

A contribution to the knowledge of *Aegopis spelaeus* A. J. WAGNER, 1914 (Gastropoda: Stylommatophora: Zonitidae)

With 8 figures

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Abstract. The first finding of the troglomorphic snail *Aegopis spelaeus* A. J. WAGNER, 1914 in Croatia (in S-Dalmatia) is recorded. A complete description of the shell is given here, as well as of the body, radula, reproductive organs, and a review of known sites from the literature and collections of this seldom recorded species.

Kurzfassung. Beitrag zur Kenntnis von *Aegopis spelaeus* A. J. WAGNER, 1914 (Gastropoda: Stylommatophora: Zonitidae). – Die troglomorphe Schnecke *Aegopis spelaeus* A. J. WAGNER, 1914 wurde zum ersten Mal in Kroatien (in S-Dalmatien) festgestellt. Eine Beschreibung von Schale, Körper, Genitalorganen und Radula sowie eine Zusammenstellung aller Fundorte dieser bisher wenig bekannten Schnecke aus der Literatur und aus den bisher unpublizierten Sammlungen werden vorgestellt.

1. Introduction

During speleological research in southern Dalmatia (Croatia), on March 6, 1998, in the "Špilja za Gromačkom vlakom" cave near the village of Gromača (10 km NW of Dubrovnik) several examples of shells and living snails of the species *Aegopis spelaeus* A. J. WAGNER, 1914 were found. Judging from the available literature, this was the first finding of living specimens since the description of A. J. WAGNER (1914, 1915), and one of the very few findings of shells of this species at all (WAGNER 1914, 1915; RIEDEL 1970).

A. J. WAGNER (1914: 39–40) described the cave snail *Aegopis spelaeus* on the basis of specimens collected by a famous speleologist of that time, the curator of the zoological department of the Landesmuseum in Brünn, Dr Karl ABSOLON, in the "Mrcine" and "Belušica" caves, Herzegovina. Along with his description of the shell, WAGNER gave an account of the radula and the reproductive organs. In a work of 1915, WAGNER repeated the same descriptions, but complemented them with drawings (1915: 453, pl. 4, 5, 8). In both works, WAGNER is of the opinion, on account of the depigmented body, excepting for the eyes on which there are faint traces of pigment, and the depigmented shell, that *Ae. spelaeus* is a real cave animal, and the biggest cave snail found to that date. Fifty five years had to pass before we could begin to find out something else about this interesting species: RIEDEL (1970: 8) wrote about a finding of numerous *Ae. spelaeus* shells in the "Bjelušica" cave; RIEDEL (1979: 468) incidentally cited (the previously known) structure of the radula of *Ae.*

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spelaeus; RIEDEL (1980: 62; 1996: 374) wrote about of the distribution and habitat of the species.

The find of both shells and living snails of the species in the "Špilja za Gromačkom vlakom" cave near Dubrovnik has made it possible to fill in our understanding of the morphology of the shell and body, the structure of the reproductive organs and the radula. Data concerning the distribution of the species were obtained by use of the material mentioned, and material stored in private and institutional (mainly museum) collections, and a review of the literature.

2. Results and discussion

2.1. A contribution to the knowledge of external morphology and anatomy of *Aegopis spelaeus*¹⁾

Besides *Meledella werneri* STURANY, 1908 and *Troglagopsis mosorensis* (KUŠČER, 1933) (= *?obenbergeri* FRANKENBERGER, 1917), *Ae. spelaeus* is the largest true troglobiont among the Zonitidae and among the subterranean land snails in general.

The data on the species were hitherto limited to the original description of the shell and a very laconic description of the genitalia and radula (WAGNER 1914: 39–40), later supplemented with rather simplified figures (WAGNER 1915: 453, pl. 4, fig. 33 – genitalia, pl. 5, fig. 46 – radula, pl. 8, fig. 63 a–c – good illustrations of the shell). WAGNER examined anatomically most probably only one specimen of the snail.

