A SYNOPSIS

OF

AMERICAN FOSSIL BRACHIOPODA

INCLUDING

BIBLIOGRAPHY AND SYNONYMY

BY

CHARLES SCHUCHERT

WASHINGTON
GOVERNMENT PRINTING OFFICE
1897
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 LETTER OF TRANSMITTAL.

UNITED STATES NATIONAL MUSEUM,
Washington, D. C., January 9, 1897.

SIR: I have the honor to transmit herewith the manuscript of A Synopsis of American Fossil Brachiopoda, including Bibliography and Synonymy, which has been prepared out of official hours. It is presented with a view to its publication as a bulletin by the United States Geological Survey.

CHARLES SCHUCHERT.

Hon. CHARLES D. WALCOTT,  
Director of the United States Geological Survey.
PREFACE.

Probably no continent is more productive of well-preserved Paleozoic brachiopods than North America. Throughout the vast territory of the United States which is drained by the Mississippi River the strata have suffered little change, and it is this region which has furnished nearly all the material, from the Middle Ordovician to the top of the Upper Carboniferous. The numerous species of American Cambrian brachiopods which are found scattered along the margins of this great interior plateau and throughout New Brunswick have also aided largely in determining the evolution of the class. To Mr. Walcott, Director of the United States Geological Survey, much honor is due for making clear the structure of brachiopods from this system.

The present synopsis was begun in Cincinnati eleven years ago, while the writer was engaged in paleontologic work with Mr. E. O. Ulrich. In 1887, when the list had increased to about 700 cards, the position of assistant to Prof. James Hall was entered upon. A nearly complete library of American paleontologic literature thus became available to the writer, and during the next two years the greater part of his leisure was devoted to recording brachiopod literature. The large private collection of brachiopods belonging to Professor Hall, together with the many public and private collections then under investigation by Hall and Clarke, also afforded the writer abundant facilities and a rare opportunity for the study of this class. Every occasion was embraced to examine into the synonymy suggested by authors, and in this work it is believed much has been attained. In addition to the above collections and to the material in his own possession, the writer has also studied the specimens belonging to this class in the American Museum of Natural History, Yale University Museum, Cincinnati Society of Natural History, and the United States National Museum. In 1890 the present catalogue comprised upward of 3,500 cards, arranged in boxes having a united length of about 4 feet. It now includes nearly 10,000 references relating to North and South American fossil brachiopods.

It is believed that with the exception of local faunal lists all the literature of North and South America pertaining to this subject is recorded in the following synopsis. Much possible synonymy which the writer could not satisfactorily determine is noted under "Observations." The complete known distribution of widely dispersed species
is not always given, only the more important localities being cited. In every case, however, the locality first mentioned is believed to be the original one.

For the proper generic disposition of the species the work of Hall and Clarke\(^1\) has been closely followed, and the entire synopsis is arranged alphabetically to facilitate easy finding. The geologic distribution of the genera is given at the end of Chapter I, and their systematic position in the classification in Chapter V. The evolution of the lophophore, from the simple crescentic condition with few tentacles of the protegulum to the most complex condition in the Terebratulacea, described in Chapter IV, is wholly the work of Dr. Beecher. From the development of this organ in recent species the peculiarly complicated growth of the lophophore in the Spiriferacea is also explained. Some of the embryonic brachial conditions are likewise indicated as probably existing in a mature condition in early Paleozoic genera.

The danger of neglecting young or small specimens of any organism can not be too often impressed upon collectors. Often by means of such fossils intricate problems in phylogeny or life history may be solved. To have much value, however, young specimens must be very small, and these can not be picked up in the field. Where brachiopods abound, whether in clay or of a siliceous nature in limestone, material should be collected in bulk and prepared later by washing or etching with weak muriatic acid. This method of collecting generally results in securing fossils that otherwise will not be observed.

To Dr. Charles E. Beecher, of Yale University Museum, the best thanks of the writer are especially due for the continued interest taken in this catalogue, as well as for valuable suggestions regarding classification; and to Mr. Charles D. Walcott, Director of the United States Geological Survey, for favors relating to the publication of the paper.

To the following gentlemen the grateful acknowledgments of the writer are due for specimens or for suggestions in synonymy: Prof. J. F. Whiteaves, Canadian Geological Survey; Prof. H. S. Williams, Yale University; Director Charles D. Walcott, Dr. W. H. Dall, Dr. T. W. Stanton, and Dr. George H. Girty, United States Geological Survey; Prof. R. P. Whitfield, American Museum of Natural History; Prof. N. H. Winchell, State geologist of Minnesota; Mr. E. O. Ulrich, Newport, Kentucky; Mr. S. A. Miller, Cincinnati, Ohio; Mr. R. R. Bowley, Louisiana, Missouri, and Mr. D. K. Gregor, Fulton, Missouri; and to Dr. 0. Davies Sherborn, of the British Museum, for valuable suggestions in bibliography.

C. S.

\(^1\)Palaeontology of New York, Vol. VIII, 1892–95.
CHAPTER I.

GEOLOGIC DEVELOPMENT AND GEOGRAPHIC DISTRIBUTION OF AMERICAN FOSSIL BRACHIOPODA.

GEOLOGIC DEVELOPMENT.

Upward of 2,500 species of brachiopods have been described or identified from the sediments of the North and South American continents and adjacent islands. Of these, 2,053 are recognized in this catalogue, the other species, about 20 per cent, being considered as synonyms.

Little is known of the fossil forms from South America. Forty-eight genera are represented by 159 species, ranging from the Cambrian upward. Of these, 125 are from the Paleozoic and 34 from the Mesozoic. The Cambrian, Ordovician, and Jurassic brachiopods require further study, since authors have given little or no attention to their internal characters, and also have too readily identified them with well-known European species.

In North America there are 1,922 species, of which 1,859 are restricted to the Paleozoic. In 1880 Zittel, on the basis of Bigsby's Thesaurus, gave a total of 4,243 species of Paleozoic Brachiopoda. Since Bigsby's compilation the total has probably been increased to 6,000 species, about one-third of which occur in North America. On account of their good preservation and great abundance, both in species and individuals, throughout the Paleozoic, the brachiopods in North America are of particular value in stratigraphic and correlative geology.

In the Mesozoic there is a remarkable scarcity of brachiopods, since but 49 species have been recorded, and many of these are rare. The Cenozoic representation is even smaller, there being but 14 species. This scarcity of post-Paleozoic brachiopods is very apparent in the oldest system of the Mesozoic, the Triassic, from which but 11 species have been described, whereas in the Carboniferous there are 478

species. In marked contrast, also, is this lack of brachiopod continuity when compared with the Alpine Trias, from which Bittner has described 380 species; but nowhere else is this system known to have so large a development. This evidence not only indicates a decadence of the class during late Paleozoic, but epeirogenic movements as well near the close of the American Carboniferous, for none of the 478 species of this system pass into the Trias.

With the Trias a new facies of brachiopod life is initiated; many of the familiar types of Paleozoic shells had, at that time, long since ceased to live or had ended in the Carboniferous or Permian. The superfamilies Acrotretacea, Obolacea, and Pentameracea have died out, while the Lingulacea, Discinacea, Craniacea, Strophomenacea, and Spiriferacea are sparingly represented, and commonly by small species. Before the close of the Jurassic system the Spiriferacea also disappeared, so that since the Cretaceous era the class is practically represented by rhynchonellas and terebratulas, with a few scattering species of Lingula, Crania, and Discinisca.

In the American Jurassic there are but 13 species, and all are rare. How remarkable is this representation when contrasted with the Jura of Europe, where certain beds of the Lias, Dogger, and Malm terranes contain millions of specimens of a few species belonging to the families Terebratulidae and Rhyynchonellidae. The Cretaceous has 26 species, also a meager representation, and yet "outside of Europe, North America is the most important for the occurrence of Cretaceous Brachiopoda." The American Eocene has 9 species and the Neocene 5. The disparity between the European and American Cenozoic brachiopod faunas is partly due to the scarcity of marine deposits representing the different horizons in America.

The geographic distribution of the 63 post-Paleozoic species shows that 30 are found along the eastern and southern border of the United States, 15 on the Pacific Coast, and 18 from the Arctic Circle south to about the fortieth parallel and between the one hundredth and the one hundred and twentieth meridians.

The Trias of eastern North America, with its unfavorable shore deposits, has but one species, while the Cordilleran Sea to the east of the Rocky Mountains has 7, and these were there followed by 5 other species in the Jurassic system. A larger brachiopod fauna may have existed in the deeper waters of the Atlantic Trias, but nothing of it is known. In Cretaceous times conditions were again more favorable, 10 forms being recorded from the Atlantic border of North America, 10 from the Pacific, and 6 from the interior Cordilleran Sea. Toward the close of the Cretaceous the Cordilleran Sea became more and more

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1 Zittel, op. cit., p. 714.
2 Ibid., p. 716.
unfit for marine life, and no brachiopods are known from the Tertiary deposits of this area. From the eastern North American Tertiary species are known, but only 2 from the Pacific border. In recent times conditions are apparently more favorable for the introduction and existence of brachiopods from other areas, as 14 species have been dredged from the Atlantic and 24 from the Pacific continental plateaus of North America.

The living forms are universally distributed in the seas of the world. Their range in depth is no less extended. They occur in shallow waters, at low-water mark, and varying degrees of depth, from 200 to 600 fathoms being the usual limit of the majority of species. Several far-ranging abyssal species were dredged in from 1,000 to 2,000 fathoms. The delicate transparent shell of that interesting little Terebratuloid, Liothyrina Wyvillei Davidson, was actually obtained in a living condition by the Challenger expedition from the enormous depth of 2,900 fathoms, or 3½ miles, at the bottom of the South Atlantic Ocean.¹

In the North American Cambrian there are 116 species described, a far greater development than in any other country. Davidson records but 14 species in Great Britain, while Bigsby, in 1868, gave the total for this system as 126 for all countries. In the next, or Ordovician, system the rapidity of brachiopod differentiation is remarkable. There are 319 species known in North America, an increase nearly three times that of the Cambrian. Bigsby's percentage of increase for this system is even greater, since in 1868 he listed 556 Ordovician species, which represent a growth of nearly four and one-half times that of his Cambrian total of 126.

While there is much specific differentiation throughout the Ordovician, it is a notable fact that the essential types of brachiopods of this system are also found near its base in the Calciferous. In the Chazy, or next younger horizon, the species are very much like those of the Trenton, where this class has great and varied representation, which is maintained to the end of the Ordovician. It is also true that the species become more generalized structurally as the Cambrian is approached, and most rapidly so toward the base of the Ordovician.

The evolution of the Cambrian brachiopods is similar in its history to that of the Ordovician, except that there the differentiation was along more fundamental structural lines. In the following table it is seen that the four orders of the class Brachiopoda began with the Lower Cambrian, and that throughout this system differentiation was mainly of family importance, since none of these divisions has many genera or species. Where minor groups occur in quantity it is always in the more primitive divisions, as in the Atremata. In none of the other three orders is there a similar rapid differentiation in the Cambrian.

¹Agnes Crane, Geol. Mag., Dec. IV, Vol. II, 1895, p. 3 (extract).
The earliest deep-water deposits of the Silurian, the Clinton formation, have a brachiopod fauna which is quite different from that of the Ordovician. The Atremata, Neotremata, and Protremata are much like those of the Ordovician, but the Spiriferacea of the Telotremata, the most characteristic brachiopods of the Silurian, have here attained a great variety of forms, with varied brachydial structures. Throughout the American Silurian the brachiopods show little structural differentiation, but in the Lower Helderberg, at the base of the Devonian, the spire-bearers are changing and assuming characters which are fully developed in the higher Devonian. Here also occur the oldest loop-bearers, or Terebratulacea, though the ontogeny of Zygospira seems to show that this superfamily originated in the Ordovician.

In the Mississippian Sea deposition was apparently quite continuous throughout Devonian and Carboniferous times, and not much interrupted by earth movements. The faunas of these systems in this area show no rapid evolution along any of the brachiopod phyla. The species of the basal member of the Carboniferous, the Waverly or Kinderhook, are not unlike those of the Chemung of the Upper Devonian, nor is there any great faunal difference between the Kas-kaskia of the Lower Carboniferous and the productive Coal Measures above.

From the foregoing rapid summary of the geologic history of American brachiopods, it follows that differentiation in the Paleozoic is most rapid near the base of the older systems, and diminishes in force from the older to the younger geologic divisions. While earth movements in America were greater and more numerous during the early Paleozoic than later in and just previous to the close of this time, yet the early and rapid evolution of the class is probably due not only to the varying conditions produced by these movements but also to the greater plasticity of the class during the Cambrian and Ordovician eras.

There are 311 species in the American Silurian, increasing to 662 in the Devonian, while the Carboniferous representation declines to 478 species. In 1880 Zittel gave a total of 1,366 species for the Devonian, 871 for the Carboniferous, and but 30 for the Permian. Waagen's researches in the Permian of India, however, have increased this representation considerably.

There is no more striking evidence than these figures needed to show
the very rapid increase of the class during the Ordovician, its culmina-
tion in the Devonian era, and its rapid decline in the Carboniferous.

Of the 230 established Paleozoic genera, not fewer than 186 are repre-
sented in North America.

GEOGRAPHIC DISTRIBUTION.

The geographic distribution of North American Paleozoic brachi-
iopods is extensive, since 30 per cent, or 537 species, had great areal or
horizontal dispersion. One hundred and seventeen species are found
in both the Mississippian and Cordilleran seas, and of these 36 are
also known to occur in foreign countries. The number of species com-
mon to North America and other continents, however, is 121.

When considered chronologically, it is observed that 20 per cent of
the Cambrian brachiopods have great geographic distribution, and that
this increases to 32 per cent in the Ordovician, Silurian, and Devonian,
and declines to 28 per cent in the Carboniferous. Greatest specific
dispersion, however, is most noticeable in the Devonian and Carbon-
iferous, where Atrypa reticularis, Leptana rhomboidalis, Orthothetes
crenistriatus, Productus semireticulatus, P. punctatus, Rhyynchonella
pleurodon, Spirifer disjunctus, and S. striatus have almost world-wide
distribution and great vertical or chronologic range. Many similar
species common to America and several European countries could be
mentioned.

Specific distribution increases with ordinal rank. In the radical order
Atremata 25 per cent had dispersion, increasing to 27 per cent in the
Neotremata, and to 32 per cent in the Protremata and Telotremata.

From the above considerations it is evident that brachiopods, as a
rule, can not be of great value in correlating over wide areas minor
Devonian, but particularly Carboniferous, horizons. In the Cambrian,
Ordovician, and Silurian, however, these fossils are of great value for
stratigraphic purposes. Since post-Paleozoic brachiopods are not com-
mon in America, they can have little stratigraphic value, but in the
Trias and Jura of Europe, where species and individuals are common,
reliance can be placed upon them, and they are there regarded as next
in importance to the Ammonoidea for correlation. When paleontology
shall have advanced sufficiently, so that extracontinental correlation
of Paleozoic formations can be taken up in detail, it will be seen that
brachiopods, because of their wide dispersion, abundance, and favora-
ble preservation, will be of great service in working out paths of
migration and intercommunicating oceanic basins.

Bull. 87—2
### Table I.—Brachiopod genera alphabetically arranged, their geologic distribution, and North American specific representation.

(There column "Ordinal rank" A., X., P., T. equal the first letters of Atretnata, Neotremata, Protretnata, and Telotremata, respectively. The geologic occurrence of non-American genera or the earlier appearance or later continuance of American genera in other countries is indicated by a black line. Small superior numerals indicate the number of species having distribution.)

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### SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.

#### Table I.—Brachiopod genera alphabetically arranged, etc.—Continued.

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North American Paleozoic representation of the orders, superfamilies, and families, geologically arranged.

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<td>Orbicula (?) excentrica Emmons</td>
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<td>Orthia (?) apicalis Billings</td>
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<td>Orthia (?) highlandensis Walcott</td>
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### Table III—Cambrian Brachiopoda—Continued.

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<td>Orthisina (?) johannensis Matthew</td>
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<td>Syntrophia arethusa (Billings)</td>
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<td>Syntrophia (?) armanda (Billings)</td>
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<td>Syntrophia barabunensis (A. Winchell)</td>
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<td>Syntrophia primordialis (Whitfield)</td>
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<td>Trematobolus insignis Matthew</td>
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</table>

Number of Cambrian species, 116.

Number of species in each division: 31 (Lower Cambrian), 39 (Middle Cambrian), 51 (Upper Cambrian).

Number of species common to the Lower and the other divisions of the Cambrian: 5.

Number of species common to the Middle and the other divisions of the Cambrian: 1.

Number of species common to the Cambrian and Ordovician system: 6.

Number of species passing from each division into the Ordovician: 0 (Lower Cambrian), 0 (Middle Cambrian), 6 (Upper Cambrian).
### TABLE IV.—Ordovician Brachiopoda.

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<th>Species</th>
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### Table IV.—Ordovician Brachiopoda—Continued.

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Bull. 87—3
### TABLE IV.—Ordovician Brachiopoda—Continued.

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### TABLE IV.—Ordovician Brachiopoda—Continued.

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Number of Ordovician species, 319.

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### SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.

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SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.

Table V.—Silurian Brachiopoda—Continued.

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### Table V. — Silurian Brachiopoda — Continued.

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### Table V. — Silurian Brachiopoda—Continued.

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TABLE VI.—Devonian Brachiopoda.

[C = Chemung; Co = Corniferous; ED = Eodevonian; G = Genesee; H = Hamilton; Hu = Huron; I = Ithaca; M = Marcellus; MD = Mesodevonian; ND = Neodevonian; P = Portage; S = Schenectary; Tu = Tully. Species preceded by an asterisk (*) are found in the Carboniferous also; by an obelisk (†) in the Silurian.]

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Note: The table continues with entries for each species, including information on their distribution across different geological periods.
### Table VI. Devonian Brachiopoda—Continued.

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TABLE VI.—Devonian Brachiopoda—Continued.

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TABLE VII.—Carboniferous and Permian Brachiopoda.

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[S = Burlington; EC = Eocarboniferous; K = Keokuk; Ka = Kaskaskia; SL = St. Louis. Species preceded by an obelisk (t) are found in the Devonian also.]
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### Table VII. - Carboniferous and Permian Brachiopoda—Continued.

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### SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.

#### TABLE VII.—Carboniferous and Permian Brachiopoda—Continued.

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### SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.

#### TABLE VII.—Carboniferous and Permian Brachiopoda—Continued.

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Number of Carboniferous species, 478.
Number of species in each division: 156 93 74 158 9.
Number of species common to the Kinderhook and the other divisions: 9 0 0 0.
Number of species common to the Burlington-Keokuk and the other divisions: 9 5 4 1.
Number of species common to the St. Louis-Kaskaskia and the other divisions: 0 5 5 1.
Number of species common to the Coal Measures and the other divisions: 0 4 5 9.
Number of species common to the Permian and the other divisions: 0 1 1 9.
### TABLE VIII.—Mesozoic Brachiopoda.

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<td>Spirifera (?) allia Hall and Whitfield</td>
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<td>Terebratula repellini d’Orbigeoy. Mexico</td>
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<td>Terebratulina guadalupensis (Roemer)</td>
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<td>Waldheimia (?) catorcensis Aguilera. Mexico</td>
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</table>

Number of Mesozoic species, 49.

| Number of species in each system | 11 | 13 | 4 | 22 |
**SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.**

**TABLE IX.—Cenozoic and Recent Brachiopoda.**

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<th>Species</th>
<th>CENOZOIC.</th>
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<tr>
<td>Rhychnochile wilmingtonensis (Lyell and Sowerby)</td>
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<tr>
<td>Teredrabula canipes Ravenel</td>
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<tr>
<td>Teredrabula carnoidea Guppy, Trinidad</td>
<td>x</td>
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</tr>
<tr>
<td>Teredrabula demissirostra Conrad</td>
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<tr>
<td>Teredrabula lecta Guppy, Trinidad</td>
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<tr>
<td>Teredrabula nitens (Conrad)</td>
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<tr>
<td>Teredrabula trinitatensis Guppy, Trinidad</td>
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<td>Teredrabula gracilis (Schoetheim)</td>
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<tr>
<td>Teredrabula lachryma (Morton)</td>
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<tr>
<td>Teredrabula tejonensis Stanton</td>
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<tr>
<td>Waldheimia kennedyi Dall</td>
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<td><strong>Number of species in each division</strong></td>
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<td>Discinisca atlantica (King)</td>
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<td>Discinisca cumingi (Broderip)</td>
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<td>Frielea halli Dall</td>
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<td>Giotididida alba (Hinida)</td>
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<td>Giotididida audebari (Broderip)</td>
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<td>Platidid anomioids (Phillippi)</td>
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<td>Terebratulia transversa (Sowerby)</td>
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<td>Terebratulina kiensis Dall and Pillsby</td>
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<td><strong>Number of species in each ocean.</strong></td>
<td>15</td>
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### TABLE X.—South American fossil Brachiopoda.

[J = Jurassic. Species preceded by an asterisk (*) are found in North America also.]

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<th>Species</th>
<th>Carboniferous</th>
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<th>Jurassic, Trias.</th>
<th>Cretaceous</th>
<th>Tertiary</th>
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<td>Amaba parisa Clarke</td>
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<td>* Anoplotechina flabellites (Conrad)</td>
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<td>* Canarotechina dotis Hall</td>
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| Productella macrurensis Rathbun         |          |            |          | x        |               |                     |            |          |
| Productus batesianus Derby              |          |            |          | x        |               |                     |            |          |
* Productus bolivianus d’Orbigny         |          | x          |          |          |               |                     |            |          |
| Productus capacii d’Orbigny             |          | x          |          |          |               |                     |            |          |
| Productus chandleezi Derby              |          | x          |          |          |               |                     |            |          |
| Productus clarkianus Derby              |          | x          |          |          |               |                     |            |          |
* Productus corn d’Orbigny               |          |            |          |          | x             |                     | x          |          |
* Productus costatus (Sowerby) de Koninck |          |            |          | x        |               |                     |            |          |
| Productus humboldti d’Orbigny           |          |            |          | x        |               |                     |            |          |
* Productus longispinus Sowerby†         |          | x          |          |          |               |                     |            |          |
| Productus papilio Gabb                  |          |            |          | x        |               |                     |            |          |
| Productus peruvianus d’Orbigny          |          |            |          | x        |               |                     |            |          |
| Productus reticulatus Gabb              |          |            |          | x        |               |                     |            |          |
| Productus rhominus Derby                |          |            |          | x        |               |                     |            |          |
* Productus semireticulatus (Martin)      |          |            |          | x        |               |                     |            |          |
| Productus villiersi d’Orbigny           |          |            |          | x        |               |                     |            |          |
| Productus wallacianus Derby             |          |            |          | x        |               |                     |            |          |
* Reticularia perplexa (McChesney)       |          |            |          | x        |               |                     |            |          |
| Retzia (†) jamesiana Rathbun            |          |            | x        |          |               |                     |            |          |
| Rhipidomella hartii (Rathbun)            |          |            |          | x        |               |                     |            |          |
| Rhipidomella inca (d’Orbigny)           |          |            | x        |          |               |                     |            |          |
| Rhipidomella penniana Derby             |          |            |          | x        |               |                     |            |          |
| Rhynochonella enigma (d’Orbigny)        |          |            |          |          |               |                     | x          |          |
| Rhynochonella andin Gottische           |          |            |          |          |               |                     |            | J        |
| Rhynochonella antifius (d’Orbigny)      |          |            | x        |          |               |                     |            |          |
| Rhynochonella antoniai Gabb             |          |            |          |          |               |                     |            |          |
| Rhynochonella belemnitica Quenstedt     |          |            |          |          |               |                     | x†         |          |
| Rhynochonella caracolensis Gottische    |          |            |          |          |               |                     |            |          |
| Rhynochonella errenensis Rathbun        |          |            |          |          |               |                     | x†         |          |
| Rhynochonella manflasensis Möricke       |          |            |          |          |               |                     |            |          |
| Rhynochonella pipira Derby              |          |            |          | x        |               |                     |            |          |
* Rhynochonella plenicorn (Phillips)      |          |            |          | x        |               |                     |            |          |
<p>| Rhynochonella plicatissima Quenstedt    |          |            |          | x        |               |                     |            | J        |
| Rhynochonella subtetradra (Conrad)       |          |            |          |          |               |                     |            | x†       |</p>
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<td>Terebratula raimondiana Gabb</td>
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SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.

TABLE X.—South American fossil Brachiopoda—Continued.

<table>
<thead>
<tr>
<th>Species</th>
<th>Cambrian</th>
<th>Ordovician</th>
<th>Silurian</th>
<th>Devonian</th>
<th>Carboniferous</th>
<th>Jurassic</th>
<th>Triassic</th>
<th>Cretaceous</th>
<th>Tertiary</th>
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<tr>
<td>Terebratula subovoides Roemer</td>
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<tr>
<td>Terebratula subnumismatica Davidson</td>
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<tr>
<td>Trigeria (?) margarida (Derby)</td>
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<td>Trigeria (?) wardiana (Rathbun)</td>
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<td>Tropidoleptus carinatus (Conrad)</td>
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<tr>
<td>Vitulina pastulosa Hall</td>
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Number of South American species, 159.
Number of species in each system: 2 12 2 61 47 26 6 2
Number of species common to South and North America, 28.
CHAPTER II.

BRACHIOPOD TERMINOLOGY APPLIED TO FOSSIL FORMS.

Adductor muscles.—In the Protremata and Telotremata these muscles have their ventral insertion one on either side of the central axis, between the diductors. In passing to the dorsal valve they divide into four, and produce in that shell the two pairs of principal scars known as the anterior and posterior adductors. By contraction these muscles close the shell. In the Neotremata they are the essential muscles, so far as scars in the fossil shells are concerned, the anterior adductors closing the valves, while the posterior pair serves to open the valves. In the Atremata there is a simple pair of adductors placed near the anterior extremity of the visceral area.

Anterior region.—That portion of the shell in front of the transverse axis and opposite the pedicle opening.

Apex.—The place of initial shell growth. It may be the most posterior portion of the valve or may be situated near the transverse axis.

Brachiidium (Hall and Clarke).—The calcareous brachial supports of the Spiriferacea and Terebratulacea.

Cardinal area.—A more or less well-developed triangular area on each side of the delthyrium, distinctly set off from the general surface of the shell. It is best developed on the ventral valve of articulate brachiopods, but is also present on the dorsal valve, and generally in a rudimentary condition in many inarticulate species. See Deltidium.

Cardinal extremities.—The terminations of the hinge line.

Cardinal process.—A variously modified apophysis, situated posteriorly at the center of the hinge of the dorsal valve in articulate brachiopods. To it are attached the diductor muscles, which by their contraction serve to open the valves anteriorly.

Cardinal slopes.—The inclined surfaces extending from the umbonal slopes to the hinge margins.

Chilidium (Beecher).—A plate, in appearance similar to the deltidium, covering the exterior portion of the cardinal process in many Protremata. Its development does not begin until early neanic or later growth, and is probably secreted by the dorsal mantle lobe.

Crura.—Processes on the dorsal hinge plate of the Telotremata and some Protremata, to which are attached the fleshy brachia and brachidia. These usually form the inner walls of the dental sockets, and may be supported by septal plates.

Cruralium (Hall and Clarke).—The dorsal equivalent of the ventral spondylium, being formed by the convergence or union of the crural plates in the Pentameracea.
Delthyrium (Hall and Clarke).—The triangular aperture transecting medially the cardinal area, or the posterior surface from the apex to the posterior margin of the ventral valve, through some portion of which the pedicle passes. It has also been termed the fissure or foramen. The delthyrium may or may not be closed by a deltidium or deltidial plates.

Deltidium.—A plate of one piece which grows over the delthyrium of many Protremata and some Neotremata. In the early larval stage of Thecidium this plate begins as a secretion from the dorsal side of the body segment, and becomes anchylosed to the ventral valve in the phylembronic stage, subsequent additions being secreted by the body wall and pedicle. The convex or concave central portion of the ventral cardinal area in some Atremata is not homologous with the deltidium. It is but a part of the area, and does not have its origin in the prodeltidium, as in Thecidium.

Deltidial plates.—Two plates growing medially from the walls of the delthyrium after neanic growth. These usually unite medially, and close the delthyrium more or less completely. They are restricted to the Telotremata, and are secreted by extensions of the ventral mantle lobe. Hall and Clarke introduced the terms deltarium and deltaria for the same plates, and for the coalesced condition of the deltaria, Bronn's pseudodeltidium.

Dental plates.—Vertical plates supporting the teeth of the ventral valve.

Dental sockets.—Excavations in the dorsal cardinal margin in which the teeth of the ventral valve articulate. The inner wall of the socket is elevated and forms the base of the crural plate.

Diductor muscles.—In the Protremata and Telotremata the principal pair of diductor muscles has the larger end attached to the ventral valve near the anterior edge of the visceral area, while the other end has its insertion on the anterior portion of the cardinal process. There is another pair of small accessory diductor muscles, but these are seldom shown in fossil shells. By contraction these muscles open the valves.

Dorsal valve.—Usually the smaller and imperforate valve and the one to which the brachia are always attached. Brachial, hemal, socket, and entering valves are other terms more rarely employed.

Ephelic (Hyatt, emend. Bather and Buckman).—Designating the mature shell.

Foramen.—A small circular passage through the deltidium or deltidial plates, either below or at the apex of the ventral valve. Sometimes the foramen encroaches by abrasion upon the umbo of the ventral valve.

Genital markings.—Radial markings or pits within the posterior portion of the visceral space, indicating the position and extent of the genitalia.
**Gerontic** (Hyatt, emend. Bather and Buckman).—Designating old age. It is indicated in the ontogeny of many species of brachiopods by extreme thickness of the valves, obesity, or by numerous, crowded growth lines near the anterior margin, a condition which sometimes produces truncation and absence of striae at the margin.

**Hinge line.**—The line along which articulation takes place.

**Jugum** (Hall and Clarke).—The transverse band and its accessory processes uniting the spiralia. When this band is medially incomplete the parts are termed *jugal processes*.

**Lateral areas.**—That portion of the shell on each side of the ventral axis.

**Listrium** (Hall and Clarke).—In some Neotremata a plate closing the progressive track of the pedicle opening or pedicle cleft, posterior to the apex of the ventral valve.

**Longitudinal axis.**—A median line through the shell from the beak to the opposite margin.

**Loop.**—The calcareous brachial supports of the Terebratulacea. It is usually composed of descending and ascending lamellae, united by a transverse band.

**Median septum.**—An internal vertical plate commonly developed along the vertical axis and between the muscles of the ventral valve. Sometimes there is also a dorsal median septum. Lateral septa are rarely developed.

**Neanic** (Hyatt, emend. Bather and Buckman).—Designating youthfulness, or the stage in which specific characters begin to develop.

**Nepionic** (Hyatt).—Designating the smooth-shell stage succeeding the protegulum.

**Pallial sinuses.**—Two convergent or divergent primary sinuses of the circulatory system, traversing the mantle and originating in the posterior medial region. They usually have numerous secondary branches, and both often leave impressions in the shell.

**Pedicle.**—The flexible muscular organ of the ventral valve by means of which brachiopods may be attached to extraneous objects.

**Pedicle muscles.**—In the Protremata and Telotremata one pair originates on the ventral valve at points just outside and behind the diduc-tors and another on the dorsal valve behind the posterior adductors, while the opposite ends of both are attached to the pedicle. Besides these, there is an unpaired muscle lying at the base of the pedicle, attaching it closely to the ventral valve.

**Platform.**—See *Spondylium*.

**Posterior region.**—That portion of the shell back of the transverse axis and toward the beak, or apex.

**Primary lamella.**—The primary descending bands of the spiralia, the posterior ends being attached to the crura.

**Prodeltidium** (Hall and Clarke restricted).—The third shell plate developed in the earlier embryonic growth of species of Atremata,
Neotremata, and Protremata, and subsequently becoming more or less firmly attached to either the dorsal (Atremata) or ventral valve.

Protegulum (Beecher).—The initial shell of brachiopods. It is smooth and of microscopic size, in outline being semicircular or arcuate, and without cardinal areas.

Protractor muscles.—In the Lingulacea one pair has the ventral ends fastened at the anterior extremity of the visceral area, extending backward and inserted near the lateral margin of the dorsal valve, outside the rotators. A second pair originates just behind the adductors of the ventral valve, and is inserted posterior to the first pair. These muscles draw the dorsal valve forward. They are apparently present in the Obolidae and Trimerellidae, but their position is different.

Pseudodeltidium.—Properly this term applies only to the united condition of the deltidid plates in the Protremata and Telotremata. It is provisionally applied to the concave or convex medial portion of the cardinal areas in Atremata and Protremata.

Retractor muscles.—In the Atremata these extend from the outer lateral margins of the visceral area in the ventral valve to its anterior extremity in the dorsal valve, and serve to readjust the dorsal shell.

Rotator muscles.—In Lingulacea these are situated posteriorly just in advance of the umbonal muscle, two on one side and one on the other. By their contraction the dorsal valve turns alternately first in one direction and then in the other.

Septal plates.—Plates supporting the crural processes, also known as crural plates.

Spondylium.—A plate in the Pentameracea, formed by the union of converging dental plates, to the upper surface of which are attached the adductor, diductor, and pedicle muscles. The spondylium may rest upon the ventral valve or may be supported by a median septum. This plate is rarely present in the Telotremata, but more commonly in the Atremata, where it is known as the platform. There is sometimes developed in the dorsal valve a plate similar in appearance to the spondylium, but different in origin, and known as the cruralium.

Spiralia (Beecher).—The calcareous spiral brachial supports in the Spiriferacea. A connecting jugum may be present or absent.

Syrinx.—A tubular structure developed in the delthyrium of some Spiriferacea, opening ventrally and partially inclosing the pedicle.

Teeth.—Two processes of the ventral valve of articulate brachiopods, serving for articulation.

Transverse axis.—A line through the shell from right to left, midway between the beak and anterior margin.

Umbo.—The elevated or prominent portion of the valve anterior to the apex.

Umbonal muscle.—A single muscle situated in the umbonal region of most Atremata. By its contraction the valves are opened anteriorly. In Obolus this muscle divides toward the ventral valve.
Umbonal slopes.—The inclined surfaces about the umbo and opposite the cardinal slopes.

Ventral valve.—The valve situated on the ventral side of the animal, and having in youth or maturity a delthyrium or pedicle opening through which the pedicle is protruded, except in Iphidea, Obolella, Lingula, etc., where the pedicle protrudes between the valves. When the shell is cemented to foreign bodies it is always by the ventral valve. It is usually the larger and deeper of the two valves. Pedicle, larger, dental, neural, and receiving valves are synonymous terms.
CHAPTER III.

BIOLOGIC DEVELOPMENT OF THE BRACHIOPODA.

ORDINAL DEVELOPMENT.

ATREMATA.

This order, which began in the Lower Cambrian, is represented by 199 species, or over 10 per cent of American Paleozoic brachiopods. Its greatest representation, both in species and genera, was during the Cambrian and Ordovician eras. A very marked decline set in during the Silurian and Devonian, with almost extinction in the Carboniferous, where only Lingula and its subgenus Glossina occur.

The terminal families Trimerellidae and Lingulidae contain species which attain the greatest individual growth. Lingulidae has the longest phylogenetic history. It is the last important and most specialized family of the Atremata, and manifests the greatest persistency and specific differentiation. Lingula, the essential genus of the family, lived at least from the Ordovician system through all succeeding time, and is represented in modern seas. During this enormous period the only change observable is that in the ancient forms the viscera occupied a little more and the brachia somewhat less space.

In the more primitive types of Atremata, Obolacea, the shell is usually much thicker and less chitinous than in the higher or derived families, Lingulacea. The shell is thickest in the Trimerellidae and thinnest in the Lingulidae. From their mode of occurrence in rocks it seems probable that Paterinidae, Obolidae, and Trimerellidae (=Obolacea) never lived in the mud or sand of the sea bottom, as did Lingulidae, Lingulasmatidae, and probably Lingulellidae (=Lingulacea). The oboloids in all probability had short pedicles, while the linguloids have very long pedicles. The long, flexible, tubular pedicle of Lingula, associated with the buried habit of the animal, apparently explains

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8Since all the species of Obolacea are known only as fossils, it may seem hazardous to ascribe to them a mode of living different from that of Lingula. These shells had short peduncles, are round or oval, sometimes very gibbous, always comparatively thick shelled, and not decidedly phosphatic. The writer has never observed any species of this superfamily in situ transverse to sedimentation, or in other words "on edge." In the Lingulacea the peduncle is very long, and the shells are elongate quadrangular, triangular, spatulate, or acuminate, and, as a rule, are decidedly thin and phosphatic. Recent Lingulas all live partially buried in the sea bottom, and not infrequently fossil species are found in situ, on edge, with their apices downward. Lingulops and Lingulasma also have been observed situated on edge. The round, thick shells of Obolacea are strongly contrasted with the elongate thin shells of Lingulacea. These peculiarities are in all probability due to mechanical causes. The Linguloids, with their long, powerful, and flexible peduncles, are buried in the sediments, while the posteriorly pointed shell is an adaptation to the same end, caused by the frequent peduncular pulling on that part of the valves.
the cause for the thinness of the shell and the long, narrow, attenuated form of its valves.

The ontogeny of Obolella and Lingula shows that one branch developed directly from the Paterinidae to Obolidae and Trimerellidae, while another branch began in the Obolidae. The derived branch continued to diverge by changing the thick round shells of the radical stock into thin spatulate or elongate subquadrate valves, first in the Lingulellidae and culminating in the Lingulidae. The latter family then gave rise to Lingulasmatidae, which, in accordance with the law of morphologic equivalents, developed some of the internal diagnostic characters of the terminal family of the first phylum in the platform of the Trimerellidae.

Hall and Clarke refer the genera of Lingulasmatidae to Trimerellidae, and thus the latter family, as understood by them, embraces two stocks having widely separated origins. This is peculiar, since they clearly understand the independent origin of these stocks, as will be seen by the following quotation, but more particularly by their diagram.

There is no single feature in the entire group of the edentulous brachiopods so striking as the great platforms in Trimerella and its allies, and it is rarely that so beautiful and well established an illustration of the attainment of such a remarkable resultant along two distinct lines of development can be presented.

The writer holds that a natural family can have but one stock, a stock can have but one origin.

Nonfunctional articular processes are developed in this order in a number of genera and at various times. Such are slightly developed in Trimerella and Monomorella, and more strongly in Tomasina, Barroisella, and Spondylobolus. In the Neotremata, articulation is also approached in Trematobolus, and in Crania a false hinge is sometimes developed in Ordovician species. A cardinal process so characteristic of the Protremata and Telotremata is faintly developed in Neobolus, Lakmina, and Trimerella of the Atremata.

**NEOTREMATA.**

The order Neotremata begins in the Lower Cambrian, and is represented by 156 species, or over 8 per cent of the brachiopods of the American Paleozoic. It has considerably fewer species than the Atremata, and exhibits a lack of specific differentiation, such as form and surface ornamentation. This probably is largely due to the fact that the pedicle is very short, or even obsolete, in this order, and that the pedicle foramen is subcentral, producing in the Trematidae and Cranidae more or less of a parasitic growth, while in the families Discinidae and Acrotretidae the great majority of species are circular or oval, with more or less cone-shaped shells.

As in the Atremata, great tenacity of life is also manifested in this order, since its two essential families, Discinidae and Cranidae, have representatives throughout all time since the Ordovician system.

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Greatest representation in both genera and species was during the Ordovician, after which generic differentiation was practically restricted to the Discinidæ and Craniidæ. Crania persisted throughout the post-Ordovician, and for longevity equals the atrematous genus Lingula.

The percentage of widely dispersed species is about the same as in the Atremata, and likewise is greatest in those families with the longest phylogenetic history, as Acrotretidæ, Discinidæ, and Craniidæ.

Development was along two lines. In one a broad fissure (the most primitive condition of the pedicle opening in this order) is retained as a mature character (Trematidæ). Later geologically, and at the maturity of the individual in derived forms, the fissure is gradually closed posteriorly, leaving a long, narrow slit, at one end of which the pedicle emerges (Discinidæ). The other line (Acrotretacea) probably developed and inherited holoperipheral growth in the ventral valve, very rapidly producing a small subcentral circular foramen, since this feature is already well developed in the Lower Cambrian Acrotretidæ, and in advance of the greatest development of the Discinidæ. It is probably this second branch that gave origin to the degraded family Craniidæ. The protegulum in the dorsal valve of Acrotretacea is probably always marginal, whereas in the Discinacea it is always more or less central.

It is remarkable that Crania, so unlike other living brachiopods and occurring abundantly in the seas of to-day, has never been completely studied developmentally or ontogenetically. The taxonomic position of the Craniidæ is therefore not actually determined, and Hall and Clarke incline to follow Waagen in regarding the Craniacea as equivalent in rank to the Atremata and Neotremata. These authors write:¹

It is nevertheless to be observed that no trace of a former pedicle-slit incision or perforation is found on mature or immature shells, and it would be difficult to comprehend in what manner such an essential modification of the shell could be wholly concealed by later growth. Were the pedicle marginal in primitive growth stages, and subsequently atrophied, the obliteration of the marginal opening by later resorption and growth would be a readily intelligible process. There is, hence, in this default of evidence, a good reason to doubt the close affinities of Crania and Pholidops to the Diacaulia [= Neotremata]. Present knowledge would seem to indicate that they were primarily of the type of the Mesocaulia [= Atremata], and that their resemblance to the Diacaulia is wholly of secondary growth. Waagen's term for this group, Gastropegmata (or Crauiacea), may therefore prove to be equivalent to each of these other two divisions.

Brachiopod embryology demands a pedicle in the early stages of Crania. The ventral valve carries the pedicle, and it is always this valve which is attached by cementation or otherwise. The writer has observed in Yale University Museum a specimen of Pholidops ovata with a cicatrix of attachment, around which point growth is holoperipheral, as in all Neotremata. Specimens of Pholidops are sometimes preserved with both valves in position and delicately attached to Bryozoa,

from the Falls of the Ohio. These are believed to be actual and not chance attachments. In Crania cementation occurs very early and is complete, causing all obliteration of the protegulum and subsequent stages of growth in the ventral shell. That cementation does obliterate nearly all the younger characters is also shown in the remarkable genera Richthofenia and Ostrea. On the interior of Pholidops and Crania the four large muscular scars, which are more those of the Neotremata than of the Atremata, are arranged medially, in the center of which, probably, was the pedicle opening. Some proof of this is seen in the excavated, posteriorly terminating muscular pit of *Crania ignabergensis*, which, if carried through the valve, will make the pedicle opening subcentral and surrounded by shell deposit. If an Acrotreta, Linnarsonia, or Conotreta became cemented, there would result practically a Crania. In no atrematous brachiopod is there the slightest indication of cementation, but where shell fixation does occur it is always (excepting in Zugmeyeria and Thecocystella) in such as have the pedicle very early surrounded by shell matter, as in the Strophomenidae and Productidae. For these reasons the characters of Craniacea seem more in accord with the Neotremata than with the Atremata. The characters of Craniacea are certainly not of ordinal importance, and possibly not even of superfamily value.

In the development of its pedicle foramen the family Siphonotretidae is unlike any other of this order. During neanic growth the pedicle opening was posterior to the protegulum, but later it gradually moves anteriorly through the shell by resorption, producing a narrow slit similar in appearance to that of the Discinidae. A pedicle foramen of the same nature is also developed in Eichwaldia and Dictyonella of the Protremata. As yet no explanation has been given as to the causes producing this aberrant development. The writer suggests that since these animals had delicate peduncles, with the shell elongate oval and sometimes cone-shaped in form, they probably stood nearly upright on their pedicles in early growth. Shell accretion being more rapid anteriorly, with the ventral side of the animal the larger and heavier, a tendency was initiated for the shell to lean against the ventral side of the peduncle. This pressure would produce resorption of the ventral shell anterior to the pedicle, and eventually, this tendency becoming hereditary, the ventral valve would lie nearly flat, with the pedicle emerging at a great angle subcentrally.

**PROTREMATA.**

This order is represented by 738 species, or nearly 40 per cent of American Paleozoic brachiopods, and is eminently characteristic of the post-Cambrian Paleozoic systems. Like the Atremata and Neotremata, it is represented in the Lower Cambrian. It was not, however, until Ordovician times that the Protremata attained very rapid evolution. In the Cambrian there are but 4 genera and 22 species, while in **Bull. 87—6**
the Ordovician there are 20 genera and 173 species, a specific increase of more than seven and one-half times the number in the Cambrian. Greatest generic differentiation occurred during the Silurian, where 30 genera appear. Then began a steady decline, with extinction in the Carboniferous of North America. In the Triassic of Europe this order is sparingly represented by small species, and is there essentially restricted to the family Thecidiidae, which continues to have living representatives in the Mediterranean Sea.

The widely distributed species gradually increase in percentage from 14 in the Cambrian to 36 in the Carboniferous, and are most marked in the family Productidae. This family is one of the last of the order to originate.

The largest of all brachiopods occur in this order, in the families Pentameridae and Productidae, exceeding the Spiriferidae of the Teleostreptata. In the former family greatest size is attained in the Silurian during the acme of the order, and in the Productidae in the Carboniferous system. *Productus giganteus* of the Lower Carboniferous is the giant of all brachiopods, attaining a diameter of nearly 1 foot. In both these families the earliest species are small, but certain groups gradually attain larger and larger size with geologic time. Upon the appearance of the giants, vitality of the families, as exemplified in specific differentiation and robustness of individuals, is at its highest. After this these families rapidly decline, and the species dwarf far more rapidly than they developed to the climax.

In the Protremata, as in the two previous orders, greatest specific differentiation does not occur in the radical families, but in those of later development. The Kutorginidae, Clitambonitidae, and Billingsellidae are the radical and, geologically, the oldest families of the Protremata. These are best but sparingly developed in the Cambrian, whereas the younger families, Pentameridae, Strophomenidae, Productidae, and Orthidae, contain over 95 per cent of the species and nearly 90 per cent of the genera. Orthidae and Strophomenidae, beginning in the Cambrian, are best developed in the Ordovician and Silurian systems, respectively; while Productidae, originating in the Silurian, attained a climax in the Carboniferous. The latter family was one of the last of the Protremata to originate and has the shortest geologic history and least generic differentiation, yet many of its species have greater geographic dispersion.

The Protremata are clearly divisible into two phyla, Strophomenacea and Pentameracea. The former superfamily has the greater number of species, and is characterized by the nondevelopment of a spondylium or cruralium. The Pentameracea has, in addition to the deltidium, an internal spoon-shaped plate, or spondylium, serving for the attachment of muscles, and a discrete or united cruralium. The superfamily Strophomenacea in North America has 608 species, and represents the most primitive phylum, since it is far better developed in the Cambrian than
is the Pentameracea, and has almost without exception a straight cardina­

nal area. The Pentameracea has 127 species, and its earliest forms also
have straight hinge-lines in the 16 species of the families Clitamboni­
tidæ and Syntrophiiidæ; but the rostrate family Pentameridæ, which
attained maximum development in the Silurian, has 87 species. The

Strophomenacea has living species, while the Pentameracea disappeared
with the Permian. The cause for the rapid extinction of the latter is
probably due to the high degree of specialization expressed by the

spondylius.

Two well-marked types of shell form are developed in this order. By
far the most prominent is the group which includes the long-hinge fami­
lies Kutorginidæ, Clitambonitidæ, Billingsellidæ, Strophomenidæ, Pro­
ductidæ, Thecidiidæ, and Orthidæ. The other group, represented by
Pentameridæ, is largely rostrate in form, but occasionally also develops
a straight hinge line. This, however, is never so prominent as in the
former group. In the Telotremata the general form is rostrate, but
very notable exceptions are present in the families Spiriferidæ and
Terebratellidæ, and occasionally in the Rhynchonellidæ and Athyridæ.
The form of the shell, however, has no great taxonomic value, and can
not be accorded more than generic rank. The dominating type of
shell form within an order probably has phyletic value, since the oldest
protrematous shells are long-hinged, while the telotrematous shells are
usually rostrate. Nevertheless, as indicated above, in the derived forms
of both orders there are notable exceptions, and these changes are
probably always induced by shortening or lengthening of the peduncles.
Since Orthorhynchula has a well-developed cardinal area, it is not in
itself "evidence of the first significance as indicating the source from
which the extensive group of the Rhynchonellas originated."

The oldest rhynchonelloids are rostrate shells (Protorhyncha minor
and P. ?ambigua of the Lower Cambrian), and the ontogeny of several spe­
cies of Rhynchonella and of Zygoöspira has not revealed a long-hinged
stage with cardinal areas. There is, therefore, no conclusive proof for the
deduction of Hall and Clarke, "that some of the Rhynchonellidæ, early
in their [geologic] history, occasionally retain a well-defined cardinal
area, and that, in default of other evidence, the presence of this char­
acter may be regarded as indicative of the common origin of Orthis,
the Strophomenidæ, and the Rhynchonellas."

In this order far more than in any other is found the closure of the
pedicle passage and atrophy of the pedicle, together with peculiar
special adaptations which entirely or partially replace the functions
of the pedicle. In the family Productidæ the ventral shell develops
more or less abundant tubular spines, either along the cardinal line or
over the entire valve. These are always most abundant in, or are

2Ibid., p. 342. For further remarks bearing on this subject, see pages 93–95 on the significance of the
prodeltidium.
restricted to, the posterior region. The functions of the spines are to hold the animal to its place of habitation, for there is no apparent pedicle opening in these shells when mature. In others of the same family the ventral apex is cemented to extraneous objects (Strophalosia), and in still others the spines clasp the object of support when small (Strophalosia goldfussi and Etheridgina). In the Strophomenidae the older species all seem to have functional pedicles throughout life, but in the Devonian, forms occur in which the apex is cemented to foreign objects (Leptœniscus). Some of the Middle and Upper Devonian Stropheodoutas show no trace of a pedicle opening when adult. In the Carboniferous cementation is far more common, and occurs in Derbya and Streptorhynchus; and when taken in connection with Strophalosia, Chonostrophia, Aulosteges, and Richthofenia, it is seen that nearly all the contemporaneous species of this order have developed other methods for fixation than the normal one. In Richthofenia calcareous cementation is complete, and the modifications resulting therefrom have so changed the shell that the lower or fixed valve is very suggestive of a cyathophyllum coral, not only in form but even in shell structure.

