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Scavenging Behaviour By a Free-ranging Balkan Adder *Vipera berus bosniensis* (Boettger 1889)

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Abstract: Scavenging is an opportunistic feeding strategy in snakes, which benefits exceed its associated costs, as carrion provides a safe and relatively easy-to-obtain food source, compared to live prey. In this paper, the authors report on an observation of scavenging feeding by a free-ranging *Vipera berus bosniensis*. On 01 September 2025, an adult female was found to ingest a dead *Clethrionomys glareolus*. The vole's carcass had visible lacerations on both the anterior and posterior sides, indicating that it was not killed by the viper, but by another predator. Such a feeding strategy has rarely been reported in Old World vipers, in contrast to pitvipers, where it appears to be more common. However, as traditional methods for studying snakes' diets are unreliable to evaluate the frequency of scavenging feeding, this type of behaviour could be highly underestimated.

Key words: Diet, ecology, prey, snakes, Viperidae

Introduction

A species' feeding habits are a crucial component of its natural history and ecology. These habits include both diet composition and foraging strategies, and understanding their patterns provides insights on the species' resource needs, its impact on prey populations, and the flow of energy through the ecosystem (Litvaitis 2000, Devault & Krochmal 2002). Most snake species rely on two main foraging strategies – sit-and-wait in ambush or active hunting; the sit-and-wait strategy is more energy-efficient, while active hunting provides more prey items per unit of time (Huey & Pianka 1981, Cundall & Greene 2000, Glaudas et al. 2019). Scavenging feeding is an opportunistic strategy, which benefits might exceed any associated costs. For instance, carrion provides a relatively easy-to-obtain food source, compared to live prey, although it might involve risks such as pathogen transmission, parasite exposure, or consumption of spoiled meat (Devault & Krochmal 2002). Even though most snake species readily accept dead prey in captivity (Rossi 1992), and various species from different families are known to incorporate scavenging feeding in the wild (Devault & Krochmal 2002 and references therein, Anđelković et al. 2021, Deso

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Fig. 1. (A) View of the adult female *Vipera berus bosniensis*, regurgitating the dead *Clethrionomys glareolus*, after it was startled by the authors' presence. (B and C) View of the lacerations on the anterior (B) and posterior (C) parts of the vole's body, indicating that it was already killed by a different predator, before the viper found it.

& Bonnet 2023, Gagliano et al. 2025), this remains a highly understudied aspect of snakes' foraging habits. As traditional methods for studying snakes' diets (i.e., dissection of stomach content or examination of scats and regurgitated prey) are usually unable to indicate whether the food items were preyed upon or scavenged, information on carcass consumption usually comes from in situ observations. Because such observations are rather accidental and do not occur frequently, this type of feeding behaviour in snakes might be highly underestimated.

Within the Viperidae family, scavenging behaviour is more frequently reported in pitvipers (subfamily Crotalinae) (Devault & Krochmal 2002 and references therein), while similar findings are very scarce for Old World vipers (subfamily Viperinae). European vipers from the *Vipera* genus are opportunistic predators that typically employ a sit-and-wait ambush foraging strategy, although they may sometimes engage in active hunting as well (Groen et al. 2020, Dyugmedzhiev et al. 2025). To date, only a few observations on scavenging foraging in the wild were reported for European vipers – four on the Nose-horned Viper *Vipera ammodytes* (Linnaeus, 1758) (Anđelković et al. 2021, Bjelica et al. 2025) and one on the Iberian Asp Viper *Vipera aspis zinnikeri* Kramer, 1758 (Gagliano et al. 2025).

The Adder *Vipera berus* (Linnaeus, 1758) is a medium-sized viper, with the northernmost and most extensive range of all snake species in the world, encompassing most of Europe, through Russia to Sakhalin Island (Nilson et al. 2005). Its prey consists mainly of small mammals and reptiles, although birds, arthropods and amphibians are also occasionally preyed upon (Šebela 1980, Luiselli & Anibaldi 1991, Bea et al. 1992, Luiselli et al. 1995). While adults' diet is more diverse, juveniles usually prey mainly on small lizards (Šebela 1980, Luiselli & Anibaldi 1991, Bea et al. 1992, Luiselli et al. 1995). The Balkan Adder *Vipera berus bosniensis* (Boettger 1889) is a distinct subspecies, endemic to the Balkan Peninsula (Ursenbacher et al. 2006).

In Bulgaria, it inhabits mainly the mid- and high-mountain areas, although some lower elevation populations are also known (Stojanov et al. 2011). It feeds mainly on lizards, frogs, small mammals, and rarely small birds (Beshkov & Nanev 2002).

