

DESCRIPTION OF THE GENITAL STRUCTURE OF FOUR TURKISH ORCULIDS (GASTROPODA: PULMONATA: ORCULIDAE)

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Abstract The genital structure of three orculid species occurring in north-eastern Turkey (*Schileykula* Gittenberger 1983) and one *Pagodulina* species from Southern Turkey (*Pagodulina pisidica* Schütt 1993) is described here. The taxonomic position of *Schileykula aculeata* Gittenberger & Menkhorst 1993, *Schileykula attilae* Páll-Gergely 2010 and *Schileykula sigma* Hausdorf 1996 are clarified based on genital-morphological data, and all of these species are shown to belong to the genus *Schileykula*. The areal distribution of *Schileykula* is indicated. Surprisingly, the richest area for *Schileykula*, in terms of numbers of species, lies within the northeastern part of the range of the genus.

Key words *Schileykula*, *Pagodulina*, *Orculidae*, taxonomy, Turkey

INTRODUCTION

The family Orculidae is well-represented in Asia Minor. The revision of Hausdorf (1996) revealed 42 taxa belonging to 28 species (including two undescribed species) in Turkey. After this publication, two additional species were described from the country, *Orculella garzanensis* Schütt 1996 from Siirt province and *Schileykula* (?) *attilae* Páll-Gergely 2010 from Artvin province.

The generic status of some species remained uncertain because of the lack of anatomical data. Most of the species with unclear taxonomic status belong to the genera *Schileykula* Gittenberger 1983 and *Orculella* Steenberg 1925, which cannot be distinguished on the basis of shell characters alone. The only publication to date which has dealt with the anatomy of the *Orculella-Schileykula* group, after the revision of Hausdorf (1996), was the paper of Garrido *et al.* (2005). They described the genital structure of Spanish *Orculella bulgarica* (Hesse 1915), and clarified the taxonomic position of that species within the genus *Orculella*.

The genital structure of four orculid species is described here, with a view to clarifying their taxonomic position.

TAXONOMIC PART

Family ORCULIDAE Pilsbry 1918
Genus *Schileykula* Gittenberger 1983

Schileykula aculeata Gittenberger & Menkhorst, 1993: 341, figs 1–2 (shells). Type locality “Turkey, Çoruh, 2.7 km NW of Ardanuç”

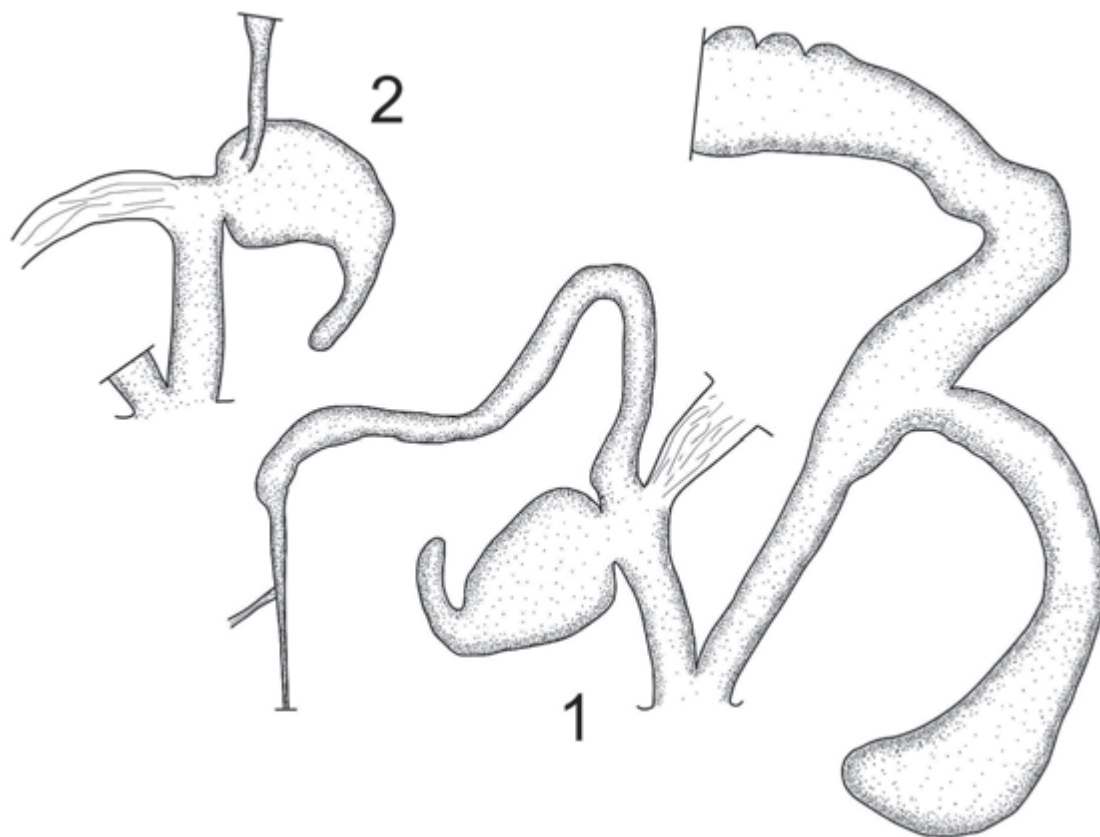
Schileykula aculeata Hausdorf, 1996: 36, pl. 4, fig. 38

