

**A new valvatoid-shelled stygobiont hydrobiid from Slovenia
(Gastropoda Prosobranchia: Hydrobiidae)**

M. BODON

Dipartimento di Biologia Evolutiva dell'Università di Siena, Via P.A. Mattioli 4, I-53100 Siena, Italy

& S. CIANFANELLI

Museo Zoologico de "La Specola", Sezione del Museo di Storia Naturale dell'Università di Firenze,
I-50125 Firenze, Italy

Kerkia brezicensis n.sp. is described from a Karstic spring in southeastern Slovenia. The new species is known both conchologically and anatomically.

Key words: Gastropoda, Prosobranchia, Hydrobiidae, *Kerkia*, taxonomy, stygobiont, Slovenia.

INTRODUCTION

During a field trip in southeastern Slovenia, a stygobiont hydrobiid snail with a *Hauffenia*-like shell was found in a Karstic spring. Anatomical study revealed it to belong to the genus *Kerkia* Radoman, 1978.

DESCRIPTION

***Kerkia brezicensis* n.sp.**

Shell (figs. 1-8). - Valvatoid, very small, very depressed, almost discoidal, waxen, whitish and translucent when fresh. Spire very low, consisting of 2½-3 convex and rapidly increasing whorls. Last whorl wide, not or only slightly descending. Sutures deep. Aperture circular; peristome uninterrupted, adhering to the last whorl, its margin thin and not reflexed. Umbilicus very large, ca. 1/3 of major shell diameter. External surface of protoconch finely malleate (figs. 16-17); external surface of teleoconch smooth with fine growth lines only.

Dimensions: shell major diameter, 1.30-1.77 mm; shell minor diameter, 1.06-1.53 mm; shell height, 0.57-0.89 mm; aperture height, 0.53-0.69 mm; aperture width, 0.51-0.68 mm.

Operculum (figs. 9, 18, 19). - Corneous, multispiral, thickened, yellow-orange in colour, with subcentral nucleus; slight projection, white and horse-shoe-like, arising from inner side, near centre.

Body (fig. 10). - Almost totally unpigmented; traces of pigment only on walls of visceral sac. Tentacles lacking eye spots.

Male genitalia (figs. 11, 12). - Testis with many lobes near apex of visceral sac; short proximal spermiduct functioning as seminal vesicle and thin distal spermiduct. Oval-

shaped prostatic gland, anterior portion of which projecting into pallial cavity. Thin vas deferens, crossing body wall to enter base of penis, running along right side of penis to end at tip. Penis unpigmented, sinuous and bent upon itself into pallial cavity; cylindrical in shape when extended, elliptical in transverse section and wrinkled near base. Penis apex slender, not or only slightly enlarged. Small lateral lobe arising from left side of penis about 3/5 along its length. No internal refractive glandular areas in penial lobe or penis visible by light microscope.

Female genitalia (figs. 13-15). - Lobated ovary near apex of visceral sac; short gonadal oviduct, slightly enlarged before end of gonopercardial duct. Renal oviduct twisted on itself to form loop which adheres to proximal part of pallial oviduct. Seminal receptacle arises close to where renal oviduct enters pallial oviduct, far from end of loop (= distal seminal receptacle or first seminal receptacle). Bursa copulatrix very wide, oval or irregular in shape, situated beside albumen gland portion of the pallial oviduct, with long canal arising at its distal apex. Pallial oviduct with albumen and capsule gland, the latter bulging into pallial cavity to open into small gonopore not far from pallial margin.

Radula (figs. 20-23). - Taenioglossate, with the following formula:

$$C = \frac{5 + 1 + 5}{2 + 2}; \quad L = 11-13; \quad M1 = 20-24; \quad M2 = c. 12.$$

Many rows of seven teeth. Central tooth butterfly-like, with long slender lateral wings and body extended posteriorly into a basal tongue. Apical margin V-like, with row of 11 denticles, central slightly longer than laterals. Two basal cusps arising between base of lateral wing and body of tooth. Outer basal cusps smaller than inner.