The supplementary description given below is based on a new material: Špilja za Gromačkom vlakom (Gromača NW of Dubrovnik, Dalmatia), March 6th 1998, B. Jalžić leg. – 9 shells (adult and juvenile) and 9 alcohol-preserved specimens (adult and juvenile). Six dry (+ remnants) and 7 wet specimens are deposited at the Croatian Natural History Museum in Zagreb, 2 shells and 2 anatomically examined specimens are at the Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw.

Shell. The examined material conchologically agrees with WAGNER's original specimens kept at the Museum in Warsaw, including the syntype from Mrcine cave.²⁾ The largest of new specimens (empty shell) is 22 mm wide.

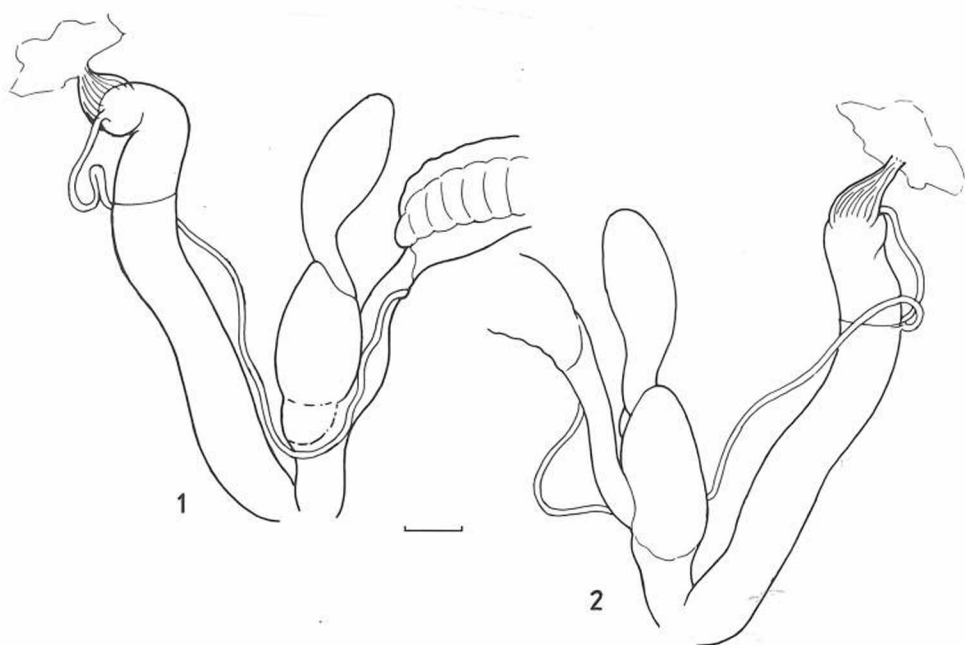
The shell is very thin-walled, delicate, colourless (in specimens collected alive – light yellowish) and almost completely translucent (like in the Vitrinidae); the whole body with many of its internal organs is clearly visible through the shell. The whorls (somewhat over 4 1/2, counted according to EHLMANN's (1933) method) are convex, separated by a deep suture. The grid-like sculpture of the upper surface (intersecting radial and spiral lines) is delicate, but very distinct, it disappears only on the body whorl; the underside of the shell is smooth and shiny.

The entire body is whitish, skin thin slightly translucent, covered with delicate wrinkles; the pedal groove is distinct, the suprapedal groove less clearly marked. At the end of the "tail", on the upperside, there is a distinct, deep longitudinal fissure. The sole is divided by rather poorly marked grooves into 3 longitudinal stripes. The left neck lobe of the mantle has a narrow accessory lappet. The eyes are probably reduced, in their place (upon examining retracted whitish ommatophores during dissection) there is only a small dot of black pigment.

Four specimens have been dissected, of shells width: 19 mm (no. 2), 17 mm (no. 1) and ca. 15.5 mm (nos 3 and 4).

¹⁾ Written by Dr. Adolf Riedel, translated by Dr. Beata M. Pokryszko.

²⁾ It follows from WAGNER's note on the label that the specimen was illustrated in WAGNER (1915) and is hereby designated as **lectotype**, and Mrcine cave is the type locality of *Ae. spelaeus*.



