Acta Geologica Polonica, Vol. 57 (2007), No. 1, pp. 89-96

A new serpulid, *Placostegus velimensis* sp. nov., from the Lower Turonian of the Bohemian Cretaceous Basin

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ABSTRACT:

JÄGER, M. & KOČÍ, T. 2006. A new serpulid, *Placostegus velimensis* sp. nov., from the Lower Turonian of the Bohemian Cretaceous Basin. *Acta Geologica Polonica*, **57** (1), 89-96. Warszawa.

A new species of serpulid tube worm, *Placostegus velimensis* sp. nov., is described from the Lower Turonian of the Bohemian Cretaceous Basin. It differs from other species of the genus *Placostegus* in its relatively large size and quadrangular cross-section.

Key words: Polychaeta, Serpulidae, *Placostegus velimensis* sp. nov., Taxonomy, Cretaceous, Bohemia, Czech Republic.

INTRODUCTION

Serpulid worm tubes are a common component of the mesofauna of Upper Cretaceous nearshore sediments in the Czech Republic and elsewhere. Velim near Kolín is one of the most important localities of the fossil-rich and high diversity nearshore facies around the Cenomanian/Turonian boundary in the Bohemian Cretaceous Basin. The most detailed information about serpulid tubes from the Bohemian Cretaceous Basin was given in a monograph by V. ZIEGLER (1984). In this monograph and another paper by the same author (ZIEGLER 1969), many species of serpulid tube worms from Velim and other localities are described. However, the new species described herein was overlooked at the time. Moreover, the new species had never been previously described, apart from a drawing and a short description in GEINITZ (1875), who erroneously determined the specimen as '*Serpula*' *quadricarinata* VON MÜNSTER in GOLDFUSS, 1831.

MATERIAL AND METHODS

During three years (2001–2004) of fieldwork at Velim near Kolín, one of us (T.K.) collected about 3250 specimens of serpulid worm tubes, including 386 specimens of the new species described below. This material was gained by washing and sieving from more than 30 kg of loose rubble, which had accumulated below the sublocality VII (also named 'pocket Václav'). In 2006, 42 additional specimens of the new species were obtained by the same method by M.J., in whose collection are also 2 speci-

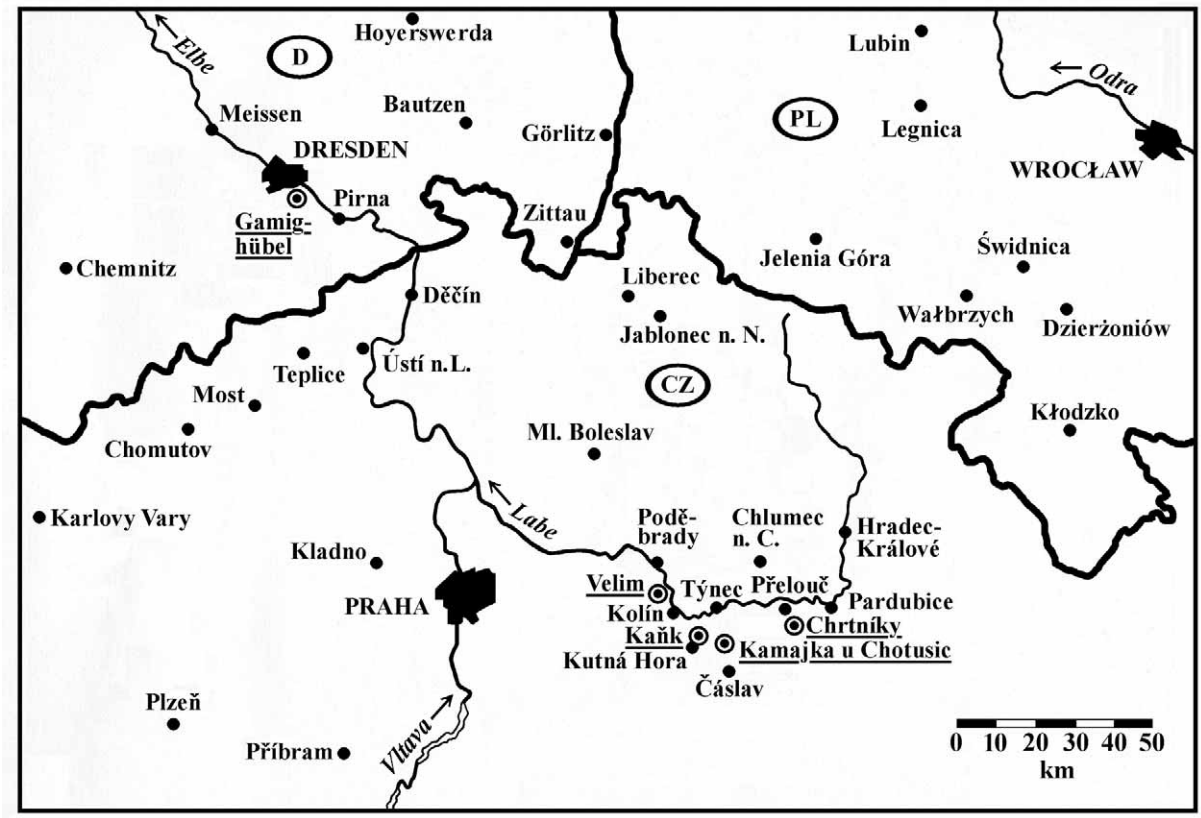

Fig. 1. Map showing the situation of the localities where *Placostegus velimensis* is found: Velim, Kamajka u Chotusic, Chrtníky, Kaňk and Gamighübel

mens from Kaňk near Kutná Hora. Moreover, Radek VODRÁŽKA collected 15 specimens of the new species at the locality Kamajka u Chotusic and 29 specimens at Chrtníky. All these localities are shown in Text-fig. 1. For a detailed description of the old Velim quarry (also known as 'Skalka u Velimi' or 'Skalka near Velim') see ŽÍTT & *al.* (1997); for a detailed description of the Chrtníky working quarry see ŽÍTT & *al.* (2006).