Lateral teeth with elongated body and anterior margin with 11-13 denticles. Inner marginal teeth rake-like, with elongated body and long apex; row of 20-24 denticles occupying entire anterior margin of apex. Outer marginal teeth spoon-shaped, with c. 12 denticles on latero-posterior side of apex.

Stomach and intestine (figs. 11, 13). - Stomach without gastric caecum. First portion of intestine running along wall of style sac, then forming first U-like loop near stomach and a second, Z-like, loop on pallial wall. Rectal portion of intestine straight. Anus opening near pallial margin.

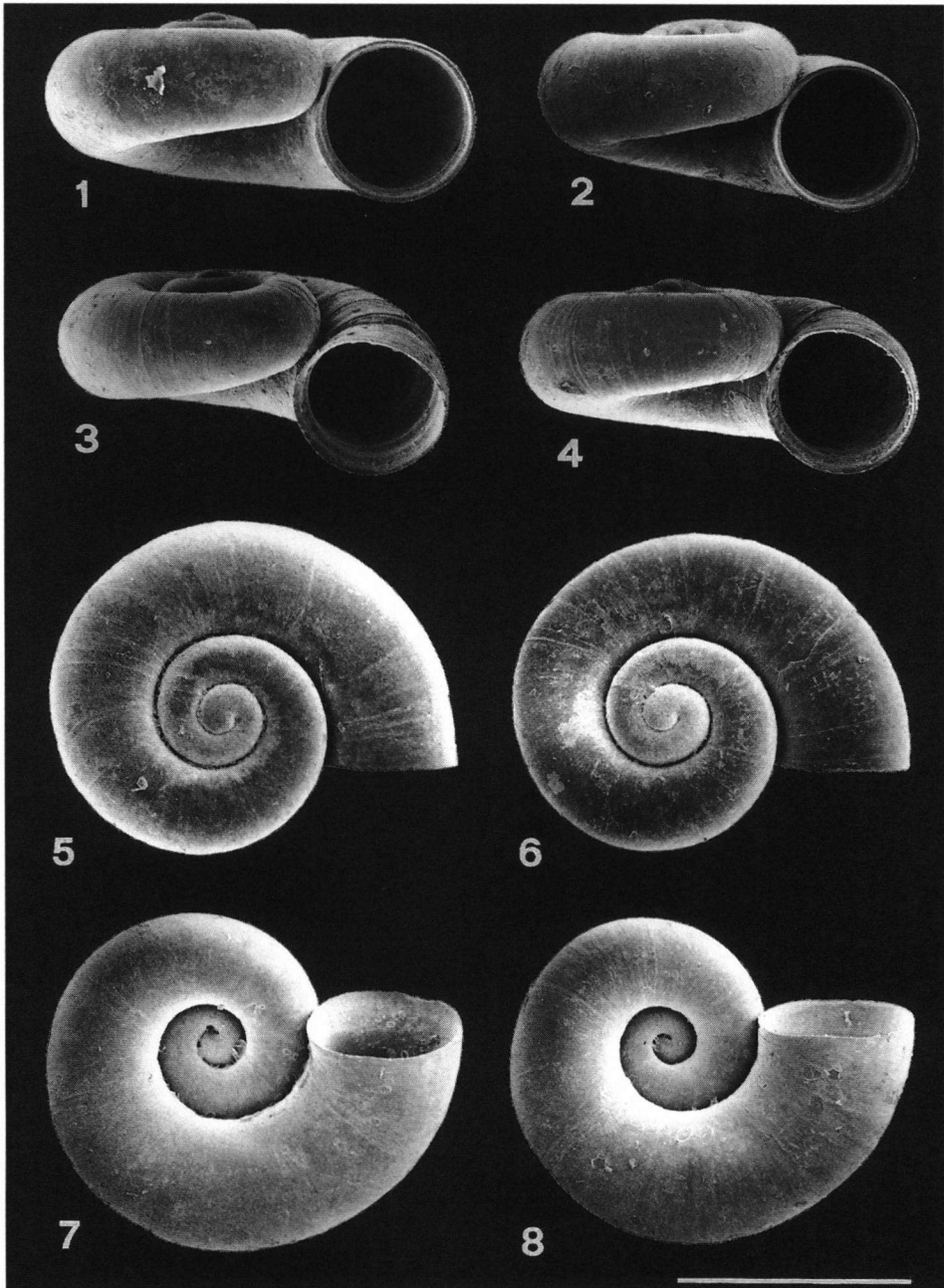
Osphradium and ctenidium (figs. 11, 13). - Osphradium oval, near pallial margin. Ctenidium well developed, consisting of 9-16 branchial lamellae.

