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# CONODONTS OF THE UPPER PERMIAN OF POLAND

*Abstract.* — Eight species of conodonts, assigned to five genera, are described from the Zechstein limestone horizon of the Werra cyclothem from Wejherowo I.G.-1 boring in Pomerania. *Lonchodina vistulensis* n.sp., *Prioniodina lindstroemi* n.sp. and *Hibbardella baltica* n.sp. have been erected as new species. The Zechstein conodonts have been compared with the conodonts being parts of so-called natural assemblages.

## INTRODUCTION

The lack of macrofauna in Zechstein formations has induced the present writer to look for conodonts. Forty eight samples, taken from the horizons of carbonate rocks in the Wejherowo I.G.-1, Chojnice 3, Biały Bór 1 and Świdwin 3 borings in Pomerania, were subjected to studies. Conodonts were found only in two samples from the Zechstein limestone horizon of the Werra cyclothem from the Wejherowo I.G.-1 boring. Eight species, including three new ones, assigned to five genera, have been distinguished. A work by Bender & Stoppel (1966), in which a very similar fauna was described from the first cyclothem of the Zechstein of Germany, appeared during the period when our forms were worked out. However, due to a very good preservation state of the fauna found by the present writer and new species occurring in it, it deserves a separate elaboration. A poor knowledge of Permian conodonts, observed so far throughout the world, does not allow one to determine the suitability of Zechstein conodonts for some more extensive stratigraphic correlations. It is, however, very likely that some species as, for instance, *Spathognathodus divergens* Bender & Stoppel, will serve in future as useful index fossils.

The collection under study is housed at the Institute of Geological Sciences (abbreviated Z. N. G.) of the Polish Academy of Sciences in Warsaw. Photographs have been taken by R. Adamik.

It is with great pleasure that I extend my heartfelt thanks to Dr Ma-

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## CHARACTERISTICS OF CONODONT HORIZONS

The Zechstein limestone and the copper-bearing shales horizons are, in Wejherowo I.G.-1 borehole, 7.5 m in total thickness. All conodonts have been found at a depth of 1181.5—1184.0 m in the upper part of the Zechstein limestone horizon. The horizon with conodonts consists of marly limestones which upwards gradually pass into a marly dolomite with many oncolites, stromatolites and a considerable admixture of anhydrite and pyrite which occur in the top part. After dissolving the rock in acetic acid, brachiopods, gastropods, ostracods, foraminifers, bryozoans, teeth and dermal plate of fish, as well as various remains of Echinodermata have been found in the residue, in addition to conodonts. In the top of the Zechstein limestone, fauna suddenly disappears, which was probably caused by the increase in the salinity of the water which preceded the precipitation of anhydrite. Towards the bottom of the horizon, the amount of fauna decreases gradually.

In order to obtain a larger amount of the material for the studies, about 15 kg of the rock were dissolved which yielded nearly 200 conodonts; about 50 per cent of them were well-preserved.

## PREVIOUS STUDIES ON PERMIAN CONODONTS

Permian condonts are known only from some localities in which they occur not very abundantly and are represented by few species. Their present knowledge is, therefore, relatively poor. Their occurrence in what is known as *Phosphoria* formation (Middle Permian) in the State of Wyoming was first reported on by Branson (1932). Later on, conodonts were mentioned many times in literature, but so far only five brief publications were devoted to their descriptions. In 1951, Younguist, Hawley & Müller described two new species of the genus *Gondolella* and one species of the genus *Spathognathodus* from the *Phosphoria* formation of the State of Idaho. Seven new species of the genera *Neoprioniodus, Lonchodina, Ozarkodina, Synprioniodina* and *Gondolella* were described by Ching (1960) from the Lower Permian of China. According to Bender &

Stoppel (1966), some of them were, however, inadequately determined. In 1962, 13 species of conodonts, including four new ones, assigned to the genera *Gondolella, Apathognathus* and *„Subbryantodus"*, were described by Clark and Ethington from the Leonardian and Wordian stages of Permian of the U.S.A. and Mexico. A year later, Rhodes (1962*a*) reported on the finding, in the Lower Permian of Wyoming, of conodonts of the genera *Hindeodella, Ligonodina, Ozarkodina* and *Streptognathodus*, and described a new species assigned to *Spathognathodus*. The last and the most extensive publication devoted to Permian conodonts is a work by Bender & Stoppel (1966) who described conodonts from the Middle Permian of Sicily, from the Upper Permian of Greenland and Germany, as well as from stratigraphically indeterminate Permian formations from the Greek Island of Chios. In addition to the forms which were formerly known from Permian and Triassic, they described six new species of the genera *Gnathodus, Gondolella, Lonchodina* and *Spathognathodus*.

