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LATE TRIASSIC SERPULIDS (ANNELIDA, POLYCHAETIA, SEDENTARIDA) IN THE WESTERN CARPATHIANS

(Figs.1—13)

Project №. 4:
„Triassic of the Tethys realm"

Abstract: In this paper Uppermost Triassic serpulid fauna discovered in the Western Carpathians is described. Two new species: *Spiraserpula mikesia* sp. nov., *Propomatoceros slavicus* sp. nov. and two other specifically indeterminable serpulid remnants are described from locality of Hybe (Hronic, Low Tatra Mts.), Mojtín valley (Hronic, Strážov Mts.) and Bystrô (Fatric, Velká Fatra Mts.). Also, paleobiogeographical distribution of serpulids and other epizoans is discussed.

Резюме: В статье впервые описываются серпулидные черви европейского вернего триаса, обнаруженные в Западных Карпатах. Из материала собранного в местонахождениях Гибе, Мойтинска долина (самый верхний триас гроника) и локалиты Бистро (самый верхний триас фатрика) происходят два новых вида серпулидов (*Spiraserpula mikesia* sp. nov. и *Propomatoceros slavicus* sp. nov.), а также два других пока что неопределенных типа серпулидных остатков. В работе обсуждается также вопрос палеогеографических закономерностей распределения серпулид и другой комменсалической эпифауны во время самого вернего триаса в области Западных Карпат на новой палинспастической схеме этого пространства.

1. Introduction

The present study comprises all the obtained data of Top Triassic serpulid fauna founded in several West Carpathian localities (Hybe, Mojtín valley and Bystrô), Owing to scarcity of some data of Triassic world serpulids, it has been necessary to compare these findings with geologically younger Jurassic (K. O. A. Parsch, 1956) and recently revised Cretaceous forms (H. Regenhardt 1961; S. Ware, 1975).

The oldest representatives of the Lower Triassic serpulids (*Spirorbis phlyctaena* Brönimann et Zaninetti, 1972) has been described from the Central Tethyan regions: Elika Formation of Central Alborz Mts. (northern Iran) and Siussi Formation of Costalunga (northern Italian Dolomites). This species migrated in the Lower Anisian into westernmore parts of Tethys (Val Cola in Trentino, northern Italy; Hyeres in Provence, southern France and (?) Préalpes Romandes of Switzerland and France). Additionally, *Spirorbis aberrans* Hohenstein, *Sp. valvata* Berger and *Serpula colubrina* v. Münster are known in Anisian Muschelkalk of Germany (localities Schwarzwald, Weimar and Canstatt, M. Schmidt, 1928) and *Serpula schimischowensis* Assm., *Serpula simplex* Assm. and *Salmacina incerta* Assm. have been found by P. Assmann, 1937 in locality of Szymiszów in Upper Silesian Muschelkalk of Poland. M. Schmidt, 1928 described findings of *Serpula ?pygmaea* v. Münster and *Cycloserpula socialis* (Gold-

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fuss) in the upper, Ladinian part of the German Muschelkalk (localities Canstantt and Würzburg). P. Brönimann and L. Zaninetti (1972) supposed Norian age of several Austrian occurrences of *Spirorbis aff. phlyctaena* from Northern Calcareous Alps. Finally, W. Goetel, 1917 mentioned Rhaetian findings of *Cycloserpula aff. socialis* from Fatra Formation at Mała Świnica (High Tatra Mts.) and *Serpula sp.* from Hybe beds, locality of Hybe.

However, the mentioned species have been described unsufficiently as usually: many of them are known only in thin sections, the others were not figured, the descriptions being incomplete, so that their comparison is often problematic. No modern systematic revision of Triassic worms has been published.

The preservation of serpulid tubes in our material is very variable. The specimens of the both new defined taxons have very well preserved details of shell morphology and structure, but their original shape is derived comparing several individuals only. Despite of poor preservation of worm tubes some ecological features (commensalism, oriented growth etc., cf. J. Michalík 1976, 1977) of these serpulid worms and relations to their host organisms are clearly observable.

II. Geological and paleogeographical distribution of epizoans in Uppermost West Carpathian Triassic (J. Michalík)

West Carpathian part of the Tethyan northern nearshore contained a lot of different environments in Uppermost Triassic (J. Michalík, 1978, 1979 a, b). These diversified environments offered different conditions for development of marine benthos.

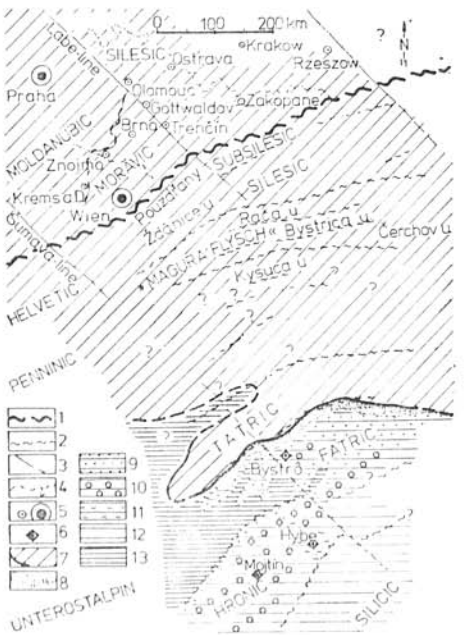

Fig. 1. Paleobiogeographic distribution of epizoans in West Carpathian area in latest Triassic time, plotted in a palinspastic scheme. Explanations: 1. border of North European platform, 2. limits of West Carpathian tectonic units, 3. sigficant zones of tectonical disturbance, 4. state frontier, 5. principal towns on the North European platform (showed for orientation), 6. localities, mentioned in the text, 7—13: paleogeographical features of Uppermost Triassic situation: 7. dry-land, 8. nearshore zone lacked of epizoans, 9. biostromal zone with cementing Atreta intusstriata, 10. biostromal flats with Atreta and worm tubes, 11. protected neritic zone with Atreta, worms, bryozoans and epizoans brachiopods, 12. carbonate platform facies lacked of data on epizoans, 13. partially restricted basinal facies. Original J. Michalík.