Materials and Methods

In this paper, the authors report on an observation of scavenging feeding by a free-ranging *V. berus bosniensis*. The observation was made during an ongoing ecological study of the species at Platoto area, Vitosha Mt., western Bulgaria (N42°36'; E23°16'; 1750-1850 m a.s.l.). This site is an extensive ridge terrace situated above the tree line, covered with alpine and boreal ericoid vegetation, temporary marshes with floating, moving peat, subarctic shrubs of *Salix* spp., and extensive areas covered by Siberian Juniper (*Juniperus sibirica*). Biometric data (snout to vent length – SVL, tail length – TL and body mass) were taken from the individual, along with determination of age stage and sex. The substrate- and air temperatures at 15-20 cm above the ground were measured with a quick-reading thermometer (TOPELEK TECP022AH, precision 0.3 °C). The microhabitat temperature was estimated by the average of the substrate- and air temperature. The date, hour of observation and the meteorological conditions (cloudiness, in percentage from 0 to 100, wind and rain) were recorded. After all measurements were taken, the captured viper was released on the exact site. Coordinates were taken with hand held GPS device (Garmin eTrex 20, accuracy ± 5 m).

Results

On September the 1st 2025, an adult female *Vipera berus bosniensis* was observed on the surface by the authors at 12:47 h (local time). When approaching it, the authors noticed that it was ingesting a dead adult Bank vole *Clethrionomys glareolus* (von Schreiber, 1780). Sensing the authors' presence, the viper, which had already swallowed a third of the vole's body, was startled and started to regurgitate its prey (Fig. 1A). After it regurgitated it completely, the viper was caught, quickly measured, weighed (SVL – 38.2 cm, TL – 5.1 cm, body mass – 55.18 g) and released at the exact site, where it immediately escaped in the shrubs. Microhabitat temperature was 18.5°C. Strong wind was present and clouds covered about 60% of the sky. Upon inspection, the authors saw that the vole's carcass had several lacerations on both the anterior and posterior sides. The vole's head, neck and hind limbs were gnawed to the bone, and its anal and thigh parts were also torn open, exposing some of the internal organs (Fig. 1B and C). The vole's carcass was left at the observation site with the hope that the viper would return for it. At the end of the field day, at 19:20 h (local time), the site was checked again and the carcass was still there with no signs that it was touched again by the viper.

Discussion

The severe lacerations and injuries on the vole's body are impossible to be caused by the viper. Therefore, they indicate one of two things: 1) that it had been killed by another predator, either a small mammal or a bird, which had previously preyed on parts of it, or 2) that the viper killed the vole, which was then attacked and partially eaten by another predator, and the snake returned to its prey after that. It is likely that the female *V. berus* was attracted by the smell of the vole's carcass. Chemical cues are considered to be most important sensory stimuli for scavenging snakes (Sazima & Strüssmann 1990, Shivik & Clark 1997, Devault & Krochmal 2002 and references therein). In fact, snake species that rely more heavily on chemosensory detection of their prey (such as vipers and aquatic or semi-aquatic piscivorous species) seem to exhibit a greater tendency to engage in scavenging than those relying on visual cues (such as arboreal snakes) (Sazima & Strüssmann 1990, Devault & Krochmal 2002 and references therein). Scavenging seems to be somewhat common in pitvipers (Devault & Krochmal 2002 and references therein), including kleptoparasitism (Teshera et al. 2021). Therefore, it might be expected that this foraging strategy might often be utilized by European vipers as well. However, there are only a few records of scavenging in European vipers. In one of the cases, a subadult *V. ammodytes* was observed devouring a dead on the road juvenile of the same species (Anđelković et al. 2021). Bjelica et al. (2025) reported three instances of scavenging on avian carrion (alpine swift *Tachymarptis melba* (Linnaeus, 1758), European goldfinch *Carduelis carduelis* (Linnaeus, 1758)) and an unidentified passerine bird) by *V. ammodytes* from an insular population. An attempt by an adult *V. aspis zinnikeri* to swallow a dead, desiccated adult *Rana temporaria* Linnaeus, 1758 was described by Gagliano et al. (2025). To the best of the authors' knowledge, this is the first record of scavenging by *V. berus* in the wild. It is likely that such a foraging strategy is employed more frequently by European vipers than previously thought, and highlights their behavioural flexibility and role as opportunistic scavengers. However, as

observations of vipers feeding in the wild are rather sporadic and accidental, this might explain the extremely small number of reports on scavenging in European vipers. Therefore, more studies are needed in order to evaluate whether this foraging strategy is rare or rather common in Old World vipers, as in pitvipers.

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