Thus the total number of the species whose holotypes come from Permian deposits, together with the three species, described in the present paper, amounts barely 24, provided, in addition, that all of them remain valid. As compared with more than 2,000 species of conodonts known so far, this is a very small number. A scarce occurrence of conodonts in Permian is not fully understandable, especially as they are once again numerously represented in Triassic.

In Zechstein deposits, conodonts have already been recorded a few times. The first mention on finding them by H. Sharp occurs in Bischoff's and Ziegler's (1957) work. The genera *Hindeodella, Prioniodina, Spathognathodus* and *Apathognathus*, determined by Bischoff, are mentioned by Malzahn (1958) from Zechstein 1 of the „Friedrich Heinrich 57" boring in Germany. However, due to a poor state of preservation, none of these forms was specifically determined. Conodonts found by Seidel (1959) in Zechstein of Thuringia have not been worked out for the same reason. All findings come from the horizons of carbonate rocks of the first cyclothem. In higher cyclothems, conodonts have not been found so far.

## CHARACTERISTICS OF ZECHSTEIN CONODONTS

The following species were described by Bender and Stoppel (1966) from Zechstein of Germany: *Hindeodella triassica* Müller, *Lonchodina inflata* Bender & Stoppel, *Lonchodina* cf. *inflata, Lonchodina muelleri* Tatge, *Roundya* sp. *a, Roundya* sp. *b* and *Spathognathodus divergens* Bender & Stoppel. The fauna of conodonts from Zechstein of Poland, described in the present paper, includes the following species: *Hindeodella triassica* Müller, *Hindeodella* sp., *Lonchodina inflata* Bender & Stoppel, *Lonchodina vistulensis* n.sp., *Hibbardella baltica* n.sp., *Spathognathodus di-*

*vergens* Bender & Stoppel and *Prioniodina lindstroemi* n.sp. Taking into account that *Roundya* sp. *a* and *Roundya* sp. *b* (Bender & Stoppel, 1966, p. 350, Pl. 15, Figs. 19 and 20 a-c) are synonyms of *Hibbardella baltica* n.sp. and that a poorly preserved form determined by Bender and Stoppel (1966, p. 347, Pl. 15, Figs. 12 a-b, non Pl. 15, Figs. 13-14) as *Lonchodina muelleri* Tatge most likely belongs to the new species *Lonchodina vistulensis* n.sp., we may state that the Zechstein assemblages of conodonts of Poland and Germany are almost identical with each other. Of interest is the fact that this fauna consists of only seven species. One of them, *Hindeodella triassica*, is also common in Triassic, and both species of the genus *Lonchodina*, as well as *Hibbardella baltica* have corresponding, similar species among the Triassic conodonts. *Spathognathodus divergens* is the most characteristic species known only from Zechstein, in which, next to *Hindeodella triassica*, it is the most numerously represented species. Its uncertain generic assignment is here discussed in the descriptive part.

Only three conodonts: *Lonchodina muelleri* Tatge, *Ozarkodina tortilis* Tatge and *Gondolella rosenkrantzi* Bender & Stoppel have been described so far from Permian of Greenland which is mostly considered to be a stratigraphic counterpart of Zechstein (Dunbar, 1955). None of these species has been found in Zechstein of Poland and Germany.

## COMPARISON WITH NATURAL ASSEMBLAGES

Natural assemblages of conodonts which, according to most authors, come from one conodont-bearing animal, consist of many elements (12—22) belonging to a few (3—5) species, each of which is assigned to a different genus. Various types of natural assemblages consist of similar components. Rhodes (1962) distinguishes the following four types of such components: elongate, arcuate, pick-shaped and platform-like. All types of components occur in the assemblages as pairs (right and left forms). Elongate components are represented usually by four pairs of conodonts and each of the remaining types by one or two pairs. The assemblage of conodonts, which occur in Zechstein, is very similar to the set of components of natural assemblages. *Hindeodella triassica* Müller, the most numerous Zechstein form, corresponds to elongate components, which in natural assemblages are represented by four pairs of conodonts of the genus *Hindeodella*. *Hibbardella baltica* n.sp., which differs from the Zechstein form of *Hindeodella triassica* only in having two, instead of one, anterior bars, probably is also a counter part of elongate components. The genus *Hibbardella* is a component of the natural assemblage of the genus *Duboisella* Rhodes, 1952. Arcuate components are represented in Zech-

stein by both species of the genus *Lonchodina*, and *Spathognathodus divergens* Bender & Stoppel is most likely to correspond to platform-like components. The last of the Zechstein genera, i.e. *Prioniodina* occurs in the assemblages of the genus *Lochriea* Scott, 1942. In the present writer's collection, all species are represented, as in natural assemblages, by right and left forms.

