New data on the Late Cenomanian taphocoenose at Kuchyňka near Brázdim (Bohemian Cretaceous Basin)

Nová data o svrchnocenomanské tafocenóze lokality Kuchyňka u Brázdimi (česká křídová pánev)

(7 figs)

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A section in a body of Late Cenomanian lydite conglomerate (Korycany Member), ca. 6 m thick, was exposed on the SW foot of the lydite elevation at Kuchyňka near Brázdim (central Bohemia) in 1999. Matrix from the upper portions of this body provided rare and unique fauna, mostly represented by echinoderms, gastropods and bivalves. The echinoderms are dominated by echinoids with prevailing species *Phymosoma cenomanense* (Cotteau). The find of an asteroid related to, or identical with, *Metopaster thoracifer* Geinitz at this locality is new for the Bohemian Cretaceous. Gastropods are small in size, with 19 species so far identified (Prosobranchia-Archaeogastropoda – 9 species, P.-Caenogastropoda – 8 species, Opistobranchia-Entomotaeniata – 2 species). Bivalves are represented by a number of poorly identifiable species among which the most prominent are rudists (*Ichthyosarcolites* sp., *Araeopleura* sp.) and boring forms (*Lithodomus* sp.) dwelling in massive skeletons of sponge type. The wide range of taphonomic features (fragmentation, disarticulation, abrasion, a.o.) of organic remains indicates that the taphocoenose is of markedly mixed nature, defined by the general character of shallow-marine environment with frequent recycling, high mobility of sediments with bioclasts, but also local possibility of rapid burial.

Key words: Echinodermata, Gastropoda, Bivalvia, taphonomy, palaeoecology, Korycany Member, Upper Cenomanian, Bohemian Cretaceous Basin

Introduction

The lydite hill of Kuchyňka near Brázdim (ca. 4 km W of Brandýs nad Labem) has been known for its occurrences of shallow-water Cretaceous sediments with fauna since the 1920s. These sediments were originally exposed in a number of quarries. The occurrences of Cretaceous sediments were last studied by Žítt *et al.* (1999a); here, the outcrops were documented as preserved in 1997–1998. Nevertheless, minor excavations were conducted at Kuchyňka in autumn 1999, aimed at re-discovery of some occurrences mentioned by Záruba (1948) and Žebera (1951) and considered no longer existing. General results of these works were briefly described by Žítt and Nekovařík (in press). More detailed results, obtained from the study of newly exposed deeper portions of the conglomerate body (Korycany Member) only, located in marginal part of the SW quarry of Kuchyňka Hill, are summarized in the submitted paper. However, taxonomic evaluation of the fauna obtained will be published in separate studies.

Research history

The "typical littoral conglomerate" from an unknown site in the SW quarry of the Kuchyňka hill was studied by Matějka (1922, p. 9). Then, it was exposed in a thickness of ca. 2 m. Lydite clasts were max. 2 m large, with high amount of angular lydite gravel and white quartz pebbles. The matrix was probably formed by weathered clayey to weakly calcareous ferruginous sandstone with abundant oyster and rudist fragments. The author ranked these deposits to Zone II (i.e., the Korycany Member). Záruba (1948) probably described

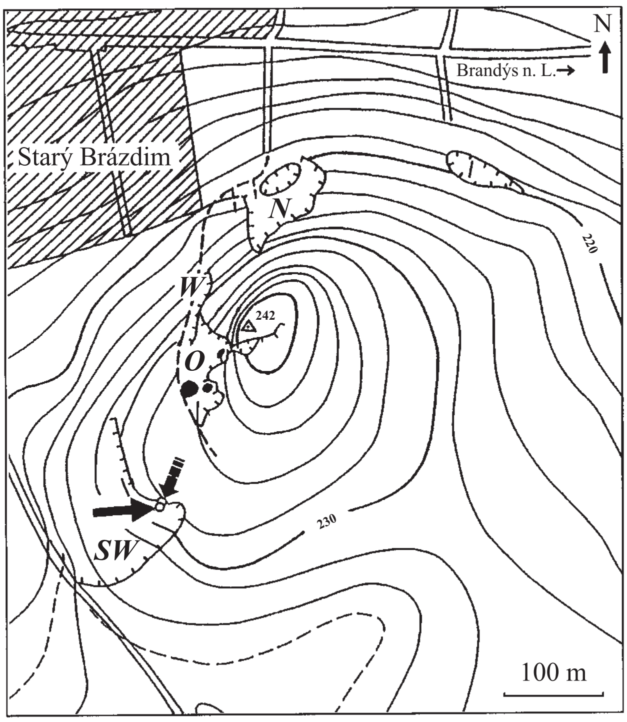

Fig. 1 A map of the Kuchyňka Hill showing the positions of old quarries (I, N, W, O, SW). Positions of an older, shallow exposure of Cenomanian conglomerate (dashed arrow above; designated as G in Žítt *et al.* 1999a) and the herein described new exposure (full arrow below) are indicated in the southwestern quarry (SW).

the same occurrence, however, then exposed in thickness of ca. 5 m due to the progress in quarrying (at wall height of 6 m). The matrix was composed of marly sand in the lower part and by rusty limonitic sand higher in the section. Conspicuously, the younger rusty matrix was found to form infiltrations in the marly matrix below. Záruba (op.cit.) stated that the conglomerate observed by Matějka (1922) in this quarry corresponded to this lower stratum. Klein (1952; pers. comm. 1997) observed lithological but also faunal difference between the lower and upper portions of the conglomerate bed; then, the outcrop probably had the same appearance as in the time of Záruba (op.cit.). Much like Matějka (1922), Klein considered the lower portion of the conglomerate accumulation to be Upper Cenomanian in age (Korycany Member). The upper portion, which also contained *Praeactinocamax plenus* (Blainville), was interpreted by Klein (op. cit.) – in agreement with the knowledge of his time – as Lower Turonian in age. In his latest opinion (pers. comm. 1997), this portion of the conglomerate accumulation could have been Upper Cenomanian in age. This idea is shared also by the present authors.