Figs. 1, 2: *Aegopis spelaeus*, specimen no. 1, genitalia viewed from two sides.

The right ommatophore retractor crosses genitalia (it runs in the angle formed by the penis and vagina).

The genitalia of the examined specimens (Figs 1–6) are in agreement with WAGNER's figure and description, but they differ in three respects:

1. WAGNER stressed that the distal end of penis was very strongly narrowed which was not observed in the examined specimens. It is difficult to say whether an individual variation of this character was involved (then WAGNER would have dealt with a rather "atypical" specimen) or an inexact observation (dissection?).

2. The shape and size of spermatheca and the gland surrounding its duct. The character depends on the size - age maturity (before or after copulation) of the snail, and in the smallest specimens examined the spermatheca was the most slender and the gland the smallest, poorest developed.

3. WAGNER presented the albumen gland and its proportion to the spermoviduct in a way different from what was observed in the studied specimens. Also this character depends on the physiological condition of the snail, but I suspect that WAGNER erroneously observed the border between the spermoviduct and the actual albumen gland. In all the specimens I have examined the albumen gland is strikingly small. It should be pointed out that all the reproductive ducts are uniformly whitish and sometimes it is fairly difficult to ascertain their limits (e.g. the place of separation of the vas deferens from the spermoviduct).

The penis is long, thick, cylindrical, for up to ca. $\frac{4}{5}$ its length surrounded by a delicate, thin, hardly distinguishable sheath. Its distal end is sharply bent and at most slightly narrowed. A thin, thread-like vas deferens opens to the penis apically; around its outlet, also apically, a very short penial retractor is inserted. The genital atrium is practically absent. The vagina is short, oviduct longer and thinner, its connection with the vagina partly hidden under the gland. The spermatheca duct is thick, almost entirely surrounded by a large, elongated gland which only slightly overlaps with the distal end of vagina. There is no typical periva-

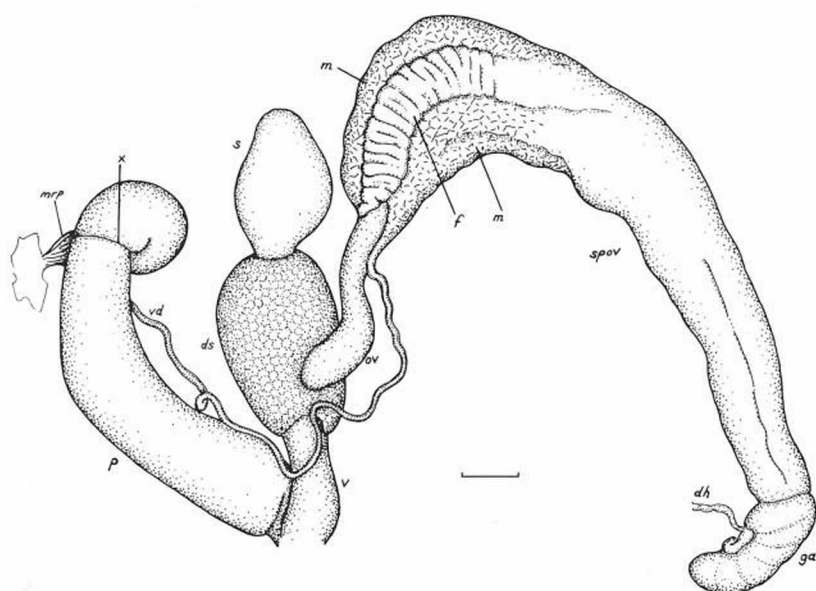
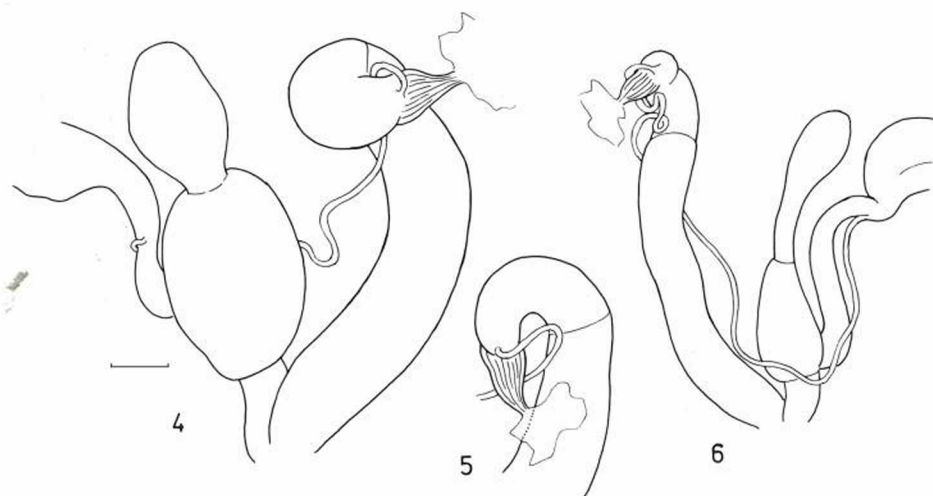


