INARTICULATE BRACHIOPODS FROM THE LOWER ORDOVICIAN IN NORTHERN POLAND

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Abstract: Some inarticulate brachiopods, including 6 new species and 1 new genus, are described from lowermost Ordovician limestone from vicinity of Leba, northern Poland. The assemblage is dominated by acrotretids some of which are closely related to some Scandinavian species. The described taxa may be of value in correlating upper Tremadocian and lower Arenigian deposits.

Key words: Ordovician, brachiopods, Inarticulata, morphology, taxonomy, new genus, new species.

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INTRODUCTION

Minute inarticulate brachiopods dominated by acrotretids were found during the preparation of conodonts from Lower Ordovician of northern Poland. The present paper contains descriptions of *Pomeraniotreta biernati* n. gen. et n. sp. and of six other species belonging to *Rowellella*, *Conotreta*, *Eurytreta*, *Myotreta*, and *Paterula*. The remaining part of the collection is being studied.

Recently, the author received a written information from Dr Lars Holmer from the University of Uppsala on his collection of inarticulate brachiopods from the Ceratopyge Limestone of Scandinavia. This collection includes brachial valves apparently identical with those described here as *Pomeraniotreta biernati* n. gen. et n. sp., and also articulated shells, i.e. those in which the brachial and pedicle valves are still joined. The pedicle valves appear to be identical with those described by Bednarczyk (1979) as *Torynelasma lebaensis* n. sp.

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STRATIGRAPHIC POSITION OF BRACHIOPOD FAUNA

The inarticulate brachiopods described in this paper have been found in the Lowermost Arenigian limestone from the Białogóra 1 borehole near Łeba in northern Poland (Fig. 1). The stratigraphic position of the limestone has been determined on the basis of the conodont fauna associated with the brachiopods as corresponding to the *Paroistodus proteus* Zone (Bednarczyk, 1979). The limestone is underlain by marly claystones and glauconitites containing conodonts of the same zone, and is overlain by claystones in which graptolites of the *Didymograptus balticus* Zone were found (Bednarczyk, 1979). The glauconitites are underlain by claystones referred by the present author (Bednarczyk, 1979) to the lower Tremadocian. This contact shows a sedimentary discontinuity resulting from submarine erosion, as the upper Tremadocian conodonts, including *Drepanoistodus inaequalis* (Pander) = *D. deltifer* (Lindstrom), are redeposited and mixed with those of the *Paroistodus proteus* Zone.

In the author’s opinion the brachiopods described may have value in correlating the Tremadocian—Arenigian transition beds between northern Poland and Scandinavia.

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Fig. 1. Location of Białogóra 1 borehole and stratigraphic position of brachiopods described. 1 — claystones; 2 — limestones; 3 — marly limestones; 4 — glauconitites; 5 — glauconite; 6 — brachiopod horizon; 7 — scouring surface
SYSTEMATIC DESCRIPTIONS

Family Obolidae King, 1846
Genus Rowellella Wright, 1963
Rowellella parallela n. sp.
(Pl. I: 1,5)

Holotype: Arch. ING PAN 4-78, Pl. I: 5.
Paratype: Arch. ING PAN 11-78, Pl. I: 1.
Type horizon and locality: the Białogóra 1 borehole near Łeba, depth 2701.4—2700.6, m, lowermost Arenigian limestone, Paroistodus proteus Zone.
Derivation of name: parallela (Latin) — parallel.
Material: 28 brachial valves.

Diagnosis: Valve small, strongly geniculate of almost parallel lateral margins.

Description: Valve small, usually about 1.0 mm long and 0.7 mm wide, thick, multilayered, strongly geniculate in anterior part. Lateral margins straight and almost parallel one to another in median part, anterior margin broadly rounded. Outer valve surface covered with numerous lamellae the anterior edges of which are elevated (Pl. 1: 5). There are about 16 lamellae per 0.5 mm. The lamellae surfaces are ornamented with single concentric lines.

