JANINA SZCZECHURA

BIFISSURINELLA (BRYOZOA) FROM THE MIDDLE MIOCENE OF THE CENTRAL PARATEThYS


Bifissurinella cornifera sp.n. and Bifissurinella cf. triangularis Poignant et Ubaldo, 1973, are described from the Middle Miocene of the Central Paratethys. New morphological features are reported in the two species which may support the assignment of Bifissurinella to the Bryozoa. The generic assignment of the described species is discussed.

Key words: Taxonomy, morphology, Bryozoa (Bifissurinella), Middle Miocene, Central Paratethys.

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INTRODUCTION

Two species of Bifissurinella occur in the Middle Miocene (Badenian) sediments of Poland and Austria. In their general appearance, they resemble the specimens referred to Bifissurinella recorded from the Upper Oligocene-Lower Miocene strata of other sites in Europe. This genus was originally assigned to “incertae sedis” (Poignant and Ubaldo 1973; Andreieff et al. 1974) but subsequently included to the Bryozoa (Cheilostomata, Anasca) (Keij 1977). Features not previously observed allow a better understanding of the morphology of this fossil and subcorrobo-
rate its assignment to the Bryozoa. Comparison of Bifissurinella (sensu lato) with the similar genus Bicornifera, gives rise, however, to questions about the validity of the genus Bifissurinella.

**MATERIAL**

In Poland Bifissurinella occurs in silty and fine-sandy sediments of the Middle Miocene (Badenian) age, outcropping in the Carpathian Foredeep. It is present in its northern periphery, i.e. on the southern slopes of the Holy Cross Mts. (Mt. Łysa and Śladków Mały localities), as well as in its central part (Raclawice locality).

In the silty sediments from Mt. Łysa (Korytnica basin, see Baluk and Radwański 1977), Bifissurinella is associated with a shallow and warm-water foraminiferal assemblage, which includes species of Amphi stegina, Heterostegina, Borelis, Dendritina, Pararotalia and others. The character of this microfauna suggests that it belongs to the older Badenian (Globigerinoides Ecozone sensu Szczechura 1982). In the sandy sample from Śladków Mały near Chmielnik (see Studencka and Studencki 1980) Bifissurinella occurs together with a deeper-water assemblage of a probably regressive or colder environment; there are numerous Cibicides and Elphidium representatives, but also rare Pullenia bulloides, Gyroidina sp., Uvigerina div.sp., Hoeglundina scalaris, Globigerina prae­bulloides, Velapertina sp., etc. The character of this microfauna, especially the presence of typical Sarmatian species such as Elphidium reginum, E. echinatum and Articulina sarmatica, suggests that it represents the boundary interval between the Badenian and the Sarmatian.

The silty sample from Raclawice near Miechów (see Gonera and Kulka 1979) which contains Bifissurinella, represents a more open sea environment than found at the above mentioned localities; here it is associated with a rich and highly diversified assemblage of planktic foraminifera including Globorotalia div. sp., Globorotalia div. sp., Orbulina cf. suturalis (rare), Globigerinoides div. sp. This assemblage is indicative of the lower neritic zone of the open sea. The character of the microfauna suggests an older Badenian age (Globigerinoides Ecozone sensu Szczechura 1982).

Comparative material was available from Austria, from an outcrop at Sooss (south of Baden), in the Vienna Basin. The marly sample contains a similar assemblage of foraminifera and is of the same age as that found at Raclawice.

Summarising the environmental preferences of Bifissurinella it appears that it lived in a moderately quiet environment on the shelf, both in its upper and lower part.
REMARKS ON THE SYSTEMATIC POSITION AND TAXONOMY OF BIFISSURINELLA AND SIMILAR FORMS

Bifissurinella was erected by Poignant and Ubaldo (1973) for some Lower Miocene microfossils of France, and referred to as "incertae sedis".