The holotype and paratypes are deposited in the National Museum in Prague, Department of Palaeontology, registered NM O 6398–6400 and NM O 6406–6414.

SYSTEMATIC PALAEONTOLOGY

Class Polychaeta GRUBE, 1850
Order Sabellida FAUCHALD, 1977
Superfamily Serpuloidea BIANCHI, 1979
Family Serpulidae RAFINESQUE, 1815
Genus *Placostegus* PHILIPPI, 1844
(= *Eoplacostegus* REGENHARDT, 1961)

TYPE SPECIES: *Serpula tridentata* FABRICIUS, 1780.

Placostegus velimensis sp. nov.
(Pl. 1, Figs 1-5; Pl. 2, Figs 1-4; Pl. 3, Figs 1-3)

1875. *Serpula quadricarinata* MÜN.; GEINITZ, p. 287, pl. 64, figs 21a-c.

DIAGNOSIS: A relatively large species of the genus *Placostegus*. Fixed tube part either straight, curved, or forming a loop. It bears one to three small keels or rounded edges.

Free tube part steeply erect. It is usually twisted around its longitudinal axis. Four sharp longitudinal keels or rounded longitudinal edges give the tube a sharp to rounded quadrangular cross-section. At the aperture there are three short teeth.

The tube usually bears a fine transverse ornament composed of either granules arranged in rows or fine crests. There are circa 12 rows of transverse ornament per millimetre.

HOLOTYPE: NM O 6398, Lower Turonian, Velim (see Pl. 1, Figs 1a-h).

It is a fragment of the free tube part, 11.5 mm long and 2.8 mm in diameter, slightly curved and twisted anticlockwise around its longitudinal axis for more than a quarter revolution. The diameter of the lumen is 1.3 mm at the posterior end and 1.6 mm at the aperture, which shows three short teeth. The longitudinal ornament is developed as sharp keels only on the underside and only in the posterior third of the specimen, but as rounded edges otherwise. Fine transverse ornament is present.

FIRST PARATYPE: NM O 6399, Lower Turonian, Kamajka u Chotusic (see Pl. 2, Figs 1a-e).

It consists of a 10 mm long, curved anterior fragment of the fixed tube part and the 8 mm long straight free tube part, which is damaged at its anterior end.

The tube had been fixed to a plain substrate, of which only a negative mould is preserved on the underside of the tube. Several bryozoans encrusted this substrate and also the serpulid tube. The fixed tube part is up to 4.6 mm wide at the base. At the posterior end, the lumen is 1.4 mm in diameter. There are three keels, of which the central and the inner one bear a row of low and blunt spines.

The free tube part is steeply erect, forming an angle of 70 degrees to the fixed part. It is straight and twisted clockwise around its longitudinal axis for a quarter revolution. Its maximum diameter is 3.5 mm. All four keels are sharp, and the upper two each bear a row of low and blunt spines. The anterior half of the free tube part is smooth, the smoothness presumably caused by an encrusting organism. Otherwise the fine transverse ornament is characteristically developed.

SECOND PARATYPE: NM O 6400, Lower Turonian, Velim (see Pl. 3, Figs 1a-d).

The specimen consists of the fixed tube part, forming a low, wide loop 10 mm in diameter with a wide umbilicus in the centre, and of the vertically erect and slightly curved 10 mm long free tube part. It was broken into two fragments, which have been glued together again, but some small pieces are missing.

The tube had been fixed to a plain but uneven substrate, of which only a negative mould is preserved on the underside. In the fixed tube part the median keel bears low and blunt spines. There are a few very weak peristomes. The peristomes as well as the elements of the fine transverse ornament are curved forward towards the median keel.

The free tube part is 3 to 3.5 mm in diameter. The longitudinal keels are sharp. Although the anterior end is irregularly compressed and damaged, the teeth at the aperture can be recognized.

STRATUM TYPICUM: Upper Cretaceous, Lower Turonian.

LOCUS TYPICUS: Old quarry near Velim, sublocality VII ('pocket Václav').

DERIVATIO NOMINIS: After the small town Velim near Kolín.

MATERIAL: 428 specimens from Velim, mostly tube fragments. Of these, 112 specimens were measured and examined in detail.

15 specimens from Kamajka u Chotusic, 29 specimens from Chrtníky, and 2 specimens from Kaňk near Kutná Hora were also briefly examined.

OCCURRENCE: Lower Turonian, Velim, Kamajka u Chotusic near Čáslav, Chrtníky, Kaňk near Kutná Hora. Cenomanian, Gamighübel near Leubnitz in Saxony, according to GEINITZ (1875), see below.

