

A long way from home: citizen science documents an alien racer, *Hemorrhois* cf. *nummifer* (Reptilia: Colubridae), in Romania

The Anthropocene is generally characterized by a significant global biodiversity decline (Pyron & Pennell 2022). Nevertheless, some species are actually broadening their distribution ranges due to increased mobility via involuntary or voluntary introduction (Mooney & Hobbs 2000). Numerous species have become invasive in their novel territories and are displacing native species, either by consumption, competition, or by disseminating alien diseases to which native species may not have means of resistance (Keller et al. 2011).

Worldwide, many reptile species have become established outside their native ranges, and several species have proven to be highly successful invaders, often with catastrophic consequences for populations of native species (e.g., Mooney & Hobbs 2000, Keller et al. 2011). Amongst the best-known examples are: the North American pond sliders (*Trachemys scripta*), which are now almost ubiquitous in southern European aquatic environments, particularly in or near urban areas, and which are displacing the native turtles (particularly *Emys orbicularis*) (e.g., Cadi & Joly 2004); the Australasian brown tree snake (*Boiga irregularis*), accidentally introduced in the Pacific Island of Guam, which has extirpated most of the bird fauna and several species of native lizards from the island, some of which were endemics (Rodda & Fritts 1992); and the Burmese python (*Python bivittatus*) which is now abundant in Florida, USA, after accidental and deliberate introductions (Dove et al. 2011).

Excluding the aquatic turtles, until now, the European continent has mostly been spared from invasive reptile species, particularly snakes. Nevertheless, the Island of Gran Canaria (politically but not geographically European) is now inhabited by a remarkably large and thriving population of North American king snakes (*Lampropeltis getula*) (Cabrera-Pérez et al. 2012), while Taiwanese beauty snakes (*Elaphe taeniura*) have invaded a fairly large area of Belgium where

they have been known to occur for more than a decade (van Doorn et al. 2021). Bellow, I report a new observation of a snake species found outside its native range, in Romania.

On July 31st, 2022, at 09:30h, a snake belonging to the genus *Hemorrhois* was observed in Ghimbav, Braşov county, Romania, geographic coordinates: 45.672894N, 25.510944E (Spinu A.M., personal communication). The information first appeared as a request for identification posted on a social media group dedicated to Romanian herpetofauna. The snake was not captured but photographed *in situ* (Figure 1).



Figure 1. Adult racer (*Hemorrhois* cf. *nummifer*) observed in Braşov county. Photo by A.M. Spinu.

It was visually estimated to have a total body length of at least 100 cm, thus being, presumably, an adult individual. It was basking on a paved road when first observed, but it moved and disappeared soon after the initial contact. Several searches during the following days did not yield any other further observations. Although I determined the individual as *H. nummifer*, based on its dorsal pattern and coloration, the possibility of the snake being a somewhat atypical example of *H. hippocrepis* (horseshoe-snake) cannot be completely excluded based on this photograph alone. The

native range of *H. nummifer* comprises areas from Greek Aegean islands, Turkey, Cyprus, the Caucasus, Israel, Lebanon, and parts of Iran, Iraq, and Egypt (Schätti & Agasian 1985), while *H. hippocrepis* is native to North Africa, Sardinia, and the Iberian Peninsula (Arnold 2003).

The observation represents the 19th alien reptile species to be documented in Romania to date and only the third-ever snake species, besides *Python (molurus) bivittatus* and *Elaphe quatorlineata* (Iftime & Iftime 2021). To my knowledge, this is also the first record of the Asian racer outside its native range. The origin of the individual is unknown. However, two plausible scenarios that explain the current observation are (i) an escaped individual from a private collection or (ii) an accidental transport from its native range, either via motor vehicle or airplane. The former scenario is improbable, as the species is very rarely kept in private reptile collections. A search in the European reptile trading platform www.terrarium.com using the term “*Hemorrhhois*” (conducted on October 21st, 2022) revealed only one ad selling *Hemorrhhois nummifer* during a three-year period. Therefore, a case of involuntary introduction of the individual is more likely. Although the snake was observed in very close proximity to an international airport, it is unclear if any international flights were active before the date of the observation, as the airport had not yet been formally opened. An overland migration via motorized vehicle is also likely, as there is regular road traffic between Turkey and Romania or traffic that transits Romania from Turkey, where *H. nummifer* is native. Indeed, although not frequently documented, overland transportation of biological stowaways is probably quite common, particularly for small or stealth species (Ascensão & Capinha 2017), and several cases of native snakes being found hidden within motor vehicles have been observed in recent years in Romania (unpublished data).

H. nummifer, like its sister species *H. hippocrepis*, is an opportunistic feeder, consuming both ectothermic (especially lizards) and endothermic prey (birds and mammals), and probably has a high dispersal ability (although there are no detailed ecological studies of *H. nummifer*) (Arnold 2003). Although *H. nummifer* is not known to be invasive, *H. hippocrepis* is known to have successfully colonized the Balearic Islands after the involuntary introduction by humans (Montes et al. 2020). Nevertheless, concerns about a potential invasion of the species in Romania are probably unwarranted, at least for the time being. This is particularly true for the current location, found within the Carpathian Mountains, as the area's climate is considerably different (colder and moister: Sandu et al. 2008) to the conditions within the species' native range (with Mediterranean and arid climate). Finally, this record is yet another testament to the utility of citizen science in the rapid detection of introduced alien species with invasive potential.

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