AMERICAN JOURNAL OF SCIENCE

MARCH 1927

CONODONTS FROM THE PORTAGE GROUP OF WESTERN NEW YORK.

RAYMOND R. HIBBARD.

INTRODUCTION.

During the summers of 1924 and 1925 an immense number of conodonts, now definitely known to be the teeth of primitive fishes, were collected by the writer from the black Rhinestreet shale at Shaleton, a small station on the Buffalo and Erie railway, approximately 14 miles southwest of Buffalo. At Shaleton the Cashaqua and Rhinestreet shales are finely exposed in the quarry near the station and conditions there are usually favorable for the collecting of conodonts and other fossils. When these collections were made it at once became apparent to the writer that he could never describe and illustrate within a reasonable length of time all of the many new genera and species the collections represented, so an ample amount of the more abundant species was sent to Ulrich and Bassler at Washington which resulted in their recent paper, "A Classification of the Toothlike Fossils, Conodonts, with Descriptions of American Devonian and Mississippian Species."[1]

In the following pages will be found the descriptions of some new species which the writer has found time to study. The illustrations of many more have been made and it is hoped that the results of their study can be made known at some later date. It was thought advisable to make these new species known to science without any further delay. The unusually fine state of preservation of these conodonts makes them useful for subsurface investigations, and are of considerable value in stratigraphical work mostly in the way of correlating strata at widely separated localities.

Specimens of conodonts have been collected recently from the Middlesex black shale, the basal member of the Portage group, at Eighteen Mile creek, Erie county, New York. A few of these species are incorporated in the present work.

[1] Proc. U. S. Nat. Museum, **68**, 1-63, 1926.

All the types described in this paper, together with a vast amount of other specimens, are contained in the cabinet of the writer at Buffalo, New York.

THE ROCKS AT SHALETON.

At Shaleton the gray Cashaqua shale, a lower subdivision of the Portage group of rocks, forms the base of the section at the east wall of the quarry. These shales are light blue-gray in color and in them occur at intervals concretionary calcareous layers a few inches thick. The shale is very soft and weathering quickly changes it into a tenacious clay. Various shaped concretions have been observed at a few places and many of them can be seen strewn about the floor of the quarry. Fossils occur in these beds and those commonly met with are the flattened shells of Goniatites representing perhaps several species. As many of them are replaced by iron pyrites much if not all of the structure is lost which makes them difficult to determine.

The upper layers of the Cashaqua where they merge into the Rhinestreet shale are dark brown in color and appear somewhat harder than the underlying gray beds. No fossils have been noticed in these beds of brown shale and even bituminous matter such as occurs in the overlying Rhinestreet beds seems to be absent.

Immediately above these brown shales rests approximately 12 feet of densely black Rhinestreet shale which may be classed as oil shale since it is highly bituminous. Fossils are apparently scarce in its upper layers but in the lower 10 inches of it they are extremely abundant. It was at this particular horizon that a large number of conodonts in a remarkably fine state of preservation were found. Associated with these specimens were found other fish remains being mostly the plates and scales of a certain type of fishes. Well preserved brachiopods, about the finest the writer has seen, have been collected but all represent the one genus—*Lingula*. It is interesting to note in this connection that species of *Lingula* occur with conodonts in other geological formations of the Devonian and Mississippian at other localities, particularly in Tennessee, Ohio and Ontario. Plant remains are plentiful in these Rhinestreet shales but most of them are in such a bad condition that their identification is a matter of extreme difficulty.

In searching for conodonts in the black shale it is suggested that the collector look for the thin slabs having black carbon-

aceous plant remains visible on the surface, for every such slab collected by the writer proved to be crowded with the little teeth. On the other hand very few conodonts were found on other slabs of the shale destitute of these plant remains. On pieces of the shale collected as many as fifty or more of the teeth could be counted in the space of a few square inches.

DESCRIPTIONS OF SPECIES.

FAMILY PRIONIODIDAE Ulrich and Bassler, 1926.

Genus *Prioniodus* Pander, 1856.

Prioniodus grandis n. sp.

(Fig. 1*h*.)

Bar straight until the outer end where it turns sharply downward as though from the weight of the enormously developed terminal main cusp which mounts there. This large tooth is broad, not so sharply pointed, in length it is equal to that of the bar and is arranged at approximately right angles to it. Seven rounded, curved and more obtusely pointed denticles are fixed in the bar. There seems to be no development of these denticles in back of the large cusp for a short distance.

From the nature of the mould left in the shale just below the terminal cusp, the downward extension in this species was considerably small for a giant anterior cusp like this.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 226, Collection of the writer.

Prioniodus sublimis, n. sp.

(Fig. 1*a*.)

The specimen figured and being the holotype is unfortunately poorly preserved but the basal extension is there to prove it to be a *Prioniodus*. Bar in this species is straight direct to the outer end where is attached with a well developed basal extension, the long terminal main cusp quite slender the upper half of its length and gracefully curved towards the bar. Inclining in the same direction are eleven acute, evenly spaced denticles; those arising from the center of the bar are, as is usual, somewhat longer.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 275, Collection of the writer.

