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SERPULID WORMS *MERCIERELLA* FAUVEL, *DURANDELLA* DRAGASTAN AND *CARPATHIELLA* NOV. GEN. FROM THE JURASSIC, CRETACEOUS AND PALEOGENE OF THE WESTERN CARPATHIANS

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Abstract: Rare worm tubes belonging to *Mercierella* Fauvel, *Durandella* Dragastan (formely attributed to Tintinnida) and to a new genus named *Carpathiella* comprising two species were described from thin sections of Jurassic, Cretaceous and Paleogene marine limestones.

Key words: Jurassic, Cretaceous, Paleogene, Western Carpathians, serpulid taxonomy, worm tubes.

Introduction

Upper Jurassic, Barremian-Aptian, Senonian and Paleocene limestones of the shallow-water facies in outcrops and especially in pebbles proceeding from younger conglomerates (Fig. 1) contain numerous tubes of serpulid worms. The genera *Mercierella*, *Durandella* and *Carpathiella* nov.gen. occur rarely and are always strongly dispersed in limestones from which they cannot be extracted. As the identification of worm tubes was predominantly based on loose specimens, the study of the tube structure in thin sections will be necessary in the future.

Systematic part

Family **Serpulidae** Burmeister 1837
Genus *Mercierella* Fauvel 1923

Mercierella (?) dacica Dragastan 1966
(Pl. I: Fig. 1)

1966 *Mercierella (?) dacica* Dragastan, 147–149, figs. 1–3
1968 *Mercierella (?) dacica* Stilla, Dragastan & Dumitru, pl. V: fig. 8
1981 *Mercierella (?) dacica* Mišík & Sýkora, 28, pl. VI: fig. 1
1985 *Ridgeia piscesae* Jones, p. 117–158
1987 *"Mercierella" dacica* Soták, 247, pl. XI: figs. 4–5
1991 *Mercierella* cf. *dacica* Mišík, 15, pl. V: fig. 2
1992 *Mercierella (?) dacica* Radoičić, 182–184, pl. I: figs. 4–6
1995 *Mercierella (?) dacica* Carras, 26–27, pl. 27: fig. 4; pl. 28: figs. 1–2
1998 *Mercierella (?) dacica* Carras & Georgala, p. 156
1998 *Mercierella (?) dacica* Schlagintweit & Ebli, p. 236
1999 *Ridgeia piscesae* Little et al., fig. 2A–D

Description: The species was described from Upper Jurassic limestones of Romania. According to the author the tubes have an average diameter of 0.12 mm (max. 0.5 mm). It possesses three collars at unequally spaced distances ranging between 10° and 70°, the most frequent angles are of 50°–60°. Collar length is 0.08–0.38 mm. Our specimen (Pl. I: Fig. 1) bears three collars, unequally spaced, with the angle 60°; inner diameter (lumen) is 0.076 mm, smaller than noted by Dragastan. It was found in Tithonian shallow-water limestones with *Tubiphytes morronensis.*

Discussion: Stratigraphical span of *Mercierella (?) dacica* is Kimmeridgean–Tithonian–Berriasian. It was found up to now on the territory of Romania, Slovakia, Czech Republic, Greece, Yugoslavia and Austria. The author of the genus *Mercierella* Fauvel (1923) described it from brackish water limestones and as a reef-forming organism. Small reefs ("biolithosores") of recent *Mercierella* were described from Tunis Bay (Lucas 1959; Davaud et al. 1994). This ecological difference of Upper Jurassic alleged representatives of the ge-

Fig. 1. Situation of localities. **M** — *Mercierella (?) dacica*, **D** — *Durandella helentappani*, **CT** — *Carpathiella triangulata*, **CP** — *Carpathiella perforata*. **Rectangle** — primary position, **circle** — pebbles in younger conglomerates.

nus is another reason for the question-mark placed after the generic name.

The same object was illustrated by Little et al. (1999: fig. 2D) from the Early Jurassic hydrothermal vent community in Franciscan Complex and compared to the vestimentiferan worm tubes found in the modern hydrothermal vents. At the difference to *Mercierella (?) dacica* they are bigger, form clusters and occur in deep water sediments.