Fig. 3: *Aegopis spelaeus*, specimen no. 2, genitalia (almost entire, only hermaphrodite gland missing).

p – penis, x – distal edge of penial sheath, mrp – penial retractor muscle, vd – vas deferens, v – vagina, ov – oviduct, spov – spermoviduct, f – female part of spermoviduct, m – male part of spermoviduct, ga – albumen gland, dh – hermaphroditic duct, s – spermatheca, ds – spermatheca duct surrounded by the gland.



Figs 4–6: *Aegopis spelaeus*: 4: specimen no. 2, genitalia viewed from the other side; 5: specimen no. 2, distal end of penis partly straightened; 6: specimen no. 3, genitalia. Scale bar in all figures 1 mm.

ginal gland, it is displaced to the spermatheca duct. The spermatheca is large, roughly oval or elongatedly oval. The spermoviduct is long, its male part (prostate) distinctly wider than the poorly folded female part. The albumen gland is very small.

Internal structure of the penis (the penis of the largest specimen was cut open lengthwise). The internal walls of the penis on its whole length are covered with densely and regularly arranged fine papillae, which at the proximal end of the penis fuse into a rather homogenous, compact, soft, pillow-like lining.

The radula (examined in specimen no. 1) agrees with WAGNER's figure and description. Formula:

$$\frac{\text{ca. } 30M}{1} + \frac{1M/L}{1} + \frac{7L}{1} + \frac{C}{1} + \text{ca. } 38-40 \times 76.$$

It should be noted that there are no ectocones in the central and lateral plates – an exception in the genus *Aegopis*.

Note. In one of the two specimens examined in this respect, I have found in the alimentary tract, besides detritus, animal remnants: fragments of chitinous arthropod skeletons and oligochaete setae.

2.2. A contribution to the knowledge of the distribution of *Aegopis spelaeus*

Since in the literature *Aegopis spelaeus* was recorded as having been found only in two sites (WAGNER 1914, 1915; RIEDEL 1970, 1996), we attempted, through field research and a review of malacological collections, to understand something further about its distribution. Field research has only just been started, and has covered only a small number of the caves in southern Croatia. As for the collections, we reviewed those which could be supposed to contain material worked on by A. J. WAGNER, who first described the species, or material of K. ABSOLON, the first collector of the snail, and those collections created by malacologists who gathered speleological material in Herzegovina and Dalmatia. These are malacological collections owned by the following institutions or private persons: Museum and Institute of Zoology, Polish Academy of Sciences, Warsaw (MIZW); National Museum, Praha (NMP); Naturhistorisches Museum, Vienna (NHW); Senckenberg-Museum, Frankfurt a. M. (SMF); Institute of Biology, Centre for Scientific Research of the Slovenian Academy of Sciences and Arts, Ljubljana (SALj); Croatian Natural History Museum, Zagreb (CNHM); Zoölogisch Museum, University of Amsterdam, Amsterdam (ZMA); Nationaal Natuurhistorisch Museum, Leiden (NNML); Mr. W. M. J. MAASSEN, Duivendrecht, The Netherlands (WM); Mr. Tonči RAĐA, Split, Croatia (TR); Mr. France VELKOVH, Lenart v Slovenskih Goricah, Slovenia (FV).

