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MARGINAL BRYOZOAN CALVINA FROM THE PALEOCENE OF
POLAND

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Calvina kalloensis Willems and *Bicornifera* sp. are described from the Paleocene of Poland. History of studies of *Calvina kalloensis* is presented and its synonymy with *Tricornicella tupilaqi* Hakansson et Jürgensen, 1987, is proved.

Key words: Taxonomy, morphology, Bryozoa (*Calvina*, *Bicornifera*), Paleocene, Poland.

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INTRODUCTION

In the sixties, Prof. K. Pożaryska and myself found some microfossils of the unknown affiliation referred to as “triangular microproblematics”, which co-occur in the Polish Paleocene with foraminifera. Recently, I happened again to come across a “triangular microproblematic” in the Polish Paleocene. This time, however, its preservation state and morphological features enabled me to assign this form to *Calvina kalloensis* Willems, which was originally referred to microfossils *incertae sedis* (Willems 1972). My opinion advanced in the present paper is that *C. kalloensis* is a bryozoan.

In addition to *C. kalloensis*, another bryozoan, *Bicornifera* sp., has been found in the Polish Paleocene and is commented in the present paper.

The material here described is housed at the Institute of Paleobiology, Polish Academy of Sciences, Warsaw (abbr. ZPAL).

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SEM photographs were taken at the Electron Microscopy Laboratory of the Nencki Institute of Experimental Biology, Warsaw. Figures were drawn after the author's sketches by Mrs. D. Sławik (Institute of Paleobiology, Polish Academy of Sciences, Warsaw).

MATERIAL

In Poland "triangular problematics", referred here to *Calvina kolloensis* Willems, 1972, occur in the Paleocene sediments of central and northern part of the country, i.e. in the Polish Lowlands and in southern Baltic. They are quite frequent in the detritic limestones in the Pamiętowo boring in NW Poland (Pomerania). These limestones resemble the typical "tuffeau" known from Belgium and southern Netherlands. A few specimens of *C. kolloensis* have been found in the glauconitic sands in the Sochaczew boring (Central Poland), the deposits in question are referred to the Montian (Pozaryska 1965, Szczuchura and Pozaryska 1968). The most numerous, best developed and preserved specimens of *C. kolloensis* come from tuffeau-like organodetritic sediments from a boring in southern Baltic, from the samples collected at the depths of 14.8—15 m and 28.6—29.65 m. Because of the co-occurring planktic foraminifera (among others *Globoconusa daubjergensis*) I consider these sediments as Danian.

The detritic sediments from Pamiętowo in central Poland were formed in warm and shallow seas what is evidenced by the occurrence of characteristic benthic foraminifera (Pozaryska and Szczuchura 1968, 1970, Szczuchura and Pozaryska 1971). Danian sediments from the Baltic bottom were probably also formed in a similar environment, i.e. warm and shallow sea (upper neritic zone); they contain mainly calcareous benthic foraminifera of the following genera: *Cibicides*, *Rosalina*, *Osangularia*, *Patellina*, *Alabama*, *Rotorbinella*, *Karrerria*, polymorphinids, *Nonion*, *Eponides*, *Valvulineria*, *Pyramidina*, etc. The dominance of wedd-attached forms suggests a high-energy environment. Beside foraminifera one finds exceptionally numerous fragments of bryozoan colonies. In the Paleocene sediments of western Greenland *Tricornicella tupilaqi* (recte *Calvina kolloensis*) comes of similar environments as in Poland, i.e. shallow-water, near-shore and of clastic sediment bottom.

The samples from the Baltic bottom and Sochaczew contained a few specimens of *Bicornifera* sp. (Bryozoa, Cheilostomata), till now recognized by some authors as "*incertae sedis*". Representatives of this genus have so far been known in Poland only from the sediments not older than the Upper Eocene and only from the Carpathian flysch (Liszka 1974).

SYSTEMATIC PALEONTOLOGY

Order **Cheilostomata** Busk, 1852
 Suborder **Anasca** Levinsen, 1909
 Family **Skyloniidae** Sandberg, 1963
 Genus *Calvina* Willems, 1972, emend.

