

Foraminifera in the Middle Cambrian of the Barrandian area (Czech Republic)

Foraminifery ve středním kambriu barrandienu (Česká republika)

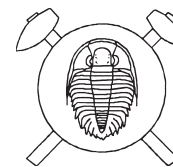
(3 figs)

MIROSLAV BUBÍK

Czech Geological Survey, Leitnerova 658 69 Brno, Czech Republic; e-mail: bubik@cgu.cz

The first find of Middle Cambrian foraminifers in the Jince Formation of the Barrandian area is reported. Poor monospecific agglutinated assemblage of *Thuramminoides* sp. was obtained from grey green shales of the *Eccaparadoxides pusillus* Zone. The find represents evidently a new species of the genus *Thuramminoides* Plummer sensu Loeblich – Tappan (1987), but scarce and fragmentary material is insufficient for erecting a new taxon. Besides foraminifers, one poorly preserved fragment of siliceous sponge spicule was found.

Key words: Barrandian, Middle Cambrian, Jince Formation, Foraminifera, Porifera, Czech Republic



Introduction

Foraminifers of Cambrian age are rare and poor known. Cambrian foraminiferal fossil record consists solely of agglutinated forms of the superfamilies Astrorhizacea and Ammodiscacea besides organic-walled allogromiids respectively. The oldest taxa are recorded already from the lowermost Cambrian of Scandinavia where two large agglutinated forms: (tubular *Platysolenites antiquissimus* Eichwald and ammodiscid *Spirosolenites spiralis* Glaessner) have been known. Føyn – Glaessner (1979) gave a detail description of these forms from the Lower Breivik Formation. Culver (1994) described the richest Cambrian fauna from red siltstones of the Nandoumari Formation of the Taoudeni Basin, west Africa. He recorded 7 species of the genera *Ammodiscus*, *Glomospirella*, *?Tolypammina*, *Turritelletta*, *Hemisphaerammina*, and *?Sorosphaera*. The assemblage is considered to be shallow marine and Early (?Middle) Cambrian in age. Recently Cope – McIlroy (1998) described a new occurrence of Lower Cambrian foraminifers from a limestone horizon within the Allt y Shed Sandstone of South Wales. Three species of the genera *Psammosphaera* and *Saccammina* were obtained by dilution of these limestones.

In acid residue of Middle Cambrian nodular limestones from Sardinia, foraminifers (*Psammosphaera* sp., *Hemisphaerammina* cf. *cecillalickeri*, tubular astrorhizids and questionable ammodiscid phosphatic moulds) were documented by Cherchi – Schroeder (1985)

In central Europe, foraminiferal fauna of Middle Cambrian age is known from the Holy Cross Mountains, Poland. Alexandrowicz (1969) assigned the uniform monothalamous agglutinated forms to the species *Thuramminoides sphaeroidalis* Plummer.

From the Barrandian area – the classical area of the Lower Palaeozoic stratigraphy and palaeontology – the foraminifers have not been known. Barrandian area is famous by its rich micro- and especially macrofossil Cambrian record and seemed to be promising also for

foraminifers. In the last four years the author analysed a set of nine samples collected from various levels of Middle Cambrian. Some of these samples were kindly provided by colleagues working in the Barrandian area (for a list of studied samples see Tab. 1). Another one sample from the recently recognized Lower Cambrian sediments of Moravia (Měnin 1 Borehole, see Fatka – Vavrdová 1998) was also studied.

Majority of the rocks samples are strongly lithified, representing lithologically silty shales. All samples were disintegrated mechanically by hydraulic press, then boiled in washing soda solution, and finally mechanically disintegrated on a rubber plate using rubber stopper. Disintegrated rock was washed on sieve (0.063 mm). Mechanical disintegration could result into a fragmentation of microfossils, but this method is generally providing satisfactory results (for example for Ordovician shales of comparable lithology). All these samples were barren of any microfossils.

In the Autumn 2000 author collected four pilot samples in different stratigraphical levels at the Vinice-Hill near Jince (Fig. 1), under guiding of O. Fatka. Vinice-Hill is the stratotype section of the Jince Formation. The set of samples was collected from lithologically most promising levels of the Jince Formation. Two of the studied samples provided positive results. Rare foraminiferal fauna could be generally compared with that described by Alexandrowicz (1969) from Holy Cross Mts.