All finds of the troglobiotic snail *Ae. spelaeus* found out about in this way are given in the list of finds that follows, and their location is shown in Fig. 7. Determination of the exact position of the caves has been done according to BOLE (1974), LAZIĆ (1930), MALEZ (1970), MALINAR (1988/89), REMY (1953), and according to explanations of the collectors.

2.2.1. List of sites

The list of the sites includes the name of the speleological feature, the name of the closest settlement, the name of the closest settlement listed in driving maps (for example, the Autoatlas of Croatia, Slovenia and Bosnia-Herzegovina, 1 : 500.000), a note of which republic the find is in, and the (10 × 10 km) UTM grid mark. The number in front of the name of the site (the speleological feature) corresponds to the number of the locality in Fig. 7. After the name of the find all the sources are given, in this order: L, data from the literature; C, collection data. Data from collections include the name of the collection written in an abbreviation, the data collected, the name of the collector, the determiner and the re-

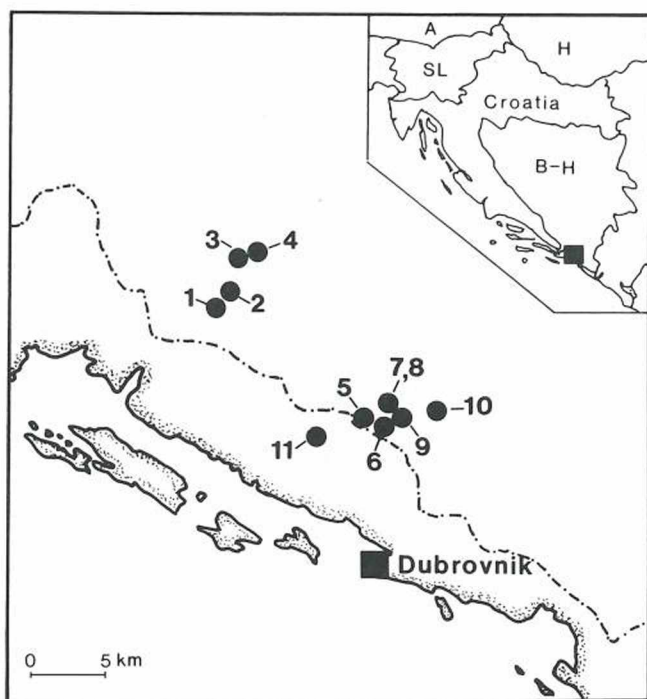


Fig. 7: Distribution of *Aegopsis spelaesus*.

Small square on the map in the right angle shows the position of the area on the big map. The finding places are denoted by numbers referring to the list of sites (finding places) in the text.

point – finding place; big square (on the big map) – town; broken line – border-line between Republic of Croatia and Republic of Bosnia and Herzegovina.

determiner, if these data were marked on the labels or available in some other way, and the number of specimens (including adult specimens' shells, as well as juveniles' and damaged shells). When live specimens are found, their number is given separately from the number of empty shells.

Often, on the labels in the collections and in the malacological literature used, the names of the caves and the settlements are given differently. In such cases we adhered to the principle that the most recently used place-name (toponym) in the literature for the determination of the position of the caves (BOLE 1974, LAZIĆ 1930, MALEZ 1970, MALINAR 1988/89, REMY 1953) is used as the "regular" name. Other names are considered (topo)synonyms, cited with the appertaining source.

List of finds (sites):

1. Benetina pećina (cave), 2 km SW from Golubinac (village), Zavala (village), B-H; UTM: YH44.

L: 0

C: MIZW: Beretina pećina, leg. K. Absolon, det. A. J. Wagner, rev. A. Riedel, 2 + 1 juv. specimens; NMW: Benetina pećina, leg. K. Absolon, 1 specimen (is marked as "original") + 1 specimen; SALj: Benetina pećina, 1956, leg. et det. J. Bole, 7 specimens; FV: Benetina pećina, 1914, leg.?, det. F. Velkovrh, 1 specimen; Benetina pećina, 09.1957, leg. et det. F. Velkovrh, 12 specimens.

