

## Notes on the anatomy of Turkish Orculidae (Gastropoda: Pulmonata: Orthurethra)

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**Abstract:** In this paper we describe the genital anatomy of three subspecies of Turkish Orculidae, namely *Orculella mesopotamica riedeli* Hausdorf, 1996, *Schileykula trapezensis contraria* Neubert, 1993 and *Schileykula scyphus enteroplax* (Pilsbry, 1922). We discuss the results in light of other members of the genera *Orculella* and *Schileykula*. The spermatophore of *Schileykula scyphus enteroplax* is also described, which is the first reported spermatophore in *Schileykula*. It is a compact, ovoid object with a slightly pointed end. This shape is very different from all other orculid spermatophores reported so far, which are elongated and often have spikes or transversal lamellae on one end.

**Key words:** taxonomy, systematics, land snails, spermatophore

### Introduction

The Turkish orculid fauna (family Orculidae Pilsbry, 1918) is exceptionally rich with many endemic species and even an endemic genus (*Alvariella* Hausdorf, 1996). Most species of *Schileykula* Gittenberger, 1983 inhabit Asia Minor, and many species of *Orculella* Steenberg, 1925 have also been reported from that area, although the latter genus has a much wider distributional area ranging from the Iberian Peninsula throughout Northern Africa to the Middle East (BRANDT, 1956; ARRÉBOLA et al., 2012). These two genera possess cylindrical or oval shells with the shell height of 4.7–18.7 mm, but most of them are smaller than 10 mm (HAUSDORF, 1996; SCHÜTT & ŞESEN, 1998). The last shell whorl usually bears several inner barriers (lamellae and plicae), some of which extend as far as the apertural margin. These barriers serve as important structures for species recognition. Most species are dextral, but the proportion of sinistral species and subspecies is high (GITTINGERGER et al., 2012). *Schileykula* and *Orculella* differ from each other in the traits of the reproductive organs only (GITTINGERGER, 1983; HAUSDORF, 1996); mainly by the presence (*Orculella*) or absence (*Schileykula*) of a penial appendix. Therefore, anatomical information on their genitalia is essential for the correct classification of *Schileykula* and *Orculella* species and subspecies. The anatomy of most *Schileykula* and *Orculella* has been described recently (GITTINGERGER, 1983; HAUSDORF, 1996; PÁLL-GERGELY, 2010; 2011; ARRÉBOLA et al., 2012; PÁLL-GERGELY & ASAMI, 2013). The aim of this publication is to describe the reproductive anatomy of three subspecies of *Orculella* and *Schileykula*, which were anatomically unknown so far.

## Material and methods

Ethanol-preserved specimens were dissected under a Leica stereomicroscope equipped with a photographic camera. In description of the reproductive system, we used the terms "proximal" and "distal" relative to the centre of the body. No "proper" description of the genitalia is necessary, because the anatomical features of the figured subspecies roughly agree with that of the related taxa which were described in previous papers. We only highlight here the differences of the figured subspecies in relation to other known taxa.

### Abbreviations

HNHM: Magyar Természettudományi Múzeum (Budapest, Hungary)  
PGB: Collection Barna Páll-Gergely (Mosonmagyaróvár, Hungary)