Microfossils similar to *Mercierella (?)* Pl. I: Figs. 2–12

Discussion: It is clear that from the random sections *Mercierella (?) dacica* cannot be determined with certainty. Longitudinal sections in Pl. I: Figs. 6, 10 could really represent the oral part of that species. The specimens in Pl. I: Figs. 2–3 probably belong to another species; they display two collars, longer than those of *M. (?) dacica* and posses vertically oscillating diameters. The specimen in Pl. I: Fig. 11 is really a new species designated by us ***Mercierella (?)* sp. 1** with the diameter 0.076 mm. It is remarkable for a double collar branching from the same point. Dragastan (1966, p. 148) wrote that the tubes have a bilamellar structure and the outer layer shows fibres arranged radially on the inner wall. The cross-section in the center of Pl. I: Fig. 9 shows that the non-recrystallized tube had a structure formed by vertical fibres, parallel with the tubes. It comes from the same rock specimen as the typical *M. dacica* (Fig. 1).

A circular continuous collar in the oblique sections like Pl. I: Figs. 4–5, is expected to be broader, which is not the case. The cross-section through the collar zone should show a double ring illustrated by Dragastan (1966: fig. 2). It should be stressed that we found no section with such a double ring and none of the other authors have mentioned or illustrated it. It is probable that some of the "collars" illustrated here (Pl. I: Figs. 2–5, 7–9) might be whorls of fibres. That is clear from the specimen in the Pl. I: Fig. 12, designated by us as *Aeolisaccus* cf. *kotori* Radoičić 1972, considered by the author as *incertae sedis*; De Castro (1975) attributed it to Cyanoshizophyta. Our specimen differs from *A. kotori* by its narrower tube, thinner wall and stratigraphical horizon (Upper Jurassic; the span of *A. kotori* is Albian to Paleocene). The genus *Aeolisaccus* was described by Elliott (1958) and characterized as a small tube open at both ends. Zaninetti (1976) rearranged all so far known species of *Aeolisaccus* in the foraminiferal genus *Earlandia*. It is, however, strange that the supposed proloculum was never found and the single case illustrated by Brönnimann et al. (1972: Pl. 3—Fig. 1) can be ascribed to a compactional deformation of the tube.

The differentiation of *Earlandia* (or *Aeolisaccus*) from the specimens similar to *Mercierella* is mostly impossible in the cross-sections. However, the first one has a larger time span from Triassic to Cretaceous, while all the specimens illustrated on Pl. I as similar to *Mercierella* (?) come from the Upper Jurassic limestones containing *Tubiphytes morronensis* and occur rarely (mostly one specimen in a thin section). The inner diameter of the specimens similar to *M. dacica* illustrated in Pl. I oscillated between 0.040 and 0.090 mm with the average about 0.070 mm.