2. Zaploče (cave), Golubinac (village), Zavala (village), B-H; UTM: YH44.
 L: 0
 C: SALJ: 1956, leg. et det. J. Bole, 5 specimens; FV: 06.1960, leg. et det. F. Velkovrh, 3 specimens; ?, leg. ?, det. F. Velkovrh, 2 specimens.
3. Bjelušnica (cave), Zavala (village), B-H; UTM: YH44.
 L: WAGNER (1914: 40, "Beluša", 1915: 453, "Beluša"); RIEDEL (1970: 8, "Bjelušica pećina"), RIEDEL (1996: 374, "Beluša pećina").
 C: MIZW: Beluša pećina, 1959, leg. et det. A. Riedel, 37 specimens; NMW: Bjelušica, leg. ?, det. ?, ex coll. Edlauer, 11 specimens; SMF: Bjelušica pećina, 31.08.1959, leg. et det. A. Riedel, ex A. Riedel, 2 specimens; CNHM: Bjelušica, 25.04.1987, leg. et det. T. Rada, 2 specimens; FV: Bjelušnica, 09.1957, leg. ?, det. F. Velkovrh, 1 specimen; 1965, leg. et det. F. Velkovrh, 9 specimens; 09.1975, leg. et det. F. Velkovrh, 22 specimens; TR: Bjelušica, 25.04.1987, leg. et det. T. Rada, 1 specimen; WM: Bjelušica, 07.1977, leg. et det. W. M. J. Maassen, 10 specimens; 07.1982, leg. et det. W. M. J. Maassen, 10 specimens; 04.1989 leg. et det. W. M. J. Maassen, 48 dry specimens + 2 wet juvenile specimens; ZMA: Bjelušica pećina, 28.04.1989, leg. W. J. M. Maassen, 4 specimens; NNML: Bjelušica Pećina, 31.07.1959, leg. et det. A. Riedel, 2 specimens; Bjelušica Pećina, 28.04.1989, leg. W. J. M. Maassen, 4 specimens.
4. Gubava peć (cave), 1km E from Zavala (village), B-H; UTM: YH44.
 L: 0
 C: SALJ: 23.09.1975, leg. et det. J. Bole, 40 specimens; FV: 09.1957, leg. ?, det. F. Velkovrh, 1 specimen.
5. Grabovica (cave), 1.5 km SW from Slivnica-Bobani (village), B-H; UTM: BN53.
 L: 0
 C: MIZW: Grabovica, 20.08.1917, leg. K. Absolon, det. A. J. Wagner, rev. A. Riedel, 1 specimen; NMP: Grabovica, 20.08.1917, leg. K. Absolon, det. ? A. J. Wagner, 2 specimens.
6. Mrcine (cave), S-slope of the Tekljač Mt., 1.5 km S from Grepci (village) /or Grepci/, Vlaka (village), B-H; UTM: BN63.
 L: WAGNER (1914: 40, 1915: 453, Taf. 4, 5, 8).
 C: MIZW: leg. K. Absolon, det. A. J. Wagner, lectotype (nov. – cf. foodnote²); SMF: Mrcina, 08.07.1914, leg. K. Absolon, det. A. J. Wagner, coll. P. Ehrmann ex K. Absolon, 3 specimens.
7. Nova Đurkovića (cave), 0.7 km NNW from Grepci /or Grepci/ (village), Vlaka (village), B-H; UTM: BN63.
 L: 0
 C: FV: 09.1957, leg. et det. F. Velkovrh, < 10 specimens³).
8. Đurkovića (cave), 0.65 km NNW from Grepci (village) /or Grepci/, Vlaka (village), B-H; UTM: BN63.
 L: 0
 C: FV: Stara Đurkovića, 09. 1975, leg. et det. F. Velkovrh, 8 specimens.
9. Poganjača (cave), 0.5 km E from Grepci /or Grepci/ (village), Vlaka (village), B-H; UTM: BN63.
 L: 0
 C: FV: 09.1975, leg. et det. F. Velkovrh, 2 specimens.
10. Pećina (cave), Nevada (village), B-H; UTM: BN63.
 L: 0
 C: SALJ: Nevada, 09.11.1961, leg. et det. J. Bole, 4 specimens.
11. Špilja za Gromačkom vlakom (cave), 2 km NE from Gromača (village), 10 km NW from Dubrovnik, Croatia; UTM: BN53.
 L: 0
 C: CNHM: 06.03.1998, leg. B. Jalžić, det. V. Štamol, rev. A. Riedel, 6 dry specimens + 7 wet specimens; 13.08.1998, leg. B. Jalžić, det. V. Štamol, 9 dry specimens; MIZW: 06.03.1998, leg. B. Jalžić, det. V. Štamol, rev. A. Riedel, 2 dry specimens + 2 wet specimens; TR: 13.08.1998, leg. B. Jalžić, det. V. Štamol, 5 dry specimens.