Type locality. - Plentiful Karstic spring at the entry to Dvorce village, south-east of Čatež, Brežice (south-east Slovenia). UTM references: 33T WL48.

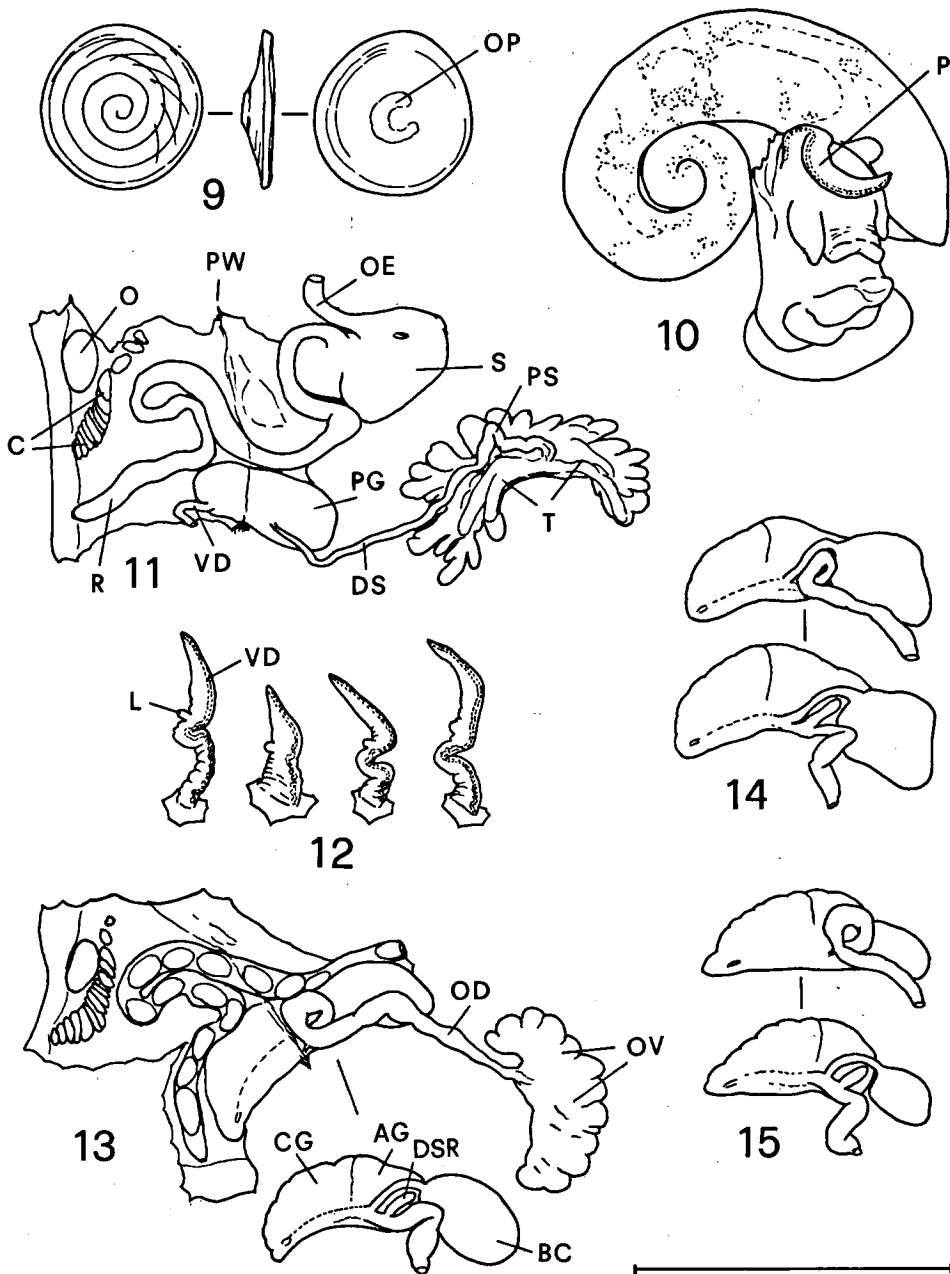
Six other species of hydrobiid snails have been found in the same spring: *Hadziella anti* Schütt, 1960; *Hauffenia* cf. *wagneri* (Kuščer, 1928); "*Iglica*" *langhofferi* Wagner, 1927; *Graziana pupula* (Westerlund, 1886) [= *Belgrandiella kuesteri* (Boeters, 1970)]; *Sadleriana sadleriana robici* (Clessin, 1890); *Bythinella* sp.