Fig. 2 A detail of the newly exposed conglomerate body with sand matrix and more calcareous matrix above (above the hammer), which yielded the fauna studied. The hammer head is 16 cm long.

The whole quarry has been completely filled for a longer time already, and sediments are exposed at its upper edge and in the slope extending from the quarry to the NNW. Here, only the uppermost portion of the conglomerate accumulation of unknown total thickness was studied in an accessible thickness of ca. 1 m (site G in Žítt *et al.* 1999a) within the first stage of our research. The conglomerate consisted of unsorted lydite clasts supported by abraded clasts max. 50 cm large. The matrix was formed by yellow-white calcareous claystone to siltstone with apparently indistinct macrofauna. Nevertheless, washing of the samples produced macrofauna in minor amounts, with a prominent downward increase in quantity. The uppermost portion of the conglomerate bed passed upwards into light yellow loess loam of Quaternary age with brown smears and numerous rounded lydite clasts and angular fragments.

Besides the above given occurrence, Cretaceous sediments were found in the close neighbourhood, too. These, however, represent significantly different sediments from lithological point of view – see characteristics in Žítt *et al.* (1999a), sites D–F.

New exposure

In autumn 1999, landfill material was removed from the area of the former outcrop G (see above) and a part of the old quarry wall was made accessible (Fig. 1). After cleaning of the wall, an almost 6 m high section across the conglomerate body was obtained, not reaching its base. The uppermost portion of the section *c.* 1.0 m thick (formerly known as outcrop G) continues downwards with conglomerate with sand-dominated but highly variable matrix (Fig. 2). Matrix is locally formed by weakly calcareous yellowish to whitish sand, with locally developed smears of strongly calcareous friable sandstone with numerous macroscopically visible bioclasts. In an interval of *c.* 1.0–1.5 m below the top of conglomerate, a 32 kg sample of matrix for further processing was gathered. The amount of biodetrital component decreases downward, and the matrix is formed by yellow sand only. Near the base, the sand is pure (weathered sandstone), greenish in colour but with no glauconite grains. Lydite clasts also generally reach larger size (max. 1 m). The section studied by Záruba (1948) showed somewhat different petrographic characteristics (see Žítt *et al.* 1999a, p. 195). Sinter-like crusts are commonly present on clasts of the deposit; their parts are easily delaminated thus macroscopically resembling oyster fragments.

Organic remains

The association of macrofauna obtained by washing 32 kg of conglomerate matrix contained the following groups: Foraminifera, Porifera (?), Vermes, Brachiopoda, Gastropoda, Bivalvia, Asteroidea, Ophiuroidea, Crinoidea and Echinoidea.

1. Foraminifera

Only the species of *Acruliammina longa* Tappan was recorded, relatively rarely found to colonize fragments of bivalve shells or sponges (?). The tests have the same character as specimens figured, for example, from the Kněžívka locality (see Žítt – Nekvasilová 1990, Pl. 5, Figs 3–4). Fragments of individuals isolated from the substrate were not observed. Other foraminifers are very rare and belong to agglutinated benthic species *Arenobulimina conoidea* (Perner) and *Ataxophragmium* sp. (see Žítt *et al.* 1999a, p. 197).

2. Porifera (?)

The washing residue contains white calcareous fragments max. 4 cm large, hard but often very friable (probably due to the effect of diagenetic dissolution and present weathering). Their surface as well as fracture show only locally perceptible fine structures having the form of elongate pillars, often radiating and sometimes forming prominent growth zones (Fig. 4h). At more favourable preservation, the structure is strongly porous (Fig. 4d). Systematic position of organisms producing these structures is subject to further study. Their attribution to the group of Porifera is merely tentative and provisional. This skeletal material frequently served as substrate for boring bivalves (see below).

3. Vermes

The species *Serpula ampullacea* Sowerby was recorded in only a single short tube fragment. Mere casts of tubes of this species occur more frequently. Their straight to strongly arched/undulating fragments are circular in cross section, max. 1 cm long and ca. 1 mm in diameter. They are often filled with crystal calcite. Species *Glomerula gordialis* (Schlotheim) is rare (tube fragments). None of the worm remains are abraded. (All worms were determined by V. Ziegler, Paedagogical Faculty of the Charles University, Prague.)

4. Brachiopoda

The species *Phaseolina phaseolina* (Valenciennes in Lamarck) was recorded very rarely. The shells are minute (around 3–4 mm), with articulated valves, and usually with secondarily destructed umbos. Calcite of the valves is very brittle and friable, which generates partial internal moulds. Species *Cyclothyris* aff. *difformis* (Valenciennes in Lamarck) was very rarely recorded among minute, often abraded fragments of isolated valves. (Brachiopods were determined by O. Nekvasilová, Prague.)

5. Gastropoda

Most of the material obtained is represented by 38 specimens, which belong to the following groups and species.

Prosobranchia – Archaegastropoda: *Pileolus cappilaris* Geinitz, *P. koninckianus* de Ryckholt, *P. orbignyi* Geinitz, *Solarium zschaui* Geinitz (see Fig. 3b), *Teinostoma cretaceum* d'Orbigny, *Trypanotrochus cretaceus* Kase, *Turbo goupilianus* d'Orbigny (see Fig. 3d), *T. neumanni* Geinitz, *Trochus plicatogranulosus* Münster.

Prosobranchia – Caenogastropoda: *Cerithium strombecki* Geinitz, *Cirsocerithium reticulatum* (Nagao), *C. subspinosum* (Cossmann) (see Fig. 3c), *Exechocirsus subpustulosus* Pchelintsev (see Fig. 3a), *E. subsocialis* Pchelintsev, *Haustator subnodus* Pchelintsev, *Metacerithium amudariaensis* Pchelintsev, *Trajanella fraasi* (Dietrich).