The chief cause for atrophy of the pedicle lies not only in the fact that this organ, in all long-hinged brachiopods, is short, but more particularly in the fact that throughout this order, and in the Acrotretacea of the Neotremata, the young shells always have the pedicle completely surrounded by shell, and thus to a great extent limit its growth. Even among the Orthidae, where the species geologically older often have thick pedicles, which is indicated by the large open delthyrium, they gradually diminish in size throughout the Paleozoic. In the Strophomenidae the pedicle is never a thick organ, and shortly after this family gives rise to the Productidae, in Chonetes, the first appearance of cementation takes place. This mode of attachment constantly increases in the different phyla to the end of the family histories. In the Productidae the early inheritance of a weak pedicle soon leads to its complete loss by the additional fixation developed. This additional fixation has its first appearance in the cardinal spines of Chonetes, which are periodically developed by mantle extensions. The degeneracy of the pedicle, once well established, is inherited at earlier and earlier periods by acceleration. The spines become more numerous, and are finally developed over the entire ventral valve. In the dorsal valve, the spines are never so long as in the ventral valve, and often are not developed at all, but are replaced by numerous concentric overlapping lamellæ. As the spines begin to develop more numerously and longer, the ventral valve attains more convexity, with a strongly incurved beak and the complete loss of a pedicle opening. Productus, therefore, does not stand erect on the cardinal areas, as in Chonetes; but lies on the ventral shell, anchored by the numerous spines. The spines are of the same nature as the shells, and never flexible. When
they came in contact with hard objects during their growth, they followed along or clasped the object of support.

The slender shell-incased pedicle of the Strophomenaceae probably leads to the growth of long, straight hinges for additional support, further weakening the pedicle and necessitating accessory fixation in four of its families, and finally occasioning in many species complete loss of this organ at the maturity of the individual. With the exception of the Thecidiidae, the order Protremata has become nearly extinct since the Jurassic era.

**TELOTREMATA.**

This order, though but 2 Cambrian and 20 Ordovician forms are known, is represented by 766 species, or about 41 per cent of all American Paleozoic brachiopods. It is as well developed specifically as the Protremata, and exhibits a far greater variety of structures. Telotremata was probably the last order to originate, and has the greatest number and variety of living species. Its highest development is in the Devonian, where 369 species in 50 genera occur, while 109 species are known from the Silurian, a growth more than five times greater than that of the Ordovician system. Here, too, as in the Protremata, considerable time was consumed in establishing a few primitive characters, and these are no sooner obtained than an almost sudden development of great specific and generic differentiation takes place.

It is highly probable that no telotrematous Paleozoic genus continued to live through half the geologic time that Lingula and Crania did. Rhynchonella, a primitive genus of this order, is often said to have continued since the Ordovician, and Terebratula since the Devonian era. This is now very doubtful, since Hall and Clarke have demonstrated that in all of the Paleozoic forms of these genera where it has been possible to examine their interiors none belong to Rhynchonella or Terebratula. In this catalogue both genera are recognized as occurring in the Paleozoic, but this is due to the fact that the internal structure of those species is not known.

Telotremata has three distinct types of brachial supports, which readily serve to differentiate 3 superfamilies. The simplest, Rhynchonellacea, has but crura, and is represented in the American Paleozoic by 14 genera and 202 species, of which 66 are widely distributed. The superfamily Terebratulacea, having more or less simple V or W shaped brachial supports, is present with 19 genera and 78 species, of which 23 are widely distributed. In the structurally more complex superfamily Spiriferacea, having spiral brachial supports, there are 41 genera and 466 species, and of these 161 become widely distributed. This again confirms the previously noted fact that the groups latest developed have the greatest generic and specific differentiation. In Spiriferacea this likewise occurred in the family Athyridae.
If the percentage of widely distributed species within a superfamily is a criterion of its vitality, it will be seen that the Eynchonellacea begin in the Ordovician with 50 per cent and decline to 23 per cent in the Carboniferous. The Spiriferacea, also beginning in the Ordovician, have 50 per cent of their species widely distributed, becoming reduced to 20 per cent in the Carboniferous. On the other hand, the Terebratulacea were not widely dispersed in the Silurian, whereas in the Devonian their distribution reached nearly 30, increasing to 34 per cent in the Carboniferous. Since no statistics of the European Mesozoic and Cenozoic species of this nature are available, the writer can not determine whether or not the Rhynchonellacea continue to decline with such rapidity. It is known, however, that this superfamily has declined considerably in the Cenozoic and late Mesozoic. After the Triassic the Spiriferacea are essentially represented by Spiriferina, yet it too died out with the Jurassic, while the Terebratulacea, which manifested progressively greater vitality during the Paleozoic, are believed to have continued so nearly throughout the Mesozoic into late Cretaceous time. Since then, however, they have also declined.

In the ontogeny of Dielasma and Zygospira—loop-bearing and spire-bearing genera respectively—Dr. Beecher and the writer have shown that the Terebratulacea may not have been the last superfamily to develop, as was formerly supposed, and that it may have given rise, during early Ordovician times, to the spire-bearing superfamily Spiriferacea. The Terebratulacea probably originated in the Rhynchonellacea, though no loop-bearing species are known until the spire-bearing forms are well advanced, or until early in the Devonian system. While some of the largest species of Terebratulacea are found in the Devonian of America and Europe, yet throughout the Paleozoic this superfamily is not a conspicuous one. In the Jurassic and Cretaceous systems of Europe, however, great specific differentiation and abundant individual development took place. There is but 1 species of this superfamily in the American Silurian, while the Devonian has 50 species in 15 genera, an increase fifty times greater than that of the Silurian. In the Carboniferous a sharp decline set in, and the superfamily is reduced to 30 species and 8 genera.

These facts suggest that either the superfamily Terebratulacea did not originate in American seas or—which seems less probable—that diminutive species occur whose interior characters have escaped detection. Further, since the earliest American primitive genera, Rensseleria and Trigeria of the Lower Devonian, have very large species, neither these nor Centronella can be the earliest adult representatives of this superfamily. When quite young, Zygospira, also, has a "centronella-like loop," and it is possible that the primitive Terebratulacea had their origin before the earliest appearance of Zygospira, or during the earliest part of the middle Ordovician era.

The great majority of telotrematous genera are rostrate in form, but
at different times and in separate phyla straight cardinal areas are more or less well developed. In America, the oldest members of this order (*Protoryynchia* minor and *P. f. ambigua*, members of the family Rhynchonellidae) occur in the Lower Cambrian. In these species, and in the great majority of this family, there is no cardinal area; but occasionally this character is present, the earliest conspicuous example being the Ordovician genus *Orthorhynchula*. Among the Paleozoic Terebratulacea cardinal areas are seldom developed. A conspicuous exception, however, occurs in Tropidoleptus. But in the Mesozoic and Cenozoic, in the family Terebratellidae, cardinal areas are very often present, and in living forms are accompanied by a short pedicle. It is, moreover, in the Spiriferacea, the youngest superfamily of the Telotremata to originate, that the greatest development of cardinal areas takes place. The oldest genera of the Spiriferacea are all rostrate, as in the Ordovician *Zygospira*, *Catazyga*, and *Cyclospira*. In the Silurian the Spiriferidae tend to develop rapidly long, straight, and wide cardinal areas, attaining greatest development in the Devonian and early Carboniferous. This excessive development of cardinal areas is no doubt due to the shortening and decline of the pedicle, since in the Triassic system forms occur in which cementation is complete (*Zugmeyeria* and *Thecocorynella*). Cardinal areas are also developed in other families of the Spiriferacea, but in no case can such be traced to Ordovician long-hinged ancestors.

In this order, more than in the Protremata, internal specialization of the brachia has progressed from a simple to a highly complex condition. In the Protremata, in its latest developed superfamily, Pentameracea, crura are also present, of the same phase of development attained by the Rhynchonellacea, the most primitive superfamily of the Telotremata. In this order, however, there are, with but few exceptions, no internal special structures, as spondylia. The specialization in the Telotremata is expressed in the progressive complication of the calcareous brachial supports. In the most primitive species of the Rhynchonellacea no crura are present (*Protoryynchia*), but in all later forms these appendages are well developed, and finally in the Trias and Jura attain very great length in Rhynchonellina. In the next more complicated superfamily, Terebratulacea, the crura in the primitive members have united anteriorly, thus forming the simple unchanging loop of Centronella and Rensselaeria, which is also known to occur in the very young of some species of the highest superfamily, the Spiriferacea. The geological history of the loop has shown that the brachia have been constantly changing, causing more or less complete resorption of the hard parts and adaptation to later requirements. The progressive development of the loop is also repeated ontogenetically and more or less fully in living terebratuloids.

In *Zygospira*, the oldest known genus of the suborder Spiriferacea, the primitive loop of Centronella is reproduced in the earliest phase in
the development of its brachidium. This is partially resorbed and changed in form, and to it is then added laterally the two spirals and medially the simple or, in the higher forms, the complex processes, or jugum. The volutions of the spirals in the oldest genera geologically are very few, but subsequently they become more numerous, and attain their maximum in the long-hinged Devonian and Carboniferous spirif'ers, where 35 volutions have been observed, with 24 in Atrypa.

The form of the paired spirals varies but little except under the necessity of conforming to the interior cavity of the valves. Their inclination and direction is a feature of much significance when considered with reference to the development of the entire shell. It is the loop, or to employ a term more appropriate in view of the homologies of the spire-bearing and loop-bearing shells, the jugum, however, which is subject to the most frequent variations in form, and which serves as the generic index. When the spirals are directed outward toward the lateral margins of the valves, the jugum seems to be much more variable than in shells where the spirals are introduced or take some intermediate position. In the latter there is a much greater variation in the position of the loop upon the primary lamellae than occurs in the former.1

GENERAL DEVELOPMENT.

In the preceding pages it is shown that the four types of pedicle openings which serve as the prime characters in distinguishing the four orders, Atremata, Neotremata, Protremata, and Telotreinata, are present in the oldest division of the Cambrian, the Olenellus zone. From the pre-Cambrian sedimentary rocks, or Algonkian system, practically no fossils are known, though there is evidence in them that life existed. The fact that the Olenellus zone has a varied marine fauna alone indicates that the sea during Algonkian times must have swarmed with living things. When the enormous time represented by the great thickness of North American pre-Cambrian sediments is considered, or that of Bohemia, it is evident that ample time elapsed for life to attain the degree of complexity manifested in the basal Cambrian zone. Kayser says that this pre-Cambrian time was "probably so long that the beginning of the Cambrian period may be considered as comparatively a recent event."2 Van Hise, in writing on the same subject, says:3

If geological history were to be divided into three approximately equal divisions, these divisions would not improbably be the time of the Archean, the time of the clastic series between the Archean and the Cambrian, and the time of Cambrian and post-Cambrian. In this connection it is well to recall that many years ago Logan suggested that the thickness of the Laurentian and Huronian may surpass that of all succeeding formations, and that the appearance of the so-called Primordial fauna may be considered as a comparatively modern event.

In the Lower Cambrian there are not many species of brachiopods, nor is the specific differentiation in any order very varied, indicating

1 Hall and Clarke, Palaeontology of New York, Vol. VIII, Part II, 1895, p. 343.
2 Text-Book of Comparative Geology, 1893, p. 13.
either that evolution in pre-Cambrian eras was much slower than subse-
sequently or that the class had its origin late in the Algonkian. Cam-
brian brachiopods usually differ fundamentally from one another, and
do not appear to have been persistent, as but 4 of the 22 genera pass
into the Ordovician. Differentiation also appears to have been slow
during the Lower and Middle Cambrian, but toward the close of this
system species begin to be more numerous and varied. In Middle Ordo-
vician times all the orders and superfamilies are well established
except Terebratulacea. The zenith of the class was attained in the
Silurian and Devonian eras, but decline began during late Devonian,
and steadily continued to the close of the Paleozoic. But 7 of the Car-
boniferous genera are known to have survived the break between the
Paleozoic and Mesozoic. During the latter time the spire-bearing
brachiopods pass out of existence, while the great Paleozoic super-
family Strophomenacea is represented by a few small species of the
Thecidiidae, which continue to be represented up to the present time.
After the Cretaceous system the orders Atremata, Neotremata, and
Protremata are represented only by Lingula, Discina, Discinisca,
Crania, and Thecidiium. The Terebratulidae may have had their incep-
tion below the middle of the Ordovician, but are not a pronounced
Paleozoic group. However, in the Jurassic and Cretaceous systems
the rocks abound with the shells of this family, and from that time on
they are the chief representatives of the class. Lingula and Crania
are present in the Ordovician, and, as far as can be determined, have
persisted to the present time.

Of the 49 families and subfamilies constituting the class, 43 became
differentiated in the Paleozoic, and of these 30 disappeared with it,
while but 13 continued from the Paleozoic into the Mesozoic. Of Paleo-
zoic families, 6 are represented by living species, viz, Lingulidae, Dis-
cinidae, Craniidae, Thecidiidae, Rhynchonellidae, and Terebratulidae.

Of the 327 genera now in use, 227 had their origin in Paleozoic seas,
or nearly 70 per cent of the entire class, and of this great number but
8 are positively known to pass into the Mesozoic, viz, Lingula, Orbicu-
loidea, Crania, Rhynchonella, Spiriferina, Athyris, Terebratula, and
Hemiptychina. Besides these, Streptorhynchus, Cyrtina, Retzia, Mar-
tinia, and Martiniopsis, are mentioned as occurring in the Triassic, but
these species probably in great part belong to other genera.

The Atremata, which contains the oldest and the simplest forms
structurally, is represented by 29 genera, while the Neotremata and
Protremata have 30 and 89, respectively. Telotremata is the last
order to appear, and has by far the greatest number of genera, 179.

The chronogenetic history of brachiopods shows that the four orders
begin with smooth shells, and that subsequently various kinds of sur-
face ornamentation are developed or disappear with varying degrees of
rapidity. The ontogeny of strongly plicated and lamellose shells, where-
ever observed, begins with smooth shells. All new surface characters

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are first introduced during adolescent growth or senility, and these by the law of acceleration appear earlier and earlier in later species. In the Lower Cambrian there are species of Billingsella with a few broad undulations in the shell, but in the Middle Cambrian the plications are pronounced and cover half or more than half the anterior portion of the valves, while in the Upper Cambrian these folds appear upon the umbones. In the oldest rostrate pentameroids the shells are either smooth or have a few folds (Camarella), which become more distinct in Parastrophe, and culminate in numerous sharp plications in Anastrophia. The rhynchonelloids, beginning in Protorthis of the Lower Cambrian as smooth shells, gradually become more and more plicated in the Silurian and Devonian, yet in the Triassic many species again appear nearly smooth.

**STRUCTURAL CHARACTERS.**

**THE PROTEGULUM.**

The order Atreinata is the radical brachiopodous stock, which early in its history gave origin more or less directly to the other three orders of brachiopods. Beecher has observed: 1

That all brachiopods, so far as studied by the writer, have a common form of embryonic shell, which may be termed the protegulum. The protegulum is semicircular or semielliptical in outline, with a straight or arcuate hinge line, and no hinge area. A slight posterior gaping is produced by the ventral valve being usually more convex than the brachial. The modifications noted are apparently due to accelerated growth, by which characters primarily nealogic [=neanie] become so advanced in the development of the individual as to be impressed finally upon the embryonic shell. This feature is well shown in the development of Orbiculoidea and Discinisca.

As the protegulum has been observed in about 40 genera, representing nearly all the leading families of the class, its general presence may be safely assumed. [In structure it is corneous and imperforate and varies in size from 0.05 to 0.60 mm. The] prototype preserving throughout its development the main features of the protegulum, and showing no separate or distinct stages of growth [is found in the Lower Cambrian genus Paterina]. The resemblance of this form to the protegulum of other brachiopods is very marked and significant, as it represents a mature type having only the common embryonal features of other genera.

Since the above was written Mr. C. D. Walcott has shown that the type species of Paterina has a well-developed cardinal area, and that it is synonymous with Iphidea. 2 The latter, however, is generally assumed to have an apical pedicle opening as in the Acrotretidae. This is now known not to be the case. The supposed perforation is but a slight depression or short groove in the apex of the ventral valve, and does not pass through the shell. Iphidea is therefore in harmony with Paterina, since both have more or less well-developed cardinal areas. The theoretical Paterina or prototype of the protegulum is therefore

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THE PRODELTIUM.

not yet known. It is evident, however, from the material Mr. Walcott possesses, that Iphidsea-like forms will be discovered in which the cardinal area is undeveloped and in harmony with the protegulum. It is in this sense that the terms Paterina and paterina stage are used throughout this work.

THE PRODELTIUM.

The term prodeltidium is applied by Hall and Clarke to the third shell plate originating on the dorsal side of the body wall in the cephalula stage of *Thecidium mediterraneum*, the only living species of Protremata. This plate, however, is not restricted to that order, but has been observed by authors as also occurring in the Atremata and Neotremata. The term prodeltidium is here applied to this embryonic plate wherever it occurs unmodified.

Beecher has shown that the prodeltidium in the Protremata is the first cause for the development of the deltidium so characteristic of this order. That this plate is also present in the Neotremata is apparent from the description of a brachiopod larva of Discina (= Discinisca) given by Fritz Mueller. These larvae were captured in abundance off Desterro or Santa Cathrina, Brazil, but Mueller was not so successful as Kovalevsky and others in securing the earlier larval stages of other genera developing in the brood pouch, and therefore nothing is known as to the place of origin of the prodeltidium in Neotremata. Since, however, the prodeltidium is also present in young Lingula of the order Atremata, where it is wholly attached to the interior of the dorsal shell, it appears safe to assume that this plate invariably develops on the dorsal side of the thoracic segment of embryonic brachiopods, and later becomes attached either to the dorsal (Atremata) or ventral valve (Neotremata and Protremata), except where, as in the Telotremata, it does not occur.

Before taking up the phylogenetic significance of the prodeltidium, it will be advisable to state what is known of this plate in the Atremata and Neotremata. Since it was first discovered by Fritz Mueller in the Neotremata, where also it is best developed, and subsequently was homologized by Brooks with a similar plate in Glottidia, it will here be given first consideration. Mueller writes:¹

Mit ihrem Hinterrande dem ausgebuchteten Hinterrande des Bauchschale anliegend, gewahrt man zwischen den Schalen eine queroval Platte, 0.06 mm. lang, 0.11 breit, mit dunklerem, oft braunrothlich gefarbtem, ringförmigen Rande. Sie haftet an der Bauchschale, deren Bewegungen sie folgt, und steht mit der Rückenschale nur durch Muskeln in Verbindung.

There is, then, in this Discinisca, a transversely oval plate somewhat loosely attached to the ventral shell near its posterior margin, the movements of which it follows. Mueller adds:²

Die queroval Platte tritt unter dem bis zum Vorderrande der Rückenschale vorgeschobenen Bauchschale vor, beginnt sich nach hinten zu verlängern und ein faseriges Ansehen zu zeigen (Stiel?); sie folgt, nach wie vor, den Bewegungen der Bauchschale.

¹Archiv Anat., Physiol., 1860, p. 74. ²Ibid., p. 78.
Since in this stage of Discinisca there is no pedicle present, Mueller apparently was disposed to regard the prodeltidium as the equivalent of the pedicle. That this is an erroneous interpretation seems certain, for in his second paper he states: ¹

Die bis dahin zwischen den Schalen verborgene querovale Platte (der Stiel) tritt hervor, indem sie sich wie es scheint, um dem ausgebuchten Hinterrande des Bauchschale vollständig herumdreht und so ihr vorderer Rand zum hinteren wird.

In Glottidia the pedicle does not appear until sometime after the prodeltidium is developed, and it seems reasonable to assume from the description of Mueller that, on the development of the pedicle, the prodeltidium is pushed and turned backward, and between this and the notched ventral margin the pedicle passes. The pedicle opening at this stage is therefore surrounded by shell matter, anteriorly by the protegulum and posteriorly by the prodeltidium, characters duplicated in Thecidium. In the latter genus the prodeltidium develops into the deltidium, whereas, according to Mueller, this plate subsequently disappears in Discinisca. Brooks, also, is not disposed to accept Mueller's interpretation of this plate as the pedicle, since he writes: ²

If it is the same [the transversely oval plate of Discinisca and the dorsal semicircular plate of Glottidia], Mueller is certainly in error in his suggestion that it is the peduncle, for there is no connection between the two structures.

In Glottidia pyramidata, Brooks has shown that the prodeltidium is also present, yet here it does not become attached to the ventral shell, but is firmly fastened to the dorsal valve, and this apparently was consummated in the paternia stage. Brooks writes:

I was not able to learn anything of the significance of the semicircular plate shown in figures 1 and 3. It is found only in the dorsal valve, and is either a mark upon its inner surface or a plate between the body and the valve. According to Fritz Mueller, the Brachiopod larva studied by him possessed a similar structure.

* * * The embryo of Lingula is so small and thin that if this were a separate plate, it would be rather difficult to prove without seeing it move, or find it bent outward. In the absence of such evidence, we seem warranted in concluding that it is a similar structure to the movable plates of Mueller's larva, although, in Lingula at least, it is in connection with the dorsal, not the ventral valve.

No one has yet mentioned the presence of the prodeltidium in living Telotremata, and it may prove to be absent in this order, as it is not developed in the three species carefully studied by Morse, Kovalevesky, and Shipley.

Recapitulation.—The prodeltidium is present in Atremata, Neotre- mata, and Protremata. In the embryonic brachiopods developing this plate it is first found on the dorsal side of the body wall, and later is anchylosed to the ventral shell in Protremata (Thecidium). In the Neotremata, the earliest embryonic stages of which are not known, it is found completely developed and loosely attached to the ventral shell, anterior to the posterior margin. It subsequently turns backward to

¹ Archiv für Naturgesch., 1861, p. 54.
² Chesapeake Zoological Laboratory, session of 1878; Johns Hopkins University, 1879.
the posterior margin of the same valve, and the pedicle is believed to emerge between the plate and the valve (Discinisca). The prodeltidium is therefore alike in final position in the Neotreinata and Protremata. In the Atremata this plate is either attached by its entire surface or by the posterior margin only to the dorsal shell, as in Glottidia, where the earliest embryonic stages are also unknown. The prodeltidium is likewise dorsal in the cephalula stage of Thecidium (Protremata), but subsequently is attached to the ventral shell, yet in reality remains dorsal to the animal. In Glottidia (Atremata) this plate remains attached to the dorsal valve, and in no wise affects the pedicle opening, as in the Neotreinata and Protremata. In the Telotremata the prodeltidium has not been observed, nor has any fossil species in this order shown the least trace of a deltidium, and wherever the delthyrium is closed it is always by plates growing medially from its walls, secreted by the mantle and never by the peduncle. Therefore, when the prodeltidium remains stationary or with the dorsal valve, it is not known that this plate affects the original pedicle opening (Atremata and Telotremata), but when subsequently attached to the ventral valve and partly surrounds the pedicle with shell matter, it completely modifies the primitive pedicle opening by restricting it to the ventral shell (Neotreinata and Protremata). In the derived or later-appearing families of the Neotreinata and Protremata the effects of foraminal modification initiated by the prodeltidium may be wholly lost, as in Craniidae and Orthiidae.

SIGNIFICANCE OF THE PRODELTIDIUM.

The deltidium is the chief character of ordinal importance in the Protremata, and since this plate is attached to the ventral valve, yet originates in the dorsal prodeltidium, it seems reasonable to assume that if similar developmental conditions are found in other orders such orders would possess closer phylogenetic relationship than those having differing conditions. It has been shown that the prodeltidium is also attached to the ventral valve in the Neotreinata, and so far both orders show relationship in their earliest embryonic growth. Beecher has shown that the protegulum or initial shell of the Protremata is discinoid in form and more like that of the Neotreinata than that of the Atremata or Telotremata. He writes: 1

Discinisca shows a subcircular ventral protegulum with a pedicle notch, and the evidence of any hinge in the dorsal protegulum is very slight. The discinoid character appearing in the second and third nepionic stage of the Paleozoic Orbi colonoida has become so accelerated in Neozoic and recent Discinisca as to produce a discinoid protegulum.

The strophomenoid shells usually retain a normal protegulum in the dorsal valve, but from the acceleration of the discinoid stage in the ventral valve the protegulum, has an abbreviated hinge and arcuate hinge line. (P. 346.)

The nepionic stage of *Leptena rhomboidalis* is represented by a shell without radii, having a comparatively large pedicle opening in the ventral valve and a large deltidium. The hinge is not well defined and the shell is discinoid in form. * * *

The external characters as expressed by both valves are manifestly nearer to Kutor-gina than to any telotremate genus. * * * It should be noted, however, that the young of Chonetes, Productus, Strophedonta, Orthothetes, Leptena, Plectambonites, and Strophomena, all have little or no indication of a straight hinge line, and that the extension of this member takes place during later nealogic and ephelobic growth. (Pp. 150-151.)

By far the greatest number of Neotremata occurring in the Lower Cambrian are species of the family Acrotretidæ. To the writer it has always seemed strange to suppose that this family has been derived through the Trematidæ, but the above interpretation of the prodeltidium in Discinisca indicates that the turning of this plate posterior to the pedicle at once led to holoperipheral growth in some of these early forms. In some species of the Acrotretidæ there is a true deltidium. In Acrothele the cardinal area is flat, without any trace of a deltidium, whereas in Acrotreta and Conotreta, which have high cardinal areas, there is a narrow concave depression bisecting it. These deltidia, whether convex or concave, are in all probability initiated by the prodeltidium, as in the Protremata. In the family Trematidæ there appears to be nothing homologous with the deltidium, since the plates situated in the apex of the wide triangular fissure of Schizocrania and Lingulodiscina seem to be formed anterior to the pedicle and subsequent to its movement posteriorly with growth, and not posterior to the pedicle, as in the Acrotretidæ. These plates in the Trematidæ should probably be homologized with the listrium of the Discinidæ.

The complete harmony of the muscular system in the Protremata and Telotremata is no evidence in itself that the latter were derived from the former. The occurrence at the base of the Cambrian of very primitive species of the four brachiopod orders is proof that divergence took place very early in the history of the class, and while there is little knowledge of the muscles in either Iphidea, Kutorgina, or Protorhynchæ (P. ? minor and P. ? ambigua), the earliest genera of Atremata, Protremata, and Telotremata, respectively, there is some evidence for supposing them to be as in the type embryo stage of living species. The high degree of specialization attained by Lingula (Atremata), as exemplified by the burrowing habit, long peduncle, and absence of valve articulation, is the cause for their complex muscular system, while the development of a functional hinge in the Protremata and Telotremata has led to the retention of very primitive conditions or to the simplification and harmony of the muscles throughout these two orders.

The presence of a terminal intestinal opening in the living species of the Atremata and Neotremata and its general absence in those of the Protremata and Telotremata is no longer held to have phylogenetic significance, as many of the Paleozoic species of the two latter orders afford good evidence of such having been present in the median line as in living Crania.¹

¹ See p. 113.
The known protegula, or initial shells, of the Neotremata and Pro-
tremata have been shown to be harmonious, and to differ from the
normal unmodified protegula of the Atremata and Telotremata. The
paterina stage in the two last-named orders is followed by the "obo-
lella stage" in the highest families of the Atremata (Lingulellidce and
Lingulidce), and probably throughout the Telotremata, since it has
been observed in a number of Ordovician and Silurian Rhynchonell-
acea, Spiriferacea, and recent Terebratulinas. In the Neotremata
and Protremata the paterina stage is not followed by the obolella stage,
but usually by holoperipheral growth, except where the pedicle slit
remains for a time wholly uninclosed by shell matter.

In tabulated form the above-presented facts appear thus:

<table>
<thead>
<tr>
<th>Character</th>
<th>Atremata</th>
<th>Telotremata</th>
<th>Neotremata</th>
<th>Protremata</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Prodeltidium in type embryo</td>
<td>With dorsal valve.</td>
<td>Absent</td>
<td>With ventral valve</td>
<td>With ventral valve</td>
</tr>
<tr>
<td>2. Prodeltidium affecting pedicle opening</td>
<td>None</td>
<td>None</td>
<td>Modified in primitive forms</td>
<td>Modified throughout.</td>
</tr>
<tr>
<td>3. Deltidium present</td>
<td>None</td>
<td>None</td>
<td>Present in primitive forms</td>
<td>Present throughout.</td>
</tr>
<tr>
<td>4. Protegulum</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
<td>Present</td>
</tr>
<tr>
<td>5. Obolella stage</td>
<td>Present</td>
<td>Present</td>
<td>Absent</td>
<td>Absent</td>
</tr>
<tr>
<td>6. Anus</td>
<td>Present</td>
<td>In many early geologic species</td>
<td>Present</td>
<td>Present in pentameroinds.</td>
</tr>
<tr>
<td>10. Articulation</td>
<td>Often present, not functional.</td>
<td>Functional</td>
<td>Rarely present, not functional.</td>
<td>Functional</td>
</tr>
<tr>
<td>11. Nature and function of pedicle</td>
<td>Affixing and burrowing.</td>
<td>Generally present, affixing; shell rarely cemented</td>
<td>Generally present, affixing; cementation complete</td>
<td>Affixing or obsolete; cementation or anchoring spines present.</td>
</tr>
<tr>
<td>12. Brachia, with or without internal skeleton</td>
<td>Without</td>
<td>With or without</td>
<td>Without</td>
<td>With or without.</td>
</tr>
</tbody>
</table>

It now appears evident that the two great divisions of brachiopods
heretofore based on the presence or absence of functional articulation
have no phylogenetic significance, and as they "do not appear to have
a primary developmental basis in nature, * * * they fail to express
the true relationships of the various groups included in them."

---

1 See papers by Beecher and Clarke, Brooks, Morse, Beecher and Schuchert, and Winchell and Schuchert.
Articulation was developed along two independent lines, and therefore the terms Lyopomata and Arthropomata have no phylogenetic significance. The presence or absence of articulating processes was at one time considered a fixed line, on either side of which all brachiopods could be arranged, but now articulation is known to be nearly functional in several lyopomatous genera, as in Spondylobolus, Trimerella, Monomorella, Tomasina, Barroisella, of the Atremata, and in Trematobolus of the Neotremata. Among the Arthropomata, articulation is hardly functional in Kutorgina, Schizopholis, Eichwaldia, and Dictyonella. However, it appears probable that two superorders exist, each having two orders. Atremata and Telotremata are the more primitive groups, and agree in the following fundamental characters: Prodeltidium attached to the dorsal valve or absent; pedicle opening primarily unmodified, and generally closed later by calcareous plates secreted by the ventral mantle extensions; presence of a functional pedicle throughout the life of the individual (except in Thecospira, Thecocyr-

tella, and Bittnerula); general presence of the “obolella stage” in the ontogeny of atremate and telotremate species, and the development of complicated calcareous brachial supports in the derived order. The Neotremata and Protremata agree in having the prodeltidium attached to the ventral valve with complete nepionic modification of the pedicle opening; delthyrium often closed by a single plate secreted by the pedicle and never by mantle extensions; the pedicle is very often lost before maturity is attained, along with the development of new anchoring adaptations; absence of the “obolella stage” and complicated calcareous brachial supports.

Owen’s superorders Lyopomata and Arthropomata have no basis in nature, and should be dropped. It is to be hoped that students will determine the complete embryology of Lingula, Discinisca, Crania, Rhynchonella, and Terebratulina, for until more of the ontogeny of some species of these genera is known, no satisfactory relationship which the orders bear to one another can be established. However, it appears probable that Atremata and Telotremata have superordinal relationship

<table>
<thead>
<tr>
<th>Algonkian</th>
<th>Paleozoic</th>
<th>Mesozoic</th>
<th>Cenozoic</th>
<th>Recent</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

![Diagram](https://example.com/diagram.png)  
**Fig. 1.—Diagram giving the geological distribution of brachiopod orders.**
differing from that of the Neotremata and Protremata. If the characters above pointed out are of superordinal value, it will be convenient to refer to these divisions as Homocaulia and Idiocaulia, respectively.

DEVELOPMENT OF CARDINAL AREAS AND ARTICULATION.

The earliest suggestion of cardinal areas occurs in Iphidea of the Atremata and in the Acrotretidae of the Neotremata. In none of these forms, however, is there a true cardinal area comparable with those of the Protremata and Telotremata, since it is not bisected by a delthyrium, nor are deltidial plates developed. A convex pseudodeltium is often present, but this feature is not homologous with the deltium of the higher forms. It is due to holoperipheral growth and interference by the pedicle. In the dorsal valves of primitive genera in both the Atremata and Neotremata growth is hemiperipheral, but in the ventral valve of Iphidea, the most primitive known genus of Atremata, and in the Acrotretidae of the Neotremata, growth is holoperipheral.

The ontogeny of many species of Protremata shows that this order had its origin in some atrematous paterina-like genus. This must have occurred in pre-Cambrian times, since in the Lower Cambrian there are several species of Billingsella, a highly developed protrematous genus when compared with the theoretical Paterina. Kutoryginia cingulata Walcott, also of the Lower Cambrian, is a more primitive species than any Billingsella, and it gives evidence as to the course of evolution from the inarticulate paterina-like ancestor to this rudimentary, articulate, long-hinged genus. K. cingulata in connection with the Indian genus Schizopholis Waagen shows that the opening between the widely gaping valves of Paterina, which was entirely occupied by the pedicle, was partially closed by a gradual thickening of the lateral walls, and there was slowly developed a primitive, ventral, cardinal area. This area and the articulating processes in K. cingulata are very rudimentary, and are situated at the lateral extremity of the cardinal area; thus this species still retains a very large open delthyrium, much as in the theoretical Paterina. In Schizopholis this wide fissure is reduced to a narrow triangular delthyrium by the development of a true cardinal area, and the articulating processes are now no longer at the lateral extremities, as in Kutorgina, but are situated more medially. Naturally, in the older Cambrian, complete articulation did not obtain, as in post-Cambrian times. Some of the oldest protrematous species, such as K. cingulata, Billingsella whitfieldi, and possibly others, also retain considerable phosphatic material in their shells, but in later and more highly specialized species the shell is decidedly calcareous.

Some of the species of Iphidea have the ventral posterior region

\[\text{Bull. 87 —— 7}\]
more drawn out beyond the dorsal posterior margin than others. If this rostrate condition were carried a little farther and the pseudodeltidium resorbed, there would practically result a telotremate shell duplicated by the neanic condition of many rostrate Telotremata. The articulation would at first be nearly obsolete and situated extremely lateral, as in the Protremata, but as the cardinal area became greater the teeth would attain a more medial position. While there are no known genera to fill in the gap between the theoretical Paterina and Protorhyncha (P. minor and P. ambigua), yet the hiatus between the Atremata and Telotremata is not greater than between theoretical Paterina and Kutorgina, or between the Atremata and Protremata.

DEVELOPMENT AND SIGNIFICANCE OF THE DELTIDIUM.

The most characteristic mature feature of ordinal importance which distinguishes Protremata from the other three orders is found in the plate that more or less completely covers the delthyrium. However, in two of the families of this order, Pentameridae and Orthidae, this plate is generally wanting in the mature individual, since here it usually develops only during early growth, and later is lost by abrasion or hidden beneath the incurved beak. Again, in the Acrotreticidae of the Neotremata, and in Iphidea of the Atremata, a deltidiun-like plate is also often developed, but as these shells are strongly phosphatic it is not difficult to distinguish the ordinal position of any shells with a true deltidiun. In Lacazella mediterranea, the only living species of Protremata, this plate has its origin in the cephalula stage along with the rudiments of the dorsal and ventral valves, when the embryo is yet free and swimming about by the aid of cilia. The dorsal shell and the prodeltidium appear first, and are secreted by the rudimentary dorsal mantle and the dorsal surface of the body, which subsequently becomes the pedicle. The ventral shell appears last, and is then widely separated from the dorsal valve. Between the two valves is the thick and short pedicle, on the dorsal surface of which still remains the third plate, or prodeltidium. Subsequently the latter is anchylosed to the posterior margin of the ventral valve. The prodeltidium is also known in the Atremata and Neotremata, yet in the Telotremata this embryonic third plate does not exist, but a covering to the delthyrium is developed sometime after the animal has become attached. In its origin this covering is wholly different from the deltidiun of the Protremata, which has its beginning in the prodeltidium and grows down from the shell apex over the delthyrium, while the deltidiun plates of Telotremata grow out medially from the walls of the delthyrium. The deltidiun plates are secreted by extensions of the ventral mantle, and at no period of development has the pedicle any share in their formation. It is not always easy to distinguish mature protrematous and telotrematous shells on the basis of these characters alone, but the young of both orders are
easily classified by the covered or open delthyria, respectively. In some of the Telotremata, toward maturity the deltidial plates ankylose medially posterior to the pedicle, or they may surround the pedicle, thus resembling the deltidium, but, since their origin is quite different, they are termed "pseudodeltidia." Such pseudodeltidia in Cyrtia, Cyrtina, and some spirifers resemble the deltidium of Clitambonites. Even the median line of ankylosis is often obliterated by the continuous secretion of the completely united prolongations of the ventral mantle lobe. In the Pentameridae the deltidium is generally absent, as in the Orthidae, but in Pentamerus and Conchidium it is often retained as a thin, fragile, concave plate. This reversal in form from the generally prevalent, convex, or flat deltidium may be due to the rostrate and arched ventral umbones so common in these genera. In the aberrant rostrate genus Dictyonella, which has an arched ventral umbone, a concave plate is also present, between which and the shell the pedicle passes and emerges upon the umbone, as in the Siphonotretidae. It is not certainly known that this plate in Dictyonella is a deltidium, but its form and position in the rostral cavity are very suggestive of that organ in Pentamerus and Conchidium. The peculiar umbonal pedicle opening in Dictyonella also finds its equivalent in Leptæna.

THE CHILIDIUM.

The chilidium is a convex plate often covering the cardinal process of the dorsal valve in the Protremata. It is particularly well developed in the families Clitambonitidæ and Strophomenidæ, and is not to be confounded with the deltidium, since it first makes its appearance not earlier than neanic growth, and apparently is a secretion of the dorsal mantle lobe. The origin of the chilidium and of the deltidium is therefore wholly different, and both have very dissimilar phyletic significance.

ORIGIN AND FUNCTION OF THE SPONDYLIUM.

The spondylium is an internal ventral plate traversing the posterior portion of the animal. The upper surface of this plate is usually transversely marked by striae, which, in the Pentameracea have three distinct curvatures in passing over it.

Since their position and the area occupied agree with the muscular scars of this valve in Orthis, they are here regarded as homologous with the adductors, diductors, and adjustors of that genus. In Lingula, Lingulops and the trimereids the muscular scars are not found in front nor underneath, but on the "platform" of those genera. The platform, therefore, is homologous with the spondylium of Clitambonites and Pentamerus. The portion of the valve immediately beneath the spondylium, and occasionally the sides of the septum, are strongly marked by the genital sinuses. Since there is no space posterior to these markings for the attachment of the muscles, this clearly indicates that they were situated on the upper surface of the spondylium.}

The spondylium is developed as the "platform" in Lingulasmatis and Trimerellidae of the Atreraata; as a "spondylium" in Pentameracea of the Protremaata, and in Cyrtina, Camerospira, Merista, and Dicamara, of the Telotremata. In the Atramaata and Telotremata, spondylia-bearing species are not numerous, but the individuals are usually abundant, often of large size, and generally are of short geologic duration.

The development of the spondylium or its morphologic equivalent probably had its origin in an excessive deposit of testaceous matter about the bases of the powerful adductors, diductors, and pedicle muscles. Growth of the individual necessitates the progressive anterior movement of the muscles, and when these are large there is but little or no space left between or outside of them for the viscera and genitalia, which are therefore crowded farther and farther anteriorly. This condition naturally produces constant pressure of the genitalia against the anterior base of the forming spondylium, and since pressure causes resorption or diverts testaceous deposition, it follows that these organs will gradually produce cavities for their relief beneath this plate. In the older species of the Trimerellidae and in all of the Lingulasmatis displacement of the genitalia does not appear to have been excessive, as the platforms are but slightly excavated. However, in the terminal genus Trimerella the genitalia chambers are very deep, and these are present in both valves. Throughout the Pentameracea the spondylium is a thin, freely terminating or medially supported plate, and never solid as in the older species of the Trimerellidae. It is likewise thin and excavated in the order Telotremata.

Hall and Clarke advance quite a different explanation as to the origin of the spondylium. They write:¹

The writer also previously entertained this view, but when it became known that spondylia are developed where no dental lamellæ exist, as in the Lingulasmatidæ and Trimerellidæ of the Atremata; that spondylia are never present in the Neotremata, where a pedicle-sheath is sometimes well developed, as in the Acrotertidæ; and finally, that a spondylum is even present where no deltidium ever existed, as in the two first-mentioned families, and in Cyrtina, Camerospira, Merista, and Dicamara of the Telotremata, such an explanation became untenable. The fact that solid or excavated spondylia exist in three orders, two of which never developed a pedicle-sheath (Atremata and Telotre­mata), and one had no dental lamellæ (Atremata), is good evidence that the prodeltidium primarily had nothing to do with the development of spondylia. Further, no spondylia are developed in the Cambrian until long after the deltidium was well established, and therefore the spon­dylium can not be “but a modification of the original pedicle-sheath.” However, it is very probable that when the dental lamellæ in the Pro­tremata became sufficiently wide to join the ventral shell, crowding all the muscles of this valve into a small area, these took advantage of the inner sides of the dental lamellæ for insertion, and thus a continuous layer of testaceous matter was deposited within the rostral cavity. With growth, the muscles move forward and press against the genitalia, which causes resorption or nondeposition for their relief. No spondylia appear before the Upper Cambrian, and here also are the first completely developed dental lamellæ. The so-called Lower Cambrian camarælæs have no completely developed dental lamellæ, and are related to the rhynchonelloid genus Protorhyncha, and to Protorhyncha billingsi, which also has no spondylum. Therefore, the further conclu­sion of Hall and Clarke can not be accepted, that, “where the teeth are wholly without dental lamellæ, or where such lamellæ do not extend to the bottom of the valve, it seems necessary to regard them as instances of degeneracy or resorption of the primitive spondylum.”

It seems clear to the writer that since the “shoe-lifter” plate, or spondylum, in Merista and Dicamara is for muscular insertion, this plate in the ventral valve of these genera is the morphic equivalent of the spondylum in the Pentameracea, and that the dorsal muscular plate in Dicamara is the equivalent of the cruralium, and can not “be interpreted as an entirely different structure from the spondylum.” It is true that the spondylia of these genera are not exactly like those of the Pentameracea, but since this plate in the Atremata is not formed by the union of dental lamellæ, as these do not exist in this order, there is no reason for rejecting the terminology for these plates in Merista and Dicamara.

1 Camarella minor and C. antiquus are more closely related to Protorhyncha than to any other genus. Of Orthia billingsi, the type of Protorhyncha, very good casts of specimens in the Cornell University Museum are in the National Museum, which show that this genus also has no spondylum, and that its characters are those of Billingsella.

2 Hall and Clarke, ibid., p. 333.

3 Ibid., p. 335.

MORPHOLOGIC EQUIVALENTS.

Because of the presence of similar or identical morphological structures in different groups of mature brachiopods, it is unsafe, on the basis of these alone, to suppose such to have close relationship. The spondylium has been shown to originate independently in three orders: Atremata, Protremata, and Telotremata. Identical mature loops have resulted in different ways in two stocks of the same family, one boreal (Dalline) and the other austral (Magellaninae). Flat and more or less wide cardinal areas develop independently of one another in Protremata and Telotremata (Spiriferacea). Cementation of valves takes place at different and widely separated geologic epochs in Neotremata, Protremata, and Telotremata, and shell plications arise from smooth stocks in Pentameracea, Rhynchonellacea, Spiriferacea, and Terebratulacea. Natural phytogenies can only be established upon ontogenies checked by chronogenesis or geologic succession.

SUMMARY.

In North America there are 1,859 Paleozoic, 49 Mesozoic, and 14 Cenozoic species of fossil Brachiopoda. There are 116 species in the Cambrian, 319 in the Ordovician, 311 in the Silurian, 663 in the Devonian, and 478 in the Carboniferous.

The remarkable scarcity of post-Paleozoic species in America is supposed to be due not so much to the general decline of the class as to great orographic movements during the close of the Paleozoic, which produced complete barriers against the introduction of species from other areas.

Specific differentiation was most rapid in the Ordovician, having exceeded the Cambrian representation more than three times.

Thirty per cent of all American Paleozoic species had wide geographic distribution, which is most pronounced in the Devonian and
Carboniferous systems. One hundred and twenty-one American species are also found on other continents.

Widely dispersed species are least common in the most primitive order, Atremata, and greatest in the highest orders, Protremata and Telotremata. The difference, however, is but 7 per cent.

The order Atremata is represented by 199 species, or over 10 per cent of the American Paleozoic representation. In the Neotremata it is 156, or over 8 per cent. The Protremata have 738 species, or nearly 40 per cent; and the Telotremata 766 species, or about 41 per cent.

The order Atremata is best developed in species and genera in the Cambrian and Ordovician systems; the Neotremata in the Ordovician; the Protremata in the Ordovician, Silurian, and Devonian; and the Telotremata in the Devonian. The climax of differentiation is therefore chronologically related to phylogenetic or sequential origin.

Since the four orders of Brachiopoda are present in the Lower Cambrian, ordinal differentiation must have taken place in pre-Cambrian times. The two more primitive orders, Atremata and Neotremata, have in Lingula and Crania, respectively, genera with longest life histories. This probably is due not so much to their primitive structures as to their modes of living.

The last order to originate, Telotremata, has the greatest number of generic and superfamily characters, and probably also of species.

The last superfamily to appear, Spiriferacea, manifests most rapid evolution and is the second one to die out, being preceded by the Pentameracea. These two superfamilies are the most highly specialized in the orders to which they belong, and their great specialization may be the cause of their early disappearance.

The trunk families of later origin throughout the class manifest the greatest specific and generic differentiation and the widest specific dispersion, and have species of the largest size and often of longer geologic persistence.

The oldest or most primitive families nearly always have short geologic duration (except Rhynchonellidae) and the least generic and specific differentiation, and commonly the individuals are of small size.

The largest of all brachiopods occur in the families Pentameridae, Productidae, and Spiriferidae, at a time when the class was at the height of differentiation.

Large specific size is probably often gradually attained in genetic lines, and is due to favorable food conditions. The gigantic brachiopods always occur in the later-developed trunk families, and just before their decline in differentiation.

But 8 genera are known to pass from the Paleozoic to the Mesozoic. There are in all 327 brachiopod genera, 227 of which are Paleozoic. The Atremata have 29 genera, the Neotremata 30, the Protremata 89, and the Telotremata 179.

All brachiopods begin with smooth shells and protegula.
The prodeltidium, or third embryonic shell plate, is known in the Atremata, Neotremata, and Protremata. In the Atremata this becomes attached to the dorsal valve, while in the Telotremata it is apparently not developed at all. In the Protremata it becomes attached to the ventral valve, as in Neotremata. In the two last-named orders it modifies the pedicle opening. For this and other ontogenic and morphologic characters, Owen's terms Lyopomata and Arthropomata are abandoned. The Atremata and Telotremata are provisionally arranged under the superordinal term Homocaulia, and the Neotremata and Protremata under Idiocaulia.

Morphologic equivalents, or similar structural features, are developed independently, as follows: A spondylium in Obolacea, Lingulacea, Pentameracea, and rarely in Spiriferacea; crural processes in Pentameracea and Rhynchonellacea; functional articulation in Protremata and Telotremata; straight, more or less long, cardinal areas from rostrate forms in Rhynchonellacea, Spiriferacea, and Terebratulacea; rostrate shells from long cardinal areas in Pentameracea, and loss of pedicle and ventral shell cementation in Craniacea, Strophomenacea, and Spiriferacea.
CHAPTER IV.

MORPHOLOGY OF THE BRACHIA.

By CHARLES E. BRECHER.¹

The diagnostic value of the brachidium, or calcareous arm supports, of brachiopods has long been recognized, and forms one of the chief characters for generic and family subdivision among the Terebratulacea and Spiriferacea. This character fails in all other brachiopods, which have simply fleshy arms, unsupported by calcareous skeletons. There is, however, generally the most obvious analogy and intimate relationship between the arms themselves and the brachidium, so that whenever either structure can be ascertained it furnishes important data aiding in the determination of the systematic position of any genus within a family or order.

The growth of the arms, or lophophore, in recent genera may be divided into distinct stages, which often have a direct correlation with other important features of the shell. In many cases it is also possible to infer the form and arrangement of the brachia in fossil genera from markings on the interior of the valves and from the calcareous arm supports, and thus to obtain the chronogenetic as well as the morphogenetic history of these organs.

The most detailed accounts of arm development are given by Brooks for Glottidia, by Morse for Terebratulina, and by Kovalevski for Cistella and Thecidea. These results, combined with original observations by the writer and occasional descriptions of arm structure by Davidson and other authors, are sufficient to include and properly interpret all the leading varieties of structure.