Genus *Durandella* Dragastan 1970

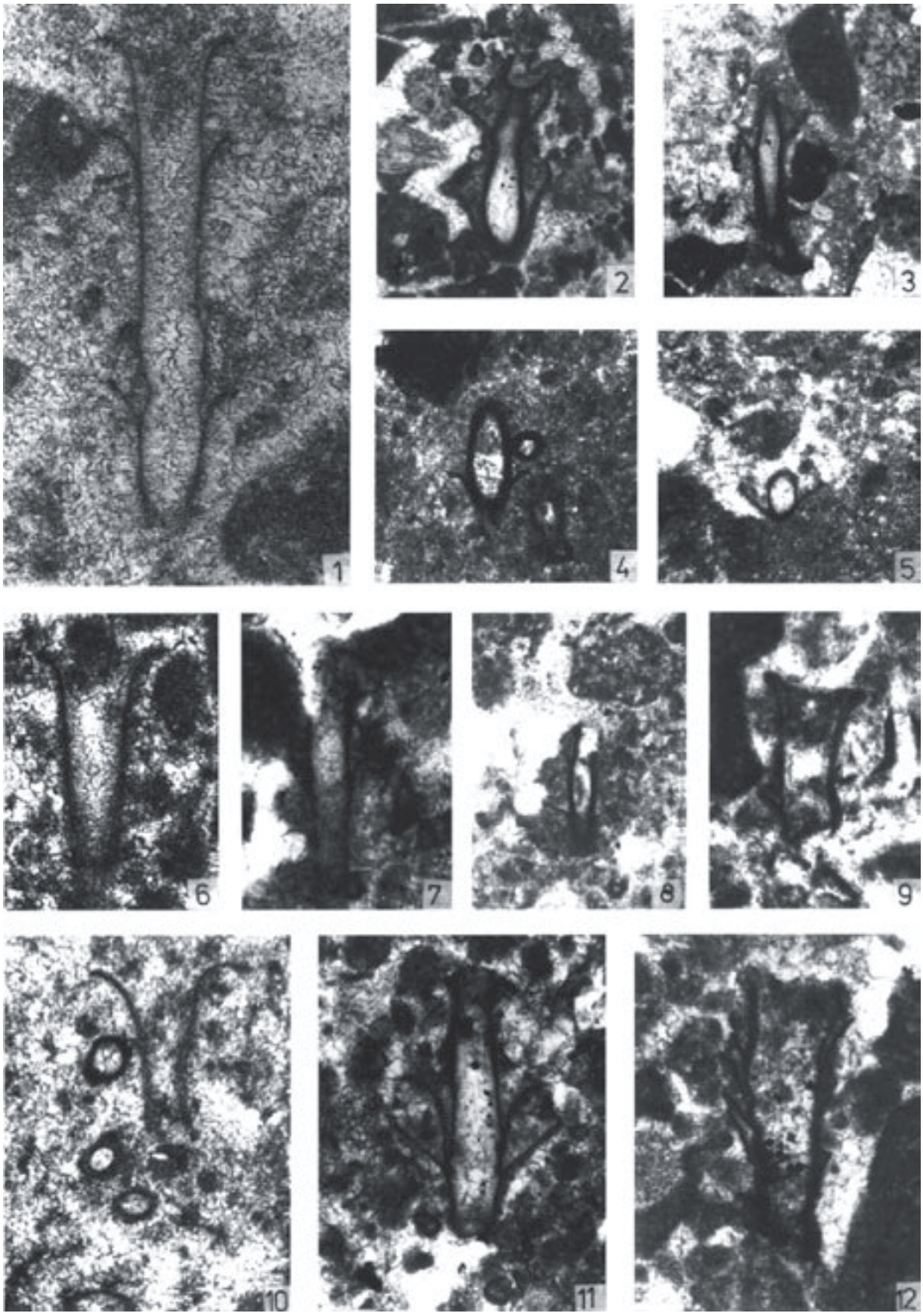
***Durandella helentappani* Dragastan 1970** (Pl. II: Figs. 1–2)

1970 *Durandella helentappani* nov.gen. nov.spec. Dragastan, 937–939, Pl. XL: Figs. 1–2
1994 *Durandella* sp. Mišík et al., 257, 259, Pl. II: Figs. 2–4

Description: The tube consists of two distinct layers. The inner layer is dark (microcrystalline calcite), outer one is clear (white). The clear layer is thinning towards the lower part of the tube; in the mouth it forms a club-shape collar in longitudinal section. The dimensions: max. inner diameter (lumen) is 0.70 mm, the width of the collar is 0.09 mm.

Remark: Dragastan (1970) ranged his new genus *Durandella* to Tintinnida according to the alleged similarity to the recent genus *Thythocorys* Tappan & Loeblich 1968. However, the object in his figure 2 clearly belongs to the worm tubes. He compared the so-called perforated calcitic lamella in the mouth to the oral diaphragma typical for some recent

