

## Redescription of *Viviparus sphaeridius* Bourguignat 1880 with an identification key of the European *Viviparus* species (Gastropoda: Viviparidae)

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### Abstract

Dilian Georgiev found topotypes of *Viviparus sphaeridius* Bourguignat, 1880, which has not been mentioned in the West European literature since its original description, except one citation by Westerlund (1886: 7). The rediscovery of this species is provided. As a result, *V. sphaeridius* is considered to represent a species in its own rights well distinguishable from the other European species in the genus *Viviparus*. Additionally, a key to the *Viviparus* species from Europe is given to facilitate future identification and prevent further misidentifications.

**Key words:** *Viviparus*, Danube, Bulgaria, redescription.

### Introduction

Many *Viviparus* spp. have been described (Bourguignat 1880, Westerlund 1886), of which four species are accepted by western European malacologists to occur in Central Europe: *V. contectus* (Millet, 1813), *V. viviparus* (Linnaeus, 1758), *V. ater* (Christofori & Jan, 1832), *V. acerosus* (Bourguignat, 1862), and two additional species which are distributed in the Balkans, the region of Montenegro and Albania: *V. mamillatus* (Küster, 1852) and *V. hellenicus* (Clessin, 1879) in Greece.

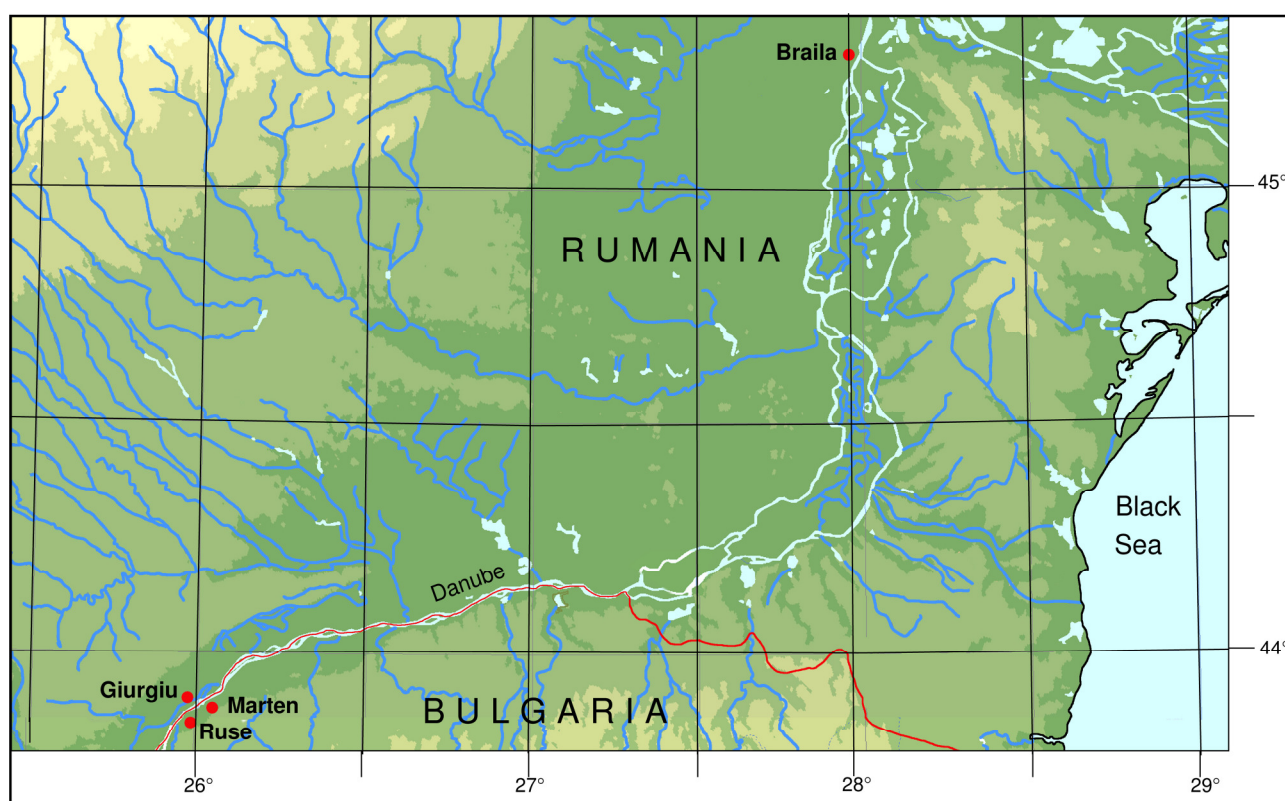
Before 1959 the names *V. contectus* and *V. viviparus* have been partly used in reverse sense (e.g. Zilch 1955: *V. contectus* = *V. viviparus*, *V. viviparus* = *V. fasciatus*), thus many old citations in the literature cannot be trusted (Glöer 2002). On the other hand there are many misidentifications because species of the genus *Viviparus* are not easy to identify. Falniowski *et al.* (1996a, 1996b, 1997, 1998) examined the morphological and anatomical characters of the European *Viviparus* spp. and discussed the taxonomical status as well as the phylogeny and could show that all species have a wide morphological plasticity and thus it is hard to identify the species.

