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New placognath Eunicida (Polychaeta) from the Ordovician and Silurian of Poland

ABSTRACT: Four species of placognath Eunicida (Polychaeta) represented by isolated jaws and jaw apparatuses are described from Ordovician and Silurian erratic boulders collected along the Baltic coast in Poland. One new genus (*Rakvereprion* gen. n.) and two new species (*Mochtyella angelini* sp. n., and *M. grazynae* sp. n.) are erected.

INTRODUCTION

Eunicida with placognath jaw apparatuses make an extinct group of Polychaeta known since the Ordovician through Permian. Some doubtful placognath eunicids were also reported from the Triassic (Kozur 1971, Zawidzka 1975). Isolated jaws were for the first time described by Hinde (1879) but they were erroneously assigned to the Staurocephalidae. Their proper systematic position has been recognized by Kielan-Jaworowska (1961, 1962, 1966) who described well-preserved jaw apparatuses from the Ordovician and Silurian of Poland. Placognath apparatuses were also studied by Szaniawski (1968, 1970), Szaniawski & Wrona (1973), and Jansonius & Craig (1974); an anterior part of undeterminable apparatus was described by Taugourdeau (1971).

In the present paper, four species of placognath Eunicida are described from Ordovician and Silurian erratic boulders from Poland. One genus (*Rakvereprion* gen. n.) and two species (*Mochtyella angelini* sp. n. and *M. grazynae* sp. n.) are new.

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MATERIAL AND METHODS

The eunicid jaws described in the present paper have been extracted from three erratic boulders from along the Baltic coast.

Boulder No. MZ/25 derived from Orzechowo, province of Słupsk, 0.40 kg. The rock resembles the Baltic Limestone, Upper Caradocian, Amorphognathus superbus Zone (Oandu or Lower Rakvere Stage of the Estonian sequence; cf. Mierzejewski & Mierzejewska 1975). Fauna: polychaetes *Rakvereprion balticus* (Eisenack) and *Vistulella kozłowskii* Kielan-Jaworowska.

Boulder No. MZ/47 derived from Orzechowo, province of Słupsk, 0.65 kg. Dark grey, medium-grained limestone, Ludlovian. Fauna: chitinozoans *Ancyrochitina* sp.; fragments of eurypterid cuticle; graptolites *Epigraptus* sp., *Dendrotubus* cf. *wimani* Kozłowski, *Dendrotubus erraticus* Kozłowski, *Bulmanicrusta* cf. *latialata* Kozłowski, Neocucullograptinae, and indeterminate Diplograptidae; polychaetes *Mochtyella angelini* sp. n., *Mochtyella* sp., *Paulinites* sp., and ?*Polychaetaspis* sp.

Boulder No. MZ/142 derived from Poddebie, province of Słupsk, 0.50 kg. Light grey, coarse-grained limestone, Upper Silurian. Fauna: conodonts; chitinozoans; fragments of eurypterid cuticle; rhabdopleurids; polychaetes *Mochtyella angelini* sp. n., *Mochtyella grazynae* sp. n., *Mochtyella* cf. *fragilis* Szaniawski, *Paulinites* spp., *Polychaetaspis* sp., *Skalenoprion* sp., *Xanthoprion* sp., and *Vistulella kozłowskii* Kielan-Jaworowska.

The placognath eunicid fossils were etched out with 15% acetic acid. Kozłowski's "wet" technique of extracting microfossils from residuum was used, as described in detail by Kielan-Jaworowska (1966). The investigated material is housed at the Museum of the Earth of the Polish Academy of Sciences, Warsaw.

The electron micrographs were taken with JEOL JSM S-1 at the Nencki Institute of Experimental Biology, Polish Academy of Sciences, Warsaw.

The scolecodont descriptive terms are mainly those of Kielan-Jaworowska (1966); some other terms are also used, introduced earlier by the present author (Mierzejewski 1978).

SYSTEMATIC DESCRIPTION

Order Eunicida Dales, 1962

Superfamily Mochtyellacea Kielan-Jaworowska, 1966

Family Mochtyellidae Kielan-Jaworowska, 1966

Genus MOCHTYELLA Kielan-Jaworowska, 1961

Type species: *Mochtyella cristata* Kielan-Jaworowska, 1961

Diagnosis: See Kielan-Jaworowska (1966, p. 52).