DESCRIPTION

Course of the fixed tube part: Portions of the fixed tube part longer than a few millimetres are preserved in only six specimens. Moreover, in many specimens the transition from the fixed to the free tube part is preserved, and these specimens also preserve a short anteriormost portion of the fixed tube part.

The diameter of the tube increases moderately. One specimen which is fixed to an oyster and a bryozoan is U-shaped, with the 'U' measuring 8 mm by 7 mm (Pl. 3, Fig. 3). In the first paratype, the preserved fragment is curved (Pl. 2, Figs 1a-b). In other specimens it is either curved or, more often, straight. In the second paratype, the tube forms a low, wide loop 10 mm in diameter, with a wide umbilicus in the centre and with a broadened base (Pl. 3, Figs 1a-d). Another specimen forms a smaller but slightly higher loop 8 mm in diameter with a narrow

umbilicus (Pl. 3, Figs 2a-e). These loops show only one and a half revolutions. The loop diameter enlarges upwards, this is in contrast to other *Placostegus* species, in which the loop becomes narrower upwards to form a cone. In the U-shaped and in the two loop-forming specimens, the coiling is sinistral (anticlockwise) in the zoological sense. (Zoologists, when describing the sense of coiling of living serpulids, especially of spiral spirorbids, consider the fact that the animal is usually lying upside down inside its tube. This fact was neglected by 19th and early 20th century palaeontologists who regarded only the empty tube and used an opposite definition of what 'sinistral' and 'dextral' means.) Some other specimens show that the anteriormost portion of the fixed tube part may be variable: either sinistrally curved, dextrally curved, or straight.

At the posterior end of the U-shaped specimen, the tube diameter is only 1.3 mm. In other specimens, the base may be broadened at the anterior end of the fixed tube part, reaching a width of up to 5.5 mm.

At the transition from the fixed to the free tube part, the left and right margins of the base protrude. Each of these margins forms a vertical wall. These two walls together act like a supporting pedestal underneath the free tube part. Between the two walls, there is a longish cave (Pl. 2, Figs 1c-d; Pl. 2, Fig. 3b; Pl. 3, Figs 2d-e), as in *Pyrgopolon* (*Septenaria*) *macropus* (J. DE C. SOWERBY, 1829), which, however, may grow to a larger size.

Course of the free tube part: At the beginning of the free tube part, the tube suddenly becomes very steeply erect or even vertical, normally at an angle of 70 to 90 degrees to the substrate (Pl. 2, Figs 1c-d; Pl. 3, Figs 1c-d). In some specimens, the fixed tube part is vertical at first and then is even slightly curved backward, resulting in an angle of more than 90 degrees (Pl. 2, Fig. 3a). Rarely the angle is between 45 and 70 degrees. In a single specimen, the angle is only circa 30 degrees at first, and later the tube is curved forward to run parallel to the substrate.

Broken off free tube parts, either complete or fragmentary, are the most common finds. Most fragments are up to 13 mm long, but some may reach up to 16.5 mm in length.

The tube diameter is between 1.6 and 4.6 mm, usually between 2 and 4 mm. It does not increase except for the bulge near its anterior end (see below). The lumen may reach up to 2.4 mm in diameter.

The free tube part is straight or slightly curved. However, in most specimens the tube is twisted around its longitudinal axis. Usually the twisting results in approximately one eighth to a quarter revolution around the longitudinal axis. In a few specimens it is a half revolution (Pl. 2, Fig. 2a), and in one specimen it is two thirds of a revolution occurring within 9 mm of tube length. Specimens in which the worm had twisted sinistrally are slightly more frequent than specimens in which the worm had twisted dextrally, the ratio is roughly 60 per cent to 40 per cent. Only a few specimens are not twisted (Pl. 1, Fig. 2a).

Longitudinal ornament of the fixed tube part: One thin and low but usually sharp and distinct, line-like median keel is usually present (Pl. 2, Figs 1a-b; Pl. 3, Figs 1a-d; Pl. 3, Figs 2a-c; Pl. 3, Fig. 3). Rarely there is a furrow instead. In some specimens, two additional keels of similar shape can be detected in upper/lateral position, especially in the anteriormost portion of the fixed tube part. However, these additional keels may be indistinct or completely absent, or there are only very much rounded edges instead.

Usually the median keel, in some specimens also one or two of the additional keels, bear inconspicuous low and blunt spines, whose base is elongated along the keel. In longitudinal direction, there are approximately two spines per millimetre.

Longitudinal ornament of the free tube part: At the transition from the fixed to the free tube part, the median main keel disappears, and there is a median longitudinal furrow instead. The two upper/lateral keels now become much more distinct. They either become sharp keels or rounded but strong edges. Moreover, the left and right borders of the base turn into two additional keels. In total, the free tube part has four keels or edges. Usually the two keels on the underside are smaller but sharper than the two keels or edges on the upper side. However, in a few specimens all four keels may have a similar aspect. Some specimens possess very strong keels (Pl. 2, Fig. 2a).

The keels in the free tube part may bear low and blunt spines similar to those in the fixed tube part. However, the longitudinal distance between the spines is now circa 1 mm.

On the underside of the free tube part there is a median longitudinal furrow similar to the one on the upper side. On the lower half of each of the lateral sides, there are one, or more often, two non-median furrows; in some tubes there are regions where there is one furrow and other regions where there are two. Two furrows are visible in Pl. 1, Figs 1b-c, for example. In total, the number of longitudinal furrows is four, five, or mostly six. They are narrow, but often sharp and distinct.