Valve interior shows a broad limbus that surrounds the concave part of valve (Pl. I: 1). Faint traces of pallial impressions are sometimes noted.

Remarks: Because of the bad state of preservation (damaged umbonal part) it is impossible to distinguish the pedicle valve from the brachial one. As the brachial valve is more bent than the pedicle one it may be supposed that majority of the valves in the collection are the brachial ones.

Comparisons: Rowellella distincta Bednarczyk & Biernat (1978, pl. 17: 1, 2) and Rowellella sp. from the Lower Ordovician of the Góry Świętokrzyskie Mts and Estonia, as described by Biernat (1973, pl. 3: 1), differ from the species described in having a smaller number of lamellae per mm. Rowellella rugosa Goryansky (1969, pl. 8: 4, 5—7) is larger and its stronger lamellae are more widely spaced. Rowellella minuta Wright (1963, pl. 1: 8—12 and 24—28), is almost twice as long as wide whereas in R. parallela the width is morely 1/3 smaller than length; Rowellella marginata Krauss & Rowell (1975, pl. 3: 8—15) has slightly arcuate lateral margins, is more elongated and twice as large as R. parallela. R. lamellosa Popov (1975, pl. 3: 1—3) differs from the species in question by its irregular concentric lines.

Occurrence: N Poland, vicinity of Łeba, Lower Ordovician, the conodont Paroistodus proteus Zone.

Rowellella multilamellata n. sp.
(Pl. I: 2, 4)

Holotype: Arch. ING PAN 5—78, Pl. I: 2.
Type horizon and locality: the Bialogóra 1 borehole near Łeba, depth 2701.4—2700.6 m, lowermost Arenigian limestone, *Paroistodus proteus* Zone. Derivation of name: *multilamellata* (Latin) — with many lamellae.

Material: 7 brachial valves.

Diagnosis: Minute valves slightly curved (geniculate) with numerous lamellae.

Description: Brachial valve small, about 1 mm long and 0.8 mm wide. Lateral margins slightly arcuate. Anterior margin rounded. Valve thick, multilayered. Outer valve surface covered with numerous lamellae. There are about 25 lamellae per 0.5 mm. No concentric striae have been observed on lamellae surfaces. Valve slightly geniculate as compared to *R. parallela*. Valve interior shows narrow limbus and traces of palium (Pl. I: 4).

Comparisons: All the morphologic differences mentioned in the description of *R. parallela* n. sp. pertain to this species as well. The new species is most similar to *Rowellella lamellosa* Popov (1975). This does not refer to the ornamentation details.

Occurrence: N Poland, vicinity of Łeba, Lower Ordovician, the conodont *Paroistodus proteus* Zone.

Family *Paterulidae* Cooper, 1956
Genus *Paterula* Barrande, 1879

*Paterula? delicata* n. sp.

(Pl. VI: 1–3)

Holotype: Arch. ING PAN, 7-78, Pl. VI: 3.
Paratype: Arch. ING PAN, 8-78, Pl. VI: 1.

Type horizon and locality: the Bialogóra 1 borehole near Łeba, depth 2701.4—2700.6 m, lowermost Arenigian limestone, *Paroistodus proteus* Zone.

Derivation of name: *delicata* (Latin) — delicate, thin.

Material: 25 pedicle valves.

Diagnosis: Valve oval, narrowing toward anterior part, with small, distinct umbo located near the posterior margin.

Description: Valve very thin, slightly transparent, oval, narrowing toward anterior part. Length about 1 to 1.5 mm, width 0.6 to 0.9 mm at a 2/3 distance from posterior margin. The largest width, 0.8 to 0.13 mm, approximately at mid length. The largest valve convexity can be observed in the umbal part and is usually about 0.3 mm. Small but distinct umbo is located near the posterior margin but does not reach it. An initially narrow furrow runs through the center of umbo broadening and becoming shallower toward the anterior part of valve (Pl. VI: 3). Outer valve surface is ornamented with delicate but distinct concentric growth lines (Pl. VI: 1, 3).