Plate I: *Mercierella (?) dacica* and similar microfossils. **Fig. 1** — *Mercierella (?) dacica* Dragastan in the shallow-water Tithonian limestone with *Tubiphytes*. Pebble from the Upper Coniacian-Santonian conglomerates, Kysuca Succession, Pieniny Klippen Belt. Loc. Žilinská Lehota-c, thin section No. 7685, magn. 136×; **Fig. 2** — Microfossil similar to *Mercierella (?)* in the Upper Jurassic shallow-water limestone with *Tubiphytes* and *Mohlerina basiliensis*. Pebble from the Senonian Valchov Conglomerate. Loc. Bzince-Rubaninské 13, Čachtické Karpaty Mts., thin section No. 23557, magn. 50×; **Fig. 3** — Similar form in the Upper Jurassic limestone with *Tubiphytes*. As previous. Loc. Bzince-Rubaninské 10, thin section No. 18142, magn. 20×; **Fig. 4** — Similar form in the Upper Jurassic limestone with *Mohlerina basiliensis* from the Silica Unit. Pebble from the Egerian conglomerates. Loc. Chvalová-II-27, thin section No. 11205, magn. 75×; **Fig. 5** — Similar form, locality as Fig. 1, thin section No. 23554, magn. 75×; **Fig. 6** — *Mercierella (?) dacica* Dragastan in the Upper Jurassic limestone with *Tubiphytes*. Pebble from the Senonian conglomerates, Kysuca Unit, Pieniny Klippen Belt. Loc. Branč-Starý hrad-n, thin section No. 8704, magn. 43×; **Fig. 7** — Similar form in the Kimmeridgean-Lower Tithonian limestone