Taking into account the fact that each type of the natural components is represented in Zechstein by only one or two species of conodonts, we may assume that the number of species of conodont-bearing animals in Zechstein was considerably limited. On the other hand, a small morphological differentiation within each type of components indicates that these animals are most likely to belong to one natural genus.

## DESCRIPTIONS

### Genus *Hindeodella* Bassler, 1925

### *Hindeodella triassica* Müller, 1956

(Pl. I, Figs. 9-11)

1956. *Hindeodella triassica* Müller; K. J. Müller, Triassic conodonts..., p. 826, Pl. 96, Figs. 4-5.
1956. *Angulodus bockae* Tatge; U. Tatge, Conodonten..., pp. 129-130, Pl. 5, Figs. 1-4.
1958. *Hindeodella triassica* Müller; R. Huckriede, Die Conodonten..., p. 149, Pl. 10, Figs. 48-50; Pl. 14, Fig. 8.
1959. *Hindeodella triassica* Müller; Ch. Hirschmann, Über Conodonten..., pp. 56-58, Pl. 4, Fig. 13.
1964. *Hindeodella triassica* Müller; K. Budurov & B. Vrabljanski, Conodonten..., Pl. 1, Figs. 2-3, 6-7, 11-12.
1966. *Hindeodella triassica* Müller; H. Bender & D. Stoppel, Perm-Conodonten..., pp. 343-344, Pl. 14, Fig. 12; Pl. 15, Figs. 1-5.

*Material.* — Thirty-five specimens.

*Description.* — Cusp large, inclined posteriorly, in transverse section flattened-oval.

Anterior bar high, mostly slightly bent laterally and downwards, with 3—6 flat, sharply pointed denticles increasing anteriorly. The largest of them, usually the last or last but one denticle, is larger than 1/2 of the cusp. The tips of denticles are slightly bent posteriorly.

Posterior bar high, about twice as long as the anterior one, posteriorly slightly deflected downwards or straight, with 8—11 flat denticles, gradually more and more strongly inclined and increasing posteriorly. The largest of them, the last or the last but one denticle, is more than twice as long as the first and usually equalls 2/3 of the length of the cusp or, in some specimens, is even longer than the cusp.

Aboral side narrow. Basal cavity usually stretches, in the form of an

aboral groove, under both bars, gradually tapering and disappearing at their ends. Width of groove considerably variable.

*Remarks.* — *Hindeodella triassica,* very common in Triassic formations, is marked by a great degree of variability. Its older, Permian forms display a considerably smaller variability. The ontogenetic stages *a*, *b* and *c*, distinguished by Hirschmann (1959, pp. 56-60, Figs. 23, 26-30, Pl. 4, Figs. 14-16), have not been found in Permian. In the present writer's collection, small forms have an identical, basic structure plan with that of large forms, and differ from Triassic forms in somewhat wider basal cavities and in the lack of an acute-angled deflection of the aboral margin under the cusp. The forms known from the Lower Triassic of the State of Nevada (Müller, 1956) are the most similar to the Permian ones.

*Occurrence.* — Middle Permian to Upper Triassic of Europe and N. America.

*Hindeodella* sp.

(Pl. I, Figs. 7-8)

*Material.* — Four, partly broken specimens.

*Description.* — Cusp very large, arcuate and inclined posteriorly, oval in transverse section.

Anterior bar short, slightly deflected laterally, with a few, short denticles, usually increasing towards the anterior end and slightly deflected posteriorly.

Posterior bar incomplete in all specimens. Only the anterior part of it is known. It is straight, provided with small, densely distributed denticles, extending and inclined posteriorly.

Denticles of both bars widely-oval in transverse section.

Aboral side wide, completely occupied by a gutterlike basal cavity, stretching under both bars; aboral margin sharp.

*Remarks.* — The lack of specimen, with a well-preserved posterior bar, prevents the present writer from erecting a new species. The form described differs from the Zechstein representatives of *Hindeodella triassica* Müller in a much wider basal cavity, larger cusp and thicker denticles of both bars.