Schileykula aculeata Schütt, 2001: 37.

Collection data of dissected material TR, Vil. Artvin, castle of Ardanuç, 41° 7'38.46"N, 42° 3'18.01"E. Leg: Páll-Gergely, B., 7/7/2010. Three specimens were dissected.

Description of the genital structure (Figs 1–2) The penis is short, with no penial appendix. The penial caecum is relatively large, its proximal part wide and flat and there is a shorter and much slimmer distal part. In one dissected specimen the epiphallus starts from the distal part of the penial caecum (Fig. 2). The retractor muscle attaches near to the penial caecum, but on the opposite side of the penis. The epiphallus is relatively long and slender. At the epiphallus-vas deferens junction there is an additional, weak retractor muscle. The vagina is long, the bursa copulatrix is strong and club-like. Measurements of some sections of the genitalia are given in Table 1.

Notes All of the known *Schileykula* species have a penial appendix, however, Hausdorf (1996) reported a population of *Schileykula scyphus* (L. Pfeiffer 1848) where dissected animals (three in all) did not have this organ. The character is therefore not of major taxonomic importance.



Figures 1–2 Genital structure of *Schileykula aculeata* Gittenberger & Menkhorst 1993.

Table 1 Measurements of some sections of the genitalia of *Schileykula* species. Abbreviations: PC: penial caecum; Vbc: vagina up to the junction with the bursa copulatrix; Vt: total length of the vagina (up to the uterus); BC: bursa copulatrix.

