A C T A P A L A E O N T O L O G I C A P O L O N I C A
Vol. XV 1970 No. 4

HUBERT SZANIAWSKI

JAW APPARATUSES OF THE ORDOVICIAN AND SILURIAN POLYCHAETES FROM THE MIELNIK BOREHOLE

Abstract. — Fifteen jaw apparatuses of polychaetes from the Ordovician and Silurian of the Mielnik boring on the Bug are described. They include eight known species, three species identified to the generic level and four new species; *Mochtyella duplicidentata* n. sp., *M. fragilis* n. sp., *M. multilamellata* n. sp. and *Skalenoprion bugensis* n. sp. The Ordovician assemblage of polychaetes differs fundamentally from the Silurian one and is much richer. The genera *Rhytiprion* Kielan-Jaworowska, *Polychaetura* Kozłowski, *Ramphoprion* Kielan-Jaworowska, *Kalloprion* Kielan-Jaworowska, *Leptoprion* Kielan-Jaworowska and *Pistoprion* Kielan-Jaworowska are known from the Ordovician only, while *Paulinites* Lange is most common in the Silurian deposits.

INTRODUCTION

Until recently, it has been a common opinion that the polychaete jaw apparatuses are unusually rare in fossil state. It were only the works of Kozłowski (1956), Kielan-Jaworowska (1961, 1962, 1966) and Szaniawski (1968) which proved that, with the application of a proper method of chemical preparation, such apparatuses might be fairly often found in the Palaeozoic deposits. Owing to Kozłowski's and Kielan-Jaworowska's works, the Ordovician and Silurian jaw apparatuses from the Baltic Region are now relatively well-known. All the apparatuses, described by these authors, come, however, from the erratic boulders and consequently their stratigraphic position is in many cases uncertain.

In 1966, Professor R. Kozłowski and Professor Z. Kielan-Jaworowska have found jaw apparatuses of polychaetes in the residua of samples from the Ordovician and Silurian calcareous series of the Mielnik borechole on the Bug. In 1968, they turned them over to the present writer for study. To increase the quantity of material, the writer took additional samples from that borehole's horizons most abounding in scolecodonts; 1 kg. samples were taken from each meter of the core at depths range of 1.088 to 1.154 m

and about 2 to 3 kg each from a depth range of 1.118–1.124 m. In clayey series, samples were mostly taken from intercalations of limestones or more calcareous claystones. All samples were dissolved in hydrochloric acid and scolecodonts were picked out from the residuum. The material consists of 18 more or less complete apparatuses and several hundred detached jaws; more than a half of them remained not worked out. The assemblage of polychaetes from the Mielnik borehole is very similar to that from the erratic boulders which enabled a fairly accurate determination of the age of some apparatuses known from these boulders. Kielan-Jaworowska's (1966, 1968) conclusions on a great stratigraphic value of scolecodonts, examined as elements of jaw apparatuses, have also been confirmed.

The methods and terminology are after that adopted by Kielan-Jaworowska (1966).

The collection described is housed at the Palaeozoological Institute of the Polish Academy of Sciences (abbr. Z. Pal.).

The writers work was greatly aided by the possibility of making use of the collections of the Ordovician and Silurian jaw apparatuses described by Professor Z. Kielan-Jaworowska and Professor R. Kozłowski.

The author wishes to express his gratitude to Prof. Z. Kielan-Jaworowska and Prof. R. Kozłowski who turned over the materials for his investigation, allowed to use their collections and gave important advice and indications. The writer feels also indebted to the Directors of the Geological Institute in Warsaw for permitting him to use the materials from borings and to Dr. H. Tomczyk from this Institute for his help in obtaining them.

Thanks are also due to Mrs. D. Sławik from the Palaeozoological Institute for drawing all figures according to the writer's sketches.

STRATIGRAPHY

In the Mielnik boring, the Ordovician deposits occur at depths ranging from 1.120 to 1.178 m and their stratigraphic division is still open to discussion (Znosko, 1964; Tomczykowa, 1964). The deposits sampled (1.120–1.154 m) belong to the Llandeilo, Caradoc and Lower Ashgill stages. They are composed mostly of grey marly limestones and calcareous claystones. At a depth of 1.120 m, a stratigraphic gap was found covering the Ashgill and Llandoverian. The Silurian deposits were found in this borehole at depths ranging from 583.5 to 1.120 m. Their simplified stratigraphy is as follows: 1.120 to 1.080 m. — Lower and Upper Wenlockian, 1.080 to 932 m — Lower Ludlovian, 932–583.5 m — Upper Ludlovian. These deposits are composed mostly of calcareous claystones with intercalations and lenses of marly limestones.

The Ordovician deposits from the Mielnik borehole abound in scolecodonts. The following species of apparatuses were found: *Mochtyella*,

cristata Kielan-Jaworowska, *M. cf. polonica* Kielan-Jaw., *M. duplicidentata* n. sp., *M. fragilis* n. sp., *M. multilamellata* n. sp., *Mochtyella* sp. *a*, *Pistoprion transitans* Kielan-Jaw., *Xanioprion borealis* Kielan-Jaw., *Rhytiprion magnus* Kielan-Jaw., *Palychaetaspis wyszogrodensis* Kozłowski, *Halloprion ovalis* Kielan-Jaw. They occur together with indeterminate, detached jaws of the genera *Mochtyella* Kielan-Jaw., *Polychaetaspis* Kozł., *Polychaetura* Kozł., *Ramphoprion* Kielan-Jaw., *Leptoprion* Kielan-Jaw., *Paulinites* Lange and *Atraktoprion* Kielan-Jaw. All species mentioned above, except for newly described ones and the jaws of the genus *Paulinites*, are known from the Ordovician erratic boulders of Poland (Kozłowski, 1956, Kielan-Jaworowska, 1961, 1962, 1966). Only the age of *Mochtyella polonica* and *Pistoprion transitans* was uncertain, given as either Ordovician or Silurian. Kielan-Jaworowska (1966) distinguished in the Ordovician boulders two assemblages of polychaetes one of them characteristic of the Llandeilo and Lower Caradoc, the other — of the Upper Caradoc. These assemblages have quite different specific composition. The material from the Ordovician of the Mielnik borehole is insufficient for distinguishing in it similar assemblages.

As compared with the Ordovician, scolecodonts are rarer in the Silurian deposits under study, in which they are represented by *Paulinites polonensis* Kielan-Jaw., *Skalenoprion bugensis* n. sp., *Mochtyella* sp. *b*, *?Tetraprion* sp. and detached jaws from the genera *Polychaetaspis* and *Mochtyella*. None of these forms, was found in the Ordovician. Of the Silurian forms, only *Paulinites polonensis* is relatively numerously represented and its occurrence is recorded from the Lower Wenlockian to the Upper Ludlovian. All the remaining ones were found in the Lower Wenlockian deposits. *Skalenoprion bugensis* n. sp. and *?Tetraprion* sp. *a* are known as single specimens and *Mochtyella* sp. *b* is represented by a few specimens. This assemblage is very similar to that found in the Silurian erratic boulders (Kielan-Jaworowska, 1966). The assemblage of polychaetes from the Silurian erratic boulders is characterized mostly by the presence of many jaws of Paulinitidae and Mochtyellidae of the group *M. trapezoidea* and by the lack of the jaws of Ramphoprionidae. The jaws of Polychaetaspidae occur in it considerably less frequently than in the Ordovician. In addition, the Silurian boulders contain Symmetroprionidae and Skalenoprionidae. The stratigraphic position of the latter was not, however, certain. Now, they seem to have appeared only in the Silurian. In addition to the fauna, known from the Silurian erratic boulders of Poland, the apparatus of *Paulinites kosoviensis* (Żebera, emend. Šnajdr) and *Paulinites burgensis* Martinsson, have hitherto been described. Both these forms are related to *Paulinites polonensis*. In the assemblage of the Silurian polychaetes from Mielnik, only *?Tetraprion* sp. *a* is not similar to any form known thus far in the Silurian fauna.

The present writer's studies have confirmed Kielan-Jaworowska's (1966) conclusions concerning a complete separateness of the faunas of polychaetes in the Ordovician and Silurian and, moreover, not only at the specific, but also generic level. The genera *Rhytiprion, Polychaetura, Ramphoprion, Kalloprion, Leptoprion* and *Pistoprion* have so far been known from the Ordovician only. The genus *Skalenoprion* is most likely to have appeared as late as the Silurian and the genera *Paulinites* and *Mochtyella* are represented in the Ordovician and Silurian by quite different species.

Recently, a great stratigraphic importance of scolecodonts has also been shown by Taugourdeau (1968).

DESCRIPTIONS

Family **Mochtyellidae** Kielan-Jaworowska, 1966
Genus *Mochtyella* Kielan-Jaworowska, 1961
Mochtyella cristata Kielan-Jaworowska, 1961
(Pl. I; Fig. 4)

1961. *Mochtyella cristata* n. sp.; Z. Kielan-Jaworowska, On two Ordovician polychaete..., p. 248, Pls. 5–7.

1966. *Mochtyella cristata* Kielan-Jaworowska; Z. Kielan-Jaworowska, Polychaete jaw apparatuses..., p. 54, Pl. 1, Fig. 1; Text-fig. 5*a*.

Material. — An incomplete apparatus composed of the right and left MI and an anterior tooth, six right MI, including one connected with an anterior tooth and a left MI. All specimens from the Upper? Ordovician deposits of the Mielnik borehole from a depth of 1.120–1.154 m.

Comparison. — The right MI of the apparatus of *Mochtyella cristata* from the Mielnik borehole almost does not differ at all from the specimens known from the Middle Ordovician erratic boulders of Poland (Kielan-Jaworowska, 1961, 1966), except for the margin of the first denticle of the main ridge which, in four specimens, extends in the form of a smooth ridge towards the outer margin of the jaw, which has never been observed in any of the specimens from the Ordovician erratic boulders. One of the right MI has a somewhat longer second ridge, equalling 0.6 of the length of the entire jaw and a greater number (28) of denticles on the main ridge. Its basal ridge is sigmoidally bent. It is possible, however, that this jaw belongs to another species.

The left MI of the specimen figured on Pl. I, Fig. IV differs fairly considerably from the specimens from erratic boulders. Its outer and inner margins are straight its anterior end being ventrally incurved and consequently the entire jaw is trapezoidal and the most anterior part of the

ventral side is covered. These differences are probably caused by deformation. Another specimen, of the left MI does not differ at all from those from erratic boulders.

The size of the right MI varies from 0.63 to 0.86 mm and the number of denticles, apart from the jaw mentioned above, varies in the main ridge from 21 to 25, in basal ridge from 11 to 18 and in second ridge from 7 to 12. In the left MI, the main ridge has 18 and 22 and the laeobasal ridge 15 and 17 denticles.

Occurrence. — Middle and ?Upper Ordovician of the Baltic Region.

Mochtyella cf. *polonica* Kielan-Jaworowska, 1966
(Pl. I, Figs. 1–2)

Material. — An almost complete apparatus composed of MIr, MIl, an indeterminate number (6 pairs?) of anterior teeth and uncomplete chains of lateral teeth. Nine right and seven left MI. An anterior tooth is attached to one and an incomplete chain of lateral teeth to another MIl. All the specimens come from the Upper? Ordovician deposits of the Mielnik borehole from a depth of 1.120–1.154 m.

Description and comparison. — The length of the right MI amounts to 0.52–1.5 mm.

