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Two new Hygromiidae from Crna Gora and Kosovo (Gastropoda Pulmonata), with a checklist of the hygromiid species described from the western Balkan

A.J. DE WINTER

c/o Nationaal Natuurhistorisch Museum, P.O. Box 9517, 2300 RA Leiden, and Animal Taxonomy Section, Dept. of Entomology, Wageningen Agricultural University, P.O. Box 8031, 6700 EH Wageningen, the Netherlands

& W.J.M. MAASSEN

Azaleahof 25, 1115 DH Duivendrecht, the Netherlands

Two new species of *Monachoides* Gude & Woodward, *M. kosovoensis* and *M. taraensis*, are described from Kosovo and Crna Gora, Yugoslavia, on the basis of conchological and anatomical characters. The assignment of both species to the genus *Monachoides* is somewhat doubtful in view of the presence of a small second dart-sac in *M. kosovoensis*, and the atypical shell of *M. taraensis*. A lectotype shell of *Monacha fallax* Wagner, 1915, is designated and figured. An annotated checklist of all nominal hygromiid western Balkan species (sensu Schileyko, 1991, exclusive of the "Helicellinae", and the genus *Monacha* Fitzinger s.l.) is provided.

Key words: Gastropoda, Pulmonata, Helicoidea, Hygromiidae, *Monachoides*, taxonomy, Yugoslavia, Crna Gora, Kosovo.

INTRODUCTION

From the western Balkan area about 45 taxa of Hygromiidae (sensu Schileyko, 1991, here only taxa not belonging to the "Helicellinae", and not to *Monacha* Fitzinger, 1833 s.l. are considered) have been described in the past. Wagner (1915) gave a revision of part of the taxa known at that time, and added some new ones. His anatomical work showed that several conchologically similar, sometimes virtually indistinguishable, taxa need to be placed into different genera. On the other hand, according to Wagner (1915) some species exhibit considerable variation in shell morphology, which he considered to be caused by environmental factors, notably altitude. Since Wagner few new data have been published, and the identification of these taxa remains very problematic in many cases, even with anatomical data available, because of the uncertain status of many nominal species. It may even be doubted whether Wagner's interpretations of older taxa are always reliable, but in the following we have assumed that they are.

During a joint visit to this area in September 1980, the authors collected live material of several Hygromiidae. At least two of these appeared to be new to science, and their formal descriptions are given below. Some of the taxonomic problems pertaining to the other taxa will be discussed while differentiating these new species. However, it is presently impossible to revise all taxa in this group, because some important type specimens and especially alcohol-preserved topotypes were not available. As a com-

plete revision may not be feasible within the foreseeable future, it was deemed worthwhile to provide future workers with a (hopefully) complete list of hygromiid taxa originally described from the western Balkan, annotated with remarks on their taxonomics status from the later literature, thus summarizing the present state of knowledge.

Throughout this paper the following abbreviations have been used: NNM for Nationaal Natuurhistorisch Museum, formerly Rijksmuseum van Natuurlijke Historie, Leiden (RMNH); IZPAN for Instytut Zoologiczny Polska Akademia Nauk, Warsaw (Poland).

We are much indebted to Dr. A. Riedel (IZPAN) for information, and the loan of type material, and to Th. Heijerman (Wageningen) and J. Goud (NNM) for respectively the photographs and the scanning electron micrographs illustrating this paper.

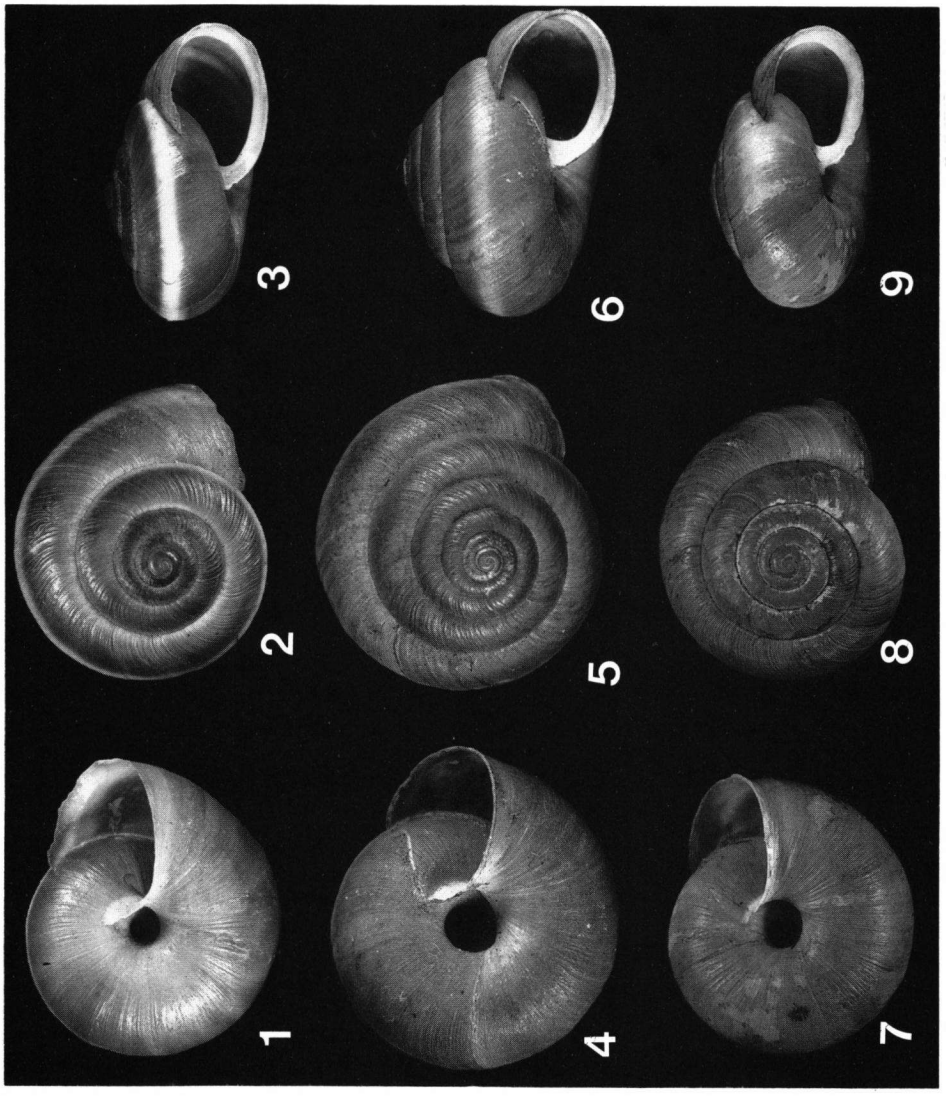
Monachoides taraensis nov. spec.

Material. — (Only specimens of populations from which at least one animal was dissected are mentioned and are considered as part of the type series) Yugoslavia, Crna Gora, Tara valley, 4 km NNW. of Donja Dobrilovina, 13 km NW. of Bistrica, limestone rocks at entrance of shallow cave, alt. 700 m, UTM CN76, 22.IX.1980, W.J.M. Maassen & A.J. de Winter leg.; holotype: RMNH 56657 (shell), RMNH slide 1093 (slide of genitalia), RMNH alc. 9341 (remaining soft parts); paratypes: RMNH 56658/7 (shells), RMNH slide 1094 (slide of genitalia), RMNH alc. 9342/4, IZPAN/1 shell, Maassen/5 shells). Type locality, 1.X.1988, W.J.M. Maassen leg. (Maassen/7 shells). Crna Gora, 2 km S. of Donja Dobrilovina, c. 7 km NW. of Bistrica; UTM CN76; 1.X.1988, W.J.M. Maassen leg. (RMNH 56659/2 shells, Maassen/8 shells, one in alc.). Crna Gora, about 21 km NW. of Bistrica, UTM CN66, VII.1979 (Maassen/1 shell, slide of genitalia).

