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***Arganiella tabanensis* n. sp. from Montenegro (Mollusca: Gastropoda: Hydrobiidae)**

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Abstract

The first Balcan representative of the Central-Western Mediterranean genus *Arganiella* Giusti & Pezzoli, 1980 is here described. It has been collected in the Taban spring in Montenegro. Hitherto only two species of this genus are known: *A. pescei* Giusti & Pezzoli, 1980 from Italy and *A. wolfi* (Boeters & Glöer, 2007) from Spain.

Key words: Hydrobiidae, *Arganiella tabanensis* n. sp., Montenegro.

Introduction

Giusti and Pezzoli (1980: 209) described the monospecific genus *Arganiella* from the Eastern side of Apennines near Teramo (L'Aquila, Abruzzo) with *Arganiella pescei* Giusti & Pezzoli, 1980 as type species. Its distribution was limited to 22 stations scattered among Abruzzo, Lazio and Marche (cfr. Giusti and Pezzoli, 1980: 213). Thus two species of *Arganiella* Giusti & Pezzoli, 1980 are known so far: *A. pescei* Giusti & Pezzoli, 1980 and *Arganiella wolfi* (Boeters & Glöer, 2007). These species live in subterranean habitats.

Recently collected samples by Vladimir Pešić from Taban spring (Montenegro) revealed a new *Arganiella* species. This paper is intended to describe this new species.

Material and Methods

The freshwater snail was collected by Vladimir Pešić with a sieve and preserved in 75 % ethanol. In order to collect live specimens, the spring sediments were transported into the laboratory, soaked in tap water and left in the dark for a few days in order to leave enough time for live animals to reach the surface of the sediment. The dissections and measurements of the genital organs and the shells were carried out using a stereo microscope, the photographs were made with a Leica digital camera system. Preservation and dissection of snails was carried out in accordance with Boeters (1998, 1999). Counting of whorls was done according to Gittenberger *et al.* (1970).

Abbreviations: BOE = Collection Boeters, ZMH = Zoological Museum Hamburg.



Figure 1. Known distribution of *Arganiella* (blue dots).

Systematics

Family Hydrobiidae Troschel, 1857

Genus *Arganiella* Giusti & Pezzoli, 1980

***Arganiella tabanensis* n. sp.**
(Figs 2-3)

Holotype: shell height = 0.8 mm, diameter = 1.5 mm, ZMH 79707.

Paratypes: 10 specimens ZMH 79708, 13 specimens coll. Glöer, 20 ad. + 5 juv. specimens BOE 3319 (18 ♂♂ and 2 ♀♀ dissected).

Locus typicus: Montenegro, Podgorica, spring Taban, 42°31.653 N, 19°13.145 E, 105 m asl.

Etymology: The species is named after the name of the sampling site Taban spring.

Description

Shell. Shell valvatiform with 2.75 transparent flat conical whorls increasing regularly in size and separated by a deep suture (Fig. 2A); last whorl descends slowly on the shell wall (Fig. 2C), sometimes to such an extent that the top of the aperture lies vertically below the periphery of the preceding whorl and that the aperture separates from the shell (Fig. 2E); peristome roundish, not broadened, border blunt (Fig. 2C); diameter of the umbilicus vis-à-vis the aperture about 3/4 of the diameter of the aperture (Fig. 2B). Operculum flexible, without any peg, coloured like reddish horn. Diameter of shell 1.25-1.47 mm (n = 7), height of shell 0.76-1.04 mm (n = 3).

Animal. Completely pigmentless, only occasionally dispersed blackish pigment grains on the proximal part of the body and in the surrounding of the stomach. Gill with 11 lamellae (n = 1 ♂). Intestine with 2 bends, a first Z-like bend behind the stomach and a second bend in the roof of the mantle cavity; the legs of the second bend may form a narrow “V” or even touch each other. Proportion ♂ : ♀ = 18 : 2.

Male genitalia. Penis simple like a bent finger, without any lobes (Fig. 2D) and tapered at the tip.

Female genitalia (Fig. 3). With bursa and distal receptaculum (DRS = RS1); the globular bursa is positioned in the corner formed by the body wall, the distal wall of the stomach and the distal leg of the Z-like bend of the intestine when leaving the style sac; the pedunculus of the bursa is longer than the diameter

of the bursa; the receptaculum is also globular but somewhat smaller than the bursa; a proximal receptaculum (PRS = RS2) could not be found.