Remarks: Poorly observable interior of the valve makes the inclusion of the studied specimens in the genus *Paterula* uncertain. Nevertheless, a narrow limbus, shape and location of umbo, and even the traces of muscle scars noted in the valve interior suggest that the valves do belong to the Barrande's genus. These characters correspond to those given by Goryansky (1969, p. 5).

Comparisons. The species in question is close to *Orbiculoidea? subovalis* Biernat
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(1973, p. 103). The differences lie, first of all, in more dense spacing of the concentric growth lines and smaller space between the umbo and the posterior margin. The species here described differs from the known representatives of the genus *Paterula* in the presence of a shallow furrow passing through the center of the valve. Occurrence: N Poland, vicinity of Łeba, Lower Ordovician, the conodont *Paroistodus proteus* Zone.

Family *Acrotretidae* Schuchert, 1893
Subfamily *Acrotretinae* Schuchert, 1893
Genus *Conotreta* Walcott, 1899
*Conotreta parva* n. sp.
(Pl. IV: 1)

Holotype: Arch. ING PAN 5-78, Pl. IV: 1.
Type horizon and locality: the Białogóra 1 borehole near Łeba, depth 2701.4—2700.6 m, lowermost Arenigian limestone, *Paroistodus proteus* Zone.
Derivation of name: *parva* (Latin) — small.
Material: 13 brachial valves in good state of preservation.
Diagnosis: Brachial valve of small dimensions with low fin-like median septum and pseudointerarea with triangular furrow.
Description: Brachial valve oval in outline, with small umbo and wide pseudointerarea on which a triangular furrow is visible. Valves about 0.65 to ca. 1.5 mm long and 0.65 to 1.5 mm wide; length of septum from ca 0.35 to 0.76 mm.
The valve interior with small median septum resembling a half of a fin in profile. It begins near the median plate close to the anterior margin of pseudointerarea (Pl. IV: 1) and rises at low angle toward the anterior margin of valve but does not reach it; from the top of septum it falls rapidly near the limbus. A pair of cardinal muscle scars visible on both sides of septum.
Comparisons: Because of its oval outline the valve resembles *Conotreta mica* Goryansky (1969, pl. II: 5, 6). It differs from that species in being smaller and having shorter median septum the top of which is more protruding forwards. Similar septum has been noted in *Conotreta czarnockii* Bednarczyk (1964, pl. IX: 2); *C. parva* n. sp. differs from the latter species in being approximately eight times smaller and having more pronounced umbo. *Conotreta cf. czarnockii* Bednarczyk (Bednarczyk & Biernat 1978, pl. 18: 2a, b) is much wider than long, its posterior margin is more straight and the umbo less pronounced.
Occurrence: N Poland, vicinity of Łeba, Lower Ordovician, the conodont *Paroistodus proteus* Zone.

Genus *Eurytreta* Rowell, 1966
*Eurytreta minor* Biernat, 1973
(Pl. I: 3; Pl. V: 1–3)
Material: 3 pedicle valves.
Description: Pedicle valve very small, 1—2 mm long, 1.1 mm wide, in the shape of an asymmetric cone. Umbo protruding posteriorly and extended in the apical part into short tube terminated with oval pedicle foramen (Pl. I: 3).

Outer valve surface covered with numerous concentric growth lines that pass through the pseudointerarea (Pl. V: 2, 3). Protegular part pitted; pitting consists of coarser (1 to 2 μm) and smaller (0.3 μm) pits (Pl. V: 1, 2) corresponding to the second pattern of pitting of Bitter & Ludvigsen (1979).

Remarks: It seems highly probable that *Eurytreta* sp. from the Scandinavian collection (Holmer, written information, 1985) also represents this species. If this is really so, the geographic range of *E. minor* would be from the Góry Świętokrzyskie Mts to Scandinavia.

