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PALÆOZOIC FOSSILS

VOL. III., PART III.

*4. The fossils of the Galena-Trenton and Black River formations of
Lake Winnipeg and its vicinity*

BY

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Palæontologist and Zoologist to the Survey



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The present report, which constitutes the third part of the third volume of "Palæozoic Fossils" now in course of publication by this Survey, consists of a systematic list of all the species from the Galena-Trenton and Black River formations of Lake Winnipeg and its vicinity, in the Museum of the Survey, with descriptions and illustrations of such as seem to be new.

The drawings for the figures and plates illustrating this report have been made from nature by Mr. L. M. Lambe, F.G.S.

GEORGE M. DAWSON.

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4. The Fossils of the Galena-Trenton and Black River formations of Lake Winnipeg and its vicinity.

BY J. F. WHITEAVES.

The existence of highly fossiliferous limestones on the western shore of Lake Winnipeg and in the Red River valley north of the United States boundary line has long been known to geologists.

On Lake Winnipeg these limestones appear to have been first observed north of the Saskatchewan, in 1819, by Sir John Richardson, when accompanying the members of the first Franklin expedition, as naturalist, on their journey to the polar sea.

In the early part of the "Narrative" of this expedition, it is stated that the party entered Lake Winnipeg, from Norway House, on the night of the seventh of October, 1819, that they spent some time in examining the north and part of the north-west shores of the lake on the eighth and on the morning of the ninth of October of that year, that they sailed for the Saskatchewan at two p.m. on the ninth of October, and reached the mouth of that river, preparatory to its ascent, on the midnight following.

In another publication,* Richardson says that the strata at the First and Second Rocky Points on the west shore of Lake Winnipeg, north of the Saskatchewan, "contain many gigantic Orthoceratites, some of which have been described by Mr. Stokes in the Geological Transactions." These Orthoceratites, therefore, would seem to have been collected upon the eighth or ninth of October, 1819, though Dr. Fitton, in an appendix to the narrative of Captain Back's Arctic Land Expedition, says that they were collected in 1820.

However this may be, in an Appendix to the Narrative of Franklin's first expedition, Richardson says that cliffs of bluish and yellowish grey limestone "appear on the west side of Limestone Bay, and continue to bound the lake as far as the mouth of the Saskatchewan, and, as we have

* Journal of a Boat Voyage through Rupert's Land to the Arctic Sea, vol. I. (London, 1851), p. 65.

been informed, down the whole of its western shore." This limestone, he adds, "which extends over a vast tract of country, probably belongs to the great series of limestone formations under the green sand and above the new red sandstone." In another part* of this Appendix, he states that Professor Jameson, who had been requested to "examine the specimens of limestone collected on the shores of Lake Winnipeg and in the Cumberland House district, obligingly sent the following note:—The specimens of limestone received from you contain examples of the following fossil organic remains:

1. Limestone with *encrinites*. The encrinites are in fragments.
2. Limestone with *orthoceratites*.
3. Limestone with *trebratulæ*.
4. Limestone with *caryophyllites*.
5. Limestone with *lingule*.

These fossils would seem to intimate that the rocks in which they are contained belong to the Mountain limestone formation, by many referred to the transition, by others to the oldest or deepest part of the secondary class of rocks."

On Franklin's second expedition to the shores of the polar sea, in 1825-27, which Richardson also accompanied as naturalist, the party proceeded *via* Fort William, the Lake of the Woods, Lake Winnipeg and the Saskatchewan, and touched at Dog Head, Stony Point, Cat Head, Broken Canoe Point, Wicked Point, Egg Island and Long Point, in 1825, before reaching the Saskatchewan. Richardson's Appendix (Appendix No. 1) to the narrative of this expedition contains a very full and graphic description of the "Limestone of Lake Winnipeg." The fossils obtained during this expedition are there stated to have been examined by Mr. Stokes and Mr. James de Carle Sowerby, "who found amongst them *trebratulites*, *spirifers*, *maclurites* and *corallines*," but it is nowhere stated where these fossils were collected. The *Maclurites* is said to belong "to the same species with specimens from Lakes Erie and Huron and also from Igloolik," and to be "perhaps referable to the *Maclurea magna* of Lesueur." Mr. Sowerby, also, is said to have determined a shell, which occurs "in great abundance in the strata at Cumberland House, about 120 miles to the westward of Lake Winnipeg, to be the *Pentamerus Aylesfordii*."

In the early part of Captain Back's Arctic Land Expedition to the mouth of Great Fish River, the party which he commanded entered Lake Winnipeg from Norway House, in 1833, and left by the Saskatchewan, as Franklin's party had done in 1819. Dr. Fitton, in Appendix

* In a foot note to page 506, which was omitted in its proper place and printed on the last page of the volume.

No. 4 to the "Narrative" of this expedition, gives a general description of some "Orthocerata of a peculiar kind" collected near the First and Second Rocky Points on the north-west shore of Lake Winnipeg, where similar specimens had previously been collected by Richardson, and says that from this locality "there is also one specimen, which, though not in good preservation, is doubtless a *Catenipora*, or chain coral, a genus characteristic of the older transition limestones, in which beds also Orthocerata are common."

Up to the year 1851, the limestones of Lake Winnipeg were regarded, at least by some geologists, as of Carboniferous age, for Edwards & Haime, in their "Monographie des Polypiers Fossiles des Terrains Paléozoïques," published in that year, described and figured a fossil coral from Lake Winnipeg as a Carboniferous species, under the name *Lithostrotion Stokesi*. But, in the first volume of the Journal of a Boat Voyage through Rupert's Land to the Arctic Sea, published also in 1851, Richardson states that the whole of the coast on the north-west side of Lake Winnipeg is occupied by the Black River limestone. No reasons are given for this statement, but a little further on in the same volume the occurrence of a species of *Receptaculites*, supposed by Dr. S. P. Woodward to be closely related to the *R. Neptuni* of DeFrance, and of large Orthocerata at Pine Island Lake, are said to point to the existence of the Birdseye and Trenton limestones in that neighbourhood. The *Receptaculites* of the Winnipeg limestones, which Etheridge subsequently identified with *R. occidentalis*, Salter, in Palliser's Report and in Sir James Hector's paper "On the Geology of the Country between Lake Superior and the Pacific Ocean,"* is now known to be, not that species, but the *R. Oweni*, Hall, of the Galena limestone.

During the Canadian exploring expedition to the Assiniboine and Saskatchewan, in 1858, in charge of Professor Henry Youle Hind, the party made a geological survey of the west coast of Lake Winnipeg from Deer Island to Cat Head. They examined the rock exposures at Deer Island, Grindstone Point, Punk Island, Limestone Cave Point, and Cat Head, and collected a few fossils at each of these localities. In the official Report upon this expedition, published at Toronto in 1859, it is stated that "the formations which have been recognized on Lake Winnipeg and in the valley of Red River are the Chazy, Bird's-eye and Trenton formations and the Hudson River group." "Fine exposures of the Chazy formation" are said "to occur on Punk Island and along the west coast north of Big Grindstone Point as far as the Cat Head;" Sir John Richardson is quoted as the authority for the statement that the whole of the

* Quarterly Journal of the Geological Society of London, vol. XVIII., p. 426, London, April, 1861.

coast on the north-west side is occupied by the Black River and Trenton limestones; and the Hudson River group is said to appear in cliffs twenty feet high at the Stone Fort (now called Lower Fort Garry) on the Red River and near the rapids.

The fossils collected by Professor Hind and Mr. Fleming from the limestones and sandstones of Lake Winnipeg, as identified or described by E. Billings in this Report, are as follows:—From Punk Island, two species of fucoids “resembling forms which occur in the Chazy sandstone”; “columns of a large *Glyptocrinus* allied to *G. ramulosus*”; “two specimens of a plaited *Rhynchonella* a little smaller than *R. plena*”; a new species of *Modiolopsis* described under the name *M. parviuscula*, but not figured; a *Pleurotomaria* “allied to *P. rotuloides*, Hall”; “a *Maclurea* allied to *M. Loganii*, Salter, but with more slender whorls,” and a small *Serpulites* “which much resembles the large species from the Chazy limestone.” From Grindstone Point, a coral “allied to *Columnaria alveolata*”; columns of a large *Glyptocrinus*, the same as those from Punk Island; and plates of a *Glyptocystites* “closely allied to *G. multiporus*.” From Cat Head, a new species of *Orthis*, described and figured under the name *O. Simpsoni*. From Limestone Point (now known as Clark’s Point) about eleven miles north of the mouth of the Little Saskatchewan, *Trochonema umbilicatum* (Hall), and a *Maclurea* like that from Punk Island. According to Mr. Billings, the occurrence of *Modiolopsis parviuscula*, *Trochonema umbilicatum*, the *Maclurea* and *Glyptocystites* “are quite sufficient to show that the localities where they have been collected are Lower Silurian, and most probably about the age of the Black River and Chazy limestones.” Fortunately, most of these fossils are still preserved in the Museum of this Survey.

The occurrence of limestone “in situ” in the Red River valley, at or near the locality now known as Lower Fort Garry, was noticed by Major Long in 1823, during his expedition to the source of the St. Peter’s River. Keating, in the second volume (page 75) of his narrative of that expedition, published two years later, says of this limestone that it is a “horizontal secondary rock, such as probably lies under these prairies.” “We observed,” he adds, “in the limestone no organic remains, although it probably contains some.”

The fossiliferous character of these limestones seems to have been first discovered by D. Dale Owen in July, 1848, for in chapter 4, pages 180 and 181 of his Report of a Geological Survey of Wisconsin, Iowa and Minnesota, published at Philadelphia in 1852, the following passage occurs: “About twenty miles below the mouth of the Assiniboine, near Lower Fort Garry, solid ledges of limestone are exposed, of a light buff colour, sometimes mottled, spotted or banded with light brown. Imme-

diately opposite the Fort, a considerable amount of rock has been quarried and used in the construction of the building. In these beds I succeeded in finding several well-defined and characteristic fossils, sufficient to establish without the least doubt, the age of the Red River limestones. They are, *Favosites basaltica*; *Coscinopora sulcata*; hemispherical masses of *Syringopora*; a *Conularia*; a small, beautiful, undetermined species of *Pleurothyridus*; *Ormoceras Brongniartii*; *Pleurotomaria lenticularis* (?); *Leptæna alternata*; *Leptæna plano-convexa* (?); *Calymene senaria*; and several specimens of the shield of *Illanus crassicauda*. Many of these are identically the same fossils which occur in the lower part of F. 3, in Wisconsin and Iowa, in the blue limestones of Indiana, Ohio, Kentucky and Tennessee, and also in the Lower Silurian of Europe. The *Coscinopora* is precisely the same as the coral which is particularly characteristic of the lower beds of the Upper Magnesian limestone of Wisconsin. The specimens of *Favosites basaltica* cannot be distinguished from those which abound in the Upper Magnesian limestones of Wisconsin and Iowa, and the Lower Coralline beds of the Falls of the Ohio. It is also worthy of note that these limestones of Red River, like their equivalents in Iowa and Wisconsin, are highly magnesian, containing from seventeen to forty per cent of the carbonate of that alkaline earth." In an appendix to this Report, two new species of fossil mollusca, viz., *Pleurotomaria muralis* and *Pleurothyridus antiqua*, are either described and figured, or merely figured. The first of these is said to occur in the Upper Magnesian limestone (F. 3) though, in a subsequent tabular list of fossils, it is referred, perhaps inadvertently, to the Lower Magnesian limestone or Calciferous (F. 2). In this tabular list the Upper Magnesian limestone (F. 3) is subdivided into F. 3 A (the Trenton), F. 3 B (the Galena, Utica and Hudson River group), and F. 3 C (the Coralline and Pentamerus beds, the Clinton and Niagara.) Of the other fossils from Lower Fort Garry, in this list, two (and one, "*Orthoceras vertebrale*," with a query) are referred to F. 3 A; four to F. 3 B; and one (*Coscinopora sulcata*) to the horizon of the Niagara limestone in F. 3 C.

The official Report of Captain Palliser's Explorations in British North America in 1857-60 contains the following list* of the fossils collected at Lower Fort Garry by Sir James Hector, apparently in July, 1857, and determined by Mr. Salter.

"MAGNESIAN LIMESTONE, LOWER FORT GARRY.

Cyathophyllum.	Strophomena euglypha.
Columnaria alveolata, Hall.	Orthis biforata, var. lynx.
Ormoceras Lyoni, Stokes.	Spirifer elegantula.
Favistella. (Favosites basaltica, Owen.)	Maclurea.
Receptaculites occidentalis, Salter.	Rhynchonella increbescens, Hall.
Strophomena plano-convexa.	

* With the typographical errors corrected

A similar list, but with the name of *Strophomena euglypha* omitted, is contained in Sir James Hector's paper "On the Geology of the Country between Lake Superior and the Pacific Ocean," &c., published in 1861, in the seventeenth volume of the Quarterly Journal of the Geological Society of London.

The geology of Lake Winnipeg and its immediate vicinity has been studied in detail by Mr. J. B. Tyrrell and Mr. D. B. Dowling, of this Survey, in 1889, 1890 and 1891. Preliminary accounts of the progress of these investigations have been published in the Summary Reports of the Survey for those years and a joint report upon the work of these three seasons is now being prepared. Mr. Tyrrell's conclusions as to the sequence and correlation of the palæozoic rocks of this region, form an introduction to a paper entitled "Three Deep Wells in Manitoba," published in the ninth volume of Transactions of the Royal Society of Canada. In this introduction, all the limestones of the Red River valley in Manitoba (except those at Stonewall, which, it is stated, may belong to the Niagara limestone, and those at Stony Mountain, which are clearly referable to the Hudson River group), and of the western side of Lake Winnipeg are referred to the Trenton formation, and the sandstones of Punk and Deer Islands, Grindstone Point, etc., to the Chazy (St. Peter's) formation. In this connection, however, it may be remarked that, so far, no fossils of any kind have yet been detected in the sandstones which are supposed to be referable to the Chazy (St. Peter's) formation, except at their summit, in passage beds which probably represent the Birdseye and Black River limestones. As elsewhere stated,* "there is, at present, no satisfactory palæontological evidence for the existence of the Chazy formation, or its equivalent, in Manitoba," or the immediate neighbourhood of Lake Winnipeg. In a paper published in the "Ottawa Naturalist" for June, 1895, Mr. Dowling subdivides the Winnipeg and Red River limestones, in descending order, into the "Upper Mottled limestones," the "Cat Head limestones," and the "Lower Mottled limestones," and calls the sandstones of Punk and Deer islands, etc., the "Winnipeg sandstones."

The occurrence of rocks of presumably the same age as the Winnipeg limestones at several localities on the Nelson River, Keewatin, had previously been recorded by Dr. Bell in the Report of Progress of this Survey for 1878-79. Rocks containing similar fossils were discovered by Mr. Tyrrell near Doobaunt Lake, in latitude 62° 44', and longitude 100°, in 1893; at Sturgeon Lake, north-east of Cumberland House, on the Saskatchewan River, and at Fort Churchill, on the west side of Hudson's Bay, in 1894, as noted by him in the Summary Report of this Survey for

* Transactions of the Royal Society of Canada for 1889, vol. VIII., sect. 4, p. 83.

1895; and at Minago and Wekusko lakes, in the District of Saskatchewan, in 1896.

Somewhat extensive collections of the fossils of the limestones and sandstones of Lake Winnipeg and the Red River valley were made by Dr. R. Bell in 1879 and 1880, by T. C. Weston in 1884, by J. B. Tyrrell in 1889 and 1890, by D. B. Dowling and L. M. Lambe in 1890, and by D. B. Dowling in 1890 and 1891. The authorities of the United States National Museum at Washington have kindly lent to the writer, for examination and comparison, all the fossils from the limestones of the Red River valley in their collection, and several fossils of much interest collected at East Selkirk and Lower Fort Garry by A. McCharles in 1884, were presented by him to the Museum of the Survey. The fossils collected by Dr. Bell from the Winnipeg limestones have been reported upon, provisionally, by the writer, in the Reports of Progress of this Survey for 1878-79 and 1879-80, and, since then, papers descriptive of some of the most remarkable species in these collections have been published in the Transactions of the Royal Society of Canada for 1889 and 1891, and in the Canadian Record of Science for July, 1895.

The last part of this volume contains a systematic list of all the fossils from the Hudson River formation at Stony Mountain that are represented in the Museum of the Survey. In the present paper it is intended to supplement this list with a similar one, as complete as possible, and with descriptions and illustrations of such species as may seem to be new, of the fossils of all the Cambro-Silurian rocks in the Lake Winnipeg district, that are believed to be older than the Hudson River formation, with the exception of a small but interesting series of Stromatoporoids, which has yet to be studied. Most of the specimens are from limestones which most probably represent the whole of the Utica and Trenton formations, inclusive of the Galena, though they hold several fossils elsewhere supposed to be restricted to the Hudson River group, but some are from the few feet of passage beds already referred to, which are presumed to represent the Birdseye and Black River limestone, immediately beneath the limestones and at the summit of the sandstones. It is thought desirable to consider the fossils of these limestones separately from those of the transition beds, and to commence with the former. The state of preservation of most of the fossils from these limestones is, however, by no means favourable to their accurate specific or generic determination. Most of the brachiopoda have no portion of the hinge area of either valve preserved, and nearly all of the mollusca and crustacea are represented by mere casts of the interior of the shell or crust.

One of the most striking features in the fossils of the Winnipeg and Red River limestones is the large size to which many of the specimens

attain, though this is more particularly the case with the Cephalopoda. Thus, one of the Receptaculitidæ (*Receptaculites Oweni*), which is abundant in these limestones, is known to attain to a size of twelve or even twenty inches in diameter. Some specimens of a simple Cyathophylloid coral (*Streptelasma robustum*) from Lower Fort Garry are nearly seven inches in length, as measured along the convex curve, and nearly five inches in height. A brachiopod from the same locality (*Rafinesquina lata*) is rather more than three inches in length at the hinge line, and a specimen of *Strophomena incurvata* from East Selkirk is fully double the usual size of that species. One of the gasteropods (*Maclurea Manitobensis*) of these limestones is sometimes as much as eight inches and a half in diameter, and another (the *Hormotoma Winnipegensis* of this Report) is eight inches long. The "gigantic Orthoceratites" noticed by Sir John Richardson on the west side of Lake Winnipeg, have already been referred to, but these are from localities north of the Saskatchewan. South of that river, at Dog Head, specimens of Orthoceratites (probably of *Endoceras subannulatum*), four feet and a half or even six feet in length, and imperfect at both ends, were observed by Mr. Lambe in 1890. A siphuncle of *Endoceras crassisiphonatum*, which is also imperfect at both ends, is nearly three feet long. A specimen, which appears to be a cast of the anterior end of the body chamber of a specimen of a *Poterioceras* (probably *P. nobile*), recently collected by D. B. Dowling and L. M. Lambe at Berens Island, and showing the infolding of the lip, is seven inches across. Rough casts of the interior of spirally coiled discoidal or nearly discoidal shells, apparently allied to *Barrandeoceras*, from several localities on the west shore of Lake Winnipeg, are nearly or quite two feet across. Lastly, a free cheek of a trilobite, *Asaphus (Isotelus) gigas*, from Cat Head, indicates a specimen that must have been twenty inches in length when alive; and other similar examples could be given.

The writer is much indebted to Mr. E. O. Ulrich, of the Geological Survey of Minnesota, for valuable information in regard to the polyzoa, pelecypoda and some of the gasteropoda that are enumerated or described in this report; to Mr. Charles Schuchert, of the United States National Museum, for assistance in the determination of some critical species or peculiarly preserved specimens of Strophomenidæ; to Professor T. Rupert Jones for the description and drawings of *Aparchites parvulus*; and to the proprietors of "Palæontographica" for permission to reproduce the figures of *Aulocopina Winnipegensis* in that publication.

LIST OF SPECIES.

A.—From the limestones.

ALGÆ.

CHONDRITES (BYTHOTREPHIS) PATULUS.

Chondrites patulus, Whiteaves.....1896 (Jan. 17th). Canad. Rec. Sc., vol. VI.,
No. 7, p. 387.

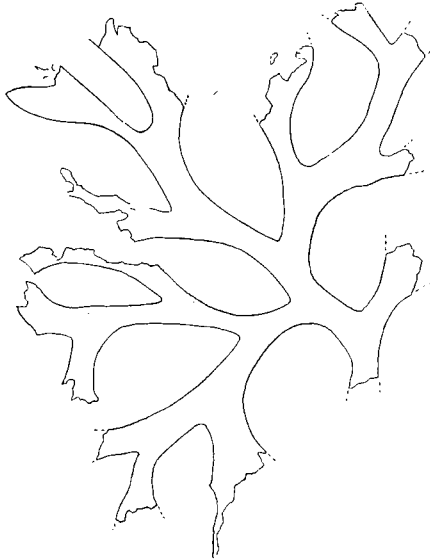


Fig. 5. *Chondrites (Bythotrephis) patulus*. The most perfect specimen collected, from Innmost Island, of the natural size.

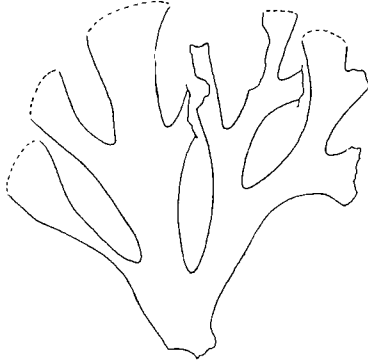


Fig. 6. *Chondrites (Bythotrephix) patulus*. Another specimen, from the same locality.
Natural size.

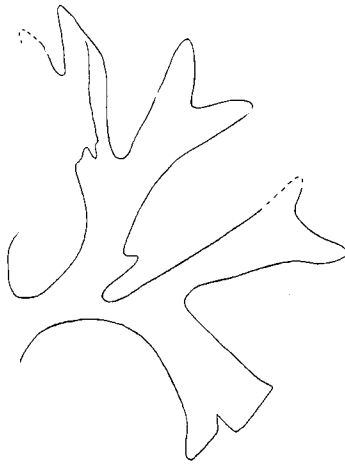


Fig. 7. *Chondrites (Bythotrephix) patulus*. Imperfect specimen, also from Inmost Island,
showing one of the terminal bifurcations of the thallus. Natural size.

*Thallus frondose, continuous, spreading widely in the same plane, and consisting, as now preserved, of a thin, uniformly flat expansion, devoid of midrib or veins, which is doubly deeply and widely trifurcate, with the secondary divisions again once or twice cleft at their summits; the undivided and partially divided portions narrow below, widening above and widest at the commencement of each division, averaging from three to four millimetres in breadth in the narrowest places, and from fourteen to fifteen mm. in the widest. Base of attachment unknown; minute structure not preserved.

Inmost or Birch Island, Kinnow Bay, Lake Winnipeg, T. C. Weston, 1884: four good specimens, consisting of well defined, rather dark brown, ferruginous impressions upon pieces of pale buff-coloured limestones, and seven similar but very imperfect ones.

In the present state of our knowledge, it would seem that *Bythotrephix*, (Hall)† can scarcely be satisfactorily distinguished from *Chondrites* (Sternberg). Goeppert,‡ though he retains the name *Bythotrephix* for *B. flexuosa* and *B. succulenta*, as described and figured by Hall, is careful to state that he does so provisionally, on account of the absence of satisfactory evidence on this point, and says that the only difference between *Bythotrephix* and *Chondrites* is the flatter habit of the thallus of the former, a character which, he adds, is not always seen in Hall's figures of species of *Bythotrephix*. Geinitz and Liebe§ say that no essential difference can be recognized between the two genera, and claim that Goeppert also is of the same opinion.

* Most of the descriptions of species that have been previously described by the writer in other publications, have been either partially or wholly rewritten for this Report.

† Originally spelled *Buthotrephix*.

‡ Ueber die Fossile Flora der Silurischen, der Devonischen und Unteren Kohlenformation oder des Sogenannten Uebergangsgebirges, 1859, p. 452.

§ Ueber ein Äquivalent der Taconischen Schiefer Nordamerika's in Deutschland, &c., p. 18.

CHONDRITES (BYTHOTREPHIS) CUNEATUS. (N. Sp.)

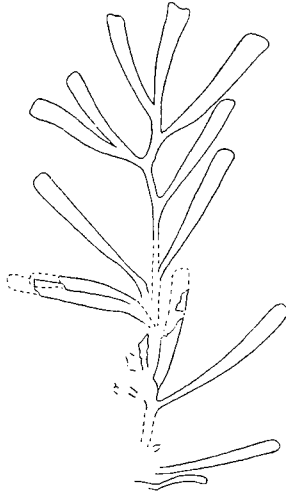


Fig. 8. *Chondrites (Bythotrephis) cuneatus*. One of the most perfect specimens known to the writer, from Cat Head, Lake Winnipeg, and of the natural size.

Thallus frondose, continuous, devoid of midrib or veins, compressed, almost flat, and consisting of a nearly straight and rather narrow central axis, with both terminal and lateral, simple or deeply bifurcate, divergent, elongated and narrowly wedge-shaped divisions, at short but irregular intervals. The central axis does not much exceed three millimetres in breadth, in any of the specimens known to the writer, and the terminal and lateral divisions average from three-quarters of an inch to about an inch in length, and from three to four millimetres in breadth at their subtruncate apices. Base of attachment unknown; minute structure not preserved.

Apparently not uncommon at Cat Head, Lake Winnipeg, where well defined but not quite perfect specimens, in a similar state of preservation to those of *C. patulus*, were collected by T. C. Weston in 1884; and three miles west of Cat Head, where a few good specimens were obtained by D. B. Dowling and L. M. Lambe in 1890.

These fossils bear a certain general resemblance to the *Sphenothallus angustifolius* of Hall, as figured on Plate 68 of the first volume of the Paleontology of the State of New York, and the writer has long been under the impression that they might possibly represent a local variety

of that species. Quite recently, however, Mr. R. Ruedemann has published a paper (in the "American Geologist" for 1896) in which he adduces arguments to prove that the specimen upon which *S. angustifolius* was based is not a plant, but a number of imperfect shells of a sessile *Conularia* (probably *C. gracilis*, Hall) with thickened margins and a bulbous base, attached to the cast of the interior of another shell (*Trocholites*). However this may be, an original drawing of the type of *T. angustifolius*, kindly forwarded by Mr. Ruedemann, shews that there is no real resemblance between that specimen and the fossils from Cat Head.

CHONDRITES CUPRESSINUS, Whiteaves.

Plate 17, fig. 1.

Chondrites cupressinus, Whiteaves 1896. Canad. Rec. Sc., vol. VI., p. 388.

"Thallus frondose, continuous, and consisting of a long, slender and extremely narrow rhachis, with numerous short, crowded and variously-divided lateral ramifications; base of attachment unknown. The rhachis is flat, erect, nearly straight, and scarcely more than half a millimetre in its maximum breadth. The lateral ramifications are linear, pinnately partite, or possibly verticillate, opposite, divergent, and spreading outward and a little upward. They decrease very gradually in length from below upward, and are either doubly bifurcate, bifurcate with both of the ultimate ramifications trifurcate, or bifurcate with one of the ultimate branchlets trifurcate and the other single.

Cat Head, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen, which has been split longitudinally down the centre into two pieces of nearly equal size.

To the naked eye this specimen has much the appearance of the polypary of a recent hydroid, and especially of that of the well known *Sertularia cupressina*, L., which Professor Allman now refers to *Thuiaria*. When viewed under an ordinary simple lens, however, it has obviously more the aspect of a plant, although its minute tissues are not preserved. There are no indications of any corneous or chitinous structures, of articulations, of a central virgula, as in the Graptolitidæ, or of marginal hydrotheca, as in the hydroids and graptolites."

CHONDRITES GRACILLINUS, Whiteaves.

Plate 17, fig. 2.

Chondrites gracillimus, Whiteaves 1896. Canad. Rec. Sc., vol. VI., p. 389.

"Thallus frondose, continuous, pinnately partite, with a slender rhachis, which is nearly a millimetre in breadth about the mid-height,

but narrower at and near the base and apex, and apparently flattened, with no indications of a central axis or virgula. Lateral ramifications simple, unbranched, narrower than the rhachis, averaging about one millimetre apart, the longest about fifteen mm. in length, divergent in the same plane outward and a little upward, but showing no traces of hydrothecæ or cell openings on their margins; basal attachment unknown.

Inmost Island, Kinwow Bay, Lake Winnipeg, T. C. Weston, 1884: one well defined and nearly perfect specimen, though its minute structure is not preserved.

This specimen is so similar in general shape to some of the Devonian and Carboniferous species of *Plumalina* that the writer has long been under the impression that it could be referred to that genus. It is also equally similar in general shape to the *Buthograptus laxus* of Hall, from the Trenton shales of Wisconsin. According to S. A. Miller,* *Ptilophyton*, Dawson, is a synonym of *Plumalina*, and the writer is informed by Sir J. W. Dawson that he has recently ascertained that *Buthograptus laxus* is exactly congeneric with *Ptilophyton*. In Hall's original description of *Plumalina*† the specimens described are said to have a 'well-preserved corneous structure,' and Whitfield has shown that the lateral branches of *Buthograptus laxus* are articulated. Under a lens, the specimen from Inmost Island shews no indication of corneous structure, and its lateral ramifications are apparently continuous with the rhachis. It would, therefore, seem to be the most prudent course to refer it provisionally to the genus *Chondrites*. Whether viewed with or without a lens, it has so many characters in common with *C. cupressinus* that practically the only difference between them is, that the one has long and undivided pinnae or lateral ramifications, and the other short and much divided ones."

RECEPTACULITIDÆ.

RECEPTACULITES OWENI, Hall.

<i>Coscinopora sulcata</i> , D. D. Owen (but not of Goldfuss).....	1844.	Rep. Geol. Expl. Iowa, Wiscons. and Ill., p. 40, pl. 7, fig. 5.
<i>Receptaculites Oweni</i> , Hall.....	1861.	Rep. Progr. Geol. Surv. Wiscons., p. 13.
" " "	1862.	Rep. Progr. Geol. Surv. Wiscons., p. 46, fig. 2, and p. 429.
" " Meek and Worthen.....	1868.	Geol. Surv. Ill., vol. III., p. 302, pl. 2, fig. 3.
<i>Receptaculites Oweni</i> Whitfield	1882.	Geol. Wiscons., vol. IV., p. 239, pl. 10, fig. 7.

* North American Geology and Palæontology, 1889, p. 136.

† Canadian Naturalist and Geologist, vol. III., p. 175.

- Receptaculites occidentalis* (partim), Hinde...1884. Quart. Journ. Geol. Soc. Lond., vol. XL., p. 842.
Receptaculites Oweni, Winchell and Schuchert. 1895. Geol. Minn., Final Rep., vol. III., pt. 1. plate I', figs. 1-4.

In the Red River valley this species has been collected at Lower Fort Garry by D. Dale Owen in 1848, by Sir James Hector in 1857, by Donald Gunn in 1858, by Dr. R. Bell in 1880,* and by T. C. Weston in 1884; at East Selkirk by A. McCharles in 1884, and by L. M. Lambe in 1890. On Lake Winnipeg it has been collected at Washow Bay by T. C. Weston in 1884; at Little Black Island,† Swampy Harbour, by J. B. Tyrrell in 1889, and by D. B. Dowling and L. M. Lambe in 1890; at Big Island by Mr. Tyrrell in 1889; and at Sturgeon and Black Bear islands by Messrs. Dowling and Lambe in 1890. In Keewatin it has been collected at the second and third rapids of the Nelson River by Dr. R. Bell in 1879, and in the District of Saskatchewan, on the east side of Sturgeon Lake, by Mr. Tyrrell in 1894.

Dr. G. J. Hinde (op. cit.) has expressed the opinion that *R. Oweni*, Hall, is merely a synonym of *R. occidentalis*, Salter. On the other hand, according to Dr. Winchell and Mr. Schuchert (op. cit.), "on account of the greater size attained by *R. Oweni*, and the plates of the inner surface having twelve canals, instead of four, as in *R. occidentalis*, a central knob on each headplate of the spicules on the outer surface of the former, should be sufficient to distinguish this species."

ISCHADITES IOWENSIS, Owen. (Sp.)

- Orbitolites reticulata*, Owen.....1844. Geol. Rep. Iowa, Wisconsin, and Ill., pl. 18, fig. 7.
Selenoides Iowensis, Owen.....1852. Rep. Geol. Surv. Wisconsin, Iowa and Minn., p. 587, pl. 2b, fig. 13.
Receptaculites (Selenoides) Iowense, Hall.....1861. Rep. Superint. Geol. Surv. Wisconsin, p. 14.
Receptaculites fungosum, Hall.....1861. Ibid., p. 15.
Receptaculites globulare, Hall.....1861. Ibid., p. 16.
Receptaculites Iowensis, Billings.....1865. Geol. Surv. Canada, Pal. Foss., vol. I., p. 385, fig. 364.
" " ".....1865. Canad. Nat. and Geol., ser. 2, vol. II., p. 191, fig. 11.
Receptaculites globularis, Meek and Worthen. 1868 (?) Geol. Surv. Ill., vol. III., p. 301, pl. 2, figs. 2, a-b.
Receptaculites, sp.? Meek and Worthen.....1868. Ibid., p. 301, pl. 2, figs. 1, a-b.

* The specimens collected by Dr. Bell in 1880 and labelled "St. Andrews, Manitoba," were all collected within about a mile north or south of Lower Fort Garry, which is on the west side of the Red River, in the parish of St. Andrews.

† A small island close to, but a little to the west of, Berens or Swampy Island, and ten miles north-east of Cat Head.

- Ischadites Kænigii* (partim), Hinde.....1884. Quart. Journ. Geol. Soc. Lond., vol. XL., p. 836.
Ischadites Iowensis, Winchell and Schuchert.1893. Geol. Minn., Final Rep., vol. III., pt. 1, p. 64, pl. F, figs. 5 and 6.
Receptaculites globularis (Hall), Whitfield....1895. Mem. Am. Mus. Nat. Hist., vol. I., pt. 2, p. 44, pl. 5, fig. 7.
Receptaculites fungosus (Hall), Whitfield....1895. Ibid., p. 45, pl. 5, figs. 5 and 6.

In the Peter Redpath Museum at Montreal there is an imperfect and badly preserved specimen of this species, which is labelled as having been collected at Lower Fort Garry by Professor J. H. Panton. The only other Canadian specimen of *I. Iowensis* that the writer has seen is the "weathered section through a specimen" from "the Trenton limestone at Ottawa," represented by fig. 364 on page 385 of the first volume of the "Paleozoic Fossils," which is still preserved in the Museum of the Survey.

PASCEOLUS GREGARIUS? Billings.

- Pasceolus gregarius*, Billings.....1866. Geol. Surv. Canada, Cat. Silur. Foss. Isl. Anticosti, p. 72.
 Cfr. *Cyclocrinus Spaskii* (Eichwald) F. Roemer.....1876. Lethæa geognost., vol. I., Atlas, pl. 3, fig. 21a.

A few specimens which can scarcely be distinguished by any external character from the types of *Pasceolus gregarius* in the Museum of the Survey, or from *Cyclocrinus Spaskii*, as figured by F. Roemer, in the Atlas to the first volume of the Lethæa Geognostica, were collected at Lower Fort Garry, at Dog Head and Inmost Island, Lake Winnipeg, by T. C. Weston in 1884; at Jack Head Island by D. B. Dowling and L. M. Lambe in 1890; and on the west shore of Lake Winnipeg north of the Saskatchewan and opposite the north end of Selkirk Island by D. B. Dowling in 1891. Most of the specimens are mere casts of the interior of the organism, which shew nothing of the minute structure. One specimen has a portion of the thin investing integument preserved, but it shews only a transverse section of the integument, the outer surface being completely covered by the matrix. The casts are small spherical bodies, about an inch in diameter, and marked externally with numerous minute hexagonal facets, about one millimetre in diameter. In some these facets are slightly convex, with a narrow flat border, and indications of a small tubercle in the centre of each, when examined with a lens, but in others the outer margin of each facet is raised and the central portion depressed.

It would seem to be doubtful whether *Pasceolus gregarius* can be satisfactorily distinguished from *Cyclocrinus Spaskii*, especially in view of the facts that the types of the former are from the Island of Anticosti, and

that *C. Spaskii* has been recorded as occurring on the "Silurian" rocks of that island, by Dr. G. J. Hinde in a paper "On the Structure and Affinities of the Family of the Receptaculitidæ," &c., in the Quarterly Journal of the Geological Society of London for 1884.

PORIFERA.

AULACOPELLA WINNIPEGENSIS, Rauff.

Plate 16, figs. 1-3.

Aulacopella Winnipegensis, Rauff.....1895. Palæontographica, (Stuttgart) vol. XLIII., p. (393) 269, pl. 24, figs. 4-6, and fig. 124 on p. (394) 270.

Cat Head, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890 : one specimen, the type of the species.

The following is a free translation, which has been revised by Dr. Rauff, of the original description of *A. Winnipegensis*, with the references to the figures altered to suit those in this publication.