Type material. - Karstic spring at Dvorce, Brežice (Slovenia): M. Bodon leg. 15.6.1985, 22 shells + 6 dissected specimens; S. Cianfanelli & M. Calcagno leg. 29.7.1994, many shells (holotype + paratypes) and 67 specimens (9 dissected).

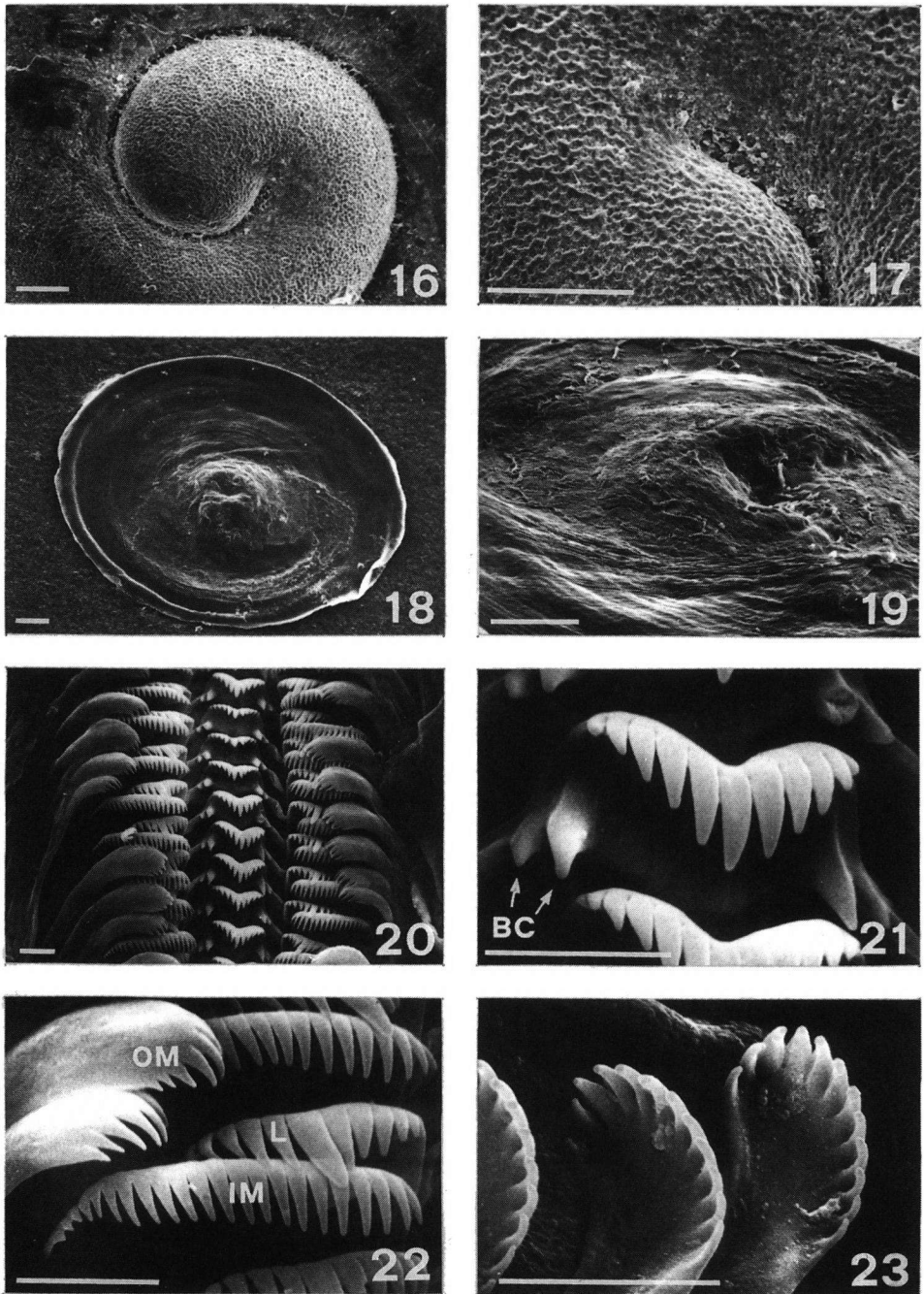
Holotype and paratypes kept in the Museo Zoologico de "La Specola", Firenze, Italy (nos. 10923 and 10903, respectively). Paratypes also in the Nationaal Natuurhistorisch Museum, Leiden, Netherlands (no. 57185/6) and in collections of M. Bodon (Genova), S. Cianfanelli (Firenze), E. Talenti (Firenze), F. Giusti (Siena), and W.J.M. Maassen (Duivendrecht).