Opistobranchia – Entomotaeniata: *Aptyxiela* sp., *Archimedea rigida* Nagao.

The fauna does not include any Neogastropoda and Heterostropha. Ten specimens are questionably assigned (three of them are too poorly preserved to warrant a specific name), but we presume their additional determination after a detailed study.

Shells of the studied gastropods are mostly well preserved but some specimens are preserved as calcite moulds with a completely recrystallized shell wall. Turbiniform shells are mostly complete including aperture and protoconch. Conispiral forms are frequently damaged at apertural area and in some specimens the protoconch and a part of apex are missing. The sculpture of shells is well preserved. Only low number of specimens are damaged (fractured) so strongly that they are indeterminable. The shells are not abraded.

The majority of studied shells are smaller than a few millimetres and larger than 0.3 mm. They mostly represent fully grown individuals of small-sized species, but some small shells belonging to young specimens of larger species are also present. In the assemblage the conispiral forms with slender, multi-whorled shells prevail. They are represented by *Aptyxiela* sp., *Archimedea rigida*, *Cerithium strombecki*, *Cirsocerithium reticulatum*, *C. subspinosum*, *Exechocirsus subpustulosus*, *E. subsocialis, Haustator subnodus*, *Metacerithium amudariaensis*, *Trajanella fraasi*, *Trypanotrochus cretaceus* (68% of all specimens). Less common are turbiniform, low spired forms (maximum number of whorls is three), with wide and more or less flattened bases [*Solarium zschaui*, *Teinostoma cretaceum*, *Trochus plicatogranulosus*, *Turbo goupilianus*, *Turbo neumanni* (18% of all specimens).] Pateloid forms of typical limpet-like shapes are very rare (only 3 specimens) – *Pileolus cappilaris*, *P. koninckianus*, *P. orbignyi*.

In the washing of the conglomerate matrix, two small (*c.* 3–5 mm) abraded fragments of columelae belonging to indeterminable species were also found.

6. Bivalvia

a. Boring forms

The washing residue contains relatively frequent boring bivalves preliminarily classified as *Lithodomus* sp. The specimens rarely possess the articulated shells (Fig. 4f) but their internal moulds prevail (Fig. 4e) in the range of 3–9 mm in length. These bivalves bored mostly to massive, hitherto unspecified skeletons of sponge character (see above; Figs 4a, d). Much less commonly, the sub-