Remarks. — Although opting for nomenclatory dualism, some authors treated isolated jaws in terms of "orthotaxonomy" (Kielan-Jaworowska 1966) or even regarded them as a basis to erect new species in this very classification (Szaniawski 1970). Eller (e.g. 1945) described both compound and simple jaws as *Staurocephalites* Hinde, 1879. The latter name is *nomen dubium* as was shown by Szaniawski & Wrona (1973) and hence, some Eller's species can be attributed to the genus *Mochtyella* Kielan-Jaworowska. However, a species can be undoubtedly assigned to the genus *Mochtyella* only when the right compound jaw is known to consist of main, second, and basal ridges. In fact, right compound jaws with

second ridge lacking occur in the genus *Multiprion* Szaniawski & Wrona as well as in *Mochtyella*.

Any species erected exclusively after a left compound jaw cannot be ultimately assigned to particular mochtyellid genera, since there are three genera with left compound jaws consisting of main and laeobasal ridges, viz. *Mochtyella* Kielan-Jaworowska, *Multiprion* Szaniawski & Wrona, and *Oxyprion* Szaniawski. Then, generic attribution of those species requires further studies on the type localities and new findings.

The systematic position of *Mochtyella duplicidentata* Szaniawski, 1970, appears doubtful. In fact, the species has been described after a jaw apparatus but Szaniawski (1970) supposed that the right jaw lacked both second and basal ridges. If so, the species cannot be attributed to the genus *Mochtyella*, as compoundness of a right jaw is the diagnostic generic feature (cf. Kielan-Jaworowska 1966).

The name *Mochtyella multilamellata* Szaniawski, 1970, is to be regarded as synonymous (cf. Mierzejewski 1978) with *M. fragilis* Szaniawski, 1970.

Then, the following species are assigned to the genus *Mochtyella*:

- M. angelini* sp. n.
- M. cristata* Kielan-Jaworowska, 1961
- ?*M. duplicidentata* Szaniawski, 1970
- M. elleri* Jansonius & Craig, 1974
- M. fragilis* Szaniawski, 1970, emend. Mierzejewski, 1978
- M. grazynae* sp. n.
- M. kielanae* Szaniawski & Wrona, 1973
- M. polonica* Kielan-Jaworowska, 1966
- M. trapezoidea* Kielan-Jaworowska, 1966
- M. tripulus* (Eller, 1945)

Occurrence: Lower Ordovician to Upper Devonian, ?Carboniferous; Europe, North America, Africa.

Mochtyella angelini sp. n.

(Pl. 1, Figs 1—3)

1966. *Mochtyella* sp. c; Z. Kielan-Jaworowska, p. 53, Pl. 4, Fig. 3.

1966. *Mochtyella* sp. d; Z. Kielan-Jaworowska, p. 53, Pl. 4, Fig. 4.

Holotype: Incomplete jaw apparatus (MIr, MI, 5 left anterior teeth and 6 right lateral teeth) presented in Pl. 1, Fig. 1.

Type locality and horizon: Erratic boulder No. MZ/142 derived from Poddębnie, province of Szupsk, Poland; Upper Silurian.

Derivation of the name: In honour of N.P. Angelin who was the first student of isolated jaws of the fossil Polychaeta.

Diagnosis: Both right and left MI strongly compressed laterally. Basal ridge distinctly denticulated, 0.17—0.30 total-jaw long. Second ridge straight, smooth, very narrow, 0.19—0.31 total-jaw long. Laeobasal ridge prominent, denticulate, half total-jaw long. Anterior teeth (not less than 5 in number) decreasing in size anteriorly; the last one provided with 3 tips. Lateral teeth subtriangular, relatively short.

Denticle formula:

MI		MIr	
Laeobasal ridge	16—18	Basal ridge	5—10
Main ridge	13—17	Main ridge	13—17
		Second ridge	smooth

Material: Apart from the type specimen, a single left compound jaw associated with 2 anterior teeth, 18 isolated *MIr*, and 17 isolated *MIl*.