Denticle formula:

Left MI		Right MI	
laeobasal ridge	11–16	basal ridge	7–10
main ridge	15–21	main ridge	14–21
		second ridge	6– 8

Mochtyella cf. *polonica* differs from *Mochtyella polonica* from erratic boulders of Poland (Kielan-Jaworowska, 1966) in the denticulation of anterior teeth. In *Mochtyella* cf. *polonica*, small triangular denticles, inclined towards the anterior part of teeth occur on lateral margins of anterior teeth. About seven teeth are situated on one margin. In addition, the specimens from the Mielnik borehole differ from *M. polonica* in a stronger lateral flattening and a greater number of denticles in the main ridge of both MI and in laeobasal ridge. The rows of denticles in the main ridges are not arranged rectilinearly over their entire lengths but at the anterior end they turn outwards so that the first denticles are not aligned with the rest of them. In *M. polonica*, except for the second denticle which is relatively small, the denticles of the main ridges, gradually decrease posteriorly and in *M.* cf. *polonica* a few first denticles, except for the first denticle which is large, increase posteriorly and only the following ones gradually decrease. In *M. polonica* the most posterior part of the main ridges is smooth, while in *M.* cf. *polonica* the row of denticles on the main

ridges stretches almost to the very posterior end. In the apparatuses from the erratic boulders, the left MI is a bit longer than the right one and in the apparatus from the Mielnik borehole both MI are of the same length. In all right MI from the Mielnik borehole, a narrow notch uncovering the pulp cavity is visible in the most posterior part on the left lateral side. Similar notches may also be seen in the specimens from erratic boulders in which they are, however, less clearly visible and, therefore, they have not been taken into account in the description.

In an apparatus from the Mielnik borehole the chains of lateral teeth stretch to the very anterior end of the apparatus partly covering the anterior teeth. They were probably shifted anteriorly in a mechanical manner, since they are absent from the posterior part of the apparatus.

Except for the denticulation of anterior teeth, all characters differing *M.* cf. *polonica* from *M. polonica* are unessential diagnostically and may be contained within the intraspecific variability. The denticles of anterior teeth are very delicate and might be destroyed in the specimens coming from erratic boulders of which only three are known. In the specimens from the Mielnik borehole they also are preserved not on all anterior teeth.

Occurrence. — ?Upper Ordovician of the Baltic Region.

Mochtyella sp. a
(Pl. III, Fig. 2)

Material. — A left MI from the Upper Ordovician deposits of the Mielnik borehole from a depth of 1.120–1.124 m.

Description. — The left MI has three ridges of denticles: the laeobasal ridge, the main ridge and the second ridge. This is a strongly elongated, laterally compressed, trapezoidal, 1.2 mm long jaw. On the dorsal side it is very narrow and pointed at the anterior end, its outer and inner margin are straight and directed posteriorly. The main ridge has 17 denticles decreasing posteriorly. Denticles are inclined posteriorly and bent outwards. A few first denticles are widely spaced, the following ones are closer to each other. The first denticle is bluntly terminating and relatively short, probably partly abraded. The denticles of the main ridge stretch almost to the very anterior end of the jaw.

The laeobasal ridge, equalling 0.24 of the length of jaw, composed of 13 denticles decreasing posteriorly, is directed posteriorly with a slight lateral deviation and separated from the main ridge by a relatively wide groove.

The second ridge, equalling 0.22 of the length of jaw, has nine denticles, is parallel to the main ridge and separated from it by a deep, narrow groove.

In the left lateral position, the anterior margin is straight and directed posteromedially, the posterior margin also straight, subtransversal, the lateral margins straight, parallel to each other, directed posteriorly, the left of them longer than the right. The laeobasal ridge narrow, straight, situated near the outer margin.

In the left lateral view the second ridge is wide, straight, its denticles being situated near the main ridge. A narrow, V-shaped notch, uncovering the pulp cavity, occurs in the posterior part of jaw.

On the ventral side, the pulp cavity is narrow, deep; dental pits invisible.

Remarks. — The jaw described above differs from the left MI of all so far known representatives of the genus *Mochtyella* Kielan-Jaw. in having the second ridge. This type of jaw has not hitherto been described. Most likely here we have to do with the case of an inverted symmetry (*situs inversus*). Such cases are known among jaw apparatuses of Recent polychaetes (Kielan-Jaworowska, 1966). The inversion happens in the species with asymmetric apparatus in which the right side of the latter corresponds to a mirror-like reflection of the left side of a normal apparatus and the left side to that of the right side. The similarity of the jaw described above to the right jaws consists not only in the occurrence of the second ridge, but also in the existence of a notch in the posterior part of its inner wall which is characteristic of the right jaws.

Mochtyella sp. a is similar to a mirror-like reflection of the right MI of *M.* cf. *polonica* Kielan-Jaw. from which it differs mostly in a greater number of denticles in the laeobasal and second ridge, as well as in a different arrangement of the first denticles in the main ridge. These differences prevent the present writer from assigning the jaw under study to *Mochtyella* cf. *polonica*. The possibility cannot be, however, precluded that they are contained within the range of the intraspecific variability.

Mochtyella duplicidentata n. sp.
(Pl. I, Fig. 3)

Holotype: An incomplete jaw apparatus, consisting of the right and left MI and five anterior teeth, figured in Pl. I, Fig. 3, Z. Pal. No. Sc. I/9.

Type horizon and locality: Upper? Ordovician, Mielnik borehole, depth 1.120–1.154 m.

Derivation of the name: Lat. *duplex* = double, *dens* = *tooth*; referring to the double pointed first pair of anterior teeth.

Diagnosis. — An elongate MI, strongly compressed laterally. From the lateral side, anterior margins are directed posteromedially. In the right MI, the second ridge is lacking, basal ridge unknown, perhaps does not occur at all. A narrow notch occurs at the posterior end of inner slope. The

left MI somewhat longer than the right one; laeobasal ridge denticulated, slightly shorter than a half of the length of jaw, situated near the main ridge but separated from it by a deep groove. The number of anterior teeth indeterminate. They are finely denticulated at the base. The first pair of them is double-pointed. Lateral teeth not recorded.

Denticle formula:

Left MI		Right MI	
laeobasal ridge	11–12	basal ridge	unknown
main ridge. . .	14–15	main ridge . .	13–14

Material. — In addition to the holotype, three right and five left MI.

Description. — The length of an MI varies between 0.37 and 0.92 mm. The left MI elongate, compressed laterally narrow dorsally. The main ridge denticulated up to the posterior end of jaw. Denticles thick, sharply pointed, oval in cross section. The first of them is the largest, the second relatively small. The laeobasal ridge, equalling 0.34–0.47 of the length of jaw, stretches to its posterior end parallel to the main ridge from which it is separated by a deep, narrow groove. The anterior margin straight, directed posteromedially and extending into the margin of the first denticle. The inner margin denticulated straight, directed posteriorly. The posterior margin rounded. The outer margin irregular, directed posteriorly in the most posterior part changes its direction into a posteromedial one and in the form of an arch transforms into the posterior margin. The anterior part of the inner slope may extend to form an attachment lamella. In the case in which it is lacking, the anterolateral corner of the jaw is narrow and strongly extended. On the left lateral side, a pulp cavity is visible in the anterior part of jaw; the laeobasal ridge slightly extends posteriorly and its denticles run near the inner margin. The entire ventral side is occupied by a relatively narrow, deep pulp cavity. Dental pits visible in some jaws only.

Right MI is, in general outline, almost identical with a mirror image of the left MI, from which it differs in somewhat smaller dimensions, lack of basal ridge(?) and presence of a narrow notch at the posterior and of the inner slope. This notch runs from the outer margin towards the middle of jaw.

Anterior teeth narrow, pointed, slightly bent, on lateral margins, except for their points, finely-denticulated and having wide basal cavities. Their denticles are very fine, spiny and better preserved on smaller teeth. The teeth of the first pair are the largest and have two points, one of which is much larger.

Remarks. — The new species is most closely related to *Mochtyella trapezoidea* Kielan-Jaw., from which it differs in a smaller width of jaws both in the dorsal and lateral position, shorter laeobasal ridge, somewhat

greater number of denticles in all ridges, situation of the first denticle of the main ridge in the same row with the remaining denticles and in the denticulation of anterior teeth. It is also most likely to differ from *Mochtyella trapezoidea* in the lack of basal ridge.

The basal ridge is absent from all the four specimens of the right MI. It is difficult, however, to state with a complete certainty whether it is lacking altogether in this apparatus or being only slightly connected with the jaw, it has not been preserved in the specimens under study.

Mochtyella fragilis n. sp.
(Pl. II, Figs. 5–7)

Holotype: A left MI; Z. Pal. No. Sc I/13, figured in Pl. II, Fig. 6.

Type horizon and locality: Upper? Ordovician, Mielnik borehole, depth — 1.120–1.154 m.

Derivation of the name: Lat. *fragilis* = fragile, referring to the structure of the walls of jaws.

Diagnosis. — The jaws of this apparatus are composed of very thin walls, elongate, relatively flat, with the main ridges anteriorly turning outwards. The laeobasal ridge denticulated, directed posteriorly, considerably longer than a half of the length of the entire jaw, with the first denticle much larger than the remaining ones. The second ridge in right MI consisting of very fine denticles and tubercles, situated in the anteroinner corner of jaw, directed posteromedially. The basal ridge, anterior teeth and lateral teeth not recorded.

Denticle formula:

Left MI		Right MI	
laeobasal ridge	17–18	basal ridge	unknown
main ridge	14–17	main ridge	17–18
		second ridge	10–11

Material. — Seven left and four right MI.

Description. — The length of MI varies from 0.69 to 1.02 mm. Jaws consist of very thin, partly transparent walls.

Left MI elongate, with moderately steep slopes. Anterior margin rounded, inner margin almost completely straight, directed posteriorly, except for the anterior and posterior ends which are bent outwards. Posterior margin short, rounded. Outer margin in all jaws poorly preserved. The main ridge denticulated over the entire length, in the anterior part of jaw turning outwards so that a few first denticles are arranged in an almost transversal line. This denticles have truncate tops. Posterior denticles of the main ridge inclined outwards. Laeobasal ridge denticulated, equalling about 0.7 of the length of MI, parallel to the posterior part of the main

ridge, connected with the entire jaw by a very thin wall. The first denticle very large, round in cross section. Laterally, the left jaw is narrow, anterior margin straight, directed posteromedially. Laeobasal ridge parallel to the main ridge, situated at the base of its denticles. Ventrally, the entire jaw is occupied by the pulp cavity with a markedly separated furrow associated with the laeobasal ridge and clearly visible, deep dental pits of both ridges.

Right MI, poorly preserved strongly elongate, with moderately steep slopes. Anterior margin long, arcuate. Inner margin straight, directed posteriorly. Outer margin in all specimens poorly preserved. The same as in the left jaw, the main ridge turns inwards, its first denticles having truncate tops. The second ridge, formed by a row of very fine denticles and tubercles, situated in the anteroinner corner of jaw, slightly arcuate and directed posteromedially, its length equalling about 0.25 of the length of jaw. Laterally, the left jaw is narrow, anterior margin directed posterolaterally and denticles of the main ridge — to the right. The second ridge narrow, straight, situated near the outer margin directed posteriorly. Ventrally, there occurs a gaping pulp cavity with clearly visible, deep dental pits.

Remarks. — Of the apparatus described above, only detached jaws are known but their structure is so characteristic that there is no fear of confusing them with the jaws of other apparatuses. These jaws have so thin walls that, after macerating them from the rock with hydrochloric acid, they are partly transparent.

The new species differs from all representatives of the genus *Mochtyella* known thus far in its thin walls, very long laeobasal plate strong outward bend of the main ridges in the anterior part of both MI and a frontal situation of the second ridge.

Mochtyella multilamellata n. sp.
(Pl. II., Figs. 1–4)

Holotype: A left MI connected with two lateral teeth, Z. Pal. No. Sc. I/18, figured in Pl. II, Fig. 4.

Type horizon and locality: Upper? Ordovician, Mielnik on the Bug borehole, depth — 1.120–1.154 m.

Derivation of the name: Lat. *multum* = many, *lamella* = lamella; referring to the structure of the walls of jaws.

Diagnosis. — The jaws of the apparatus consist of thick walls in which growth lines are visible after a partial bleaching. MI elongate, with moderately steep slopes, the thickest anteriorly. Main ridges of both MI anteriorly turn outwards. Basal ridge in the right MI narrow, delicate, very finely-denticulated equalling about one third of the length of MI. The second ridge absent. In the left MI, laeobasal ridge denticulated considerably

longer than a half of the length of jaw. Lateral teeth(?) shaped like a thin claw. Anterior teeth unknown.