Figs. 1-8. Shells of *Kerkia brezicensis* n. sp. from the spring at Dvorce, Čatež, Brežice (Slovenia). Paratypes, Museo Zoologico de "La Specola", Firenze, Italy (no. 10903). Scale bar = 1 mm.



Figs. 9-15. Operculum and anatomical details of *Kerkia brezicensis* n. sp. collected in the spring at Dvorce, Čatež, Brežice (Slovenia). 9, Outside (left), profile (centre) and inside (right) of operculum; 10, body of a male with pallial cavity open to show head and penis; 11, male genitalia (penis excluded), stomach, intestine and pallial organs; 12, penis in four males; 13, genitalia and pallial organs in a female; 14-15, distal portion of genitalia in two females. Abbreviations: AG = albumen gland; BC = bursa copulatrix; C = ctenidium; CG = capsule gland; DS = distal spermiduct; DSR = distal seminal receptacle (RS1); L = penial lobe; I = intestine; O = osphradium; OD = oviduct; OE = oesophagus; OP = opercular projection; OV = ovary; P = penis; PG = prostate gland; PS = proximal spermiduct (seminal vesicle); PW = posterior wall of pallial cavity; R = rectum. S = stomach; T = testis; VD = vas deferens. Scale bar = 1 mm.



Figs. 16-23. Protoconch (figs. 16-17), operculum (figs. 18-19) and radula (figs. 20-23) of *Kerkia brezicensis* n. sp. from the spring at Dvorce, Čatež, Brežice (Slovenia). 16-17, microsculpture of external surface of protoconch; 18, inside of operculum; 19, horse-shoe-like opercular projection at centre of inner face of operculum; 20, whole central portion of radula; 21, central tooth showing the two basal cusps (BC); 22, lateral tooth (L), inner marginal tooth (IM) and a group of outer marginal teeth (OM); 23, inner side of some outer marginal teeth. Scale bars = 50 μm (figs. 16-19), 5 μm (figs. 20-23).

Origin of the name. - From the town of Brežice, near where the new species was found.

DISCUSSION

Stygobiont hydrobiids with valvatoïd shells from Slovenia have been attributed to the genera *Hadziella* Kuščer, 1932, *Hauffenia* Pollonera, 1898, *Neohoratia* Schütt, 1961, *Erythropomatiana* Radomann, 1978, and *Kerkia* Radoman, 1978 (cf. Bole & Velkrovrh, 1986).

The species attributed to the genus *Hadziella* have a discoidal shell and an aperture with very expanded peristome (cf. Bole, 1963). The anatomy is known only for the type species, *H. ephippiostoma* Kuščer, 1932: the female has a bursa copulatrix the duct of which opens into its posterior side; the male has a penis without penial lobes (cf. Bole, 1993).