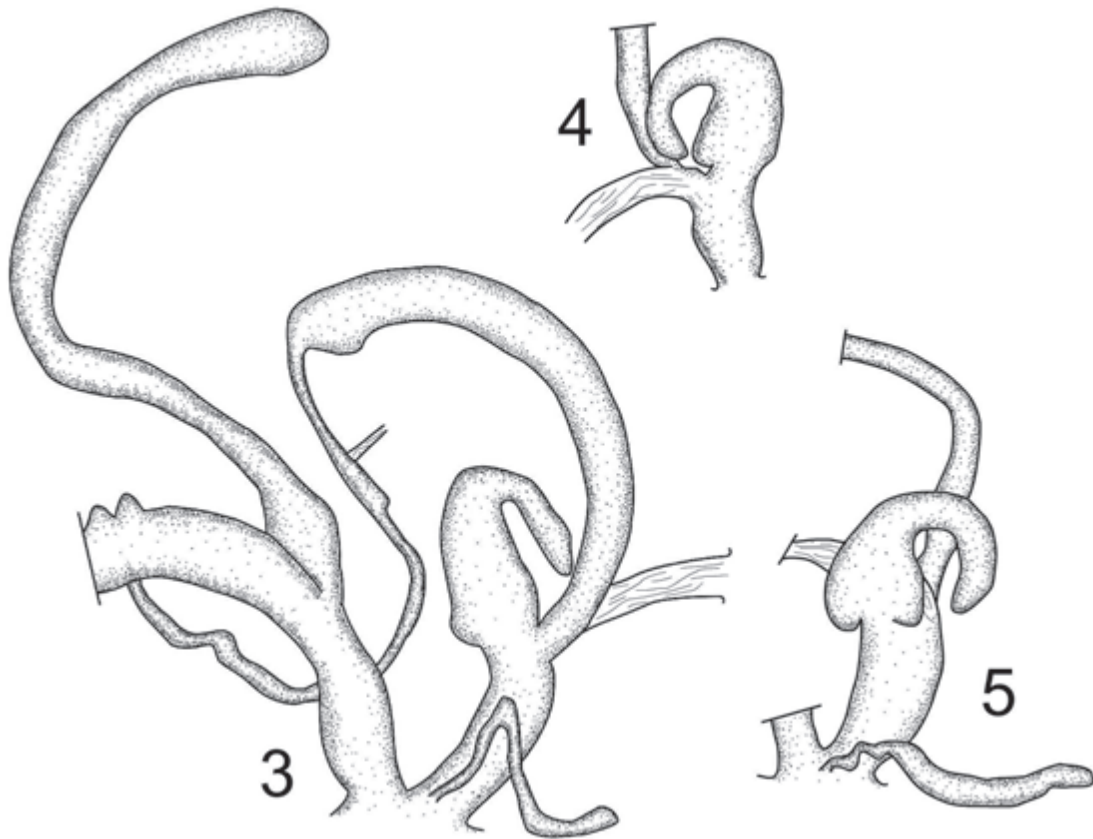
	Penis	PC	Epiphallus	Vbc	Vt	BC	Appendix
<i>Sch. aculeata</i>	0.9	1.3	2.8	1.6	4.0	2.9	—
<i>Sch. aculeata</i>	0.8	1.4	4.4	1.4	4.1	2.6	—
<i>Sch. aculeata</i>	0.7	1.2	3.8	0.7	3.5	2.6	—
<i>Sch. sigma</i>	1.0	0.2	3.8	0.7	2.9	3.8	2.1
<i>Sch. sigma</i>	0.8	0.2	3.3	0.6	2.6	5.2	1.8
<i>Sch. sigma</i>	0.7	0.2	4.0	1.1	3.3	2.5	1.5
<i>Sch. attilae</i>	1.0	1.8	4.0	1.4	3.3	6.3	2.8
<i>Sch. attilae</i>	1.4	2.1	3.4	1.0	3.3	6.0	3.0

Schileykula attilae Páll-Gergely 2010

Schileykula (?) *attilae* Páll-Gergely, 2010: 89, figs 2–5. Type locality: “TR, Vil. Artvin, Şavşat kalesi (fortress), 950 m a.s.l. GPS: 41° 15.59’ N 42° 19.64’ E.”

Collection data of dissected material TR, Vil. Artvin, Şavşat kalesi, 41°15.59’N, 42°19.64’E. Leg: Páll-Gergely, B., 7/7/2010. Two specimens were dissected.

Description of the genital structure (Figs 3–5) The penis is thick, with a relatively strong penial appendix on the base. The penial caecum is well-developed, sometimes with a wide, heart-shaped base (Fig. 5). The slimmer distal part of the caecum is usually as long as the proximal portion. The retractor muscle attaches at the penis-epiphallus junction. The epiphallus is long and cylindrical, with a swelling before the junction with the vas deferens. The first part of the vas deferens is a bit thicker than after, and



Figures 3–5 Genital structure of *Schileykula attilae* Páll-Gergely 2010.

there is an additional retractor muscle on it. The vagina is relatively thick. The bursa copulatrix is well-developed and very slowly tapers towards the end. Measurements of some sections of the genitalia are given in Table 1.

Notes There are no major differences between the genital structure of *Schileykula attilae* and the similar and sympatric *Schileykula batumensis* (Retowski 1889) (see Hausdorf, 1996). Only the penial caecum is worth mentioning, there being a wider base in *S. attilae* and with the wider proximal and slimmer distal parts well separated.

Schileykula sigma Hausdorf 1996

Schileykula (?) *sigma* Hausdorf, 1996: 49, pl. 5, figs 61–62. Type locality: “V. Giresun: Şebin Karahisar, Burg, DE56”.

