

Occasional bat predation by the horseshoe whip snake (Reptilia, Colubridae)

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Predators include Chiroptera in their diet only marginally, though some individuals specialize on bat hunting if large bat populations inhabit their home range (Kowalski 1995). Among snakes, chiropterophagy is rare, and most of the records on this feeding habit come from tropical areas (Gillette & Krimbourg 1970, Foster & Price 1997, Digana *et al.* 2005, Esbérard & Vrcibradic 2007). In the Nearctic, this behaviour has been observed particularly in rat snakes (genus *Elaphe*), colubrids that specialize on small mammals (Davis 1951, Wiseman 1963, Cary *et al.* 1981, Ridlehuber & Silvy 1981). In the Western Palearctic, only scattered cases have been recorded for another rat snake (*Zamenis longissimus* Schätti, 1984). The predation by the horseshoe whip snake, *Hemorrhois hippocrepis* (Linnaeus, 1758), on *Myotis punicus* Fellten, Spitzenberger & Storch, 1977, in a cave of north-eastern Morocco, was also recorded, although it was considered accidental because the grate protecting the entrance of the cave facilitated the capture (Hammer & Arlettaz 1998). Moreover, in southern Spain, for the same snake species, a case of predation on *Myotis oxygnathus* Monticelli, 1885 was recorded and some individuals were found among colonies of *Pipistrellus pipistrellus* (Schreber, 1774) and *Eptesicus isabellinus* Temminck, 1840 displaying hunting behaviour, at least in three localities (Migens *et al.* 2002). However, neither publication describes the capture and handling process by the snake. Here, we contribute new data on chiropterophagy by *H. hippocrepis* and discuss the role of bats in its diet.

In Torrejón el Rubio (6°03' W 39°45' N, / UTM square 10x10 km 29SQE51, 461 masl, Cáceres, Spain; 2009/02/20) an individual was

observed and photographed feeding on a *Plecotus austriacus* (Fischer, 1829) (G. de Hoog *pers. comm.*). In Granadilla (6°6' W 40°16' N / UTM square 10x10 km 29SQE46, 386 masl, Cáceres, Spain; 2009/05/17), one of the authors (JAG-G) observed how one *H. hippocrepis* fell from the roof of a building grasping in its jaws an *Eptesicus serotinus* (Schreber, 1774) / *Eptesicus isabellinus* (Temminck, 1839) (Fig. 1); on the ground, the snake coiled around the bat, whilst the mammal tried to get free by biting and with spasms. Spasms have been also observed in this bat when handled by researchers (*pers. obs.* of the authors), presumably as a defensive tactic of the species. In the two cases, we can observe completely the process of ingestion.

All snakes observed were adults, and the weight for captured bats (6-10 g for *P. austriacus*, 17-28 g for *E. serotinus*/*E. isabellinus*, and 19-25 g for *M. oxygnathus* and *M. punicus*; Dietz *et al.* 2009), was within the range for the weight of most *H. hippocrepis* prey, and both bats were ingested head first, as usual in this snake (Pleguezuelos & Moreno 1990, Pleguezuelos & Fahd 2004).

Until now, we have recorded four chiropterophagous events and three occurrences of foraging behaviour among bat colonies by *H. hippocrepis*, throughout most of the range of the species in the Western Mediterranean. Except for the case in Morocco, these records are not related to obstacles hindering the flight of bats leaving from their refuges. Records on feeding events coming from direct observation must be considered cautiously, and not be taken as the sole source of information to describe the feeding habits of predators; rather, these observations should be accompanied by analyses of gut contents to provide a more complete



Figure 1. A horseshoe whip snake coiled around a serotine bat (Granadilla, Cáceres, Spain, 17-5-2009; Author: JAGG).

picture of their trophic ecology (Rodríguez-Robles 1998). The literature offers descriptions of the feeding habits of six *H. hippocrepis* populations throughout the range of the species (Vericad & Escarré 1976, Meijide & Salas 1987, Pleguezuelos & Moreno 1990, Capula *et al.*, 1997, Corti *et al.* 2000, Pleguezuelos & Fahd 2004), and none of the 247 prey identified from 439 snake specimens was a bat. This suggests that a) bats are quite local prey, or b) studies on diet tend to show only the general pattern on the feeding habits of the species, but fail to detect occasional prey (Rodríguez-Robles 1998).

This snake is an active forager and an expert climber, proficient at moving along vertical or overhanging substrates of natural surfaces or constructions, and adept at capturing prey inaccessible to other Mediterranean colubrids, including nestlings or adults of Hirundinidae and Passeridae surprised within their nests (Feriche 2004). Its slender-bodied morphology also allows it to forage on crevice-dwelling saurians, such as *Tarentola mauritanica* (Linnaeus 1758) or *Podarcis hispanica* (Steindachner 1870) (Pleguezuelos & Moreno 1990). These foraging habits may also lead the snake to forage on bats resting in fissures and lofts. We presume that it is easier for this snake to capture crevice-dwelling (genus *Pipistrellus*, *Hypsugo*, *Eptesicus*, *Plecotus*) than cavernicolous bats (*Rhinolophus*, *Myotis*, *Miniopterus*), the latter being less affordable because they rest hanging from roofs, and are more difficult to find during random foraging because they normally collect in large but dense colonies (Dietz *et al.* 2009). All of the data here presented came from researchers focusing on cavernicolous bats, which could bias

the observations on this group of bats; however, only two of the records presented here refer to cavernicolous species, whilst five records refer to crevice-dwelling ones. We suggest that the capture of crevice-dwelling bats would be more common than recorded in the literature concerning the feeding habits of this snake.

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