Description. — Right and left *MI* vary in length from 0.42 up to 2.23 mm.

Right *MI* is strongly compressed laterally, fairly narrow in dorsal view, wide in lateral view. The jaw width ranges from 0.16 to 0.28 of the length. In dorsal view, the jaw is anteriorly pointed or seldom slightly rounded. The anterior margin is straight or slightly arcuate, distinctly oblique relative to the outer and inner ones. The outer and inner margins are very distinct, subparallel, somewhat convergent posteriorly. The posterior margin is rounded or irregular. The main ridge is straight and displays 13—17 denticles decreasing gradually in size posteriorly; in a few cases, the most posterior part of the ridge is smooth. The basal ridge ranges from 0.17 to 0.30 of the total-jaw length. It is very prominent and distinctly denticulated; the denticles are 5-10 in number and decrease in size posteriorly. In very small specimens, the basal ridge may be denticulated but indistinctly. The second ridge is smooth, straight or slightly arcuate, very narrow, parallel to the main one. It ranges from 0.17 to 0.31 of the total-jaw length. In lateral view, the jaw is very wide anteriorly, somewhat tapering posteriorly, with straight denticulated margin. In ventral view, the myocoele opening is narrow; the furrows associated with the main and basal ridges are distinctly separated.

Left *MI* is somewhat less compressed laterally than the right one. Its width ranges from 0.21 to 0.30 of the length. In dorsal view, all the margins appear as mirror images of the *MIr* margins. The main ridge resembles that of the right jaw. The laeobasal ridge displays 16—18 denticles decreasing in size anteriorly. It attains or even exceeds half the total-jaw length and is separated from the main ridge by a fairly wide furrow. It is commonly broken off. In lateral view, the jaw is very wide anteriorly, somewhat tapering posteriorly, with straight denticulated margin. In ventral view, the furrows associated with the ridges are distinctly separated one from the other.

Six right lateral teeth are known, adherent to the right slope of *MIr*; they are subtriangular and fairly short. The total number of lateral teeth is, however, unknown.

Five left anterior teeth are known; they are fairly large but decrease in size anteriorly; the last one is provided with three tips. The total number of anterior teeth is unknown. In a single specimen (Pl. 1, Fig. 3a), one anterior tooth with three tips and another one with one tip are housed in the *MIl* myocoele.

Remarks. — Isolated right *MI* from erratic boulders of Silurian age attribut-

PLATE 1

Abbreviations: *At* anterior tooth, *br* basal ridge, *lbr* laeobasal ridge, *Lt* lateral tooth, *MIl* left maxilla, *MIr* right maxilla, *sr* second ridge, *sr'* second ridge of secondary maxilla, *sMIr* secondary *MIr*