*Occurrence.* — Zechstein 1 of Poland.

Genus *Lonchodina* Ulrich & Bassler, 1926

*Lonchodina inflata* Bender & Stoppel, 1966

(Pl. I, Figs. 5-6)

1966. *Lonchodina inflata* Bender & Stoppel; H. Bender & L. Stoppel, Perm-Conodonten.., p. 346, Pl. 15, Fig. 8 a-c; Pl. 16, Fig. 18 a-b.

*Material.* — Seven, partly broken specimens.

*Description.* — Cusp large, wide, incurvate, in transverse section oval.

Anterior bar with some five small, slightly differentiated, oval denticles, fused together almost up to a half of the height. They are inclined to the cusp and slightly incurved.

Posterior bar shorter than anterior, with three denticles, the last of them being small and the remaining two larger than those of anterior bar.

Basal cavity wide, shallow and strongly stretched inwards under the cusp and continued in the form of narrow medial grooves — under the bars. Aboral margin sharp.

*Occurrence.* — Zechstein 1 of Poland and Germany.

### *Lonchodina vistulensis* n.sp.

(Pl. I, Figs. 1-4)

*Holotypus*: Specimen Z.N.G. No. KP 48; Pl. I, Fig. 1 *a-c*.
*Stratum typicum*: Zechstein, cyclothem 1, Zechstein limestone horizon.
*Locus typicus*: Wejherowo I. G.-1 boring in Pomerania, depth 1181.5-1184.0 m.
*Derivatio nominis*: *vistulensis* — found near the Vistula River.

*Material.* — Six specimens.

*Diagnosis.* — A species of the genus *Lonchodina* with a large, strongly incurvate cusp, one bar long and the other short, with a wide basal cavity.

*Description.* — Cusp large, much thicker than bars, strongly incurvate. In transverse section, the inner side strongly convex, the outer side slightly convex or flat.

Anterior bar long, thin, gently arcuate, with 6—10 separate, narrow, pointed denticles. The length of denticles mostly decreases gradually towards the anterior end; in some specimens, however, the longest are the middle denticles. All denticles are strongly inclined to the cusp, their tips being incurvate.

Posterior bar short, much less inclined downwards than the anterior one, with at least one denticle which is mostly larger than the denticles of the anterior bar.

Basal cavity, under cusp, subtriangular in outline, strongly stretched towards the inner side; under both bars, extended in the form of narrow grooves, which in some specimens are indistinct. Aboral margin sharp.

*Remarks.* — *Lonchodina vistulensis* n.sp. differs from *Lonchodina muelleri* Tatge, 1956 in a larger basal cavity, much more incurvate cusp and a greater number of denticles on the anterior bar. The new species differs from *Lonchodina inflata* Bender & Stoppel, 1966 in a longer anterior bar, having more denticles which are more widely spaced, and in a slightly smaller basal cavity. The forms described from Zechstein of Germany as *Lonchodina muelleri* Tatge (Bender & Stoppel, 1966, p. 347, Pl. 15, Fig. 12 a-b, non Figs. 13 and 14), most likely also belong to the

species *Lonchodina vistulensis* n.sp. but, due to a poor state of preservation, it is impossible to determine them to a certainty.

*Occurrence.* — Zechstein 1 of Poland.

## Genus *Prioniodina* Ulrich & Bassler, 1926

### *Prioniodina lindstroemi* n.sp.

(Pl. II, Figs. 6-9)

*Holotypus*: Specimen Z.N.G. No. KP 56; Pl. II, Fig. 7 *a-b*.
*Stratum typicum*: Zechstein, cyclothem 1, Zechstein limestone horizon.
*Locus typicus*: Wejherowo G.I.-1 boring in Pomerania, depth 1181.5—1184.0 m.
*Derivatio nominis*: *lindstroemi* — in honour of Dr. Maurits Lindström.

*Material.* — Seven specimens.

*Diagnosis.* — A species of the genus *Prioniodina* with a relatively large cusp, posteriorly increasing denticles of posterior bar and a distinct, elongate basal cavity.

*Description.* Cusp relatively large, inclined posteriorly, oval in transverse section.

Anterior bar short, straight, mostly with two pointed denticles which are vertical or slightly inclined posteriorly. The denticle near the middle is usually larger than a half of the cusp, and the last denticle is much smaller.