Only *Viviparus viviparus* can be easily distinguished by the blunt apex from all the other *Viviparus* spp. which have an acute apex, a feature which can be tested with the fingertip (Glöer 2002). From Russia many more *Viviparus* spp. are listed, especially *Viviparus sphaeridius* (Bourguignat, 1880) (Starobogatov *et al.* 2004, Kantor *et al.* 2009). The identity of *V. sphaeridius* mentioned by Starobogatov 2004 (p. 267, pl. 95.2) could only be compared by the drawing and the given distribution range by Kantor *et al.* (2009: “rivers and lakes of the basins of Danube, Dnieper and Dniester rivers ...”), both coincides with our findings.

In the Danube near Marten, Bulgaria, Dilian Georgiev found topotypes of *Viviparus sphaeridius* Bourguignat, 1880 a *Viviparus* sp. different from the other *Viviparus* spp. known from this region. This paper is intended to redescribe this species and to expand the knowledge of the mollusk fauna of Bulgaria and the Danubian region.

## Material and Methods

The living snails were collected by sieve and preserved in 75% ethanol. The measurements were carried out by using a stereo microscope (Zeiss) with an eye-piece micrometer, the photographs were made with a Leica digital camera system. Voucher material is stored in the Zoological Museum Hamburg (ZMH) and in the collections of the authors.



**Figure 1.** Sampling site of *Viviparus sphaeridius* (Marten) and its type locality (Giurgiu).

## Results

Unfortunately, Bourguignat does not mention a locality in his original description. In his oeuvre publication from 1891 in the register (p. 254), he mentioned the locality „Valachie“ for *sphaeridia*; going to the collection, MHNG 4861 is recorded from “Giurgewo”, and thus from what at his time could be considered the “Valachie”. The collection houses two other lots under this name, i.e. MHNG 4743 and MHNG 4744, these two lots, however, come from the Uluabat Gölü and the Sapanca Gölü in Turkey. For this reason, they are not considered to be type specimens, because they do not come from „Valachie“. It is for this reason that the type locality can be restricted to „Giurgewo“ (=Giurgiu, Romania). Because the recent sampling site Marten is opposite to Giurgiu the collected *Viviparus sphaeridius* can be accepted as topotypes (Fig. 1).

Bourguignat’s original description (Fig. 2) and the syntypes, which are housed in the Bourguignat collection in the Muséum d’histoire naturelle de Genève MNHG (Fig. 3A), revealed, that the newly collected specimens of *Viviparus* belong to *V. sphaeridius*. We here compared this species with all other European *Viviparus* spp. known so far and found that *V. sphaeridius* is distinct from all other species.

