

# New Genera *Anadoludamnicola* and *Sivasi* (Gastropoda: Hydrobiidae) from Sivas and Malatya (Turkey)

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**Abstract:** New freshwater genera (*Anadoludamnicola* and *Sivasi*) of Hydrobiidae are described for new hydrobiid species (*Anadoludamnicola gloeri* and *Sivasi bodoni*) from material collected from provinces Sivas and Malatya (Turkey), using anatomical and morphological data. For now, *Sivasi* is known from a single locality, while we expect *Anadoludamnicola* will be found to be commonly distributed in Anatolia.

**Key words:** Hydrobiidae, *Anadoludamnicola*, *Sivasi*, East Anatolia

## Introduction

Since the late Triassic, Anatolia witnessed active geological evolution. Tethys-related land evolution was partially completed by the late Miocene and by the Pliocene, evolution of aquatic systems continued. Diversity of the land and aquatic environment yielded a rich biota in the systems formed. Little of this rich fauna has been clarified by malacological studies, which have increased in recent years (ÖNAL and KAYA 2007, ŞENGÖR and YILMAZ 2003).

In hydrobiids, with the addition of the species described in the presented paper, 46 species are known from Turkey so far. Most of the genera and species are, as far as are known, endemic to Anatolia up to 50% (YILDIRIM *et al.* 2006). But, the lack of detailed studies and regional expertise of researchers has resulted in taxonomical problems when comparing the local fauna to that of Europe. For instance, *Paludina natolica* Küster 1852 named as *Pseudamnicola natolica* (Küster 1852) by SCHÜTT (1965), later Radoman refused as *Pseudorientalia natolica* (1973) in the end of the long years (RADOMAN 1983). After si-

milar studies, the genus *Pseudamnicola*, reported to be common throughout Anatolia, was seen to be restricted to Eastern Anatolia only (SCHÜTT and BILGIN, 1970, SCHÜTT and ŞEŞEN, 1993). Thus further revisions are needed in the group. In this poorly studied region of Turkey, so far Hydrobiidae genera *Islamia*, *Sadleriana*, *Pseudamnicola*, *Belgrandiella*, *Sheitanokok*, *Hydrobia*, *Ventrosia*, *Pyrgorientalia*, *Bythinella*, *Kirelia*) were found (SCHÜTT and BILGIN 1970, SCHÜTT and ŞEŞEN 1993, YILDIRIM *et al.* 2004).

Here, two new genera of Hydrobiidae (*Anadoludamnicola* and *Sivasi*) and two new species (*A. gloeri* and *S. bodoni*) and one subspecies (*A. gloeri brevis*) are described from Sivas and Malatya. Identification has been realised by comparing the anatomy and morphology of the material collected.

## Material and Methods

Sampling was quantitative using Ekman grab (225 cm<sup>2</sup>). Gastropods were separated from sedi-

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ment using a system of sieves of different mesh sizes (20, 2, 1 and 0.5 mm). Gastropods were preserved in 75% ethanol. Samples were collected from 3 stations with inflatable boat (Fig. 1). between August 2005 and September 2006. WELCH'S (1948) method was followed to collect, sift and preserve the samples. The dissections and measurement of the genital organs and the shell were carried out using a stereo microscope (Olympus, SZX12). Totally 82 species have been dissection (22 species belong to *Anadoludamnicola gloeri*, 27 species belong to *Sivasi bodoni* and 33 species belong to *A. gloeri brevis*). The photographs were taken with a digital camera (Olympus C-5060).

Type materials, paratypes and holotypes are deposited in IUSHM (İstanbul University Science Faculty Hydrobiology Museum)

Abbreviations: ago: accessory gland of oviduct; bc: bursa copulatrix; gp: gonopore; ovd: oviduct; p: penis; rs: receptaculum seminis; I: intestine; OE: oesophagus; SL: shell length; SW: shell width; AL: aperture length; AW: aperture width.