Occurrence: N Poland, vicinity of Łeba, Lower Ordovician, the conodont *Paroistodus proteus* Zone; the Góry Świętokrzyskie Mts, Upper Tremadocian, the conodont *Drepanoistodus deltifer pristinus* Subzone.

Genus *Myotreta* Goryansky, 1969

*Myotreta goryansky* n. sp.

(Pl. IV: 2, 3)


Holotype: Arch. ING PAN 7-78, Pl. IV: 2, 3.

Type horizon and locality: the Białogóra 1 borehole near Łeba, depth 2701.4—2700.6 m, lowermost Arenigian limestone, *Paroistodus proteus* Zone.

Derivation of name: in honour of Dr V. Yu. Goryansky, a distinguished Soviet brachiopod specialist.

Material: 9 pedicle valves.

Diagnosis: Valve of microscopic size, with slightly incurved beak terminated with short pedicle tube.

Description: Pedicle valve of microscopis size, resembling a curved beak; length 0.4 to 0.5 mm, width 0.4 to 0.6 mm, convexity 0.5 to 0.6 mm. Apex terminated with short tube with oval foramen pedicle (Pl. IV: 2). Pseudointerarea apsacline, flat and hardly distinguishable from the lateral valve surface. The valve outline almost circular, posterior margin almost straight. Anterior valve surface more convex than the lateral one. The outer valve surface covered with concentric growth lines. They may be simple or bifurcating (Pl. IV: 3).

The valve interior filled with sediment that is difficult to remove, which does not allow to make observations.

Comparisons: The valve here described resembles in shape and size the pedicle valve of *Myotreta crassa* Goryansky (1969, p. 67, pl. II: 10—17, 24, 26) but differs in having less curved umbo, lacking the internal furrow on pseudointerarea and having slightly longer pedicle tube.

Occurrence: N Poland, vicinity of Łeba, Lower Ordovician, the conodont *Paroistodus proteus* Zone.
Subfamily *Torynelasmatinae* Rowell, 1965
Genus *Pomeraniotreta* n. gen.

**Type species:** *Pomeraniotreta biernati* n. sp.

**Derivation of name:** *Pomerania* (Latin) — the name of a region in northern Poland.

**Diagnosis:** Torynelasmatids having discoidal protegulum, weakly developed median septum of the brachial valve and a pair of narrow-oval muscle scars on both its sides.

**Remarks:** The peculiar structure of the brachial valve showing discoidal protegulum unknow so far in other *Acrotretidae* justifies separation of the new genus. Weakly developed median septum of the brachial valve and a pair of oval muscle scars on both its sides are the characters that make this new form different among the torynelasmatininds. The affinities to this subfamily as well as to *Acrotretidae* are best observable in the structure of the juvenile part (protegulum) typical of the first pattern of pitting of Bitter & Ludwigsen (1979). The second important feature is the pedicle foramen located excentrically on short external tube.

**Occurrence:** N Poland, vicinity of Łeba, Lower Ordovician, the conodont *Paroistodus proteus* Zone.

*Pomeraniotreta biernati* n. sp.

(Pl. II: 1–3; Pl. III: 1–3; Fig. 2)


1971. Acrotretacean pedicle valves... Poulsen, p. 265–273, pl. 1: 1, 2; pl. 2: 1.

**Holotype:** Arch. ING PAN, 9-78, Pl. II: 2–3.

**Paratype:** Arch. ING PAN, 10-78, Pl. III: 1–3.

**Type horizon and locality:** the Bialogóra 1 borehole near Łeba, depth 2701.4–2700.6 m, lowermost Arenigian limestone, *Paroistodus proteus* Zone.