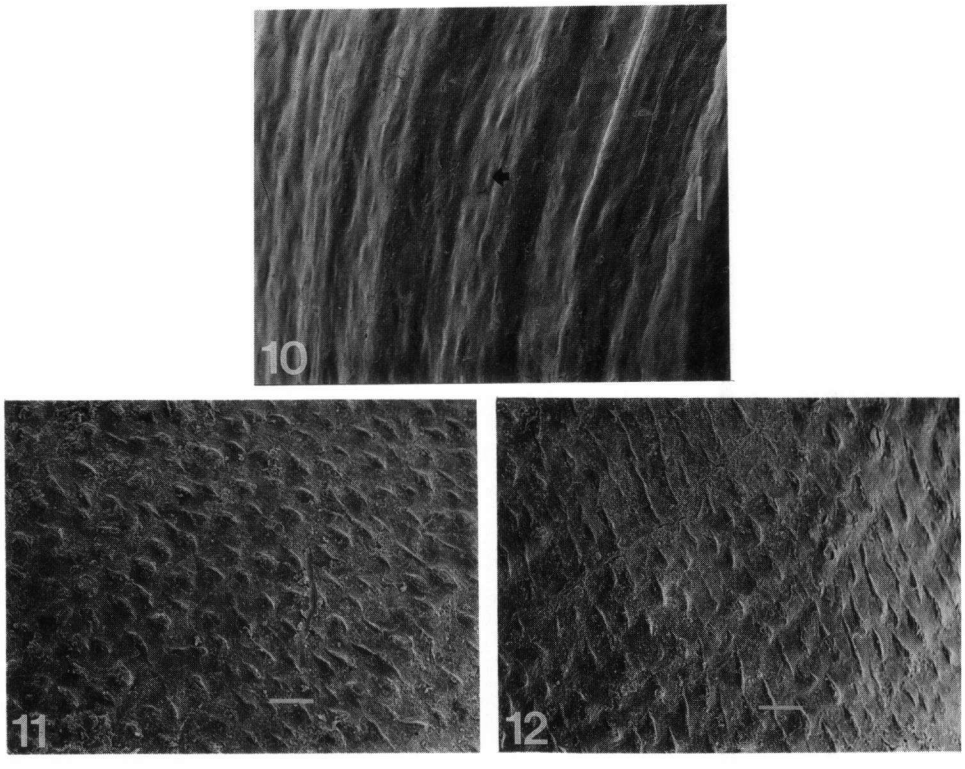
Shell (figs. 1-3, 10). — Holotype measurements: maximum diameter 12.1 mm, height 7.2 mm, whorls 4.9. Measurements of other specimens can be read from figs. 13-15. Correlation between diameter and whorl-count weak. Spire little elevated. Colour pale brownish, becoming lighter towards the sutures, with a conspicous white band around the periphery. Last whorl markedly dilated towards the aperture. Periphery somewhat angulated. Shell surface with strong growth ridges, and rather weakly and irregularly 'granulose' (perhaps better termed 'pitted') sculpture (fig. 10), which is best visible on the upper side. Umbilicus somewhat elliptical, taking up about one eighth of the shell diameter. Aperture oval, broadly reflexed basally, with a low internal rib.

Radula (figs. 16-18). — (1 examined) Formula (half a row): R-11-14. Central tooth smaller than the lateral teeth, tricuspid. Lateral teeth bicuspid, the endocone being virtually lost from the first lateral onwards. The transition of the laterals into the marginal teeth is located somewhat arbitrary, and is mainly apparent by the smaller size of the marginal cusps and basal plate. In the mid- and outer marginals many cusps are bifurcated or even trifurcated.

Pallial organs (fig. 22). — (3 examined) The pallial region takes up about one whorl. Mantle for the greater part uniformly greyish brown, becoming paler towards the mantle rim, without a clearly defined pattern of darker of lighter spots. The pigmentation of the lung is strikingly white only above the kidney, the white being



Figs. 1-9. Different views of shells of *Monachoides* species. 1-3, *M. taraensis* spec. nov., holotype shell (actual width 12.1 mm); 4-6, *M. kosovoensis* spec. nov., holotype shell (actual width 13 mm); 7-9. *M. fallax* (Wagner, 1915), lectotype shell (actual width 11.4 mm).



Figs. 10-12. S.E.M. photographs of *Monachoides* shells. 10, sculpture on upper side of paratype of *M. taraensis* nov. spec. (arrow indicates pit); 11-12, sculpture on upper side of paratype shell of *M. kosovoensis* nov. spec. Scale bars 100 µm.

marked with some thin brown lines and spots. Kidney long and slender, taking up somewhat less than half the length of the lung. Length of the heart is less than one third of that of the kidney. Primary ureter conspicuous. In all specimens examined, the secondary ureter opens about half-way along its length, and continues as an open gutter with one wall closely adhering to the hind-gut.

Genital system (figs. 23-30). — (6 specimens examined) The right ocular retractor passes between penis and vagina. The male organ is traditionally divided into the penis proper, the epiphallus, and the flagellum according to the place of insertion of the retractor muscle and the place of entrance of the vas deferens. However, here this division proved not to correspond to a division according to the function of these organs, as evidenced by their internal structures. The penis proper is rather short, and is restricted to the basal part containing the penial papilla, which is elongate oval, with some constrictions (fig. 24). On cross-section (fig. 25) its central lumen appears to be surrounded by a thick cylindrical layer of glandular tissue, which is enclosed by a muscular sheath. This muscular layer is enveloped by two macroscopically somewhat

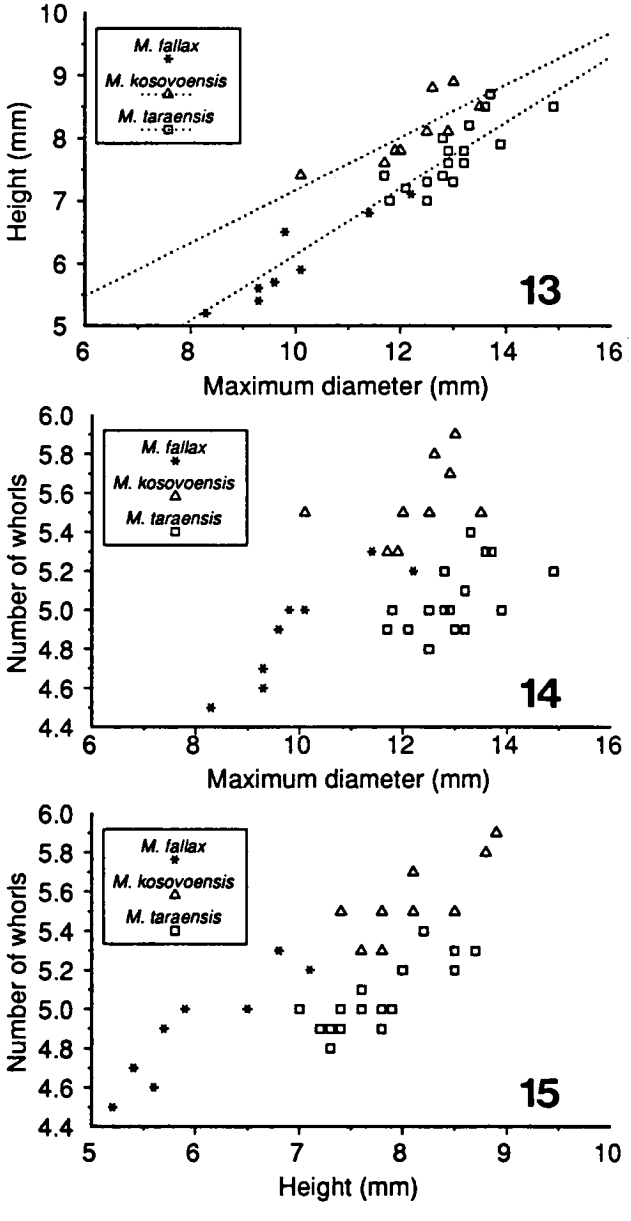
different strata. Immediately above the penial papilla (thus below the insertion of the penial retractor muscle) the long epiphallus begins, which continues to well below the place of entrance of the vast deferens, as indicated in figs. 23-24. On cross-section (figs. 26-27) the epiphallus lumen exhibits the outline of the spermatophore, the six to seven narrow crypts corresponding to the ridges on the back of this structure (cf. Schileyko, 1978: 52, fig. 28A). The penial retractor muscle originates from the diaphragm and inserts on the distal part of the epiphallus. The epiphallic lumen is lined with a glandular epithelium, surrounded by a muscular outer layer. The flagellum (as defined according to the outer morphology of the genitalia) is less than half the length of the epiphallus; internally there is a single, spirally coiled, ridge (fig. 28). The vagina is narrow just proximally of the atrium, but broadens after a short distance, due to presence of a wide, triangular dart-sac. Unlike in the species described hereafter, there is only one large dart-sac, which contains a relatively short dart (figs. 29-30). There are eight long mucus glands, which appear to arise independently of each other from the slender portion of the oviduct above the dart-sac.