#### *Anadoludamnicola* n. gen.

**Diagnosis:** A genus of Hydrobiidae, living in freshwater springs, characterized by a very minute shell that is ovoid conical and has a strongly developed last whorl. Umbilicus closed by the inner lip. Operculum is typically orange coloured. Genital system of male and female are similar to *Pseudamnicola* with 1 receptaculum seminis and penis is large and getting narrower; rather sparsely pigmented. Oviduct isn't black; seminal receptacle is small and elongated.

**Type species:** *Anadoludamnicola gloeri* n.sp.

#### *Anadoludamnicola gloeri* n.sp.

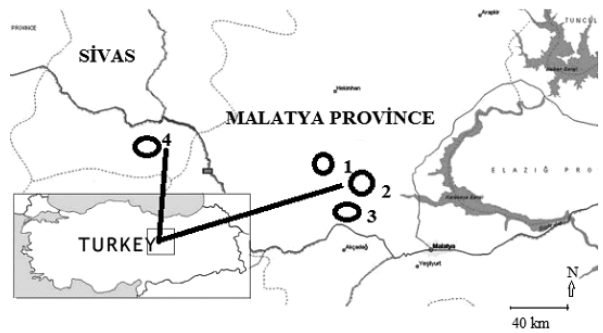
##### Description

**Shell (Fig. 2a):** Shell thin, dully horn coloured, with apex not very acute and 3-3,5 whorls; shell ovoid conical with a strongly developed last whorl more developed and oval aperture nearly angular at the top; umbilicus closed by the lip, suture not deep.

**Operculum (Fig.2b):** Operculum ellipsoidal, paucispiral, nucleus submarginal, typical operculum is orange in colour, but nucleus is darker.

**Body (Fig. 2c):** Eye spots present, lower part of tentacles and area surrounding eyes is pigmented.

**Male genitalia (Fig. 2d):** Male genitals with a rather elongated penis, at the distal end pointed and rather pigmented.



**Fig. 1.** The sampling sites of new taxa. (1:Malatya-Akçadağ-Melet, 2: Malatya-Akçadağ-İnekpınarı, 3: Malatya-Akçadağ-Takas, 4: Sivas-Gürün- Gökpinar)

**Female genitalia (Fig. 2e):** Female genital with a bursa copulatrix of normal size and with a long duct connecting with the oviduct at the middle part of the albumen gland. There is a thin and long receptaculum seminis.

**Radula (Fig. 2f):** Central tooth of radula has 1 cusp at each side of the base; on the upper side of the central tooth are 9 cusps (1 median, and 4 cusps on each side).

**Stomach and intestine (Fig. 2g):** Stomach is bean shape, without gastric caecum, having two chambers. Intestine enveloping the style sack up to the midsection.

**Type locality:** Malatya-Akçadağ, İnek Pınarı 38° 31' 08.04"N 38° 00' 28.93"E; Small spring in the Picnic area. Snails living on all surfaces of stones in the spring.

**Details water:** pH: 8,1; dissolved oxygen: 9.2 mg/L, water temperature: 22.3 °C; conductivity: 315 µs/cm.

**Other localities:** Malatya-Akçadağ Melet Deresi. 38° 11' 11" N, 37° 59' 28" E (10 September 2005). Small stream. Snails living on all surfaces of stones and on the *Ceratophyllum* sp. in the stream. **Details water:** pH: 8.2; dissolved oxygen: 8.6 mg/L; water temperature: 21.2 °C; conductivity: 330 µs/cm