Results

Foraminifers were rarely found in two levels (Fig. 1):

(1) sample Vinice 2 (lower part of the *E. pusillus* Zone, A. snajdri – L. rejkovicensis Subzone sensu Fatka – Kordule, 1992), grey green more-or-less silty shale with fragments of trilobite exoskeletons (*Eccaparadoxides* sp. sensu Fatka – Kordule, 1992) provided very rare foraminifers. Faunal density (D) reaches only 0.07 specimens per 1 g of sediment.

Table 1 Studied localities in the Cambrian of the Bohemian Massif.

Locality	age	litho/biostratigraphy	environment/facies	Coll.
Měnin 1 Borehole (507–512 m)	Lower Cambrian	“basal clastic formation”	marine	E. Franců, 1999
Kočka	Lower Cambrian	Holšiny-Hořice Formation (Paseky Shale)	limnic, brackish	R. Mikuláš, 1995
Potůček near Rejkovice	Middle Cambrian	Jince Formation Litavkaspis rejkovicensis Subzone	marine	R. Mikuláš, 1995
Skryje, Luh	Middle Cambrian	Jince Formation Eccaparadoxides pusillus Zone	deeper marine	P. Kraft, 1997
Jince, Vinice 1	Middle Cambrian	basal Jince Formation (Ornamentaspis+Conocoryphe horizon)	brackish?, shallow marine (“Lingula” community)	R. Mikuláš, 1999
Jince, Vinice 2	Middle Cambrian	Jince Formation, A. snajdri - L. rejkovicensis Subzone (lower)	marine	M. Bubík, 2000
Jince, Vinice 3	Middle Cambrian	Jince Formation, A. snajdri - L. rejkovicensis Subzone (higher)	marine	M. Bubík, 2000
Jince, Vinice 4	Middle Cambrian	Jince Formation, O. hybridus - E. pusillus concurrent-range zone	deeper marine	M. Bubík, 2000
Jince, Vinice 5	Middle Cambrian	Jince Formation, Paradoxides gracilis Zone	marine	M. Bubík, 2000
Medový Újezd	Middle Cambrian	uppermost Jince Formation	brackish?, shallow marine (“Lingulella” community)	M. Bubík, 2000

(2) sample Vinice 4 (O. hybridus – E. pusillus concurrent-range zone), grey green shale contain the most diversified faunistic assemblage within the Jince Formation, with a dominance of agnostid trilobites (most probably indicating deepening of the basin). In the washing residuum, relatively frequent fragments of chloritized volcanic glass were observed. Foraminifers are still rare (faunal density $D = 0.12$).

All mostly fragmentary tests can be assigned to the genus *Thuramminoides*.

Besides foraminifers, the washing residue comprises limonitized fragments of trilobite exoskeletons and also one fragment of sponge spicule was recognized (Vinice 4). Fragment is very poor preserved – broken on both ends, recrystallized and corroded. Despite poor preservation, it evidences sponge presence in the studied level.

Systematic paleontology

Foraminifera

Superfamily *Astrorhizacea* Brady, 1881

Genus *Thuramminoides* Plummer, 1945, emended Loeblich et Tappan, 1987

Type species: *Thuramminoides sphaeroidalis* Plummer 1945 (middle Pennsylvanian Texas).

Thuramminoides sp.

Fig. 2a–g

Material: Three deformed specimens, four fragments.

Diagnosis: test small, subcircular to subangular in outline, collapsed and flattened in preservation; no aperture or pores visible; internal cavity simple, without any internal structures; wall whitish, translucent in immersion, very finely agglutinated, most probably composed from very fine quartz grains.

Size: maximal test diameter of two unbroken specimens is 0.19 and 0.24 mm; with respect to test diameter estimated from fragments it could range from 0.15 to 0.36 mm.

Occurrence: In the Jince Formation (Middle Cambrian) *Thuramminoides* sp. was found in the lower part of the *Acadolenus snajdri*-*Litavkaspis rejkovicensis* Subzone of the *Eccaparadoxides pusillus* Zone (Vinice 2, see Fig. 1). Higher in the section it occurs also in the *Eccaparadoxides pusillus*-*Onymagnostus hybridus* concurrent range zone, approximately 6 to 7 m above the *Dawsonia bohemica* Horizon. (Vinice 4, see Fig. 1). Very similar forms of the genus *Thuramminoides* have been observed also in different stratigraphical levels of the Ordovician sequence (Klabava, Šárka, Bohdalec and Kralův Dvůr formations) and Lower Silurian (Litohlavy Formation) of the Prague Basin (Barrandian area).

