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***Grossuana* Radoman, 1973 from Macedonia (Greece) (Gastropoda: Truncatelloidea) with the description of three new species**

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Abstract

Four samples of hydrobiids from Macedonia (N-Greece) have been studied, two of which could be identified as *Grossuana angeltsekovi*, a widely distributed species in Bulgaria and N-Greece. Three species are described as new for science by morphology of the shell and penis. A distribution map, photos of the shells and the penis are presented. The material has been collected by Robert Reuselaars and Kyriakos Papavasileiou during a field trip in September 2017.

Key words: *Grossuana*, N-Greece, Macedonia, new species, Truncatelloidea.

Introduction

The genus *Grossuana* Radoman, 1973 is widely distributed in the Eastern Balkan Peninsula (Radoman 1983, Falniowski *et al.* 2016, Georgiev *et al.* 2015) and inhabits predominantly springs. Radoman (1983) reported representatives of *Grossuana* from Romania, Serbia, Bulgaria and Greece but they do not occur in Asian Turkey (Yıldırım 1999). The first record of *Grossuana* from FYROM has been reported by Boeters *et al.* (2017) as *G. maceradica*. The highest species diversity can be found in Bulgaria with 8 nominal taxa and 6 species in Central Greece (Falniowski *et al.* 2015).

The first paper of the mollusk fauna of Macedonia (N-Greece) has been published by Wagner (1927) but he did not list hydrobiid snails of this region. The freshwater mollusk fauna of Macedonia (N-Greece) is not well investigated yet.

Material and Methods

The freshwater snails were collected in September of 2017 on 4 sampling sites (Table 1) using a sieve and pincer. The samples were preserved in 90% ethanol. The dissections and measurements of the genital organs and the shells were carried out using a Zeiss stereo microscope with an eyepiece-micrometer; the photographs were made with a Leica R8 camera system with a digital adapter.

For species identification we used identification keys (Radoman 1983, Georgiev *et al.* 2015).

For counting the whorls of the shells see Glöer (2002: 40).

The holotypes and paratypes are stored in RMNH (Rijksmuseum van Natuurlijke Historie, Leiden, The Netherlands) and in the collections of Reuselaars and Glöer.

Table 1. The sampling sites.

Sampling site	coordinates
1. well near small church west of Avandas, Prefecture of Evros, Greece. Wet place quite hidden under Platanus trees, there was no stream or real waterflow, water dried up after 4-5 m. 08.09.2017 R.E. Reuselaars leg.	N 40° 56' 29.70176" E 25° 54' 40.05771"
2. Feeding spring of the river Nestos, close to Stena of Nestos. Prefecture of Xanthi, Greece Strong running spring. 10.09.2017 R.E. Reuselaars leg.	N 41° 05' 32.69308" E 24° 46' 06.87423"
3. Spring in St. Johns gorge, north of Thiriopetra, Prefecture of Pella, Greece. Concrete construction, specimen on small stones and leaves in spilled water (spring connected to watersupply) 12.09.2017 R.E. Reuselaars leg.	N 41° 03' 19.97231" E 22° 07' 17.62115"
4. Spring in Sidironero, 45 km north of Drama, Prefecture of Drama, Rhodopi mountains, Greece. 06.09.2017 R.E. Reuselaars leg.	N 41° 22' E 24° 15'



Figure 1. The sampling sites. The numbers refer to table 1.

Results

New samples of hydrobiid snails revealed some *Grossuana* spp. from Macedonia (N-Greece) of which three species are new for science. All these species are only known from their type localities.

Genus *Grossuana* Radoman, 1973

Radoman (1983) described the genus *Grossuana* as follows: “Shell ovoid, rarely somewhat elongated or shortened. With a strongly developed last whorl and an ovoid aperture. Operculum red. ... Penis long, with a very prolonged, pointed top and a weak outgrowth on the left side, which is hardly visible in many specimens.”

That the shape of the penes of distinct species-groups look different in *Grossuana* spp. has already been depicted by Georgiev *et. al.* (2015). They all have in common the tapered penis-tip which is much slimmer than the rest of the penis (e.g. Fig. 3.2).