##### Type material

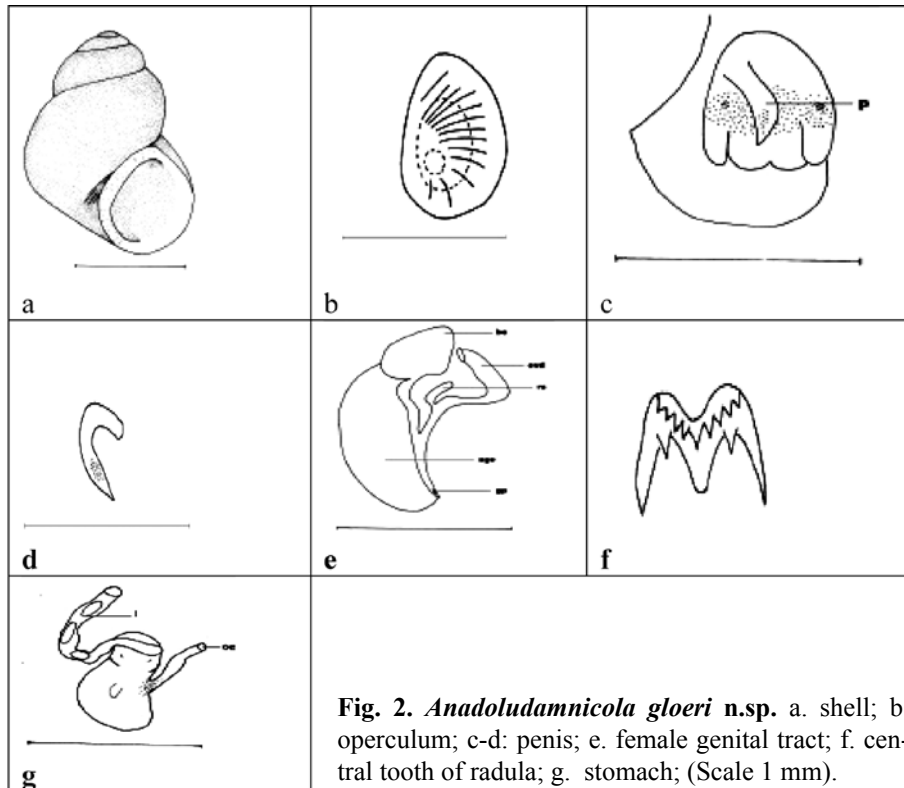
**Holotype:** IUSHM 2012-1039. Holotype dimensions: SL: 1.9 mm, SW: 1.7 mm, AL: 1.0 mm, AW: 0.9 mm.

**Paratypes:** Paratypes 2 samples IUSHM 2012-1040.

**Etymology:** The name of genus derived from Anatolia in Turkish and closest relative 'damnicola'. Specific epithet is named in honour of malacologist Peter Glöer.

**Table 1.** Dimensions of *Anadoludamnicola gloeri*, n: 21.

	Height of shell	Diameter of shell	Height of aperture	Diameter of aperture	HS/DS	HA/DS
<b>min</b>	1.69	1.44	0.94	0.78	1.104	1
<b>max</b>	2.41	1.87	1.22	1.09	1.401	1.218
<b>average</b>	1.951±0.070	1.621±0.040	1.063±0.029	0.95±0.030	1.203±0.030	1.122±0.018



**Fig. 2.** *Anadoludamnicola gloeri* n.sp. a. shell; b. operculum; c-d. penis; e. female genital tract; f. central tooth of radula; g. stomach; (Scale 1 mm).

***Anadoludamnicola gloeri brevis* n.subsp.**

**Description**

**Shell (Fig. 3a):** General view of shell similar to nominal species but subspecies is smaller in size. Shell dull horny, with a blunt apex and 2-3 whorls; ovoid conical with more developed last whorl and oval aperture nearly angular at the top side; umbilicus closed by the lip.

**Operculum (Fig. 3b):** Operculum ellipsoidal, paucispiral, nucleus submarginal, orange coloured, but nucleus darker.

**Body (Fig. 3c):** Face is dark black and eye spots present but not perceptible because of black face.

**Male genitalia (Fig.3d):** Male genital similar with the nominal species.

**Female genitalia (Fig.3e):** Female genital similar with the nominal species.

**Radula (Fig.3f):** Radula similar with the nominal species.

**Type locality:** Malatya, Takas Village (38° 31' 03.85 "N 38° 00' 46.78" E).

Small spring and its pool. Snails living on the surfaces of the stones in the pool. **Details water:** pH: 7.6; dissolved oxygen: 10.3 mg/L; water temperature: 20.7 °C; conductivity: 250 µs/cm.

