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ARTHROPOD FRAGMENTS IN *MYOTIS MYOTIS* AND *MINIOPTERUS SCHREIBERSII* DROPPINGS FROM MAGURICI CAVE (ROMANIA). PRELIMINARY RESULTS

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INTRODUCTION

The insectivorous bats glean prey from all types of surfaces: water, ground, cliff walls, tree bark, branches or leaves, grass etc. The analysis of bat droppings is considered to yield reliable information on the diet of insectivorous bats, because insect remains are more concentrated in faeces than in stomach contents. Digestion does not cause any major problems because the food passes rapidly through the gut and insects have tough exoskeletons of chitin. Moreover, Shiel *et al.* (1997) have found parts of a

range of lightly sclerotised insects, such as mayflies, lacewings, and aphids, which were virtually undamaged.

MATERIALS AND METHODS

The diet of two bat species, *Myotis myotis* and *Miniopterus schreibersii,* was investigated through the analyzing of 30 faecal samples. Faecal pellets were collected in Magurici Cave (Somesan Plateau, NW Romania) between May - July from the nursery of *M. myotis* and between August - October from the matting colony of *M. schreibersii.* The selected items were mounted in glycerinated gelatin under a cover slip on a microscope slide. Prey fragments were identified to order or family level under a binocular microscope. Arthropod fragments were identified according to the methods of Shiel *et al.* (1997).

RESULTS AND DISCUSSION

The foraging habitats of the bats that provided the analyzed bat droppings were orchards, pastures, crops, woodlands and water flow. The arthropod fragments identified in the guano of both studied bat species were from Insecta class, Coleoptera, Diptera, Lepidoptera, Heteroptera orders and Arachnida class, Araneidae family (Table 1 and Table 2).

Class Insecta

Order Lepidoptera

The most fragments found in the analyzed samples belong to *Lepidoptera* (butterflies and moths). It has been shown that moth scales may remain in the digestive tract of a bat for relatively long periods. Those of a single moth species could appear in droppings long after the bulk of the remains had been voided. For this reason, a small number of scales cannot be considered a reliable indicator. Only pellets with abundant scales should be scored as containing Lepidoptera (Shiel et al., 1997). We found a few eggs and scale fragments in great number, but it was not possible to determine any of these remains to family level. These scales resulted from moths, unattached in the droppings.

Order Coleoptera

Carabidae (ground beetles) were present as leg fragments of different size, 2-3 tarsal fragments with claws, tibia fragments, elytra fragments with hairs and maxillae fragments. Fragments with thick hair on the inferior part and posterior part of pronotum were founded from *Carabus auronitens.* The colors of these fragments ranged from green to dark green.

From the Scarabeoidea (scarab beetles) family we found tracheae fragments and legs stout and end in well-developed claws, each of which bear a tooth.

Order Diptera

We found wing and leg fragments, coming from Sphaeroceridae family (lesser dung-flies). The wing venation is characteristic and there is usually a pale spot on the thick cross vein in the center of the wing.

Order Heteroptera

From Heteroptera order, precisely Corixidae family (water boatmen), were present the following fragments: legs with claws and obvious darkly pigmented tubular band between segments, chitin from elytra, which is yellow with black spots.

Order Neuroptera

From this order we found one specific wing fragment, belonging to Hemerobiidae family (brown lacewings). Neuropteran wings are delicate and have a very characteristic net-like venation.

Order Siphonaptera

Adult, larvae and flea eggs are often common in the layer of droppings. All of these entire adult, larvae and eggs found in the layer of droppings are unlikely to have been eaten by bats, being guanophylic insects. We found one egg fragment, with a protrusion at one end.

Class Arachnida

Order Araneida

Only leg fragments of spiders were recovered from the droppings, most frequently tarsal fragments. The legs, ending in a pair of curved claws, were identifiable by their long, flexible bristles.

Foraging habitats and flight style, which is associated to wing design, determine the prey selection in a given habitat. Feeding activity of *Myotis myotis* took place in woodlands and also outside wooden habitats, these bats being predominately ground-gleaning predators. The analyses of bat droppings collected at nursery roosts from Magurici Cave revealed that *M. myotis* fed predominantly with insects from Lepidoptera (52.63%), and Coleoptera (39.46%). Diptera (2.63%) and Neuroptera (2.63%) were only occasionally found in their droppings (Fig. 1) Scales, legs and claws prevailed in the analyzed samples (Tab.1).