This remarkable sponge is distinguished by its singular form from all other Aulocopidæ, and in that respect stands in the same relation to them as the Cretaceous *Siphonia* (*Hallirhoa*) *costata* does to the other Siphoniæ.

Plate 16, fig. 1, shews the upper side of the fragment, whose boundary on the right hand side is formed by the broken surface. The smooth parts are the mineral fillings up of originally empty spaces; p is the Paragaster, while G 1, G 2, and G 5, are mineral wedges, shaped like the segments of an orange, whose inner edges are almost parallel to the longitudinal axis of the sponge, in an almost perpendicular direction from the summit to the base. The under side of the sponge is concave (as seen in fig. 9 on the next page) whereas the summit is convex. Between the wedges of sediment (G 1, G 2, and G 5) is situated the body skeleton, which is divided into a number of strong ribs or rays, traversed by thick, arched exhalent canals (aporrhysen) which appear upon the outer surface of the strongly weathered and probably worn fragment (Plate 16, fig. 1, as interrupted grooves.

A vertical section through the middle of one of the rays is shown in the woodcut (Fig. 9), which represents both the vertically fractured surface and a section through the longitudinal axis of the Paragaster.

The Paragaster is deep; it reaches nearly down to the point from which the skeleton fibres (Skelet-radiant) radiate, and occupies about two-thirds the entire height of the sponge. The exact point from which

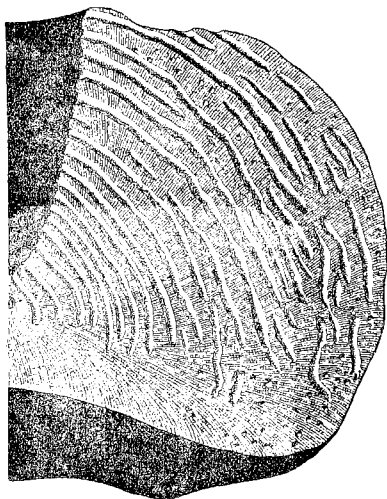


Fig. 9. *Adactopella Winnipegensis*. Vertical section through the middle of one of the rays to the centre of the sponge. The fibres and canals of the skeleton partly restored, though their course in the greater part of the original can be clearly followed.

these fibres radiate could not indeed be actually observed, but its position is so clearly indicated by the convergence of the fibres that the possible deviation from its true position, as represented in the figure, cannot amount to more than one or two millimetres. I have not been able to find distinct inhalent canals, though it is possible that they may have disappeared in consequence of the complete and unfavourable silicification* which the body skeleton has undergone. The basal surface

*The rock is a most peculiar, very uniform, fine grained, siliceous limestone. The grains, which for the most part measure from 30 to 60 micromillimetres, consist of well defined calc spar rhomboids, which are so closely embedded in an isotropic siliceous mass that the rock effervesces but weakly with acids, in spite of the amount of lime that it contains. This sediment is completely free from other organisms, such as sponge spicules, which are often found distributed throughout siliceous limestones. The whole silicified sponge body is free from calcareous matter, and is altered, not to an isotropic silica, but into a compact cryptocrystalline chalcedony.

adheres inextricably to the matrix, as shown in the woodcut. We must therefore conclude that this surface was originally concave, or else we must suppose that the basal concavity was caused by an alteration of its original form previous to fossilization, a view which is not borne out by the regular contour of the specimen.

A transverse section half way up through the fragment gives the appearance represented between A and C on figure 1 of Plate 16. This figure, considered in connection with the woodcut, proves that the skeleton fibres, in each of the radial rays, are pinnately arranged on both sides of a vertical median plane, and that these fibres diverge upward and downward as well as to the right and left. The distance between the axes of the fibres would measure from 0.35 to 0.50 mm. Of an integument layer I could find no traces.

Although the skeleton has undergone a secondary silicification, and has therefore for the most part become obliterated, there is no doubt that, in structure and dimensions, it corresponds with that of *Autocypium* or the American *Zittella*.

Figures 2 and 3 of plate 16 are attempts at a restoration of this sponge, the diagrams being one-third the natural size. Figure 2 shews a side view, and figure 3 a basal view of the organism, as it is supposed to have been when entire. The sponge had the form of a cog-wheel, with a diameter of at least 150 millimetres and a height of 75 mm., from whose conical hollow axis (about 40-50 mm. in diameter) eight radial rays proceed, which are 15-20 mm. thick and 50 mm. long at the midheight. From the mouth of the Paragaster, surface furrows radiate downward over the convex summit and upper surface of the rays. The naked basal surface is concave. In each ray the skeleton fibres are symmetrically arranged to a radial vertical median plane.

TRICHOSPONGIA HYSTRIX. (N. Sp.)

Plate 17, fig. 3.

The foregoing name is proposed provisionally for a single specimen of a sponge, in which the main portion of the body skeleton is represented by a light brown or pale ferruginous impression or stain on the flat surface of a piece of limestone, with its margin outlined by a darker tint. This impression is rather narrowly elongated, about five times as long as high, with the base nearly straight but slightly convex in the middle, the summit still straighter, and the two ends narrowly rounded. Lying across it are numerous, exceedingly narrow, straight and apparently simple spicules, which project beyond the summit and ends to a maximum distance of eight millimetres. Exclusive of the projecting spicules,

the impression which is supposed to represent the body skeleton is forty-five millimetres in length, and nine in its maximum height or depth.

The specimen figured, which is the only one known to the writer, was collected at Cat Head, Lake Winnipeg, by D. B. Dowling and L. M. Lambe in 1890.

COELENTERATA.

HYDROZOA.

CLIMACOGRAPTUS BICORNIS, Hall.

- Graptolithus bicornis*, Hall 1847. Pal. N. York, vol. I., p. 268, pl. 73, figs. 2, *a-s*.
Climacograptus bicornis, Hall 1865. Canad. Org. Rem., Dec. 2, p. 112.
Graptolithus bicornis (Hall), Billings. 1863. Geol. Canada, p. 200, fig. 193.
Climacograptus bicornis (Hall), Miller. 1889. N. Amer. Geol. and Paleont., p. 178, fig. 153.

South-east side of Elk Island, Lake Winnipeg, Dr. A. R. C. Selwyn, 1872: one specimen, from a loose piece of limestone.

THAMNOGRAPTUS AFFINIS. (Nom. prov.)



Fig. 10. *Thamnograptus affinis*.

The only specimen collected, of the natural size.

Perhaps a var. of *T. capillaris*, Hall.

Cfr. *Thamnograptus capillaris*, Hall 1859. Pal. N. York, vol. III., p. 520.

Polypary extremely thin and slender, its main axis linear and almost straight, its branches simple, not perceptibly narrower than the main axis, rather irregularly disposed, but apparently divergent upward and outward at a very acute angle when not obviously distorted. Sicula and hydrothecæ unknown.

Cat Head, Lake Winnipeg, T. C. Weston, 1884: a single specimen which is imperfect at both ends. All the branches on its right hand side look as if they had been abruptly and abnormally bent backward near the main axis, and then forward or forward and outward, prior to fossilization.

With only one specimen for comparison, and that one partially distorted, it is impossible to be at all certain whether this fossil is merely a local variety of *T. capillaris* or a distinct species. As compared with Hall's original figure of *T. capillaris*, the specimen from Cat Head would seem to differ in the much more acutely angular divergence of its branches from the main axis, and in the circumstance that these branches do not, apparently, bear any short secondary branches.

INOCAULIS CANADENSIS. (N. Sp.)

Plate 17, fig. 4.

Polypary large, thin, nearly flat or slightly undulated, widely expanded and composed of very numerous narrow radiating branches, which diverge or divide, reunite and anastomose in every direction, at short and frequent intervals, in such a way as to form a close and finely meshed network. Meshes longer than wide, varying in outline from subrhomboidal to almost lanceolate, and usually pointed at one or both ends. Branches averaging from about one-fifth to one-third of a millimetre in breadth, though the largest are as much as two-thirds of a millimetre broad, and apparently bearing on their celluliferous surface two or three longitudinal rows of rounded cell apertures or pores, with intervals between them of about twice their length or more, though the only specimen which shews this feature is very imperfectly preserved. Surface markings not clearly ascertainable, base of attachment and free extremities of the branches unknown.

A few large but imperfect specimens of this graptolite were collected in or around Lake Winnipeg, at Inmost Island, Kinnow Bay, by T. C. Weston in 1884; at Cat Head by D. B. Dowling and L. M. Lambe in 1890; and at Clark's Point, about eleven miles north of the Little Saskatchewan, by D. B. Dowling in 1891. The largest of these specimens is three inches high, nearly two inches and a half broad, and was evidently much larger than this when entire.

This species is provisionally referred to *Inocaulis*, Hall, because it would seem to be most nearly related to the *I. arbuscula* of Ulrich* from the Hudson River or Cincinnati group of Ohio, which is still retained in that genus by Dr. Gurley in his recent paper on North American

*Journal of the Cincinnati Society of Natural History, vol. II., 1879, p. 28, pl. 7, figs. 27 and 27a.

Graptolites,* though Mr. Joseph F. James asserts that it is undoubtedly a *Dictyonema*.† It seems to be a much larger species than *I. arbuscula*, with branches apparently devoid of the "strong, prong-like projections rising from the sides at variable intervals," which are said to characterize that species, forming a more complete network, with very numerous, fine meshes. Mr. Ulrich, to whom one of the best specimens from Innmost Island was submitted, thinks that it is quite distinct from his *I. arbuscula*, and that a new genus, near to *Dictyonema*, ought perhaps to be constituted for the reception of these two species. In the absence of any knowledge of the base of attachment of *I. Canadensis*, it is not at all clear to the writer how it can be separated generically from *Rhizograptus*, Spencer.

ACTINOZOA.

ALCYONARIA.

HALYSITES CATENULARIA, L., var. GRACILIS.

- Catenipora gracilis*, Hall.....1851. In Foster & Whitney's Geol. Land
Distr. Lake Superior, pt. 2, p. 212, pl.
29, figs. 1, *a-b*.
Halysites catenularia, Whiteaves.....1880. Geol. Surv. Canada, Rep. Progr.,
1878-79, p. 45 c.
" " "1881. Geol. Surv. Canada, Rep. Progr.,
1879-80, p. 57 c.

Original description of *Catenipora gracilis*:

"Coral massive or hemispheric; cells quadrangular or suboval; walls thin; interspaces rarely thicker than the walls; arranged in a single series, in wide, irregular reticulations.

"This species differs from the *C. escharoides* in the almost quadrangular form of the cells and the extremely thin walls, the reticulations are wider and the whole aspect less solid than in that species. From *C. agglomerata* it differs essentially in the form and arrangement of the cells.

"This species occurs in the green shales near the upper part of the Hudson River group, and so far as I know is the first time that a species of this genus has been found in the Lower Silurian series.

"Eastern shore of Green Bay, Wisconsin."

Mr. L. M. Lambe, who has recently made a special study of Canadian specimens of *Halysites*, thinks that *Catenipora gracilis*, Hall, is a stratigraphic variety of *Halysites catenularia*, and characteristic of the Galena-Trenton limestone of Lake Winnipeg and its vicinity, and of the

*Journal of Geology, Chicago, vol. IV., 1896, p. 99.

†Journal of the Cincinnati Society of Natural History, vol. XIV. (1891) p. 153.

Hudson River formation of Anticosti and Ontario. The chief peculiarities of this variety, Mr. Lambe thinks, are "the marked regularity of the corallites, their sides being flattened,—and the absence of the tubules between them."

It is most probably a specimen of this variety of *H. catenularia* that was collected on the west shore of Lake Winnipeg, north of the Saskatchewan, by Captain Back in 1833, and referred to in Dr. Fitton's Appendix No. 4 to Back's Narrative of the Arctic Land Expedition to the mouth of the Great Fish River," &c., as "doubtless a *Catenipora* or chain coral."*

More recently specimens of this coral have been collected by members of the staff of the Geological Survey of Canada at the following localities: In the Red River valley, at Lower Fort Garry, by T. C. Weston in 1884, and at East Selkirk by T. C. Weston in 1884 and by L. M. Lambe in 1890. In or around Lake Winnipeg, at Dog Head and Big Grindstone Point, by T. C. Weston in 1884; at Little Black Island by J. B. Tyrrell in 1889, and D. B. Dowling and L. M. Lambe in 1890; at Black Bear and Jack Head islands by D. B. Dowling and L. M. Lambe in 1890; at Little Tamarack and Commissioners (Cranberry) islands, and one mile west of Bull Head by D. B. Dowling in 1890; and at Cat Head by D. B. Dowling in 1891.

TETRADIMUM FIBRATUM, Safford.

<i>Tetradium fibratum</i> , Safford.....	1856.	Am. Journ. Sc. and Arts, ser. 2, vol. XXII., p. 237.
" " Billings.....	1863.	Geol. Canada., p. 139, figs. 71, a-b.
" " S. A. Miller.....	1889.	N. Am. Geol. & Palaeont., p. 206, figs. 224 and 225.

In the Redpath Museum at Montreal, until quite recently, there were two specimens of this species, but which are probably portions of the same corallum, labelled as having been collected at East Selkirk by Professor J. H. Panton. Through the kindness of Sir J. W. Dawson, one of these specimens has since been presented to the Museum of the Survey.

ZOANTHARIA.

COLUMNARIA ALVEOLATA, Goldfuss.

<i>Columnaria alveolata</i> , Goldfuss.....	1826.	Petref. Germ., vol. I., p. 72, pl. 24, figs. 7, a-c.
<i>Columnaria multiradiata</i> , Castlneau.....	1843.	Sil. Syst. de l'Amer. Septentr., p. 44, pl. 19, fig. 1.

* The typical form of the chain coral had previously been collected (probably for the first time in North America) at Drummond Island, Lake Huron, by Dr. J. J. Bigsby in 1819 or 1820, and the fact is recorded on page 204 of the first volume of the second series of the Transactions of the Geological Society of London, published in 1824.

- Favistella stellata*, Hall..... 1847. Pal. N. York, vol. I., p. 275, pl. 75, fig. 1, but not *Columnaria alveolata*, Hall, ibid., p. 47.
- Columnaria alveolata* (pars), Edwards & Haine..... 1851. Mon. Polyp. Foss. Terr. Palæoz., p. 309.
- Columnaria Gothlandica*, Edwards & Haine. 1851. Ibid., p. 309, pl. 14, figs. 2 and 2a.
- Favistella stellata*, Nicholson..... 1875. Rep. Pal. Prov. Ont., p. 23, and Geol. Surv. Ohio, Paleont., vol. II., p. 185.
- Columnaria stellata*, Rominger..... 1876. Geol. Surv. Mich., Foss. Corals, p. 90, pls. 34, fig. 3, and 28, fig. 1.
- Columnaria alveolata*, Nicholson..... 1879. Tabul. Corals Palæoz. Per., p. 195, pl. 10, figs. 1 and 1a. Not *Columnaria alveolata* of McCoy, Hall, Billings or Rominger.

Lower Fort Garry, Dr. R. Bell, 1880: two specimens of a variety approaching *C. Blainvilliei*, Billings, in which the average diameter of the larger corallites is about three millimetres. East Selkirk, A. McCharles, 1884, one specimen of the typical form, and L. M. Lambe, 1890, three similar specimens. Jack Head Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen, with the larger corallites averaging four mm. and a-half in their longest diameters. In all these specimens the longer septa reach to the centre of the corallites.

This coral appears to have been previously collected at Lower Fort Garry by D. Dale Owen in 1848, and by Sir James Hector in 1857. It is probably the *Favosites basaltica* of Owen's list of Lower Fort Garry fossils, on page 181 of his Report of the Geological Survey of Wisconsin, Iowa and Wisconsin, published in 1852, and the "*Favistella* (*Favosites basaltica* of Owen)" of the list of fossils from the same locality on page 245 of Captain Palliser's official report. Mr. Lambe recognizes it in a small collection of fossils made by J. B. Tyrrell at Doobaunt Lake in 1893. It appears to be abundant at Fort Churchill, Hudson's Bay, where a number of specimens were collected by Mr. Tyrrell in 1894, from a small exposure of dolomite; and it has since been collected at Wekusko (Herb) Lake, and at Hill's Lake, Minago River, in the district of Saskatchewan, by Mr. Tyrrell, in 1896.

DIPHYPHYLLUM STOKESI, Edwards and Haine. (Sp.)

Plate 17, figs. 5 and 5, a-b.

- Lithostrotion Stokesi*, Edwards and Haine..... 1851. Mon. Polyp. Foss. Terr. Palæoz., p. 449, pl. 20, fig. 2.
- Probably "*Sarcinula (?) obsoleta*," Hall..... 1851. In Foster & Whitney's Rep. Geol. Land Distr. Lake Superior, pt. 2, p. 213, pl. 29, figs. 2, a-b.

The following is the original description of "*Lithostrotion Stokesi*": "Polypières cylindriques, parallèles, assez espacées, présentant de forts bourrelets d'où partent des expansions murales unissant entre eux les individus. Ces expansions ne sont pas toujours complètes, mais elles ne paraissent jamais affecter la forme de tubes de connexion. Les planchers sont bien développés. Nous avons pu compter 36 cloisons très-minces, qui nous ont semblé peu inégales et peu développées. Le diamètre des polypières est de 5 ou 6 millimètres. CARBONIFÈRE. Amérique du Nord: Lac Wennipeg. Coll. Stokes." This species was probably referred to *Lithostrotion*, by Edwards & Haime, rather than to *Diphyphyllum*, because the rocks from which it was collected were then supposed to be of Lower Carboniferous age. In the description quoted, it will be observed that there is no mention of any styliform columella, like that of *Lithostrotion*, in the centre of the corallites, and there is no indication of any such structure in the original figure of *L. Stokesi*.

A few well preserved specimens, which agree very well with the description and figure of *L. Stokesi*, also with Hall's illustrations and vague diagnosis of his "*Sarcinula (?) obsoleta*," but which are clearly referable to the genus *Diphyphyllum*, as now understood, were collected at Lower Fort Garry by Donald Gunn in 1858, and by T. C. Weston in 1884. These specimens consist of large portions of colonies of fasciculated corallites, with few connecting processes between them. The corallites average from six to eight millimetres in diameter, and are covered externally by a thin, transversely striated epitheca. When the epitheca is worn off or broken away, as it often is, the surface of the corallites underneath it is marked with fine linear longitudinal grooves, corresponding to the septa within. The internal structure of the corallites consists of twenty-two long septa, alternating with as many shorter ones, and of the usual transverse tabule characteristic of *Diphyphyllum*.

STREPTELASMA ROBUSTUM, Whiteaves.

Plate 18, figs. 1 and 1a.

Streptelasma corniculum? Hall. Large and robust variety. Whiteaves 1886. Geol. Surv. Canada, Rep. Progr., 1879-80, p. 57.
Streptelasma robustum, Whiteaves. 1896. Canad. Rec. Sci., vol. VI., p. 391.

"Corallum simple, elongate conical, usually rather strongly curved, though some specimens are not so much curved as others, very large for the genus, attaining to a length of seven inches as measured along the curve of the convex side, to a height of nearly five inches, and to a breadth or width of nearly two inches and a quarter at the summit. In some adult or nearly adult specimens the sides are so much compressed

(perhaps abnormally so) that the convexly arched region is obtusely angulated in the centre, longitudinally; in some young specimens this region is distinctly flattened, but others are circular in outline in transverse section, or as seen from above. Septa alternately long and short, varying in number in large specimens from 160 to 170 in all, the longer ones extending to the centre at the bottom of the calyx. Surface marked with transverse wrinkles and numerous fine striae of growth in well-preserved specimens, but often so much worn, apparently prior to fossilization, as to be almost smooth.

"Longitudinal sections through the centre of large specimens show that the calyx is not very deep, and that its cavity occupies but a small proportion of the entire length. Below the calyx the corallum is filled with strongly developed and apparently thickened septa, with well-marked dissepiments between them, and these septa, with their dissepiments, unite in the centre in such a way as to form a large irregularly reticulated pseudo-columella, which projects" slightly "above the centre of the base of the calyx, as a boss of irregular shape, but with a narrowly rounded summit.

"This fine coral is especially abundant, and attains to a large size in the Red River valley, at Lower Fort Garry and East Selkirk, Manitoba, where it was collected by Dr. R. Bell in 1880, by T. C. Weston and A. McCharles in 1884, by L. M. Lambe in 1890, and by D. B. Dowling in 1891."

On the western side of Lake Winnipeg a few comparatively small and very imperfect specimens, which may be referable to this species, were collected at Deer Island by T. C. Weston in 1884, at Little Black Island by J. B. Tyrrell in 1889, at Jack Head and Snake islands by D. B. Dowling and L. M. Lambe in 1890, at Dog Head, Dancing Point, Little Tamarack and Selkirk islands, and on the main shore opposite the north end of Selkirk Island and north of the Saskatchewan by D. B. Dowling in 1891. Most of the specimens from these localities appear to widen out much more rapidly, at a short distance from the pointed base, than any of the eastern examples of *S. corniculum* do, but a single specimen from Little Black Island approaches very near to that species.

A small specimen, which is probably also referable to *S. robustum*, was collected at the junction of the Little and Great Churchill rivers by Dr. R. Bell in 1889.

When fully grown this species can be readily distinguished from *S. corniculum* by its very much larger size and more robust habit of growth. It seems to bear somewhat the same kind of relationship to *S. corniculum* that the *Receptaculites Oweni* of the Cambro-Silurian rocks of the west does to the eastern fossil known by the rather inappropriate name of

R. occidentalis, and that *Hormotoma Winnipegensis* of the same rocks does to the eastern *M. bellicincta*.

PROTARÆA VETUSTA, Hall.

<i>Porites? vetusta</i> , Hall.....	1847.	Pal. N. York, vol. 1., p. 71, pl. 25, figs. 5, <i>a-b</i> .
<i>Porites vetusta</i> , Edwards and Haime.....	1851.	Mon. Polyp. Foss. Terr. Paleoz., p. 208, pl. 14, figs. 6 and 6 <i>a</i> .
" " Nicholson.....	1875.	Geol. Surv. Ohio, Paleont., vol. II., p. 221.
" " ".....	1875.	Rep. Pal. Prov. Ont., p. 9.
" " Hall.....	1882.	Eleventh Rep. St. Geol. Indiana, p. 378, pl. 49, fig. 4.
" " Winchell and Schuchert. .	1895.	Geol. Minn., Final Rep., vol. III., pt. 1, p. 94, pl. G., figs. 24 and 25.

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889: one specimen, a little more than an inch in its maximum diameter, and about a millimetre thick.

PROTARÆA (VETUSTA? var.) MAGNA.

Plate 18, figs. 2, 3 and 3*a*.

Corallum large, attaining to a maximum diameter of at least six inches and forming crusts from five to fifteen millimetres thick, on or around other organisms such as corals or Orthoceratites. Calyces closely contiguous, extremely shallow, about two millimetres in diameter, rounded polygonal, but very indistinctly defined, the centre of each occupied with a group of from five to seven minute tubercles. Septa about twelve in number, short, wedge-shaped, and perhaps crenulated at their summits. When the surface is slightly ground down and examined with a lens the closely grouped tubercles in the centre of each calyx have somewhat the appearance of a spongiöse pseudo-columella.

Transverse and vertical sections, if correctly interpreted by the writer, shew that the entire corallum is composed exclusively of compact sclerenchyma, consisting of a close aggregation of minute tubes which are nearly uniform in size and extent from the base to the summit of the organism, and that the calyces are mere shallow depressions of the surface of this mass of sclerenchyma. Transverse sections through the calyces shew that there are from three to six sclerenchymatous tubes between two closely adjacent calyces, and similar sections below the calyces exhibit only a dense mass of minute sclerenchymatous tissue, composed of tubes that are irregularly four to six sided. In longitudinal sections these tubes are seen to be frequently rather flexuous and somewhat twisted together. They are invariably filled with the matrix, but in some of

them transverse diaphragms or tabulae can be detected with the aid of a lens.

Lower Fort Garry, Dr. R. Bell, 1880, one specimen completely surrounding the body chamber of a large Orthoceratite, which measures two inches and three-quarters in diameter at the larger end and upwards of four inches in length,—and T. C. Weston, 1884, four specimens, one partly encrusting a colony of the *Chonetes perantiquus* of this Report, and the others detached from the organisms to which they were originally adherent.

These specimens would seem to indicate a well marked local variety of *P. vetusta*, or perhaps a distinct species, which differs from the ordinary form of *P. vetusta* chiefly in its much greater size and thickness. They very closely resemble the *Coccoseris Ungerni* of Eichwald, as described and figured in the "Lethæa Rossica,"* but the calyces of *C. Ungerni* are represented as a line and a half, or three mm. in diameter. Lindström, however, in his "Index to the Genera of Palæozoic Corals,"† regards *Proturca* and *Coccoseris* as distinct and "well-established" genera. In this "Index," *Stylurca* of Von Seebach is stated to be synonymous with *Coccoseris*. *Proturca Verneuli* of Edwards and Haime‡ is said to have calyces three millimetres in diameter, with twenty septa in each.

FAVOSITES PROLIFICUS, Billings.

- Favosites prolificus*, Billings.....1865. Canad. Nat. and Geol., Second Series, vol. II., p. 429.
 " "1866. Geol. Surv. Canada, Cat. Silur. Foss. Isl. Anticosti, p. 6.
 " Whiteaves.....1895. This vol., pt. 2, p. 113.
 Cfr. *Favosites aspera* (d'Orbigny) Edwards & Haime.....1854. Brit. Foss. Corals, p. 257, pl. 60, figs. 3 and 3a, and of other European authors.

Several specimens of a large coral, which appear to be referable to this species, were collected at East Selkirk by Dr. R. Bell in 1880, and by T. C. Weston and A. M. McCharles in 1884; also at Lower Fort Garry, by T. C. Weston and A. McCharles in 1884. In the writer's judgment they are essentially similar, in every respect, to the specimen from Stony Mountain referred to on page 113 of the second part of this volume, as being "labelled *Favosites prolificus* in Mr. Billings's own handwriting." They are either subhemispherical colonies, or large portions of such colonies, the largest of which is a little more than six inches in diameter, by about two inches and a-half in height, and sometimes

* Volume I., part 1, p. 442, Atlas, pl. 25, figs. 4, a-c.

† Bihang Till K. Svenska Vet.-Akad. Handlingar (Stockholm, 1883), Band 8, No. 9, pp. 12 and 8.

‡ Monographie des Polypiers Fossiles des Terrains Paléozoïques (Paris, 1851), p. 209

flattened at the summit. The corallites of which they are composed are usually hexagonal but sometimes pentagonal tubes, nearly equal in size, and the largest average from two millimetres and a quarter to two mm. and a half in diameter. The spiniform septa are very short, and the mural pores would seem to be placed in the angles of the corallites, though they cannot be seen distinctly in any of the specimens, as the corallites are nearly always either filled, or their walls lined, with minute crystals of calcite. The tubulae are complete, numerous and placed at a distance of one millimetre apart. A single specimen of a coral which is probably only a variety of this species, and in which the corallites average about a millimetre in diameter, was collected at Wicked Point, Lake Winnipeg, by D. B. Dowling, in 1891.

In the second part of this volume it is stated that "it is doubtful whether *F. prolificus* should be regarded as a distinct species or as a mere local variety of *F. Gothlandica*," but if all the specimens from Stony Mountain, East Selkirk, and Lower Fort Garry that are here referred to *F. prolificus* are correctly determined, it would appear that *F. prolificus* is most probably synonymous with *F. aspera*. In Great Britain, according to Edwards and Haime, both *F. Gothlandica* and *F. aspera* occur at as low a geological horizon as the Churadoc sandstone.

CALAPACCIA CANADENSIS, Billings.

Hemispherical masses of *Springopora*.

D. Dale Owen.....1852. Rep. Geol. Surv. Wisconsin, Iowa and Minn., p. 181.

Calapaccia Canadensis, Billings.....1865. Canad. Nat. and Geol., Sec. Ser., vol. II., p. 426.

Probably = *Calapaccia Huronensis*, Billings.

Cfr. *Calapaccia Huronensis*, Billings.....1865. Canad. Nat. and Geol., Sec. Ser., vol. II., p. 426.

Columnopora cribriformis, Nicholson...1874. Geol. Mag., vol. I., p. 253.

" " " ".....1874. Rep. Pal. Prov. Ont., p. 25.

" " " ".....1875. Rep. Geol. Surv. Ohio, vol. II., pt. 2, p. 187.

Houghtonia Huronica, Rominger.....1876. Geol. Surv. Mich., Foss. Corals, p. 17, pl. 3, fig. 3.

Lower Fort Garry, D. Dale Owen, 1848, Dr. R. Bell, 1880, and T. C. Weston and A. McCharles, 1884; East Selkirk, T. C. Weston and A. McCharles, 1884. At Lake Winnipeg a few imperfect specimens, which appear to be referable to this species, were collected from the basal beds of the limestone at Big Grindstone Point, by Mr. Weston, in 1884, and by Mr. Tyrrell in 1889, at Punk Island by Mr. Weston in 1884, and at Deer Island by Mr. Tyrrell in 1889. Two small but characteristic specimens of this species were collected at the junction of the Little and

Great Churchill Rivers, Keewatin, by Dr. Bell in 1879; it is represented in a small collection of fossils from the vicinity of Doolbaunt Lake, made by Mr. Tyrrell in 1893; and a badly preserved specimen of it was collected at Wekusko (Herb) Lake by Mr. Tyrrell in 1896.

The genus *Calaparcia* was first proposed and defined (in 1865) by E. Billings, who regarded it as consisting of three species, which he described under the names *C. Canadensis*, *C. Huronensis*, and *C. Anticostiensis*. In 1866, however, in a foot-note to page 33 of his Catalogue of the Silurian Fossils of the Island of Anticosti, Mr. Billings says of *Calaparcia Anticostiensis* that "it appears to be congeneric with *Syringophyllum organum* (*Saccinula organum*).” Lindström, in 1883, made *Columnopora*, Nicholson, a synonym of *Calaparcia*, and Nicholson had previously (in 1879) regarded *Houghtonia* of Rominger as a synonym of *Columnopora*.

The writer has long been convinced that *Columnopora cribriformis*, Nicholson, is identical with *Calaparcia Huronensis*, and that the latter cannot be satisfactorily distinguished, even as a mere stratigraphical variety, from *Calaparcia Canadensis*. Mr. Billings admits that *C. Huronensis* is closely allied to *C. Canadensis*, but claims that the former "has the corallites in general more slender," and that it "presents a different aspect." In the original descriptions it is stated that the corallites of *C. Canadensis* are "about one line, usually a little more, in diameter, and generally in contact though still remaining circular," but that those of *C. Huronensis* are "somewhat less than one line in diameter, with a few others much smaller between them." In one of the specimens of *C. Huronensis*, from Cape Smyth, in the Museum of the Survey, most of the corallites are certainly a little larger than those of *C. Canadensis*, and perhaps a little farther apart, but this is not the case with other specimens of *C. Huronensis* from the same locality. The specimens from the Red River valley and Lake Winnipeg correspond almost equally well with the descriptions of either, but, upon the whole, in the mere size of their corallites, perhaps a little better with the character of *C. Canadensis* than with those of *C. Huronensis*.

In a letter dated October 10th, 1885, Professor Nicholson (to whom one or more examples of each of the nominal species of *Calaparcia* had been sent by the writer, for comparison with specimens of *Syringophyllum*) states that he had arrived at the following conclusions in regard to them: "(1.) My *Columnopora cribriformis* is identical, both generically and specifically, with *Calaparcia Huronensis*, Billings. My name must, therefore, be abandoned. It is quite probable that *Calaparcia Canadensis*, Billings, is also the same as *C. Huronensis*, but, the specimens being silicified in the former, I am not sure of this. (2.) *Calaparcia*

Anticostiensis, Billings, is not generically separable from *Syringophyllum*, and must stand as *Syringophyllum Anticostiense*, Billings, sp. (3.) Having obtained lately much material of *S. organum*, Linn., in Russia, I have worked out the genus *Syringophyllum*, and find it to be an ally of *Chonostegites*, E. & H., and *Thecostegites*, E. & H. Indeed, I am doubtful if *Syringophyllum* and *Chonostegites* can be regarded as generically separable at all. These genera, viz., *Syringophyllum*, *Chonostegites* and *Thecostegites* are all related to *Syringopora*, and form a kind of intermediate group between the Favositidae and Syringoporidae.

ECHINODERMATA.

CRINOIDEA.

No crinoids with any portion of the calyx preserved have yet been collected in place from the Winnipeg or Red River limestones, so far as the writer is aware, though a good specimen of an apparently new species of *Saccoerinus*, with the dorsal cup and portions of the arms preserved, in a loose piece of limestone probably of Silurian (Upper Silurian) age, was picked up at Cat Head by Dr. Selwyn in 1873.

A few badly preserved portions of columns of apparently two or three genera of crinoids were collected at Inmost Island by T. C. Weston in 1884; at the same island and at Snake Island by D. B. Dowling and L. M. Lambe in 1890; and at Cat Head by Mr. Dowling in 1893. Most of these are scarcely determinable, even generically, but some of those from Inmost Island appear to be referable to *Glyptocrinus* or *Schizocrinus*.

CYSTOIDEA.

GLYPTOCYSTITES. (Species undeterminable.)

A few calyx plates of a species of *Glyptocystites*, which Mr. E. Billings said are "closely allied to his *G. multiporus*," were collected by Professor Hind in 1858, at Grindstone Point, as previously stated on page 132, and similar plates were collected at the same locality by Mr. Weston in 1884, and by Mr. Tyrrell in 1889. Detached calyx plates and specimens apparently referable to the same species, with the whole or part of the column and two or three of the plates of the basal portion of the calyx preserved, though the whole of their outer surface is much water worn, were collected at Deer Island by Mr. Tyrrell in 1889.

ASTEROIDEA.

An imperfect and obscure specimen of a protasteroid starfish was collected at Cat Head by D. B. Dowling and L. M. Lambe in 1890, on the

same small piece of limestone as the type of *Trichospongia hystrix*. Mr. Schuchert, who has seen this starfish, in a letter to the writer dated Jan. 21, 1897, states that "it cannot be described specifically, but that generically it appears to be a *Thrinaster*."

VERMES.

ANNELIDA.

SERPULITES DISSOLUTUS, Billings.

Serpulites dissolutus, Billings 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 56.

Punk Island, Lake Winnipeg, Professor H. Y. Hind, 1858, an imperfect but fairly well preserved specimen, which seems to be essentially similar to the types of *S. dissolutus* in the Museum of the Survey. It is about an inch and three-quarters in length, but imperfect at both ends, and one millimetre and a half in its maximum breadth. The surface of *S. dissolutus* was described as apparently smooth, but, when examined with a lens the "elevated wire-like margin on each side of the central depression" of the specimen from Punk Island is seen to be marked with minute transverse undulations, which are not so clearly visible in eastern examples of *S. dissolutus*. In the twentieth chapter of Professor Hind's Report on the Canadian Exploring Expedition to the Assiniboine and Saskatchewan (page 87) Mr. Billings says that "a small *Serpulites* appears to be common at Punk Island; it much resembles the large species of the Chazy limestone," but this chapter was written four years before *S. dissolutus* was described.

ARABELLITES. (Species undeterminable.)

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889: a well-preserved portion of a jaw. This specimen has been kindly examined by Dr. G. J. Hinde, who has made a special study of the teeth and jaws of the Annelida of the Palaeozoic rocks, and who thus reports upon it in a letter to the writer dated June 22nd, 1894. "It is too fragmentary for positive determination, but it seems to have had a prominent anterior hook, about half of which remains, and a long row of subequal minute teeth on the crest of the plate. So far as I can judge, it belongs to the genus *Arabellites*, forms of which are figured in the Quarterly Journal of the Geological Society of London, vol. xxxv., pl. 18, figs. 13-19, also in vol. xxxvi., pl. 14, and in the Transactions of the Royal Swedish Academy of Science, Sept. 13, 1882 (Kongl. Sv. Vet. Akadem. Handl., Band 7, No. 5). But the portions wanting in your specimen prevent any close comparison with the forms already described."

MOLLUSCOIDEA.

POLYZOA.

STOMATOPORA CANADENSIS. (N. Sp.)

Plate 18, figs. 4 and 4a.

Zoarium adnate, consisting of frequently branching, uniserially arranged zoecia. Zoecia slender, clavate, each about 0.6 mm. in diameter at the proximal or narrow posterior end, increasing gradually in size to 0.3 mm. at the rounded anterior end, and averaging about 1 mm. in length. Apertures small, circular, nearly terminal, about 0.8 mm. in diameter.

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889: one specimen.

Mr. E. O. Ulrich, who has examined the specimen upon which this species is based, thinks that it is "most nearly related to *S. Proutiana*, Miller,* but that it has much larger zoecia." He is of the opinion that it is quite distinct from *S. inflata* (the *Alecto inflata* of Hall†), and that in *S. arachnoidea* (*Autopora arachnoidea*, Hall‡) "the zoecia are smaller and less constricted proximally."