**Other localities:** As far as is known, only from the type locality Takas from Malatya.

**Type material**

**Holotype:** IUSHM 2012-1041 Holotype dimensions SL: 1.2 mm, SW: 1.2 mm, AL: 0.7, AW: 0.7 mm.

**Paratypes:** paratypes 2 samples IUSHM 2012-1042.

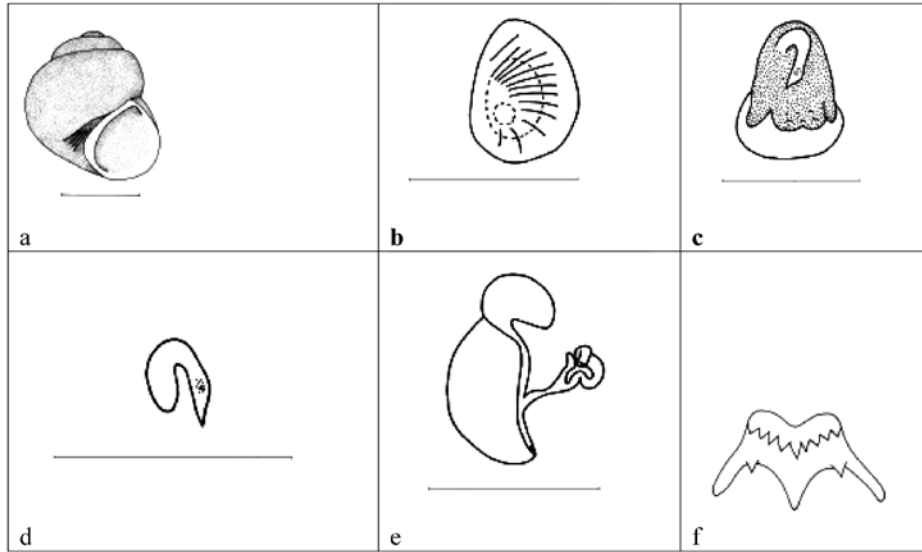
**Etymology:** The name of subspecies derived from smaller shell.

***Sivasi* n. gen.**

**Diagnosis:** A genus of Hydrobiidae, living in freshwater springs, characterized by large ovoid

**Table 2.** Dimensions of *Anadoludamnicola gloeri brevis*, n: 20

	Height of shell	Diameter of shell	Height of aperture	Diameter of aperture	HS/DS	HA/DS
min	1.09	1.12	0.68	0.65	0.924	0.958
max	1.44	1.25	0.78	0.78	1.180	1.103
average	1.295±0.031	1.219±0.013	0.741±0.013	0.717±0.012	1.063±0.024	1.034±0.014



**Fig. 3.** *Anadoludamnicola gloeri brevis* n. sub. sp. a. shell; b. operculum; c-d: penis; e. female genital tract; f: central tooth of radula (scale 1 mm).

shell, with blunt, rounded mostly corroded apex, more developed last whorl, rather deep suture. Distal side of penis is large, the end of it resembles a bird's claw and slightly pigmented. Female genitals with a rather big bursa copulatrix; big and elongated  $rs_1$  is situated and lying near oviduct.

**Etymology:** From Sivas, locality in Turkey near which the new genus was discovered.

**Type species:** *Sivasi bodoni* n. sp.

***Sivasi bodoni* n. sp.**

**Description**

**Shell (Fig. 4a):** Shell large ovoid, dull horny, with a blunt apex and 2-2,5 swollen whorls; last whorl strongly developed; umbilicus small slit like, or closed.

**Operculum (Fig. 4b):** Operculum elongate-ellipsoidal, paucispiral, nucleus submarginal, and orange in colour, but nucleus darker.