with microoncoids and *Saccocoma*. Pebble from the Paleocene Proč Conglomerate of the Pieniny Klippen Belt. Loc. I-novce-24, thin section No. 17148, magn. 95×; **Fig. 8** — Similar form. Locality as Fig. 1, thin section No. 23550, magn. 50×; **Fig. 9** — Similar form in the Tithonian limestone with *Tubiphytes*. Pebble from the Eocene Strihovce Conglomerate, Krynica Subunit, Magura Flysch Belt. Loc. Matiaška 1-1, thin section No. 23547, magn. 75×; **Fig. 10** — *Mercierella (?) dacica* Dragastan, as Fig. 1, thin section No. 23554, magn. 27×; **Fig. 11** — *Mercierella (?)* sp. 1. Locality as Fig. 2, thin section No. 11499, magn. 95×; **Fig. 12** — *Aeolisaccus* cf. *kotori* Radoičić in the shallow-water Upper Jurassic limestone with *Mohlerina basiliensis*. Locality as Fig. 2. Thin section No. 14566, magn. 95×.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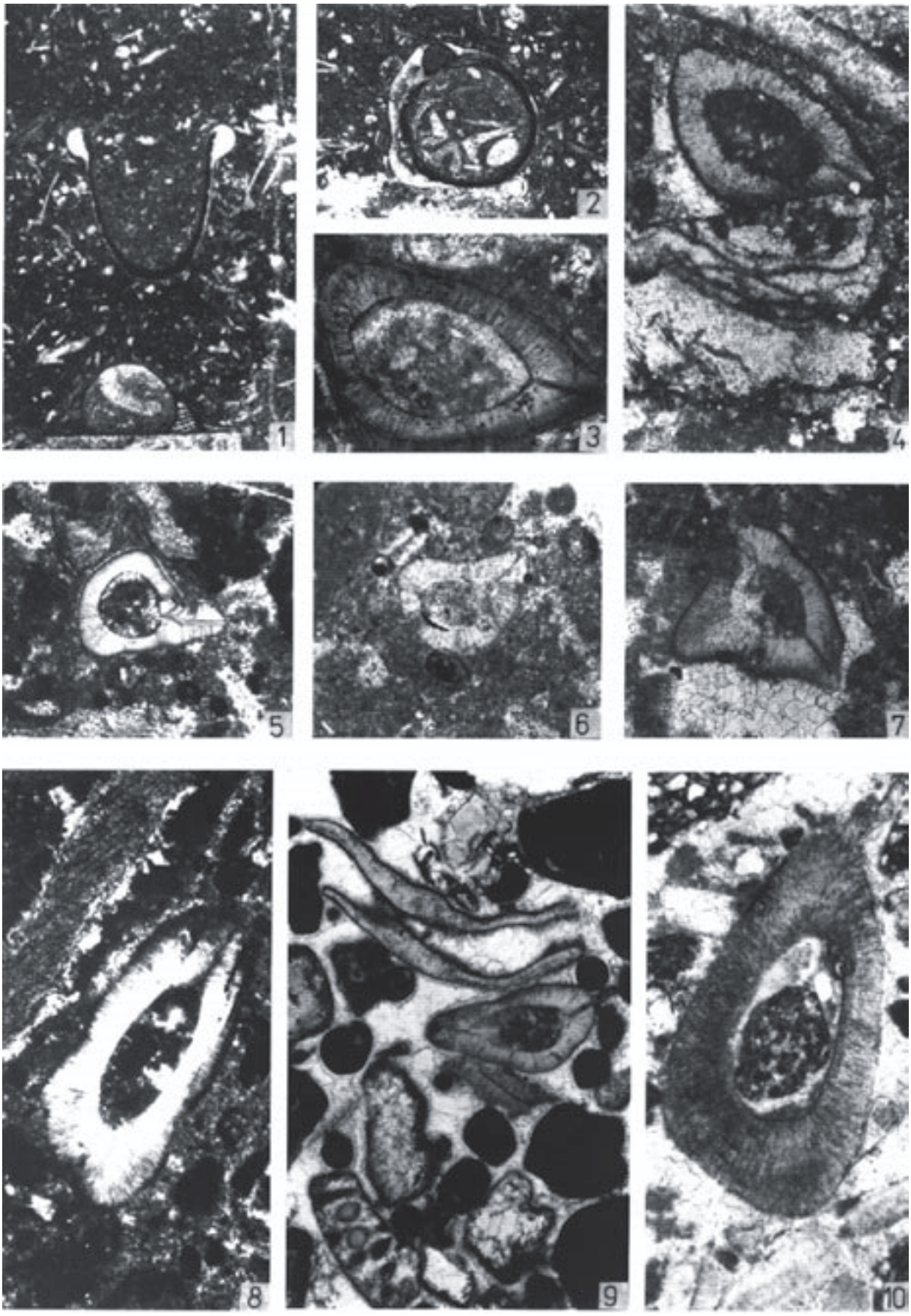
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Tintinnida. It may be noted that such a diaphragma is not known in any fossil representative of the Tintinnida. The annelid nature is clear in the lower specimen figured in our Pl. II: Fig. 1, which has its tube fixed with serpulid cellular layer to the substratum. The stratigraphic level of our specimen is Tithonian, the same as that one illustrated by Dragastan (1970).