PACHYDICTYA MAGNIPORA, Ulrich.

Pachydictya magnipora, Ulrich.....1889. Geol. Surv. Canada, Contr. Micro-
Pal. Cambro-Silur. rocks, etc., p. 43.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: the type and only specimen known to the writer.

PACHYDICTYA ACUTA, Hall. (Sp.)

Stictopora (?) acuta, Hall.....1847. Pal. N. York, vol. I., p. 74, pl. 26,
figs. 3 *a-b*.
Ptilodictya acuta, Billings.....1863. Geol. Canada, p. 158, fig. 121, and p.
941.
" " Nicholson.....1873. Rep. Pal. Prov. Ontario, p. 12, fig. 3.
Pachydictya acuta, Ulrich.....1886. Fourteenth Ann. Rep. Geol. and Nat.
Hist. Surv. Minn., p. 67.
" " ".....1889. Geol. Surv. Canada, Contr. Micro-
Pal. Cambro-Silur. rocks, etc., p. 44.
" " ".....1893. Lower Silur. Bryoz. Minn. (advance-
copies from Final Rep. Geol. Minn., vol.
III., pt. 1) p. 155, pl. 8, figs. 11-17, and
pl. 9, fig. 7.

*Journal Cincinnati Society of Natural History, vol. V., pt. 2, p. 39. See also Ulrich's Lower Silurian Bryozoa of Minnesota, p. 117, pl. 1, figs. 8-12.

†Paleontology of the State of New York, vol. I. (1847), p. 77, pl. 26, figs. 7, *a-b*. See also Ulrich's Lower Silurian Bryozoa of Minnesota, p. 117, pl. 1, figs. 13-21.

‡Paleontology of the State of New York, vol. I., p. 76, pl. 26, figs. 6, *a-c*.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: one specimen, associated with the preceding species and *Monticulipora Wetherbyi*, Ulrich.

PHYLLOPORINA TRENTONENSIS, Nicholson. (Sp.)

- Retepora Trentonensis*, Nicholson 1875. Geol. Mag., vol. II., p. 37; and Rep. Pal. Prov. Ont., p. 15, pl. 2, figs. 4, and 4, *a-b*.
 " " Whiteaves 1881. Geol. Surv. Canada, Rep. Progr. 1879-80, p. 580.
Phylloporina Trentonensis, Ulrich 1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, etc., p. 47.
 " " " 1890. Geol. Surv. Illinois, vol. VIII, p. 639, pl. 53, figs. 1, and 1, *a-c*.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: one good specimen.

PHYLLOPORINA. (Species undeterminable.)

Lower Fort Garry, D. B. Dowling, 1881: a fragment of the lower portion of the zoarium of a species which is apparently distinct from *P. Trentonensis*, and which may be undescribed. Mr. Ulrich, who has examined this specimen, writes as follows in regard to it:—"On comparison with my *P. variolata*, which it resembles most, it proves to be a stronger species, with larger and even more irregular fenestrules. It is much stronger and much less regularly fenestrated than *P. reticulata*, Hall. The position of the species seems to be intermediate between the Black River *P. Halli*, Ulrich (a species with stronger branches and more rounded fenestrules) and the Cincinnati *P. variolata*. *P. Trentonensis*, Nicholson, belongs to quite a different section of the genus."

MONTICULIPORA WETHERBYI, Ulrich.

- Monticulipora Wetherbyi*, Ulrich 1882. Journ. Cincinn. Soc. Nat. Hist., vol. V., p. 239, pl. 19, figs. 4-4 *b*.
 " " " 1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, etc., pt. 2, p. 30.
 " " " 1893. Lower Silur. Bryoz. Minn., p. 218, pl. 15, figs. 7 and 8.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: two specimens growing upon the zoarium of *Pachydictya magnipora*.

MESOTRYPA SELKIRKENSIS. (N. Sp.)

Plate 19, figs. 1 and 1 *a*.

Zoarium forming expansions of as much as half an inch in thickness: surface characters unknown, the few specimens yet collected being buried in the matrix, with only the broken edges exposed. Zoörcia, as seen in

transverse sections or by grinding down the surface, polygonal: mesopores smaller and more distinctly angular, either occupying the interstices of the zoëcia or forming numerous isolated clusters or maculæ, which are irregular in shape but nearly equidistant, their maximum diameter being about one millimetre and their distance apart averaging about four mm.: acanthopores apparently absent. Longitudinal sections shew that the zoëcia are provided with about thirty continuous and usually straight or slightly concave diaphragms in the space of five mm., and that the diaphragms in the mesopores are nearly twice as close together as those of the zoëcia, but otherwise similar to them.

East Selkirk, L. M. Lambe, 1890: a few remarkably well preserved but imperfect specimens.

These specimens seem to indicate a new species, which appears to differ from *M. Quebecensis* (= *Diplotrypa Quebecensis*, Ami*), by its nearly equidistant and clearly defined maculæ or clusters of mesopores, and from *M. infida*, Ulrich, † by the same character, coupled with the absence of acanthopores.

DIPLOTRYPA WESTONI, Ulrich.

Diplotrypa Westoni, Ulrich.....1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, etc., pt. 2, p. 39, pl. 8, figs. 4, and 4, *a-b*.

Big Island, Lake Winnipeg, T. C. Weston, 1884: one specimen, the type of the species, which latter is said to be "very nearly related to the European *Diplotrypa petropolitana* (Pander)."

BYTHOTRYPA LAXATA, Ulrich.

Fistulipora (?) *laxata*, Ulrich.....1889. Geol. Surv. Canada, Contr. Micro-Pal. Cambro-Silur. rocks, etc., pt. 2, p. 37, pl. 8, figs. 2, and 2*a*.

Bythotrypa laxata, Ulrich.....1893. Lower Silur. Bryoz. Minn., p. 325, pl. 28, figs. 21-25.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: one large specimen.

* Canadian Record of Science, vol. V. (1893), p. 100; and, Ulrich, 1893, Lower Silurian Bryozoa of Minnesota, p. 259, and figs. 15, *e-f*, on p. 248.

† Lower Silurian Bryozoa of Minnesota, p. 258, pl. 17, figs. 1-8.

BRACHIOPODA.

LINGULA IOWENSIS, Owen.

- Lingula Iowensis*, Owen 1844. Geol. Rep. Iowa, Wiscons. and Ill.,
p. 79, pl. 15, fig. 1.
Lingula quadrata? Owen..... 1851. Geol. Rep. Wiscons., Iowa and Minn.,
pl. 2 n. fig. 8.
 " " Hall..... 1862. Geol. Wiscons., vol. I, p. 46, fig. 1,
and p. 435.
 " " Meek and Worthen..... 1868. Geol. Surv. Illinois, vol. III., p. 305,
pl. 2, fig. 4.
Lingulidula Iowensis, Whitfield 1882. Geol. Wiscons., vol. IV., p. 242, pl. 9,
fig. 1.
Lingula Iowensis, Hall..... 1892. Pal. N. York, vol. VIII., pt. 1, p. 8,
pl. 1, fig. 14.
 " " Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn. (advance
copies from Final Rep. Geol. Minn., vol.
III., pt. 1.) p. 349, pl. 29, figs. 19-22.

South east side of Elk Island, Lake Winnipeg, Dr. A. R. C. Selwyn, 1872; three specimens "from loose fragments of limestone;" and two miles south of Whiteway (or Dog Head) Point, on the same lake, D. B. Dowling, 1891; one specimen.

The following observations upon the affinities of this species are made by Professor Winchell and Mr. Schuchert in their memoir on "the Lower Silurian Brachiopoda of Minnesota." "*Lingula quadrata*, as identified by Hall,* and Billings,† we regard as identical with *L. rectilateralis*, Emmons.‡ This species occurs in the Trenton, Utica slate and Loraine groups of New York and eastern Canada, and differs but slightly, if any, from *L. Iowensis*, Owen. The characteristic striated hinge areas of *L. Iowensis*, Owen, and *L. Vincinutiensis*, Hall and Whitfield, have not been observed in *L. rectilateralis*, Emmons. Should these parts eventually be discovered in the latter species, *L. Iowensis*, Owen, will give place to *L. rectilateralis*, as the latter has two years' priority over the former. Professor Hall in 1847** regarded Emmons's species as a synonym of *L. quadrata*, Eichwald, while Whitfield †† regarded this form as identical with *L. Iowensis*, Owen." "We have seen four specimens of typical *Lingula quadrata*, Eichwald, from Esthonia, in the collection of Mr. Ulrich, and these prove beyond a doubt that none of the American forms identified with this species are correctly named. The Russian species is larger, with very strongly convex valves and a more narrowly

* Paleontology of New York, vol. I. (1847), p. 96, pl. 39, fig. 4, and p. 285, pl. 79, fig. 1.

† Canadian Naturalist and Geologist, 1856, vol. I., p. 318, fig. 8.

‡ Geology of New York: Report of the Second District (1842), p. 399, fig. 6.

** Loc. cit., p. 285.

†† Loc. cit., p. 242.

rounded anterior margin than in *L. Iowensis*, *L. rectilateralis*, or *L. Cincinnatiensis*, Hall and Whitfield."

On the other hand, M. Friedrich Schmidt, of St. Petersburg, who visited the Museum of the Survey on the second and third of October, 1891, and carefully examined the specimens identified by E. Billings, expressed the opinion (which the writer took down in writing, at the time, from his dictation) that the Anticosti specimens labelled *Lingula quadrata*, Eichwald, are exactly similar to Eichwald's types, and that two specimens from the Trenton limestone near Montreal that are similarly labelled, may be correctly named.

LINGULA ELONGATA, Hall.

Lingula elongata, Hall.....1847. Pal. N. York, vol. I, p. 97, pl. 30
fig. 5.
" " Billings.....1863. Geol. Canada, p. 161, fig. 133.

Inmost Island, Kinnow Bay, Lake Winnipeg, T. C. Weston, 1884: a flat piece of limestone with one surface strewn with numerous valves of a small *Lingula*, which agrees very well with Hall's description and figure of *L. elongata*, but which is almost intermediate in size between that species and *L. riciniiformis*. Two of the most perfect of these valves measure respectively, the one 10.5 mm. in length by 6 mm. in breadth, and the other 8.5 mm. by 5.5. All of them shew the "narrow depressed line" which "extends along the length of the shell, from the beak, more than half way to the base," which constitutes part of the original description of *L. elongata*. According to Messrs. Winchell and Schuchert,* *L. elongata*, Hall, differs in being twice the size of *L. riciniiformis*, but if this is the only difference between these two forms, the former could very well be the adult state of the latter, though Hall's figures give one the impression that *L. riciniiformis* is a proportionately less elongated shell and with more convex sides than *L. elongata*.

LINGULA OBTUSA, Hall.

Lingula obtusa, Hall.....1847. Pal. N. York, vol. I, p. 98, pl. 30,
figs. 7, &c.
" " Billings.....1863. Geol. Canada, p. 161, fig. 137.

Cat Head, Lake Winnipeg, T. C. Weston, 1884: one nearly perfect and beautifully preserved specimen and two very bad ones. The only one that is well preserved is nearly flat, a little broader in advance of the midlength than behind it, and therefore slightly more ovate than oval in outline. Its surface markings consist of crowded and prominent, minute

* Lower Silurian Brachiopoda of Minnesota, p. 344.

and acute, laminar concentric ridges, not unlike those of *L. Hurlburti*, N. H. Winchell, from the Galena limestone of Minnesota. It (the Cat Head specimen) resembles figure 7*b*, on plate 30 of the first volume of the Palæontology of New York, more than figure 7*a* on the same plate, but is more narrowly rounded in front than the former and not quite so obtuse at the beak. As compared with the representation of *L. obtusa* on page 161 of the "Geology of Canada," it is not quite so much elongated in proportion to its breadth, and more obtuse at the beak. It is remarkably similar to specimens from the Utica slate near Collingwood, in the Museum of the Survey, which appear to have been identified with *L. obtusa* by E. Billings. Mr. Schuchert, who has examined this specimen, writes that "in form it is not *L. Hurlburti*," but that it "approaches it in surface characters. It is more in harmony," he adds, "with *L. obtusa* or small *L. Cohoargensis*."

DINOBOLUS PARVUS, Whitfield.

- Dinobolus parvus*, Whitfield.....1882. Geol. Wisconsin, vol. IV., p. 347, pl. 27, figs. 8-10.
Dinobolus (?) parvus, Winchell and Schuchert, 1893. Lower Silur. Brach. Minn., p. 356, figs. 27, A-D.

West shore of Lake Winnipeg, north of the Saskatchewan and opposite the north end of Selkirk Island, eight well preserved casts of the interior of separate valves; and Stonewall, Manitoba, a similar specimen but from rocks that may be referable to the Hudson River group, all collected by D. B. Dowling in 1891. Similar but not so well preserved specimens have since been collected from loose pieces of rock on the west bank of the Churchill River, at Fort Churchill, Hudson's Bay, by J. B. Tyrrell in 1894.

CLITAMBONITES DIVERSA, Shaler. (Sp.)

- Orthisina diversa*, Shaler.....1865. Bull. Mus. Comp. Zool., Cambridge No. 4, p. 67.
Orthisina Vernanti, Billings.....1866. Geol. Surv. Canada, Cat. Silur. Foss. Anticosti, pp. 43 and 74.
Hemipronites Americanus, Whitfield.....1877. Ann. Rep. Geol. Surv. Wisconsin, p. 72.
 " " ".....1882. Geol. Wisconsin, vol. IV., p. 243, pl. 10, figs. 15-17.
Streptorhynchus Americanus, Miller.....1889. N. Am. Geol. and Palæont., p. 378.
Clitambonites Americanus, Hall.....1892. Pal. N. York, vol. VIII., p. 232, pl. 15a, figs. 1-8.
 " " Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 378, pl. 30, figs. 11-17.

Western shore of Lake Winnipeg, two miles south of Dog Head, D. B. Dowling, 1891: one imperfect but fairly characteristic specimen.

"This widely distributed species was first described by Shaler as *Orthisina diversa*." A year later Billings identified it as *O. Verneuli*, Eichwald, at the same time regarding Shaler's species as synonymous with it. On the other hand, Shaler has since referred *Orthisina Verneuli*, Billings, to his species, in which he is correct. On comparison with the European species, as illustrated by de Verneuil,* it is seen that the American species is wider along the hinge-line, the ventral area much less incurved and elevated, with finer striae and a narrow sinus in the dorsal valve. These differences are sufficient to distinguish the two species." Winchell & Schuchert, op. cit., p. 380.

In the Museum of the Survey there are eight specimens on exhibition in the cases, which were identified with *Orthisina Verneuli* by E. Billings, and which are still so labelled. Four of these are from the Trenton limestone at Ottawa, three are from the same formation at Jessup's Rapids on the Bonnechere, and one is from Division 1 of the "Anticosti group" at Gamache Bay, Anticosti. All of these specimens were carefully examined in 1891 by M. Friedrich Schmidt, who informed the writer that the Anticosti example labelled *O. Verneuli* agrees with Eichwald's types of that species, but that the specimens from the Trenton limestone are more like *O. Wesenbergensis*, Pahlen,† and that they differ from the true *O. Verneuli*.

ANASTROPHIA (?) HEMIPLICATA, Hall. (Sp.)

- Atrypa hemiplicata*, Hall.....1847. Pal. N. York, vol. I., p. 144, pl. 33 fig. 10.
 " " Billings.....1856. Canad. Nat. and Geol., vol. I., p. 208, figs. 20-23.
Pentamerus hemiplicatus, Billings.....1859. Canad. Journ., vol. IV., p. 316.
 " " Hall.....1859. Twelfth Rep. N. York St. Cab. Nat. Hist., p. 66.
Canarella hemiplicata, Billings.....1863. Geol. Canada, p. 168, figs. 154, a-c.
Anastrophia (?) hemiplicata, Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 382, pl. 30, figs. 29-31.

Deer Island, Lake Winnipeg, T. C. Weston, 1884, one adult specimen of a small form of this species, and J. B. Tyrrell, 1889, an apparently immature example.

STROPHOMENA INCURVATA, Shepard.

- Producta incurvata*, Shepard.....1838. Am. Journ. Sc. and Arts, vol. XXXIV., p. 144, figs. 1 and 2.
Orthis incurvata, Costeleanu.....1843. Essai sur le Syst. Silur. de l'Amér. Septentr., p. 38.

* Russia and the Ural Mountains, vol. II., pls. 11 and 12.

† Monogr. *Orthisina*. Mém. l'Académie de St-Petersbourg, 1878.

- Strophomena convexa*, Owen..... 1844. Geol. Expl. Iowa, Wiscons. and Ill.,
p. 70, pl. 17, fig. 2.
Leptæna filitesta, Hall..... 1847. Pal. N. York, vol. I., p. 111, pl. 31b,
figs. 3, a, f.
Strophomena filitesta, Billings..... 1850. Canad. Nat. and Geologist, vol. I.,
p. 203, figs. 1 and 2.
Strophomena incurvata, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 385,
pl. 30, figs. 36-40.

Several specimens of this species were collected at Lower Fort Garry by Dr. R. Bell in 1880, and by T. C. Weston in 1884. At East Selkirk, in 1884, Mr. Weston obtained an unusually large ventral valve of *S. incurvata*, which is about seventy millimetres broad at the hinge line, and forty-four mm. long. On Lake Winnipeg the species has been collected at Kinnow Bay, and at Birch or Inmost Island, in Kinnow Bay, by T. C. Weston in 1884, and by D. B. Dowling and L. M. Lambe in 1890; also at Cat Head and Big Sturgeon Island by D. B. Dowling and L. M. Lambe in 1890.

Characteristic examples of *S. incurvata* had previously been collected by Dr. R. Bell in 1879, on the Nelson River, Keewatin, at the Limestone Rapids, 100 miles up, at the second and third rapids, and at the first Birch Brook. Some of these are referred to, under the name *Strophomena filitesta*, Hall, on page 470 of Appendix 1 to Dr. Bell's Report, in the Report of Progress of this Survey for 1878-79.

STROPHOMENA RUGOSA (Rafinesque Ms.), Blainville.

- Strophomena rugosa* (Rafinesque) Blainville..... 1825. Malacol. and Conchyliol., vol. I., p.
513, pl. 53, figs. 2 and 2a.
Strophomena rugosa, DeFrance..... 1827. Dict. Sc. Naturelles, vol. I., p. 151, and
Atlas.
Leptæna planumbona, Hall..... 1847. Pal. N. York, vol. I., p. 112, pl. 31,
figs. 4, a-c.
Strophomena rugosa, King..... 1850. Brit. Perm. Foss., p. 103.
Strophomena planumbona, Hall..... 1862. Geol. Wiscons., vol. I., p. 54, fig. 7.
Strophomena (Hemipronites) planumbona,
Meek..... 1873. Rep. Geol. Surv. Ohio, vol. I., p. 79,
pl. 6, figs. 3, a-h.
Streptorhynchus (Strophomena) elongata,
James..... 1874. Cincinnati Quart. Journ. Sc., vol. I., p.
240.
Hemipronites planumbona, S. A. Miller..... 1875. Ibidem, vol. II., p. 45.
Streptorhynchus planumbona, S. A. Miller..... 1877. Am. Pal. Foss., p. 134.
Streptorhynchus elongata, Mickleborough
and Wetherby..... 1878. Journ. Cincinnati Soc. Nat. Hist., vol.
I., p. 76.
Strophomena planumbona, White..... 1880. Second Ann. Rep. Indiana Bur. Statist.
and Geol., p. 483, pl. 2, figs. 13 and 14.
" " "..... 1881. Tenth Rep. Indiana St. Geologist, p.
115, pl. 2, figs. 13 and 14.

- Streptorhynchus planumbona*, Hall 1883. Second Ann. Rep. N. York St. Geologist, pl. 39, figs. 15-17, and pl. 42, figs. 8-9.
- Strophomena planumbona* (partim) Shaler... 1887. Mem. Kentucky Geol. Surv., p. 13, pls. 4 and 5.
- Strophomena rugosa*, Hall..... 1892. Pal. N. York, vol. VIII., pt. 1, p. 247, figs. 13 and 14.
- Strophomena planumbona* or *rugosa*, Hall.... 1892. Ibidem, p. 251, pl. 9, figs. 15-17, and pl. 11A, figs. 8 and 9.
- Strophomena rugosa*, Winchell and Schuchert 1893. Lower Silur. Brach. Minn., p. 390, pl. 31, figs. 4 and 5.

Lower Fort Garry, T. C. Weston, 1884: one specimen.

An excellent summary of the various names that have been applied to this and to the preceding species is given by Professor Winchell and Mr. Schuchert, in their Lower Silurian Brachiopoda of Minnesota, from which the preceding list of synonyms is quoted.

STROPHOMENA RUGOSA, var. SUBTENTA.

- Strophomena subtenta*, Conrad..... 1841. Fifth Ann. Rep., N. York Surv., p. 37 (undefined).
- Leptæna subtenta*, Hall 1847. Pal. N. York, vol. I., p. 115, pl. 31B, figs. 9, *a-b*.
- Strophomena subtenta*, Billings..... 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 132, and fig. 109 on p. 130.
- Strophomena* (*Hemicprionites*) *plicata* (James), Meek 1873. Rep. Geol. Surv. Ohio, vol. I., pt. 2, p. 81, pl. 6, figs. 4, *a-b*.
- Strophomena subtenta*, Whiteaves..... 1880. Geol. Surv. Canada, Rep. Progr. 1878-79, p. 47c.
- Strophomena rugosa* var. *subtenta*, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 393.

Limestone Rapids, 100 miles up the Nelson River, Keewatin, Dr. R. Bell, 1879: two good specimens.

STROPHOMENA TRILOBATA, Owen. (Sp.)

- Leptæna trilobata*, Owen..... 1852. Geol. Surv. Wisconsin, Iowa and Minn., p. 584, pl. 2, figs. 17 and 18.
- Strophomena trilobata*, Miller 1877. Amer. Pal. Foss., p. 138.
- " " Winchell & Schuchert. 1893. Lower Silur. Brach. Minn., p. 395, pl. 31, figs. 12 and 13.

East Selkirk, L. M. Lambe, 1890: one large and well preserved but imperfect dorsal valve.

On Lake Winnipeg a few characteristic specimens of this species have been collected at the following localities: At Bull Head, Big Grindstone Point and Elk Island, by T. C. Weston, in 1884; at Deer Island by J. B. Tyrrell in 1889; at Snake and Jack Head islands by D. B. Dowling and L. M. Lambe in 1890; at the mouth of the Little Saskatchewan River

and at Little Tamarack Island by D. B. Dowling in 1890; at Clark's or "Limestone" Point, eleven miles north of the mouth of the Little Saskatchewan, at an exposure eight miles north of Clark's Point, and on the west shore of the lake, north of the Saskatchewan and opposite the north end of Selkirk Island by D. B. Dowling in 1891. Nearly all the specimens from these localities are dorsal valves in various states of preservation. They are here referred to Owen's species, which has not yet been satisfactorily illustrated, mainly on the authority of Mr. Charles Schuchert, to whom three of the best specimens were sent for comparison, and who regards them as "typical examples of *Strophomena trilobata*, as found in the upper Mississipi valley."

STROPHOMENA. (Species uncertain.)

A few dorsal valves of a *Strophomena*, whose specific relations are at present uncertain, were collected at Lower Fort Garry by Dr. Bell in 1880 and by Mr. Weston in 1884. So far as can be ascertained from their imperfect state of preservation, these specimens would appear to be intermediate in their characters between *S. trilobata* and *S. Hecuba*, Billings.* In the dorsal valve of *S. trilobata* the visceral disc is flattened and the remainder of the valve bent abruptly inward at an obtuse angle, at about one-third of the length from the beak to the nasute anterior extremity, while that of *S. Hecuba* is ventricose and evenly convex. These dorsal valves from Lower Fort Garry are tumid and gibbous a little behind the midlength, when viewed laterally, and neither obtusely angulated posteriorly, as in *S. trilobata*, nor uniformly convex as in *S. Hecuba*. They may possibly indicate or represent a nasute local variety of *S. incurcata*.

STROPHOMENA BILLINGSII, Winchell and Schuchert.

- Strophomena recta*, Billings 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 130, figs. 108, *a-c*. But apparently not *S. recta*, Conrad, 1843.
Strophomena Billingsii, Winchell & Schuchert, 1893. Lower Silur. Brach. Minn., p. 397, figs. 32, *a-c*.

East Selkirk, Manitoba, T. C. Weston, 1884: four specimens, on two small pieces of limestone.

RAFINESQUINA DELTOIDEA, Conrad. (Sp.)

- Strophomena deltoidea*, Conrad 1839. Third Ann. Rep. Geol. Surv. N. York, p. 64.
 " " " " 1841. Fifth Ann. Rep. Geol. Surv. N. York, p. 37.

* Vide Geological Survey of Canada, Palaeozoic Fossils, vol. I., p. 126, fig. 104.

- Strophomena deltoidea*, Vanuxem.....1842. Geol. N. York, Rep. Third District, p. 46, fig. 2.
 " " Emmons1842. Ibidem, Rep. Second District, p. 389, fig. 2.
Strophomena camerata, Conrad.....1842. Journ. Ac. Nat. Sc. Philad., vol. VIII, p. 254, pl. 14, fig. 5.
Leptaena camerata, Hall.....1847. Pal. N. York, vol. I., p. 106, pl. 31 A, figs. 2, *a-b*.
Leptaena deltoidea, Hall.....1847. Ibidem, p. 106, pt. 31 A, fig. 3, *a-c*.
Strophomena deltoidea, Billings.....1863. Geology of Canada, p. 163, fig. 141.
Streptorhynchus (Strophonella) deltoidea, Hall, 1883. Second Ann. Rep. N.Y. St. Geol., pl. 42, figs. 1, 2, 4 (but not 3).
Rafinesquina deltoidea, Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pl. 9 A, figs. 1, 2, 4.
 " " Winchell & Schuchert. 1893. Lower Silur. Brach. Minn., p. 403, pl. 31, figs. 30 and 31.

Washow Bay, Lake Winnipeg, T. C. Weston, 1884: one ventral valve.

RAFINESQUINA ALTERNATA (Conrad, Ms.) Emmons.

- Leptaena alternata*, Conrad.....1838. Second Ann. Rep. N.Y. Geol. Surv., p. 115 (undefined).
Strophomena alternata, Conrad.....1838-41. Ibidem, Third Rep., p. 63; Fourth Rep., p. 201; and Fifth Rep., p. 37 (undefined).
Strophomena alternata, Emmons..1842. Geol. N. York, Rep. Second District, p. 395, fig. 3.
Orthis Huronensis, Castelneau.....1843. Ess. sur le Syst. Silur. de l'Amérique Septentr., p. 37, pl. 14, fig. 6.
Orthis plana, Castelneau (not Pander) 1843. Ibidem, p. 38, pl. 14, fig. 1.
Strophomena angulata? Owen.....1844. Geol. Expl. Iowa, Wisconsin and Ill., pl. 18, figs. 1, 3.
Leptaena alternata, Hall.1847. Pal. N. York, vol. I, pp. 102 and 286, pl. 31, figs. 1, *a-n*; pl. 31A, figs. 1, *a-i*; and pl. 79, figs. 2, *a-l*.
Strophomena alternata, Billings1856. Canad. Nat. and Geol., vol. I., p. 204, figs. 3 and 4: and of numerous subsequent U. S. and Canadian palaeontologists.
Rafinesquina alternata, Hall.....Pal. N. York, vol. VIII., pt. 1, p. 281, pl. 8, figs. 6-11.
 " " Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., vol. III., pt. 1, p. 404, (which see for a complete list of synonyms of this species), pl. 31, figs. 32-34.

Lower Fort Garry,—where specimens were collected by D. Dale Owen in 1848, by Dr. R. Bell in 1880, and by T. C. Weston in 1884,—and East Selkirk, where specimens were collected by A. McCharles in 1884. On Lake Winnipeg it was collected at Inmost or Birch Island, in Kinnow Bay, by D. B. Dowling and L. M. Lambe in 1890, and in Keewatin it had previously been collected on the Nelson River sixty miles from its

mouth, and at the Limestone Rapids, one hundred miles up, by Dr. R. Bell in 1879.

RAFINESQUINA LEDA, Billings. (Sp.)

- Strophomena Leda*, Billings, 1860. Canad. Nat. and Geol. vol. V., p. 55.
 " " " 1862. Geol. Surv. Canada, Pal. Foss., vol.
 I, p. 120, figs. 98 and 99.
Brachyprion Leda, Shaler, 1865. Bul. Mus. Comp. Zool., Cambridge
 (Mass.), vol. I., p. 63.
 " " Hall and Clarke, 1892. Pal. N. York, vol. VIII., (Brachio-
 poda 1), p. 288, fig. 21.

One fairly characteristic ventral valve of the typical form of this species was collected at Deer Island, Lake Winnipeg, by Mr. J. B. Tyrrell in 1889. The following remarks upon this rather peculiar shell are made by Messrs. Hall and Clarke, on page 288 of the eighth volume of the Palaeontology of the State of New York: "There is a small number of species, the incipient members of the genus *Stropheodonta*, in which the delthyrium is open, or but partially covered, as in some of its later forms, the crenulations are confined to a very limited extent on either side of the deltidium, and upon one of these forms, *Strophomena Leda*, Billings, from the Anticosti group, Professor Shaler has proposed to found the genus BRACHYPRION. To the same group belong the *Strophomena Philomela*, Billings, from the *Pentamerus oblongus* beds of Anticosti, and Professor Shaler has described two other species from Anticosti, *Brachyprion ventricosum* and *B. geniculatum*. These features can scarcely be regarded as of generic value, but the group is an interesting one on account of its being the precursor of the fuller development of those characters upon which the genus *Stropheodonta* was originally founded."

RAFINESQUINA LATA, Whiteaves.

Plate 19, figs. 2-5.

- Rafinesquina lata*, Whiteaves, 1896. Canad. Rec. Sci., vol. VI., p. 392.

"Shell large, adult specimens measuring as much as three inches along the hinge line, deeply concavo-convex, much broader than long, and broadest at the hinge line; cardinal angles produced. Ventral or pedicle valve strongly convex exteriorly, usually regularly arched from back to front, most prominent and in some specimens gibbous and even obtusely subangular about the midlength, with the visceral disc flattened obliquely, in others most tumid in the umbonal region posterior to the midlength, its beak moderately prominent, its cardinal area wide and about four millimetres and a quarter in height, with a broadly triangular deltidium in the centre. Dorsal or brachial valve deeply concave, closely following

the curvature of the ventral, its cardinal area about one mm. and a quarter in height, and its beak apparently small.

"Surface of both valves marked with very numerous and closely disposed, thread-like radiating raised lines or minute ridges. In the only well preserved dorsal valve known to the writer these radii are very nearly equal in size, but upon the ventral valves of several specimens they are unequal in size and irregular in their disposition. In some places the larger radii alternate with the smaller ones, but in others there are from two to four, or even more, of the smaller radii between two of the larger ones. In addition to these radii, the visceral disc of the ventral valve of some specimens is marked with comparatively coarse, undulating, concentric but somewhat interrupted corrugations.

"Hinge dentition and characters of the interior of both valves unknown, but an imperfectly preserved cast of the interior of the shell of a ventral valve" from Cat Head "shews that the flabellate diductors of that valve are very similar in shape to those of *R. alternata*, as figured by Hall on Plate 8, figure 10, of the eighth volume of the 'Paleontology of the State of New York,' though their external margins are very much less distinctly defined."

"Apparently not uncommon" "at Lower Fort Garry—where it was collected by Do ald Gunn in 1858, by Dr. R. Bell in 1880, by T. C. Weston in 1884, and D. B. Dowling in 1891, and at East Selkirk—where specimens were obtained by T. C. Weston and A. McCharles in 1884. From the limestones of Lake Winnipeg it has so far been collected only at Cat Head (by T. C. Weston in 1884 and D. B. Dowling in 1891), and at Jack Head Island (by D. B. Dowling and L. M. Lambe in 1890).

"Altogether, the writer has seen fourteen specimens of this shell, three of which show the characters of the hinge area of both valves fairly well though the beak of the dorsal valve cannot be seen in either, as it is either broken off or buried under the matrix. The ventral aspect of these specimens is remarkably similar to that of the fossil figured by Professor Winchell and Mr. Schuchert on Plate 31, figures 35 and 36 of the 'Lower Silurian Brachiopoda of Minnesota,' as *Rafinesquina alternata*, var. *loxorhytis*, but which, Mr. Schuchert has recently informed the writer, he now regards as a form of *R. Kingii*, the *Strophomena Kingii* of Whitfield. Mr. Schuchert, however, who has seen all the specimens from Manitoba upon which the preceding description is based, states that their hinge areas are always nearly three and even four times as high as those of the Minnesota specimens of *R. Kingii* which he has studied, and regards this as a valid distinction between them. Professor Whitfield, also, who has seen some of the most perfect Manitoba specimens of *R. lata*, regards them as specifically distinct from his *Strophomena Kingii*, on the ground that the umbones of ventral valves of the

former are more full, and the valves themselves proportionately more convex than those of *S. Kingii*."

LEPTENA UNICOSTATA, Meek and Worthen. (Sp.)

- Strophomena unicastata*, Meek and Worthen, 1868. Geol. Surv. Illinois, vol. III., p. 335, pl. 4, fig. 11.
 " " Whitfield, 1882. Geol. Wisconsin, vol. IV., p. 262, pl. 12, fig. 14.
Leptena unicastata, Winchell and Schuchert, 1893. Lower Silur. Brach. Minn., p. 411, pl. 32, figs. 6-9.

Lower Fort Garry, T. C. Weston, 1884: one specimen.

On Lake Winnipeg a few specimens have been collected at Kinnow Bay by T. C. Weston in 1884; at Cat Head by D. B. Dowling and L. M. Lambe in 1890; at Inmost or Birch Island by D. B. Dowling and L. M. Lambe in 1890; at Clark's Point by D. B. Dowling in 1891; on the west shore north of the Saskatchewan and opposite the north end of Selkirk Island by D. B. Dowling in 1891; and at the First Limestone Point on the west shore north of the Saskatchewan by D. B. Dowling in 1891.

Keewatin, Limestone Rapids 100 miles up the Nelson River, Dr. R. Beil, 1879: one ventral valve.

PLECTAMBONITES SERICEA, Sowerby. (Sp.)

- Leptæna sericea*, Sowerby, 1839. In Murchison's Silur. Syst., pl. 19, figs. 1 and 2.
Strophomena sericea, Conrad, 1840. Third Ann. Rep. Geol. Surv. N. York, p. 201.
 " " Emmons, 1842. Geol. N. York, Rep. Third District, p. 47.
Leptæna sericea, Hall, 1847. Pal. N. York, vol. I., pp. 110 and 287, pl. 21a, fig. 2, and pl. 79, fig. 13.
 " " " 1852. Ibidem, vol. II., p. 39, pl. 21, fig. 1.
 " " Billings, 1856. Canad. Nat. and Geol., vol. I., p. 41, fig. 2.
 " " " 1863. Geol. Canad., p. 163, fig. 139: and of many subsequent writers on U. S. and Canadian fossils.
Plectambonites sericea, Hall, 1892. Pal. N. York, vol. VIII., pt. 1, pl. 15, figs. 25-29.
 " " Winchell and Schuchert, 1893. Lower Silur. Brach. Minn., p. 414, pl. 32, figs. 10-12.

This well known species has been collected at Lower Fort Garry by Dr. A. R. C. Selwyn in 1872, and by Mr. Weston in 1884. At Lake Winnipeg it has been collected on Elk Island by T. C. Weston in 1884; at Inmost or Birch Island, in Kinnow Bay, by T. C. Weston in 1884,

and by D. B. Dowling and L. M. Lambe in 1890; on Snake Island by Messrs. Dowling and Lambe in 1890; and from Dog Head by Mr. Lambe in 1890. In 1879 it was collected by Dr. R. Bell at the Limestone Rapids of the Nelson River, in the district of Keewatin.

ORTHIS TRICENARIA, Conrad.

- Orthis tricenaria*, Conrad.....1843. Proc. Ac. Nat. Sc. Philad., vol. I., p. 333.
Orthis disparilis, Conrad.....1843. Ibidem, p. 333.
Orthis testudinaria (?) Owen.....1844. Geol. Expl. Iowa, Wiscons. and Ill., pl. 15, fig. 11.
Orthis tricenaria, Hall.....1847. Pal. N. York, vol. I., p. 121, pl. 32, figs. 8, *a-d*.
Orthis disparilis, Hall.....1847. Ibidem, p. 119, pl. 23, figs. 4, *a-d*.
" " Billings.....1859. Canad. Nat. and Geol., vol. IV., p. 440, fig. 20.
Orthis tricenaria, Salter.....1859. Canad. Org. Rem., Dec. I., p. 39, pl. 9, figs. 1-4.
" " Hall.....1862. Geol. Wiscons., vol. I., p. 42, figs. 8-11.
Orthis disparilis, Hall.....1862. Ibidem, p. 435.
" " Billings.....1863. Geol. Canada, p. 130, figs. 60, *a-b*.
Orthis tricenaria, Billings.....1863. Ibidem, p. 167, figs. 151, *a-b*.
" " Hall.....1883. Second Ann. Rep. N. York St. Geologist, pl. 35, figs. 1-5.
" " Walcott.....1884. Mon. U. S. Geol. Surv., vol. VIII., p. 74, pl. 11, fig. 4.
" " Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pp. 191, 193, 221, 228, pl. 5, figs. 9-12.
Orthis disparilis, Hall.....1892. Ibidem, pp. 191, 221, 228.
Orthis tricenaria, Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 418, pl. 32, figs. 18-23.

