, when food is scarce, young barn owls have been observed to kill and consume their siblings, an act that could permit them to survive periods of severe food shortages (D.S. Bunn et al. 1981). The killing of an owlet by an adult and feeding it to the other young is the most unlikely of seven different cannibalism scenarios and has not been documented (D.S. Bunn et al. 1981). Reports of adult barn owls killing one of their own injured young and eating it or feeding it to their remaining young has also not previously been reported. Some circumstantial evidence exists to suggest that both of these scenarios can occur in North American barn owls (B.A Colvin 1984).

In the process of studying a pair of nesting barn owls, I observed evidence of cannibalism in which one or both of the adults presumably killed and consumed one of their offspring during a period when food was becoming scarce.

I observed a pair of barn owls and their offspring on an abandoned herbicide manufacturing facility in Houston, Texas. I visited the site at 1–2 wk intervals from 10 April 1988 through 19 August 1989. The owls used a small brick structure (4.6 × 2.4 × 3.0 m) as a roosting/nesting site. A wooden box (0.3 × 1.2 × 0.3 m) above a small doorway, the only opening to the structure, served as a nest box. On 23 October 1988, a clutch of seven eggs was found in the nest. This was the second of three clutches produced by the owls during this 16-mo period. By 30 October, the first two eggs had hatched and by 12 November, a third egg had hatched and one egg remained in the nest; the other three eggs were missing. The remaining egg never hatched and disappeared within a week. The three owlets were last observed in the nest together on 17 December. On 24 December, both parents were seen at the roost and there were only two young still in the nest. The oldest owlet (57–59 d) was found dead on the floor and I observed the adult male sitting next to it. The owlet appeared to have been dead for about 1–2 d. Its body cavity had been ripped open, and it had been almost completely eaten. Only the wings, feet, skull, and stripped skeleton remained. It was not decapitated as is usually done with live prey and cannibalized young (D.S. Bunn et al. 1981) and its feathers were not scattered around the roost (K.L. Hamilton 1980, *Texas J. Sci.* 32:175). A necropsy on the dead owlet revealed a broken right humerus. I suspect that this occurred during practice flying within the small enclosed area, but may have been a result of falling out of the nest to the floor (about 2.6 m).

The barn owl roost and nest box were inaccessible to the few potential mammalian predators at the site and other avian predation was highly unlikely. In addition, the condition of the owlet's carcass strongly suggested that it had been eaten by the owls and not by another predator.

The hunger of either the parents or the remaining owlets, combined with the colder than normal temperatures at the time, probably led to this cannibalism. Pellet analyses indicated that prey were becoming scarce as winter progressed into 1989, and many birds and insects were found in the diet (unpubl. data).

Feeding behaviors such as cannibalism of healthy or injured young can be important in predatory species such as