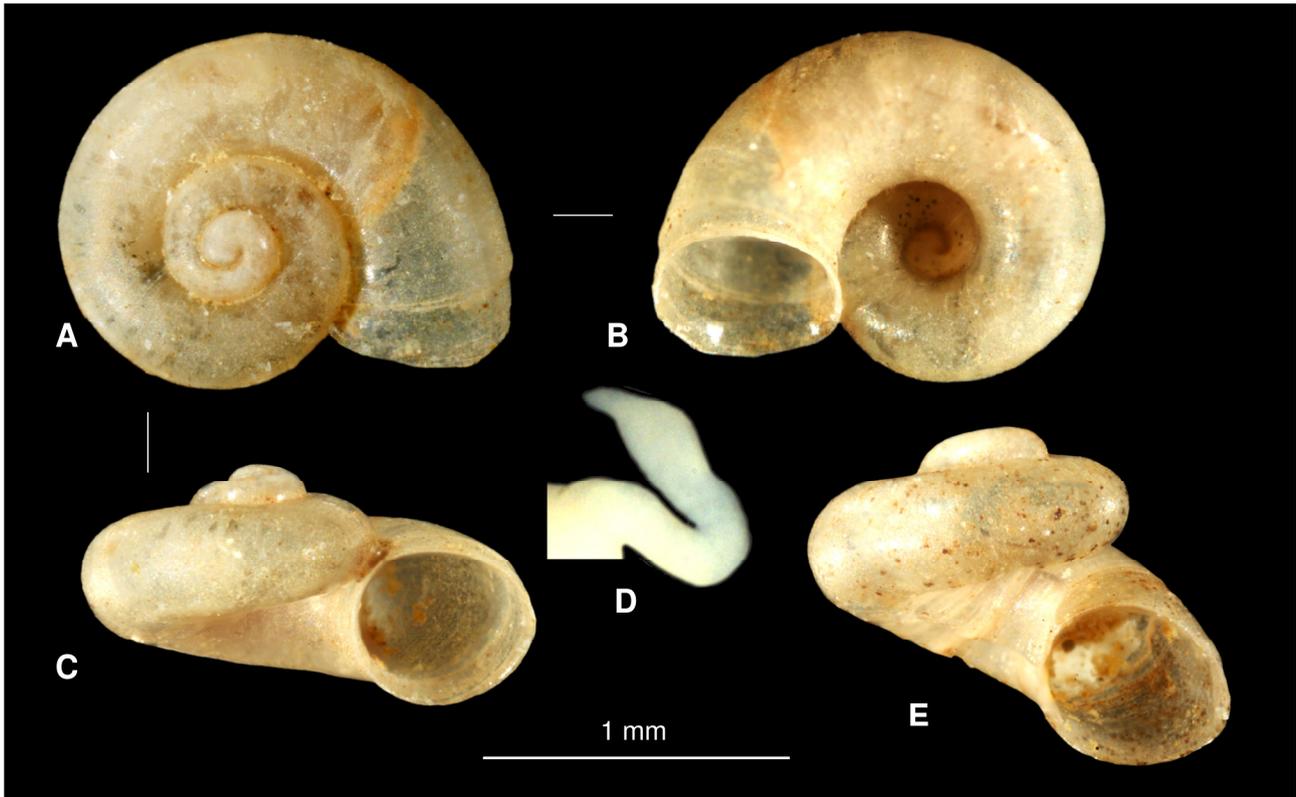


Figure 2. *Arganiella tabanensis* n. sp. A: apical view, B: umbilical view, C: frontal view, D: penis, E: shell with descended last whorl.