Remarks: Genus *Thuramminoides* was established by Plummer (1945) with the type species *Thuramminoides sphaeroidalis* Plummer from the middle Pennsylvanian of Texas. Very broad original concept of the type species made from *Thuramminoides* a “taxonomic rubbish-basket” used for miscellaneous Palaeozoic discoidal agglutinated forms. I follow redefinition of the genus by Loeblich – Tappan (1987) which was based on the examination of the holotype specimen. Earlier redefinition of genus by Conkin (1961) and also the following re-

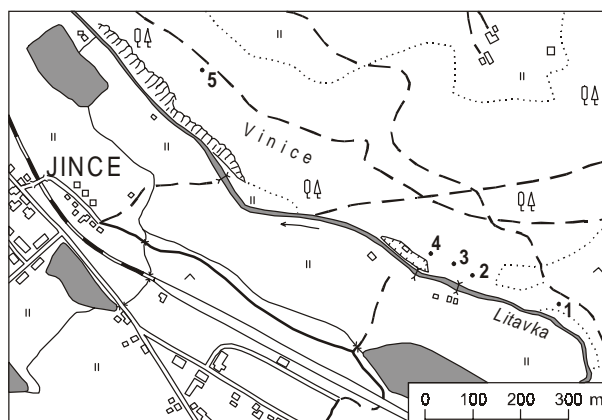


Fig. 1 Topographic situation of studied sites in “Jince, Vinice” section (for details see Tab. 1, following site numbers).

assignment to Radiolaria (Conkin – Conkin, 1979) have not been based on the holotype and thus have no legitimacy. Following Loeblich – Tappan (1987), the genus *Thuramminoides* should be reserved for sub-globular or discoidal forms with no distinct aperture and having both the inner and outer wall surfaces smoothly finished. The form found in the Jince Formation fits to this concept. From the type species representing the only described true species of the genus, the Bohemian form differs by its much smaller size and more irregular outline, representing most probably a new species. I resign from erecting a new species name, considering the scarce and fragmentary material. It will be important to compare this form with much more abundant Ordovician fauna. Very similar, but much larger form was found, for example, in the Upper Ordovician Králův Dvůr Formation (Bubík 1996). The monospecific assemblage from the Jince Formation shows an affinity

to fauna described by Alexandrowicz (1969) from the Polish Middle Cambrian. To *Thuramminoides sphaeroidalis* Alexandrowicz assigned forms with single aperture, and forms with more than one aperture, and also forms with labyrinthic inner structure, besides simple forms without aperture. Only the simple forms without aperture are to be assigned to the genus *Thuramminoides*. They differ generally from the Bohemian form by a little larger size. Alexandrowicz also mentioned differences in the wall appearance. Part of the Polish specimens show white feebly translucent wall, another part have yellowish grey transparent wall. Unfortunately, Alexandrowicz did not mentioned a relation of this character to the presence of aperture.

Representatives of genus *Thuramminoides* belong to the passive suspension feeders, considering the absence of aperture. The distribution of this form was therefore controlled by the amount of organic suspension in the