Lake Winnipeg, at Deer Island, from the basal beds of the limestone, T. C. Weston, 1884, and J. B. Tyrrell, 1889; at Inmost or Birch Island, and three miles west of Cat Head, D. B. Dowling and L. M. Lambe, 1890; and at Cat Head, D. B. Dowling, 1891.

ORTHIS (DINORTHIS) PECTINELLA (Emmons) Hall.

- Orthis pectinella*, Emmons.....1842. Geol. N. York, Rep. Second Distr. p. 394, fig. 2 (not defined).
" " Hall.....1847. Pal. N. Y., vol. I., p. 123, pl. 32, figs. 10, *a-c*.
" " var. *semiovalis*, Hall.....1847. Ibidem, p. 124, pl. 32, figs. 11, and 11, *a-b*.
" " Billings.....1856. Canad. Nat. and Geol., vol. I., p. 205, fig. 5.
" " Rogers.....1858. Geol. Pennsylv., vol. II., p. 818, fig. 602.
" " Billings.....1863. Geol. Canada, p. 165, figs. 147, *a-c*.
Orthis Charlotte, N. H. Winchell.....1880. Eighth Rep. Geol. and Nat. Hist. Surv., Minn., p. 67.

- Orthis pectinella*, Hall.....1883. Second Ann. Rep. N. York St. Geol.,
pl. 34, figs. 39 and 40.
" " var. *semioides*, S. A. Miller. 1889. N. Am. Geol. and Palæont., p. 359.
Dinorthis pectinella, Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pp.
195, 222 and 228, pl. 5, figs. 27-33.
Orthis (Dinorthis) pectinella, Winchell and
Schuchert.....1893. Lower Silur. Brach. Minn., p. 424,
pl. 32, figs. 31-34.

Lake Winnipeg, at the north end of Punk Island, D. B. Dowling,
1890: one imperfect but characteristic ventral valve.

ORTHIS (DINORTHIS) SUBQUADRATA, Hall.

- Orthis subquadrata*, Hall.....1847. Pal. N. York, vol. I., p. 126, pl. 32 A,
fig. 1.
" " ".....1862. Geol. Wisconsin, vol. I., p. 54, figs. 1
and 2.
" " Billings.....1863. Geol. Canada, p. 165, figs. 146, *a-b*.
" " Meek.....1873. Rep. Geol. Surv. Ohio, vol. I., pt. 2,
p. 94, pl. 9, fig. 2: and of subsequent
writers on N. Amer. paleontology.
Orthis (Phosionys) subquadrata, Hall.....1892. Pal. N. York, vol. VIII., pt. 1, pp.
194, 197, and 222, pl. 5 A, figs. 17-19.
Orthis (Dinorthis) subquadrata, Winchell
and Schuchert.....1893. Lower Silur. Brach. Minn., p. 428,
pl. 32, figs. 46-50.

Lake Winnipeg, at Little Black Island, and Snake Island, D. B.
Dowling and L. M. Lambe, 1890; on the west shore, north of the Sas-
katchewan and opposite the north end of Selkirk Island,—and at the
First Limestone Point north of the Saskatchewan, D. B. Dowling, 1891.

ORTHIS (DINORTHIS) PROAVITA? Winchell and Schuchert.

- Orthis proavita*, Winchell and Schuchert... 1892. (April 1). Amer. Geol., vol. IX., p. 290.
" *petra*, Sardeson.....1892. (April 9). Bull. Minn. Ac. Nat. Sc.,
vol. III., p. 332, pl. 5, figs. 18-21.
Orthis (Dinorthis) proavita, Winchell and
Schuchert.....1893. Lower Silur. Brach. Minn., p. 431, pl.
32, figs. 51-57.
Orthis (Dinorthis) proavita, Whiteaves.....1895. This volume, pt. 2, p. 120.

A few imperfect natural moulds of the exterior of shells of a coarsely
ribbed subquadrate *Orthis*, which are possibly referable to this species,
were collected by Mr. Dowling in 1891 at Dancing Point and Selkirk
Island, Lake Winnipeg, also on the west shore of the lake opposite the
north end of Selkirk Island. Gutta percha squeezes from these moulds
are essentially similar in form and sculpture to specimens of the large
variety of *O. proavita* from Stony Mountain, but none of these squeezes
shew any portion of the hinge area, or anything but the sculpture and
general outline of imperfect detached valves.

ORTHIS (DALMANELLA) TESTUDINARIA, Dalman.

- Orthis testudinaria*, Dalman1828. Kongl. Svenska Vet-Akad. Handl. for 1827, p. 115, pl. 2, fig. 4.
 " " Conrad1839. Ann. Rep. N. York Geol. Surv., p. 63.
Orthis striatula, Emmons.1842. Geol. N. York, Rep. Second Distr., p. 394, fig. 3.
Orthis testudinaria (?) Emmons.1842. Ibidem, p. 404, fig. 4.
Orthis testudinaria, Hall1847. Pal. N. York, vol. I., p. 117, pl. 32, figs. 1, *a-l*.
 " " Billings1856. Canad. Nat. and Geol., vol. I., p. 49, fig. 1.
 " " "1863. Geol. Canada, p. 165, figs. 144, *a-c*. And of numerous European and N. Am. paleontologists.
Dalmanella testudinaria, Hall.1892. Pal. N. York, vol. VIII., pt. 1., pp. 190 and 206, pl. 5B, figs. 1-4.
Orthis (Dalmanella) testudinaria, Winchell and Schuchert.1893. Lower Silur. Brach. Mimm., p. 441, pl. 33, figs. 17-22.

Lower Fort Garry, Dr. R. Bell, 1880, and T. C. Weston, 1884: a few badly preserved specimens. In this connection it may be noted that M. Friedrich Schmidt expressed the opinion that the specimens in the Museum of the Survey from the Trenton limestone at St. Johns, P. Q., at Ottawa, at Jessups' Rapids on the Bonnechere, and at the Bay of Quinté, which E. Billings identified with this species, are the same as the Russian form called *Orthis testudinaria*, Dalman.

PLATYSTROPHIA BIFORATA, Schlotheim (Sp.).

- Terebratulites biforatus*, Schlotheim.1820. Petrefactenkunde, p. 265. For a full list of European synonyms of this species see Davidson's Mon. Brit. Silur. Brach., pt. VII., p. 268, under the name *Orthis biforata*.
Spirifer Sheppardi, Castelneau.1843. Essai sur le Syst. Silur. de l'Amer. Septentr., p. 42, pl. 14, fig. 15.
Delthyris brachynota, Hall.1843. Geol. N. York, Rep. Fourth Distr., p. 70, fig. 6.
Orthis and *Delthyris*, Owen.1844. Geol. Expl. Iowa, Wiscons. and Ill., pl. 15, figs. 3 and 7.
Delthyris lynx, Hall (partim—but not of Eichwald).1847. Pal. N. York, vol. I., p. 133, pl. 32D, fig. 1.
Orthis biforata, Billings.1856. Canad. Nat. and Geol., vol. I., p. 206, figs. 6-10.
Orthis lynx, Billings.1863. Geol. Canada, p. 167, fig. 149.
Platystrophia regularis, Shaler.1865. Bull. Mus. Comp. Zoology, p. 67.
Platystrophia lynx, Hall.1892. Pal. N. York, vol. VIII., pt. 1, pp. 202 and 223, pl. 5B, fig. 10.

- Platystrophia biforata*, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 455
(which see for a fuller list of synonyms of N. Amer. specimens of this species than it is thought necessary to quote here), pl. 33, figs. 49-52.

Abundant at Lower Fort Garry, where it was collected by Sir James Hector in 1857, by Dr. R. Bell in 1880, and by Mr. Weston in 1884.

Lake Winnipeg, at Big Grindstone Point, where a small but nearly perfect ventral valve was collected by Mr. Weston in 1884.

All the specimens from Manitoba that the writer has seen (like those from the Galena and Trenton shales of Minnesota described by Winchell and Schuchert) belong to the small and typical form of this species, and not to the "large and globose variety *lynx*, as defined by Meek," in the first volume of the Paleontology of Ohio.

PLATYSTROPHIA BIFORATA, var. CRASSA.

- Orthis (Platystrophia) crassa*, James (non-Lindström)..... 1874. Cincinnati Quart. Journ. Sc., vol. I., p. 20.
Orthis dentata, Miller..... 1875. Ibidem, vol. II., p. 27.
Orthis centroura, Miller..... 1880. N. Am. Geol. and Palæont., p. 356.
Platystrophia crassa, Hall..... 1892. Pal. N. York, vol. VIII., pt. 1, p. 223.
Platystrophia biforata, var. *crassa*, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 458, pl. 33, figs. 55 and 56.

Lake Winnipeg, at Little Black Island and at the south end of Snake Island, D. B. Dowling and L. M. Lambe, 1890: one good specimen from each of these localities.

RHYNCHOTREMA CAPAX, Conrad. (Sp.)

- Atrypa capax*, Conrad..... 1842. Journ. Ac. Nat. Sc. Philad., vol. VIII., p. 264, pl. 14, fig. 21.
Atrypa inerebescens (partim), Hall..... 1847. Pal. N. York, vol. I., p. 146, pl. 33, figs. 13 *i*, and 13, *k-y*.
" " Billings..... 1856. Canad. Nat. and Geol., vol. I., p. 207, figs. 15 and 16.
" " Hall..... 1860. Thirteenth Rep. N. Y. St. Cab. Nat. Hist., p. 66, figs. 6, 7, 9-11.
Rhynchonella inerebescens (partim), Hall..... 1862. Geol. Wisconsin, vol. I., p. 55, figs. 5-7.
Rhynchonella capax, Billings..... 1863. Geol. Canada, p. 211, figs. 213, *a-c*. And of several other subsequent writers on N. Am. Paleontology.
Rhynchotrema capax, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 462, pl. 34, figs. 30-34.

Lake Winnipeg, at the mouth of the Little Saskatchewan, Dr. R. Bell, 1874, one specimen, and D. B. Dowling, 1880, two specimens; about five miles north of Clark's Point, D. B. Dowling, 1891, two specimens; Big Grindstone Point, J. B. Tyrrell, 1889, one specimen; Selkirk Island, north of the Saskatchewan, D. B. Dowling, 1891, one specimen; west shore of the lake, opposite the north end of Selkirk Island, D. B. Dowling, 1891, two specimens; and First Limestone Point north of the Saskatchewan, D. B. Dowling, 1891, two specimens.

An imperfect but characteristic example of this species was collected by Dr. R. Bell, in 1879, from a loose piece of limestone at Fort Churchill, Hudson's Bay.

RHYNCHOTREMA INÆQUIVALVIS, Castelneau. (Sp.)

- Spirifer inaequivalvis*, Castelneau.....1843. Essai sur le Syst. Silur. de l'Amérique Septentr., p. 40, pl. 14, fig. 8.
Atrypa inerebescens (partim), Hall.....1847. Pal. N. York, vol. I, pp. 146 and 289, pl. 33, figs. 13, *a-h*.
Rhynchonella inerebescens (partim), Billings.....1856. Canad. Nat. and Geol., vol. I, p. 207, figs. 11-14.
" " Billings.....1863. Geol. Canada, p. 168, fig. 153.
Rhynchotrema inaequivalvis, Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 459, pl. 34, figs. 9-25.

Lower Fort Garry, Dr. R. Bell, 1880: two specimens.

Punk Island, Lake Winnipeg, Professor H. Y. Hind, 1858: two specimens. A specimen which is probably referable to this species, but which has the beak of the ventral valve broken off, was collected at Cat Head, Lake Winnipeg, by Mr. Weston in 1884.

RHYNCHONELLA ANTICOSTIENSIS. Var.

- Rhynchonella Anticostiensis*? Whiteaves....1880. Geol. Surv. Canada, Rep. Progr., 1878-79, p. 47 c.
Cfr. *Rhynchonella Anticostiensis*, Billings....1862. Geol. Surv. Canada, Pal. Foss., vol. I, p. 142, figs. 119, *a-c*.
" " " "1863. Geol. Canada, p. 211, figs. 212, *a-c*.
Cfr. *Rhynchonella*(?) *Anticostiensis*, Winchell and Schuchert.....1893. Lower Silur. Brach. Minn., p. 464, figs. 34, *a-c*.
Compare also *Atrypa subtrigonalis*, Hall....1847. Pal. N. York, vol. I, p. 145, pl. 33, figs. 12, *a-c*.

Several specimens of a shell which the writer is convinced is a rather large local variety of *Rhynchonella Anticostiensis*, were collected at Lower Fort Garry by the late Mr. Donald Gunn in 1858, by Dr. R. Bell in 1880, and by Mr. Weston in 1884; also at the First Limestone Rapids, 100 miles up the Nelson River, Keewatin, by Dr. R. Bell in 1879.

In all the specimens of this north-western variety that the writer has seen, the ventral valve is longer than broad, or at least as long, and its beak is prominent, erect or prolonged, and narrowly conical, whereas the ventral valve of *Rhynchotrema incurvalvis*, Castelneau (= *incrabescens*, Hall) is almost always broader than long, and its beak short and incurved. This variety of *Rhynchonella Anticostiensis* differs from the typical form of that species in being a little larger, and proportionately rather broader in advance of the midlength. The eastern specimen of *R. Anticostiensis* figured by Billings, which is as large as any the writer has seen from Anticosti, is 17 millimetres long, as measured along the median line, and 15 mm. in its greatest breadth. Two average adult examples of the north-western variety of that species, from Lower Fort Garry, measure,—the one 19 mm. in length by 17.75 mm. in its greatest breadth,—and the other 20 mm. in length by 20 mm. in breadth. Some of the specimens from Lower Fort Garry approach rather closely to *Atrypa sub-trigonalis*, Hall, but the antero-lateral angles of the former are more broadly rounded. The characters of the interior of the typical *R. Anticostiensis* are still entirely unknown, but casts of the interior of the closed valves of the north-western variety shew the impression of a mesial septum, which commences at the beak and extends about half way to the anterior margin, in the dorsal valve.

ZYGOSPIRA RECURVIROSTRA, Hall. (Sp.)

- Atrypa recurvirostra*, Hall..... 1847. Pal. N. York, vol. 1., p. 140, pl. 33, figs. 5, *a-d*.
Rhynchonella ? recurvirostra, Hall..... 1859. Twelfth Rep. N. Y. St. Cab. Nat. Hist., p. 66.
Rhynchonella recurvirostra, Billings..... 1863. Geol. Canada, p. 168, fig. 152.
Anazyga recurvirostra, Davidson..... 1882. Suppl. Brit. Silur. Brach., p. 129.
Zygospira recurvirostra, Winchell and Schuchert..... 1893. Lower Silur. Brach. Minn., p. 466, pl. 34, figs. 38-41.

Inmost or Birch Island, Kinnow Bay, Lake Winnipeg, T. C. Weston, 1884, three specimens; and Big Sturgeon Island, D. B. Dowling and L. M. Lambe, 1890, one specimen.

CYCLOSPIRA BISULCATA, Emmons. (Sp.?)

- Orthis bisulcata*, Emmons..... 1842. Geol. N. York, Rep. Second Distr., p. 396, fig. 4. But not described.
Atrypa bisulcata, Hall..... 1847. Pal. N. York, vol. 1., p. 139, pl. 33, fig. 3.
Cunavilla bisulcata, Miller..... 1877. Amer. Pal. Foss., p. 107.
Cyclospira bisulcata, Winchell and Schuchert..... 1893. Lower Silur. Foss. Minn., p. 470, pl. 34, figs. 49-54.

Elk Island, Lake Winnipeg, T. C. Weston, 1884, abundant; also Deer Island, T. C. Weston, 1884, one specimen, and J. B. Tyrrell, 1889, one specimen.

MOLLUSCA.

PELECYPODA.

PALÆOPTERIA. (Gen. nov.)

Shell small, aviculoid in outline, both ears being well developed and the left valve more convex than the right: hinge dentition consisting of minute elongated thin laminar teeth, nearly parallel with and close to the cardinal margin, on both sides of the beaks.

The specimens upon which this genus is based are all casts of the interior of separate valves, and the slightly divergent hinge teeth are represented by their imprints, which are scarcely visible to the naked eye. When carefully examined with a lens, however, these casts show the impressions of two anterior and two posterior teeth in the right valve, and of two anterior and apparently three posterior teeth in the left valve. The genus is here proposed at the suggestion of Mr. Ulrich, who has examined the specimens, and who thinks that their hinge dentition is more like that of the *Macrodontidae* than any pterineoid hinge known to him.

PALÆOPTERIA PARVULA. (N. Sp.)

Plate 20, figs. 1, 2 and 3.

Shell inequilateral, oblique, with a small anterior wing and a larger and more obtusely angular posterior alation, and varying in outline from obliquely or elongated subovate to somewhat rhomboidal. Anterior side shorter than the posterior: anterior end, inclusive of the wing, longest at the hinge line, rather acutely subangular above, narrowing obliquely inward and sometimes a little concave at the midheight, and ultimately curving convexly, obliquely and abruptly, inward and downward, to the ventral margin below: posterior end, also inclusive of the alation, obtusely angular at its junction with the cardinal margin above, obliquely truncated and slightly concave at about the midheight, narrowly rounded and somewhat produced below: ventral margin broadly rounded: cardinal margin long and straight: beaks incurved, elevated slightly above the hinge line, and placed a little in advance of the midlength.

Surface markings unknown, though on some of the specimens there are a few concentric plications preserved, which are most distinct anteriorly.

Dimensions of an average specimen, the original of fig. 1 : maximum length, 5.8 mm. ; height at the midlength, 5.2 mm.

Inmost or Birch Island, Kinnow Bay, Lake Winnipeg, where a few specimens were collected by Mr. Weston in 1884 and by Messrs. Dowling and Lumbe in 1890.

A cast of the interior of the left valve of a shell which is probably referable to this species, in a loose piece of limestone, was collected by Mr. Dowling in 1890, at Reindeer Island, Lake Winnipeg. This specimen, which is represented by fig. 3, on plate 20, is much larger than the specimens from Inmost Island, much more produced at the base posteriorly, and has a comparatively shorter posterior wing.

BYSSONYCHIA INTERMEDIA, Meek and Worthen. (Sp.)

Ambonychia intermedia, Meek and Worthen, 1868. Geol. Surv. Ill., vol. III, p. 306.
Byssonychia intermedia, Ulrich 1894. Lower Silur. Lamell., Minn. (advance copies fr. Geol. Minn., Final Rep., vol. III., pt. 2) p. 499, pl. 35, figs. 23-26.

In the United States National Museum there is a single specimen of the right valve of a shell, which Mr. Ulrich has recently identified with this species, labelled "Lower Fort Garry, Charles L. Anderson, No. 5214."

MODIOLOPSIS PARVIUSCULA, Billings.

Modiolopsis parviuscula, Billings 1859. In Hind's Rep. Assinib. and Saskatch. Expl. Exped., p. 186.

"This species closely resembles *M. modiolaris* (Conrad) but is always much smaller. It is transversely elongate, anterior extremity small, rounded, half the width of the posterior; the latter obliquely truncate and somewhat straight from the end of the hinge line for rather more than half the width, then rounded at the lower posterior angle. Hinge line straight or a little arched, full three-fourths the whole length of the shell. The umbones are less than one-fifth the length from the anterior extremity. The valves are moderately convex, obscurely and obliquely carinate from the umbones towards the lower posterior angle. In many specimens the ventral margin is concave near the anterior extremity, as if for the purpose of a byssus. Surface with obscure concentric undulations of growth. Length of large specimen, one and a half inch. In general they are a good deal smaller."

"This shell so much resembles *M. modiolaris* that I have long hesitated as to the propriety of giving it a separate name. It is very widely distributed, since we have specimens from Lake Winnipeg at Punk Island, from the Pallideau Islands in Lake Huron, where it occurs in

strata which hold fossils of the Chazy, Black River and Trenton limestones, and from near Cornwall and the Island of Montreal in the Chazy."—E. Billings (op. cit.).

In the Museum of the Survey there are three specimens of *M. parvus*. *cula* which are labelled as having been collected by Professor H. Y. Hind at Punk Island in 1858, but, although from the typical locality, they are all so imperfect and so badly preserved that their characters are indefinite and their specific relations obscure. It has been found impracticable to make a satisfactory drawing of either of these specimens, as their original outlines are not sufficiently distinct, and the writer has seen no others from the Lake Winnipeg region.

MODIOLOPSIS ANGUSTIFRONS. (N. Sp.)

Plate 20, fig. 4.

Shell moderately elongated, nearly twice as long as high, slightly arcuate, very narrow, in the direction of the height, anteriorly, and expanded in the same direction posteriorly, the greatest height being at a short distance from the posterior end: valves moderately convex, most prominent on the broadly rounded, oblique, posterior umbonal slope, in front of which there is an abrupt concave inflection or shallow constriction. Anterior side very short, narrow in the direction of its breadth or thickness as well as height, and rounded at the end: posterior side much longer than the anterior and rather more than twice as high: posterior end obliquely subtruncate above, rounded and somewhat produced below: ventral margin, or margin of the valves in the byssal region, shallowly concave a little in advance of the midlength: hinge line nearly straight and gently ascending behind the beaks, occupying rather more than one-half of the entire length of each valve: umbones broad, depressed in the middle but tumid behind: beaks depressed, incurved, inclined forward, and placed at a short distance from the anterior end.

Surface markings unknown, though the well preserved and perfect cast of the interior of both valves upon which the preceding description is based, is marked by numerous small concentric plications, which are most strongly marked on the upper part of the valves and behind the beaks.

Dimensions of the only specimen collected: greatest length, 47.5 mm.; maximum height, 26.5 mm.: greatest height in front of the beaks, 12 mm.; approximate thickness of the two valves when closed, about 16 mm.; length of hinge line behind the beaks, between 28 and 30 mm.

Lower Fort Garry, T. C. Weston, 1884: a cast of the interior of a specimen with the valves widely open.

The most salient characteristics of this species are the pinched or constricted anterior end, and the concavely arched margin of the valves in the byssal region. The surface markings appear to be essentially similar to those of *M. concentrica*.

ORTHODESMA AFFINE. (N. Sp.)

Plate 20, fig. 5.

Shell elongated, nearly three times as long as high, and highest behind, valves strongly compressed and very inequilateral. Anterior side very short and narrowly rounded: posterior side much longer than the anterior, increasing gradually and very slightly in height and depth posteriorly, though the cardinal margin behind the beaks and the posterior half of the ventral margin are not far from parallel: posterior end more broadly rounded than the anterior: ventral margin nearly straight or slightly concave anteriorly and at the midlength, but faintly convex posteriorly: cardinal border, behind the beaks, slightly ascending outward, almost straight but very slightly convex: beaks probably small, depressed and appressed, evidently placed very near to the anterior end.

Hinge dentition unknown, muscular impressions not distinctly defined.

Maximum length of the only specimen collected, 59.4 mm.; greatest height, 21 mm.; height at midlength, 19 mm.

West side of Selkirk Island, Lake Winnipeg, D. B. Dowling, 1891: a cast of the interior of both valves, in a loose piece of limestone. The beaks are broken off, but in every other respect the cast is nearly perfect. The specimen seems to indicate a species which is most nearly related to *O. curvatum* of Hall and Whitfield,* from the Hudson River group of Ohio, but which differs therefrom in its flatter valves, more obscure umbonal slopes, more evenly and less obliquely rounded posterior extremity, and, more particularly, by its proportionately shorter and much broader (or rather, higher) anterior side.

VANUXEMIA. (Species undeterminable.)

Little Tamarack Island, D. B. Dowling, 1890: an imperfect cast of the interior of both valves of a specimen, which, Mr. Ulrich thinks, represents an undetermined species of the *V. Hayniana* section of the genus.

CTENODONTA ASTARTEFORMIS, Salter.

<i>Ctenodonta astarteformis</i> , Salter.....	1859.	Geol. Surv. Canada, Can. Org. Rem., Dec. 1, p. 39, pl. 8, fig. 7.
"	"	Billings1863. Geol. Canada, p. 175, figs. 164, a-b.

* Report of the Geological Survey of Ohio, vol. II., pt. 2, p. 95, pl. 2, fig. 6.

Big Sturgeon Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: a cast of the interior of both valves, from a loose piece of limestone.

CTENODONTA SUBNASUTA, Ulrich.

Ctenodonta subnasuta, Ulrich 1894. Lower Silur. Lamellibr. Minn., p. 583, pl. 42, figs. 34-36.

Cat Head, Lake Winnipeg, D. B. Dowling, 1891: a well-preserved cast of the interior of a left valve. Considering the section of the genus to which this species belongs, the strength and definition of the muscular scars, pallial line, and hinge denticles, and in fact the whole characters of the cast, would seem to shew that it was made by an adult shell and not by a young specimen of *Ctenodonta* (or *Tellinomya*) *ovata*, Hall. In the Cat Head specimen the denticles bend toward and not away from the beak.

CLINOPISTHA (?) ANTIQUA. (N. Sp.)

Plate 20, fig. 6.

Shell equivalve, compressed convex but lightly inflected above and behind the subangular posterior umbonal slopes, elongate, about twice as long as high, and rather narrowly subelliptical. Anterior side longer and broader in the direction of its height than the posterior, its extremity somewhat narrowly rounded, posterior side short and truncate or subtruncate at the end: umbones depressed, beaks incurved, and placed a little behind the midlength.

Surface markings unknown, as the test is not preserved, but the cast of the interior of both valves is nearly smooth and marked only with a few faint concentric striae of growth.

Hinge dentition unknown, though the test appears to have been very thin and the hinge practically edentulous. Immediately behind the beaks there are indications of a short external ligament. Pallial line and anterior muscular impression unknown, but the posterior muscular impression seems to have been shallow, rather large, subovate or somewhat wedge-shaped in outline and longer than high.

Length of the most perfect specimen collected, 31 mm.; height of the same, at the midlength, 15 mm.

Inmost or Birch Island, Kiuwow Bay, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: a perfect but not very well preserved cast of the interior of a specimen with both valves widely open. An imperfect natural mould of the exterior of a specimen which is probably referable to this species, had previously been collected at the same locality by Mr. Weston in 1884.

At first sight the more perfect of these two specimens has the general appearance of a *Ctenodonta*, and its marginal outline is somewhat like that of *C. dubia* (Hall) as figured by E. Billings on page 175 of the "Geology of Canada." On closer examination, however, its hinge would seem to have been practically edentulous, and therefore very different to that of *Ctenodonta*. The shell, also, has much the aspect of a small, narrow species of *Thracia*, but in that genus the left valve is always flatter than the right, and the ligament internal. The species is here provisionally referred to *Clinopistha*, at the suggestion of Mr. Ulrich, but it may represent a new generic type, which at present there are not sufficient data to define. In the preceding description of the characters of the species, the shorter, narrower and truncated or subtruncated portion of the shell is regarded as the posterior side, and *vice versa*, in accordance with what are presumed to be its natural homologies.

RHYTIMYA RECTA. (N. Sp.)

Plate 29, fig. 7.

Shell elongated, more than twice as long as high, and very inequilateral: valves compressed laterally, most convex but not very prominent along the very oblique and indistinctly defined posterior umbonal slope and shallowly inflected above it. Anterior side extremely short, its margin sloping obliquely and rapidly downward and outward in the lunular region, most prominent and forming a narrowly rounded or somewhat pointed junction with the ventral margin, at a little below the midheight: posterior side about five times as long as the anterior: posterior end obliquely truncated, and forming an obtusely pointed junction with the ventral margin, which is nearly straight or but very slightly convex for the greater portion of its length: cardinal margin, behind the beak, straight, horizontal and almost parallel with the ventral border: umbones compressed and slightly depressed both laterally and vertically, beaks incurved, placed very near to the anterior end, but not quite terminal.

Surface of the cast marked with irregularly disposed but continuous concentric striae or lines of growth, and by a few short faint undulations, parallel to them, on the posterior umbonal slope.

Hinge dentition and muscular impressions unknown.

Dimensions of the only specimen known to the writer: maximum length, 38 mm.; height, at the midlength, 15.2 mm.

A perfect and tolerably well preserved cast of the interior of the right valve of a specimen of this species was collected by Mr. Dowling in 1890 from a loose piece of limestone at Reindeer Island, Lake Winnipeg.

The marginal outline of this specimen would seem to be sufficiently different from that of the *R. compressa* and *R. convexa* of Ulrich, as figured on plate 56 of the seventh volume of the Report of the Geological Survey of Ohio, to justify its separation from either, as a distinct species. Thus, in *R. compressa* the anterior side is proportionately longer and more broadly rounded than that of *R. recta*, and the posterior end of the former is less pointed below. In *R. convexa* the anterior side is also much longer than that of *R. recta*, the cardinal margin of the former is more arched and its posterior end is represented as more produced below.

CONOCARDIUM ANTIQUUM, D. Dale Owen. (Sp.)

<i>Pleurorhynchus antiqua</i> , Owen.....	1852.	Geol. Rep. Wiscons., Iowa and Minn.,
		Table 2B, fig. 19.
<i>Conocardium antiquum</i> , S. A. Miller.....	1883.	Amer. Pal. Foss., second edit., p. 310.
" " " " " " " " " " " "	1889.	N. Amer. Geol. and Paleont., p. 472.

Lower Fort Garry, Owen, 1848. "This small and delicately formed *Pleurohynchus* is, I believe, the first of the genus that has been discovered in this country in rocks of Lower Silurian age." Owen. Only one specimen would seem to have been obtained, which is badly figured, and the species has never been described.

EDMONDIA (?) VETUSTA. (N. Sp.)

Plate 20, fig. 8.

Shell small, moderately convex, obliquely subovate, a little longer than high and very inequilateral. Anterior side short, its margin abruptly contracted both above and below and narrowly rounded or narrowly subtruncated at the end : posterior side longer and broader (in the direction of its height) than the anterior : posterior end obliquely subtruncate and somewhat contracted above, rather narrowly rounded and moderately produced below : ventral margin broadly rounded, but more convex posteriorly than anteriorly, most prominent behind the midlength and straighter in front : cardinal margin, behind the beaks, very short, faintly convex and slightly ascending : beaks moderately prominent, incurved and placed considerably in advance of the midlength.

Surface marked by concentric lines of growth, and on some specimens, when viewed with a lens, there are obscure indications of close set, minute radiating striae. Hinge dentition not known with any degree of certainty, but probably edentulous. On each side of the umbones there is a long and narrow, widely divergent slit or groove, at a short distance from the cardinal border and not far from parallel with it. Muscular impressions not distinctly defined, though the scar of the anterior adductor seems to have been vertically elongated.

Dimensions of one of the largest specimens known to the writer, the cast of the interior of a right valve figured: length 12.2 mm.; height, 10.3 mm.; estimated thickness of a cast of both valves, 5 mm.

Casts of the interior or moulds of the exterior of one or both valves of shells of this species are abundant at Inmost Island, Kinnow Bay, Lake Winnipeg, where they were collected by T. C. Weston in 1884 and by D. B. Dowling and L. M. Lambe in 1890.

In the preceding description the shorter and narrower portion of each valve is regarded as the anterior side, and the longer and broader as the posterior, but it is by no means clear that these terms, as thus used, represent the true homologies of the shell. It may be that the shorter is the posterior side and *vice versa*.

This curious little shell is referred provisionally to the genus *Edmondia*, at the suggestion of Mr. Ulrich, who, in a letter to the writer, dated May 8th, 1896, make the following remarks upon specimens of it that had been sent to him for examination and comparison: "After a most careful investigation and comparison, I fail to find, despite my earnest wish to do so, the remotest difference between this Manitoba Trenton shell and the most typical Devonian and Carboniferous species of *Edmondia*! The agreements are as follows: (1) the hinge is edentulous; (2) there is an internal plate in each valve beneath the beak, which extends posteriorly and leaves in the cast (as your specimens show very clearly) a long narrow sharp slit or fissure running nearly parallel with and a short distance within the cardinal margin; (3) the muscular scars have the same position and form, and the anterior one, which is vertically elongated, sends up an obscure furrow to the front side of the beak; (4) the surface of the casts exhibit obscure traces of radiating lines; and (5) the rounded form and short anterior end. Considering these important agreements, together with the fact that the material at hand shows no differences, I do not see that you can do otherwise than refer the species to *Edmondia*."

In some manuals of paleontology or conchology *Edmondia* is said to be restricted to the Permian and Carboniferous systems, but Hall * has recently described and figured several species from the Devonian rocks of the United States, and Zittel † says that it ranges in time from the Silurian to the Dyas (Permian).

GASTEROPODA.

TETRANOTA BIDORSATA, Hall. (Sp.)

- Bucania bidorsata*, Hall.....1847. Pal. N. York, vol. I., p. 186, pl. 40, figs. 2, *a-g*.
Tetranota bidorsata, Ulrich and Scofield...1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 877, pl. 65, figs. 10-18.

* In the Paleontology of New York, vol. V., pt. 1, Lamellibranchiata 2.

† Handbuch der Paläontologie, vol. II., p. 128.

Inmost Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: a well preserved cast of the interior of the shell of a small specimen, which is about eleven millimetres in its longest diameter. A badly preserved but otherwise similar cast was collected by Mr. Dowling, in 1891, on the west shore of Lake Winnipeg, north of the Saskatchewan and opposite the north end of Selkirk Island.

SALPINGOSTOMA BUELLII, Whitfield. (Sp.)

- Bucania Buellii*, Whitfield. 1878. Ann. Rep. Geol. Surv. Wisconsin for 1877, p. 76.
Bucania (Tremenotus?) Buellii, Whitfield. 1882. Geol. Wisconsin, vol. IV., p. 224, pl. 6, figs. 12-14.
Salpingostoma Buellii, Ulrich and Scofield. 1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 900, pl. 67, figs. 34-37, and (?) 38.

Lower Fort Garry, Dr. R. Bell, 1880, one specimen; and Commissioners (formerly called Cranberry) Island, Lake Winnipeg, D. B. Dowling, 1890, one specimen; both of which are badly preserved casts of the interior of the shell.

CONRADELLA. (Species uncertain.)

A single specimen of a small *Conradella*, which the writer once thought could be identified with *C. compressa* (the *Phragmolites compressus* of Conrad), but which is much too imperfect to be satisfactorily compared with the nearly related and very critical species recently described by Ulrich and Scofield in the second part of the third volume of the Final Report of the Geology of Minnesota,—was collected at Lower Fort Garry by Dr. R. Bell in 1880.

PLEUROTOMARIA MURALIS, D. D. Owen.

- Pleurotomaria muralis*, Owen. 1852. Rep. Geol. Surv. Wisconsin, Iowa and Minn., p. 581, pl. 2, fig. 6.
 " " Whiteaves. 1893. Canad. Rec. Sc., vol. V., p. 319.

"Specific characters.—Obtusely conical, convolutions five to six, with nearly vertical sides, like a spiral wall; upper surface of the whorls deeply channelled and doubly carinated; undulating striae, transverse to the convolutions. Height about two-thirds of the width.

"From the Magnesian limestones (F. 3) of Red River of the North," at Lower Fort Garry. Owen.

P. muralis appears to have been based upon a single specimen with the whole of the umbilical side covered by the matrix, so that only the characters of the apical side are known. A natural mould of the exterior, with part of the test adherent thereto, of the apical side of a specimen

collected by Dr. R. Bell in 1879 at the Limestone Rapids, 100 miles up the Nelson River, Keewatin, and a very badly preserved specimen collected by Mr. Dowling in 1891 at Dog Head, Lake Winnipeg, are both possibly referable to this meagrely described and badly figured species.

PLEUROTOMARIA STOKESIANA. (N. Sp.)

Plate 20, figs. 9 and 9a.

Shell, or rather cast of the interior of the shell, subconical, a little broader than high, spire short, umbilicus narrow, nearly or perhaps quite closed when the test is preserved. Volutions about four, though only three are preserved in the few specimens known to the writer, those of the spire flattened obliquely above, with a shallow spiral groove or constriction at the midheight, and obtusely angulated near the suture below: outer volution, as viewed dorsally, higher than the spire, more than twice as broad as high, bluntly angulated at about its midheight, with a shallowly concave spiral groove just above the angle and convex below, umbilical region rather flattened: slit-band not clearly shewn but apparently occupying the summit of the spiral angulation.

Surface marked with three small but distinct spiral ridges above the angulation, and with traces of similar but much less distinct ones below, the whole crossed by faint transverse lines of growth.