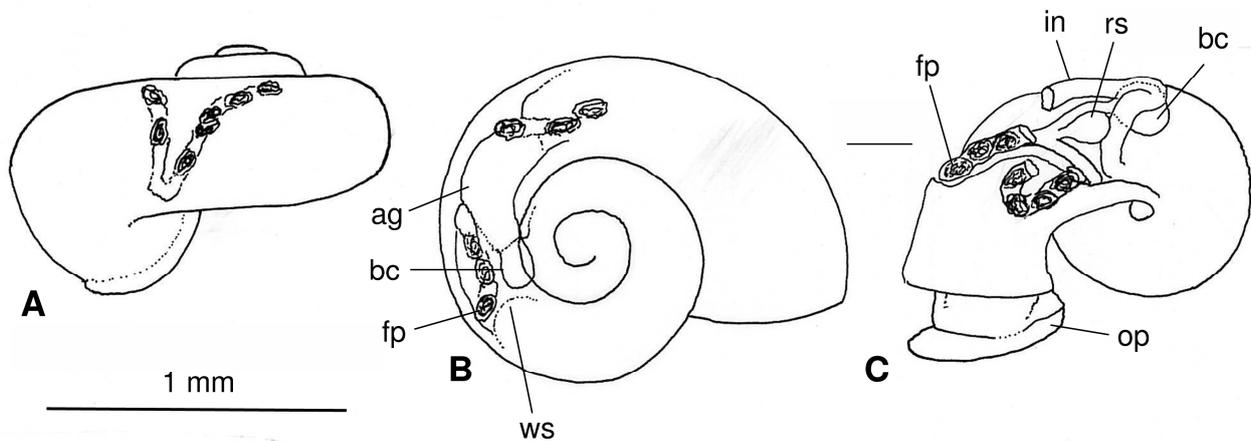


Figure 3A-C. A (male), V-like bend of intestine in the roof of the mantle cavity seen through shell wall; B (female), sections of the intestine filled with faecal pellets and bursa copulatrix seen through shell wall; C (same female as for Fig. 3B), proximal part of the mantle removed and body lumen opened to such an extent that the V-like bend of the intestine in the roof of the mantle cavity is separated from the proximal and the distal section of the intestine to expose bursa copulatrix and receptaculum seminis.

ag = albumen gland, bc = bursa copulatrix, fp = faecal pellet, in = intestine, rs = receptaculum seminis, op = operculum, ws = wall of stomach.

Habitat and distribution. Only known from type locality (Fig. 4). The new species was collected in a small rheocrene spring in deciduous forests dominated by common beech (*Fagus sylvatica* L.). The spring water and sediment had a smell of hydrogen sulphide.



Figure 4. Type locality of *Arganiella tabanensis* n. sp.

Differentiating characters. *Arganiella pescei* Giusti & Pezzoli, 1980 differs by a gill with 17-18 instead of 11 lamellae, further, a coiled instead of U-like bend intestine on the pallial wall and, finally, a greater difference in size of bursa and receptaculum, that is a larger bursa and a smaller receptaculum compared to the new species. The far remote *Arganiella wolfi* (Boeters & Glöer, 2007) can be differentiated by a penis with a black pigmented core and an oblong and not globular bursa.

Discussion

Generic position. For Southern Europe species of the Hydrobiidae with valvatooid shells and males with a simple penis have been described for *Arganiella* Giusti & Pezzoli, 1980, *Dabriana* Radoman, 1974, *Hadziella* Kuscer, 1932, *Hauffenia* Pollonera, 1898, *Heraultia* Bodon, Manganelli & Giusti, 2001 and *Sardohoratia* Manganelli, Bodon, Cianfanelli, Talenti & Giusti, 1998 (see Bodon *et al.* 2001). Further, for Southern Europe species of the Hydrobiidae with valvatooid shells and females with bursa and a distal as single receptaculum have been described for *Arganiella* Giusti & Pezzoli, 1980, *Dabriana* Radoman, 1974, *Hadziella* Kuscer, 1932, *Heraultia* Bodon, Manganelli & Giusti, 2001 and *Kerkia* Radoman, 1978.

The new species of *Arganiella* differs from representatives of the following genera as follows.

In *Dabriana* the distal receptaculum (RS1 = DRS) is larger and not smaller than the bursa.

In *Hadziella valvataeformis*, the type species, bursa and its duct are not aligned but bent U-like.

In *Hauffenia tellinii*, the type species, the operculum is provided with a peg and the rectum strongly coiled.

In the type species of *Heraultia*, *H. exilis* (Paladilhe, 1867), the pedunculus enters the bursa proximally and not distally.

In males of *Kerkia kusceri* (Bole, 1961), the type species, the penis carries a lobe.

Sardohoratia sulcata Manganelli, Bodon, Cianfanelli, Talenti & Giusti, 1998, the type species, differs by the presence of a second receptaculum (RS2 = PRS).

