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COMMUNAL ROOSTING AND DIET OF BLACK-SHOULDERED KITES (*ELANUS CAERULEUS*) WINTERING IN SOUTHWESTERN SPAIN

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The Black-shouldered Kite (*Elanus caeruleus*) is widely distributed through the southern and central portions of the Iberian Peninsula, northern Africa, and South Africa (Cramp and Simmons 1980). Its main prey are small mammals, although it sometimes eats reptiles, birds, and insects (Cramp and Simmons 1980). It tends to rely on rodent populations that often fluctuate substantially and unpredictably (Mendelsohn and Jaksic 1989). Its use of sporadically-abundant prey apparently favors communal roosting in the species (Mendelsohn 1988), although the association between winter communal roosting behavior and ephemeral food resources has not always been reported (Morel and Poulet 1976, Allen 1982, Bharos 1997).

In the Iberian Peninsula, the population of Black-shouldered Kites has increased in both size and distribution since 1970 (Ferrero and Onrubia 1997). These increases have been attributed to recent intensification of agriculture and a predominance of open cultivated areas with disperse trees, both of which are ideal conditions for the hunting and breeding requirements of the Black-shouldered Kite (Carbajo and Ferrero 1985). In winter in Extremadura (Carbajo and Ferrero 1985) and Portugal (Moore 1991), there has been a recent increase in the number of birds around irrigated cropland. However, there is little information on the feeding habitats and habitat use of the species in the recently-colonized areas of Iberia. Heredia (1983) described the hunting and diet of kites based only on 34 pellets and Aguilar et al. (1980) surveyed the kite population in the Guadiana River basin. However, no information exists on its roosting behavior in Iberia and little is known about its winter diet. In this paper, we describe the roosting behavior and the diet of Black-shouldered Kites wintering in irrigated fields in Extremadura.

STUDY AREA AND METHODS

The study was conducted in southwestern Spain near the Portuguese border in an irrigated area of Badajoz province (38°45′N, 7°10′W). The area is in the meso-mediterranean climate area (Rivas-Martínez 1981), with a mean annual temperature and rainfall of 17°C and 600 mm, respectively. Pellets of Black-shouldered Kites were collected in December 1999 at a large communal roost located on a piece of irrigation equipment. Four more visits were made between 7 December 1999–5 February 2000 at sunset to monitor the use of this roost by the kites. We collected 500 pellets at the roost. Collections were made in the morning after the departure of birds to avoid disturbing them.

Insect remains were identified by comparing head capsules, mandibles, or elytra with reference material in the collection of the Department of Zoology, University of Extremadura, Badajoz, Spain. Passerine remains were identified using bones and feathers. Mammalian remains were identified on the basis of skulls or dentary pairs following Chaline et al. (1974). Only one prey item was counted when we found only hair remains in a pellet and we classified these specimens as unidentified mammals.

To assess the biomass contribution of each prey taxon in the diet, we assigned body mass as follows: for insects, we used the average body mass obtained from specimens captured near the study area (Orthoptera = 0.119 g and Coleoptera = 0.182 g) (Avilés and Costillo 1998); for passerines, we used an average body mass of 17.0 g; and for mammals, we used the values for average body mass given by Blanco (1998) for *Crocidura russula* (9.3 g), *Mus spretus* (13.0 g), *Apodemus sylvaticus* (32.5 g), and *Pytimis duodecimostatus* (25.5 g). For unidentified mammals, we used the mean body mass of all three of these species (20.1).

RESULTS

Only one roost was used between 7 December 1999–5 February 2000. During this time, we visited the roost five

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Table 1. Maximum number of Black-shouldered Kites observed at a roost site in Extremadura, Spain in the winter 1999–2000.