Mochtyella angelini sp. n.; Ludlovian, erratic boulder No. MZ/142

1a—b Holotype, jaw apparatus in two views; specimen No. MZ VIII.O/142p/1, ×70

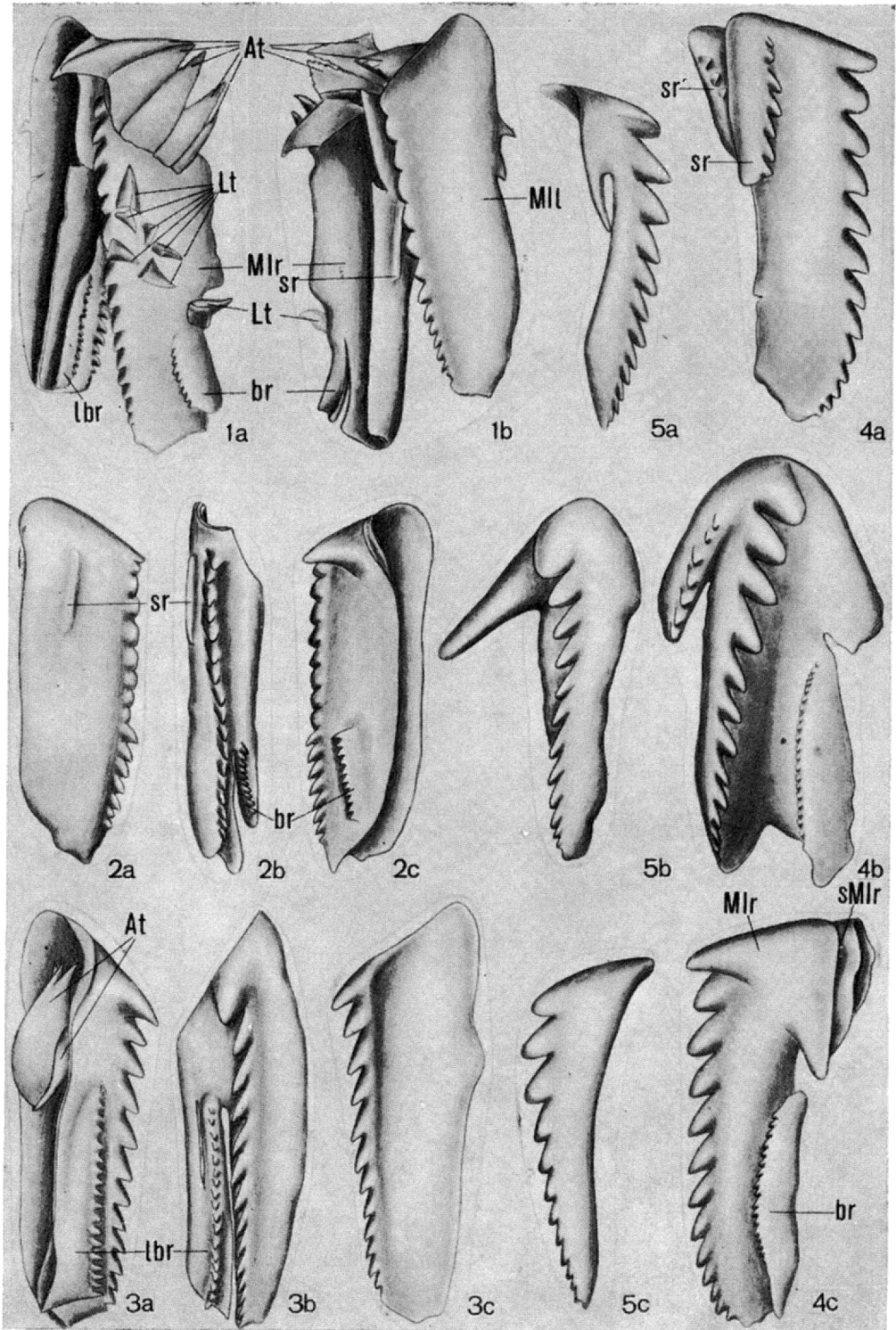
2a—c Right *MI* in left lateral, dorsal, and right lateral views; specimen No. MZ VIII.O/142p/3, ×70