Arganiella has been reported from Spain and Italy, inter alia from the Tyrrhenian side of Apennines and Abruzzo vis-à-vis the Dalmatian coast (Fig. 1). This is in analogy to another genus of the Hydrobiidae, i.e. *Islamia* Radoman, 1973 with species with valvatooid shells. Species of *Islamia* are known from the mainland of Italy and from the Balkans as well.

The following list compiles characters of ctenidium, intestine, males and females of species of genera with valvatooid shells (alphabetical order) followed by a summarising table. List and table aim at a deepened characterisation of *Arganiella* with *A. tabanenensis* n. sp.

Arganiella Giusti & Pezzoli, 1980. A species of this genus, known from Italy with its type species only (Bodon *et al.* 2001: 173 fig. 186), has recently been reported also from Spain (Arconada and Ramos 2007). These species show a well-developed ctenidium (Giusti and Pezzoli 1981: 210-211 figs 1B and 2F; Arconada and Ramos 2007: 67 fig. 4E). Further, their final section of the intestine is only slightly bent (Giusti and Pezzoli 1981: 211 figs 2A-C; Arconada and Ramos 2007: 67 fig. 4E), in males the penis is simple (Giusti and Pezzoli 1981: 211 figs 2F-0; Arconada and Ramos 2007: 65 fig. 3C and 67 fig. 4H), and in females a proximal receptaculum (RS2 or PRS) is missing, only bursa and distal receptaculum are present (RS1 or DRS) (Giusti and Pezzoli 1981: 210 figs 1A-E; Arconada and Ramos 2007: 67 figs 4H-J).

Boetersiella Arconada & Ramos, 2001. In species of *Boetersiella* known from Spain only, a ctenidium is missing (Arconada and Ramos 2001: 95). The final section of their intestine is bent like a U (Boeters 1988: 218 fig. 172; Arconada and Ramos 2001: 957: fig. 4B), the penis of males shows an outgrowth or lobe (Boeters 1988: 218 figs 160-161; Arconada and Ramos 2001: 961 figs 8A-B) and in females the distal receptaculum (RS1 or DRS) is missing, only bursa and proximal receptaculum are present (RS2 or PRS) (Boeters 1988: 218 fig. 173; Arconada and Ramos 2001: 960 figs 8C-D and 968 figs 12C-D).

Bracenicia Radoman, 1973. In the type species of the Balkanese genus *Bracenicia* (Bodon *et al.* 2001: 173 fig. 186), that is *B. spiridoni* Radoman, 1973, the operculum shows an outgrowth on its inner side which twists and penetrates into the foot of the animals (Radoman 1983: 66). The penis of males shows a lobe (Radoman 1983: 67 fig. 29). As regards the female genitalia with bursa, distal and proximal receptaculum, the distal receptaculum (RS1 or DSR) is embedded by the hollow formed by the bursa and its pedunculus (Radoman 1983: 67 fig. 29), it does not lean over the wall of the bursa as in the monotype of the new genus. The ctenidium and intestine of *B. spiridoni* has not yet been examined.

Chondrobasis Arconada & Ramos, 2001. Reference can be made to the foregoing comments on *Boetersiella*. The only species of *Chondrobasis* and which is only known from Spain, can be distinguished from the two known species of *Boetersiella* simply by a penis of their males which is not simple but provided with a papilla, and by a proximal receptaculum (RS2 or PRS) of their females which does not lean over the bursa (Arconada & Ramos 2001: 974 fig. 16D).

Dabriana Radoman, 1974. The monotype of this genus, *D. bosniaca* Radoman, 1974, differs from species of *Arganiella* by a shell with spiral striations, a caudal tentacle, a missing gill, an presumably U-like bent rectum (Radoman 1983: 169 fig. 102A) and in females a small bursa and a receptaculum much larger than the bursa. The penis is simple.

Daphniola Radoman, 1973. The shell of its type species, *D. graeca* Radoman, 1973, is globular and not planispiral (Radoman 1983: pl. 5 fig. 87). The penis of males carries a lobe (Radoman 1983: 84 fig. 45). The female genitalia of the type species comprise a bursa and 2 receptacula. The distal receptaculum (RS1 or DSR) is surrounded but not embedded by the hollow formed by the bursa and its pedunculus (Radoman 1983: 84 fig. 45) and does not lean over the wall of the bursa. Ctenidium and intestine of *D. graeca* has not yet been examined. *Daphniola* has only been reported from the Balkans yet (Bodon *et al.* 2001: 173 fig. 186).

