

Birds in the diet of the Barn Owl (*Tyto alba*) in an agricultural habitat of northern Italy

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Few data are available on the diet of Barn Owls (*Tyto alba*) in northern Italy (Groppali 1987, Boldreghini *et al.* 1988, Vicini and Malaguzzi 1988, Bon *et al.* 1992) and, more importantly, avian prey has been poorly documented in the Italian ornithological literature. Most papers usually list birds as unidentified (e.g. Bon *et al.* 1992), possibly as a result of identification problems due to the osteologic homogeneity of birds (Noriega *et al.* 1993). In addition avian prey may be decapitated (Glue 1967) and the fragility of the skull adds further problems to the identification of smaller birds, particularly insect-eaters (Glue 1972). We describe a case of ornithophagy from an agricultural area in the Po Valley in northern Italy.

The study area was located near the village of Casalmoro (Mantova) (45° 15' 10" N, 10° 25' 40" E). Cultivated fields, mainly of maize and sunflowers (40%), wheat (5%), vegetables and fodder (35%), made up approximately 80% of the land surveyed in search of Barn Owl roosting and perching sites. The remaining land consisted of woody areas (2%), grazing fields (6%) and abandoned fields, roads and buildings (8%).

During October 1991, we collected complete undatable pellets (i.e. no fragments, no broken ends, no splitting or loosening of pellets) in seven sites (four abandoned silos and three haylofts) where we observed Barn Owls on several occasions. We identified and quantified remains of birds on the basis of skulls and osteologic characters that present a marked variability among different species of Passeriformes, following the indications given by Moreno (1985, 1986, 1987). Mammal remains were identified on the basis of skulls or dentaries characteristics. Avian bones of diagnostic interest were measured to the nearest mm using a dial calliper. All remains were identified to the finest possible taxonomic category.

Biomass estimates were derived from the Italian ornithological and theriological literature (see Di Palma and Massa 1981). We determined the biomass contribution of each prey category to the owl's diet by multiplying the number of individuals in the pellets by the body mass of that prey. In the case of unidentified prey, we assumed that the biomass was similar to the mean value of the most closely related identified taxon. The 207 pellets analysed yielded 681 prey items (Table 1), of which rodents and insectivores were the most frequent.

Table 1. Barn Owl prey derived from pellets (N = 207) collected in the Po Valley, northern Italy.

Prey	Number Biomass		
	N	(%)	(%)
Mammals	605	88.8	84.0
Rodents	346	50.8	70.7
Insectivores	259	38.0	13.3
Birds	69	10.2	15.4
<i>Passer domesticus</i>	45	6.6	10.0
<i>Passer montanus</i>	3	0.4	0.6
<i>Passer</i> spp.	9	1.3	2.0
<i>Carduelis carduelis</i>	1	0.2	0.2
<i>Turdus philomelos</i>	1	0.2	0.3
Unidentified Passeriformes	10	1.5	2.3
Amphibians	4	0.6	0.6
Insects	3	0.4	0.0
Total Prey	681	100.0	100.0

Sixty-nine (10.2%) of the preys were birds. Apart from the unidentified small Passeriformes (belonging

to a weight class < 60 g), the most common preys were House Sparrow (*Passer domesticus*) and Tree Sparrow (*Passer montanus*); the former species accounted for 6.3% and 9.6% of the vertebrate prey by number and biomass, respectively, while the latter accounted for 0.2% and 0.2% of the vertebrate prey by number and biomass respectively.

The occurrence of bird remains proved similar among six of the seven sites, with values comprised between 2% and 16% (by number). The only exception was an abandoned silo (E) where birds occurred in 92% of the 24 collected pellets (Table 2) and made up approximately 67% and 82% of total prey by number and biomass, respectively. Pellets collected at silo (E) contained approximately half (49.3%) of the total number of avian remains found in this study. Sparrows (*Passer* spp.) made minor contributions (< 16%) to the total number of prey recovered in the other abandoned silos.

Table 2. Occurrence of avian remains in Barn Owl (*Tyto alba*) pellets collected in four silos (A, D, E, F) and three haylofts (B, C, G) in the Po valley, northern Italy.