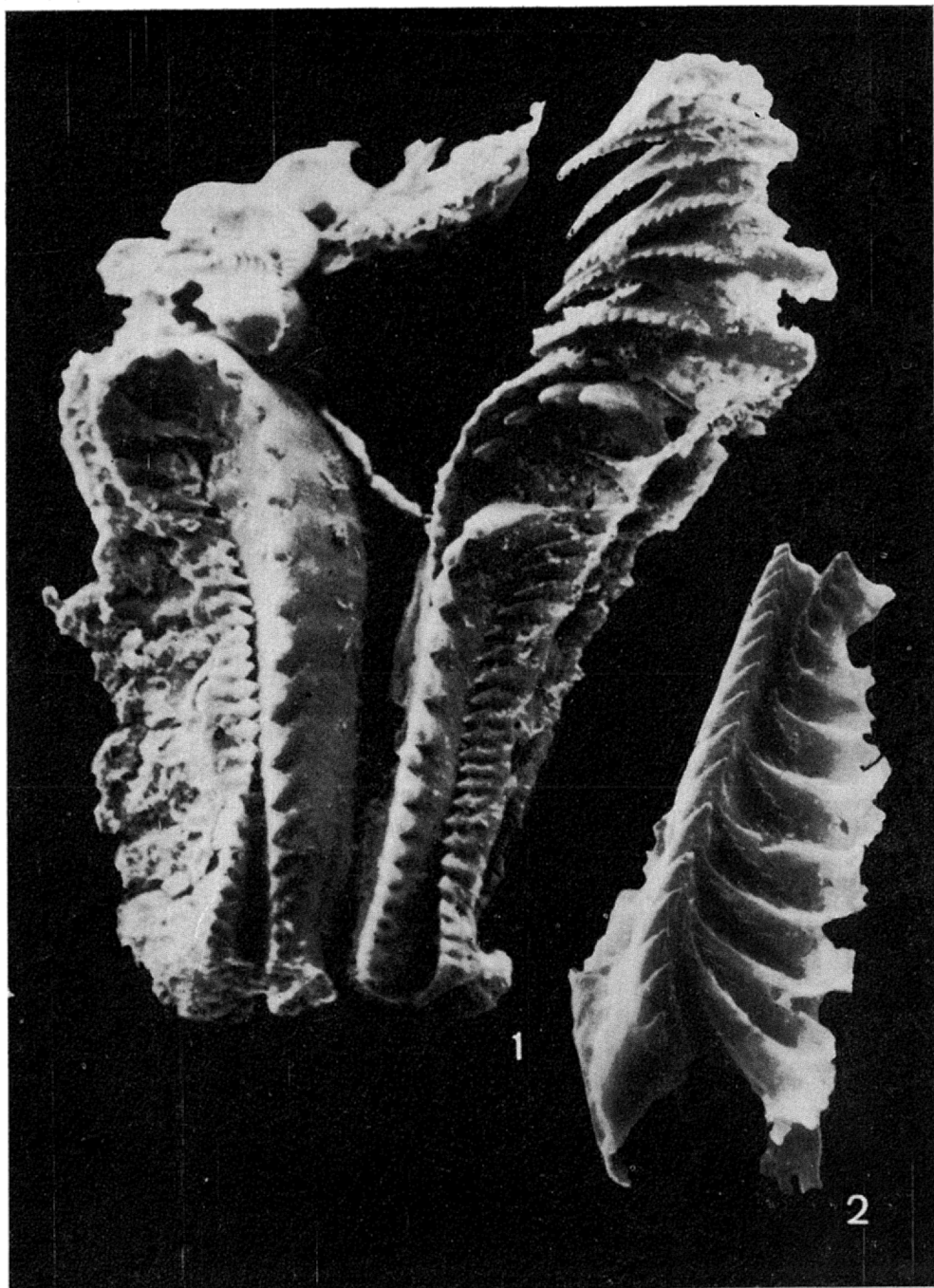
3a—c Left *MI* in left lateral, dorsal, and right lateral views; specimen No. MZ VIII.O/142p/2, ×70

Mochtyella grazynae sp. n.; Ludlovian erratic boulder No. MZ/142

4a—c Holotype, right *MI* in left lateral, dorsal, and right lateral views; specimen No. MZ VIII.O/142p/6, × ca. 150

5a—c Left *MI* in right lateral, dorsal, and left lateral views; specimen No. MZ VIII.O/142p/7, ×70





- 1 *Vistulella kozlowskii* Kielan-Jaworowska; jaw apparatus; specimen No. MZ VIII.O/25p/6; SEM micrograph, $\times 185$
 Upper Ordovician (Amorphognathus superbus Zone), erratic boulder No. MZ/25
- 2 *Rakvereprion balticus* (Eisenack); left MI along with laeobasal plate; specimen No. MZ VIII.O/25p/7; SEM micrograph, $\times 300$
 Upper Ordovician (Amorphognathus superbus Zone), erratic boulder No. MZ/25

ed by Kielan-Jaworowska (1966) to two distinct species appear to fall within the range of intrapopulation variability of *Mochtyella angelini* sp. n.