Synonyme: *Tricornicella* Hakansson et Jürgensen, 1987.

Type species: *Calvina kalloensis* Willems, 1972.

Stratigraphic range: Early Paleocene — Early Eocene.

Geographic distribution: Poland, Belgium, western Greenland.

Emended diagnosis.—The diagnosis of the genus as given by Willems (1972) needs emendation in that the test (internode) has one basal corner (proximal end) corresponding to the distal part of the first zoecium, and two disto-lateral corners at the top (distal end) corresponding to the distal part of the second and third zoecium: between the second and third zoecium there is fourth zoecium. All corners are multiporous. Chamber walls are pierced by uniporous septula. Internode, consisting of side-by-side arranged in one plane zoecia, has distinct frontal and back side. No ovicells or avicularia are present, but kenozoecia may occur at the distal parts of the distal corners.

Remarks.—*Calvina kalloensis* Willems, 1972, was described from the Lower Eocene (Ypresian) of Belgium and considered *incertae sedis*. Specimens from Poland are undoubtedly conspecific with those described by Willems (1972). Hakansson and Jürgensen (1987) described from the Paleocene of Greenland *Tricornicella tupilaqi* affiliated to the marginal Bryozoa, which is a junior synonym of *C. kalloensis*.

Hakansson and Jürgensen (1987) used numerous and convincing arguments to prove the bryozoan nature of the discussed form. They also commented the general organization of its colony. In general, I agree with their interpretation.

The difference concerns opinion on the generic features represented by the discussed form. According to Hakansson and Jürgensen at least some representatives of *Kylonisa* Keij, 1972 (i.e. *K. nagappai* Keij, 1972 from the Eocene of India, and *K. triangularis* Keij, 1972 from the Oligocene of France) should be referred to *Tricornicella* (recte *Calvina*). In my opinion, however, only in the most general shape and morphological details and, probably, their functions, *Calvina* resembles the bryozoan genus *Kylonisa* Keij, 1972, referred by Keij to Cheilostomata, Skyloniidae. Keij (1972) referred to that genus three species known from the Middle Eocene up to Middle Oligocene from western Europe, Libya and India. *Calvina* differs from *Kylonisa* mostly in lesser number of zoecia, i.e. four, instead of twelve to sixteen, and in their arrangement: side by side in one plane, with distinct frontal and back side, instead of quadriserial arrangement as in *Kylonisa*. The morphological similarity of *Calvina* and *Kylonisa* probably results from their similar colony ontogenetical development (astogenesis) and similar way of life.

The apparent similarity of *Calvina* and *Biffissurinella* Poignant et Ubaldo, 1973 concerns only the most general appearance of the forms. They both resemble similar in size, minute, triangular pillows. In *Biffissurinella*, however, there are only three distinct, side by side, uniserially arranged zoecia undoubtedly forming terminal segments of sessile zoaria (like in *Bicornifera* Keij, 1977).

Calvina is also somewhat similar, mostly in its external general outline, to *Triangulina* Quilty, 1970, described as "problematica" from the Tertiary of Australia. They differ from each other in number, arrangement and shape of chambers as

well as in shape and number of apertures. Further studies of *Triangulina*, especially of its internal structures may explain its systematic position. In my opinion, it also represents a bryozoan genus.

Calvina kolloensis Willems, 1972

(pl. 9: 1—4; pl. 10: 1—6; pl. 11: 1—6, 9; pl. 12: 1—5)

1972. *Calvina kolloensis* Willems: 62, pl. 3: 3, 4; pl. 5: 4, 5.

1987. *Tricornicella tupilagi* Hakansson et Jürgensen: 105, fig. 3: a—j.

Material.—Forty eight mostly well preserved specimens.

