

Three juvenile *Natrix natrix* (Reptilia) as prey of *Oncorhynchus mykiss* (Actinopterygii, Salmoniformes, Salmonidae) in a Bavarian stream

Christian VOGELMANN^{1,2}, Philip WENDT², Andreas MARTENS³

¹ Ludwig-Maximilians-Universität München, Faculty of Biology, Department II, Aquatic Ecology, Planegg-Martinsried, Germany

² Bavarian State Research Center for Agriculture (LfL). Institute for Fisheries, Starnberg, Germany

³ University of Education Karlsruhe, Institute for Biology, Karlsruhe, Germany

<https://zoobank.org/0E5C8BC6-E4CB-44D2-94B3-B23951390599>

Corresponding author: Christian Vogelmann (c.vogelmann@lmu.de)

Academic editor: Jan Kotusz ♦ **Received** 3 November 2025 ♦ **Accepted** 10 December 2025 ♦ **Published** 16 January 2026

Citation: Vogelmann C, Wendt P, Martens A (2026) Three juvenile *Natrix natrix* (Reptilia) as prey of *Oncorhynchus mykiss* (Actinopterygii, Salmoniformes, Salmonidae) in a Bavarian stream. Acta Ichthyologica et Piscatoria 56: 23–25. <https://doi.org/10.3897/aiep.56.176058>

Abstract

On 14 May 2025, three juvenile grass snakes, *Natrix natrix* (Linnaeus, 1758), were dissected from the stomach of a single rainbow trout, *Oncorhynchus mykiss* (Walbaum, 1792), caught in the Ammer River, Bavaria, Germany. That record completes the scarce evidence of reptiles as prey in salmonid diets and highlights the trophic plasticity of the introduced *O. mykiss*.

Keywords

Salmonidae opportunistic feeding, trophic interaction, reptile predation, diet composition, freshwater ecology, review

Introduction

There are only a few documented cases in which reptiles play a role as prey of salmonids. Keiz (1963) reported a predation attempt of a rainbow trout, *Oncorhynchus mykiss* (Walbaum, 1792), on an adult grass snake, *Natrix natrix* (Linnaeus, 1758), in a fish farm. Eder et al. (1988) described an unsuccessful predation attempt by *O. mykiss* of about 30 cm total length on *N. natrix* measuring around 50 cm total length. In addition, they reported a collection record of a dead lake trout (*Salmo trutta* m *lacustris* Linnaeus, 1758) that contained a 50–60 cm long grass snake in its digestive tract. Bernini et al. (2006) found remains of a wall lizard, *Podarcis muralis* (Laurenti, 1768), a slow worm (*Anguis fragilis* Linnaeus, 1758), and an unidentified snake of the genus *Natrix* in *O. mykiss*. Smith (1973) noted the presence of snake remains in the stomachs of pike, *Esox lucius* Linnaeus, 1758, and

eel, *Anguilla anguilla* (Linnaeus, 1758). Additional records include a hatchling *Natrix helvetica* (Lacépède, 1789) in France (Thomas et al. 2021) and several juvenile reptiles including a *Natrix* sp. in northern Italy (Candiotto et al. 2011). Such records of fish preying upon snakes are exceptionally rare and are generally considered opportunistic incidents that have so far hardly been investigated systematically.

Oncorhynchus mykiss is one of the most widely introduced fish species worldwide and now occurs well outside its native range, with established feral populations documented in many parts of Europe and beyond (Stanković et al. 2015).

The feeding ecology of *O. mykiss* has been examined in numerous studies by Haddix and Budy (2005), Juncos et al. (2011), Blair et al. (2012), Di Prinzio et al. (2013), Rodger et al. (2021). Most of these works focus on aquatic macroinvertebrates, fish, and occasionally terrestrial

insects as the main prey. Amphibians can play a locally important role in the diet of salmonids during certain seasons or in specific regions (Kats and Ferrer 2003; Orizaola and Braña 2006), whereas reptiles have so far only been reported from single events (Strijbosch 1981; Eder et al. 1988; Bernini et al. 2006).

Here, we report for the first time the clear evidence of three *Natrix natrix* in the digestive tract of a single *O. mykiss*. This finding considerably expands the existing data and documents a specific interaction between salmonids and semi-aquatic snakes that has so far received little attention.