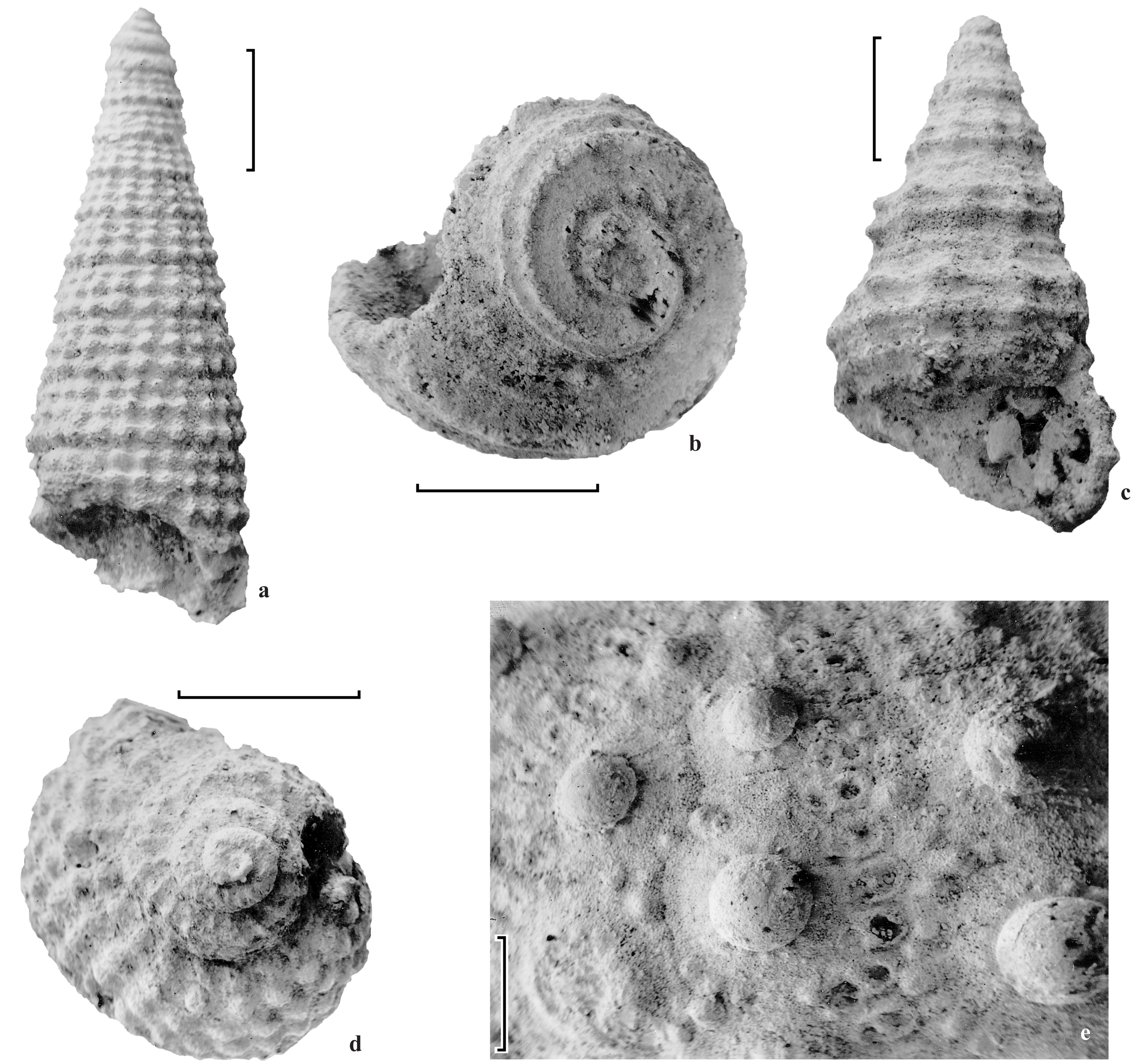

Fig. 3 Gastropod shells (a–d) and a part of an echinoid corona (e) from the new exposure at Kuchyňka near Brázdim locality. a – *Exechocirsus subsocialis* Pchelintsev, 1953; b – *Solarium zschaui* Geinitz, 1871; c – *Cirsocerithium subspinosum* (Cossmann, 1906); d – *Turbo goupilianus* d'Orbigny, 1842; e – *Phymosoma cenomanense* (Cotteau, 1859). Scale bars in Figs a–d equal 1 mm, in Fig. e – 0.5 mm.

strates are represented by shells of rather massive types of bivalves (probably rudists and oysters). The borings themselves are of sack-like character, morphologically attributable to *Gastrochaenolites* sp. (Fig. 4i). Most of the borings are observed in incomplete state on substrate fracture, sometimes even with the boring producer (*Lithodomus* sp.) inside (Fig. 4a). Narrowed proximal parts of borings are visible on more complete moulds (fillings) of these borings, which can be, however, found only very rarely in isolated state. A few such specimens were distinctly arched proximally.

As most of the shells and internal moulds were picked in isolated state from washed sediment, it is difficult to say whether they come from decomposed substrates originally inhabited by these bivalves. In some cases, occurrences of internal moulds and shells were recorded in the sediment (sandstone) itself, which indicates removal of shells from their original substrates and separate deposition. Such shells were buried with their valves tight together.

b. Rudists

Remains of rudists of genera *Ichthyosarcolites* Desmarest, 1817 and *Araeopleura* Cox, 1965 were hitherto identified in the individual-rich set of bivalve fragments. *Ichthyosarcolites* sp. is represented by fragments of lower valves (originally attached to the substrate). The fragments attain max. 20 mm in length and 9 mm in width. The fragments are angular or slightly abraded (Fig. 6d). *Araeopleura* sp. is represented by opercula-like upper

