FEEDING HABITS OF THE LONG-EARED DESERT BAT, *OTONYCTERIS HEMPRICHI* (CHIROPTERA: VESPERTILIONIDAE)

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We studied food habits of the long-eared desert bat, *Otonycteris hemprichi,* in a subdesert area of Kirghizstan (central Asia) by fecal analysis and light-tagging. The bulk of the diet of 13 individuals in September consisted of arachnids (Solifugae, Scorpiones, and Araneae; 49.9% of total volume) and orthopterans (Acrididae, Gryllidae, and Tettigoniidae; 34.7%). Visual nocturnal observations confirmed that this species captures its prey from the surface of the ground.

Key words: *Otonycteris hemprichi,* diet, feeding habits, foraging behavior, Kirghizstan, trophic ecology

The long-eared desert bat, *Otonycteris hemprichi,* has long been considered enigmatic (Horacek, 1991). This Old World species is the sole member of the genus (Nowak, 1991), and its exact systematic position remained unclear until the recent karyological investigations by Zima et al. (1992) and Qumsiyeh and Bickham (1993) who placed *Otonycteris* within the tribe Plecotini (*Plecotus, Barbastella,* and others). These results confirmed predictions based on morphology by Horacek (1991). Despite its wide distribution in the southwestern Palaearctic region, *O. hemprichi* is a rare inhabitant of desert and subdesert areas, and its ecology is poorly documented. Horacek (1991) reported that this bat flies close to the ground and may feed on nonflying prey. Based on size and wing morphology, Norberg and Fenton (1988) suggested that *Otonycteris* could prey on small terrestrial vertebrates. However, preliminary qualitative fecal analyses by Horacek (1991) suggested these bats feed exclusively on insects. During a recent expedition to Kirghizstan we gathered not only additional data on diet, but we were able to observe how *O. hemprichi* forages.

MATERIALS AND METHODS

The study was conducted 18–22 September 1992 in the province of Aravan (Fergana Basin, southern Kirghizstan, central Asia) at the border of Ouzbekistan. During 5 consecutive nights, strings of mist nets (totaling 24, 42, 39, 42, and 51 m, respectively) were set from dusk to dawn on rocky saddles at two locations in desert rocky hills at the periphery of the intensively cultivated Fergana plain (40°33′N, 72°30′E; 40°22′N, 72°31′E; 850 m elevation). The landscape of this area is described by Horacek (1991). Bats were measured, weighed, and held in linen bags until they had defecated, allowing us to collect fecal pellets for dietary analysis. Fragments were identified to order or family using a binocular microscope. Body size of prey was estimated roughly by comparing remains in feces with specimens of prey collected in the field. Proportion (percent volume) and frequency of occurrence (presence-absence) of the different categories of prey were estimated for each fecal sample. One sample was comprised of all pellets from a single individual. Proportion refers to the relative biomass of the different categories of

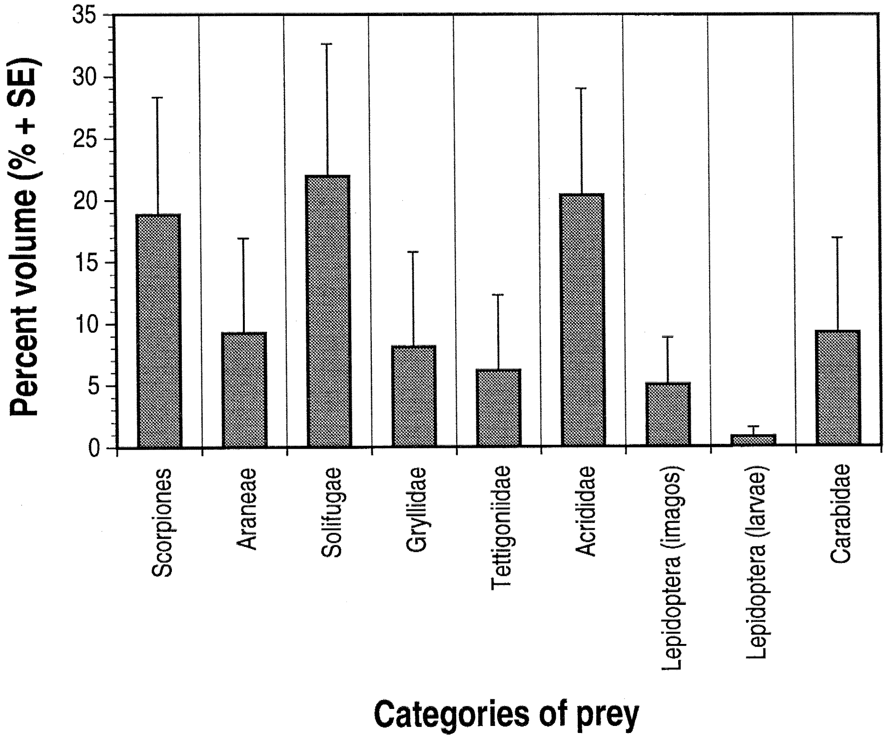

FIG. 1.—Proportions (percent volume + 1 *SE*) of different categories of prey found in the diet of 13 individuals of *Otonycteris hemprichi.* All categories represent terrestrial arthropods except lepidopteran imagos. Taxa are arranged according to systematic order from left to right.

prey in the diet, whereas frequency provides information about the frequency with which a particular prey item is eaten.

To observe foraging behavior, 11 bats captured for fecal pellets were light-tagged (Buchler, 1976). Bats captured before midnight were released when defecation was completed, within 1–3 h of capture. However, bats taken after midnight were kept in captivity until the beginning of the following night. Foraging activity was followed during the night by 5 observers with binoculars standing at certain vantage points in the local landscape.