Remarks. — In view of the presence of one large dart-sac, *M. taraenis* is provisionally assigned to the genus *Monachoides* Gude & Woodward, 1921, although the shape and colour of the shell seem to be rather atypical for the genus. Shells of *M. taraensis* are extremely similar to those of *Semifruticicola costulata serbica* Wagner, 1915, especially to those from the Sutjeska valley S. of Tjentiste (Bosna I Hercegovina). The only noticeable differences are perhaps the slightly less elongated aperture and the still weaker 'pitted' sculpture in the latter species. The genital anatomy of these species is very different, however (cf. Wagner, 1915: 491, pl. 22 fig. 180). Shells of *Semifruticicola costulata* s.s. (Brancsik, 1897) have blunt, widely spaced radial ribs, as well as a more raised spire. *Trichia (Xerocampylaea) zelebori* (L. Pfeiffer, 1853) too is conchologically very similar, but has a slightly less dilated last whorl, and a whitish shell, normally with, but occasionally without, brown bands. Both *Monachoides fallax* and *T. erjaveci* s.l. differ by their higher spired shells, and conspicuous granulose sculpture. All these taxa actually or potentially live sympatrically.

Monachoides kosovoensis spec. nov.

Material. — Yugoslavia, Kosovo, eastern slope of Cakor pass, about 4 km W. of Kuciste, along road from Andrijevica to Pec, on trunks of pine trees along brook, UTM DN12, alt. c. 1600 m, 24.IX.1980, W.J.M. Maassen and A.J. de Winter leg.; holotype: RMNH 56660 (shell), RMNH slide 1093 (slide of genitalia), RMNH alc. 9343 (remaining soft parts); paratypes: RMHN 56661/3 (shells), RMNH alc. 9344/2; Colln. Maassen/9 shells, 3 in alc., IZPAN/1 shell).

Shell (figs. 4-6, 11-12). — Dimensions of holotype: maximum diameter 13 mm, height 8.9 mm, whorls 5.9. Measurements of other specimens can be read from figs. 13-15. Adult shells have between 5.3 and 6 whorls, the number of whorls being surprisingly weakly correlated with the shell diameter or height/width ratio; rather, whorl count is better correlated with shell height. Spire distinctly raised. Whorls moderately inflated, with conspicuous, but irregular growth ridges. Periphery somewhat angulated to well rounded. Shell colour pale brown, becoming lighter towards the sutures, and with a light band around the periphery. Both the upper and lower side of the shell surface are covered with a granulose sculpture consisting of fine droplets



Figs. 13-15. Scatter plots of metric characters in adult shells of the type series of *Monachoides fallax* (Wagner) (N = 8), *M. taraensis* nov. spec. (N = 17), and *M. kosovoensis* nov. spec. (N = 9). 13, shell height against maximum diameter; Pearsons product moment correlation coefficients *R*: *M. fallax*, $R = 0.93^{***}$; *M. taraensis*, $R = 0.79^{***}$; *M. kosovoensis*, $R = 0.79^{**}$. 14, maximum diameter against number of whorls; *M. fallax* = 0.91^{**}; *M. taraensis*, $R = 0.55^{*}$; *M. kosovoensis*, $R = 0.44^{NS}$. 15, height against number of whorls; *M. fallax*, $R = 0.91^{**}$; *M. taraensis*, $R = 0.79^{***}$; *M. kosovoensis*, $R = 0.79^{**}$. Significant levels: ***, $P<0.001$; **, $P<0.01$; *, $P<0.05$; NS, not significant.

(fig. 11). Towards the sutures these tend to fuse into ridges (fig. 12). Umbilicus cylindrical and deep, taking up about 0.2 times the width of the shell. Aperture broader than high, the basal side broadly reflexed and white, with a low internal rib.

Radula (figs. 19-21). — (1 examined) Rather similar to that in *M. taraensis*. Formula (half a row): R-12-± 13. Central tooth smaller than the lateral teeth, tricuspid. Lateral teeth bicuspid, the endocone being virtually lost from the first lateral onwards. The place of transition of the laterals into the marginal teeth is somewhat arbitrary, and is mainly apparent by the smaller size of the marginal cusps and basal plate. In the mid- and outer marginals many cusps are bifurcated, some even trifurcated.

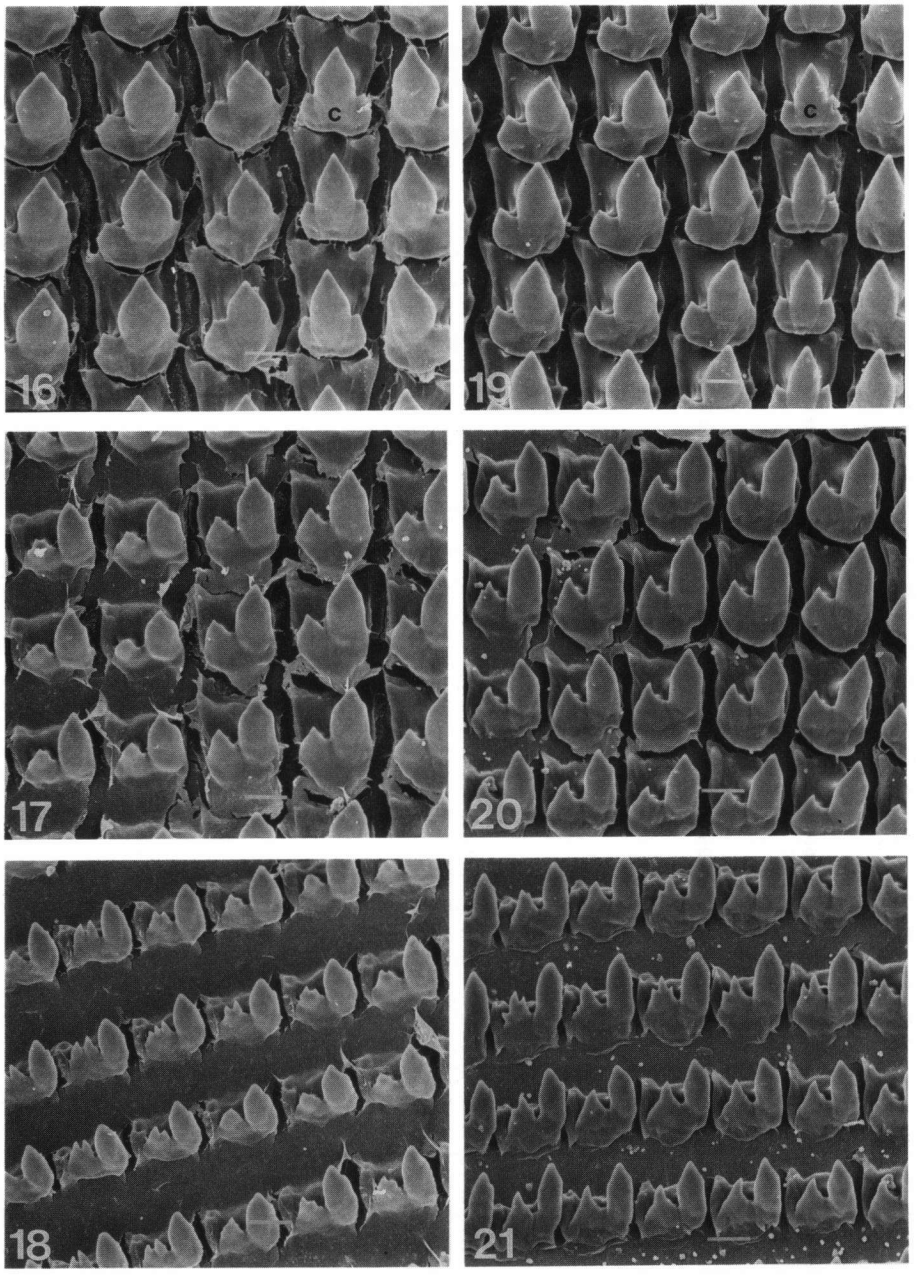
Pallial region (fig. 31). — (3 examined) Dorsal side of lung as well as part of the mantle rim mottled with an irregular pattern of black spots and stripes. The kidney is clearly shorter and less slender than in *M. taraensis*, occupying about one third of the length of the lung. Length of the heart less than one third of that of the kidney. Primary ureter inconspicuous. The secondary ureter appears to be closed along its entire length.