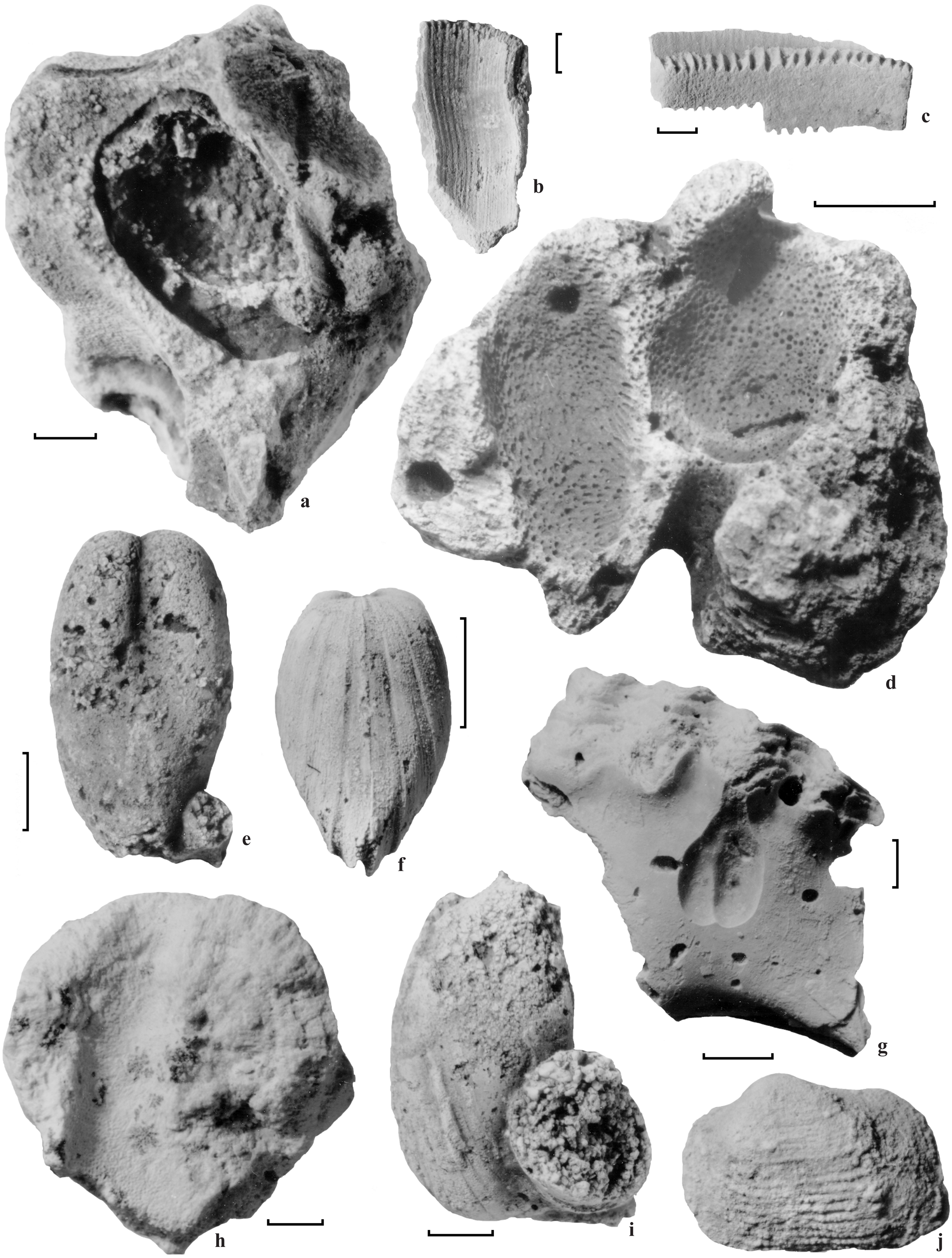

Fig. 4 Fossils from the new exposure at Kuchyňka near Brázdim locality. a – A fragment of a sponge with *Gastrochaenolites* sp. boring and remains of its producer inside (*Lithodomus* sp.); b, c – fragments of indetermined bivalve shells; d – a fragment of a sponge with *Gastrochaenolites* sp. borings and some other smaller ones; e – internal mould of a shell of *Lithodomus* sp. viewed ventrally; f – articulated shell of *Lithodomus* sp. viewed dorsally; g – bioeroded fragment of a lophid oyster with desquamated outer shell layers; h – a prolonged part of a sponge in cross section showing growth increments; i – isolated internal mould of *Gastrochaenolites* sp. (orientated distally down) with a fragment of some other filling of a boring trace laterally; j – an articulated shell of *Arca* (?) sp. Scale bars in all figures equal 2 mm.

valves, which are largely fragmentary (Figs 6b, c). These fragments (6 pieces in total) were identified only by the presence of articulation structures characteristically formed by two teeth separated by a deep socket. The fragments of the opercula are, much like in the last mentioned genus, angular or weakly abraded. Complete opercula (2 pieces found so far) belong both to adult (Fig. 6a) and juvenile (Fig. 5) individuals and are well preserved.

The material is also rich in yet undetermined shell fragments (e.g., Figs 4b, c) which may be, at least partly, attributed to rudists. They include minute fragments with numerous internal canals as well as larger fragments structured by surface grooves. A comparative study of these materials with the aim of their determination is currently under way.

c. Oysters
Oyster remains are relatively infrequent in the washing residue. Although not abraded, their fragments are minute and impossible to determine more precisely. They are characterized by decomposition along incremental planes. This character is also shared by one of larger fragments (Fig. 4g), which comes from marginal area of an oyster valve of probably lophid affinity, bearing visible traces of bioerosion on its fracture.

d. Arca (?) sp.
The only find preliminarily determined as *Arca* sp. belongs to a young individual (length 7. 9 mm, see Fig. 4j). The shell is articulated with its valves somewhat opened.

e. Not identified species
The material includes abundant minute thin-walled valve fragments with smooth outer surface or outer surface sculpted by fine grooves. Their pertinence to a particular species was not determined yet. The fragments often show weakly to strongly rounded edges. The present

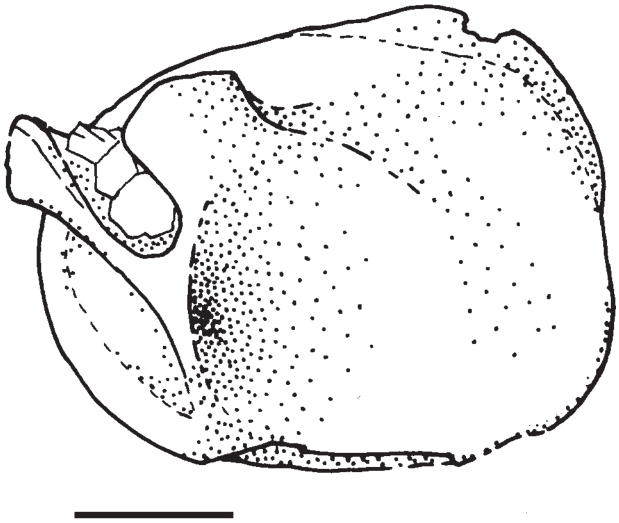

Fig. 5 Upper valve of the rudist species *Araeopleura* sp. from the new exposure at Kuchyňka near Brázdim. Scale bar equals 1 mm.

sharp-edged fragments also probably formed only during sediment compaction, partly posing an artefact produced by sampling and washing of the sediment.

7. Echinodermata
a. Asteroidea
Surprisingly, relatively rich material of asteroids was found, composed exclusively of disarticulated elements of arms and discs. The material probably contains several taxa of astropectinid and goniasterid type, which have not been reported from the Bohemian Cretaceous sediments and may possibly pose new taxa. Several large elements of the species *Metopaster* cf. *thoracifer* (Geinitz, 1871) (see also Breton 1992) were also identified. Skeletal elements are often weakly abraded, particularly on edges and projections. Morphological structures on the outer surface (ornamentation) are generally distinct, sometimes with surface microstructure of the stereome visible. Besides asteroids, a single lateral brachial element of an unidentifiable ophiuroid was recorded.

b. Crinoidea
All remains of crinoids encountered belong to the order Comatulida. The material is dominated by small isolated brachials with muscular as well as syzygial articulations. The only two complete calices were preliminarily determined as *Semiometra impressa* (Carpenter). Both specimens are relatively well preserved even in finer portions of upwards-extending parts of radials above muscle fossae. Isolated centrodorsals (2 pieces in total) are abraded, partly fragmented, with poorly preserved cirral facets. Poorly preserved centrodorsals figured in Žítt *et al.* (1999a, Fig. 7f), determined as *Glenotremites* sp., coming from the hangingwall of the presently studied sample (see Fig. 1, dashed arrow), probably belong to a different species. The sample contains no isocrinid or roveacrinid crinoids.

c. Echinoidea
This group is represented by coronas and parts thereof, elements of the chewing apparatus (Aristotle's lantern) and spines.