West shore of Lake Winnipeg, north of the Saskatchewan, and opposite the north end of Selkirk Island, D. B. Dowling, 1891: two imperfect casts of the interior of the shell.

The specific name suggested for this shell is intended as a tribute of respect to the memory of the late Charles Stokes, who was one of the first to describe some of the fossils of the Winnipeg limestones. The only North American fossil from a similar or nearly similar geological horizon that would seem to be at all closely comparable with it, is *Cyclonema percarinatum*,* the *Pleurotomaria percarinata* of Hall,† but that species is represented as being higher than broad and as encircled with fewer, much more prominent and differently arranged spiral ridges.

PLEUROTOMARIA (?) MARGARITOIDES. (N. Sp.)

Plate 20, fig. 10.

Shell very small, turbinate, subglobose, about as broad as high, spire short, umbilicus very narrow in the cast and apparently almost or quite closed when the test is preserved. Volutions probably about four, though only three are preserved in the single specimen known to the

* Geology of Wisconsin, vol. IV., p. 211, pl. 5, fig. 15.

† Paleontology of New York, vol. I., p. 177, pl. 38, fig. 4.

writer, those of the spire rounded, the outer one rounded, ventricose, much broader than high, and higher than the spire: suture distinctly defined.

Surface, as indicated by a gutta percha impression of a natural mould of the exterior of the test, marked with numerous, extremely fine (or thin) spiral raised lines or minute ridges. On the dorsal side of the outer volution, when viewed with a lens, these ridges are seen to be unequal in size, the larger ones usually alternating with one or two smaller ones. There are about twenty of the larger ridges in this region, and these, although placed rather close together, are not quite equidistant. On a cast of the interior of the shell there are indications of the larger revolving ridges, and in addition to these there is a faint narrow spiral groove, with an obtuse peripheral carination immediately under it, which may represent the slit-band, at about the midheight of the outer volution. On the surface of the gutta percha impression, however, the middle of the supposed slit-band, when viewed with a lens, is seen to be encircled with a minute spiral ridge.

Maximum breadth of the specimen described, six millimetres; probable height of the same, when perfect, about equal to the breadth.

Inmost Island, Kinnow Bay, Lake Winnipeg. D. B. Dowling and L. M. Lambe, 1890: an imperfect but well preserved cast of the interior of the shell and a sharply defined natural mould of the exterior of the same. The figure on Plate 20 is drawn from a gutta percha impression of this mould.

Although many of the spiral lines on this mould are so small as to be invisible without the aid of a lens, no clear indications of any of the lines of growth can be detected. It is quite uncertain whether the shell was really provided with a slit-band or not, and consequently whether it should be referred to *Pleurotomaria* or *Cyclora*. Its shape is not very unlike that of *Cyclora minuta*, Hall, as figured by Meek,* but the surface of that species is described and represented as smooth.

LIOSPIRA AMERICANA, Billings. (Sp.)

- Pleurotomaria lenticularis*, Hall..... 1847. Pal. N. York, vol. I., p. 173, pl. 37, figs. 6, a-d.
Pleurotomaria Americana, Billings..... 1860. Canad. Nat. and Geol., Vol. V., p. 164, fig. 7.
 " " " 1863. Geol. Canada, p. 184, fig. 179.
Liospira Americana, Ulrich and Scofield.... 1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 996.

A few casts of the interior of shells of this species were collected at Punk Island by Professor H. Y. Hind in 1858; at Cat Head and at Inmost

* Geological Survey of Ohio, Palæontology, vol. I., p. 152, pl. 13, figs. 7, a-c.

or Birch Island, by T. C. Weston in 1884 ; at Dog Head by L. M. Lambe in 1890 ; and at Commissioners (or Cranberry) Island, by D. B. Dowling in 1890.

Liospira persimilis, Ulrich and Scofield.

Liospira persimilis, Ulrich and Scofield, . . . 1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 998, pl. 82, figs. 39-41.

Reindeer Island, Lake Winnipeg, D. B. Dowling, 1890: one specimen, from a loose piece of limestone.

Liospira angustata, Ulrich and Scofield.

Liospira angustata, Ulrich and Scofield, . . . 1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 997, pl. 68, figs. 35-37, and pl. 69, figs. 1 and 2.

Inmost or Birch Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen of the variety with obtuse periphery.

Hormotoma gracilis (?) Hall. (Sp.)

Marchisonia gracilis, Hall. 1847. Pal. N. York, vol. I., p. 181, pl. 39, figs. 4, *a-c*.
 " " Salter. 1859. Geol. Surv. Canada, Can. Org. Rem., Dec. I., p. 22, pl. 5, fig. 1.
 " " Billings 1863. Geol. Canada, p. 183, fig. 178.
 " " Nicholson 1875. Rep. Pal. Prov. Ont., p. 18, fig. 7, *c*.
Hormotoma gracilis, Ulrich and Scofield, . . . 1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 1014, pl. 70, figs. 18-36.

Snake Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: four casts of the interior of shells which are doubtfully referred to this species. A similar cast of the interior of a shell which is possibly also referable to this species had previously been collected sixty miles up the Nelson River, Keewatin, by Dr. B. Bell in 1878.

Hormotoma winnipegensis. (N. Sp.)

Plate 21, fig. 1.

Shell elongated, more than twice as long as broad, very large and attaining to a length of fully eight inches: spire, as viewed dorsally, much higher or longer than the last volution: apical angle of one of the largest and least compressed specimens in the Survey collection, 36°.

Volutions about nine, the later ones much broader than high, the breadth of the last but one being nearly or quite twice its height, moderately convex, but somewhat compressed at their midheight; suture distinct but not deeply impressed.

Surface markings of the later volutions consisting of a broad, flat slit-band near their midheight or midlength, and of low, rounded, riblike plications or wrinkles of growth, which converge very obliquely backward to the slit-band.

The foregoing description is based upon two large specimens, with considerable portions of the test preserved, collected at Little Black Island (not at Berens or Swampy Island proper)* by D. B. Dowling and L. M. Lambe in 1890. The larger of these specimens, which is figured, is fully eight inches in length and very much flattened in the dorso-ventral direction. The smaller, which is upward of seven inches in length, is slightly compressed in the same direction. They both differ from *Murchisonia major*, Hall,† in their very much larger size, and from *M. teretiformis*, Billings,‡ in their much less ventricose volutions, more lightly impressed suture, and in their coarser and more rib-like wrinkles of growth.

Comparatively small specimens, which are apparently referable to the same species and which rarely exceed four inches and a half in length, had previously been collected at two localities on the Nelson River, Keewatin, by Dr. R. Bell in 1879; at Dog Head and Jackfish Bay, Lake Winnipeg, by T. C. Weston in 1884; at Little Black Island by J. B. Tyrrell in 1889; at Little Tamarack and Commissioners' islands and at a point off Moose Creek, near Snake Island, Lake Winnipeg, by D. B. Dowling in 1890. All of these specimens are slightly compressed, and most of them are mere casts of the interior of the shell.

SOLENOPIRA PAGODA (Salter), var. OCCIDENTALIS.

Shell resembling *S. pagoda* (the "*Ennema? pagoda*" of Salter) || in shape, and in the circumstance that its volutions are encircled with four spiral ridges, but differing therefrom in its much greater size and proportionately broader slit-band.

The type of *S. pagoda*, as figured by Salter, is twenty-four millimetres in length, and its outer volution is nearly eight mm. broad. In the only specimen of the var. *occidentalis* known to the writer, the length is about fifty-nine mm., the breadth of the last volution nineteen mm. and a half, though the whole specimen is laterally and abnormally compressed, and the slit-band, near the aperture, is three mm. and a half broad.

* Little Black Island is very close to Berens Island, and connected with it by a bar or reef.

† In Foster & Whitney's Report on the Geology of the Lake Superior Land District, pt. 2, p. 209, pl. 26, figs. 1, a-c.

‡ Geological Survey of Canada, Rep. Progr., 1853-56, p. 298.

|| Geological Survey of Canada, Canadian Organic Remains, Decade 1, 1859, p. 30, pl. 6, fig. 5.

Little Black Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen which is unfortunately not well enough preserved to be figured satisfactorily.

The genus *Solenospira* has recently been constituted by Messrs. Ulrich and Scofield (in their monograph of the "Lower Silurian Gastropoda of Minnesota") * for the reception of a group of *Murchisonia*-like shells, of which *Eunema* (?) *pagoda* and *E. prisca* of Salter, are the types. According to Mr. Ulrich, in a letter dated May 12th, 1896, "they have a notched aperture like *Hormotoma* and *Lophospira*, and are widely different from *Eunema strigillata*, Salter, which is nothing more than a high-spined *Trochonema*. *Solenospira* is distinguished from *Hormotoma* by the strong revolving ridges and great width of band."

MACLUREA (MACLURINA) MANITOBEENSIS, Whiteaves.

Plate 20, fig. 11.

- Maclurea Manitobensis*, Whiteaves.....1890. Trans. Royal Soc. Canada, vol. VIII., sec. 4, p. 75, pl. 12, and pl. 13, figs. 1 and 2; and (1893) Canad. Rec. Sc., vol. V, p. 324.
Maclurina Manitobensis, Ulrich & Scofield. 1897. Geol. Minn., Final Rep., vol. III, pt. 2, p. 1041.

Amended description.—Shell large, attaining to a maximum diameter of eight inches and a half, and consisting of about five somewhat slender volutions, which increase rather slowly in size: outer volution nearly always distinctly angulated at the periphery. Flat side faintly depressed in the centre in some specimens and as faintly raised in others: volutions, as viewed on this side, very shallowly concave in the centre and slightly raised on their outer margins: suture lightly impressed. Convex side moderately prominent (the greatest thickness or depth varying in different examples from two-fifths to one-third the maximum diameter): somewhat conical or subhemispherical, the outer volution obliquely flattened and narrowing very rapidly, but in a few specimens somewhat convexly, from the periphery to the umbilical margin: umbilicus deep, conical, and moderately wide: aperture obliquely and rather narrowly subtrapeziform: outer lip apparently simple: test thick.

Surface of the test on the flat side marked with irregularly disposed, but for the most part distant, transverse linear grooves or periodic arrests of growth, each of which curves gently backward in a shallowly convex curve, and occasionally with a few striations which run parallel to them. In the specimen figured on Plate 13, fig. 1, of the eighth volume of Transactions of the Royal Society of Canada, which is little less than four inches in its greatest diameter, and in which the whole of the test is

* Published in volume III., part 2, of the Final Report of the Geology of Minnesota.

preserved on the flat side, there are six of these periodic arrests of growth on the outer volution, while the inner whorls are perfectly smooth. In larger but similarly preserved specimens these arrests of growth, which are not sufficiently deep to produce any impressions on the casts, are somewhat more numerous and disposed at still more unequal intervals. On the convex side the test is ornamented with rounded spiral ribs of nearly equal size, and these are crossed by straight, transverse costae, in such a way as to present a somewhat nodulous appearance.

"The foregoing description is intended to apply only to those specimens in which the greater part of the test is preserved. The condition in which the species is usually obtained is that of mere casts of the interior of the shell. In these, the slender early whorls are often broken off, the suture, on the flat side, is deeply excavated or channeled, and, on the convex side, a large portion of the inner whorls is visible in the umbilicus. The whole of the thick test between the volutions is sometimes removed in these casts, in which case the volutions are completely separated.

"In Appendix 1 to the Narrative of Franklin's Second Expedition to the Shores of the Polar Sea, under the heading 'Limestone of Lake Winnipeg,' the discovery, among other fossils, of specimens of a *Maclurea* which is most probably identical with the present species, on the western shore of that lake, in 1825, is thus referred to by Sir John Richardson:— 'Professor Jameson enumerates *terebratulæ*, *orthoceratites*, *enerinites*, *caryophyllites* and *lingule*, as the organic remains in the specimens brought home by Captain Franklin on his first expedition. Mr. Stokes and Mr. James De Carle Sowerby have examined those which we procured on the last expedition, and found amongst them *terebratulites*, *spirifers*, *maclurites* and *corallines*. The *maclurites* belonging to the same species with specimens from Lakes Erie and Huron, and also from Igloolik, are perhaps referable to the *Maclurea magna* of Le Sueur.'

"A few casts of the interior of shells which are certainly referable to *M. Manitobensis* were collected by Mr. John Fleming in 1858 " at Limestone or "Clark's Point, Lake Winnipeg, eleven miles north of the Little Saskatchewan, and by Prof. H. Youle Hind, in the same year, at Deer Island, near Grindstone Point and at Punk Island, on the same lake. These specimens, which are still in the Museum of the Survey, are referred to by Mr. E. Billings, in chapter 20 of Prof. Hind's report, as belonging to a species of *Maclurea*, 'allied to *M. Loganii*, Salter, but with more slender whorls.'

"Since then the species has been collected at the following localities, but the first specimens known to the writer in which any considerable portion of the test is preserved, were obtained in 1884 by Mr. T. C. Weston at Pike Head and Kinnow Bay, Lake Winnipeg, and by Mr. McCharles at East Selkirk. Between Fort Alexander and the mouth of the Red River,

Dr. R. Bell, 1874. At the second and third rapids of the Nelson River, Keewatin, Dr. R. Bell, 1879. Elk Island, Big Island, Grindstone Point, Washow Bay, Bull Head Bay, Dog Head, Pike Head or Jackfish Bay, and Kinwow Bay, all in or on Lake Winnipeg; T. C. Weston, 1884. East Selkirk, T. C. Weston, and A. McCharles, 1884. North end of Big Island, Big Grindstone Point" and Little Black Island, "Lake Winnipeg, J. B. Tyrrell, 1889." Little Black Island, Sturgeon, Snake and Black Bear islands, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890; Dog Head, L. M. Lambe, 1890. Commissioners, Little Tamarack and Punk islands, Grindstone Point, Selkirk Island, and west shore of Lake Winnipeg, north of the Saskatchewan, and opposite the north end of Selkirk Island, D. B. Dowling, 1891. East side of Sturgeon Lake, District of Saskatchewan, J. B. Tyrrell, 1894.

"It is one of the most abundant and characteristic fossils of the Galena-Trenton limestone of Manitoba, and, according to Messrs. Weston, Tyrrell, Dowling and Lambe, it always occurs with the flat side uppermost in the rock.

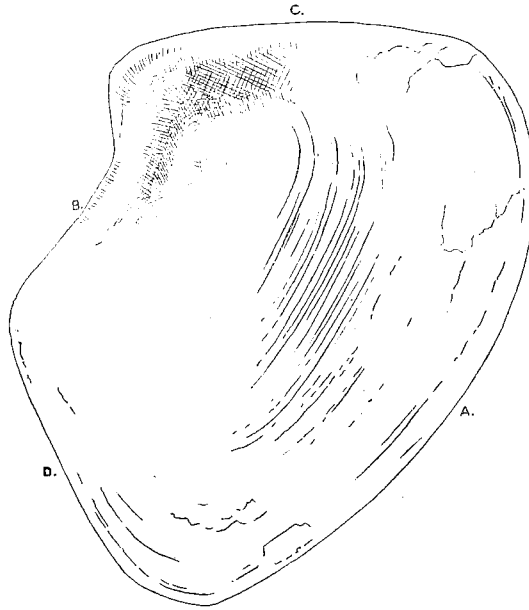


Fig. 11. *Machurea Manitobensis*.—Inner side of an operculum, supposed to be that of a large specimen of this species, from Jack Fish Island. Natural size.

"In 1890 Messrs. Dowling and Lambe collected an operculum, which is probably that of a large specimen of this species, at Jack Fish Island, opposite the mouth of Jack Fish River, Lake Winnipeg. "This operculum, which is represented in outline in the wood-cut, is a little more than four inches in height or depth, and not quite three inches in its maximum breadth. Its outer surface is completely buried in the matrix, the inner surface only being exposed. In the wood-cut the side indicated by the letter A clearly corresponds to the outer side of the shell, and the concave side opposite,—B,—to the inner or columellar side. The side marked C corresponds to the flattened spiral side of the shell, and that marked D to the inner wall of the umbilicus. The margins of the sides C and B, whose junction forms the 'nuclear angle,' are thickened, but the edges of the other two sides are very thin. This thickening of the sides C and B is immediately followed by a shallow depression in the nuclear region, but the inner side of the operculum is otherwise nearly flat. The surface markings of this side consist of numerous concentric raised lines of growth, but there are no clear indications of any "internal projections for the attachment of muscles." Although the opercula of *M. Loganii*, Salter, and *M. crenulata*, Billings, are known to be provided with well developed "projections or "muscular processes on the inner side, this is by no means always the case in other species of the genus. On page 238 of the first volume of the "Palaeozoic Fossils" of Canada, E. Billings distinctly states that there are no muscular processes on the inner side of the operculum of his *M. oceanica*, and on page 243 of the same volume he figures opercula of two other species of *Maclurea*, from Cape Norman, Newfoundland, in which there are no muscular processes on that side. In the Museum of the Geological Survey at Ottawa there are two opercula from the Calceiferous of the Mingan Islands, which were referred by E. Billings, with some doubt, to the *M. matutina* of Hall. There are no processes on the inner side of these opercula."

According to Messrs. Ulrich and Scofield (op. cit., p. 194), their genus *Maclurina* (which the writer prefers to regard, for the present, as a subgenus) is proposed for "the reception of shells heretofore classed as *Maclurea*, but differing from the typical form of the genus in wanting the projections for the attachment of muscles on the inner side of the operculum." "*Maclurea Manitobensis*, Whiteaves, the operculum of which is figured and described by Whiteaves in the Canadian Record of Science for April, 1893, is regarded as the type of the new genus." "In this species the nucleus is at the junction of the lower and inner margin of the operculum, and we believe the same is true of *M. cuneata* and *M. subrotunda* of Whitfield, which, with Whiteaves's species, are all that at the present time it seems safe to refer to *Maclurina*."

TROCHONEMA UMBILICATUM, Hall. (Sp.)

- Pleurotomaria umbilicata*, Hall 1847. Pal. N. York, vol. I., pp. 43 and 175,
pl. 10, figs. 9, *a-b*, and pl. 38, figs. 1, *a-g*.
Trochonema umbilicatum, Salter..... 1859. Geol. Surv. Canada, Can. Org. Rem.,
Dec. I., p. 27, pl. 6, fig. 3.
" " Billings..... 1863. Geol. Canada, p. 145, fig. 92.
" " Ulrich and Scofield..... 1897. Geol. Minn., Final Rep., vol. III.,
pt. 2, p. 1047, pl. 77, figs. 1-8.

A few specimens which have been identified with this species by E. Billings, and which are still in the Museum of the Survey, were collected at Limestone (now known as Clark's) Point, on the west shore of Lake Winnipeg, about eleven miles north of the Little Saskatchewan, by Mr. John Fleming in 1858. These specimens, however, are distorted and badly preserved casts of the interior of shells, which are difficult to distinguish from those of closely related species. Similar casts have been collected at the same locality by D. B. Dowling in 1890, and at an exposure on the Little Saskatchewan River, one mile from Lake Winnipeg, by Dr. R. Bell in 1875. Single specimens, which are too imperfect to be determined specifically, but which are probably referable either to this species or the next, were collected at Lower Fort Garry and at Dog Head by T. C. Weston in 1884; at Little Black and Snake islands by D. B. Dowling and L. M. Lambe in 1890; and at Commissioner's Island by Mr. Dowling in 1890.

TROCHONEMA ECCENTRICUM, Ulrich and Scofield.

- Trochonema eccentricum*, Ulrich and Scofield..... 1897. Geol. Minn., Final Rep., vol. III.,
pt. 2, p. 1049, pl. 77, figs. 17 and 18.

A distorted specimen, but with most of the test preserved, which agrees very well with the description and figures of this species, was collected from a loose piece of limestone on the south end of Reindeer Island, Lake Winnipeg, by D. B. Dowling, in 1890.

TROCHONEMA NIOTA, Hall. (Sp.)

- Pleurotomaria niota*, Hall 1861. Geol. Surv. Wiscons., Rep. Progr.
1861, p. 33; and Whitfield (1895), Mem.
Am. Mus. Nat. Hist., vol. I., pt. 2, p. 60,
pl. 8, fig. 11.
Trochonema niota, Ulrich and Scofield..... 1897. Geol. Minn., Final Rep., vol. III.,
pt. 2, p. 1052, pl. 76, figs. 16-18.

A cast of the interior of a shell which agrees fairly well with Professor Whitfield's and with Ulrich and Scofield's recent figures of this species, was collected at Stony Point, a little to the north of Jackfish River, on the west shore of Lake Winnipeg, by Mr. Weston in 1884. Two similar

but badly distorted and much less perfect specimens, which are probably referable to the same species, were collected by Mr. Weston at Dog Head (a little farther to the south-east), also in 1884.

EUNEMA STRIGILLATUM, Salter.

- Eunema strigillata*, Salter..... 1859. Geol. Surv. Canada, Can. Org. Rem.,
Dec. 1, p. 29, pl. 6, fig. 4.
" " Billings..... 1863. Geol. Canada, p. 145, fig. 88.

Lower Fort Garry, T. C. Weston, 1884 : a single specimen, with the test preserved, which seems to agree better with the description and figures of this eastern species, than with those of the nearly related *Trochonema* (*Eunema*) *Salteri* of Ulrich and Scofield.* The spire of this specimen is comparatively high and narrow, and the transverse lines of growth on the dorsal surface of the outer volution are nearly straight, but curved slightly forward at the base.

SUBULITES. (Species uncertain.)

An imperfect cast of the interior of the shell of a small and very slender species of *Subulites*, which is similar in shape to the *S. pergracilis* of Ulrich and Scofield,† but which shews no evidence of a sutural band, was collected on the west shore of Lake Winnipeg, north of the Saskatchewan, and opposite the north end of Selkirk Island, by D. B. Dowling in 1891.

FUSISPIRA INFLATA, Meek and Worthen. (Sp.)

- Subulites inflatus*, Meek and Worthen..... 1870. Proc. Ac. Nat. Sc. Philad., p. 47 ;
also (1875) Geol. Surv. Ill., vol. VI.,
p. 495.
Fusispira ventricosa, Hall..... 1871. Twenty-fourth Rep. N. Y. St. Cab.
Nat. Hist., p. 229, pl. 8, fig. 6.
" " Whitfield..... 1882. Geol. Wisconsin, vol. IV., p. 245, pl.
9, fig. 2.
Fusispira inflata, Ulrich and Scofield..... 1897. Geol. Minn., Final Rep., vol. III.,
pt. 2, p. 1075, pl. 80, figs. 17 and 18.

Casts of the interior of shells of this species are abundant at many of the limestone exposures in the Red River Valley, on the western shore of Lake Winnipeg, and on some of the islands in that lake. Specimens of it have been collected by Mr. Weston in 1884 at Lower Fort Garry ; at Bull's Head, Dog Head, Big Grindstone Point, Big and Elk islands, Lake Winnipeg ; by Mr. Tyrrell in 1889, at Little Black Island ; by Messrs. Dowling and Lambe in 1890 at Little Black, Snake and Black Bear islands ; by Mr. Dowling in 1890 at Commissioners and Punk islands ; and by Mr. Lambe in the same year at Dog Head.

* Geology of Minnesota, Final Report, vol. III., pt. 2, p. 1053, pl. 77, figs. 42-43.

† Ibidem, p. 1072, pl. 81, figs. 12-15.

FUSISPIRA ELONGATA, Hall.

- Fusispira elongatus*, Hall.....1871. Twenty-fourth Rep. N. Y. St. Cab.
 Nat. Hist., p. 229, pl. 8, fig. 5.
 " *elongata*, Whitfield.....1882. Geol. Wisconsin., vol. IV, p. 245, pl. 9,
 fig. 3.

A few imperfect casts of the interior of shells of this species were collected at Lower Fort Garry by Dr. R. Bell in 1880 and by Mr. Weston in 1884.

LOXONEMA WINNIPEGENSE, Whiteaves.

- Loxonema Winnipegense*, Whiteaves.....1893. Canad. Rev. Sc., vol. V., p. 326.

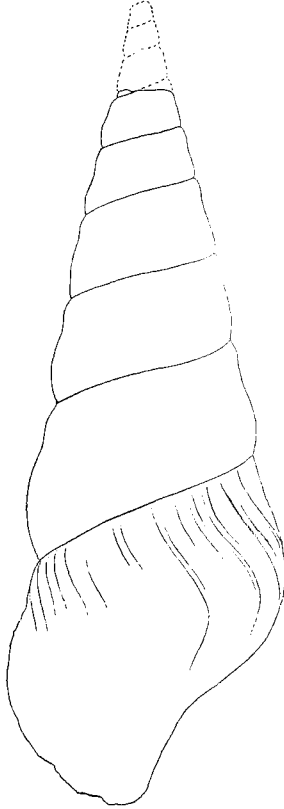


Fig. 12. *Loxonema Winnipegense*.—Dorsal view of a specimen from Stony Point, Lake Winnipeg, in outline only, and of the natural size. The earlier volutions restored from another specimen.

"Shell large, attaining to a length of upwards of five inches, terebriform, elongated and nearly three times as long as broad: spire, as measured on the dorsal side, occupying not quite two-thirds the entire length: apical angle 27° . Volutions ten, allowing for " a possible apical one, which is not preserved in any of the specimens collected, "increasing slowly in size and obliquely compressed, the later ones slightly constricted above and moderately inflated below, those of the spire much broader than high: suture distinctly impressed: outer or last volution a little higher than broad, moderately convex but scarcely ventricose in the middle and narrowing abruptly into the somewhat pointed base.

"Surface of the spire nearly smooth, that of the last volution marked only with a few flexuous lines of growth, which curve gently and concavely backward above, and still more gently forward below.

"Four fine large specimens of this species, each with nearly the whole of the test preserved, have been collected at as many different localities on or in Lake Winnipeg." Two of these specimens were collected by Mr. Weston in 1884, one at Stony Point and one at Jack Fish Bay; one by Mr. Tyrrell in 1889 at Little Black Island, and one by Mr. Dowling in 1891 at Dog Head.

"Nine volutions are preserved in the most perfect of these specimens, the slender apex of each being broken off. In the perfect shell there must have been at least ten and probably as many as eleven volutions. The species is of considerable interest on account of its strikingly close similarity to some of the most typical Jurassic species of *Pseudomelania*."

PTEROPODA.

CONULARIA ASPERATA, Billings.

Plate 21, figs. 2 and 2 a.

Conularia asperata, Billings.....1866. Geol. Surv. Canada, Cat. Silur. Foss. Isld. Anticosti, p. 21.

Cfr. *Conularia formosa*, Miller and Dyer...1878. Journ. Cincinnati Soc. Nat. Hist., vol. I, p. 38, pl. 1, figs. 12 and 12a.

A few good specimens, which seem to be essentially similar to the type of *C. asperata* from Manitowish Bay, Anticosti, were collected from limestone exposures at Cat Head by T. C. Weston in 1884 and by D. B. Dowling in 1891; also at Inmost or Birch Island, in Kinnow Bay, by T. C. Weston in 1884; and by D. B. Dowling and L. M. Lambe in 1890. Similar specimens were collected from loose pieces of limestone at Reindeer Island by D. B. Dowling in 1890, and at Big Sturgeon Island by D. B. Dowling and L. M. Lambe in the same year.

In the type of *C. asperata* from Anticosti, and in all the specimens of that species from Lake Winnipeg that the writer has seen, each of the

obliquely transverse ridges on the flattened sides of the test bears a row of minute tubercles, and the narrow linear depressions or grooves between the tuberclose ridges are marked with fine, longitudinal and parallel raised lines. It seems highly probable that *C. formosa* is synonymous with *C. asperata*.

CEPHALOPODA.

ENDOCERAS ANNULATUM, Hall. Var.

Endoceras annulatum, Hall. Var. Whiteaves. 1891. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 77, pl. 5, figs. 1 and 1 a.

Between the second and third rapids of the Nelson River, Keewatin, Dr. R. Bell, 1879: a cast of the interior of the septate portion of the shell and two fragments. The most perfect of these specimens, the one figured in the Transactions of the Royal Society of Canada, differs from the type and only known specimen of *E. annulatum*, as described and figured by Hall (which is also a septate cast), in the much more oblique disposition of its annular ridges, each of which passes obliquely over three of the septa. In transverse sections, the outlines of both shell and siphuncle of the Nelson River specimens are broadly elliptical, but this appearance is probably due to the abnormal compression to which they have been subjected.

ENDOCERAS SUBANNULATUM, Whitfield.

Endoceras (*Cameroceus*) *subannulatum*, Whitfield.....1882. Geol. Wiscons., vol. IV., p. 230, pl. 7, figs. 15 and 16.
Endoceras subannulatum, Whiteaves1891. Trans. Royal Soc. Canada, Vol. IX., Sect. 4, p. 77, pl. 5, figs. 2 and 2a.

"Numerous examples of a large annulated *Endoceras*, which in many respects agree fairly well with Professor Whitfield's description of this species, have been collected in the valley of the Red River, on the western shore of Lake Winnipeg and on many small islands in that lake. Specimens in which the annulations of the exterior are preserved were obtained at East Selkirk by Dr. Bell in 1880, by Messrs. T. C. Weston and A. McCharles in 1884 and by Mr. L. M. Lambe in 1890; at Grindstone Point, Lake Winnipeg, by Mr. Weston in 1884, and by Mr. J. B. Tyrrell in 1889; near Cat Head, by Mr. Donald Gunn in 1853;" at Little Black Island by Mr. Tyrrell in 1889, and by Messrs. Dowling and Lambe in 1890; at Snake, Jack Head, Little Black, and Big Sturgeon islands, by Messrs. Dowling and Lambe in 1890. "Very large but badly preserved specimens, which probably belong to the same species but which do not show the characteristic surface ornamentation, were col-

lected at Lower Fort Garry, and at Dog Head, Lake Winnipeg, by Mr. Weston in 1884; at Big Island, by Mr. Tyrrell in 1889; at Black Bear Island (near Snake Island), by Messrs. Dowling and Lambe in 1890; and at Commissioners (or Cranberry) Island by Mr. Dowling in 1890."

"The largest specimen in which any considerable portion of the test is preserved is the one from East Selkirk collected by Mr. McCharles, the posterior moiety of which is represented by fig. 2, on Plate 5" of the ninth volume of Transactions of the Royal Society of Canada. "It is upwards of seventeen inches and a half in length, three inches and a half in thickness at the smaller end and about four and a quarter at the larger. It is septate throughout, and its transverse annulations are comparatively narrow, there being five to an inch. The largest specimens without the test are upwards of two feet in length, and imperfect at both ends, while a large fragment, which, however, has been abnormally compressed, is eight inches in breadth by about fifteen in length. All of these also are septate throughout, and, so far, not a trace of the chamber of habitation can be found in any of the specimens from Manitoba. This is the more remarkable when it is borne in mind that the Wisconsin specimen of *E. subannulatum* figured by Professor Whitfield, which is represented as only two inches in breadth at the larger end, has no less than three inches and three-quarters of the body chamber preserved and only about an inch and three-quarters of the septate portion of the shell.

"In *Endoceras annulatum* the septa are stated to be 'more approximated than the annulations,' but in the present species the opposite is the case, the sutures of the septa being usually about twice as far apart as the breadth of the annulations. In the Manitoba specimens, which may possibly prove to be distinct from the typical *E. subannulatum*, there is a considerable amount of variation in the proportionate thickness of the annulations. Some medium-sized ones, a little less or a little more than two inches in thickness, have as few as three or four annulations to the inch and others as many as six. The annulations, although always rounded at the summit, are by no means always 'low,' as described by Professor Whitfield, but are often so prominent as to give a strongly ribbed appearance to the shell, and the concave spaces between them are not infrequently broader than the annulations themselves.

"Detached siphuncles of this species are by no means rare in Manitoba, the largest known to the writer (from Big Sturgeon Island) being fifteen inches and a-half in length, nearly one inch and a quarter thick at its smaller end, and two inches and an eighth at its larger. The very large and apparently single siphuncular sheath is elongated, conical and rather thin walled, the test of the wall being about half a millimetre thick. The endosiphon has not been observed."

ENDOCERAS (NARTHEOCERAS) CRASSISIPHONATUM, Whiteaves.

Endoceras crassisiphonatum, Whiteaves. . . . 1891. Trans. Royal Soc., vol. IX., sect. 4,
p. 79, pl. 6, figs. 1-4, and pl. 7, fig. 1.

Narthecoceras (Endoceras) crassisiphonatum.

Hyatt 1895. Amer. Geol., vol. XVI., p. 3.

"Siphuncle (the only part of the shell known) very long and thick, attaining apparently to a length of considerably more than four feet, circular in transverse section, nearly cylindrical, but alternately slightly swollen and as slightly constricted at distant but regular intervals, the constrictions, which cross the siphuncle somewhat obliquely, being probably caused by the overlapping of the posterior portion of the necks of the septa; increase in thickness very slow but regular, at the rate, so far as known, of three-tenths of an inch per foot; septa unknown, though the distances apart of the annular siphuncular constrictions and their obliquity seem to indicate that the septa also were widely distant, and the siphuncle itself either marginal or submarginal. Endosiphon narrow and nearly cylindrical posteriorly, but widening irregularly and gradually anteriorly. At the anterior end of the thickest specimen collected (which is represented in outline on Plates 6, fig. 4, and 7, fig. 1" of the paper in which the species was originally described) "the diameter of the endosiphon is a little more than half that of the siphuncle." "In another specimen (the original of figure 3 on Plate 6" of the same paper) "the interior of the narrow posterior end of the siphuncle appears to be portioned off by a few transverse concave dissepiments.

"Collected at Lower Fort Garry by Mr. Donald Gunn in 1858; and at East Selkirk by Dr. R. Bell in 1880, by Messrs. McCharles and Weston in 1884, and by Mr. Lambe in 1890.

"The most perfect specimen in the Survey collection, which it will be convenient to designate as No. 1, and which is represented in outline, one-fourth of the natural size, on Plate 6, fig. 1," of the paper already referred to, "was collected at East Selkirk by Mr. McCharles. Its actual length is three feet all but an inch, and it is obviously imperfect at both ends. It is the only specimen known to the writer in which the increase in thickness is very obvious. At the smaller end its maximum thickness is an inch and a tenth, and at the larger end just two inches. Its rate of increase, therefore, as already remarked, is three-tenths of an inch per foot.

"Another large fragment, collected by Mr. Lambe at East Selkirk, which is represented in outline, of natural size, on plate 6, fig. 1" of the paper quoted, "and which may be indicated as specimen No. 2, is about eight inches in length by two inches and three and a half-tenths in its maximum thickness at one end and not appreciably more at the

other. Judging by its thickness, No. 2 could very well have formed part of the anterior end of No. 1, and both are from the same locality. At the rate of taper of three-tenths of an inch per foot, it is estimated that specimen No. 1 would have to be eight inches longer anteriorly than it now is before it could be as thick as No. 2. This would give thirty-five inches for No. 1, eight for No. 2 and eight for the interval between them, or a total of four feet and a quarter for the siphuncle only, which, even then, would be imperfect at both ends.

"In their proportionate thickness and probably submarginal position, as well as in the irregularity and gradual expansion of their endosiphons, these siphuncles seem to agree better with those of *Endoceras* than with those of *Orthoceras* proper. Although no clearly defined sheath or sheaths have yet been detected in them, they appear to be most nearly related to that section of the genus *Endoceras* which Professor Hyatt has differentiated under the name *Sannionites*, Waldheim, and in this view of their affinities the writer's opinion was endorsed by Professor Hyatt," who, however, has since indicated a new genus of Endoceratidae, which he proposes to call *Narthecoceras*, and based upon these siphuncles and those of *Orthoceras Simpsoni*, Billings. Specifically, these siphuncles also seem to differ from those of *O. Simpsoni* in their huge size and proportionate thickness, but more especially in their more rapid increase in thickness, though this increase is still so very gradual as to be not readily appreciable in the comparatively short fragments that are usually obtained."

ENDOCERAS (NARTHECOCERAS) SIMPSONI, Billings. (Sp.)

- Orthoceras Simpsoni*, Billings 1859. In Hind's Rep. Assinib. and Saskatch.
Expl. Exped., p. 186, pl. 1, fig. 1.
" " Whiteaves..... 1891. Trans. Royal Soc. Canada, vol. IX.,
sect. 4, p. 80, pl. 7, figs. 2 and 2a, and pl.
8, fig. 1.
Narthecoceras (Endoceras) Simpsoni, Hyatt. 1895. Amer. Geol., vol. XVI., p. 3.