Observation

On 14 May 2025, an *Oncorhynchus mykiss* with a total length of 39 cm was caught in the Ammer River near Peißenberg (47°46'22.9"N, 11°02'03.4"E). Rainbow trout in this river section originate from regular stocking for recreational angling, with individuals—typically 30–40 cm in length—released annually from Bavarian aquaculture facilities. The fish was caught using fly fishing gear with a dry fly and was humanely stunned by a single percussive blow to the head and subsequently dispatched by bleeding, in accordance with German fisheries and animal welfare regulations. The fish was dissected shortly after capture by P.W., using a standard surgical hemostat (length 15 cm); the procedure was documented on video. Inside the stomach, three dead juvenile *N. natrix* were discovered. Based on visual comparison with the hemostat visible in the footage, the snakes each measured approximately 20 cm in total length.

Discussion

The record of several juvenile *Natrix natrix* within a single *Oncorhynchus mykiss* illustrates the extent of the opportunistic feeding behavior of this species. In accordance with previous studies, *O. mykiss* appears capable of including reptiles in its diet in addition to aquatic macro-invertebrates and fish (Eder et al. 1988; Haddix and Budy 2005; Bernini et al. 2006; Blair et al. 2012; Spurgeon et al. 2014; Rodger et al. 2021).

The present record of multiple *N. natrix* found as prey in a single *O. mykiss* complements earlier single observations of fish acting as predators of snakes (Keiz 1963; Smith 1973) and demonstrates that such interactions may also occur in wild populations. Nevertheless, this represents a very rare and most likely incidental event. The snakes measured about 20 cm and thus correspond

to the size of juvenile individuals. As *N. natrix* in Central Europe usually hatch in late summer, between July and September (Esterbauer 2019), a hatching event in May can be excluded. The juveniles observed were therefore most likely overwintered individuals from previous year. During spring, such individuals frequently occur near the shoreline or swim on the water surface (Isaac and Gregory 2007), making them particularly conspicuous and vulnerable to visually hunting predators such as trout.

The record of three snakes within a single fish indicates that predation events are not necessarily restricted to isolated cases, but may occur repeatedly when the prey is locally abundant. This is consistent with the observations of Bernini et al. (2006) who reported reptiles in the diet of salmonids mainly during the summer months, when these animals are especially active.

The opportunistic feeding spectrum of rainbow trout has been described in many studies and is considered a key factor for the species' global establishment (Juncos et al. 2011; Di Prinzio et al. 2013). Baxter et al. (2007) further demonstrated that *O. mykiss* can exploit terrestrial food resources when these are available. Such observations do not necessarily imply negative ecological impacts but rather reflect the pronounced trophic plasticity of this species.

Although such opportunistic feeding behavior enhances the adaptive potential of *O. mykiss*, it may also involve risks for the predator itself, as illustrated by previous observations of salmonids that had ingested large snakes. These cases show that the consumption of comparatively large or unsuitable prey can, in rare instances, be physiologically stressful or even harmful to the fish (Keiz 1963; Eder et al. 1988).

The presently reported finding can therefore be interpreted as an expression of this flexibility: under certain environmental conditions, *O. mykiss* is capable of consuming unusual prey such as small reptiles, without this necessarily having ecological relevance for their populations.

This observation represents one of the few confirmed records of reptiles as prey of salmonids in Central Europe and highlights the value of incidental dietary records in expanding our understanding of trophic plasticity in an introduced fish species.

Data availability

The video documenting the dissection of the rainbow trout and the three juvenile grass snakes is publicly available on Figshare. DOI: <https://doi.org/10.6084/m9.figshare.30524165>.

References

- Baxter CV, Fausch KD, Murakami M, Chapman PL (2007) Invading rainbow trout usurp a terrestrial prey subsidy from native charr and alter interspecific interactions. *Oecologia* 153: 461–470. <https://doi.org/10.1007/s00442-007-0743-x>
- Bernini F, Candiotto A, Nardi PA, Rossi S, Razzetti E (2006) Reptiles in the diet of *Oncorhynchus mykiss* (Osteichthyes: Salmonidae) naturalized population in Piedmont (N Italy). *Acta Herpetologica* 1: 61–63. https://doi.org/10.13128/Acta_Herpetol-1256