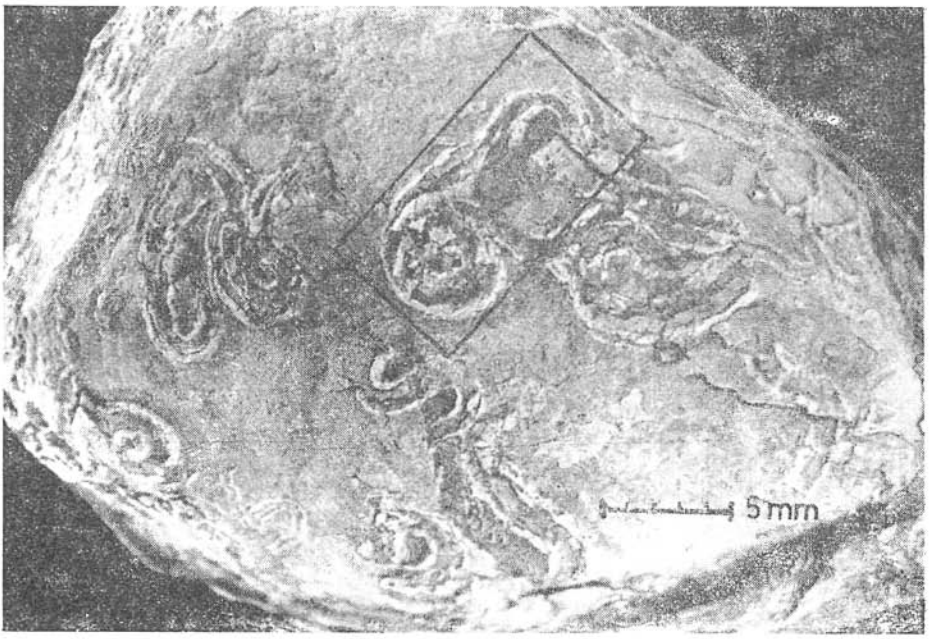

Fig. 2. *Spiraserpula mikesia* sp. n., locality Hybe, Viper Hole (Rhaetian, Uppermost Triassic). Holotype. Collection SNM Z—16 511 in Slovak National Museum, Bratislava. Substrate: shell of Rhaetina pyriformis. Scale in mm. Photo F. Martančík.

Fig. 3. *Spiraserpula mikesia* sp. n. on inner surface of Modiolus schaffhaeutli. Locality of Hybe, layer XXXII, collection SNM Z—16 512, Slovak National Museum in Bratislava. Scale in mm.

Partially restricted shallow marine basin of Fatra Formation (Fig. 1) (its sediments are now preserved in both the Vysoká- and Krížna-nappes of Fatric) has been inhabited by low-diversity benthic assemblages with dominance of opportunistic bivalve, brachiopod and coral species. Unstable environmental conditions provided little opportunity for development of epizoans. Here dominanted bivalve *Atreta intusstriata,* attached on large shell surfaces of benthic animals. Tubes of serpulid worms were extremely rare (in biostromal flats, e. g. locality of Bystrô).

Quite different conditions prevailed in the Hronic area (now Šturec- and Choč nappes), which had lain in the northernmost part of giantic shallow marine platform (ancestor of Kreios plate of A. T o l l m a n n, 1978 ?). Extensive open shallows were inhabited by rich and diverse communities including many epizoan species : worms, bryozoans, bivalves, brachiopods etc. (J. M i c h a l í k, 1977). Our first most productive locality in Hronic (Hybe) was situated in a channel-like depression; the second locality (Mojtín valley) with less diversified community was probably in shallower environment, more influenced by disturbing activity of waves.

III. Systematic descriptions (V. Ziegler)

Order *Sedentarida* L a m a r c k, 1815
Family *Serpulidae* S a v i g n y, 1818
Subfamily *Serpulinae* RIOJA, 1925
Genus *Spiraserpula* REGENHARDT, 1961
Spiraserpula mikesia spec. nov.

(Figs. 2—5)

H o l o t y p e : specimen No. SNM—Z 16 511, collection of the Slovak National Museum in Bratislava, Dept. of Natural History, figured on Fig. 2., with reconstruction on the Fig. 4.

S t r a t u m t y p i c u m : (Lower ?) Rhaetian, Uppermost Triassic

L o c u s t y p i c u s : Hybe, exposure „Ružiakov úvoz" on the right bank of Biely Váh — river near community of Hybe (northern foot of low Tatra Mts.), small artificial dug-out called Viper Hole (J. M i c h a l í k, 1975).