"The type of this species, which is still preserved in the Museum of the Geological Survey, was collected by Professor H. Youle Hind in 1858 at Cat Head, on the western shore of Lake Winnipeg, and is thus described by the late E. Billings. The specimen is a portion of the siphuncle, nine inches and one-fourth in length, eleven lines at the larger extremity, and ten at the smaller. It is nearly cylindrical, with a broad, shallow constriction above and below each of the narrow annulations which mark the attachment of the septa. There are eight of these septal rings at the following distances from each other, commencing at the smaller extremity: Between the 1st and 2nd, fourteen lines; 2nd and 3rd, twelve lines; 3rd and 4th, ten and a half lines; 4th and 5th, thirteen and a

half lines; 5th and 6th, fifteen lines; 6th and 7th, thirteen and a half lines; 7th and 8th, twelve and a half lines. The annulations are nearly at right angles to the length, and we must infer from this fact either that the septa are scarcely at all concave, or that the siphuncle must be central or very nearly so. If in an orthoceratite the septa are flat, then, no matter whether the siphuncle be central or not, the septal annulations must be at right angles, but if the septa are concave then the annulations will be oblique if the siphuncle be at all removed from the centre. My impression is, that this is a large orthoceratite with distant septa and a nearly central siphuncle, since the annulations have a scarcely perceptible obliquity.

"It is one of those species in which the siphuncle became gradually filled with a solid calcareous animal secretion, with the exception of a narrow cylindrical channel along the centre. This central canal is clearly indicated in the specimen and has a diameter of nearly two lines.

"Dedicated to Sir George Simpson, Governor of the Hudson's Bay Company."

Since this description was published, a few specimens of siphuncles with very similar characters to those of *O. Simpsoni*, and which are therefore probably referable to that species, have been collected at each of the following localities in or on Lake Winnipeg: Dog Head, T. C. Weston, 1884, and L. M. Lambe, 1890; Little Black Island, J. B. Tyrrell, 1889, and D. B. Dowling and L. M. Lambe, 1890; Snake Island, Messrs. Dowling and Lambe, 1890; and Commissioners Island, D. B. Dowling, 1890.

Some of the specimens from these localities are much longer and of course proportionately thicker than the type from Cat Head, but the increase in thickness in all of them is so slow as to be scarcely appreciable. In the type, the septal annulations certainly cross the siphuncle at nearly right angles, as described by Mr. Billings and as represented in his figure, a reproduction of which, in outline, is given on Plate 7, fig. 2, of the ninth volume of Transactions of the Royal Society of Canada, but in the majority of specimens there referred to *O. Simpsoni*, which have been collected since, this is by no means always the case. Thus, in a specimen from Dog Head, which is nearly two feet long and a portion of which is represented in outline on Plate 7, fig. 3, of the volume just referred to, the septal rings cross the siphuncle somewhat obliquely.

The only specimen, presumably referable to this species, in which any remains of the septa and outer shell are preserved, as well as the siphuncle, is the large fragment from Little Black Island, represented in outline by fig. 1 of Plate 8 of the volume cited. This specimen, which is about four inches in length and not quite three inches and a half in breadth, has been worn down on one side in such a way as to give a natural and

longitudinal section of the shell, showing the edges of the septa and the lateral margins next to the test, as well as the siphuncle. The latter is seen to be eccentric and sublateral but not quite marginal, and to occupy, at its thickest part, rather more than one-third of the entire diameter. As exposed in this section, the septa are seen to be rather deeply concave internally, but the nature of the markings of the exterior of the test is still unknown.

ACTINOCERAS RICHARDSONII, Stokes.

- Actinoceras Richardsonii*, Stokes.....1840. Trans. Geol. Soc. Lond., ser. 2, vol. V., pt. 3, p. 708, pl. 59, figs. 2 and 3.
? Ornoceras Brongniarti, D. Dale Owen.... 1852. Geol. Rep. Wisconsin, Iowa and Minn., p. 181.
Actinoceras Lynni, Whiteaves (non Stokes)..1880. Geol. Surv. Canada, Rep. Progr., 1878-79, pp. 460 and 480 of Appendix 1.
Actinoceras Richardsoni, Foord.....1888. Cat. Foss. Cephal. Brit. Mus., pt. 1, p. 172.
" " Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 83, pl. 9, figs. 1, 2 and 2a.

Western shore of Lake Winnipeg, "near the First and Second Rocky Points," north of the Saskatchewan, where specimens were collected by Sir John Richardson on Franklin's first expedition in 1814, and subsequently by Captain Back in 1832. Specimens have since been collected by Mr. Dowling, in 1891, at nearly or possibly the same place, viz., on the west shore of Lake Winnipeg, opposite the north end of Selkirk Island, and at the north end of that island; also at Clark's or Limestone Point, eleven miles north of the mouth of the Little Saskatchewan. It is apparently abundant at Lower Fort Garry, where it was collected by D. Dale Owen in 1848, by Sir James Hector in 1857, by Donald Gunn in 1858, by Dr. R. Bell in 1879 and 1880, and by T. C. Weston and A. McCharles in 1884. It occurs also at East Selkirk, where it was collected by Mr. Weston and Mr. McCharles in 1884.

This species is represented in the Museum of the Survey by a fine series of specimens from the Red River valley. These shew that the rate of tapering in some specimens is rather more rapid than has generally been supposed. Thus, in the original of fig. 1, on Plate 8, of the ninth volume of Transactions of the Royal Society of Canada, in a length of four inches the maximum diameter of the shell increases from thirty-seven millimetres at the smaller end to sixty at the larger. The outline of a transverse section is usually circular, except when the specimen has been abnormally compressed. The surface markings consist of rather regularly disposed transverse and imbricating striæ. The septa, as described by Mr. Foord, are "four lines distant where the shell has a diameter of three inches," and arch strongly forward and outward.

The very large submarginal and nummuloidal siphuncle varies in its proportionate size in different specimens, though its maximum diameter is usually more than half that of the shell. It is very strongly inflated between the septa, and both acutely and narrowly constricted at the places where they join it. In the longitudinal section of a specimen of this species represented by fig. 2 of Plate 9 of the volume referred to, the posterior segment of the siphuncle is thirty-six millimetres in maximum breadth and nine in height, while the last perfect segment anteriorly is forty-seven mm. in its greatest breadth by ten in height. The endosiphon and the lateral tubuli which proceed from it are all well shown in this and in similar sections.

Figures 3 and 3a on Plate 9 of the volume cited represent the apical extremity of what appears to be an abnormally flattened specimen of this species, in which the outline of a transverse section at the larger end (fig. 3a) is elliptical and not circular.

ACTINOCERAS BIGSBY? Bronn.

- Orthoceras*.....Bigsby.....1824. Trans. Geol. Soc. Lond., ser. 2, vol. I, p. 198, pl. 23, figs. 1 and 2 (but not 3).
Actinoceras Bigsbyi, Bronn.....1837. Lethæa Geogn., Bd. I., p. 98, taf. 1, f. 8 (after Bigsby).
 " " Stokes.....1840. Trans. Geol. Soc. Lond., ser. 2, vol. V., pt. 3, p. 797.
Actinoceras Lyonii, Stokes.....1840. *Ib.*, p. 797, pl. 59, fig. 1.
 " " Coste.....1843. Syst. Silur. de l'Amer. Septentr., p. 32, pl. 17, figs. 1, *a-b*.
Ormoceras tenuifilum, Hall.....1847. Pal. N. York, vol. I., p. 55, pls. 15, 16, and 17, figs. 1, *a-b*. Teste E. Billings, in Geol. Canada, 1863.
Ormoceras Lyonii, Hector.....1861. Quart. Jour. Geol. Soc. Lond., vol. XVII., p. 439 (Salter's determination).
Orthoceras Bigsbyi, Billings.....1863. Geol. Canada, p. 149, figs. 109, *a-b*, and Appendix, p. 949.
Orthoceras (Actinoceras) Bigsbyi, Barrande.....1874. Syst. Silur. de la Bohême, vol. I., Texte 3, p. 534, and pl. 231, figs. 4 and 5 (copied from Dr. Bigsby) and pl. 437, figs. 10-16.
Orthoceras (Ormoceras) tenuifilum, Barrande.....1874. *Ib.*, p. 754, pl. 237, figs. 5-7.
Actinoceras Bigsbyi, Foord.....1888. Cat. Ceph. Brit. Mus., p. 168.
 " " Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX., sec. 4, p. 84, pl. 10, fig. 2.

One of the species of fossils collected by Sir James Hector in 1857 at Lower Fort Garry was identified by the late Mr. Salter with *Ormoceras Lyonii*, which Mr. Foord includes among the synonyms of *Actinoceras Bigsbyi*, Bronn. Specimens, which the writer has referred to *A. Bigsbyi*, have since been collected in the Red River valley, at East Selkirk, by A. McCharles in 1884; and on or around Lake Winnipeg, at Little

Black Island, by J. B. Tyrrell in 1889 and by D. B. Dowling and L. M. Lambe in 1890; at Big Sturgeon Island by Mr. Dowling and Mr. Lambe in 1890; and at the mouth of the Fisher River by Mr. Dowling in 1891.

Although part of the test is preserved on some of the specimens from these localities, it is invariably so much worn or weathered as to shew no trace of the "longitudinal, undulated, thread-like lines" which suggested to Hall the specific name *tenuifilum*. The surface markings, however, are rarely preserved in specimens of *O. Bigsbyi* from the Black River or Trenton limestones of the provinces of Ontario or Quebec.

The siphuncles of the specimens from Lake Winnipeg and the Red River valley, which are here referred to *A. Bigsbyi*, are quite different in their contour to those of *A. Richardsoni*. In the former the siphuncle consists of prominent annular ridges, with deeply and obliquely excavated grooves between them, and the latter of a single series of large anchylosed nummuloidal discs, with rounded edges. A portion of a siphuncle, from Snake Island, Lake Winnipeg, which is crushed almost flat but somewhat obliquely, and which may represent an extreme form of *A. Bigsbyi*, has the annular ridges low and rounded and the grooves or constrictions between them unusually broad and shallow. The longitudinal section of a specimen from Little Black Island represented on Plate 10, fig. 2, of the ninth volume of Transactions of the Royal Society of Canada, "shews the opening of the large foramen directly into the endosiphon posteriorly, and some of the lateral canals or tubuli, which radiate first outward and then outward and forward, from the endosiphon. Not a vestige of the chamber of habitation of this species, nor of that of *A. Richardsoni*, has yet been discovered."

The types of *Actinoceras Bigsbyi* are from Thessalon Island, Lake Huron, where they were collected by Dr. Bigsby in 1820. In the "Geology of Canada" (1863), specimens which were identified by E. Billings with *A. Bigsbyi* (under the name *Orthoceras Bigsbyi*) are recorded as occurring, in Ontario, on Campement d'Ours Island, on the Palladeau, Manitoulin and Lacloche Islands and on Snake Island, in Lake Huron,—at Loughborough, Dickson's Mills, near Pakenham and Cornwall; in Quebec, at Point Claire (on the island of Montreal,) Montreal, St. Ambroise and Lake St. John. The specimens from Montreal are from the Trenton limestone, but all the others from the localities just cited, in the provinces of Ontario and Quebec, are from the Black River limestone.

ACTINOCERAS ALLUMETTENSE, Billings. (Sp.)

<i>Orthoceras Allumettense</i> , Billings.....	1857.	Geol. Surv. Canada, Rep. Progr. 1853-56, p. 331.
" "	Barrande.....1870.	Syst. Silur. de Bohême, vol. II., pl. 436, figs. 6-9.
" "	Barrande.....1874.	Ibid. texte III, p. 729.

Actinoceras Allumettense, Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX.
sect. 4, p. 85, pl. 10, figs. 3 and 3a.

Lower Fort Garry, Dr. R. Bell, 1880: a single specimen, a longitudinal section of which is figured in the publication last cited. The specimen is a little more than six inches in length, by nineteen millimetres in its maximum diameter at the smaller end and thirty-six at the larger. It was identified with the present species, with some confidence, after a careful comparison with four of Billings's types of *O. Allumettense*, from Paquette's Rapids, on the Ottawa River. A specimen collected by Messrs. Dowling and Lambe at Black Bear Island, Lake Winnipeg, in 1890, which consists of a natural but much weathered longitudinal section of the shell, about eight inches in length, in a piece of limestone, is also probably referable to this species.

A. Allumettense seems to be intermediate in its characters between *Actinoceras* and *Sactoceras*, and should, perhaps, be referred to the latter genus rather than to the former. Still, in the *Orthoceras Richteri* of Barrande, which is stated by Professor Hyatt to be the type of his genus *Sactoceras*, the height and breadth of the siphuncular segments, which are moniliform rather than nummuloidal, are represented as nearly equal, whereas in *A. Allumettense* these segments are nearly twice as broad as high, and therefore more nearly nummuloidal.

ACTINOCERAS (DEIROCERAS) PYTHON, Billings. (Sp.)

Orthoceras Python, Billings1857. Geol. Surv. Canada, Rep. Progr.
1853-56, p. 335.
Actinoceras (Deiroceras) python, Hyatt.....1883. Proc. Boston Soc. Nat. Hist., vol.
XXII, p. 273.

Clark's Point, on the west shore of Lake Winnipeg, about eleven miles north of the mouth of the Little Saskatchewan, D. B. Dowling, 1890: a natural mould of part of a siphuncle, shewing four of the "subglobular or oval expansions" characteristic of this species.

ACTINOCERAS (SACTOCERAS ?) CANADENSE, Whiteaves.

Sactoceras Canadense, Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX.,
p. 85, pl. X., figs. 1, a-c.
Orthoceras Canadense, S. A. Miller.....1892. First Appendix to N. Am. Geol. and
Paleont., p. 697. But not *Orthoceras*
Canadense, Billings, 1857, which, however,
is a synonym of *Huronia vertebralis*,
Stokes.

"Shell narrowly elongated, rather slender, somewhat fusiform, cylindro-conical and increasing very slowly in thickness from the posterior end to a short distance beyond the midlength, thence narrowing slightly to the aperture; length about six times greater than the maximum thickness;

dorsal and ventral regions compressed, though perhaps abnormally so, the outline of a transverse section through the thickest part, near to the body chamber, being broadly elliptical. Septate portion, in the only specimen known to the writer, occupying about two-thirds of the entire length, and divided into seventeen chambers, its apical extremity obtusely pointed; chamber of habitation nearly cylindrical, though its maximum diameter is about six millimetres greater at its commencement posteriorly than at the aperture. Surface markings unknown. Septa shallowly concave externally in the dorsal and ventral regions, their distance apart averaging about one-third the maximum diameter, except the two or three last formed, which are rather closer together. Siphuncle, as seen in a longitudinal section of the specimen, eccentric, submarginal, very large and much swollen between the septa posteriorly, but ultimately much diminishing in size towards the chamber of habitation. At the apex, posteriorly, nearly the whole of the first chamber is filled up with the first segment of the siphuncle, which is twelve millimetres in its maximum diameter. In the next five or six chambers, the siphuncular segments fill the greater part of the space, and average from fifteen to sixteen millimetres in their maximum diameter, after which the siphuncle decreases so rapidly in size that in the fourth chamber from the body chamber, the maximum diameter of the segment therein contained is only five mm. Dimensions of the specimen figured and described; total length, about nine inches, or 23 cm.; greatest thickness, 36 mm.; length of the septate portion of the shell, as measured in the median line of the section, 14.6 cm.; greatest diameter of the body chamber, 35 mm. posteriorly and 29 mm. anteriorly.

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889: one nearly perfect cast of the interior of the shell, with the whole of the siphuncle and septa well preserved.

"The internal structure of this species is essentially similar to that of the *Orthoceras docens* of Barrande, which Professor Hyatt regards as an aberrant member of his genus *Sartoceras*, but the external contour of these two shells seem to be quite different. The remarks which Professor Hyatt makes upon *S. docens*, however, are quite as applicable to the Canadian species. In reference to the former, he states that 'it is a transition form' but we place it in this genus because at an age when an *Actinoceras* would have the rosettes large and perfect, this species begins to lose them, and the siphon decreases also. The reduction of the siphon is a degradational senile shrinkage, and it occasions the loss of the rosettes. M. Barrande views this old stage of the siphon as a return to the tubular siphon, but in our opinion we cannot call this a tubular siphon. As a matter of fact it is a modified nummuloidal siphon, as may be seen by comparison with others."

ORTHOCERAS WINNIPEGENSE, Whiteaves.

Orthoceras Winnipegense, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. IX.,
sect. 4, p. 82, pl. 8, figs. 4 and 4, *a-b*.

"Shell narrowly elongated, somewhat fusiform, very slightly inflated in advance of the midlength; outline of transverse section nearly rounded but approaching to elliptical. Septate portion cylindro-conical, and increasing very slowly in thickness; chamber of habitation broadly but shallowly constricted in the middle, and a little narrower at the aperture than at its commencement. Surface markings unknown, though the interior of the test is marked by closely disposed and exceedingly minute, transverse raised lines. Septa, as shown in the longitudinal section represented by fig. 4b," on Plate 8, of the ninth volume of Transactions of the Royal Society of Canada, "seven millimetres and a half apart at the smaller end, and eight mm. at the larger, as measured at their broadest part, next to the siphuncle; siphuncle slightly eccentric, narrow, almost cylindrical, but faintly constricted at the septa."

Little Black Island, Lake Winnipeg, two specimens; and south end of Berens or Swampy Island, about eight miles from Little Black Island, one specimen; all three collected by Messrs. Dowling and Lambe in 1890.

The specimen from Little Black Island, which is figured on Plate 8, figure 4, of the publication already referred to, has about three inches of the chamber of habitation preserved and a little more than three and a-half of the septate portion. The specimen from Berens Island, which is septate throughout but imperfect at both ends, is five and a-half inches in length, by about thirty-six millimetres in its maximum diameter at the larger end and twenty-nine at the smaller.

ORTHOCERAS MAGNISULCATUM, Billings.

Orthoceras magnisulcatum, Billings. 1857. Geol. Surv. Canada, Rep. Progr.
1853-56, p. 330.

A characteristic specimen of this species, which was previously known only from a fragment an inch and a-half long, from the Hudson River formation at Charleton Point, Anticosti, was recently given to Mr. Tyrrell at Selkirk, Manitoba. The colour of the matrix shews that this specimen, which consists of a portion of the body chamber and of eight septa, is probably from the limestones of the Red River Valley or Lake Winnipeg, but the exact locality at which it was collected is unfortunately unknown.

ORTHOCERAS SELKIRKENSE, Whiteaves.

Orthoceras Selkirkense, Whiteaves. 1891. Trans. Royal Soc. Canada, vol. IX.,
sect. 4, p. 82, pl. 8, figs. 2 and 2, *a, b*.

"Shell very nearly cylindrical, but increasing in thickness at the rate of about one millimetre in two inches, and slightly compressed, the outline of its transverse section being rounded elliptical, with the larger diameter about one-fourth larger than the smaller. Surface marked with narrow but very prominent distant annulations, or transverse raised ridges, separated by flat intervals, which are about half as broad as the maximum diameter of the tube, and transversely costulate where the test is well preserved. Septa remote, each of the larger annulations of the test marking the commencement of a new septum, and shallowly concave internally, as seen in longitudinal sections through the centre of the tube; siphuncle rather large, placed near the margin of one of the flattened sides, and slightly contracted at the septa. Chamber of habitation unknown.

"The largest specimen collected is not quite five inches in length. At a distance of a little more than half an inch from its smaller extremity its maximum diameter is twenty-five millimetres, and at about a quarter of an inch from its larger end the greatest thickness is twenty-seven millimetres.

"East Selkirk, Manitoba; two specimens, both collected in 1884, one by Mr. T. C. Weston and the other by A. McCharles."

ORTHOCERAS ANELLUS, Conrad.

- Orthoceras anellus*, Conrad.....1843. Proc. Ac. Nat. Sc. Philad., vol. I., p. 334.
Orthoceras anellum, Hall.....1847. Pal. N. York, vol. I., p. 262, pl. 43, figs. 6 *a-f*.
 " " Whitfield.....1882. Geol. Wisconsin, vol. IV., p. 226, fig. 13.
Orthoceras anellus, Clarke.....1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 784, pl. 43, figs. 22 and 23.

West shore of Lake Winnipeg, about five miles north of Clark's Point, and sixteen north of the mouth of the Little Saskatchewan, D. B. Dowling, 1891: one badly preserved and abnormally compressed specimen.

TRIPTEROCERAS LAMBII, Whiteaves. (Sp.)

- Gonioceras Lambii*, Whiteaves.....1891. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 86, pl. 11, figs. 1 and 1 *a-b*.
Triptoceras Lambii, Clarke.....1897. Geol. Minn., Final Rep., vol. III., pt. 2, p. 793, pl. 56, figs. 1 and 2.

"Shell large, its body chamber unknown, the septate portion elongated, compressed conical, but increasing very slowly in size, strongly compressed on the dorsum and venter and broadly expanded at the sides, which are ultimately sharply angulated; lateral diameter a little more than twice the dorso-ventral, the exact proportions being as two to five; outline of

transverse section nearly lenticular, though the venter is a little flatter than the dorsum. Surface markings unknown. Septa rather closely approximated, their sutures averaging from ten to eleven millimetres apart on the median line of the dorsum, each suture being broadly concave on the dorsum and venter, and produced into a large obtusely pointed saddle on each of the lateral angles. Siphuncle ventral, marginal, strongly inflated between the septa, but very small proportionately, its thickest portion occupying not much more than one-seventh the maximum diameter of the tube. The constrictions between the siphonal inflations are very deep, and, when viewed in longitudinal section, appear as narrow incisions which cut obliquely backward and inward, on each side, thus giving a very peculiar appearance to the siphuncle.

"Approximate dimensions of the specimen described: length rather more than ten inches; maximum diameter, at the smaller end, five inches, the corresponding diameter at the larger end being six inches and a half."

East Selkirk, L. M. Lambé, 1890: a single specimen of the septate portion of the shell. Wekusko Lake, District of Saskatchewan, J. B. Tyrrell; 1896, a specimen which is also septate throughout, imperfect at both ends, and which measures about a foot in length, by seven inches and three-quarters at the larger end. Two specimens from the Galena limestone of Minnesota have recently been identified with this species by Dr. John M. Clarke.

TRIPTEROCERAS SEMIPLANATUM, Whiteaves. (Sp.)

Orthoceras semiplanatum, Whiteaves, 1891. Trans. Royal Soc. Canada, vol. IX., sect. 4, p. 81, pl. 8, figs. 3 and 3a.

Shell compressed subcylindrical, increasing very slowly in thickness (at the rate, so far as can be ascertained, of three millimetres and a half in a length of five centimetres), nearly planoconvex in transverse section, one side being broadly and very gently convex and the other nearly flat, the shorter of the two diameters of the tube being about one-third less than the longer, and the lateral margins narrowly rounded. Surface markings unknown: sutures of the septa shallowly concave on the flattened side, slightly convex on the other and closely approximated, the seven anterior chambers together measuring half an inch, on the median line of the flattened side: siphuncle small, cylindrical, placed close to the margin of the convex side.

"Lower Fort Garry, Dr. R. Bell, 1880: an imperfect and not very well preserved cast of the interior of the shell, not quite three inches and a half in length, and showing two inches and four-tenths of the body chamber, with about an inch of the septate portion. The species

resembles the *O. planoconvexum* of Hall, from the Trenton limestone of Wisconsin, in its planoconvex transverse section and in the close approximation of its septa, but differs therefrom in its much less rapid increase in thickness, less compressed sides, and, more particularly, in the entirely different position of its siphuncle, which latter, in *O. planoconvexum*, is said to be "centrally situated on the flattened side."

ASCOCERAS COSTULATUM, Whiteaves.

Plate 22, fig. 1.

Ascoceras costulatum, Whiteaves.....1896. Canad. Rec. Sc., vol. VI., p. 394.

"Shell large, elliptic-subovate, longer than broad, and broadest in advance of the midlength, the neck or anterior prolongation of the body chamber being broken off in the only specimen known to the writer; outline of transverse section in the broadest part apparently elliptical, the dorsum and venter being compressed and the sides slightly expanded.

"Surface transversely but rather finely ribbed, the ribs averaging from seven to nine in the length of one centimetre, and rather closer together near the aperture than in the more expanded portion.

"Sigmoidal septa apparently three in number, though their distances apart on the dorsum cannot be ascertained. The suture, however, which forms the line of demarcation between the decurrent extremity of the body chamber and the septate portion, on both sides, is clearly defined. It shows that the body chamber extends as far backward as to within about half an inch from the blunted pointed posterior end, that it is dilated or produced laterally, toward the dorsum, for a short distance posteriorly, and concavely constricted for a much longer distance anteriorly."

Little Black Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: a badly preserved cast of the interior of the shell, with one side much worn, but with portions of the test preserved on both the venter and dorsum.

"This species bears some resemblance to *A. Bohemicum* of Barrande, particularly in size and in the general style of its surface markings. The ribs or riblets of this Bohemian species, however, are represented as finer and very much more numerous. Thus, according to Lindström, in *A. Bohemicum* there are as many as twenty-two riblets in a length of five millimetres, and hence, presumably, forty-four to a centimetre, but in the present species there are only from seven to nine ribs to a centimetre. Among Canadian species, *A. costulatum* would seem to be nearest to *A. Canadense*, Billings, the type of Hyatt's genus *Billingsites*, and hence may be referable to that genus. The surface markings of *A. Canadense*, however, are still unknown, or at least not preserved in any of the specimens in the Museum of the Geological Survey."

POTERIOCERAS NOBILE, Whiteaves.

Poterioceras nobile, Whiteaves. 1889. Trans. Royal Soc. Canada, vol. VIII.,
sect. 4, p. 77, pl. 14, fig. 1.

"Shell very large, attaining to a length of upwards of seven inches, straight, subtruncate, about one-third longer than broad, and broadest a little in advance of the midlength, considerably inflated but slightly compressed, one side being flatter than the other, so that the outline of a transverse section through the broadest part would be nearly elliptical, and the" supposed "dorso-ventral diameter about one-fourth greater than the lateral. Septate portion increasing rather rapidly in size from the apex: body chamber rather large, occupying more than one-third but less than half the entire length, and narrowing gradually and somewhat convexly to the aperture: character of the aperture unknown, though, as far as can be made out in the most perfect specimen collected, it appears to have been simple and entire, as well as apparently rather large and subovate in outline.

"Sutures, or outer edges of the septa, nearly straight all round, parallel, and, in the specimen figured, placed at a distance of eight millimetres apart at or near the (imperfect) posterior end, while the four nearest to the body chamber appear to have been about fourteen millimetres apart. In places where the test has been broken off and the cast of the interior exposed, the septa are often seen to be coarsely crenulated. Surface markings and shape and position of the siphuncle unknown.

Dimensions of the most perfect specimen known to the writer (in which, however, about two chambers are broken off at the posterior end):—length, 177 millimetres; maximum dorso-ventral (?) diameter, 124 mm.; greatest lateral diameter (approximately) about 98 mm.

"East Selkirk, Manitoba, T. C. Weston, 1884: one badly preserved and somewhat distorted but otherwise nearly perfect specimen, and a large fragment of another, consisting of the greater part of the septate portion of the shell. Lower Fort Garry, Manitoba, T. C. Weston, 1884: one very imperfect specimen, consisting also of most of the chambered portion of the shell." Very large specimens, which are possibly referable to *P. nobile*, are indicated by two worn casts of the anterior extremity of the body chamber collected in 1890, the one, which is seven inches broad, by Messrs. Dowling and Lanbe at Berens or Swampy Island, and the other, which is six inches broad, by Mr. Dowling at Commissioners Island. Both are broadly ovate or ovately subcircular in a full front view, and both shew the infolding of the lip, which seems to be characteristic of the genus.

"This species is provisionally referred to *Poterioceras*, on account of its supposed simple and entire aperture, but it may prove to be a true *Gomphoceras*.

"The genus *Potrioceras* was thus originally defined by McCoy:—"Shell fusiform, short; mouth contracted; siphuncle dilated between the chambers, eccentric. Distinguished from the true *Orthoceratites* by its short fusiform contour, and contracted mouth." This diagnosis is accompanied by a small diagram, which shews that, although the body chamber narrows rapidly from its commencement up to the aperture, yet the aperture itself is simple and entire, and neither T-shaped or lobate as in *Gomphoceras*, nor contracted in the middle and expanded at both ends as in *Phragmoceras*.

"The validity of the genus *Potrioceras* is not recognized by Barrande, Fischer, Zittel and others, who place the name among the synonyms of *Gomphoceras*. On the other hand, in the first part of his Monograph of the British Fossil Cephalopoda," Professor J. F. Blake "accords full generic rank to *Potrioceras* on the ground that 'the only species described by McCoy, as well as his diagram, indicates a genus with the form of a *Gomphoceras* without its peculiar aperture.' In the same volume, Professor Blake contends that *Oncoceras*, Hall, is synonymous with *Potrioceras*, and states that Professor Hall's "actual type, as well as others which have been referred to the genus, in no respects differ from McCoy's genus. To this contention the present writer feels compelled to demur, as the statement by which it is supported seems to be at variance with the known facts of the case. If the genus *Potrioceras* is to be retained at all, in the sense in which it was defined by McCoy, the name will probably have to be restricted to those straight *Gomphoceras*-like shells in which the aperture is simple and entire, and it is in accordance with this definition of its character that the name will be used in the present paper. In *Oncoceras*, on the other hand, the shell is always distinctly curved and inflated in a peculiar manner in advance of the midlength, while its body chamber is transversely constricted just behind the aperture. According to Professor Hall the aperture of *Oncoceras* is constricted, but as Mr. E. Billings asserts that it is oval,* the constriction referred to by Hall may have been meant to refer to that immediately behind the aperture."

In the outline drawing of the type of the species on Plate 14 of the seventh volume of Transactions of the Royal Society of Canada, although the contour and exact dimensions of the original are correctly represented, the sutural lines are slightly restored and the supposed outline of the aperture, on one side of the specimen, is indicated by a dotted line.

POTRIOCERAS APERTUM, Whiteaves.

Potrioceras apertum, Whiteaves. 1889. Trans. Royal Soc. Canada, vol. VII.,
sect. 4, p. 78, pl. 14, figs. 2-4; and (1891)
ibid., vol. IX., p. 87, pl. 11, figs. 2 and 3.

* Geological Survey of Canada, Rep. Progr. 1853-56, p. 311.

Shell much smaller than that of the preceding species, straight, though in some specimens there is a scarcely perceptible curvature at the apical end, varying in contour from ovately subfusiform to rather narrowly subovate, about one-third longer than broad in the largest and most perfect specimen known to the writer, and somewhat compressed, so that the outline of a transverse section in the broadest part would be elliptical or ovately subelliptical: body-chamber truncated transversely at the anterior end. Septate portion narrowly rounded at the apex in some specimens, but more pointed in others, compressed conical and increasing rather rapidly in size: body-chamber occupying about one-third of the total length, and narrowing very gently and in some specimens somewhat convexly towards and up to its anterior termination: aperture apparently large, simple, open, and not much narrower than the posterior part of the body-chamber: lip infolded.

The surface markings are very imperfectly preserved, but the test appears to have been nearly smooth and marked only with a few faint lines of growth.

Sutures almost straight and parallel, the last two, at least, being coarsely crenulated: siphuncle inflated between the septa, placed near the margin and a short distance from the middle of one of the flattened sides.

The dimensions of the largest specimen collected (the original of Plate 14, section 4, fig. 2, of the seventh volume of Transactions of the Royal Society of Canada) are as follows:—length, 124 millimetres (or nearly five inches); maximum breadth, seventy-four mm.; greatest diameter from the siphonal to the antisiphonal side, fifty-eight mm. In the specimen represented by fig. 3 on the same plate, the length along the median line is sixty-six millimetres, the maximum breadth forty-seven mm., and the greatest diameter from the siphonal to the antisiphonal side, forty mm.

Dog Head, Lake Winnipeg, T. C. Weston, 1884, and D. B. Dowling, 1891; Little Black Island, J. B. Tyrrell, 1889, and D. B. Dowling and L. M. Lambe, 1890; and Cat Head, Messrs. Dowling and Lambe, 1890: a few specimens from each of these localities.

This species possesses many characters that are common to it and to the brevicone *Orthoceratites* for which Professor Hyatt has constituted the genus *Rioceras*, but it differs materially from that group or genus in the circumstance that its body chamber always narrows distinctly from its commencement to the aperture. From *P. mobile* it seems to be readily separable by its much smaller size, more slender contour, and more compressed sides.

In Professor Blake's original description of *P. intortum* * (which, by the way, seems to be very closely allied to *P. apertum*) the following

* On page 187 of the first part of his "Monograph of the British Fossil Cephalopoda," London, 1882.

sentence occurs: "The shell thickens near the aperture, but at last a sudden inbending takes place to an opening much smaller than the general section. This may, of course, be an abnormal feature." The thickening of the shell towards the aperture and its "sudden inbending" are so well shown in the two specimens of *P. apertum* from Little Black Island, represented on Plate 11, section 4, of the ninth volume of Transactions of the Royal Society of Canada, that these characters can scarcely be considered as accidental or even abnormal. The original of fig. 2, on this plate, is slightly and rather irregularly worn down in the siphonal region, in such a way as to give a natural and longitudinal section of the whole shell, very near to the surface. Posteriorly, the weathering of this specimen exposes six or seven of the septa and five segments of the very eccentric siphuncle. Anteriorly, it gives a section of the whole of the body chamber, and, more particularly, of the thickening and inbending of the test at the aperture, though in this particular specimen the thickening and inbending happen to be very slight. The specimen whose aperture only is represented by fig. 3 on the same plate is so weathered as to give a natural and longitudinal section of part of the shell, but the section of the aperture is nearly through the centre of the latter. In this specimen the thickening and infolding of the test at the aperture are strongly marked, the test being fully six millimetres thick at its recurved extremity, and the aperture appreciably diminished in size by the infolding of the lip.

As stated elsewhere,* in the original description of this species, of *Oncoceras pugnum*, *O. gibbosum* (Whiteaves not Hall, = *O. Whiteavesii*, Miller) and *Cyrtoceras Manitobense*, their convex sides were inadvertently designated as dorsal and their straighter sides as ventral, in accordance with the old terminology. In the amended descriptions of these species in this Report, the use of such terms as ventral, dorsal and the like is purposely avoided, as it is not quite clear which is really the venter and which the dorsum of either.

POTERIOCERAS GRACILE, Whiteaves.

Poterioceras gracile, Whiteaves.....1892. Trans. Royal Soc. Canada, vol. IX.,
sect. 4, p. 87, pl. 12, figs. 4 and 4, a-b.

"Shell fusiform, strongly compressed, straight and rather slender, flattened conical and obtusely pointed posteriorly, thickest at the mid-length, where it is very gently convex, thence narrowing gradually and very slightly towards the aperture, which apparently is simple and broadly truncated; immediately behind the aperture there is a faint annular constriction: siphonal and antisiphonal regions narrowly rounded:

* In a foot note to page 102, sect. 4, of the eighth volume of Transactions of the Royal Society of Canada.

sides compressed, somewhat expanded, especially at the midlength and anteriorly; chamber of habitation occupying about one-third of the entire length, which latter is more than twice but less than three times the maximum breadth; outline of transverse section, in the thickest part, elliptical, with the longer axis of the ellipse not quite twice the length of the shorter; surface showing indications of fine transverse costae, though the exterior of the test is not very well preserved. Septa rather closely approximated and averaging about three millimetres apart; siphuncle nearly marginal, moniliform, and slightly inflated between the septa, the maximum breadth of each siphuncular segment being one-third less than its height or depth."

Approximate dimensions of the only specimen known to the writer: length, eighty-six millimetres; greatest breadth, thirty-three mm.; maximum diameter at a right angle to the breadth or length, nineteen mm.

Little Black Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen, which is almost if not quite equilateral in its broadest aspect.

ONCOCERAS MAGNUM, Whiteaves.

Oncoceras magnum, Whiteaves,.....1889. Trans. Royal Soc. Canada, vol. VII, sect. 4, p. 79, pl. 15, fig. 1.

Shell large, slightly compressed, somewhat fusiform and contracted at both ends, but convexly curved, prominent, tumid and gibbous near the midlength, on the antisiphonal side, and nearly straight on the opposite or siphonal side; outline of transverse section in the thickest part broadly elliptical or subovate. Septate portion broadening rather slowly, on the antisiphonal side, to a point a little in advance of the midlength, after which it narrows somewhat more rapidly to the commencement of the body chamber. On the siphonal side the margin of the septate portion is shallowly concave posteriorly and slightly convex anteriorly. Body chamber oblique, short, occupying about one-third the entire length, contracted and obliquely truncated anteriorly. At its commencement posteriorly the body chamber is broad and bounded by a rather deep, obliquely transverse groove, which is almost parallel to the septa nearest to it; in front of this groove the chamber narrows rapidly, but at first convexly, towards the aperture, behind which there is a broad and shallowly concave constriction. Shape of the aperture not certainly known, but it appears to have been simple, entire, subovate and rather narrow.

Sutures nearly straight but slightly arched posteriorly; oblique anteriorly, rather wide apart on the antisiphonal side, and faintly convex on its median line,—much closer together on the siphonal side and slightly concave on its median line: siphuncle inflated between the septa, nummuloidal, and placed very near to the margin of the straighter side.

Surface markings unknown.

Approximate dimensions of the most perfect specimen known to the writer, which is imperfect at the posterior end: 180 millimetres, or a little more than seven inches; maximum breadth, from the siphonal to the antisiphonal side, 106 mm.