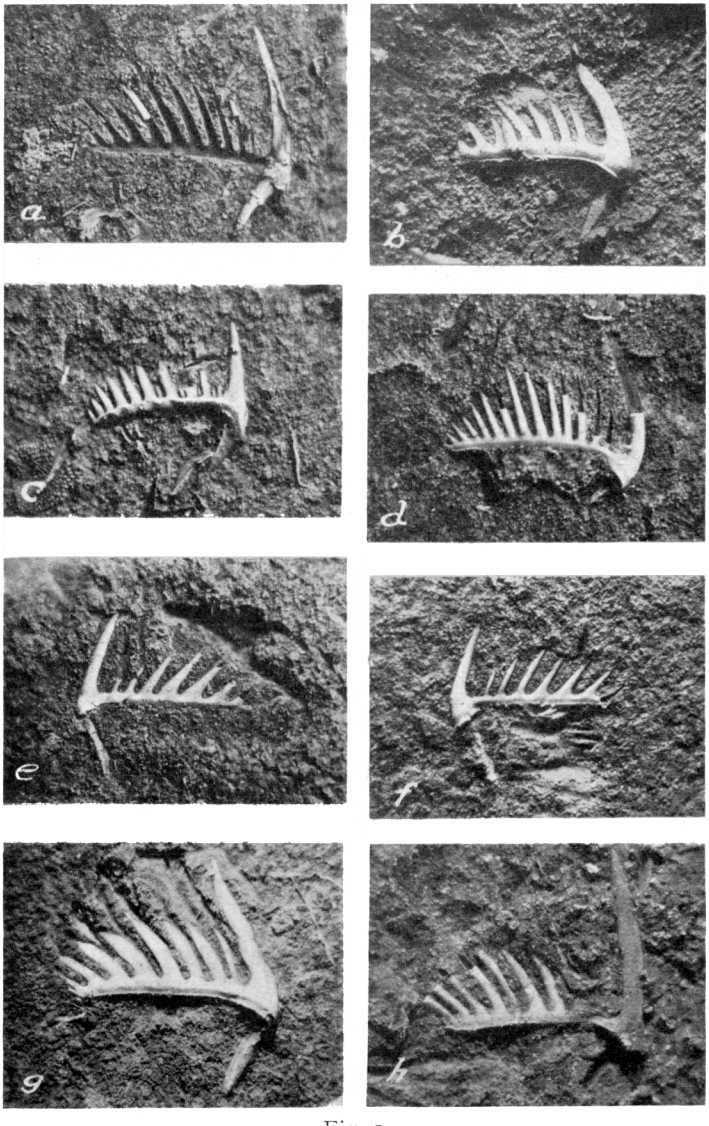

Fig. 1.

a. Prioniodus sublimis, Hibbard. x 10.
b. Prioniodus irregularis, Hibbard. x 10.
c. Prioniodus abnormis, Hibbard. x 10.
d. Prioniodus expolitus, Hibbard. x 10.
e. Prioniodus mundus, Hibbard. x 10.
f. Prioniodus mundus, Hibbard. x 10.
g. Prioniodus permagnus, Hibbard. x 10.
h. Prioniodus grandis, Hibbard. x 10.

Prioniodus patulus n. sp.

(Fig. 2*f*.)

This form represented by a single specimen is distinguished by its peculiar shaped, obtusely pointed main terminal cusp which is exceedingly broad at the base and rapidly narrows out in its upper half. Although the downward extension of the main cusp is not preserved, the tooth suggests the genus *Prioniodus* rather than *Ligonodina*. The bar is unusually heavy as are also the six backward curved denticles; it appears to have been somewhat longer in which case it apparently bore more denticles.

Horizon and locality.—Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 321, Collection of the writer.

Prioniodus mundus n. sp.

(Fig. 1*e, f*.)

Bar of this fine species is narrow and flat. On the one extremity projects the fairly large tapering main cusp, broad at its base and sloping towards the bar. A basal extension is well shown in the one specimen figured and the length of it does not approach that of the terminal cusp. Imbedded in the bar are seven acute widely spaced denticles varying in height, the center ones being longest; those situated posteriorly are broadened considerably at the bar and are slightly more inclined.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Cotypes Nos. 35, 282, Collection of the writer.

Prioniodus pinguis n. sp.

(Fig. 2*c*.)

Similar to *P. mundus* but differs from that species in that the main outer cusp which sets at approximately right angles to the horizontal portion of the bar, is longer, stouter and more acutely pointed. The bar is thicker and considerably curved in its anterior half, instead of being flat as in *P. mundus*. Also, another feature noticed is that the lateral denticles curve, rather than slant, towards the posterior end.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 278, Collection of the writer.

