

Winter diet analysis in *Rhinolophus euryale* (Chiroptera)

Research Article

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Abstract: We investigated the winter food of Mediterranean horseshoe bats (*Rhinolophus euryale*) in four winter cave roosts in southern Slovakia and northern Hungary and investigated the relationship between food and ambient temperature. The bats were active during the whole winter period and they produced excrement throughout the entire hibernation period, even when outside temperatures dropped below zero. The guano was in two forms, containing (1) prey items and (2) non-prey items. The identifiable items belonged to lepidopteran species, but only one was identified, on the basis of the genital fragments, the moth *Colotois pennaria*, which was the main prey species in autumn and early winter. Our results shed light on the extraordinarily high level of activity in this bat species during winter hibernation, which in temperate regions is a strategy that enables bats to survive when prey is reduced or absent. In *R. euryale*, the torpor in the course of hibernation is not continuous and our results help to explain how energy losses caused by bat movements are covered.

Keywords: Hibernation • Bats • Moths • Slime-like guano • Winter activity

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1. Introduction

In temperate regions bats typically hibernate, using this strategy to survive the long periods when the numbers of arthropod prey are reduced or totally absent. The torpor during hibernation is not continuous, and there is evidence of relatively frequent breaks [1]. The frequency of such breaks varies among species and individuals [1–4]. However, the causes of these arousals appear varied and uncertain, though temperature in the roost has been suggested to play an important role [5]. Breaks in hibernation can lead to changing the hibernation site, drinking or to foraging activity. When temperatures are sufficiently high, and other climatic conditions prove suitable, breaks can be rather frequent [1,4,6–10].

The Mediterranean horseshoe bat, *Rhinolophus euryale* Blasius, 1853, is a typical bat species of the thermo-Mediterranean zone of the Mediterranean region – the southern limits of its distribution range are in the Levant and Iran, while the northern limits extend to southern Slovakia and northern Hungary [11]. *R. euryale* has been reported feeding close to vegetation, with moths as the main prey [12]. However, the nematocerans, beetles and lacewings could also play an important role in some habitats or in certain seasons [13–15]. In the Slovakian/Hungarian border zone an isolated population of *Rhinolophus euryale* occurs – at the very north of its range [16–18]. The population is small with a total of 10–12,000 individuals estimated in this area [18–21]. It has become clear that this population favours underground sites as

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