Transverse ornament of the fixed and free tube parts: In most specimens, the tube is densely covered by a characteristic fine transverse ornament (Pl. 1, Fig. 1f; Pl. 2, Fig. 1b; Pl. 3, Fig. 1b; Pl. 3, Fig. 2b). However, in about 20 to 25 per cent of the specimens there are leafy incremental lines instead (Pl. 2, Figs 4a-b, and lower half of Pl. 1, Fig. 5). This variation may only be a result of weathering.

In some specimens the fine transverse ornament consists of tiny granules which are arranged to form transverse rows of granules. In other specimens there are tiny transverse crests instead. However, the resulting pattern is very similar. There are approximately 12 rows of granules or crests, respectively, per millimetre. Although this fine transverse ornament altogether seems to be very regular, the individual rows may divide, combine, set in, or end. In the fixed tube part, the fine transverse ornament may be slightly curved forward towards the median keel and, less distinctly, towards the base.

In the free tube part the fine transverse ornament is slightly curved forward towards the median furrow on the upper side and towards the two keels on the left and right borders of the underside, and weakly curved forward towards the median furrow of the underside. This curvature (except the last mentioned one) results in three short but distinct teeth protruding at the aperture (moderately developed in the holotype, see Pl. 1, Figs 1a-g, and strongly developed in Pl. 1, Figs 2a-b). As the tube wall becomes thin at the aperture, the aperture and the teeth are broken off, damaged, or compressed in many specimens. At the rounded edges in upper/lateral position, the rim of the aperture is slightly curved backward (Pl. 1, Fig. 3, upper half).

Most specimens show a more or less prominent bulge near the anterior end of the free tube part. In front of the bulge, the diameter of the tube and the thickness of the tube wall both diminish rapidly towards the aperture. A very strong bulge is seen in Pl. 1, Fig. 4. Four specimens possess two bulges each, with the distance from the first to the second maximum of swelling being 3 to 4 mm. One specimen possesses three bulges, here the two distances measure 2.5 mm each.

Except for these bulges, peristomes are rare. Weak peristomes are present in two specimens in the loop-shaped fixed tube parts. The swelling is very short and very low, but nevertheless detectable. In one of these two specimens, the peristome is slightly swollen at the spots where it crosses the upper/lateral longitudinal edges (Pl. 3, Figs 2a-c). Just like the fine transverse ornament, the weak peristomes are also slightly curved forward towards the median keel, thus resembling the 'alae' of the genera *Cementula* REGENHARDT, 1961 and *Spiraserpula* REGENHARDT, 1961.

Cross-section of the fixed tube part: The posteriormost preserved portion may be subtriangular, but with convex sides, and with a pronounced median keel. The middle and anterior portions of the fixed tube-part are more or less U-shaped to broad bell-shaped, or, if the upper/lateral keels are developed, they may be trapezoid (Pl. 2, Figs 1c and 1e) and may resemble the genus *Mucroserpula* REGENHARDT, 1961.

In the first paratype two holes are visible at the left and right borders of the base, each of them presumably representing a longitudinal canal (Pl. 2, Figs 1c and 1e).

Cross-section of the free tube part: At the transition between the fixed and free tube parts, and in the free tube part, the cross-section becomes either nearly square, or quadrangular with the height slightly greater than the width. According to the sharpness of the longitudinal ornaments, the square or quadrangle has either sharp or rounded corners. In many specimens the two upper corners are more rounded and the two lower corners are sharper (Pl. 1, Fig. 1h; Pl. 3, Fig. 2e). Moreover, if the rounded longitudinal edges on the upper side are strong, the quadrangle may be wider in its upper half than in its lower half.

At the aperture, in front of the bulge, the cross-section may become rounded triangular, corresponding to the three teeth (Pl. 1, Fig. 1g; Pl. 1, Fig. 2b; Pl. 2, Fig. 2b).

Tube structure of the fixed and free tube parts: In the posterior and middle portions of the fixed tube part, the tube wall is relatively to moderately thin. At the transition from the fixed to the free tube part, however, the tube wall rapidly becomes very thick. Here the circular lumen amounts to only circa 40 per cent of the diameter, and the tube wall consists of a very thick bright outer layer and a thin grey to violet inner layer (Pl. 1, Fig. 1h; Pl. 3, Fig. 2e). In the free part the tube wall stays rather thick, although it is not quite as thick as at the transition. In front of the bulge, at the aperture, the tube wall becomes thin.

The tube wall is thick at the keels or edges, but less so at the furrows. During compaction of the sediment the free tube part therefore tends to break in a longitudinal direction along the furrows into four fragments which are dislocated relative to each other for some tenths of millimetres (Pl. 3, Figs 1c-d). The fact that most of the free tube parts are twisted around the longitudinal axis further complicates the pattern resulting after breakage and compaction.

The surface of the tube is chalky white to light-brownish, but not dark brown.

The tube structure, as seen under a light microscope, gives no hint whether or not the tube had originally been slightly translucent as in some living species of *Placostegus*.

COMPARISON

The specimen figured as '*Eoplacostegus dentatus* (BRÜNNICH NIELSEN, 1931)' by V. ZIEGLER (1984, pl. 5, fig. 7), although similar in appearance to *Placostegus velimensis*, lacks transverse ornament and has a triangular cross-section.