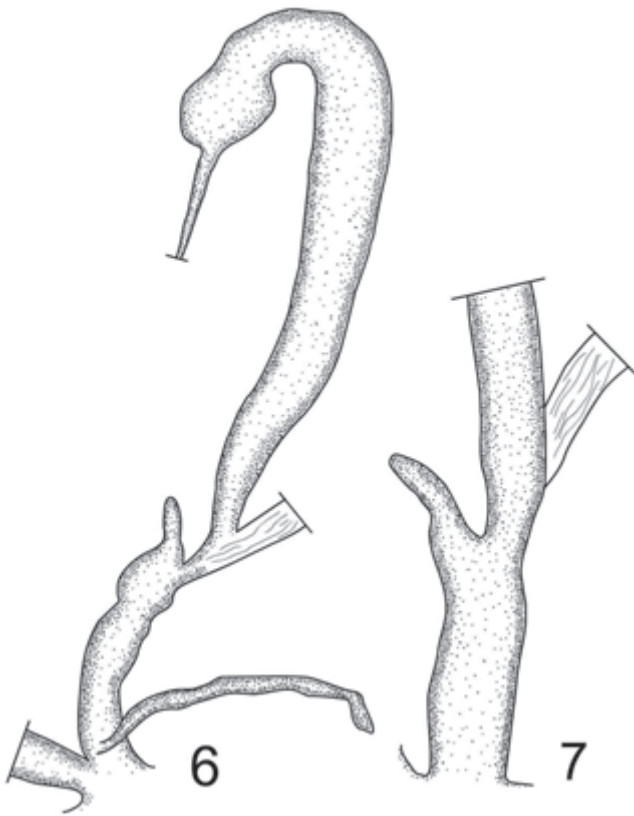
Schileykula sigma Schütt, 2001: 44.

Collection data of dissected material Turkey, on the borders of vil. Erzurum and vil. Erzincan, Tercan tüneli, calcareous rocks near the tunnel,

39°50′23.82″N, 40°33′59.02″E. Leg: Páll-Gergely, B., 5/7/2010. Three specimens were dissected.

Description of the genital structure (Figs 6–7) The penis is normal, with a relatively long penial appendix at the base. The penial caecum is weak, resembling that of *Schileykula scyphus* (see Hausdorf, 1996). The retractor muscle attaches to the epiphallus, immediately after the penis-epiphallus transition. The epiphallus is long, from the junction with the penis it tapers till the end, and the very distal part of the epiphallus has a swelling. The vagina is relatively short and the bursa copulatrix is well-developed, very slowly tapering towards the end. Measurements of some sections of the genital structure are given in Table 1.

Notes Hausdorf (1996) reported this species from “V. Erzincan, Genist des Tercan Barajı”. This locality is close to the present one. The specimens in the present study are slightly bigger than those of in the original description (Hausdorf, 1996). The mean height of Hausdorf’s specimens is 5.2 mm, whereas the specimens



Figures 6–7 Male part of the genital structure of *Schileykula sigma* Hausdorf 1996.

collected by me has an average shell height of 6.3 mm (6.0–6.7 mm).

Pagodulina pisidica Schütt 1993

Pagodulina pisidica Schütt, 1993: 52. Type locality: "Döşeme alti bei Antalya"

Pagodulina pisidica Hausdorf, 1996: 65, pl. 6, figs 88–89

Pagodulina pisidica Schütt, 2001: 57

Collection data of the dissected material TR, Vil. Antalya, Beşkonak S, Karabük cross. Conglomerate rocks next to the Köprü çay, 100 m