According to the generic diagnosis of Bifissurinella, emended by Keij (1977), this genus is characterized (among others) by "Small proximal zoecium with a circular frontal opening, the two following zoecia with long, narrow, frontal openings bordered by a low rim". Specimens from Poland and Austria externally are almost identical with those so far assigned to Bifissurinella, they have, however, more complicated and more varied morphology of their frontal parts than that described by Keij (1977). It is evident that Keij had at his disposal poorly preserved material, without primary structures, which was admitted by him. He (1977) referred Bifissurinella to the Bryozoa (Cheilostomata, Anasca) erecting a new family Bicorniferidae, mostly on the basis of the connections occurring between chambers and on the basis of lateral rootlet pores and of terminal pores reminding the pores in articulated cheilostomatous Bryozoa; these terminal pores were observed mostly in Bicornifera, a genus close to Bifissurinella.

According to Keij (1977: 230) "... tricamerate tests of Bifissurinella are either the calcified, terminal segments arising from a non-calcified, stolonate system or arise as single colonies with a rootlet system. The smaller terminal chambers may be compared with kenozooecia of Bryozoa, and the two much bigger ones with autozooecia". Keij confirmed, however, that the silt-like character of the frontal apertures, observed in Bicornifera as well as in Bifissurinella are uncommon in Bryozoa and noted that none of the two genera has structures comparable with bryozoan ovicells, avicularia or vibracula.

The interpretation of the morphological structures, observed in Bifissurinella (especially in specimens here described), is not easy. Since there is, however, distinct polymorphism of chambers, and moreover, these chambers possess numerous openings diversified in shape and cryptocyst-like structures, it seems that there are no more obstacles left to refer this genus to the Bryozoa.

The regular of the tube-like proximal end of specimens (zoarium) referred to Bifissurinella (p. 4: 1a, 1b) suggests that it is either the basal part of the entire colony or the terminal part of a segment (internode) with which it was articulated with another segment.

According to its general morphology, Bifissurinella resembles Bicornifera, a genus described as a problematicum from the Oligocene of Austria (Lindenberg 1965). This similarity was also noted by Poignant
and Ubardo (1973), as well as by Keij (1977), who included both forms into the *Bicornifera-Bifissurinella* group.

According to Keij (l.c.) *Bifissurinella* differs from *Bicornifera* by: representing terminal segments or individual colonies instead of an articulated zoarium (as ascribed to *Bicornifera*); being tricamerate in contrast to generally quadricamerate; having a pronounced carina (unknown in *Bicornifera*). According to this author, there is, however, a transitional taxon between the two genera, i.e. tricamerate *Bicornifera lagaaiji*, the distal opening or pore field of which suggests that it represents an internode of an articulated zoarium.

Since in *Bicornifera* from the Oligocene of North America (described as problematicum by Haman et al. 1981) the distal part of the test appears to be nonporous and the proximal part is suggested to be non perforated as well, and because the carina is not a stable feature of *Bifissurinella* (see Keij 1977 and the present paper) it is difficult to distinguish *Bicornifera* from *Bifissurinella*. The large variation in other morphological details, observed by different authors (Keij 1977; Haman et al. 1981; present paper), further adds to the doubt whether both genera warrant a separate systematic status.

*Bifissurinella* (Late Oligocene-Middle Miocene) seems to represent a more integrated colony, with more individualised chambers (zooecia) than found in *Bicornifera* (Paleocene-Oligocene), especially in the Paleocene representatives of that latter genus. But specimens referred to *Bicornifera* also change in time, tending towards a more integrated colony, so that some of the Oligocene species (e.g. *B. lagaaiji* or *B. alpina*, the type species of *Bicornifera*) are hardly distinguishable in this respect from those of *Bifissurinella*.

*Bifissurinella* appears to belong to the same phyletic stock as *Voor- thuyseniella* Szczechura, 1969, which is known from the Early Eocene to Recent and generally considered as a problematicum, while Keij (1977) suggested its affiliation with the Bryozoa.