Placostegus zbyslavus (V. ZIEGLER, 1984) is similar to *Placostegus velimensis*, but smaller, has a rounded triangular cross-section, and its arrangement of rounded keels and furrows is somewhat different.

Discussion of an early figure in Geinitz (1875): A fragment of the free tube part of *Placostegus velimensis* from the Cenomanian of the Gamighübel near Leubnitz in Saxony possessing four distinct keels was briefly described and figured by GEINITZ (1875, p. 287, pl. 64, figs 21a-c) as '*Serpula*' *quadricarinata* VON MÜNSTER. GEINITZ erroneously considered this specimen to be conspecific with the fixed spiral of '*Serpula*' *quadricarinata* VON MÜNSTER in GOLDFUSS (1831, p. 237, pl. 70, figs 8a-c) from the Cenomanian glauconitic sandstone near Regensburg in Bavaria. REGENHARDT (1961, p. 94) already disagreed with this earlier assignment by GEINITZ.

Discussion of the position of *Placostegus velimensis* within the genus *Placostegus*: Formerly, the fossil species of the genus *Placostegus* had been grouped under the genus name *Eoplacostegus* REGENHARDT, 1961, which, however, is considered to be a subjective synonym of *Placostegus*.

The tubes of the living *Placostegus* species and also the tubes of many Upper Cretaceous and Danian species of the genera *Placostegus* PHILIPPI, 1844, and *Cycloplacostegus* JÄGER, 2005, together form a large and somewhat heterogeneous group. Nevertheless, many species have several morphological features in common. Tube small to medium-sized. Fixed tube part commonly curved with a tendency to form a loop or a spiral and in some species (genus *Cycloplacostegus*) even a more or less regular slender conical shell. The free tube part usually becomes steeply erect. Its diameter stays more or less constant. Many species (except the genus *Cycloplacostegus*) possess three teeth at the aperture. The cross-section is usually triangular or circular. However, *Placostegus velimensis* is quadrangular. A triangular or quadrangular cross-section results from the presence of sharp longitudinal keels and/or rounded longitudinal edges, and narrow but sharp longitudinal furrows. The furrows, but not the keels and edges, are situated in a similar position in many species of *Placostegus* and *Cycloplacostegus*. Many fossil species possess a fine transverse ornament. Except for bulges in some species, peristomes are rare. Although all these features together point to a common ancestor, the possibility of polyphyletic origin cannot be excluded. This may be true especially for the genus *Cycloplacostegus*.

Within this large and somewhat heterogeneous group a smaller group of species belonging to *Placostegus sensu stricto* can be separated. This smaller group includes the living and some of the fossil species. Their tubes are small, triangular and translucent. In all of these three features the tube of *Placostegus velimensis* is different, because it is relatively large, quadrangular and not translucent. Therefore *Placostegus velimensis* is not a 'typical' representative of *Placostegus*, but certainly a mem-

ber of the heterogeneous larger group described above.

The species sharing the most similarities are probably *Cycloplacostegus pusillus* (J. DE C. SOWERBY, 1844) and *Cycloplacostegus schumacheri* JÄGER, 2005. Their combined stratigraphy ranges from the Lower Santonian to the Lower Maastrichtian. However, there are also distinct differences between *Placostegus velimensis* and the free tube parts of the two *Cycloplacostegus* species, which lack teeth at the aperture as well as distinct positive longitudinal elements. Moreover, they have only three longitudinal furrows, and their cross-section is more or less circular instead of quadrangular. Therefore *velimensis* is not considered to be a species of *Cycloplacostegus.*

ECOLOGY

Substrate: In one specimen the substrate is a small oyster shell, in a second specimen it is an oyster shell and a flat bryozoan colony encrusting that oyster, and in a third specimen it is a flat bryozoan colony. In all other specimens, the substrate is not preserved, but the negative mould on the underside of the tube shows that in most cases the substrate was medium-sized to large and more or less plain but uneven.

In the chalk and marly limestone facies in the Campanian and Maastrichtian of northern Germany, small cylindrical substrates, presumably marine plants, were commonly encrusted by other serpulid species. However, such a kind of substrate was either not present at Velim, or it was avoided by *Placostegus velimensis*.

Encrusters and borers: In some specimens, encrusting epibionts such as bryozoans, small oysters, sponges, foraminifers, the base of an octocoral (Pl. 1, Fig. 5), or the spirorbid *Neomicrorbis* settled upon the tube of *Placostegus velimensis*. The largest encruster is a 10 mm long fragment of an originally much larger oyster. Most of these epibionts are fixed to the free tube part, probably because it projected a few millimetres above the substrate. In most specimens it cannot be decided if they settled upon the serpulid tube when the serpulid was still alive or when the empty tube was part of the sediment. A few tubes are bored by drilling predators, one specimen shows two drilled holes.

Symbionts: None of the tubes of *Placostegus velimensis* seen so far is infected by the symbiont *Protulophila gestroi* ROVERETO, 1901 (see SCRUTTON 1975).

CONCLUSIONS

Placostegus velimensis is a new species from the Lower Turonian of the Bohemian Cretaceous Basin. Although it is relatively common at some localities, it has hitherto not been recognized as a separate species. It differs from other species of the genus *Placostegus* in its relatively large size and in its quadrangular cross-section.

