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SABELLIDAE AND SERPULIDAE (POLYCHAETA, CANALIPALPATA) FROM THE LOCALITY KAŇK – NA VRŠÍCH IN KUTNÁ HORA (UPPER CENOMANIAN – LOWER TURONIAN, BOHEMIAN CRETACEOUS BASIN – THE CZECH REPUBLIC)

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Abstract. The relatively rich assemblage of tube dwelling polychaetes: sabellid (Sabellidae) and serpulid (Serpulidae) worms (Polychaeta, Canalipalpata) from the nearshore locality Kaňk – Na Vrších (Upper Cenomanian – Lower Turonian, Kolín area, Bohemian Cretaceous Basin) is described in detail for the first time. Eight taxa are described belonging to six genera: Glomerula Brünnich Nielsen, 1931; Filograna Oken, 1815; Neovermilia Day, 1961; Dorsoserpula Parsch, 1956; Placostegus Philippi, 1844; and Pyrgopolon de Montfort, 1808. Their taxonomy and palaeoecology are discussed.

■ Nearshore facies, Upper Cenomanian, Lower Turonian, Bohemian Cretaceous Basin, Serpulidae, Filograna, Neovermilia, Dorsoserpula, Placostegus, Pyrgopolon

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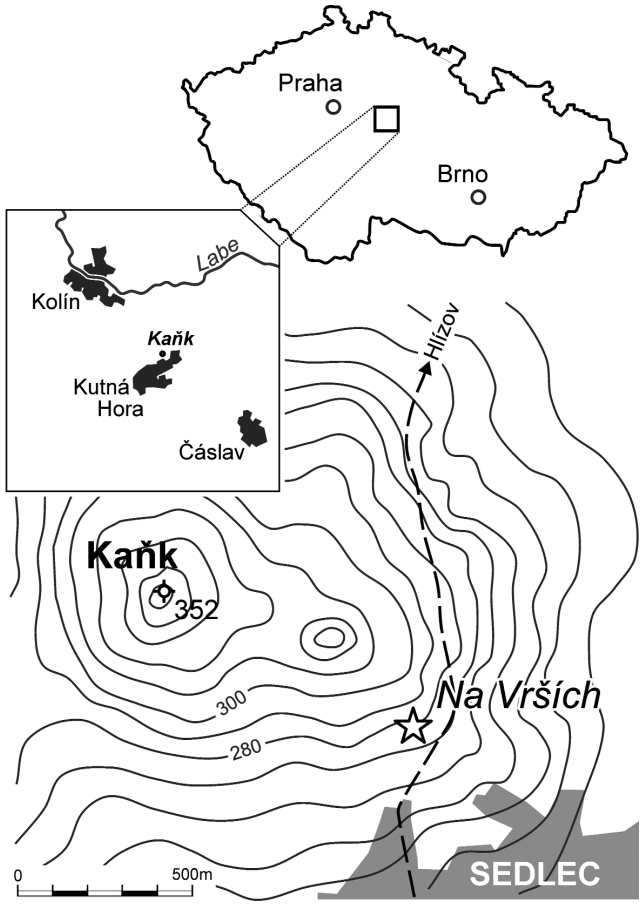
Introduction

Serpulid worm tubes are a common component of the mesofaunal remains of Upper Cretaceous nearshore sediments in the Czech Republic and elsewhere. The locality Kaňk – Na Vrších is one of the most important classic localities for the high diversity fossil-rich nearshore facies around the Cenomanian / Turonian boundary in the Bohemian Cretaceous Basin. The most detailed information on serpulid tubes from the BCB was presented in a monograph by V. Ziegler (1984). In this monograph and other papers by the same author (Ziegler 1966a, 1966b, 1967, 1969, 1973, 1974, 1978, 2006) many species of serpulid tube worms from Kaňk and other nearshore localities (Velim, Turkaňk, Kamajka, Předboj near Prague, Kněžívka) are described. Recent papers were published by Kočí (2007a, 2007b, 2008, 2009a, 2009b, 2010).