**SYSTEMATIC PALAEONTOLOGY**


*Stratigraphic range:* Late Oligocene-Middle Miocene.
*Geographic distribution:* SW France, NW Italy, F.R.G., Austria, S Poland.
*Diagnosis* (modified after Keij 1977).—Calcareous, uniserial, terminal, tricamerate segments. Small proximal zooecium followed by two larger ones that have frontal pores and horn-like protuberances. Bilamellar walls separating zooecia perforated by simple septula. Lateral wall with pronounced carina or smooth.
Bifissurinella cornifera sp.n.

(pl. 9: 1; pl. 10: 1—3; pl. 11: 1; pl. 12: 1—4)

Holotype: ZPAL V.XIII/1.

Type horizon: Middle Miocene (Badenian).

Type locality: Mt. Lysa (Korytnica Bay), central Poland.

Derivation of the name: Lat. cornifera — horned.

Diagnosis.— Bifissurinella with horn-like protuberances on second and sometimes also on third zooecium. Carina, if present, parallel and close to the dorsal side.

Material.—Six specimens.

Dimensions (in mm) (without horns):

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<th>ZPAL V.XIII/1</th>
<th>V.XIII/2</th>
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Description.—Zoarium triangular in lateral view, consisting of three tightly joined zooecia of unequal size and shape. The small and rather narrow proximal zooecium is followed by two larger, laterally inflated ones. Distinct, weakly incised sutures between zooecia are seen in transparent specimens. The proximal end is prolonged (in well preserved specimens) by a thin-walled, tube-like rim (pl. 10: 2; pl. 12: 1a, 1b), adjoining and contacting by distinct hollow the first zooecium (pl. 11: 1c; pl. 12: 2c).

The first zooecium is supported frontally by a somewhat concave cover (shield) reminiscent of a cryptocyst, which is bordered by a more or less distinct rim and pierced by one or more openings (pl. 10: 1, 3d); plates partly covering the openings may be present (pl. 10: 3a, 3d). The second zooecium possesses a round or horseshoe-shaped, rather large orifice, partly covered by finely furrowed, deepening inwards shield (cryptocyst-like structure) which is externally distinctly rimmed. The distally prolonged frontal face of this second zooecium together with the orifice rim form a horn-like protuberance. A small and round pore occurs proximally to the orifice, whereas a row of small and round pores occurs in the distal part of the orifice (pl. 9: 1a; pl. 10: 1). The frontal face of the third zooecium, with (or without) the horn-like protuberance, has a round and rather small main orifice and a row of small pores (pl. 9: 1b, 1c, 1f; pl. 11: 1b; pl. 12: 2b). The surface of the zoarium is smooth, sometimes glossy, or finely furrowed. The carina, if present, is generally better developed on the terminal zooecium and runs parallel and close to the dorsal side; it is present in specimens with a flattened dorsal side (pl. 10: 2).

Variability concerns mostly the general shape and size of the specimens and the development of the horn-like protuberances (there may be one or two of them). The rounded or flattened dorsal side of the zoarium may be caused by the shape of substrate to which it was attached. The variation in shape and size of the orifices at the frontal faces of the zooecia is probably a preservational artefact. The proximal end of the specimens may also be differently preserved; generally it is short and broken-off.

Remarks.—In comparison with the most similar species Bifissurinella triangularis Poignant et Ubaldo, 1973. Bifissurinella cornifera sp.n. differs by one or two distinct horn-like protuberances and a carina, if present, that is close to the dorsal side. The horn-like protuberances lack in B. triangularis.
Occurrence.—Poland, Carpathian Foredeep, Mt. Lysa and Raclawice localities, and Austria, Vienna Basin, Sooss locality—Middle Miocene (Badenian).

*Bifissurinella* cf. *triangularis* Poignant et Ubaldo, 1973

*(pl. 11: 2)*

**Material.**—One specimen.

**Dimensions (in mm):**

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**Remarks.**—From the specimens referred to *Bifissurinella triangularis*, by Poignant and Ubaldo (1973) and Keij (1977), the Polish one differs in having a short horn-like protuberance in the distal part of the second zoecium.

Occurrence.—Poland, Carpathian Foredeep, Śladków Mały locality—Middle Miocene, passage layer between Badenian and Sarmatian.