DATES	NUMBER KITES	MINUTES AFTER SUNSET
7 December	60	27
9 December	55	0
12 January	42	
2 February	45	41
5 February	45	38

times and counted an average of 49.4 ± 7.7 (±SD) kites at the roost (Table 1). The maximum number was 60 kites observed in the beginning of December. On three of four visits, we counted the number of kites in the roost after sunset. Because they stopped coming to the roost before complete darkness, it was not likely that we underestimated the actual number of individuals using the roost.

The mean number of prey in each of the pellets we collected was 1.44 ± 0.66 (range = 1–4, $N = 500$). Two rodent species comprised 92.7% of the diet by frequency (Table 2). *Microtus duodecimcostatus* was the most frequently consumed prey (73.80%), followed by *Mus spretus* (18.90%).

Small rodents represented 97.01% of biomass of the diet. This was mainly due to the large number of *Microtus duodecimcostatus* (83.82%) and *Mus spretus* (10.96%) that were eaten. Passerines contributed 2.54% of the prey biomass and the biomass of insects was negligible.

DISCUSSION

Black-shouldered Kites use a variety of tree and shrub species as winter roosts throughout their range (see review in Mendelsohn 1988, Clark and Wheeler 1989). Use of a piece of irrigation equipment as a roost has not been previously reported. The number of kites we observed at this roost site were greater than that which has been observed at winter roosts in South Africa (5–8 kites, Mendelsohn 1988), but lower than the number sometimes reported in central Africa in Senegal (500–600 kites, Morel and Poulet 1976) and in North America in California (100 kites, Clark and Wheeler 1989). The majority of kites arrived at the roost we studied after sunset, as has been previously shown by Cramp and Simmons (1980) and Mendelsohn (1988).

Our results showed that 97% of the diet by biomass consisted of small mammals. We did not observe hunting behavior but the kites most likely hunted small mammals in the surrounding irrigated fields of Extremadura. Our results differed from those of Pulido (1990) who reported 75% of the diet by biomass in Iberia throughout the year to consist of small mammals. This difference could be due to two factors. First, during the breeding season, birds and insects are more important in the diet, most likely due to their higher relative abundance (Amat 1979, Cramp and Simmons 1980, Pulido 1990). Secondly, previous studies in Iberia have found winter concentrations of kites in areas with high rodent availability (Heredia 1983, Carbajo and Ferrero 1985, Moore 1991). Our data indicate that the Black-shouldered Kite feeds opportunistically on prey such as small mammals when they become abundant in agricultural areas and this may explain the recent range expansion of the species into northern Spain probably following the range expansion of *Microtus arvalis* (Ferrero and Onrubia 1997).

The relationship between communal roosting of Black-shouldered Kites and ephemeral food resources has been pointed out in Africa (Mendelsohn 1988). This may explain the roosting behavior we observed. The kites exploited the large number of *Pytimis* spp. in the irrigated fields where trees are scarce but artificial irrigation structures are abundant.

Table 2. Diet of Black-shouldered Kites using a winter roost site in Extremadura, Spain.

PREY TAXON	NUMBER	% FREQUENCY	% BIOMASS
Insects			
Orthoptera	1	0.1	0.001
Coleoptera	2	0.3	0.002
Birds			
Unidentified passerines	25	3.4	2.540
Mammals			
Shrews (*Crocidura russula*)	8	1.1	0.447
Rodents			
Mus spretus	141	18.9	10.955
Apodemus spp.	1	0.1	0.194
Microtus duodecimcostatus	550	73.8	83.819
Unidentified mammals	17	2.3	2.042
Total	745	100	100

RESUMEN.—Se describe la dieta invernal del Elanio Azul *Elanus caeruleus* y la formación de dormideros en el suroeste de España. El dormidero estuvo activo al menos desde la mitad de diciembre hasta el principio de febrero, con 60 individuos como máximo, y estuvo ubicado sobre un pivote de riego en un campo de alfalfa. La mayoría de las aves llegaban al dormidero después de la puesta de sol. La dieta estuvo basada casi exclusivamente en roedores, siendo las aves y los insectos presas esporádicas.

[Traducción de autores]

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