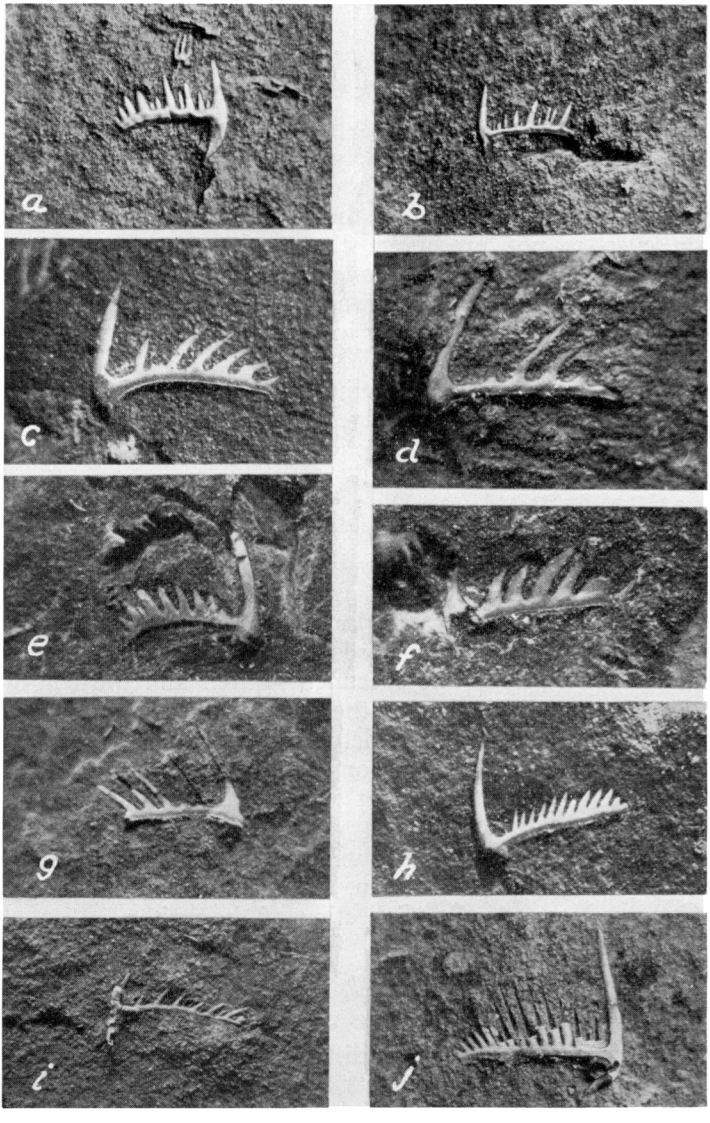

Fig. 2.

a. Prioniodus spicatus, Hinde. x 10.
b. Prioniodus spicatus, Hinde. x 10.
c. Prioniodus pinguis, Hibbard. x 10.
d. Prioniodus obsoletus, Hibbard. x 10.
e. Prioniodus shaletonensis, Hibbard. x 10.
f. Prioniodus patulus, Hibbard. x 10.
g. Prioniodus flaccidus, Hibbard. x 10.
h. Ligonodina curvidens, Hibbard. x 10.
i. Ligonodina alternata, Hibbard. x 10.
j. Ligonodina nitida, Hibbard. x 10.

Prioniodus spicatus Hinde, 1879.

(Fig. 2*a, b*.)

1879. Prioniodus spicatus, G. J. Hinde, Quar. Jour. Geol. Soc., 35, 361, pl. 16, figs. 1-3, 1879.
1887. Prioniodus spicatus, J. M. Clarke, Rep. State Geologist, New York for 1886, pl. A-1, fig. 22, 1887.
1900. Prioniodus spicatus, G. J. Hinde, Glasgow Nat. Hist. Soc., Trans., New Ser., 5, 343, pl. 10, fig. 20, 1900.
1921. Prioniodus spicatus, W. L. Bryant, Bull. Buffalo Soc. Nat. Sci., 13, No. 2, 19, 1921.

Diligent collecting at Shaleton resulted in finding several specimens of this well known species but the bar is more curved and not so flat as in Hinde's specimens. At the outer end of the bar a short, straight main cusp is developed with a somewhat shorter basal extension. The arrangement of the lateral denticles differ but little from those figured by Hinde; the stout obtusely pointed denticles are not much inclined, are irregular in size and between them are intercalated still smaller ones.

Horizon and locality.—Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Plesiotypes.—Nos. 280, 322, Collection of the writer.

Prioniodus flaccidus, n. sp.

(Fig. 2*g*.)

Founded upon a single specimen which is characterized by a long and curved flimsy looking outer main cusp, which is, however, somewhat more substantial at its base. The denticles likewise are tall and thin and have a set of finer ones alternating them. Although the specimen is incomplete, the bar is apparently flat and long.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 225A on slab, Collection of the writer.

Prioniodus shaletonensis n. sp.

(Fig. 2*e*.)

Bar thick, curved and mounting on the outer extremity is the rounded terminal main cusp curved towards the back of the bar. Ten mostly stout and well separated denticles, with those situated posteriorly more fused at their bases, are set in the bar in an inclined position.