Small echinoids were subjected to the weakest post-mortem destruction. Coronas of non-cidarid echinoids were completely preserved in several rare cases. These include coronas of very small individuals (5 specimens in total), such as *Salenia liliputana* Geinitz, *Orthopsis* sp. and irregular species *Pyrina* cf. *desmoulinsi* d'Archiac. Coronas of many small but mainly of large individuals are generally preserved fragmentarily, in the form of two or more interconnected columns of ambulacral and interambulacral plates. Disintegration of tests into these fragments followed vertical sutures, most typically adradial sutures (i.e., between ambulacrals and interambulacrals). Such preservation was observed in coronas of species *Phymosoma cenomanense* (Cotteau), *Orthopsis milliaris* (d'Archiac) and *Salenia* (?) sp. Coronas of *P. cenomanense* are very frequently represented also by isolated

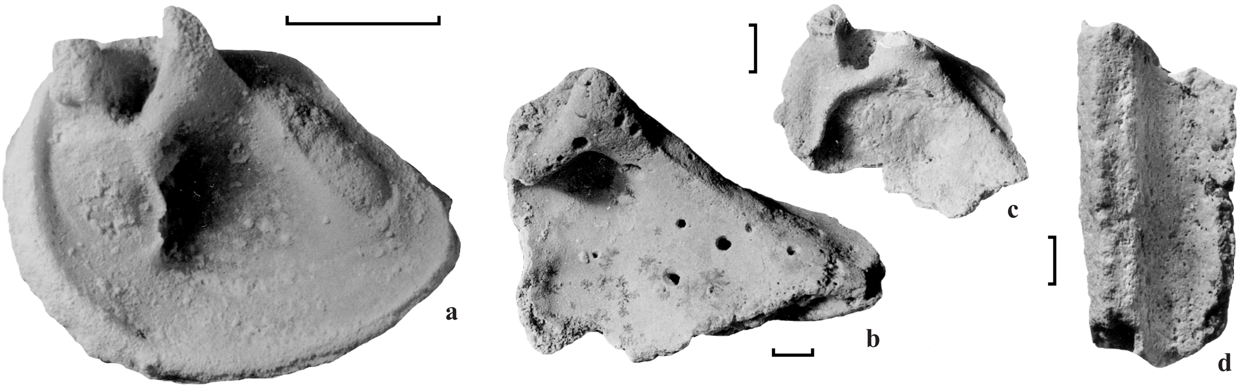

Fig. 6 Rudist remains from the new exposure at Kuchyňka near Brázdim. a – upper valve of *Araeopleura* sp.; b, c – as above, fragments; d – a fragment of the lower valve of *Ichthyosarcolites* sp. Scale bars in all photos equal 2 mm. Photos J. Žítt.

ambulacral and interambulacral plates. The same type of preservation was also observed in species *Tetragramma* cf. *variolare* (Brongniart) and *Codiopsis* cf. *doma* (Desmarest). A number of isolated coronal plates have not been determined yet.

No abrasion of coronal fragments was observed (Fig. 3e). Coronas are thin-walled, obviously unable to resist mechanical stress. Abrasion was rarely observed on isolated plates but, considering the softened, chalky surfaces and edges, it may pose an artefact from washing.

In some cases, fragmentation of coronas occurred diagonally to the sutures. These cases include *Phymosoma cenomanense*, a.o. Secondary fragmentation due to sediment compaction (see below) with no signs of transport of fragments obviously occurred in larger shells of *Pyrina* sp., which are completely fractured, forming angular fragments with otherwise perfect preservation of surface structures.

Cidarid echinoids are very rare and their coronas are always completely disarticulated. Only two isolated interambulacral plates were found, with perforate and crenulate primary tubercles. Their possible primary abrasion cannot be recognized due to poor preservation.

The Aristotle's lanterns are present in completely disarticulated state only, represented by rotulae (6 pieces), demipyramids (10 pieces) and only one compass. These elements must be attributed to at least three species but their taxonomic identity will be solved in the future. Rotulae are often weakly abraded and sometimes even fragmented. Demipyramids are usually incomplete in their apical parts, fine edges are also generally poorly preserved. In contrast, articulation planes against the neighbouring demipyramids are often well preserved. The compass is not abraded, well preserved with the exception of the adaxial part, which is secondarily broken (probably an artefact from washing).

Spines are the most common echinoid remains in the studied sample. Relatively rare cylindrical spines of cidarid affinity are present, tentatively classified to *Cidaris vesiculosa* Goldfuss. None of these spines is complete: all of them are fragments, often strongly abraded. Spines of pseudodiadematid affinity are more abundant; they are very fine but always equally fragmented. The best preserved spines are those of phymosomatid type (Fig. 7). Some of them are elliptical in cross section, strongly flattened distally (Fig. 7c). These spines are fragmented and strongly abraded or, more rarely, complete and only weakly abraded.

Remarks on taphonomy and ecology

Lithological and structural character of the conglomerate containing the studied taphocoenose indicates its progressive building during storm events or seasonal weather oscillations, involving transport of detrital material from higher positioned parts of the elevation onto its base. As it has been pointed out in the lithological description already, the conglomerate is markedly clast-supported, with only small amount of matrix. The abundance of macrofauna increases upwards across the section, from quartzose sandstones to calcareous sandstones. The fauna, however, undergoes no changes and shows no signs of dissolution in the quartzose sandstones. Therefore, dissolution is not responsible for the quantitative changes of the faunal remains present. Lydite clasts are very often crushed or at least strongly fractured. Faunal remains show the same features in some portions of the conglomerate body. This is particularly well visible in echinoderms whose elements often show old rhombohedral cleavage planes. This cleavage is, however, obtained only after their recrystallization during diagenesis. Crushing of clasts and fossil remains may be related with the compaction of a formerly "looser" conglomerate.