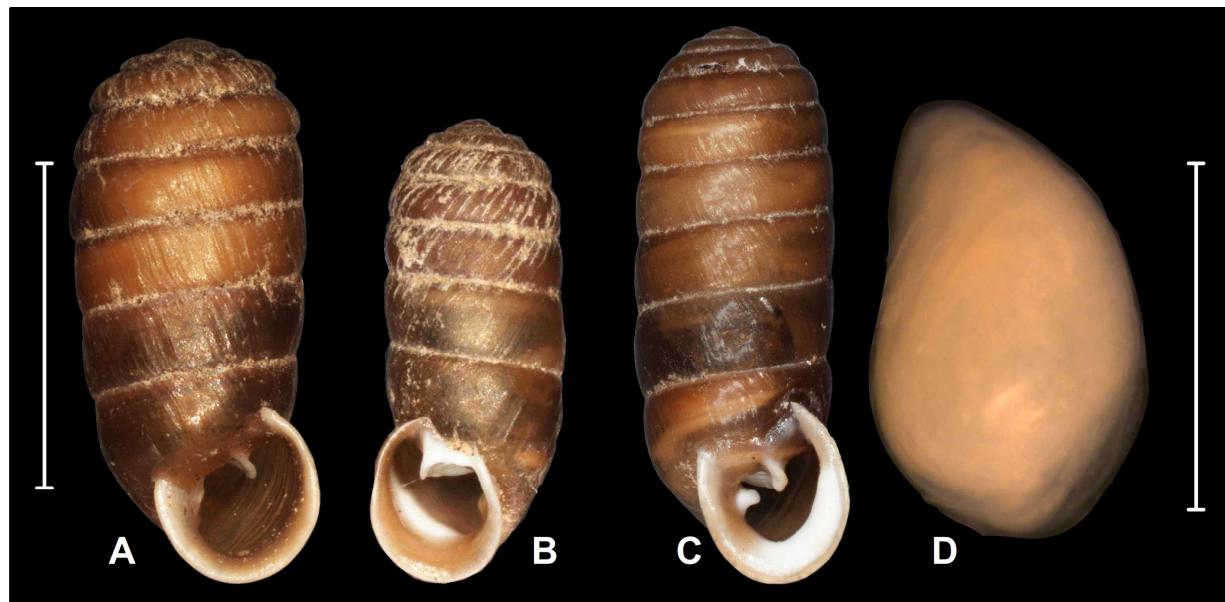


Fig. 1. Shells (A-C) and spermatophore (D) of Turkish orculids. A. *Orculella mesopotamica riedeli* Hausdorf 1996: TR, Vil. Hatay, Çevlik near Samandağ entrance of the Titus tüneli,  $36^{\circ}07.263'N$ ,  $35^{\circ}55.359'E$ , leg. Németh, L. & Páll-Gergely, B. 02.06.2011.; B: *Schileykula trapezensis contraria* Neubert 1993, Vil. Bayburt, 11.3 km S of Maden, (S of Çalidere), 1800 m a.s.l., rocks (Bayburt-Aşkale road),  $40^{\circ} 05.255' N$   $40^{\circ} 25.407' E$ , leg. Németh, L. & Páll-Gergely, B., 05.06.2011.; B: C-D: *Schileykula scyphus enteroplax* (Pilsbry 1922): Vil. Gümüşhane, Torul 12 km S toward Gümüşhane  $40^{\circ} 31.117' N$   $39^{\circ} 24.884' E$ , leg. Németh, L. & Páll-Gergely, B., 07.06.2011. Left scale represents 5 mm, and refers to the shell photos. The right scale represents 1 mm, and refers to the spermatophore. Photos: J. Harl (A–C) and B. Páll-Gergely (D).

## Results

### *Orculella mesopotamica riedeli* Hausdorf, 1996

**Material examined:** Turkey, Vil. Hatay, Çevlik near Samandağ entrance of the Titus tüneli, 36°07.263'N, 35°55.359'E, leg. Németh, L. & Páll-Gergely, B. 02.06.2011.

**Notes on the anatomy:** Two specimens were dissected (coll. PGB). Hausdorf (1996) published a drawing of two specimens of the genital anatomy of *Orculella mesopotamica mesopotamica* (Mousson, 1874). In comparison with the nominotypical subspecies, the two *Orculella mesopotamica riedeli* specimens examined by us had a much shorter penial appendix. Moreover, the penial caecum was shorter than the epiphallus, whereas it is longer in *O. mesopotamica mesopotamica*.

Although the anatomy of these two taxa are different, these differences are rather minor. Therefore, we retain *O. mesopotamica riedeli* Hausdorf, 1996 on subspecific level.