Differs from others of the genus by the greatly curved bar supporting nine short but stout obtuse denticles with a finer one inserted near the posterior end.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 272, Collection of the writer.

Prioniodus permagnus n. sp.

(Fig. 1*g*.)

This species is distinguished from all others of the genus by its very stout appearance. The terminal main cusp is well developed both in its upward and downward extension. The bar appears thick, is little curved and longer than the large end tooth. Nine denticles, those in the center highest and more robust, increase their inclination towards the posterior end of the bar; these denticles are not so widely spaced as in some species of the genus.

Horizon and locality.—Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 274, Collection of the writer.

Prioniodus irregularis, n. sp.

(Fig. 1*b*.)

Bar of this elegant species is thick and very little curved; on the one end is set the stout, obtuse main cusp curving towards the bar. In back of this terminal cusp and mounted in the bar are eight stout, acute and obtuse denticles. These denticles are irregular in size and arrangement; the first four back from the large cusp are quite evenly spaced and all about the same height; of the remaining four two are close set and two widely separated, these are also much shorter.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 8, Collection of the writer.

Prioniodus curtus n. sp.

(Fig. 3*g*.)

Two specimens of this peculiar species have been found and are interesting in that they exhibit the long downward extension of the main cusp. The bar is short and slightly convex.

Situated anteriorly is the exceptionally short but stout main cusp with a well developed downward extension in line with it; this lower portion of the main cusp is twice as long as the cusp itself. Set in the bar in a rather regular arrangement are six short, obtuse denticles, the majority of them not differing much from the terminal main cusp.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 14, Collection of the writer.

Prioniodus expolitus n. sp.

(Fig. 1*d*.)

The large terminal cusp in this species differs from *P. sublimis* mainly in that it is perfectly round and approximately the same diameter nearly its entire length. The bar also is slightly curved for the greater part of its length and considerably so near the outer end where the main tooth mounts. Fourteen evenly spaced, rounded denticles project from the bar in back of the large end tooth; these denticles are more or less inclined and decrease in length posteriorly.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 281, Collection of the writer.

Prioniodus abnormis n. sp.

(Fig. 1*c*.)

The pick shape so characteristic of the genus *Prioniodus* is well exhibited in this species. Bar thick, slightly curved and of quite normal length for species of the genus. Nine stout, very little inclined denticles with a set of finer ones alternating them in the vicinity of the large anterior cusp are conspicuous in this species. Both the erect terminal main cusp and its downward extension are beautifully preserved in the single specimen collected. One minute obtuse denticle is developed at the extreme outer end of the bar at the junction of the main cusp and its basal extension.

Horizon and locality.—Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 279, Collection of the writer.

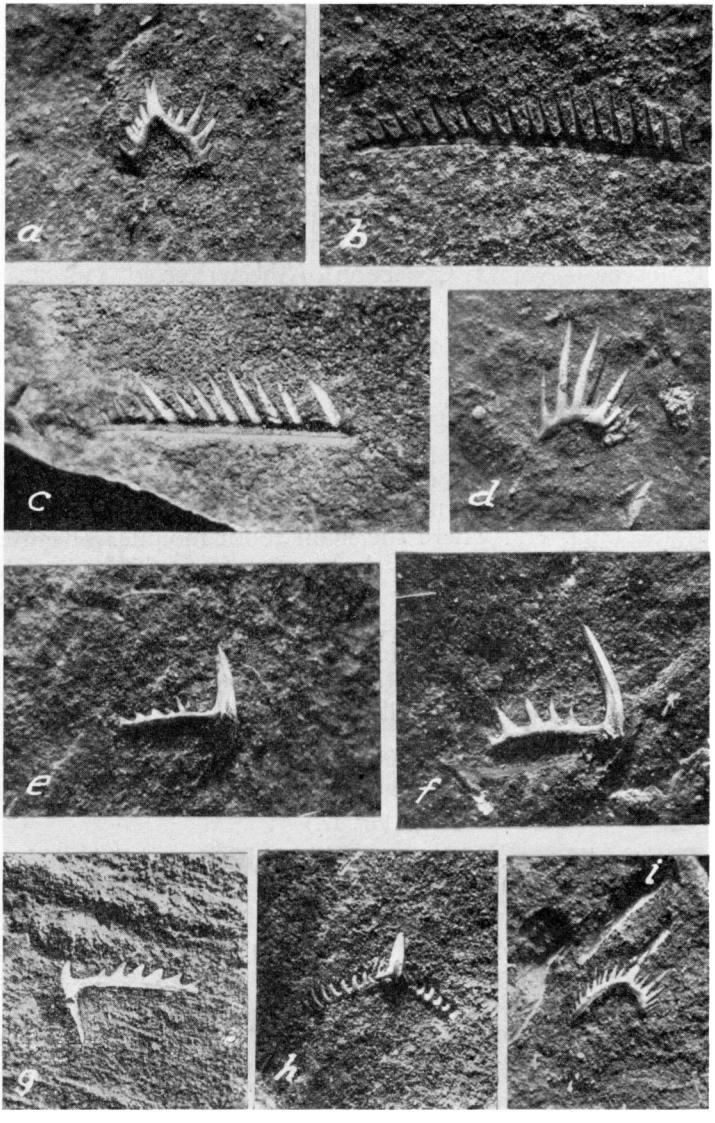

Fig. 3.