Fissuria Boeters, 1981. Species of this genus are distributed from the Balkans to France (Bodon *et al.* 2001: 174 fig. 187). The ctenidium of *F. boui* Boeters, 1981, the type species of *Fissuria*, is well-developed

(Bodon *et al.* 2001: 112 figs 25 and 27). The final section of the intestine is slightly coiled (Boeters 1981: 57 fig. 8; Bodon *et al.* 2001: 112 figs 25 and 27) and the penis is provided with at least 2 wart-like small protrusions and papillae, resp., and not a lobe (Boeters 1981: 57 figs 5-8; Bodon *et al.* 2001: 112 figs 30-34). The female genitalia comprise a bursa and 2 receptacula (Boeters 1981: 57 fig. 9; Bodon *et al.* 2001: 112 figs 27-29).

Hadziella Kuscer, 1932. Representatives of this genus have become known from the Balkans and Italy (Bodon *et al.* 2001: 173 fig. 186) and as *H. leonorae* Rolán & Pardo, 2011 from Majorca. In *H. ephippiostoma* Kuscer, 1932, a ctenidium is missing (Bole 1993: 11 fig. 3A; Bodon *et al.* 2001: 119 fig. 59). The final section of the intestine of this species is coiled (Bodon *et al.* 2001: 119 fig. 59) and the penis is simple (Bole 1993: 11 fig. 3C; Bodon *et al.* 2001: 119 fig. 58). Further, in females the second receptaculum (RS2 or PSR) is missing. Only bursa and a distal receptaculum (RS1 or DRS) are present (Bole 1993: 11 fig. 3C). The bursa and its duct are bent U-like.

Hauffenia Pollonera, 1898. Species of this genus have been described from the Balkans up to Austria and northeast Italy. The operculum of e.g. *H. tellinii* (Pollonera, 1898), the type species, is provided with a well developed peg. A ctenidium is present. The final section of the intestine is strongly coiled (double sack-like folded) (Bodon *et al.* 2001: 123 figs 77-79). Bursa and proximal receptaculum (RS2 = PRS) are present, but a distal receptaculum (RS1 or DRS) is missing (Bodon *et al.* 2001: 123 figs 78-80).

Heraultia Bodon, Manganelli & Giusti, 2001. The monotype, *H. exilis* (Paladilhe, 1867) is provided with a ctenidium and a V-like bent rectum. The penis of males is simple. Bursa and distal receptaculum (RS1 = DRS) are present. The duct of the bursa enters the bursa proximally and not distally (Boeters 1974: 87 figs 3-4; Bodon *et al.* 2001: 208 figs 289-294).

Horatia Bourguignat 1887. Representatives of this genus have become known only from the Balkans (Bodon *et al.* 2001: 173 fig. 186). The ctenidium is well-developed (Bodon *et al.* 2001: 130 figs 108-109). The final section of the intestine is only slightly bent like a V. In males of the type species, that is *H. klecakiana* Bourguignat, 1887, the penis carries at least one lobe (Boeters 1974: 87 figs 1-2; Bodon *et al.* 2001: 130 figs 106 and 110). The female genitalia comprise a bursa and 2 receptacula. The distal receptaculum (RS1 or DSR) is surrounded or embedded by the hollow formed by the bursa and its pedunculus (Radoman 1983: 48 fig. 20; Bodon *et al.* 2001: 130 fig. 108), it does not lean over the wall of the bursa. (Bodon *et al.* loc. cit.).

Iberhoratia Arconada, Delicado & Ramos, 2007. The ctenidium of *I. morenoi* Arconada, Delicado & Ramos, 2007, the type species, is well-developed (Arconada *et al.* 2007: 2018 fig. 4C). The distal section of the intestine is formed like a V (Arconada *et al.* 2007: 2018 fig. 4E). In males, the penis is provided with a lobe (Arconada *et al.* 2007: 2018 fig. 4F). Bursa and 2 receptacula (RS1 = DRS, RS2 = PRS) are present, the distal receptaculum (RS1 = DRS) does not lean over the bursa, but is at most embedded by the bursa and its pedunculus (Arconada *et al.* 2007: 2018 fig. 4H).