**REFERENCES**


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BIFISSURINELLA (BRYOZOA) ZE ŚRODKOWEGO MIOCENU PARATETYDY CENTRALNEJ

Streszczenie

W pracy opisano Bifissurinella cornifera sp.n. i Bifissurinella cf. triangularis Poignant et Ubaldo, 1973, ze środkowego miocenu (badenu) Polski, z zapadliska przedkarpackiego. B. cornifera sp.n. znaleziono także w materiałach porównawczych z badenu Basenu Wiedeńskiego. Nieznane dotąd u tej grupy mikroskamieniałości szczegóły budowy stwierdzone w opisany w pracy materiale, pozwoliły potwierdzić stanowisko Keija (1977), że reprezentują one mszywoły (Chelostomata); inni badacze tej grupy mikroskamieniałości uznają je za problematyki. W pracy przekształcono przynależność rodzajową opisanych gatunków.

EXPLANATION OF PLATES 9—12

Plate 9

1. Bifissurinella cornifera sp.n.: ZPAL V.XIII/1, holotype; a frontal view of second zooecium showing proximal opening (op), distal openings (od) and main orifice, ×180; b terminal part of the horn-like protuberance of third zooecium, seen from above, showing row of distal openings, ×570; c frontal view of third zooecium showing distal openings arranged in a row, ×210; d general, somewhat oblique frontal view of specimen, ×110; e general, lateral view of specimen, ×110; f proximal part of frontal face of third zooecium, seen from above, showing weakly differentiated openings, arranged in a row, ×570.

Badenian, Mt. Łysa (Korytnica basin), Carpathian Foredeep, Poland.
Plate 10

1—3. *Bifissurinella cornifera* sp.n.: 1—ZPAL V.XIII/1, holotype, frontal view of first and second zooecium, ×120; 2—ZPAL V.XIII/5, general somewhat oblique view of specimen with broken horn-like protuberance of first zooecium, showing flattened dorsal side and carina, ×100; 3—ZPAL V.XIII/2, a somewhat oblique frontal view of specimen showing its proximal part, ×100; b oblique frontal view of third zooecium, ×215; c general lateral view of specimen, ×100; d oblique frontal view of first zooecium showing apertures partly covered by lids, ×350.

1, 3 Badenian, Mt. Lysa (Korytnica basin), Carpathian Foredeep, Poland; 2 Badenian, Sooss near Baden (Vienna Basin), Austria.

Plate 11

1. *Bifissurinella cornifera* sp.n.: ZPAL V.XIII/3, a lateral view of specimen, ×120; b frontal view of third zooecium showing round orifice and small distal openings, ×370; c frontal view of proximal part of specimen showing pore (p) in proximal end, and horseshoe-shaped orifice of second zooecium, ×150.

2. *Bifissurinella cf. triangularis* Poignant et Ubald: ZPAL V.XIII/4, a oblique, frontal view of distal part of specimen, showing secondary slit-like opening of third zooecium, ×150; b lateral view of specimen, ×100; c frontal view of first and second zooecium showing row of more or less elongated openings in second zooecium, ×150.

1 Badenian, Raclawice near Miechów, Carpathian Foredeep, Poland; 2 passage layer between Badenian and Sarmatian, Śladków Mały near Chmielnik. Carpathian Foredeep, Poland.

Plate 12

1—3. *Bifissurinella cornifera* sp.n.: 1—ZPAL V.XIII/5, a lateral view of specimen with broken horn-like protuberance of second zooecium, ×210; b somewhat oblique, frontal view of proximal end showing its regular edge, ×450; 2—ZPAL V.XIII/6, a somewhat oblique, lateral view of specimen with twisted horn-like protuberance of second zooecium and damaged proximal end, ×120; b somewhat oblique, frontal view of third zooecium showing its round orifice and distal openings, ×190; c damaged proximal end pierced by pore (p), ×300; 3—ZPAL V.XIII/7, lateral view of specimen with broken horn-like protuberance of second zooecium, ×120.

1—3 Badenian, Sooss near Baden (Vienna basin), Austria.