As shown by Brooks, the tentacles, or cirri, in Glottidia originate on the dorsal side of the oral disk. They grow in pairs, one on each side of a central lobe. New tentacles are added between the first pair formed and the median lobe. Thus the cirri farthest removed from the median lobe are the oldest. Tentacles are added rapidly until the first arc is extended to a semicircle, and then progressively the whole disk becomes surrounded by a circle of these organs. The further introduction of cirri can only take place by the enlargement of the oral disk or through the deformation of the circle by lobes, loops, or extensions. In Glottidia, Lingula, Discinisca, Crania, and Rhynchonella the two points of tentacular increase, originally together and on

¹The references to the literature will be found at the end of this chapter.
opposite sides of a median lobe, or tentacle, gradually separate, and the further multiplication of tentacles results in strap-shaped extensions on each side, which finally assume a coiled form, due to the limited space in which they grow. Therefore the arms in adult individuals of these genera have a single cirrated edge, extending from their free extremities to the sides of the oral disk, and, continuing posteriorly, unite on the ventral side of the disk behind the mouth. Each cirrated edge in the adult lophophore apparently has two approximate rows of alternating cirri (Hancock), but as they were originally a single row in early stages, this appearance is evidently the result of a crowding of the cirri or a crumpling of the edge.

Kovalevski has shown that in Cistella the tentacles also originate in pairs on each side of the dorso-median line, without a central tentacle or lobe. The same mode of increase has been shown by the writer to be present in Magellania and Terebratalia. In young stages of Cistella, Terebratulina, Magellania, and other terebratuloid genera, as well as in Thecidea, after the circle of tentacles is complete the two points at which new ones are added do not separate, but remain close together throughout the life of the animal. In this case the cirrated margin is lengthened by means of lobation and looping, and often by the final growth of a single, median, coiled arm, cirrated on both margins. Gwynia illustrates the completed circle of tentacles about the mouth. Adult Cistella shows an advance in having the anterior margin of the lophophore introverted, making it bilobed. Megathyris is slightly more complicated by two additional lobes. This simple method of increase is further elaborated in the Thecidiidae. In the higher genera, especially among the Terebratulidae, the maximum is reached by means of a median, unpaired, coiled arm, as in Magellania and Terebratulina.

The development of the different types and varieties of arm structure is presented in the accompanying figures (figs. 2–6), which are necessarily somewhat diagrammatic in order to show the features clearly, but the essential structure can readily be verified from consultation of the works cited or from a study of actual specimens. In the case of fossil forms, such as Dielasma, the Atrypidae, and Athyridae, the brachial supports have sufficient analogy with the arm structures of Terebratulina and Rhyynchonella to warrant their interpretation as given. Also the spiral impressions on the valves of Davidsonia, and those occasionally present in Leptena and Productus, clearly point to the possession of coiled arms by these genera.

CLASSIFICATION OF BRACHIAL STRUCTURES.

From what has already been shown it is seen that the various types of lophophores admit of a simple classification into stages and groups. It is proposed to give to these distinctive names, which may be used with facility in making comparisons and correlations. They may be found
useful, also, in designating the kind of brachial complexity attained in any genus the arm structure of which can be determined, thus helping to fix its place in a genetic scale. It should be emphasized, however, that the form and complexity of the cirrated margin of the lophophore can have a taxonomic value only within comparatively narrow limits. This at once becomes evident when the arms of Lingula, Disciniscia, Crania, Rhynchonella, and all the Spiriferacea are considered. Each has spiral arms, which were probably developed through similar changes of form, and yet each is genetically distinct, as shown by all the other leading characters. But when this classification of arm structures is applied within a family or genus, or even when made the basis of comparison among some closely related families, it is sometimes possible to reach very satisfactory conclusions relating to the systematic position of various forms.

LEIOLOPHUS STAGE.

It is hardly necessary to direct attention to the embryonic brachial structure before the growth of any of the tentacles, or cirri, on the edge of the lophophore, while the animal is in the typembryonic stage. For the sake of designating all the stages, this may be called the leiolophus stage, though it has no special significance beyond indicating the beginning of the lophophore.

TAXOLOPHUS STAGE.

The first stage in which a true brachial structure is manifest is an early larval form, often the protegulum stage, when the tentacular portion of the lophophore is a simple arc, or crescent. This may be called the taxolophus. The tentacles are few in number, and increase takes place on each side of the median line, dorsally, in front of the mouth. In figs. 2a, e, 3a, f, 5a this character is clearly shown. The tentacles at the ends of the arc are the oldest, and new ones are being formed in the middle portion. In Thecidea, Cistella, and Magellania the tentacles of the taxolophus are centripetal, due to the edge of the lophophore being near the margin of the shell; while in Terebratulina, Disciniscia, and Lingula they are centrifugal, due to the smaller and central lophophore.

So far as known, there is no adult living form which has the taxolophian brachial structure. It may have been present in adult Iphidea of the Cambrian.

TROCHOLOPHUS STAGE.

By the continual addition of new cirri and the pushing back of the old ones, the fringed margin of the lophophore passes from a crescentic to a circular form, thus making a complete ring about the mouth. This may be termed the trocholophus stage. It appears in the late larval and early adolescent stages of Thecidea (fig. 2b), Cistella (fig. 2f), Magellania and Terebratalia (fig. 3b), Terebratulina (fig. 3g), Glottidia (fig. 5b),
SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.

and Discinisca, and, like the former stages, is undoubtedly common to all brachiopods, except, perhaps, Iphidea.

Gwynia is an adult living representative of this stage, and never develops any higher type of brachial structure. Dyscolia also belongs here, since it has a discoid lophophore surrounded by a marginal fringe of tentacles (Fischer and Oehlert). It is possibly a little more advanced than Gwynia, as it has a slight median anterior notch, suggesting the beginning of the bilobed structure of the next higher type.

The absence of septum, hinge-plate, and dental plates are other primitive characters belonging to Dyscolia.

SCHIZOLOPHUS STAGE.

After the completion of the trocholophus stage in all brachiopods, except such simple forms as Gwynia and Dyscolia, no further increase in the ciliated edge of the lophophore can occur without some deformation of the circle. This is first accomplished by an introversion of the anterior median edge, thus dividing the lophophore into two lobes, and suggesting the name *schizolophus* for this type. (See figs. 2c, g, 3c, h, 5c.)

Several brachiopods retain the schizolophian brachia as an adult character. Of these, Cistella is perhaps the best example, as it agrees exactly with an early stage of arm structure among the Terebratellidae, which has been called the cistelliform stage (fig. 3c). Terebratulina (fig. 3h), Glottidia (fig. 5c), and other higher forms, also have corresponding schizolophian stages, but are without the median septum. *Lacazella mediterranea* presents a similar larval structure, and in *L. barretti* it is retained to maturity. The fossil genera Davidsonella and Thecicella of the Thecidiidae, and Zellania of the Terebratellidae, never developed beyond the schizolophus stage, and they must therefore be considered as quite primitive genera in their respective families.

From this point the further development and complication of arm structure proceeds in three distinct diverging lines, producing the
three characteristic types of brachia of all the higher brachiopods, as exemplified in Thecidea, Terebratulina, and Rhynchonella.

**PTYCHOLOPHUS STAGE.**

The simplest of the types of brachia just cited is developed out of the schizolophus by the additional lobation, or looping, of the primary lobes, making a structure which may be called the *ptycholophus*. Megathyris and *Locazella mediterranea* both have 4 lobes (fig. 2d, h); *Thecidea radiata* has 6; *T. vermicularis* and *Eudesella mayrsei*, 8; *E. digitata*, 10; Pterophloios and Oldhamina, about 20. Lobation in some (*Thecidea*) is produced by the forking or branching of the median septum; in others (*Pterophloios*) the septum remains simple while the lateral borders of the lophophore are lobed.

**ZUGOLOPHUS AND PLECTOLOPHUS STAGES.**

All the higher Terebratulacea reach the final growth of the lophophore through an intermediate stage which from its form may be called the *zugolophus*—fig. 3d, i. Eucalaphis and Platidia (*Tropicoleptus*) are apparently adult representatives of this stage, while Kraussina and probably Boucharidia are slightly more advanced by the growth of a short median, coiled arm, and lead to the next highest, or plectolophus, stage, in which there is a well-developed spiral arm with a fringe of cirri on each edge—fig. 3e, j.

A long loop pointed in front like Rensselaeria and Centronella could not have supported a median arm, as the pallial cavity is thus fully occupied, and the development of the brachidium in the Terebratellidae shows that the central space between the branches of the loop is to accommodate such an organ. The same is doubtless true of Dielasma, which first has a Centronella-like loop, and through the subsequent resorption of the anterior portion the ascending branches are formed.
and space allowed for the median arm—fig. 4a–d. In a spire-bearing genus like Zygospira this is more obvious, for here the transverse process or jugum is clearly the result of the growth and resorption of the centroneliform loop to admit the spiralia.

The calcareous loop in Terebratulina and Liothyra is only a posterior basal support, and does not repeat the outline of the cirrated margin of the lophophore, exclusive of the arm. Therefore it is impossible in these and closely allied genera to infer the stage of development of the lophophore from the loop alone. Dyscolia is an excellent example, since the loop is the same as in Terebratulina; but the lophophores are quite distinct in each, the former being of the trocholophus type and the latter belonging to the plectolophus.

**SPIROLOPHUS STAGE.**

The last type to be noticed is the one in which there are two separate coiled arms, each with a row of cirri on one edge only—fig. 5a, b, e. It embraces the greater part of the families of brachiopods in the orders Telotremata and Proteramata, and includes all the living species in the orders Atremata and Neotremata.

In the early stages of development of the spiral lophophore there is an agreement with the early stages of the families already noticed, and the taxolophus, trocholophus, and schizolophus stages may be determined—fig. 5a, b, c. The separation and growth of the spiral arms seem to be due to the widening or expansion of the median lobe or tentacle, on each side of which is the formative tissue for new cirri. This is very apparent in the young Discinisca described by Muller, and the Glottidia described by Brooks.5

The brachidium in Zygospira passes through a series of changes which have been described in detail elsewhere. These metamorphoses are of great assistance in understanding the development and comparative morphology of this feature in other groups of the Spiriferacea. The earliest stage observed (fig. 6a) has the form of a simple terebratuloid loop, which, from its resemblance to Centronella, was called the
centronelliform stage. Since approximately this form of brachidium is also characteristic of the young of recent terebraluloids, it may be taken in Zygospira as indicative of the trocholophus stage of brachial development. With this as a starting point for comparison, the further correlation of the succeeding stages is very simple.

The first resorption of the end of the loop in Zygospira produced a schizolophus condition, and further resorption carried the brachidium to a stage closely resembling Dielasma (fig. 6b). The dielasmatiform stage has already been explained as due to the requirements of space for the growth of the coiled brachia. Next, the initial calcification of the spiral arms resulted in the extension of the descending branches beyond the jugum (fig. 6c), and, lastly, complete calcification manifests the spirolophus structure and produced the characteristic brachidium of the Spiriferacea.

The Atrypidæ and the Athyridæ seem to stand to each other in the same relation as the Terebratellidæ and Terebratulidæ. In the first the descending branches are widely separated and follow the edges of the valves; in the second the descending branches are close together. This difference in the Spiriferacea produces the converging cones of the Atrypidæ (fig. 6d) and the diverging cones of the Athyridæ, Spiriferidæ, Retziidæ (fig. 6e), etc.

It seems doubtful whether the fleshy portions of the brachia in the Meristellidæ and Athyridæ possessed additional characters expressing the complexity and elaboration reached by the jugal processes, even when the lamellæ were duplicated, as in Koninckina and Kayseria.

From the above descriptions and illustrations it appears that the mode of growth of the cirrated lophophore, or brachia, is alike in the larval stages of all brachiopods. They first develop tentacles in pairs on each side of the median line in front of the mouth (taxolophus stage). New tentacles are continually added at the same points, until, by pushing back the older ones, they form a complete circle about the mouth (trocholophus stage), later becoming introverted in front (schizolophus stage). From this common and simple structure all the higher types of brachial complication are developed through one of two methods: (1) The growing points of the lophophore, or points at which new tentacles are formed, remain in juxtaposition; or (2) they separate. Complexity in the first is produced (a) by lobation, as in...
Megathyris, Eudesella, Pterophloios, Thecidea, etc. (ptycholophus type), and (b) by looping (zugolophus) and the growth of a median, unpaired coiled arm (plectolophus), as in Magellania, Terebratulina, etc.; in the second (c) by the growth of two, separate, coiled extensions or arms, one on each side of the median line (spirolophus), as in Lingula, Crania, Discinisca, Rhynchonella, Leptaena, Davidsonia, Spirifer, Athyris, Atrypa, etc.

REFERENCES.

CHAPTER V.

CLASSIFICATION OF THE BRACHIOPODA.

HISTORICAL.

Fabius Columba, in 1616, and Martin Lister, in 1678, were the first to describe brachiopods, calling them Concha anomia. Grundler, in 1774, was, however, the first to give a good illustration of a brachiopod in Terebratulina caput-serpentis. In 1818 Lamarck recognized 5 genera, including the operculate coral Calceola. Other genera were added by Sowerby, Dalman, and Defrance, from 1820 to 1830, and in the early forties about 1,500 species had been defined. In 1849 King recognized 49 genera in 16 families, and Bronn, in 1862, knew nearly 2,000 species and 51 genera. At present there are probably no fewer than 6,000 species known in 321 genera, grouped in 31 families, 9 superfamilies, 4 orders, and 2 superorders.

Since 1858 the class Brachiopoda has been divided by nearly all systematists into two orders, based on the presence or absence of articulating processes. These two divisions were recognized by Deshayes as early as 1835, but not until twenty-three years later were the names Lyopomata and Arthropomata given to them by Owen. These terms have been generally adopted by authors, though some prefer Inarticulata and Articulata of Huxley, or Bronn's Ecardines and Testicardines. Bronn, in 1862, and King, in 1873, while retaining these divisions, considered the presence or absence of an anal opening more important than articulation, and accordingly proposed the terms Pleuropygia and Apygia, and Treutenterata and Clistenterata, respectively. In many Paleozoic genera of Clistenterata it has been shown that an anal opening was also present, and therefore the absence or presence of this organ is not of superordinal value. Beecher writes:

The dorsal beaks of Amphigenia, Athyris, Cleiothyria, Atrypa, and Rhynchonella are usually notched or perforate. The perforation comes from the union of the crural plates above the floor of the beak leaving a passage through to the apex. A similar opening occurs between the cardinal processes in Strophomena, Stropheodonta, and allied genera, and the chilidium may also be furrowed, as in Leptena rhomboidalis. This character is evidently in no way connected with the pedicle opening, but points to the existence, in the early articulate genera, of an anal opening dorsal to the axial line, as in the recent Crania. This dorsal foramen was described and figured by King.

in 1850, Hall in 1860, and by several authors since, and has commonly been termed a visceral foramen. Ehlehr suggests that it was probably occupied by the terminal portion of the intestine. The persistence of the foramen seems to indicate an anal opening.

Hall and Clarke state: 1

It has become evident, from a study of the hinge plate, that the so-called visceral foramen which perforates it, and which is often present in Athyria, Rensseliera, Cryptonella, etc., is a remnant of this aperture, the remainder of the median opening having become filled by a testaceous secretion. There is every reason to believe that the visceral foramen was actually traversed by the lower alimentary canal, and if this were true, then the deep and narrow median chamber bounded by the crural plates must also have inclosed the terminal portion of the intestine.

In 1834 Von Buch also divided the class into two sections, founded on the mode of attachment. The first section contained all brachiopods fixed by a pedicle to foreign bodies, while the second was restricted to those forms in which there is no pedicle at maturity, the entire lower or ventral valve being cemented to other objects, as in Crania. The first section was again divided into three groups, on the basis of the pedicle: (a) Pedicle emerging from between the valves, as in Lingula; (b) ventral valve perforated for the protrusion of the pedicle; and (c) uncremented shells without a pedicle opening. The third group, however, is identical with b, since Leptena, Productus, and Strophomena, genera referred to section c, do possess a pedicle opening. While this classification lacks a complete understanding of the features in question, it is remarkable that Von Buch nearly sixty years ago, and Deslongchamps twenty-eight years later, recognized some of the principles upon which the classification of the Brachiopoda is now established, viz, the nature of the pedicle opening.

Up to 1846 the general external features of brachiopods served the majority of authors as the essential basis for generic differentiation. In that year, however, King pointed out that more fundamental and constant characters exist in the interior of the shell, a fact which soon came to be generally recognized, mainly through the voluminous writings of Thomas Davidson.

In 1848 Gray, probably stimulated by King's paper, divided the Brachiopoda into two subclasses, Ancylopoda and Helictopoda. These divisions rest entirely on the basis of the structure and the presence or absence of calcareous supports. The Ancylopoda are distinguished in having the "oral arms recurved and affixed to fixed appendages on the disk of the ventral [dorsal] valve," while in Helictopoda "they are regularly spirally twisted when at rest." The brachia, however, in all recent species, are recurved and more or less spirally enrolled, except in some gerontic forms of loop-bearing genera, as Cistella and Gwynia. Therefore Helictopoda, as far as the brachial structure is concerned, will also include the Ancylopoda. In fact, to the former Gray referred only the terebratuloids, if Thecidia is

excluded, while the Ancylopoda contained all other brachiopods, both articulate and inarticulate forms. These subclasses are further divided, on the basis of the brachia, into four orders: Ancylobrachia, Cryptobrachia, Sclerobrachia, and Sarcicobrachia. Of these the first only has value as a superfamilial group, since it includes the "loop-bearing" genera, or Terebratulacea. The other orders have so heterogeneous an assemblage of forms as to be of no permanent value.

Beyond the introduction of new families, no further attempt was made by writers to divide the Brachiopoda into other orders than Lyopomata and Arthropomata until 1883, when Waagen published his great work on the fossils of this class from the Salt Range group of India. He found it "absolutely necessary" to further divide the Lyopomata and Arthropomata into seven suborders. The basis for these suborders has no underlying principle of general application, yet the majority of the divisions are of permanent value, for each contains an assemblage of characters not to be found in any of the others. Waagen's genealogy of the Arthropomata, with Orthis as the prototype, falls at once to the ground, since the comprehensive studies of the genus Orthis by Hall and Clarke have shown that it is questionable "whether any of these primordial forms can be included under Orthis according to the strict definition of the term or even under any of the subdivisions" 1 proposed by them. There are, however, a few species in the Upper Cambrian which seem to agree with such dalmanellans as O. subcequata, but these originated long after many undoubted Prototremata and Telotremata had lived in the Lower and Middle Cambrian. Lingula, on the other hand, was usually regarded as the prototype of all brachiopods, but this is also impossible, since a number of inarticulate genera flourished for ages before Lingula was developed.

PRINCIPLES OF CLASSIFICATION.

No classification can be natural and permanent unless based on the history of the class (chronogenesis) and the ontogeny of the individual. However, as long as the structure of the early Paleozoic genera of Brachiopoda remained practically unknown and the ontogeny untouched, nothing of a permanent nature could be attempted. In the recent volumes by Hall and Clarke many of these 'early genera are clearly defined, so that their structures and geologic sequence are now far more accurately known. The ontogenetic study of Paleozoic species was initiated in 1891 by Beecher and Clarke, and was continued by Beecher and Schuchert. These results, combined with those derived from the development of some recent species, and published by Kovalevsky, Morse, Shipley, Brooks, Beecher, and others, confirm the conclusions reached through chronogenesis. Moreover, the application by Beecher of the law of morphogenesis, as defined by Hyatt, and the

recognition and establishment of certain primary characters have resulted in the discovery of a fundamental structure of general application for the classification of these organisms. It has for its basis the nature of the pedicle opening and the stages of shell growth. On these characters Beecher has divided the class into four orders—the Atremata, Neotremata, Protremata, and Telotremata.¹

Hall and Clarke ² reject Beecher’s ordinal terms Atremata and Neotremata for the subordinal names Mesokaulia and Daikaulia of Waagen, on the ground of priority, and because the latter terms are “an admirable expression of the significance of the pedicle passage.” If some of Waagen’s subordinal terms are elevated to ordinal rank and amended by Hall and Clarke, then these terms are no longer Waagen’s, but should be credited to Hall and Clarke. Such being the case, the law of priority demands the retention of Beecher’s terms, as they do not conflict with those of Waagen but with the secondary definition and rank accorded them by Hall and Clarke.

On the other hand, Dall claims³ that “names of higher rank than genera are not subject to the rule of strict priority, on account of the mutability of their limits.” Again, if Waagen’s subordinal terms (and there are seven of them) are to be elevated to ordinal rank—i.e., if the characters upon which they are established are ordinal characters—then all should be elevated alike in rank. Besides the two mentioned above, Hall and Clarke accept also Gasteropegmata and Helicopegmata. The latter, however, they retain as suborders, and would do likewise with Kampylopegmata if Gray’s term Ancylobrachia of earlier date did not cover the same group of brachiopods; while Gasteropegmata, having certainly no greater value than a superfamily, is elevated to an order. Again, they accept Beecher’s Protremata, when Waagen’s suborder Aphaneropegmata could as well be raised to ordinal rank and adapted so as to include the former, since Waagen based the latter upon families having the diagnostic character of the Protremata, namely, the well-developed deltidium. However, a far more important reason why Waagen’s terms should not be elevated to ordinal rank and made to displace Beecher’s names is that the latter clearly understood the value of the different ordinal characters and defined them excellently, which definitions are accepted by Hall and Clarke. He pointed out the most primitive shelled condition in the protegulum, and found this first shell-growth stage in all the important families in the class. He observed that not the mere pedicle slit of the Daikaulia is the ordinal character for Neotremata, but the way in which growth proceeds to form this derived pedicle slit from the open pedicle notch of primitive forms. He was the first to interpret the true morphologic

meaning of the deltidium and deltidial plates, and subsequently, from the works of others, chiefly Kovalevsky, was able to demonstrate the great morphologic significance of the deltidium. Without any injustice to the monumental work of Waagen—and there is no more careful work on the Brachiopoda—it can safely be asked, Were Waagen's suborders based on a fundamental morphologic character of general importance throughout or on ontogeny? Mesokaulia and Daikaulia are the only two of the seven suborders having, as now understood, the required ordinal characters, and these divisions were established by Waagen on the form, general expression, and the position of the pedicle, and not on the morphologic development of the pedicle opening. Four of the other five suborders are based on superfamily and the fifth on family characters. Five of Waagen's seven suborders, therefore, are here retained as superfamilies, and practically in the sense of their author.

Since orders are established on the nature of the pedicle opening, persistent internal characters of the shell are, as a rule, used for superfamily purposes. Such are the absence or presence of a spondylium (Strophomenacea and Pentameracea, respectively); the absence or presence of calcareous brachial supports, and their nature (crura only in the Rhynchosporinacea, loop in the Terebratulacea, and spirals in the Spiriferacea).

Families within the superfamilies are based upon a combination of external and internal generic characters common to many genera, or even to one genus. Such characters are: Outer form; nature and position of muscles (Obolidæ, Lingulidae, etc.); internal plates (Trimerellidae, Lingulasmatidae, Pentameridae); peculiarities of the cardinal process (Orthidæ, Strophomenidæ); imperfection or perfection or persistent peculiarities of ordinal and superfamily characters (Orthidæ, Trematidæ, Discinidæ, Siphonotretidæ, etc.); simplicity or complexity of the jugum (Hindellinae, Diplospirinæ, etc.); and occasionally the nature of the shell structure (Rhynchospirinæ). When families are large it is not rare to find groups of genera having a common origin which have characters in common but not differentiated sufficiently to introduce new characters of family importance. In such cases it is advisable to divide the family into subfamilies, which facilitates systematic review and discussion. Such is the case in the large families Strophomenidæ, Terebratulidæ, Terebratellidæ, Spiriferidæ, and Athyridæ.

No division, however, has any value unless the group contains forms of but one phylum. A phylum, or line of descent, can not originate twice. It happens, however, that the same or nearly the same combination of mature characters is developed along different phyla. When this occurs the ontogeny will show it. It is therefore not correct to group these different stocks as belonging to one family. For instance,
the Trimerellidae and Lingulasmatidae have family structures in common and were referred to the same family. Ontogeny and chronogenesis, however, show that the former family originated directly in the Obolidae, while the latter was not evolved from the linguloid phylum until the Obolidae had given origin to the Lingulellidae and the Lingulidae. Again, the family Terebratellidae, probably during early Mesozoic times, divided, one stock drifting into boreal and another into austral regions. These two stocks agree in the earliest shelled condition and at maturity, but between these two stages of growth the austral group (Magellane) passes through a series of loop metamorphoses different from that through which the boreal group (Dalline) passes. Therefore it is unnatural to include both in one subfamily, as was formerly done.

It was by the application of the above-mentioned principles that the writer, in 1893, arranged all brachiopod genera under the four orders instituted by Beecher. Since then this subject has received considerable attention, and the many Cambrian brachiopods brought together by Walcott have been examined as to their generic structures. These studies have led to some changes in the classification which follows, the most important being that the order Telotremata could not have originated in the Pentameriidae, since no Pentameracea are known in the Cambrian until long after that order had representation. The divisions Lyopomata and Arthropomata, introduced by Deshayes and Owen, have been abandoned for reasons given in previous pages.

CLASSIFICATION AND SYNONYMY. 

Class BRACHIOPODA Cuvier, 1802; Duméril, 1

Spirobranchiophora Gray, 1821; Palliobranchiata Blainville, 1824; Branchiopoda Rissø, 1826 (not Latreille); Branchiopodida Broderip, 1839; Branchionopoda Agassiz, 1847; Brachionocephala Bronn, 1862; Spirobranchia Bronn, 1862; Branchionobranchia Paetel, 1875.

Bivalved Molluscoidea with inequivalved, equilateral shells attached to extraneous objects by a posterior prolongation of the body, or pedicle, (1) throughout, (2) during a portion of life, or (3) cemented ventrally. Valves ventral and dorsal. In composition, phosphatic or calcareous, or both. Animal consisting of two pallial membranes intimately related to the shell. Within the mantle cavity at the sides of the mouth are inserted the two, more or less long, oral, usually spirally enrolled, cirrated brachia, which are variously modified, and are supported in the two terminal superfamilies by an internal calcareous skeleton, or brachidium, attached to the dorsal valve. Anus present or absent. Central nervous system consisting of an oesophageal ring, with weakly
developed brain and infráesophageal ganglionic swellings. Blood-vascular system probably present, with the sinuses developed into vascular dilatations at the back of the stomach and elsewhere. Sexes separate. Exclusively inhabitants of the sea. The class is present in the Lower Cambrian, attained maximum development in the Silurian and Devonian, and is represented by about 140 living species. During this time, probably upward of 6,000 fossil and recent species have been developed, and these are distributed in 328 genera, grouped in 31 families, 10 superfamilies, and 4 orders.

Order **ATREMATA** Beecher, 1891.¹

Mesokaulia, or Lingulacea (partim) Waagen, 1885.

Inarticulate Brachiopoda with the pedicle emerging freely between the two valves, the opening being more or less shared by both. Growth taking place mainly around the anterior and lateral margins, never inclosing or surrounding the pedicle. Aperture unmodified. Prodeltidium attached to dorsal valve.

Superfamily **OBOLACEA** Schuchert, 1896.²

Rounded or semicircular and more or less lens-shaped, thick-shelled, primitive Atremata, fixed by a short pedicle throughout life to extraneous objects.

1.³ Family **PATERINIDÆ** Schuchert, 1893 (emend.).⁴

Obolacea with the dorsal valve semicircular and the ventral subcircular in outline. Posterior region more or less closed by cardinal areas.

_Iphidea_ Billings, 1872.  
_Paterina_ Beecher, 1891.  
_Volbornia_ von Möller, 1873.

2. Family **OBOLIDÆ** King, 1846.

Obolines Gill, 1871.

Thick-shelled Obolacea of nearly circular or ovoid outline, biconvex, usually smooth, with rudimentary cardinal areas traversed by shallow

¹ Since in this classification no superordinal terms are for the present adopted, it will be well to give here all such terms used by authors and others which are of lower rank and not readily referred as synonyms to their proper places:

Ancylobranchia, Ancylopoda, Holotopoda, Sarcicobrachia Gray, 1843; Lyopomata and Arthropomata Owen, 1858; Pleuroptygla, Sarcicobranchia, Selerobranchia Bronn, 1862; Articulata and Inarticulata Huxley, 1864; Clisenterata and Tretenterata King, 1873.

² Text book of Paleontology, by Zittel and Eastman, 1896, p. 305. Also see page 78 of this bulletin.

³ The numbers and letters before a family or subfamily term indicate the phylectic relations which these have to one another within a superfamily. The phylogeny of the families, however, is more clearly represented in the diagram on PI. I, facing p. 134.

⁴ Recent discoveries have shown that Iphidea has no pedicle opening, and should include forms referred to Paterina. Therefore this family is of doubtful value, and is provisionally retained for the reception of genera more primitive in structure than those of the Obolidae.
pedicle grooves. Muscular scars distinct, consisting of two pairs of adductors and three of sliders, or adjustors.

Obolella Billings, 1861.
   Dicellonius Hall, 1871.
Elkania Ford, 1886.
   Billingsia Ford, 1886.
Neobolus Waagen, 1885.
   Botsfordia Matthew, 1893.
   ?Spondylobolus McCoy, 1852.
Obolus Eichwald, 1829.
   Ungula Pander, 1830.
   Ungulites Bronn, 1848.
   Aulontreta Kntorga, 1848.
   Euobolus Mickwitz, 1896.

Acritis Volborth, 1869.
Schmidtia Volborth, 1869 (not Bals-Criv., 1863).
Thysanotos Mickwitz, 1896.
Leptembolon Mickwitz, 1896.

3. Family TRIMERELLIDÆ Davidson and King, 1874.

Large, thick-shelled, inequivalved Obolacea, with the ventral cardinal area usually very prominent, triangular, and transversely striated. Adjustors and anterior adductor muscles elevated upon solid or deeply excavated platforms, or spoundary.

?Lakmina Öhlert, 1887.
   Davidsonella Waagen, 1885 (not Munier-Chalmas, 1880).
Lingulobolus Matthew, 1896.
Spherobolus Matthew, 1896.
Dinobolus Hall, 1871.
   Conradia Hall, MS., 1862.
   Obolellina Billings, 1871.
   Ungulites Quenstedt, 1871 (not Bronn, 1848).

   Monomorella Billings, 1871.
   Trimerella Billings, 1862.
   Gotlandia Dall, 1870.
   Rhinobolus Hall, 1874.

Superfamily LINGULACEA Waagen, 1885 (restricted).¹

Elongate, thin-shelled, burrowing, derived Atreinata, with a more or less long, worm-like, tubular, flexible pedicle.

1. Family LINGULELLIDÆ Schuchert, 1893.

Spatulate, inequivalved Lingulacea, structurally intermediate between the Obolidae and Lingulidae.

Lingulella Salter, 1866.
   Lingulepis Hall, 1863.
   Leptobolus Hall, 1871.

   ?Paterula Barrande, 1879.
   Cyclus Barrande, 1879.

¹Waagen’s term Mesokaulia, or Lingulacea, is based upon the families Obolidae, Trimerellidae, and Lingulidae. Since this term has value, and to avoid proposing another, Lingulacea is here restricted to the latter family and two others recently proposed. Waagen in using this term gave a dual series; the second one is here adopted to conform in euphony with other superfamily terms.
2. Family LINGULIDÆ Gray, 1840.

Lingulidæ Gill, 1871.

Attenuate, subquadrate or spatulate, almost equivalved Lingulacea, derived through Lingulellidæ, with a more or less long, tubular, flexible pedicle. Muscles highly differentiated and consisting of six pairs, two of adductors, and four of sliders, or adjustors.

Lingula Bruguière, 1792.
Pharetra Bolton, 1798.
Lingularius Duméril, 1806.
Glossina Phillips, 1848.

Dignomia Hall, 1871.
Glottidia Dall, 1870.
Barroisella Hall and Clarke, 1892.
Tomasina Hall and Clarke, 1892.

3. Family LINGULASMATIDÆ Winchell and Schuchert, 1893.

Platform-bearing Lingulacea derived through Lingulidæ.

Lingulops Hall, 1871.

Lingulasma Ulrich, 1889.
Lingulasma Miller, 1889.

Order TELOTREMATA Beecher, 1891.

Sclerobrachia Gray, 1848; Kampylopegmatæ (partim) Waagen, 1883; Pegmatobrancchiata (partim) Nonnayr, 1883.

Articulate Brachiopoda, with the pedicle opening shared by both valves in nepionic and early neanic stages, usually confined to one valve in later stages, and becoming more or less modified by deltidial plates in ephebic stages. Brachia supported by calcareous crura, loops, or spiralia. Prodeltidium absent.

Superfamily RHYNCHONELLACEA Schuchert, 1896.¹

Rostracea Schuchert, 1893; Ancistropegmatæ (partim) Zittel, 1895.

Rostrate, primitive Telotremata, with or without crura.

1. Family PROTORHYNCHIDÆ Schuchert, 1896.¹

Primitive Rhynchonellacea, without deltidial plates or crura.

Protorhyncha Hall and Clarke, 1893.

2. Family RHYNCHONELLIDÆ Gray, 1848.

Hypothyridæ (partim) King, 1850; Rhynchonellinae Gill, 1871; Waagen, 1883.

Rhynchonellacea with more or less long crura.

¹ Text-book of Paleontology, by Zittel and Eastman, 1896, p. 323.
Orthorhynchula Hall and Clarke, 1893.
Rhynchotrema Hall, 1860.
  Stenochisma Courad, 1839; Hall, 1867.
Rhynchotrema Hall, 1879.
Camarotectichia Hall and Clarke, 1893.
  Plathorhynchus Hall and Clarke, 1893.
Leiorhynchus Hall, 1860.
Wilsonia Kayser, 1871.
  Uncinulina Bayle, 1878.
Uncinulus Bayle, 1878.
Hypothyris King, 1846 (not Phillips, 1841).
Pugnax Hall and Clarke, 1893.
Eatonia Hall, 1857.
Cyclorhina Hall and Clarke, 1893.
Rhychopora King, 1856.
  Rhychoporina Ehlert, 1887.

Terebratuloidea Waagen, 1883.
Rhynchonella Fisher de Waldheim, 1809.
  Oxyrychus Lihwyd, 1699 (not Aristotle).
  Rhynchonella Bronn, 1849.
  Bicornes Quenstedt, 1851.
  Rhyynchonellopsis Bose, 1894.
Halorella Bittner, 1890.
Austriella Bittner, 1890.
Norella Bittner, 1890.
Peregrinella Ehlert, 1887.
Rhynchonellina Gemmelaro, 1871.
Dimerella Zittel, 1870.
Acathothyris d'Orbigny, 1850.
  Hemitheirus d'Orbigny, 1847.
  Frieleia Dall, 1895.
Cryptopora Jeffreys, 1869.
  Atretia Jeffreys, 1876.
  Neatretia Ehlert, 1891.

Superfamily **TEREBRATULACEA** Waagen, 1883 (restricted).¹

Ancylopoda, Cryptobrachia, and Ancylobrachia (partim) Gray, 1848; Kampylopegmata Waagen, 1883; Ancylopegmata Zittel, 1895.

Derived Telotreinata with the brachia supported by calcareous, primitive, or metamorphosed loops.

**Section A. TEREBRATULA.**

Terebratulacea with the loops unsupported by a median dorsal septum at any stage of growth. Brachial cirri directed outward in larval stages.

1. **Family CENTRONELLIDÆ** Hall and Clarke, 1895.²

Centronellinae Waagen, 1882; Beecher, 1893; Renneselendidæ Hall and Clarke, 1895.

Terebratulas with the loop developing direct and composed of two descending lamellæ, uniting in the median line and forming a broad, arched plate.

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¹Terebratulacea Waagen is used here in preference to Ancylobrachia Gray, in violation of the law of priority, for the sake of euphony.
²Since Beecher’s “Revision of the families of loop-bearing Brachiopoda” (Trans. Conn. Acad., Vol. IX, 1893), it has been shown by Beecher and Schuchert (Proc. Biol. Soc. Washington, Vol. VIII, 1893) that the loop in the family Terebratulidae, as limited in the former paper, does in part pass through a short series of metamorphoses. This necessitates the removal of Centronellium from the family Terebratulidae, since its loops remain essentially without change throughout growth.
Rensselandia Hall, 1867.
Oriskania Hall and Clarke, 1893.
Trigeria (Bayle, 1875?) Hall and Clarke, 1893.
Scaphioecelia Whitfield, 1891.
Centronella Billings, 1859.
Cryptonella Hall, 1883 (not 1861 and 1867).

Chascothyris Holzapfel, 1895.
Selenella Hall and Clarke, 1893.
Romingerina Hall and Clarke, 1893.
Juvavella Bittner, 1888.
Juvavellina Bittner, 1896.
Nucleatula (Zugmayer) Bittner, 1890.
Dinarella Bittner, 1892.
Lissopleura Whitfield, 1896.

2. Family TEREBRATULIDÆ Gray, 1840.
Terebratulas developing originally a Centronella-like loop, and thence by a short series of metamorphoses resulting at maturity in a free loop of varying form.

Subfamily STRINGOCEPHALINÆ Dall, 1870.

Stringocephalidae King, 1850; Davidson, 1853.
Terebratulidæ with a “long loop, following the margin of the dorsal valve, not recurved in front. Probably no median coiled arm” (Beecher).¹

Stringocephalus Defrance, 1827.

2a. Subfamily MEGALANTERINÆ Waagen, 1882.

Terebratulidæ with a long loop having ascending branches.

Megalanteris Oehlert, 1887.
Meganteris Suess, 1855.
Cryptacanthia White and St. John, 1868.

Cryptonella Hall (1861?), 1867.
Harttina Hall and Clarke, 1893.

2a¹. Subfamily TEREBRATULINÆ Dall, 1870.

Terebratulidæ with a short loop. “A median unpaired coiled arm exists in recent genera” (Beecher).

Eunella Hall and Clarke, 1893.
Crannena Hall and Clarke, 1893.
Dielasma King, 1859.
Epithyris King, 1850 (not Phillips, 1841).
Seminula McCoy, 1855 (not 1844).

Dielasmina Waagen, 1882.
Notothyris Waagen, 1882.
Zugmeyeria Waagen, 1882.
Dictyothyris Douvillé, 1880.
Glossothyris Douvillé, 1880.
Pygope Link, 1830.

¹The ontogenetic history of Stringocephalus is not known. Its mature loop, however, is so different from that of the Centronellidæ that it appears probable that this appendage passed through a short series of changes, and therefore the reference of this subfamily to the Terebratulidæ.
Beecheria Hall and Clarke, 1893.
Hemiptychina Waagen, 1882.
Rhætina Waagen, 1882.
Terebratula Klein, 1753.
   Terebratula Lhwyd, 1699.
   Sacculus Lhwyd, 1699.
   Lampsas Menschen, 1787.
   Terebratularia Duméril, 1806.
   Nucleata Quenstedt, 1871.
   Musculus Quenstedt, 1871 (not Klein, 1753).
   Diphitytes Schröter, 1799.
   Pugites de Hann, 1833.
   Antinomia Catullo, 1850.

Propygope Bittner, 1890.
Liothyrina Ehlert, 1887.
Epithyris Deslongchamps, 1862 (not King, 1848).
Gryphus Megerle, 1811 (not Brisson, 1760).
Liothyria Douvillé, 1880 (not Conrad, 1875).
Terebratulina d'Orbigny, 1847.
?Disculina Deslongchamps, 1884.

2a. Subfamily DISCULINÆ Beecher, 1893.

Discoliidae Fischer and Ehlert, 1892.

Terebratulidae with the "loop short and continuous with the cirrated edge of the lophophore. No coiled median arm" (Beecher).

Discolia Fischer and Ehlert, 1890.
Eucalathis Fischer and Ehlert, 1890.

Section B. TEREBRATELLA.

Terebratulacea with the loop supported by a median dorsal septum throughout life, or only in the younger stages. Brachial cirri directed inward during larval stages. This section has two phyla having a common origin now geographically separated in two provinces, one austral, the other boreal.

1. Family TEREBRATELLIDÆ King, 1850 (emend Beecher, 1893).

Waldheimidæ Douvillé, 1880; Waldheimianæ Waagen, 1882.

Terebratulacea with the "loop in the higher genera composed of two primary and two secondary lamellæ, passing through a series of distinct metamorphoses while attached to a dorsal septum" (Beecher).


Terebratellidae with the loop consisting of two slender descending branches, uniting with a high, vertical septum. Apparently the ancestral stock for the Terebratellidae.

Tropidoleptus Hall, 1859.

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1a. Subfamily MEGATHYRINÆ Dall, 1870 (emend Beecher, 1893).

Argiopidae King, 1850; Megathyridae Cebert, 1887; Argiopidae Davidson, 1884; Argiopinae Davidson, 1887.

Terebratellidae in which the “loop is composed of descending branches only, passing in the highest genus through stages correlative with Gwynia, Cistella, and Megathyris. The lower genera do not complete the series” (Beecher). The original stock for the two following subfamilies:

Megathyris d’Orbigny, 1847.
Argiope Deslongchamps, 1842 (not Savigny and Audouin, 1827).
Zellania Moore, 1854.

Gwynia King, 1859.
Cistella Gray, 1850.

1a*. Subfamily DALLINÆ Beecher, 1893.

Platidiinae Dall, 1870.

Terebratellidae with the “loop composed of descending and ascending lamellae, passing in the highest genera through metamorphoses comparable to the adult structure of Platidia, Ismenia, Mühlfeldtia, Terebratalia, and Dallina. The lower genera, therefore, do not progress to the final stages” (Beecher). Recent genera restricted to boreal seas.

Dallina Beecher, 1893.
Macandrevia King, 1859.
Terebratalia Beecher, 1893.
Lacquens Dall, 1870.
Frenula Dall, 1871.
Frenulina Dall, 1895.
Mühlfeldtia Bayle, 1880.
Megerlia King, 1850 (not Robinneau Desvoidy, 1830).
Platidia Costa, 1852.
Morrisia Davidson, 1852.
Ismenia King, 1850 (not Dall, 1871).
Kingena Davidson, 1852.
Kingia Schoenbach, 1867.
Trigonosemus Koenig, 1825.
Fissirurostra d’Orbigny, 1847.
Fissirostra d’Orbigny, 1847.
Delthyrida King, 1850.
Lyra Cumberland, 1816.
Terebrostra d’Orbigny, 1847.

Endesia King, 1850.
Orthotoma Quenstedt, 1871.
Trigonella Quenstedt, 1871.
Flabellothyris Deslongchamps, 1884.
Zeilleria Bayle, 1878.
Fimbriothyris Deslongchamps, 1884.
Microthyris Deslongchamps, 1884.
Ornithella Deslongchamps, 1884.
Aulacothyris Douvillé, 1880.
Camerothyris Bittner, 1890.
Epicyrta Deslongchamps, 1884.
Cincta Quenstedt, 1871.
Antiptychina Zittel, 1883.
Plesiothyris Douvillé, 1880.
†Hyuniphoria Suess, 1858.
†Cruratula Bittner, 1890.
†Orthoidea Friren, 1875.

† Since many of the fossil genera here referred to this family have not been studied in the light of Beecher’s and Cebert’s recent researches, it is not known that all belong to this boreal stock.
SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.

1a. Subfamily MAGellaninæ Beecher, 1893.

Waldheimidae (partim) Douville, 1880; Terebratellinae and Magasinæ Davidson, 1887; Magasidæ (partim) d'Orbigny, 1847; King, 1850; Rhynchoridæ (partim) King, 1850; Mühlfeldtinae Öhlert, 1887; Kraussinæ Dall, 1870; Kraussidæ Davidson, 1870.

Terebratellidæ with the "loop composed of descending and ascending branches, passing in the higher genera through metamorphoses comparable to the adult structure of Bouchardia, Magas, Magasella, Terebratella, and Magellanæ. The lower genera become adult before reaching the terminal stages" (Beecher). Recent genera are restricted to austral seas.

Magellania Bayle, 1880.
   Waldheimia King, 1850 (not Brulle, 1846).
   Neothyris Douville, 1880.
Terebratella d'Orbigny 1847.
   Delthyris Menke, 1830 (not Dalman, 1828).
   Ismenia King, 1850 (not Dall, 1870).
   Waltonia Davidson, 1850.
Magasella Dall, 1870.
Rhynchorina Öhlert, 1887.

Magas Sowerby, 1816.
Megerlina Deslongchamps, 1884.
Bouchardia Davidson, 1849.
   Pachyrhynchus King, 1850.
Kraussia Davidson, 1859.
   Kraussia Davidson, 1852 (not Dana, 1852).
Cœnothyris Douville, 1880.
Mannia Dewalque, 1874.
† Rhynchora Dalman, 1828.

Superfamily SPIRIFERACEA Waagen, 1883.

Helicopegnata Waagen, 1883.

Telotremata with the adult brachia supported by calcareous spiral lamellæ or spiralia.

1. Family ATRYPIDÆ Gill, 1871.
Atrypide Dall, 1877.

Spiriferacea with the crura directly continuous with the primary lamellæ, which diverge widely and have the spiral cones between them. Jugum simple, complete or incomplete.

1a. Subfamily ZYGOSPIRINÆ Waagen, 1883.

Anazygidae Davidson, 1884; Zygospiridæ Hall and Clarke, 1895.

Atrypidæ with a simple jugum either posteriorly or anteriorly directed. Spiralia with their apices toward the median dorsal region.

Zygospira Hall, 1862.
   Stenocisma Hall, 1864 (not Conrad, 1839; Hall, 1867).
   Anazyga Davidson, 1882.
   Orthonomsea Hall, 1858.
   Hallina Winchell and Schuchert, 1892.
   Protozyga Hall and Clarke, 1893.

Catazyga Hall and Clarke, 1893.
Atrypina Hall and Clarke, 1893.
Glassia Davidson, 1882.
† Clintonella Hall and Clarke, 1893.
CLASSIFICATION OF TELOTREMATA.

Subfamily Dayinae Waagen, 1883.

Atrypidae with the jugum drawn out posteriorly into a simple short process. Spiralia laterally directed.

Dayia Davidson, 1882.

1a. Subfamily Atrypinae Waagen, 1883.

Atrypidae with the jugum situated extremely posterior, complete in young stages, but at maturity discontinuous. Spiralia dorso-medially directed.

Atrypa Dalman, 1828.

Cleiothyria Phillips, 1841 (not King, 1830).

Spirigerina d'Orbigny, 1874.

Dayia Davidson, 1882.

1b. Subfamily Atrypinae Waagen, 1883.

Atrypidae with the jugum drawn out posteriorly into a simple short process. Spiralia laterally directed.

Atrypa Dalman, 1828.

Cleiothyria Phillips, 1841 (not King, 1830).

Spirigerina d'Orbigny, 1874.

2. Family Spiriferidae King, 1846 (emend Davidson).

Martiniini and Reticulariini Waagen, 1883; Spiriferinidae Davidson, 1884.

Spiriferacea with the crura directly continuous with the bases of the primary lamellae, which are situated between the laterally directed spiralia. Jugum simple, complete or incomplete.

2a. Subfamily Suesninæ Waagen, 1883.

Spiriferidae with the jugum continuous and more or less V-shaped. Shell structure punctate.

Cyrtila Davidson, 1858.

Theocyrtella Bittner, 1892.

Cyrtotheca Bittner, 1890 (not Salter).

2b. Subfamily Trigonotretinae Schuchert, 1893.

Spiriferidae with the jugum at maturity discontinuous, represented by two short jugal processes, one attached to each primary lamella.

?Cyclospira Hall and Clarke, 1893.

Spirifer Sowerby, 1815.

Choristites Fisher de Waldheim, 1825.

Trigonotreta Koenig, 1825; Meek and Hayden, 1864.

Spiriferus Blainville, 1827.

Spirifera J. de C. Sowerby, 1835.

Brachythyrus McCoy, 1844.

Fusella McCoy, 1844.

Hysteroliths Quenstedt, 1871.

Cyrtia Dalman, 1828.

Syringothyris Winchell, 1863.

Spirifer Meek and Hayden, 1864.

Delthyris Dalman, 1828.

Martinia McCoy, 1844.

Martinopsis Waagen, 1883.

Mentzelia Quenstedt, 1871.

Ambocelia Hall, 1860.

Reticularia McCoy, 1844.

Verneuilia Hall and Clarke, 1893.

?Metaplasia Hall and Clarke, 1893.

Nucleospiridae Davidson, 1882; Konineckinidae Davidson, 1853.

Spiriferacea with the bases of the primary lamellae situated between the spiralia, and sharply recurved dorsally at their junction with the crura. Spiralia more or less laterally directed. Jugum complete, V-shaped, with the apex drawn out into a simple, bifurcated, or otherwise modified process.

3a. Subfamily RHYNCHOSPIRINÆ Schuchert, 1894.

Retziinae Waagen, 1883; Retziidae and Rhynchospiridae Hall and Clarke, 1895.

Athyrinæ with the single process of the jugum commonly recurved, but sometimes bifurcated. Shell structure distinctly punctate.

Homoeospira Hall and Clarke, 1893. | Parazyga Hall and Clarke, 1893.
Rhynchospira Hall, 1859. | Acambona White, 1862.
Ptychospira Hall and Clarke, 1893. | Hustedia Hall and Clarke, 1893.
Enmetria Hall, 1864. | Retzia King, 1850.
Trematospira Hall, 1857. | Trigeria Bayle, 1878.

3b. Subfamily HINDELLINÆ Schuchert, 1894.

Coelospiridae and Nucleospiridae Hall and Clarke, 1895.

Athyrinæ in which the jugum has a single process which may be simple, or it articulates in a ventral septal socket, and sometimes (rarely) is sharply recurved terminally. Shell structure impunctate.