Acknowledgements

We thank Václav ZIEGLER, Faculty of Education of the Charles University at Prague, for his kind help. We are also grateful to Radek VODRÁŽKA, Czech Geological Survey and Faculty of Nature of the Charles University, for material from Kamajka u Chotusic and Chrtníky and for giving us help and much valuable information. We are indebted to the staff of the National Museum, especially Jan SKLENÁŘ and Helena PRAŽANOVÁ, for giving us access to the collections and for other help. We thank the reviewers, Urszula RADWAŃSKA, University of Warsaw, and Helmut ZIBROWIUS, Centre d'Oceanologie de Marseille, Station Marine d'Endoume, for their remarks and comments which considerably improved the manuscript. We thank Chris WOOD, Minehead, for improving our English considerably.

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Manuscript submitted: 18th July 2006
Revision version accepted: 14th November 2006

PLATES 1-3

PLATE 1

Placostegus velimensis sp. nov., Lower Turonian, Velim

1 – NM O 6398, **holotype**, fragment of free tube part; **a** – upper side of anterior part; **b** – lateral view of anterior part, oblique view opposite lateral / upper side of posterior part; **c** – oblique view lateral / underside of anterior part, upper side of posterior part; **d** – underside of anterior part, oblique view lateral / upper side of posterior part; **e** – oblique view lateral / underside of anterior part, oblique view opposite lateral / underside of posterior part; **f** – view as in Fig. 1e, enlarged (combination of two photographs); **g** – tube mouth; **h** – cross-section of posterior part.

2 – NM O 6406, fragment of free tube part, showing three sharp spines at the tube mouth; **a** – upper side, partly overgrown by bryozoans; **b** – tube mouth.

3 – NM O 6407, fragment of free tube part. Tube mouth, showing rim somewhat curved backward at the rounded edges, looking like ears in the photograph.

4 – NM O 6408, club shaped fragment of free tube part. Upper side, showing swelling of the tube.

5 – NM O 6409, fragment of free tube part. Anterior part overgrown by the base of an octocoral, argumenting for a vertical position of free tube part.