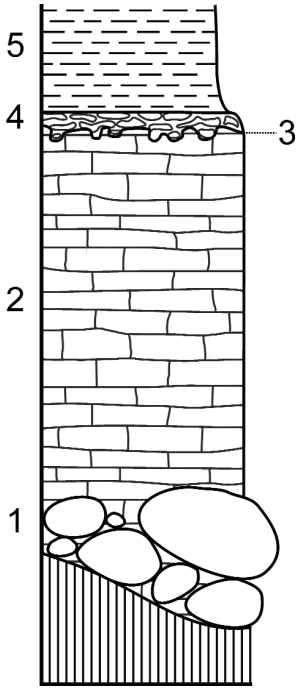
Geological and geographical setting

The State nature reserve known as "Na Vrších" is an abandonned quarry composed of crystalline (gneiss) rocks. The geographical detail is shown in Text-fig. 1. Depressions in the gneiss surface are filled with Upper Cretaceous sediments of neashore facies. This locality has two parts. The base of the Upper Cretaceous sediments consists of a coarse grained gneiss conglomerate with a bioclastic limestone matrix (1m thick), the bioclastic limestone passing gradually into the overlying thin-bedded white organodetritic limestones. The white limestones are 1.8 m thick, and they are separated from the overlying calcareous claystones (1 m



Text-fig. 1. Geographical position of Kutná Hora – Kaňk and detailed location of the site "Na Vrších".

thick) by an erosional surface (Žítt, 1992). The matrix of the conglomerate and the lower part of the organodetritic limestones were dated as Late Cenomanian (Korycany Formation) – base of the Early Turonian (Bílá Hora Formation) by the presence of the foraminifer *Pseudotextulariella cretosa* and the nanoplankton species *Predicosphaera cretacea* (Hradecká and Švábenická, 2007). The overlying calcareous claystones belong to the Early Turonian (Bílá Hora Formation). For details of lithology see Žítt (1992), and for more details of the stratigraphical section see Text-fig. 2.



Text-fig. 2. Lithology of basal Upper Cretaceous sediments at Kaňk – Na Vrších (a). 1 – conglomerates; 2 – limestones; 3 – erosional surface with borings and mineralization; 4 – limestone layer with nodule-like bodies; 5 – calcareous claystones. (after Žítt, 1992; slightly modified).

Material and methods

During eight years (2002–2010) of fieldwork at the locality Kaňk – Na Vrších about 100 specimens of serpulid worm tubes were collected, of which 13 specimens are complete. This material was obtained by washing and sieving (mesh diameter 1 mm) more than 50 kg of loose rubble which had accumulated below and between the two parts of this locality. Some specimens (e.g. *Pyrgopolon ziegleri* and *Pyrgopolon* (*Septenaria*) cf. *tricostata*) were collected at the top of both parts of this locality which belong to the Lower Turonian. Original material described by Weinzettl (1910) and Ziegler (1984) was studied in the National Museum collection in Prague.

Systematic palaeontology

Classification of sabellid and serpulid worms follows that of Goldfuss (1826-1833), Reuss (1845-1846), Geinitz (1871–1875, 1872–1875), Regenhardt (1961), Ware (1975), Lommerzheim (1979), Jäger (1983, 1993, 2005), Jäger, M. and Breton, G. (2002), Ziegler (1966a, 1967, 1969, 1973, 1974, 1984, 2006), Radwańska (1996) and ten Hove, H. A. ten and Kupriyanova, E. K. (2009). In the monograph by V. Ziegler (1984) 13 species were mentioned from the locality Kaňk – Na Vrších. After revision of Václav Ziegler's collection, which is deposited in the National Museum in Prague, and after determination of new finds, Ziegler's determinations are redetermined as follows: *Glomerula gordialis* (only pl. 1, fig. 1) and *Serpula prolifera* belong to *Glomerula serpentina; Glomerula scitula* belongs to *Glomerula lombricus; Sarcinella plexus* and *Sarcinella minor* (only specimen NM-O5373 which is not the specimen figured by Ziegler) belong to *Filograna socialis*; *Serpula antiquata* and *Proliserpula ampullacea* belong to *Neovermilia ampullacea*; *Eoplacostegus dentatus* belongs to *Placostegus* sp.; *Pomatoceros ares* belongs to *Pyrgopolon (Septenaria)* sp.; *Spirorbis asper* and *S. subrugosus* belong to *Dorsoserpula* ex. gr. *Wegneri*; *S. milada* belongs to *Neomicrorbis crenatostriatus subrugosus; Neomicrorbis knobi* belongs to *N. crenatostriatus crenatostriatus.*

Below are described only species which were found during the present fieldwork.

