

LETTER

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EVIDENCE OF AN URBAN PEREGRINE FALCON (*FALCO PEREGRINUS*) FEEDING YOUNG AT NIGHT

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Peregrine Falcons (*Falco peregrinus*) are typically considered diurnal raptors; thus, the majority of studies on the nesting and hunting behavior of the species have been carried out during the day in rural/natural areas (e.g., Carlier 1993, Carlier and Gallo 1994, Palmer et al. 2003). Nevertheless, early morning (Byre 1990) and late night (Sick 1961) hunting has been observed occasionally in urban environments. Furthermore, studies of prey remains indicate that urban Peregrines may feed on nocturnal species, including bats, as well as species that are typically secretive throughout the day and fly mostly at night, including Jack Snipe (*Lymnocyptes minimus*) and Western Water Rail (*Rallus aquaticus*; Drewitt and Dixon 2008); although this latter finding may suggest that Peregrines hunt nocturnally, it does not provide conclusive evidence.

Following their population recovery, peregrines are frequently found nesting in urban areas. As a result, nests can be accessed with relative ease and many urban nests (e.g., Winnipeg, Canada; New York City, U.S.A.; Brisbane, Australia; Brussels, Belgium; Rome, Italy) now have cameras that stream live footage on the internet day and night, providing an opportunity to study nesting behaviors in detail. Thus, nocturnal behaviors at the nests are increasingly observed. For example, in Derby, U.K., a web camera documented adults bringing in and plucking a live Eurasian Woodcock (*Scolopax rusticola*), female Green-winged Teal (*Anas crecca*) and Eurasian Collared-Dove (*Streptopelia decaocto*) at around 2300 H on each occasion; these were delivered to the nest in December, March (when there were no nestlings), and May, respectively, and it was thought that the prey items were cached rather than eaten on the night when they were caught (N. Brown pers. comm.). However, the frequency of nocturnal hunting is not entirely clear.

More rarely, the nocturnal feeding of young at the nest has been observed. In Warsaw, Poland, Rejt (2004) monitored a single nest for two breeding seasons (2000 and 2002) between 2000 H and 0400 H and found that

nocturnal feedings occurred on 59% of the total observed nights in 2000 ($n = 34$) and 76% of the total observed nights in 2002 ($n = 21$). Rejt (2004) suggested that this behavior might result from the pair taking advantage of the city lights, individual fitness, availability of prey, and/or weather conditions. Video archives from the pair nesting in Derby also showed evidence of nocturnal feeding of young (Derby Cathedral Peregrine Project 2012). However, the extent to which this nocturnal behavior occurs is unknown, likely because many nest observers do not watch the birds during the night. Here, we compare the nocturnal behaviors observed at three nest sites in the U.K.

Recordings of streamed web-cameras were made using screen-capture software for later analysis as part of a larger study on the parental care of urban Peregrines. Nests were located in Chichester, Sheffield, and Nottingham in England, U.K. We collected and analyzed 1800 hr of footage, 451 hr of which were recorded between 2200 H and 0400 H (Chichester, $n = 127$; Sheffield, $n = 208$; Nottingham, $n = 116$).

We observed nighttime feeding at only one nest (Fig. 1A); in Nottingham, on four occasions the adult male visited the nest (Table 1), bringing with him what appeared to be small- to medium-sized birds (though on one occasion possibly a bat). On average, the male visited the nest for 10 min 36 sec and fed the chicks for 8 min 4 sec (Table 1). During the night feedings, the female remained at the nest; she brooded the nestlings ($n = 4$) for the entire night, only lifting slightly when they were being fed (Fig. 1B). The male did not feed the female on any of the occasions. The nestlings were fed a further eight times during the day on 27 April and nine times during the day on 30 April (recording stopped at 1737 H that day, thus the recording was incomplete), and it is therefore likely that the adults were providing an adequate number of birds during the day, which may suggest that prey availability was not low. The lunar phase was in its third quarter on 27 April and there was a full moon on 30 April; the impact of the lunar phase on nocturnal hunting and feeding warrants further investigation.

We observed no nocturnal feeding of young at either Chichester or Sheffield. Both nests produced fewer young

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Figure 1. Still images of male Peregrine Falcon (A) bringing food to the nest and (B) feeding young during the night.

($n=2$ and 3 , respectively) than at Nottingham ($n=4$); this difference in brood size may have caused an increase in food delivery rates. In a study of urban ($n=4$) and rural ($n=9$) nests in and around Melbourne, Australia, provision-

ing by the male was positively correlated with brood size (Olsen et al. 1998); furthermore, after manipulating brood sizes, Olsen and Tucker (2003) found that parents with enlarged broods fed nestlings larger prey items and

Table 1. Nocturnal visits and feeding at a Peregrine Falcon nest at Nottingham, U.K. by the adult male.

VISIT NUMBER	DATE	TIME OF ARRIVAL	LENGTH OF STAY	AMOUNT OF TIME SPENT FEEDING YOUNG	AGE OF FIRST-HATCHED NESTLING (d)
1	27 April 2015	0152 H	11 min 28 sec	10 min 21 sec	7
2	30 April 2015	0010 H	13 min 13 sec	10 min 36 sec	10
3	30 April 2015	0107 H	10 min 0 sec	6 min 57 sec	10
4	30 April 2015	0218 H	7 min 42 sec	4 min 23 sec	10

greater prey biomass than did parents with control broods or those with reduced brood size.

It is unlikely, however, that brood size alone triggered this nighttime feeding behavior. Urban environments present nocturnal hunting opportunities for Peregrines; it is possible that the male observed here was simply taking advantage of the street lights and maximizing his hunting opportunities. However, although nocturnal hunting has been observed in urban environments (e.g., Wendt et al. 1991, DeCandido and Allen 2006), it should be noted that it is unclear whether the male that we observed provisioning young at night also *hunted* the food at night, or if it was brought in from a nearby cache; further research into the nocturnal behaviors of Peregrine Falcons is needed to further understand the importance of nighttime feeding of young. A thermal camera, which will reveal whether food brought to the nest is freshly caught, has been installed on the nests at Nottingham and Sheffield to aid our research. Nevertheless, this study supports previous evidence from Poland that nighttime feeding of young is more widespread than previously known. The use of infrared cameras on Peregrine nests is now common; thus, the study of nocturnal behaviors can be done with ease. We stress the importance of using modern camera technology to study both day and night behaviors at Peregrine Falcon nests to further our understanding of this urban adaptor.

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