M a t e r i á l : Hybe, Viper Hole . . . . . 7 specimens
Hybe, Kantorská pit . . . . . 2 specimens
Hybe, layer XXXIV . . . . . 1 specimen
Hybe, layer XXXII . . . . . 1 specimen

D i a g n o s i s : Small, in cross-section rounded tube, with equal diameter of tube and lumen during growth. Simple planispiral coil forms the posterior part of the tube. Middle and anterior part of the tube is irregular, mouth is funnel-like.

D e s c r i p t i o n : Shell consists of small tube up to 12 mm long, with diameter near to 10 mm. Cross-section of tube and lumen is round. The tube has diameter 0,9 — 1,2 mm, and lumen 0,6 — 1 mm. The tube wall is near to 0.1 mm thick with tolerance up to several hundreds of mm. The lumen

has stable dimension along all the tube, it ends with rounding at the posterior part of the tube. Neither true nor false serpulid tabulae were observed.

The tube itself is attached to the substrate along all its length by slight developed cellular layers which wipe off the original ornamentation in the middle and anterior part of the tube. The sculpture consists of six transversal shallow V-like furrows in the middle and anterior part of the tube. Longitu-

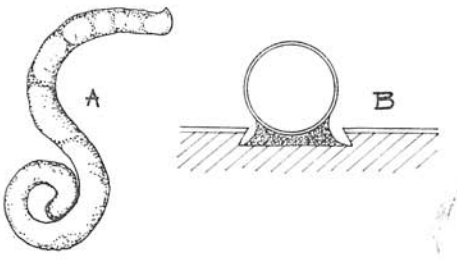

Fig. 4. A — Reconstruction of the specimen SNM Z—16 512 (Fig. 3). B — Attachment of the tube to the substrate. V. Ziegler, original.

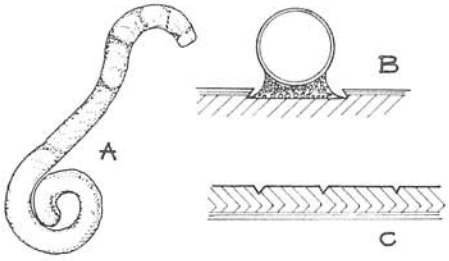

Fig. 5. A — Reconstruction of the holotype specimen of *Spiraserpula mikesia* sp. n. B—Attachment of its tube to the substrate by cellular serpulid layers. C—Detail of the tube wall with transversal V—shaped lines. V. Ziegler, original.

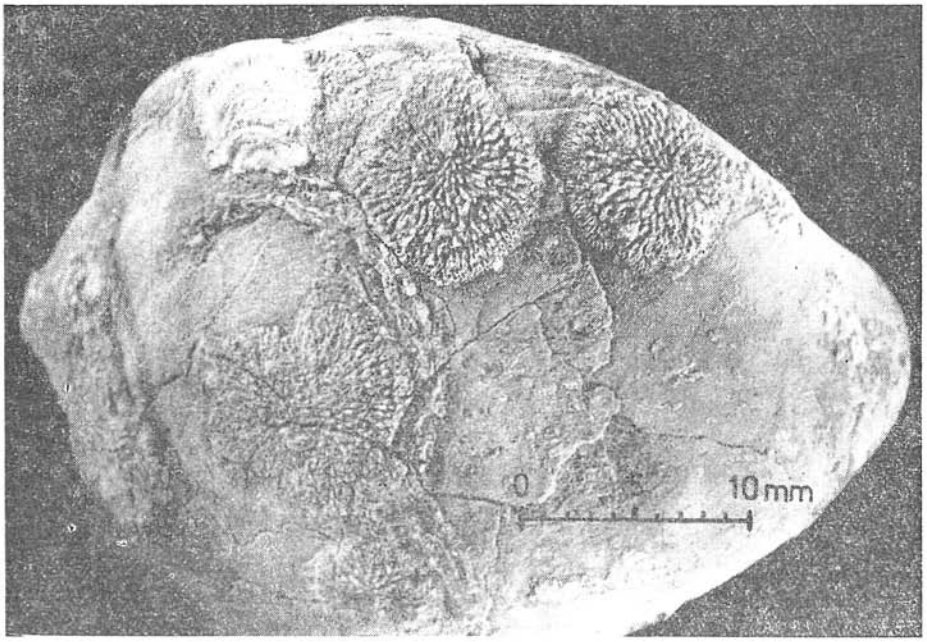

Fig. 6. *Serpula sp.* and *Berenicea hybensis* Prantl on *Rhaetina pyriformis* (Suess) shell. Locality of Hybe, Kantorská pit (Rhaetian, Uppermost Triassic). SNM Z—16 513, collection of Slovak Nat. Museum in Bratislava. Scale in mm. Photo F. Martančík.

dinal sculpture is not developed. The mouth is simple, funnel-like formed. Operculum has never been observed.

Remarks and relations: Shell morphology of anterior and middle part of the tube of this very primitive type of spiraserpulid worm seems to be more similar to *Serpula* Linnaeus, than to the typical species of the genus *Spiraserpula* Regenhardt — *S. circinalis* (Parsch). However, the entirely coiled posterior part of the tube indicate spiraserpulid affinity of this worm. Coiling is tight.

The most variable morphological feature of described species are the tube dimensions — they change in values, usual with serpulid worms (tenths of mm). Typical features of the tube (coiled posterior part, dimensions and termination of lumen and funnel-like shape of the mouth) are stable. The effects of variability in expressiveness of sculpture are overlapped by ontogenetic changes (as usually, in anterior part of the tube are the grooves deeper and narrower).