RESULTS

A total of 18 individuals (12 adult males, 3 subadult males, 2 adult females in postreproductive state, and 1 subadult female) was captured during 5 nights of netting. *Otonycteris* accounted for 13% of all bats captured. Males weighed 24.7 ± 2.4 g (mean ± 1 *SD*) and females 30.7 ± 5.8 g, and length of forearm averaged 60.9 ± 2.0 mm in males and 65.1 ± 0.2 mm in females.

We collected feces from 13 individuals that had eaten at the time of capture. Ten categories of prey were identified in their feces (Fig. 1). Percent occurrence by volume was 21.9% Solifugae, 20.4% Acrididae, 18.8% Scorpiones, 9.2% Araneae, 9.2% Carabidae, 8.1% Gryllidae, 6.2% Tettigoniidae, 5.0% lepidopteran imagos, 0.8% lepidopteran larvae, and 0.4% Staphylinidae. Nearly one-half the diet consisted of arachnids, and one-half of insects. The small samples meant fairly great interindividual variation in prey consumed (see departures from the means, Fig. 1).

Percent frequency data showed lepidopteran imagos (53.8%), Gryllidae (46.2%), Acrididae (38.5%), Solifugae (30.8%), and Scorpiones (30.8%) occurring at high levels in the fecal samples. Estimated from fragments, average body length of captured prey was 60 mm for scorpions (two pedipalp and three tarsal fragments) and 45 mm for Solifugae (seven tarsal fragments).

During 3 nights, 11 individuals were fitted with light-tags and released. Nine bats disappeared in <2 min. Two individuals (sex unknown) foraged for 10 and 40 min, respectively. They flew close to the ground (mostly 40–100 cm) and, upon detecting a prey on the ground, landed briefly (2–5 s) to catch it. We saw no evidence of light-tagged bats searching for prey on the ground by walking. Successful captures were revealed by chewing noises audible to 20 m. All prey were eaten on the wing during a slow, gliding, and widely circling flight of ca. 3–7 m above the ground.

DISCUSSION

In spite of the small number of fecal samples analyzed, this is the first quantitative study of diet in *O. hemprichi*. Horacek (1991) found Blattoidea, Orthoptera, and tenebrionids from May to August in the diet, but provided no information on relative proportion of items in the samples. Our samples from September contained neither Blattoidea nor Tenebrionidae. Because our study sites are the same, these differences probably reflect seasonal variations in the diet. Horacek (1991) found many Solifugae in the environment and was surprised when neither the stomachs nor the feces contained them. Solifugae were the most important prey in our samples. Contrary to Norberg and Fenton's (1988) suggestion, small vertebrates were not found in our samples. In the study area, the sole terrestrial vertebrate occurring in large numbers in habitats where *Otonycteris* is found is the gecko *Cyrtodactylus russowi* (Horacek, 1991; present study). Casual predation upon this small nocturnal reptile, which is ca. 11 cm long for adults including tail, cannot be excluded.

Otonycteris hemprichi shows some convergence in trophic niche with two other desert-dwelling, ground-gleaning bats, *Nycteris thebaica* from Africa and *Antrozous pallidus* from North America. Felten (1956) reported that culled parts of prey found under a night roost of *N. thebaica* in Namibia consisted mainly of debris from Scorpiones and Solifugae. The exact proportion of these two groups could not be extrapolated from the data because large insectivorous bats usually eat larger prey from a perch while smaller items are eaten on the wing (Jones, 1990). *A. pallidus* shows a large geographical variation in dietary composition, but scorpions and even small vertebrates (*Perognathus*) are taken, although both generally represent a minor proportion of the diet (Bell, 1982; Orr, 1954; O'Shea and Vaughan, 1977; W. E. Rainey, in litt.).

Our results confirm Horacek's (1991) conclusion that *Otonycteris* is primarily a ground-gleaning species. However, we could not confirm Horacek's (1991) observation of aerial pursuit of flying prey although some lepidopteran imagos may have been captured while flying. We think *Otonycteris* forages much like *A. pallidus* and *Myotis myotis* (Arlettaz, 1994; Bell, 1982; Krull, 1992). However, it does not seem to hover before dropping on potential prey (Arlettaz, 1994; Krull, 1992). We agree with Horacek (1991) that *Otonycteris* is locating prey on the ground by listening while flying close to the surface and not while perching. This technique is probably the rule for most ground-gleaning bats (Bell, 1982; Deutschmann, 1991; Krull, 1992).

Although carnivory has not been established, *O. hemprichi* must be considered as the strongest predator among Palearctic insectivorous bats. First, the size of its prey appears bigger than in *M. myotis* (Arlettaz and Perrin, in press), which is the only other large Palearctic species of bat that gleans most of its prey from the ground (Arlettaz, 1994; Kolb, 1958). Second, *Otonycteris* is able to seize dangerous arthropods like Scorpiones and Solifugae.

Acknowledgments

We thank W. E. Rainey and K. G. Heller who provided help with the literature and M. B. Fenton, L. Keller, and T. H. Kunz for comments and corrections of an early draft of the manuscript. This expedition was supported by the Vaud Academic Society, Ignace Mariétan Foundation, Basel Foundation for Zoological Research, Swiss Academy for Nature Sciences, Georgine Claraz Foundation, Foundation of the 450th Anniversary of the University of Lausanne, and the Museum of Zoology of Lausanne.

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Submitted 9 August 1994. Accepted 21 December 1994.

Associate Editor was Patricia W. Freeman.