This specimen, which is figured in the seventh volume of Transactions of the Royal Society of Canada, is a cast of the interior of the shell, collected by Mr. W. Chesterton at East Selkirk and presented to the Museum of the Survey in 1888 by the Historical and Scientific Society of Manitoba. A larger but less perfect specimen in the Museum of the Survey was collected at East Selkirk in 1884 by Mr. T. C. Weston.

ONCOCERAS (MAGNUM? var.) INTERMEDIUM.

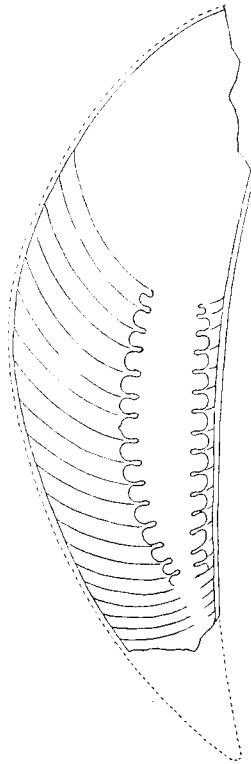


Fig. 13. *Oncoceras* (*magnum?* var.) *intermedium*. Outline of a longitudinal section of the only specimen known to the writer, one-half the natural size.

Shell elongated, slightly curved, narrowly subfusiform, but much narrower at the posterior than at the anterior end: antisiphonal side gently convex and broadly arched: siphonal side almost straight but faintly concave.

Septate portion conical: septa, as seen in a longitudinal section, rather closely approximated, the sutures of the last twelve or fourteen averaging from five to six millimetres apart: siphuncle large, occupying nearly one-half the entire diameter in the broadest part, but narrowing rather abruptly near the body chamber, nummuloidal, expanded between the septa and placed near the margin of the concave side.

Surface markings unknown.

Little Black Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen, which is much narrower in proportion to its length than *O. magnum* and not nearly so prominent or gibbous on the anti-siphonal side, but it is doubtful whether it should be regarded as a mere variety of that species or as a distinct species.

ONCOCERAS WHITEAVESII, Miller.

- Oncoceras gibbosum*, Whiteaves, 1889. Trans. Royal Soc. Canada, vol. VII., sect. 4, p. 80, pl. 15, figs. 2 and 3. But not *O. gibbosum*, Hall, 1852.
Whiteavesii, Miller 1892. First Append. to N. Amer. Geol. and Paleont., p. 697.

Shell resembling that of *O. magnum* in form, though perhaps a little broader in proportion to its length, also in the characters of its interior, but apparently always differing therefrom in its very much smaller size. Thus, the smallest specimen of *O. magnum* known to the writer must have been at least eight inches in length when perfect and the largest fully eleven, whereas in the present species, out of twenty-seven specimens collected, the smallest could not have been much more than three inches and a half long when perfect and the largest four and a half. These two series of specimens, too, do not seem to be connected by any intermediate gradations in size. The surface markings of *O. magnum* are still unknown, but the surface of the test of the septate portion of *O. Whiteavesii* is marked with very small, low, faint, closely and regularly disposed, straight, transverse ribs.

Big Island, Washow Bay, Bull Head Bay, and Pike Head, Lake Winnipeg, T. C. Weston, 1884: three specimens from Pike Head and one from each of the other localities. Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889, seven specimens, and D. B. Dowling and L. M. Lambe, 1890, ten specimens. Little Tamarack Island, Commissioners' Island, and Clark's Point, Lake Winnipeg, D. B. Dowling, 1890: one specimen from each of these localities. North end of Big Island, D. B. Dowling, 1891: one specimen.

CYRTOCERAS MANITOBENSE, Whiteaves.

Cyrtoceras Manitobense, Whiteaves. 1889. Trans. Royal Soc. Canada, vol. VII.,
sect. 4, p. 80, pl. 13, figs. 3 and 4, and pl.
15, fig. 4.

Shell very slightly curved, slender, elongated and narrowly subfusiform, moderately inflated a little in advance of the mid-length, though the siphonal side, in a full lateral view, is much more convexly curved than the antisiphonal; posterior extremity narrower and more pointed than the anterior; body chamber short, occupying less than one-third of the entire length, and narrowing gradually to the somewhat obliquely truncated anterior end; aperture rather large, simple and open, with a broad and shallowly concave constriction immediately behind it, but only on the antisiphonal side; outline of a transverse section through the broadest part ovate, the siphonal side being narrower than the antisiphonal.

On the septate portion of most of the specimens collected, the surface of the test is marked by low, rounded, longitudinal ribs, but in some flattened fragments from Inmost Island, which are apparently referable to this species, there are very distinct transverse crenate raised lines between the ribs.

Sutural lines concavely arched on the sides, produced into moderately elevated and simple saddles on the siphonal side, and into similar but less prominent saddles on the antisiphonal side. Siphuncle placed at a short distance from the margin of the convex side. In the longitudinal section of a specimen from Bull's Head figured on Plate 15 of the seventh volume of Transactions of the Royal Society of Canada, the siphuncle appears to be very slightly expanded between the septa.

Dimensions of the most perfect specimen collected: actual length along the median line of one of the sides, 129 mm.; estimated total length of the same, when perfect, 133.5 mm.; maximum diameter of the same, from the siphonal to the antisiphonal side, 34.5 mm.; greatest lateral diameter 31.5.

Big, Deer and Punk islands, Big Grindstone Point, Bull's Head, Dog Head and Pike Head, Lake Winnipeg, T. C. Weston: two nearly perfect specimens, one from Big Island and one from Bull's Head, those from the other localities being for the most part only pieces of the posterior and septate portion of the shell.

Deer Island, Lake Winnipeg, J. B. Tyrrell, 1889: the most perfect specimen known to the writer.

A fine specimen of a *Cyrtoceras*, collected by Dr. R. Bell in 1879 at the second rapid of the Nelson River, Keewatin, may also be referable to *C. Manitobense*, though it differs somewhat from that species in the size,

shape and position of its siphuncle. As seen in a longitudinal section, the siphuncle of the Nelson River specimen is nummuloidal, expanded, about twice as broad as high between the septa, and placed at a distance not much less than its maximum breadth from the margin of the side of the convex curve.

CYRTOCERAS LATICURVATUM, Whiteaves.

Cyrtoceras laticurvatum, Whiteaves, 1896. Canad. Rec. Sc., vol. VI., p. 365.

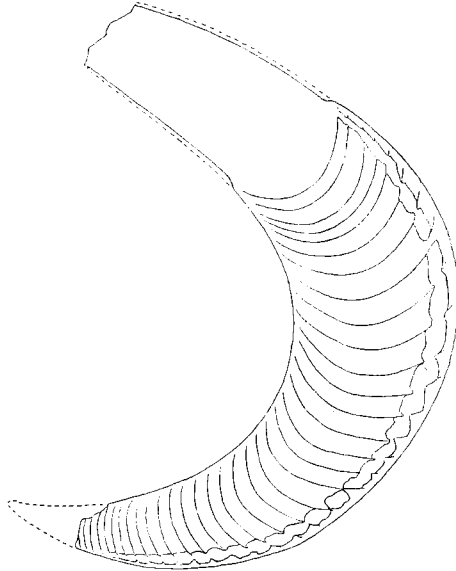


Fig. 14. *Cyrtoceras laticurvatum*. Outline of a longitudinal section of a specimen from Little Black Island, one-half the natural size.

"Shell large (attaining to a length of about twelve inches, as measured along the convex and presumably ventral curve), narrowly fusiform and broadest at a short distance from the body chamber, elongated, slender and so much curved as to form a broad semicircular arch, which is straighter anteriorly than posteriorly: sides compressed, the outline of a transverse section of the broadest part being elliptical: body chamber compressed cylindrical, more than twice as long as broad, and occupying about one-third of the entire length.

"Surface markings unknown, though there are indications of faint longitudinal ribs on one of the casts.

"Longitudinal sections shew that the septa (thirty-five of which can be counted in one specimen) are strongly concave and about seven or eight millimetres apart near the body chamber, but much closer together at the posterior end, also that the siphuncle is almost cylindrical, but slightly contracted at the septa," "and placed at a distance about equal to its own breadth from the margin of the convex (ventral) side."

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889 (four specimens), and D. B. Dowling and L. M. Lambe, 1890 (three specimens). Jack Fish Island, Lake Winnipeg, Messrs. Dowling and Lambe, 1890 (one specimen), Commissioners or Cranberry Island (one specimen), and Point off Moose Creek, eight miles southwest of Whiteway Point (one specimen), D. B. Dowling, 1890. All the specimens from these localities are mere casts of the interior of the shell, but the septa and siphuncle are usually well preserved.

EURYSTOMITES *PLICATUS*, Whiteaves.

Eurystomites plicatus, Whiteaves... 1896. Canad. Rec. Sc., vol. VI., p. 395.

Plate 22, fig. 2

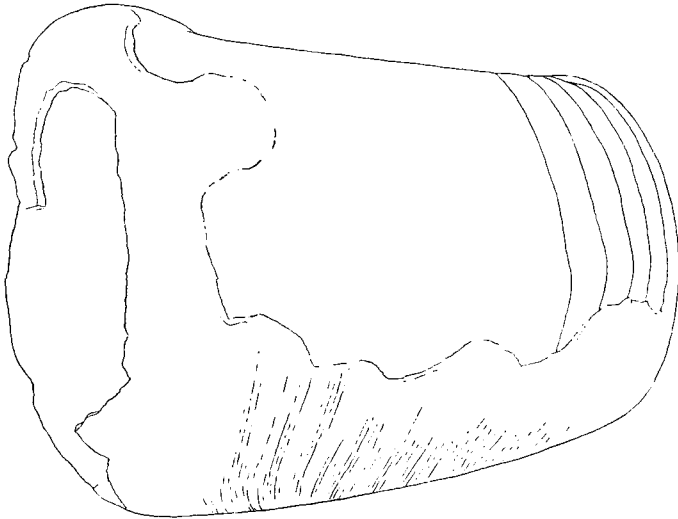


Fig. 15. *Eurystomites plicatus*. Outline of the convex, outer and probably ventral side of a specimen from Little Black Island, shewing the body chamber and five of the septa. Natural size.

"Shell involute, volutions apparently one and a half, coiled closely on the same plane but without embracing, strongly compressed on the venter and dorsum and increasing very slowly in the ventro-dorsal diameter, but

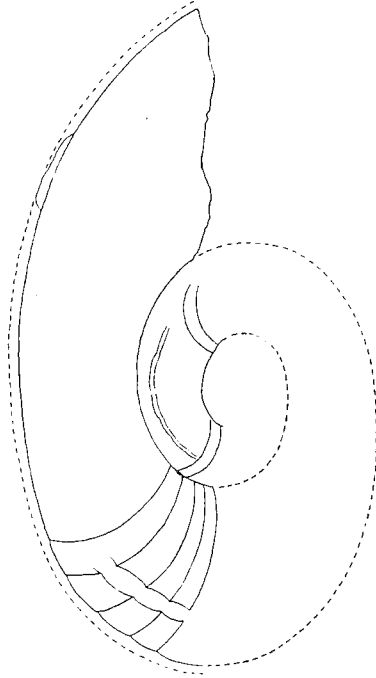


Fig. 16. *Everstonites plicatus*. Outline of a longitudinal section through the same specimen, showing the shape and position of the siphuncle, and the apparent decollation of the earlier volutions. Natural size.

expanding and widening rapidly at the sides, which are rounded and gibbous, the outline of a transverse section of the chamber of habitation near the aperture being broadly reniform, with the lateral diameter about three times greater than the dorso-ventral, and the dorsum impressed by a shallow and rather narrow furrow of contact: umbilical perforation large and deep.

"Surface marked with rather broad, low, rounded, flexuous, transverse plications, and crowded striae parallel to the plications, both between and upon them.

"A longitudinal section through the centre of one of the specimens shews that the cut edges of the concave septa are about two millimetres

apart on the dorsum, and seven mm. on the venter, near the body chamber, that the siphuncle is placed about half-way between the centre and the venter, and that it is almost cylindrical, but slightly constricted at or near each of the septa."

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889, two specimens, and D. B. Dowling and L. M. Lambe, 1890, two specimens.

"These are referred to the genus *Eurystomites*, Schröder, on the authority of Professor Hyatt, to whom one of the most perfect specimens was sent for examination. In a letter recently received, Professor Hyatt says of this specimen: 'The suture has a decided broad ventral lobe and lateral lobes, and internally there is an impressed zone showing a true close coiled nautilian form. The siphuncle is ventrad of the centre, small and with delicate walls.' *Nautilus Hercules* of Billings, from the Hudson River formation of the Island of Anticosti, which Hyatt doubtfully refers to the genus *Litoceras*, has a broad flattened venter and a similar kind of coiling to that of *E. plicatus*, but both sides of the outer volution of *Nautilus Hercules* are distinctly angular."

DISCOCERAS CANADENSE. (N. Sp.)

Plate 22, figs. 3 and 3a.

Shell discoidal, whorls three, coiled apparently in the same plane, or very nearly so, in close contact but with little or no overlapping, the outer one, where least distorted, slightly compressed at the sides and rounded on the venter or periphery, so that the outline of a transverse section would be broadly elliptical or nearly circular: umbilicus wide, open and shallow, exposing nearly the whole of the inner volutions: body chamber occupying about one-half of the outer volution.

Surface of the two outer volutions marked by rather prominent simple ribs or rib like folds, which curve obliquely backward and form a series of deeply angular sinuses on the venter, and are separated by rather broad, concave grooves. Inner volution nearly smooth, marked only with fine and crowded transverse striae.

Siphuncle placed near the margin of the inner and probably dorsal side: sutures of the septa unknown.

Maximum diameter of the most perfect specimen collected: two inches and a half.

Little Black Island, Lake Winnipeg, J. B. Tyrrell, 1889, one specimen; and Commissioners (or Cranberry) Island, D. B. Dowling, 1890, the specimen figured. The slight lateral flattening observable on both of them is apparently abnormal and probably due to compression subsequent to their fossilization.

This species is placed in the genus *Discoceras* solely on a count of the dorsal position of its siphuncle, and at the suggestion of Professor Hyatt, who has seen one of the specimens. Externally it is very similar, especially in the style of its surface markings, to the fossil from Lorette, in the province of Quebec, which Mr. A. H. Foord described and figured under the name *Trochoceras Halli* on page 42, figs. 4, *a-b*, of the second part of his Catalogue of the Fossil Cephalopoda of the British Museum, but in specimens from several localities in that province, in the Museum of the Survey, which are apparently referable to *T. Halli*, the siphuncle is placed on the venter.

TROCHOCERAS (?) McCHARLESII, Whiteaves.

Trochoceras McCharlesii, Whiteaves, 1889. Trans. Royal Soc. Canada, vol. VII.,
sect. 4, p. 81, pl. 16.

"Shell very large (the only specimen known to the writer, which is septate throughout, having a maximum diameter of ten inches and a-half) and composed of about three apparently separate but closely contiguous volutions, which are circular in transverse section, and which increase rather slowly in size: they are also slightly asymmetrical and enrolled on very nearly but not quite the same plane, the spire being sunk a little below the highest level of the outer whorl.

"Surface of the outer volution marked by very numerous, close-set, rounded and flexuous ribs, which are rather narrow but unequal in size, with an average breadth of about three millimetres." Across the sides the ribs curve obliquely and convexly backward and outward, and on the periphery each rib makes a broad, shallowly concave and backwardly directed sinus.

On and near the periphery or venter, the only place where they happen to be visible, the sutural lines run parallel with the ribs on the test, though the former are placed much further apart, the average distance between them being about nineteen millimetres. Position of the siphuncle unknown.

The specimen upon which this species was based was collected at East Selkirk by Mr. A. McCharles in 1884. About one-third of this specimen has been broken off, but the part remaining presents a very instructive transverse section of the shell at a right angle to the direction of the volutions. A considerable portion of the test is well preserved on the outer volution, and in those places where the test has been accidentally removed, the characters of the septa are well shown. The two inner whorls are not nearly so well preserved as the outer volution, and the asymmetry and separation of all three are best exhibited in the transverse section afforded by the specimen.

A few specimens showing traces of a similar surface ornamentation, which are therefore possibly referable to this species, were collected at Little Black Island, Lake Winnipeg, by J. B. Tyrrell in 1889, and by D. B. Dowling and L. M. Lambe in 1890. One of these is a rough cast of one side of the greater part of the outer volution (with a small portion of the test preserved) about twenty-seven inches in length, as measured along the middle of the side and following its curve, the septate portion occupying about nine inches thereof posteriorly. This specimen, which appears to have been abnormally compressed laterally, is about four inches and three-quarters in its dorso-ventral diameter posteriorly and about five inches anteriorly. It is regularly curved posteriorly, but straighter anteriorly. Another is a rough cast of one side of an almost straight but very slightly curved and much more slender specimen, which is sixteen inches in length, as measured along the middle of the gentle curve of the side, and two inches and three quarters in its dorso-ventral diameter at about the midlength. A third is a mould of the exterior of one side of the outer volution, upwards of six inches in diameter, and shewing posteriorly impressions of fine transverse ribs, but much worn and indefinite anteriorly. In another large fragment from this locality the ribbing is unusually fine and the ribs average scarcely a millimetre in breadth. All four, however, are much too imperfect and too badly preserved to be satisfactorily determined.

In addition to these, a few coarse and very imperfect casts of large nautilian or gyroceran shells, which represent at least two and perhaps more species, but which shew no indications of the position of the siphuncle, nor any trace of the surface markings, and which cannot at present be determined even generically, were collected at Dog Head by Mr. Weston in 1884, and at Clark's Point and the mouth of the Little Saskatchewan by Mr. Dowling in 1890. In most of these specimens, if not in all, the sutures of the septa appear to curve concavely backward on each of the sides, and probably form single, convex saddles on the periphery, whereas in *Trochoceras McCharlesii* the sutures curve convexly forward on the sides, and concavely backward on the periphery.

CRUSTACEA.

OSTRACODA.

APARCHITES WHITEAVESII, Jones.

Aparchites Whiteavesii, Jones 1889. Ann. and Mag. Nat. Hist., ser. 6., vol. III., p. 384, pl. 17, fig. 10, and woodcuts 5 and 6 on p. 385.

Lower Fort Garry (in the parish of St. Andrews), Dr. R. Bell, 1880 : a cast of the interior of both valves.

A "subglobular Leperditoid Ostracod, with strong dorsal angles fore and aft, and a steep postero-dorsal and more gentle antero-dorsal slope, the former falling into a bolder curve than the latter; and with the ventral outline almost semicircular. The ventral and end margins of the united valves are thick and bevelled inwards, and slightly fluted there." Professor T. Rupert Jones (op. cit.).

APARCHITES PARVULUS, Jones. (Sp. nov.)

Plate 22, figs. 4, *a-c*.

"The specimen figured is an *Aparchites*, and it is related to *A. subovatus*, Jones, from the Lower Silurian strata of Dufton, Westmoreland,* and of Girvan, Scotland.† It has not, however, exactly the same outline as any of the figured specimens, and it is decidedly more convex along the median line than any of them. It is elongate-ovate in shape; smooth, cream-coloured, in a soft, whitish limestone. The difference above mentioned lead me to regard it as a distinct species, which I name *Aparchites parvulus*.

"It is too narrow and too convex for *Aparchites Billingsii*, Jones,‡ and very much smaller, being only three millimetres long by one mm. and a half high." Professor Jones, in a letter to the writer, received 4th July, 1896.

Little Black Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890 : a single right valve.

For the preceding description and the drawings reproduced on Plate 22 (figs. 4, *a-c*), the writer is indebted to Professor Jones.

* Quarterly Journal of the Geological Society of London, vol. XLIX. (1893), p. 292, pl. 12, figs. 7 and 8.

† Ibidem, p. 297, pl. 13, figs. 4 and 5.

‡ Annals and Magazine of Natural History. Series 5, vol. VIII. (1881), p. 345 (*Leperditia*), pl. 20, figs. 9, *a-b*.

Aparchites Billingsii, the *Leperditia Billingsii* of Jones, which was supposed by its describer to be from the "Lower Silurian (Trenton?) strata near (to the west of) Lake Winnipeg and north of Lake Superior," is distinctly stated in Mr. S. J. Dawson's Report* to have been collected from the "limestone of Lake Winnipegosis" (*i.e.*, Lake Winnipegosis), and is therefore either a Devonian or Silurian (Upper Silurian) species.

TRILOBITA.

CALYMENE SENARIA, (Conrad) Owen.

Calymene senaria, (Conrad) Owen. 1852. Rep. Geol. Surv. Wisconsin, Iowa and Minn., p. 181.

Lower Fort Garry, D. Dale Owen, 1848. No specimens of this species have yet been recognized in any of the Survey collections of fossils from the Winnipeg or Red River limestones, though it is possible that the cephalon, minus the free cheeks, of a very small trilobite from the Hudson River formation at Stony Mountain, which was referred to the *Calymene callicephala* of Green, with some doubt, on page 128 of this volume, may be referable to *C. senaria*.

ASAPHUS (ISOTELUS) SUSSE, Whitfield.

Asaphus Susse (Calvin, M. S.) Whitfield. 1882. Geol. Wisconsin, vol. IV., p. 235, pl. 5, fig. 3, and pl. 10, fig. 8.

Isotelus Susse, Clarke, 1894. 1894. Lower Silur. Trilob. Minn. (advance copies fr. Geol. Minn., Final Rep., vol. III., pt. 2), p. 708, figs. 10 and 11.

Cfr. *Asaphus platycephalus*, as figured by E. Billings in Geol. Canada (1863), p. 184, fig. 183; and in Cat. Silur. Foss. Isl. Anticosti (1866), p. 24, fig. 7.

Lower Fort Garry, T. C. Weston, 1884; East Selkirk, A. McCharles, 1884; and Inmost or Birch Island, Lake Winnipeg, D. B. Dowling and L. M. Lambe, 1890: one specimen from each of these localities. The most perfect of these is the fine doubled up specimen from East Selkirk kindly presented by Mr. McCharles, which shews most of one of the large and very prominent eyes, but only very small portions of the crust are preserved on any of them. A doubled up specimen of *A. Susse*, labelled "Selkirk Settlement,† Donald Gunn (No. 1176)," and belonging to the United States National Museum, has also been lent to the writer, for comparison, by the authorities of that institution. Each of these specimens agrees perfectly with the original description and figures of *A. Susse*, especially in the very broadly rounded outer margins of the glabella and pygidium, and three of them show the rounding of the

* "Report on the Exploration of the Country between Lake Superior and the Red River Settlement," Toronto, 1859, p. 18.

† Practically the same place as Lower Fort Garry.

genal angles very clearly. Still, it is most probable that *A. Susae* is nothing more than a broad, short form of the *Isotelus gigas* of De Kay, the *Asaphus platycephalus* of Canadian and some United States palaeontologists. The writer can see practically no difference between *Isotelus Susae*, as figured by Dr. Clarke on page 708 of the "Lower Silurian Trilobites of Minnesota," and *Asaphus platycephalus*, as previously figured by E. Billings in the "Geology of Canada" and in the "Catalogues of the Silurian Fossils of the Island of Anticosti."

A glabella collected at Little Black Island by Mr. Tyrrell in 1889, which is four inches in length but imperfect laterally, and very broadly rounded in front, may have formed part of a very large specimen of *A. Susae*.

ASAPHUS (ISOTELUS) GIGAS, De Kay.

- ? *Asaphus platycephalus*, Stokes 1822. Trans. Geol. Soc. Lond., ser. 2, vol. I., p. 208, pl. 27.
Isotelus gigas, De Kay 1824. Ann. Lyc. Nat. Hist. N. York, vol. I., p. 174, pl. 12, fig. 1, and pl. 13, fig. 1.
 " " Green 1832. Mon. Trilob., pp. 67 and 68.
 " " Vanuxem 1842. Geol. Rep. N. York, p. 46, fig. 1.
 " " Emmons 1842. *Ib.*, p. 389, fig. 1.
 " " Conrad 1843. Proc. Ac. Nat. Sc. Philad., vol. I., pp. 339 and 331.
 " " Hall 1847. Pal. N. York, vol. I., p. 231, pls. 60, figs. 7, *a-i*; 61, figs. 3, *a-m*, and 4, *a-c*; 62, figs. 1, *a-c*; and 63.
 " " Emmons 1855. Amer. Geol., vol. I., pt. 2, p. 215, pl. 16, fig. 12.
 ? *Asaphus platycephalus*, Billings 1863. Geol. Canada, p. 184, fig. 183, and p. 218, fig. 229.
 " " " 1866. Geol. Surv. Canada, Cat. Silur. Foss. Isl. Anticosti, p. 24, fig. 7.
 ? *Asaphus platycephalus*, Billings 1870. Quart. Journ. Geol. Surv. Lond., vol. XXVI., p. 479, pl. 31, figs. 1-6, and pl. 32, figs. 1 and 2.
Isotelus gigas, Miller 1877. Amer. Pal. Foss., first ed., p. 219.
Asaphus gigas, Miller 1889. N. Amer. Geol. and Palaeont., p. 531.
Isotelus gigas, Clarke 1894. Lower Silur. Trilob. Minn., p. 701.

Dr. John M. Clarke, who has recently studied an extensive series of specimens of *Isotelus gigas* and *I. maximus (megistos)* from the Trenton limestone of the state of New York, says that he is convinced that the only valid distinction between these forms is the absence of cheek spines in the one and their presence in the other. He also adopts the name *Isotelus gigas* in preference to *Asaphus platycephalus*, on the ground that "none of the figures given by Stokes shew the structure of the genal angles, and it is therefore wholly a matter of presumption whether his specimens were of the same character as those afterwards fully described and illustrated by De Kay." (Op. cit. supra., p. 706.)

Most of the trilobites from the Winnipeg and Red River limestones have scarcely any portion of the crust preserved, and the specimens referable to *Asaphus* or *Isotelus* in particular are often so imperfect that it is scarcely possible to ascertain whether they had genal spines or not. In addition to the four specimens here identified with *Asaphus* (*Isotelus*) *Sarsi*, which are probably not sufficiently distinct from *I. gigas*, an imperfect left free cheek of a large *Isotelus*, with the genal angles distinctly rounded, which appears to be referable to *I. gigas*, was collected at Cat Head by D. B. Dowling and L. M. Lambe in 1890. This specimen must have been about twenty inches in length when entire. The maximum diameter of the eye is twenty millimetres, and the breadth of the cheek, immediately below the eye, is four inches and a half.

Several small specimens of an *Isotelus*, which do not show the characters of the genal angles at all clearly, but which are also probably referable to *I. gigas*, were collected at Cat Head by Mr. Weston in 1884, and by Messrs. Dowling and Lambe in 1890; at Kinnow Bay by Mr. Weston in 1884; and at Inmost or Birch Island by Mr. Weston in 1884 and by Messrs. Dowling and Lambe in 1890. The largest of these specimens are from three and a half to four inches in length. One of the specimens from Inmost Island is nearly entire, though most of the test is exfoliated, and one from Cat Head is a natural mould of the exterior of the dorsal surface of an entire specimen. In each of these, the cranial shield and pygidium are narrowly rounded or somewhat pointed in the middle. Two of the specimens from Inmost Island are separate glabella; two, cephalic shields with the lower surface exposed and showing the doublure, one with the hypostoma in place; and one is a small separate hypostoma.

ASAPHUS (ISOTELUS) MAXIMUS, Locke.

<i>Isotelus maximus</i> , Locke	1838.	Second Ann. Rep. Geol. Surv. Ohio,
		p. 246, fig. 8 and 9.
<i>Isotelus megistos</i> , Locke	1841*.	Trans. Amer. Assoc. Geol. and Nat.,
		p. 221, pl. 6.
<i>Asaphus megistos</i> , Billings	1863.	Geol. Canada, p. 184, fig. 182, and p.
		351.
" " "	1866.	Geol. Surv. Canada, Cat. Silur. Foss.
		Isl. Anticosti, p. 26.
<i>Isotelus maximus</i> , Clarke	1894.	Lower Silur. Trilob. Minn., p. 701,
		and fig. 5 on p. 703.

An imperfect free cheek of a huge trilobite which may be referable to this species, with a well developed spine at the genal angle, was collected at Cat Head by D. B. Dowling and L. M. Lambe in 1890. Although imperfect at both ends the actual length of this free cheek is upward of seven inches.

* But, in the "Report of the Geology of Ohio," vol. I. (1873) p. 159, Meek gives 1842 and 1843 as the dates on which the species was described under this name.

A badly preserved mould of the exterior of the dorsal surface of a nearly entire specimen of a small trilobite, which is also probably referable to *I. marinus*, and which has a short cheek spine at each of the genal angles, was collected near the First Limestone Point on Lake Winnipeg, north of the Saskatchewan, in a loose piece of limestone, by Mr. J. B. Tyrrell in 1890. The length of this specimen is one inch and three quarters.

Two doubled up and nearly entire specimens, which are probably referable to this species, though no vestige of the genal spines is preserved in either, were collected by Mr. Weston in 1884, one at Big Grindstone Point, Lake Winnipeg, and the other at Dog Head, on that lake. In both of these specimens, but especially in the one from Dog Head, the cephalic shield and pygidium are almost triangular in outline, with the apices obtusely pointed, and the sides nearly straight.

ILLENUS AMERICANUS, Billings.

- Illenus Americanus*, Billings.....1859. Canad. Nat. and Geol., vol. IV., p. 371.
Illenus taurus, Hall.....1861. Geol. Surv. Wisconsin. Rep. Progr., p. 49.
Illenus Americanus, Billings.....1865. Geol. Surv. Canada, Pal. Foss., vol. I, p. 329, figs. 316, *a-d*.
Illenus taurus, Meek and Worthen.....1868. Geol. Surv. Illinois, p. 320, pl. 3, fig. 2.
Illenus crassicauda (Hall and D. Dale Owen) Whiteaves.....1881. Geol. Surv. Canada, Rep. Progr. 1879-80, p. 58c.
Illenus Americanus, Clarke.....1894. Lower Silur. Trilob. Minn., p. 714, figs. 20-23.

This is probably the "*Illenus crassicauda*" of Dr. D. Dale Owen's list of fossils collected at Lower Fort Garry in 1884, and quoted on page 133 of this report. Of late years, casts of the interior of the cephalic shield or pygidium of an *Illenus*, which agree very well with the descriptions and figures of *I. Americanus*, have been collected at Lower Fort Garry by Dr. R. Bell in 1880, by Mr. Weston in 1884 and by Mr. Dowling in 1891, also at East Selkirk by Mr. McCharles in 1884. Similar or more nearly complete specimens were collected at Washow Bay, Lake Winnipeg, by Mr. Weston in 1884, at Little Tamarack Island by Mr. Dowling in 1890 and at Black Bear Island by Messrs. Dowling and Lambe in 1890.

BUMASTUS TRENTONENSIS (Emmons) Clarke.

- Illenus Trentonensis*, Emmons.....1842. Geol. N. York, Rep. Second Distr., p. 390, fig. 8.
Illenus Milleri, Billings.....1859. Canad. Nat. and Geol., vol. IV., p. 375, fig. 10.
" " ".....1863. Geol. Canada, p. 151, fig. 112.

Bumastus Trentonensis (Emmons) Clarke ... 1894. Lower Silur. Trilob. Minn., p. 718
p. 719, figs. 30 and 31; p. 720, figs. 32 and
33; and p. 721, figs. 34 and 35.

A few specimens of this species, mostly detached glabellæ or pygidia, were collected at Lower Fort Garry (St. Andrews) by Dr. R. Bell in 1879 and 1880; at East Selkirk by T. C. Weston in 1884 and by L. M. Lambe in 1890; also at Little Black Island, Lake Winnipeg, by J. B. Tyrrell in 1889, and by D. B. Dowling and L. M. Lambe in 1890. A cast of the interior of the crust of a nearly entire but rolled up specimen of a trilobite belonging to the U. S. National Museum, and labelled "Rapids N. Red River (loose), D. Gunn, No. 4260," is evidently a medium sized or rather small specimen of *B. Trentonensis*. The specimen from "St. Andrews" referred to on page 58 c of the Report of Progress of this Survey for 1879-80, as *Bumastes Barriensis*, is a large example of *B. Trentonensis* with only the thoracic segments and the pygidium preserved. The supposed new species of *Stricklandinia* in the list of St. Andrew's fossils on that page is now known to be a loose example of a *Pentamerus* since described as *P. decussatus*, * and the "*Thecia*, Nov. Sp.," and "*Eridophyllum*, Nov. Sp.," of that list are the *Protaraca* (*retusta*, var.) *major*, and *Diphyphyllum Stokesii* of this Report.

BRONTEUS LUNATUS, Billings.

Bronteus lunatus, Billings, 1857. Geol. Surv. Canada, Rep. Progr.
1853-56, p. 338.
" " " 1863. Geol. Canada, p. 188, fig. 187.
" " Clarke 1894. Lower Silur. Trilob. Minn., p. 725,
fig. 43.

Inmost or Birch Island, Kinnow Bay, Lake Winnipeg, T. C. Weston, 1884: a perfect and well preserved pygidium.

Three obscure fossils, which are portions of tails of a very large and undescribed species of *Bronteus*, but which are too imperfect for description, were collected at Cat Head by D. B. Dowling and L. M. Lambe in 1890.

PTERYGOMETOPUS CALLICEPHALUS, Hall. (Sp.)

Platycops callicephalus, Hall. 1847. Pal. N. York, vol. I., p. 247, pl. 65,
figs. 3, *a-i*.
Pterygomotopus callicephalus, Clarke 1894. Lower Silur. Trilob. Minn., p. 731,
figs. 51 and 52.

East Selkirk, A. McCharles, 1884: two pygidia, which were kindly presented by him to the Museum of the Survey.

* In the Canadian Record of Science for April, 1891, vol. IV., p. 235, pl. 3, figs. and 4

CHEIRURUS PLEUREXANTHEMUS, Green.

- Cheirurus pleurexanthemus*, Green 1832. Mon. Trilob. N. Amer., p. 83, cast 33, pl. 3, fig. 10.
 " " Hall 1847. Pal. N. York, vol. I., p. 242, pl. 65, figs. 1, *a-n*, and pl. 66, figs. 1, *a-h*.
Cheirurus pleurexanthemus, Billings 1863. Geol. Canada, p. 188, fig. 188.
Cheirurus pleurexanthemus, Walcott 1881. Bull. Mus. Comp. Zool. Harvard Coll., vol. VIII., p. 211, pl. 5, figs. 1-6.
 " " Clarke 1894. Lower Silur. Trilob. Minn., p. 734.

A few specimens which have since been identified with this well known eastern species were collected at Lower Fort Garry (St. Andrews) by Dr. Bell in 1880, and by T. C. Weston and A. McCharles in 1884; also at East Selkirk by Mr. McCharles in 1884. A badly preserved cast of a glabella, which is also apparently referable to *C. pleurexanthemus*, was collected at Big Sturgeon Island, Lake Winnipeg, by D. B. Dowling and L. M. Lambe in 1890.

STAUROCEPHALUS. (Species undeterminable.)

Two specimens of the spherical anterior termination of the glabella of a species of *Staurocephalus*, each followed by a short and not very deep transverse constriction, were collected by Mr. Weston in 1884, the larger one at Lower Fort Garry and the smaller at East Selkirk. In the larger one the spherical portion is five millimetres broad, and about a quarter of a millimetre less in length.

LICHAS (PLATYMETOPUS) CUCULLUS.

- Lichas cucullus*, Meek and Worthen 1865. Proc. Ac. Nat. Sc. Philad., vol. XVII., p. 266.
 " " " " " 1868. Geol. Surv. Ill., vol. III., p. 299, pl. 1, figs. 6, *a-c*.
Platymetopus cucullus, Clarke 1894. Lower Silur. Trilob. Minn., p. 746, figs. 66 and 67.

?=*Lichas Trentonensis*, Conrad.

- Cfr. *Asaphus? Trentonensis*, Conrad 1842. Journ. Ac. Nat. Sc. Philad., vol. VIII., pt. 2, p. 277, pl. 16, fig. 16; and
Platynotus Trentonensis, Hall 1847. Pal. N. York, vol. I., p. 235, pl. 64, figs. 1, *a-c*.

East Selkirk, A. McCharles, 1884: three heads, which are now in the Museum of the Survey. These agree very well with the descriptions and figures of *Lichas* or *Platymetopus cucullus*, but, on the other hand, they can scarcely be distinguished from heads from the Trenton limestone at Hull, Que., which are believed to be referable to *Lichas Trentonensis*. "The slight concavity of the median lobe of the glabella" of *L. cucullus* "on its posterior slope, which gives it a peculiar subconical protuberance,"

is the character mainly relied upon by Dr. Clarke to distinguish that species from *L. Trentonensis*, but it is doubtful whether this distinction between these two forms can be maintained.

LICHAS (CONOLICHAS) CORNUTUS, Clarke.

Conolichas cornutus, Clarke.....1894. Lower Silur. Trilob. Minn., p. 749, figs. 72 and 73.