Denticle formula:

Left MI		Right MI	
laeobasal ridge	16	basal ridge	23
main ridge	14–17	main ridge	20

Material. — In addition to the holotype, three right and five left MI.

Description. — The length of MI varies within the range of 0.59 and 1.78 mm. Jaws built of thick walls in which thick growth lines, reflecting the outlines of jaws, are visible after a partial bleaching. Only external parts of jaws, on which the basal and laeobasal ridges are situated, are built of thin walls, on the whole poorly preserved. Growth lines are marked on some of the jaws in the form of furrows parallel to the margin. They are best visible near the anterior and inner margin.

Left MI elongate, tapering posteriorly with a maximum width in the anterior part equalling 0.3 to 0.4 of the length. Anterior margin arcuate. Inner margin straight, directed posteriorly. Posterior margin very short, rounded. Outer margin directed posteromedially, poorly preserved in all specimens. Main ridge denticulated over the entire length, in the anterior part of jaw turning outwards. Its first denticles, are relatively blunt, posterior ones bent outwards. The anteroinner end of jaw extends in some specimens to form an attachment lamella. Laeobasal ridge denticulated, equalling 0.65 of the length of jaw directed posteriorly. Its first denticle, much larger than the remaining ones, equalls the largest denticles of the main ridge. Laeobasal ridge connected with the entire jaw by a relatively thin wall, the anterior part of this ridge being the most strongly fused with the jaw. Posterior par, mostly not preserved, is known only from the holotype in which it is detached from the jaw. In the lateral position, the jaw is relatively narrow and slightly tapering posteriorly. Lateral margins straight, converging posteriorly. Denticles of both ridges directed to the right. Laeobasal ridge situated at the base of denticles of the main ridge. A wide shallow pulp cavity with clearly visible, deep dental pits of both ridges, occurs ventrally.

Right MI is similar in general outline to the mirror image of the left MI, from which it differs mostly in the basal ridge. The latter is narrow, delicate, covered with many, very fine, blunt denticles, equalling about 0.35 of the length of MI, situated near the main ridge and directed straight posteriorly. It is known fromone specimen only in which its most posterior end is not directly connected with the jaw.

Lateral teeth. Two teeth, unnaturally arranged, are attached to the laeobasal plate of the holotype. They are thin, long, with long, inflected

and sharp tips. Another, short but sharp tip occurs at the base of the larger tooth. These are probably lateral teeth.

Remarks. — No right and left jaws connected with one another have been found in the newly described apparatus. Their structure is, however, so characteristic that they certainly belong to one and the same species.

The new species is most similar to *Mochtyella fragilis* n. sp., from which it differs in the structure of walls and lack of the second ridge in the right MI. The walls of the newly described apparatus are built as if many jaws of the same shape were placed one in another (cone in cone), very closely adhering to each other. Outer layers do not completely cover inner ones, forming furrows around the jaw. Such a structure resembles the jaws of other apparatuses in the process of moulting; (Kielan-Jaw. 1966, Pl. I, Figs. 1–2), but differs from them in a greater number of coatings, their smaller thickness and their being fused with each other. The growth process in *Mochtyella multilamellata* n. sp. probably took place in a manner different from that in these apparatuses.

Mochtyella sp. b
(Pl. III, Fig. 1)

Material. — Four right MI from the Lower Wenlockian deposits of the Mielnik borehole depth 1110–1118 m.

Description. — The length of the right MI varies from 0.46 to 0.74 mm, the maximum width occurring in the anterior part of jaw and equalling 0.36 of the length. Posteriorly, the jaw is much narrower. Anterior margin relatively long, rounded. Lateral margins, directed and slightly converging posteriorly. Posterior margin short, rounded. Main ridge, consisting of 12–14 posteriorly inclined denticles, runs through the middle of jaw up to its posterior end. Anterior denticles much longer and less sharp than the posterior ones. Basal ridge, equalling 0.24 of the length of jaw, covered with a row of about 14 very fine, irregular denticles and parallel to main ridge from which it is separated by a relatively deep furrow. Second ridge, equaling 0.53 of the jaw length, undenticulated, narrow, forming a sharp, high edge and parallel to main ridge from which it is separated by a deep and wide furrow. Very fine tubercles are visible in the anterior part of this ridge in some of the specimens. Laterally, jaw is the widest in the anterior part (about 0.4 of the length) and tapering posteriorly. Anterior and posterior margins directed posteromedially. Inner margin straight, directed posteriorly. Outer margin almost straight directed posteromedially. On the left side second ridge is situated near the left margin and directed straight posteriorly. On the right side, basal ridge is situated near the right margin and directed posterolaterally. The entire ventral side is occupied by a wide and deep pulp cavity with visible dental pits and furrows which

correspond to the basal and second ridge. At the posterior end of jaw, the inner slope is fused with the outer slope only near the main ridge.

Remarks. — The newly described jaw is most similar to *Mochtyella* sp. b described by Kielan-Jaworowska (1966, pp. 56 and 57, Pl. 4, Fig. 2; Pl. 5, Fig. 4) from the Silurian erratic boulders of Poland, from which it differs, however mostly in a considerably longer and more conspicuous second ridge, denticulation of the main ridge stretching up to the posterior end of jaw, slightly longer, somewhat differently situated and more conspicuously denticulated basal ridge and stronger posterior narrowing of jaw.

Genus *Pistoprion* Kielan-Jaworowska, 1966
Pistoprion transitans Kielan-Jaworowska, 1966
(Pl. III, Figs. 3–7)

1966. *Pistoprion transitans* n. sp.; Z. Kielan-Jaworowska, Polychaete jaw apparatuses..., pp. 60–62, Pl. 3, Fig. 2; Pl. 6, Fig 2; Pl. 7, Figs. 2, 3; Text-figs. 5, 6.

Material. — Connected jaws: MIl with lbp, MIr with bp, MIr with MIIr and it, MIr with MIIr (×2), MIr with mdb; 17 detached MIr and 22 MIl. All specimens from the ?Upper Ordovician of the Mielnik borehole from depths ranging between 1.120 and 1.154 m.

Description. — The collection includes a right mandible connected, in a natural position, with a right MI. Mandibles of the genus *Pistoprion* have so far been unknown. This mandible is 0.45 mm long and equalls 1.6 of the length of the right MI. Dorsally, it is flat and sharpened at both ends. Its maximum width occurs at 0.4 of the length from the anterior end and equalls 0.35 of the length. Outer margin is slightly arcuate and directed almost straight posteriorly. A small triangular notch is visible at its anterior end. Anterior margin running posteromedially. A narrow, deep bight occurs at its anterolateral end. Anterior margin contacts inner margin at 0.4 of the length from the anterior end where a projection is formed which is directed medially and parallel to the longer axis of the mandible. Inner margin directed first laterally, subsequently runs posteriorly meeting, at the posterior end, the outer margin.

Ventrally, it is visible that the mandible consists of two parts: a slightly shorter, oval and relatively wide anterior part equalling in length 0.45 of the length of the entire mandible and an elongate barlike basal part. The two parts are separated by a wide, shallow furrow. The anterior part is elongate posteromedially, inwardly compressed and oblique to the basal part, which is directed straight posteriorly. The basal part is, in cross section, convex ventrally. From the left lateral side a longitudinal depression, which may be, however, a result of deformation, is visible in the middle of the anterior part.

Comparison. — Specimens of *P. transitans* from the Mielnik borehole differ from those of this species from the Ordovician erratic boulders of Poland (Kielan-Jaworowska, 1966) in the following characters:
1. Slightly larger dimensions; the size of their MI varies from 0.32 to 0.97 mm, while a maximum size of the specimens from the erratic boulders amounts to 0.6 mm.
2. The number of denticles in both MI varies in wider limits (in the right MI from 11 to 16 and in the left MI from 13 to 18) than in the denticle formula of this species.
3. The basal and laeobasal plates, known from single specimens only found in the Mielnik borehole, have each two denticles less (in bp — 10 and in lbp — 12) than in the specimens from the erratic boulders.
4. The basal plate is somewhat shorter (0.35 of the length of MI) and the laeobasal plate longer (0.57 of the length of MI) than it has been given in the definition of the species (0.4 and 0.5 esp. of the length of MI). Judging, however, from different lengths of bights which correspond to these plates in MI, the length of basal and laeobasal plates in the apparatuses, which come from the Mielnik borehole, was to a certain extent differentiated.

All the differences listed above are, in the present writer's opinion, contained within the range of the intraspecific variability.

Occurrence. — ?Upper Ordovician of the Baltic Region.

Family **Xanioprionidae** Kielan-Jaworowska, 1966
Genus *Xanioprion* Kielan-Jaworowska, 1962
Xanioprion borealis Kielan-Jaworowska, 1962
(Pl. IV, Figs. 2–4.)

1962. *Xanioprion borealis* n. sp.; Z. Kielan-Jaworowska, New Ordovician genera..., pp. 321–323, Pls. 11–13, Text-fig. 4*a*.
1966. *Xanioprion borealis* Kielan-Jaworowska; Z. Kielan-Jaworowska, Polychaete jaw apparatuses..., p. 65, Text-fig. 1*B*.

Material. — An incomplete apparatus consisting of bp, lbp, MIl and MIIl; two specimens of MIIl connected with lbp and detached fragments: four lbp, four bp, three MIl, two MIr, thirty-two MIIr and twenty-nine MIIl. All of them from the Upper? Ordovician deposits of the Mielnik borehole, from depths ranging between 1.120 and 1.154 m.

Comparison and remarks. — Particular elements of the apparatus of X. borealis from the Mielnik borehole only insignificantly deviate from the description of the elements of this apparatus, coming from erratic boulders of Poland (Kielan-Jaworowska, 1962):
1. Specimens from Mielnik are larger, length of MII varies from 0.37 to 1.6 mm, while that of MII from erratic boulders from 0.17 to 0.68 mm.
2. The jaws MII have a smaller number of denticles, usually nine and at

most eleven, while in the description of the elements from erratic boulders this figure fluctuates between 12 and 16.

3. The only well-preserved posterior part of the laeobasal plate from Mielnik (Pl. IV, Fig. 2) has 24 denticles, while in the posterior parts of basal and laeobasal plates from erratic boulders there are 15 to 21 denticles.

In the present writer's opinion, the differences mentioned above are of no fundamental diagnostic importance.

The elements of the apparatus of *X. borealis* are, in the horizons under study from the Mielnik borehole, among the most abundantly occurring scolecodonts. Their MII jaws, mostly met with, are the largest and most strongly built elements of the apparatus. In addition, their characteristic shape enables their easy distinction from other scolecodonts, whereas the jaws MI are similar to some of the MI of the family Mochtyellidae.

Due to thinnings of chitin on the extension of the boundaries between denticles, the jaws of the apparatus of *X. borealis* easily disintegrate to unidenticle fragments which may be confused with separate elements.

Occurrence. — Middle and ?Upper Ordovician of the Baltic Region.

Family **Rhytiprionidae** Kielan-Jaworowska, 1966

Genus *Rhytiprion* Kielan-Jaworowska, 1966

Rhytiprion magnus Kielan-Jaworowska, 1966

(Pl. IV, Figs. 5–6)

1966. *Rhytiprion magnus* n. sp.; Z. Kielan-Jaworowska, Polychaete jaw apparatuses..., pp. 66–67, Pl. 8, Text-fig. 5*D*.

1966. *Rhytiprion* sp. *a*; Z. Kielan-Jaworowska, *Ibid.*, p. 68, Pl. 9, Fig. 1.

Material. — Five left, MI without laeobasal ridges and one right MI with a broken-off posterior part. All the specimens from the Upper Ordovician of the Mielnik borehole, from depth ranging between 1.120 and 1.154 m.