Hindella Davidson, 1882. | Anoplotheca Sandberger, 1856.
Whitfieldella Hall and Clarke, 1893. | Biada Davidson, 1882.
Meristina Davidson, 1882 (not Hall, 1867). | Coelospira Hall, 1863.
Nucleospira Hall, 1858. | Leptocælia Hall, 1857, 1859.
Hyattella Hall and Clarke, 1893. | Vitulina Hall, 1860.

3c. Subfamily ATHYRINÆ Waagen, 1883.

Athyrinæ in which the single process of the jugum bifurcates. The branches may or may not terminate between the first and second volutions of the spiralia.

Meristina Hall, 1867. | Cleiothyris King, 1840 (not Phillips, 1841).
Athyris Davidson, 1853 (not McCoy, 1844). | Seminula McCoy, 1844.
Whitfieldidia Davidson, 1882. | Spirigerella Waagen, 1883.
Glassina Hall and Clarke, 1893. | Anomactinella Bittner, 1890.
Athyris McCoy, 1844. | Pomatospirella Bittner, 1892.
Spirigerella d’Orbigny, 1847. | Amphitomella Bittner, 1890.
Euthyris Quenstedt, 1871. | Tetractinella Bittner, 1890.
Actinoconchus McCoy, 1844. | Plicigera Bittner, 1890.
Torynifer Hall and Clarke, 1895. | Pentactinella Bittner, 1890.
3°. Subfamily DIPLOSPIRINÆ Schuchert, 1894.

Athyridæ (partim) Hall and Clarke, 1895.

Athyridæ with the jugal bifurcations very long, lying between the volutions of the spiralia, and continuing with these to their outer ends. Sometimes there is an additional jugal process which articulates with the ventral valve, or recurses and joins the jugum.

- Kayseria Davidson, 1882.
- Diplospirella Bittner, 1890.
- Euractinella Bittner, 1890.
- Pexidella Bittner, 1890.
- Anisactinella Bittner, 1890.
- ?Didymospira Salomon.

3°b. Subfamily KONINKINÆ Waagen, 1883.

Koninckinidae Davidson, 1853; Amphiclininae Waagen, 1883; Diplospidæ and Diplospiridæ Munier-Chalmas, 1880.

Athyridæ with jugum and spiralia essentially as in Diplospiridæ. The spiralia in Koninckinæ, however, are not laterally directed as in the former group, but point ventrally, this being due to the concave form of the dorsal shell.

- Koninckina Suess, 1853.
- Amphiclinia Laube, 1865.
- Koninckella M.-Chalmas, 1880.
- ?Thecospira Zugmeyer, 1880.
- ?Amphiclinodonta Bittner, 1890.

3°a. Subfamily MERISTELLINÆ Waagen, 1883.

Meristellidiæ Hall and Clarke, 1895.

Athyridæ in which the jugal bifurcations do not enter the spiralia, but recurve and join near their origin.

- Meristella Hall, 1860.
- Charionella Billings, 1861.
- ?Pentagonia Cozzens, 1846.
- Goniochelia Hall, 1861.
- Dicamara Hall and Clarke, 1893.
- Merista Suess, 1851.
- Camarium Hall, 1859.
- Dioristella Bittner, 1890.
- ?Camarospira Hall and Clarke, 1893.

Order NEOTREMATA Beecher, 1891.

Circular or oval, more or less cone-shaped, inarticulate Brachiopoda, with the pedicle opening restricted throughout life to the ventral valve. Pedicle aperture modified by a deltidium or listrium. Prodeltidium attached to the ventral valve.

Superfamily ACROTRETACEA Schuchert, 1896.¹

Daikaulia (partim) Waagen, 1885; Diacaulia Hall and Clarke, 1895.

Neotremata with phosphatic shells and a more or less well-developed pseudodeltidium. Dorsal protegulum marginal.

1. Family ACROTRETIDÆ Schuchert, 1893.

Acrotretacea with the pedicle opening posterior to the protegulum.

Acrothele Linnarsson, 1876.
Linnarssonia Walcott, 1885.
Discinopsis (Matthew) Hall and Clarke, 1892.
Acrotreta Kutorga, 1848.

Conotreta Walcott, 1889.
Mesotreta Kutorga, 1848.
Orbicella d'Orbigny, 1849.
Keyserlingia Pander, 1861.
Helmerenia Pander, 1861.

2. Family SIPHONOTRETIDÆ Kutorga, 1848.

Acrotretacea with the pedicle opening passing by resorption anteriorly through the protegulum and the umbo of the shell.

Yorkia Walcott, 1897.
Trematobolus Matthew, 1893.
Siphonotreta de Verneuil, 1845.

Protosiphon Matthew, 1897
Schizambon Walcott, 1884.
Schizambonia Ehlert, 1887.

Superfamily DISCINACEA Waagen, 1885.

Daikanlia (partim) Waagen, 1885; Diacaulia (partim) Hall and Clarke, 1895.

Neotremata with phosphatic shells, a listrium, but with no deltidiun. Dorsal protegulum usually subcentral.

1. Family TREMATIDÆ Schuchert, 1893.

Primitive Discinacea, in which the posterior margin of the ventral valve has a triangular pedicle notch throughout life. A listrium is usually present.

Discinolepis Waagen, 1885.
Trematis Sharpe, 1847.
Orbicella Hall and Whitfield, 1875
(Schizocrania Hall and Whitfield, 1875).

Schizambon Hall and Whitfield, 1884.
Schizobolus Ulrich, 1886.
Lingulodiscina Whitfield, 1890.
Ehlertella Hall and Clarke, 1890.
Monobolina Salter, 1865.

2. Family DISCINIDÆ Gray, 1840.

Orbiculidae McCoy, 1844.

Derived Discinacea with an open pedicle notch in early life in the posterior margin of the ventral valve, which is closed posteriorly during neanic growth, leaving a more or less long, narrow slit partially closed by the listrium.

Orbiculoidea d'Orbigny, 1847.
Schizotreta Kutorga, 1848.
Lindstrømella Hall and Clarke, 1890.
Rømerella Hall and Clarke, 1890.

Discina Lamarck, 1819.
Orbicula Sowerby, 1830 (not Cuvier, 1798).
Discinisca Dall, 1871.
Superfamily **CRANIACEA** Waagen, 1885.¹

Cemented, calcareous Neotremata without pedicle or anal openings at maturity.

Family **CRANIIDÆ** King, 1846.

Orbicula Deshayes, 1830; Cranidae Gray, 1840.

**Craniacea** with the pedicle functional probably only during nepiontic growth.

*Craniella* Ehlert, 1888.

*Cardiocrania* Waagen, 1885.

*Ancistrocrania* Dall, 1877.

*Cranopsis* Dall, 1871 (not A. Adams).

*Craniscus* Dall, 1871.

*Siphonaria* Quenstedt, 1851 (not Sowerby).

*Pholidops* Hall, 1860.

*Cranioptus* Hall, 1859.

*Pseudocrania* McCoy, 1851.

*Palaeocrania* Quenstedt, 1871.

**Order PROTREMATA** Beecher, 1891.

Derived, articulate Brachiopoda, with the pedicle opening restricted to the ventral valve throughout life or during early growth. Prodeltidium originating on the dorsal side of the body wall in the cephalula stage, and later ankylosed to the ventral shell, thus initiating the development of a deltidium. Pedicle aperture modified by the deltidium. Brachia unsupported by a calcareous skeleton except in the Pentameracea where there are crura.

Superfamily **STROPHOMENACEA** Schuchert, 1896.²

*Linucardia* (partim) and *Denticardia* (partim) Brown, 1882; *Aphanopogmata* (partim), *Productaceae*, *Coralliopsida*, and *Kampylopegmata* (partim) Waagen, 1883; *Eleutherobranchiata* (partim) Neumayr, 1883; *Cryptobrachia* (partim) Gray, 1848; *Thecacea* Schuchert, 1893.

Primitive Protremata without spondylia and cruralia.

Family **KUTORGINIDÆ** Schuchert, 1893.

Primitive Strophomenacea with incipient cardinal areas, great delthyrial opening, and very rudimentary articulating processes and deltidium.

*Kutorgina* Billings, 1861 (emend) | *Schizopholis* Waagen, 1885.

Walcott.

¹The writer believes that when the young growth stages of Crania are studied it will be shown that the Cranacea have the superfamily characters of Acrotretacea rather than those of Discinacea.

Family EICHWALDIIDÆ Schuchert, 1893.

Primitive or aberrant, rostrate Strophomenacea, with narrow lateral grooves and ridges for articulation. Delthyrium closed by a concave plate (?deltidium). Pedicle emerging through the ventral umbone and moving with growth anteriorly by resorption through the shell, as in Siphonotretidae.

Eichwaldia Billings, 1858.  Dictyonella Hall, 1867.

1. Family BILLINGSELLIDÆ Schuchert, 1893.

Strophomenacea with well-developed cardinal areas and deltidium. Cardinal process obsolete or very rudimentary. Articulation fairly well developed.

Billingsella Hall and Clarke, 1892.  Proothis Hall and Clarke, 1892.

2. Family STROPHOMENIDÆ King, 1846.

Strophomenacea with well-developed cardinal areas, deltidium, chilidium, cardinal and articulating processes.

2a. Subfamily RAFINESQUININÆ Schuchert, 1893.

Leptenesacea Braun, 1840; Orthisidæ (partim) d’Orbigny, 1847; Davidsonidæ King, 1850; Davidsoninæ Gill, 1871; Strophomeninæ (partim) Gill, 1871; Waagen, 1884; Cadomellinæ Munier-Chalmas, 1887; Leptenidæ Hall and Clarke, 1895.

Strophomenoids with ventral valve convex and dorsal concave, except in Strophonella. The relative form of the valves is the reverse of the Orthothetinæ.

Rafinesquina Hall and Clarke, 1892.  Pholidostrophia Hall and Clarke, 1892.

Leptæna Dalman, 1828.  Strophonella Hall, 1879.

Leptagonia McCoy, 1844.  Amphistrophia Hall and Clarke, 1892.

Strophomena Meek, 1873 (not Blainville, 1825).  Cadomella M.-Chalmas, 1887.

Plectambonites Ehler, 1887 (not Pander, 1830).  Leptella Hall and Clarke, 1892.

Stropheodonta Hall, 1852.  Plectambonites Pander, 1830.

Brachyprion Shaler, 1865.  Leptaenisca Beecher, 1890.

Douvillina Ehler, 1887.  Christiania Hall and Clarke, 1892.

Leptostrophia Hall and Clarke, 1892.  Davidsonia Bouchard, 1847.

In 1893 the writer referred this family with doubt to the Rhynchonellacea. The absence of crural plates in Eichwaldia forbids that disposition. If the concave plate closing the umbonal pedicle passage is a deltidium, there can be no doubt that this family belongs to the Protermata. Students should search for the very young of Eichwaldia or Dictyonella, since it is through ontogeny alone that the true systematic position of this family will be determined.
SCHUCHERT.

CLASSIFICATION OF PROTREMATA.

2b. Subfamily ORTHOTHETINÆ Waagen, 1884.

Strophomeninae (partim) Waagen, 1884.

Strophomenoids with the ventral valve convex during early growth, becoming subsequently concave.

? Orthidium Hall and Clarke, 1892.
Strophomena Blainville, 1825.
Hemipronites Meek, 1872 (not Pander, 1830).
Orthothetes Fischer de Waldheim, 1837.
Orthis King, 1850 (not Dalman, 1828).
Hipparionyx Vanuxem, 1842.

Streptorhynchus King, 1850.
Derbya Waagen, 1884.
Kayserella Hall and Clarke, 1892.
Meekella White and St. John, 1870.
Triplecia Hall, 1859.
Diceraniscus Meek, 1872.
Mimus Barraude, 1879.
Streptis Davidson, 1881.

3. Family THECIDIIDÆ Gray, 1840.

Cemented Strophomenacea in which the interior of the shell is impressed with variously indented brachial furrows.

3a. Subfamily LYTTONINÆ Waagen, 1883.

Thecidiidæ with the brachial markings common to both valves.

Lyttonia Waagen, 1883.
Leptodorus Kayser, 1882.

Oldhamina Waagen, 1883.

3b. Subfamily THECIDIIDÆ Dall, 1870.

Thecidiidæ with the brachial markings restricted to the dorsal valve.

Thecidia Defrance, 1822.
Theclidium Sowerby, 1824.
Lacazella M.-Chalmas, 1880.
Thecidops M.-Chalmas, 1887.
Thecidella M.-Chalmas, 1887.

Eudesella M. Chalmas, 1880.
Pterophloios Gindbel, 1861.
Bacetruios Emmerich, 1855.
(In error. Not Bactrillium Herr.)
Davidsonella M. Chalmas, 1880.

2a. Family PRODUCTIDÆ Gray, 1840.

Productina Giebel, 1846.

Strophomenacea with hollow anchoring spines.

2aa. Subfamily CHONETINÆ Waagen, 1884.

Chonetidæ Bronn, 1862; Hall and Clarke, 1895.

Productidæ with the anchoring spines restricted to the ventral cardinal margin.

Chonetes Fischer de Waldheim, 1837.
Leptena McCoy, 1844 (not Dalman, 1828).
Anoplia Hall and Clarke, 1892.
Chonetella Waagen, 1884.

Chonostrophia Hall and Clarke, 1892.
Chonetina Krotow, 1888.
Chonetella Krotow, 1884 (not Waagen, 1884).
2a° Subfamily Productinæ Waagen, 1884.

Productidæ with the anchoring spines more or less abundant over the ventral valve and sometimes also over the dorsal valve.

Daviesiella Waagen, 1884.
Productella Hall, 1867.
Productus Sowerby, 1812.
Pyxis Chemnitz, 1784.
Producla G. B. Sowerby, 1825.
Arbusculites Murray, 1831.
Protonia Linck, 1830 (not Raffnesque).
Marginifera Waagen, 1884.
Proboscidella Eehlert, 1887.
Eutherigina Eehlert, 1887.
Chonopectus Hall and Clarke, 1892.
Strophalaosia King, 1844.
Orthothrix Geinitz, 1847.
Leptopilaosia King, 1845.
Aulosteges von Helmersen, 1847.
† Aulacorhynchus Dittmar, 1871.
Isogramma Meek and Worthen, 1873.

2a™ Family RICHTHOFENIDÆ Waagen, 1885.

Strophomenaceæ probably derived through the Productidæ, and remarkably modified by ventral cementation. The form of the shell is that of cyathophyllloid corals with an operculiform dorsal valve. Shell structure cystose.

Richthofenia Kayser, 1881.

1a. Family ORTHIDÆ Woodward, 1852.

Orthisidæ (partim) d’Orbigny, 1847; Orthinæ and Enteleitinae Waagen, 1884.

Strophomenaceæ usually with large open delthyria; deltidium only developed in younger growth stages.

Orthis Dalman, 1828.
Orthambonites Pander, 1830.
{ Plectorthis Hall and Clarke, 1892.
Hebertella Hall and Clarke, 1892.
Schizophoria King, 1850.
Omithichtia Hall, 1892.
Entelites Fischer de Waldheim, 1830.
Syntrielasrua Meek, 1865.
Platyctrophia King, 1850.
Orthotropia Hall and Clarke, 1895.
\{ Dinorthis Hall and Clarke, 1892.
Phaeomys Hall and Clarke, 1892.
Orthostrophia Hall, 1883.
Dalmannella Hall and Clarke, 1892.
Heterorthis Hall and Clarke, 1892.
Bilobites Linne, 1775.
Dicectosia King, 1850.
Rhipidomella Eehlert, 1890.
Rhipidomys Eehlert, 1887 (not Wagner).

Superfamily PENTAMERACEA Schuchert, 1896.

Trullacea Schuchert, 1893; Ancistropega (partim) Zittel, 1895; Aphanopegma (partim) and Productacea (partim) Waagen, 1883; Eleutherobranchiata (partim) Neumayr, 1883.

Derived Protremata with spondylia to which are attached the adductor, diductor, and ventral pedicle muscles. Commonly cruralia are present.

1. Family CLITAMBONITIDÆ Winchell and Schuchert, 1893.

Orthisidæ (partim) d’Orbigny, 1849; Orthisinae Waagen, 1884.

Primitive Pentameracea with long, straight cardinal areas and a well-developed deltidium. No cruralia.
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<thead>
<tr>
<th>Family</th>
<th>Cambrian</th>
<th>Ordov.</th>
<th>Silurian</th>
<th>Devonian</th>
<th>Carb.</th>
<th>Permian</th>
<th>Triassic</th>
<th>Jurassic</th>
<th>Creta</th>
<th>Tertiary</th>
<th>Recent</th>
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<td><strong>Spiniferacea</strong></td>
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<td><strong>Terebratulacea</strong></td>
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<td><strong>Rhynconeellacea</strong></td>
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<td><strong>Lingulacea</strong></td>
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<td><strong>Obolacea</strong></td>
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<td><strong>Discinacea</strong></td>
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<td><strong>Craniacea</strong></td>
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<td><strong>Strophomenacea</strong></td>
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<td><strong>Pentameracea</strong></td>
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*Diagram illustrating geologic distribution of families.*
2. Family SYNTROPHIIDÆ Schuchert, 1896.¹

Primitive Pentameracea with long, straight cardinal areas, deltidia, and cruralia.

Syntrophia Hall and Clarke, 1892-93.

2a. Family PÓRAMBONITIDÆ Davidson, 1853.²

Pentameracea intermediate in structure between the Syntrophiidæ and Pentameridæ, in that the deltidium and the straight cardinal areas of the former family tend to obsolescence, particularly the deltidium. The Porambonitidæ approach the latter family in tending to develop a rostrate shell. Cruralium present.

Porambonites Pander, 1830.

2b. Family PENTAMERIDÆ McCoy, 1844.

Rostrate Pentameracea rarely with straight cardinal areas. Deltidium commonly absent, but sometimes present as a concave plate, being the reverse of the ordinary form of the deltidium and due to the incurved beaks. Cruralium present.

² Since Hall and Clarke's family Camarellidæ (1895), after removing Camarophoria and Camarophorella, is based upon the same family characters as those of the Porambonitidæ (1853), as Porambonites is now interpreted, Davidson's family is retained on the ground of priority.
### Synopsis of the divisions of Brachiopoda higher than genera.

<table>
<thead>
<tr>
<th>Superorders</th>
<th>Orders</th>
<th>Superfamilies</th>
<th>Families</th>
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<tr>
<td></td>
<td>Pedicle opening common to both valves only in youthful growth. Deltital plates usually present. (Tetlotremata.)</td>
<td>Brachia supported by loops. (Terebratulacea.)</td>
<td>Shells primitive. No deltital plates; articulation rudimentary = Protorhynchidae. Articulation and deltital plates well developed = Rhynchonellidae. Loops free, developing indirect; no metamorphoses = Centronellidae. Loops free, developing indirect = Terebratulidae. Loops attached to a median septum; developing indirect = Terebratelididae.</td>
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<td>Shells rounded. Pedicle short. Animal not burrowing. (Obolacea.)</td>
<td></td>
<td>Shells round. Pedicle opening more or less large = Paterinidae. Valves round; posteriorly acuminate; pedicle opening small = Obolidae. Valves round or oval, thick, with solid or excavated platforms = Trimerellidae.</td>
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<td>Shells elongate, with oboloid interiors = Lingulidae. Shells elongate, with solid platforms = Lingulammatidae.</td>
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</table>

### Presence of Brachia
- Brachia supported by crura. (Rostracea.)
- Brachia supported by spiralia. (Spiriferacea.)

### Presence of Bases of Primary Lamellae
- Bases of primary lamellae between the spiralia, and sharply recurving dorsally at their junction with the crura = Athyridae.
Synopsis of the divisions of Brachiopoda higher than genera—Continued.


Pedicle restricted to ventral valve throughout life. Inarticulate. (Neotremata.)

Pedicle restricted to ventral valve throughout life or only in youthful growth. (Idiocauclia.)

Pedicle opening small, circular, posterior to protogulum = Acrotretidae.

Pedicle fissure narrow, elongate, anterior to protogulum = Siphonotretidae.

Pedicle fissure marginal, open posteriorly = Trematidae.

Pedicle fissure narrow, elongate, closed posteriorly = Discinidae.

Shells partially or completely cemented to foreign bodies = Cranidae.

Pedicle opening large; deltitudium and articulation incipient. No crural process = Kutorginidae.

Rostrate, aberrant Strophomenacea = Eichwaldiidae.

Cardinal areas and deltitudium well developed. No cardinal process = Billingiellidae.

Cardinal areas, deltitudium, chilidium, and cardinal process well developed = Strophomenidae.

Strophomenidae with impressed brachial furrows = Thecidiidae.

Valves more or less covered with hollow, anchoring spines = Productidae.

Cone-shaped productoids completely modified by cementation = Richtofenidae.

Deltythrium usually large, open; deltitudium developed only in early growth = Orthidae.

Large, straight cardinal areas with prominent deltitudium. No cruralia = Clitambonitidae.

Straight cardinal areas, prominent deltitudium, and short cruralia = Syntrophididae.

Shells intermediate in structure between Syntrophididae and Pentameridae = Porambonitidae.

Shells rostrate, commonly without deltitudium. Cruralia well developed = Pentameridae.
CHAPTER VI.
INDEX AND BIBLIOGRAPHY OF AMERICAN FOSSIL BRACHIOPODA.


Acambona osagensis (Swallow). Chouteau (L. Carb.)
Acambona? osagensis Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 120, pl. 51, figs. 38, 39.
Retzia? osagensis Keyes, Geol. Survey Missouri, V, 1895, p. 94.
Loc. Cooper and Benton counties, Missouri.

Acambona prima White. Burlington (L. Carb.)
Loc. Burlington, Iowa.
Obs. It is probable that this species is identical with A. osagensis.

ACROTHELE Linnarsson. Genotype A. coriacea Linnarsson.

Acrothele bellula Walcott. Middle Cambrian.
Acrothele bellula Walcott, Proc. U. S. National Mus., XIX, 1897, p. 716, pl. 60, figs. 4-4e.
Loc. Cowans Creek, Cherokee County, Alabama.

Acrothele decipiens Walcott. Lower Cambrian.
Loc. Near Stoner's, York County, Pennsylvania.

Acrothele (?) dichotoma Walcott. Lower Cambrian.
Loc. Eureka district, Nevada.

Acrothele matthewi (Hartt). Middle Cambrian.
Loc. Portland, New Brunswick; Manuels Brook, Conception Bay, Newfoundland.
Acrothele matthewi costata Matthew.
Acrothele matthewi var. costata Matthew, Trans. N. Y. Acad. Sci., XIV, 1895, p. 128, pl. 5, fig. 9.
Loc. Hanford Brook, New Brunswick.

Acrothele matthewi lata Matthew.

Acrothele matthewi prima Matthew.
Loc. Hanford Brook, New Brunswick.

Acrothele subsidua (White).
Loc. Antelope Spring, Utah; Pioche, Nevada.


Acrotreta attenuata Meek = A. gemma.

Acrotreta baileyi Matthew.
Acrotreta baileyi Matthew, Trans. Royal Soc. Canada, III, 1886, p. 36, pl. 5, fig. 13.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 102, pl. 3, figs. 32-34.—Matthew, Trans. Royal Soc. Canada, IX, 1892, p. 43, pl. 12, fig. 7d.
Loc. Hanford Brook and Long Reach, New Brunswick.

Acrotreta gemma Billings.
Acrotreta attenuata Meek, Ibidem, 1873, p. 463.
Loc. Near Portland Creek, Newfoundland; Eureka and White Pine mining districts, Nevada.

Acrotreta gemma depressa Walcott.
Acrotreta gemmula Matthew. Middle Cambrian.
Acrotreta gemmula Matthew, Trans. Royal Soc. Canada, X, 1894, p. 87, pl. 16, fig. 2;—Trans. N. Y. Acad. Sci., XIV, 1895, p. 126, pl. 5, fig. 5.

Acrotreta guliemli Matthew=Discinopsis guliemli.

Acrotreta microscopica (Shumard). Middle Cambrian.
Discina microscopica Shumard, American Jour. Sci., XXXII, 2d ser., 1861, p. 221.
Loc. Occurs abundantly in Burnett and Llano counties, Texas.

Acrotreta pyxidicula White=Acrotreta gemma.

Acrotreta subconica Meek (non Kutorga)=Acrotreta gemma.

Ægilops Hall. A genus of pelecypods.

AMBOCELLIA Hall. Genotype Orthis umbonata Conrad.

Amboccelia fimbriata Claypole. Portage (Dev.).
Loc. Perry County, Pennsylvania.

Amboccelia gemmula McChesney=Amboccelia planoconvexa.

Amboccelia gregaria Hall. Chemung (Dev.).
Orthis uuguiculus Hall (non Phillips), Geol. New York; Rep. Fourth Dist., 1843, p. 267, fig. 5.
Loc. New York; Pennsylvania, and Virginia.
Obs. See Martinia subumbona.

Amboccelia minuta White. Kinderhook (L. Carb.).

Amboccelia planoconvexa (Shumard). Upper Carboniferous.
Amboccelia gemmula McChesney, New Pal. Fossils, 1860, p. 41;—Ibidem, 1865, pl. 1, fig. 3.
Spirifer (Martinia) planoconvexa Meek and Hayden, Pal. Upper Missouri, Smithsonian Cont. to Knowl., 172, Pt. I, 1864, p. 20, figs. a-e.—Meek, Final Rep. U. S. Geol. Survey Nebraska, 1872, p. 184, pl. 4, fig. 4; pl. 8, fig. 2.
Martinia planoconvexa McChesney, Trans. Chicago Acad. Sci., I, 1868, p. 34, pl. 1, fig. 3.
Amboccelia planoconvexa (Shumard)—Continued.

Spirifera (Martinia) planoconvexa Derby, Bull. Cornell Univ., I, 1874, p. 19, pl. 8, figs. 12, 16, 18; pl. 9, fig. 7.—White, Wheeler's Geogr. Geol. Expl. and Survey west 100 Merid., IV, 1875, p. 135, pl. 10, fig. 3.—Thirteenth Rep. Indiana State Geol., 1884, p. 134, pl. 32, figs. 23, 24.—Herrick, Bull. Denison Univ., II, 1887, p. 46, pl. 1, fig. 12.—Keyes, Geol. Survey Missouri, V, 1885, p. 85.


Loc. Missouri; Iowa; Illinois; Ohio; Indiana; Kansas; Nebraska; New Mexico; Elko Mountain, Nevada; Bomjardim and Itaituba, Brazil.

Amboccelia praebumba Hall. Hamilton (Dev.).


Amboccelia spinosa Hall and Clarke. Hamilton (Dev.).


Loc. Livingston County, New York.

Amboccelia subumbona Hall = Martinia subumbona.

Amboccelia umbonata (Conrad). Marcellus—Chemung (Dev.).


Martinia umbonata Herrick, Geol. Ohio, VII, 1895, p. 20, fig. 3.

Loc. New York; Pennsylvania; Falls of Ohio.

Amboccelia umbonata gregaria Hall = Amboccelia gregaria.

AMPHIGENIA Hall. Genotype Pentamerus elongatus Vanuxem.


Amphigenia curta (Meek and Worthen). Oriskany (Dev.).

Stricklandia elongata var. curta Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 402, pl. 8, fig. 1; pl. 9, fig. 5.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 254.

Loc. Union County, Illinois.

Amphigenia elongata (Vanuxem). Oriskany and Up. Helderberg (Dev.).


Stricklandia elongata Billings, Canadian Jour., VI, 1861, p. 267, figs. 91, 92.
Amphigenia elongata (Vanuxem)—Continued.

Stricklandinia elongata (Vanuxem) Continued.


Loc. New York; Michigan; Cayuga, Ontario; Rio Maecuru and Rio Curua, Brazil.

Amphigenia elongata subtrigonalis Hall. Up. Helderberg (Dev.).


Loc. Erie County, New York.

Amphigenia elongata undulata Hall. Up. Helderberg (Dev.).


Loc. Mackinac, Michigan.

AMPHISTROPHIA Hall and Clarke. Genotype Strophonella striata


Obs. Proposed as a subgenus of Strophonella.

ANABATA Clarke. Genotype A. paraia Clarke.


Anabaia paraia Clarke.

Silurian.


Loc. Rio Trombetas, Province of Para, Brazil.

ANASTROPHIA Hall. Genotype Pentamerus verneuili Hall.


Anastrophia brevirostris (Sowerby?) Hall. Niagara (Sil.).

Terebratula brevirostris Sowerby, Murchison's Sil. System, 1839, p. 631, pl. 13, fig. 15.

Atypa brevirostris? Hall, Pal. New York, II, 1832, p. 278, pl. 58, fig. 1.


Rhychnoellina brevirostris Billings, Geol. Canada, 1863, p. 315, fig. 324.

Loc. Lockport, New York.

Obs. Compare with Anastropia interreplicata. If a pentameroid, this species is probably identical with Anastropia interreplicata Hall.

Anastrophia hemipliicata W. and S.=Parastrophia hemipliicata.

Anastrophia internascens Hall. Niagara (Sil.).


Loc. Waldron, Indiana; Louisville, Kentucky; Milwaukee, Wisconsin.
Anastrophia interplicata (Hall).

Niagara (Sil).
Anastrophia interplicata Hall, Pal. New York, II, 1852, p. 275, pl. 57, fig. 2.
Loc. Lockport, New York; Louisville, Kentucky; Wisconsin.
Obs. See A. brevirostris.

Anastrophia reversa Miller = Parastrophia reversa.
Anastrophia scofieldi W. and S. = Parastrophia scofieldi.
Anastrophia verneuili Hall, 1876 (non 1859) = Anastrophia internascens.

Anastrophia verneuili (Hall).

Lower Helderberg (Dev.).
Anastrophia lacnosa Vanuxem (non Sowerby), Geol. N. Y.; Rep. Third Dist., 1842, p. 117, fig. 3, and p. 119.
Anastrophia verneuili Miller, N. American Geol. Pal., 1889, p. 334.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 224, pl. 63, figs. 31-38; pl. 84, figs. 43, 44.
Loc. Eastern New York; Perry County, Tennessee; Petermann Fiord, Greenland.

Anazyga recurvirostra Davidsou = Zygospira recurvirostris.

ANOPLIA Hall and Clarke. Genotype Leptæna nucleata Hall.

Anoplia nucleata Hall.

Leptæna nucleata Hall, Pal. New York, III, 1859, p. 419, pl. 94, fig. 1.—Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 393, pl. 8, fig. 8.
Loc. Albany County, New York; Alexander County, Illinois; Cayuga, Ontario.
Obs. It is probable that Productella nucleata Nicholson is a synonym of this species.

ANOPLOTHECA Sandberger (emend Hall and Clarke). Genotype Productus lamellosus Sandberger = Terebratula venusta Schuur.
Bifida Davidson, Supplement to British Dev. Brach., Palæontographical Soc., 1882, p. 27.
ANOPLOTHECA Sandberger (emend Hall)—Continued.

Obs. Hall and Clarke have shown that Anoplotheca and Bifida are synonymous terms and that Ccelospira is also structurally identical. The latter name, however, they retain as a subgenus of Anoplotheca. While the brachydidium is not yet fully known in Leptocelia, all its other characters are the same as those of Ccelospira. Under these circumstances it appears best, for the present at least, to refer all American species of Leptocelia and Ccelospira to Anoplotheca.

Anoplotheca acutiplicata (Conrad). Corniferous (Dev.).


Anoplotheca camilla (Hall). Oriskany and Up. Helderberg (Dev.).

Ccelospira concava Hall (non Hall 1863), Pal. New York, IV, 1867, p. 329.

Anoplotheca concava (Hall). Lower Helderberg (Dev.).

Loc. Albany and Scholharie counties, New York; Kennedy Channel, Arctic region.

Anoplotheca dichotoma (Hall). Oriskany (Dev.).

Loc. Cumberland, Maryland.

Obs. Possibly the young of Anoplotheca flabellites.

Anoplotheca fimbriata (Hall). Oriskany (Dev.).

Loc. Cumberland, Maryland.

Anoplotheca flabellites (Conrad). Oriskany and Corniferous (Dev.).

Leptocelia flabellites Hall, Twelfth Rep. Ibidem, 1859, p. 33, figs. 1, 2, 4;—Pal. New York, III, 1859, p. 449, pl. 103B, fig. 1; pl. 106, fig. 1.—Billings, Canadian Journ., VI, 1861, p. 351, fig. 126;—Geology Canada, 1863, p. 369, fig. 382.—Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 397, pl. 8, fig. 3.—Billings, Pal. Fossils, II, 1874, p. 42, pl. 3, figs. 5, 6.—Steinmann, American Naturalist, XXV, 1891, p. 856.—A. Ulrich, N. Jahrb. f. Mineral., Beilageband,
Anoplotheca flabellites (Conrad)—Continued.


Loc. Schoharie, etc., New York; county of Haldimand, Ontario; Gaspé; Cumberland, Maryland; Union County, Illinois; Bolivia; Tanquarassu, Matto Grosso, Brazil; Falkland Islands; South Africa.

Anoplotheca hemispherica (Sowerby).

Atrypa hemispherica Sowerby, Murchison’s Silurian System, 1839, p. 639, pl. 20, fig. 7.—Hall, Pal. New York, II, 1852, p. 74, pl. 23, fig. 10.—Billings, Geology Canada, 1863, p. 318, fig. 337.

Atrypa hemispherica? Hall, Geology, N. Y.; Rep. Fourth Dist., 1843, p. 73, fig. 4.


Celsiuspira? hemispherica Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 136, pl. 52, figs. 1-4 († pl. 52, fig. 16).

Loc. England; Rochester, Sodus, and Walcott, New York; Louisville, Kentucky; Cumberland Gap, Tennessee; Ringgold, Georgia; Collinsville, Alabama; Arisaig, Nova Scotia (Am); Anticosti.

Anoplotheca infrequens (Walcott).

Trematospira infrequens Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 151, pl. 4, fig. 3.

Loc. Lone Mountain, Nevada.

Obs. The exterior is like that of A. flabellites.

Anoplotheca planoconvexa (Hall).

Atrypa planoconvexa Hall, Pal. New York, II, 1852, p. 75, pl. 23, fig. 11.—Billings, Geology Canada, 1863, p. 318, fig. 336.


Celsiuspira? planoconvexa Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 136, pl. 52, fig. 15; pl. 53, figs. 11-16.

Loc. Flamborough Head, Ontario; Niagara of Wisconsin (Whitfield).

Anoplotheca plicatula (Hall).

Atrypa plicatula Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 71, fig. 4;—Pal. New York, II, 1852, p. 74, pl. 23, fig. 9.


Celsiuspira? plicatula Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 136, pl. 52, figs. 12-14; pl. 82, fig. 5.


ATHYRIS McCoy (emend Hall and Clarke).

Genotype Terebratula concentrica von Buch.

SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA. [BULL. 87.

ATHYRIS McCoy (emend Hall and Clarke)—Continued.


Enthyris Quenstedt, Petrefactenkunde Deutschlands, 1871, p. 442.

Athyris americana Swallow=Cleiothyris roissyi.

Athyris angelica Hall. Chemung (Dev.).


Loc. Phillipsburg, Rockville, etc., New York; Meadville, Pennsylvania; Eureka district, Nevada.

Athyris angelica occidentalis Whiteaves. Hamilton (Dev.).

Athyris angelica occidentalis Whiteaves, Cont. Canadian Pal., I, 1891, p. 227, pl. 32, fig. 3.

Loc. Athabasca River, Canada.

Athyris ashaundensis Herrick=A. lamellosa.

Athyris biloba (A. Winchell). Kinderhook (L. Carb.).


Loc. Rockford, Indiana.

Obs. This species is not well established and is based upon a single ventral valve.

Athyris blancha Billings=Meristella blancha.

Athyris borealis Billings=Catazyga erratica.

Athyris brittsi Miller. Middle Devonian.


Loc. Near Otterville, Missouri.

Obs. Probably the same as A. spiriferoides.

Athyris caputserpentis Swallow=Seminula caputserpentis.

Athyris charitonensis Swallow=Seminula charitonensis.

Athyris chloe Billings=Parazyga hirsuta.

Athyris clara Billings=Meristella nasuta.

Athyris claytoni Swallow=Seminula claytoni.

Athyris clintonensis Swallow=Cleiothyris clintonensis.

Athyris clusia Billings=Meristella clusia.

Athyris concentrica Billings (non von Buch)=A. spiriferoides.

Athyris congesta Conrad=Hyatella congesta.

Athyris cora Hall. Hamilton and Chemung ? (Dev.).


Athyris (?) corpulenta (A. Winchell). Kinderhook (L. Carb.).


Loc. Burlington, Iowa.

Athyris crassicardinalis White=Cléothyris crassicardinalis.

Athyris crassirostra Billings=Whitfieldella cylindrica.

Athyris cylindrica Billings=Whitfieldella cylindrica.

Athyris densa Hall and Clarke. St. Louis (L. Garb.).

Athyris densa Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 364, pl. 46, figs. 6-12.

Loc. Washington County, Indiana; Colesburg, Kentucky.

Obs. Compare with Centronella (?) crassicardinalis.

Athyris differentis McChesney=Seminula argentea.

Athyris eboraea A. Winchell=A. vittata.

Athyris euzona Swallow=Seminula formosa.

Athyris (?) formosa Swallow=Seminula formosa.

Athyris fultonensis (Swallow). Corniferous and Hamilton (Dev.).


Spirigera eboraea A. Winchell, Rep. Lower Peninsula Michigan, 1866, p. 94.

Loc. Callaway County, Missouri; Iowa City and New Buffalo, Iowa; Falls of Ohio; Alpena, Michigan; Lake Winnipegeosis, Manitoba.

Obs. Specimens of S. fultonensis Swallow and S. eboraea Winchell in the writer's collection prove to be the same as A. vittata Hall.

Athyris hannibalensis (Swallow). Chouteau (L. Carb.).


Loc. Clarksville, Hannibal, etc., Missouri; Sciotoville, Ohio.

Obs. Meek was inclined to regard this species the same as A. lamellosa. It is, however, distinct. See A. missouriensis.

Athyris harpalyce Billings=Whitfieldella harpalyce.

Athyris hawni Swallow=Seminula hawni.

Athyris headi Billings=Catazyga headi.

Athyris headi anticostiensis Billings=Catazyga erratica.

Athyris headi borealis Billings=Catazyga erratica.

Athyris hirsuta Hall=Cleiothyris hirsuta.

Athyris incrassata Hall. Burlington (L. Carb.).

Athyris incrassata Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 600, pl. 12, fig. 6.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 90, pl. 46, fig. 21; pl. 83, fig. 39.

Athyris incrassatus Keyes, Geol. Survey Missouri, V, 1895, p. 91, pl. 41, fig. 10.

Loc. Burlington, Iowa; Quincy, Illinois; Hannibal, Missouri.
Athyris intermedia Nicholson = Whitfieldella intermedia.

Athyris intervarica McChesney. Burlington (L. Carb.).
Loc. Burlington, Iowa.
Obs. May be the same as A. lamellosa L'Eveillé.

Athyris (?) jacksoni (Swallow). Upper Coal Measures.
Loc. Cass County, Missouri.

Athyris julia Billings = Whitfieldella julia.
Athyris junia Billings = Hyattella junia.

Athyris lamellosa (L'Eveillé). Waverly-Keokuk (L. Carb.).
Athyris lamellosa Meek, Pal. Ohio, II, 1875, p. 283, pl. 14, fig. 6.—Herrick, Bull Denison Univ., III, 1888, p. 49, pl. 2, fig. 7.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 90, pl. 46, figs. 16-20.
Athyris ashlandensis Herrick, Bull. Denison Univ., IV, 1888, p. 24, pl. 3, fig. 6;— Geol. Ohio, VII, 1895, pl. 23, fig. 10.
Loc. Europe; Sciotoville, and Licking County, Ohio; Lebanon, Kentucky; Crawfordsville, Indiana; New Mexico.
Obs. See A. intervarica McChesney.

Athyris lara Billings = Atrypa lara.

Athyris macouensis Swallow = Seminula macouensis.
Athyris maia Billings = Martinia maia.
Athyris minima Swallow = A. fultonensis.

Athyris minutissima Webster. Chemung (Dev.).
Athyris minutissima Webster, American Nat., XXII, 1888, p. 1015.
Loc. Near Rockford, Iowa.

Athyris missouriensis Swallow = Cleiothyris missouriensis.

Athyris missouriensis (A. Winchell). Chouteau (L. Carb.).
Loc. Louisiana, Missouri; Medina County, Ohio.
Obs. Should be compared with A. hannibalensis.

Athyris monticola (White). Lower Carboniferous.
Loc. Mountain Spring, Nevada.

Athyris naviformis Billings = Whitfieldella naviformis.
Athyris nitida Billings = Whitfieldella nitida.
Athyris obmaxima McChesney = Cleiothyris obmaxima.
Athyris obvia McChesney = Cleiothyris obvia.

Athyris ohioensis (A. Winchell). Waverly (L. Carb.).
Loc. Akron and Sciotoville, Ohio.
Athyris orbicularis McChesney = Cleiothyris orbicularis.
Athyris (?) ottervillensis Miller. Middle Devonian.


Loc. Near Otterville, Missouri.

Athyris papilioniformis McChesney. Kaskaskia (L. Carb.).

Athyris? papilioniformis McChesney, Ibidem, 1865, pl. 6, fig. 4;—Trans. Chicago Acad. Sci., I, 1868, p. 33, pl. 6, fig. 4.

Loc. Fountain Bluff, Illinois.

Athyris parvirostris Meek and Worthen = Cleiothyris roissyi.

Athyris parvula Whiteaves. Hamilton (Dev.).

Athyris parvula Whiteaves, Cont. Canadian Pal., I, 1891, p. 228, pl. 32, figs. 4, 5.

Loc. Athabasca River, Canada.

Athyris pectinifera? Swallow (non Sowerby) = Cleiothyris roissyi.

Athyris (?) perinflata McChesney. Keokuk (L. Carb.).


Athyris persinuata Meek = Seminula persinuata.

Athyris planosulcata American authors (non Phillips) = Cleiothyris roissyi.

Athyris plattensis Swallow = Seminula plattensis.

Athyris polita Hall. Chemung (Dev.).


Athyris polita Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 46, figs. 1-5.


Athyris prinstana Billings = Hindella prinstana.

Athyris prouti (Swallow). Chouteau (L. Carb.).


Athyris prouti Keyes, Geol. Survey Missouri, V, 1895, p. 91.

Loc. St. Louis County, etc., Missouri.

Athyris reflexa Swallow = Cleiothyris reflexa.

Athyris roissyi = Cleiothyris roissyi.

Athyris singletoni Swallow = Seminula singletoni.

Athyris (?) solitaria Billings. Anticosti (Sil.).


Loc. Anticosti.

Athyris spiriferoides McChesney (non Eaton) = A. papilioniformis.

Athyris spiriferoides (Eaton). Corniferous and Hamilton (Dev.).


Athyris spiriferoides (Eaton)—Continued.

Athyris concentrica Billings, Canadian Jour., VI, 1861, p. 145, figs. 54–57;—Geol. Canada, 1863, p. 373, fig. 399; p. 385, fig. 421.

Loc. New York; Pennsylvania; Maryland; Virginia; Cayuga and Widder, Canada.

Athyris squamosa (Eaton)=Cleiothyris squamosa.
Athyris sublamellosa Hall=Cleiothyris rossyi.
Athyris subquadrata Hall=Seminula subquad rata.
Athyris subtilita Hall=Seminula argentea.
Athyris trinucleus Hall=Seminula trigynus.
Athyris trisinuatus McChesney=Meristina trisinnata.
Athyris tumida Koemer=Meristina tumida.

Athyris (?) tumidula Billings.


Loc. Anticosti.

Obs. Probably a species of Whitfieldella.

Athyris (?) turgida Shaler.


Loc. Anticosti.

Athyris ultravaria McChesney.


Loc. Keokuk, Iowa.

Athyris unbonata Billings=Hindella unbonata.
Athyris unisulcata Billings=Pentagonia unisulcata.
Athyris vittata Hall=A. fultonensis.

ATRYPÁ Dalman.

Genotype Anomia reticularis Linnaeus.


Atrypa æquiradiata Conrad=Rensselaeria æquiradiata.
Atrypa acutiplicata Conrad=Anoplotheta acutiplicata.
Atrypa acutirostrum Hall=Rhynchonella acutirostris.
Atrypa affinis Vanuxem=A. reticularis.
Atrypa altis Hall=Camarotectia plena.
Atrypa ambiguа Hall=Camarella ambigua.
Atrypa aprins Hall=Homoeospira aprinsiformis.
Atrypa arata Conrad=Pentamerella arata.
Atrypa aspera American authors=A. spinosa.
Atrypa aspera occidentalis Hall=A. hystrix occidentalis.
Atrypa bidens Hall=Rhynchonella bidens.
Atrypa bidentata Hall=Rhynchonella bidentata.
Atrypa bisulcata Hall (non Vanuxem)=Cyclospira bisulcata.
Atrypa bisulcata Vanuxem (non Hall)=Whitfieldella bisulcata.
Atrypa brevirostris Hall=Anastrophia brevirostris.
Atrypa calviui Nettelroth = A. rugosa.
Atrypa camura Hall = Trematospira camura.
Atrypa capax Conrad = Rhynochotrema capax.
Atrypa chemungensis Conrad = A. reticularis.
Atrypa circulus Hall = Parastrophia hemiplicata.
Atrypa comis Owen = Gypidula comis.
Atrypa concentrica Conrad, and Hall = Athyris spiriferoides.
Atrypa congregata Hall = Nucleospira congregata.
Atrypa congesta Conrad = Hyattella congesta.
Atrypa contracta Hall = Camarotoechia contracta.
Atrypa corallifera Hall = Dictyonella corallifera.
Atrypa crassirostrnm Hall = Whitfieldella cylindrica.
Atrypa cuboides Vanuxem, and Hall = Hypothyris cuboides.
Atrypa cuneata Hall = Rhynochotretra cuneata americana.
Atrypa cuspidata Hall = Triplecia cuspidata.
Atrypa cylindrica Hall = Whitfieldella cylindrica.
Atrypa deflecta Hall = Zygospira deflecta.
Atrypa dentata Hall = Rhynochotrema dentata.

**Atrypa desquamat,a Sowerby.** Middle Devonian.

Loc. Europe; Petoskey, Michigan; Eureka district, Nevada.

Atrypa disparilis Hall = Atrypina disparilis.
Atrypa dubia Hall = Protochyrincha dubia.
Atrypa dumos,a Hall = A. spinosa.
Atrypa duplicata Hall = Camarotoechia duplicata.

**Atrypa ellipsoid,a Nettelroth.** Corniferous (Dev.).

Loc. Falls of Ohio.

Atrypa elongata Conrad = Rensselaeria ovalis.
Atrypa emacerta Hall = Rhynochonella emacerta.
Atrypa equiradiata Hall = Camarotoechia equiradiata.
Atrypa exigua Hall = Zygospira exigua.
Atrypa eximia Hall = Camarotoechia eximia.
Atrypa extans Emmons = Triplecia extans.
Atrypa fiabella Shaler = Anoplotheca hemispherica.
Atrypa flabellites Conrad = Anoplotheca flabellites.
Atrypa galeatus Dalman = Gypidula galeata.

**Atrypa (?) gibbosa Hall.** Clinton (Sil.).
Atrypa gibbosa Hall, Pal. New York, II, 1852, p. 79, pl. 20, fig. 10.


Atrypa globuliformis Vanuxem = Leiorhynchus globuliforme.
Atrypa hemiplicata Hall = Parastrophia hemiplicata.
Atrypa hemispherica Sowerby = Anoplotheca hemispherica.
Atrypa hirsuta Hall = Parazyga hirsuta.
Atrypa hystrix Hall.


Loc. Steuben County, New York; Pennsylvania; Rockford, Iowa; Milwaukee, Wisconsin.

Obs. See A. spinosa.

Atrypa hystrix elongata Webster.

Atrypa hystrix var. elongata Webster, American Nat., XXII, 1888, p. 1104.

Loc. Near Rockford, Iowa.

Atrypa hystrix occidentalis Hall.

Atrypa aspera var. occidentalis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 515, pl. 6, fig. 3.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 55, figs. 18–20.

Atrypa aspera Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 403, pl. 13, fig. 7.

Loc. Independence, Davenport, etc., Iowa; Rock Island, Illinois;

Obs. This variety is probably more closely related to A. hystrix than to A. aspera.

Atrypa hystrix planosulcata Webster.

Atrypa hystrix var. planosulcata Webster, American Nat., XXII, 1888, p. 1104.

Loc. Near Rockford, Iowa.

Atrypa imbricata Hall (non Sowerby)=A. nodostriata.

Atrypa impressa Hall=A. reticularis impressa.

Atrypa impressa Shaler (non Hall)=A. reticularis.

Atrypa increbescens Hall=Rhynchothere inaequivalvis.

Atrypa intermedia Hall=Whitfieldella intermedia.

Atrypa interplicata Hall=Anastrophia interplicata.

Atrypa laevis Vanuxem=Meristella laevis.

Atrypa lacunosa Vanuxem=Anastrophia verneuilli.

Atrypa lamellata Hall=Rhynchonella lamellata.

Atrypa (?) lara (Billings).


Loc. Anticosti.

Obs. Said to have a true Atrypa loop and spires. The exterior is smooth. Probably the type of a new genus.

Atrypa laticostata Hall (non Phillips)=Camarototha contracta.

Atrypa lentiformis Vanuxem=A. reticularis.

Atrypa limitaris Hall=Leiorhynchus limitare.

Atrypa (?) lingulata Nicollet.


"Sub fusiform; valves nearly equally convex; inferior valve with a longitudinal sinus; base projecting in the middle, the margin of the projection truncated. St. Louis, and also the bluff beneath Rockwell, Illinois."
Atrypa marginalis (Dalman).