Carpathiella nov. gen.

Type species: *Carpathiella triangulata* nov. spec.

Derivation of name: *Carpathiella* — after the Carpathian Mts.

Diagnosis: Tubes relatively thick (mostly 0.13–0.18 mm). The tube is formed by one layer; the calcite fibres are oriented radially in the cross-section. The cross-section tends to a triangular shape.

Carpathiella triangulata nov. spec.
(Pl. II: Figs. 3–9)

1981 Worm tube (?) Mišík & Sýkora, Pl. IX: Fig. 9

Plate II: *Durandella helentappani* and *Carpathiella triangulata* nov.gen., nov.spec. **Fig. 1** — *Durandella helentappani* Dragastan, in the upper part a longitudinal section, in the lower part a cross-section of the tube fixed by the celullar structure, proving its annelid nature. Lower Tithonian limestone with *Parastomiosphaera malmica*, Czorsztyn Succession, Pieniny Klippen Belt. Loc. Quarry Babiná near Bohunice, thin section No. 12693, magn. 40×; **Fig. 2** — *Durandella helentappani* Dragastan, cross-section in the collar part. The same locality and thin section, magn. 40×; **Fig. 3** — *Carpathiella* nov.gen. *triangulata* nov.spec., holotype, in the *Palorbitolina*-bearing Upper Barremian-Lower Aptian limestone (Urgonian facies). Block in the Cenomanian conglomerates, Manín Unit. Loc. W of Malé Hradisko near Žilina, thin section No. 6149, magn. 43×; **Fig. 4** — *Carpathiella triangulata* fixed on the alga *Pseudolithotamnium album*. Barremian-Aptian limestone, pebble from the Albian Ludrová Conglomerate, Krížna Nappe. Loc. Medzibrodie-10, Strážov Mts., thin section No. 12013, magn. 48×; **Fig. 5** — *Carpathiella triangulata*, paratype, in the Upper Jurassic Barmstein Limestone, Choč Nappe. Loc. Šipkovský háj-13, Čachtické Karpaty Mts., thin section No. 23558, magn. 63×; **Fig. 6** — *Carpathiella triangulata* in the Kimmeridgean-Lower Tithonian limestone with *Saccocoma*. Pebble from the Eocene Strihovce Conglomerate, Krynica Subunit, Magura Flysch Zone. Loc. Mičákovce-b, thin section No. 14702, magn. 80×; **Fig. 7** — *Carpathiella triangulata* in the *Palorbitolina*-bearing Upper Barremian-Lower Aptian limestone with corals (Urgonian facies). Pebble from the Senonian conglomerates, Klape Unit. Loc. Vrtižer-XXI , thin section No. 9560, magn. 43×; **Fig. 8** — *Carpathiella triangulata* in the Tithonian limestone with *Tubiphytes*. Pebble from the Cenomanian conglomerates, Manín Unit. Loc. Súlov-ces-a, thin section No. 10463, magn. 48×; **Fig. 9** — *Carpathiella triangulata*, cross and longitudinal section, in the *Palorbitolina*-bearing Upper Barremian-Lower Aptian limestone. Pebble from the Paleocene Proč Conglomerate, Pieniny Klippen Belt. Loc. Proč-II-i, thin section No. 16684, magn. 30×; **Fig. 10** — *Carpathiella* sp. in the Cenomanian limestone with *Orbitolina concava*. Pebble from Upper Cenomanian-Turonian conglomerates, Klape Unit. Loc. Podvážie-II-9 , thin section No. 10931, magn. 30×.

Holotype: Specimen at the Pl. II: Fig. 3, thin section No. 6149. Coll. of the Department of Geology and Paleontology, Faculty of Sciences, J.A. Comenius University, Bratislava, Slovakia.

Paratype: Specimen on the Pl. II: Fig. 5, thin section No. 23550. Coll. as above.

Type horizon: Upper Barremian-Lower Aptian

Type locality: Holotype — Malé Hradisko Hill near Žilina, Slovakia, Urgonian Limestone, block in the Cenomanian conglomerate, Manín Unit. Paratype — Šipkovský háj near Krajné, Čachtické Karpaty Mts., Barmstein Limestone, Upper Jurassic.

Derivation of name: Triangulata — after irregularly triangular cross-section.

Material: Eight sections of tubes from limestones of Upper Jurassic and Barremian-Aptian age.

Diagnosis: The tube consists of one layer, sometimes with a thin dark micritized rim on its outer and rarely also in its inner side. The calcite fibres in the tube are radially arranged. In the acute corner of the triangle a dark line (suture) is present, it may rarely be replaced by a narrow canal (Pl. II: Fig. 5). The longitudinal section of the tube is irregularly curved with oscillating thickness (Pl. II: Fig. 9).

Description: The largest diameter of the tube oscillates between 0.45–1.12 mm. The lumen is between 0.18–0.60 mm. The length cannot be measured.

Localities: Seven localities are cited in the caption of Plate II. Other localities: Chvalová-II-16, Upper Jurassic, pebble from Egerian conglomerates, Milovice-1, Upper Jurassic, pebble from the Paleogene conglomerates.

Carpathiella perforata nov. spec.
(Pl. III: Figs. 1–3)

1964 Problematicum Garcia, Fig. 24, photo 40
1972 cf. *Haliotus* Samuel et al., Pl. CLXXIV: Fig. 2; Pl. CLXXV: Fig. 4
1995 worm tube — Mišík, Pl. III: Figs. 5–6

Holotype: Specimen on Pl. III: Fig. 1, thin section No. 14354. Coll. of the Department of Geology and Paleontology, Faculty of Sciences, J.A. Comenius University, Bratislava, Slovakia.

