

## 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 Łeba, 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.

The author expresses his cordial thanks to Professor Gertruda Biernat for kind discussion concerning the new acrotretid species and for her useful remarks, and to Dr Lars Holmer for sending scanning photographs of the Scandinavian specimens.

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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

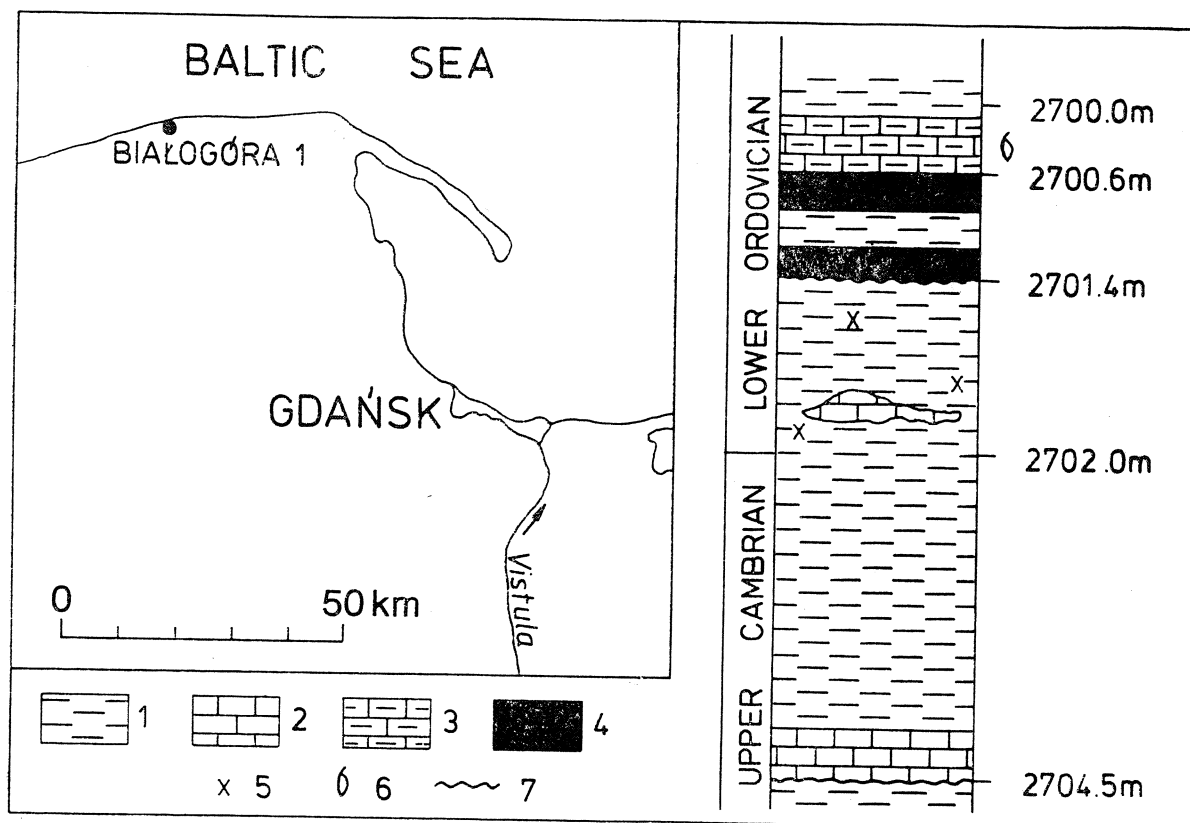


Fig. 1. Location of Białogóra 1 borehole and stratigraphic position of brachiopods described. 1 — claystones; 2 — limestones; 3 — marly limestones; 4 — glauconitites; 5 — glauconite; 6 — brachiopod horizon; 7 — scouring surface

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.

## 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. I: 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 more or less 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.

Paratype: Arch. ING PAN 2–78, Pl. I: 4.

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: *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 Białogóra 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 umbonal 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

(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)

1973, *Eurytreta minor* Biernat: p. 74, pl. IX: 16, text-fig. 26.

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  $\mu\text{m}$ ) and smaller (0.3  $\mu\text{m}$ ) pits (Pl. V: 1, 2) corresponding to the second pattern of pitting of Bitter & Ludwigsen (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)

1973. *Myotreta* sp., Biernat, p. 85, pl. XV: 6.

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 microscopic 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 aplanate, 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, 1965Genus *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 unknown 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 torynelasmatinids. 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)

1979. *Torynelasma lebaensis* Bednarczyk, p. 415 (nomen nudum).