Atrypa nodoostriata Foerste (non Hall), Bull. Denison Univ., I, 1885, p. 90, pl. 13, fig. 9.
Loc. Europe; Anticosti; Dayton, Ohio; Hanover, Indiana; Louisville, Kentucky; Decatur County, Tennessee; Bridgeport, Illinois.

Atrypa masonii (Salter).

Loc. Near Wellington Channel, Bessels Bay, lat. 81° 6'.

Atrypa medialis Vanuxem = Eatonia media.
Atrypa mesacostalis Hall = Leiorhynchus mesacostale.

Atrypa missouriensis Miller.

Loc. Near Otterville, Missouri.

Atrypa modesta Hall = Zygoespira modesta.
Atrypa nasuta Conrad = Meristella nasuta.
Atrypa naviformis Hall = Whitfieldella naviformis.
Atrypa neglecta Hall = Camarotcechia neglecta.
Atrypa nitida Hall = Whitfieldella nitida.
Atrypa nitida oblata Hall = Whitfieldella oblata.
Atrypa nodoostriata Foerste (non Hall) = A. marginalis.

Atrypa nodoostriata Hall.

Atrypa imbricata Hall (non Sowerby), Geol. N. Y.; Rep. Fourth Dist., 1843, Tab. Organic Remains, 13, fig. 1.
Loc. Lockport, New York; Yellow Springs, Ohio; Louisville, Kentucky; Wisconsin.

Atrypa nucleolata Hall = Whitfieldella nucleolata.
Atrypa nucleus Hall = Triplecia nucleus.
Atrypa nustella Castelnau = Eatonia peculiaris.
Atrypa oblata Hall = Whitfieldella oblata.
Atrypa obtusiplicata Hall = Camarotcechia obtusiplicata.
Atrypa octocostata Conrad = Pentamerella arata.
Atrypa palmata Morris and Sharpe = Anoploethca flabellites.
Atrypa peculiaris Conrad = Eatonia peculiaris.
Atrypa phoca (Salter). Silurian.
Rhynchonella phoca Salter, Sutherland's Jour. Voyage Baffins Bay, etc., II, 1852, p. cxxvi, pl. 5, figs. 1-3.
Loc. Cape Riley, Cornwallis, Seal Islands, Bessels Bay, lat. 81° 6', and Dobbins Bay, lat. 79° 41', Arctic America.
Atrypa planoconvexa Hall = Anoplotheca planoconvexa.
Atrypa pleiopleura Conrad = Camarotocheia pleiopleura.
Atrypa plena Hall = Camarotocheia plena.
Atrypa plicatula Hall = Rhynchonella plicatula.
Atrypa plicifera Hall = Camarotocheia plicata.
Atrypa polita Hall = Athyris polita.
Atrypa prisca Vanuxem = A. reticularis.

Atrypa pseudomarginalis Hall. Up. Helderberg (Dev.).
Atrypa quadricostata Hall, 1843 = Leiorhynchus quadricostatum.
Atrypa quadricostata Hall, 1852 = Hyattella congesta.
Atrypa rectiplicata Conrad = Spirifer rectiplicatus.
Atrypa recurvirostris Hall = Zygospora recurvirostris.

Atrypa reticularis (Linnaeus). Silurian and Devonian.
Anomia reticularis Linné, Systema Naturae, ed. xii, I, 1767, p. 1132.
Atrypa prisca Vanuxem, Geol. New York; Rep. Third Dist., 1842, p. 139, fig. 5.—Hall, Ibidem, Rep. Fourth Dist., 1843, p. 175, fig. 5; p. 198, fig. 4.—Owen, Geol. Expl. Iowa, Wisconsin, Illinois, 1844, pl. 12, figs. 2, 10.—Billings, Canadian Nat. Geol., I, 1856, p. 474, pl. 7, fig. 11.
Atrypa lentiformis Vanuxem, Geol. New York; Rep Third Dist., 1842, p. 163, fig. 3; p. 164.—Hall, Ibidem, Rep. Fourth Dist., 1843, p. 215, fig. 3.
Strophomena ithacensis Vanuxem, Geol. New York; Rep. Third Dist., 1842, p. 174, fig. 2. (On the authority of Professor Williams.)
Atrypa tribulis Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 271, fig. 3.
Terebratulina prisca Castelnau, Essai Syst., Sil. l'Amérique Septentrionale, 1843, p. 40, pl. 13, fig. 8.
Atrypa reticularis Hall, Pal. New York, II, 1852, p. 72, pl. 23, fig. 8; p. 270, pl. -55, fig. 5.—Billings, Canadian Nat. Geol., I, 1856, p. 137, pl. 2, fig. 10.—Hall, Geol. Survey Iowa, II, 1858, p. 518;—Pal. New York, III, 1859, p. 253, pl. 42, fig. 1.—Roemer, Sil. Fauna west. Tennessee, 1860, p. 69, pl. 5, fig. 9.—Billings, Canadian Jour., VI, 1861, p. 264, figs. 84-87;—Geol. Canada, 1863, p. 318.
Atrypa reticularis (Linnæus)—Continued.


Atrypa impressa Shaler (non Hall), Bull. Mus. Comp. Zool., 4, 1865, p. 68.

Loc. A characteristic fossil of the Silurian and Devonian throughout the world.

Atrypa reticularis impressa Hall. Schoharie grit (Dev.).


Loc. Schoharie, Clarksville, etc., New York.

Atrypa reticularis niagarensis Nettelroth. Niagara (Sil.).

Atrypa reticularis var. niagarensis Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 92, pl. 32, figs. 5-8, 44-47.

Loc. Jefferson County, Kentucky; Clarke County, Indiana.

Atrypa reticularis nuntia Hall and Whitfield. Hamilton (Dev.).


Loc. Falls of Ohio.

Atrypa reticularis ventricosa Hall and Whitfield. Hamilton (Dev.).

Atrypa reticularis Hall, Pal. New York, IV, 1867, p. 316, pl. 52, figs. 4-6.


Loc. Falls of Ohio.

Atrypa robusta Hall = Rhynchonella robusta.

Atrypa rostrata Hall = Meristella rostrata.

Atrypa rugosa Hall. Niagara (Sil.).


Rhynchonella rugosa Billings, Geol. Canada, 1863, p. 315, fig. 321.


Loc. Lockport, New York; Anticosti; Osgood, Indiana; Louisville, Kentucky.

Atrypa scitula Hall = Charionella scitula.

Atrypa semiplicata Conrad = Rhynchonella semiplicata.

Atrypa singularis Vanuxem = Eatonia singularis.
Atrypa sordida Hall = Rhynchonella sordida.

Atrypa spinosa Hall. Corniferous-Chemung (Dev.).
Atrypa spinosa Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 200, figs. 1, 2.—Whitfield, Geol. Wisconsin, IV, 1882, p. 333, pl. 26, figs. 7, 8.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 55, figs. 21, 22.
Atrypa durnosa Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 271, fig. 1.
Atrypa aspera vel aspera Hall, Pal. New York, IV, 1867, p. 322, pl. 53A, figs. 1-14, 18, 24, 25.
Atrypa reticularis var. aspera Whiteaves, Cont. Canadian Pal., I, 1891, pp. 229, 289.
Loc. New York; Pennsylvania; Maryland; Virginia; Kentucky; Ohio; Illinois; Iowa; Wisconsin; Ontario; Lockhart and Athabasca rivers, etc., Northwest Territory, Canada.
Obs. The Corniferous limestone specimens of A. spinosa are not always easily distinguished from A. reticularis. The fewer plications of the former, however, will usually distinguish it from the latter species. This tendency to fewer plications is more marked in the Hamilton formation and attains its climax in the Chemung, where the species is known as A. hystrix.
Atrypa subtrigonalis Hall = Rhynchonella subtrigonalis.
Atrypa sulcata Vanuxem = Whitfieldella sulcata.
Atrypa tenuilineata Hall = Dalmanella tenuilineata.
Atrypa tribulis Hall = A. reticularis.
Atrypa unguiformis Hall = Hipparionyx proximus.
Atrypa unissulcata Conrad = Pentagonia unissulcata.

ATRYPINA Hall and Clarke. Genotype Leptocephia imbricata Hall.

Atrypina clintoni Hall and Clarke. Clinton (Sil.).
Loc. Orleans County, New York.

Atrypina disparilis (Hall). Niagara (Sil.).
Loc. Wolcott, New York; Waldron, Indiana.
Obs. Davidson in 1882 regarded this species the same as Atrypa barrandei of Europe.
Atrypina imbricata Hall.


Trematospira imbricata Meek and Worthen, Geol. Survey Illinois, III, 1866, p. 381, pl. 7, fig. 2.

Atrypina imbricata Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 53, figs. 5, 6, 8–10.

Loc. Albany and Schoharie counties, New York; Perry County, Missouri.

Atrypina intermedia (Hall).


Loc. Arisaig, Nova Scotia.

Avicula desquamata Hall=Obolella crassa.

Aulacorhynchus Dittmar.


Isogramma Meek and Worthen, Geol. Survey Illinois, V, 1873, p. 568.


Isogramma millipunctata Meek and Worthen, Ibidem, 1873, p. 568.


Chonetes millipunctatus Keys, Geol. Survey Missouri, V, p. 54.

Loc. Marion County, Illinois; Kansas City, Missouri.

Aulosteges guadalupensis Shumard=Strophalosia guadalupensis.

Aulosteges spondyliformis White and St. John=Strophalosia spondyliformis.

Barrandella Hall and Clarke=Clorinda.

Barroisella Hall and Clarke.

Genotype Lingula subpatulata Meek and Worthen (non Hall and Meek).


Barroisella subpatulata (Meek and Worthen). Black Slate (Dev.).

Lingula subpatulata Meek and Worthen (non Hall and Meek), Geol. Survey Illinois, III, 1888, p. 437, pl. 13, fig. 1.


Loc. Jonesboro, Illinois; Louisville and Lebanon, Kentucky; Rockford, Indiana.

BEACHIA Hall and Clarke.

Genotype Meganteris suessana Hall.

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Beachia suessana Hall. Oriskany (Dev.).
Loc. Cumberland, Maryland; near Rondout, New York.

EECHERIA Hall and Clarke. Genotype B. davidsoni Hall and Clarke.

BILLINGSSELLA Hall and Clarke.
Genotyp Othris pepina Hall=O. coloradoensis Shumard.

Obs. Protorthsis was founded on Orthis billingsi Hartt, a species rarely found in good preservation. The diagnostic character was supposed to be the presence of a rudimentary spondylium and the absence of a deltidium. In the National Museum collection, however, there are two artificial casts of the ventral valve made from Hartt's original specimens and other material collected by Mr. Walcott, showing O. billingsi to be without a spondylium. The rostral plate is the deltidium distorted by pressure to which these shells have been subjected. The only character of generic importance is that the geologically older species of Billingsella have a more rudimentary or nearly obsolete cardinal process than the type species. This difference, however, hardly justifies the retention of Protorthsis.

BILLINGSSELLA alberta (Walcott). Middle Cambrian.
Loc. Mount Stephan, British Columbia.

BILLINGSSELLA billingsii (Hartt). Middle Cambrian.

BILLINGSSELLA coloradoensis (Shumard). Upper Cambrian.
Loc. Burnett County, Texas; Lake Pepin, Minnesota; St. Croix River and Berlin, Wisconsin.
Billingsella festinata (Billings). Lower Cambrian.
Loc. Swanton, Vermont; York, Pennsylvania.

Billingsella (?) grandaeva (Billings). Calciferous (Ord.).
Orthisina grandaeva Billings, Canadian Nat. Geol., IV, 1859, p. 349, fig. 1;—Geology Canada, 1863, p. 113, fig. 21.
Loc. Mingan Island, Gulf of St. Lawrence.

Billingsella latourensis (Matthew). Middle Cambrian.

Billingsella (?) laurentina (Billings). Anticosti (Sil.).
Loc. Anticosti.

Billingsella orientalis (Whitfield). Lower Cambrian.
Loc. Georgia and Swanton, Vermont.

Billingsella (?) primordialis (Whitfield). Calciferous (Ord.).
Loc. Fort Cassin, Vermont.

Billingsella quacoensis (Matthew). Middle Cambrian.

Billingsella transversa (Walcott). Lower Cambrian.
Loc. Georgia, Vermont.

Billingsella whitfieldii (Walcott). Lower Cambrian.
Kutorgina whitfieldii Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 18, pl. 9, fig. 4.
Loc. Eureka district, Nevada.
Billingsia Ford (non de Koninck, 1876)=Elkania.
Bilobites Linnaeus. Genotype Anomia biloba Linnaeus.


Bilobites acutilobus (Ringueberg). Niagara (Sil.).


Loc. Lockport, New York.

Bilobites bilobus (Linnaeus). Niagara (Sil.).

Anomia biloba Linnaeus, Systema Naturæ, ed. XII, 1767, p. 1154.


Bilobites bilobus Beecher, American Jour. Sci., 3d ser., XLII, 1891, p. 52, pl. 1, fig. 28.

Bilobites biloba Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 190, 204, 205, 223, pl. 5B, figs. 11-14.

Loc. Lockport, New York; Waldron, Indiana; Wisconsin.

Bilobites varicus (Conrad). Lower Helderberg (Dev.).


Orthis varica Hall, Pal. New York, III, 1859, p. 179, pl. 24, fig. 1.

Orthis (Diccelosis) varica Hall, Second Ann. Rep. New York State Geol., 1883, pl. 35, figs. 38-42.


Loc. Albany and Schoharie counties, New York; Decatur County, Tennessee; St. Blandine, New Brunswick.

Botsfordia Matthew. Genotype Obolus pulcher Matthew.


Botsfordia pulchra Matthew. Middle Cambrian.


Obolus pulcher Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 81, 183, pl. 4K, fig. 22.

Obolus (Botsfordia) pulchra Matthew, Trans. Royal Soc. Canada, X, 1894, p. 90, pl. 16, fig. 3.


Brachymererus Shaler (non Dejean, 1834)=Anastrophia.

Brachymererus reversus Shaler=Parastrophia reversa.
Brachyprion Shaler = Stropheodonta.
Brachyprion geniculatum Shaler = Stropheodonta geniculata.
Brachyprion leda Shaler = Rafinesquina leda.
Brachyprion ventricosum Shaler = Stropheodonta ventricosa.

**CAMARELLA** Billings.

- Genotype *C. volborthi* Billings.

- *Camarella ambiguа* (Hall).

- *Camarella antiquаta* Billings = *Protorhyncha antiquаta*.
- *Camarella bisulcata* Emmons = *Cyclospira bisulcata*.
- *Camarella bernensis* Sardeson = *Parastrophia hemiplicata*.
- *Camarella breviplicata* Billings = *Parastrophia hemiplicata*.
- *Camarella circularis* Miller = *Parastrophia hemiplicata*.
- *Camarella (?) costata* Billings = *Parastrophia hemiplicata*.
- *Camarella costata* Billings = *Parastrophia hemiplicata*.
- *Camarella parva* Billings = *Parastrophia hemiplicata*.

- Camarella calcifera Billings = *Syntrophia calcifera*.
- Camarella circularis Miller = *Parastrophia hemiplicata*.
- Camarella lenticularis Billings.
  - Anticosti (Sil.).
  - Loc. Anticosti.

- Camarella longirostris Billings.
  - Chazy (Ord.).
  - *Camarella longirostra* Billings, Canadian Nat. Geol., IV, 1859, p. 302; p. 445, fig. 23;—Geol. Canada, 1863, p. 127, fig. 53.
  - Loc. Mingen Islands, Gulf of St. Lawrence.

- *Camarella minor* Walcott = *Protorhyncha minor*.
- *Camarella ops* Billings = *Parastrophia ops*.
- *Camarella owatonensis* Sardeson = *Cyclospira bisulcata*.

- Camarella panderi Billings = *Cyclospira bisulcata*.
- *Camarella parva* Billings.
  - Calciferous (Ord.).
  - Loc. Stanbridge, Quebec, Canada.

  - Loc. Table Head and Portland Creek, Newfoundland; near St. John, New Brunswick.

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Camarella polita Billings. Calciferous (Ord.).
Loc. Stanbridge, Quebec, Canada.

Camarella reversa Billings = Anastrophia reversa.

Camarella varians Billings. Calciferous-Chazy (Ord.).
Camarella varians Billings, Canadian Nat. Geol., IV, 1859, p. 445, fig. 24;—Geol.
Loc. Mingan Islands, Gulf of St. Lawrence; Table Head and Portland Creek,
Newfoundland; Chazy, New York.

Camarella volborthi Billings. Black River (Ord.).
Camarella volborthi Billings, Canadian Nat. Geol., IV, 1859, p. 301;—Geol.
Canada, 1863, p. 143, fig. 77.—Hall and Clarke, Pal. New York, VIII, Pt. II,
1893, p. 220, pl. 62, figs. 11-18; pl. 84, fig. 42.
Loc. Panquettes Rapids, Ontario, Canada.

Camarium Hall = Merista.
Camarium elongatum Hall = Merista typus.
Camarium meeki Hall = Meristella meeki.
Camarium princeps Hall = Meristella princeps.
Camarium typus Hall = Merista typus.

CAMAROPHORELLA Hall and Clarke.
Genotype Pentamerus lenticularis White and Whitfield.

Camarophorella lenticularis (White and Whitfield).
Burlington (L. Carb.).
VIII, 1862, p. 295.
Camarophorella lenticularis Hall and Clarke, Pal. New York, VIII, Pt. II, 1893,
Loc. Burlington, Iowa.

CAMAROPHORIA King. Genotype Terebratula schlotheimi von Buch.
Stenochisma (Ehler. (non Conrad), Fischer’s Manuel Conchylologie, 1887, p. 1309.

Camarophoria (?) bisulcata Shumard. Upper Carboniferous.
Camarophoria (?) bisulcata Shumard, Trans. St. Louis Acad. Sci., I, 1858, p. 296,
pl. 11, fig. 2.
Loc. Guadalupe Mountains of New Mexico and Texas.

Camarophoria caput-testudinis (White). Burlington (L. Carb.).
Camarophoria caput-testudinis Hall and Clarke, Pal. New York, VIII, Pt. II,
1893, p. 215.
Loc. Burlington, Iowa.
Obs. Probably identical with C. ringens Swallow.

Camarophoria eucharis Hall = Camarospira eucharis.

Camarophoria explanata (McChesney). Kaskaskia (L. Carb.).
Rhynchonella explanata McChesney, Descriptions New Pal. Foss., 1860, p. 50;—
Trans. Chicago Acad. Sci., I, 1868, p. 30, pl. 6, fig. 7.
Camarophoria explanata (McChesney)—Continued.

Pugnax explanatus Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 60, figs. 43-45.

Loc. Chester, Illinois; Princeton, Kentucky.

Obs. Specimens of this species in Mr. Ulrich’s collection prove it to be a Camarophoria.

Camarophoria giffordi Worthen = Enteletes hemiplicatus.
Camarophoria globulina Geinitz (non Phillips) = Pugnax utah.
Camarophoria globulina Davidson = Pugnax globulina.

Camarophoria occidentalis Miller.


Loc. Lake Valley district, New Mexico.

Camarophoria osagensis Swallow = Pugnax utah.

Camarophoria ringens (Swallow).


Loc. Callaway County, Missouri.

Obs. Compare with C. caput-testudinis and Rynchonella strata. The writer has seen specimens of R. ringens from Callaway County, Missouri, Swallow’s original locality.

Camarophoria rhomboidalis Hall and Clarke.


Loc. Cass County, Indiana.

Camarophoria subcuneata Hall.


Loc. Spiergel Hill and Bloomington, Indiana. In the Waverly at Granville, Ohio, according to Herrick.

Obs. See Rynchonella arcritostrata.

Camarophoria subtrigona Meek and Worthen.


Rynchonella parvini McChesney, Descriptions New Pal. Foss., 1861, p. 83;—Ibidem, 1865, pl. 6, fig. 2.

Camarophoria subtrigona Meek and Worthen, Geol. Survey Illinois, II, 1866, p. 251, pl. 18, fig. 7.—McChesney, Trans. Chicago Acad. Sci., I, 1868, p. 31, pl. 6, fig. 2.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 214, pl. 62, figs. 38-43.

Camarophoria ringens Hall and Clarke (non Swallow), Ibidem, 1893, pl. 84, fig. 5.

Loc. Keokuk, Iowa; Nauvoo and Warsaw, Illinois.

Camarophoria swallovana Shumard = Pugnax swallovana.

Camarophoria thera (Walcott).

Lower Carboniferous.


Loc. Eureka district, Nevada.
Camarophoria (?) wortheni (Hall).

*Camarophoria* wortheni Hall, *Rhynchonella* wortheni Hall, *Camarophoria* wortheni Hall, Trans. Albany Institute, IV, 1858, p. 11.


**CAMAROSPIRA** Hall and Clarke.

Genotype *Camarophoria eucharis* Hall.


**Camarospira eucharis** Hall.

*Coriniferous* (Dev.).


*Camarospira eucharis* Hall and Clarke, *Ibidem*, VIII, Pt. II, 1893, p. 82, pl. 50, figs. 46-52.

*Loc.* Ontario, Canada; Cass County, Indiana.

**Camarotcechia** Hall and Clarke.

Genotype *Atrypa congregata* Conrad.


**Camarotcechia (?) acinus** Hall.

*Niagara* (Sil.).


*Loc.* Waldron, Indiana; Louisville, Kentucky.

**Camarotcechia (?) acinus convexa** (Foerste).

*Clinton* (Sil.).


*Loc.* Hanover, Indiana.

**Camarotcechia aequiradiata** Hall.

*Clinton* (Sil.).

*Atrypa* aequiradiata Hall, Pal. New York, II, 1852, p. 70, pl. 23, fig. 5.


*Protorhyncha* aequiradiata Hall and Clarke, *Ibidem*, 1895, pl. 56, figs. 7-9.

*Loc.* Onondaga County, New York; Arisaig, Nova Scotia.

**Camarotcechia (Plethorhyncha) barrandei** Hall.

*Oriskany* (Dev.).

*Rhynchonella* barrandi Hall, Tenth Rep. New York State Cab. Nat. Hist., 1857, p. 82, figs. 1-3; p. 84, fig. 4;—Pal. New York, III, 1859, p. 442, pl. 103, figs. 3-8.


**Camarotcechia billingei** Hall.

*Coriniferous* (Dev.).


Camarotœchia billingsi Hall—Continued.
Camarotœchia billingsi Hall and Clarke, Ibidem, VIII, Pt. II, 1893, p. 192, pl. 57, fig. 3.
Loc. New York; Columbus, Ohio; Ontario.

Camarotœchia carica Hall.
Loc. Hamilton, Madison County, New York.

Camarotœchia carolina Hall.
Camarotœchia Carolina Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 192, pi. 57, figs. 4-6.
Loc. Columbus and Sandusky, Ohio; Falls of Ohio.

Camarotœchia congregata (Conrad).

Camarotœchia contracta Hall.
Camarotœchia contracta saxatilis (Hall).
Loc. New York; Meadville and Bradford, Pennsylvania; Licking County, Ohio.

Camarotœchia contracta saxatilis (Hall).
Camarotœchia contracta saxatilis Hall, Pal. New York, IV, 1867, p. 417, pi. 54A, figs. 44-51.
Loc. Rockford, Iowa.

Camarotœchia dotis Hall.
Loc. New York; Meadville and Bradford, Pennsylvania; Licking County, Ohio.

Camarotœchia(?) duplicata Hall.
Loc. Geneseo and York, New York; Columbus, Ohio; Rio Maecuru and Río Curua and Erere, Brazil.

Camarotœchia duplicata Hall.
Loc. Geneseo and York, New York; Columbus, Ohio; Rio Maecuru and Río Curua and Erere, Brazil.
Camarotoechia (?) duplicata Hall—Continued.


Loc. New York; Eureka district, Nevada.

Camarotoechia (Plethorhynchia) endlichii (Meek).


Loc. East of Animas River, Colorado.

Obs. This type of Rhyynchonella occurs in eastern North America only in the Lower Devonian. It therefore seems probable that Meek’s provisional reference to the Devonian is nearer correct than White’s to the Lower Carboniferous.

Camarotoechia eximia Hall. Portage-Chemung (Dev.).


Camarotoechia eximia Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 192, pl. 57, figs. 44, 45.


Camarotoechia fringilla (Billings). Anticosti (Sil.).

Rhyynchonella fringilla Billings, Pal. Fossils, I, 1862, p. 141, fig. 118.


Loc. Anticosti.

Camarotoechia glacialis (Billings). Anticosti (Sil.).

Rhyynchonella glacialis Billings, Pal. Fossils, I, 1862, p. 143, fig. 120.


Loc. Anticosti.

Camarotoechia horsfordi Hall. Marcellus and Hamilton (Dev.).


Rhyynchonella (Stenocisma) horsfordi Hall, Pal. New York, IV, 1867, p. 339, pl. 54, figs. 24-32.


Loc. Moscow, York, Geneseo, and Avon, New York; Eureka district, Nevada.

Camarotoechia (?) indianensis (Hall). Niagara (Sil.).


Loc. Waldron, Indiana; Louisville, Kentucky.

Camarotoechia marshallensis (A. Winchell). Marshall (L. Carb.).

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Camarotœchia marsnallensis (A. Winchell)—Continued.

Loc. Marshall, Michigan; Granville, etc., Ohio.

Camarotœchia (?) neglecta Hall.

Camarotœchia (?) neglecta Hall, Pal. New York, II, 1852, p. 70, pl. 23, fig. 4; p. 274, pl. 57, fig. 1.—Billings, Canadian Nat. Geol., I, 1856, p. 138, pl. 2, figs. 11, 12.

Loc. Reynolds Basin, Lockport, etc., New York; Hamilton, Ontario; Dayton and Cedarville, Ohio; Hanover, Indiana; Wisconsin; Arisaig, Nova Scotia.

Camarotœchia obtusiplicata Hall.

Camarotœchia obtusiplicata Hall, Pal. New York, II, 1852, p. 279, pl. 58, fig. 2.

Loc. Lockport, New York.

Camarotœchia orbicularis Hall.

Rhyynchonella (Stenocisiua) orbicularis Hall, Pal. New York, IV, 1867, p. 353, pl. 55, figs. 40-46.

Loc. Chautauqua County, New York; Meadville, Pennsylvania.

Camarotœchia plena Hall.

Camarotœchia plena Hall, Pal. New York, I, 1847, p. 21, pl. 4 bis, fig. 7.—Billings, Canadian Nat. Geol., I, 1856, p. 207, figs. 17-19.—Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 817, fig. 592.
Camarotœchia plena Hall, Pal. New York, I, 1847, p. 22, pl. 4 bis, fig. 8.
Camarotœchia alttilis Hall, Ibidem, 1847, p. 23, pl. 4 bis, fig. 9.
Rhyynchonella plena Hall, Ibidem, 1847, p. 22, pl. 4 bis, fig. 8.
Rhyynchonella plena Billings, Canadian Nat. Geol., IV, 1859, p. 444, fig. 22.—Geol. Canada, 1863, p. 126, fig. 50.

Loc. Chazy, New York; Montreal and Ottawa, Canada.

Camarotœchia (Plethorhyncha) pleiopleura (Conrad).

Camarotocechia (Plethorhyncha) pleiopleura (Courrad)—Continued.


Loc. Albany and Schoharie counties, New York; Indian Cove, Gaspé.

Camarotocechia prolifica Hall. Marcellus and Hamilton (Dev.).
Rhynchonella (Stenocisma) prolifica Hall, Pal. New York, IV, 1867, p. 343, pl. 54A, figs. 1-10.
Camarotocechia prolifica Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 192, pl. 57, figs. 42, 43.

Loc. Fultonham and Cooperstown, New York; Russia.

Camarotocechia sageriana (A. Wmchell). Marshall (L. Carb.).

Loc. Marshall, Michigan; Weymouth, Ashland, Sciotoville, and Newark, Ohio; Hickman County, Tennessee.

Camarotocechia sappho Hall. Marcellus-Waverly (Dev.-L. Garb.).
Rhynchonella (Stenocisma) sappho Hall, Pal. New York, IV, 1867, p. 340, pl. 54, figs. 33-43; var. pl. 55, figs. 47-52.

Loc. Leroy, Geneseo, and York, New York; Licking County, Ohio.

Camarotocechia (Plethorhyncha) speciosa (Hall). Oriskany (Dev.).

Loc. Cumberland, Maryland; Jackson County, Illinois.

Camarotocechia stephani Hall. Portage and Chemung (Dev.).
Rhynchonella (Stenocisma) stephani Hall, Pal. New York, IV, 1867, p. 349, pl. 55, figs. 9-16.


Camarotocechia tethys (Billings). Corniferous (Dev.).
Rhynchonella (Stenocisma) tethys Hall, Pal. New York, IV, 1867, p. 335, pl. 54, figs. 1-8.
Camarotocechia tethys Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 192, pl. 57, figs. 1, 2.

Loc. County of Haldimand, Ontario; Stafford and Williamsonsville, New York; Columbus, Ohio; Falls of Ohio; Eureka district, Nevada.
Camarotoechia ventricosa Hall. Lower Helderberg (Dev.).
Wilsonia ventricosa Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 58, figs. 13, 14.
Loc. Schoharie, Carlisle, and Cherry Valley, New York.

Camarotoechia whitei Hall. Niagara (Sil.).
Rhynchonella whitii Hall (non A. Winchell), Trans. Albany Institute, IV, 1863, p. 216.
Loc. Waldron and Osgood, Indiana.

Capulus lugubris Conrad=Discinisca lugubris.

CAPELLINIA Hall and Clarke. Genotype C. mira H. and C.

Capellinia mira Hall and Clarke. Niagara (Sil.).
Capellinia mira Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 249, pl. 70, figs. 6-14.
Loc. Vicinity of Milwaukee, Wisconsin.

CATAZYGA Hall and Clarke. Genotype Athyris headi Billings.

Catazyga erratica Hall. Lorraine (Ord.).
Orthis erratica Hall, Pal. New York, I, 1847, p. 288, pl. 79, fig. 5.
Athyris headi var. anticoostiensis Billings, Pal. Fossils, I, 1862, p. 147, fig. 127.
Athyris headi var. borealis, Billings, Ibidem, 1862, p. 147, fig. 126.
Athyris borealis Billings, Geol. Canada, 1863, p. 212, fig. 216.
Zygospira erratica Davidson, Ibidem, 1882, p. 126.
Orthis erratica, var. Keesow, Ueber Sil. u. Devon. geschiebe Westpreussens, 1884, p. 246, pl. 2, fig. 10.
Catazyga headi var. borealis and anticoostiensis Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 54, figs. 27, 31-34.
Loc. Oswego County, New York; River Sagnenay, Lake St. John, Canada; Anticosti; “Weensenberg Schicht,” Prussia.

Catazyga headi (Billings). Lorraine (Ord.).
Catazyga headi (Billings)—Continued.

Catazyga headi Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 158, fig. 151; pl. 54, figs. 24-26, 30.

Loc. St. Lawrence River, opposite Three Rivers; near St. Nicholas, St. Croix, and Becancour River, Quebec, Canada; Wayneville, etc., Ohio; Richmond and Versailles, Indiana. According to Mr. Ami, also in the Utica slate at Ottawa, Canada.

Catazyga uphami (Winchell and Schuchert). Trenton (Ord.).


Loc. Near Spring Valley and Wykoff, Minnesota.

CENTRONELLA Billings. Genotype Rhynchonella glansfagea Hall.


Centronella(?) allei A. Winchell. Waverly (L. Carb.).


Loc. Burlington, Iowa; Hamburg, Illinois; Summit County, Ohio.

Centronella alveata Hall. Onondaga (Dev.).


Centronella hecate Billings, Canadian Jour., VI, (May) 1861, p. 272, fig. 99;— Geol. Canada, 1863, p. 374, fig. 403.—Hall, Pal. New York, IV, 1867, p. 420, pl. 61A, figs. 27-29.—Ibidem, VIII, Pt. II, 1895, pl. 79, fig. 15.


Loc. New York; Cayuga, Ontario.

Obs. See C. impressa Hall.

Centronella anna Hartt=Harttina anna.

Centronella(?) arcei A. Ulrich. Devonian.


Loc. Icla, and near Pulquina, Bolivia.

Centronella billingsiana Meek and Worthen=Whitfieldella billingsiana.

Centronella(?) crassicardinalis Whitfield. Warsaw (L. Carb.).


Loc. Spergen Hill, Indiana.

Obs. This species is not well established and is based upon a single ventral valve. Compare with Athyris densa.

Centronella(?) flora A. Winchell. Waverly (L. Carb.).


Loc. Sciotoville, Ohio.
Centronella glansfagea Hall. Oriskany-Corniferous (Dev.).
Loc. Albany and Schoharie counties, New York; Cayuga, Ontario; Falls of Ohio; Michigan.
Obs. In the American Museum of Natural History this species is labeled Atrypa naviculooides Conrad. The writer has not been able to find this description. It may be one of Conrad's manuscript names.

Centronella glaucia Hall. Hamilton (Dev.).

Centronella hecate Billings=C. alveata.

Centronella impressa Hall. Hamilton (Dev.).
Obs. Billings says this species is the same as C. hecate (=C. alveata).

Centronella julia A. Winchell=Romingerina julia.

Centronella margarida Derby=Trigeria margarida.

Centronella (?) navicella Derby. Chemung (Dev.).
Terebratula navicella Hall, Pal. New York, IV, 1867, p. 301, pl. 60, figs. 38-44.
Centronella (?) navicella Hall and Clarke, Ibidem, VIII, Pt. II, 1895, pl. 79, figs. 40-42.
Loc. Rockford, Iowa.

Centronella ovata Hall. Upper Helderberg (Dev.).
Centronella ovata Hall, Pal. New York, IV, 1867, p. 419, pl. 61A, figs. 47-49.
Loc. Cayuga, Ontario.

Centronella (?) silvetii A. Ulrich. Devonian.
Centronella silvetii A. Ulrich, N. Jahrb. f. Mineral., Beilageband, VIII, 1892, p. 51, pl. 4, figs.15a-15d.
Loc. Chahuarani, Bolivia.

Centronella tumida Billings. Oriskany and Corniferous (Dev.).
Centronella tumida Billings, Canadian Jour., VI, 1861, p. 272, fig. 98;—Geol. Canada, 1863, p. 374, fig. 404.
Loc. Cayuga and Port Colbourne, Ontario.

CHARIONELLA Billings.
Genotype Atrypa scitula Hall.
Charionella circe Billings = C. scitula.
Charionella doris Billings = Meristella doris.
Charionella hyale Billings = Whitfieldella hyale.
Charionella rostrata Billings = Meristella rostrata.

Charionella scitula Hall.
Charionella scitula Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 171, fig. 1.
Charionella circe Billings, Ibidem, VI, 1861, p. 273, fig. 109;—Geol. Canada, 1863, p. 374, fig. 400.
Meristella scitula Hall, Pal. New York, IV, 1867, p. 302, pl. 47, figs. 34–38.
Loc. Williamsville and Clarence Hollow, New York; Columbus, Ohio (Whitfield); county of Haldimand, Ontario.

CHONETES Fischer de Waldheim. Genotype Orthis striatella Dalman.

Chonetes acutiradiatus Hall.
Chonetes acutiradiatus Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 171, fig. 3.
Loc. Williamsville, Stafford, etc., New York; Columbus, Ohio; Falls of Ohio.

Chonetes amazonicus Derby.
Chonetes amazonicus Derby, Bull. Cornell Univ., I, 1874, p. 41, pl. 6, figs. 3, 12, 19; pl. 9, figs. 8, 9.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 15B, fig. 13.
Loc. Itaituba, Brazil.

Chonetes antiope Billings.

Chonetes arcei A. Ulrich.

Chonetes arcuatus Hall.
Loc. Williamsville, Clarence Hollow, etc., New York; Columbus, Ohio.
Chonetes armata Norwood and Pratten (non Bouchard) = C. pusilus.

Chonetes canadensis Billings.

Chonetes canadensis Billings, Pal. Fossils, II, 1874, p. 17, fig. 7.

Loc. Percé, Nova Scotia.

Chonetes complanata Hall = Chonostrophia complanata.

Chonetes comstockei Rathbun.


Loc. Province of Para, Brazil.

Chonetes cornutus (Hall).

Strophomena cornuta Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 73, fig. 3.


Loc. Wayne County, New York.

Chonetes coronatus (Conrad).


Strophomena syrtalis Conrad, Ibidem, 1842, p. 253, pl. 14, fig. 1.


Chonetes maclurea Norwood and Pratten, Ibidem, 1854, p. 28, pl. 2, fig. 8.

Chonetes tuomyi Norwood and Pratten, Ibidem, 1854, p. 28, pl. 2, fig. 9.

Chonetes martini Norwood and Pratten, Ibidem, 1854, p. 29, pl. 2, fig. 10.


Loc. New York; Pennsylvania; near Arkona, Ontario; Bakeoven, Illinois; Milwaukee, Wisconsin.

Obs. In the Illinois State collection there are specimens of C. maclurea and C. littoni which are not specifically distinct from C. coronatus Conrad. In the American Museum of Natural History the writer has seen specimens of C. tuomyi and C. martini labeled as varieties of C. coronatus.

Chonetes curvaensis Rathbun.


Loc. Province of Para, Brazil.

Chonetes dawsoui Billings = Chonostrophia dawsoni.

Chonetes deflecta Hall = C. vicinus.

Chonetes emmetensis A. Winchell.


Loc. Grand Traverse Region, Michigan.

Chonetes falklandicus Morris and Sharpe.


Loc. Falkland Islands; Taquarassu, Matto Grosso, Brazil.
Chonetes filistriatus Walcott. Lower Devonian.
Loc. Eureka district, Nevada.

Chonetes fischeri Hall=Chonopectus fischeri.

Chonetes freitassii Rathbun. Middle Devonian.
Loc. Province of Para, Brazil.

Chonetes geinitziana Waagen, and Miller=Ch. variolatus.

Chonetes geinitziana Waagen, and Miller=Ch. glaber.

Chonetes geniculatus White. Kinderhook (L. Carb.).
Chonetes geniculatus Keyes, Geol. Survey Missouri, V, 1895, p. 53, pl. 38, fig. 3.
Loc. Hamburg, Illinois; Clarksville, Missouri; Rockford, Indiana; Rockville, Ohio.
Obs. Compare with C. ornatus Shumard.

Chonetes gibbosa Hall=Ch. vicinus.

Chonetes glabra Hall (non Geinitz)=Ch. lineatus.

Chonetes glaber Geinitz. Upper Carboniferous.
Chonetes geinitziana Waagen, Palaeontologia Indica, Ser. XIII, I, 1884, p. 621.
Loc. Nebraska City, Nebraska; Kansas; Iowa; Illinois; Bonjardim and Itaituba, Brazil; Yampopata and Cochabamba, Bolivia.

Chonetes granulifer Owen. Upper Carboniferous.
Chonetes granuliferus Beecher, American Jour. Sci., 3d ser., XLI, 1891, p. 357, pl. 17, fig. 15.
Loc. Mouth of Keg Creek, Iowa; Illinois; Kansas; Missouri; Alabama; Kanab Canyon, Arizona; Cochabamba, Bolivia.
Chonetes hemisphericus Hall. Upper Helderberg (Dev.).


Loc. Schoharie, etc., New York; Eureka district, Nevada; Ontario, Canada.

Chonetes herbert-smithi Rathbun. Middle Devonian.


Loc. Province of Para, Brazil.

Chonetes illinoensis Worthen. Burlington (L. Carb.).


Loc. Burlington, Iowa; Jersey County, Illinois; Rockford, Indiana; Licking County, Ohio.

Chonetes iowensis Owen=C. iowensis.

Chonetes koninckianus Norwood and Pratten. Middle Devonian.


Chonetes levis Keyes=C. glabra Geinitz.

Chonetes lepidus Hall. Marcellus-Chemung (Dev.).


Loc. Cayuga Lake, etc., New York; Meadville, Pennsylvania.

Chonetes lineatus (Conrad). Corniferous (Dev.).


Chonetes lineata Hall, Pal. New York, IV, 1867, p. 121, pl. 20, fig. 3;—Second Ann. Rep. New York State Geol., 1865, p. 47, fig. 34.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 16, fig. 34.

Loc. Cayuga Lake, etc., New York.

Chonetes littoni Norwood and Pratten=C. coronatus.

Chonetes logani Hall (non Nor. and Prat.)=C. illinoensis.

Chonetes logani Norwood and Pratten. Kinderhook-Burlington (L. Carb.).


Loc. Burlington, Iowa; Quincy, Illinois; Licking County, Ohio.
SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA. [BULL. 87.]

Chonetes logani aurora Hall. Tully-Burlington (Dev.-L. Carb.).
Chonetes logani var. aurora Hall, Pal. New York, IV, 1867, p. 137, pl. 22, figs. 16-18;—Second Ann. Rep. New York State Geol., 1883, pl. 47, figs. 9, 18.—Whitaves, Cont. to Canadian Pal., I, 1891, p. 215, pl. 29, fig. 2.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 16, figs. 9, 18.
Chonetes aurora Williams, Bull. Geol. Soc. America, I, 1890, p. 491, pl. 12, figs. 10, 11.
Loc. Tully and Deruyter, New York; Athabasca, Mackenzie, and Red Deer rivers, Northwest Territory, Canada; Cuyahoga and Licking counties, Ohio; Burlington, Iowa.

Chonetes loganensis Hall and Whitfield. Kinderhook (L. Carb.).
Chonetes loganensis Hall and Whitfield, King's Geol. Expl. 40th Paral., IV, 1877, p. 293, pl. 4, fig. 9.
Loc. Logan Canyon, Wabsatch Range, Utah.

Chonetes maclurea Norwood and Pratten=C. coronatus.

Chonetes macrostriata Walcott=Stropheodonta macrostriata.

Chonetes manitobensis Whiteaves. Upper Devonian.
Chonetes manitobensis Whiteaves, Cont. to Canadian Pal., I, 1892, p. 281, pl. 37, figs. 1, 2.
Loc. Manitoba Island, Lake Manitoba, Canada.

Chonetes martini Norwood and Pratten=C. coronatus.

Chonetes melonicus Billings. Oriskany (Dev.).
Loc. Little Gaspé, Quebec, Canada.

Chonetes mesolobus Norwood and Pratten. Upper Carboniferous.
Loc. Belleville, Illinois; Charboniere, Missouri; Flint Ridge, Ohio; New Mexico; Arizona.

Chonetes michiganensis Stevens. Upper Carboniferous.
Chonetes michiganensis Stevens, American Journ. Sci., 2d ser., XXV, 1858, p. 263.
Loc. Battle Creek, Michigan.

Chonetes millipunctata Meek and Worthen=Aulacorhynchus milli-
punctatum.

Chonetes minima Hall (non Sowerby)=C. undulatus.

Chonetes mucronata Meek and Hayden (non Hall)=C. granulifer.

Chonetes mucronata Hall. Oriskany-Hamilton (Dev.).
Strophomena mucronata Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 180, fig. 3.
Chonetes mucronata Hall, Pal. New York, IV, 1867, p. 124, pl. 20, fig. 1; pl. 21, fig. 1.—Nicholson, Pal. Prov. Ontario, 1873, p. 74.—Hall, Second Ann. Rep. New York State Geol., 1883, pl. 47, figs. 6, 7.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 16, figs. 6, 7.
Loc. New York; Cayuga, Ontario; Gaspé; Eureka district, Nevada.
Obs. See C. stiubeli.
Chonetes multicosta A. Winchell. Kinderhook and Burlington (L. Carb.).
Loc. Burlington, Iowa; Hickman and Maury counties, Tennessee.

Chonetes muricata Hall = Strophalosia muricata.

Chonetes nana Norwood and Pratten (non de Verneuil) = C. yandellanus.

Chonetes novascoticus Hall. Arisaig and Niagara (Sil.).
Loc. Arisaig, Nova Scotia; Waldron, Indiana.

Chonetes onettianus Rathbun. Middle Devonian.
Loc. Province of Para, Brazil.

Chonetes ornatus Shumard. Chouteau (L. Carb.).
Loc. Louisiana and Hannibal, Missouri.
Obs. See C. geniculatus White.

Chonetes parvus Shumard. Upper Carboniferous.
Loc. Boone County, Missouri.
Obs. Keyes says this species is a synonym for C. flemingi = C. variolatus.

Chonetes permianus Shumard. Upper Carboniferous.
Loc. Mouth of Delaware Creek, Texas.

Chonetes planumbonus Meek and Worthen. Keokuk (L. Carb.).
Loc. Monroe County, Illinois; Crawfordsville, Indiana; Kings Mountain, Kentucky.

Chonetes platynotus White. Upper Carboniferous.
Loc. Santa Fe, New Mexico; near Salt Lake, Utah.

Chonetes pulchellus A. Winchell. Waverly (L. Carb.).
Loc. Moscow, Hilladale County, Michigan; Trumbull, Summit, and Licking counties, Ohio; Shafers, Pennsylvania; Hickman County, Tennessee.

Chonetes punctatus Simpson. Lower Helderberg (Dev.).

Chonetes pusillus Hall. Hamilton (Dev.).
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Chonetes pusillus Hall—Continued.
Loc. Bakeoven, Illinois; Fort Resolution, Great Slave Lake, British America.
Obs. In the Illinois State collection there is a specimen of C. armatus N. and P. with an old label attached. This specimen is identical with C. pusillus Hall.
Chonetes reversa Whitfield=Ghonostrophia reversa.
Chonetes riicki A. Ulrich.   Middle Devonian.
Chonetes riicki A. Ulrich, N. Jahrb. f. Mineral., Beilageband, VIII, 1892, p. 79, pl. 5, figs. 1, 2.
Chonetes sarcinulatus Norwood and Pratten.
Obs. It is impossible to point out the American representative intended by these authors for this species.
Chonetes scitulus Hall.  Marcellus–Chemung (Dev.).
Loc. Moscow, Hamburg, etc., New York; Meadville, Pennsylvania; Delaware and Licking counties, Ohio.
Chonetes setigerus (Hall). Marcellus–Waverly (Dev.–L. Carb.).
Strophomena setigera Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 180, fig. 2; p. 222, fig. 3.
Loc. New York; Meadville, Pennsylvania; Ohio; Union City, Branch County, Michigan; Eureka district, Nevada.
Chonetes shumardianus de Koninck. Keokuk (L. Carb.).
Loc. The Knobs, Jefferson County, Kentucky.
Chonetes smithii Norwood and Pratten=C. granulifer.
Chonetes striatellus (Dalman).   Silurian.
Loc. Europe; Cape Louis Napoleon, lat. 79° 38'.
Chonetes stiubeli A. Ulrich. Middle Devonian.
Loc. Rio Sicasica, Bolivia.
Obs. Probably the same as C. mucronatus.

Chonetes subquadratus Nettelroth. Hamilton (Dev.).
Loc. Falls of Ohio.

Chonetes tenuistriatus Hall. Arisaig (Sil.).
Chonetes tenuistriata Hall, Canadian Nat. Geol., V, 1889, p. 145, fig. 3.—Dawson, Acadian Geol., 3d ed., 1878, p. 596, fig. 200.

Chonetes tumidus Herrick. Waverly (L. Carb.).
Loc. Moores Run, Licking County, Ohio.

Chonetes tuomyi Norwood and Pratteu=C. coronatus.

Chonetes undulatus Hall. Niagara (Sil.).
Loc. Waldron, Indiana.

Chonetes variolatus (d'Orbigny). Upper Carboniferous.
Leptina variolata d'Orbigny, Voyage dans l'Amérique Meridionale; Paléontol.
ogie, 1842, p. 49.
Productus variolata d'Orbigny, Ibidem, 1842, pl. 4, figs. 10, 11.
Chonetes flemingi Norwood and Pratten, Ibidem, 1854, p. 26, pl. 2, fig. 5.—Geinitz, Car bou u. Dyas in Nebraska, 1866, p. 59.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 15B, fig. 11.—Keyes, Geol. Survey Missouri, V, 1895, p. 54, pl. 38, fig. 6.
Loc. Yarbichambi, Bolivia; Guernsey, etc., Ohio; Illinois; Missouri; Kansas; Nebraska.
Obs. Compare with C. parvus.

Chonetes verneuilianus Norwood and Pratten. Upper Carboniferous.
Loc. Carboniere, Missouri; Indiana; Illinois; Missouri; Kansas; Nebraska; banks of Colorado River.

Chonetes verneuilianus utahensis Meek. Upper Carboniferous.
Loc. Near Humboldt Mountains, Utah.
Chonetes vicinus (Castelnau), Hamilton (Dev.).

Leptena vicina Castelnau, Systeme Sil. l'Amérique Septentrionale, 1843, p. 39, pl. 14, fig. 9.


Obs. Castelnau's specimens are from "Ontario County, New York." His figures are good and can not be compared with any other species than the well-known C. deflectus Hall, a species occurring abundantly in Ontario County.

Chonetes yandellanus Hall. Corniferous (Dev.).


Loc. Falls of Ohio; Columbus, Ohio.


Chonopectus fischeri (Norwood and Pratten).

Kinderhook and Burlington (L. Carb.).


Loc. Burlington, Iowa; Warren, Pennsylvania.

CHONOSTROPHIA Hall and Clarke.

Genotype Chonetes reversa Whitfield.


Chonostrophia complanata Hall. Oriskany (Dev.).


Loc. Albany and Schoharie counties, New York; Cayuga, Ontario; Cumberland, Maryland; † Bolivia.

Chonostrophia dawsoni (Billings). Lower Devonian.

Chonetes dawsoni Billings, Pal. Fossils, II, 1874, p. 18, fig. 8.


Loc. Gaspé and Percé, Quebec, Canada.
Chonostrophia nelderbergiae Hall. Lower Helderberg (Dev.).
Loc. Albany County, New York.

Chonostrophia reversa (Whitfield). Corniferous (Dev.).
Loc. Columbus and Delaware, Ohio; Union Springs, New York; Cayuga, Ontario.