Posterior bar longer than anterior, straight or slightly deflected laterally, with 3-5 denticles inclined posteriorly. The size of denticles gradually increases posteriorly. In some specimens, the last denticle is considerably smaller. The length of the largest denticle is usually approaching that of the larger denticle of anterior bar.

Aboral side narrow. The basal cavity under the cusp is relatively wide, extends under both bars and contracts towards their ends.

*Remarks.* — The new species differs from the Triassic form — *Prioniodella decrescens* Tatge, 1956 in its cusp much larger as the remainder denticles and in the denticles of posterior bar which increase posteriorly. Judging from illustrations, *Ligonodina?* sp. (Tatge, 1956, p. 133, Pl. 6, Fig. 15) is very similar to *Prioniodina lindstroemi* n.sp., but in view of the lack of any well-preserved specimen and description, it is impossible to compare them in detail.

*Occurrence.* — Zechstein 1 of Poland.

## Genus *Hibbardella* Bassler, 1925

### *Hibbardella baltica* n.sp.

(Pl. II, Fig. 11-12)

1966. *Roundya* sp. *a*; H. Bender & D. Stoppel, Perm-Conodonten..., p. 350, Pl. 15, Fig. 19.
1966. *Roundya* sp. *b*; H. Bender & D. Stoppel, *Ibid.*, p. 350, Pl. 15, Fig. 20 a-c.

*Holotypus*: Specimen Z.N.G. No. KP 63; Pl. II, Fig. 12 a-c.
*Stratum typicum*: Zechstein, cyclothem 1, Zechstein limestone horizon.
*Locus typicus*: Wejherowo I.G.-1 boring in Pomerania, depth 1181.5—1184.0 m.
*Derivatio nominis*: *balticus* — found on the Baltic Sea coast.

*Material.* — Nine specimnes.

*Diagnosis.* — A species of the genus *Hibbardella* with a long, slender cusp, triangular at the base, large terminal denticles of posterior bar strongly inclined posteriorly and narrow grooves of basal cavity.

*Description.* — Cusp large, slender, inclined posteriorly, with a transverse section triangular at the base and oval in the higher part.

Posterior bar long, in the posterior part gently arcuate and deflected downwards, having 7-11 long, pointed, densely distributed, posteriorly inclined denticles. Except for the last denticle, the length and the inclination angle of all of them increase posteriorly. The last but one or the third denticle from the end is markedly the largest. The last denticle is usually much smaller and almost horizontally inclined.

Lateral bars, about three times shorter than the posterior one and deflected from it at an angle of about 110°, are slightly bent downwards and have a few narrow denticles; the largest, usually the middle ones, are equal in length to the middle denticles of the posterior bar (in both specimens illustrated, one lateral bar is broken off).

Aboral side is narrow; aboral grooves of the basal cavity narrow, but clearly visible, run under all three bars gradually contracting and disappearing towards the ends of the bars.

*Remarks.* — The new species differs from the Triassic species *Hibbardella meissneri* (Tatge, 1956) in a considerably larger cusp, triangular at its base, in a greater number of denticles on all bars and in clearly visible aboral grooves of the basal cavity.

*Occurrence.* — Zechstein 1 of Poland and Germany.

## Genus *Spathognathodus* Branson & Mehl, 1941

### *Spathognathodus divergens* Bender & Stoppel, 1966

(Pl. II, Fig. 1-5)

1966. *Spathognathodus divergens* Bender & Stoppel; H. Bender & D. Stoppel, Perm-Conodonten, pp. 350-351, Pl. 16, Figs. 1-3, 21.

*Material.* — Twenty-five specimens.

*Description.* — Blade, with its height approaching length, has 3—7 round, strong denticles fused together at the base, inclined posteriorly and mostly regularly increasing posteriorly. The length of the denticles and the degree of their being fused together, are variable and depend on their number. In specimens with a greater number of denticles, they are

usually shorter and fused together higher up. The posterior part of blade considerably extends downwards forming an incipient, steep platform of cordiform outline.

Cusp, mostly the terminal one, is most strongly inclined posteriorly and usually larger than denticles, but not differing greatly from them. In some specimens, an additional, small, posterior denticle, mounted directly on the oral surface of the basal cavity, is situated behind the cusp.

Aboral side wide, completely occupied by an open, blown up, subtriangular basal cavity, which narrows towards the anterior end. Under the cusp, this cavity is deep and its tip is clearly visible in some specimens.