a. Lonchodina bidens, Hibbard. x 10.
b. Ligonodina princeps, Hinde. x 10.
c. Ligonodina princeps, Hinde. x 10.
d. Lonchodina extenta, Hibbard. x 10.
e. Ligonodina triangulata, Hibbard. x 10.
f. Ligonodina seducta, Hibbard. x 10.
g. Prioniodus curtus, Hibbard. x 10.
h. Hibbardella subgrandis, Hibbard. x 10.
i. Lonchodina multidens, Hibbard. x 10.

Prioniodus obsoletus n. sp.

(Fig. 2*d*.)

Main cusp long and rounded with a basal extension of rather good length and sharply pointed. The principal specific peculiarity of the species lies in the two long, stout denticles emerging from the center of the bar with the development of one very short, sharply curved denticle in front and another one in back of them. The bar is straight except at its extreme outer end where it deflects downward and at the posterior end it thins out.

Horizon and locality.—Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 270, Collection of the writer.

Genus *Ligonodina* Ulrich and Bassler, 1926.

Ligonodina seducta n. sp.

(Fig. 3*f*.)

This rather unusual form is particularly interesting in showing the development of the lateral denticles which are few in number and exceedingly remote from one another; the two in back of the main cusp uncommonly curve outwards while the other three are more stout, less acute, and incline backwards. The terminal main cusp appears sharp edged, acutely pointed and the curving takes place just below its center, and in the direction of the bar. A carina is preserved in the only specimen observed and one suckerlike impression is conspicuous at the base of the large cusp.

This species must not be confused with *L. magnidens* Ulrich and Bassler, from which it differs markedly in the remote development of the lateral denticles with two curving outwards and three inclining backwards. The terminal cusp is fully developed, so naturally the denticles must be likewise.

Horizon and locality.—Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 23, Collection of the writer.

Ligonodina curvidens n. sp.

(Fig. 2*h*.)

The bar in this species is slightly irregularly curved, supporting on the outer end the large, rounded, gradually tapering, curved terminal main cusp. Back of this in a quite regu-

lar arrangement are twelve rounded, obtusely pointed, short denticles. These denticles incline towards the back and their slight increase in size posteriorly is noticeable.

The rounded, acute terminal main cusp curving towards the back and the short denticles developed along the bar separates this from other species of the genus.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 1, Collection of the writer.

Ligonodina princeps Hinde, 1879.

(Fig. *3b, c.*)

1879. Polygnathus princeps, G. J. Hinde, Quart. Journ. Geol. Soc., 35, 365, Plate XVI, fig. 23, 1879.

During the summer of 1924 and again in 1925 a number of specimens of this species were found but none of them bearing the terminal main cusp. It is apparently a *Ligonodina* and is separated from other species of the genus by the exceedingly long and thick bar curved in some specimens and straight in others. The lateral denticles are acutely pointed, well spaced, and like other species of the genus they diminish in height posteriorly.

Horizon and locality.—Common in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Plesiotypes.—Nos. 39, 5, Collection of the writer.

Ligonodina alternata n. sp.

(Fig. *2i.*)

Bar thin, curved and bearing numerous alternating large and small denticles all of which are inclined posteriorly. The larger acutely pointed denticles are well spaced to have allowed it seems for the development of the needle-like teeth set in between them. If the short rounded terminal main cusp with its downward extension were detached from the lateral denticles in this species, one would place it in the genus *Hindeodella*. Fortunately, however, the main cusp is preserved with its downward extension and bears several suckerlike impressions so characteristic of the genus *Ligonodina*.

Horizon and locality.—Occurs in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 225B on slab, Collection of the writer.

Ligonodina triangulata n. sp.

(Fig. 3*e*.)

This species is represented in the collection by a single rather well preserved specimen having a bar that is short and nearly flat. Emerging from the bar at the one end is the short triangular main cusp; this with its basal extension are well developed and a carina the full length of the tooth is discernible. The large cusp is strikingly wide at its base but gradually tapers into a sharp point. Back of this stout end tooth are mounted in the bar five irregularly shaped, widely separated, short denticles all pointing posteriorly.

This species may be separated from others of the genus by the stout, short triangular main cusp and the short denticles.

Horizon and locality.—Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 323, Collection of the writer.

Ligonodina nitida n. sp.

(Fig. 2*j*.)

The collection contains several examples of this species and in all of them the bar is rather straight and about as long as the terminal main cusp. Fifteen rounded denticles highest and sharpest in the center and shorter and more obtusely pointed posteriorly, are mounted obliquely in the bar. The main cusp curves backward in its lower half and outwards in its upper half. A short downward extension bearing one suckerlike impression is preserved.