Paratype: Specimen on the Pl. III: Fig. 2, thin section No. 3783. Coll. as above.

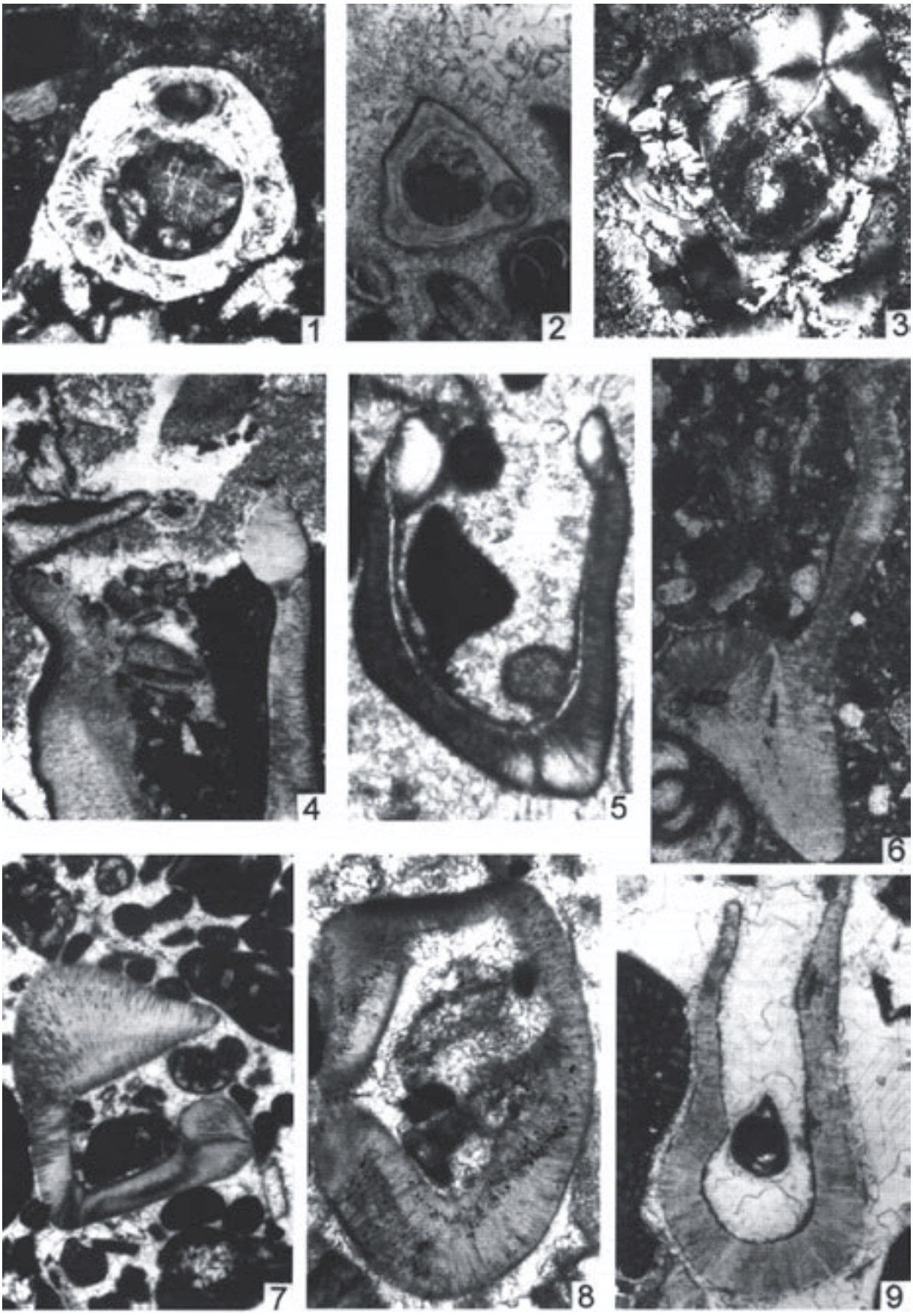
Type horizon: Senonian

Type locality: Lipovec near Jablonica, pebble of Senonian limestone in the Karpatian Jablonica Conglomerate.