CHRISTIANIA Hall and Clarke. Genotype Leptena subquadrata Hall.

Christiania subquadrata Hall. Lower Helderberg (Dev.).
Christiania subquadrata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 298, 351, pl. 15, figs. 32, 33; pl. 15A, fig. 36; pl. 20, figs. 18-20.
Loc. Perry and Blount counties, Tennessee.

CISTELLA Gray. Genotype Terebratula cuneata Risso.

Cistella beecheri Clark. Upper Cretaceous.
Cistella beecheri Clark, Johns Hopkins Univ. Circ., XV, 121, 1896, p. 3.
Loc. Vincentown, New Jersey.

Cistella plicatilis Clark. Upper Cretaceous.
Cistella plicatilis Clark, Johns Hopkins Univ. Circ., XV, 121, 1896, p. 3.
Loc. Vincentown, New Jersey.

Cleiothyris King.
Genotype Atrypa pectinifera J. de C. Sowerby = Spirifer roissyi L'Éveillé = Athyris roissyi of authors.

Cleiothyris clintonensis (Swallow). Kaskaskia (L. Carb.).
Loc. Chester, Illinois; St. Genevieve and Cooper counties, Missouri.
Obs. Compare with C. roissyi. Regarded by Keyes as a synonym for Seminula subquadrata. However, this species does not appear to be a Seminula.

Cleiothyris crassicardinalis (White). Kinderhook (L. Carb.).
Loc. Burlington, Iowa.

Cleiothyris hirsuta Hall. St. Louis and Kaskaskia (L. Carb.).
Cleiothyris hirsuta Hall—Continued.
Loc. Spergen Hill, Indiana; Alton and Chester, Illinois; Princeton, Kentucky; Montana.

Cleiothyris missouriensis (Swallow).
Loc. Montgomery and Chariton counties, Missouri.

Cleiothyris obmaxima (McChesney).
Spirigerella obmaxima White, Wheeler’s Expl. Survey west 100 Merid., IV, 1875, p. 92, pl. 5, fig. 12.
Loc. Nauvoo and Warsaw, Illinois; Keokuk, Iowa; Mountain Spring, Nevada; Ophir City, Utah.
Obs. The specimen figured by White may be Athyris incrassata Hall.

Cleiothyris obvia (McChesney).
Obs. Probably a synonym for C. roissyi.

Cleiothyris orbicularis (McChesney).
Loc. "Extensively distributed in the Western States."
Obs. Specimens of this species in the United States National Museum donated by Professor Worthen show it to be a Cleiothyris.

Cleiothyris reflexa (Swallow).
Loc. Barretts Station, St. Louis County, Missouri.
Obs. Should be compared with C. roissyi. Regarded by Keyes as a synonym for Seminula trinuclea. Swallow’s species, however, does not appear to be a Seminula.

Cleiothyris roissyi (L’Eveillé).
Terebratula roysii Marcon, Geol. North America, 1858, p. 51, pl. 6, fig. 10.
Athyris sublamarillosa Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 702, pl. 27, fig. 1.—Derby, Bull. Cornell Univ., I, 1874, p. 10, pl. 2, figs. 9-12; pl. 3, figs. 15-21, 29; pl. 6, fig. 16; pl. 9, figs. 5, 6.
Spirigerella pectinifera Swallow (non Sowerby), Ibidem, 1863, p. 88.
Athyris planosulcata Geinitz (non Phillips), Carbon u. Dyas in Nebraska, 1866, p. 42.—Meek and Worthen, Geol. Survey Illinois, II, 1866, p. 254, pl. 18, fig. 8.
Athyris planosulcata? Hall and Whitfield, King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 257, pl. 4, figs. 10, 11.
Athyris roissyi Meek, Ibidem, 1877, p. 82, pl. 9, fig. 3.
Athyris hirsuta Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 222, pl. 18, fig. 5.
Cleiothyris roissyi Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 91, pl. 46, figs. 23, 24; pl. 84, fig. 32.
Cleiothyris roissyi (L'Éveillé)—Continued.
Cleiothyris sublamellosa Hall and Clarke, Ibidem, 1898, p. 91.
Loc. Europe; Mississippi Valley; White Pine and Eureka districts, Nevada;
Salt Lake City, etc., Utah; Lake Valley mining district, etc., New Mexico;
Lake County, Colorado; Guatemala; Bonjardim and Itaituba, Brazil.
Obs. American specimens usually referred to this species are constantly smaller,
and are often without sinus or fold. If these differences are regarded as of
sufficient importance to distinguish American specimens from typical C.
roissyi then this species will be known as C. sublamellosa Hall. Of Spirin-
gera americana Swallow, authentic specimens have been seen by the writer
in Professor Hall's collection. These are identical with Athyris sub-
lamellosa.
Meek's Athyris roissyi (1877) will probably prove to be a new species of
Seminula.
See C. clintonensis, C. reflexa Swallow, and C. ovbia McChesney.
Cleiothyris squamosa (Worthen).
Geol. Survey Illinois, VIII, 1890, p. 103, pi. 11, fig. 2.
Loc. Monroe County, Illinois.

CLINTONELLA Hall and Clarke.

Genotype C. vagabunda Hall and Clarke.
Clintonella Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 159;—Thir-

Clintonella vagabunda Hall and Clarke.
Clintonella vagabunda Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 160,
pl. 52, figs. 1-11.
Loc. Orleans County, New York.

Klitambonites Pander, Beitrag zur Geognosie des Russischen Reiches, 1830,
p. 70, pl. 3, fig. 14; pl. 28, figs. 16, 17.
Clitambonites (Ehler), Fischer's Manuel de Conchyliologie, 1887, p. 1289, fig.
and Schuchert, Minnesota Geol. Survey, III, 1893, p. 377.—Hall and Clarke,
Clitambonites adscendens (?Pander). Ordovician.
Orthisina adscendens (Pander) Kayser, Paleontographica, Suppl., III, 1876, p. 20,
pl. 2, figs. 9-11.
Loc. Europe; Juan Pobre and Laja, Cordillere San Juan, Argentine Republic.
Obs. This identification is probably erroneous.
Clitambonites(? borealis (Castelnau).
“Magnesia limestone” = ? Galena (Ord.).
Terebratula borealis Castelnau, Essai Syst. Sil. l’Amérique Septentrionale, 1843,
p. 40, pl. 14, fig. 14.
Terebratula turpis de Verneuil, Ibidem, 1843, p. 40, footnote.
Loc. “Magnesian limestone of Green Bay, Wisconsin.”
Obs. The figure is not satisfactory. The species seems to be related to C. diversus
Shaler.
Clitambonites diversus (Shaler). Trenton-Lorraine (Ord.).
Orthisina venenoi Billings (non Eichwald), Catalogue Sil. Foss. Anticosti, 1866,
pp. 43, 74.
Hemipronites americanus Whitfield, Ann. Rep. Geol. Survey Wisconsin, 1877,
p. 72;—Geol. Wisconsin, IV, 1882, p. 243, pl. 10, figs. 15-17.
Clitambonites diversus (Shaler)—Continued.

Loc. Anticosti; Cannon Falls, Kenyon, etc., Minnesota; Oshkosh, Wisconsin; Ottawa and Lake Winnipeg, Canada.  
Obs. See C. borealis.

Clitambonites diversus altissimus Winchell and Schuchert. Trenton (Ord.).  
Clitambonites diversus var. altissima Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 381, pl. 30, figs. 18, 19.  
Loc. Near Cannon Falls, Minnesota.

Clitambonites (?) johannensis Matthew.  
Orthisina johannensis Matthew, Trans. Royal Soc. Canada, IX, 1892, p. 49, pl. 12, figs. 13a-13c.  

Clitambonites planus retroflexus (de Verneuil).  
Gonambonites plana var. retroflexa de Verneuil; Beitrage zur Geognosie des Russischen Reiches, 1830, p. 77, pl. 25, figs. 1, 2.  
Clitambonites (Gonambonites) plana var. retroflexa Matthew, Trans. Roy. Soc. Canada, 2d ser., 1, 1896, p. 265, pl. 2, figs. 1a-1c.  
Loc. Me. Feei, Cape Breton, Nova Scotia.

CLORINDA Barrande. Genotype C. armata Barrande.  
Clorinda Barrande, Systeme Silurien Boheme, V, 1879.  

Clorinda arcuosa (McChesney).  
Loc. Milwaukee, Wisconsin.

Clorinda areyi (Hall and Clarke).  

Clorinda barrandei (Billings).  
Loc. Anticosti.

Clorinda fornicata (Hall).  
Pentamerus fornicatus Hall, Pal. New York, II, 1852, p. 81, pl. 24, fig. 7.  
Loc. Lockport, New York; Waldron, Indiana; Wisconsin.
Clorinda ventricosa (Hall).


Pentamerus (Pentamerella) ventricosus Hall and Whitfield, Pal. Ohio, II, 1875, p. 138, pl. 7, figs. 7, 8.

Barrandella ventricosa Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 243, pl. 71, figs. 4–10; pl. 84, fig. 46.

Loc. Waukesha, Wisconsin; Bridgeport, Illinois; Louisville, Kentucky; Ohio.

Celo spir a Hall = Anopl othe ca.

Ccelosp ira concava Hall 1867 (not 1863) = Anopl otheca camilla.

Ccelospira disparilis Hall = Atrypina disparilis.

**CONCHIDIUM** Linné.

Genotype C. biloculare Linné.


Helmintholitus Linné, Systema Natura, ed. xii, IV, 1766, p. 163.

Pentamerus Sowerby (non Pentamera Dumeril, 1806), Mineral Conchology, I, 1813, p. 73.


Antirynchonella Quenstedt, Petref. Deutschlands, Brach., 1871, p. 231.

Zdimir Barrande, Système Silurien Bohème, VI, 1881, p. 171.

**Conchidiun biloculare** Linné.

Silurian.


Pentamerus conchidiun Emmerson, Geol. Frobisher Bay; Nourses Narr. Hall’s Arctic Exped., 1879, p. 578.

Loc. Europe; Rescue Harbor, Arctic America.

**Conchidiun colletti** (Miller).

Waterlime (Sil.).


Loc. Kokomo, Indiana.

Obs. Compare with C. laqueatum Conrad.

**Conchidiun crassiplica** Hall and Clarke.

Niagara (Sil.).


Loc. {Near Louisville, Kentucky.

**Conchidiun crassiradiatum** (McCchesney).

Niagara (Sil.).


Loc. Milwaukee, Wisconsin.
Conchidium decussatum (Whiteaves). Silurian.
   Pentamerus decussatus Whiteaves, Canadian Record of Science, 1891, p. 295, pl. 3, figs. 3, 4.—Calvin, Bull. Lab. Nat. Hist. State Univ. Iowa, XI, 1892, p. 164, pl. 11, figs. 1-3; pl. 12, fig. 2.
   Conchidium decussatum Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 235, pl. 65, figs. 1, 2; pl. 66, fig. 15.
   Loc. Grand Rapids of the Saskatchewan, etc., Canada.

Conchidium exponeum Hall and Clarke. Niagara (Sil.).
   Conchidium exponeum Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 66, figs. 6-9.
   Loc. Louisville, Kentucky.

Conchidium georgie Hall and Clarke. Clinton (Sil.).
   Conchidium georgie Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 369, pl. 66, figs. 18, 19.
   Loc. Trenton, Georgia.

Conchidium greenei Hall and Clarke. Niagara (Sil.).

Conchidium knappi (Hall and Whitfield). Niagara (Sil.).
   Loc. Louisville, Kentucky

Conchidium knighti (Nettelroth). ?Corniferous (Dev.).
   Pentamerus knighti Nettelroth (non Sowerby), Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 57, pl. 29, figs. 1, 2, 17.
   Conchidium nettelrothi Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 234, pl. 64, figs. 14-16.
   Loc. Louisville, Kentucky.
   Obs. This species is very much like C. nysius and may be identical with it (Ami says that C. knighti occurs in the Upper Silurian at Arisaig, Nova Scotia).

Conchidium laqueatum (Conrad). Niagara (Sil.).
   Pentamerus nobilis Emmons, Manual of Geol., 1860, p. 107, figure.
   Loc. Delphi, Indiana.

Conchidium littoni Hall. Niagara (Sil.).
   Conchidium littoni Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 64, figs. 9, 10.
   Loc. Hardin County, Tennessee; Louisville, Kentucky.
Conchidium multicostatum Hall.
Niagara (Sil.).
Conchidium multicostatum Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 64, fig. 6; pl. 66, fig. 10.
Loc. Wauwatosa and Waukesha, Wisconsin.

Conchidium nettelrothi Hall and Clarke.—C. knighti.

Conchidium nysius (Hall and Whitfield).
Niagara (Sil.).
Pentamerus nysius var. tenuicosta Nettelroth, Ibidem, 1889, p. 60.
Conchidium nysius Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 235, pl. 64, figs. 1, 8, 27.
Loc. Louisville, Kentucky.
Obs. See C. tenuicostatum.

Conchidium obsoletum Hall and Clarke.
Niagara (Sil.).
Conchidium obsoletum Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 67, figs. 8, 9.
Loc. Genoa, Ottawa County, Ohio.

Conchidium occidentale Hall.
Guelph (Sil.).
Pentamerus occidentalis Hall, Pal. New York, II, 1852, p. 341, pl. 79, figs. 1, 2.—Billings, Geol. Canada, 1863, p. 337, fig. 341.—Nicholson, Pal. Prov. Ontario, 1875, p. 67, fig. 35.—Whitfield, Geol. Wisconsin, IV, 1882, p. 314, pl. 17, fig. 10; pl. 23, figs. 1, 2.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1883, p. 239.
Conchidium (?) occidentalis Hall and Clarke, Ibidem, 1885, pl. 67, figs. 1-5.
Loc. Gault and Guelph, Ontario; Point St. Vital, Lake Huron; Williamstown, Wisconsin.

Conchidium (?) salinense (Swallow). “Base of Chemung” (Dev.).
Loc. Moniteau County, Missouri.
Obs. The geological horizon is probably Corniferous or Hamilton.

Conchidium scoparium Hall and Clarke.
Guelph (Sil.).
Conchidium scoparium Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 67, figs. 6, 7.

Conchidium tenuicostatum (Hall and Whitfield).
Niagara (Sil.).
Conchidium tenuicostatus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 235, pl. 64, figs. 3-5.
Loc. Louisville, Kentucky.
Obs. P. nysius is described as consisting of two varieties. If these varieties are species, as pointed out by Nettelroth, then P. nysius will be based upon and supplant variety crassicosta, while variety tenuicosta must be elevated to specific rank. P. complanatus Nettelroth, therefore, becomes a synonym for C. tenuicostatum, as both are established upon the same specimens.
Conchidium unguiforme (Ulrich).
Gypidia unguiformis Ulrich, Contrib. American Pal., 1886, p. 28, pl. 3, fig. 2.
Loc. Louisville, Kentucky.

CONOTRETA Walcott.
Genotype C. rusti Walcott.
Conotreta Walcott, Proc. U. S. Nat. Mus., XII, 1890, p. 365 (extract 1889).—

Conotreta rusti Walcott
Conotreta rusti Walcott, Proc. U. S. Nat. Mus., XII, 1890, p. 365, figs. 1-4 (extract
1889).—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 104, pl. 4K,
figs. 16-21.
Loc. Trenton Falls, New York; Covington, Kentucky.

Conradia Hall and Clarke (non Adams)=Dinobolus.

CRANÆNA Hall and Clarke. Genotype Terebratula romingeri Hall.
Cranæna Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 297;—Thirteenth

Cranæna iowensis (Calvin).
Terebratula (Cryptonella) iowensis Calvin, Bull. Lab. Nat. Hist. Univ. Iowa,
I, 1890, p. 174, pl 3, fig. 4.
80, figs. 36-39; pl. 83, fig. 40.
Loc. Fayette, Iowa; Fulton, Missouri.

Cranæna romingeri Hall.
1863, p. 48, figs. 22, 23;—Pal. New York, IV, 1867, p. 389, pl. 60, figs. 17-25,
66, 67.—Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey,
1889, p. 155, pl. 16, figs. 20-22.
Cranæna romingeri Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 297,
fig. 215; pl. 80, figs. 13-19.
Loc. Thunder Bay, Michigan; Waterloo, Iowa; York and Hamburg, New York;
Clarke County, Indiana.

CRANIA Retzius.
Genotype Anomia craniolaris Linneé.
31.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 145, 169.—Winchell
and Schuchert, Minnesota Geol. Survey, III, 1893, p. 372.—Hall and Clarke,

Crania acadiensis Hall.
Crania acadiensis Hall, Canadian Nat. Geol., V, 1860, p. 144, fig 1.—Dawson,
Acadian Geol., 3d ed., 1878, p. 595, fig. 198.

Crania agaricina Hall and Clarke.
Genotype Lower Helderberg (Dev.).
4H, fig. 2.
Loc. Albany County, New York; Decatur County, Tennessee.

Crania albersi Miller and Faber.
Crania albersi Miller and Faber, Jour. Cincinnati Soc. Nat. Hist., XVII, 1894,
p. 154, pl. 8, figs. 17-19.
Loc. Cincinnati, Ohio.
Crania alternata James = C. scabiosa.

Crania anna Spencer. Niagara (Sil.).


Crania asperula James = C. scabiosa.

Crania aurora Hall. Schoharie Grit (Dev.).


Crania bella Billings. No. 5 Gaspé Series (?Dev.).

Crania bella Billings, Pal. Fossils, II, 1874, p. 15, fig. 5.

Loc. Cape Bon Ami, Gaspé, Canada.

Crania blairi Miller = C. rowleyi.

Crania bordeni Hall and Whitfield = C. sheldoni.

Crania carbonaria Whitfield = C. modesta.

Crania centralis Hall. Portage (Dev.).

Crania centralis Hall, Pal. New York, V, Pt. II, 1879, pl. 88, fig. 2.


Crania chesterensis Miller and Gurley. Kaskaskia (L. Carb.).


Loc. Chester, Illinois.

Crania (?) columbiana Walcott. Middle Cambrian.


Obs. Probably a species of Acrotreta.

Crania costata James = C. scabiosa.

Crania crenistriata Hall. Corniferous and Hamilton (Dev.).


Loc. Alexander, etc., New York; Columbus, Ohio; Louisville, Kentucky; Alpena, Michigan.

Obs. See C. sheldoni White.

Crania (?) deformata (Hall). Chazy (Ord.).

Orbicula (?) deformata Hall, Pal. New York, I, 1847, p. 23, pl. 4 bis, fig. 10.


Obs. This species is not well established and had better be dropped since the type specimen does not preserve the generic or specific characters.

Crania dentata Ringueberg. Niagara (Sil.).


Loc. Lockport, New York.

†Crania dubia Foerste. Clinton (Sil.).

†Crania dubia Foerste, Geol. Ohio, VII, 1895, p. 565, pl. 37, fig. 17.

Loc. Dayton, Ohio.

Obs. May not be a brachiopod.
Crania dyeri Miller.  
**Utica (Ord.).**  
Crania dyeri Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 13, fig. 3.  
*Loc.* Cincinnati, Ohio.

Crania famelica Hall and Whitfield.  
**Hamilton (Dev.).**  
Crania famelica Hall and Whitfield, Descriptions n. sp. Fossils, 1872, p. 17, pl. 11, figs. 6, 7;—Twenty-third Rep. New York State Cab. Nat. Hist., 1873, p. 236, pl. 11, figs. 6, 7.  
*Loc.* Cerro Gordo, Iowa; Callaway County, Missouri.  
*Obs.* Compare with Craniella hamiltoniae Hall.

Crania favincola Hall and Clarke.  
**Middle Devonian.**  
Crania favincola Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 180, pl. 4H, fig. 33.  
*Loc.* Crab Orchard, Kentucky.

Crania gracilis Ringeberberg.  
**Niagara (Sil.).**  
Crania pannosa Ringeberberg, Ibidem, 1886, p. 17, pl. 2, fig. 8.  
*Obs.* Species of Crania are very variable in shape, and since both forms are attached to one Orthoceras, it is probable that but a single species is here represented.

Crania granosa Hall and Clarke.  
**Hamilton (Dev.).**  

Crania granulosa N. H. Winchell.  
**Trenton (Ord.).**  
*Loc.* Minneapolis, Minnesota.

Crania gregaria Hall = Craniella hamiltoniae.  

Crania greenii Miller.  
**Upper Helderberg (Dev.).**  
Crania greenii Miller, Eighteenth Ann. Rep. Geol. Survey Indiana, 1894, p. 310, pl. 9, fig. 7.  
*Loc.* Falls of Ohio.  
*Obs.* Probably the same as Craniella hamiltoniae.

Crania halli Sardeson = Craniella ulrichi.  

Crania hamiltoniae Hall = Craniella hamiltoniae.

Crania lœlia Hall.  
**Utica and Lorraine (Ord.).**  
*Loc.* Cincinnati and Oxford, Ohio; Richmond, Indiana.

Crania lœvis Keyes.  
**Chouteau (L. Carb.).**  
Crania lœvis Keyes, Geol. Survey Missouri, V, 1895, p. 40.  
*Loc.* Louisiana, Missouri.

Crania leoni Hall.  
**Portage and Chemung (Dev.).**  
Craniad modesta White and St. John. Upper Carboniferous.
Craniad modesta White and St. John, Trans. Chicago Acad. Sci., I, 1868, p. 118.—
White, Thirteenth Rep. State Geol. Indiana, 1884, p. 121, pl. 35, fig. 9; pl. 36, fig. 5.
Ibidem, V, 1891, p. 599, pi. 15, figs. 11, 12;—Geol. Ohio, VII, 1895, p. 484, pl. 11, figs. 11, 12.
Loc. Fremont County, Iowa; Vermilion and Sullivan counties, Indiana; Carbon Hill, Ohio; Manhattan, Kansas.
Craniad multipunctata Miller = C. scabiosa.
Craniad pannosa Ringueberg = C. gracilis.
Craniad parallela Ulrich = C. scabiosa.
Craniad percarinata Ulrich = C. scabiosa.
Craniad(?) permiana Shumard.
Loc. Guadalupe Mountains, New Mexico.
Obs. Probably not a Craniad.
Craniad pulchella Hall and Clarke. Lower Helderberg (Dev.).
4H, fig. 3.
Loc. Albany County, New York.
Craniad radicans A. Winchell = Strophalosia radicans.
Craniad reposita White. Burlington (L. Carb.).
Loc. Burlington, Iowa.
Craniad reticularis Miller = Trematis reticularis.
Craniad(?) reversa Sardeson. St. Peter (Ord.).
3, figs. 6, 7.
Craniad rowleyi Gurley. Chouteau (L. Carb.).
Craniad rowleyi Gurley, New Carb. Fossils, 1, 1883, p. 3.—Hall and Clarke, Pal.
New York, VIII, Pt. I, 1892, pl. 4H, fig. 13.
9, figs. 5, 6.
Loc. Pike County and Sedalia, Missouri.
Craniad scabiosa Hall. Utica and Lorraine (Ord.).
Craniad scabiosa Hall, Descriptions n. sp. Crinoidea and other Foss., 1866, p. 13;—
15.—Hall and Whitfield, Pal. Ohio, II, 1875, p. 74, pl. 1, fig. 17.—Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 12.—Hall and Clarke, Pal. New York,
Craniad multipunctata Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 13, fig. 4.
4, fig. 12.
Craniad parallela Ulrich, Ibidem, 1878, p. 98, pl. 4, fig. 13.
Craniad asperula James, The Palaeontologist, 3, 1879, p. 22.
Craniad costata James, Ibidem, 1879, p. 22.
Craniad alternata James, Ibidem, 1879, p. 23.
Loc. Cincinnati, etc., Ohio; Indiana; Illinois; Wisconsin.
Obs. The shells of Craniad are adapted to the objects upon which they are cemented.
Crania scabiosa Hall—Continued.
C. scabiosa has been found growing on Rafinesquina, Strophomena, Rhynchonella, Pleurotomaria, and Monticulipora. In nearly all cases this species partakes more or less of the ornamentation of its host. The variation pointed out by authors is accidental and has no specific value.

Crania setigera Hall.

Loc. Waldron, Indiana.

Crania setigera Hall.

Loc. Mineral Point and Beloit, Wisconsin; Decorah, Iowa; Minneapolis, Cannon Falls, etc.; Minnesota; Wilmington, Illinois.

Crania shelldoni White.

Loc. New Buffalo and Iowa City, Iowa; Falls of Ohio.

Obs. This species may not be distinct from C. crenistria.

Crania siluriana Hall.

Loc. Waldron, Indiana.

Crania socialis Ulrich.

Loc. Cincinnati, Ohio.

Crania spinigera Hall.

Loc. Waldron, Indiana.

Crania trentonensis Hall.

Loc. Middleville, New York; Cannon Falls, Minnesota; Janesville, Wisconsin; Dixon, Illinois.
CRANIEMMI (pbhert. Genotype C. medinanensis Buhlert.


Crania (? Clintonensis Foerste. Clinton (Sil.)

Crania (^ Clintonensis Foerste, Geol. Ohio, VII, 1895, p. 565, pl. 37, figs. 3a, 3b. Loc. Todd’s Fork, Ohio.

Crania hamiltonia Hall. Hamilton (Dev.)


Loc. Cazenovia, Hamilton, etc., New York; Hay and Athabasca rivers, Canada. (Waverly group, Moote Run, Licking County, Ohio, according to Herrick.)

Obs. See Crania Greenei Miller.

Crania (?) Ulrichi Hall and Clarke. Trenton (Ord.)


Loc. Minneapolis, St. Paul, and Fountain, Minnesota.

Craniops Hall = Pholidops.


Loc. Madison County, Missouri.

CRYPTONELLA Hall, 1867. Genotype Terebratula rectirostra Hall.


Obs. This genus can not be considered as established before 1867.

Bull. 87—13
Cryptonella calvini Hall and Whitfield = Dielasma calvini.

Cryptonella(?) circulus Walcott.
- Devonian.
- Loc. Lone Mountain, Nevada.
- Obs. Additional material shows that this species attained a length of 1 inch.

Cryptonella eudora Hall and Whitfield, 1873 = Dielasma calvini.

Cryptonella(?) eudora Hall.
- Chemung-Waverly (Dev.-L. Carb.).
- Cryptonella (Terebratula) eudora Hall, Pal. New York, IV, 1867, p. 398, pl. 61, figs. 31-41.
- Cryptonella eudora Herrick, Bull. Denison Univ., III, 1888, p. 48, pl. 5, fig. 10;—Geol. Ohio, VII, 1895, pl. 21, fig. 10.
- Loc. Ithaca, New York; Licking County, Ohio.

Cryptonella(?) eximia Hall.
- Lower Helderberg (Dev.).
- Loc. Not given.

Cryptonella(?) inconstans (Herrick).
- Waverly (L. Carb.).
- Terebratula? inconstans Herrick, Bull. Denison Univ., IV, 1888, p. 24, pl. 3, figs. 8, 9; pl. 11, fig. 18.
- Cryptonella(?) inconstans Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 79, figs. 31, 32.
- Terebratula inconstans Herrick, Geol. Ohio, VII, 1895, pl. 23, fig. 17.
- Loc. Ashland County and Lodi, Ohio.

Cryptonella iowensis Calvin = Cransena iowaeusis.

Cryptonella iphis Hall.
- Corniferous (Dev.).

Cryptonella lens Hall.
- Corniferous (Dev.).

Cryptonella lincklaBni Hall = Euella lincklaeni.

Cryptonella ovalis Miller.
- Hamilton (Dev.).
- Cryptonella ovalis Miller, Seventeenth Rep. State Geol. Indiana, 1891, p. 76, pl. 13, figs. 1, 2.

Cryptonella pinonensis Walcott.
- Upper Devonian.
- Cryptonella pinonensis Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 163, pl. 4, fig. 4.
- Loc. Pinon Range, Nevada.

Cryptonella planirostris Hall.
- Marcellus, Hamilton (Dev.).
Cryptonella rectirostris Hall. Hamilton (Dev.).
Loc. Bellona, York, Moscow, etc., New York; Falls of Ohio.

Cryptonella subelliptica Hall and Clarke. Waverly (L. Carb.).
Cryptonella subelliptica Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 81, figs. 41-43.
Loc. Sciotoville, Ohio.

Cyclorhina Hall and Clarke. Genotype Rhynchospira nobilis Hall.

Cyclorhina nobilis Hall. Hamilton (Dev.).
Cyclorhina nobilis Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 207, pl. 61, figs. 1-12.

Cyclospira Hall and Clarke. Genotype Orthis bisulcata Emmons.

Cyclospira bisulcata (Emmons). Trenton (Ord.).
Atrypa bisulcata Hall, Pal. New York, I, 1847, p. 139, pl. 33, fig. 3.
Cyclospira bisulcata? Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 470, pl. 34, figs. 49-54.
Loc. Adams, Jefferson County, New York; Ottawa, Canada; Cannon Falls, etc., Minnesota; Lake Winnipeg, Manitoba.

Cyclospira?(?) sparsiplica Foerste. Clinton (Sil.).
Cyclospira?(?) sparsiplica Foerste, Geol. Ohio, VII, 1895, p. 593, pl. 37A, fig. 18.
Loc. Dayton, Ohio.
Obs. May be a species of Parastrophia or a rhynchonelloid.

Cyrtia Dalman. Genotype Anomites exporrectus Wahlenberg.

Cyrtia acutirostris Shumard = Cyrtina acutirostris.
Cyrtia alta Hall. Waverly (L. Carb.).
Cyrtia alta Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 42, pl. 26, figs. 1-5; pl. 39, figs. 37, 38.
Loc. Meadville, Pennsylvania; Bedford, Ohio.

Cyrtia biplicata Hall=Cyrtina biplicata.

Cyrtia curvilineata White=Cyrtina curvilineata.

Cyrtia cyrtiniformis (Hall and Whitfield). Chemung (Dev.).
Loc. Rockford, Iowa; Hay River, Canada.
Obs. Compare with C. norwoodi Meek.

Cyrtia dalmani Hall=Cyrtina dalmani.

Cyrtia exporrecta (Wahlenberg). Niagara (Sil.).
Loc. Europe; Louisville, Kentucky.

Cyrtia exporrecta arrecta Hall and Whitfield=C. myrtea.
Cyrtia gigas Troost=Syringothyris gigas.
Cyrtia hamiltonensis Hall=Cyrtina hamiltonensis.

Cyrtia meta (Hall). Clinton and Niagara (Sil.).
Spirifer radiatus (pars) Hall, Pal. New York, II, 1852, p. 66, pl. 22, figs. 2a–2c, 2t.
Cyrtia radians Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 42, 362, pl. 28, figs. 4, 5, 50, 52; pl. 39, fig. 33.
Loc. Lockport and Rochester, New York; Milwaukee, Wisconsin.

Cyrtia missouriensis Swallow=Cyrtina missouriensis.

Cyrtia myrtia Billings. Anticosti and Niagara (Sil.).
Cyrtia exporrecta Hall and Whitfield, Twenty-seventh Rep. Ibidem, 1875, pl. 9, figs. 22, 23.
Cyrtia exporrecta var. arrecta Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 94, pl. 27, fig. 21; pl. 34, fig. 35; pl. 37, figs. 60, 61.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 28, figs. 2, 3; pl. 39, fig. 32.
Loc. Anticosti; Louisville, Kentucky.
Cyrtia norwoodi (Meek). Middle Devonian.
Loc. Buell Valley, Utah.
Obs. Compare with C. crytiniformis Hall and Whitfield.

Cyrtia occidentalis Swallow = Cyrtina occidentalis.
Cyrtia radians Hall and Clarke = C. meta.
Cyrtia rostrata Hall = Cyrtina rostrata.
Cyrtia trapezoidalis Hisinger = C. exporrecta.
Cyrtia trapezoidalis arrecta Hall and Whitfield = C. myrtia.
Cyrtia triquetra Hall = Cyrtina triquetra.
Cyrtia umbonata Hall = Cyrtina umbonata.

CYRTINA Davidson. Genotype Cyrtia heteroclitai Defrance.

Cyrtina acutoirostris (Shumard). Chouteau (L. Carb.).
Cyrtina acutoirostris Shumard, Geol. Rep. Missouri, 1855, p. 204, pl. C, fig. 3.
Loc. Hannibal and Louisiana, Missouri.

Cyrtina affinis Billings. Oriskany (Dev.).
Cyrtina dalmani Billings, Canadian Nat. Geol., VIII, 1863, p. 37.
Cyrtina affinis Billings, Pal. Fossils, II, 1874, p. 49, pl. 3A, fig. 6.
Loc. Grand Greve, Gaspé.

Cyrtina billingsi Meek. Hamilton (Dev.).
Cyrtina billingsi Meek, Trans. Chicago Acad. Sci., I, 1868, p. 97, pl. 14, fig. 6.—Whiteaves, Cont. to Canadian Pal., I, 1891, p. 227.
Loc. Clearwater and Athabasca rivers, British America.

Cyrtina biplicata Hall. Upper Helderberg (Dev.).
Cyrtina biplicata Hall, Pal. New York, IV, 1867, p. 266, pl. 27, figs. 5-10.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 28, figs. 7-10.
Loc. Albany and Schoharie counties, etc., New York; Michigan.

Cyrtina burlingtonensis Rowley. Burlington (L. Carb.).
Cyrtina burlingtonensis Rowley, American Geologist, XII, 1893, p. 308, pl. 14, figs. 15-17.
Loc. Louisiana, Missouri.
Obs. Compare with C. neogenes.

Cyrtina crassa Hall. Corniferous (Dev.).
Loc. Vienna, New York; Falls of Ohio.
Cyrtina(?) curupira Rathbun. Middle Devonian.
Loc. Erere, Province of Para, Brazil.

Cyrtina curvilineaata White. Hamilton (Dev.).
Cyrtina curvilineaata Hall and Clarke, Ibidem, VIII, Pt. II, 1895, pl. 28, figs. 11, 12.
Loc. Iowa City, Iowa.

Cyrtina dalmani Billings (non Hall)= C. affinis.

Cyrtina dalmani (Hall). Lower Helderberg (Dev.).
Cyrtina dalmani Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 383, pl. 7, fig. 3.
Loc. Albany and Schoharie counties, New York; Perry County, Missouri; Decatur County, Tennessee; Dalhousie, New Brunswick.

Cyrtina davidsoni Walcott. Middle and Upper Devonian.
Cyrtina davidsoni Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 146, pl. 3, fig. 2.
Loc. White Pine district, Nevada.

Cyrtina hamiltonensis Hall. Up. Helderberg, Ham., and Port. (Dev.).
Cyrtina panda Meek, Trans. Chicago Acad. Sci., I, 1868, p. 100, pl. 14, fig. 8.
Loc. New York; Pennsylvania; Maryland; Cayuga and Thedford, Ontario; Louisville, Kentucky; Independence, Iowa; Eureka district, Nevada; Mackenzie and Athabasca rivers, and lakes Manitoba and Winnipegosis, British America.
Obs. C. panda is a variation of this species with a higher ventral area.

Cyrtina hamiltonensis recta Hall. Hamilton and Chemung (Dev.).
Loc. Allegany County, New York; Falls of Ohio.

Cyrtina lachrymosa Hall and Clarke. Waverly (L. Carb.).
Cyrtina lachrymosa Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pp. 46, 362, pl. 28, figs. 36, 37, 47.
Loc. Richfield, Ohio.

Cyrtina missouriensis (Swallow). Hamilton (Dev.).
Loc. Callaway County, Missouri.
Obs. Regarded by Keyes as a synonym for C. umbonata.
Cyrtina neogenes Hall and Clarke. Burlington (L. Carb).
Cyrtina neogenes Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 84, fig. 41.
Loc. Burlington, Iowa.
Obs. Compare with C. burlingtonensis.

Cyrtina (?) occidentalis (Swallow). Hamilton (Dev.).
Syringothyris occidentalis Keyes, Geol. Survey Missouri, V, 1889, p. 86.
Loc. Callaway County, Missouri.
Obs. This is probably a Spirifer with a high area as in S. asperns, or it is a Cyrtia.

Cyrtina pande Meek = C. hamiltonensis.

Cyrtina pyramidalis (Hall). Niagara (Sil.).
Spirifer pyramidalis Hall, Pal. New York, II, 1852, p. 266, pl. 54, fig. 7.
Loc. Lewiston, New York.

Cyrtina rostrata Hall. Oriskany and Corniferous (Dev.).
Pal. New York, III, 1859, p. 429, pl. 96, figs. 1-6; pl. 98, fig. 8.—Billings,
Canadian Jour., VI, 1861, p. 263.
Cyrtina rostrata Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 25, figs.
1-8; pl. 28, fig. 6.
Loc. Albany County, New York; Cumberland, Maryland; Cayuga, Ontario.

Cyrtina triplicata Simpson. Waverly (L. Carb.).
fig. 4.

Cyrtina triquetra (Hall). Hamilton (Dev.).
Cyrtina triqueta Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 513.

Cyrtina umbonata (Hall). Hamilton (Dev.).
Cyrtina umbonata Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 512, pl. 5, fig. 2.
Cyrtina umbonata Miller, N. American Geol. Pal., 1889, p. 343.—Keyes, Geol.
Survey Missouri, V, 1895, p. 90.
Loc. Buffalo, Iowa; Rock Island, Illinois; Callaway County, Missouri.
Obs. See C. missouriensis.

Cyrtina umbonata alpenaensis Hall and Clarke. Hamilton (Dev.).
Cyrtina umbonata var. alpenensis Hall and Clarke, Pal. New York, VIII, Pt. II,
1895, p. 362, pl. 28, figs. 16-20.
Loc. Alpena, Michigan.

DALMANELLA Hall and Clarke.
Genotype Orthis testudinaria Dalman.
Dalmanella Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 205, 223.—
Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 439.—Hall
Dalmanella amœna N. H. Winchell.
Orthis (D.) amœna Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 453, pl. 33, figs. 48-50.
Loc. Spring Valley, Minnesota.

Dalmanella arcuaria Hall and Clarke.
Trenton (Ord.).
Loc. Perry County, Tennessee.

Dalmanella bellula (Meek).
Niagara (Sil.).
Dalmanella bellula (James MS.) Meek, Pal. Ohio, I, 1873, p. 103, pl. 8, fig. 5; Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 31.
Loc. Cincinnati, Ohio.

Dalmanella concinna Hall.
Lower Helderberg (Dev.).
Loc. Cumberland, Maryland.

Dalmanella crispata (Emmons).
Lorraine (Ord.).
Dalmanella crispata Emmons, Geol. New York; Rep. Second Dist., 1842, p. 404, fig. 5.
Loc. Lorraine, New York.

Dalmanella devonica (Walcott).
Lower Devonian.
Loc. Eureka district, Nevada.
Obs. The type specimen has no spondylium and therefore is no Skenidium.

Dalmanella electra (Billings).
Calciferous (Ord.).
Loc. Point Levis and St. John, Canada; Newfoundland; House Range, Utah.

Dalmanella electra major (Matthew).
Calciferous (Ord.).
Orthis electra var. major Matthew, Trans. Royal Soc. Canada, X, 1893, p. 100, pl. 7, fig. 3.

Dalmanella electra lævis (Matthew).
Calciferous (Ord.).

Dalmanella elegantula (Dalman).
Clinton and Niagara (Sil.).
Dalmanella elegantula (Dalman)—Continued.


Dalmanella elegantula Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 207, 224, pl. 5C, figs. 15–19.

Orthis (Dalmanella) elegantula Foerste, Geol. Ohio, VII, 1895, p. 581, pl. 25, figs. 11, 17.

Loc. Europe; New York; Ohio; Indiana; Kentucky; Tennessee; Missouri; Ontario and Nova Scotia, Canada; Collinsville, Alabama.

Dalmanella elegantula parva (Foerste).

Orthis elegantula var. parva Foerste, Bull. Denison Univ., I, 1885, p. 85, pl. 13, fig. 17.


Loc. Dayton, Ohio.

Dalmanella (?) evadne (Billings).


Loc. Point Levis, Canada; Fort Cassin, Vermont.

Dalmanella hamburgensis (Walcott).

Orthis hamburgensis Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 73, pl. 2, fig. 5.

Orthis (Dalmanella) hamburgensis? Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 440, pl. 33, figs. 14–16.

Loc. Pogonip group, Eureka district, Nevada. In the Trenton at St. Paul, Cannon Falls, etc., Minnesota; Highbridge, Kentucky.

Dalmanella infera (Calvin).


Dalmanella lenticularis (Vanuxem).

Orthis lenticularis Vanuxem (non Wahlenberg), Geol. New York; Rep. Third Dist., 1842, p. 139, fig. 4.—Hall, Pal. New York, IV, 1867, p. 33, pl. 5, figs. 1, 2.

Orthis lenticularis and O. lentiformis Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 175, fig. 4.

Orthis eboracensis Miller, N. American Geol. Pal., 1889, p. 357.

Dalmanella lenticularis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 207, 224, pl. 5C, figs. 36–41.

Loc. Leroy, Caledonia, etc., New York.

Dalmanella lepida Hall.


Loc. Ontario County, New York.
Dalmanella macleodi (Whitfield). Calciferous (Ord.).
Loc. Beekmantown, New York.

Dalmanella melita (Hall and Whitfield). Upper Cambrian.
Loc. Eureka district, Nevada.
Obs. This species is related to D. evadne (Billings).

Dalmanella(?) nettoana (Rathbun). Middle Devonian.
Loc. Province of Para, Brazil.

Dalmanella parva (de Verneuil). Anticosti (Sil.).
Orthis parva (Pander) de Verneuil, Geology of Russia and the Ural Mountains, 1845, p. 188, pl. 13, fig. 3.—Billings, Cat. Sil. Foss. Anticosti, 1866, p. 41.
Loc. Europe; Anticosti.

Dalmanella perergans Hall. Lower Helderberg (Dev.).
Dalmanella perergans Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 207, 224, pl. 5C, figs. 34, 35.
Loc. Albany and Schoharie counties, New York; Decatur County, Tennessee.

Dalmanella planoconvexa Hall. Lower Helderberg and Oriskany (Dev.).
Loc. Albany County, New York; Cumberland, Maryland.

Dalmanella(?) plicifera (Hall). Chazy (Ord.).
Lepttena plicifera Hall, Pal. New York, I, 1847, p. 19, pl. 4 bis, fig. 1.

Dalmanella pogonipensis (Hall and Whitfield). Pogonip (Ord.).
Orthis pogonipensis Hall and Whitfield, King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 232, pl. 1, figs. 9, 10.
Loc. White Pine and Eureka districts, Nevada.
Obs. These are shells of the D. perveta group. S. nemea is based on a dorsal valve of O. pogonipensis.

Dalmanella quadrans Hall. Lower Helderberg (Dev.).
Orthis quadrans Hall, Pal. New York, III; Corrigenda in vol. with plates, 1861, pl. 12, figs. 9-12.
Dalmanella stonensis (Safford).
Orthis stonensis Safford, Geol. Tennessee, 1869, p. 286.
Dalmanella stonensis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 224, pl. 5C, figs. 4, 5.

Dalmanella subaequata (Conrad).

Dalmanella subaequata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 194, 207, 224, pl. 5C, figs. 6-11.
Dalmanella perveta Hall and Clarke, Ibidem, 1892, p. 224, pl. 5C, figs. 13, 14.
Orthis (D.) subaequata Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 446, pl. 33, figs. 30-36.
Loc. Mineral Point, Wisconsin; Minneapolis, St. Paul, Cannon Falls, Fountain, etc., Minnesota; Decorah and McGregor, Iowa; Auburn, Lincoln County, Missouri; Montreal, Canada.

Dalmanella subaequata circularis N. H. Winchell.
Orthis (D.) subaequata var. circularis Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 452, pl. 33, figs. 46, 47.
Loc. Minneapolis, Cannon Falls, etc., Minnesota; Highbridge, Kentucky; Lebanon, Tennessee.

Dalmanella subaequata conradi N. H. Winchell.
Loc. Minneapolis, Minnesota; Decorah, Iowa; Janesville and Beloit, Wisconsin; Montreal, Canada; ?Eureka district, Nevada.

Dalmanella gibbosa (Billings).
Orthis (D.) subaequata var. gibbosa Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 451, pl. 33, figs. 43-45.
Loc. Near Ottawa and Belleville, Canada; Minneapolis, Cannon Falls, etc., Minnesota; Decorah, Iowa; Mineral Point, Wisconsin; in the Chazy, Island of Montreal, and Pallideau Islands, Lake Huron.

Dalmanella perveta (Conrad).
Dalmanella subaequata pervetus (Conrad)—Continued.


†Orthis perveta Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 72, pl. 11, fig. 3.

Dalmanella perveta Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 5C, fig. 12.

Orthis (D.) subaequata var. perveta Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 450, pl. 33, figs. 40-42.

Loc. Mineral Point, Beloit, etc., Wisconsin; Minneapolis, St. Paul, Cannon Falls, etc., Minnesota; Decorah, Iowa; Dixon, Illinois; Tennessee.

Dalmanella subcarinata Hall.

Lower Helderberg (Dev.).


†Orthis subcarinata Tschernyeyschew, Fauna Untern Devon des Urals, Mém. Com. Geol., Russie, IV, 1885, p. 57, pl. 7, fig. 97.


Loc. Catskill, Schoharie, etc., New York; Perry and Pike counties, Missouri; Decatur County, Tennessee; Wabakee, Wisconsin; Arisaig, Nova Scotia (Ami); Russia.

Dalmanella superstes Hall and Clarke.

Chemung (Dev.).

Dalmanella superstes Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 207, 224, 342, pl. 5C, figs. 44-47.

Loc. Near Howard, Steuben County, New York.

Dalmanella tenuilineata (Hall).

Chemung (Dev.).


Orthis leonensis Hall, Pal. New York, IV, 1867, p. 62, pl. 8, figs. 3-8.

Dalmanella leonensis Hall and Clarke, Ibidem, VIII, Pt. I, 1892, p. 224, pl. 5C, figs. 42, 43.

Loc. Leon, Conewango, etc., New York.

Dalmanella tersa (Sardeson).

Lorraine (Ord.).


Loc. Wilmington, Illinois; Nye, Wisconsin.

Dalmanella testudinaria (Dalman).

Chazy-Lorraine (Ord.).


Orthis striatula Emmons, Geol. New York; Rep. Second Dist., 1842, p. 394, fig. 3.


Orthis disparilis Owen (non Conrad), Geol. Survey Wisconsin, Iowa, Minnesota, 1852, pl. 2B, fig. 23 (see specimens U. S. Nat. Mus., Cat. Invert. Foss., 17887).
Dalmanella testudinaria (Dalman)—Continued.

Dalmanella testudinaria Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 190, 206, 218, 224, pl. 5B, figs. 27-39.

Orthis rogata Sardeson, Bull. Minnesota Acad. Nat. Sci., III, 1892, p. 331, pl. 5, figs. 1-4.—American Geol., XIX, 1897, p. 95, pl. 4, figs. 1-10.


Loc. Europe; throughout the extent of the formations in America.

Dalmanella testudinaria emacerata Hall.


Dalmanella emacerata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 207, 224, pl. 5C, figs. 1, 2.


Orthis (D.) testudinaria var. emacerata Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 451, pl. 33, figs. 23, 24.

Loc. Cincinnati, Ohio; Spring Valley and Granger, Minnesota; Cape Girardeau, Missouri; St. Croix, Quebec, Canada.

Dalmanella testudinaria futilis (Sardeson).

Trenton (Ord.).

Orthis futilis Sardeson, American Geol., XIX, 1897, p. 104, pl. 5, figs. 25-27.

Loc. Near Granger and Wykoff, Minnesota.

Dalmanella testudinaria ignota (Sardeson).

Lorraine (Ord.).

Orthis ignota Sardeson, American Geol., XIX, 1897, p. 99, pl. 5, figs. 1-7.

Loc. Near Spring Valley, Minnesota.

Dalmanella testudinaria meeki (Miller).

Lorraine (Ord.).

Orthis emacerata Meek (non Hall), Pal. Ohio, I, 1873, p. 109, pl. 8, figs. 1, 2
Orthis meeki Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 20.—Sardeson, American Geol., XIX, 1897, p. 98, pl. 4, figs. 24-29.

Orthis jugosa James, The Paleontologist, 4, 1879, p. 31.

Dalmanella meeki Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 206, 224, pl. 5C, fig. 3.


Orthis (D.) testudinaria var. meeki Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 445, pl. 33, figs. 25-29.

Loc. Oxford, etc., Ohio; Spring Valley, Minnesota.

Dalmanella testudinaria multisecta (Meek).

Utica (Ord.).

Orthis emacerata var. multisecta (James MS.) Meek, Pal. Ohio, I, 1873, p. 112, pl. 8, fig. 3.—Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 22.

Orthis multisecta Sardeson, American Geol., XIX, 1897, p. 97, pl. 4, figs. 20-23.


Loc. Cincinnati, Ohio.

Dalmanella testudinaria porrecta (Sardeson).

Trenton (Ord.).

Orthis porrecta Sardeson, American Geol., XIX, 1897, p. 104, pl. 5, figs. 19-24.

Loc. Near Granger, Minnesota.
DELTHYRIS Dalman.  Genotype Delthyris elevata Dalman.

Dall, American Jour. Conch., VI, 1870, p. 116.—Hall and Clarke, Pal. New
York, VIII, Pt. II, 1893, pp. 9 and 16 under caption Septati (non p. 19).
Obs. Specimens of D. elevata examined by the writer show a distinct median
septum in the ventral valve.

Delthyris acanthoptera Conrad=Spirifer acanthopterus.
Delthyris acanithota Hall=Spirifer disjunctus.
Delthyris acuminata Conrad=Spirifer acuminatus.
Delthyris acuminata Hall (non Conrad)=D. mesicostalis.
Delthyris acutilirata Conrad=Platystrophia acutilirata.
Delthyris arenaria Vanuxem=Spirifer arenosus.
Delthyris arenosa Conrad=Spirifer arenosus.
Delthyris audacula Conrad=Spirifer audaculus.
Delthyris bialveata Conrad=Spirifer radiatus.
Delthyris biloba Conrad= bilobites varius.
Delthyris brachynota Hall=Platystrophia biformata.
Delthyris chemungensis Conrad=Spirifer disjunctus.
Delthyris congesta Hall=Spirifer granulosus.