Stratigraphical range: Lower Rhaetian (together with *Misikella posthernsteini* — see J. Michalík, 1973, H. Kozur — R. Mock, 1974).

West Carpathian distribution: Locality of Hybe Low Tatra Mts.).

Genus *Serpula* Linnaeus, 1758)

Serpula sp.
(Figs. 6, 7, 12).

Material: Hybe, Viper Hole . . . . . 5 specimens
Hybe, Kantorská pit . . . . . 17 specimens
Hybe, layer XXXIV . . . . . 3 specimens
Hybe, layer XXXII . . . . . 2 specimens
Mojtín valley, cut of state road Beluša—Mojtín
horizon 19 . . . . . 1 specimen

Description: According to the preserved remnants, the tube was probably round-shaped in cross-section. The lumen was circular, with remains of false tabulae in the middle of the tube. Dimensions of the tube are very variable. The tube is never coiled (nor in the posterior part), but irregulary zig-zag deflected, the anterior part frequently overlapping the older parts of the tube. The cellular layers are developed relatively expressively, their growth sometimes partially damaged the shell of host animal. The mouth is simple, funnel-like shaped. True tabulae and operculum were never observed, maximal length and soulpture pattern are not known as yet.

Remarks and relation: The shape of the tube, lumen and cellular layer are similar to the types, formerly designed as *„Serpula" gordialis,* or *„Serpula" lumbricalis.* However, owing to the fact that the dorsal side of the tube, sculpture and shape of anterior part of the tube have never been preserved in our material, we cannot correlate our species with any of these species with certainty.

Stratigraphical range: Lower-Upper Rhaetian (with *Misikella posthernsteini* and *Triasina hantkeni* (see A. Gaździcki — J. Michalík, 1980).