Remarks. — Although only single jaws of this apparatus were found in the Mielnik borehole, their identification does not arouse any doubts. They are in complete conformity with the description of a right and left MI from the apparatus of *Rh. magnus* known from the Ordovician erratic boulders of Poland. In addition to the characters given in the description of this species, it was found that a narrow, longitudinal ridge with a row of very numerous small crenulations, probably vestigial denticles, occurred in the anterior part of the right MI near its outer margin. This ridge, equalling in length about 0.3 of the jaw length runs from the inner end of the first transversal ridge, along the inner margin, straight posteriorly. Having had the possibility of studying the collection from the erratic boulders of Poland, the present writer found that similar ridges occurs in all well-preserved specimens of the right MI of this species. In most

specimens, the crenulations in the ridges under study are very fine, frequently fused with each other and visible only after bleaching. Their number, mostly difficult to count, varies from about 10 to about 16 so on the right side of the apparatus of *Rh. magnus*, there occur, more elements that on the left, similarly as in all apparatuses of the family Mochtyellidae Kielan-Jaw. A ridge, similar to that described above, occurring in the right MI of the apparatus of the genus *Mochtyella* and called the second ridge is considered as a homological element of the right MII of other apparatuses (Kielan-Jaworowska, 1966). In the apparatus of *Rhytiprion magnus*, there is, however, a separate right MII which cannot be considered as MIII since it is very similar to the left MII. In the present writer's opinion, the second ridge, together with the right MII of this apparatus is homologous to a single jaw MII in other apparatus, much the same as MIIa and MIIb in the genus *Vistuella* Kielan-Jaworowska (Kielan-Jaworowska, 1966).

The right MI, from the Mielnik borehole, described by Kielan-Jaworowska as *Rhytiprion* sp. a (1966, p. 68, Pl. 9, Fig. 1) differs from the specimens from erratic boulders in a larger width of the entire jaw, as well as in a smaller number of denticles and the development of the third transversal ridge in the form of a tubercle. The specimen figured on Pl. IV, Fig. 5, coming from the same range of depths, has a strongly developed third transversal ridge and its anterior part is in relation to the specimen, described by Kielan-Jaworowska, somewhat narrower. The length-width ratio of the left jaws from the Mielnik borehole varies from 2.5 to 3.0. The differences between the right MI of *Rh. magnus* and that of *Rhytiprion* sp. a, mentioned above, are therefore, most likely to be contained within the range of the intraspecific variability.

Family ?**Tetraprionidae** Kielan-Jaworowska, 1966
Genus ?*Tetraprion* Kielan-Jaworowska, 1966
?*Tetraprion* sp.
(Pl. IV, Fig. 7)

Material. — One apparatus from the Lower Wenlockian(?) deposits of the Mielnik borehole, from a depth between 1.119 and 1.120 m.

Description. — An apparatus composed of paired MI, MII and MIV, an unpaired left MIII, an intercalary booth and lateral and anterior teeth. A basal and laeobasal plate may be also parts of the apparatus but they are not preserved in the specimen under study. The right MI is 0.33 mm long.

Right MI. Dorsally, it is narrow, elongate and with a very steep, almost vertical inner slope. Anterior margin short, arcuate, running anteromedially and passing gradually into inner margin. Inner margin anteriorly gently arcuate directed posteromedially, further on straight,

directed posteriorly. Outer margin of the specimen under study poorly preserved converges at the posterior and with inner margin. Twelve denticles directed posteriorly and slightly inclined inwards are distributed over the entire inner and anterior margin. The size of a few first denticles increases posteriorly, the largest being teeth 4 and 5 and those following them decrease posteriorly. In the lateral view the jaw is triangular. Anterior margin subtransversal, slightly inclined towards denticles; it extends to form the anterior margin of the first denticle. Ventrally, the entire jaw is occupied by a gaping pulp cavity.

Left MI is very similar to a mirror reflection of the right MI but much smaller (0.7 of the length of MI) and having one denticle less. Outer margin well-preserved, straight, running posteromedially. Inner margin, except for an arcuate most anterior part, runs straight posteriorly. Ventrally, dental pits are claerly visible in a deep pulp cavity.

Right MII is similar in shape to the right MI but considerable smaller (0.58 of its length). Dorsally, it is narrow, subtriangular. Anterior margin directed posteromedially. Inner margin straight directed posteriorly. Outer margin directed posteromedially. Eleven denticles of which denticle 5 is the largest, occur along the inner and anterior margin. Laterally, the jaw is also subtriangular but considerably wider. Anterior margin subtransversal, lateral margins converging posteriorly. On the left side, the anterior part of inner slope extends to form an attachment lamella and on the right side, part of pulp cavity is visible. The entire ventral side is occupied by pulp cavity with clearly visible dental pits.

The left MII is almost the same in size as the left MI to which it is very similar except for its outer margin which is more arcuate and forms a whole together with anterior margin. Since the posterior part of the jaw is covered by the right MI, it is impossible to count exactly its denticles, but their number should be approximately the same as in MI jaws.

Left MIII is very similar to a mirror reflection of the right MII but somewhat smaller having two denticles less and its anterior margin being more transversal dorsally.

Left MIV equals 0.53 of the length of MI is more strongly compressed laterally and gently arcuate. A row of 14 relatively narrow denticles, of which the largest is denticle 7, runs along the inner margin. Laterally, the jaw is much wider and triangular; part of pulp cavity is visible on the left. Ventrally, this cavity is narrow and deep.

Right MIV poorly preserved, similar to a mirror reflection of the left MIV and approximately the same in size.

The intercalary tooth, situated anteriorly on the right MI, triangular, elongate in the anterior part, fine-denticulated along both margins. Laterally, it is slightly convex on the left and slightly concave on the right side.

Lateral teeth arranged in rows. Posteriorly, single rows of teeth stretch on both sides of the apparatus along outer slopes of MI and MII, covering them in part dorsally. These teeth are triangular, relatively wide at the base, on lateral margins fine denticulated, dorsally flat or slightly concave, ventrally convex. Denticles on margins are shaped like thin spines. In the anterior part of apparatus, teeth are numerous but their arragement has only slightly been investigated. Most likely, two rows of teeth occur on both sides of the apparatus.

Anterior teeth. In the anterior part of the apparatus, in addition to the teeth described above, there occur more elongate teeth with long, thin tips. These are probably anterior teeth. Their arrangement in the apparatus is unknown.

Remarks. — The newly described apparatus has only tentatively been assigned to the genus *Tetraprion* Kielan-Jaworowska. It differs to a considerable extent from an only representative of this genus, known thus far, that is, *T. pozaryskae* Kielan-Jaw. First of all, the apparatus of *T. pozaryskae* is symmetric. In addition to basal and laeobasal plate, it has three pairs of symmetric or almost symmetric jaws, while the newly described apparatus has four jaws on the left and three on the right side, but the jaws corresponding to each other on each side of the apparatus considerably differ in size. Besides, in the apparatus of *T. pozaryskae*, outer rows of teeth stretch only as far as the anterior margin of MI (anterior teeth) and in the apparatus from the Mielnik borehole they run further posteriorly along outer slopes of both MI (lateral teeth). These teeth in the apparatus of *T. pozaryskae* are smooth and in the newly described one denticulated. In the apparatus of *T. pozaryskae*, the intercalary tooth is situated in the anterior part of basal plate and in the apparatus from Mielnik in the anterior part of MI. These differences are of considerable diagnostic importance and the newly described apparatus is most likely to belong to another genus unknown as yet. A new species and genus cannot be, however, erected since the collection contains only one partly deformed apparatus and it is not yet known whether or not the basal and laeobasal plate were its component parts. Likewise nobody knows for certain what was the original arrangement of anterior jaws and anterior teeth. Due to its similarity in the structure and arrangement of posterior jaws, this apparatus has tentatively been included to the genus *Tetraprion*.

The newly described apparatus also deviates considerably from the definition of the family Tetraprionidae Kielan-Jaw. and after a closer study of it, either the definition will have to be extended or a new family erected.

Tetraprion sp. a has been found on the borderline between the Upper Ordovician and Silurian deposits and, therefore, its stratigraphic position is not quite certain.

Family **Polychaetaspidae** Kielan-Jaworowska, 1966
Genus *Polychaetaspis* Kozłowski, 1956
Polychaetaspis wyszogrodensis Kozłowski, 1958
(Pl. IV, Fig. 1)

1956. *Polychaetaspis wyszogrodensis* n. sp.; R. Kozłowski, Sur quelques appareils masticateurs..., pp. 175–188, Figs. 3, 4, non Assemblage A. p. 180, Figs. 5, 6.
1966. *Polychaetaspis wyszogrodensis* n. sp.; Z. Kielan-Jaworowska, Polychaete jaw apparatus..., pp. 76–78, Pl. 12, Figs. 1–3, Pl. 19, Fig. 4, Text-figs. 5*K*, 8*A*.

Material. — An incomplete apparatus consisting of a basal plate, a right and a left MI, right and left MII; connected elements: MIr with MII and left lateral tooth; five detached basal plates, 23 right MI, 25 left MI, a right MII and a left MII. All specimens coming from the Upper? Ordovician deposits of the Mielnik borehole, from a depth ranging between 1.120 and 1.154 m.

Remarks. — The apparatus of *P. wyszogrodensis* from the Mielnik borehole figured on Pl. IV, Fig. 1 differs in some characters from the specimens of this species known from the Ordovician erratic boulders of Poland (Kozłowski, 1956; Kielan-Jaworowska, 1966). A maximum width of both its MI occurs at a distance of 0.4 of the length of jaw from the front, while in the specimens from the Ordovician erratic boulders — halfway the length of jaw. The size of a bight which, in the right MI, corresponds to basal plate and of an inner wing, in the left MI of the apparatus from the Mielnik, equalls 0.6 of the length of jaw, whereas in the specimens from the erratic boulders, a maximum length of the bight in the right MI is equal to a half of the length of jaw and the inner wing in the left MI is usually also shorter.

The differences mentioned above mostly concern the specimen figured on Pl. IV, Fig. 1, whereas the majority of the detached right and left MI from the Mielnik borehole almost do not differ at all from corresponding jaws from the erratic boulders. The existence of intermediate forms among the detached jaws MI, allows one to presume that the differences in the structure of the apparatus, from the Mielnik borehole and those from the erratic boulders are contained within the range of intraspecific variability.

Dimensions of the right MI in the collection, vary from 0.6 to 1.6 mm.

Detached elements of the apparatus of the family Polychaetaspidae and in particular MI are the most numerous scolecodonts occurring in the beds under study of the Ordovician deposits from the Mielnik borehole. Their differentiated shapes indicate that they belonged to a few species. Apart from those described above, they remain not worked out since identification of apparatuses on the basis of detached jaws would be, in the case of their multi-directional differentiation, rather risky.

Occurrence. — Middle and Upper Ordovician of the Baltic Region.

Family **Kalloprionidae** Kielan-Jaworowska, 1966
Genus *Kalloprion* Kielan-Jaworowska, 1962
Kalloprion ovalis Kielan-Jaworowska, 1962
(Pl. V, Fig. 2)

1962. *Kalloprion ovalis* n. sp.; Z. Kielan-Jaworowska, New Ordovician genera..., p. 311, Pls. 5–7.

1966. *Kalloprion ovalis* Kielan-Jaworowska; Z. Kielan-Jaworowska, Polychaete Jaw apparatuses..., p. 115, Text-fig. 10 C.

Material. — An incomplete apparatus consisting of a basal plate, a right and a left MI, a right and a left MII, a left MIII and a left MIV; the right MI joined with the basal plate. In addition, there are the following detached elements: a basal plate, six right MI, unic left MI, a right MII, three left MII and two left MIII. All the specimens are from the Upper? Ordovician deposits of the Mielnik borehole and come from a depth between 1.120 and 1.154 m.

Comparison and remarks. — *K. ovalis* from the Mielnik differs slightly from the apparatuses of this species which come from the Ordovician erratic boulders of Poland (Kielan-Jaworowska, 1962, 1966). All jaws are relatively wider and have shorter, thicker and more bluntly terminating denticles. Basal plate has only eight denticles, that is, one less than in such plates with the least number of denticles from the erratic boulders. In addition, the specimens, from Mielnik are somewhat larger. The largest of the apparatuses coming from the erratic boulders has its right MI 0.58 mm long, while the length of right MI from Mielnik varies within limits of 0.7 and 1.4 mm.

