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The *Pseudamnicola* spp. from Greece (Gastropoda: Hydrobiidae) with the description of four new species

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Abstract

Four species of the genus *Pseudamnicola* (Gastropoda: Hydrobiidae Stimpson, 1865), i.e. *P. stasimoensis* n. sp., *P. lesbosensis* n. sp., *P. samosensis* n. sp. and *P. skalaensis* n. sp are described as new to science. The type localities of 13 *Pseudamnicola* spp. and 1 subspecies hitherto known from Greece, including the Greek part of Cyprus, are presented on a map.

Key words: *Pseudamnicola*, new species, Greece, Peloponnesos, Lesbos, Samos.

Introduction

When Schütt (1980) wrote his paper about the Hydrobiids of Greece, he mentioned six *Pseudamnicola* spp. and one subspecies from continental Greece (*Pseudamnicola macrostoma* (Küster 1853) and *Pseudamnicola macrostoma negropontina* (Clessin 1878)), *Pseudamnicola. exilis* (Frauenfeld 1863) from the Peloponnesos, and the others from the Aegean islands: *Pseudamnicola brachia* (Westerlund 1996) from the island of Crete, *Pseudamnicola chia* Martens 1889 from the island of Chios, *Pseudamnicola pieperi* Schütt 1980 from the island of Karpathos and *Pseudamnicola malickyi* (Schütt 1980) from the Greek part of Cyprus.

Radea and Parmakelis (2015) described *Pseudamnicola ianthe* from the island of Rhodes. Later Falniowski (2016) described *Pseudamnicola magdalenae* from the island of Kythira and Glöer & Hirschfelder (2019) could add *Pseudamnicola occulta* in 2019 from the island of Crete.

In 2015 Szarowska et al. (2015) sequenced numerous samples from Greece and found 16 main mitochondrial clades, most of them endemic to their type localities.

This paper is intended to describe another four *Pseudamnicola* spp. from Greece which were collected in 2007, 2008 and 2010 by Robert Reuselaars in the Peloponnesos and on the islands of Samos and Lesbos.

Material and methods

The snails have been collected by Robert Reuselaars and fixed in 80% ethanol. Unfortunately the alcohol evaporated during the long period of storage so we could not study the anatomy. The specimen were taken by hand or with a tweezers in the springs of Pnaka (figure 1), Stassimo, Tripi and the spring between Argenos and Lepetymnos. On these localities only a few specimen were collected to avoid disturbing these small populations too much. A sieve has been used in the strong running water of the Vasilopotamus river near Skala. Of the three new species, two are living in a habitat of about only 1-1,5 m² and in relatively low densities (see figures 3 and 6).

The measurements of the shells were carried out using a stereo microscope (ZEISS) with an eyepiece micrometer; the photographs were made with a digital camera system (Leica R8). The type material is stored in RMNH (Rijksmuseum van Natuurlijke Historie Naturalis Leiden, The Netherlands) and in the collection of Robert Reuselaars.

Study Area

Greece is a hotspot for land and freshwater molluscs (Strong et al. 2008). Despite the fact that Greece is visited by many malacologists in the past, there is a continuous flow of new discoveries (Radea et al. 2015, Szarowska et al. 2015, Falniowski 2015, Glöer & Hirschfelder 2019, Glöer & Reuselaars 2020, Glöer & Hirschfelder 2020). In this article we present our findings on the freshwater genus *Pseudamnicola*. As shown on the map, the distribution of this genus is concentrated in the Aegean area, except for the islands in the central part. It seems to be absent in the northern and western part of continental Greece and the northern and central part of the Peloponnesos. On many visits in Greece in the past 20 years, no *Pseudamnicola* sps were discovered in those areas.