Delthyris consobrina (d’Orbigny). Hamilton (Dev.),

Delthyris ziczac Hall (non Roemer), Geol. New York; Rep. Fourth Dist., 1843,
p. 200, fig. 5.
Spirifer consobrina d’Orbigny, Prodrome Pal., I, 1850, p. 98.—Miller, N. Ameri-
can Geol. Pal., 1889, p. 372.
Spirifer ziczac Hall, Pal. New York, IV, 1867, p. 222, pl. 35, figs. 15-23.—Second
Ann. Rep. New York State Geol., 1883, pl. 59, fig. 9; pl. 60, fig. 18.—Whit-
field, Annals New York Acad. Sci., V, 1891, p. 554, pl. 11, fig. 13.—Geol.
Ohio, VII, 1895, p. 448, pl. 7, fig. 13.
Spiriferina? ziczac Whitfield, Geol. Wisconsin, IV, 1882, p. 332, pl. 25, figs. 23, 24.
Spirifer consobrinus Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 34,
figs. 9, 18; pl. 37, figs. 9, 10.

Loc. Moscow, York, Darien, etc., New York; Columbus, Ohio; Milwaukee, Wis-
cconsin; Louisville, Kentucky.

Delthyris cuspidata Hall=Spirifer disjunctus.
Delthyris decemplicatus Hall=D. sulcata.
Delthyris disjuncta Hall=Spirifer disjunctus.
Delthyris duodenaria Hall=Spirifer duodenarius.
Delthyris duplicata Conrad=Spirifer duplicatus.
Delthyris euruteines Owen=Spirifer euruteines.
Delthyris expansa Owen=Pterotheca expansa, a Pteropod.
Delthyris fimbriata Conrad=Reticularia fimbriata.
Delthyris granulifera Hall=Spirifer granulosus.
Delthyris granulosa Conrad=Spirifer granulosus.
Delthyris inermis Hall=Spirifer disjunctus.
Delthyris laevis Hall=Reticularia laevis.
Delthyris lynx Hall=Platystrophia lynx and biformata.
Delthyris macronota Hall=Spirifer macronotus.
Delthyris macropleura Conrad = Spirifer macropleura.
Delthyris medialis Hall = Spirifer audaculus.

Delthyris mesicostalis Hall. Ithaca and Chemung (Dev.).
Delthyris mesacostalis Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 269, fig. 9.
Delthyris acuminata Hall (non Conrad), Ibidem, 1843, p. 270, fig. 5.
Spirifer mesacostalis Hall, Second Ann. Rep. New York State Geol., 1883, pl. 59, figs. 32-34.
Spirifer mesacostalis var. acuminata Hall, Ibidem, 1883, figs. 27-31.
Loc. Ithaca, Philipsburg, Olean, etc., New York.

Delthyris mesastralis Hall = Spirifer mesistrialis.
Delthyris mucronata Conrad = Spirifer pennatus.
Delthyris niagarensis Conrad = Spirifer niagaraensis.

Delthyris perlamellosa (Hall). Lower Helderberg (Dev.).
Delthyris macropleura Rogers (non Conrad), Geol. Pennsylvania, II, Pt. II, 1858, p. 825, fig. 643.
Spirifer perlamellosa Keyes, Geol. Survey Missouri, V, 1895, p. 77.
Loc. Schoharie, Carlisle, etc., New York; Cumberland, Maryland; Pennsylvania; Square Lake, Maine; Perry County, Missouri; Decatur County, Tennessee.

Delthyris perlatus Conrad = Spirifer disjunctus.
Delthyris prolata Vanuxem = Spirifer disjunctus.
Delthyris prora Conrad = Spirifer acuminatus.
Delthyris radiatus Hall = Spirifer radiatus.

Delthyris raricosta Conrad. Upper Helderberg (Dev.).
Delthyris undulatus Vanuxem, Geol. New York; Rep. Third Dist., 1842, p. 132, fig. 3.
Loc. Schoharie, Caledonia, etc., New York; Columbus, Ohio; Falls of Ohio; Eureka district, Nevada; Port Colborne, Ontario; Square Lake, Maine; Grand Greve, Gaspé.
Delthyris rugatina Conrad = D. sulcata.

**Delthyris(?) rugicosta** (Hall).


**Delothyris sculptilis** Hall.

Spirifer sculptilis? Billings, Canadian Jour., VI, 1861, p. 262, fig. 79.
Spirifer sculptilis Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 37, fig. 8.

*Loc.* Ludlowville, York, etc., New York; Monroe County, Pennsylvania; Boscawen, Ontario; Falls of Ohio.

**Delothyris sinuatus** Hall = Bilobites bilobus.

**Delothyris staminea** Hall = Spirifer crispus.

**Delothyris sulcata** Hisinger.

*Delothyris sulcata* Hisinger, Petref. Suecica, 1837, p. 73, pl. 21, fig. 8.


*Obs.* Davidson regards this species as synonymous with D. elevata Dalman, 1828.

**Delothyris undulatus** Vanuxem = D. raricosta.

**Delothyris varica** Conrad = Bilobites varius.

**Delothyris ziczac** Hall = D. consobrina.

**DERBYA** Waagen.

Genotype Derbya regularis Waagen.


**Derbya affinis** Hall and Clarke.


*Loc.* Near Kansas City, Missouri.

**Derbya bennetti** Hall and Clarke.


*Loc.* Near Kansas City, Missouri.

**Derbya biloba** Hall.

*Streptorhynchus* biloba Hall, Second Ann. Rep. New York State Geol., 1883, pl. 41, figs. 4, 5.
*Derbya biloba* Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 350, pl. 11, figs. 4, 5.

*Loc.* Winterset, Iowa.
Derbya broadheadi Hall and Clarke. Upper Carboniferous.
Loc. Near Kansas City, Missouri.

Derbya correanus (Derby). Upper Carboniferous.
Streptorhyncus correanus Derby, Bull. Cornell Univ., I, 1874, p. 32, pl. 6, fig. 11; pl. 7, figs. 1-4, 8, 10, 11-14, 17.—Hall, Second Ann. Rep. New York State Geol., 1883, pl. 41, figs. 18-22.
Derbya correana Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 262, pl. 11, figs. 18-22; pl. 20, figs. 10, 11.
Loc. Itaituba, Brazil.

Derbya (?) costatula Hall and Clarke. Kaskaskia (L. Carb.).
Loc. Crittenden County, Kentucky.

Derbya crassa (Meek and Hayden). Upper Carboniferous.
Orthis arachnoïdes Roemer (non Phillips), Kreidebildung Texas, 1852, p. 89, pl. 11, fig. 9.—Hall, Mexican Bound. Survey, 1857, pl. 20, fig. 3.
Orthis richmondia McChesney, Descriptions New Pal. Foss., 1860, p. 32;—Ibidem, 1865, pl. 1, fig. 5.

Hemipronites crassus Meek and Hayden, Pal. Upper Missouri, Smithsonian Cont. Knowl., XIV, 172, 1864, p. 26, pl. 1, fig. 7.—Meek, Final Rep. U. S. Geol. Survey Nebraska, 1872, p. 174, pl. 5, fig. 10; pl. 8, fig. 1.—Meek and Worthen, Geol. Survey Illinois, V, 1873, p. 570, pl. 25, fig. 12.—Herrick, Bull. Denison Univ., II, 1887, p. 50, pl. 2, fig. 19.
Orthis crenistria Geiutz (non Phillips), Carbon u. Dyas in Nebraska, 1866, p. 46, pl. 3, figs. 20, 21.

Hemipronites lasallensis McChesney, Trans. Chicago Acad. Sci., I, 1868, p. 28, pl. 1, fig. 6.
Hemipronites richmondia McChesney, Trans. Chicago Acad. Sci., I, 1868, p. 32, pl. 1, fig. 5.

Hemipronites crenistria White, Wheeler's Expl. Survey west 100 Merid., IV, 1877, p. 124, pl. 10, fig. 9.

Streptorhyncus crassus Whitfield, Annals New York Acad. Sci., V, 1891, p. 580, pl. 13, figs. 11, 12;—Geol. Ohio, VII, 1893, p. 468, pl. 9, figs. 11, 12.
Loc. Leavenworth, Kansas; Nebraska City, Nebraska; Illinois; Missouri; Iowa; Ohio; Arkansas; Utah; Nevada; northern New Mexico; San Saba Valley, Texas.
Bull. 87—14
**Derbya cymbula** Hall and Clarke. 
Upper Carboniferous. 
*Loc.* Near Kansas City, Missouri.

**Derbya kaskaskiensis** (McChesney). 
Kaskaskia (L. Carb.). 
*Derbya kaskaskiensis* Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 11B, fig. 6. 

**Derbya keokuk** Hall. 
Knobstone-Keokuk (L. Carb.). 
*Orthis keokuk* Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 640, pl. 19, fig. 5. 
*Keyes,* Geol. Survey Missouri, V, 1895, p. 63. 
*Loc.* Keokuk, Iowa; Warsaw and Nauvoo, Illinois; New Providence, Indiana; Clark County, Missouri; Nevada.

**Derbya pratteni** (McChesney). 
Upper Carboniferous. 
*Loc.* Charbonier, Missouri.

**Derbya robusta** (Hall). 
Upper Carboniferous. 
*Orthis umbraculatum* Owen (non Schlothe.), Geol. Survey Wisconsin, Iowa, Minnesota, 1852, pl. 5, fig. 11 (see specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17945). 
*Orthis robusta* Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 743, pl. 28, fig. 5. 

**Derbya ruginosa** Hall and Clarke. 
Keokuk (L. Carb.). 

**Dicellomus** Hall = Obolella. 
**Dicellomus crassa** Hall = Obolella crassa. 
**Dicellomus polita** Hall = Obolella polita. 
**Dicelosia** King = Triplceia. 
**Dicraniscus** Meek = Triplceia ortoni. 

**DICTYONELLA** Hall. 
Genotype *Rhynchonella? reticulata* Hall. 
Dictyonella anticostiensis (Billings). Anticosti (Sil.).

Dictyonella concinna Hall. ?Niagara (Sil.).

Dictyonella corallifera Hall. Niagara (Sil.).

Dictyonella gibbosa Hall. Niagara (Sil.).

Dictyonella reticulata Hall. Niagara (Sil.).

DIELASMA King. Genotype Terebratulites elongatus Schlotheim.

Dielasma bovidens (Morton). Upper Carboniferous.
Dielasma bovidens (Morton)—Continued.

Terebratula (Dielasma) bovidens White, Ibidem, Final Rep., IV, 1875, p. 144, pl. 11, fig. 10.
Dielasma bovidens Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 295, 296, fig. 213; pl. 81, figs. 29-35.
Loc. Putnam Hill, Ohio; Indiana; Illinois; Missouri; Iowa; Nebraska; Arkansas; New Mexico; Eureka district, Nevada; Guadalupe Mountains, Texas.

Dielasma burlingtonense White. Kinderhook (L. Carb.).

Terebratula (Dielasma) burlingtonensis White, Wheeler’s Expl. Survey west 100 Merid., IV; 1875, p. 93.
Dielasma burlingtonensis Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 296, pl. 81, figs. 9-11.
Loc. Burlington, Iowa; Mountain Spring, Nevada.

Dielasma calvini (Hall and Whitfield). Chemung (Dev.).

Cryptonella calvini Hall and Whitfield, Ibidem, 1873, p. 239.
Dielasma calvini Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 296, pl. 80, figs. 20-22.
Loc. Hackberry Grove, Iowa; Mackenzie and Peace rivers, Canada.

Dielasma formosum Hall. Warsaw (L. Carb.).

Loc. Bloomington and Spergen Hill, Indiana; Alton and Warsaw, Illinois; Caldwell County, Kentucky.

Dielasma gorbyi (Miller). Keokuk (L. Carb.).

Loc. Edwardsville and Crawfordsville, Indiana.

Dielasma hochstetteri (Toula). Upper Carboniferous.

Terebratula hochetetteri Toula, Sitzb. der k. k. Akad. der Wissen. zu Wien, LIX, 1869, p. 1, pl. 1, fig. 1.—Derby, Bull. Cornell Univ., I, 1874, p. 63.
Loc. Near Cochabamba, Bolivia.
Obs. Probably synonymous with D. bovidens (Morton).

Dielasma itaitubaense (Derby). Upper Carboniferous.

Terebratula itaitubensis Derby, Bull. Cornell Univ., I, 1874, p. 1, pl. 2, figs. 1, 3, 8, 16; pl. 3, fig. 24; pl. 6, fig. 15.
Loc. Beach at Itaituba, Brazil; Belgium.
Dielasma obovatum Hall and Clarke. | ?Upper Carboniferous.
Dielasma obovata Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 81, figs. 38-40.
Loc. Kentucky.

Dielasma occidentale (Miller). | Chouteau (L. Carb.).
Loc. Sodalia, Missouri.

Dielasma (?) rowleyi (Worthen). | Burlington (L. Carb.).
Dierasbrutax rowleyi Worthen, Bull. Illinois State Mus. Nat. Hist., 2, 1884, p. 23;—Geol. Survey Illinois, VIII, 1890, p. 102, pl. 11, fig. 6.—Keyes, Geol. Survey Missouri, V, 1895, p. 103, pl. 40, fig. 15.
Dielasma rowleyi Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 296, pl. 81, figs. 27, 28.
Loc. Pike County, Missouri.

Dielasma sacculus (Martin). | Upper Carboniferous.
Conchyliolithus anomitos sacculus Martin, Petrel'. Derbesiana, 1809 tab 46 figs. 1, 2.
Terebratula sacculus Dawson, Acadian Geol., 1855, p. 219, fig. 27.—Davidson, Quart. Jour. Geol. Soc. London, XIX, 1863, p. 169, pl. 9, figs. 1-3.—Dawson, Acadian Geol., 3d ed., 1878, p. 289, fig. 87.
Loc. Europe; Windsor, Nova Scotia.

Dielasma shumardianum (Miller). | Kaskaskia (L. Carb.).
Loc. St. Genevieve County, Missouri; Chester, Illinois; near Virginia City, Montana.
Obs. Regarded by Meek and White as probably synonymous with D. bovidens (Morton).

Dielasma turgidum (Hall). | Warsaw and St. Louis (L. Carb.).
Loc. Bloomington and Spergen Hill, Indiana; Crittenden County, Kentucky; Maxville and Newtonville, Ohio; Alton and Warsaw, Illinois; Pella, Iowa; Boonville, Missouri.

DIGNOMIA Hall. | Genotype Lingula alveata Hall.

Dignomia alveata Hall. | Hamilton (Dev.).
Dignomia alveata Hall—Continued.


Loc.—Canandaigua Lake, etc., New York.

**DINOBOLUS Hall.**

*Genotype Obolus conradi Hall.*


Dinobolus canadensis (Billings).

Dinobolus canadensis Billings, Canadian Nat. Geol., III, 1858, p. 441, fig. 20–23 (non fig. 19 = D. magnificus);—Geol. Survey Canada; Rep. Prog. for 1857, 1858, p. 189, figs. 20–23 (non fig. 19);—Geol. Canada, 1863, p. 142, figs. 75.

Obolellina canadensis Billings, Canadian Nat. Geol., VI, 1871, p. 222;—Ibidem, 1872, p. 326, fig. 15;—fig. 6, p. 329.


Loc. Pauquette Rapids, etc., Canada.

Dinobolus conradi Hall.


Obolus (Trimerella?) conradi Meeck and Worthen, Geol. Survey Illinois, III, 1868, p. 351, pl. 5, fig. 7.

Trimerella conradi Dall, American Jour. Conch., VII, 1871, p. 83.


Loc. Port Byron, Illinois; Leclaire, Iowa; Racine and Grafton, Wisconsin; Crawford, Ohio; England; Gotland.

Dinobolus magnificus (Billings).

Dinobolus magnificus Billings, (partim), Geol. Surv. Canada, Rep. Prog. for 1857, 1858, p. 189, fig. 19 (non 20–23);—Canadian Nat. Geol., III, 1858, p. 441, fig. 19 (non figs. 20–23 = D. canadensis).

Obolellina magnificus Billings, Ibidem, n. ser., VI, 1872, p. 329, fig. 7.


Loc. Pauquette Rapids, etc., Canada.

Dinobolus (?) parvus Whitfield.


Loc. Whitewater, Wisconsin; Wykoff, Minnesota; Lake Winnipeg, Canada.
DINORTHIS Hall and Clarke. Genotype Orthis pectinella Emmons.


Dinorthis deflecta (Conrad.) Trenton (Ord.).


Leptana deflecta Hall, Pal. New York, I, 1847, p. 113, pl. 31B, fig. 5.

Leptana recta Hall, Ibidem, 1847, p. 113, pl. 31B, fig. 6.


Streptorhynchus deflectum Miller, N. American Geol. and Pal., 1889, p. 378.

Pliesiomys deflecta Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 197, 222, pl. 5A, figs. 28–34.

Pliesiomys recta Hall and Clarke, Ibidem, 1892, pp. 197, 222.

Pliesiomys loricula Hall and Clarke, Ibidem, 1892, pp. 197, 341, pl. 5A, figs. 31–34.


Loc. Mineral Point, Beloit, Janesville, Wisconsin; Dixon, Illinois; Minneapolis, St. Paul, etc., Minnesota; McGregor, Iowa; central Tennessee; Highbridge, Kentucky.

Dinorthis fontinalis (White). Calciferous (Ord.).

Strophomena fontinalis White, Wheeler's Expl. and Survey west 100th Merid., IV, 1875, p. 54, pl. 3, fig. 4.—Prelim. Rep., p. 10, 1874.

Loc. Fish Spring, House Range, Utah.

Obs. Related to D. deflecta (Conrad).

Dinorthis iphigenia (Billings). Trenton (Ord.).


Loc. Ottawa, Canada.

Dinorthis meedsi Winchell and Schuchert. Trenton (Ord.).

Orthis meedsi Winchell and Schuchert, American Geol., IX, April 1, 1892, p. 289.


Orthis (Dinorthis) meedsi Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 427, pl. 32, figs. 39–42.

Loc. Cannon Falls, Kenyon, Preston, etc., Minnesota; Decorah and McGregor, Iowa; Neenah and Oshkosh, Wisconsin.

Dinorthis meedsi germana Winchell and Schuchert. Trenton (Ord.).

Orthis meedsi var. germana Winchell and Schuchert, American Geol., IX, 1892, p. 290.

Orthis (D.) meedsi var. germana Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 428, pl. 32, figs. 43–45.

Loc. Cannon Falls, Kenyon, and Fountain, Minnesota.

Dinorthis pectinella (Emmons). Trenton (Ord.).

Orthis pectinella Emmons, Geol. New York; Rep. Second Dist., 1842, p. 394, fig. 2.—Hall, Pal. New York, I, 1847, p. 123, pl. 32, fig. 10.—Billings6, Canadian Nat. Geol., I, 1856, p. 205, fig. 5.—Rogers, Geol. Pennsylvania, II, Pt. II,
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Dinorthis pectinella (Emmons)—Continued.
1858, p. 818, fig. 602.—Billings, Geol. Canada, 1863, p. 165, fig. 147.—Hall,
Second Ann Rep. New York State Geol., 1883, pl. 34, figs. 39, 40.
Orthis pectinella var. semiovialis Hall, Pal. New York, I, 1847, p. 124, pl. 32, fig. 11.—Miller, N. American Geol. Pal., 1889, p. 359.
1880, p. 67.
Dinorthis pectinella Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 195, 222,
228, pl. 5, figs. 27-33
Orthis (Dinorthis) pectinella Winchell and Schuchert, Minnesota Geol. Survey,
III, 1893, p. 424, pl. 32, figs. 31-34.—Whiteaves, Pal. Foss., III, Pt. III, 1897,
p. 175.
Loc. Middleville, Trenton Falls, etc., New York; Pennsylvania; Mercer County,
Kentucky; Ontario, Canada; Decorah, Iowa; St. Paul, Minneapolis, and
Cannon Falls, Minnesota; Lake Winnipeg, Canada.

Dinorthis pectinella sweeneyi N. H. Winchell.
1881, p. 117.
Dinorthis sweeneyi Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 196,
222, 228, pl. 5, figs. 34-36.
Orthis (Dinorthis) pectinella var. sweeneyi Winchell and Schuchert, Minnesota
Geol. Survey, III, 1893, p. 426, pl. 32, figs. 35-38.

Dinorthis platys (Billings).
*Chazy (Ord.)*
Orthis platys Billings, Canadian Nat. Geol., IV, 1859, p. 438, fig. 17.—Geol.
Canada, 1863, p. 129, fig. 54.—Hall and Clarke, Pal. New York, VIII, Pt. I,
1892, p. 218.
Loc. Island of Montreal, Canada.

Dinorthis porcata (McCoy).
Trenton and Lorraine (Ord.).
Orthis porcata McCoy, Silurian Foss. of Ireland, 1846, p. 32, pl. 3, fig. 14.—Billings,
Orthis anticostiensis Shaler, Fossil Brachiopoda of the Ohio Valley, 1887, p. 19,
pl. 6.
Plesionyx porcata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 197, 222,
pl. 5A, figs. 20, 21.
Loc. Ireland; Ottawa, Canada; Anticosti.

Dinorthis praevita Winchell and Schuchert.
Lorraine (Ord.).
Orthis praevita Winchell and Schuchert, American Geol., IX, April 1, 1892, p. 293.
Orthis petra Sarsden, Bull. Minnesota Acad. Nat. Sci., III, April 9, 1892, p. 332,
pl. 5, figs. 18-21.
Orthis (Dinorthis) praevita Winchell and Schuchert, Minnesota Geol. Survey,
III, 1893, p. 431, pl. 32, figs. 51-57.—Whiteaves, Pal. Foss., III, Pt. III,
1897, p. 176.
Loc. Spring Valley, Minnesota; Wilmington, Illinois; Lake Winnipeg, Canada.

Dinorthis retrorsa (Salter).
Trenton and Lorraine (Ord.).
Orthis retrorsa Salter, Mem. Geol. Survey Great Britain, II, 1858, p. 373, pl. 27,
figs. 3, 4.—Billings, Pal. Fossils, I, 1862, p. 136, figs. 112, 113.—Meek, Pal.
Ohio, I, 1873, p. 92, pl. 11, fig. 7.—Miller, Cincinnati Quart. Jour. Sci., II,
1875, p. 37.
Orthis carleyi Hall, Thirteenth Rep. New York State Cab. Nat. Hist., 1860, p. 120,
fig.in text;—Second Ann. Rep. New York State Geol., 1883, pl. 34, figs. 28, 29.
Dinorthis retrorsa (Salter)—Continued.
Plagiostomys retrorsa Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 197, 222, pl. 5A, figs. 14-16.
Loc. England; Oxford, etc., Ohio; Ottawa, Canada.

Dinorthis subquadrata (Hall).
Loc. Ohio Valley; Spring Valley, Minnesota; Wilmington, Illinois; Warren and Jefferson counties, Missouri; Latanners, Iowa; Iron Ridge, Wisconsin; Lake Winnipep, Canada; Anticosti.

Discina of authors (non Lamarck) = Orbiculoidea.
Discina acadica Hartt = Parmophorella acadica, a gastropod.
Discina alleghaniensis Hall = Orbiculoidea alleghaniensis.
Discina ampla Hall = Orbiculoidea ampla.
Discina capax White = Orbiculoidea capax.
Discina capuliformis McChesney = Orbiculoidea capuliformis.
Discina circe Billings = Orbiculoidea lamelloosa.
Discina clara Spencer = Schizotreta tenuilamellata.
Discina concordensis Sardeson = Schizotreta pelopaea.
Discina connata Walcott = Lingulodiscina connata.
Discina conradi Hall = Orbiculoidea conradi.
Discina convexa Shumard = Orbiculoidea convexa.
Discina discus Hall = Orbiculoidea discus.
Discina doria Hall = Orbiculoidea doria.
Discina elmira Hall = Orbiculoidea elmira.
Discina forbesi Nicholson = Schizotreta tenuilamellata.
Discina gallaheri Winchell = Orbiculoidea gallaheri.
Discina grandis Vanuxem = Ræmerella grandis.
Discina grandis Hall = Orbiculoidea ampla.
Discina humilis Hall = Orbiculoidea humilis.

?Discina inutilis Hall.
Loc. Masonania, Wisconsin.
Obs. Undeterminable.

Discina illinoensis Miller and Gurley = Orbiculoidea illinoensis.
Discina jervensis Barret = Orbiculoidea jervensis.
Discina keokuk Gurley = Orbiculoidea keokuk.
Discina lodensis Hall = Orbiculoidea lodiensis.
Discina magnifica Herrick = Orbiculoidea magnifica.
Discina manhattensis Meek and Hayden = Orbiculoidea manhattensis.
Discina marginalis Whitfield = Orbiculoidea marginalis.
Discina media Hall = Orbiculoidea lodiensis media.
Discina meekana Whitfield = Orbiculoidea missouriensis.
Discina microscopica Shumard = Acrotreta microscopica.
Discina minuta Hall = Orbiculoidea minuta.
Discina missouriensis Shumard = Orbiculoidea missouriensis.
Discina munda Miller and Gurley = Orbiculoidea munda.
Discina neglecta Hall = Orbiculoidea neglecta.
Discina newberryi Hall = Lingulodiscina newberryi.
Discina nitida Meek and Worthen = Orbiculoidea missouriensis.
Discina nitida = Orbiculoidea nitida.
Discina patellaris Winchell = Orbiculoidea patellaris.
Discina pelopea Billings = Schizotreta pelopea.

**Discina (?) pileolus** Whiteaves.  

? Lower Cretaceous.
Discina pileolus Whiteaves, Cont. Canadian Pal., I, 1889, p. 159, pl. 21, fig. 3.
Loc. Rink Rapids on Lewis River, British America.
Obs. “Professor Hyatt thinks that the fossils from this locality are Jurassic” (Stanton).

Discina pleurites Meek = Lingulodiscina pleurites.
Discina randalli Hall = Orbiculoidea randalli.
Discina saffordi Winchell = Orbiculoidea saffordi.
Discina sampsoni Miller = Orbiculoidea sampsoni.

**Discina (?) semipolita** Whiteaves.  

Cretaceous.
Discina semipolita Whiteaves, Mesozoic Fossils, I, Geol. Survey Canada, 1884, p. 252, pl. 33, fig. 9.
Loc. Queen Charlotte Island.

Discina seneca Hall = Orbiculoidea seneca.
Discina solitaria Ringueberg = Schizotreta tenuilamellata.

**Discina sublamellosa** Ulrich.  

Lorraine (Ord.).
Loc. Covington, Kentucky.
Obs. Probably not a brachiopod.

Discina subtrigonalis McChesney = Orbiculoidea subtrigonalis.
Discina tenuilamellata var. subplana Hall = Orbiculoidea subplana.
Discina tenuilineata Meek and Hayden = Orbiculoidea tenuilineata.
Discina tenuistriata Ulrich = Orbiculoidea tenuistriata.
Discina trigonalis McChesney = Orbiculoidea subtrigonalis.
Discina truncata Hall = Schizobolus concentricus.
Discina truncata Emmons = Orbiculoidea lamellosa.
Discina tullia Hall = Orbiculoidea tullia.
Discina utahensis Meek = Orbiculoidea utahensis.
Discina(?) vancouverensis Whiteaves.
Discina vancouverensis Whiteaves, Mesozoic Fossils, I, Geol. Survey Canada, 1879, p. 177, pl. 20, fig. 6.
Loc. Admiralty Island.

Discina vanuxemi Hall = Orbiculoidea vanuxemi.
Discina varsoviensis Worthen = Orbiculoidea varsaviensis.
Discinella Hall = Operculum of Pteropod.

DISCINISCA Dall. Genotype Discina lamellosa Broderip.

Discinisca lugubris (Conrad). Miocene and Pliocene.
Orbicula lugubris Conrad, Fossils Medial Tertiary For. U. S., 1845, p. 75, pl. 43, fig. 2.—Tuomey and Holmes, Foss. South Carolina, 1855, p. 17, pl. 5, fig. 1.—Dall, Republication of Conrad's Foss. Medial Tert. For. U. S., 1893, p. 101, pl. 43, fig. 2.
Loc. St. Marys County, Maryland; Petersburg, Virginia; Pee Dee River, South Carolina; Atlantic City, Shiloh, and Bridgeton, New Jersey.
Obs. Referred to Discinisca on authority of Dr. W. H. Dall.

Discinisca multilineata (Conrad). Miocene.
Orbicula multilineata Conrad, Fossils Medial Tertiary For. U. S., 1845, p. 75, pl. 43, fig. 3.—Tuomey and Holmes, Foss. South Carolina, 1855, p. 18, pl. 5, fig. 2.—Dall, Republication of Conrad's Foss. Medial Tert. For. U. S., 1893, p. 101, pl. 43, fig. 3.
Loc. City Point, Virginia; Pee Dee River, South Carolina.
Obs. Probably a less worn variety of D. lugubris (Dall).


Discinopsis gulielmi Matthew. Middle Cambrian.

EATONIA Hall. Genotype Atrypa peculiaris Conrad.

Eatonia coulteri Miller and Gurley. Oriskany (Dev.).
Loc. Jackson County, Illinois.

Eatonia eminens Hall. Lower Helderberg (Dev.).
Loc. Decatur County, Tennessee.
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**Eatonia medialis** (Vanuxem). Lower Helderberg (Dev.).
Atrypa medialis Vanuxem, Geol. New York; Rep. Third Dist., 1842, p. 120, fig. 4.

Loc. Schoharie, Carlisle, Catskill, etc., New York; Square Lake, Maine.

**Eatonia peculiaris** (Conrad). Lower Helderberg and Oriskany (Dev.).


Eatonia peculiaris Keyes, Geol. Survey Missouri, V, 1895, p. 104.
Loc. Schoharie, etc., New York; Pennsylvania; Cumberland, Maryland; Jackson and Perry counties, Missouri; Gaspé.

**Eatonia sinuata** Hall. Lower Helderberg (Dev.).
Loc. Albany County, New York.

**Eatonia singularis** (Vanuxem). Lower Helderberg (Dev.).
Atrypa singularis Vanuxem, Geol. New York; Rep. Third Dist., 1842, p. 120, fig. 3.
Loc. Schoharie, etc., New York.

**Eatonia sinuata** Hall. Lower Helderberg (Dev.).

Loc. Cumberland, Maryland.

**Eatonia (? ) variabilis** Whiteaves. Hamilton (Dev.).
Eatonia variabilis Whiteaves, Cont. to Canadian Pal., I, 1891, p. 233, pl. 29, figs. 6-9.
Loc. Hay River, Canada.

**Eatonia whitfieldi** Hall. Lower Helderberg (Dev.).
Loc. Cumberland, Maryland.

**EICHWALDIA** Billings. Genotype Eichwaldia subtrigonalis Billings.

Eichwaldia of other authors = Dictyonella.
Eichwaldia subtrigonalis Billings.
Loc. Panquette Rapids, Canada.

ELKANIA Ford. Genotype Obolella desiderata Billings.
Billingsia Ford (non de Koninck, 1876), American Jour. Sci., 3d ser., XXXI, 1885, p. 466.

Elkania ambigua (Walcott).
Loc. Eureka district, Nevada.

Elkania desiderata (Billings).
Billingsia desiderata Ford, American Jour. Sci., 3d ser., XXXI, 1886, p. 466, figs. 1, 2.
Loc. Point Levis, Canada.

ENTELETES Fischer de Waldheim. Genotype Orthis lamarcki Fisch.

Enteletes andii (d'Orbigny). Upper Carboniferous.
Terebratula andii d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 45, pl. 3, figs. 14, 15.
Orthis andii Salter, Quart. Jour. Geol. Soc. London, XVII, 1861, p. 64, pl. 4, fig. 3.
Loc. Yarbiehambi and Lake Titicaca, Bolivia; Santa Cruz.

Enteletes gaudryi (d'Orbigny). Upper Carboniferous.
Terebratula gaudryi d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 45.
Terebratula autissiensiis d'Orbigny, Ibidem, 1842, pl. 3, fig. 16 (non pl. 2).
Loc. Yarbiehambi, Bolivia.

Enteletes hemiplicata Hall. Upper Carboniferous.
Spirifer hemiplicata Hall, Stansbury's Exped. Great Salt Lake, 1852, p. 409, pl. 4, fig. 3.
Enteletes hemiplicata Hall—Continued.
Rhynchonella angulata Geinitz (non Linne), Carbon u. Dyas Nebraska, 1866, p. 37, pl. 3, figs. 1-4.
Syntrielasma hemiplicata Meek and Worton, Geol. Survey Illinois, II, 1866, p. 323, fig. 36; p. 324, fig. 37.—Meek, Final Rep. U. S. Geol. Survey Nebraska, 1872, p. 177, pl. 6, fig. 1; pl. 8, fig. 12.—Meek and Worton, Geol. Survey Illinois, V, 1873, p. 571, pl. 26, fig. 20.—Kayser, Richthofens China, IV, 1883, p. 179, pl. 24, figs. 2, 3.—White, Thirteenth Rep. State Geol. Indiana, 1884, p. 131, pl. 26, figs. 15-18.—Keyes, Geol. Survey Missouri, V, p. 76, pl. 39, fig. 8.
Loc. Weston, Platte County, Missouri; Vandalia and Alta, Illinois; Steuett, Iowa; Kansas City, Missouri; Nebraska City, Nebraska; Lo Ping, China.

EUMETRIA Hall.
Genotype Retzia verneuiliana Hall= Terebratula marcyi Shumard.

Eumetria(?) altirostris (White). Kinderhook (L. Carb.).
Loc. Burlington, Iowa.

Eumetria marcyi (Shumard). St. Louis and Kaskaskia (L. Carb.).
Terebratula serpentina? Owen (non de Koninck), Geol. Survey Wisconsin, Iowa, Minnesota, 1852, pl. 3 A, fig. 13 (see specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17955).
Retzia verneuiliana Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 657, pl. 23, fig. 1;—Trans. Albany Institute, IV, 1858, p. 9.
Retzia vera Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 704, pl. 27, fig. 3.
Retzia radialis Walcott (non Phillips), Mon. U. S. Geol. Survey, VII, 1884, p. 220, pl. 7, figs. 5, 5 a (5 b?).
Eumetria verneuiliana and vera Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 117, figs. 104, 105, pl. 50, figs. 13-26, 34, 37; pl. 83, figs. 26, 27.
Loc. Washington and Crawford counties, Arkansas; Floyd County and elsewhere in Indiana; Alton, Illinois; Greene County, Missouri; Iowa; Cumberland Mountain, Tennessee.
Obs. Hall and Clarke (1893), in treating of the American species of Eumetria (E. vera and var. costata, and E. verneuiliana), say they "are, perhaps, all representatives of the same species." The writer regards them as one species, varying in different localities in size and number of striations. Owen was the first to observe this form and identified it provisionally with T. serpentina de Koninck. Shumard, however, believed it to be distinct from that species, and gave the name T. marcyi four years prior to that of Hall.
**Eumetria marcyi costata Hall.** Kaskaskia (L. Carb.).
Retzia vera var. costata Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 704, pl. 27, fig. 3.
Eumetria vera var. costata Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 51, figs. 27-33.
*Loc.* Chester, Illinois; Crittenden County, Kentucky.

**Eumetria vera Hall =** E. marcyi.
Eumetria verneuiliana Hall = E. marcyi.

**Eumetria woosteri (White).**
*Loc.* Near Greeley, Colorado.
*Obs.* Closely related with E. marcyi of the Lower Carboniferous.

**EUNELLA Hall and Clarke.** Genotype Terebratula sullivanti Hall.

**Eunella harmonia Hall.** Corniferous (Dev.).
Eunella harmonia Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 290, pl. 80, figs. 33-35.
*Loc.* Falls of Ohio; Ontario, Canada.

**Eunella linckleni Hall.** Marcellus and Hamilton (Dev.).
Terebratula linckleni var. Hall, Ibidem, 1867, p. 418, pl. 60, figs. 32-37.

**Eunella simulator Hall.** Hamilton (Dev.).
Terebratula simulator Hall, Pal. New York, IV, 1867, p. 391, pl. 60, figs. 69, 70.
Eunella simulator Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 290, pl. 80, fig. 27.
*Loc.* Thedford, Ontario.

**Eunella sullivanti Hall.** Corniferous (Dev.).
Terebratula sullivanti Hall, Pal. New York, IV, 1867, p. 387, pl. 60, figs. 5-10, 68.—Whiteaves, Cout. Canadian Pal., I, 1892, p. 291, pl. 37, figs. 9, 10.
*Loc.* Columbus and Sandusky, Ohio; near Cayuga, Ontario, and Lakes Manitoba, and Winnipegosis, Canada.

**GLASSIA Davidson.** Genotype Atrypa obovata Sowerby.
Glassia romingeri Hall and Clarke. Trenton (Ord.).
Loc. Drift near Ann Arbor, Michigan.

Glassia schucherti Ulrich = Catazyga headi.


Glassia acuminata Hall and Clarke = Lingulepis acuminata.

Glossina crassa (Hall). Trenton (Ord.).
Lingula crassa Hall, Pal. New York, I, 1847, p. 98, pl. 30, fig. 8.
Loc. Middleville and Lake Champlain, New York.

Glossina cyane (Billings). Calciferous (Ord.).
Loc. Near Portland Creek, Newfoundland.

Glossina deflecta Winchell and Schuchert. Trenton and Lorraine (Ord.).
Lingula (Glossina) deflecta Winchell and Schuchert, American Geol., IX, 1892, p. 284;—Minnesota Geol. Survey, III, 1893, p. 348, pl. 29, figs. 15-18.
Loc. Near Fountain and Spring Valley, Minnesota.

Glossina dubia (d'Orbigny). Ordovician.
Lingula dubia d'Orbigny, Voyage dans l'Amérique Méridionale, 1842, p. 29, pl. 2, fig. 7.
Loc. Tacopaya, Bolivia.

Glossina flabellula Hall and Clarke. Waverly (L. Carib.).
Loc. Sciotoville, Ohio.

Glossina hurlbuti N. H. Winchell. Trenton (Ord.).
Lingula (Glossina) hurlbuti Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 347, pl. 29, figs. 13, 14.
Loc. Mantorville and near Spring Valley, Minnesota.

Glossina leana (Hall). Hamilton (Dev.).
Loc. Bristol, New York; Lone Mountain, Nevada.

Glossina nebraskensis (Meek). Upper Carboniferous.
Lingula scotica var. nebraskensis Meek, Final Rep. U. S. Geol. Survey Nebraska, 1872, p. 158, pl. 8, fig. 3.
Loc. Nebraska City, Nebraska.

Glossina perovata (Hall). Clinton (Sil.).
Lingula perovata Hall, Pal. New York, II, 1852, p. 55, pl. 20, fig. 3.
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**Glossina sedaliaensis (Miller).**


*Loc.* Sedalia, Missouri.

*Obs.* This species is probably the same as *G. waverlyensis*.

**Glossina spatiosa (Hall).**

Lingula spatiosa Hall, Pal. New York, III, 1859, p. 158, pl. 9, fig. 10.


**Glossina trentonensis (Conrad).**


*Loc.* Glen Falls, Trenton Falls, Middleville, New York; Wisconsin; Montreal and Ottawa, Canada; near Vacas, Bolivia.

**Glossina triangulata (Nettelroth).**

Lingula triangulata Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 34, pl. 26, fig. 1.

*Loc.* Falls of Ohio.

**Glossina waverlyensis (Herrick).**

Lingula waverlyensis Herrick, Bull. Denison Univ., IV, 1888, pp. 12, 18, pl. 3, fig. 1.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1893, p. 9, pl. 4K, fig. 7.

*Loc.* Berea and Newark, Ohio; Oil City, Pennsylvania.

*Obs.* See *G. sedaliaensis* (Miller).

**Goniocælia Hall = Pentagonia.**

**Goniocælia uniangulata Hall = Pentagonia unisulcata.**

**Gothlandia Hall = Trimerella.**

**Gypidia Dalman = Conchidium.**

**Gypidia unguiformis Ulrich = Conchidium unguiformis.**

**GYPIDULA Hall.**

Genotype Pentamerus occidentalis Hall.


**Gypidula comis (Owen).**

Middle Devonian.


Pentamerus (n. sp. ?) Owen, Ibidem, 1852, pl. 3A, fig. 11 (Ibidem, Cat., 17929).

Pentamerus occidentalis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 514, pl. 6, fig. 2 (non Pentamerus occidentalis Hall, 1852).

Pentamerus galeatiformis Meek and Worthen; Geol. Survey, Illinois, II, 1866, p. 325.


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Gypidula comis (Owen)—Continued.
Pentamerus comus Meek and Worthon, Geol. Survey Illinois, III, 1868, p. 428, pl. 13, fig. 6.—Whiteaves, Cont. Canadian Pal., I, 1892, p. 290.
Pentamerus (Gypidula) comis Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 159, pl. 3, figs. 4, 7; pl. 14, fig. 15; pl. 15, fig. 5.
Gypidula comis Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 247, fig. 177; pl. 73, figs. 15-24.
Loc. Independence and Davenport, Iowa; Rock Island, Illinois; Eureka district, Nevada; Lakes Manitoba and Winnipegosis, Canada.

Gypidula coppperi (Etheridge). Silurian.
Loc. Otley Island, lat. 81° 16'.

Gypidula galeata (Dalman). Lower Helderberg and Middle Devonian.
Pentamerus galeatus var. Whiteaves, Cont. to Canadian Pal., I, 1891, p. 234.
Sieberella galeatus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 246, fig. 175; pl. 72, figs. 7-13.
Loc. Europe; Albany and Schoharie counties, New York; Cumberland, Maryland; Pennsylvania; St. Blandine, New Brunswick; Mackenzie River, Canada.

Gypidula globulosa (Nettelroth). Niagara (Sil.).
Loc. Louisville, Kentucky.

Gypidula knotti (Nettelroth). Niagara (Sil.).
Pentamerus knotti Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 56, pl. 32, figs. 9-12.
Loc. Louisville, Kentucky.

Gypidula laeviuscula Hall. Middle Devonian.
Loc. Waterloo, Iowa.

Loc. White Pine mining district, Nevada.

Gypidula mundia Calvin. Middle Devonian.
Loc. Independence, Iowa.

Gypidula nucleus (Hall and Whitfield). ?Clinton (Sil.).
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Gypidula nucleus (Hall and Whitfield)—Continued.
Loc. Louisville, Kentucky.

Gypidula occidentalis Hall=G. comis.

Gypidula pseudogaleata (Hall).

Gypidula roemeri (Hall and Clarke).
Pentamerus roemerianus Roemer (not Dalman), Sil. Fanna west. Tennessee, 1860, p. 73, pi. 5, fig. 14.
Sieberella roemeri Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 247, pl. 72, fig. 6.
Loc. Decatur County, Tennessee.

Gypidula romingeri Hall and Clarke.
Pentamerus subglobosus Meek and Wortheu, Geol. Survey Illinois, III, 1868, p. 429, pi. 13, fig. 5.
Loc. Alpena, Michigan.

Gypidula subgloboista (Meek and Worthen).
Loc. Louisville, Kentucky.

HARTTINA Hall and Clarke. Genotype Centronella anna Hartt.

Harttina coutinhoana (Derby).
Waldheimia coutinhoana Derby, Bull. Cornell Univ., I, 1874, p. 3, pi. 3, fig. 22; pl. 8, fig. 6; pl. 9, figs. 1, 2.
Loc. Bomjardim, Brazil.

Harttina anna (Hartt).
Loc. Windsor, Nova Scotia.

Hallina Winchell and Schuchert=Zygospira.

HEBERTELLA Hall and Clarke. Genotype Orthis sinnata Hall.
Hebertella battis (Billings).  
*Calciferous (Ord.)*


*Loc.* Point Levis, Canada.

Hebertella bellirugosa (Conrad).  
*Trenton (Ord.)*


Hall, Pal. New York, I, 1847, p. 118, pl. 32, fig. 3.


Orthis (Hebertella?) bellirugosa Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 434, pl. 33, figs. 1-4.

*Loc.* Mineral Point, Janesville, Neenah, etc., Wisconsin; Minneapolis, St. Paul; Cannon Falls, etc., Minnesota; Decorah and McGregor, Iowa; Curdsville, Kentucky; Rutherford County, Tennessee.

Hebertella borealis (Billings).  
*Chazy-Trenton (Ord.)*


Orthis (Hebertella) borealis Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 433, fig. 33.

*Loc.* Canunawaga, St. Genevieve, Isle Bizard, and Cornwall, Canada; Frankfort, Kentucky; Nashville, Tennessee; Cannon Falls, etc., Minnesota; Wisconsin (Whitfield).

Hebertella daytonensis (Foerste).  
*Clinton (Sil.)*


Orthis (Hebertella) daytonensis Foerste, Geol. Ohio, VII, 1895, p. 575, pl. 25, figs. 13, 20, 21.

*Loc.* Dayton, Ohio.

Hebertella fausta (Foerste).  
*Clinton (Sil.)*

Orthis fausta Foerste, Bull. Denison Univ., I, 1885, p. 85, pl. 13, figs. 15, 16.


Orthis (Hebertella) fausta and var. squamosa Foerste, Geol. Ohio, VII, 1895, pp. 573, 574, pl. 23, figs. 15a-15d, 16a, 16b; pl. 37A, figs. 19a, 19b.

*Loc.* Dayton, Ohio.

Hebertella imperator (Billings).  
*Chazy (Ord.)*

Orthis imperator Billings, Canadian Nat. Geol., IV, 1859, p. 435, figs. 11-13;—Geol. Canada, 1863, p. 129, fig. 55.


*Loc.* Hawkesbury and Cornwall, Canada.

Hebertella insculpta Hall.  
*Lorraine (Ord.)*


Orthis bellirugosa Hall (non Conrad), Second Ann. Rep. New York State Geol., 1883, pl. 35, fig. 22.

Hebertella insculpta Hall—Continued.

Loc. Oxford, etc., Ohio; Richmond, Indiana; Wilmington, Illinois; Iron Ridge, Wisconsin; Lattners, Iowa.

Hebertella lonensis (Walcott).

Orthis lonensis Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 74, pl. 11, fig. 6.
Loc. Eureka district, Nevada.

Hebertella maria (Billings).

Hebertella sinuata or maria? Hall and Clarke, Pal. New York, VIII, Pt. 1, 1892, p. 222, pl. 5A, figs. 9, 10.
Loc. Anticosti; Colby, Kentucky.

Hebertella occidentalis Hall.

Orthis subjungata Hall, Pal. New York, I, 1847, p. 129, pl. 32C, fig. 1.
Orthis subjungata(?) Owen, Geol. Survey Wisconsin, Iowa, Minnesota, 1852, pl. 2B, figs. 4, 5 (see specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17885).
Hebertella occidentalis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 222, pl. 5A, figs. 11, 12.
Loc. Cincinnati, Oxford, etc., Ohio; Richmond, Indiana; Savanna, Illinois; Cape Girardeau, Missouri; Delafield, Wisconsin; Silver City, New Mexico.

Hebertella occidentalis sinuata Hall.

Orthis occidentalis var. sinuata Meek, Pal. Ohio, I, 1873, p. 98.
Loc. Cincinnati, Ohio.

Hebertella scovilli (Miller).

Loc. Lebanon, Ohio.

Hemipronites americanus Whitfield = Clitambonites diversus.
Hemipronites apicalis Whitfield = Polytachia apicalis.
Hemipronites crassus McChesney = Derbya crassa.
Hemipronites crenistria White (non Meek or Phillips) = Derbya crassa.
Hemipronites crenistria Meek, and Herrick = Orthothetes crenistria.
Hemipronites propinquus Meek and Worthen = Orthothetes subplanus.

HEMITHYRIS d'Orbigny. Genotype Rhynchonella psittacea Gmel.
Hemithyris psittacea (Chemnitz). Pliocene and Recent.
Anomia rostrum psittacea Chemnitz, Neues syst. Conch.-Cab., VIII, 1785, pl. 78, fig. 713.
Loc. Fossil. Gulf of St. Lawrence, Canada.

HETERORTHIS Hall and Clarke.
Genotype Orthis clytie Hall.

Heterorthis clytie Hall.


Loc. Frankfort and Paris, Kentucky.

HINDPELLA Davidson.
Genotype Athyris umbonata Billings.

Hindella prinastana (Billings).
Hindella prinastana Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 64, pl. 41, fig. 28; pl. 49, fig. 1.
Loc. Anticosti.

Hindella umbonata (Billings).
Meristella umbonata Forster, Bull. Denison Univ., I, 1885, p. 88, pl. 13, fig. 2;—Geol. Ohio, VII, 1893, p. 590, pl. 25, fig. 2.
Loc. Anticosti; Dayton, Ohio (Forster).

HIPPARIONYX Vanuxem.
Genotype Hipparionyx proximus Vanuxem.

Hipparionyx consimilis Vanuxem = Atrypa reticularis.

Hipparionyx proximus Vanuxem.

Oriskany (Dev.).
Atrypa unguiformis (Conrad) Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 149, fig. 4.—Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 826, fig. 651
Orthis conradi Castelnau, Essai Syst. Sil. l'Amérique Septentrionale, 1843, p. 37, pl. 15, fig. 4.
Orthis unguiformis Castelnau, Ibidem, 1843, p. 37, pl. 15, fig. 3.—Emmons, Manual Geol., 1860, p. 129, fig. 115.
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Hipparionyx proximus Vaux—Continued.

Orthis hipparionyx Hall, Pal. New York, III, 1859, p. 407, pl. 89, figs. 1-4; pl. 90, figs. 1-7; pl. 91, figs. 4, 5; pl. 94, fig. 4.