The specimens of *K. ovalis* from Mielnik are similar in some respects to *K. triangularis* Kielan-Jaw. According to Kielan-Jaworowska (1966), *K. triangularis* differs from *K. ovalis* mostly in a longer basal plate and its larger cover on the ventral side as well as in having a wide inner slope in the right MI and both MII. The shape of the inner slope in jaw apparatus from Mielnik (Pl. V, Fig. 2) is not visible since it is compressed dorsally, while in the most detached right MI and left MII in collection inner slopes are wide. Those jaws do not differ from corresponding elements of *Kalloprion triangularis*. Thus, the length-to-width ratio of the basal plate remains a main character in which *K. ovalis* differs from *K. triangularis*. In the holotype of *K. ovalis* this ratio amounts to 1.36, in the specimens from Mielnik to 1.27 and 1.48 and in the holotype of *K. triangularis* to 1.71. This difference is not, therefore, so great and in some of the specimens from erratic boulders it is even smaller. In the writer's opinion, it is very likely that a more abundant material should allow one to determine several transitional forms between these species.

Attention should here be attracted to the fact that the width of basal plates, in particular the detached ones, may easily be subject to "decrease"

by breaking off the posterolateral corner which is composed of a very thin chitin wall covered in a normal position in the apparatus, under the posterolateral shank of the right MI. The width of inner slopes also depends to a considerable extent on the state of preservation of the specimens.

Occurrence. — Middle and ?Upper Ordovician of the Baltic Region.

Family **Paulinitidae** Lange, 1947
Genus *Paulinites* Lange, 1947
Paulinites polonensis Kielan-Jaworowska, 1966
(Pl. I, Fig. 5)

1966. *Paulinites polonensis* n. sp.; Z. Kielan-Jaworowska, Polychaete jaw apparatuses..., pp. 126–129, Pl. 29, Pl. 30, Figs. 7–8, Text-figs. 5 *L* and 11.

Material. — Three apparatuses from the Upper Ludlovian, deposits of the Mielnik borehole, the first complete, from a depth of 638–662 m the second consisting of MIr, MIl, MIIr and MIII from a depth of 663 m and the third consisting of MII, MIIr and MIII from a depth of 791 m; MIr connected with MIIr from the Lower Wenlockian deposits from a depth of 1.115 m and a few detached MI and MII from various depths, mostly ranging between 1.112 and 1.120 m.

Description. — Carriers are preserved in the specimen from a depth of 638–662 m. They have not as yet been known form *P. polonensis.* Their length equalls 0.42 of the length of MI and their maximum width observed in the anterior part, amounts to 0.25 of their length. Their anterior margin is transversal anterolateral corner rounded, anteromedial corner bent ventrally and outer margin, gently bent inwards, runs posteriorly. Inner margin straight anteriorly, directed posteriorly, poorly preserved in the posterior part of both carriers. In the anterior part of carriers chitin relatively thick, posteriorly very thin. In the specimen under study, carriers are connected with one another in the anterior part only.

Comparison. — The complete apparatus from a depth of 638–662 m differs from the specimens described from the erratic boulders of Poland (Kielan-Jaworowska, 1961) in the following characters:

1). In the posterior part of the right MI in which basal plate is situated, bight is shorter, its length being 0.1 of the length of MI and in the specimens from erratic boulders — 0.15.

2). Inner wing is insignificantly shorter — 0.21 of the length of MI and in the specimens from erratic boulders — 0.26.

3). The smooth, nondenticulated part of inner margin equals 0.18 of the length of MI and, therefore it is also shorter than in the specimens from erratic boulders in which it equals 0.25 of the length of MI.

4). In the posterior part of the left MI, bight equals 0.14 of the length of jaw and in the specimens from erratic boulders — 0.18.

5). In the MI jaws, denticles do not decrease posteriorly but except for the first of them, are approximately of the same size.

6). In the right MI, pulp cavity is somewhat longer, equalling 0.35 of the length of MI, while in the specimens from erratic boulders — 0.31.

7). In the right MII, pulp cavity equals 0.73 of the length of MI and in the specimens from erratic boulders — 0.65.

The remaining apparatuses from the Upper Ludlovian deposits differ from the specimens known from erratic boulders to a considerably smaller extent. In the specimen from a depth of 663 m, bight of the right MI equals 0.13 and inner wing 0.25, of the length of jaw. In the specimen from a depth of 791 m, the length of bight in the right MI is 0.14 and that of pulp cavity — 0.33 of the length of jaw. The specimen from the Lower Wenlockian deposits (from a depth of 1.115 m) is completely conformable in its proportions with the holotype. On the other hand, it has in the right MI as many as 40 denticles, that is, six more than in the right MI from erratic boulder with a maximum number of denticles. These denticles, except for a few first ones (the largest) and a few last ones (the smallest) are approximately identical in size and only become less sharp posteriorly.

In addition to the differences mentioned above, basal plates of the specimens from Mielnik are less strongly fused with the right MI. Most likely, it depends on the state of preservation and size of specimens. In smaller specimens, the fusion is stronger.

The size of the specimens which form the collection is relatively large, the length of their MI varying from 0.8 to 1.5 m.

The material available is too scant to allow one for a quite certain statement that the apparatus from a depth of 638–662 m is not a separate variety of the species *P. polonensis*. It is, however, indicated by transitional forms that certain small differences in the proportions of jaws may be contained within the range of intraspecific variability even in the case in which they concern elements important diagnostically.

P. polonensis is, in the writer's opinion, considerably related to *P. kosoviensis* (Żebera, emend. Šujdr) and *P. burgensis* Martinsson. Both these species are unfortunately known only from poorly preserved specimens.

Occurrence. — Silurian of the Baltic Region.

Family **Skalenoprionidae** Kielan-Jaworowska, 1966

Genus *Skalenoprion* Kielan-Jaworowska, 1962

Skalenoprion bugensis n. sp.

(Pl. V, Fig. 1)

Holotype: A jaw apparatus figured in Pl. V, Fig. 1.

Type horizon and locality: Lower Wenlockian, Mielnik on the Bug borehole, depth 1.116–1.118 m.

Derivation of the name: Found near the Bug River.

Diagnosis. — A relatively small jaw apparatus, composed of paired MI, MII, MIV and MV, a nonpaired left MIII and, most likely, carriers unknown as yet. In the right MI, basal ridge short, smooth, inconspicuous; fusion furrow invisible; hook slightly shorter, than a half of the length of jaw. The left MI almost completely symmetrical with the right MI except for its not having a basal ridge and its larger hook. MII almost symmetrical, narrow, with a long, thin, arcuate and sharply terminating shank and a gaping pulp cavity on the ventral side. The left MIII is a small, subtriangular jaw with a transverse branch considerably longer than the longitudinal one. MIV asymmetrical flat plates with a few denticles of which the first one is considerably longer than the rest of them; MV in the form of single teeth fused with MIV.

Denticle formula:

MI	5	5
MII	6	5
MIII	4	—
MIV	3	4
MV	1	1

Material. — An almost complete apparatus from the Lower Wenlockian deposits of the Mielnik borehole, from a depth of 1.116–1.118 m.

Description. — A relatively small apparatus with MI 0.22 m long. Carriers unknown.

Right MI — length-width ratio amounts to about 2:1. A stout hook makes up almost a half of the length of jaw. Outer margin of jaw runs around the hook and subsequently, in the form of a gentle arch, posteriorly; before the posterior end it is slightly bent inwards, forming a shallow bight. Posterior margin generally posteromedial but slightly wavy. Posteriorly margin describes a large semicircle, forming a hook and further running straight posteriorly. Five denticles bent dorsally and inclined posteriorly are distributed along its posterior part. Before the posterior end, this margin bends outwards forming a small inner wing. A short, smooth, poorly visible basal ridge occurs in the posterior inner corner of the jaw and is directed posteromedially. Fusion furrow of basal plate invisible. Ventrally, the entire posterior half of jaw is occupied by pulp cavity reaching the level of the first denticle. It is separated from the inner margin by a narrow belt. In the lateral view, the most swollen is the most posterior part of jaw, the tip of hook and denticles being directed to the right.

Left MI is almost symmetric to the right MI, except for its not having the basal ridge and inner wing, its hook being slightly longer and a denticulate part of inner margin shorter, thus allowing the pulp cavity on the ventral side to reach further anteriorly than the denticles.

Right MII equals almost a half of the length of MI; its transverse

branch equals 0.65 of the length of longitudinal one and its maximum width, excluding shank, equals about 0.3 of the length. Anterior margin, strongly extended laterally, forms a long, narrow, arcuate and pointed shank whose tip is directed posteriorly. Outer margin runs posteriorly but is slightly wavy, forming a contraction of jaw below the shank and an extension in the posterior part. Just before the posterior end, it is bent inwards forming a small bight. Inner margin makes up a row of denticles bent dorsally and inclined posteriorly. At the posterior end, lateral margins converge, forming a short process slightly deflacted laterally.

From the right lateral side the jaw is somewhat wider, its denticles directed to the left and shank upturned. Except for the shank, the entire ventral side is occupied by a gaping pulp cavity.

Left MIII equals in size about 0.2 of the length of MI. Transverse branch considerable longer than longitudinal one. Shape subtriangular. Anterior margin long, slightly arcuate, forming long and stout shank laterally and a large denticle internally. Inner and outer margins converge posteriorly. A row of four denticles decreasing posteriorly occurs along inner margin. Opening of pulp cavity gaping ventrally, narrow.

Right MIV represents a small, irregularly outlined plate, strongly compressed laterally, with an attachment lamella and fine denticles on inner margin. The first denticle considerably larger than the rest of them.

Left MIV is a small plate compressed laterally, with a relatively large attachment lamella and three denticles, the first of which is considerably larger than the remaining ones.

Right and left MV are long, narrow teeth fused with the first denticles of MIV and their attachment lamellae.

Remarks. — The newly described apparatus has a complete set of nine well-preserwed jaws in natural position which considerably extends the knowledge of the family Skalenoprionidae. An only apparatus of this family, known so far and assigned to *Skalenoprion alatus* Kielan-Jaw., 1962 had only two first pairs of jaws preserved. Now, only carriers and mandibles of this family remain unknown. The new find confirms Kielan-Jaworowska's observation (1962) that the family Skalenoprionidae is considerably related to the Atraktoprionidae. It turned out that, in addition to the similarity in posterior jaws, the two families have the same number and arrangement of anterior jaws. The lack of basal plate in Skalenoprionidae and, consequently, a different outline of the posterior part of the right MI is the only important character distinguishing these two families.

An almost complete disappearance of traces of basal plate in the apparatus described, relates it to the Recent family Arabellidae from which it radically differs, however, in the structure of the anterior part of apparatus, consisting in Arabellidae of only two pairs of symmetrical teeth.

S. bugensis n. sp. differs from *S. alatus* Kielan-Jaw. in a smaller and

less conspicuous basal ridge, an invisible fusion furrow in the right MI, MII longer than MI, their slightly different shape in particular of branches in considerably smaller dimensions of the entire apparatus. *S. bugensis* n. sp. differs from *Skalenoprion* a, b and c (Kielan-Jaworowska, 1966, pp. 143–144, Pl. 36, Figs. 3–5) in a smaller and less conspicuous basal ridge, slightly different shape of the right MI and considerably smaller dimensions.

In the newly described apparatus, basal ridge is very poorly visible and, in worse preserved specimen, may be overlooked at all.

Our species is most likely to occur very rarely. Only the right MI may be identified on the basis of its detached elements, the remaining ones cannot be distinguished for certain from the jaws of other apparatuses of both the Skalenoprionidae and Atraktoprionidae. None single MIr of the apparatus described, has, however, been found by the writer, which perhaps might be ascribed in part, to their small dimensions. A comparison of the right MI of the apparatus belonging to the Skalenoprionidae with the scolecodonts described in the parataxonomic systematics was carried out by Kielan-Jaworowska (1962, 1966).

