Feeding Activity and Seasonal Changes in Prey Composition of urban Peregrine Falcons Falco peregrinus

Author: Rejt, Łukasz

Source: Acta Ornithologica, 36(2) : 165-169

Published By: Museum and Institute of Zoology, Polish Academy of Sciences

URL: https://doi.org/10.3161/068.036.0201

ACTA ORNITHOLOGICA
Vol. 36 (2001) No. 2

Feeding activity and seasonal changes in prey composition of urban Peregrine Falcons *Falco peregrinus*

Łukasz REJT

Museum & Institute of Zoology, Polish Academy of Sciences, Wilcza 64, 00–679 Warsaw, POLAND, e-mail: luka@robal.miiz.waw.pl

Rejt Ł. 2001. Feeding activity and seasonal changes in prey composition of urban Peregrine Falcons *Falco peregrinus*. Acta Ornithol. 36: 165–169.

Abstract. Despite the increasing populations of Peregrine Falcons in European cities, detailed quantitative studies of their diet composition and feeding activity in urban environments are rare. The results from observations in Warsaw have added to the knowledge of the feeding ecology of urban raptors. In 2000 and 2001 the same pair of Peregrines bred successfully in nest boxes situated on two different buildings in the city centre, rearing three and four chicks in the respective years. During the breeding seasons from hatching to fledging, the nests were monitored with a video camera. Only diurnal observations were used in the detailed analysis of feeding activity — 428 h in 2000 (33 days) and 384 h (24 days) in 2001. Two peaks of parental activity were noted: in the morning and in the afternoon. Additional data collected in 2000 showed that the falcons also fed their young at night. In 1998–2001 486 prey remains were collected on the buildings occupied by the Peregrines. In Warsaw these falcons preyed most often on Feral Pigeons (32%), and also on various thrush species (23.5%), Skylarks (8%) and Corncrakes (5.6%). Seasonal variations in prey composition were identified. During the spring and autumn migrations, the proportion of pigeons in the falcons' diet was 10–19%, while in summer and winter it was over 40%. The trend was reversed with regard to migrant species, which were prevalent in the diet in spring and autumn, but less numerous in summer and winter.

Key words: Peregrine Falcon, *Falco peregrinus*, urban area, diet, feeding activity

Received — Oct. 2001, accepted — Nov. 2001

INTRODUCTION

The Peregrine Falcon is a cosmopolitan species, occurring in the Western Palearctic from the tropics to the high Arctic (e.g. Cramp 1980, del Hoyo 1994). After the decline in the 1960s and the subsequent recovery following reintroduction (Martell et al. 1994, Septon et al. 1995, Busche et al. 1998 and others), the population increased in various areas within the species' range (e.g. Hennen 1996, Enderson et al. 1995). In Europe, the number of Peregrines has increased in many areas, and recent population levels in the United Kingdom and Germany are already above the pre-crash figures (e.g. Wegner 1994, Crick & Ratcliffe 1995, Mammen & Stubbe 2000). In several European countries, more and more Peregrines have adjusted to urban conditions, as has been the case in other parts of the species' range (e.g. Cade & Bird 1990, Cade et al. 1996). Nowadays, Peregrines nest in Rome (Ranazzi 1995), Berlin (Müller 1989, Sömmer 1989), Prague (Peške 1997), Plzen (Hruška et al. 2000), and also in Brighton, Swansea, Liverpool, Dublin and a number of other English and Irish cities (e.g. Roberts 1999, Ratcliffe 2000).

The regular wintering of the Peregrine Falcon in Warsaw has been recorded since the mid-19th century (Taczanowski 1882). After the last war a pair probably nested in the devastated city centre, and Peregrines were also observed regularly in other parts of the city (Luniak et al. 1964). However, the species disappeared from Warsaw in the 1950s and also from the whole of Poland as a result of DDT contamination (Mizera & Sielicki 1995). In 1996–97 two reintroductions were carried out to restore the Peregrine to Warsaw's avifauna. The falcons appeared in the city centre in 1998 and have bred every year since then, doing so success-

fully for first time in 2000. The Warsaw pair is one of the three recently recorded breeding pairs of Peregrines in Poland (Sielicki & Sielicki 1999).