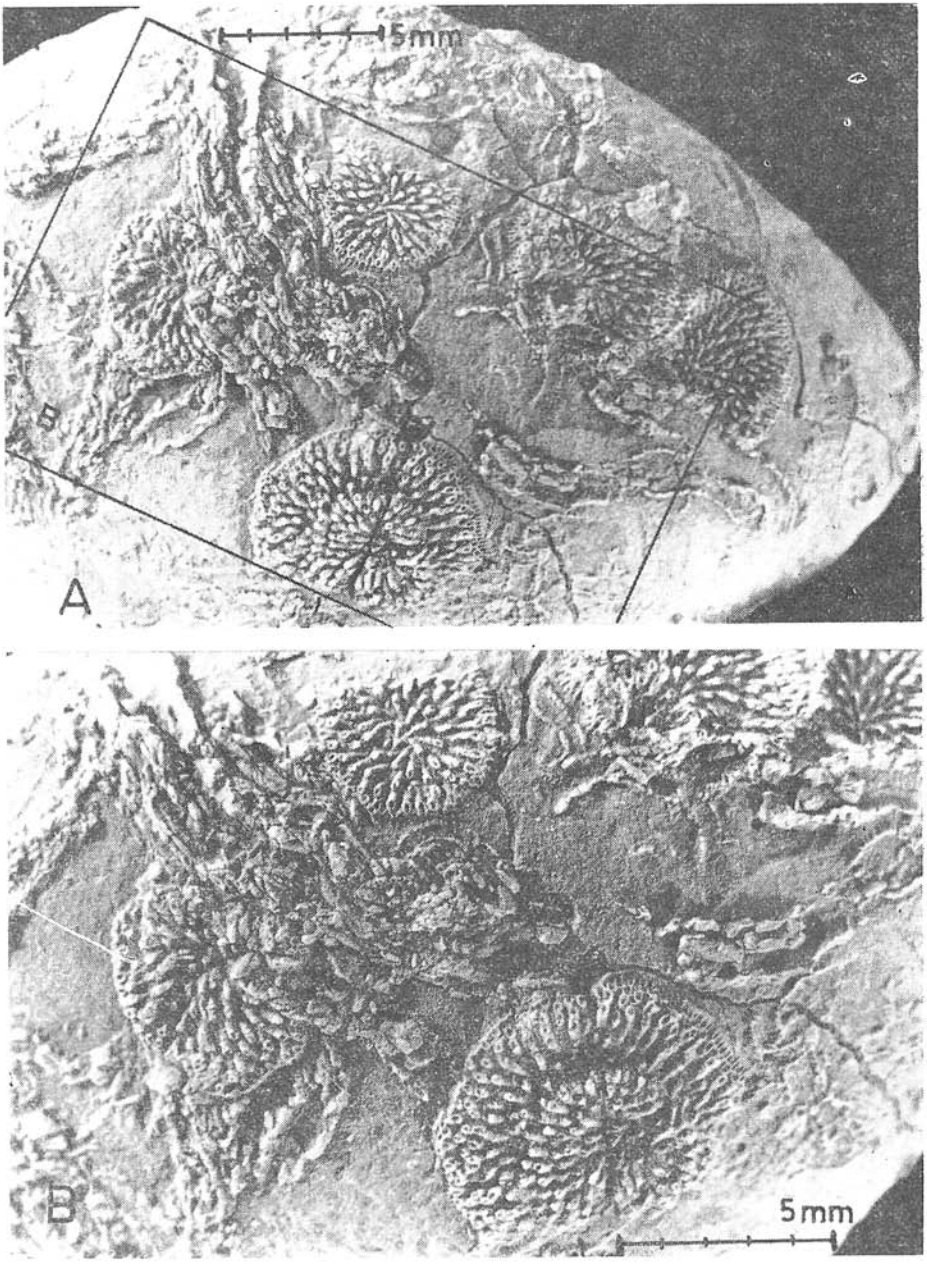

Fig. 7. A — *Serpula sp.* and target-shaped zoaria of *Berenicea hybensis* Prantl on *Rhaetina pyriformis* (Suess) shell, locality of Hybe, Viper Hole (Rhaetian, Uppermost Triassic). B — the same specimen more in detail SNM Z—16 514, collection of Slovak Nat. Museum in Bratislava. Scale in mm. Photo F. Martančík.

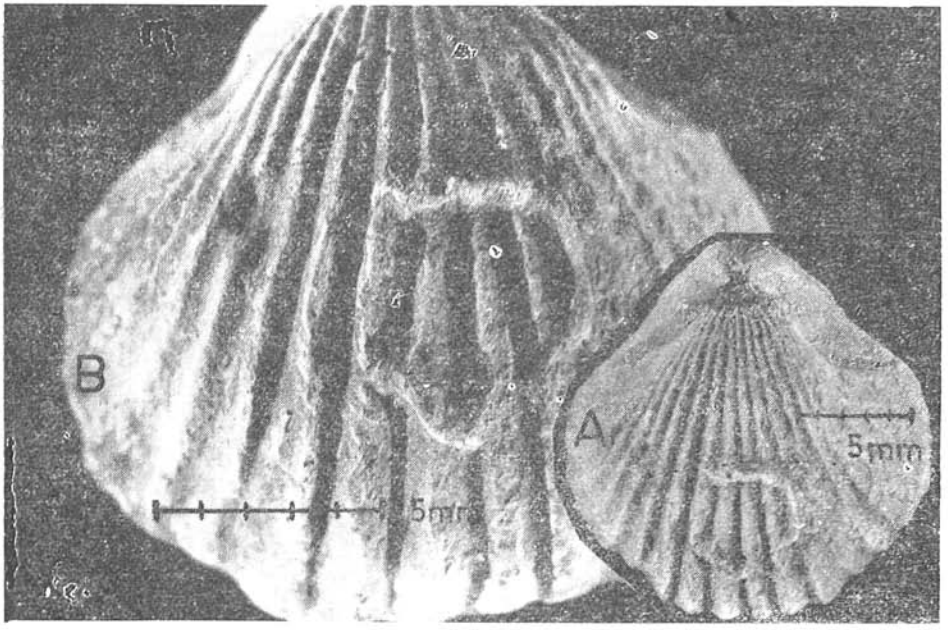

Fig. 8. *Propomatoceros slavicus* n. sp. tube attached on dorsal (brachial) valve of *Fissirhynchia fissicostata* (Suess), Hybe, Viper Hole (Rhaetian, Uppermost Triassic). SNM Z—16 515, collection of Slovak Nat. Museum in Bratislava. Scale in mm. Photo. F. Martančík.

West Carpathian distribution: Localities of Hybe (Low Tatra Mts.) and Mojtín valley (Strážov Mts.).

Genus *Propomatoceros* Ware, 1975.
Propomatoceros slavicus spec. nov.

(Figs. 8—12).

Holotype: Specimen No. 16517 in the collection SNM-Z (Slovak National Museum in Bratislava, Dept. Nat. History), figured on the Fig. 8, reconstrued on Fig. 10.

Stratum typicum: Lower (?) Rhaetian, Uppermost Triassic.

Material: Hybe, Viper Hole . . . . . 9 specimens
Hybe, Kantorská pit. . . . . 1 specimen
Hybe, layer XXXIV . . . . . 1 specimen
Mojtín valley, horiz. 19 . . . . . 1 specimen

Diagnosis: Cross section of the tube triangular. Low ridge on the shell surface is distinct in the anterior and middle part of the tube only. Rim of