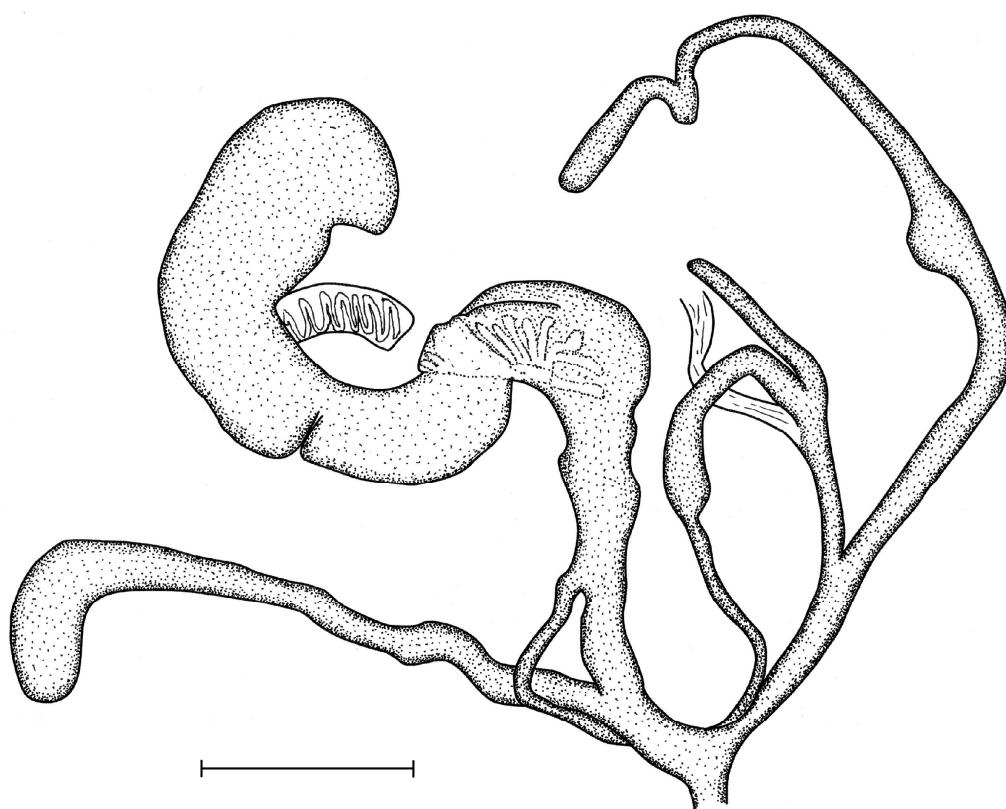


Fig. 2. Genital anatomy of *Orculella mesopotamica riedeli* Hausdorf, 1996. Scale represents 1 mm.

### *Schileykula trapezensis contraria* Neubert, 1993

**Material examined:** Turkey, Vil. Bayburt, 11.3 km S of Maden, (S of Çalidere), 1800 m a.s.l., rocks (Bayburt-Aşkale road),  $40^{\circ} 05.255'$  N  $40^{\circ} 25.407'$  E, leg. Németh, L. & Páll-Gergely, B., 05.06.2011.

**Notes on the anatomy:** One specimen was anatomically examined. The most conspicuous feature of the specimen examined by us is the extremely long appendix (about 3 mm), possibly the relatively and absolutely longest in the genus. Otherwise the genitalia of *S. trapezensis contraria* agree with that of the nominotypical subspecies, *Schileykula trapezensis trapezensis* (Stojaspal, 1981).

### *Schileykula scyphus enteroplax* (Pilsbry, 1922)

**Material:** Turkey, Vil. Gümüşhane, Torul 12 km S toward Gümüşhane,  $40^{\circ} 31.117'$  N  $39^{\circ} 24.884'$  E, leg. Németh, L. & Páll-Gergely, B., 07.06.2011.

**Notes on the anatomy:** Two specimens were anatomically examined (coll. PGB). The penial caecum of this subspecies is more slender than that of any other *Schileykula* taxa.

Both specimens examined lacked an appendix. The absence of an appendix in *S. scyphus enteroplax* is not unique to the genus. It was observed in a population of *S. scyphus scyphus* (L. Pfeiffer, 1848) (HAUSDORF, 1996) and in *S. aculeata* Gittenberger & Menkhorst 1993 (PÁLL-GERGELY, 2011). The loss of the appendix possibly happened multiple times throughout the evolution of the genus, although this hypothesis should to be tested using molecular phylogeny.

A slender muscle is attached on the vas deferens of both specimens, not far from the proximal part of the epiphallus. The presence of this second retractor muscle has not been indicated in other subspecies of *S. scyphus* (see HAUSDORF, 1996).

In the bursa copulatrix of one of the dissected specimens an ovoid spermatophore was found with a slightly pointed end. This is the first known of its kind in *Schileykula*. SCHILEYKO (2012) summarised the knowledge on the orculid spermatophores. According to him, only a few orculid spermatophores are published in the literature (*Orcula*, *Fauxulus*) and they are all elongated, usually with spikes and transversal lamellae on one or both ends. The spikes and lamellate protuberances of the spermatophore correspond with the slit-like pockets of the inner wall of the proximal part of the epiphallus.

The spermatophore we found looked complete and intact, its outer surface was smooth, and it contained a globular sperm mass. Therefore, we do not have reason to believe that it was an incomplete or decayed version of a longer and more complicated spermatophore. Moreover, the proximal end of the epiphallus had no slits on its inner wall, although it was not completely smooth, but was somewhat very finely, transversely ribbed. SCHILEYKO, (2012) claims that the long epiphallus suggests the formation of a long spermatophore, which might be true to some extent. However, for example the spermatophore of *Orcula conica* is much shorter than the total length of the epiphallus (see SCHILEYKO, 2012: Fig. 4). The epiphallus of *Schileykula scyphus enteroplax* contained a thickened, longitudinal fold which gradually became lower towards the proximal end of the epiphallus and disappears at the very end of the organ. The rounded spermatophore is possibly produced by the very end of the epiphallus, whereas the other, longer part of the epiphallus possibly plays no role in spermatophore formation.