In the southern part of the Bulgarian Rhodope Mountains occurs *Grossuana angeltsekovi* Glöer & Georgiev 2009 and *G. slavyanica* Georgiev & Glöer 2013, thus we have to compare the new species with these ones.

***Grossuana angeltsekovi* Glöer & Georgiev, 2009**

(Figures 2-5)



Figures 2-5. *Grossuana angeltsekovi*. 2: sampling site 3; 3-4: sampling site 4; 5: penis of 1.

Distribution: *Grossuana angeltsekovi* has been found on sampling sites 3 and 4 (see table 1 and figs. 18-19). It is widely distributed in Bulgaria (Georgiev *et al.* 2015, Falniowski *et al.* 2015), as well as in the Greek part of the Rhodope Mountains (Georgiev *et al.* 2013). The sampling sites mentioned above have not been reported before.

***Grossuana avandasensis* n.sp.**

(Figs. 6-9, Fig. 20)

Type series. Holotype (RMNH.MOL.339912): Shell height 1.65 mm, shell width 1.2 mm; 12 paratypes (dried) and 10 paratypes (in ethanol, RMNH.MOL.339913) from type locality, 11 ex. in coll. Reuselaars (no. 1140), 2 ex. (dry) in coll. Glöer, 3 ex. (ethanol) coll. Falniowski.

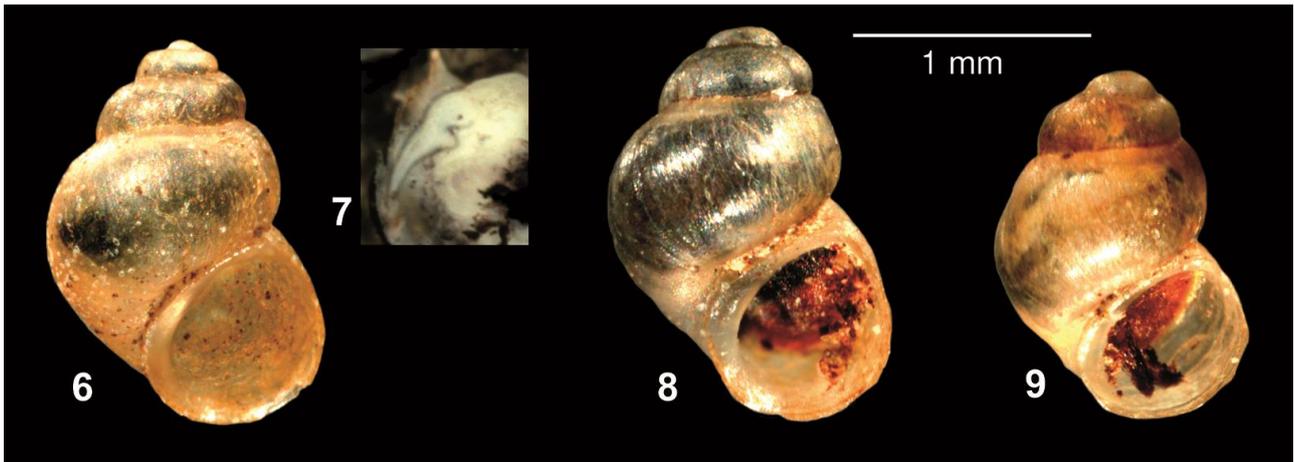
Locus typicus: well near small church west of Avandas, Prefecture of Evros, Greece. Wet place quit hidden under Platanus trees, there was no stream or real waterflow, water dried up after 4-5 m. 08.09.2017 R.E. Reuselaars leg. The specimens were collected from the leaves.

Etymology: Named after Avandas town.

Description: The yellowish brownish shell is ovate-conical with a prominent body whorl. The 4.5-5 whorls are fast increasing, convex with a clear suture. The aperture is ovate, slightly angled at the top. The periostome is thickened at the columella. The umbilicus is closed. The operculum is red.