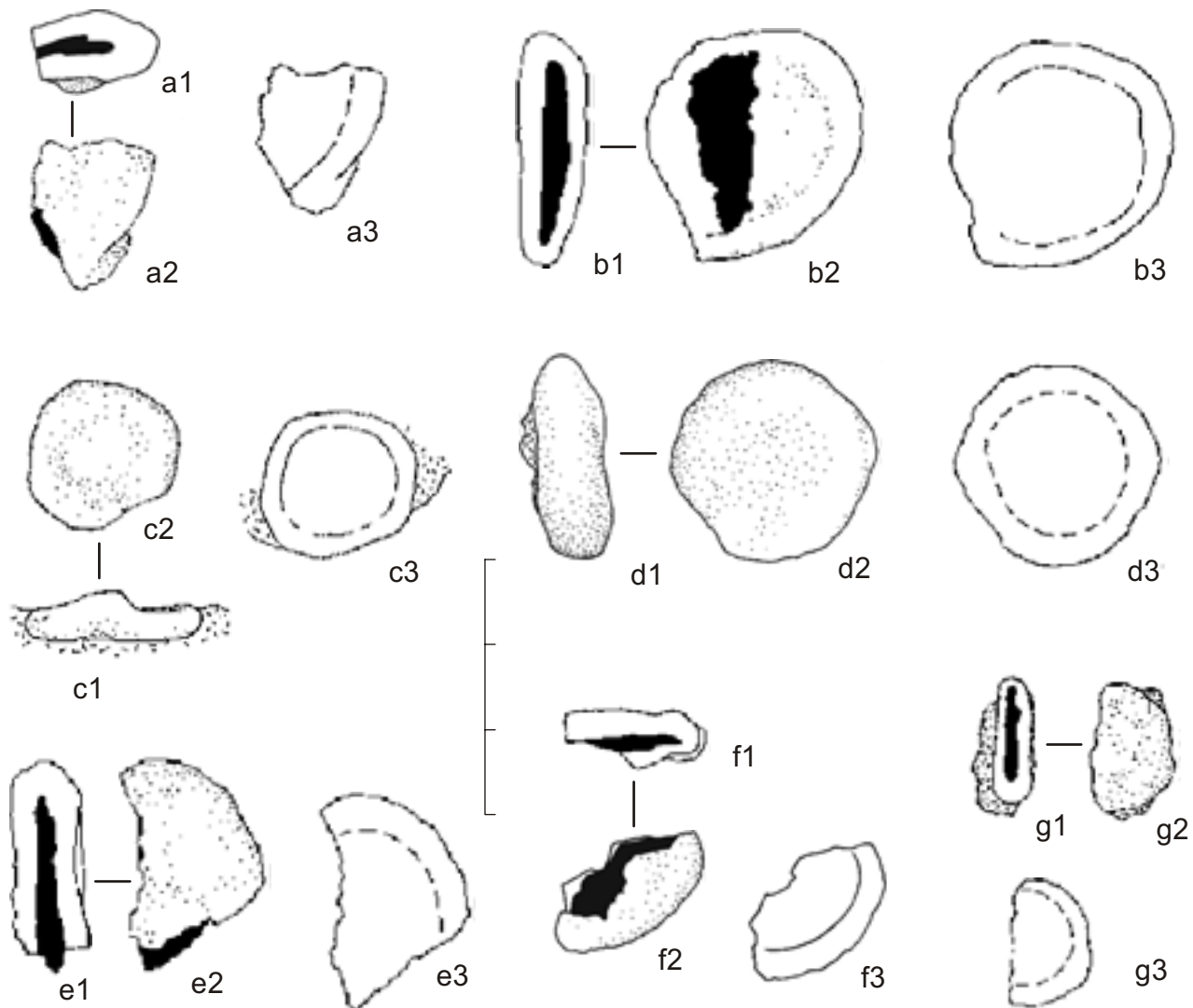


Fig. 2 *Thuramminoides* sp.: a1–b3 – Jince, Vinice 2, *Acadolenus snajdri* – Litavkaspis rejkovicensis Subzone, lower part; c1–g3 – Jince, Vinice 4, *Onymagnostus hybridus* – *Eccaparadoxides pusillus* concurrent-range zone; a3–g3 views are drawn in transparency. Length of bar 0.3 mm.

water. The occurrence of the foraminifers in the Jince Formation is restricted to the levels characterized by a high diversity of both macro- and organic walled microfossils. The foraminifer community was most probably not tolerant to the fluctuation in salinity. Foraminifers are absent in marginal facies characterized by with the “Lingulella community”. Coarser (silty) sediment grain size represents probably another limiting factor which could indicate a higher sedimentation rate, unfavourable for sessile microbenthos. The foraminifers were found in the most fine, pelitic lithotypes of the section. Volcanic activity indicated by glass admixture (ash-fall) could also affect foraminiferal distribution.

Acknowledgements. I wish to thank to R. Mikuláš, P. and J. Kraft, and E. Franců for the rock samples from various localities. J. Kraft and O. Fatka kindly guided me in field when searching for favourable foraminifers-bearing facies. For careful reading of the draft and valuable comments I am grateful to O. Fatka.