Class: **Polychaeta Grube, 1850**

Ordo: **Sabellida Fauchald, 1977**

Family: ***Sabellidae* Johnston, 1846**

***Glomerula* Brünnich Nielsen, 1931**

***Glomerula serpentina* (Goldfuss)**

Pl. 1, fig. 1

1831 *Serpula gordialis* Schlotheim var. *Serpentina*. – Goldfuss: p. 240, pl. 71, fig. 4.
1840 *Serpula implicata* – von Hagenow: p. 668, pl. 9, fig. 17.
1846 *Serpula serpentina* Goldfuss. – Reuss: pl. 42, fig. 22.
1904 *Serpula eximplicata* – Rovereto: p. 12, pl. 3, fig. 8a-e.
1911 *Serpula gordialis,* var. *serpentina.* – Frič: fig. 304.
1961 *Glomerula solitaria* n. sp. – Regenhardt: p. 28, pl. 9, fig. 11.
1961 *Protula rasilis* n. sp. – Regenhardt: p. 33, pl. 1, fig. 7.
1961 *Omasaria omnivaga* n. sp.– Regenhardt: pp. 45-46, pl. 5, fig. 7.
1964 *Glomerula jerseyensis* – Clough: p. 999, fig. 1.
1973 *Glomerula solitaria* Regenhardt, 1961. – Pasternak: p. 10, pl. 1, figs 6-7.
1973 *Protula rasilis* Regenhardt, 1961. – Pasternak: p. 12, pl. 1, fig. 9.
1984 *Glomerula gordialis* (Schlotheim, 1820) – Ziegler: pp. 215-216., pl. 1, figs 3, 4, 5.
2005 *Glomerula serpentina* (Goldfuss, 1831). – Jäger: p. 130, pl. 1, fig. 1.

M a t e r i a l : One specimen attached to an oyster. 15 tube fragments.

D e s c r i p t i o n : Tube circular. Surface smooth. The tube is coiled to form a ball or knots. Lumen circular, a trilobite lumen was not observed in these specimens. Tube diameter ranges from 1.6 to 2.6 mm, in most specimens the diameter is 2 mm.

D i s c u s s i o n : *Glomerula serpentina* belongs among the typical species of nearshore facies of the BCB. *Glomerula serpentina* (Goldfuss) was considered to

belong to *G. gordialis* SCHLOTHEIM by some authors (for example, Regenhardt 1961, Jäger 1983, Ziegler, 1984) Later Jäger (2005) restricted *Glomerula gordialis* SCHLOTHEIM to Jurassic material and determined Cretaceous specimens as a separate species, *G. serpentina*. A similar species, *Glomerula lombricus* (DEFRANCE), is distinguished by its small tube diameter which is normally less than circa 1 mm. The systematic position of the genus *Glomerula* is very problematic. The genus *Glomerula* has survived from the Hettangian to the Recent, and it is most common and geographically widespread from the Upper Toarcian until the Eocene. Jäger (personal communication) predicts that the genus *Glomerula* existed as a large number of species, but that it is nearly impossible to separate them because the construction of the tube is so simple and the morphologic variation between specimens even in one sample is extremely wide.

Jäger (1983, 1993, 2005 and personal communication) mentioned that the genus *Glomerula* did not possess a trilobate lumen even in the Jurassic. From the uppermost Valanginian onwards, trilobate lumina are present, but they are still rare in most samples from the Lower Cretaceous and even in some samples from the Upper Cretaceous. The ability of the animal to produce a tube which in some sections has a trilobate lumen seems to be true phylogenetic progress. Jäger (2005 and personal communication) gave different names to species from the Jurrassic and those from the Cretaceous to Eocene. Trilobate lumina may be present in *Glomerula plexus* (SOWERBY), in *Glomerula serpentina* (GOLDFUSS), and in *Glomerula lombricus* (DEFRANCE), but trilobate lumina are more frequent in *G. serpentina* than in *G. lombricus*. *Glomerula plexus* (SOWERBY) is gregarious, consisting of smooth uniform tubes, each measuring 1-2 mm in diameter, many of these together forming large irregular masses of a bulbous or elongated shape, reaching dimensions of up to 5 cm in the BCB and even larger in some localities, predominantly in the Santonian and Campanian of northern Germany, England, and southern Sweden. Apart from these typical large clusters consisting of dozens or even hundreds of tubes, in many localities it is possible to find two, three or four tubes fixed upon each other. Formally, these small clusters should be named „plexus“, but in reality they probably represent only dense populations of the „normal“ *serpentina* and *lombricus* (Jäger, personal communication).