*Remarks.* — The generic assignment of the species described above is uncertain. It differs from typical representatives of the genus *Spathognathodus* Branson & Mehl, 1941 in an extension of the base of blade in the posterior, and not central part, and in a terminal situation of the cusp. In this respect, *Spathognathodus divergens* is similar to the conodonts of the genus *Gondolella* Staufer & Plummer, 1932, to which most platform-like Permian and Triassic conodonts are assigned. A poorly developed platform and a vestigial posterior bar, which is present in some specimens of *Spathognathodus divergens* in the form of a single denticle, are considered in the genus *Gondolella* as primitive characters. The species under study differs, however, from the genus *Gondolella* in an open basal cavity and in the lack of platform ledges.

*Occurrence.* — Zechstein 1 of Poland and Germany.

Gen. et spec. indet.
(Pl. II, Fig. 10)

*Material.* — One, partly damaged specimen, Cusp small, flat in transverse section, strongly inclined posteriorly.

Posterior bar consisting of eight, flat denticles, more and more inclined posteriorly. Except for the last denticle, their size slightly increases posteriorly. The largest of them are equal in length to the cusp.

Anterior part of posterior bar, together with the cusp, are strongly deflected laterally.

Aboral side narrow. Basal cavity very small, visible only under the cusp.

Anterior bar lacking at all or possibly only broken off.

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## KONODONTY Z PERMU GÓRNEGO POLSKI

*Streszczenie*

W pracy opisano 8 gatunków konodontów, należących do 5 rodzajów. Trzem nowoustanowionym gatunkom nadano następujące nazwy: *Lonchodina vistulensis* n. sp., *Prioniodina lindstroemi* n. sp. i *Hibbardella baltica* n. sp. Cała kolekcja pochodzi z poziomu wapienia cechsztyńskiego cyklotemu Werra, z wiercenia Wejherowo I.G.-1 na Pomorzu.

Fauna konodontów, opisana w niniejszej pracy, jest bardzo podobna do fauny znanej z pierwszego cyklotemu cechsztynu Niemiec (Bender & Stoppel, 1966). W wyższych cyklotemach cechsztynu konodontów dotychczas nie znaleziono. Najbardziej charakterystycznym i stosunkowo licznie reprezentowanym gatunkiem, znanym wyłącznie z cechsztynu, jest *Spathognathodus divergens* Bender & Stoppel, 1966. Słaba dotychczas znajomość konodontów permskich na świecie nie pozwala na określenie przydatności opisanej fauny do korelacji stratygraficznych.

Przeprowadzono porównanie konodontów cechsztyńskich z konodontami, wchodzącymi w skład tak zwanych zespołów naturalnych i stwierdzono, że wszystkie konodonty cechsztyńskie należały najprawdopodobniej do jednego rodzaju zwierząt, opatrzonych tymi organami.

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ГУБЕРТ ШАНЯВСКИ

## ВЕРХНЕПЕРМСКИЕ КОНОДОНТЫ ПОЛЬШИ

*Резюме*

В работе описано 8 видов конодонтов, принадлежащих 5 родам. Установлено 3 новых вида: *Lonchodina vistulensis* n. sp., *Prioniodina lindstroemi* n. sp. и *Hibbardella baltica* n. sp. Вся коллекция происходит из горизонта цехштей-

нового известняка циклотемы Вэрра, из буровой скважины Вейхерово I. G.—1 на Поморье.

Описанная в настоящей работе фауна конодонтов очень сходна с фауной, известной из первой циклотемы цехштейна Германии (Bender & Stoppel, 1966). В более высоких горизонтах цехштейна до сих пор конодонты неизвестны. Наиболее характерным и довольно обильным видом является *Spathognathodus divergens* Bender & Stoppel, 1966, известный исключительно из цехштейна. Слабая изученность пермских конодонтов во всем мире не позволяет пока определить стратиграфическое значение описанной фауны.