The shell height is 1.5-1.7 mm, shell width 1.2 mm.

The mantle is black with a light-grey border. The penis has a small triangular outgrowth at the left side near the basis (Fig. 2.2). The penis-tip is long and tapered.



Figures 6-9. *Grossuana avandasensis* n. sp. 6: holotype, 7: penis in situ, 8-9: paratypes.

Differentiating features: The shell of *G. slavyanica* is slimmer than *G. avandaensis* n. sp. and *G. angeltsekovi* is much larger. Only *G. avandaensis* n. sp. has a triangular outgrowth near the basis of the penis, also different from the *Grossuana* spp. described here as new.

***Grossuana stenaensis* n.sp.**
(Figs. 10-13, Fig. 21)

Type series. Holotype (RMNH.MOL.339914): Shell height 1.9 mm, shell width 1.3 mm; 7 adult Paratypes and some juveniles in ethanol from type locality (RMNH.MOL.339915), 6 ex. in coll. Reuselaars (no. 1140), 2 ex. (dry) in coll. Glöer, 3 ex. (ethanol) coll. Falniowski.

Locus typicus: Feeding side-spring of the river Nestos, close to Stena of Nestos, Prefecture of Xanthi, Greece. Strong running spring. 10.09.2017 R.E. Reuselaars leg. The specimen were collected from small and medium sized stones on the bottom of the spring.

Etymology: Named after the nearby recreation area Stena of Nestos.

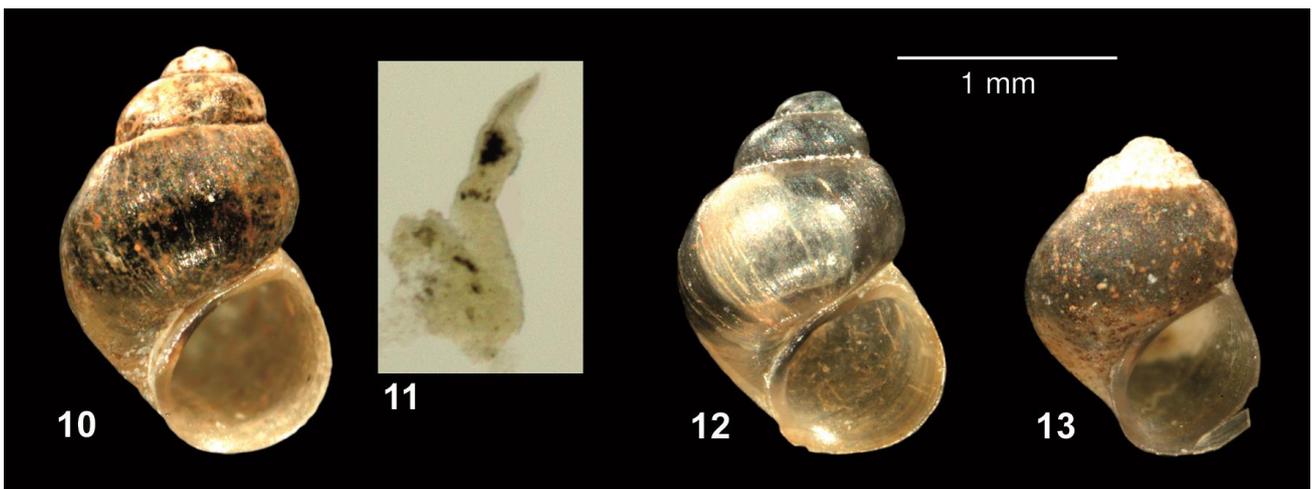


Figure 10-13. *Grossuana stenaensis* n. sp. 10: holotype, 11: penis, 12-13: paratypes.

Description: The horn-coloured shell is ovate with a prominent body whorl. The 4.5-5 whorls are slightly convex with a weak suture. The aperture is ovate slightly angled at the top with a sharp periostome. The umbilicus is closed.

Shell height 1.7-1.9 mm, width 1.2-1.3 mm.

The mantle is black with a light-grey border. The penis is slim with a tapered penis-tip. At the basis of this tip is a dark spot visible.