The investigated species resembles most closely the Silurian species *M. trapezoidea* Kielan-Jaworowska; the most important difference is in the absence of second ridge in the latter species. The investigated species resembles also *M. kielanae* Szaniawski & Wrona; the differences are in the distinctness of both outer and inner margins due to the massiveness of the jaws, the smoothness of the second ridge, and the more distinctly denticulated basal ridge of *M. angelini*. Furthermore, both the species differ also in the outline of left and right anterior margins of *MI*. According to Kielan-Jaworowska (1966), *M. kielanae* (= *M. sp. b* Kielan-Jaworowska, 1966) and *M. angelini* represent distinct phyletic lineages; namely, *crystata*-group and *trapezoidea*-group, respectively. Then, one may claim that the morphological similarity of both the species is due to a parallel evolution.

Occurrence. — Upper Silurian erratic boulders of Poland.

Mochtyella grazyna sp. n.

(Pl. 1, Figs 4—5)

Holotype: Right *MI* presented in Pl. 1, Fig. 4.

Type locality and horizon: Erratic boulder No. MZ/142 derived from Poddębnie, province of Słupsk, Poland; Upper Silurian.

Derivation of the name: In honour of my wife, Grażyna Mierzejewska, student of the fossil Polychaeta.

Diagnosis: Both right and left *MI* very wide and translucent. Main ridges of both jaws almost straight. Second ridge almost straight, distinctly denticulated, 0.35 total-jaw long. Basal ridge denticulated, 0.55—0.65 total-jaw long. Laeobasal ridge unknown; as judged from the morphology of incomplete *MII*, it is a mirror image of basal ridge.

Denticle formula:

<i>MII</i>	<i>MIr</i>
Laeobasal ridge ?	Basal ridge 16—20
Main ridge 12—13	Main ridge 13—16
	Second ridge 7

Material: Apart from the type specimen, 5 isolated *MII*, 3 isolated *MIr*, 4 isolated basal and/or laeobasal ridges.

Description. — Right and left *MI* vary in length from 0.46 up to 1.85 mm.

Right *MI* is wide and translucent, considerably flattened dorsally. It is twice as long as wide. Its anterior margin is more or less pointed. The outer and inner margins are very irregular. The posterior margin is very broad, ragged in outline. The main ridges is almost straight and displays 13—16 denticles. The basal ridge ranges from 0.55 to 0.65 of the total-jaw length. It displays 16—20 denticles distinctly arcuate in lateral view. The second ridge occurs in the middle of the anterior half of the left slope. It attains 0.35 of the total-jaw length and displays 7 distinct denticles. In lateral view, the jaw is somewhat arcuate, fairly wide anteriorly, markedly tapering posteriorly. In ventral view, the furrow associated with the main ridge is deeper and wider than those associated with the second and basal ridges.

The type specimen (*MIr*) is a single pharate jaw. The secondary jaw is complete, rather weakly embedded within the primary one.

Any complete left *MI* is unknown. The main ridge displays 12—13 denticles decreasing in size posteriorly and slightly bent outwards. The laeobasal ridge is

unknown; however, as judged from the morphology of incomplete jaws, it is probably a mirror image of the basal ridge.

Any lateral or anterior teeth are unknown.

Remarks. — The investigated species resembles most closely *H. fragilis* Szaniawski; the most important differences are in its almost straight main ridges of both *MI*, the position of the second ridge and its more distinct denticulation, the more prominent denticulation of the basal ridge, and the wider outlines of both *MI*.

Incomplete *MI* of the investigated species are easily recognizable, since an absence of basal and laeobasal ridges results in very large false shanks (Pl. 1, Fig. 5).

Isolated basal and/or laeobasal ridges of *M. grazynae* sp. n. resemble in their general shape and arcuateness the jaws attributed to *Lunoprionella* Eisenack; however, there are no constrictions among the teeth of the investigated basal ridges, while such constrictions are typical of the genus *Lunoprionella* (cf. Eisenack 1975). As a matter of fact, the latter genus represents undoubtedly the placognath Eunicida and it may be synonymous with an older genus of this group.

Occurrence. — Upper Silurian erratic boulders of Poland.