Despite the fact that Peregrines are becoming a more and more frequent sight in European towns and cities, detailed quantitative studies on their feeding activities are rare (e.g. Thiollay 1982, Schneider & Wilden 1994). Moreover, there are only a few studies (fragmental in most cases) on the diet composition and mode of prey selection of falcons inhabiting urban environments (Sömmer 1989, Schneider & Wilden 1994, Ranazzi 1995, Schneider 1995, Mlikovsky & Hruška 2000, Rabosee et al. 2000, Rejt 2000). As it is known from studies on other diurnal raptors, urbanised populations differ from those living in natural habitats. In urban Kestrels *Falco tinnunculus*, for instance, there were significant differences in prey composition and feeding ecology as compared to rural or even suburban birds (e.g. Cramp 1980, Salvati et al. 1999, Rejt et al. 2000). Similar differences were also found in Lesser Kestrels *F. naumanni* (e.g. Tella et al. 1996). Observations in Warsaw have added to the knowledge of the feeding ecology of urban raptors. Feral pigeons *Columba livia*, the most common prey of Peregrines (e.g. Cramp 1980), reach high numbers in urban areas and are available throughout the year. Interestingly, it has been reported from European cities that Peregrines do not prey only on this species; sometimes they hunt smaller and only seasonally available species as well as exotic ones (e.g. Sömmer 1989, Schneider & Wilden 1994). The primary aim of the Warsaw study was to find out how the prey composition varies seasonally, if it does at all. Another aim was to compare the feeding activity of the Peregrines occurring in the same area in two consecutive years.

MATERIAL AND METHODS

In 2000 and 2001 the same pair of Peregrines bred successfully in nest boxes situated on high buildings in the centre of Warsaw, Poland (21°E 5°23'N). In 2000 the Peregrines reared three chicks (two males and female), while the following year four young birds (two males and females) fledged. Two different nest boxes were occupied by the falcons in both years — in 2000 they nested on the tallest building in the centre of Warsaw, 185 m above the ground. In the following year, the Peregrines chose a nest box situated on a lower building, c. 120 m tall. From hatching to fledging the nest interiors were monitored with a KPC-400 video camera. In 2000 observations were continuous, an infrared searchlight being used at night. In the following year material was only collected between 04:00 and 20:00. For the detailed analysis of feeding activity, only comparisons of diurnal observations (04:00–20:00, summer time) were used — 428 h of observations in 2000 (33 days) and 384 h (24 days) in 2001.

In 1998–2001 prey remains were collected on the buildings occupied by Peregrines. All finds were allocated to one of four seasons: spring (March–May), summer (June–August), autumn (September–November) and winter (December–February). In all 486 prey remains were collected — 167 in the spring, 136 in the summer, 104 in the autumn and 79 in the winter. Almost half of the remains (223) were collected in 1998–1999. To compare the species composition, the Soerensen index of species identity was used:

$$QS = (2c/a+b)100\%$$

where a is the number of species in group A, b is the number of species in group B, and c is the number of species common to both groups A and B. To compare the identity of groups of birds preyed on in different seasons, the criteria suggested by Tomiałojć (1970) were applied (0–50% — no identity, 50–70% similarity, 70–100% — identity).

For both breeding seasons the mean weight of prey found in the nest boxes was compared using the Mann-Whitney U test. All items were divided into three weight groups (I: < 100g, II: 101–300g, III: > 300g) and compared using the χ^2 test.

RESULTS

Feeding activity

During the breeding season there were significant differences in feeding frequency during the day time. Parental activity peaked twice: in the morning, between 04:00 and 06:00 and in the afternoon between 16:00 and 20:00 (2000) or 15:00–16:00 (2001); it was lowest between 09:00 and 10:00 (Fig. 1). In both years, the majority of feeds (58.4% and 53.7% respectively) took place after midday. The 2000 data also showed that the falcons were active (i.e. fed their young) at night, more than 13% of feeds taking place between 20:00 and 04:00, and > 9% after 22:00.