## VIVIPARA SPHÆRIDIA.

Testa imperforata (rima omnino tecta), tumido-globosa, brevi, obesa, sat crassa, parum nitente, uniformiter sordide griseo subluteolo-olivacea, in supremis lævigata, in ultimo striatula (striæ prope aperturam rudiores ac validiores); — spira brevi, oblongo-rotundata, obtusissima, ad apicem (apex minutissimus) leviter mucronata; — anfractibus 6 ventrosis, regulariter crescentibus, sutura sat impressa separatis; — ultimo oblongo-rotundato, ad insertionem labri recto vel leviter ascendente, dimidiam altitudinis superante; — apertura parum obliqua, oblongo rotundata, superne angulata, inferne latiore, intus subcæruleo-albida, in crassatula, ad margines (præsertim in penultimi ventre) nigrolabiata; — peristomate continuo, non soluto, recto, acuto; — margine externo leviter antrorsum arcuato; — margine columellari crasso, valido, leviter expanso ac super rimam adpresso; — Opereulo membranaceo, corneo-rubiginoso (striæ concentricæ

— 18 —

argutissimæ), in centro concavisculo; — alt. 24. Diam. 18. alt. ap. 14 1/2. lat. 11 1/2 millim.

Cette espèce se distingue de la *Danubialis* par sa coquille plus ventrue, plus en forme de boule; par ses tours supérieurs plus gros, plus trapus, moins élevés; par son avant-dernier tour exactement ventru-arrondi offrant, juste à la partie moyenne, le maximum de la convexité (chez la *Danubialis*, la convexité est plus inférieure, et la partie supérieure du tour, bien que convexe, est un tant soit peu méplan, ce qui donne à ce tour une légère apparence anguleuse); par sa spire moins élancée, plus trapue; arrondie et d'un diamètre plus large; par son bord externe sensiblement arqué en avant à sa partie moyenne; etc.

Figure 2. Facsimile of the original description of *Viviparus sphaeridius* (scaled-down) (Bourguignat 1880).

Family **Viviparidae** J.E. Gray 1874 (1833)

Genus ***Viviparus*** Montfort, 1810

***Viviparus sphaeridius*** Bourguignat, 1880  
(Figs. 2-5)

**Materials examined:** 3 adult females from Danube near vill. Marten 14.05.2009 Georgiev leg.; 7 empty shells from Brashlen near Marten. June 2008 Georgiev leg.

**Redescription:** Shell oval conical, thick and yellowish brown (Fig 3B) with three brownish bands (Fig. 3E), not visible in the adults. The 5-6 whorls are slightly convex with a flat suture and an acute apex (Fig. 3D, 3E). The body whorl is very bulbous, the umbilicus is scarcely visible. The first two whorls are very small in height, the others are regularly fast growing. Spire height about a fifth of shell height. Shell height 24-28 mm, width 18-20 mm.