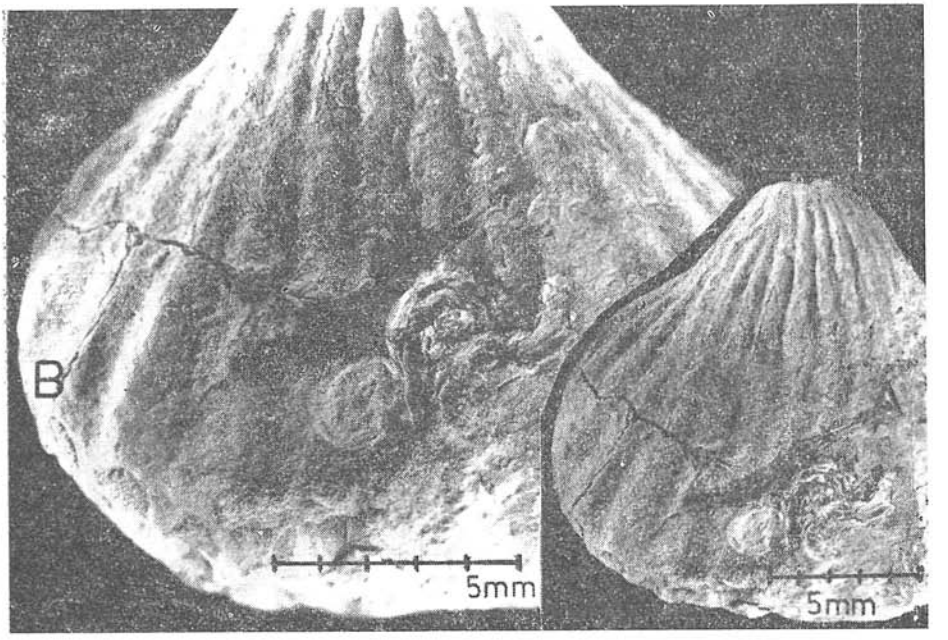

Fig. 9. *Propomatoceros slavicus* sp. n. on ventral (pedicle) valve of *Fissirhynchia fissicostata* (Suess). A single valve of *Atreta intusstriata* (Emmr) is attached close to the worm tube. Hybe, Viper Hole (Rhaetian, Uppermost Triassic). SNM Z—16. 516, coll. Slovak Nat. Museum in Bratislava. Scale in mm. Photo F. Martančik.

the mouth is zig-zag formed. One tabula in right posterior part of the tube is round, concave.

Description: Minute shell, narrowing to its posterior part: here it terminates abruptly. Length of the tube is 6—11 mm, diameter of the mouth is 0,4—0,7 mm. The lumen is round, sharp declining in its posterior part: it terminates with moderate posterior arcuation by the right tabula. The tube wall is the thickest (0,1 mm) in the anterior part of the tube. The tube is attached to the substratum for most of the length with relatively mighty de-

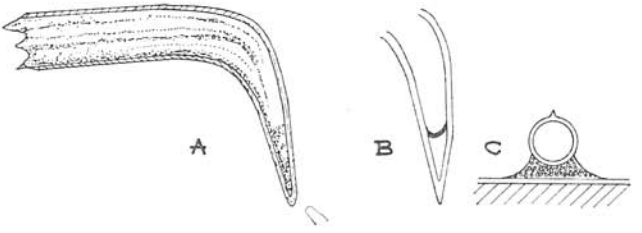

Fig. 10. A — Reconstrued holotype specimen of *Propomatoceros slavicus* sp. n. B — Situation of the right tabula in longitudinal section through the posterior part of the tube. C—attachment of the tube to substrate. V. Ziegler, original.

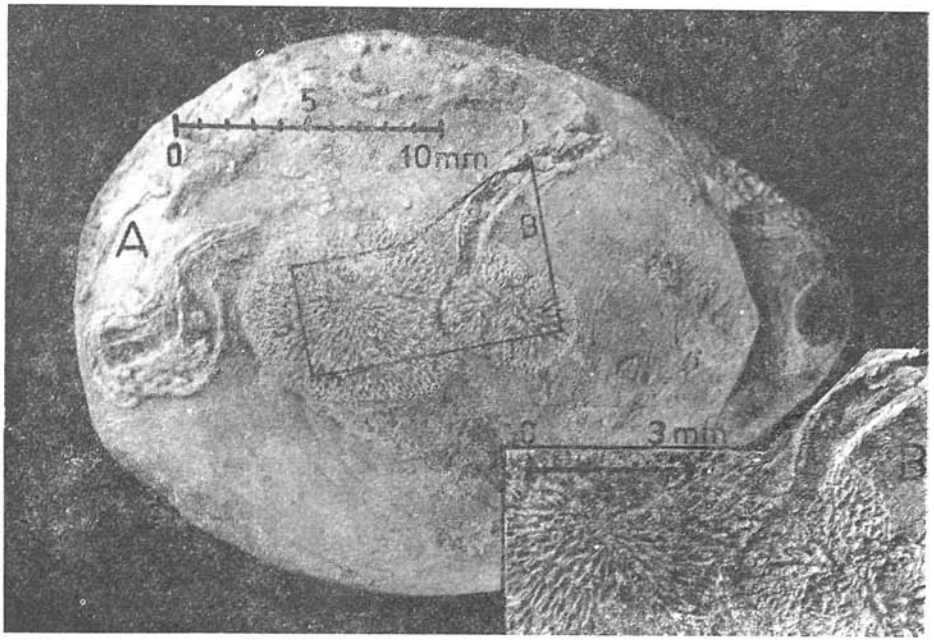

Fig. 11. *Propomatoceros slavicus* sp. n. oriented growed on the surface of dorsal (brachial) valve of *Rhaetina pyriformis* (Suess) from the locality of Hybe, Viper Hole, Rhaetian, Uppermost Triassic). The posterior part of the tube has been gradually overgroßed by *Berenicea hybensis*, Prantl zoaria. SNM Z—16 517, collection of Slovak Nat. Museum in Bratislava. Scale in mm. Photo. F. Martančík.

veloped cellular layers, as typical for *Pomatoceros* Philippi and *Propomatoceros* Ware. Sculpture of the tube consists both of longitudinal elements (dorsal ridge and shallow side furrows), visible in anterior and middle part of the tube, and transversal elements (tiny V-shaped striae) in the anterior part of the tube. The posterior part of the tube is smooth. The depth of transversal striae is more variable. The tube is usually simple bended. The mouth is smooth, its rim is zig-zag deflected: the ridges protrude anteriorly and tooth-like surround the subcircular termination of the lumen. Operculum has never been ascertained.