Genus *VISTULELLA* Kielan-Jaworowska, 1961

Type species: *Vistulella kozlowskii* Kielan-Jaworowska, 1961

Revised diagnosis: Jaw apparatus consisting of basal plate, laeobasal plate, intercalary tooth, laeointercalary tooth, left *MI*, bipartite right *MI* (*MIRA* and *MIRb*), and 6 pairs of denticulated anterior teeth. Basal plate strongly elongate, almost equal in length to *MIRb*, somewhat covering it dorsally. Denticles at basal plate very long anteriorly, decreasing in size posteriorly. Myocoele of basal plate with a narrow opening. Intercalary tooth in front of basal plate, *MIRA* and *MIRb* subrectangular; the former an order of magnitude longer than the latter. *MIIr* bent, elongate, situated along the inner margin of *MIRb* and the anterior part of inner margin of *MIRA*. Laeobasal plate and laeointercalary tooth forming mirror images of basal plate and intercalary tooth, partly covering left *MI* dorsally.

Remarks. — Kielan-Jaworowska (1966) claimed that the jaws called now by the present author as *MIRb* and *MIIr* (Text-fig. 1) are to be regarded as homologous with *MIIr* of other mochttyellid genera, viz. second ridge of *Mochttyella* and *MIIr* of *Pistoprion*. In contrast, the present author is of the opinion that the denticles at *MIRb* continue with those at *MIRA* and may be jointly conceived as a mirror image of *MII*. Then, the denticles at *MII* and *MIRA*+*MIRb* of *Vistulella* make counterparts of the main ridges of *MII* and *MIR* of *Mochttyella*, respectively while *MIIr* of *Vistulella* corresponds exactly to the second ridge of *Mochttyella*. One may claim that the apparatus *Vistulella* developed due to a separation of ancestral second ridge from the compound jaw and its subsequent transformation into a distinct element *MIIr*, and a transversal splitting of the main ridge of *MIR* into *MIRA* and *MIRb*.

Occurrence. — Ordovician to Devonian; Europe, North America.

Vistulella kozlowskii Kielan-Jaworowska, 1961

(Text-fig. 1; Pl. 2, Fig. 1)

1961. *Vistulella kozlowskii* n. sp.; Z. Kielan-Jaworowska, p. 243, Text-fig. 2, Pls 1-4.

1966. *Vistulella kozlowskii* Kielan-Jaw.; Z. Kielan-Jaworowska, p. 64, Text-fig. 5c.

1975. *Vistulella kozlowskii* Kielan-Jaw.; G. Mierzejewska & P. Mierzejewski, p. 89, Text-fig. 1.

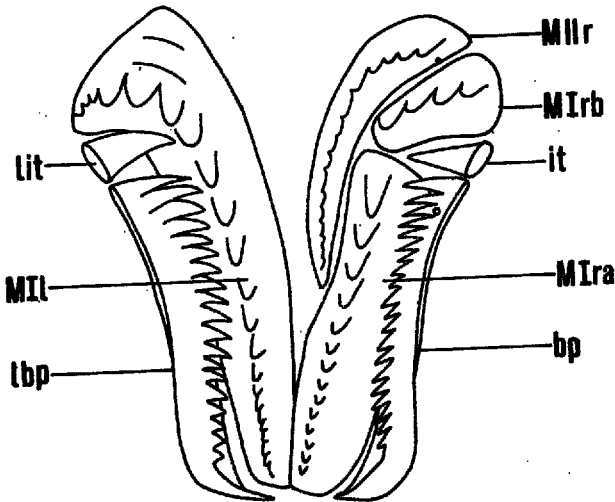


Fig. 1. Diagrammatic sketch of jaw apparatus of *Vistulella kozlowskii* Kielan-Jaworowska

bp basal plate, it intercalary tooth, lbr laeobasal ridge, lit laeointercalary tooth

MIl left maxilla I, MIra posterior part of right maxilla I, MIrb anterior part of right maxilla I, MIIr right maxilla II

From Kielan-Jaworowska (1961); modified

Diagnosis: As for the genus.

Material: 2 apparatuses and right side of another one, numerous isolated and connected jaws.