Detached scolecodonts

In addition to the apparatuses described, the collection from Mielnik includes many detached jaws which belong to unidentified jaw apparatus. In the Silurian deposits, these scolecodonts are very few. The collection contains only three, relatively very small jaws of the genus *Polychaetaspis* Kozłowski, a few fragmentary jaws of the genus *Mochtyella* Kielan-Jaw. of the group *trapezoidea* and some indeterminate fragments of other jaws.

On the other hand, scolecodonts abundly occur in the Middle and Upper Ordovician deposits. In addition to the apparatuses here described, the collection includes detached jaws of apparatuses belonging to the genera *Mochtyella* Kielan-Jaworowska, *Polychaetaspis* Kozłowski, *Polychaetura* Kozłowski; *Ramphoprion* Kielan-Jaworowska, *Leptoprion* Kielan-Jaworowska, *Paulinites* Lange, *Atraktoprion* Kielan-Jaworowska, as well as the jaws of apparatuses unknown thus far. The Upper Ordovician jaws of the genus *Paulinites* Lange, compared with the Silurian ones, are characterized by considerably longer pulp cavities in both MI and much longer bights in the posterior parts of the right MI.

Palaeozoological Institute
of the Polish Academy of Sciences,
Warszawa, Żwirki i Wigury 93,
May, 1970

REFERENCES

GRIES, J. P. 1944. Ordovician scolecodonts. Dissertation. Univ. Chicago, 1–44, Illinois.

KIELAN-JAWOROWSKA, Z. 1961. On two Ordovician polychaete jaw apparatuses (O dwóch ordowickich aparatach szczękowych wieloszczetów (Annelida, Polychaeta)). — *Acta Palaeont. Pol.*, **6**, 3, 237–259, Warszawa.

— 1962. New Ordovician genera of polychaete jaw apparatuses (Nowe rodzaje ordowickich aparatów szczękowych wieloszczetów (Annelida, Polychaeta)). — *Ibidem*, **7**, 3/4, 291–332.

— 1966. Polychaete jaw apparatuses from the Ordovician and Silurian of Poland and a comparison with modern forms (Aparaty szczękowe wieloszczetów z ordowiku i syluru Polski i porównania z formami współczesnymi). — *Palaeont. Pol.*, **16**, 1–152, Warszawa

— 1968. Scolecodonts versus jaw apparatuses. — *Lethaia*, **1**, 1, 39–49, Oslo.

KOZŁOWSKI, R. 1956. Sur quelques appareils masticateurs des Annélides Polychètes ordoviciens (O paru narządach szczękowych pierścienic wieloszczetów z okresu ordowickiego). — *Acta Palaeont. Pol.*, **1**, 3, 165–210. Warszawa.

LANGE, F. W. 1949. Polychaete annelids from the Devonian of Parana, Brazil. — *Bull. Amer. Palaeont.*, **33**, 134, 1–71, Ithaca.

ŠNAJDR, M. 1951. Bluždajuščie polichety češskogo drevnego paleozoja. — *Sborn. Centr. Geol. Komit. Č.S.R.*, **18**, 245–296, Praga.

SZANIAWSKI, H. 1966. Three new polychaete jaw apparatuses from the Upper Permian of Poland (O trzech nowych aparatach szczękowych wieloszczetów z permu górnego Polski). — *Acta Palaeont. Pol.*, **13**, 2, 255–281, Warszawa.

TAUGOURDEAU, Ph. 1968. Les Scolécodontes du Siluro-Dévonien et du Carbonifère de sondages sahariens; stratigraphie-systématique. — *Rev. Inst. Franç. Pétrole, Ann. Combust. Liquides*, **23**, 10, 1219–1252, Paris.

TOMCZYK, H. 1968. Sylur. *In*: S. Sokołowski (*ed.*), Budowa geologiczna Polski. Stratygrafia. Cz. 1: Prekambr i paleozoik. 237–312, Warszawa.

TOMCZYKOWA, E. 1964. Ordowik platformy wschodnioeuropejskiej na obszarze Polski (Ordovician of the East-European Platform in the area of Poland). — *Kwart. Geol.*, **8**, 3, 491–505, Warszawa.

ZNOSKO, J. 1964. Ordowik obszaru Białowieży i Mielnika (The Ordovician in the regions of Białowieża and Mielnik). — *Ibidem*, **8**, 1, 60–72.

HUBERT SZANIAWSKI

APARATY SZCZĘKOWE WIELOSZCZETÓW Z ORDOWIKU I SYLURU WIERCENIA MIELNIK

Streszczenie

W pracy opisano aparaty szczękowe wieloszczetów z utworów ordowiku i syluru wiercenia Mielnik nad Bugiem. Wyróżniono 15 gatunków aparatów, z których 8 jest znanych z ordowickich i sylurskich głazów narzutowych Polski (Kozłowski 1956, Kie-

lan-Jaworowska 1961, 1962, 1966), a 4 uznano za nowe: *Mochtyella duplicidentata* n. sp., *Mochtyella fragilis* n. sp., *Mochtyella multilamellata* n. sp. i *Skalenoprion bugensis* n. sp. Pozostałe 3 gatunki ze względu na niedostateczny stan zachowania określono do szczebla rodzajowego. Ponadto w badanych utworach znaleziono liczne izolowane szczęki, z których część oznaczono rodzajowo. Stwierdzono, że zespół wieloszczetów ordowickich z wiercenia Mielnik różni się zasadniczo od sylurskich. Wyniki te zgodne są z obserwacjami Kielan-Jaworowskiej (1966), poczynionymi w oparciu o badania aparatów szczękowych z głazów narzutowych Polski. W utworach ordowiku skolekodonty są urozmaicone gatunkowo i bogate w okazy. Wśród nich rodzaje: *Rhytiprion* Kielan-Jaworowska, *Polychaetura* Kozłowski, *Ramphoprion* Kielan-Jaworowska, *Kalloprion* Kielan-Jaworowska, *Leptoprion* Kielan-Jaworowska i *Pistoprion* Kielan-Jaworowska znane są dotychczas wyłącznie z ordowiku. W utworach syluru skolekodonty są stosunkowo nieliczne i reprezentowane są głównie przez szczęki z rodzaju *Paulinites* Lange.

Badania autora potwierdzają wnioski Kielan-Jaworowskiej (1966, 1968) o znacznej wartości stratygraficznej skolekodontów rozpatrywanych jako elementy aparatów szczękowych.

ХУБЭРТ ШАНЯВСКИ

ЧЕЛЮСТНЫЕ АППАРАТЫ МНОГОЩЕТИНКОВЫХ ЧЕРВЕЙ (POLYCHAETA) ИЗ ОРДОВИКА И СИЛУРА БУРОВОЙ СКВАЖИНЫ МЕЛЬНИК (ПОЛЬША)

Резюме

В статье описаны челюстные аппараты многощетинковых червей из ордовикских и силурийских отложений буровой скважины Мельник на Буге. Выделено 15 видов аппаратов, из которых 8 известно из ордовикских и силурийских эрратических валунов Польши (Kozłowski, 1956; Kielan-Jaworowska, 1961, 1962, 1966), а 4 считается новыми: *Mochtyella duplicidentata* n. sp., *Mochtyella fragilis* n. sp., *Mochtyella multilamellata* n. sp. и *Skalenoprion bugensis* n. sp. Остальные 3 вида, принимая во внимание плохую сохранность материала, определены только до уровня рода. Кроме того, в изученных отложениях найдены многочисленные отдельные челюсти, часть которых определено до уровня рода. Обнаружено, что состав ордовикских челюстей многощетинковых червей из буровой скважины Мельник резко отличается от силурийского. Эти результаты совпадают с наблюдениями Келян-Яворовской (Kielan-Jaworowska, 1966) по стратиграфическому распространению челюстных аппаратов из эрратических валу-

нов Польши. В отложениях ордовика сколекодонты многочисленны и значительно разнообразны по видовому составу. Среди них роды: *Rhytiprion* Kielan-Jaworowska, *Polychaetura* Kozłowski, *Ramphoprion* Kielan-Jaworowska, *Kalloprion* Kielan-Jaworowska, *Leptoprion* Kielan-Jaworowska и *Pistoprion* Kielan-Jaworowska — известны до сих пор только из ордовика. В силуре сколекодонты довольно редки и представлены главным образом челюстями рода *Paulinites* Lange.

Исследования автора подтверждают предположения Келян-Яворовской (Kielan-Jaworowska, 1966, 1968) о стратиграфическом значении сколекодонтов, рассматриваемых как элементы челюстных аппаратов.

PLATES

ABBREVIATIONS

al — attachment lamella
at — anterior teeth
bp — basal plate
br — basal ridge
it — intercalary tooth
lbp — laeobasal plate
lbr — laeobasal ridge
lt — lateral teeth
MIl — MVl — particular left jaws
MIr — MVr — particular right jaws
mdb — mandible
mr — main ridge
sr — second ridge

Plate I

Mochtyella cf. *polonica* Kielan-Jaworowska
Mielnik boring, ?Upper Ordovician, depth 1.120–1.154 m

Fig. 1. Almost entire jaw apparatus composed of a right and left MI, eight anterior teeth and incomplete chains of lateral teeth: a—b from dorsal and ventral sides (Z. Pal. No. Sc. I/4).
Fig. 2. Left MI joined with anterior tooth from left lateral side (Z. Pal. No. Sc. I/5).

Mochtyella duplicidentata n. sp.
Mielnik boring, Upper? Ordovician, depth 1.120–1.154 m

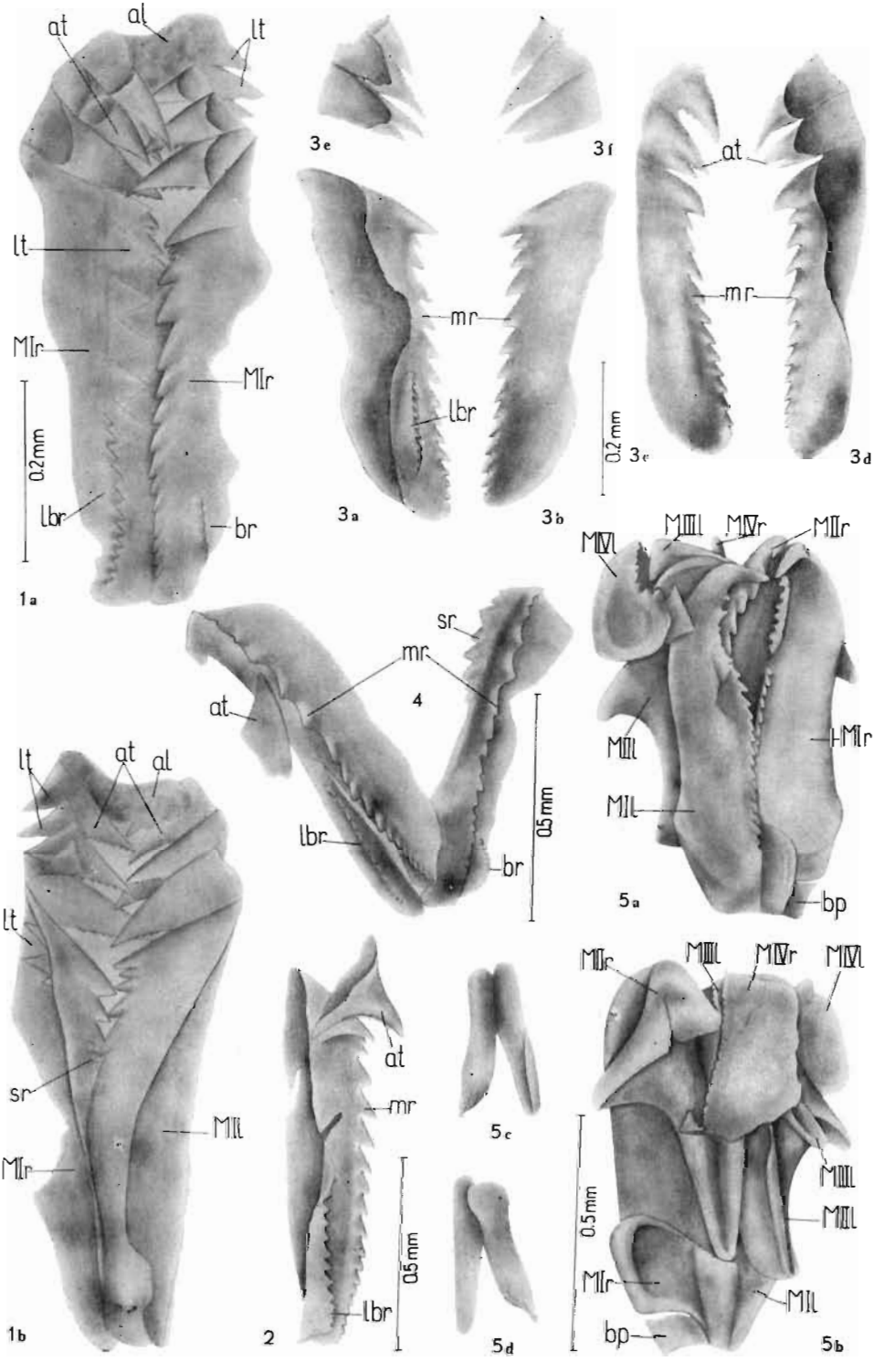
Fig. 3. Holotype, jaw apparatus composed of a right and left MI and five anterior teeth previosly joined together: *a*—*b* left MI from left lateral and right lateral sides; *c*—*d* right MI with two anterior teeth from left lateral and right lateral sides; *e*—*f* joined three left anterior teeth from left lateral and right lateral sides (Z. Pal. No. Sc. I/9).

