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DIET OF THREE SYMPATRIC OWLS IN STEPPE HABITATS OF EASTERN KAZAKHSTAN

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KEY WORDS: *Eurasian Eagle-Owl*; *Bubo bubo*; *Little Owl*; *Athene noctua*; *Long-eared Owl*; *Asio otus*; *Asia*; *diet*; *steppe habitats*.

We studied the diet and food-niche overlap of three sympatric owls, the Eurasian Eagle-Owl (*Bubo bubo*), the Long-eared Owl (*Asio otus*) and the Little Owl (*Athene noctua*), during the breeding season in semiarid steppe habitats of eastern Kazakhstan and compared their food

habits with other localities in the western Palearctic. These remote steppe habitats have been little studied and their breeding raptor communities resemble those of Mediterranean Europe.

STUDY AREA AND METHODS

The study was conducted between 12 and 28 June 1999 in eastern Kazakhstan in central Asia. The climate is continental, with very cold winters (when temperatures remain under 0°C for months), and warm summers. Such conditions can also be considered as arid or semiarid with annual rainfall <300 mm. Extreme temperatures

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Table 1. Number and percent occurrence in the diet of three owl species during the breeding season in eastern Kazakhstan. *N* = number of prey.

PREY ITEMS	EURASIAN EAGLE-OWL		LONG-EARED OWL		LITTLE OWL	
	<i>N</i>	PERCENT	<i>N</i>	PERCENT	<i>N</i>	PERCENT
Birds	54	17.3	2	2.5	8	4.1
<i>Sturnus roseus</i>	25	8.0	2	2.5	0	0
<i>Falco naumanni</i>	4	1.3	0	0	0	0
Unidentified	25	8.0	0	0	8	4.1
Reptiles	19	6.1	1	1.2	3	1.5
Lacertidae	2	0.6	0	0	1	0.5
Colubridae	9	2.9	1	1.2	0	0
Unidentified	8	2.6	0	0	2	1.0
Mammals	195	62.5	74	91.3	109	55.3
Microtinae	82	26.3	39	48.1	39	19.7
Muridae	12	3.9	27	33.4	8	4.1
<i>Hemiechinus auritus</i>	45	14.4	1	1.2	1	0.5
Sciuridae	39	12.5	6	7.4	8	4.1
Soricidae	1	0.3	0	0	0	0
Unidentified	16	5.1	1	1.2	53	26.9
Invertebrates	44	14.1	4	5.0	77	39.1
Coleoptera	13	4.2	2	2.5	53	26.9
Orthoptera	19	6.1	2	2.5	11	5.6
Unidentified	12	3.8	0	0	13	6.6
Total	312		81		197	

and rainfall limit the growth of tree species (Walter 1981) and the landscape is dominated by steppe and semidesert plains and hills with herbaceous vegetation and small bushes, whereas trees are confined to foothills of large mountains (Tian Shan in the south, Altai and Alatul in the east) or around human settlements and river valleys.

Pellets were collected in two different habitat types in the study area (Sánchez-Zapata et al. in press): (1) *Semi-natural* grasslands. Here the landscape was dominated by extensive livestock use and widespread croplands, but villages are small with <500 inhabitants. There are many abandoned fields and degraded steppe areas. (2) *Dry steppes*. This includes large areas of natural dry steppes with little or no human presence. Trees are lacking and the vegetation is dominated by grasses and forbs (*Artemisia* spp., *Limonium* spp., *Salsola* spp., *Ephedra* spp., *Haloxylon* spp.). There are also sparse rocky outcrops.

Fresh pellets were collected under perches around nests of the three species. Overall, we analyzed 108 pellets of the Eurasian Eagle-Owl collected in nine localities, 40 pellets of Long-eared Owls collected in two localities, and 107 pellets of Little Owls collected in four localities. All prey items were classified into 15 different categories (at the level of species, family, or order) included in four broad classes; birds, reptiles, mammals (Corbet 1978), and invertebrates. Diversity was quantified by means of the Levin's Index ($D = 1/\sum p_i^2$) whereas food niche overlap was calculated using the MacArthur-Levins's Index

modified by Pianka ($O_{ij} = \sum p_{ki}p_{kj}/\sqrt{(\sum p_{ki}^2 \sum p_{kj}^2)}$) (Marti 1987, Krebs 1989).

RESULTS

The diet of the eagle-owl included mostly mammals and birds (Table 1). The main prey species were voles (Microtidae) and medium-sized mammals such as hedgehogs (*Hemiechinus auritus*) and hamsters (*Citellus* sp., *Sciurus* sp., *Alactaga* sp., *Pygerethmus* sp.) and Rosaceous Starlings (*Sturnus roseus*). Long-eared Owls preyed almost exclusively upon small rodents such as mice (Muridae) and voles whereas Little Owls fed mainly on small rodents and invertebrates, mostly beetles (Coleoptera). The diversity of the diet of eagle-owls ($D = 7.63$) and Little Owls ($D = 5.10$) was higher than that of Long-eared Owls ($D = 2.85$). Food niche overlap was higher between eagle and Long-eared Owl ($O = 0.73$), than between Little Owls and the two other species ($O = 0.58$ and 0.47 , respectively).

The diet of the eagle-owl was more diverse in steppe habitat than that found in Mediterranean countries, where the species feeds mainly on rabbits (*Oryctolagus cuniculus*), one of the staple food sources for top predators of Mediterranean ecosystems in Western Europe (Delibes and Hiraldo 1981). The absence of rabbits and the di-

urnal habits of similar medium-sized rodents in steppe habitats of Central Asia may be responsible for this difference. As a consequence, small rodents, hedgehogs, and birds (including raptors) play an important role in the diet, similar to that found in other semiarid Mediterranean habitats when rabbits are scarce (Jaksic and Marti 1984, Serrano 2000, Martínez and Zuberogoitia 2001) and other semiarid or lower-latitude Nearctic biomes (Donazar et al. 1989, Marchesi et al. 2002).

Long-eared Owls had a similar diet to that reported for other populations in the Western Palearctic, with voles and mice as the main prey species, with the exception of a few localities in Mediterranean and suburban habitats where birds may also play an important role in the diet (García and Cervera 2001).

The diet of the Little Owl was also similar to that described in the Western Palearctic (Mikkola 1983), although invertebrates were more important in Mediterranean countries (Mañez 1983) and rodents were more important in temperate-climate areas including cold deserts (Herrera and Hiraldo 1976). Our results point that despite regional differences in prey communities, owls did not show large intercontinental differences in food-niche metrics, as suggested in previous broader-scale studies (Marti et al. 1993).

RESUMEN.—Se estudia la dieta de tres rapaces nocturnas; el mochuelo (*Athene noctua*), búho chico (*Asio otus*) y búho real (*Bubo bubo*) en hábitats esteparios de Kazastán. Los restos de presas se obtuvieron del análisis de egagrópilas recogidas en las proximidades de los nidos durante el período reproductor. Los invertebrados y micromamíferos fueron la presa principal de *Athene noctua*, mientras que *Asio otus* predó casi exclusivamente sobre micromamíferos y *Bubo bubo* presentó una dieta muy diversificada, aunque basada en aves y mamíferos de mediano tamaño. La dieta de las tres especies fue más similar a la observada en latitudes templadas y desiertos fríos que a la descrita para ecosistemas mediterráneos semiáridos.

[Traducción de los autores]

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