	Number of pellets	Number of prey	Number of birds	Birds (%)
Silo (A)	62	227	4	1.8
Silo (D)	21	77	12	15.6
Silo (E)	24	51	34	66.7
Hayloft (B)	15	61	3	4.9
Hayloft (C)	21	75	7	9.3
Hayloft (G)	13	32	3	9.4

A large proportion of pellets (79.7%) contained the remains of a single bird; however, we also found the simultaneous occurrence of two (14.5%) and even three birds (5.8%) in a pellet. The smallest number of prey per pellet (2.12) was recorded in the sample where most avian remains were found (silo E), while the highest value (4.07) occurred in a small pellet sample collected at a hayloft (B). This is not surprising as it seems reasonable to expect a smaller number of prey in those pellets that already contain the bulky skulls and bones of a bird (Table 2).

However, the expected negative correlation between the occurrence of avian remains and number of prey per pellet was not significant ($r_s = -0.40$, $N = 7$, $P > 0.05$). The possibility that small sample sizes may affect this relationship should be taken into account when interpreting this result.

On no occasion did we find any bird species nesting

inside the abandoned silos or the haylofts. However, the abandoned silo (E) was located approximately 50 m from an old inhabited building where House Sparrows and Swallows (*Hirundo rustica*) used to nest and occurred in large numbers during the summer period. On the contrary, the availability of trees and indirectly of Tree Sparrow nests, is rather scarce within the study area, which may partly explain the low predation of this bird by Barn Owls. No remains of Swallows were found in the pellet sample collected at the abandoned silo (E) and we suspect that this prey may be too difficult to catch. No studies in Italy (see Contoli, 1988), have documented a proportion of birds in the diet of barn owls as large as that reported at silo (E).

However, Schmidt (1972) found that House Sparrows made up 93% of the avian prey by number in Barn Owl pellets from Hungary; Tree Sparrows made a minor contribution (5%) to the total number of avian prey, while the occurrence of other bird species was negligible. More recently, Jentzsch (1988) reported that House Sparrows made up 87.3% and 88.1% of avian prey by number and biomass, respectively. Other studies have also shown cases of high ornithophagy, although these are an exception to the general mammalian-based diet (Herrera 1974, De Bruijn 1979, Libois *et al.* 1983, Hardy 1989).

Finally, anecdotal observations suggest that individual Barn Owls may be highly successful in catching House Sparrow (Sage 1962) and Starlings (Fernandez Cruz and Garcia Rodriguez 1971) available in large numbers near their roost sites.

Lacking information on the spatial and temporal availability of small rodents, we cannot evaluate at present whether the high incidence of Sparrows (primarily *Passer domesticus*) resulted from a decline in rodent populations or was simply a dietary response to a temporary concentration and abundance of communal - roosting birds or to climatic conditions (see Brosset 1956, Sage 1962, Fernandez Cruz and Garcia Rodriguez 1971, Bayle 1979, De Bruijn 1979). A further alternative is that ornithophagy might reflect significant differences in predatory behaviour by individual Barn Owls which consistently exploit selected bird species either seasonally (Jentzsch 1988) or throughout the year (Vargas *et al.* 1982). Further investigations on pellets, collected at monthly intervals at silo (E) as well as at other Barn Owl roosting sites, may help to explain the occurrence and importance of ornithophagy in the feeding ecology of a predator which relies primarily upon small mammals (Bunn *et al.* 1982, Marti 1988).

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Riassunto - In un campione di 207 borre di barbagianni (*Tyto alba*), raccolte in una zona agricola della Pianura Padana, sono stati rilevati resti di 69 Passeriformi, appartenenti principalmente a passerii (*Passer domesticus* (62.3%), *Passer montanus* (4.4%) and *Passer* spp. (13%)). Gli uccelli costituiscono il 10% della dieta in termini di frequenza numerica ed il 15% in termini di biomassa. La maggior parte dei resti di uccelli è stata raccolta in un silo abbandonato dove costituivano la componente principale della dieta sia in termini di frequenza numerica (67%) che di biomassa (82%).

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