

Attempted predation by the grass snake *Natrix natrix* of the great ramshorn snail *Planorbarius corneus* in Hungary

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Colubrid snakes feed on a wide spectrum of vertebrate and invertebrate prey, nevertheless, several colubrids are known to be dietary specialists. For example, snail- or slug-eating has evolved in at least four groups. However, attempts to consume (mostly) aquatic snails by non-snail specialists have occasionally been reported.

The grass snake *Natrix natrix* (L., 1758) is a widely distributed water snake (subfamily Natricinae) across central Europe, with its range extending far into central Asia (Speybroeck et al., 2016). As a semi-aquatic species, it primarily inhabits wetlands, though it is not as aquatic as other European water snakes. *Natrix natrix* is considered a generalist feeder, preying predominantly on anurans but also frequently consuming small mammals, and occasionally fish, lizards and birds (Luiselli & Capula, 1997).

On 26 July 2024, at the Botankerti-tó, a small artificial pond in the Botanical Garden of Sopron University (NW Hungary, 47.680408° N, 16.573403° E, WGS 84), the first author (KK) observed a subadult *N. natrix* (approximately 40 cm in length) with an aquatic great ramshorn snail *Planorbarius corneus* (L., 1758) (family Planorbidae) in its mouth. The botanical garden is located in a suburban area on the northern slopes of the Sopron Mountains. The pond itself is richly vegetated, with the water surface almost entirely covered by *Lemna minor* during the summer months. It hosts a healthy population of water frogs *Phelophylax* sp. and newts *Lissotriton vulgaris*. Additionally, various aquatic invertebrates (i.e. aquatic beetles, water bugs and aquatic snails) can be found in high numbers. When discovered, the snake was floating motionless on the surface and was initially thought to be dead. However, when picked up, it became evident that the snake was alive, as it attempted to escape, though it did not show any antipredator behaviour typical of the species. Upon closer examination, it was apparent that the snake's upper jaw, including most of its head up to the eyes, had disappeared into the snail's shell, while its lower jaw was grasping the whorl of the snail from the outside (Fig. 1). Despite being handled, the snake did not release its prey, and it was not clear whether it was stuck. It appeared to still be trying to swallow the snail.



Figure 1. Subadult *Natrix natrix* attempting to eat a *Planorbarius corneus* (Sopron, NW Hungary)

The specimen was not collected but instead released in a concealed part of the pond; therefore, we have no information on whether it managed to ingest its unusual prey. To our knowledge, this is the fifth documented observation of an attempted predation of an aquatic snail by *N. natrix* and the first such observation in Hungary. Examination of previous cases suggest that attempts to consume aquatic snails, particularly species with an operculum (i.e. a calcareous anatomical structure attached to the foot that functions like a trapdoor) are likely fatal to snakes that lack specific adaptations for consuming these molluscs (Kornilev et al., 2023). Recently, Balogh et al. (2024) reported that a *N. natrix*, attempting to feed on a Lister's river snails *Viviparus contectus* was trapped by the snail's operculum, leading to its subsequent death, likely by suffocation. These trapped

snakes are also prone to predation and may become road traffic victims. Fuchs et al. (2020) reported an adult southern watersnake *Nerodia fasciata* crossing a paved road while its head was trapped by a spotted apple snail *Pomacea maculata*. Similarly, Young & Boyarski (2012) reported an adult northern Mexican garter snake *Thamnophis eques megalops* being run over by a vehicle while attempting to eat a Chinese mystery snail *Cipangopaludina chinensis*.

Although *P. corneus* lacks an operculum, this does not necessarily make it a less dangerous prey. Previously, Consul et al. (2009) and Zimić & Klisura (2016) described feeding attempts on *P. corneus* very similar to ours. In all cases, the snouts and eyes of the snakes were entirely covered by the snail's shell, likely incapacitating their main sensory organs. Wood & Hollingsworth (2005) described a subadult Baja California gartersnake *Thamnophis validus celaeano* whose lower jaw was stuck inside the shell of a *Planorbella subcrenata* and died of exhaustion and/or starvation. The fact that our *N. natrix* specimen was found floating on the water suggests that residual air in its prey's shell likely hindered it from submerging. Repeated and failed attempts to dive could lead to fatigue and, eventually, predation, given that both the Eurasian goshawk *Accipiter gentilis* and the European kestrel *Falco tinnunculus* are very common in the area.

These observations indicate that even non-specialist water snakes, such as *N. natrix*, occasionally attempt to prey on aquatic snails, particularly *P. corneus*. However, it remains a question whether *P. corneus* is a common prey item for *N. natrix*. If it is, these observations might represent sporadic events where the snake erred. Otherwise, all attempts could be doomed to failure from the outset due to the specific characteristics of *P. corneus*. Since *P. corneus* is a widespread species across various aquatic habitats in Europe, Asia and, more recently, North America (Seddon & Van Damme, 2011), more observations of water snakes attempting to feed on these snails are likely.

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REFERENCES

- Balogh, A., Kúdela, M. & Jablonski, D. (2024). The first observation of an attempt by *Natrix natrix* to predate an aquatic snail with an operculum. *The Herpetological Bulletin* 168: 38–39.
- Consul, A., Eger, S. & Kwet, A. (2009). The grass snake, *Natrix natrix natrix* (Squamata: Colubridae), as a predator of the great ramshorn snail, *Planorbarius c. corneus* (Gastropoda: Planorbidae). *Salamandra* 45: 50–52.
- Fuchs, A.L., Easterling, I.C., Fuchs, A.R. & Hengstebeck, K.C. (2020). *Nerodia fasciata* (southern watersnake). Diet. *Herpetological Review* 51: 149–150.
- Kornilev, Y.V., Natchev, N.D., Lillywhite, H.B. (2023). Perils of ingesting harmful prey by advanced snakes. *Biological Reviews* 98: 263–283.

- Luiselli, L. & Capula, M. (1997). Food habits, growth rates, and reproductive biology of grass snakes, *Natrix natrix* (Colubridae) in the Italian Alps. *Journal of Zoology* 241: 371–380.
- Seddon, M.B. & Van Damme, D. (2011). *Planorbarius corneus*. The IUCN Red List of Threatened Species 2011: e.T156083A4889234.
- Speybroeck, J., Beukema, W., Bok, B., Van Der Voort, J. & Velikov, I. (2018). *Field Guide to the Amphibians and Reptiles of Britain and Europe*. Bloomsbury Publishing. 432 pp.
- Young, M.E. & Boyarski, E.L. (2012). *Thamnophis eques megalops* (northern Mexican gartersnake). Diet and mortality. *Herpetological Review* 43: 498.
- Wood, D.A. & Hollingsworth, B.D. (2005). *Thamnophis validus celaeano* (Baja California gartersnake). Mortality. *Herpetological Review* 36: 328–329.
- Zimic, A. & Klisura, T. (2016). Confusion in the pond: new item on the menu for the naive grass snake (*Natrix natrix* Linnaeus) versus an unexpected great ramshorn (*Planorbarius corneus* Linnaeus). *Ecologica Montenegrina* 9: 10–12.

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