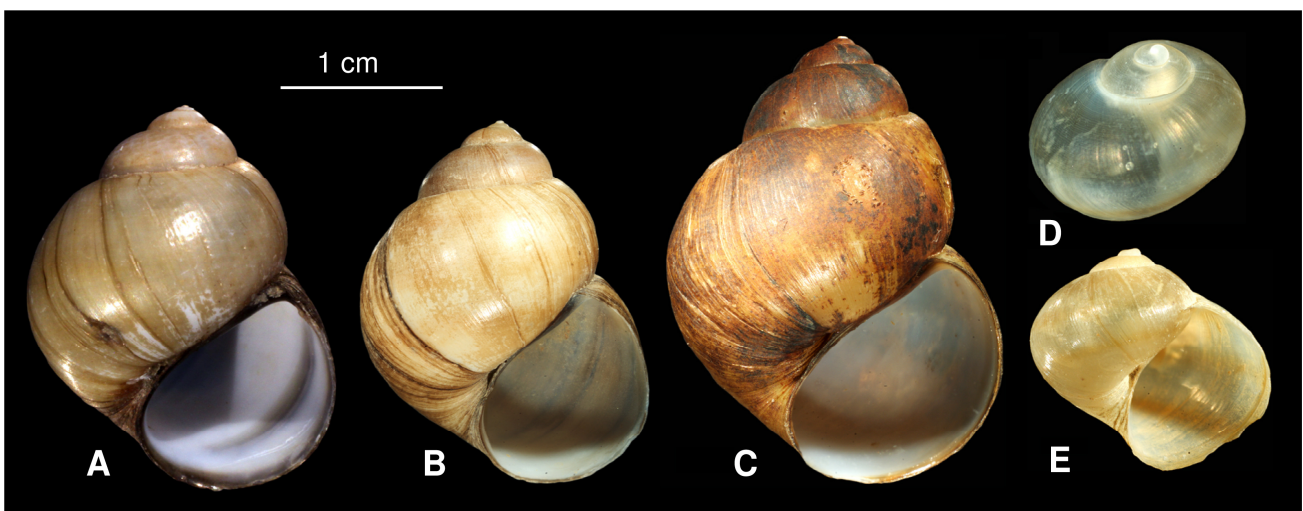


Figure 3. *Viviparus sphaeridius*. A: Syntype: 23.6 mm, MHNG 4861, Romania, Dabube à Giurgewo (photo E. Neubert); B-C: adult shells from Marten, Bulgaria (topotypes), D-E: embryonic shells from C.