Dimensions (in mm):

	ZPAL XVII/7	XVII/8	XVII/13
Height	0.47	0.34	0.42
Width	0.39	0.31	0.44

Description.—The internode triangular in outline, distinctly flattened, more or less equilateral, generally with more elongated basal corner, i.e. its proximal end. Wall calcareous, non translucent (translucent in specimens from Belgium), smooth when well preserved. As seen in abraded specimens (or in sections of damaged tests), the wall consists of laminar layers with prism-like crystals and sponge-like cavities. Zooecia four in number, arranged side by side in one plane with distinct frontal (pl. 9: 4) and back sides (pl. 9: 3). Each zooecium with more or less developed rather ovate aperture; the latter sometimes surrounded by a deepening inwards shield (?cryptocyst-like structure) and a raised rim (?peristome) (pl. 12: 5). There may be distinguished two lateral zooecia (second and third) and two middle ones (first and fourth) (pl. 9: 3, 4). Aperture of the lower middle zooecium is situated in its central part, whereas those of other zooecia tend to be placed at the periphery of the internode. Distal parts of the first, second and third zooecium with more or less distinct rootlet pores (rosette plate) (pl. 12: 4). Proximal zooecium seems to be provided additionally with one more distinct opening (pl. 9: 3, 4). Sutures between zooecia flushed with surface or somewhat depressed. Wall separating zooecia with well visible pore (uniporous septula) (pl. 10: 4—6).

Variability.—It concerns the size, general shape and the following morphological details of the test: zooecia are individualized to a different extent (cf. pl. 11: 2, 6, 9; pl. 12: 5), and aperture and sutures are more or less distinctive depending rather on the state of preservation of the tests than on the primary structure of the colony.

Remarks.—Specimens from Poland are almost identical with specimens from the Lower Eocene of Belgium. In comparison with specimens from the Paleocene of Greenland (Hakansson and Jürgensen 1987) the Polish specimens are generally smaller and more uniform, especially in their size and general appearance. The specimens from Greenland have only 1—2 pores in their disto-lateral corners, whereas up to 10 pores may be seen in some specimens from Poland.

Globular kenozoecia observed in distal parts of the distolateral corners of the Greenland specimens are not seen in the Polish ones.

Tests of *C. kolloensis* seem to represent internodes of an erect, flexible zoarium its internodes being reproduced bilaterally as is suggested by illustrations in pl. 9: 1, 2. Hakansson and Jürgensen (1987) gave similar interpretation of organization of the colony suggesting, however, more or less regular rotations of internode axes.

The internode found in the sample from Poland, attached to a rock fragment, xenomorphically shaped (pl. 10: 1) seems to represent the basal part of colony. It is similarly built as other internodes, i.e. those of the later part of colony. However, Hakansson and Jürgensen found one specimen much deviating from the rest, i.e. consisting only of one zoecium (autozoecium), and treated by these authors as the earliest part of colony. According to these authors the ancestral complex was of a kenozooidal nature in the species in question. In my opinion, further discussion concerning the earliest stage of development of colony in *C. kolloensis* needs more material and additional researches.

Occurrence.—Lower and Middle Paleocene of central and northern Poland; Lower-Upper Paleocene of Greenland; Lower Eocene of Belgium.

Family *Bicorniferidae* Keij, 1977

Genus *Bicornifera* Keij, 1977

Bicornifera sp.

(pl. 11: 7, 8)

Material.—Five rather poorly preserved specimens.

Remarks.—Due to small number of specimens and their poor preservation state, and also due to high intraspecific variability (incorrectly considered as interspecific which makes it difficult to describe the distinctive features), I leave the nomenclature for this form open.

Occurrence.—Early (Lower and Middle) Paleocene of central and northern Poland.

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MSZYWIOŁ CALVINA Z PALEOCENU POLSKI

Streszczenie

Opisano *Calvina kalloensis* Willems, 1972 (pl. 9: 1—4; pl. 10: 1—6; pl. 11: 1—6, 9; pl. 12: 1—5) i *Bicornifera* sp. (pl. 11: 7, 8) z paleocenu Nizy Polskiego i z dna południowego Bałtyku. Zaliczoną wcześniej do problematyków *Calvina kalloensis* uznano za kongeneryczną i konspecyficzną z *Tricornicella tupilaqi*, gatunkiem zaliczonym do mszywiołów, Cheilostomata, Anasca, opisanym z paleocenu Grenlandii (Hakansson i Jürgensen, 1987). Uważa się, że znajduwane w stanie kopalnym okazy *Calvina kalloensis* stanowią bilateralnie reprodukuje się segmenty (połączone za pomocą stolonów i/albo rizoidów) kolonii trwale przytwierdzających się do podłoża ale elastycznych w wyższych partiach.