Derivation of name: After the circular voids within the tube.

Material and localities: Three thin sections from three localities Barremian-Aptian, Senonian and Paleocene. The localities are cited in the caption of Pl. III: Fig. 1–3.

Diagnosis: Triangular shape but with rounded corners; one to three circular voids in the tube wall are present in the cross-section (three voids were present in the specimens illustrated by Garcia (1964) and Samuel et al. (1972: Pl. CLXXV—fig. 4). Different structure of the corners also in the case of lacking voids (concentric cracks — Pl. III: Fig. 1,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radial fibrous structure — Pl. III: Fig. 3). It is possible that the voids gradually evolve in the anterior part of the tube.

Description: The diameter of the tube was between 0.62 and 1.92 mm; the holotype—0.91 mm and the width of the wall—0.18 mm.

Remark: Samuel et al. (1972: Pl. CLXXIV—fig. 2 and Pl. CLXXV—fig. 4) designated our *Carpathiella perforata* as cf. *Haliotus*. They have mistaken objects figured by Majewske (1969: Pl. 14— fig. 1) where the gastropod *Haliotus* is accompanied by an annelid tube.

Carpathiella sp.

(Pl. II: Fig. 10; Pl. III: Figs. 4–9)

Thick one-layered very irregular tube with radially arranged calcite fibres. The mouth of the tube is club-shaped, formed by spherolitic aggregate of thin fibres (white colour on the Pl. III: Fig. 4). In some oblique sections thin pores ("channels") can be seen (Pl. III: Fig. 6). Numerous localities of the Upper Jurassic and especially Barremian-Aptian limestone (Urgonian facies).

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Plate III: *Carpathiella perforata* nov. gen., nov. spec. and *Carpathiella* sp. **Fig. 1** — *Carpathiella perforata*, holotype, in the Senonian limestone. Pebble from the Karpatian Jablonica Conglomerate. Loc. Lipovec-ces-a, Malé Karpaty Mts., thin section No. 14354, magn. 48×; **Fig. 2** — *Carpathiella perforata*, paratype, in the block of Paleocene Kambühel biohermal limestone. Loc. Stará Turá near the church, thin section No. 3783, magn. 37×; **Fig. 3** — *Carpathiella perforata* partially silicified (quartzine fills in enlarged void on the left) with calcitic spherulitic structure in the upper corner. Barremian-Aptian limestone with corals and rudist fragments (Urgonian facies), pebble from the Cenomanian limestones of the Manín Unit. Loc. Hradná-JRD-e, thin section No. 7120, magn. 26×, crossed polars; **Fig. 4** — *Carpathiella* sp. in the Albian limestone with *Orbitolina durandelgai*. Pebble from the Paleocene Proč Conglomerate, Pieniny Klippen Belt. Loc. Nižné Ladičkovce-4, thin section No. 16258, magn. 32×; **Fig. 5** — *Carpathiella* sp. in the Lower Berriasian limestone with *Protopeneroplis trochangulata*. Loc. Štramberk, thin section No. 20265, magn. 30×; **Fig. 6** — *Carpathiella* sp. in the Barremian-Aptian limestone with *Sabaudia*. Pebble from the Paleocene Proč Conglomerate. Loc. Beňatina-II-22, thin section No. 17186, magn. 48×; **Fig. 7** — *Carpathiella* sp. in the *Palorbitolina*-bearing Upper Barremian-Lower Aptian limestone. Pebble from the Paleocene Proč Conglomerate. Loc. Beňatina-II-40, thin section No. 16536, magn. 30×; **Fig. 8** — *Carpathiella* sp. in the Barremian-Aptian limestone. Pebble from the Senonian conglomerates, Klape Unit. Loc. Ďurčovia-d, thin section No. 10014, magn. 60×; **Fig. 9** — *Carpathiella* sp. in the *Palorbitolina*-bearing Upper Barremian-Lower Aptian limestone. Pebble from the Paleocene Proč Conglomerate, Pieniny Klippen Belt, Proč-II-d, thin section No. 16691, magn. 48×.

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