Differentiating features: The shell of *Grossuana stenaensis* n. sp. is broader than *G. slavyanica* and the penis-tip is shorter than in *G. angeltsekovi* and different from the *Grossuana* spp. described here as new.

Associated species: *Theodoxus fluviatilis* (Linnaeus 1758).

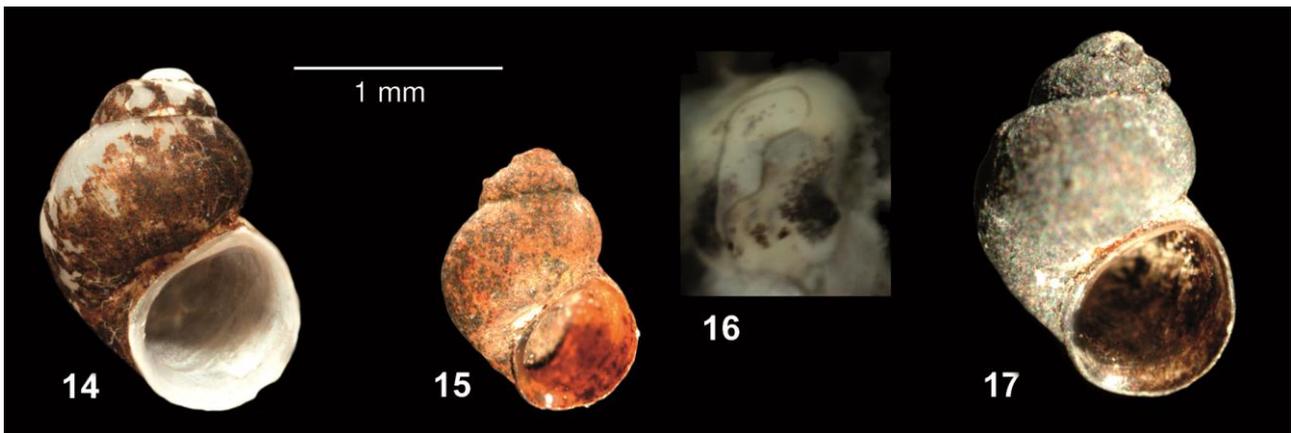
***Grossuana sidironerensis* n.sp.**

(Figs. 14-17, Fig. 19)

Type series. Holotype (RMNH.MOL.339916): Shell height 1.7 mm, shell width 1.0 mm; 3 Paratypes (ethanol) from type locality (RMNH.MOL.339917). 4 ex. in coll. Reuselaars (no. 1141), 2 ex. (dry) in coll. Glöer, 3 ex. (ethanol) coll. Falniowski.

Locus typicus: Spring in Sidironero, 45 km north of Drama, Prefecture of Drama, Greece, Rhodope mountains. 06.09.2017 R.E. Reuselaars leg. The specimen were collected from old leaves in the spring.

Etymology: Named after the town Sidironero



Figures 14-17. *Grossuana sidironerensis* n. sp. 14: holotype, 15, 17: paratypes, 16: penis in situ.

Description: The brownish shell is ovate with 4.5 fast growing whorls which are slightly convex with a weak suture. The periostome is sharp and the umbilicus is closed. The aperture is ovate, the operculum is red.

The shell height is 1.3-1.8 mm, width 1.0-1.3 mm.

The mantle is black with a light-grey border. The penis is nearly regularly broad with a small tapered penis-tip. There is a dark spot at the basis of the penis-tip.

Differentiating features: The penis is regularly broad with a small and thin tapered penis-tip by which it differs from *G. angeltsekovi* and *G. slavyanica*, as well as from the *Grossuana* spp. described here as new.

Associated species: *Grossuana angeltskovi*, *Bythinella dierckingi* Glöer & Georgiev 2011(new record for Greece).

Remark: All specimens are coated with a layer of Fe/Mn (Fig. 17).



Figures 18-21: The sampling sites. 18: Saint Johns, 19: Sidironero, 20: Avandas, 21: Nestos.

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