Remarks and relations: *P. slavicus* sp. nov. is the oldest known propomatocerid serpulid, bearing all the features of this genus. Its shape is similar to the known species *Propomatoceros triangularis* (v. Münster), however, it is smaller, the cellular layers are less developed and the septa between individual cells of these layers are substantially stronger.

Stratigraphical range: Lower—Upper Rhaetian (see A. Gaździcki and J. Michalík, 1980).

West Carpathian distribution: localities of Hybe (Low Tatra) Mts.) and Mojtín valley (Strážov Mts.).

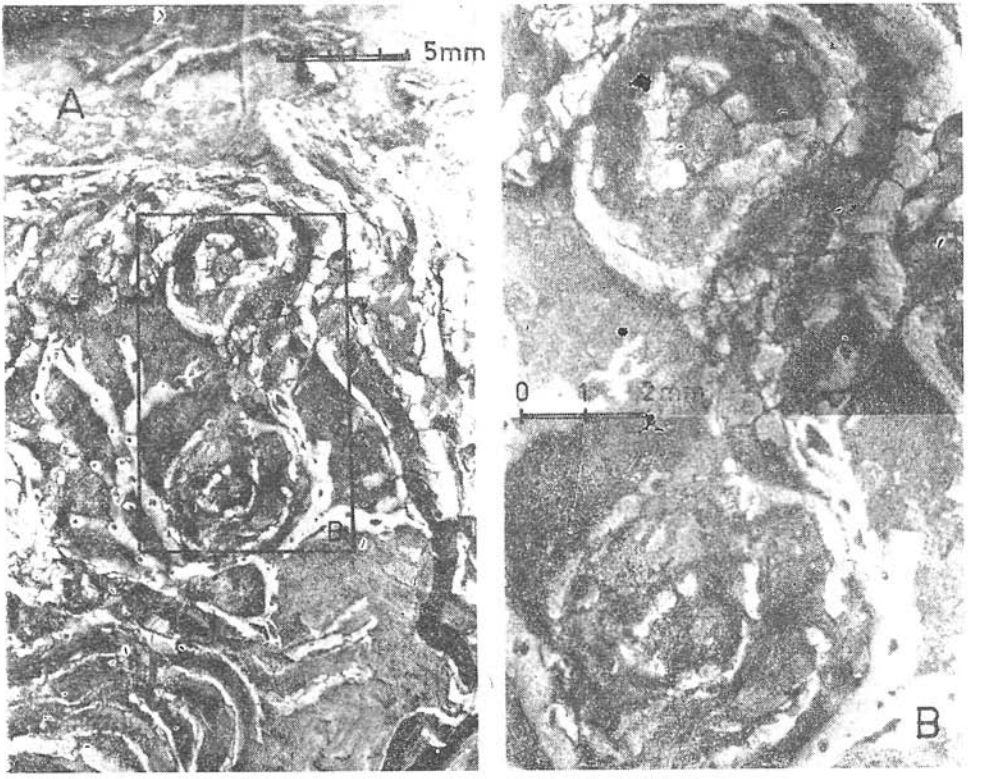

Fig. 12. ? *Spirorbis sp.*, *Serpula sp.*, *Propomatoceros slavicus* sp. n., *Stomatopora sp.* on *Rhaetina pyriformis* (Suess) shell. Locality of Hybe, Viper Hole (Rhaetian, Uppermost Triassic). SNM Z—16 514, collection of Slovak Nat. Museum in Bratislava. Scale in mm. Photo F. Martančík.

Subfamily *Spirorbinae* Chamberlin 1919

Genus *Spirorbis* Daudin 1800

? Spirorbis sp.

(Figs. 12, 13)

Material: Hybe, Viper Hole . . . . . 4 specimens

Description: Tiny spirorbid-like coiled tube with diameter of coil 2,3—4 mm. Diameter of the tube is 0,6—0,9 mm. The lumen is round, the wall thickness up to 0,1 mm. Cellular layers are developed weakly. No other features were observable.

Remarks and relations: Spirorbid coiling is typical of the genus *Spirorbis* Daudin, which occurred frequently since Silurian up to Recent.