Taphonomic features of faunal remains show a wide qualitative dispersion (see text in individual systematic groups). Preservation of multi-element skeletons of echinoderms is highly variable. The fact that it was the small echinoids that were subjected to the weakest postmortem destruction can be observed at many other localities of the nearshore deposits of the Bohemian Cretaceous Basin, such as Předboj or Radim (Žítt 1993, Žítt *et al.* 1999b). Incomplete disarticulation of these small coronas argues for their relatively rapid burial. Their fine structure and fragility then practically excludes any longer

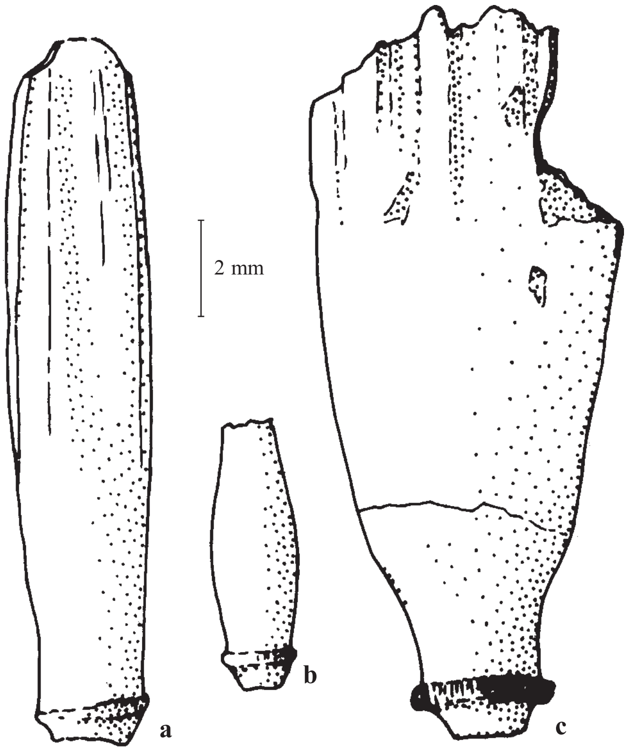

Fig. 7 Phymosomatoid spines from the new exposure at Kuchyňka near Brázdim locality. Scale bar equals 2 mm.

transport together with clasts and sand-dominated sediment, in which they were buried. It can be therefore speculated that these small echinoids form more or less autochthonous component of the preserved taphocoenose. Evidence for the possible transport of these echinoids by postmortem floating (e.g., Glynn 1968) is missing. Judged by the number of skeletal remains, the most common species at the site was *Phymosoma cenomanense* (d'Orbigny). Larger individuals were rare among echinoids, with the probably only autochthonous taxon being *Pyrina* sp. Fragmentation of some larger coronas (particularly *P. cenomanense*) across sutures seems to indicate the possibility of destruction during life of the individuals or shortly after their death (Kidwell – Baumiller 1990, Greenstein 1991), either by purely mechanical effect or by the effect of predators or scavengers. Relatively mobile comatulid crinoids may have belonged, judged by the two preserved calices, to the parautochthonous component of fauna. Postmortem decomposition of calices into centrodorsals and radials generally takes place as the last step in the process of overall decomposition of comatulid skeletons (Meyer 1971, Meyer – Meyer 1986). The absence of abrasion of calices (thus also of possible transport) in this particular case seems to confirm the paraautochthonous character of the species *Semiometra impressa* in the zone of detrital sediments. Their minute brachial elements, on the other hand, undergo very rapid and easy postmortem dispersal throughout the environment (Donovan 1991). Very rare isolated cidarid plates may be of either allochthonous or parautochthonous origin as their skeletons are very rapidly disintegrated even in low-energy environments (analogous features were also accentuated in asteroid skeletons – see Donovan 1991). Nevertheless, the generally massive structure of cidarid shells and the presence of cidarid, usually fragmented and abraded spines, indicate rather a shallower bottom with higher energy and frequent sediment mobility. While regular echinoids represent mostly typical grazers, feeding on algal growths and organic coatings on bottom substrates, and crinoids were generally filtrators feeding mostly on plankton, asteroids were predators dependent on the development of sessile benthos.

Species composition of the studied gastropod assemblage indicates a shallow water environment occuring near the shore. This fauna is characterized by high number of individuals and relatively high species diversity. Patellid species indicate high-energy areas with hard, most probably rocky-bottom substrates with rich microorganism and algal coatings they were grazing. An absence of sand in the proximity of these substrates was necessary (see, e.g., the modern *Patella cochlear* on South African shores (Stephenson – Stephenson 1972)). The recognized species of Archaeogastropoda were associated with a similar type of bottom. On the other hand, adult individuals of Cerithiimorpha were usually hidden in the sand and aquired their food by filtering of water. A sufficient sediment stability and nutrition-rich suspension, possibly below the wave base, were necessary for the survival of these filter-feeders (Bandel 1991).

Strongly abraded gastropod remains (particularly the rare columellae), generally belonging to larger individuals, most probably come from shallower environment with constantly higher energy. Modern information available on Cenomanian gastropods of Europe is unfortunately scarce. Associations relatively close in their species composition have been described from Japan (Kase 1984) and Central Asia and the Caucasus Mts. (Pchelintsev 1953).

Most of the bioclasts derived from bivalves probably come from a shallower zone of sea bottom. Here, their skeletons were also subjected to most of the postmortem taphonomic processes such as detachment from substrates, fragmentation and abrasion. Fragmentation was observed practically in 100 % specimens. The only endurable bivalve remains in the studied set were several minute opercula (upper valves) of rudists and a single shell of the species *Arca*(?) sp. Complete preservation and partial opening of shell valves of this individual evidence its rapid burial, probably during its life or early after its death. In contrast, the 100% disarticulation of shells of larger bivalves including rudists indicates long-term influence of taphonomic processes. Massive skeletons tentatively placed among sponges were most probably forming local growths on rocky bottom or lydite clasts in shallower areas of the bottom. Individuals of bivalves of *Lithodomus* sp., probably still living, were occasionally released from borings in sponges only later, probably due to transport-related fragmentation. These bivalves were immediately buried in sandy sediment along with sponge fragments. Bioerosion of skeletons of rather massive bivalve types (rudists, oysters) was also relatively frequent, possibly inflicted mainly by boring sponges. Attacks by these borers seem to have been fatal in outcome, resulting in rapid postmortem decomposition of the skeletons affected.