During the study the number of feeds per day differed in the successive weeks of the chicks' lives, peaking in the second (in 2001) and fourth week (in 2000 and 2001). While in 2001 the num-

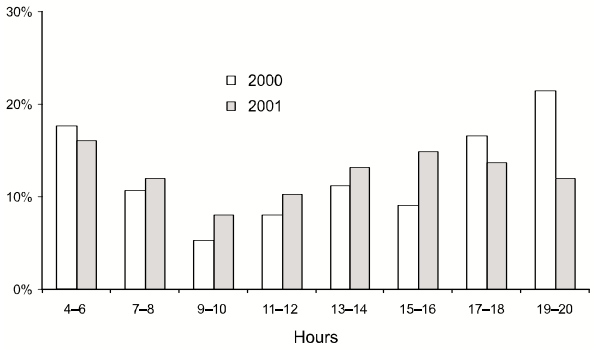

Fig. 1. Daily pattern of chicks' feedings (2000–2001). N_{2000} = 187, N_{2001} = 175.

ber of feedings per day was greater than in 2000, the mean number of feedings per chick during the first five weeks was similar in both years (1.87 and 1.84 respectively). In subsequent weeks of the chicks' lives, male participation in feeding increased significantly.

Changes in prey composition

The Warsaw Peregrines preyed most often on Feral Pigeons (32%) and various thrush species *Turdidae* (23.5%). Other species making up more than 5% of the falcons' diet included Skylarks *Alauda arvensis* (8%) and Corncrakes *Crex crex* (5.6%). In spring and autumn the respective proportions of pigeons in the diet were 19.4% and 22.7%, increasing to 50% and 51.5% during summer and winter. The trend was reversed with respect to thrushes: dominant in Peregrine prey during spring and autumn, their proportion decreased to 17% in summer and winter (Fig. 2a–d). Seasonally, falcons also fed on other species: Quails *Coturnix coturnix*, Skylarks *Alauda arvensis*, Starlings *Sturnus vulgaris* and Swifts *Apus apus*.

The Soerensen index of species identity exceeded 50% only in the comparison of the spring and autumn species.

The mean weight of prey items found in the falcons' nest was 165.1 g (n = 20) in 2000, and 194.7g (n = 49) in 2001, but the difference was not significant (Mann-Whitney U test, z = 1.05, p = 0.264, ns). The differences in the proportion of the three prey weight classes was also insignificant (c^2 = 1.41, df = 2, ns). In both years, similar proportions of Pigeons (40% and 51% respectively), Corncrakes (10% and 12.2%) and Starlings (5% and 4.1%) were found in the nest remains. The proportions of Swifts (20% and 6.1% respectively) or various thrushes (15% and 8%) differed significantly in both years.

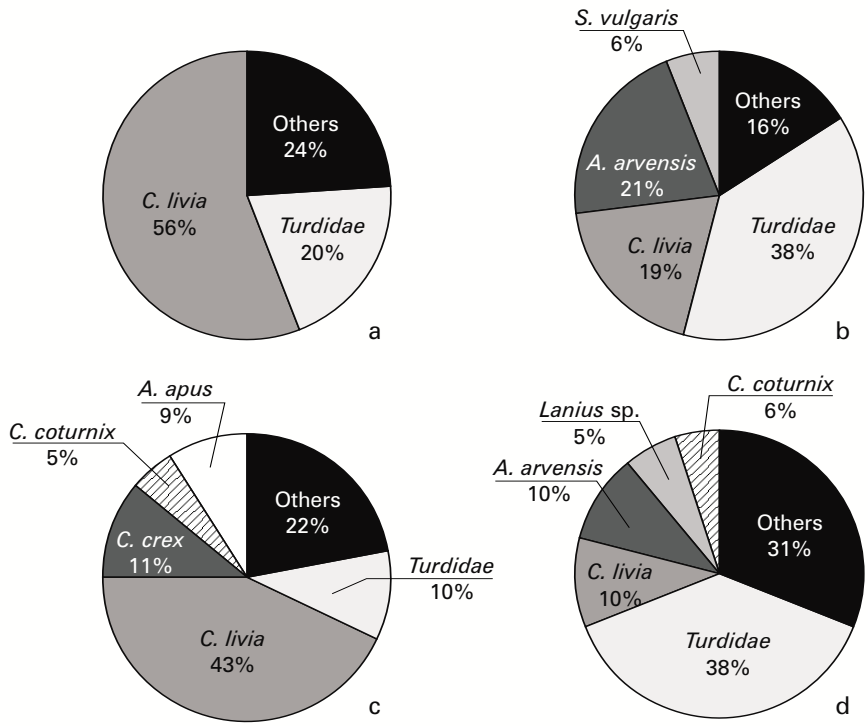

Fig. 2. Seasonal changes in Peregrines' diet composition. a — winter, b — spring, c — summer, d — autumn.