**Derivation of name:** in honour of Professor Gertruda Biernat, a distinguished Polish brachiopod specialist.

**Material:** about 200 brachial valves and about the same number of pedicle valves.

**Diagnosis:** Pedicle valve slender, conical, with pedicle foramen located eccentricaly on short external tube. Brachial valve weakly convex, oval, laterally elongate, with characteristic thick discoidal protegular part.

**Description:** Pedicle valve in the shape of a slender asymetrical cone, with pedicle foramen located eccentricaly on short external tube. Outline of pedicle valve oval. Valves about 0.37 to 0.5 mm long and 0.37 to 0.5 mm wide. Pseudointerarea procline, weakly marked with shallow internal furrow. External ornamentation composed of densely set concentric growth lines passing also through pseudointerarea. These lines are regulary spaced and of different thickness, i.e. between every few slender lines there occurs one coarser line; nine such coarse lines occur on each valve (Pl. III: 2). Protegular part has distinct vesicular structure corresponding to the first pattern of pitting of Bitter & Ludwigsen (1979).
Brachial valve oval in outline, weakly convex, about 0.37 to 0.56 mm long and 0.3 to 0.5 mm wide. Protegular part in the form of a thick discoidal swell. A shallow, narrow furrow runs along the internal elevated margin of this disc. Apex is slightly posterior. Vesicular structure of the brachial protegulum is similar to that in pedicle one (Pl. II: 3). Pseudointerarea apsacline, with broad interthrough. External surface is ornamented with numerous delicate concentric striae which occur also on the surface of the pseudointerarea (Pl. II: 1).

The interior of pedicle valve was not observed. The interior of brachial valve shows a broad limbus (width ca 1/3 of the median width of valve). Median septum indistinct, low, with a pair of weakly marked, oval, relatively large muscle scars (Pl. II: 1, Fig. 2).

![Fig. 2. Interior of brachial valve of *Pomeraniotreta biernati* sp. n., x75. d — discoidal swell of protegulum; m sc — muscle scars; ms — median septum; l — limbus](image)

Remarks: The presence of the discoidal swell of the protegulum of the brachial valve is the main diagnostic character of this genus and species. The weakly developed median septum of the brachial valve is remarkable. It may represent a feature characteristic of the oldest representatives of *Torynelasmataineae* (Biernat, 1984).

The specimens described by Poulsen (1971, p. 265—73) as “Acrotretacean pedicle valves” are similar to the species discussed in having similar outline and the general appearance of pedicle valve, and thus are included in its synonymy. Also some brachial and pedicle valves from the Ceratopyge Limestone of Scandinavia are identical with *P. biernati* n. sp. (Holmer, written information including also SEM micrographs, 1985).

Occurrence: North Poland, vicinity of Łeba, Lower Ordovician, the conodont *Paroistodus proteus* Zone. Ceratopyge Limestone of the Upper Tremadocian of Scania and Oslo region (Slemmestad, Killingen) in Norway*.

**REFERENCES**


* Recently, the author received from Dr. Michal Mergl, Ustřední ústav geologický, Praha, some photographs of brachial valves belonging unquestionably to *Pomeraniotreta biernati* that were found within a clay-clast in a single bed of greywacke in the lowermost Klabava Formation (near the base of the Arenigian) in Bohemia.


Streszczenie

BEZZAWIASOWE BRACHIOPODY Z DOLNEGO ORDOWIKU PÓŁNOCNEJ POLSKI

Wiesław Bednarczyk

W szarych, marglistych wapieniach najniższego arenigu północnej Polski (otwór Białogóra 1, Fig. 1) stwierdzono zespół bezzawiasowych brachiopodów w asocjacji z konodontami reprezentującymi zonę Paraistodus proteus. Wapienie te występują ponad marglistymi iłowcami i glauconitytami zawierającymi konodonty tej samej zony (Bednarczyk, 1979). W stropie wapienie te kontaktują z iłowcami, w których znaleziono graptolity poziomu Didymograptus balticus (Bednarczyk, 1979). Poniżej glauconitytów znajdują się iłowce tremadoku. Kontakt ten wskazuje na niezgodność wywołaną procesami podmorskiej erozji, bowiem w zespole konodontowym reprezentującym zonę Paraistodus proteus napotkano redeponowane konodonty górnotremadockie (m. in. Drepanoistodus? inaequalis (Pander)).