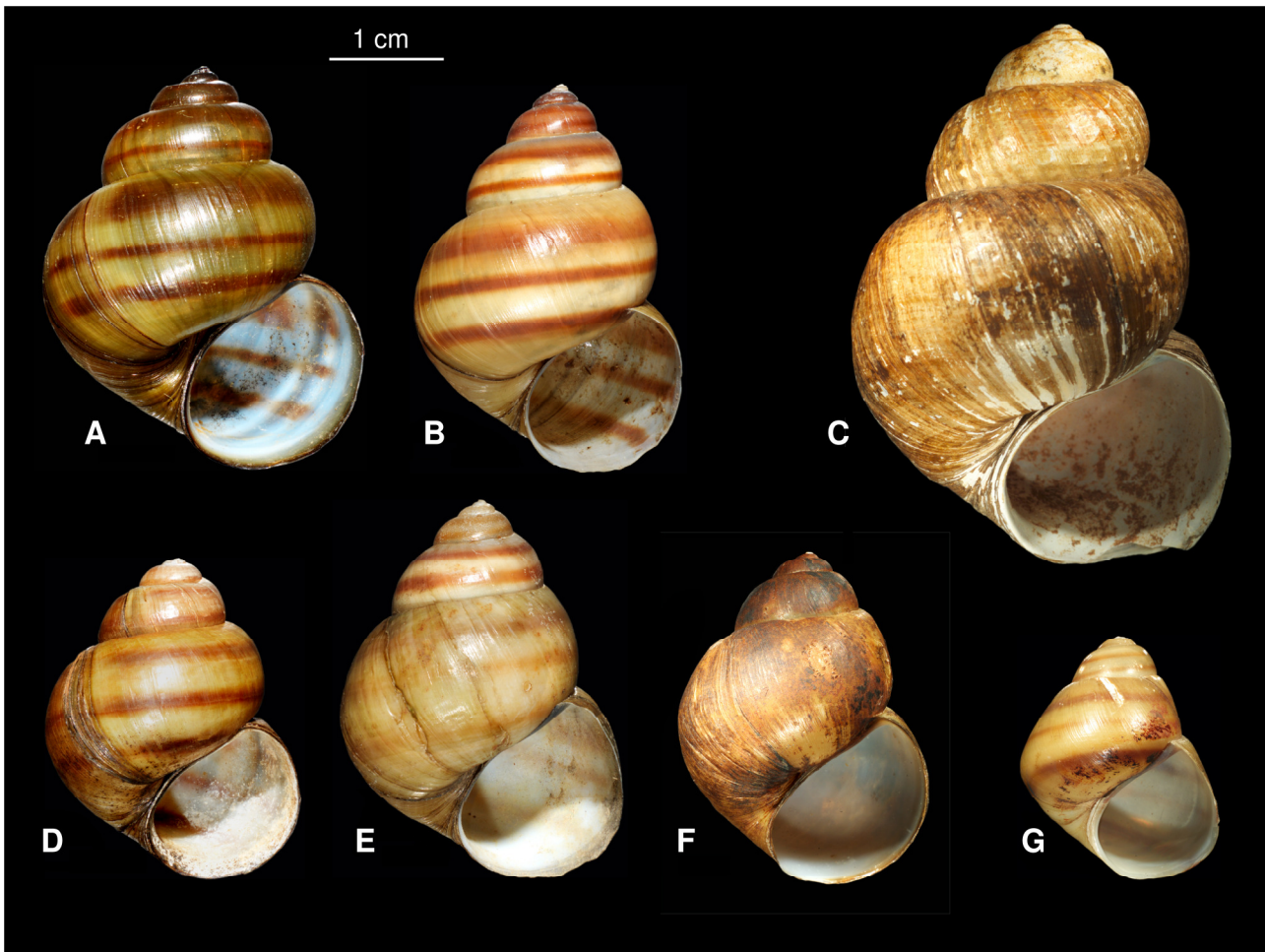


**Differentiating features:** *V. sphaeridius* belongs to the smaller *Viviparus* spp. of Europe, together with *V. viviparus* and *V. hellenicus* (Fig. 4). Independent of the shell height it can be distinguished by the acute apex from *V. viviparus* which has a blunt apex. It differs from *V. hellenicus* in the form of the body whorl, which is canted in this species while the body whorl in *V. sphaeridius* is rounded. From *V. acerosus*, which also occurs in this region it can be distinguished by the first whorls, which are more flattened in *V. sphaeridius* and less convex than in *V. acerosus*. In addition the spire is less higher than in *V. acerosus*.

**Associated species:** *Theodoxus danubialis* (C. Pfeiffer, 1828), *Bithynia danubialis* Glöer & Georgiev 2012, *Bithynia tentaculata* (Linnaeus, 1758), *Lithoglyphus naticoides* (C. Pfeiffer, 1828), and *Esperiana daudebartii* (Prevost, 1821).

**Habitat and ecology:** *V. sphaeridius* was collected from the littoral zone of the Danube from sandy bottom with patches of aquatic macrophytes.

**Distribution:** Rivers and lakes of the basins of Danube, Dnieper and Dniester rivers (Anistratenko 1998b; Starobogatov *et al.* 2004; cited after Kantor *et al.* 2009).