**Body (Fig. 4c):** Face is dark black and eye spots present but sometimes eyes not perceptible because of black face.

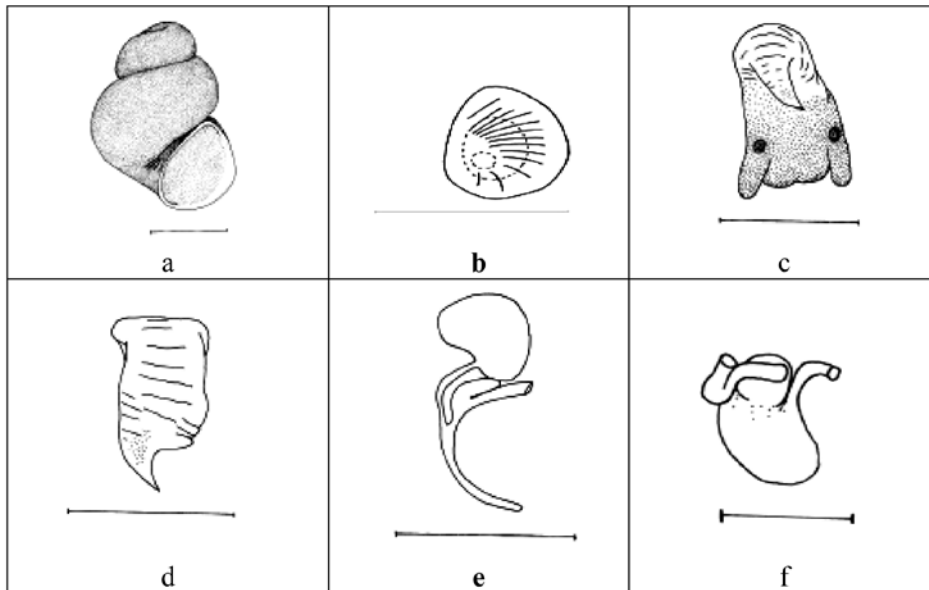
**Male genitalia (Fig. 4d):** Proximal side of penis is large, distal end resembling a bird's claw and slightly pigmented.

**Female genitalia (Fig. 4e-f):** Female genitals with a rather big bursa copulatrix; big and elongated ( $rs_1$ ) is situated and lying near oviduct.

**Type locality:** Sivas-Gürün Gökpınar, 38° 39' 22"N 38° 18' 15"E. Type locality is small lake fed by springs.

**Table 3.** Dimensions of *Sivasi bodoni*, Sivas-Gökpınar n: 21

	Height of shell	Diameter of shell	Height of aperture	Diameter of aperture	HS/DS	HA/DS
min	1.91	1.53	0.97	0.91	1.038	0.893
max	2.78	2.19	1.44	1.41	1.712	1.147
average	2.436±0.046	1.888±0.042	1.179±0.026	1.135±0.029	1.298±0.029	1.043±0.015



**Fig. 4.** *Sivasi bodoni* n.sp. a. shell; b. operculum c-d. penis; e. female genital tract; f. stomach (scale 1 mm).

**Other localities:** *S. bodoni* is known only at the Type Locality (Sivas-Gürün-Gökpinar).

**Type material**

**Holotype:** IUSHM 2012-1043. Holotype dimensions: SL: 2.4 mm, SW: 1.7 mm, AL: 1.2, AW: 1.1 mm.

**Paratypes:** Paratypes 2 samples IUSHM 2012-1044

**Etymology:** The name of the genus is derived from the Sivas city in Turkey; the species is named in honour of Dr. Marco Bodon.

## Discussion

In order to determine whether our new *Anadoludamnicola* and *Sivasi* species are new, we compared them with all other hydrobiid taxa mentioned in the literature from Central Europe: Especially *Sadleriana* species which are similar (GLÖER 2002), Turkey: (SCHÜTT and ŞEŞEN 1993, SCHÜTT and BİLGİN 1970, BİLGİN 1980, SC 1980) and other Balkan countries (RADOMAN 1983).