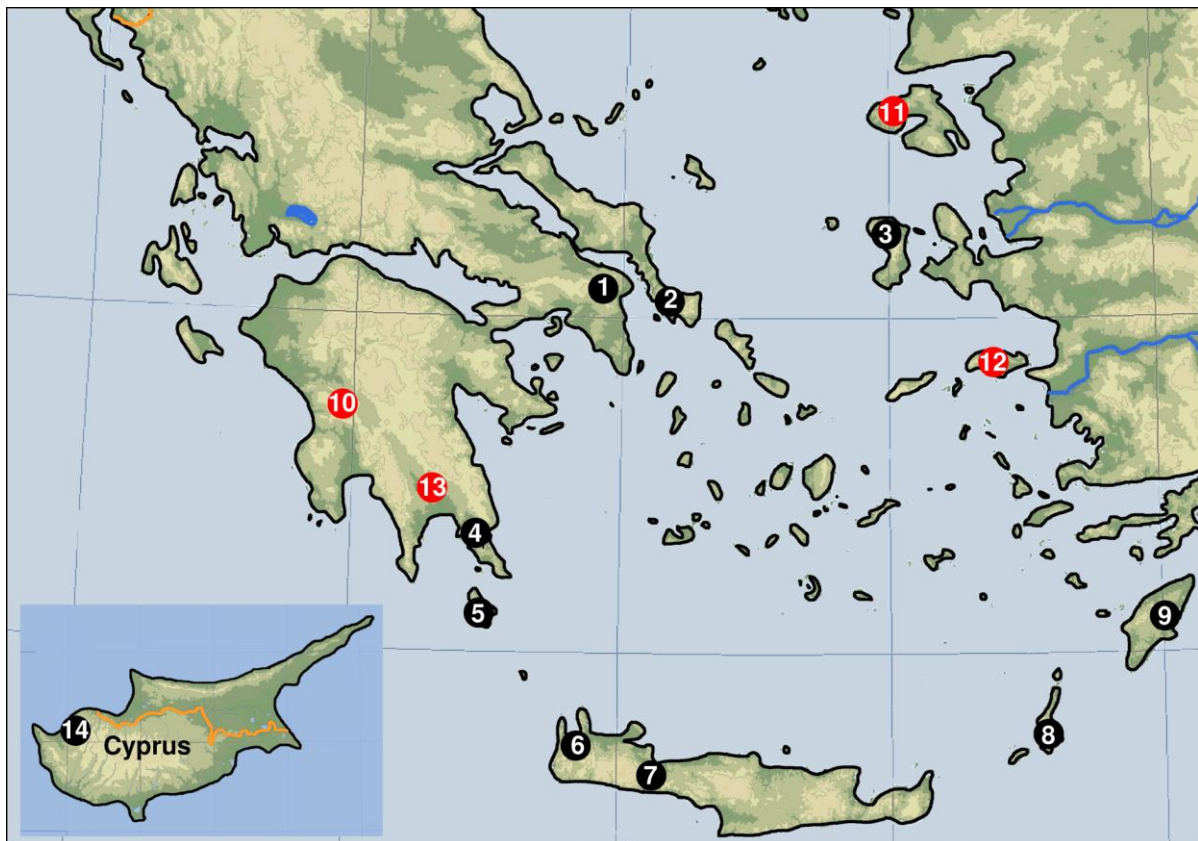


Figure 1. The type localities of the *Pseudamnicola* spp. of Greece. Black dots (1-9 and 14) hitherto known (sub)species, red dots (10-13) species described here as new. 1: *Pseudamnicola macrostoma*, 2: *Pseudamnicola macrostoma negropontina*, 3: *Pseudamnicola chia*, 4: *Pseudamnicola exilis*, 5: *Pseudamnicola magdalenae*, 6: *Pseudamnicola occulta*, 7: *Pseudamnicola brachia*, 8: *Pseudamnicola pieperi*, 9: *Pseudamnicola ianthe*, 10: *Pseudamnicola stassimoensis* n. sp., 11: *Pseudamnicola lesbosensis* n. sp., 12: *Pseudamnicola samosensis* n. sp., 13: *Pseudamnicola skalaensis* n. sp., 14: *Pseudamnicola malicky*.

Results

Genus *Pseudamnicola* Paulucci, 1878

Type specie: *Bythinia lucensis* ISSEL 1866

Pseudamnicola stasimoensis n. sp. [fig. 2.1]

Material examined: Holotype (RMNH.MOL.347628) and 30 paratypes from type locality (0.5 km northeast of Stasimo) and 2 from the spring in the town of Stasimo.

Holotype: 2.0 mm high, 1.3 mm broad from type locality.