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 Białogóra 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 eccentrically 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 asymmetrical cone, with pedicle foramen located eccentrically 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 regularly 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).

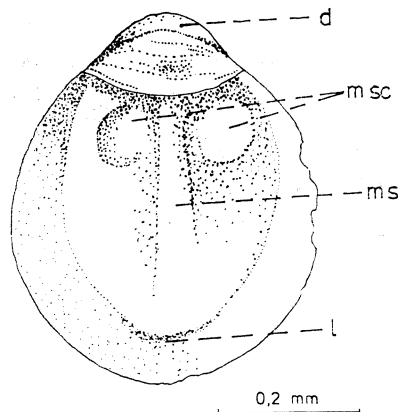


Fig. 2. Interior of brachial valve of *Pomeraniotreta biernati* sp. n.,  $\times 75$ . d — discoidal swell of protegulum; m sc — muscle scars; ms — median septum; l — limbus

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 *Torynelasmatinae* (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\*.

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\* Recently, the author received from Dr. Michal Mergl, Ustředni 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.



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### Streszczenie

## BEZZAWIASOWE BRACHIOPODY Z DOLNEGO ORDOWIKU PÓLNOCNEJ 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 glaukonitytami zawierającymi konodonty tej samej zony (Bednarczyk, 1979). W stropie wapienie te kontaktują z iłowcami, w których znaleziono graptolity poziomu *Didymograptus balticus* (Bednarczyk, 1979). Poniżej glaukonitytów znajdują się iłowce tremadoku. Kontakt ten wskazuje na niezgodność wywołaną procesami podmorskiej erozji, bowiem w zespole konodontowym reprezentującym zonę *Paraistodus proteus* napotkano redeponowane konodonty górno-tremadockie (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 zasługuje na szczególną uwagę ze względu na nie znany dotychczas dyskoidalny kształt protegulum skorupki brachialnej.

Ogółem opisano siedem gatunków należących do rodzajów: *Rowellella* (*R. parallela* 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 opatrzone 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 Czechosłowacji.

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 reprezentujących *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,  $\times 60$ ; 5 — paratype, Arch. ING PAN 11–78, exterior of brachial valve, posterior part damaged,  $\times 100$
- 2,4. — *Rowellella multilamellata* n. sp. 2 — holotype, Arch. ING PAN 5–78, exterior of brachial valve, posterior part damaged,  $\times 100$ ; 4 — paratype, Arch. ING PAN 12–78, interior of brachial valve, posterior part damaged,  $\times 60$ .
3. — *Eurytreta minor* Biernat. Posterior view of pedicle valve,  $\times 100$

#### Plate II

- 1–3. — *Pomeraniotreta biernati* n. gen. et n. sp. 1 — paratype, Arch. ING PAN 10–78, interior of brachial valve,  $\times 150$ ; 2 — holotype, Arch. ING PAN 9–78, exterior of brachial valve,  $\times 100$ ; 3 — protingular part of the same brachial valve,  $\times 300$

#### Plate III

- 1–3. — *Pomeraniotreta biernati* n. gen. et n. sp. 1 — holotype, Arch. ING PAN 9–78, lateral view of pedicle valve,  $\times 100$ ; 2 — paratype, Arch. ING PAN 10–78, posterior part of pedicle valve,  $\times 75$ ; 3 — protingular part of the same specimen,  $\times 750$

#### Plate IV

1. — *Conotreta parva* n. sp., holotype, Arch. ING PAN, 3–78, internal view of pedicle valve,  $\times 50$
- 2,3. — *Myotreta goryansky* n. sp. 2 — holotype, Arch. ING PAN 2–78, lateral view of pedicle valve,  $\times 200$ ; 3 — surface ornamentation of the same valve,  $\times 2000$

#### Plate V

- 1–3. — *Eurytreta minor* Biernat. 1 — fragment of pitted protigulum of pedicle valve,  $\times 3000$ ; 2 — junction of protigulum and adult valve, the same specimen,  $\times 600$ ; 3 — the same specimen, apical view,  $\times 60$