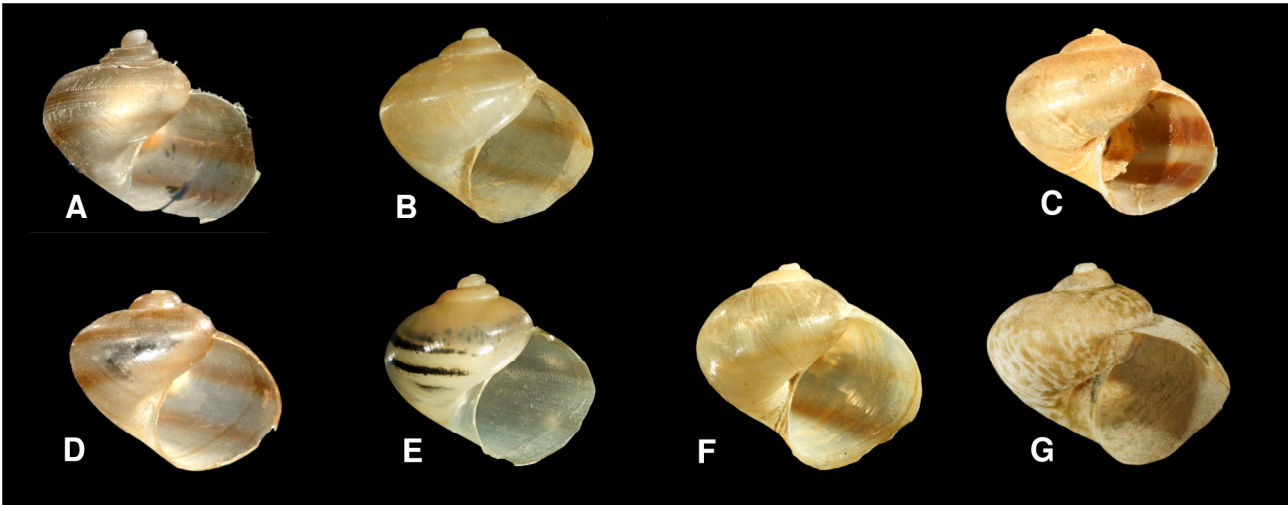


**Figure 4.** The shells of the European *Viviparus* species. **A:** *Viviparus contectus* (Hamburg), **B:** *V. ater* (Bodensee), **C:** *V. mamillatus* (Montenegro), **D:** *V. viviparus* (Hamburg), **E:** *V. acerosus* (Hungary), **F:** *V. sphaeridius* (Danube, Bulgaria), **G:** *V. hellenicus* (Trichonis lake).

#### Identification of European *Viviparus* species

While in females both tentacles are acute, in males the right tentacle is transformed to function as a penis. At a first glance the differences between the European *Viviparus* spp. seem to be very scarce. To distinguish between the *Viviparus* species it is better to compare the juveniles. The apex of *V. viviparus* is obtuse (Fig. 5D), the others are acute (Fig. 5). The juvenile shells of *V. ater* and *V. hellenicus* are canted, the others are

rounded. The suture of the first whorls of *V. sphaeridius* are small with a flat suture and the spire is only about a fifth of the shell height.



**Figure 5.** The juveniles of the European *Viviparus* species. . **A:** *Viviparus contectus* (Hamburg), **B:** *V. ater* (Bodensee), **C:** *V. mamillatus* (Montenegro), **D:** *V. viviparus* (Hamburg), **E:** *V. acerosus* (Hungary), **F:** *V. sphaeridius* (Danube, Bulgaria), **G:** *V. hellenicus* (Trichonis lake).