Family: *Serpulidae* RAFINESQUE, 1815

Filograna BERKELEY, 1835

Filograna socialis (GOLDFUSS)

Pl. 1, fig. 5

1831 *Serpula socialis* nobis. – Goldfuss: p. 235, pl. 69, fig. 12 a-c.
1845 *Serpula filiformis* SOWERBY. – Reuss: p. 20, pl. 5, fig. 26.
1846 *Serpula filiformis* SOWERBY. – Geinitz: p. 253, pl. 16, fig. 25.
1875 *Serpula socialis* GOLDFUSS. – Geinitz: p. 200, pl. 37, fig. 2.
1883 *Serpula socialis* GOLDFUSS. – Frič: fig. 113.
1961 *Sarcinella socialis* (GOLDFUSS 1831). – Regenhardt: pp. 29-30, pl. 1, fig. 5.
1961 *Filograna sollistima* n. sp. – Regenhardt: p. 24, pl. 2, fig. 4.
1973 *Sarcinella socialis* (GOLDFUSS). – Ziegler: pp. 36-37, pl. 5, figs 4, 5, 6; pl. 6, fig. 1.
1978 *Sarcinella socialis* (GOLDFUSS). – Ziegler: pp. 219-221, pl. 50, fig. 4.
1979 *Filograna plexus* (SOWERBY, 1829). – Lommerzheim: p. 128.
1983 *Filograna socialis* (GOLDFUSS, 1831). – Jäger: pp. 20-23, pl. 1, figs 3-8.
1984 *Sarcinella socialis* (GOLDFUSS, 1831). – Ziegler: pp. 219-220, pl. 2, figs 7-8.
2005 *Filograna socialis* (GOLDFUSS, 1831). – Jäger: p. 135.

M a t e r i a l : Four free bundles found as loose specimens, 2 specimens in limestone.

D e s c r i p t i o n : Many tubes attached more or less parallel to eachother forming bundles. Tube circular. Surface smooth. Diameter of the tube 1.8 mm (sample in limestone), 1.2 mm in a bundle consisting of ca. 20 tubes collected in January 2006.

D i s c u s s i o n : In the BCB, this species is not typical for the nearshore facies, but it is typical for deeper environments in the Middle Turonian e.g. at the localities Dolánky near Turnov, Klokočské Loučky, Mladá Boleslav, Jizerní Vtělno, and Sychrov (see Ziegler 1973, 1978). These finds could probably indicate a deeper sea at this locality. *Filograna filosa* (DUJARDIN) has a similar habit, but can be distinguished by its smaller tube diameter (0.2-0.4 mm).

Neovermilia DAY, 1961

Neovermilia ex gr. *ampullacea* (SOWERBY)

Pl. 1, fig. 8

M a t e r i a l : One complete specimen attached to an oyster. Three poorly preserved specimens also attached to an oyster. Six fragments of tube.

D e s c r i p t i o n : The tube cross-section is subcircular. There is an indistinct very fine keel. The transversal ornamentation is very distinct and shows fine corrugations. The tube increases in diameter towards the anterior. Near the base of the tube a very distinct strong cellular layer is developed. The posterior portion of the tube forms a loop. Tube diameter 2.6 mm. Width of the tube´s base is 5 mm in the anterior portion. Lumen circular, 1.9 mm in diameter.

D i s c u s s i o n : The present tubes correspond well to the description given by Ziegler (1974), but these specimens from Kaňk have a cellular layer which is wider than the diameter of the tube at the base. There is pronounced variability within this species (Jäger, 2005). Specimens from the nearshore facies of the BCB (e.g. Kaňk – Na Vrších, Velim – eastern part, Předboj near Prague) differ in their tube morphology from specimens found in the deeper water facies of the BCB (e.g. in the Upper Turonian of the working quarry at Úpohlavy near Lovosice). The genus *Neovermilia* bears shorter cells in the cellular layer than the genera *Pomatoceros* and *Pyrgopolon*. In the nearshore facies, a very fine but distinct longitudinal keel may be present (in the eastern part of the locality Velim and at Předboj near Prague) or may not (some specimens found at Kaňk – Na Vrších).