#### Plate VI

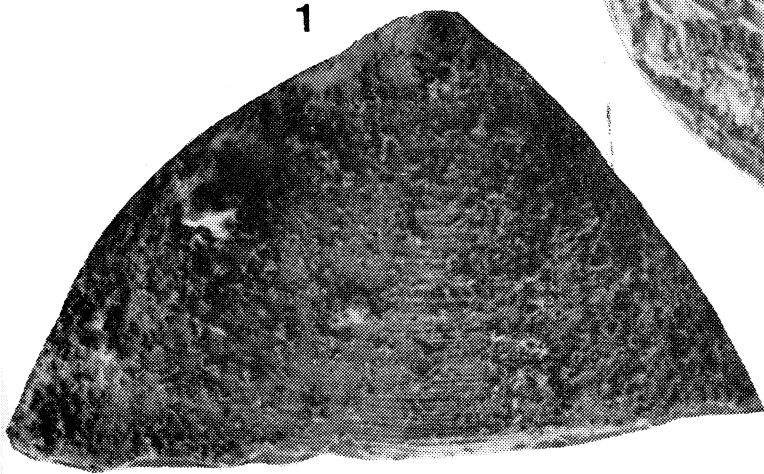
- 1–3. — *Paterula? delicata* n. sp. 1 — holotype, Arch. ING PAN 7–78, external surface of pedicle valve,  $\times 60$ ; 2 — interior of pedicle valve,  $\times 60$ ; 3 paratype, Arch. ING PAN 8–78, surface ornamentation of pedicle valve,  $\times 50$



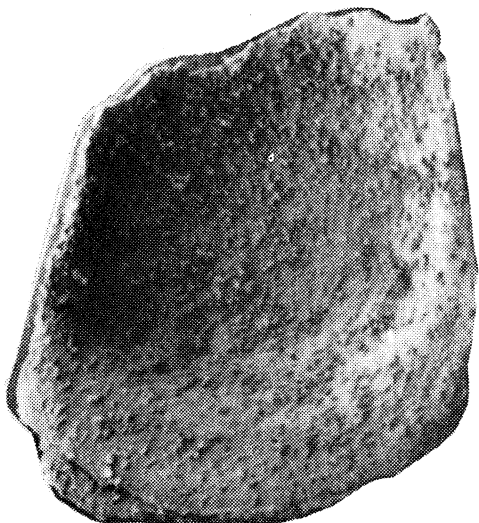
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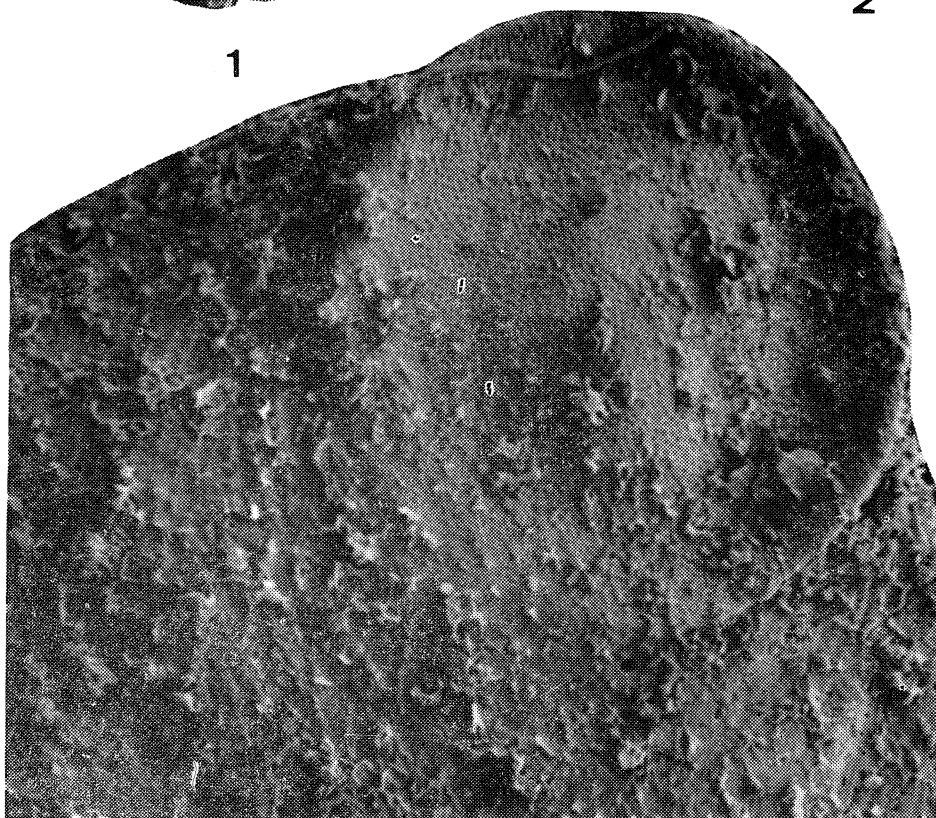
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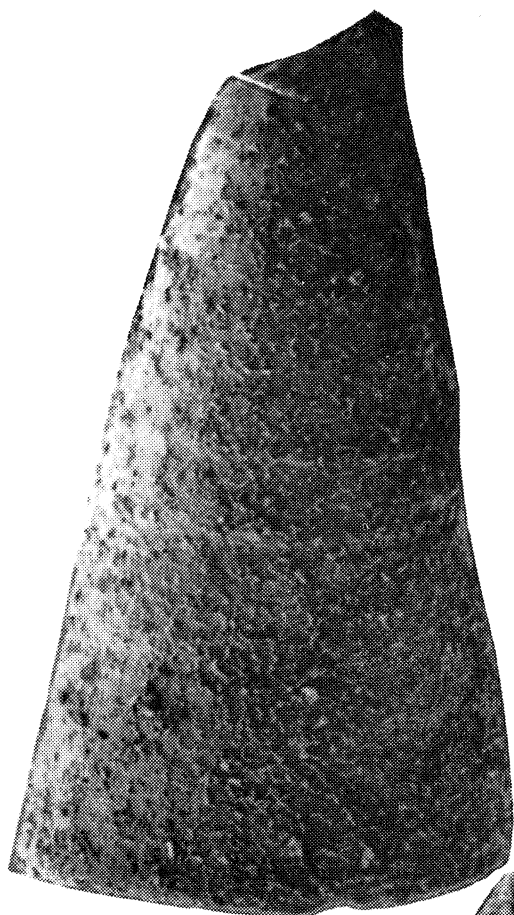
1