Mochtyella cristata Kielan-Jaworowska
Mielnik boring, ?Upper Ordovician, 1.120–1.154 m

Fig. 4. Incomplete jaw apparatus composed of a right and left MI and anterior tooth attached to it in unnatural arrangement (Z. Pal. No. Sc. I/1).

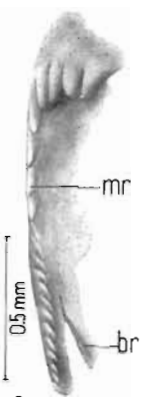
Paulinites polonensis Kielan-Jaworowska
Mielnik boring, ?Upper Ludlovian, depth 638–662 m

Fig. 5. Complete jaw apparatus with intentionally separated carriers: a—b the apparatus from dorsal and ventral sides, e—d carriers from dorsal and ventral sides (Z. Pal. No. Sc. I/63).


at
al
lt
lt
MIr
MIr
0.2mm
lbr
br
1a
3e
3f
mr
lbr
3a
3b
at
mr
0.2mm
3c
3d
sr
mr
at
4
lbr
br
0.5mm
MIVl
MIIIl
MIVr
MIIr
MIIIl
MIr
MIl
bp
5a
lt
at
al
lt
sr
MIl
MIr
1b
at
mr
lbr
0.5mm
2
5c
5d
MIIr
MIIIl
MIVr
MIVl
MIIIl
MIIl
MIr
MIl
bp
0.5mm
5b

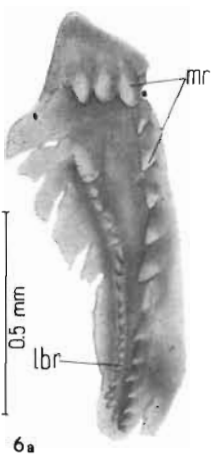
1a 1b

1c



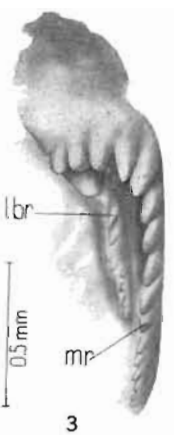
2

5

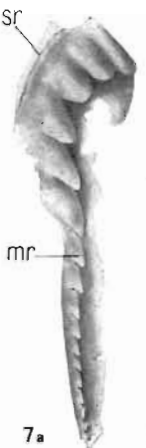


6a

6b

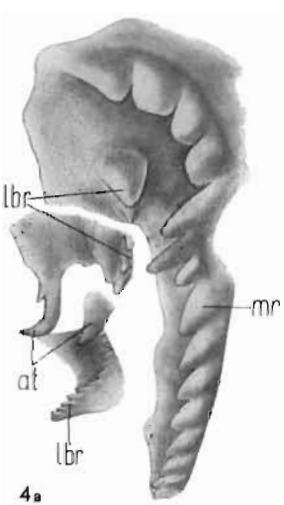


3

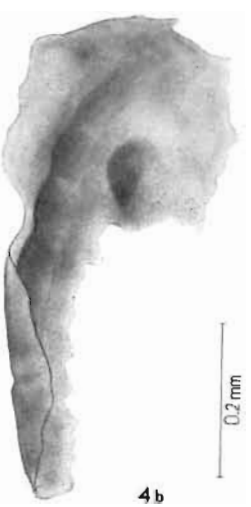


7a

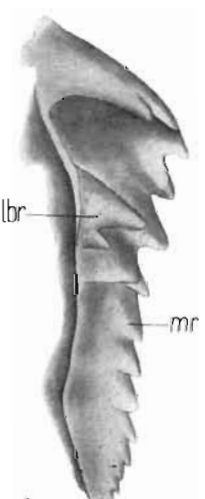
7b



4a



4b



4c

7c

Plate II

Mochtyella multilamellata n. sp.
Mielnik boring, Upper Ordovician, depth 1.120–1.154 m

Fig. 1. Right MI with broken off posterior part: *a*—*b* from dorsal and ventral sides, *c* from right lateral side, as seen in transmitted light after bleaching (Z. Pal. No. Sc. I/20).
Fig. 2. Right MI from dorsal side (Z. Pal. No. Sc. I/19).
Fig. 3. Left MI with broken off posterior part of laeobasal ridge (Z. Pal. No. Sc. I/21).
Fig. 4. Holotype, left MI with two lateral teeth preserved in unnatural arrangement. The laeobasal ridge and lateral? teeth has broked during the drawings; *a* from dorsal side with pieces broken off, *b*—*c* from ventral and left lateral sides (Z. Pal. No. Sc. I/18).

Mochtyella fragilis n. sp.
Mielnik boring, Upper? Ordovician, depth 1.120–1.124 m

Fig. 5. Left MI from dorsal side (Z. Pal. No. Sc. I/15).
Fig. 6a—b. Holotype, left MI from dorsal and ventral sides (Z. Pal. No. Sc. I/13).
Fig. 7a—c. Right MI from dorsal, ventral and left lateral sides (Z. Pal. No. Sc. I/14).

Plate III

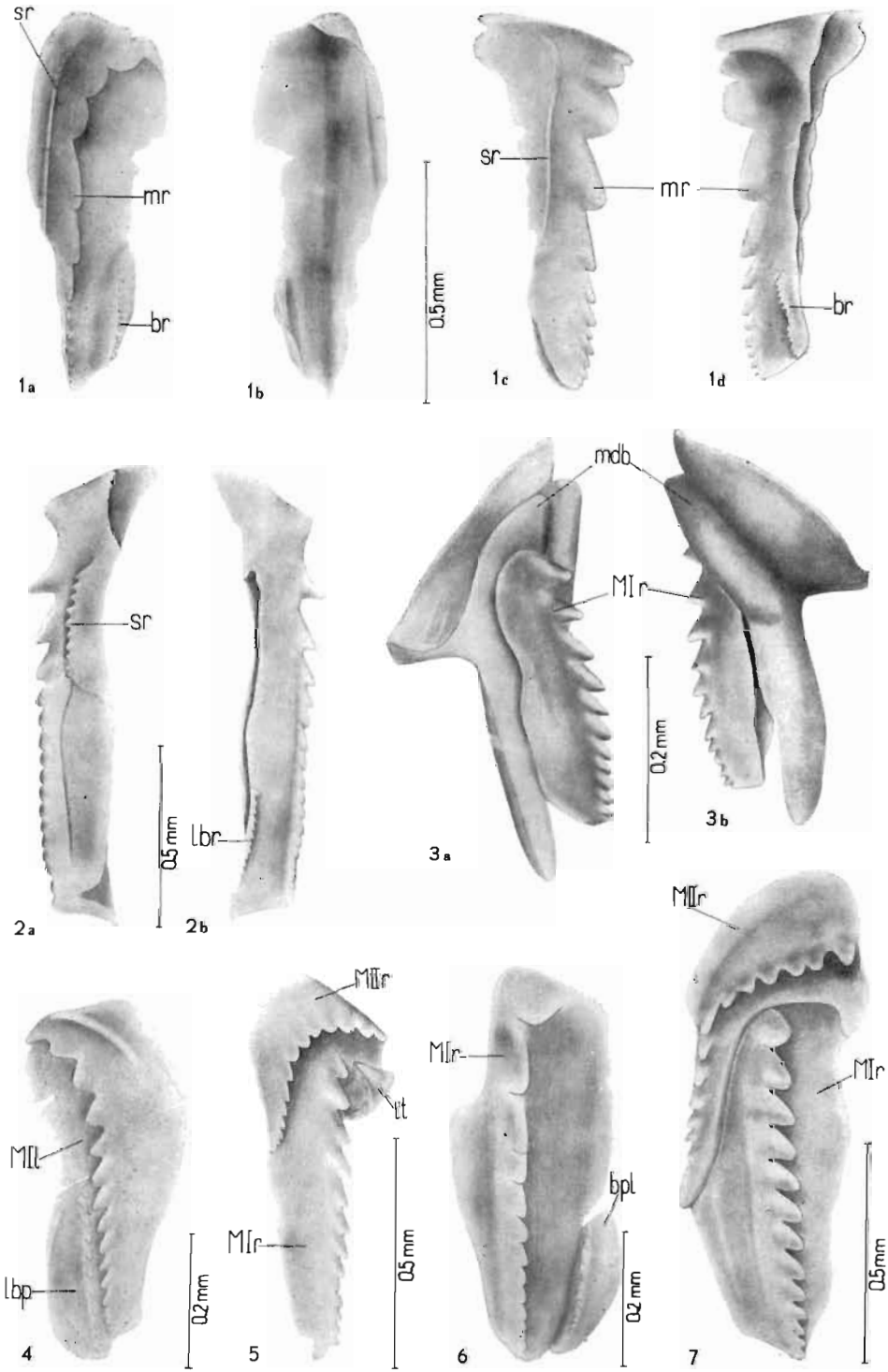
Mochtyella sp. *b*
Mielnik boring, Lower Wenlockian, depth 1.110–1.118 m
Fig. 1*a*—*d*. Left MI from dorsal, ventral, left lateral and right lateral sides (Z. Pal. No. Sc. I/25).

Mochtyella sp. *a*
Mielnik boring, Upper Ordovician, depth 1.120–1.124 m.

Fig. 2*a*—*b*. Left MI from right lateral and left lateral sides (Z. Pal. No. Sc. I/24).