Genitalia (figs. 32-39). — (6 examined) The right ocular retractor passes between penis and vagina. The remarks made above for *M. taraensis* with respect to the division of the male organ into penis, epiphallus, and flagellum also apply here. In fact, the relative dimensions of these organs are similar too. The penis proper is rather short, and is restricted to the swollen basal part containing the penial papilla, which is irregularly oval-shaped with a slit-like opening (fig. 33). On cross-section (fig. 34) the penial papilla appears to be composed of a thin outer wall, and a thicker inner wall connected with three strands of tissue to the innermost wall, which surrounds the central lumen. The additional cavities in the penial papilla appear to be absent in *M. taraensis*. The epiphallus is internally similarly structured as in *M. taraensis*, but the crypts of the lumen are wider and shallower (figs. 35-36), suggesting the spermatophore to have a somewhat different morphology. The long and narrow penial retractor muscle inserts on the distal part of the epiphallus, and originates from the diaphragm. The flagellum has a wider lumen, a thinner outer muscular layer, and is somewhat shorter than in *M. taraensis*, but otherwise appears to be similar.

Immediately above the atrium the female duct is greatly dilated due to the presence of a large, elongate bulbous dart-sac, containing a long, slightly curved dart (fig. 39). On closer examination, especially when an outer tissue layer is peeled off, as well as in cross-section (fig. 38), a smaller additional dart-sac becomes visible, which has an elongate, narrow lumen, but contains no dart. Somewhat distally from the dart-sac four pairs of mucus glands, as well as the bursal duct arise. The duct of the bursa copulatrix is clearly longer than in *M. taraensis*, with a larger bursa.

Remarks. — Shells of *M. kosovoensis* may be easily confused with some forms attributed by Wagner (1915) to *Trichia erjaveci* (Brusina, 1870), which seem to have a similar granulose sculpture. Most of these were described by 19th century authors (e.g. Brancsik, Clessin, Kobelt, Servain, and Wohlberedt) from conchological characters only. If we accept Wagner's (1915) view that these all belong to the genus *Trichia*, they are easily distinguished on genital characters from the species here described. In our experience, forms of *Trichia* with similar shells appear not to occur in the area where *M. kosovoensis* was found.

The only other group of species with which *M. kosovoensis* can be confused, are some other species related to *Monachoides* (= *Monacha* sensu Wagner, 1915). All forms of *M. incarnata* (Müller, 1774) have a narrower umbilicus, and a different shell sculpture.



Figs. 16-21. Radular teeth of paratypes of *Monachoides taraensis* nov. spec. (figs. 16-18) and *M. kosovoensis* nov. spec. (figs. 19-21). Figs. 16 and 19, central tooth (C), and early laterals; figs. 17 and 20, transition of laterals into marginals; figs. 19 and 21, mid-marginal teeth. Scale bar to all figures 10 μm.

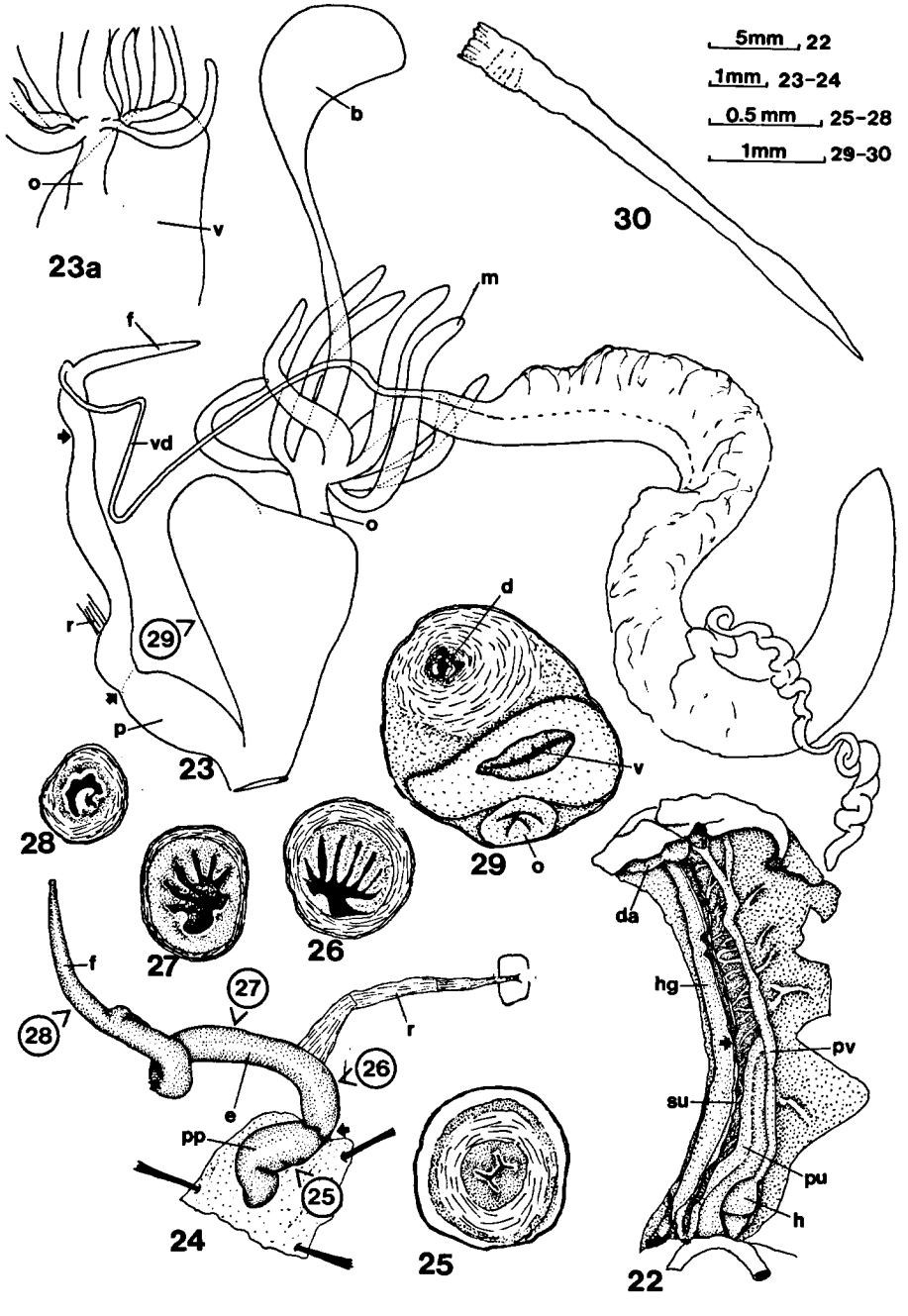
Urticicola umbrosa (C. Pfeiffer, 1828), has a flatter shell, with a wider umbilicus. Moreover, there are conspicuous anatomical differences, among others the extremely long flagellum in *U. umbrosa*. Apart from the dart-sac, there are many similarities in genital morphology with *M. taraensis*, which differs considerably conchologically.