Remarks. — The investigated specimens are entirely consistent with the description given by Kielan-Jaworowska (1961), except of the absence of a subtriangular surface in front of the anterior part of denticulated ridge at MIl. The illustrated apparatus differs from the type specimen in the presence of six instead of only four anterior teeth. Thus, it is the most complete apparatus of the genus *Vistulella* recorded insofar.

Occurrence. — Upper Ordovician to Upper Silurian, ?Devonian; Europe, North America.

Genus RAKVEREPRION gen. n.

Type species: *Staurocephalites? balticus* Eisenack, 1975

Derivation of the name: Rakvere, after the occurrence in the Rakvere Stage of Estonia and its equivalents; Greek *prion*, saw.

Diagnosis: Jaw apparatus of placognath type with symmetric posterior part consisting of right and left MI, basal and laeobasal plates. Anterior part of the apparatus unknown. MIr almost straight, slightly bent outwards in its anterior part, elongate. Basal plate elongate, compressed laterally, equal in length to MIr, adhering to its outer margin. MIl and laeobasal plate forming mirror images of MIr and basal plate.

Remarks. — The type species of the genus has been tentatively assigned by Eisenack (1975) to the genus *Staurocephalites* Hinde, 1879. Actually, however, the latter name is *nomen dubium*.

The holotype of the type species of *Rakvereprion* gen. n. is in the form of *MIr* along with basal plate. The apparatus fragments investigated in the present paper make mirror images of both *MIr* and basal plate and hence, can be regarded as *MII* along with laeobasal plate. Then, the posterior part of the apparatus can be restored and the genus can be defined.

Kielan-Jaworowska (1966) mentioned an undescribed apparatus with its *MI* resembling *MI* and *MII* of *Xanioprion* Kielan-Jaw. attached one to the other; the apparatus was assigned to *Xanioprion* sp. Actually, it may be congeneric with *Rakvereprion*. One may claim that *Rakvereprion* is closely related to *Xanioprion*, the main difference being in the wholeness of the apparatus elements in the former genus, while they are split transversally in the latter one. In fact, *Rakvereprion* appears intermediate between the Mochtyellidae and Xanioprionidae.

Rakvereprion balticus (Eisenack, 1975)
(Pl. 2, Fig. 2)

1975. *Staurocephalites? balticus* n. sp.; A. Eisenack, p. 248, Text-figs 45—49.

Emended diagnosis: Both *MIr* and *MII* strongly elongate, with ridges denticulated at the whole jaw or smoothening posteriorly. Anterior denticles at both *MIr* and *MII* often weakly denticulated. Basal and laeobasal plates with very long, secondarily denticulated denticles decreasing in size posteriorly.

Material: Two *MII* along with laeobasal plates.

Description. — Left *MI* is 0.3—0.4 mm long. It is strongly compressed laterally, almost straight, slightly bent outwards in its anterior part. The ridge displays a series of denticles decreasing in size posteriorly; its posterior part is indistinctly denticulated or smooth. The first denticle is very small, the next 2—3 ones are often weakly denticulated. The lateral slopes are steep. The inner and outer margins are slightly bent antero-laterally. The anterior and posterior margins are rounded.

Basal and laeobasal plates are very similar to each other. They are compressed laterally with denticles decreasing in size posteriorly. The anterior denticles are very long, claw-like, very acute. All the denticles are secondarily denticulated.

Anterior part of the jaw apparatus is unknown.

Occurrence. — Upper Ordovician; Europe.

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P. MIERZEJEWSKI

**NOWE WIELOSZCZETY PLAKOGNATYCZNE
Z ORDOWIKU I SYLURU POLSKI**

(Streszczenie)

Na podstawie aparatów szczękowych i izolowanych szczęk opisano cztery gatunki wieloszczetów plakognatycznych z rzędu Eunicida z ordowickich i sylurskich gładów nanzutowych północnej Polski (patrz fig. 1 oraz pl. 1—2). Ustanowiono jeden nowy rodzaj (*Rakvereprión* gen. n.) i dwa nowe gatunki (*Mochtyella angelini* sp. n., *M. grazynaë* sp. n.) oraz przeprowadzono homologizację szczęk *Vistulella* Kielan-Jaworowska ze szczękami *Mochtyella* Kielan-Jaworowska.