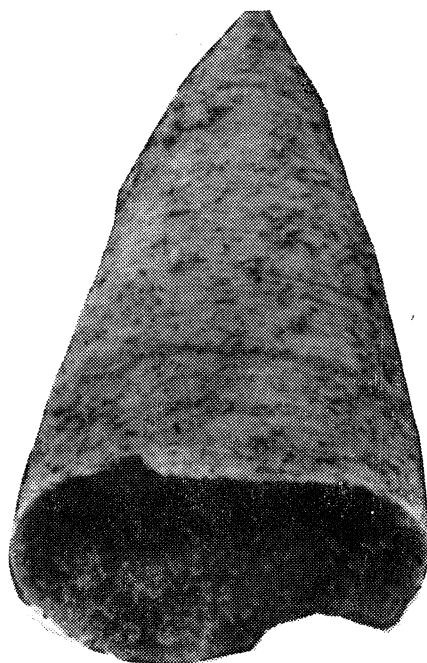
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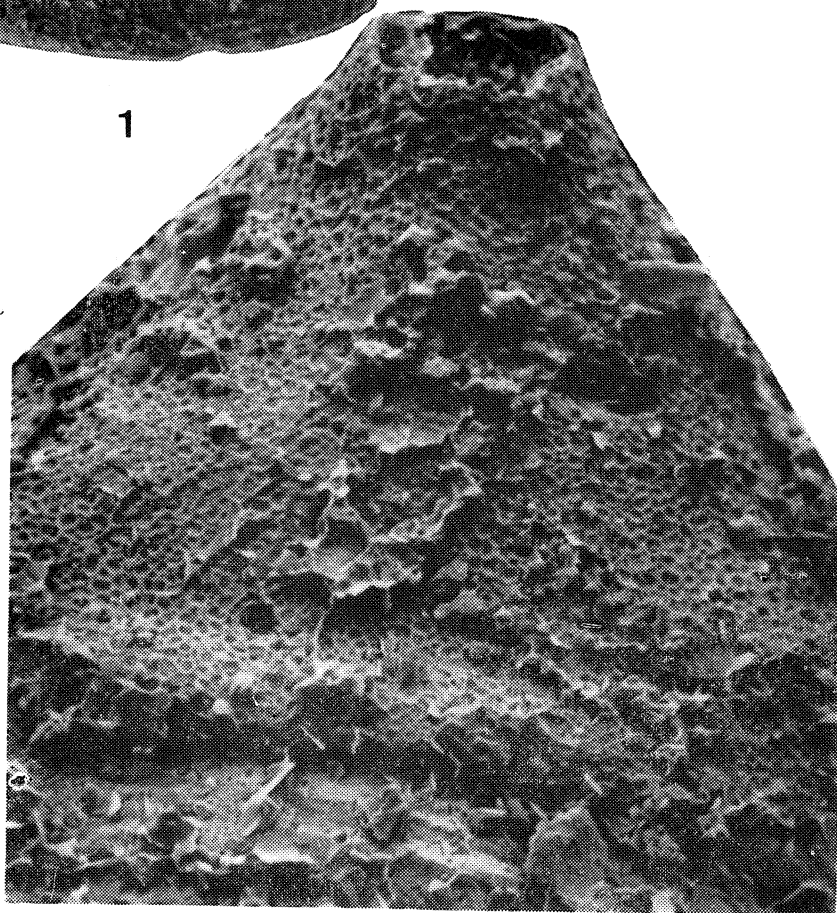
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1