The new species closely resembles *Monachoides fallax* (Wagner, 1915), described from near Sarajevo. Through the kindness of Dr. A. Riedel (IZPAN) we were able to examine two series of syntypes (3 + 5 specimens) of this species, labelled "Monacha fallax n, Trebovic 1629 m, 35964", and "Monacha fallax Wagner, Trebovic bei Sarajevo, 35880", respectively. One specimen from the former sample is here selected as lectotype (figs. 7-9). For shell measurements of this material see figs. 13-15. The specimens examined are generally smaller, paler, and have more depressed shells, as well as a slightly narrower umbilicus. In other respects, especially the sculpture, the shells of both species appear to be very similar (shells of *M. fallax* were not examined under a S.E.M.). The soft parts of the types appear to be lost (Riedel, in litt.), although the anatomy was described and figured by Wagner. Judged from Wagner's (1915, pl. 23 fig. 185d) figure there are significant anatomical differences: the penis in *M. fallax* is hardly dilated; the epiphallus is much shorter than in *M. kosovoensis*; the vagina has a slender distal portion followed by the dart-sac, whereas in *M. kosovoensis* the vagina becomes greatly swollen immediately above the atrium; the dart-sac of *M. fallax* appears to be much more slender, thus the presence of an additional one in this species seems less likely; finally, both the bursal duct and the portion of the free oviduct above the mucus glands of *M. fallax* are shorter.

The presence of a small second dart-sac makes the assignment of the new species to the genus *Monachoides* somewhat doubtful. It is genuinely absent in *M. incarnata* (Müller, 1774), the type species of *Monachoides* (Schileyko, 1978: 235, text fig. 268, and own observations), as well as in other species attributed to the genus (including species of *Urticicola* Lindholm, 1927, which is often considered a subgenus of *Monachoides*). However, it does occur in some central Russian hygromiid genera, like *Archaica* Schileyko, 1970, *Chilanodon* Westerlund, 1897, and *Lindholmomneme* Haas, 1936 (detailed anatomical descriptions in Schileyko, 1978). However, we prefer to refrain from any far-reaching conclusions, because we are unfamiliar with the latter genera.

Figs. 22-30. Anatomical details of *Monachoides taraensis* nov. spec. 22, pallial organs; 23, genital apparatus (organs enclosed on a canada-balsam slide, arrows indicate the approximate boundaries of epiphallus); 24, male organ, with penial sheath removed showing penial papilla (arrows indicate the approximate boundaries of epiphallus); 25-28, cross-sections through penial papilla (fig. 25), epiphallus (figs. 26-27) and flagellum (fig. 28) as indicated in fig. 24; 29, oblique cross-section through vaginal region as indicated in fig. 23; 30, dart. All figures are from paratypes. Abbreviations to figs. 22-39: b, bursa copulatrix; d, dart; da, (remnants of) diaphragm; e, epiphallus; f, flagellum; h, heart; hg, hindgut; k, kidney; m, mucus glands; p. penis; pp, penial papilla; pu, primary ureter; pv, pulmonary vein; o, slender part of oviduct; r, penial retractor muscle; sd, second dart-sac; su, secondary ureter; v, vagina; vd, vas deferens.

Figs. 31-39. Anatomical details of *Monachoides kosovoensis* nov. spec. 31, pallial organs; 32, genital apparatus; 33, penial papilla, as seen after detachment of the penial sheath; 34-37, cross-sections through penial papilla (fig. 34), epiphallus (figs. 35-36) and flagellum (fig. 37) as indicated in fig. 32; 38, cross-section through vaginal region as indicated in fig. 32; 39, dart, drawn from a slide containing the genitalia of the holotype. All drawings except fig. 39 are from paratypes. For abbreviations see legend to figs. 22-30.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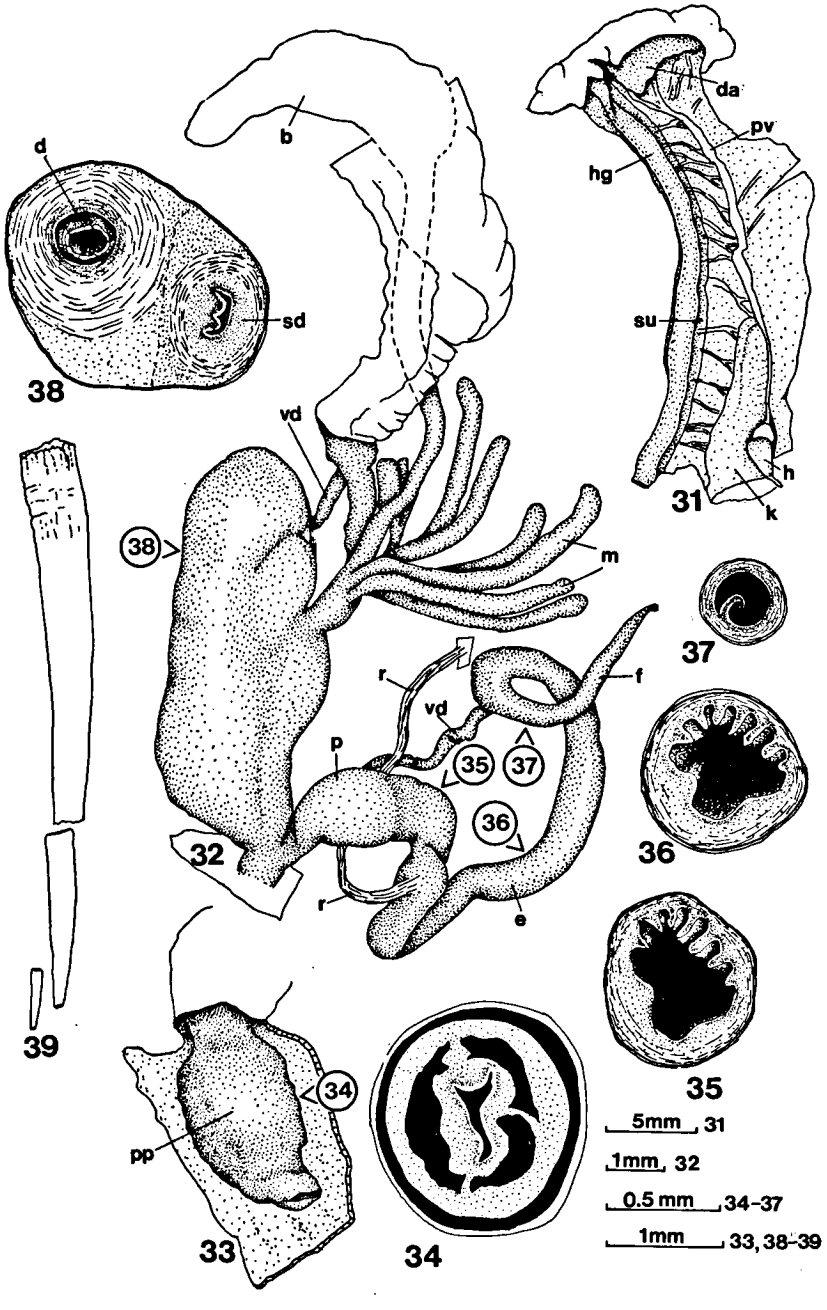
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1mm, 33, 38-39

It was somewhat surprising to us that there turned out to be a relatively poor relationship between whorl count and shell diameter in both species described in this paper. Intuitively one expects, within each species, a more or less fixed correlation between the size of a shell and its number of whorls. In species with shells wider than high, at least we were inclined to take the diameter as a measure of size, whereas in the case of elongate slender shells one usually considers the height. Our present data suggest that height, at least in these two species, might be a better measure of size, if one is comparing relative increase of the whorls between different species. However, in *M. fallax* the number of whorls appeared to be equally well correlated to both diameter and height.