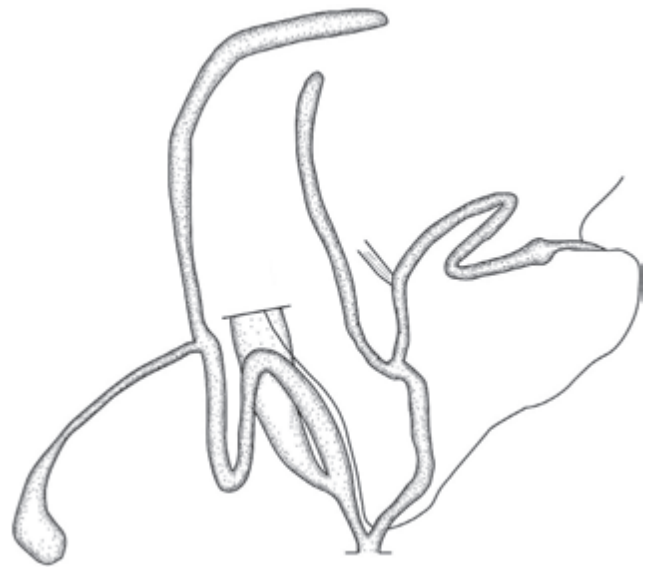


Figure 8 Genital structure of *Pagodulina pisidica* Schütt 1993.

37°07'01.8"N, 31°12'43.9"E. Leg: Páll-Gergely, B. 1/10/2007. Three specimens were dissected.

Description of the genital structure (Fig. 8) The whole genital system consists of rather slim and long sections. The penis is about half of the length of the epiphallus, there is a long penial caecum, which very slowly tapers towards the end. The epiphallus has a swelling before the transition with the vas deferens. The retractor muscle attaches to the epiphallus, close to the transition with the penis. Before the epiphallus-vas deferens junction there is a very weak additional retractor muscle. The vagina is very short, but the pedunculus is long. The bursa copulatrix is club-like, with a slim stem. The diverticulum is much longer than the bursa copulatrix. Measurements of some sections of the genital structure are given in Table 2.

Notes *Pagodulina lederi* (O. Boettger 1886) is the only Asiatic species of that genus in which

Table 2 Measurements of some sections of the genitalia of *Pagodulina pisidica*. Abbreviations: PC: penial caecum; BC: bursa copulatrix.

	Penis	Epiphallus	PC	Pedunculus	BC	Diverticulum
<i>P. pisidica</i>	1.6	2.8	3.0	4.0	1.8	3.5
<i>P. pisidica</i>	1.5	3.0	2.4	3.1	1.7	3.9
<i>P. pisidica</i>	1.6	3.1	2.6	3.0	2.1	3.8



Figure 9 Distribution of the genus *Schileykula* Gittenberger 1983. The dotted area indicates the area richest in species.

the genital system is known (Schileyko, 1976). Anatomical data from European species of the genus was published by Moquin-Tandon (1855), Klemm (1939) and Gittenberger (1978). According to these authors and the data published here, the following taxa possess a penial caecum: *P. pagodula* (Des Moulins 1830) (Moquin-Tandon, 1855), *P. subdola* (Gredler 1856), *P. austeniana* (G. Nevill 1880) (Gittenberger, 1978) and *P. pisidica*, whereas the following taxa lack this organ: *P. sparsa principalis* Klemm 1939, *P. sparsa altilis* Klemm 1939 (Klemm, 1939) and *P. lederi* (Schileyko, 1976). The presence or absence of the penial caecum appears to be of little taxonomic importance in this genus.

CONCLUSIONS

Distribution of the genus Schileykula The taxonomic position of only one former *Schileykula* species remains unclear, that of *S. robusta* (Nägele 1906) (see Hausdorf, 1996). Within the area of distribution of the genus *Schileykula* (Fig. 9)

there is only a single species ascribed in the literature to *Orculella* i.e. *O. bulgarica* (Hesse 1915) (see Hausdorf, 1996). The inclusion of this species within *Orculella* was confirmed by Garrido *et al.* (2005). Thus, the distribution of the genus *Schileykula* is known relatively well (Fig. 9). Almost all of the *Schileykula* species live in Turkey. Only a single subspecies, *Schileykula scyphus crassa* (Pilsbry 1922) occurs outside this area, in Iran (Hausdorf, 1996). The distribution of the genus within Turkey can be ascribed to three separate areas the richest of which, in terms of species, is in the the north-eastern quadrant. Here *S. aculeata*, *S. attilae*, *S. batumensis* and *S. trapezensis* (Stojaspal, 1981) can be found within a limited area.

ACKNOWLEDGEMENTS

I am grateful to Semih Çelik (Trabzon, Turkey) and his family for their support during my field work, to Josef Harl (Vienna, Austria), Bernhard Hausdorf (Hamburg, Germany) and Aydın

Örstan (Pittsburgh, USA) for their valuable advices.

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