The role of predation in the diet of Niphargus (Amphipoda: Niphargidae)

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Niphargus (Amphipoda: Niphargidae) is the largest genus of freshwater amphipods, with over 300 described species. Recently, it was identified as important for addressing ecological and evolutionary questions. Nevertheless, the exploration of these issues critically depends on understanding the biology of individual species, which is mostly unknown. For instance, utilization of food sources has rarely been studied. Laboratory observations acknowledged a broad spectrum of foraging behaviors in N. virei Chevreux 1896 and N. fontanus Bate 1859, ranging from limnivory, detritivory, predation on oligochaetes and arthropods, feeding on decayed leaves and carrion, and fish flakes. Sket briefly mentioned how N. krameri Schellenberg 1935 fed on dead conspecifics. Finally, Mathieu et al. speculated that adult N. rheinorhodanesis Schellenberg 1937 could prey upon their own conspecifics. Here we report on dietary data of two species from the Dinaric Karst.

In 2001, we held several individuals of the troglobiotic Niphargus balcanicus Absolon 1927 in an aquarium. Unlike many other amphipods, this large (about 30 mm) species retains an upright position during activity (swimming, walking on ground) and rest. The animals were kept in the speleological laboratory in permanent darkness at 8 °C. After a few days, we dropped a live isopod Asellus aquaticus (about 10 mm long) into the tank. The isopod never reached the bottom: the niphargid intercepted it, vigorously seized it with its gnathopods, smashed and ate it. All other Asellus occasionally fed to the amphipods later on were seized and eaten immediately. Elements of active predatory behavior were also observed in this species in its natural environment in Vjetrenica Cave, Herzegovina. Observed in a pool, a passing cave shrimp (Troglocaris sp.) attracted the attention of a N. balcanicus individual. The amphipod turned toward the shrimp, following it for about half a meter but failed to catch it because it was swimming too fast. It is hard to imagine what would have happen if it did catch the shrimp, because both animals were approximately of the same length, the shrimp being much bulkier than the amphipod.
The other species, *N. timavi* Karaman 1954 is endemic to two small karstic drainages in the northwestern Dinaric Karst. In 2004, several hundred animals were found feeding on a dead grass snake (*Natrix natrix*) in the spring of Podstenjišek in southwestern Slovenia. In 2007, we collected several samples of *N. timavi* from a locality nearby (spring of Kolaški potok). At that site, *N. timavi* dwells in sympatry with the surface amphipod *Gammarus fossarum* Koch 1835. In order to find out whether the two species select different food, we examined stomach contents of 14 specimens of each species. All specimens were measured and partially dissected to obtain the anterior part of the digestive tract (cardial stomach). The stomachs were subsequently macerated in glycerin on microscopic slides. Their contents were examined under a light microscope and described qualitatively. In both species we identified four types of food particles, namely debris of vascular plants (well preserved plant cells), filamentous plant material (colorless filaments with thick, walls, resembling fine roots), algal cells, and arthropod remnants. The *G. fossarum* specimens measured between 9-14 mm, the *N. timavi* specimens 7-15 mm. The food composition of both species was essentially the same. It consisted mainly of plant material, where plant debris was most commonly found, while arthropod remnants were found in only three specimens of each species (Figure 1). It is unclear whether arthropod remnants originated from carrion or from prey.

![Figure 1](image-url)

**Figure 1.** Frequency of food types observed in stomachs examined in a surface (*Gammarus fossarum*) and a subterranean (*Niphargus timavi*) amphipod species at a site of sympatric occurrence. Fourteen specimens of each species were examined.
In short, data on *N. timavi* support the hypothesis that niphargids are generalists in foraging behavior. Moreover, the observations on *G. fossarum* and *N. timavi* do not contradict the notion that predation is an important feeding strategy in freshwater amphipods. Observations on *N. balcanicus* even reinforce this view, implying that specialized subterranean amphipods may prey on animals up to their own size.

**Literature Cited:**