Pistoprion transitans Kielan-Jaworowska
Mielnik boring, Upper? Ordovician, depth 1.120–1.154 m

Fig. 3*a*—*b*. Joined right MI and mandible from dorsal-left lateral side and ventral--left lateral sides (Z. Pal. No. Sc. I/28).
Fig. 4. Joined left MI and laeobasal plate from dorsal side (Z. Pal. No. Sc. I/31).
Fig. 5. Joined right MI, MII and intercalary tooth from dorsal-left lateral side (Z. Pal. No. Sc. I/29).
Fig. 6. Joined right MI and basal plate from dorsal side (Z. Pal. No Sc. I/30).
Fig. 7. Joined right MI and MII from dorsal side (Z. Pal. No. Sc. I/32).


sr
mr
br
1a
1b
0.5mm
sr
mr
1c
br
1d
sr
0.5mm
2a
lbr
2b
mdb
MIr
0.2mm
3a
3b
MIIr
MIr
MIIl
lbp
0.2mm
4
MIIr
lt
MIr
0.5mm
5
MIr
bpl
0.2mm
6
MIIr
MIr
0.5mm
7

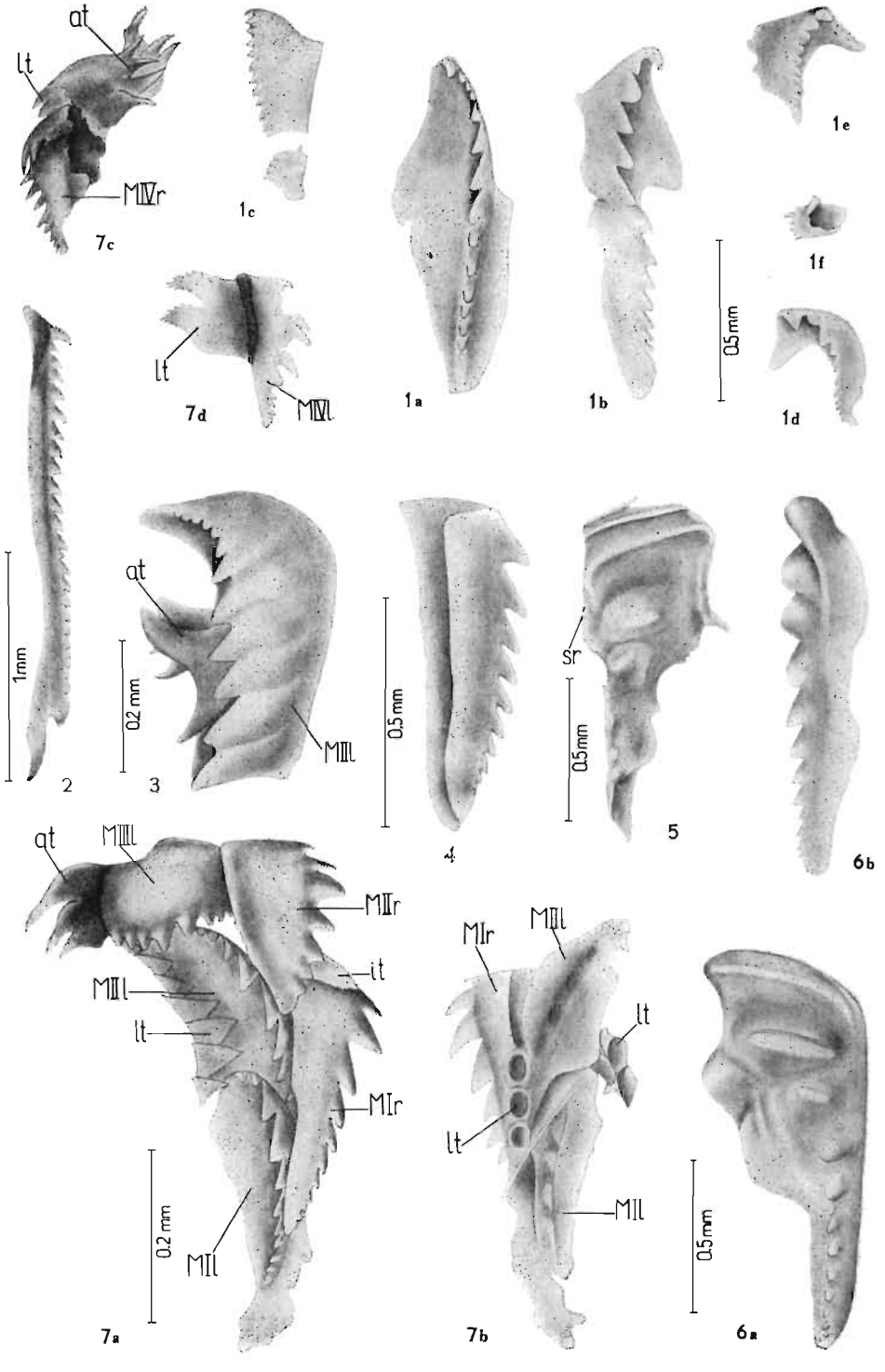

at
lt
MIVr
7c
1c
1a
1b
1e
1f
1d
0.5mm
lt
MIVl
7d
1mm
2
at
0.2 mm
MIIIl
3
0.5 mm
4
sr
0.5mm
5
6b
at
MIIIl
MIIr
it
MIIl
lt
MIr
0.2 mm
MIl
7a
MIr
MIIl
lt
lt
MIl
7b
0.5mm
6a

Plate IV

Polychaetaspis wyszogrodensis Kozłowski
Mielnik boring, Upper? Ordovician, depth 1.120–1.154 m

Fig. 1. Incomplete jaw apparatus composed of a basal plate, right and left MI, right and left MII and right MIV previously joined together: *a* left MI from dorsal side, *b* right MI from dorsal side, *c* basal plate from dorsal side, *d* left MII from dorsal side, *e* right MII from dorsal side, *f* right MIV from right lateral side (Z. Pal. No. Sc. I/50).

Xanioprion borealis Kielan-Jaworowska
Mielnik boring, Upper? Ordovician, depth 1.120–1.154 m

Fig. 2. Posterior part of laeobasal plate from left lateral side (Z. Pal. No. Sc. I/38).
Fig. 3. Left MII from dorsal side and three anterior? teeth attached to it in unnatural arrangement (Z. Pal. No. Sc. I/36).
Fig. 4. Left MI from left lateral side (Z. Pal. No. Sc. I/37).

Rhytiprion magnus Kielan-Jaworowska
Mielnik boring, Upper? Ordovician, depth 1.120–1.154 m

Fig. 5. Right MI from dorsal side with broken off posterior part (Z. Pal. No. Sc. I/45).
Fig. 6*a*—*b*. Left MI from dorsal and right lateral sides (Z. Pal. No. Sc. I/46).

?*Tetraprion* sp.
Mielnik boring, Lower Wenlockian?, depth 1.119–1.120 m

Fig. 7. Jaw apparatus composed of a right and left MI, right and left MII, left MIII, right and left MIV, intercalary tooth and incomplete chains of lateral and anterior teeth: *a* the apparatus from dorsal side with detached right and left MIV and some of anterior teeth, *b* posterior part of the apparatus from ventral side, *c* separated, deformed right MIV from right lateral side joined with a part of the chain of anterior teeth, *d* separated, partly broken left MIV from left lateral side joined with two lateral? teeth (Z. Pal. No. Sc. I/48).

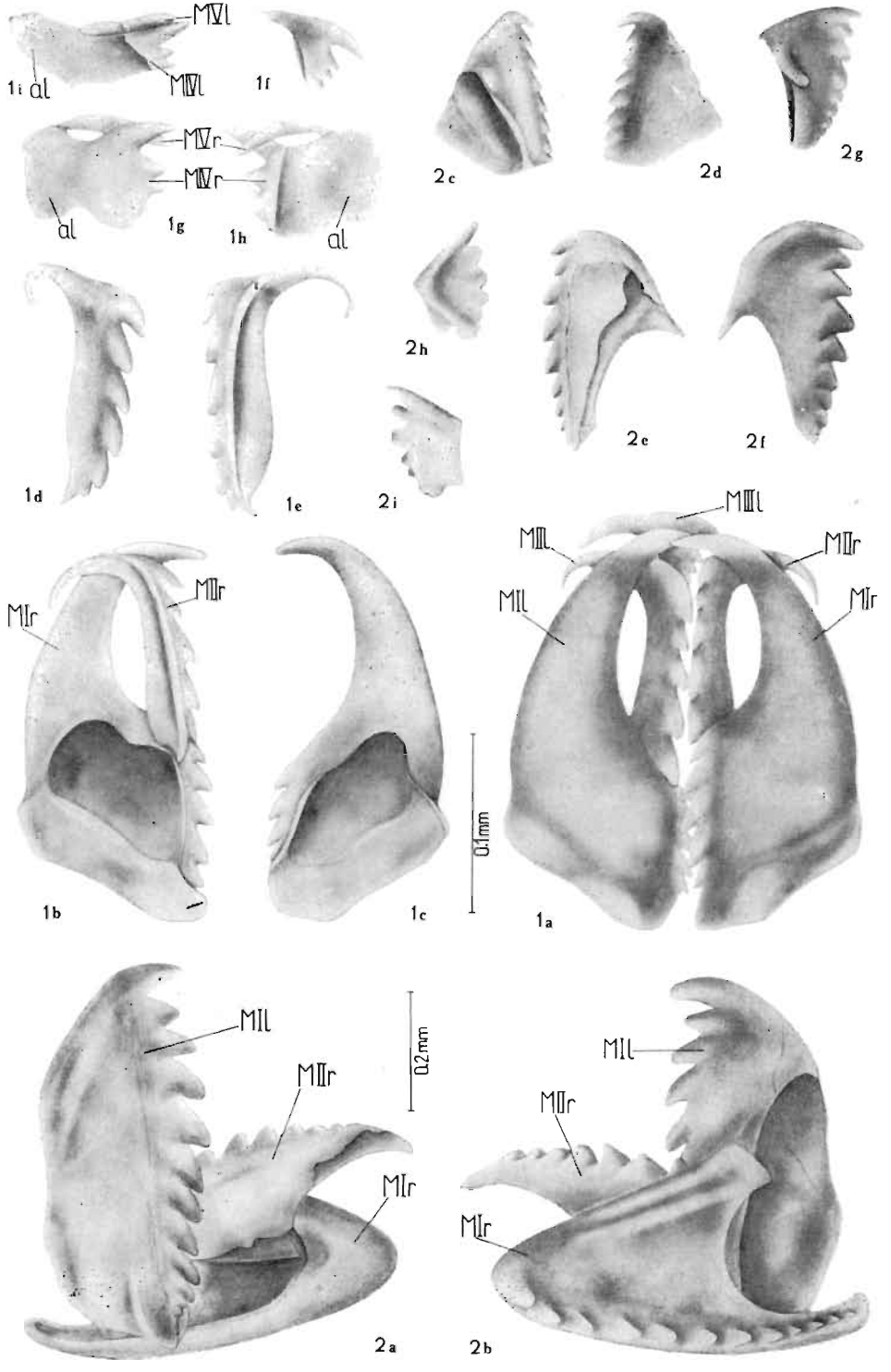
Plate V

Skalenoprion bugensis n. sp.
Mielnik boring, Lower Wenlockian, depth 1.116–1.118 m

Fig. 1. Holotype, almost complete jaw apparatus composed of right and left MI, right and left MII, left MIII, right and left MIV and right and left MV: *a* the apparatus from dorsal side with detached both MIV and MV, *b* separater dight MI and MII from ventral side, *c* separated MIl from ventral side, *d*—*e* separated left MII from left lateral and right lateral sides, *f* separated left MIII from left lateral side, *g*—*h* separated right MIV and MV from left lateral and right lateral sides, *i* separated left MIV and MV from left lateral side (Z. Pal. No. Sc. I/70).

Kalloprion ovalis Kielan-Jaworowska
Mielnik boring, ?Upper Ordovician, depth 1.120–1.154 m

Fig. 2. Almost complete jaw apparatus composed of basal plate, right and left MI, right and left MII, left MIII and left MIV preserved in unnatural arrangement and intentionally separated into elements: *a*—*b* right MI, left MI and right MII from both sides, *c*—*d* separated basal plate from ventral and dorsal sides, *e*—*f* left MII from ventral and dorsal sides, left MIII from left lateral side, *h*—*i* left MIV from left lateral and right lateral sides.


MIIIl
MIIIr
MIIr
MIr
MIIl
0.1mm
1a
1b
1c
MIIr
MIr
MIIl
MIIr
MIr
0.2mm
2a
2b
MVl
MVIr
MVr
MIVr
al
al
al
1d
1e
1f
1g
1h
1i
2c
2d
2e
2f
2g
2h
2i