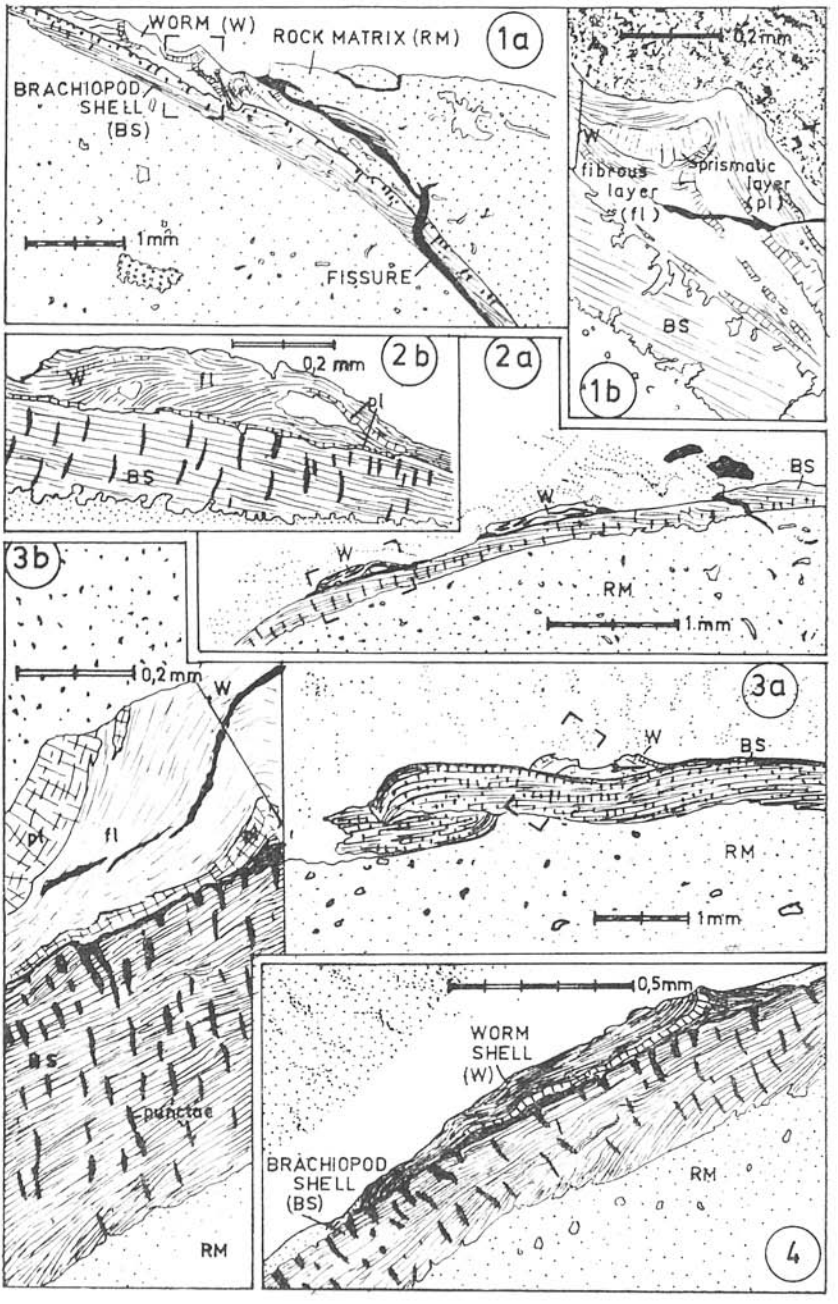

Fig. 13. Thin sections cross the serpulid tubes *(Serpula sp.)* cemented on brachiopod shells *(Rhaetina pyriformis)* from locality of Hybe, Viper Hole, Magnification according to the scale.

However, the genera *Rotularia* Defrance and *Neomicrorbis* Rovereto (Jurassic—Recent), which both have also spirorbid coiled tubes could have been present in the Uppermost Triassic, too. Thus, the definite conclusion of generic competence of our specimens will be possible when the next, better preserved material will be obtained.

Stratigraphical range: ?Lower Rhaetian (together with *Misikella posthernsteini*).

West Carpathian distribution: locality of Hybe (Low Tatra Mts.).

IV. Ecological remarks

All the described worms were marine sessile epibenthic commensalic animals: their tubes were attached on the shell surfaces of large brachiopods (like *Rhaetina pyriformis, R. hybensis, R. gregaria, Oxycolpella oxycolpos, Fissirhynchia fissicostata* etc.) and bivalves (*Modiolus schafhaeutli, Mysidioptera* sp. etc.) and rarely on other enough large smooth hard surfaces together with other animals (?spiriferid brachiopod *Thecospira haidingeri,* ?thecideid brachiopod *Bactrynium bicarinatum,* bryozoans *Berenicea hybensis, Stomatopora* sp., bivale *Atreta intusstriata* etc. — see J. Michalík, 1975, 1976, 1977). The worms probably needed normal salinity, good aeration, stable support of the nutrients and stable temperature. All these demands were fully ensured in the shallow-water pelagic realms (like Hronic platform) only.

Oriented growth is observable in many worm specimens. They settled mostly on anterolateral shell flanks of host brachiopods and growed to their commisure (see J. Michalík, 1975, Fig. 23). They probably utilized the currents, produced by brachiopod lophopore. The worms in „commensalic position" are only rarely founded on bivalve shells: this is probably caused by semiinfaunal and infaunal mode of life of the majority of Hybe bivalves.

Serpula sp. is the most abundant worm type of the Hybe and Mojtín localities, *Propomatoceros slavicus* n. sp. is the second most frequent species. They both probably laid no strict specific claims to the hosts and they could tolerate wider scale of environments than the other worms. *Spiraserpula mikesia* n. sp. is also frequent type of worm, but it is known from the locality of Hybe only at present. The last described species, *?Spirorbis sp.* probably preferred the shells of *Fissirhynchia* as the substrate.

V. *Conclusions*

Described Upper Triassic serpulid worms fill the gaps in knowledge of the development of family *Serpulidae* Burmeister not only from West Carpathians but in the European Triassic as a whole. Four serpulid forms were ascertained: two of them represent new species. Remaining two forms belong also to the typical serpulid worms, but their insufficient preservation allowed only generic (*Serpula sp.*) or approximate (*?Spirorbis sp.*) determination. Both the new described *Spiraserpula mikesia* sp. n. and *Propomatoceros slavicus* sp. n. are the oldest known representatives of their genera and may serve as important elements in reconstruction of phylogenetical development of the whole family Serpulidae.

Acknowledments

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