ALPHABETICAL LIST OF SPECIES OF HYGROMIIDAE SENSU SCHILEYKO, 1991 (EXCLUSIVE OF "HELICELLINAE", AND OF THE GENUS MONACHA S.L.) DESCRIBED FROM THE WESTERN BALKAN REGION

Hygromiid genera, formerly classified as "Helicellinae", and sharing a broadly similar ecology, like *Helicella, Cernuella, Xeropicta*, etc., are not considered here, because they comprise a separate complex of taxonomic problems. The same holds for taxa which belong to the genus *Monacha* s.l.

Only taxa described from Albania and what was until recently Yugoslavian territory, i.e. Slovenia, Croatia (Hvratska), Montenegro (Crna Gora), Bosna I Hercegovina, Kosovo, Serbia, and Macedonia, and which from their original description or from data in later papers can be suspected to be Hygromiidae in the above sense, are listed below. Taxa with the somewhat ambiguous locality "Carniole" or "Carniolia" have also been included.

Apart from the original name, reference, and type locality (between inverted commas), we have attempted to list all later publications providing taxonomical and/or morphological information on the species, with between [ ] the name employed, and the kind of information provided. Faunistic papers have been included only if they use a name in a new combination for the first time. The fact that a secondary publication is listed here, does not necessarily imply that the name used therein refers to the same species as meant in the original description. In fact, in certain instances it is evident that this is not the case. Nevertheless, by providing this list we hope to stimulate and facilitate future work on this interesting taxonomic nightmare.

- *acaria* Servain [*Helix*]

Servain, 1884: 365 "dans le détritus des sources de la Bosna".

Westerlund, 1889: 310 [*Helix* (*Xerocampylaea*) *zelebori* var. *a.*]; Brancsik, 1889: 70, pl. 2 fig. 6 (plates are lacking in our copy) [*Helix zelebori* var. *a.*].

- *albida* "Rolle" Wohlberedt [*Fruticicola* (*Euomphalia*) *floerickesi* (sic!) f.]

Wohlberedt, 1901: 202 (without description) "Moracathal".

We have been unable to trace a valid description of this species by Rolle or by any other author. This is probably a nomen nudum.

- *amela* "Bourguignat" Servain [*Helix*]

Servain, 1884: 361 "Carniole".

Westerlund, 1889: 44 [*Helix* (*Trichia*) *umbrosa* var. *a.*]; Hesse, 1921: 75 [synonym of *Monacha umbrosa*].

- *aporata* "Bourguignat" Servain [*Helix*]
Servain, 1884: 356 "des environs d'Agram".
Westerlund, 1889: 44 [*Helix* (*Trichia*) *umbrosa* var. *a.* with remark: "wird mitunter für *erjaveci* genommen"]; Hesse, 1921: 75 [synonym of *Monacha umbrosa*].

- *australis* Jaeckel, Klemm & Meise [*Fruticicola leucozona* var.]
Jaeckel, Klemm & Meise, 1957: 187 [new name because of secondary homonymy for *Fruticicola leucozona* var. *erjaveci* Clessin, 1887, non Brusina, 1870. This problem will be treated by R.A. Bank (in prep.)].

- *avarica* Servain [*Helix*]
Servain, 1884: 352 "Environs de Zenica".
Westerlund, 1889: 45 [*Helix* (*Trichia*) *erjaveci* var. *a.*]; Hesse, 1921: 74 [synonym of *Fruticicola erjaveci osoria* Brancsik].

- *blaui* Kobelt [*Helix* (*Trichia*) *erjaveci*]
Kobelt, 1892: 6, pl. 122 fig. 727 (shell) "bei Serajewo".
Wagner, 1915: 479 [synonym of *Fruticicola erjaveci*]; Hesse, 1921: 74 [synonym of *Fruticicola erjaveci*].

- *bortana* Servain [*Helix*]
Servain, 1884: 362 "sous les pierres dans les gorges des montagnes, près de Serajewo"
Westerlund, 1889: 310 [*Helix* (*Xerocampylaea*) *zelebori* var. *b.*].

- *bosnensis* Moellendorff [*Helix* (*Fruticicola*) *bielzi* var.]
Moellendorff, 1873: 35 "am Igmangebirge".
Brusina, 1886: 37 [*Helix* (*Fruticicola*) *b.*]; Pavlovic, 1912: 35 [*Fruticicola* (*Perforatella*) *b.*]; Wagner, 1915: 490, pl. 21 figs. 178a-b [*Fruticicola* (*Perforatella*) *leucozona b.*, shell]; Polinski, 1928: 182, pl. 28 figs. 34-35 [*Fruticicola* (*Filicinella*) *filicina b.*, shell]; Jaeckel et al., 1957: 187 [*Trichia filicina bosnensis*]; Klemm, 1973: 404 [*Trichia* (*Edentiella*) *filicina bosniensis* (sic!)].

- *carosina* Servain [*Helix*]
Servain, 1884: 363 "dans les anfractuosités des montagnes entre Serajewo et les sources de la Bosna"
Westerlund, 1889: 309 [*Helix* (*Xerocampylaea*) *zelebori* var. *c.*].

- *cavarella* Servain [*Helix*]
Servain, 1884: 354 "sous les détritus entre Zenica et Serajewo".
Westerlund, 1889: 45 [*Helix* (*Trichia*) *c.*]; Wagner, 1915: 480 [synonym of *Fruticicola erjaveci osoria* Brancsik]; Hesse, 1921: 74 [synonym of *Fruticicola erjaveci osoria* Brancsik].

- *cincta* Soos [*Fruticicola erjaveci* var.]
Soos, 1904a: 295 "Goszpics (Lika-Krbava vm.)"
Soos, 1904b: 159 [*Fruticicola erjaveci c.*].

- *costulata* Brancsik [*Helix zelebori* var.]
Brancsik, 1897: 87 "vom Gebirge Volujak aus bedeutender Höhe".

Wagner, 1915: 491, pl. 21 figs. 181a-c [*Semifruticicola serbica c.*, shell].

- *costulata* Wohlberedt [*Fruticicola haueri* var.]
Wohlberedt, 1909a: 630 "auf dem Volujak 2000 m und im Zentral-Durmitor nächst dem Bubotov Kuk 2100 m".

Wagner, 1915: 481, pl. 18 fig. 156a-c [*Fruticicola* (*F.*) *erjaveci c.*, shell]; Bole, 1984: 382, text fig. 2a [*Trichia costulata*, genitalia].

- *erjaveci* Brusina [*Helix* (*Fruticicola*)]
Brusina, 1870: 26 "Vidovec, Agram, Ozalj, Slunj, Plitvice Ostaria".

Westerlund, 1889: 45 [*Helix* (*Trichia*) *e.*]; Schubert, 1891: 16, pl. 2 fig. 5-7 [*Helix e.*, genitalia, radula]; Kobelt, 1892: 5, pl. 122 fig. 726 [*Helix* (*Trichia*) *e.*, shell]; Soos, 1904b: 158 [*Fruticicola e.*]; Wagner, 1915: 479, pl. 16 fig. 146a-g [*Fruticicola* (*F.*) *e.*, shell, genitalia, radula, jaw]; Hesse, 1931: 7 [*Fruticicola e.*]; Jaeckel et al., 1957: 164, 187 [*Trichia e.*]; Jungbluth, 1983: 269, text fig. [*Trichia* (*Edentiella*) *e.*, shell]; Maassen, 1985: 20, pl. 7 fig. 7 [*Trichia e.*, genitalia].

- *erjaveci* Clessin [*Fruticicola leucozona* var.]
Clessin, 1887: 122 "Im Friaul, Eingang zur Grotte Vodnik ober Tublje auf dem Karste".

Jaeckel et al., 1957: 187 [*Fruticicola leucozona* var. *australis*, new name because of secondary homonymy with *Fruticicola erjaveci* Brusina, 1870]; Polinski, 1928: 176, pl. 27 figs. 29-30 [*Fruticicola* (*Filicinella*) *e.*, shell). This problem will be treated by R.A. Bank (in prep.).

- *fallax* Wagner [*Monacha*]
Wagner, 1915: 492, pl. 23 fig. 185a-d (shell, genitalia), pl. 24 fig. 187 (jaw) "Trebovic bei Sarajevo".