Paratypes: 2 paratypes (RMNH.MOL.347629), 3 ex. in coll. Peter Glöer, 25 ex. in coll. Robert Reuselaars (no. 758) from type locality, 2 ex. in coll. Robert Reuselaars (no. 687) from the spring in the town of Stasimo.

Locus typicus: Spring 0.5 km northeast of Stasimo, Peloponnesos, Greece, 37°23'30.66817" N 21°56'01.58046" E, Robert Reuselaars 22.09.2010 leg.

Sampling site 2: Spring in the town of Stasimo, Peloponnesos, Greece, 37°23'22.65283" N 21°55'31.61080", Robert Reuselaars 22.09.2010 leg.

Habitat (type locality): Small artificial basins and gutter below the outflow of the spring where the species was found on the sandy gravel and old leaves. Habitat is less than 1.5 m².

Etymology: Named after the town Stasimo.

Description: The shell is ovate with 4-4.5 slightly convex whorls with a deep suture. The aperture is ovate, slightly angled at the top. The peristome is sharp, thickened at the columella and somewhat reflexed. The umbilicus is closed. The body whorl takes 0.8 of shell height. The aperture is 0.8 mm high and 0.8 mm broad. The ratio of shell height to shell width is 1.5. The shell is 2.0 mm high and 1.3 mm broad.

Differentiating characters: The body whorl is broader than in the other *Pseudamnicola* spp.

Distribution: Greece; only known from type locality.



Figure 2. The new *Pseudamnicola* spp. 1: *Pseudamnicola stasimoensis* n. sp., 2: *Pseudamnicola lesbosensis* n. sp., 3: *Pseudamnicola samoensis* n. sp., 4: *Pseudamnicola skalaensis* n. sp.

Pseudamnicola lesbosensis n. sp. [fig. 2.2]

Material examined: Holotype (RMNH.MOL.347626) and 27 paratypes from type locality.

Holotype: 2.0 mm high, 1.2 mm broad from type locality.

Paratypes: 2 ex. (RMNH.MOL.347627), 1 ex. in coll. Peter Glöer, 4 adult, 13 subadult and 7 juvenile ex. in coll. Robert Reuselaars (no. 756) from type locality

Locus typicus: Spring between Argenos and Lepetymnos, northeast of the island of Lesbos, Greece, 39°21.67536" N 26°16.24839" E, Robert Reuselaars 07.05.2007 leg.

Habitat: Artificial basin of about 1 m² below outflow of the spring where the species was found on sandy gravel.

Etymology: Named after the island of Lesbos.

Description: The shell is ovate with 4.5-5 slightly convex whorls which are separated by a deep suture. The aperture is ovate, angled at the top. The peristome is slightly thickened at the columella, The umbilicus is closed. The body whorl takes 0.8 of shell height. The aperture is 0.8 mm high and 0.7 mm broad. The shell is 2.0 mm high and 1.2 mm broad.

Distribution: Greece; only known from type locality.

Pseudamnicola samosensis n. sp. [fig. 2.3]

Material examined: Holotype (RMNH.MOL.347621) and 20 paratypes from type locality.

Holotype: 1.95 mm high, 1.2 mm broad from type locality.

Paratypes: 2 ex. (RMNH.MOL.347622), 1 ex. in coll. Peter Glöer, 6 adult, 6 subadult and 5 juvenile ex. in coll. Robert Reuselaars (no. 553) from type locality.

Locus typicus: Spring in Pnaka, on the northeast of the island of Samos, Greece, 37°47.50768" N 26°50.91700" E, Robert Reuselaars 07.08.2008 leg.

Habitat: Artificial basin about 1-1,5 m² of the spring, the species was found on the sandy mud on the bottom of the spring and on the sides of the artificial basin amongst algae.

Etymology: Named after the island of Samos.

Description: The shell is ovate with 4-4.5 slightly convex whorls with a deep suture. The aperture is ovate, rounded at the top. The peristome is sharp and the umbilicus is closed. The body whorl takes 0.8 of shell height. The aperture is 0.8 mm high and 0.7 mm broad. The ratio of shell height to shell width is 1.4. The shell is 2.0 mm high and 1.3 mm broad.

Distribution: Greece; only known from type locality.

Pseudamnicola skalaensis n. sp. [fig. 2.4]

Material examined: Holotype (RMNH.MOL.347623) and 27 paratypes from type locality west of Skala: 41 paratypes from the spring in Tripi.