DISCUSSION

The overall results of the present study were similar to those obtained by other authors. The variations in feeding frequency during the successive weeks of the chicks' life, the distribution of activity peaks during the day and of male and female participation in feeding their young were much the same as given by Schneider & Wilden (1994). However, the observations of these authors make no mention of crepuscular or nocturnal feeding in Peregrines. In Warsaw Peregrines were active 24 h a day — in 2000 food was brought to the nest even at midnight. Nevertheless, it is hard to say whether the prey brought to the nest after 22:00 was indeed freshly caught (Cade & Bird 1990) or whether it had been brought from some food store (see del Hoyo et al. 1994, Schneider & Wilden 1994).

In 2001 the activity of the adult birds, measured as the number of feeds per day, was greater in comparison with the previous year. Schneider & Wilden (1994) point out that neither the times of first feeding nor the number of feeds per day, nor the total time spent feeding per day, nor the daily range of feeding intervals were affected by the weather (daily mean temperature, rainfall, wind strength, amount of sunshine). The mean weight of prey items found in the nests in both years was very much the same. Hence, the lower height to which prey items had to be brought in the second year did not encourage the raptors to select larger birds, such as pigeons. The larger number of feeds in 2001 is therefore probably not related to either the nest height or the weather conditions, rather to the number of nestlings. During the daytime, each nestling was fed practically the same number of times. Dijkstra et al. (1990) found that in manipulated broods of European Kestrels, parents spent more time hunting and brought more food to larger broods and less to smaller ones as compared with the controls. Gard & Bird (1990) found similar trends in American Kestrels *Falco sparverius*, but differences between years were significant and difficult to interpret. The Warsaw results are thus in agreement with the available literature data.

In contrast to the results obtained in other cities (e.g. Sömmer 1989, Schneider & Wilden 1994), common urban species, like Swifts, Starlings or Gulls *Larus* spp. made up a very small percentage of the Peregrine's prey (Rejt 2000, this study). Its diet in Warsaw consisted largely of Feral Pigeons, and periodic migrants such as thrushes and larks. These latter species are much smaller than pigeons, so energetically they are not as profitable. Thiollay (1982) pointed out that the Peregrines' hunting effort for small passerine birds is four times higher than for a pigeon. Larks and thrushes often migrate at night. Furthermore, they are often among the birds that perish as a result of collisions with city-centre buildings (Rejt & Maniakowski 2000), so the possibility cannot be ruled out that at least some of these migrants were not caught during hunting flights. The falcons may well have finished off birds injured in such collisions, as has already been suggested (Rejt 2000). Comparing the seasons in this respect, only the springs and autumns displayed a similarity of around 55%. The figure for the other seasons did not exceed 50%, so there was no similarity between them. The spring and autumn similarities are probably due to the similar species composition of the migrants appearing at these times over Warsaw.

It is well known that over open country falcons prey on a wide range of species present in their hunting territories (e.g. Cramp 1980). In Warsaw, however, there is a distinct seasonality in the proportions of the different groups of victims. Despite the fact that pigeons, the Peregrines' most profitable prey, are available all the year round, they do also hunt these smaller species that seasonally turn up.

English translation by Peter Senn

ACKNOWLEDGMENTS

The studies on Peregrine Falcons in Warsaw were supported by the National Fund for Environmental Protection and Water Management in Warsaw, S. C. Johnson Ltd., and the staffs of the Warsaw Financial Centre and the Palace of Science and Culture.

LITERATURE

Busche G., Bruns H. A., Todt P. 1998. Zunahme rastender Wanderfalken (*Falco peregrinus*) im Westen von Schleswig-Holstein ab 1980. Vogelwarte 39: 183–189.