Lower Fort Garry (St. Andrews), Dr. R. Bell, 1880: a well preserved and characteristic though imperfect pygidium. The identification of this specimen has been corroborated by Dr. Clarke.

HARPES. (Species undeterminable.)

Deer Island, Lake Winnipeg, J. B. Tyrrell, 1889: a crushed and distorted specimen, which is too imperfect to admit of a satisfactory specific determination or description.

INCERTÆ SEDIS.

SOLENOPORA COMPACTA, Billings. (Sp.)

- Stromatopora compacta*, Billings.....1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 55.
Tetradium Peachii, Nicholson and Etheridge.1877. Ann. and Mag. Nat. Hist., ser. 4, vol. XX., p. 166.
Solenopora spongioides, Dybowski.....1877. Die Chetetiden der ostbaltisch. Silur. form., p. 124, taf. 2, figs. 11, *a-b*.
Tetradium Peachii, Nicholson and Etheridge.1880. Mon. Silur. Foss. Girvan distr. Ayr., p. 31, pl. 1, fig. 3, and pl. 2, figs. 1, *a-b*.
Tetradium Peachii, var. *Canadensis*, Foord.....1883. Geol. Surv. Canada, Contr. Micro-Pal. Silur. rocks, &c., p. 24, pl. 6, figs. 1, and 1, *a-f*.
Solenopora compacta, Nicholson and Etheridge.....1885. Geol. Mag., Dec. 3, vol. II., p. 529, pl. 13, figs. 1-11.

A few well preserved and characteristic specimens of *S. compacta* were collected by Mr. Weston in 1884 at Big, Deer and Punk islands, at Big Grindstone Point, at Washow Bay, and at Dog Head, Lake Winnipeg.

The systematic position of this well known species, which is so abundant in the Trenton limestone at Ottawa and other localities in eastern Canada, is still an open question. Zittel, in the first volume of his Handbuch der Palæontologie, published in 1883, places it, with doubt, with some other genera, at the end of the Cyclostomata, in the Bryozoa; and Nicholson & Lyddeker, in the first volume of their Manual of Palæontology, published in 1889, refer it provisionally to the Hydrozoa. More recently, however, Dr. A. Brown, in a paper published in the Geological Magazine for April and May, 1894, claims that it is a calcare-

ous alga, on the ground that "no recent coelenterate has zooidal tubes as minute, or nearly as minute, as those of *Solenopora*. Its structure is," he says, "truly cellular and not tubular." In the same paper, Professor H. A. Nicholson is quoted as saying: "We cannot refer it to the Hydrozoa, for we are not acquainted with any hydrozoon, living or extinct, with which *Solenopora* could be compared. It shows no features in its minute structures which remind us of the hydrocorallines, and it assuredly presents no structural resemblance to any known type of the Stromatoporoids."

CHÆTETES PERANTIQUUS. (N. Sp.)

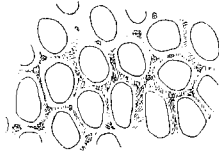


Fig. 17.

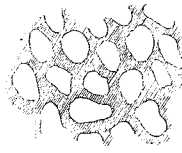


Fig. 18.

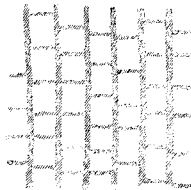


Fig. 19.

Figs. 17, 18 and 19. *Chætetes perantiqus*.—Fig. 17, transverse section of part of the specimen described, close to the surface and above the uppermost transverse diaphragm, $\times 10$; fig. 18, transverse section of part of the same specimen, lower down and below the uppermost diaphragm, $\times 16$; and fig. 19, longitudinal section of a part of the same, $\times 10$.

Corallum, as indicated by a single and imperfect specimen, forming a large undulating expansion or crust, which is slightly and irregularly convex above, shallowly and irregularly concave below; and from three to seven millimetres thick. Corallites of one kind only, in complete contact throughout their entire length, and averaging a little more than half a millimetre in their longer diameter, and a little less than half a mm. in their shorter. As seen in transverse sections near the surface, such as that represented by fig. 17, the corallites are variable but for the most part nearly oval or almost circular in outline, with a depressed space or groove round each, and with single minute interspaces between them. The two features last named, however, are purely superficial, for

transverse sections made lower down (fig. 18) shew that the walls of adjoining corallites are completely amalgamated and solid below the calyces. Longitudinal sections (fig. 19) shew that the corallites are provided with complete and rather distant traverse diaphragms or tabulae.

Lower Fort Garry, T. C. Weston, 1884: one imperfect specimen about two inches and a half by two inches in diameter, with part of its upper surface covered with a colony of *Protarva* (*retusta*? var.) *magna*.

This species is referred to the genus *Charites* on the authority of Mr. Ulrich, who has carefully examined the specimen upon which it is based, and who was the first to recognize its structural characters and generic position. It is of special interest as occurring at such a low geological horizon. Its more minute surface characters are somewhat similar to those of *Charites tumidus*, as represented by Milne Edwards and Haime, on Plate 45, fig. 3b, of their Monograph of the British Fossil Corals, published by the Paleontographical Society. The exact systematic position of *Charites* has yet to be ascertained. In a letter recently received, Mr. Ulrich expresses the opinion that it is not a polyzoon or bryozoon, but a coral, and it is in accordance with this view that the preceding description was written, and the terms "corallum" and "corallites" used rather than zoarium and zoecia. He is inclined to think that *Charites* is most nearly related to *Labeclia*.

B.—From the passage beds at the top of the Lower Sandstones.

ALGÆ.

LICROPHYCUS OTTAWAENSIS, Billings.

Licropycus Ottawaensis, Billings..... 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 99, fig. 87.

Punk Island, Lake Winnipeg, Professor H. Y. Hind, 1858, one specimen, and D. B. Dowling, 1890, two specimens. Grindstone Point (two specimens) and Deer Island (two specimens), Lake Winnipeg, T. C. Weston, 1884.

ECHINODERMATA.

CRINOIDEA.

GLYPTOCRINUS. (Species undeterminable.)

Portions of the column of a crinoid which the late Mr. E. Billings believed to be "allied to *Glyptocrinus ramulosus*" were collected by Professor Hind in 1858 at Punk Island and Grindstone Point. Similar but rather more slender portions of columns, with the "large projecting joints" farther apart, were collected by Mr. Weston in 1884 at Grindstone Point. These latter specimens are very similar to the columns of *Schizocrinus nodosus*, as figured by Professor James Hall on Plate 27 of the first volume of the "Paleontology of New York."

VERMES.

ANNELIDA.

SERPULITES DISSOLUTUS, Billings.

Serpulites dissolutus, Billings..... 1862. Geol. Surv. Canada, Pal. Foss., vol. I., p. 56.

Deer Island, J. B. Tyrrell, 1889: a fragment, about an inch long, which appears to be conspecific with the specimen collected by Professor Hind at Punk Island, and referred to on page 160.

MOLLUSCOIDEA.

POLYZOA.

RHINIDICTYA MUTABILIS, Ulrich.

Stictopora mutabilis (partim), Ulrich.....1886. Fourteenth Ann. Rep. Geol. and Nat. Hist. Surv., Minn., p. 66.
Stictopora mutabilis, var. *minor*, Ulrich1886. Ibidem, p. 67.
Rhinidictya mutabilis, Ulrich.....1893. Bryoz. Lower Silur., Minn. (advance copies fr. Geol. Minn. Final Rep., vol. III., pt. 1) p. 125, pl. 6, figs. 2-6, and 12, 13; pl. 7, figs. 19-23, and 25-28; and pl. 8, figs. 1-3.

Deer Island, Lake Winnipeg, J. B. Tyrrell, 1889: four specimens, which have been identified with this species by Mr. Ulrich, who has examined all the specimens collected of this and of the two following species.

RHINIDICTYA. (N. Sp.)

Deer Island, J. B. Tyrrell, 1889: a fragment of a zoarium, in reference to which Mr. Ulrich writes as follows. "It is a new species of *Rhinidictya* which I suggest that you call *R. obliqua*. Its zoecia are

larger than in any species of the genus except my *R. grandis*, in which they are of about the same size. The obliquity of the apertures, which is very marked, is the principal external distinctive feature." The specimen, however, is too imperfect to admit of a sufficiently detailed description of the distinctive characters of the species.

ESCHAROPORA RAMOSA? Ulrich, Var. (or N. Sp.?)

Deer Island, J. B. Tyrrell, 1889: two specimens of a small branching *Escharopora*, which Mr. Ulrich writes is either a "new variety of *E. ramosa*, or possibly a new species, differing from the *E. ramosa* in its smaller size and narrower and more rapidly divergent branches. The surface is not sufficiently preserved for finer comparisons, but the diagonal arrangements of the zoecial apertures and the pointed base point very certainly to *Escharopora*."

BRACHIOPODA.

STROPHOMENA TRILOBATA, Owen. (Sp.)

For references to publications in which this species is described, see page 169.

Deer Island, J. B. Tyrrell, 1889: one small dorsal valve.

ORTHIS (DALMANELLA) TESTUDINARIA, Dalman.

References to publications in which this species is described are given on page 177.

Deer Island, D. B. Dowling, 1890: one specimen.

MOLLUSCA.

PELECYPODA.

CYRTODONTA CANADENSIS, Billings.

Cyrtodonta Canadensis, Billings.....1858. Geol. Surv. Canada, Rep. Progr., 1857,
p. 182, figs. 8-10.
" " "1863. Geol. Canada, p. 148, fig. 106.

A cast of the interior of the right valve of a *Cyrtodonta*, which is much too imperfect to be determined specifically, was collected at Big Grindstone Point, Lake Winnipeg, by T. C. Weston in 1884. About six miles to the south-west of this locality, at Little Grindstone Point, eighteen specimens, which are also clearly referable to Billings's genus *Cyrtodonta*, were collected by D. B. Dowling in 1891. All of these have a considerable portion of the test preserved, but most of its outer surface is covered or obscured by the tenacious matrix. Some of them have essentially the same marginal outline as *C. Canadensis*, and are probably referable to that species; others have an unusually prominent

posterior alation and may be nearer to Ulrich's *C. grandis*, but most of them are too imperfect and badly preserved to be determined specifically.

PTEROPODA.

CONULARIA. (Species undeterminable.)

A few fragmentary specimens, collected at Deer Island by Mr. Tyrrell in 1889, are probably referable to the genus *Conularia*, but none of them are sufficiently well preserved to be determined specifically, though they appear to be quite different to the *C. asperata* of the Winnipeg limestones.

CRUSTACEA.

OSTRACODA.

APARCHITES TYRRELLII, Jones.

Aparchites Tyrrellii, Jones. 1891. Geol. Surv. Canada, Contr. to Canad.
Micro-Pal., part 3, p. 62, pl. 13, figs. 14, *a-c*.

The types and only known specimens of this species were collected at Great Black Island, near Big Island, Lake Winnipeg, by Mr. Tyrrell in 1889.

ERRATA.

- Page 151—Line 2 from the top, for "regularity" read "angularity."
Page 155—Line 6 from the top, for "*Porites*" read "*Protaræa*."

PLATE XVI.

Unless otherwise stated, all the figures are of the natural size.

AULACOPELLA WINNIPEGENSIS (page 145).

- Figure 1. Upper side of the specimen upon which the species is based. *A-B*, represents a broken surface; *P*, the mineral deposit in the Paragaster; *G*¹, *G*² and *G*³, the wedge-shaped fillings up, by the matrix, of spaces that were originally empty; and *A-C*, a transverse section of part of the specimen, at the midheight.
- " 2. Restoration of the upper surface of the sponge, one-third the natural size.
- " 3. Restoration of the base of the same, also one-third the natural size.

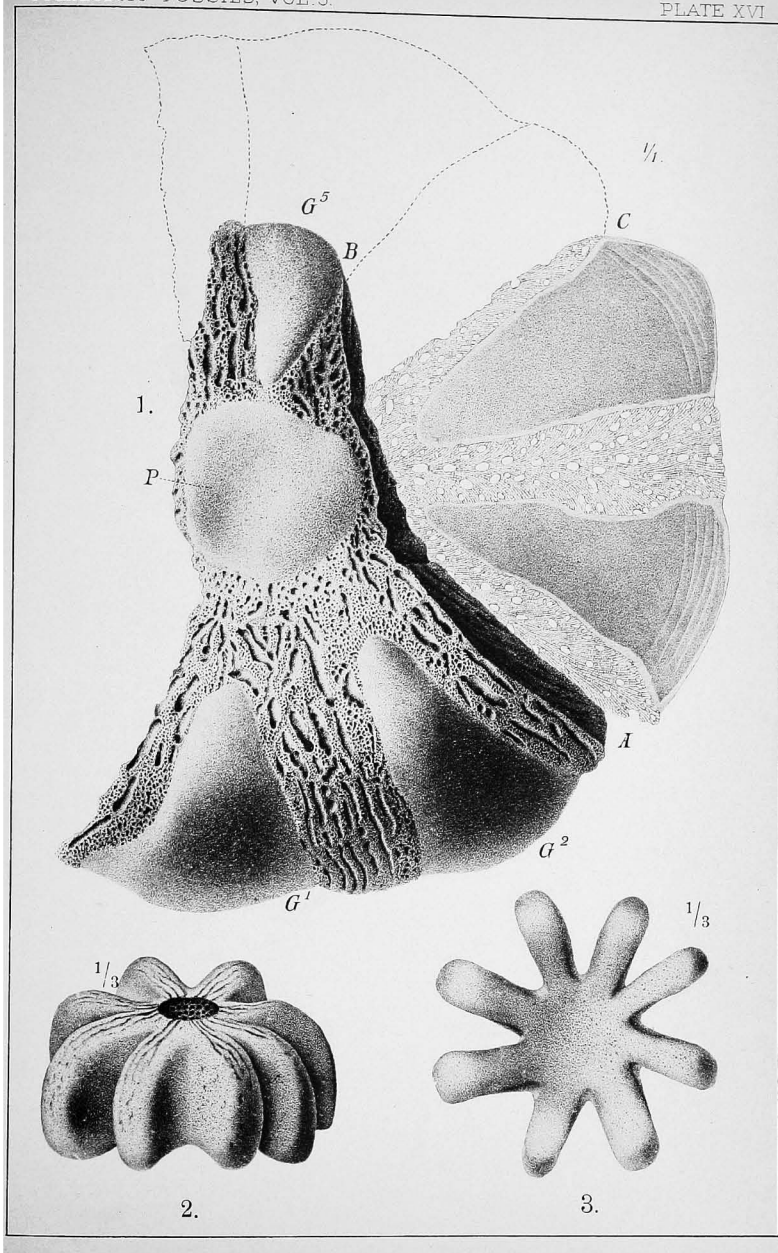


PLATE XVII.

CHONDRITES CUPRESSINUS (page 141).

Figure 1. The specimen upon which the description of this species is based.

CHONDRITES GRACILLINUS (page 141).

Figure 2. The type and only known specimen of this species.

TRICHOSPONGIA HYSTRIX (page 147).

Figure 3. The only specimen that the writer has seen.

INOCAULIS CANADENSIS (page 149).

Figure 4. A large but imperfect specimen of this species, from Inmost Island.

DIPHYPHYLLUM STOKS II (page 152).

Figure 5. Portion of a colony of this species, from Lower Fort Garry.

" 5a. Longitudinal section of part of one of the corallites of the same, shewing the tabulae.

" 5b. Transverse section of one of the corallites, shewing the number and comparative length of the septa.

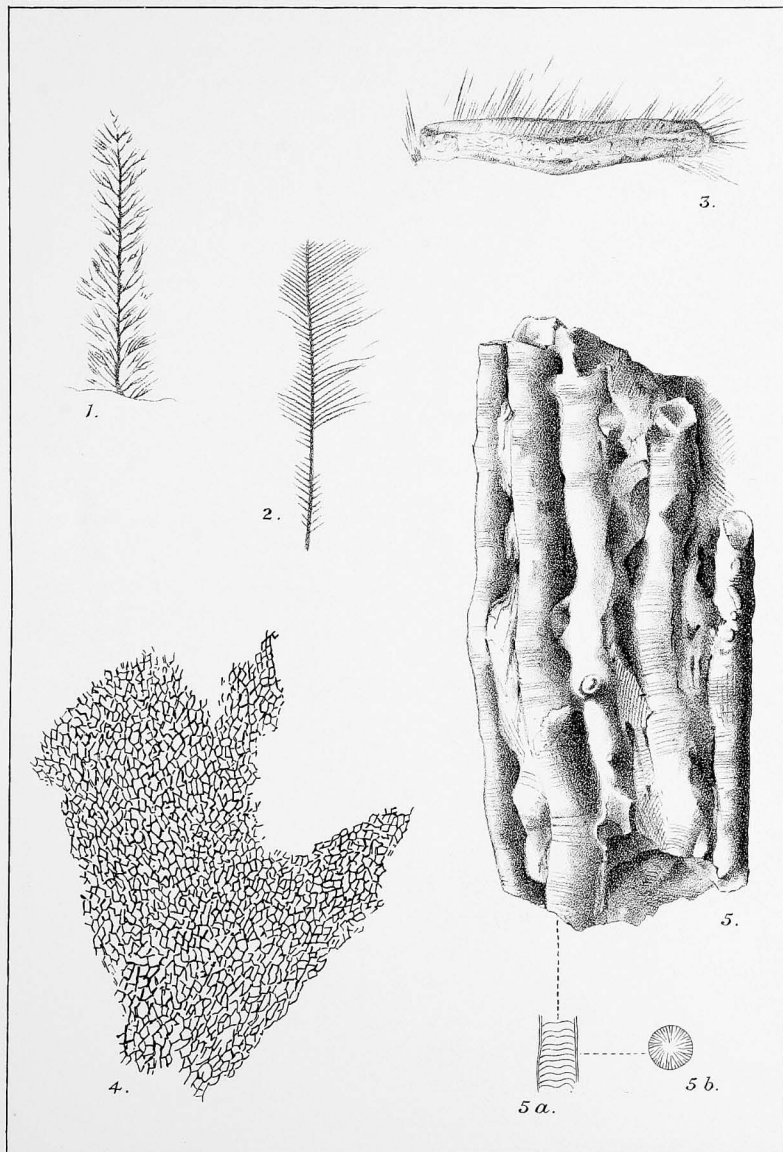


PLATE XVIII.

STREPTELASMA ROBUSTUM (page 153).

- Figure 1. Side view of a nearly perfect specimen of this species from the Red River valley in Manitoba, presented to the Museum of the Survey by the Smithsonian Institution.
- " 1a. Longitudinal section of the same, to show the internal structure.

PROTARÆA (VETUSTA? var.) MAGNA (page 155).

- Figure 2. Portion of the upper surface of a colony of this species, magnified three times, to shew the shallow calices, wedge-shaped septa, and small tubercles in the centre of each calyx.
- " 3. Longitudinal section of a portion of a corallum of this species, magnified eight times.
- " 3a. Transverse section of the same, also eight times the natural size.

STOMATOPORA CANADENSIS (page 161).

- Figure 4. Zoarium of the specimen described.
- " 4a. The same, four times the natural size.

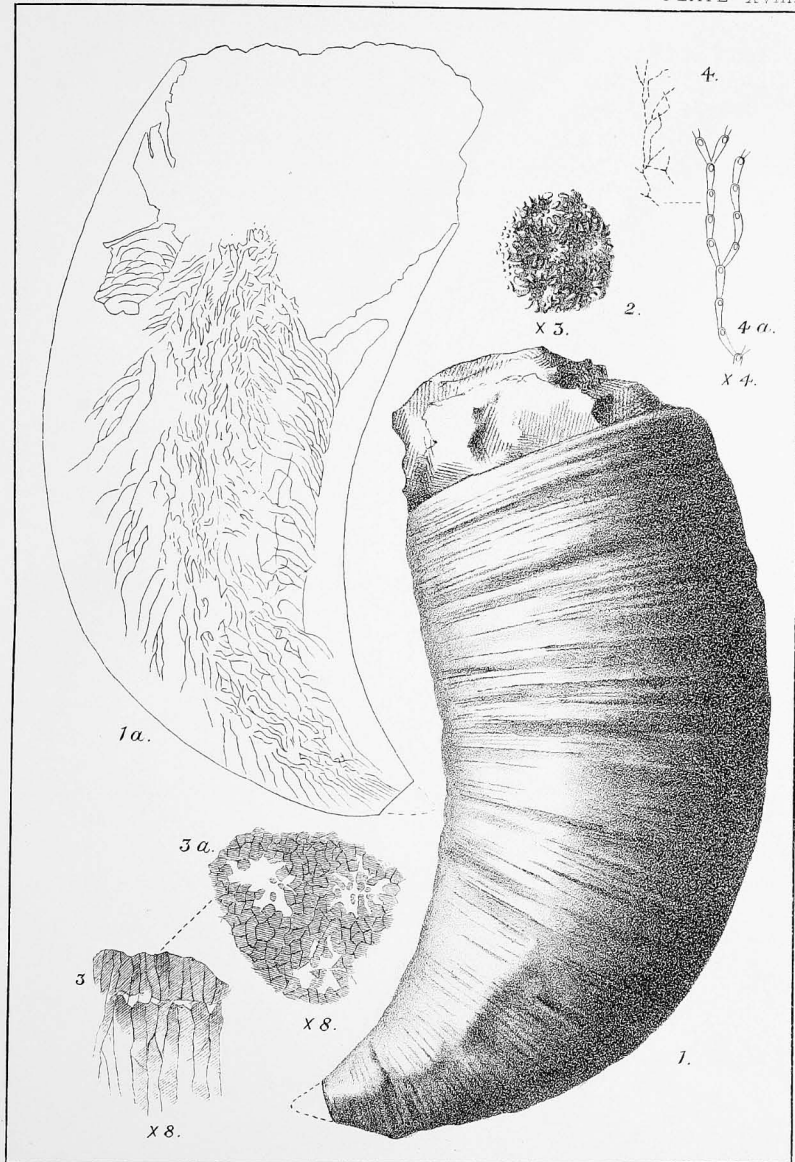


PLATE XIX.

MESOTRYPA SELKIRKENSIS (page 162).

- Figure 1. Transverse section of a portion of a specimen of this species, magnified fifteen times.
- " 1a. Longitudinal section of a portion of a specimen, also magnified fifteen times.

RAFINESQUINA LATA (page 172).

- Figure 2. View of a specimen with most of both valves preserved, shewing the dorsal valve and part of the ventral. The hinge areas of both valves, and the cardinal extremities, restored in outline from other specimens.
- " 2a. Outline of a transverse section of the same in the median line, shewing the relative convexity of the ventral valve and concavity of the dorsal valve.
- " 2b. Portion of surface markings of the dorsal valve of the same, magnified three times.
- " 3. An imperfect ventral valve, with coarse corrugations on the visceral disc.
- " 4. Unusually perfect cast of the interior of a ventral valve of a specimen from the Red River valley in Manitoba, loaned by the Smithsonian Institution, and shewing most of the marginal outline.
- " 5. Portion of the surface markings of a ventral valve, magnified three times.

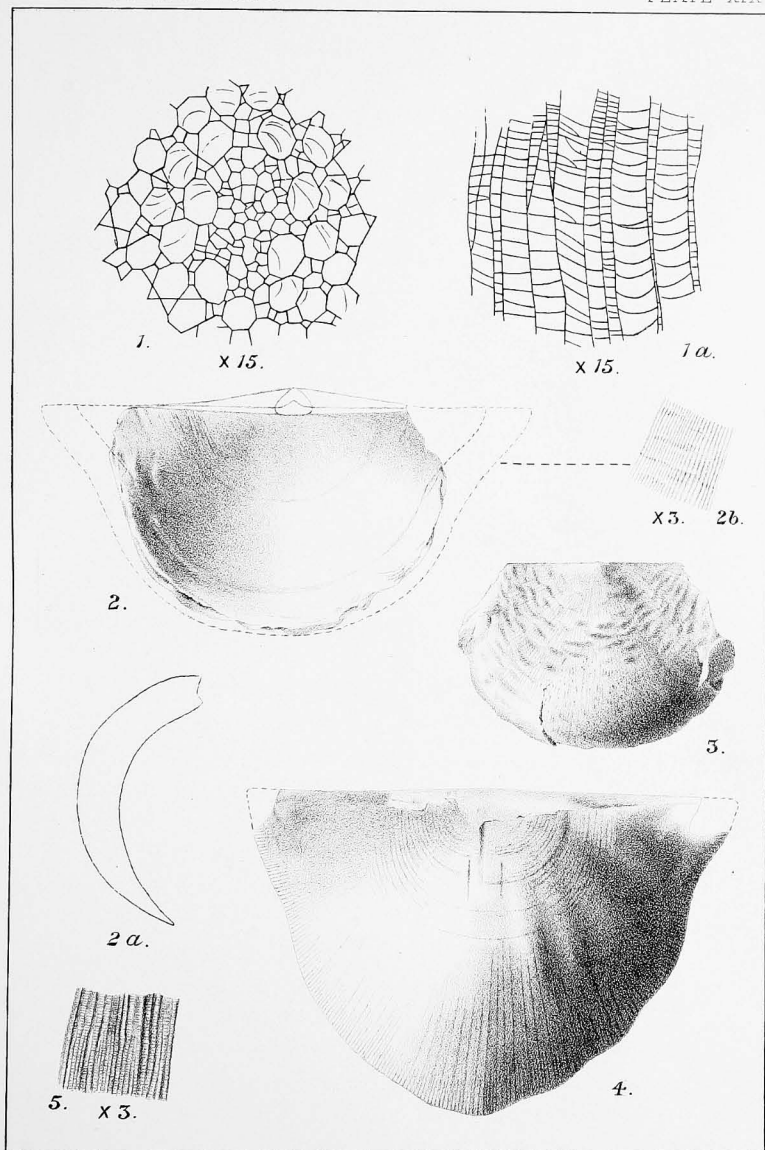


PLATE XV.

PALÆOPTERIA PARVULA (page 181).

- Figure 1. Side view of a cast of the interior of a small right valve, twice the natural size.
" 2. Outline of the cardinal region of the cast of another right valve, six times the natural size, and shewing the impressions made by the hinge teeth.
" 3. Side view of a cast of the interior of a large left valve supposed to be referable to this species, twice the natural size.

MODIOLOPSIS ANGUSTIFRONS (page 183).

- Figure 4. Side view of the type and only known specimen of this species, shewing the left valve.

ORTHODESMA AFFINE (page 184).

- Figure 5. Side view of the specimen described, shewing the right valve.

CLINOPISTHA ANTIQUA (page 185).

- Figure 6. Side view of the only specimen known to the writer.

RHYTIMYA RECTA (page 186).

- Figure 7. Side view of a cast of the interior of a right valve of this species.

EDMONDIA (?) VETUSTA (page 187).

- Figure 8. Side view of a specimen of this species, twice the natural size.

PLEUROTOMARIA STOKESIANA (page 190).

- Figure 9. Dorsal view of the most perfect specimen collected, which is a cast of the interior of the shell, twice the natural size.
" 9a. Basal view of the same.

PLEUROTOMARIA MARGARITOIDES (page 190).

- Figure 10. Dorsal view of a gutta percha squeeze of a natural mould of the exterior of a shell of this species, three times the natural size.

MACLUREA (MACLURINA) MANITOBENSIS (page 194).

- Figure 11. View of a specimen from Little Black Island, with most of the test preserved on the convex side.

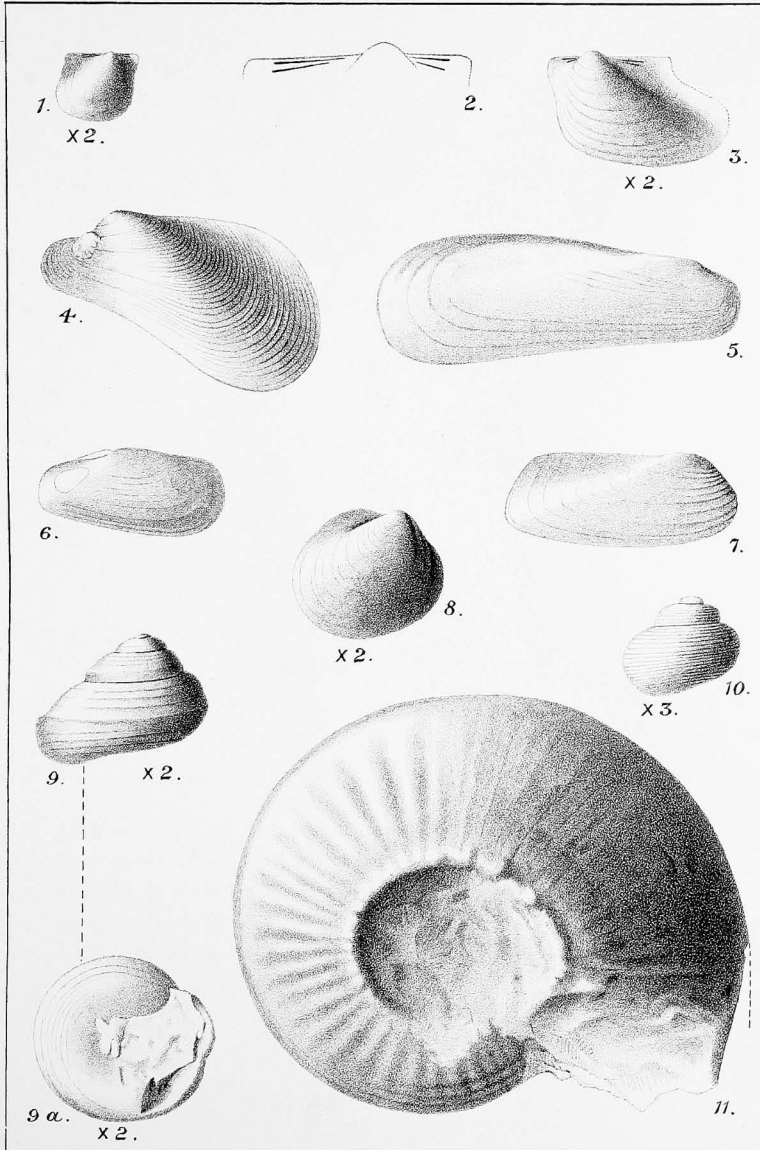


PLATE XXI.

HORMOTOMA WINNIPEGENSE (page 192).

Figure 1. View of a large but much compressed specimen, from Little Black Island.

CONULARIA ASPERATA (page 201).

Figure 2. Side view of a specimen from Cat Head.

" 2*c.* Portion of the sculpture of another specimen from the same locality, four times the natural size.

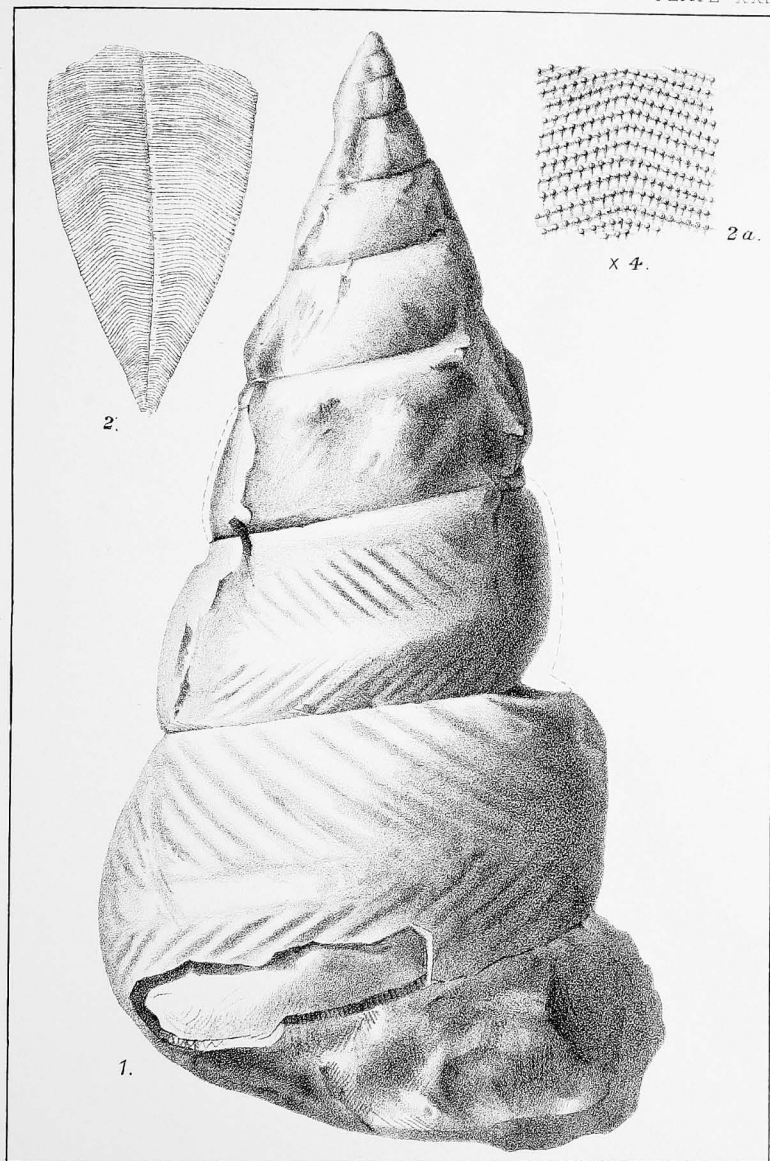


PLATE XXII.

ASCOCERAS COSTULATUM (page 215).

- Figure 1. View of the ventral side of the only specimen collected, shewing most of the decurrent extremity of the body chamber, and portions of the septa.

EURYSTOMITES PLICATUS (page 225).

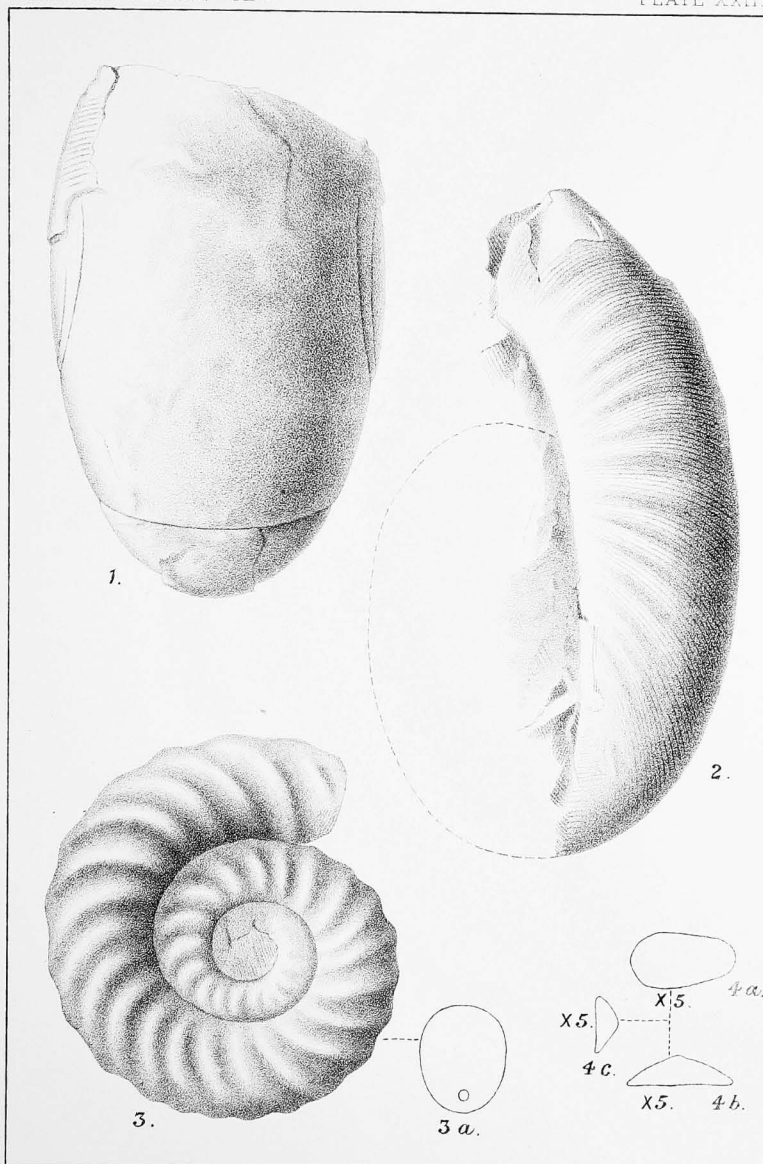
- Figure 2. Side view of an imperfect specimen of this species from Little Black Island, shewing the surface ornamentation of part of the outer volution.

DISCOCERAS CANADENSE (page 227).

- Figure 3. Side view of the most perfect specimen collected.
" 3a. Outline of transverse section of the same, shewing the position of the siphuncle.

APARCHITES PARVULUS (page 230).

- Figure 4a. Side view of right valve, in outline, and magnified five diameters.
" 4b. Ventral outline of the same.
" 4c. Edge outline of the same.



L.M. Lambe, F.G.S. Del^t

Mertens Lith.