Conclusions

The new exposure at Kuchyňka near Brázdim undoubtedly deepened our knowledge of Late Cretaceous sediments and fauna in the western Brandýs nad Labem area, and of nearshore sedimentation in the Bohemian Cretaceous Basin in general. Excavations in the quarry on the SW foot of the hill exposed a section across a thick conglomerate body. The body was progressively built in the Late Cenomanian when the hill of Kuchyňka still functioned as a cliff, and as a shallow submerged elevation later. The newly obtained set of macrofaunal remains indicates a diverse benthic life, in which an important role was played by echinoderms (especially echinoid *Phymosoma cenomanense*), gastropods and rudists. Species composition of the taphocoenose is unique for the Bohemian Upper Cretaceous, although it appears to be close to the classic locality of Předboj (Žítt *et al.* 1999b). Taphonomic features of the organic remains suggest that the taphocoenose has a markedly mixed character, controlled by the general character of shallow-water environment with frequent recycling and high mobility of sediment with bioclasts. Some of the recorded species could have been living in shallower, higher-energy environments on the elevation. Then, their remains could have been episodically transported to the base of the elevation together with detrital material. A number of species could have been possibly dwelling even in the proximity of such clastic deposits or directly in the clast interstices, where rapid ultimate burial of organic remains was more probable. True obrution deposits, formed during obrution episodes (Brett 1990), which would provide implications for faunal autecology are obviously not developed here. The individual faunal groups will be described in more detail in separate papers.

Acknowledgements. We wish to thank especially Mr. J. Bratka from Máslovice (district Prague – east) for providing the excavation works, Dr. O. Nekvasilová from Prague for consultation of selected problems, Dr. V. Ziegler of the Paedagogical Faculty of the Charles University, Prague, for the determination of worms, and Dr. Jiří Adamovič of the Institute of Geology AS CR, Prague, for translating most of the text into English. The study was conducted within the Projects No. 205/99/1315 and 206/01/1580 of the Grant Agency of the Czech Republic and, to some extent, also within the Research Programm of the Institute of Geology, Academy of Sciences of the Czech Republic No. Z3 013912.

Submitted September 11, 2001

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Nová data o svrchnocenomanské tafocenóze lokality Kuchyňka u Brázdimi (česká křídová pánev)

Na jihozápadním úpatí vrchu Kuchyňka u Brázdimi (cca 4 km západně od Brandýsa nad Labem), na okraji starého zavezeného lomu, byl koncem r. 1999 odkryt cca 6 m mocný profil tělesem svrchnocenomanského buližníkového konglomerátu. V převážně písčité až vápnito-písčité rozpadavé matrix tohoto konglomerátu se velmi vzácně vyskytuje neobyčejně zajímavá, v rámci všech lokalit vrchu Kuchyňka, unikátní fauna. Svým celkovým složením se tato fauna značně liší od dosud známých, zhruba izochronních, výskytů, přičemž nejbližší se jeví být zaniklé klasické lokalitě Předboj u Prahy (Žítt *et al.* 1999b). Nejvýznamněji jsou zde zastoupeni ostnokožci, gastropodi a mlži, podřízeně pak přitmelující se aglutinované foraminifery, červi, brachiopodi a masivní nárůsty pracovně zařazené jako houby. Mezi ostnokožci převažuje ježovka *Phymosoma cenomanense* (Cotteau), další druhy ježovek jsou pak vzácnější (např. *Salenia liliputana* Geinitz, *Orthopsis milliaris* (d'Archiac), aj.). Drobní juvenilní jedinci některých druhů jsou zachováni jako větší fragmenty nebo kompletní korony. Mezi izolovanými elementy mořských hvězdic byl poprvé v české svrchní křídě zjištěn druh blízký nebo identický s *Metopaster thoracifer* (Geinitz, 1871), známý dosud jen ze saské křídy. Lilijice jsou reprezentovány komatulidním druhem *Semiometra impressa* (Carpenter). Gastropodi jsou přítomni v 19 většinou drobných druzích, např. *Pileolus koninckianus* de Ryckholt, *Trypanotrochus cretaceus* Kase, *Cirsocerithium reticulatum* (Nagao), *Exechocirsus subpustulosus* Pčelincev, *Haustator subnodus* Pčelincev, *Trajanella fraasi* (Dietrich), *Archimedea rigida* Nagao aj. Mlži jsou zastoupeni hlavně vrtavým druhem *Lithodomus* sp., vrtajícím převážně ve skeletech hub, fragmenty rudista *Ichthyosarcolites* sp. a víčkovitými svrchními miskami rudista *Araeopleura* sp. V souboru mlžích zbytků dominují fragmenty řady zatím neidentifikovaných druhů, z nichž mnohé náleží rovněž rudistům. Fragmenty ústřic jsou velmi vzácné. Tafonomické rysy studovaných organických zbytků ukazují, že tafocenóza má výrazně smíšený ráz, daný generelním charakterem mělkovodního prostředí s častou recyklací a velkou mobilitou sedimentů s bioklasty. Část zjištěných druhů mohla žít v mělčích prostředích elevace s vyšší energií, odkud pak byly její zbytky spolu s klastickým materiálem epizodicky transportovány na úpatí elevace. Řada druhů mohla patrně žít i poblíž takto se vytvářejících klastických uloženin či přímo v mezerních prostorách mezi klasty, kde bylo rychlé definitivní pohřbívání organických zbytků pravděpodobnější. Pravé „obrution deposits" (Brett 1990), jež by mohly poskytnout přesnější data o ekologii fauny, zde však samozřejmě vyvinuty nejsou. Přesto je již nyní zřetelný význam, který bude studium nového souboru fauny z Kuchyňky mít pro hlubší poznání cenomanské fauny i příbřežní sedimentace v české křídové pánvi. Nejdůležitější skupiny fauny budou detailněji popsány v samostatných pracech.