This species bears some resemblance to *Prioniodus expolitus* of this paper but differs from it in the bar being more horizontal and having more closely set denticles. The terminal main cusps in both species are decidedly different. Moreover, in this species the suckerlike impression is quite conspicuous.

Horizon and locality.—Occurs in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 277, Collection of the writer.

Family Prioniodinidae Ulrich and Bassler, 1926.

Genus *Euprioniodina* Ulrich and Bassler, 1926.

Euprioniodina bassleri n. sp.

(Fig. 4*i*.)

Characterized by the two prominent equally developed main cusps slightly curving backwards and fused together at their

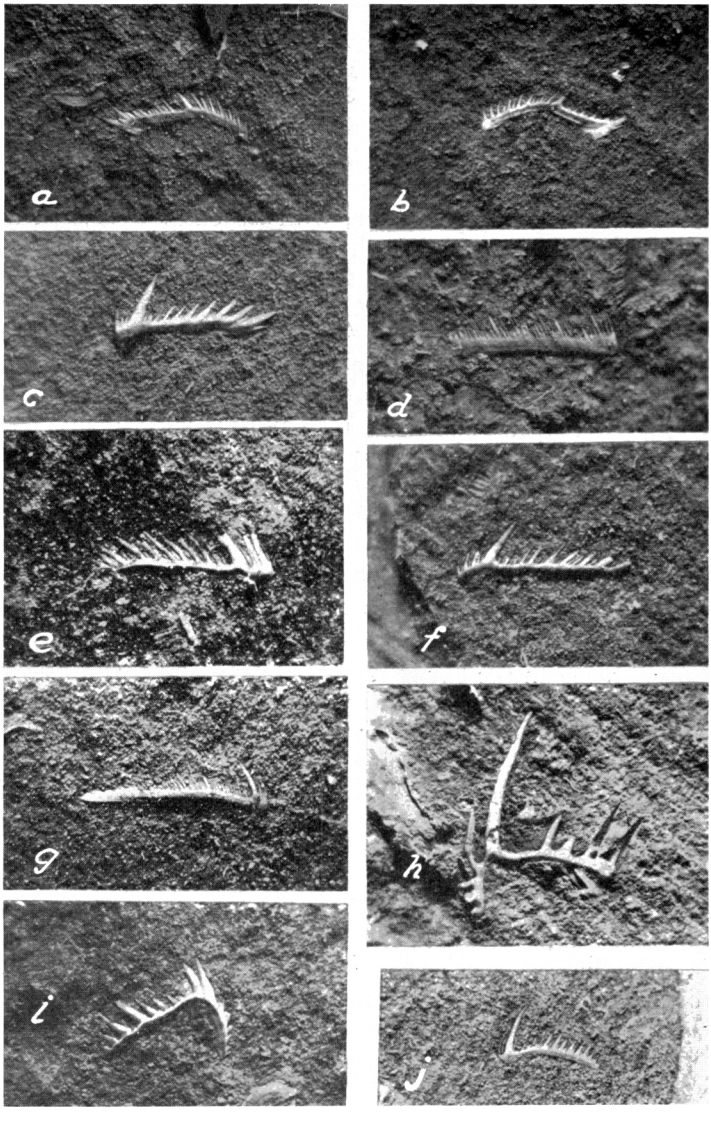

Fig. 4.

a. Hindeodella walrathi, Hibbard. x 10.
b. Hindeodella walrathi, Hibbard. x 10.
c. Hindeodella deflecta, Hibbard. x 10.
d. Hindeodella macilenta, Hibbard. x 10.
e. Hindeodella kindlei, Hibbard. x 10.
f. Hindeodella rotunda, Hibbard. x 10.
g. Hindeodella panderi, Hibbard. x 10.
h. Euprioniodina devonica, Hibbard. x 10.
i. Euprioniod na bassleri, Hibbard. x 10.
j. Hindeodella pertenuis, Hibbard. x 10.

bases. Bar flat and thin, bearing seven oblique denticles with those more fully developed in the posterior half. The downward extension is long, broad, and carries on it six very short obtuse denticles, two of which are relatively wide.

This beautiful species is named in honor of Dr. Ray S. Bassler of Washington, to whom the writer is indebted for many favors.

Horizon and locality.—One specimen in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 3, Collection of the writer.

Euprioniodina devonica n. sp.

(Fig. 4*h*.)

Distinguished from all others of the genus by the relatively long, slender, gradually tapering and curved terminal main cusp. The only specimen collected is unfortunately incomplete so the length of the bar is unknown. The lateral denticles are well separated from one another and somewhat irregular in height. The basal extension bears four or more apparently long, obtuse denticles, with the first one in front of the main cusp very sharply bent upwards.

Horizon and locality.—Rare in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 168 on slab, Collection of the writer.

Genus *Lonchodina* Ulrich and Bassler, 1926.

Lonchodina multidens n. sp.

(Fig. 3*i*.)