Dorsoserpula Parsch, 1956

Dorsoserpula gamigensis (Geinitz)

Pl. 1, fig. 6

1875 *Serpula gamigensis* Geinitz. – Geinitz: pp. 286-287, pl. 63, figs 19-21.

M a t e r i a l : Single specimen.

D e s c r i p t i o n : Tube circular. A fine distinct undulated keel and two lateral keels are present. The posterior tube portion is coiled planispirally. The diameter of the planispiral is 3 mm, the diameter of the tube aperture is 1.6 mm. In the anterior tube portion, the transversal ornamentation consists of very fine incremental lines shaped like the letter V.

D i s c u s s i o n : A closely related species common in the Upper Cretaceous, especially in the Santonian and Campanian, was described by Jäger (1983) under the name *Parsimonia wegneri* nom. nov. This species usually lacks a true longitudinal keel. Later Jäger (2005) renamed that species *Dorsoserpula wegneri* and, moreover, erected a new subspecies, *Dorsoserpula wegneri maastrichtensis*, for specimens of Maastrichtian age differing from typical *wegneri* specimens by the presence of a longitudinal keel and by the presence of a cellular tube base. *Dorsoserpula gamigensis* also possesses a longitudinal keel.

Dorsoserpula cf. *conjuncta* (Geinitz)

Pl. 1, fig. 7

1843 *Serpula conjuncta* Geinitz – Geinitz: Nachtr. zur Charakt. IV, p. 7, pl. 4, figs 6-9.
1849 *Serpula conjuncta* Geinitz – Geinitz: p. 106.
1875 *Serpula conjuncta* Geinitz. – Geinitz: pp. 283-284, pl. 63, figs 6-9.
1969 *Serpula conjucta* Geinitz, 1846 – Ziegler: pp. 38-40, fig. 1.
1984 *Serpula conjucta* Geinitz, 1846 – Ziegler: p. 223, pl. 3, fig. 2.

M a t e r i a l : Single specimen.

D e s c r i p t i o n : Tube diameter 9 to 11.4 mm. The tube wall is 2.3 mm thick. The present specimen resembles those described by Ziegler (1969), but it differs by the presence of a cellular layer which is very strongly developed and by dense transversal lines at the base of the middle portion of the tube.

D i s c u s s i o n : Because of the differences in morphology described above, a more precise determination than 'cf. *conjuncta*' is not possible. The cellular layer may have enabled the specimen to live on the surface of a soft substrate.

Placostegus Philippi, 1844

Placostegus zbyslavus (Ziegler)

Pl. 1, fig. 3

1984 *Eoplacostegus zbyslavus* n. sp. – Ziegler: p. 236, pl. 6, figs 1-2.

M a t e r i a l : One well preserved specimen. Two fragments of the erect free tube portion.

D e s c r i p t i o n : The free subtriangular tube portion is steeply erect and is twisted around its longitudinal axis. The tube diameter is 1.6 mm in the anterior tube portion and 1.5 and 1.9 mm in the middle part. Lumen circular. The posterior tube portion is coiled to form a planispiral 3.9 mm in diameter. The surface bears fine transversal furrows and three distinct longitudinal lines situated between three rounded longitudinal edges which give the tube a rounded triangular cross-section.

D i s c u s s i o n : *Placostegus zbyslavus* (Ziegler) belongs among the smaller species of the genus *Placostegus*. The specimens described by Ziegler (1984) do not bear transversal furrows in the posterior fixed tube portion. *Placostegus dentatus* (Regenhardt) has a triangular cross-section, but lacks transversal ornamentation. *Placostegus velimensis* (Jäger and Kočí, 2007) is larger and has a rounded rectangular cross-section.

Pyrgopolon de Montfort, 1808

Pyrgopolon (*Septenaria*) cf. *tricostata* (Goldfuss)

Pl. 1, figs 4a-b

pars 1910 *Burtinella* (?) *Reussi* m. – Weinzettl: pp. 23-24, pl. 3, fig. 48, 50.
1967 *Ditrupa tricostata* (Goldfuss), 1841. – Ziegler: pp. 14-18, figs 2-3.
pars 1984 *Ditrupa subtorquata* (Münster), 1831. – Ziegler: pp. 238-239,
1984 *Ditrupa tricostata* (Goldfuss), 1841. – Ziegler: p. 239, pl. 6, figs 8-9.
2010 *Pyrgopolon* (*Septenaria*) cf. *tricostata* (Goldfuss). – Kočí: pp. 124-125, figs 5-6.