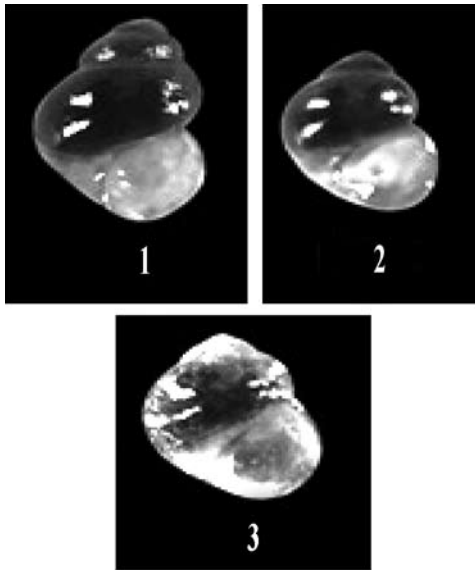
Among the forms in neighbouring areas, the new genus *Anadoludamnicola* is most close anatomically to *Pseudamnicola*. Presence of one receptaculum seminis and an tapering straight penis are the shared characters. This resemblance marks the relativeness of closely distributed genera. However, *Pseudamnicola* has black pigmentation in the ovary canal and enlarged oviduct

(RADOMAN 1983), which is not in the new genus. Also *Sadleriana* Clessin, 1890 and *Pseudorientalia* Radoman, 1973 are similar in penial morphology, but they differ in having two rs instead of one (GLÖER 2002 and RADOMAN 1983).

SCHÜTT (1980) described the *Pseudamnicola* species which have a black ovary canal, however ovary canal is not black in two new genera in our study.

Considering the other species recorded from the region, BOETTGER (1957) described *Pseudamnicola lindbergi* from Elbistan (Type locality Elbistan originally reported to be a town in Malatya, but it belongs to Kahramanmaraş province close to Malatya) using shell characters, but shell characters of the species (olive green coloration and corroded apex) does not fit with *Anadoludamnicola gloeri* n. gen. n. sp. Another aspect to be mentioned is that the presence of the new genera may indicate that the taxonomical status of Anatolian '*Pseudamnicola*' should be re-evaluated. At least this study shows the absence of real *Pseudamnicola* in the studied area.

Among regional *Pseudamnicola* species, *Pseudamnicola bilgini* described by SCHÜTT and ŞEŞEN (1993) from Amrud spring (Kızıltepe) Mardin is distinctive with a long bursa copulatrix uncommon in the genus, but penial characters and the coloration of the oviduct is similar to that of *Pseudamnicola*. Female characters of *Pseudamnicola intranodosa* described by SCHÜTT and ŞEŞEN (1993) from Düziçi, Urfa are not known but this species is differentiated



**Fig. 5.** 1: *Anadoludamnicola gloeri*, 2: *Anadoludamnicola gloeri brevis*, 3: *Sivasi bodoni*

from *Anadoludamnicola* by a small tubercle on the inner lip and black oviduct.

Conchologically, *Sivasi* n.gen is also similar to *Pseudamnicola* (Zhadii, 1952). But the male and female genitalia are clearly different: *Pseudamnicola*

genus has tapering straight penis shape while *Sivasi* genus has the penis like bird's claw. The oviduct *Pseudamnicola*'s is not black in *Sivasi*. Penial shape is also very characteristic in differentiation from other similar genera like *Anadoludamnicola* and *Sadleriana*.

Accordingly, both new genera can be differentiated from *Pseudamnicola* distributed in proximity of the study area simply by oviduct coloration, shell characters or penis shape.

The shell dimensions of the new species are given in Table 1, 2, 3.

In Turkey there have been few survey studies on Hydrobioidea, but so far 20 genera and 46 species have been reported to occur in Turkey (YILDIRIM et al. 2004). Generic and higher systematics in the fauna is still problematic. The high speciation in the spring snails is evidently a consequence of narrow habitat needs and occurrence in places with consistent geographical isolation. Thus we expect further new species from Turkey.

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