Islamia Radoman, 1973. Representatives of *Islamia* have been reported from Asia Minor to Spain (Bodon *et al.* 2001: 172 fig. 185). A ctenidium is present and the final section of the intestine is merely slightly coiled or bent (Bodon *et al.* 2001: 182 figs 193-194; 183 figs 198, 200 and 205-206; 197 figs 258-260; 204 figs 272, 274 and 279-280; 206 figs 285-286). Females are provided with 2 receptacula, however, a bursa is missing (Radoman 1983: 125 fig. 69A-B; Bodon *et al.* 2001: 182 fig. 194; 183 figs 200 and 206; 197 figs 259-261; 204 figs 272-273 and 279; 206 fig. 286).

Kerkia Radoman, 1978. The type species, *K. kusceri* (Bole, 1961), is provided with a ctenidium and a coiled rectum (Bodon *et al.* 2001: 137: figs 121-122). The penis of males carries a lobe and the renal oviduct of females a bursa and a distal receptaculum (Bodon *et al.* 2001: 137: figs 120 and 122).

Milesiana Arconada & Ramos, 2006. The only species of this Spanish genus, *M. schuelei* (Boeters, 1981), is characterised by the presence of a ctenidium and a final section of the intestine which is bent like a V (Boeters 1981: 57 fig. 4; Arconada and Ramos 2006: 117 fig. 167) and not strongly coiled. The penis of males carries a lobe (Boeters 1981: 57 fig. 3; Arconada and Ramos 2006: 117 figs 170-171). Proximal and

distal receptaculum (RS1 + RS2 or DRS + PRS) are present, but a bursa is missing (Boeters 1981: 57 fig. 4; Arconada and Ramos 2006: 117 fig. 167 figs 172-173).

Pezzolia Bodon, Manganelli & Giusti, 1986. Representatives of this genus have become known from Italy only (Bodon *et al.* 2001: 173 fig. 186). A ctenidium is missing (Bodon *et al.* 1986: 65 figs 1D-E; Bodon *et al.* 2001: 146 figs 148-149). The final section of the intestine is slightly coiled (Bodon *et al.* 2001: 146 figs 148-149). In males of the type species, *P. radapalladis* Bodon & Giusti, 1986, the penis is generally provided with one or more papillae (Bodon *et al.* 2001: 146 figs 153-155). At least 2 receptacula (RS1 = DRS, RS2 = PRS) are present, however, the bursa of the female genitalia is small or even missing (Bodon *et al.* 1986: 65 figs 1D-F; Bodon *et al.* 2001: 146 figs 145-147 and 149).

Prespolitorea Radoman, 1983. In males of *P. valvataeformis* Radoman, 1983, the type species of the genus, the penis carries an outgrowth (Radoman 1983: 67 fig. 31). Females of *Prespolitorea* are provided with a bursa and 2 receptacula. The distal receptaculum (RS1 or DSR) is at most surrounded and not embedded by the hollow formed by the bursa and its pedunculus (Radoman 1983: 67 fig. 31) and does not lean over the wall of the bursa. Ctenidium and intestine are unknown. According to Bodon *et al.* (2001: 150) the relationship of this genus to other genera on the Balkans such as *Daphniola* and *Horatia* has not yet been satisfactorily clarified. Nevertheless, species comprised by *Prespolitorea* inhabit on the Balkans ancient lakes and not subterranean water courses and their outflows.

Pseudohoratia Radoman, 1967. The type species, *P. ochridana* (Polinski, 1929), shows a ctenidium and an only slightly bent rectum (Bodon *et al.* 2001: 150 figs 161-162). The penis of males carries a simple lobe and the renal oviduct of females a bursa and a proximal receptaculum (RS2 = PRS) (Bodon *et al.* 2001: 150 figs 161-162).

Pseudoislamia Radoman, 1979. The aperture of the shell of the type species of the Balkanese genus *Pseudoislamia* (Bodon *et al.* 2001: 173 fig. 186), that is *P. balcanica* Radoman 1979, shows a characteristic convex palatal lip. The penis of males is provided with a lobe (Radoman 1983: 84 fig. 44). The bursa is accompanied by 2 receptacula. However, the distal receptaculum (RS1 or DSR) is at most surrounded and not embedded by the hollow formed by the bursa and its pedunculus (Radoman 1983: 84 fig. 44), it does not lean over the wall of the bursa. Ctenidium and intestine are unknown.