M a t e r i a l : One complete specimen, 30 specimens of the free anterior tube portion, 4 incomplete specimens of the free anterior tube portion and attached posterior tube portion, 26 tube fragments.

D e s c r i p t i o n : Posterior tube portion is attached to the substrate; the cross-section of this part is triangular, and there is one median keel. Anterior tube portion freely erect with five rounded keels respectively, four lobes and a very fine distinct median keel. Diameter of the anterior tube portion 2.6 mm. Lumen circular, 2.4 mm in diameter. A groove is present on the underside between the lower lateral lobes.

D i s c u s s i o n : These specimens are very similar to *Ditrupa* (*Pentaditrupa*) *iubata* Regenhardt, 1961 from the Turonian of Troo, Loire-et-Cher, France, which has four rounded keels (lobes) and a very distinct dorsal keel. The cross-section is pentangular and there is no transversal ornamentation. The holotype differs from the specimens from Kaňk due to its larger median keel, and from Regenhardt´s description it is clear that the anterior tube portion was still attached to the substrate. In contrast the specimens from Kaňk have anterior tube portions which are free and erect above the substrate.

Moreover, the specimens from Kaňk do not belong to the typical *tricostata* species from the Cenomanian of Essen in Germany. According to their morphological features they belong to the subgenus *Pyrgopolon* (*Septenaria*), see (Jäger, 1983, 2005; Jäger and Breton, 2002). In the BCB, *Pyr-*

gopolon (*Septenaria*) cf. *tricostata* was found in nearshore localities, e.g. Velim, Nová Ves, Kamajka, and Chrtníky.

The specimen from Nová Ves near Kolín which Ziegler (1984) described as *Ditrupa iubata* (Regenhardt) (NM-O5391) is not serpulid. The specimen which according to its registration number NM-O5363 should be, is not the original specimen figured by Ziegler (1984) on his pl. 6, fig. 7 as *Ditrupa subtorquata* from Nová Ves. In addition, the original specimens NM-O5394 and NM-O5395 determined by Ziegler as *Ditrupa tricostata* from Velim, all are very similar to the specimens from Kaňk and represent the same species, which is, however, neither *subtorquata* nor *tricostata*. Ziegler (1967, 1984) described specimens from the BCB as belonging to the genus *Ditrupa*, but this is a misinterpretation, because in contrast to *Ditrupa,* the posterior tube portion is attached to the substrate, whereas the shape is similar to the genus *Pyrgopolon* and especially the subgenus *Septenaria.* The species *Ditrupa subtorquata* and *Ditrupa schlotheimi* clearly belong to the genus *Ditrupa*.

Pyrgopolon (*Septenaria*) *ziegleri* Kočí

Pl. 1, figs 2a-b

2010 *Pyrgopolon ziegleri* sp. n. – Kočí: p. 125, figs 7-8.

M a t e r i a l : One complete specimen. Two fragments of tube.

D e s c r i p t i o n : Fixed tube portion large, smooth, triangular in cross-section, bears a distinct median keel. There is no transversal ornamentation. Tube width at the anterior end of the base 13.2 mm, corresponding tube height 12.6 mm. Towards the posterior, the tube is considerably narrower, and the height is only 6.7 mm. Lumen circular, 3.96 mm in diameter. The lumen is situated in an excentric position, near to the keel. Immediately below the aperture, there is a smaller tall but narrow chamber measuring circa 2 mm, and between that chamber and the tube's base there is a fine groove. Free tube portion is unknown.