**Identification key**

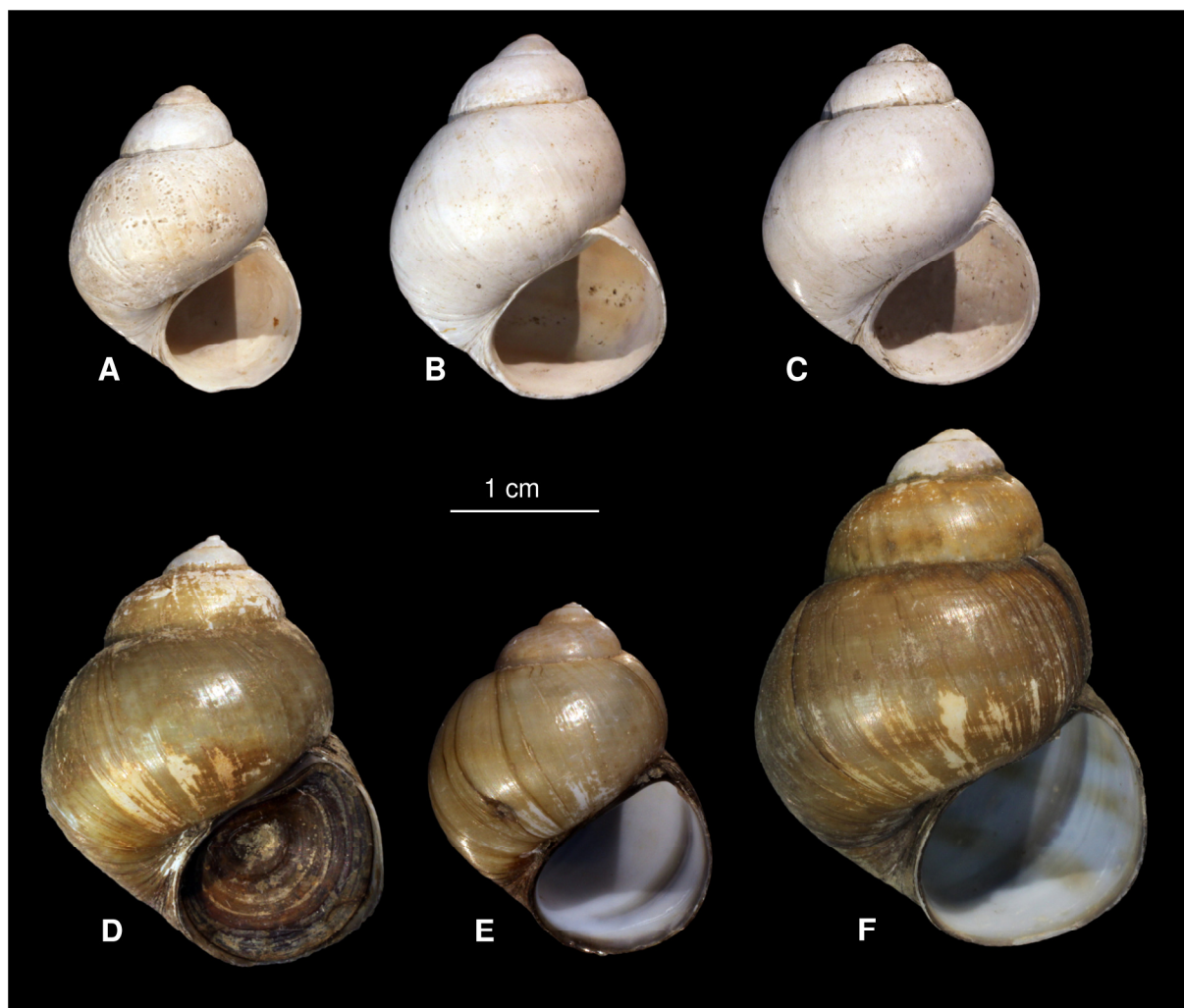
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|----|---|-----------------------|
| 1. | Apex acute (test with fingertip)  | 2                     |
| 1' | Apex blunt (test with fingertip)  | <i>V. viviparus</i>   |
| 2  | Whorls convex and stepped, apex acute   | <i>V. contectus</i>   |
| 2' | Whorls slightly convex and not stepped  | 3                     |
| 3  | Body whorl canted, shell height up to 22 mm, embryonic shells without hairs                 | <i>V. hellenicus</i>  |
| 3' | Body whorl rounded, shell height larger than 22 mm  | 4                     |
| 4  | First whorls flat, spire height : shell height 0.21, shell height up to 28 mm, lower Danube | <i>V. sphaeridius</i> |
| 4' | Spire height : shell height > 0.24, shell larger than 28 mm                                 | 5                     |
| 5  | Body whorl of juveniles slightly canted, embryonic shells without or with very small hairs  | <i>V. ater</i>        |
| 5' | Body whorls of juveniles rounded, embryonic shell with hairs                                | 6                     |
| 6  | First whorls flat, and slightly flattened at the suture                                     | <i>V. mamillatus</i>  |
| 6' | Whorls not flattened at the suture  | <i>V. acerosus</i>    |

**Discussion**

When Bourguignat 1870 described *Vivipara danubialis*, *V. amblya*, and *V. microlena* from the same sampling site, Ibraïla (= Braïla, Romania), later on in 1880 he added descriptions of *V. letourneuxi*, *V. taciti*, and *V. sphaeridia*, from Giurgewo (= Giurgiu, Romania). Westerlund (1886: 11) believes that the *Vivipara microlena* is a female of *V. amblya*. The other species: *V. danubialis* and *V. sphaeridia* were considered by him to be juveniles of *V. acerosus* Westerlund (1886: p. 7).

However, none of the syntypes illustrated in Fig. 6 corresponds to *Viviparus acerosus*. Probably, the species A-D in Fig. 6 are conspecific and represent another distinct species that needs to bear the name *V. danubialis* Bourguignat, 1870. Next to this species, *V. taciti* (Fig. 6F) likewise seems to be distinct from *V. acerosus* and *V. sphaeridius* as well. At the moment, not enough specimens are available from the area to resolve this problem.