Bar in this species strongly arcuate as in *L. arcuata* Ulrich and Bassler, but is distinguished from that species by the unequal development of the bar which is long on one side and short on the other side of the median cusp. The anterior half of the bar bears ten acute, short denticles and the posterior half only seven likewise sharp denticles. One of the denticles on the shorter end of the bar bears some resemblance to the slightly larger main cusp.

The general sharp appearance of the entire tooth separates it from other strongly arcuate species of the genus.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 47, Collection of the writer.

Lonchodina extenta n. sp.

(Fig. 3*d*.)

Bar thick, short and bowed, bearing eight or nine acutely pointed denticles; those near the center being longest while the others, especially on the posterior half of the bar, decrease rather regularly in length towards the extremities of the bar. It is impossible to pick out the main cusp.

Horizon and locality.—Occurs in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 267, Collection of the writer.

Lonchodina bidens n. sp.

(Fig. 3*a*.)

Bar in this species is rather thick and greatly arched so that both sides meet at an acute angle. From the apex arises what appears like a wide blunt tooth split at the end, but is apparently two sharp-pointed denticles fused together for over half their length. These are the principal cusps and on one side of them are developed five short blunted denticles while the bar on the other side bears also five more irregular and pointed denticles, two of them actually reaching the length of the median cusps.

This is a unique form and so far is the only *Lonchodina* observed having the two median main teeth. These two teeth fused together for over half their length serve to distinguish this from other forms of the genus.

Horizon and locality.—Rare in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 49, Collection of the writer.

Genus *Hibbardella* Ulrich and Bassler, 1926.

Hibbardella subgrandis n. sp.

(Fig. 3*h*.)

Base thin, narrow and arched but not to such a great degree as in some species of the genus. Where the two sides meet to form an acute angle, there projects the exceedingly short, stout, obtuse median main cusp. Mounted in the bar on both sides of the central tooth are a number of sharply curved, short, obtuse and well spaced denticles on both sides curving towards the main cusp.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 7, Collection of the writer.

Genus *Hindeodella* Ulrich and Bassler, 1926.

Hindeodella walrathi n. sp.

(Fig. 4*a*, *b*.)

This species is founded on two well preserved examples in which the bar is thick and strongly curved. The main cusp instead of mounting near the outer end as is usual, is in the species more median and rather short. The bar both in front and in back of the median cusp bears numerous alternating large and small denticles. The denticles developed at the posterior extremity of the bar are somewhat larger as in other species of the genus.

The development of numerous denticles in front of the median cusp separates this from other species of *Hindeodella*.

The specific name is in honor of Lyman D. Walrath of the Acme Shale Brick Company who very kindly granted the writer permission to visit their shale pit at Shaleton to collect this fauna.

Horizon and locality.—Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Cotypes.—Nos. 81, 225C on slab, Collection of the writer.

Hindeodella panderi n. sp.

(Fig. 4*g*.)

The base of this comb-like form is very little curved, narrow and somewhat pointed posteriorly; situated near the opposite end is the acutely pointed main needle-like cusp, with four or more fine teeth uneven in length fixed in the bar in front of it. Between this principal tooth and the posterior end of the bar are numerous fine, sharp needle teeth quite irregular in length, all inclining in the one direction and not differing much from the four situated anteriorly.

Of this fine species the collection contains several examples but the one figured and being the type specimen came from along Eighteen Mile Creek. It is separated from others of the genus by the numerous close set fine denticles and the likewise delicate appearance of the slightly curved main outer tooth.

Horizon and locality.—Occurs in the Middlesex shale of the Portage group at Eighteen Mile Creek, Erie county, New York; also in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. A-2, Collection of the writer.

Hindeodella macilenta n. sp.

(Fig. 4*d*.)

Similar to *H. panderi* from the Middlesex shale but the bar is straighter, thicker and bearing two sets of lateral denticles which are relatively longer. Moreover, the main outer cusp is inclined and a trifle shorter with several long thin denticles developed in front of it.

Horizon and locality.—Found in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 233, Collection of the writer.

Hindeodella rotunda n. sp.

(Fig. 4*f*.)

Bar straight, of rounded appearance with the outer end deflected downwards; on the outer end it bears three long backward curving acute denticles with a set of finer ones alternating them. Main cusp rounded, slightly curved near its base and tapering quite gradually. The bar in back of this principal tooth bears numerous long, widely separated denticles with a finer set of usually two or three separating them.

The development of the three anterior denticles with three finer ones alternating them and the rounded appearance of the entire tooth in general are characters which will separate it from other associate species of the genus.

Horizon and locality.—Occurs in the Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 50, Collection of the writer.

Hindeodella pertenuis n. sp.

(Fig. 4*j*.)

Readily separated from all associated species of the genus by the rather short but thick well curved bar bearing numerous acutely pointed, rounded denticles with a set of finer ones alternating them. The main outer cusp is strong at its base, little

curved and tapers into a sharp point. To the front of this main tooth are two greatly curved, exceedingly long, slender denticles.

Horizon and locality.—Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 175, Collection of the writer.