- Blair JM, Hicks BJ, Pitkethley R, Ling N (2012) Diet of rainbow trout in Lake Rotoiti: An energetic perspective. *New Zealand Journal of Marine and Freshwater Research* 46: 557–565. <https://doi.org/10.1080/00288330.2012.707660>
- Candiotto A, Bo T, Fenoglio S (2011) Biological and ecological data on an established rainbow trout (*Oncorhynchus mykiss*) population in an Italian stream. *Fundamental and Applied Limnology* 169: 67–76. <https://doi.org/10.1127/1863-9135/2011/0179-0067>
- Di Prinzio CY, Soto DX, Vigliano PH (2013) Feeding strategy of the non-native rainbow trout (*Oncorhynchus mykiss*) in Patagonian streams. *Fisheries Management and Ecology* 20: 176–186. <https://doi.org/10.1111/fme.12028>
- Eder J, Eder H, Schumacher A, Schumacher D (1988) Die Ringelnatter, *Natrix n. natrix* (Linnaeus, 1758) als Beute der Regenbogenforelle, *Salmo gairdneri* Richardson, 1836, und der Seeforelle, *Salmo trutta lacustris* Linnaeus, 1758. *Herpetozoa* (Wien) 1: 69–71.
- Esterbauer H (2019) Die Ringelnatter – *Natrix natrix* (Linnaeus, 1758) im Mostviertel (Niederösterreich): Ergebnisse aus zehn Jahren Untersuchung. *ÖKO.L* 41: 17–29.
- Haddix TL, Budy P (2005) Factors that limit growth and abundance of rainbow trout across ecologically distinct areas of Flaming Gorge Reservoir, Wyoming–Utah. *North American Journal of Fisheries Management* 25: 1082–1094. <https://doi.org/10.1577/M04-157.1>
- Isaac LA, Gregory PT (2007) Aquatic versus terrestrial locomotion: Comparative performance of two ecologically contrasting species of European natricine snakes. *Journal of Zoology* (London, England) 273: 56–62. <https://doi.org/10.1111/j.1469-7998.2007.00299.x>
- Juncos R, Milano D, Macchi PJ, Vigliano PH (2011) Response of rainbow trout to different food web structures in Northern Patagonia: Evidence from diet and stable isotopes. *Transactions of the American Fisheries Society* 140: 661–676. <https://doi.org/10.1080/00028487.2011.572000>
- Kats LB, Ferrer RP (2003) Alien predators and amphibian declines: Review of two decades of science and the transition to conservation. *Diversity and Distributions* 9: 99–110. <https://doi.org/10.1046/j.1472-4642.2003.00013.x>
- Keiz G (1963) Eine schlangenfressende Regenbogenforelle. *Allgemeine Fischerei-Zeitung* 88: 576.
- Orizaola G, Braña F (2006) Effect of salmonid introduction and other environmental characteristics on amphibian distribution and abundance in mountain lakes of northern Spain. *Animal Conservation* 9: 171–178. <https://doi.org/10.1111/j.1469-1795.2006.00023.x>
- Rodger AW, Wolf SL, Starks TA, Burroughs JP, Brewer SK (2021) Seasonal diet and habitat use of large, introduced rainbow trout in an Ozark highland stream. *North American Journal of Fisheries Management* 41(6): 1764–1780. <https://doi.org/10.1002/nafm.10694>
- Smith M (1973) *The British amphibians and reptiles*. 5th ed. Collins, London. <https://doi.org/10.2307/1442391>
- Spurgeon JJ, Paukert CP, Healy BD, Kelley CA, Whiting DP (2014) Can translocated native fishes retain their trophic niche when confronted with a resident invasive? *Ecology Freshwater Fish* 24(3): 456–466. <https://doi.org/10.1111/eff.12160>
- Stanković D, Crivelli AJ, Snoj A (2015) Rainbow trout in Europe: Introduction, naturalization, and impacts. *Reviews in Fisheries Science and Aquaculture* 23(1): 39–71. <https://doi.org/10.1080/23308249.2015.1024825>
- Stribosch H (1981) Inheemse slangen als prooi voor andere dieren. *De levende Natuur* 83: 147–156.
- Thomas O, Allain SJR, Owen H (2021) Predation and ingestion of a barred grass snake *Natrix helvetica* by a rainbow trout *Oncorhynchus mykiss* in Lot, France. *Herpetological Bulletin* 156: 40–41. <https://doi.org/10.33256/hb156.4041>

Supplementary material 1

Dissection video documenting predation of *Natrix natrix* by *Oncorhynchus mykiss* in a Bavarian stream

Authors: Christian Vogelmann, Philip Wendt, Andreas Martens

Data type: mp4

Explanation note: Video documentation of the stomach dissection of a rainbow trout (*Oncorhynchus mykiss*) caught in the River Ammer, Germany (May 2025), showing three juvenile grass snakes (*Natrix natrix*) as prey items.

Copyright notice: This dataset is made available under the Open Database License (<http://opendatacommons.org/licenses/odbl/1.0>). The Open Database License (ODbL) is a license agreement intended to allow users to freely share, modify, and use this Dataset while maintaining this same freedom for others, provided that the original source and author(s) are credited.

Link: <https://doi.org/10.3897/aiep.56.176058.suppl1>