Sardohoratia Manganelli, Bodon, Cianfanelli, Talenti & Giusti, 1998. *Sardohoratia* is known from Sardinia only. In species of *Sardohoratia* the number of lamellae of the gill is small, e.g. 6-7, or a gill can even be missing (Manganelli *et al.* 1998: 66 figs 42, 44, 49, 51) and the legs of the bend of the intestine in the roof of the mantle cavity touch each other. The penis of males is simple (Manganelli *et al.* 1998: 66 figs 41, 43, 47 and 50). Females of the two known species of *Sardohoratia* show a combination of bursa, distal receptaculum (DRS = RS1) and proximal receptaculum (PRS = RS2) (Manganelli *et al.* 1998: 66 figs 44-45 and 51-52).

Spathogyna Arconada & Ramos, 2002. A ctenidium is present (Arconada and Ramos 2002: 324 fig. 5C). The distal section of the intestine of the monotype of *Spathogyna*, that is *Sp. fezi* (Altimira, 1960), is formed like a V (Hinz *et al.* 1994: 73 fig. 3; Arconada and Ramos 2002: 324 fig. 5B). In males the penis is provided with a lobe (Arconada and Ramos 2002: 325 figs 7A-B). The bursa is accompanied by 2 receptacula, however, the distal receptaculum (RS1 or DRS) does not reach the wall of the bursa (Arconada and Ramos 2002: 325 fig. 7C).

Tarraconia Ramos, Arconada, Rolán & Moreno, 2000. Species of this genus known from Spain only show a well-developed ctenidium (Ramos *et al.* 2000: 83 fig. 5C) and a final section of their intestine which is bent like a V (Ramos *et al.* 2000: 83 figs 5C-D). In males of *T. gasulli* Ramos, Arconada, Rolan & Moreno, 2000, the type species of the genus, the penis is provided with a lobe (Ramos *et al.* 2000: 89 figs 8C-D). In females only a bursa but no receptacula are present (Ramos *et al.* 2000: 89 figs 8A-B and 94 fig. 13A).

Remarks. The intestine of the type species of *Arganiella*, i.e. *A. pescei*, is not U-like bend on the pallial wall as published by Giusti and Pezzoli (1980: 44 fig. 19C; 1981: 210 figs 1A-B) but coiled as illustrated by Bodon *et al.* (2001: 107 figs 6-7; Bodon in litt. 19.09.2014).

NEW ARGANIELLA FROM MONTENEGRO

Genus	cteni- dium	Penis simple	bursa	RS1 (DRS)	RS2 (PRS)	shape of rectum
<i>Arganiella</i>	x	x	x	x	-	U- to V-like
<i>Boetersiella</i>	-		x	-	x	U-like
<i>Bracenicia</i>	?		x	x embedded by pedunculus + bursa	x	?
<i>Chondrobasis</i>	-		x	-	x	?U-like
<i>Dabriana</i>	-	x	x	x larger than bursa	-	?U-like
<i>Daphniola</i>	?		x	x surrounded by pedunculus + bursa	x	?
<i>Fissuria</i>	x		x	x		
<i>Hadziella</i>	-	x	x	x	-	U-like
<i>Hauffenia</i>	x		x	-	x	double sack- like
<i>Heraultia</i>	x	x	x	x	x	V-like
<i>Horatia</i>	x		x	x	x	V-like
<i>Iberhoratia</i>	x		x	x	x	V-like
<i>Islamia</i>		x		-	x	U-like to coiled sack-like
<i>Kerkia</i>	x	x	x	X	-	
<i>Milesiana</i>	x		-	X	v	V-like
<i>Pezzolia</i>	-		- to x	X	x	sack-like
<i>Prespolitorea</i>	?		x	x surrounded by pedunculus + bursa	x	?
<i>Pseudoislamia</i>	?		x	x surrounded by pedunculus + bursa	x	?
<i>Sardohoratia</i>	- to x	x	x	X	x	V- to sack-like
<i>Spathogyna</i>	x		x	X	x	V-like
<i>Tarracona</i>	x		x	-	-	V-like

Explanations: ? = unknown; - = missing; + = present

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