³) Shells are joined by flowstone, so it is difficult to determine their exact number.



Fig. 8: *Aegopis spelaeus*, "Špilja za Gromačkom vlakom" cave, Croatia. Photo: B. Jalžić

? 12. Jama Srebrovica (pit), Hercegovina, B-H.

L: 0

C: MIZW: Jama Srebrovica, Hercegovina, det. A. J. Wagner, rev. A. Riedel, 2 specimens; NMW: Srebrovica, Hercegovina, leg. ?, det. ? A. J. Wagner, ex W. Klemm from coll. A. Wagner, 1 specimen.

? 13. Cave at a mountain-ridge above Zavala, Hercegovina, B-H.

L: 0

C: NMW: Cave at a mountain-ridge above Zavala, Hercegovina, leg. K. Absolon, 2 specimens.

Apart from these sites, in thematically broader works of a monographic or zoogeographic character, two areas appear as wider localities: Herzegovina (RIEDEL 1980: 62; RIEDEL 1986: 374, "Höhlen in Herzogowina"), and Dalmatia (RIEDEL 1986: 374, "Höhlen in ...Dalmatien").

The places where *Ae. spelaeus* is found are exclusively speleological features in Herzegovina (B-H) and Dalmatia (Croatia). According to the more narrowly defined sites so far, *Ae. spelaeus* was known only in two localities in Herzegovina. By going over the collections stated and the material recently collected in Dalmatia, we found another nine sites, the topographic positions of which can be stated, and two further localities (marked in the list with a ?) the topographical positions of which have not been defined. The reason for the lack of definition of a position is the fact that it is a question of a toponym not being given in the literature for the determination of the position of the speleological feature (loc. no. 12: Srebrovica pit) or that the name of speleological feature and its exact position are not given (loc. no. 13: cave at a mountain ridge above Zavala). As for the Srebrovica cave, it is very possible that it might be an incorrectly written label, the Grabovica cave really being meant (this is the opinion of Dr A. RIEDEL).

Of the 11 defined sites of *Ae. spelaeus* finds given in this work, 10 of them are in Herzegovina (B-H) and one is in Croatia. Of the 10 Herzegovinian localities, two were familiar from the literature (Mrcine and Bjelušnica), and all others derive from the collections. The most recent *Ae. spelaeus* material is deposited in the CNHM, MIZW and in TR, that is, material from the "Špilja za Gromačkom vlakom" cave near the village of Gromača collected during our speleological field research in Dalmatia in 1998, which is the first and to date only material of this species found in Croatia (Fig. 8).

Sites of *Ae. spelaeus* known so far can be classified into three groups. The first is constituted by speleological features of the northern part of Popovo polje, around Zavala; the second by speleological features of the south west periphery of Popovo polje around the village of Grebci. The third, a locality so far isolated from these groups, is the "Špilja za Gromačkom vlakom" cave near Gromača in Croatia. This is about 4 km from the closest localities of the second group, but does form a logical whole with them. It is interesting that in the relatively close large Croatian speleological features of caves Močiljska špilja near Osojnik and Vilina špilja above Ombla spring near Dubrovnik, *Ae. spelaeus* was not found during our research.

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