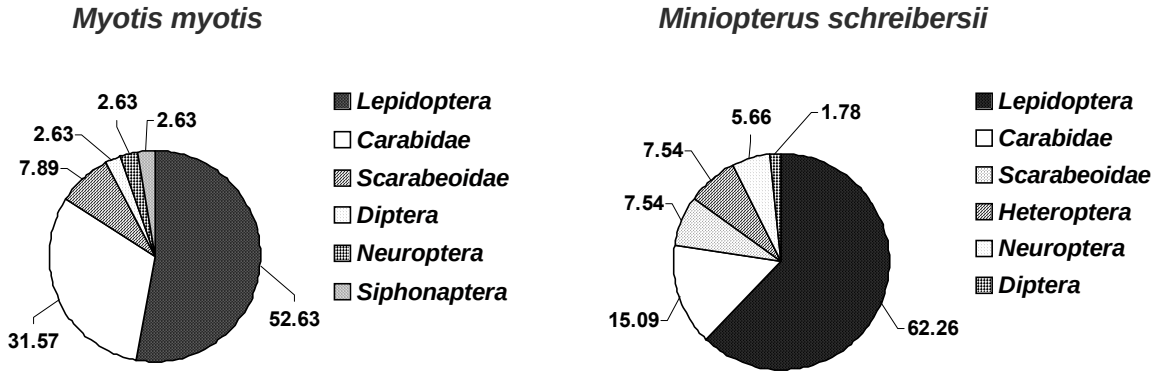

Fig. 1. Percentage of prey categories found in the diets of *Myotis myotis* and *Miniopterus schreibersii* from Magurici Cave.

Miniopterus schreibersii, having long, narrow wings flies very fast and prefers large open spaces. This bat species has a large trophic spectrum. In our study, *Miniopterus schreibersii* was found to feed with insects from *Lepidoptere* (62.26%), *Coleoptera (*22.63%), *Heteroptera, Corixidae* (7.54%), and *Diptera* (1.78%). Moreover in their diet we also found *Araneida* (5.66%) (Fig. 1). Scales, wings and legs were found in great number in the droppings from this bat (Tab. 2).

Table 1. Arthropod fragments found in dropping samples of *Myotis myotis,* which fed in Magurici Cave surroundings.

Arthropod group	**Fragments**					
	Scales	Wings	Legs	Antenna	Claws	Eggs
Insecta Coleoptera Carabidae Scarabeoidae		* 	* *	*	* *	
Diptera Sphaerocerida		*				
Lepidoptera	*					
Neuroptera Hemerobiidae		*				
Siphonaptera						*
Percentage of fragments (%)	52.63	21.05	13.05	5.26	5.26	2.63

Table 2. Arthropod fragments found in dropping samples of *Miniopterus schreibersii,* which fed in Magurici Cave surroundings.

Arthropod group	**Fragments**							
	Scales	Legs	Eggs	Wings	Eye	Maxilla	Antenna	Trachea
Insecta Coleoptera Carabidae Scarabeoidae		* *	*	*	*	*	*	 *
Diptera Sphaerocenda		*						
Heteroptera Corixidae		*						
Lepidoptera	*		*					
Arachnida Araneida		*						
Percentage of fragments (%)	56.6	24.5	5.6	3.77	3.7	1.88	1.88	1.88

Generally, different bat species show preferences in the choice of insects. In Central Europe, *Myotis myotis* preys mainly on flightless carabid beetles (Gebhard & Hirschi, 1985), and is thus believed to be exclusively a ground-gleaning predator (Audet, 1990). Ariettaz *et al*., 1993, showed that this bat species preferred the *Carabidae* (46%), *Lepidoptera* larvae (19%) and *Gryllotalpidae* (10%). Based on direct visual observations in temporary food patches, Ariettaz (1994) showed that mouse-eared bats gleaned most prey on the soil surface while flying, but cockchafers were usually caught in flight. McAney and Fairley (1989) collected faeces and studied the diet of eight different

clusters of *Rhinolophus ferrumequinum* in Western Ireland and they identified 23 insect families from 7 orders, as well as spiders. In this case, the chief prey (37,7% of occurrences) consisted of nematoceran *Diptera* (tipulids, anisopodids, midges, mosquitoes and gnats).

In the composition of bat diets can be observed seasonal differences. For example, in the Alps of Valais (Southern Switzerland) *Melolontha melolontha* and *Gryllotalpa gryllotalpa* were caught by *M. myotis* only during May and June, in July-August *Carabidae* predominated in the diet of this bat species and in September bats clearly exploited *Tipulidae* (Arlettaz, 1994). Moreover, there are differences in the specific arthropod spectra populating different habitats, during the same year and between two years in the same habitat (Ransome, 1990). These differences can be also noticed in the diet of bats.

In conclusion, both bat species analyzed in this study were eating arthropods from 6 orders and 5 families, *Lepidoptera* and *Carbidae* being the preferred feed. By consuming large quantities of harmful arthropods, these bats bring major benefits to agriculture and forestry.

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WATER MITES (ACARI, HYDRACHNIDIA) AND OLIGOCHAETES (ANNELIDA: OLIGOCHAETA) FROM HYPORHEIC ZONES OF THE TRANSYLVANIAN RIVERS ARIES AND SOMEŞUL RECE (ROMANIA)

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This is a preliminary study on water mites (Acari, Hydrachnidia) and oligochets (Annelida: Oligochaeta) communities from some hyporheic zones on the Aries and Someşul Rece Rivers.

Previous studies on water mites from fresh water and hyporheic habitats were made by Soarec (1941) on the Aries river and by Szalay (1943a, 1943b, 1945a, 1945b, 1947), Motas et al (1947) and Motas & Tanasachi (1962) on the Someşul Rece river.

No previous on hyporheic oligochaetes were made on the Aries and Someşul Rece rivers. Botea (1966, 1968), Botea & Plesa (1968), Botea et al. (1964) studied oligochaetes from interstitial habitats in the catchments area of the Cris River.