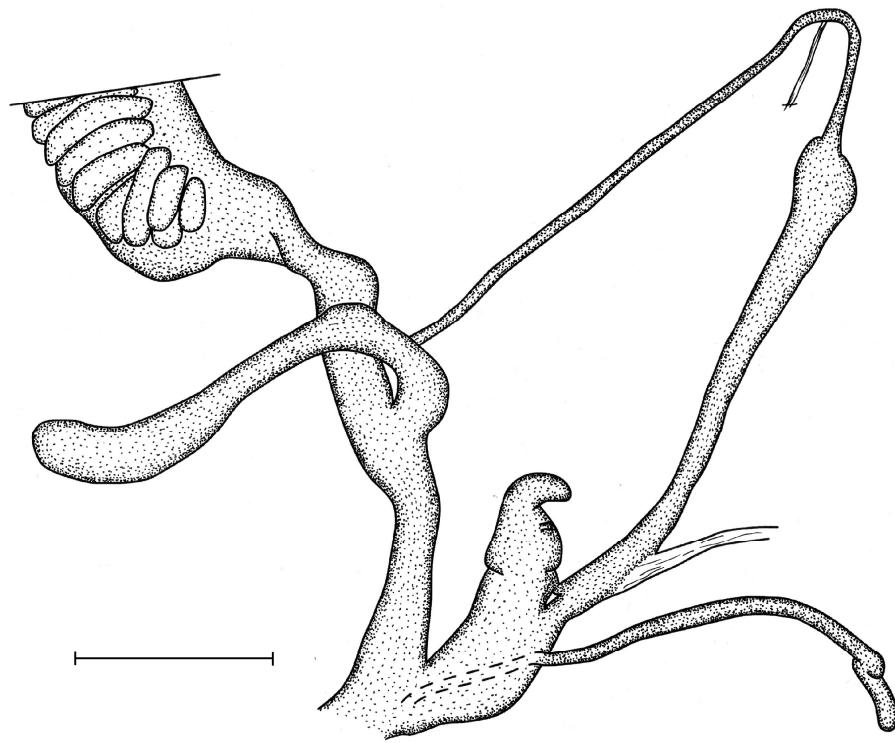


Fig. 3. Genital anatomy of *Schileykula trapezensis contraria* Neubert, 1993. Scale represents 1 mm.

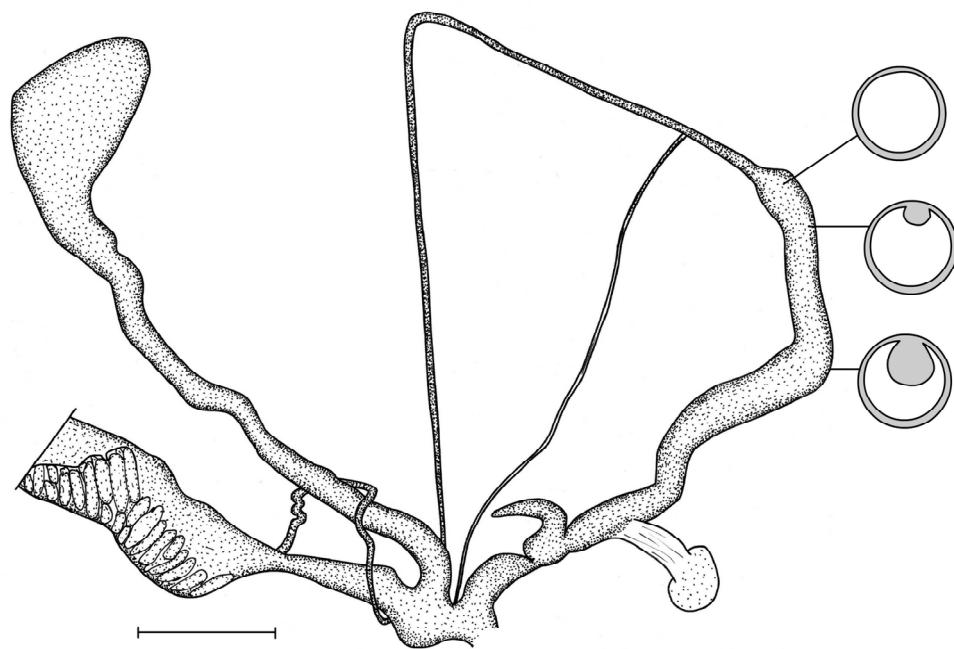


Fig. 4. Genital anatomy of *Schileykula scyphus enteroplax* (Pilsbry, 1922). The small images show the cross sectional view of the epiphallus. Scale represents 1 mm.

**Acknowledgements:** We are very grateful to László Németh, Zoltán Fehér, Takashi Ishibe, Kenji Ohara, Kanji Okubo and Jamen Uirimamu Otani for their help during fieldwork, and to Simon Hursthause for correcting the English.

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