Some species of the genus *Hauffenia* live in Slovenia and in northeastern Italy. The type species, *Hauffenia tellinii* (Pollonera, 1898), *Hauffenia michleri* Kuščer, 1932, and *Hauffenia wagneri* (Kuščer, 1928), are known anatomically. The females have a small bursa copulatrix and a proximal seminal receptacle only (RS2); the males have a penis with a wide apex and small corneous stylet. The operculum has a typical projection, more or less developed, on its inner side (cf. Bodon et al., 1996; Bole, 1967, 1970; Giusti & Pezzoli, 1980). Two other species, *Hauffenia media* Bole, 1961, and *Hauffenia subcarinata* Bole & Velkrovrh, 1987, are only partly known anatomically, but, judging by the operculum and penis, they probably belong to the genus *Hauffenia* (cf. Bole, 1961; Bole & Velkrovrh, 1987).

The type species of *Neohoratia*, *Valvata subpiscinalis* Kuščer, 1932, is found in Slovenia and in northeastern Italy. The anatomical details of this species show a close relationship with the genus *Hauffenia*, differing only in minor aspects: operculum without projection on inner surface and different shape of penial lobe (cf. Bodon et al., 1996; Bole, 1967). *Neohoratia* is therefore probably a synonym of *Hauffenia*.

The anatomical details of the type species of *Erythropomatiana*, *Valvata erythropomatia* Hauffen, 1856, coincide in certain distinctive features with those of the genus *Hauffenia* and are practically indistinguishable from those of *Neohoratia* (cf. Bodon et al., 1996; Bole, 1993; Radoman, 1983). Another nominal species of Slovenia, *E. veridica* Radoman, 1978, has been assigned to this taxon; this concerns a junior synonym of *H. subpiscinalis* (cf. Bodon et al., in prep). *Erythropomatiana*, therefore, is probably also a synonym of *Hauffenia*.

The genus *Kerkia* includes only the type species, *Hauffenia kusceri* Bole, 1961. This species is characterized by the female genitalia which have a large bursa copulatrix and only one seminal receptacle in distal position (RS1), near the insertion of the bursa copulatrix duct. The males have a penis with a moderately pointed apex, no stylet, and with a big penial lobe in lateral position (cf. Bodon et al., 1996; Bole, 1963; Radoman, 1983).

The genital tracts of *Kerkia brezicensis* n. sp. have a basic structure (bursa copulatrix + distal seminal receptacle; penis with lobe) similar to that known for the genus *Kerkia*, which distinguish it from all other hydrobiids with valvatoïd shells (cf. Bodon & Giusti, 1986). More specifically, the very wide bursa copulatrix situated beside the albumen gland portion of the pallial oviduct and the long seminal receptacle, are identical to the female genitalia of *Kerkia kusceri*. Some characters, however, distinguish *Kerkia bre-*

zicensis n. sp. from the type species and justify its status as a new species. These characters are:

- smaller shell (shell major diameter = 1.60-2.23 mm in *K. kusceri*, cf. Radoman, 1983) with more depressed spire;
- longer tapered penial apex and much smaller penial lobe (squat and wide penial apex and wide penial lobe in *K. kusceri*);
- multispiral operculum, with horse-shoe-like projection on inner side (operculum with fewer whorls and with a sinuous crest on inner side in *K. kusceri*, cf. Bodon et al., 1996).

Other hydrobiids, not known anatomically, have been described from the Balkans. Among these, there are a few species with shells very similar to those of *Kerkia brezicensis* n. sp.; for example, "*Hauffenia*" *sinjana* Kuščer, 1933, and "*Hauffenia*" *plana* Bole, 1961. The generic status of these two species, which have been found in Dalmatia, is uncertain, as the genus *Hauffenia* has only been confirmed anatomically for the eastern Alps and northern Balkans: eastern Austria, northeastern Italy, Slovenia and Croatia (cf. Bodon et al., 1996; Haase, 1992, 1993; Radoman, 1983). In any case, *Kerkia brezicensis* n. sp. is distinguishable from "*H.*" *sinjana* by virtue of its round, not horizontally widened aperture (cf. Kuščer, 1933, fig. 2), but it is difficult to distinguish from "*H.*" *plana* (cf. Bole, 1991, fig. 3C). On the whole, the malacofauna of stygobiont hydrobiids of Dalmatia is very different from that of Slovenia. Radoman (1985) shows obvious faunistic differences, at species rank, between the northwestern Dinaric district that drains into the Danube Basin and the central-eastern one, that drains into the Adriatic Sea. This suggests that there is no zoogeographic basis for *Kerkia brezicensis* n. sp. and "*H.*" *plana* being conspecific.