D i s c u s s i o n : This species includes the largest specimens with triangular cross-section in the BCB and is characterized by its shape and size. *Pyrgopolon* (*Septenaria*) *ares* (Ziegler) differs by the position of its lumen and by its narrower longitudinal keel. *Pyrgopolon* sp. A1, *Pyrgopolon* sp. A2 and *Pyrgopolon* sp. B from the nearshore locality Velim (see Kočí, 2007a) differ also in the position of the lumen, and partly by their tube morphology. *Pyrgopolon* (*Septenaria*) *marechali* (Jäger et Bréton) from the Lower Cenomanian of Normandy, France, is even larger, and its tube is much more rounded. *Pyrgopolon* (*Septenaria*) *polyforata* (Jäger) differs by its specific ornamentation. *Pyrgopolon* (*Septenaria*) *macropus* (Sowerby) has a pentagonal to heptagonal cross-section and a more prominent keel (Jäger, 2005, pl. 9, fig. 5a). The tube of *Pyrgopolon* (*Septenaria*) *macropus* is attached to the substrate by its posterior tube portion and its anterior tube portion is erect above the substrate. The same is seen in *Pyrgopolon* (*Septenaria*) *erecta* (Goldfuss), which is distinguished by its larger tube diameter which may reach 14 mm. The subgenus *Pyrgopolon* (*Septenaria*) is most common in transgression facies (Jäger, personal communication).

Palaeoecological remarks – worms and their substrates

The worm-substrate relationship has been at least a partial theme of many papers dealing with polychaetes (e.g. Taylor and Wilson 2003, Žítt et al. 2003) and other benthic organisms since the 1960s. An exhaustive study of soft-bottom dwellers was published in 2008 by Seilacher et al. This research mainly concerned the substrate preference or life strategies of taxa present in the locality. The dominant and most diverse species are obligate encrusters. Unfortunately only one small specimen of *Glomerula serpentina* fixed to fragment of an oyster valve was found. Moreover, larvae of *Glomerula serpentina* have frequently been found attached to tiny pieces of substrate such as small shell fragments or large foraminifers or very small pebbles and during growth created a self-supporting knot-like reeflet which was an adaptation for living above the soft bottom. The larvae of *Filograna socialis* preferred attachment to the tubes of their own species after a first tube had successfully begun colonization. *Filograna socialis* belongs among the mud-sticking species and was able to fasciculate colonies which grew upright like staghorn corals (see Seilacher et al. 2008, fig. 3 C-D). At Kaňk only smaller parts of the fasciculate colonies were found.

Neovermilia ex. gr. *ampullacea* belongs to the obligate encrusters. Four specimens were found fixed to an oyster valve. The next species described belong to the obligate epibionts with the exception of *Dorsoserpula* cf. *conjuncta*. This specimen differs considerably from other *conjuncta* specimens found at other nearshore facies localities (e.g. Velim, Plaňany) by its very strong cellular layers which may be interpreted as an adaptition for living on soft muddy sediment.

The new finds from Kaňk described above, comparison of the species (e.g. *Filograna socialis* and *Pyrgopolon* cf. *tricostata*) with the fauna from other neashore localities (e.g. Velim and Kamajka), and sedimentological arguments (Eliáš and Zelenka, 2002) point to the conclusion that the sea at Kaňk was probably deeper than at other typical nearshore localities. Howewer, according to the presence of redepositional shallow water corals (e.g. *Synhelia gibbosa*, *Dimorphastrea sp., Meandrastraea pseudomeandrina*, *Calamophylliopsis sp., Proaplophyllia*? sp.) at these localities, the depth was 0-50 m, and according to comparison with recent corals, the depth reached 20-30 m (Eliášová, 1997).

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Explanation of the plate

PLATE 1

Fig. 1 *Glomerula serpentina* (Goldfuss); NM-O6975.

Fig. 2 *Pyrgopolon ziegleri* Kočí – 2a: view of anterior end, 2b: view from above; NM-O6832.

Fig. 3 *Placostegus zbyslavus* (Ziegler) – basal coiled part and free triangular fusiform anterior part; NM-O6976.

Fig. 4 *Pyrgopolon* (*Septenaria*) cf. *tricostata* (Goldfuss) – 4a: lateral view, 4b: view from above including aperture; NM-O6977.

Fig. 5 *Filograna socialis* (Goldfuss) – fragment of a bundle of tubes; NM-O6978.

Fig. 6 *Dorsoserpula gamigensis* (Geinitz) – lateral view; NM-O6979.

Fig. 7 *Dorsoserpula* cf. *conjuncta* (Goldfuss) – two tubes with a strong tube wall; NM-O6980.

Fig. 8 *Neovermilia* ex gr. *ampullacea* (Sowerby) – specimen is attached to oyster valve; NM-O6981.

(photo: Jan Sklenář)

PLATE 1