Bicornifera sp., zdaniem autorki również reprezentująca mszywioły (Cheilostomata, Anasca), jest po raz pierwszy opisanym przedstawicielem *Bicornifera* z paleocenu Polski.

EXPLANATION OF PLATES 9—12

Plate 9

Calvina kolloensis Willems, 1972

1. Branching (supposed) internode; rhizoids (r) connect mother internode with the successive (daughter) internode through the proximal zoecium of the latter.
2. Supposed shape of colony (zoarium).
3. Diagrammatic presentation of zooecia arrangement and their apertures (o), rootlet pores (r.p.) and pore canal (p.c.) as seen from back side.
4. Diagrammatic presentation of zooecia arrangement and their apertures (o), rootlet pores (r.p.) and pore canal (p.c.) as seen frontally.

Plate 10

Calvina kolloensis Willems, 1972

1. Modified internode attached to the rock particle (substratum) with much elongated second zoecium, ZPAL V. XVII/1, a seen from above, $\times 140$, b seen somewhat obliquely laterally, $\times 100$.
2. Internode seen from back side somewhat obliquely, ZPAL V. XVII/2, a general view, $\times 100$, b enlarged distal part of the third zoecium showing rootlet pores, $\times 400$.
3. Internode seen from back side, general view, ZPAL V. XVII/3, $\times 100$.
4. Damaged internode showing interior of the second zoecium and its uniporous septulum (u.s.), ZPAL V. XVII/4, $\times 140$.
5. Damaged zoecium seen from inside showing uniporous septulum (u.s.), ZPAL V. XVII/5, $\times 120$.
6. Damaged internode seen from inside, showing chamber wall (w.) and uniporous septula V. XVII/6, $\times 140$.

All specimens from the Paleocene (Danian) of the southern Baltic

Plate 11

1—6, 9 *Calvina kolloensis* Willems, 1972

- 1—6, 9. Internodes, ZPAL V. XVII/7—13, seen frontally (1 and 5 somewhat obliquely), showing their varying size and general shape, and varying details of the external morphology; 9 neotype, ZPAL V. XVII/13; $\times 110$, $\times 140$, $\times 100$, $\times 100$, $\times 100$, $\times 140$, $\times 120$.

7, 8 *Bicornifera* sp.

7. Rather well preserved segment in somewhat obliquely lateral view ZPAL V. XVII/19, $\times 100$.
 8. Much damaged segment seen from above, ZPAL V. XVII/20, $\times 100$.
- Specimens 1, 3—6, 9 are from the Paleocene (Danian) of the southern Baltic, 2 from

the Paleocene (Montian) of the Pamiętowo boring (northern Poland), depth — 250.5 m, while 8 from the Paleocene (Montian) of the Sochaczew boring (central Poland), depth — 249 m

Plate 12

Calvina kalloensis Willems, 1972

1. Damaged internode, ZPAL V. XVII/14, *a* general frontal view, $\times 140$, *b* enlarged morphological details, mostly rootlet pores, of the distal part of the third zoecium, $\times 400$.
2. Damaged internode showing microstructure of its external wall, ZPAL V. XVII/15, $\times 200$.
3. Damaged or incomplete internode with possible remnants of the adapertural structure (?cryptocyst), ZPAL V. XVII/16, $\times 180$.
4. Internode in side view, ZPAL V. XVII/17, *a* general view, $\times 100$, *b* enlarged morphological details of distal part of the third zoecium with distinct rootlet pores, $\times 350$.
5. Damaged internode, ZPAL V. XVII/18, *a* general view, $\times 100$, *b*, enlarged morphological details of the first zoecium mostly microstructure of its wall, $\times 400$.

All specimen from the Paleocene (Danian) of the southern Baltic