Hesse, 1931: 15 [*Monacha f.*]; Jaeckel et al., 1957: 164 [*Zenobiella? f.*].

- *filicina* L. Pfeiffer [*Helix*]
L. Pfeiffer, 1841: 39 "Carniolia".

Schmidt, 1852: 5 [*Helix f.*, dart]; Moellendorff, 1873: 35 [*Helix* (*Fruticicola*) *f.*]; Westerlund, 1889: 35 [*Helix* (*Trichia*) *f.*]; Soos, 1904b: 154 [*Fruticicola f.*]; Polinski, 1928: 178, pl. 24 fig. 7, pl. 27 fig. 31 [*Fruticicola* (*Filicinella*) *f.*, shell, genitalia]; Hesse, 1931: 8 [*Fruticicola f.*]; Jaeckel et al., 1957: 164 [*Trichia f.*]; Klemm, 1973: 403 [*Trichia* (*Edentiella*) *f.*]; Jungbluth, 1983: 267, text fig. [*Trichia* (*Edentiella*) *f.*, shell]; Falkner, 1990: 206, 207 fig. 6 [*Petasina f.*, live animal].

- *floerickei* Kobelt [*Euomphalia(?)*]
Kobelt, 1898: 162 "Moraca, Montenegro".

Kobelt, 1902: 28, pl. 251 figs. 1622-1623 [*Helix* (*Euomphalia*) *f.*, shell]; Wohlberedt, 1909a: 630, pl. 47 figs. 15-20 [*Euomphalia*, shell]; Wagner, 1915: 481, pl. 18 fig. 157a-f, fig. 158a-b, fig. 159a-b, pl. 19 fig. 160a-c [*Fruticicola* (*F.*) *f.*, shell, genitalia]; Jaeckel & Meise, 1956, pl. 1 fig. 4 [*Trichia? f.*, shell]; Jaeckel et al., 1957: 187 [*Trichia erjaveci f.*]; Bole, 1984: 382-383 fig. 2b [*Trichia erjaveci f.*, genitalia].

- *hajlensis* Jaeckel [*Trichia erjaveci*]

Jaeckel in Jaeckel & Meise, 1956: 29, pl. 1 fig. 4 (shell) "Hajla Planina, Mazedonien 1900 m".

Jaeckel et al., 1957: 187 [*Trichia erjaveci h.*]

- *haueri* "Kim." Brancsik [*Helix*]

Brancsik, 1889: 69, pl. 2 fig. 3 (plates lacking in our copy) "in procliviis montis Trebevic".

Wohlberedt, 1909a: 630 [*Fruticicola h.*]; Wagner, 1915: 52-53 [synonym of *Fruticicola erjaveci osoria* Brancsik]; Hesse, 1921: 480 [synonym of *Fruticicola erjaveci osoria* Brancsik].

- *hirci* Clessin [*Helix*]

Clessin, 1883: 198 "auf dem Schneeberg in 1506 m. Höhe und im Veliki Risnjak in 1528 m Croatien".

Hirc, 1886: 380 [*Helix h.*, shell]; Westerlund, 1889: 95 [*Helix* (*Euomphalia*) *h.*]; Soos, 1904b: 160 [*Fruticicola h.*]; Wagner, 1915: 480, pl. 16 fig. 147a-c, pl. 17 fig. 149a-c [*Fruticicola* (*F.*) *erjaveci h.*, shell)]; Jaeckel et al, 1957: 187 [*Trichia erjaveci h.*].

- *gyroides* "Parreyss" L. Pfeiffer [*Helix*]

L. Pfeiffer, 1870: 143 "Croatia".

L. Pfeiffer, 1872: 42, pl. 117 fig. 16 [*Helix g.*, shell]; Pfeiffer & Clessin, 1881: 132 [*Helix* (*Helicopsis*) *g.*, ? synonym of *Helix homoleuca* Sabljar]; Jaeckel et al., 1957: 164, 188 [*Trichia g.*, "fragliche Art" "*Helicella gyroides* Pfr. 1870. Sie ist nach 3 im Zoologischen Museum Berlin liegenden, von Maltzan stammenden Exemplaren eine verblichene leer gesammelte *Trichia*, keine *Helicella*"].

- *kusmici* Clessin [*Helix* (*Trichia*)]

Clessin, 1887: 51-52 "Cattaro in der Nähe des Fort Trinita, am Berge vis a vis der Stadt, bei Percovic-Slivno".

Westerlund, 1889: 63 [*Helix* (*Trichia*) *k.*]; Kobelt. 1892: 4, pl. 71 fig. 723 [*Helix* (*Trichia*) *k.*, shell]; Wagner, 1915: 493 [*Monacha k.*]; Hesse, 1934: 36, pl. 7 fig. 59 [*Ashfordia k.*, genitalia]; Jaeckel & Meise, 1956: 26 [*Trichia k.*]; Jaeckel et al., 1957: 164 [*Monacha k.*]; Maassen, 1978: 1, pl. 1 [*Monacha* (*Ashfordia*) *k.*, shell, genitalia]; Pintér & Szigethy, 1979: 37-42, text figs. 1-9 [*Metafruticicola k.*, shell, genitalia, mantle pigmentation]; Maassen, 1979; 47, figs. 10-12 [*Metafruticicola k.*, genitalia].

- *leptolasia* Wagner [*Fruticicola erjaveci*]

Wagner, 1912: 250 "Vlasic bei Travnik, Jablanica in Bosnien".

Wagner, 1915: 53, pl. 17 figs. 150a-c, pl. 18 figs. 155a-c [*Fruticicola erjaveci l.*, shell genitalia].

- *leucozona* C. Pfeiffer [*Helix*]

C. Pfeiffer, 1828: 34, pl. 6 figs. 19-20 (shell) "in Illyrien".

Rossmässler, 1838: 3, pl. 31 figs. 435-436 [*Helix l.*, shell]; Schmidt, 1852: 5 [*Helix l.*, dart]; Schubert, 1891: 16, pl. 2 fig. 2-3 [*Helix l.*, genitalia, radula]; Soos, 1904: 154 [*Fruticicola l.*]; Wagner, 1915: 488, pl. 20 fig. 170, 171a-b, pl. 21 figs. 172a-f [*Fruticicola* (*Perforatella*) *l.*, shell, genitalia]; Polinski, 1928: 146, pl. 24 figs. 5-6 [*Fruticicola* (*Filicinella*) *leucozona l.*, genitalia]; Hesse, 1931: 8 [*Fruticicola l.*]; Jaeckel et al., 1957:

164 [*Trichia l.*]; Maassen, 1980: 46, pl. 3 figs. 4-7 [*Trichia l.*, shell, genitalia]; Jungbluth, 1983: 267, text fig. [*Trichia* (*Edentiella l.*), shell]. This species will be revised by R.A. Bank (in prep.).

- *lurida* C. Pfeiffer [*Helix*]

C. Pfeiffer, 1828: 33, pl. 6 figs. 14-15 (shell) "in Illyrien"

Schmidt, 1852: 5 [*Helix l.*, dart]; Westerlund, 1889: 78 [*Helix* (*Theba*) *l.*]; Schubert, 1891: 16 [*Helix* (*Fruticicola*) *l.*]; Polinski, 1929: 149-150, pl. 25 figs. 12-13 [*Fruticicola* (*Filicinella*) *l.*, genitalia, circulating system]; Hesse, 1931: 8 [*Fruticicola l.*]; Jaeckel et al., 1957: 164 [*Trichia l.*]; Maassen, 1980: 46, pl. 3 figs. 1-3 [*Trichia l.*, shell, genitalia]; Jungbluth, 1983: 267, 268 text fig. [*Trichia* (*Edentiella*) *l.*, shell].

- *mathildae* Westerlund [*Helix*]

Westerlund, 1881: 8 "Imoski, Dalmatia".

Westerlund, 1889: 45 [Synonym of *Helix* (*Trichia*) *erjaveci*].

- *mortella* Servain [*Helix*]

Servain, 1884: 351 "aux alentours de Zenica".