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REFERENCES

- BODON, M., & F. GIUSTI, 1986. A new valvatoïd shelled hydrobiid from Liguria (Italy). (Gastropoda: Prosobranchia). — Arch. Molluskenk. 117: 61-71.
- —, G. MANGANELLI & F. GIUSTI, 1996. The genus *Hauffenia* Pollonera, 1898 and other European valvatoïd genera revised. (Gastropoda: Hydrobiidae). In press.
- BOLE, J., 1961. Nove Hidrobide (Gastropoda) iz podzemeljskih vodazahodnega balkana. — Biol. Vestn. 9: 59-69.
- —, 1963. O morfoških spremenbah pri podzemeljskih polžih. — Treći Jugoslovenski Speleološki Kongres, Sarajevo: 121-124.
- —, 1967. Polži iz freatičnih voda Jugoslavije. — Slovenka Akademija Znanosti in Umetnosti Razned za prirodoslovne in medicinske Vede Oddlek za prirodoslovne vede 10: 111-120.
- —, 1970. Prispevek k poznavanju anatomije in taksonomije podzemeljskih Hidrobiid (Gastropoda, Prosobranchia). — Slovenka Akademija Znanosti in Umetnosti Razned za prirodoslovne in medicinske Vede Oddlek za prirodoslovne vede 13: 87-111.

- , 1993. Podzemeljski polži družine Horatiidae (Gastropoda, Prosobranchia) v Sloveniji in njihov taksonomski položaj. — Slovenka Akademija Znanosti in Umetnosti Razned za prirodoslovne in medicinske Vede Oddlek za prirodoslovne vede 34: 3-17.
- , & F. VELKOVHRH, 1986. Mollusca from continental subterranean aquatic habitats. In L. BOTOSANEANU, ed., Stygofauna mundi. A faunistic, distributional and ecological synthesis of the world fauna inhabiting subterranean waters (including the marine interstitial): 177-208. Leiden.
- , & F. VELKOVHRH, 1987. Nove vrste podzemeljskih polzev Jugoslavije. — Slovenka Akademija Znanosti in Umetnosti Razned za prirodoslovne in medicinske Vede Oddlek za prirodoslovne vede 28: 69-83.
- GIUSTI, F., & E. PEZZOLI, 1980. Gasteropodi 2. (Gastropoda: Prosobranchia: Hydrobioidea, Pyrguloidea). Consiglio Nazionale delle Ricerche. Collana del Progetto finalizzato "Promozione della qualità dell'ambiente". Pubblicazione AQ/1/47. Guide per il riconoscimento delle specie animali delle acque interne italiane 8: 1-67.
- HAASE, M., 1992. A new, stygobiont, valvatiform, hydrobiid gastropod from Austria (Caenogastropoda: Hydrobiidae). — J. Moll. Stud. 58: 207-214.
- , 1993. *Hauffenia kerschneri* (Zimmermann 1930): zwei Arten zweier Gattungen (Caenogastropoda: Hydrobiidae). — Arch. Molluskenk. 121: 91-109.
- KUŠČER, L., 1933. Prispevek k poznavanju podzemskih gastropodov Dalmacije in Hercegovine. — Prirodoslovna Istraživanja Kraljevine Jugoslavije, 18: 59-67.
- RADOMAN, P., 1983. Hydrobioidea a superfamily of Prosobranchia. I. Systematics. — Serb. Acad. Sci. Arts Monogr. Dep. Sci. 57: 1-256.
- , 1985. Hydrobioidea, a superfamily of Prosobranchia (Gastropoda). II. Origin, zoogeography, evolution in the Balkans and Asia Minor. — Fac. Sci., Dept. Biol., Beograd, Monogr. 1: 1-173.