Hindeodella kindlei n. sp.

(Fig. 4*e*.)

In this unusual form the bar is moderately thick and straight until the posterior end is reached where it appears thinner and droops gently downward; immediately underneath the stout, rounded anteriorly situated main cusp it is slightly arched. In front of this main tooth and almost reaching the same length are two or three close set denticles of approximately equal size and slightly fused together at their bases. The bar in back of the main cusp bears a number of tall, regularly spaced, curved denticles with a set of shorter fine needle-like teeth alternating them.

Named in honor of Dr. Edward M. Kindle of Ottawa to whom the writer is indebted for many favors. Distinguished from other species of the genus in the Rhinestreet shale by the long anterior teeth and the likewise long teeth with the finer set alternating them, in back of the main cusp.

Horizon and locality.—Rhinestreet shale of the Portage group at Shaleton, Erie county, New York.

Holotype.—No. 44, Collection of the writer.

Hindeodella deflecta n. sp.

(Fig. 4*c*.)

Bar of this beautiful and well preserved specimen figured is considerably thick and straight for the greater part of its length, with the anterior portion deflected downward. At the junction of curvature of the bar projects upwards and obliquely the robust, acutely pointed main cusp; in front of this are two slender, close set denticles in back of a much larger one which almost reaches in size that of the posterior end teeth. In back of the main cusp are two sets of inclined, alternating small and large denticles, the larger ones becoming more protuberant near the end of the bar.

Both the anterior and posterior denticles as well as the main cusp in this species presents a much different appearance than

in *H. alternata* Ulrich and Bassler, a species which it resembles in some respects.

Horizon and locality.—Middlesex shale of the Portage group at Eighteen Mile Creek, Erie county, New York.

Holotype.—No. A-3, Collection of the writer.

BUFFALO, N. Y.

BIBLIOGRAPHY.

Pander, C. H., Monographie der fossilen fische des silurischen Systems der russisch-baltischen Gouvernments, St. Petersburg, 1856.

Newberry, J. S., Rep. Geol. Survey of Ohio, Vol. 2, pt. 2, Paleontology 41-44, pl. 57, 1875.

Hinde, G. J., On conodonts from the Chazy and Cincinnati group of the Cambro-Silurian, and from the Hamilton and Genesee shale divisions of the Devonian, in Canada and the United States. Quar. Jour. Geol. Soc., **35**, No. 139, 351-369, pls. 15-17, 1879.

Clarke, J. M., On the Higher Devonian faunas of Ontario county, New York. U. S. Geol. Survey Bull. **16**, 40-42, 1885.

Rohon, J. V. and v. Zittel, K. A., Ueber conodonten. Sitzungsbericht der Bayrischen Akademie der Wissenschaften, Munchen, 108-136, pls. 1, 2, 1886.

Clarke, J. M., Annelid teeth from the lower portion of the Hamilton group and from the Naples shales of Ontario county, New York. 6th An. Rep., N. Y. State Geologist, 30-32, pl. A1, 1887.

Grabau, A. W., Geology and Paleontology of Eighteen Mile Creek and the lake shore sections of Erie county, New York. Bull. Buffalo Soc. Nat. Sci., **6**, 148-158, figs. 33A-46, 1899.

Hinde, G. J., Notes and descriptions of new species of Scotch Carboniferous conodonts. Trans. Glasgow Nat. Hist. Soc., New Ser., **5**, 338-346, pls. 9, 10, 1900.

Smith, John, On the occurrence of conodonts in the Arenig-Llandello formations of the southern uplands of Scotland. Trans. Glasgow Nat. Hist. Soc., New Ser., **7**, 235-252, pls. 5-9, 1907.

Kindle, E. M., The Onondaga fauna of the Allegheny region. U. S. Geol. Survey Bull., **508**, 67-68, pl. 2, 1912.

Hadding, Assar, Lunds Universitets Arsskrift, N. F., Afd. 2, Band **9**, Nr. 15; Kongl. fysiografiska Sallskapets Handlingar, N. F., Band **24**, Nr. 15, 30-32, pl. 1, 1913.

Bryant, W. L., The Genesee conodonts. Bull. Buffalo Soc. Nat. Sci., **13**, No. 2, 1-27, figs. 1-7, pls. 1-16, 1921.

Parks, A. W., The stratigraphy and paleontology of Toronto and vicinity. Ontario Dept. of Mines, **31**, part 9, pp. 35-37, pl. 6, 1923.

Bassler, R. S., Classification and stratigraphic use of the conodonts (abstract): Bull. Geol. Soc. America, **36**, 218-220, 1925.

Ulrich, E. O. and Bassler, R. S., A classification of the toothlike fossils, conodonts, with descriptions of American Devonian and Mississippian species. Proc. U. S. Nat. Museum, **68**, 1-63, figs. 1-5, pls. 1-11, 1926.

Roundy, P. V., Mississippian formations of San Saba county, Texas. U. S. Geol. Survey Prof. Paper **146**, 8-17, pls. 3, 4, 1926.