Unfortunately DG could not find *V. acerosus* at the same sampling site but Angelov (2000: 5) listed this species as being distributed “mainly in the Lower Danube” and thus, however, it is possible that both species, *V. acerosus* and *V. sphaeridius* live sympatrically in this Danubian region.



**Figure 6.** *Viviparus* syntypes of Bourguignat's collection: **A:** *Vivipara microlena* Bourguignat 1870, H= 20.9 mm, MHNG4843, Romania, Danube à Ibraila. **B:** *V. amblya* Bourguignat, 1870, H=24.4 mm, MHNG4765, Danube à Ibraila; **C:** *V. danubilais* Bourguignat, 1870, H= 22.8 mm, MHNG4811, Romania, Danube à Ibraila; **D:** *V. letourneuxi* Bourguignat, 1880, H=28.8 mm, MHNG4838 Romania, Danube à Guirgewo; **E:** *V. sphaeridia* Bourguignat, 1880, H=23.6 mm, MHNG4861, Romania, Danube à Guirgewo; **F:** *V. taciti* Bourguignat, 1880, H=34.5 mm, MHNG4876, Romania, Danube à Guirgewo. (Photos : Eike Neubert)

### Acknowledgements

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### References

- Angelov, A.M. (2000) Mollusca (Gastropoda et Bivalvia) aquae dulcis. Catalogus Faunae Bulgaricae 4. Pensoft & Backhuys Publishers BV, Sofia & Leiden, 57 pp.
- Bourguignat, M.J.R. (1870) Aperçu sur la faune malacologique du bas Danube. *Annales de Malacologie*, 1, 36–76.
- Bourguignat, M.J.R. (1880) Recensement de *Vivipara* du système Européen, Paris, 52 pp.
- Falniowski, A., Mazan, K. & Szarowska, M. (1996a) Embryonic shells of *Viviparus* – what they may tell us about taxonomy und phylogeny? (Gastropoda: Architaenioglossa: Viviparidae). *Malakologische Abhandlungen*, 18 (1), 35–42.
- Falniowski, A., Mazan, K. & Szarowska, M. (1996b) Tracing the viviparid evolution: radular characters (Gastropoda: Architaenioglossa: Viviparidae). *Malakologische Abhandlungen*, 18 (1), 43–52.

- Falniowski, A., Mazan, K., Szarowska, M. & Kozik, A. (1997) Tracing viviparid evolution: soft part morphology and opercular characters (Gastropoda: Architaenioglossa: Viviparidae). *Malakologische Abhandlungen*, 18 (2), 193–211.
- Falniowski, A., Fialkowski, W., Szarowska, M. & Mazan, K. (1998) Shell biometry characters in species discrimination and classification within the genus *Viviparus* (Gastropoda: Architaenioglossa: Viviparidae). *Malakologische Abhandlungen*, 19 (1), 29–45.
- Glöer, P. (2002) Die Süßwassergastropoden Nord- und Mitteleuropas. Die Tierwelt Deutschlands, 73. ConchBooks, Hackenheim, 327 pp.
- Kantor, Y.I., Vinarski, M.V., Schileyko, A.A. & Sysoev, A.V. (2009) Catalogue of the continental Mollusks of Russia and adjacent territories. Version 2.3, published online.
- Starobogatov, Ya.I., Prozorova, L.A., Bohatov, V.V. & Sayenko, E.M. (2004) Molluscs. In: Tsalolikhin, S.J. (Ed.), Key to freshwater Invertebrates of Russia and Adjacent Lands. Vol. 6. Molluscs, Polychaetes, Nemerteans. Akad. Nauka, St. Petersburg, 1-528 pp. [in Russian]
- Westerlund, C. A. (1886) Fauna der in der Paläarktischen Region lebenden Binnenconchylien. VI. Fam. Ampullaridae, Paludinidae, Hydrobiidae, Melanidae, Valvatidae & Neritidae. Register. Lund, H Ohlsson's Buchdruckerei, 156 pp. + 13 pp.
- Zilch, A. (1955) Die Typen und Typoide des Natur-Museums Senckenberg, 14 : Mollusca, Viviparidae. *Archiv für Molluskenkunde*, 84, 45–86.