Cade T. J., Bird D. M. 1990. Peregrine Falcons *Falco peregrinus* nesting in an urban environment: a review. Canadian Field-Naturalist 104: 209–218.

Cade T. J., Martell M., Redig P., Septon G. A., Tordoff H. B. 1996. Peregrine Falcons in urban North America. In: Bird D. M., Varland D. E., Negro J. J. Raptors in urban landscapes. Academic Press, pp. 13–23.

Cramp S. (ed.). 1980. Handbook of the Birds of Europe, the Middle East and North Africa. Oxford University Press.

Crick H. Q., Ratcliffe D. 1995. The Peregrine *Falco peregrinus*: breeding populations of the United Kingdom in 1991. Bird Study 42: 1–19.

Dijkstra C., Bult A., Bijlsma S., Daan S., Meijer T., Zijlstra M. 1990. Brood size manipulations in the Kestrel (*Falco tinnunculus*): effects on offspring and parent survival. J. Anim. Ecol. 59: 269–285.

Enderson J. E., Heinrich W., Kiff L., White C. M. 1995. Population changes in North American Peregrines. Trans. 60th No. Am. Wildl. & Natur. Resour. Conf., pp. 142– 161.

del Hoyo J., Elliott A., Sargatal J. (ed.). 1994. Handbook of the Birds of the World. V. 2. New World Vultures to Guineafowl. Lynx Editions, Barcelona, 638 pp.

Gard N. W., Bird D. M. 1990. Breeding behavior of American Kestrels raising manipulated brood sizes in years of varying prey abundance. Willson Bull. 102: 605–614.

Hennen M. 1996. The Peregrine Falcon: time to delist? Meadowlark 5: 42–47.

Hruška J., Melichar D., Stovicek V. 2000. [Reintroduction and breeding of the Peregrine Falcon (*Falco peregrinus*) in Plzen, Czech Republic] Buteo 11: 139–147.

Luniak M., Kalbarczyk W., Pawłowski W. 1964. [Birds of Warsaw]. Acta Ornithol. 8: 175–285.

Mammen U., Stubbe M. 2000. Zur Lage der Greifvögel und Eulen in Deutschland von 1995 bis 1998. Vogelwelt 121: 207–215.

Martel M. S., Tordoff H. B., Redig P.T. 1994. The introduction of three native raptors into the Midwestern United States. W: Meyburg B.-U., Chancellor R. D. (ed.). Raptor Conservation Today. WWGBP, The Pica Press.

Mizera T., Sielicki J. 1995 The Peregrine Falcon *Falco peregrinus* in Poland — its situation and perspectives for reinstatement. Acta Ornithol. 30: 47–52.

Mlikovsky J., Hruška J. 2000. [Food of the Peregrine Falcon (*Falco peregrinus*) in Plzen, Czech Republic]. Buteo 11: 125–127.

Müller Th.1989. Management am Berliner Wanderfalkenpaar. Pica 16: 114–120.

Peške L. 1997. [Successful nesting of Peregrine (*Falco peregrinus*) in Prague in 1996]. Buteo 9: 109–114.

Rabosee D., Warrin de H., Janssens M. 2000. [Uncommon preys of the Peregrine Falcon (*Falco peregrinus*) in urban site]. Aves 37: 70–72.

Ranazzi L. 1995. Dati preliminari sul regime alimentare del Falco pellegrino *Falco peregrinus* a Roma. Avocetta 19: 122.

Ratcliffe D. 2000. The Peregrine Falcon. Calton, England, 416 pp.

Rejt Ł. 2000. [The diet of Peregrines in Warsaw (1998–1999)]. Notatki Ornitol. 41: 165–170.

Rejt Ł., Maniakowski M. 2000. [Bird collisions with the Palace of Culture in Warsaw]. Notatki Ornitol. 41: 319–326.

Rejt Ł., Turlejski K., Bronche K., Oszustowicz A. 2000. Can food caching increase feeding frequency in urban Kestrels *Falco tinnunculus*? Acta Ornithol. 35: 217–221.

Roberts G. 1999 Brighton's peregrines have been at it again. Urban wildlife news 16: 4.