Wśród brachiopodów dominują akrotretidy reprezentujące w większości nowe gatunki, a w jednym przypadku nowy rodzaj i nowy gatunek. Ten ostatni zaszczytuje na szczególną uwagę ze względu na nieznany dotychczas dyskoidalny kształt protegulum skorupki brachialnej.

Ogółem opisano siedem gatunków należących do rodzajów: Rowellella (R. pannella n. sp., R. multilamellata n. sp.), Paterula (P. delicata n. sp.), Eurytreta (E. minor Biernat), Conotreta (C. parva n. sp.) i Myotreta (M. goryansky n. sp.). Nowy rodzaj i nowy gatunek opatrzono nazwą Pomeraniotreta biernati. Zdaniem autora gatunki te mogą mieć znaczenie w szczególności dla stratygrafii utworów z przełomu
tremadoku i arenigu nie tylko północnej Polski, ale także i Skandynawii i Czecho-
slowacji.

Dzięki uprzejmości dra Larsa Holmera z Uniwersytetu w Uppsali, autor mógł
stwierdzić w kolekcji brachiopodów bezzawiasowych z wapienia ceratopygowego
Skanii obecność między innymi skorupek brachialnych i pedikularnych reprezent-
tujących Pomeraniotreta biernati n. gen. et. sp.

EXPLANATION OF PLATES

All specimens derived from Białogóra 1 borehole, depth 2701.4—2700.6 m.

Plate I

1,5. — Rowellella parallela n. sp. 1 — holotype, Arch. ING PAN 4—78, interior of brachial
valve, posterior part damaged, × 60; 5 — paratype, Arch. ING PAN 11—78, exterior
of brachial valve, posterior part damaged, × 100

2,4. — Rowellella multilamellata n. sp. 2 — holotype, Arch. ING PAN 5—78, exterior of brachial
valve, posterior part damaged, × 100; 4 — paratype, Arch. ING PAN 12—78, interior
of brachial valve, posterior part damaged, × 60.

3. — Eurytreta minor Biernat. Posterior view of pedicle valve, × 100

Plate II

1—3. — Pomeraniotreta biernati n. gen. et n. sp. 1 — paratype, Arch. ING PAN 10—78, interior
of brachial valve, × 150; 2 — holotype, Arch. ING PAN 9—78, exterior of brachial valve,
× 100; 3 — protegular part of the same brachial valve, × 300

Plate III

1—3. — Pomeraniotreta biernati n. gen. et n. sp. 1 — holotype, Arch. ING PAN 9—78, lateral view
of pedicle valve, × 100; 2 — paratype, Arch. ING PAN 10—78, posterior part of pedicle
valve, × 75; 3 — protegular part of the same specimen, × 750

Plate IV

1. — Conotreta parva n. sp., holotype, Arch. ING PAN, 3—78, internal view of pedicle valve,
× 50

2.3. — Myotreta goryansky n. sp. 2 — holotype, Arch. ING PAN 2—78, lateral view of pedicle
valve, × 200; 3 — surface ornamentation of the same valve, × 2000

Plate V

1—3. — Eurytreta minor Biernat. 1 — fragment of pitted protegulum of pedicle valve, × 3000;
2 — junction of protegulum and adult valve, the same specimen, × 600; 3 — the same
specimen, apical view, × 60

Plate VI

1—3. — Paterula? delicata n. sp. 1 — holotype, Arch. ING PAN 7—78, external surface of pedicle
valve, × 60; 2 — interior of pedicle valve, × 60; 3 paratype, Arch. ING PAN 8—78,
surface ornamentation of pedicle valve, × 50
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