Submitted January 15, 2001

References

- Alexandrowicz, S. W.* (1969): *Thuramminoides sphaeroidalis* Plummer (Foraminifera) from Cambrian beds of the vicinity of Sandomierz. – *Rocznik Polskiego Towarzystwa Geologicznego, Krakow*, 39: 1–3, 27–34.
- Bubík, M.* (1996): Nález foraminifer v ordoviku Barrandienu. – *Zprávy geol. Výzk. v Roce 1995, Praha*, 18–20.
- Cherchi, A – Schroeder, R.* (1985): Middle Cambrian foraminifera and other microfossils from SW Sardinia. – *Bollettino della Societa Paleontologica Italiana, Modena*, 23(2): 149–160.
- Conkin, J. E.* (1961): Mississippian smaller foraminifera of Kentucky, southern Indiana, northern Tennessee, and southcentral Ohio. – *Bulletins of American Paleontology, Ithaca*, 43: 131–368.
- Conkin, J. E. – Conkin, B. M.* (1979): North American Ordovician agglutinate foraminifera. – *University of Louisville Studies of in Paleontology and Stratigraphy, Louisville*, 8: 1–24.
- Cope, J. C. W. – McIlroy, D.* (1998): On the occurrence of foraminiferans in the lower Cambrian of the Llangynog Inlier, South Wales. – *Geological Magazine, Cambridge*, 135(2): 227–229.
- Culver, S. J.* (1994): Early Cambrian foraminifera from the southwestern Tauodeni Basin, West Africa. – *Journal of Foraminiferal Research, Washington*, 24(3): 191–202.
- Fatka, O. – Kordule, V.* (1992): New fossil sites in the Jince Formation (Middle Cambrian, Bohemia). – *Věst. Čes. geol. Úst., Praha*, 67(1): 47–60.
- Fatka, O. – Vavrdová, M.* (1998): Early Cambrian Acritarcha from sediments underlying the Devonian in Moravia (Měnin 1 borehole, Czech Republic. – *Věst. Čes. geol. Úst., Praha*, 73(1): 55–60.
- Føyn, S. – Glaessner, M. F.* (1979): Platysolenites, other animal fossils, and the Precambrian–Cambrian transition in Norway. – *Norsk Geologisk Tidsskrift, Oslo*, 59: 25–46.
- Loeblich, A. R. – Tappan, H.* (1987): Foraminiferal genera and their classification. – *Van Nostrand Reinhold Company, New York*, 2 vol., 970 + 212, 847 pl.
- Plummer, H. J.* (1945): Smaller foraminifera in the Marble Falls, Smithwick, and lower Strawn strata around the Llano uplift in Texas. – *Bulletin University of Texas Bureau of Economic Geology and Technology, Austin*, 4401, 209–271.

Foraminifery v kambriu Barrandienu

Foraminifery v kambriu jsou vzácné a znalosti o nich jsou dosud neuspokojivé. Výskyt foraminifer v kambrických sedimentech byl zaznamenán ve Skandinávii, západní Africe, Sardinii, Walesu, Polsku aj. Na našem území jsou foraminifery v kambriu zjištěny vůbec poprvé jako první výsledek dosud převážně neúspěšného mikrozoopaleontologického průzkumu kambrických sedimentů Českého masívu. Jejich nálezy jsou vázány na nižší část jineckého souvrství na klasické lokalitě Vinice v Jincích. Dosud byly zjištěny ve spodní části subzóny *Acadolenus* snajdri – *Litavkaspis rejkovicensis* a přibližně 6 až 7 m nad horizontem s *Dawsonia bohemica* v zóně společného rozsahu *Eccaparadoxides pusillus* – *Onymagnostus hybridus*. Nález představuje celkem 7 převážně fragmentárních jedinců, které lze zařadit do rodu *Thuramminoides* Plummer v pojetí Loeblicha a Tappanové (1987). Lze je charakterizovat jako jednoduřkové aglutinované typy bez zjevného ústí a s hladkým vnějším i vnitřním povrchem. Formy z jineckého souvrství patří jedinému a patrně novému druhu. Od stanovení nového taxonu však bylo upuštěno s ohledem na málo početný a fragmentární materiál. Podobné formy se vyskytují ve více stratigrafických úrovních ordoviku a spodního siluru Barrandienu a bude nutné jejich srovnání s kambrickým materiálem. Limitujícími faktory výskytu monospecifického společenstva *Thuramminoides* sp. v kambriu Barrandienu byl patrně dostatek potravy (organická suspenze), salinita, zrnitost substrátu respektive rychlost sedimentace a patrně i vulkanický spád. Kromě foraminifer byl ve výplavu z břidlic nad horizontem s *Dawsonia bohemica* nalezen ojedinělý nepříznivě zachovalý fragment jehlice silicispongie.