2



3



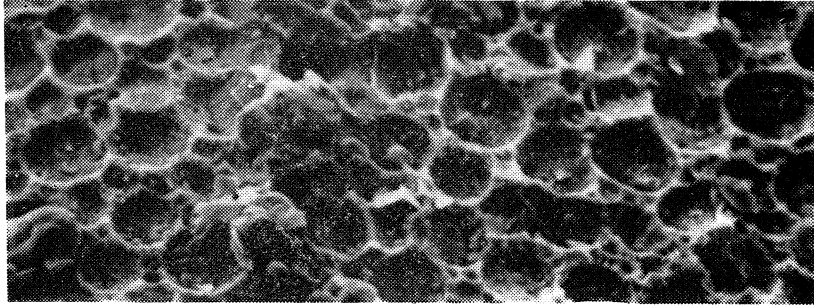
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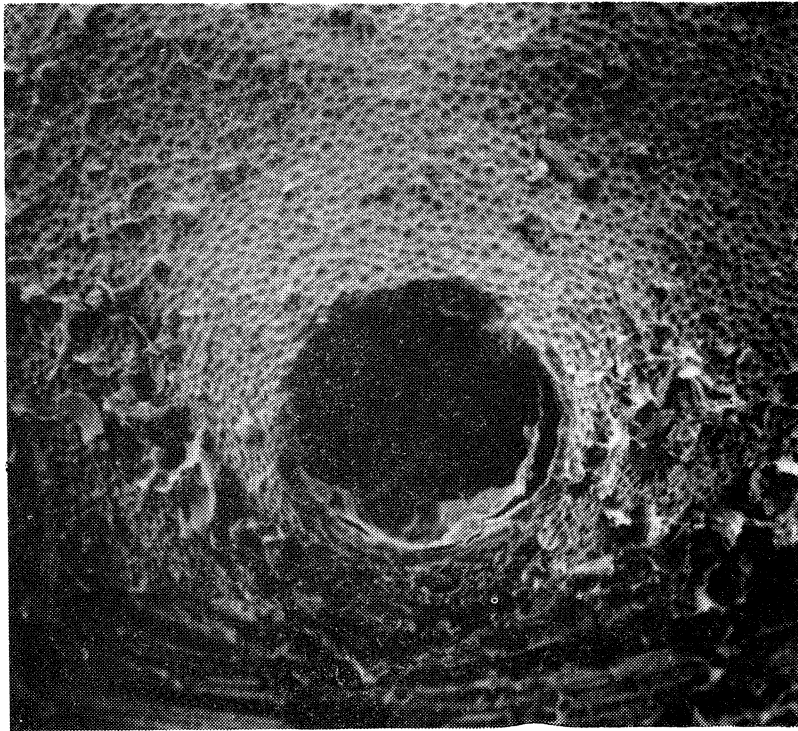
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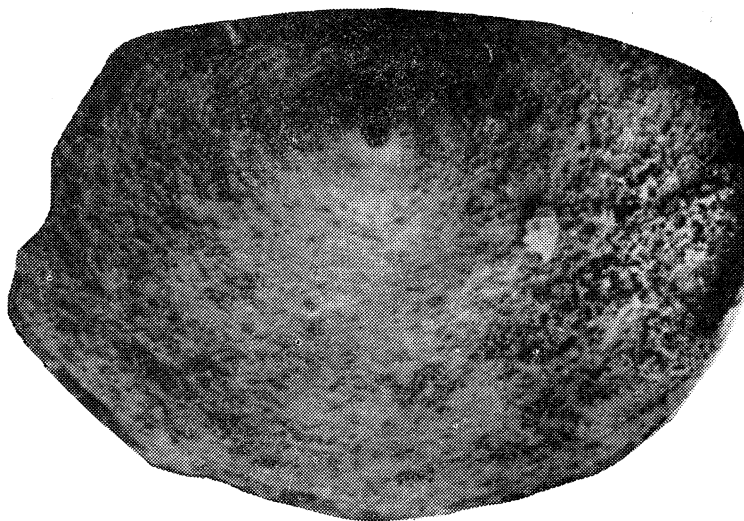
3



1



2



3