Westerlund 1889: 45 [*Helix* (*Trichia*) *erjaveci* var. *m.*]; Kobelt, 1892: 7, pl. 72 fig. 729 [*Helix* (*Trichia*) *m.*, shell); Hesse, 1921: 74 [synonym of *Fruticicola erjaveci osoria* Brancsik].

- *nactara* Servain [*Helix*]

Servain, 1884: 364 "sur les rochers qui environnent Serajewo".

Westerlund, 1889: 310 [*Helix* (*Xerocampylaea*) *zelebori* var. *n.*].

- *nudata* Westerlund [*Helix* (*Trichia*) *filicina* var.]

Westerlund, 1889: 46 "Bosnien bei Mostar".

- *oecoscia* "Bourguignat" Servain [*Helix*]

Servain, 1884: 359 "environs d'Agram et d'Ojcow (Pologne)".

Westerlund, 1889: 44 [*Helix* (*Trichia*) *umbrosa* var. *o.*]; Hesse, 1921: 74 [synonym of *Monacha umbrosa*].

- *oreinos* Wagner [*Fruticicola* (*F.*) *erjaveci osoria*]

Wagner, 1915: 481, pl. 18 figs. 154a-d (shell, genitalia) "Ljubnicna und Radovina bei Celebic in Bosnien".

- *osoria* Brancsik [*Helix*]

Brancsik, 1889: 69, pl. 2 fig. 4 (plates are lacking in our copy) "in valle Miljacka".

Westerlund, 1890: 121 [*Helix* (*Fruticicola*) *o.*]; Pavlovic 1912: 36 [*Fruticicola* (*Trichia*) *o.*]; Wagner, 1915: 480, pl. 17 figs. 152a-c, 153a-c [*Fruticicola* (*F.*) *erjaveci o.*, shell]; Jaeckel et al., 1957: 187 [*Trichia erjaveci o.*, synomym of "*Trichia erjaveci braueri* Kimak, 1888"].

- *ottoi* Servain [*Helix*]

Servain, 1884: 363 "abondante aux alentours de Serajewo".

Westerlund, 1889: 309 [*Helix* (*Xerocampylaea*) *zelebori* var. *o.*].

– *ovirensis* Rossmässler [*Helix leucozona* var.]
Rossmässler, 1838: 4, pl. 31 fig. 434 (shell) "Spitze des Ovir"

Clessin, 1887: 121 text fig. 45 [*Fruticicola leucozona* var. *o.*, shell]; Wagner, 1915: 488, pl. 21 figs. 173a-b, 174 [*Fruticicola* (*Perforatella*) *leucozona o.*, shell]; Polinski, 1928: 174 [*Fruticicola* (*Filicinella*) *leucozona leucozona* var. *o.*]; Bole, 1962: 75, pl. 4 figs. 7-9 [*Trichia leucozona o.*, (shell)]; Mildner, 1981: 35 [*Trichia* (*Edentiella*) *leucozona o.*].

– *peregra* Brusina [*Helix* (*Fruticicola*) *strigella* var.]
Brusina, 1870: 26 "Senj".

Hirc, 1880: 523 [*Helix strigella* var. *p.* Parr.].

– *savinella* Servain [*Helix*]
Servain, 1884: 353 "Environs de Zenica".

Westerlund, 1889: 45 [*Helix* (*Trichia*) *erjaveci* var. *s.*]; Hesse, 1921: 74 [synonym of *Fruticicola erjaveci osoria* Brancsik].

– *sciraia* "Bourguignat" Servain [*Helix*]
Servain, 1884: 359 "Croatie".

Westerlund, 1889: 44 [*Helix* (*Trichia*) *umbrosa* var. *s.*]; Hesse, 1921: 75 [synonym of *Monacha umbrosa*].

– *serbica* Wagner [*Semifruticicola*]
Wagner, 1915: 491, pl. 22 fig. 180 (genitalia) "Prosjecenica vrata bei Grab an der Sutjeska nächst Cemerno".

Hesse, 1931: 12 [*Semifruticicola s.*]; Jaeckel et al., 1957: 187 [*Semifruticicola costulata s.*].

– *solidula* Brusina [*Helix* (*Fruticicola*) *strigella* var.]
Brusina 1870: 25 "Zavalje".

Wohlberedt, 1909b: 243 [synonym of *Euomphalia strigella* (Draparnaud, 1805)].

– *subangulata* "Von Moellendorff" Wohlberedt [*Trichia haueri* var.]
Wholberedt, 1901: 202 (without description) "Zalbjak".

We have been unable to trace a valid description of this species by Moellendorff or by any other author. This is probably a nomen nudum.

– *syrmiensis* Soos [*Fruticicola erjaveci* var.]
Soos, 1904a: 295 "Hungaria: Krusedol".

Soos, 1904b: 158 [*Fruticicola erjaveci* var. *s.*].

– *tanora* Servain [*Helix*]
Servain, 1884: 352 "près de Zenica".

Westerlund, 1889: 45 [*Helix* (*Trichia*) *erjaveci* var. *t.*]; Kobelt, 1892: 7, pl. 122 fig. 728 [*Helix* (*Trichia*) *t.*, shell]; Wagner, 1915: 480 [synonym of *Fruticicola* (*F.*) *erjaveci osoria* Brancsik]; Hesse, 1921: 74 [synonym of *Fruticicola erjaveci osoria* Brancsik].

- *twartkoi* Servain [*Helix*]

Servain, 1884: 364 "environs de Serajewo".

Westerlund, 1889: 309 [*Helix* (*Xerocampylaea*) *zelebori* var. *t.*].

- *waldemari* Wagner [*Fruticicola*]

Wagner, 1912: 250 "Umgebung von Sarajevo, Jajce und Bocac bei Banjaluka in Bosnien".

Wagner, 1915: 484, p. 19 figs. 163a-c [*Fruticicola* (*F.*) *w.*, shell]; Jaeckel, 1954: 86 [*Trichia w.*]; Jaeckel et al., 1957: 164 [*Trichia w.*]; Maassen, 1985: 20, text figs. 1-5, 8-10 [*Trichia w.*, shell, genitalia].

- *welebitana* "Stenz" L. Pfeiffer [*Helix incarnata* γ. *Helix welebitana*]

L. Pfeiffer, 1848: 139 (no explicit locality mentioned, probably Velebit Mts.).

Moellendorff, 1873: 36 [*Helix incarnata* var. *velebitana* (sic!)]; Hirc, 1886: 380 [*Helix incarnata* f. *velebitana* (sic!)]; Wohlberedt, 1909b: 242 [*Monacha incarnata* var. *velebitana* (sic!)]; Jaeckel et al., 1957: 187 [*Perforatella incarnata w.* (Stenz)]; Falkner, 1990: 214, text fig. 3 [*Monachoides incarnatus welebitanus*, live animal].

- *zelebori* L. Pfeiffer [*Helix*]

L. Pfeiffer, 1853: 186 ("Umgebung von Visegrad").

Kobelt, 1879: 11, pl. 153 figs. 1562-1563 [*Helix z.*, shell]; Clessin, 1887: 169, text fig. 81 [*Campylaea z.*, shell]; Westerlund, 1889: 309 [*Helix* (*Xerocampylaea*) *z.*]; Hesse, 1905: 12 [*Fruticicola* (*Xerocampylaea*) *z.*]; Pavlovic, 1912: 56 [*Xerophila* (*Xerocampylaea*) *z.*]; Wagner, 1915: 485, pl. 19 figs. 161a-f, 162a-c [*Fruticicola* (*F.*) *z.*, shell, genitalia, jaw]; Hesse, 1915: 21 [*Xerocampylaea z.*]; Hesse, 1931: 9 [*Fruticicola* (*Xerocampylaea*) *z.*]; Jaeckel et al., 1957: 165 [*Trichia z.*]; Grossu, 1983: 465, 466, text fig. 285 [*Trichia* (*Xerocampylaea*) *z.*, genitalia]; Maassen, 1985: 20, pl. 7 fig. 6 [*Trichia* (*Xerocampylaea*) *z.*, genitalia].

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