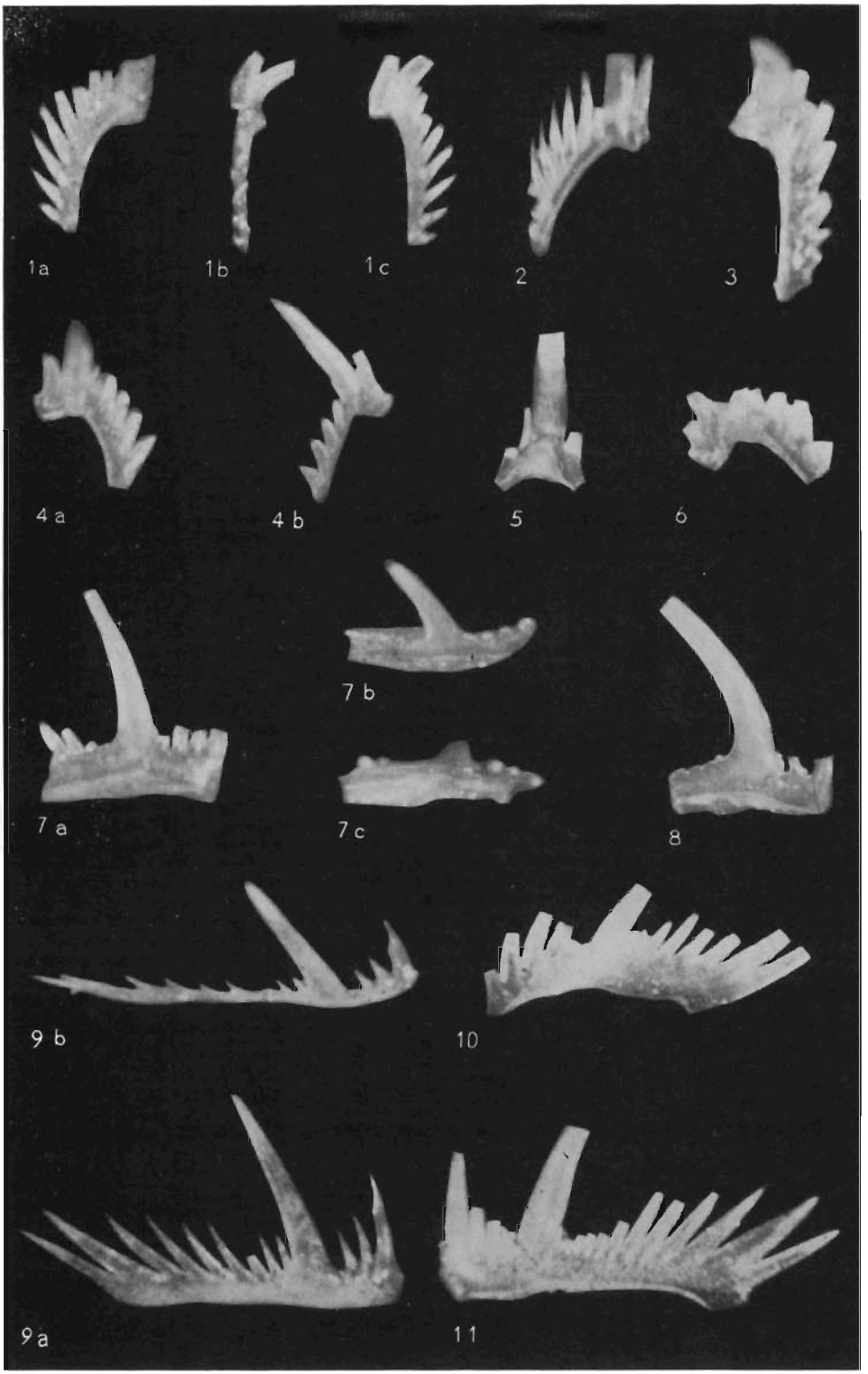
Проведено сравнение конодонтов цехштейна с конодонтами, входящими в состав так называемых естественных сообществ и констатировано, что все конодонты цехштейна принадлежали вероятно одному роду животных, имевших эти органы.