Holotype: 1.85 mm high, 1.2 mm broad from type locality.

Paratypes: 2 ex. (RMNH.MOL.347624). 1 ex. in coll. Peter Glöer, 7 adult, 5 subadult and 12 juvenile ex. in coll. Robert Reuselaars (no. 741) from type locality. 2 Ex. (RMNH.MOL.347625), 3 ex. in coll. Peter Glöer, 8 adult, 15 subadult and 13 juvenile ex. in coll. Robert Reuselaars (no. 757) from the spring in Tripi.

Locus typicus: Vasilopotamos river near the bridge over the river, west of Skala, Peloponnesos, Greece, 36°50' 36.80320" N 22°38' 48.62719" E, Robert Reuselaars 19.09.2010 leg.

Sampling site 2: Spring in Tripi, Taygetos mountains, Peloponnesos, Greece 37°05'36.76754" N 22°20'49.59351" E, Robert Reuselaars 24.09.2010 leg.

Other material examined: Spring is Faskomilia, Taygetos mountains, Peloponnesos, Greece 37°26'24.50127" N 21°44'52.49749" E 22.09.2010 in coll. Robert Reuselaars (no. 759).

Habitat of type locality: Strong running river where the species was found amongst waterplants, while another locality (Tripi) is an artificial basin and gutter of the spring where the species was found amongst algae.

Etymology: Named after the nearby town Skala.

Description: The shell is elongated ovate with 4.5-5 convex whorls which are separated by a deep suture. The aperture is ovate, slightly angled at the top and detached from the shell wall. The peristome is sharp. The umbilicus is closed. The body whorl takes 0.8 of shell height. The aperture is 0.8 mm high and 0.7 mm broad. The shell is 1.9-2.0 mm high and 1.2 mm broad.

Distribution: Greece; known from two localities in the Peloponnesos.

Conservation

Of the *Pseudamnicola* sps which are described in this article, we consider the species *samosensis* and *lesbosensis* as critically endangered due to the low number of specimen and both are restricted to a single

spring where they live in and which is already under human pressure. *Pseudamnicola stasimoensis* is known of two springs with a very small habitat. This species is also considered as critically endangered due to human pressure. We do not consider *Pseudamnicola skalaensis* as endangered because it is living in in the spring in Tripi and the Vasilopotamos river near Skala town. However if someone decides to clean the gutter of the spring in Tripi this species most likely will be eradicated from this location.



Figure 3-8. The type localities of the new *Pseudamnicola* spp. 3: Spring in Pnaka, type locality of *P. samosensis*, 4: Vasilopotamos river, near the bridge west of Skala, type locality of *Pseudamnicola skalaensis*, 5: spring in Tripi, secondary locality of *P. skalaensis*, 6: spring between Argenos and Lepetymnos, type locality of *P. lesbosensis*, 7: spring 0.5 km northeast of Stasimo, type locality of *Pseudamnicola stasimoensis*, 8: spring in Stasimo secondary locality of *P. stasimoensis*.

Our contribution to the knowledge of springsnails in Greece is important if we want to protect these species. Springs are very sensitive ecosystems (Cantonati et al. 2006, Savić et al. 2019). Most species in Greece are serious under stress where springs are used for drinking water or irrigation purposes. Human impact has led to the extinction of many springsnail species in the past and will lead to more extinctions if they will not be protected. But this is not only the case with springs. During a field trip in september 2019 we noticed the very low water levels in the lakes Prespa, Kastoria, Zirou and Pamvotis (see figure 9). Most of these lakes are used as water reservoir for irrigation and/or drinking water and a combination of long droughts and closing the water supply from springs (i.e. the springs at the east bank of lake Pamvotis) have led to these very low water levels. At the eastern bank of lake Pamvotis we saw hundreds of fresh shells of *Sinanodonta woodiana* (introduced) and *Viviparus hellenicus* in the mud, all died during the summer. At lake Zirou this was the case with *Unio crassus*. All these species also live in deeper water of these lakes, so most likely they will survive, for now. This is just another example of human impact on freshwater ecosystems which can lead to the extinction of species.



Figure 9. Eastern bank of lake Pamvotis, normal water level is almost up to the vegetation. (Photo by R. Reuselaars).

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