Each scale bar represents 1 mm

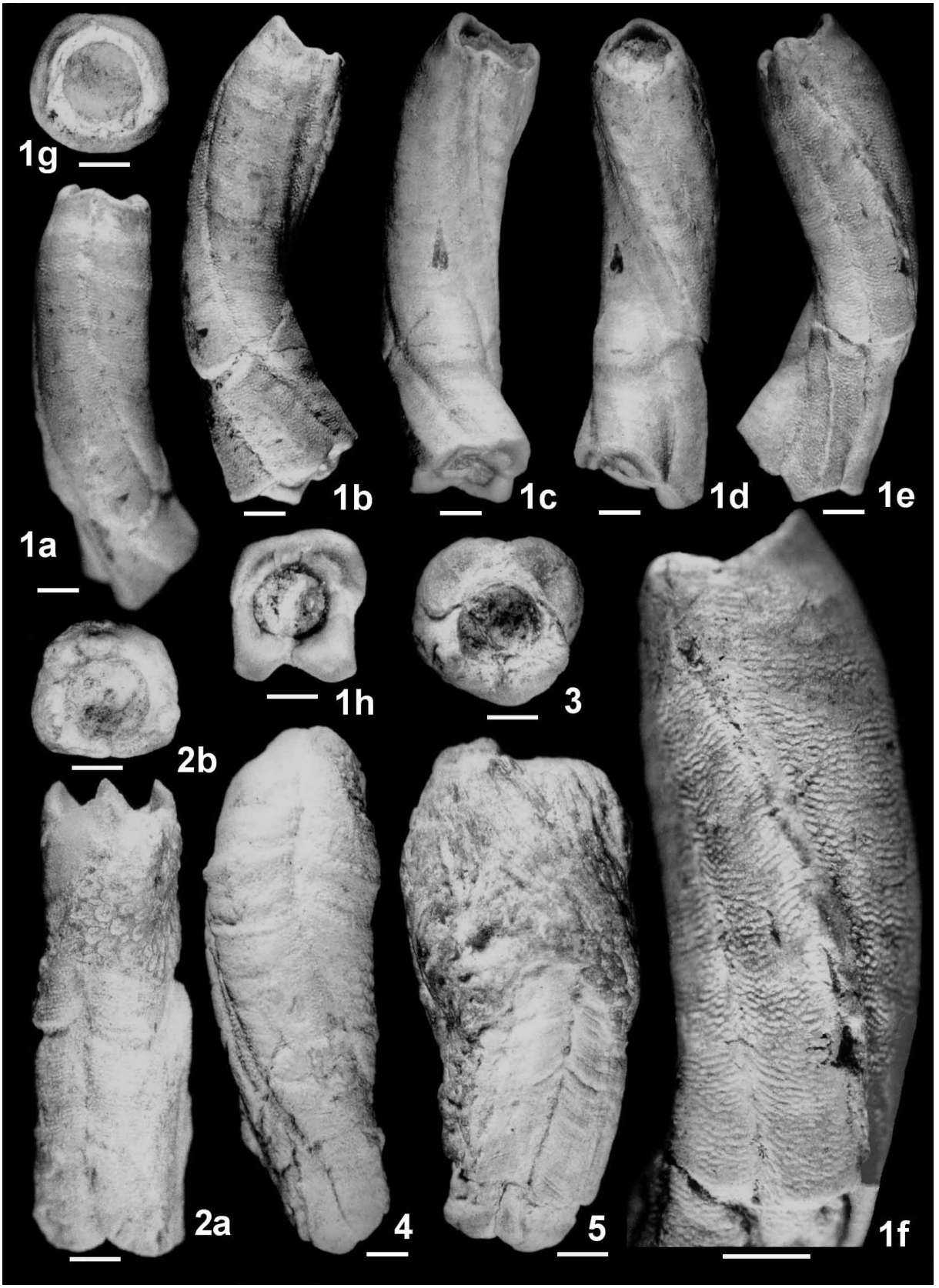

1g
1a
1b
1c
1d
1e
1h
3
2b
2a
4
5
1f

PLATE 2

Placostegus velimensis sp. nov., Lower Turonian, Kamajka u Chotusic (Fig. 1) and Velim (Figs 2, 3, and 4)

1 – NM O 6399, **first paratype**, anterior part of fixed tube part and free tube part; **a** – anterior part of fixed tube part, upper side; **b** – anterior part of fixed tube part, upper side as in Fig. 1a, enlarged; **c** – lateral view, partly overgrown; **d** – opposite lateral view; **e** – cross-section of fixed tube part.

2 – NM O 6410, fragment of free tube part, strongly twisted and strongly ornamented; **a** – underside; **b** – tube mouth.

3 – NM O 6411, short posteriormost fragment of fixed tube part and long, vertical, even slightly curved backward free tube part; **a** – upper side of anterior tube part, lateral view of posterior tube part; **b** – lateral view of anterior tube part, oblique view lateral / underside of posterior tube part, underside showing 'cave' at the beginning of free tube part.

4 – NM O 6412, fragment of free tube part. Leafy incremental lines instead of fine transverse ornament; **a** – upper side; **b** – underside.