Salvati L., Manganaro A., Fattornini S., Piatella E. 1999. Population features of Kestrels *Falco tinnunculus* in urban, suburban and rural areas in Central Italy. Acta Ornithol. 34: 53–58.

Schneider R. 1995. Der Wanderfalke *Falco peregrinus* als Brutvogel in der Großstadt — Neue Chancen für eine vom Aussterben bedrohte Tierart? Ornit. Beob. 92: 315–319.

Schneider R., Wilden I. 1994. Choice of prey and feeding activity of urban Peregrine Falcons *Falco peregrinus* during the breeding season. W: Meyburg B.-U., Chancellor R. D. (eds). Raptor Conservation Today. WWGBP, The Pica Press, pp. –.

Septon G. A., Marks J. B., Ellestad T. 1995. A preliminary assessment of Peregrine Falcon *Falco peregrinus* recovery in Midwestern North America. Acta Ornithol. 30: 65–68.

Sielicki J., Sielicki J. 1999. [Results of Peregrines restitution in 1999]. Myślistwo ptasze 4: 14–19.

Sömmer P. 1989. Die Ernährung des berliner Wanderfalkenpaares. Pica 16: 120–129.

Taczanowski W. 1882. [Polish birds]. Vol. 1. Kraków.

Tella J. L., Hiraldo F., Donazar-Sancho J. A., Negro J. J. 1996. Costs and benefits of urban nesting in the Lesser Kestrel. In: Bird. D., Varland D., Negro J. 1996. Raptors in the human landscape. Academic Press, pp. 53–60.

Thiollay J.-M.1982. Les ressources alimentaires, facteur limitant la reproduction d'une population insulaire de faucons pelerins, *Falco peregrinus brookei*. Alauda 50: 1–44.

Tomiałojć L. 1970. [Quantitative studies on the synanthropic avifauna of Legnica and its environs]. Acta Ornithol. 12: 293–392.

Wegner P. 1994. Population, Ecology of Peregrine Falcons *Falco peregrinus* in Baden-Württemberg, 1965–1991. In: Meyburg B.-U., Chancellor R. D. (eds). Raptor Conservation Today. WWGBP, The Pica Press. pp: 211–218.

STRESZCZENIE

[Częstotliwość karmienia piskląt i sezonowe zmiany w składzie pokarmu miejskich sokołów wędrownych w Warszawie]

Sokoły wędrowne coraz częściej zasiedlają tereny zurbanizowane. Mimo to niewiele jest prac dotyczących biologii tych drapieżników w mieście. Wyniki badań przeprowadzonych w Warszawie uzupełniają wiedzę o funkcjonowaniu sokołów w środowisku zmienionym przez człowieka. W 2000 r. i 2001 r. ta sama para sokołów wędrownych gniazdowała w skrzyniach lęgowych ustawionych na dwóch różnych budynkach w centrum Warszawy. W kolejnych latach drapieżniki wyprowadziły kolejno trzy i cztery młode. Przebieg lęgów był monitorowany przy użyciu kamer video. Do badań nad aktywnością łowiecką sokołów (mierzoną częstotliwością karmień piskląt) użyto materiał nagrany w ciągu dnia, między 4.00 i 21.00. — w sumie 428 h (33 dni) w 2000 r. i 384 (24 dni) w 2001 r. Zaobserwowano dwa szczyty aktywności dorosłych sokołów — rano i po południu. Dodatkowe dane zebrane w 2000 r. pozwoliły stwierdzić, że sokoły były aktywne (tj. karmiły pisklęta) także w nocy.

W okresie od 1998 r. do 2001 r. na budynkach zajmowanych przez sokoły zebrano 486 resztek ich ofiar. Stwierdzono, że w Warszawie drapieżniki polowały głównie na gołębie miejskie (32% ofiar) oraz różne gatunki drozdów (23.5%), skowronki (8%) i derkacze (5.6%). Zaobserwowano sezonowe zmiany w składzie pokarmu sokołów wędrownych. Wiosną i jesienią udział gołębi w pokarmie sokołów nie przekraczał 23%, podczas gdy latem i zimą sięgał 50%. Z kolei udział pozostałych gatunków był znaczny podczas wiosennych i jesiennych migracji i spadał w okresie lęgowym i zimą.