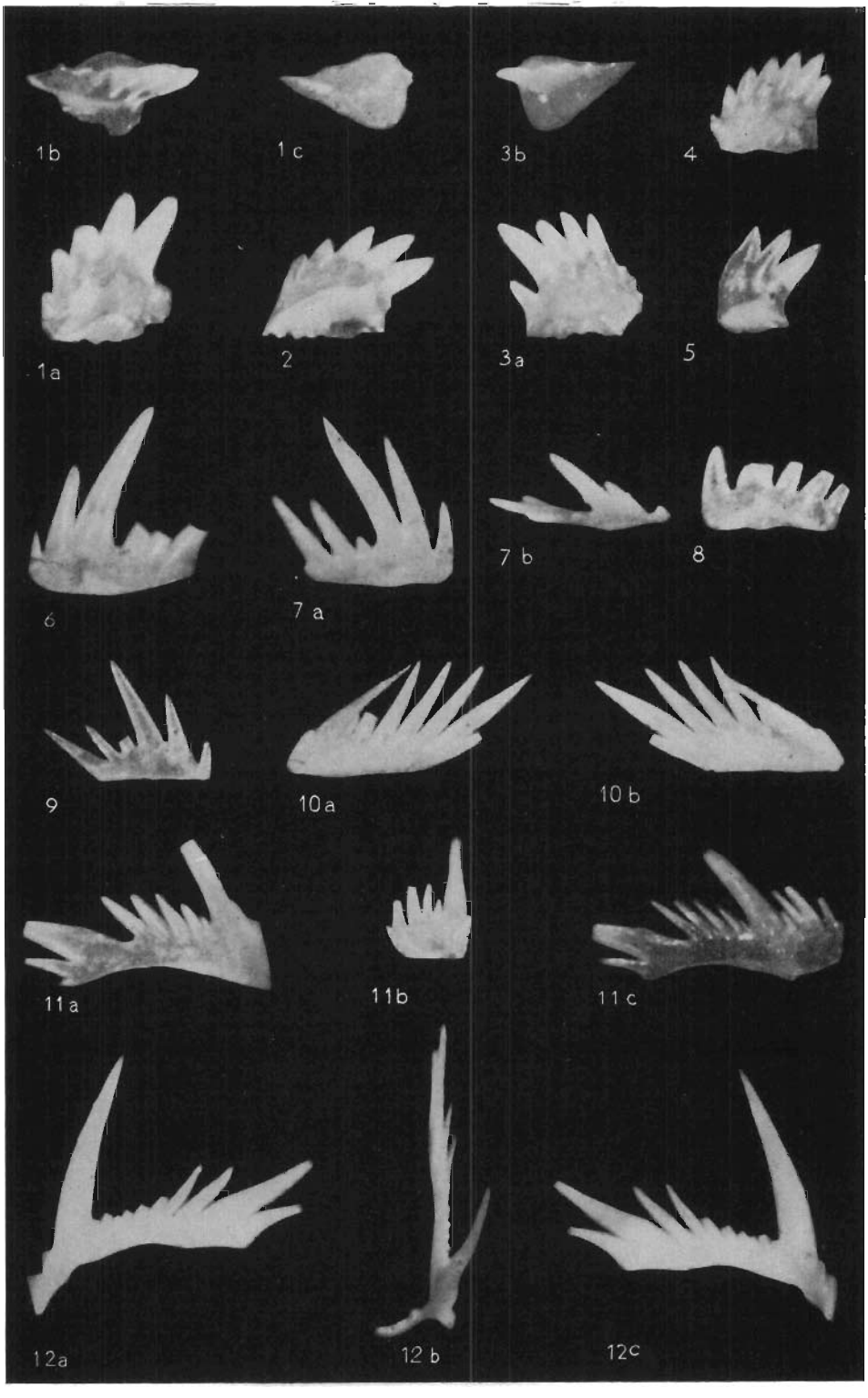
# PLATES

Plate I

Figs. 1-4. *Lonchodina vistulensis* n. sp. (ZNG No. KP 48-51). Fig. 1 *a-c* holotype.
Figs. 5-6. *Lonchodina inflata* Bender & Stoppel (ZNG No. KP 40-41).
Figs. 7-8. *Hindeodella* sp. (ZNG No. KP 36-37).
Figs. 9-11. *Hindeodella triassica* Müller (ZNG No. KP 1-3).

All from the Zechstein limestone horizon of the Werra cyclothem, Wejherowo I.G.-1 boring, Pomerania; approx. × 63.


1a
1b
1c
2
3
4a
4b
5
6
7b
7a
7c
8
9b
10
9a
11


1b
1c
3b
4
1a
2
3a
5
6
7a
7b
8
9
10a
10b
11a
11b
11c
12a
12b
12c

## Plate II

Figs. 1-5. *Spathognathodus divergens* Bender & Stoppel (ZNG No. KP 71-75).
Figs. 6-9. *Prioniodina lindstroemi* n. sp. (ZNG No. KP 55-58). Fig. 7 *a-b* holotype.
Fig. 10. Gen. et spec. indet. (ZNG No. KP 96).
Figs. 11-12. *Hibbardella baltica* n. sp. (ZNG No. KP 62-63). Fig. 12 *a-c* holotype.

All from the Zechstein limestone horizon of the Werra cyclothem, Wejherowo I.G.-1 boring, Pomerania; approx. × 63.