Each scale bar represents 1 mm

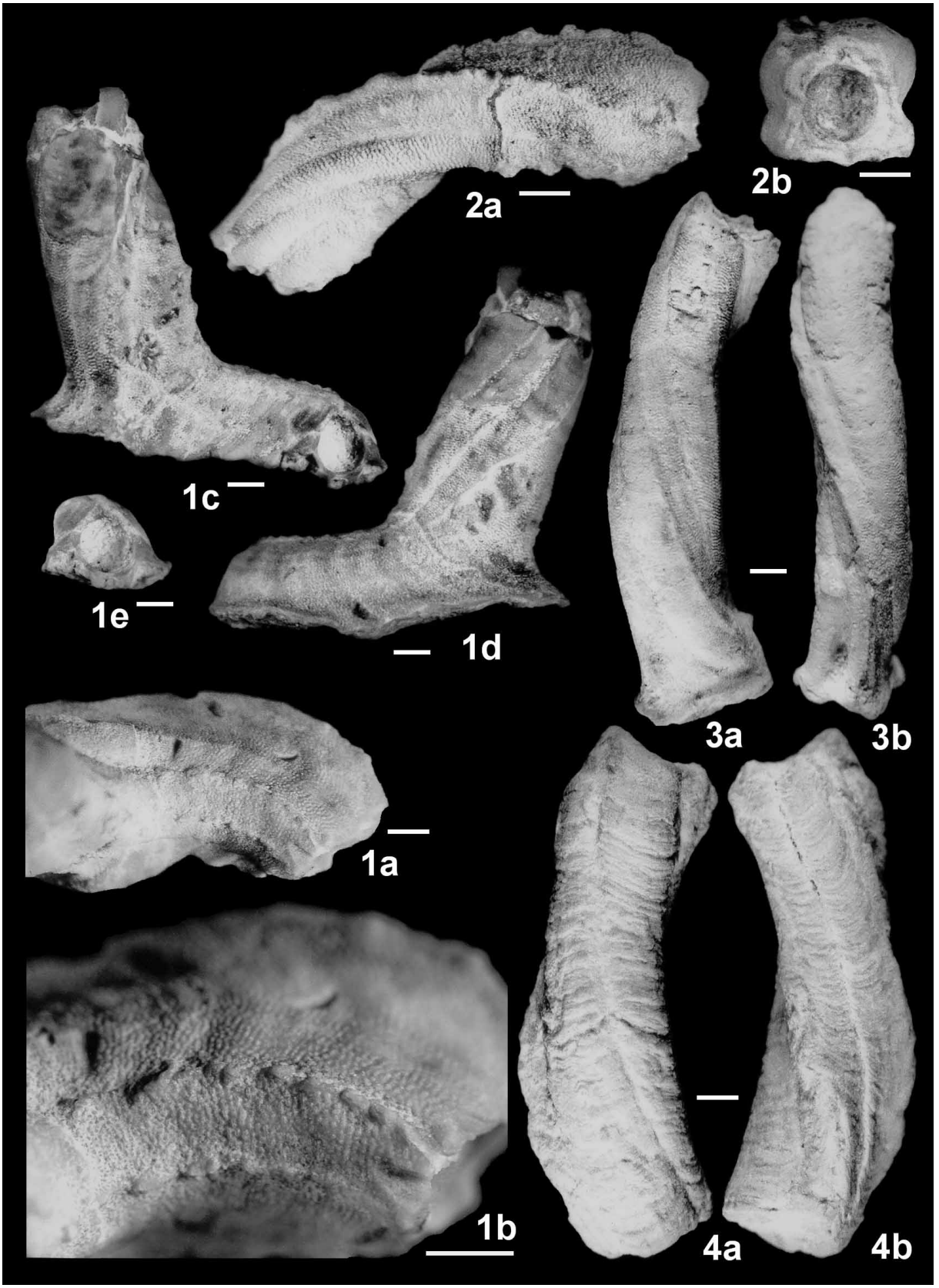

2a
2b
1c
1e
1d
3a
3b
1a
1b
4a
4b

PLATE 3

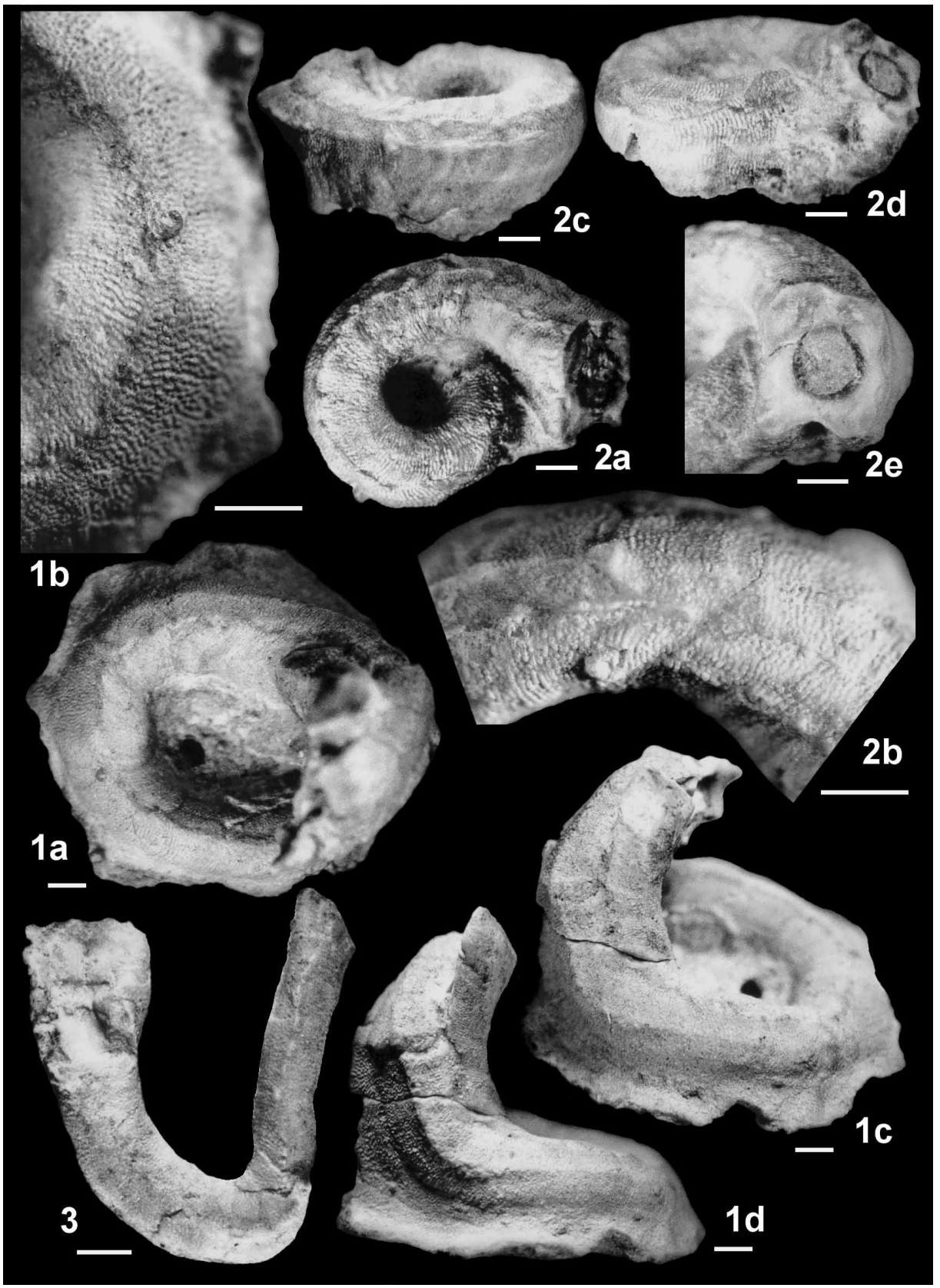
Placostegus velimensis sp. nov., Lower Turonian, Velim

1 – NM O 6400, **second paratype**, coiled fixed tube part and deformed free tube part; **a** – upper side of fixed tube part; **b** – upper side of fixed tube part as in Fig. 1a, enlarged, to show details of ornament; **c** – oblique view lateral / upper side; **d** – lateral view.

2 – NM O 6413, coiled fixed tube part; **a** – upper side; **b** – upper side, part of Fig. 2a, enlarged, showing alae-like peristome; **c** – oblique view lateral / upper side; **d** – oblique view opposite lateral / upper side; **e** – cross-section at transition from fixed to broken off free tube part.

3 – NM O 6414, U-shaped anterior part of fixed tube part, upper side.

Each scale bar represents 1 mm


2c
2d
2a
2e
1b
2b
1a
1c
3
1d