Strophodon interpilus Hall, Pal. New York, III, 1859, p. 482, pl. 95A, figs. 13, 14.


Loc. Schoharie and Albany counties, New York; Frankstown, Pennsylvania; Cumberland, Maryland; Cayuga, Ontario.

Obs. This species does not occur in Germany according to Kayser.

**Homoeospera** Hall and Clarke. Genotype Rhynchospira evax Hall.


**Homoeospera apriniformis** Hall.

Atrypa aprinis Hall (non de Verrill), Pal. New York, II, 1852, p. 280, pl. 57, fig. 7.


Homoeospera apriniformis Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pl. 111, pl. 83, figs. 24-25.

Loc. Lockport, New York.

**Homoeospera evax** Hall.

Rhynchospira evax Hall, Trans. Albany Institute, IV, 1863, p. 213.


Loc. Waldron, Indiana; Perry County, Tennessee.

**Homoeospera sobrina** (Beecher and Clarke).

Retzia sobrina Beecher and Clarke, Mem. New York State Mus., I, 1889, p. 61, pl. 5, figs. 10-16.


Loc. Waldron, Indiana.

**Hustedia** Hall and Clarke. Genotype Terebratula mormoni Marcou.


**Hustedia(?) meekana** (Shumard). Upper Carboniferous.

Retzia(?) meekana Shumard, Trans. St. Louis Acad. Sci., I, 1858, p. 295, pl. 11, fig. 7.

Loc. Guadalupe Mountains, New Mexico.

**Hustedia mormoni** (Marcou). Upper Carboniferous.

Terebratula mormoni Marcou, Geol. N. America, February, 1858, p. 51, pl. 6, fig. 11;—Trans. St. Louis Acad. Sci., III, 1875, p. 252.

**Hustedia mormoni** (Marcou)—Continued.


Retzia compressa Meek, Geol. Survey California, I, 1864, p. 14, pl. 2, fig. 7.—Kaysor, Richthofens China, IV, 1883, p. 176, pl. 22, figs. 1-4.

Eumetria punctulifera Derby, Bull. Cornell Univ., I, 1874, p. 4, pl. 8, figs. 4, 5, 7, 8, 10; pl. 9, fig. 3.


**Hustedia mormoni** Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 120, fig. 106; pl. 51, figs. 1-9.

Loc. Salt Lake City, Utah; Santa Fe, New Mexico; Nevada; Shasta County, California; Nebraska; Kansas; Arkansas; Missouri; Iowa; Illinois; Indiana; Bonjardim and Itaituba, Brazil; Lo Ping, China.

**Hustedia (?) papillata** (Shumard). Upper Carboniferous.

Retzia papillata Shumard, Trans. St. Louis Acad. Sci., I, 1858, p. 294, pl. 11, fig. 9.

Loc. Guadalupe Mountains, New Mexico.

**Hustedia (?) triangularis** (Miller). Chouteau (L. Carb.).


Loc. Sedalia, Missouri.

**HYATTELLA** Hall and Clarke. Genotype Atrypa congesta Conrad.


**Hyattella congesta** (Conrad). Clinton (Sil.).


Atrypa quadricostata Hall, Pal. New York, II, 1852, p. 68, pl. 23, fig. 2.


Triplesia? quadricostata Hall, Ibidem, 1859, p. 78.


Hyattella congesta Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 61, fig. 45; pl. 40, figs. 23-28; pl. 81, figs. 26-28.

Loc. Rochester, Reynales Basin, etc., New York; Flamborough Head, Ontario; Pennsylvania; Louisville, Kentucky.

**Hyattella junia** (Billings). Anticosti (Sil.).

Athyris junia Billings, Catalogue Sil. Foss. Anticosti, 1866, p. 46.


Loc. Anticosti.
HYPOTHYRIS King.

Genotype Atrypa cuboides Sowerby.


Hypothyris castanea (Meek).

Middle Devonian.


Liorhynchus castaneus Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 59, figs. 28, 29.

Loc. Lockhart and Mackenzie River, Canada; Eureka district, Nevada.

Hypothyris cuboides (Sowerby).

Tully (Dev.).


Loc. Europe; Tully, Ovid, Penn Yan, etc., New York.

Hypothyris emmonsi (Hall and Whitfield).

Middle Devonian.


Rhynchonella cuboides Whiteaves, Cont. to Canadian Pal., I, 1891, p. 231.


Loc. White Pine district, Nevada; Davenport, Iowa; Hay and Peace rivers, Canada.

IPHIDEA Billings.

Genotype Iphidea bella Billings.


Iphidea alabamaensis Walcott.

Middle Cambrian.


Loc. Coosa Valley, Cherokee County, Alabama; near Rogersville, Tennessee.

Iphidea bella Billings.

Lower Cambrian.

Iphidea bella Billings—Continued.
p. 100, pl. 7, fig. 4;—Tenth Ann. Rep. U. S. Geol. Survey, 1891, p. 608, pl. 67, fig. 6.—Hall and Clarke, Pal. New York, VIII, Pt. 1, 1892, p. 98, fig. 54, pl. 4, figs. 8, 9.
Loc. Trois Pistoles, below Quebec, Canada; Anse an Loup, Labrador.

Iphidea crenistria Walcott.
Loc. Grand Canyon of the Colorado.

Iphidea labradorica (Billings).
Obolus labradoricus Billings, Geol. Vermont, II, 1861, p. 946, fig. 345;—Pal. Fossils, I, 1861, p. 6, fig. 6;—Geol. of Canada, 1863, p. 284, fig. 291.
Loc. Anse an Loup, Straits of Belle Isle, Labrador; Conception Bay, Newfoundland.

Iphidea labradorica swantonensis Walcott.
Loc. East of Swanton and Highgate Springs, Vermont.

Iphidea logani Walcott.
Loc. Trois Pistoles, Quebec, Canada.

Iphidea ornatella Hall and Clarke—I. superba.

Iphidea pannulus (White).
Trematis? pannulus White, Ibidem, Final Rep., IV, 1875, p. 36, pl. 1, fig. 4.
Loc. Pioche, Nevada; Wasatch Mountains, Utah; Mount Stephen and Castle Mountain, British Columbia; Washington County, New York; Island of Orleans in the Sillery conglomerate.

Iphidea pealei Walcott.
Loc. Near Hillsdale, Montana.

Iphidea prospectensis Walcott.
Loc. Eureka district, Nevada.

Iphidea sculptilis Meek.
Micromitra sculptilis Meek, Ibidem, 1873, p. 479.
Kutorgina minutissima Hall and Whitfield, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 207, pl. 1, figs. 11, 12.
Iphidea sculptilis Meek—Continued.
Kutorgina sculptilis Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 20, pl. 1, fig. 7; pl. 9, fig. 7.
Loc. Gallatin City, Montana; Eureka district, Nevada.
Obs. The ventral pedicle foramen in this species, the genotype of Micromitra, is partially closed posteriorly, but otherwise does not seem to differ generically from Iphidea.

Iphidea stissingensis (Dwight).
Kutorgina stissiugensia Dwight, American Jour. Sci., 3d ser., XXXVIII, 1889, p. 145, pl. 6, figs. 5-8;—Trans. Vassar Brothers’ Inst., V, 1891, p. 105, pl. 1, figs. 5-8.
Loc. Stissing Mountain, Duchess County, New York.

Iphidea superba Walcott.
Iphidea cnf. ? ornatella Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 4, figs. 6, 7.
Loc. Grand Canyon of the Colorado.

Isogramina Meek and Worthen = Aulacorrhynchus.
Isogramma millipunctata Meek and Worthen = Aulacorrhynchus millipunctatum.

KINGENA Davidson.
Genotype Terebratula lima Defracne.

Kingena leonensis (Conrad).
Loc. Leon Springs, Texas; also Denison, Texas (Hill).

Kingena wacoensis (Roemer).
Terebratula sp. undet. Roemer, Texas, 1849, p. 408.
Loc. Near New Braunfels, Texas; Trent River, Vancouver Island. “I have traced its continuity from the Red River to the Rio Grande” (Hill).
Obs. Gabb is correct in regarding T. choctawensis as a synonym for T. wacoensis. “The Vancouver specimens are doubtful” (Stanton).

Klitambonites Pander = Clitambonites.
Kouincikiana americana Swallow = Productus swallovi.

KUTORGINA Billings.
Genotype Obolella cingulata Billings.
Kutorgina cingulata Billings. Lower Cambrian.
Obolella (Kutorgina) cingulata Billings, Geol. Vermont, II, 1861, p. 948, figs. 347-349;—Pal. Fossils, 1, 1861, p. 8, figs. 8-10.
Obolella cingulata Billings, Geol. Canada, 1863, p. 284, fig. 287.
Loc. Anse an Loup, Labrador; Swanton and Georgia, Vermont; Malvern Hills, England; Island of Bornholm, Sweden.

Kutorgina labradorica Walcott = Iphidea labradorica.
Kutorgina labradorica var. swantonensis Walcott = Iphidea labradorica swantonensis.

Kutorgina latourensis Matthew = Billingsella latourensis.
Kutorgina minutissima Hall and Whitfield = Iphidea sculptilis.
Kutorgina pannula White = Iphidea pannulus.
Kutorgina prospectensis Walcott = Iphidea prospectensis.

Kutorgina pterineoides Matthew. Middle Cambrian.
Loc. Hanford Brook and St. Martins, New Brunswick.
Obs. It is not certain that this species is a brachiopod. May be the operculum of a pteropod.

Kutorgina sculptilis Walcott = Iphidea sculptilis.
Kutorgina stissingensis Dwight = Iphidea stissingensis.
Kutorgina whitfieldi Walcott = Billingsella whitfieldi.

Leiorhynchus Hall. Genotype Orthis quadricostata Vanuxem.
Obs. A subgenus of Canadacea, differing only in exterior ornamentation.

Leiorhynchus boonense (Shumard). Burlington (L. Carab.).
Leiorhynchus boonense Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 194, pl. 60, fig. 35.
Loc. Columbia, Boone County, and Cooper County, Missouri.

Leiorhynchus dubium Hall. Marcellus (Dev.).
Leiorhynchus dubius Tschernychev, Mém. Comité Géologique de St. Peters­burg, III, 3, 1887, p. 90, pl. 14, fig. 7.
Loc. New York; Urals of Russia.

Leiorhynchus globuliforme (Vanuxem). Chemung (Dev.).
Atrypa globuliformis Vanuxem, Geol. New York; Rep. Third Dist., 1842, p. 152, fig. 2.
Loc. Otsego County, New York.
Leiorhynchus greeneanum (Ulrich). Waverly (L. Carb.).
Pugnax greeneanus Hall and Clarke, Ibidem, 1895, pl. 60, figs. 36-38.

Leiorhynchus (?) hecate Clarke.
Leiorhynchus (?) hecate Clarke, Bull. U. S. Geol. Survey, 16, 1885, p. 31, pl. 3, fig. 4.
Loc. Ontario County, New York.
Obs. Probably the same as Spirifer pluto Clarke.

Leiorhynchus iris Hall.
Leiorhynchus iris Hall, Pal. New York, IV, 1867, p. 360, pl. 56, figs. 41-43.
Loc. Rockford, Iowa.

Leiorhynchus kelloggi Hall.
Leiorhynchus kelloggi? Whitfield, Geol. Wisconsin, IV, 1882, p. 334, pl. 26, fig. 9.
Loc. Ohio; New York; Milwaukee, Wisconsin; Urals of Russia.

Leiorhynchus laura (Billings). Marcellus-Hamilton (Dev.).
†Rhynchonella multicosta Tschernyschew, Devon. im Donetz Becken, 1886, pl. 15, figs. 1-3;—Mém. Comité Géologique de St. Peters­burg, III, 3, 1887, p. 92.
Leiorhynchus multicosta and laura Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 194, pl. 59, figs. 8-10, 13-17.
Loc. Thedford and Bosauquet, Ontario; New York; Eureka district, Nevada; ?Russia.

Leiorhynchus lesleyi Hall and Clarke.
Loc. “Pennsylvania.”

Leiorhynchus limitare (Vanuxem).
Leiorhynchus limitare (Vanuxem), Geol. New York; Rep. Third Dist.; 1842, p. 146, fig. 3.
Leiorhynchus limitaris Hall, Ibidem, Rep. Fourth Dist., 1843, p. 182, fig. 11.
Rhynchonella limitaris Tschernyschew, Mémoires du Comité Géologique de St. Peters­burg, 1887, III, 3, pl. 14, fig. 5.
Leiorhynchus limitaris Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 194, pl. 59, figs. 12, 35.
Loc. Schoharie, Marcellus, Avon, etc., New York; Delaware County, Ohio (Whit­field); Urals of Russia.
Leiorhynchus mesicostale Hall. Portage-Chemung (Dev.).
Organic Remains, 64, fig. 1.
Rhynchoneilla mesacostalis Tschernyschew, Mémoires du Comité Géologique de St. Petersburg, 1887, p. 91, pl. 14, figs. 3, 4.
Leiorhynchus mesacostalis Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 194, pl. 59, figs. 11, 12.
Loc. Ithaca, Elmira, Bath, etc., New York; Urals of Russia.

Leiorhynchus multicosta Hall=L. laura.

Leiorhynchus mysia Hall. Marcellus (Dev.).
Leiorhynchus mysia Hall, Pal. New York, IV, 1867, p. 357, pl. 56, figs. 1-5.

Leiorhynchus nevadaense Walcott. Middle Devonian.
Loc. Eureka district, Nevada.

Leiorhynchus newberryi Hall. Waverly (L. Carb.).
Leiorhynchus newberryi Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 194, pl. 59, figs. 37, 38.
Loc. Kelloggsville, Ashtabula County, Ohio.

Leiorhynchus quadriocostatum (Vanuxem). Genesee (Dev.).
Atrypa (Orthis) quadriocostata Hall, Ibidem, Rep. Fourth Dist., 1843, p. 223, fig. 2.

Leiorhynchus robustum Hall and Clarke. Chemung (Dev.).
Loc. Steuben County, New York.

Leiorhynchus sesquiplicatum A. Winchell. Hamilton (Dev.).
Loc. Grand Traverse district, Michigan.

Leiorhynchus sinuatum Hall. Chemung (Dev.).
Rhynchoneilla (Leiorhynchus) sinuatus Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 158, pl. 14, fig. 5.
Loc. Ithaca and Chemung Narrows, New York; Eureka district, Nevada.
LEPTENA Dalman.

Genotype Productus rugosa Hisinger = Conchita rhomboidalis
Wilckens,

Leptena Dalman, Kongl. Svenska Vet.-Akad. Handl., for 1827, 1828, pp. 93, 94.—
New York, VIII, Pt. I, 1892, p. 276.—Winchell and Schuchert, Minnesota
York State Geologist, 1894, p. 277.

Plectambonites C%hlert, Fischer's Manuel Conchyliologie, 1887, p. 1283.

Leptena alternata Conrad = Rafinesquina alternata.
Leptena alternatista Hall = Rafinesquina alternata alternatista.
Leptena barabuensis Whitfield = Syntrophia barabunensis.
Leptena bipartita Hall = Strophomena bipartita.
Leptena camerata Hall = Rafinesquina camerata.

Leptena charlottaæ Winchell and Schuchert.

Leptena charlottaæ Winchell and Schuchert, American Geol., IX, April 1, 1892,
Strophomena halli Sardeson, Bull. Minnesota Acad. Nat. Sci., III, April 9, 1892,
p. 334, pl. 4, figs. 36-38.

Loc. Minneapolis and St. Paul, Minnesota.

Leptena concava Hall = Leptena concava.
Leptena corrugata Hall = Strophomena corrugata.
Leptena decipiens Billings = Leptella decipiens.
Leptena deflecta Hall = Dinorthis deflecta.
Leptena deltoidæ = Rafinesquina deltoidæ and R. minnesotaensis.
Leptena depressa Hall = L. rhomboidalis.
Leptena fasciata Hall = Rafinesquina fasciata.
Leptena incrassata Hall = Rafinesquina incrassata.
Leptena indenta Conrad = Stropheodonta indenta.
Leptena julia Shaler = Strophomena julia.
Leptena laticosta de Verneuil = Tropidoleptus carinatus.
Leptena melita Hall and Whitfield = Dalmauella melita.
Leptena mesacosta Shumard = Rafinesquina mesicosta.
Leptena minnesotaensis Sardeson = Plectambonites sericeus.
Leptena nucleata Hall = Anoplia nucleata.
Leptena obscura Hall = Rafinesquina obscura.
Leptena orthididea Hall = Strophonella orthididea.
Leptena patenta Hall = Strophonella patenta.
Leptena planoconvexa Hall = Strophomena planoconvexa.
Leptena planumbona Hall = Strophomena rugosa.
Leptena plicatella Ulrich = Plectambonites plicatellus.
Leptena plicifera Hall = Dalmauella ? plicifera.
Leptena praecosis Sardeson = Plectambonites sericeus.
Leptena profunda Hall = Stropheodonta profunda.
Leptena prolongata Forerste = Plectambonites transversalis prolongatus.
Leptena punctulifera Conrad = Strophonella punctulifera.
Leptaea quadrilatera Shaler=L. rhomboidalis.
Leptaea reedens Sardeson=Plectambonites sericeus.
Leptaea recta Hall=Dinorthis deflecta.

**Leptaea rhomboidalis** (Wilckens). Trenton-Waverly (Ord. L. Carb.).

Conchita rhomboidalis Wilckens, Nachricht von selten Versteinerungen, 1769, p. 77, pl. 8, figs. 43, 44.


Strophomena depressa Vanuxem, Geol. New York; Rep. Third Dist., 1842, p. 79, fig. 5.—Hall, Ibidem, Rep. Fourth Dist., 1843, p. 77, fig. 5; p. 104, fig. 2.—Billings, Canadian Nat. Geol., I, 1856, p. 59, pl. 1, fig. 5.—Roemer, Sil.-Fauna west. Tennessee, 1860, p. 65, pl. 5, fig. 2.

Strophomena undulatus Vanuxem, Geol. New York; Rep. Third Dist., 1842, p. 139, fig. 3.

Strophomena undulata Hall, Ibidem, Rep. Fourth Dist., 1843, p. 175, fig. 3.—Yandell and Shumard, Cont. Geol. Kentucky, 1847, p. 11.

Productus sulcatus Castelnau, Essai Syst. Sil. l’Amérique Septentrionale, 1843, p. 39, pl. 13, fig. 7.


Leptaea depressa Hall, Pal. New York, II, 1852, p. 62, pl. 21, fig. 8; p. 257, pl. 53, fig. 6.—Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 823, fig. 630.

Strophomena rugosa Hall, Pal. New York, III, 1859, p. 195, pl. 19, fig. 1.


Leptaea rhomboidalis Hall and Clarke, Pal. New York, VIII, Pt. 1, 1892, p. 279, pl. 8, figs. 17-31; pl. 15A, figs. 40-42; pl. 20, figs. 21-24.—Foerste, Geol. Ohio, VII, 1895, p. 566.

Leptaea (Strophomena) rhomboidalis Keyes, Geol. Survey Missouri, V, 1895, p. 70, fig. 6.

Loc. Generally distributed in the above-given formations throughout America and Europe.
Leptaena rhomboidalis ventricosa Hall.

Oriskany (Dev.).


Strophomena rugosa var. ventricosa Hall, Pal. New York, III, 1859, p. 417, pl. 94, figs. 2, 3.

Leptaena rhomboidalis var. ventricosa Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 15A, fig. 43.

Loc. Albany and Schoharie counties, New York; Cumberland, Maryland; Cayuga, Ontario.

Leptaena rugosa = L. rhomboidalis.

Leptaena saxea Sardeson = Plectambonites sericeus.

Leptaena sericea Sowerby = Plectambonites sericeus.

Leptaena sordida Billings = Leptella sordida.

Leptaena (?) stelzneri Kayser. Ordovician.

Leptaena stelzneri Kayser, Palaeontographica, Suppl., III, 1876, p. 21, pl. 3, fig. 21.

Loc. Guanaco, Argentine Republic.

Obs. Since this species has a high ventral area and a perforated deltidium it is probably a Clitambonites.

Leptaena striata Hall = Strophonella striata.

Leptaena subplana Hall = Orthotheres subplanus.

Leptaena subquadrate Hall = Christiania subquadrate.

Leptaena subtenta Hall = Strophomena trentonensis or S. rugosa subtenta.

Leptaena sulcata de Verneuil = Strophomena sulcata.

Leptaena tenuiplineata Hall = Rafinesquina tenuiplineata.

Leptaena tenuistriata Hall = L. rhomboidalis.

Leptaena transversalis = Plectambonites transversalis.

Leptaena transversalis var. alabamaensis Foerste = Plectambonites alabamaensis.

Leptaena trilobata Owen = Strophomena trilobata.

Leptaena unicostata Meek and Worthen. Lorraine (Ord.).

Leptaena (n. sp. ?) Owen, Geol. Survey Wisconsin, Iowa, Minnesota, 1852, pl. 2B, fig. 3. [See specimen in U. S. Nat. Mus., Cat. Invert. Foss., 1708.]

Strophomena unicostata Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 335, pl. 4, fig. 11.—Whitfield, Geol. Wisconsin, IV, 1882, p. 262, pl. 12, fig. 14.

Rafinesquina unicostata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 15A, fig. 39; pl. 20, fig. 25.


Loc. Savanna and Wilmington, Illinois; Delafield and Iron Ridge, Wisconsin; Spring Valley and Grainger, Minnesota; Lattner's, Iowa; Rapids of the Nelson River, Lake Winnipeg, Manitoba.

Leptaena variolata d’Orbigny = Chonetes variolatus.

Leptaena vicina Castelnau = Chonetes vicinus.

LEPTÆNISCA Beecher.

Genotype Leptaena concava Hall.


Bull. 87.—16
Leptaenisca adnascens Hall and Clarke. Lower Helderberg (Dev.).

Leptaenisca concava Hall. Lower Helderberg (Dev.).
Loc. Albany County, New York; Decatur County, Tennessee.

Leptaenisca tangens Hall and Clarke. Lower Helderberg (Dev.).

LEPTELLA Hall and Clarke. Genotype Leptaena sordida Billings.

Leptella decipiens (Billings). Calciferous (Ord.).
Loc. Point Levis, Canada; Portland Creek, Newfoundland.

Leptella sordida (Billings). Calciferous (Ord.).
Leptaena sordida Billings, Pal. Fossils, I, 1862, p. 73, fig. 66;—Geol. Canada, 1863, p. 231, fig. 242.
Loc. Point Levis, Canada.

LEPTOBOLUS Hall. Genotype L. lepis Hall.

Leptobolus grandis Matthew. Lowest Ordovician.

Leptobolus insignis Hall. Utica (Ord.).
Loc. Middleville, Utica, etc., New York; Ottawa, Canada; Cincinnati, Ohio.

Leptobolus lepis Hall. Utica (Ord.).
Loc. Cincinnati, Ohio.
SCHUCHERT.

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Leptobolus occidentalis Hall.

Loc. Hawleys Mills, Iowa; Platteville, Wisconsin; Ottawa, Canada (Ami).

Leptocelia Hall=Anoplotheca.

Leptocelia propria Hall=Anoplotheca flabellites.

Leptocelia disparilis Hall=Atrypina disparilis.

Leptocelia imbricata Hall=Atrypina imbricata.

LEPTOSTROPHIA Hall and Clarke.

Genotype Stropheodonta magnifica Hall.

Obs. This is a subdivision of Stropheodonta. The following species have been referred to it: S. magnifica, S. perplana, S. textilis, S. beckei, S. magniventra, S. junia, S. irene, S. blainvillei, and S. tullia.

LINDSTROMELLA Hall and Clarke. Genotype L. aspidium H. and C.

Lindstroemella aspidium Hall and Clarke.

Loc. Leonardsville, Hamilton, Darien, etc., New York.

LINGULA Bruguiere. Genotype Lingula anatina Lamarck.

Lingula acuminata Hall=Lingulepis acuminata.

Lingula acutangula Roemer=Lingulepis acutangulus.

Lingula acutirostris Hall. Clinton (Sil.).
Lingula acutirostra Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 77, fig. 9 on p. 76;—Pal. New York, II, 1852, p. 56, pl. 20, fig. 5.

Loc. Wolcott, New York.

Obs. Based upon a single specimen now lost.

Lingula æqualis Hall. Trenton (Ord.).


Lingula alba-pinensis Walcott. Upper Devonian.

Loc. White Pine district, Nevada.
244 SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA. [BULL. 87.

Lingula alveata Hall = Dignomia alveata.
Lingula ampla Owen = Lingulella ampla.
Lingula antiqua Emmons = Lingulepis acuminata.
Lingula antiqua Hall, 1851, 1862, Hayden, 1863 (non Hall, 1847) = Lingulepis piuuniformis.
Lingula antiquata Emmons = Lingulepis acuminata.

**Lingula artemis** Billings.

Loc. Gaspé, Cape Bon Ami.

**Lingula atra** Herrick.

Loc. Waverly (L. Carb.).
Lingula atra Herrick, Bull. Denison Univ., IV, 1888, pp. 13, 16, pl. 10, fig. 30;—
Geol. Ohio, VII, 1895, pl. 22, figs. 5, 6.
Loc. Cuyahoga River, Ohio.

**Lingula attenuata** Hall = Glossina trentonensis.

**Lingula aurora** Hall = Lingulella aurora.

**Lingula aurora var.** Hall = Lingulella stoneana.

**Lingula belli** Billings.

Loc. Chazy (Ord.).
Lingula belli Billings, Canadian Nat. Geol., IV, 1859, p. 431, figs. 7, 8;—Geol.
Canada, 1863, p. 124, fig. 47.
Loc. Island of Montreal, Allumette Island, Canada.

**Lingula beltrami** Winchell and Schuchert.

Loc. Lorraine (Ord.).
Lingula beltrami Winchell and Schuchert, Minnesota Geol. Survey, III, 1893,
p. 351, figs. 25a, 25b.
Loc. Spring Valley, Minnesota.

**Lingula bicornata** Ringuéberg.

Loc. Niagara (Sil.).
pl. 3, fig. 8.—Miller, N. American Geol. Pal., 1889, p. 349.
Loc. Lockport, New York.

**Lingula billsnsana** Whitcaves = Lingulella billsnsana.

**Lingula bisulcata** Ulrich.

Loc. Utica (Ord.).
Lingula bisulcata Ulrich, American Geologist, III, 1889, p. 380, fig. 2, on p. 378.
Loc. Ludlow, Kentucky.

**Lingula brevirostris** Meek and Hayden.

Loc. Jurassic.
p. 50;—Ibidem, 1860, p. 419;—Pal. Upper Missouri, Smithsonian Cont. to
Knowl., XIV, 172, 1865, p. 69, pl. 3, fig. 3.—Whitfield, Powell’s Geol. Geogr.
Survey Rocky Mt. Region, 1880, p. 346, pl. 3, figs. 4, 5.
Loc. Black Hills, Dakota.

**Lingula briseis** Billings.

Loc. Trenton (Ord.).
Lingula briseis Billings, Pal. Fossils, I, 1862, p. 48, fig. 52;—Geol. Canada, 1863,
p. 161, fig. 136.
Loc. Bayonne River, Canada.

**Lingula (?) calumet** N. H. Winchell.

† Cambrian.
Loc. Pipestone, Minnesota.
Obs. It is not certain that these specimens are organic.
Lingula(?) canadensis Billings. Trenton and Lorraine (Ord.).
Loc. Anticosti; in the Galena at Mantorville and Hador, Minnesota.

Lingula carbonaria Shumard. Upper Carboniferous.
Loc. Clarke County, Missouri.

Lingula centrilinata Hall. Lower Helderberg (Dev.).
Loc. Albany County, New York.

Lingula ceryx Hall. Scholiarie (Dev.).

Lingula cincinnatiensis Hall and Whitfield. Lorraine (Ord.).
Lingulella (Dignomia) cincinnatiensis Hall and Whitfield, Pal. Ohio, II, 1875, p. 67, pl. 1, figs. 2, 3.
Loc. Cincinnati, Ohio.

Lingula clathrata Winchell and Schuchert. Trenton (Ord.).
Lingula clathrata Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 345, pl. 29, fig. 42.

Lingula clintoni Vanuxem. Clinton (Sil.).
Lingula clintoni Vanuxem, Geol. New York; Rep. Third Dist., 1842, p. 79, fig. 4.
Lingula suboblonga d'Orbigny, Prodrome Pal. Stratig., 1850, p. 34.
Loc. Cayuga County, New York; Pennsylvania; Hamilton, Ontario; Arisaig, Nova Scotia (Honeyman and Ami).

Lingula cobourgensis Billings. Trenton (Ord.).
Lingula cobourgensis Billings, Pal. Fossils, I, 1862, p. 50, fig. 54;—Geol. Canada, 1863, p. 161, fig. 132.
Loc. Cobourg and Collingwood, Canada; ?Minneapolis, Minnesota; in the Utica at Ottawa, Canada (Ami).

Lingula coheni A. Ulrich. Middle Devonian.
Lingula coheni A. Ulrich, N. Yahrb. f. Mineral., Beilageband, VIII, 1892, p. 82, pl. 5, fig. 11.
Loc. Near Pulquina, Bolivia.

Lingula complanata Williams. Hamilton-Ithaca (Dev.).
Lingula nuda Hall, Pal. New York, IV, 1867, pl. 2, fig. 4 (not figs. 5, 6).
Lingula compta Hall and Clarke. Hamilton (Dev.).

Lingula compta Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 171, pl. 1, fig. 16.


Lingula concentrica Vanuxem = Schizobolus concentricus.

Lingula concentrica Conrad. Cornerious (Dev.).


Obs. Insufficiently defined to be recognized.

Lingula covingtonensis Hall and Whitfield. Utica (Ord.).


Loc. Covington, Kentucky.

Lingula crassa Hall = Glossina crassa.

Lingula crawfordsvillensis Gurley. Keokuk (L. Carb.).


Loc. Crawfordsville, Indiana.

Obs. Should be compared with L. varsaviensis.

Lingula cuneata Conrad. Medina (Sil.).


Lingula curta Conrad. Trenton-Utica (Ord.).


Loc. East Canada Creek and Middleville, New York; Carlisle, etc., Pennsylvania; Montmorency Falls, Canada; Frobisher Bay.

Lingula cuvahoga Hall. Chemung-Waverly (Dev.-L. Carb.).


Lingula cuvahoga Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 1, fig. 18.

Loc. Akron and Cuyahoga Falls, Ohio; Chemung group, Panama, New York.

Lingula cyan Billings = Glossina cyan.

Lingula daphne Billings = Glossina trentonensis.

Lingula dawsoni Matthew = Lingulella dawsoni.

Lingula delia Hall. Hamilton (Dev.).


Lingula densa Hall. Hamilton (Dev.).

Lingula densa Hall—Continued.
Lingula densa Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 15, pl. 1, fig. 23.
Loc. Summit and Centerfield, New York.

Lingula desiderata Hall.
Loc. Ontario County, New York.

Lingula (?) dolata Sardeson.
Loc. Stillwater, Minnesota.

Lingula dubia d’Orbigny=Glossina dubia.

Lingula elderi Whitfield.
Loc. Ontario County, New York; Beloit, Wisconsin; Cincinnati, Ohio.

Lingula elegantula Shaler=L. rectilateralis.

Lingula elliptica Hall (non Phillips)=L. subelliptica.

Lingula (?) elliptica Emmons.
Lingula elliptica Emmons (non Phillips, 1836), American Geology, Pt. II, 1855, p. 112.
Loc. Augusta County, Virginia.
Obs. This species belongs to another genus. The specific name will therefore not conflict with that of Phillips.

Lingula elongata Hall.
Loc. Lewis County, New York; Lake Winnipeg, Manitoba; Ottawa, Canada, in the Utica terrane (Ami).

Lingula ererensis Rathbun.
Loc. Erere, Province of Para, Brazil.

Lingula exilis Hall=Lingulodiscina exilis.

Lingula eva Billings.
Lingula eva Billings, Canadian Nat. Geol., VI, 1861, p. 150;—Geol. Canada, 1863, p. 141, fig. 73.—Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 341, pl. 29, figs. 5, 6.
Loc. Murray Bay, Canada; Fremont, Winona County, Minnesota.

Lingula forbesi Billings.
Lingula forbesi Billings, Pal. Fossils, I, 1862, p. 115, fig. 96.
Loc. Autocosti.

Lingula gannensis Herrick.
Lingula gannensis Herrick, Bull. Denison Univ., IV, 1888, pp. 12, 17, pl. 3, figs. 2, 3;—Geol. Ohio, VII, 1895, pl. 22, figs. 2, 3.
Loc. Gann, Knox County, Ohio.
Lingula gibbosa Hall.


Loc. Waldron, Indiana.

Lingula gorbyi Miller.


Loc. Sedalia, Missouri.

Lingula gracana Rathbun.


Loc. Erie, Province of Para, Brazil.

Lingula halli White.


Loc. Burlington, Iowa.

Lingula howleyi Matthew.


Loc. Kelleys Island, Conception Bay, Newfoundland.

Obs. Appears to be a synonym for L. murrayi Billings.

Lingula hurlbuti N. H. Winchell = Glossina hurlbuti.

Lingula huronensis Billings.

Lingula huronensis Billings, Canadian Nat. Geol., IV, 1859, p. 433, fig. 9;—Geol. Canada, 1863, p. 124, fig. 48.


Lingula indianensis Miller and Gurley.


Loc. Crawfordsville, Indiana.

Lingula ingens Spencer.


Lingula insularis Billings.


Loc. Anticosti.

Lingula iole Billings.


Loc. Near Portland Creek, Newfoundland.

Lingula iowaensis Owen.


Lingula quadrata Hall, Geol. Wisconsin, I, 1862, p. 46, fig. 1, and p. 435.—Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 305, pl. 2, fig. 4.

Lingulella iowensis Whitfield, Geol. Wisconsin, IV, 1882, p. 242, pl. 9, fig. 1.

Loc. Wisconsin; Iowa; Minnesota; Illinois; Lake Winnipeg, Manitoba.
Lingula irene Billings = Lingulella irene.

**Lingula iris Billings.**

Lingula iris Billings, Pal. Fossils, I, 1865, p. 301, fig. 290.

Loc. Point Levis, Canada.

**Lingula kingstonensis Billings.**

Lingula kingstonensis Billings, Pal. Fossils, I, 1862, p. 48, fig. 51; — Geol. Canada, 1863, p. 141, fig. 74.

Loc. Long Island, near Kingston, Canada.

Lingula lamellata Hall, 1852 (partim, non Hall, 1843) = L. tæniola.

**Lingula lamellata Hall.**


Lingula leana Hall = Glossina leana.

**Lingula leigea Hall.**


Lingula leigea var. Hall, Pal. New York, IV, 1867, p. 8, pl. 2, fig. 8.

Lingula leigea Whitfield, Annals New York Acad. Sci., V, 1891, pp. 547, 573, pl. 11, figs. 3, 4; — Geol. Ohio, VII, 1895, p. 411, pl. 7, figs. 3, 4; p. 462.

Loc. Seneca Lake, Ithaca, etc., New York; Thedford, Ontario (Whiteaves); Delaware County, Ohio (Whitfield); Eureka district, Nevada.

Lingula leigea nevadaensis Walcott.

Lingula leigea var. nevadaensis Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 107, pl. 2, fig. 3.

Loc. Eureka district, Nevada.

**Lingula lingulata Hall and Clarke.**

Lingula lingulata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 173, pl. 4K, fig. 5.


**Lingula lonensis Walcott.**


Loc. Lone Mountain, Nevada.

**Lingula lucretia Billings.**

Lingula lucretia Billings, Pal. Fossils, II, 1874, p. 14, fig. 3.

Loc. Cape Bon Ami, Gaspé.

**Lingula lyelli Billings.**

Lingula lyelli Billings, Canadian Nat. Geol., IV, 1869, p. 348, fig. 1; p. 431; — Geol. Canada, 1863, p. 124, fig. 49.

Loc. Alumette Island.

**Lingula maida Hall.**


Loc. Moscow, New York.
Lingula manni Hall. 


Loc. Delaware County, Ohio.

Lingula mantelli Billings. 

Lingula mantelli Billings, Canadian Nat. Geol., IV, 1859, p. 349, figs. 1e-1f;—Geol. Canada, 1863, p. 113, fig. 20.

Loc. St. Eustache, Canada.

Lingula (?) manticula White. 


Loc. Schell Creek Range, Nevada.

Lingula marginata d'Orbigny (non Phillips)=L. submarginata. 

Lingula matthewi Hartt=Acrothele matthewi.

Lingula meeki Herrick. 

Lingula meeki Herrick, Bull. Denison Univ., IV, 1888, pp. 13, 18, pl. 10, fig. 31;—Geol. Ohio, VII, 1895, pl. 22, figs. 7, 8.

Loc. Cuyahoga Valley, Ohio.

Lingula melie Hall. 


Loc. Chagrin Falls and Berea, Ohio.

Lingula membranacea Winchell. 


Lingula (Lingulella?) membranacea Meek, Pal. Ohio, II, 1875, p. 275, pl. 14, fig. 4.

Loc. Burlington, Iowa; Harts Grove and Londonville, Ohio; Shafers, Pennsylvania.

Lingula metensis Terquem? 

Lingula cf. metensis (Terquem) Möricke, Neues Jahrbuch f. Mineral., Beilageband, IX, 1894, p. 58, pl. 5, fig. 10.

Loc. Sierra de la Ternera; Mine Anolanes, Chile.

Lingula minnesotaensis N. H. Winchell=L. elderi.

Lingula minuta Meek. 

Lingula minuta Meek, Trans. Chicago Acad. Sci., I, 1868, p. 87, pl. 13, fig. 1.

Loc. Near Fort Resolution, Great Slave Lake, British America.

Lingula modesta E. O. Ulrich. 

Lingula modesta Ulrich, American Geologist, III, 1889, p. 382, fig. 4 on p. 378.—Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 344, pl. 29, fig. 41.

Lingula vanhorni Hall and Clarke (non Miller), Pal. New York, VIII, Pt. I, 1892, pl. 1, fig. 4.

Loc. Covington and Frankfort, Kentucky; Lattners, Iowa; Granger and Wykoff, Minnesota.
Lingula morsel (N. H. Winchell). St. Peters (Ord.).
Lingulepis morsel Miller, N. American Geol. Pal., 1889, p. 332.
Loc. Near Fountain, Minnesota.

Lingula mosia Hall. Upper Cambrian.
Loc. LaGrange Mountain, Minnesota; Mazomanie, Wisconsin.

Lingula münsteri d’Orbigny. Ordovician.
Lingula münsterii d’Orbigny, Voyage dans l’Amérique Méridionale, Pal., 1842, p. 29, pl. 2, fig. 6.
Loc. Tocopaya, etc., Bolivia.

Lingula(? murrayi Billings. Upper Cambrian.
Lingula murrayi Billings, Canadian Nat. Geol., n. ser., VI, 1872, p. 467, fig. 3;—Pal. Fossils, II, 1874, p. 66, fig. 34.
Loc. Bell Island, Conception Bay, Newfoundland.
Obs. See Lingula howleyi.

Lingula mytiloides Sowerby. Upper Carboniferous.
Lingula mytiloides Sowerby, Mineral Conchology, I, 1813, p. 55, tab. 19, figs. 1, 2.—Meek and Worthen, Geol. Survey Illinois, V, 1873, p. 572, pl. 25, fig. 2.
Loc. Illinois.

Lingula nitida Meek and Hayden. Upper Cretaceous.
Loc. Mouth of Big Horn River, Nebraska; Sage Creek, Colorado; Near Irvine Station, Canadian Pacific Railroad, Canada.

Lingula norwoodi James=Lingulopsis norwoodi.
Lingula nuda Hall (partim)=L. complanata.

Lingula nuda Hall. Hamilton (Dev.).

Lingula nympha Billings. Caleiferous (Ord.).
Loc. Table Head, Newfoundland.

Lingula oblata Hall. Clinton (Sil.).
Lingula oblata Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 77, fig. 8 on p. 76;—Pal. New York, II, 1852, p. 54, pl. 20, fig. 2.
Loc. Sodus and Wolcott, New York.

Lingula oblonga Conrad (non Eichwald)=L. clintoni.

Lingula obtusa Hall. Trenton-Utica (Ord.).
Loc. Middleville, New York; Lake Winnipeg and Ottawa, Canada.
Lingula paliformis Hall = Lingulella paliformis.

Lingula papillosa Emmons. Trenton (Ord.).
Lingula papillosa Emmons, American Geology, Pt. II, 1855, p. 202, fig. 64;— Manual Geol., 1860, p. 99, fig. in text.
Loc. Unknown.

Lingula paracletus Hall and Clarke. Waverly (L. Carb.).
Lingula paracletus Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 10, 12, fig. 8; p. 172.
Loc. Chardon, Ohio.

Lingula parrishi Miller. Upper Carboniferous.
Lingula parrishi Miller, Eighteenth Ann. Rep. Geol. Survey Indiana, 1894, p. 307, pl. 8, fig. 2; pl. 9, fig. 1.
Loc. Kansas City, Missouri.

Lingula perlata Hall. Lower Helderberg (Dev.).
Lingula perlata Hall, Pal. New York, III, 1859, p. 156, pl. 9, figs. 3-5.
Loc. Albany and Schoharie counties, New York.

Lingula perovata Hall = Glossina perovata.
Lingula perplexa Hall = L. subelliptica.

Lingula perryi Billings. † Chazy (Ord.).
Loc. Highgate Spring, Vermont.

Lingula philomela Billings. Trenton and Lorraine (Ord.).
Loc. Montmorency Falls, Ottawa, etc., Canada; Florenceville, Iowa.

Lingula plagemanni Mörircke. Jurassic.
Lingula plagemanni Mörircke, Neues Jahrbuch f. Mineral., Beilageband, IX, 1894, p. 59, pl. 5, fig. 9.
Loc. Canales and Caracoles, Bolivia.

Lingula piunaformis Hall = Lingulepis pinniformis.
Lingula polita Hall = Obolella polita.
Lingula prima Hall = Lingulepis prima.
Lingula procteri Ulrich = L. vanhorni.

Lingula progne Billings. Trenton-Utica (Ord.).
Lingula progne Billings, Pal. Fossils, I, 1862, p. 47, fig. 50;—Geol. Canada, 1863, p. 161, fig. 134; p. 201, fig. 196.
Loc. Montreal, Collingwood, Ottawa, etc., Canada.

Lingula punctata Hall. Hamilton and Ithaca (Dev.).
Loc. Canandaigua Lake and Summit, New York; Portage group at Ithaca (Williams).

Lingula quadrata, American authors = L. rectilateralis and L. iowaensis.
**Lingula quebecensis** Billings. Upper Cambrian and Calciferous.
Lingula quebecensis Billings, Pal. Fossils, I, 1862, p. 72, fig. 65; pp. 72, 216—
Geol. Canada, 1863, p. 230, fig. 241.
**Loc.** Point Levis, Sillery, etc., Canada; Cow Head, Newfoundland.

**Lingula rectilaterea** Hall. Lower Helderberg (Dev.).
Lingula rectilaterea Hall, Pal. New York, III, 1859, p. 156, pl. 9, figs 6-8.
**Loc.** Albany and Schoharie counties, New York; Arisaig, Nova Scotia (Ami).

**Lingula rectilateralis** Emmons. Trenton-Lorraine (Ord.).
Lingula quadrata Hall (non Eichwald), Pal. New York, 1, 1847, p. 96, pl. 30, fig. 4; p. 285, pl. 79, fig. 1.—Billings, Canadian Nat. Geol., I, 1856, p. 319, fig. 8.—Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 820, fig. 615.—Billings, Geol. Canada, 1863, p. 161, fig. 131;—Catalogue Sil. Foss. Anticosti, 1866, p. 10.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 1, fig. 13.
**Loc.** Rodman, Lorraine, Middleville, Trenton Falls, etc., New York; Ottawa etc., Canada; Anticosti.

**Obs.** This species is more closely related to L. iowaensis than to L. quadrata Eichwald.

**Lingula riciniformis** Hall. Trenton (Ord.).
Lingula riciniformis Hall, Pal. New York, I, 1847, p. 95, pl. 30, fig. 2.—Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 343, fig. 24; pl. 29, fig. 9.
Lingula (Glossina) riciniformis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 1, fig. 3.
**Loc.** Middleville, New York; Charlesbourg, Canada; St. Paul, Minnesota.

**Lingula riciniformis galenaensis** Winchell and Schuchert. Trenton (Ord.).
Lingula riciniformis var. galenaensis Winchell and Schuchert, American Geol., IX, 1892, p. 284;—Minnesota Geol. Survey, III, 1893, p. 344, pl. 29, figs. 10, 11.
**Loc.** Near Kenyon and Fountain, Minnesota; Neenah and Oshkosh, Wisconsin.

**Lingula rodriguezii** Rathbun. Middle Devonian.
**Loc.** Erere, Province of Para, Brazil.

**Lingula scotica** Meek (non Davidson)=Glossina waverlyensis.
**Lingula scotica var. nebraskensis** Meek=Glossina nebraskensis.

**Lingula scutella** Hall and Clarke. Chemung (Dev.).
Lingula scutella Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 171, pl. 1, fig. 30.
**Loc.** Alleghany County, New York.

**Lingula shumardi** Cragin. Lower Cretaceous.
**Loc.** Bonham-Sherman road, Fannin County, Texas.

**Lingula spatathia** Hall. Lower Helderberg (Dev.).
Lingula spatathia Hall, Pal. New York, III, 1859, p. 157, pl. 9, figs. 7, 9, 11.
**Loc.** Albany and Schoharie counties, New York; Arisaig, Nova Scotia (Ami).

**Lingula spatiosa** Hall=Glossina spatiosa.

**Lingula spatulata** Vanuxem. Genesee and Portage (Dev.).
Lingula spatulata Vanuxem—Continued.

Tschernyschew, Mémoires du Comité Géologique de St. Pétersbourg, 1887, p. 116, pl. 14, fig. 29.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 1, fig. 15.


Loc. Lodi, Seneca Lake, etc., New York; Portage group at Ithaca, New York (Williams); Erere, Province of Para, Brazil; Urals of Russia.

Lingula staontiana Rathbun.


Loc. Erere, Province of Para, Brazil.

Lingula(?) striata Emmons. Cambrian.

Lingula striata Emmons, American Geology, Pt. II, 1855, p. 112, pl. 1, fig. 17;—Manual Geol., 1860, p. 88, fig. 74.

Loc. Augusta County, Virginia.

Lingula subelliptica d'Orbigny. Clinton (Sil.).

Lingula elliptica Hall (non Phillips), Geol. New York; Rep. Fourth Dist., 1843, p. 76, fig. 7.

Lingula subelliptica d'Orbigny, Prodrome de Pal., I, 1850, p. 34.

Lingula perplexa Hall, Miller's American Pal. Fossils, 1877, p. 244.

Loc. Wolcott, New York.

Lingula submarginata d'Orbigny. Ordovician.

Lingula marginata d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 28, pl. 2, fig. 5.


Loc. Tacopaya, Bolivia.

Lingula suboblonga d'Orbigny = L. clintoni.

Lingula subspatulata Meek and Worthen (non Hall and Meek) = Barroisella subspatulata.

Lingula subspatulata Hall and Meek. Upper Cretaceous.


Loc. Near Red Cedar Island, Nebraska; near old Fort Wingate, New Mexico; Rolling River, Manitoba.

Lingula tæniola Hall and Clarke.

Lingula lamellata Hall (partim), Pal. New York, II, 1852, p. 55, pl. 20, fig. 4.

Lingula tæniola Hall and Clarke, Ibidem, VIII, Pt. I, 1892, pp. 18, 173, pl. 4K, fig. 8.


Lingula thefordensis Whiteaves. Hamilton (Dev.).

Lingula thefordensis Whiteaves, Extract Cont. Canadian Pal., I, 1887, p. 3, pl. 15, fig. 1;—Cont. Canadian Pal., I, 1889, p. 111, pl. 15, fig. 1.

Loc. Thedford, Ontario.

Lingula tightt Herrick. Upper Carboniferous.

Lingula tightt Herrick, Bull. Denison Univ., II, 1887, p. 43, pl. 4, fig. 5.

Loc. Newark, Ohio.

Lingula trentonensis Conrad = Glossina trentonensis.

Lingula triangulata Nettelroth = Glossina triangulata.
Lingula triquetra Clarke. Portage (Dev.).
Loc. Ontario County, New York.

Lingula truncata Sowerby. Neocomian (Cret.).
Lingula truncata Sowerby, Trans. Geol. Soc. London, IV, 1836, pl. 14, fig. 15.—
Davidson, British Cret. Brach., Pal. Soc., 1852, p. 6, pl. 1, figs. 27, 28, 31.—
Behrendsen, Zeit. der Deutschen Geol. Gesell., XLIV, 1892, p. 27.
Loc. Europe; Arrogo, Triuurgico, Argentine Republic.

Lingula umbonata Cox. Upper Carboniferous.
Lingula umbonata Cox, Owen's Geol. Survey Kentucky, III, 1857, p. 576, pl. 10,
fig. 4.—White, Thirteenth Rep. Geol. Survey Indiana, 1894, p. 120, pl. 25,
fig. 14.—Herrick, Bull. Denison Univ., II, 1887, p. 144, pl. 14, fig. 2.—Keyes,
1895, p. 38, pl. 35, fig. 4.
Loc. Crittenden, Union, and Hancock counties, Kentucky; Newark, Ohio; Des
Moines, Iowa; Clinton and Kansas City, Missouri.

Lingula vanhorni Hall and Clarke (partim)=L. modesta.

Lingula vanhorni Miller. Trenton and Lorraine (Ord.).
Lingula vanhorni Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 9, fig. 1;—
Lingula procteri Ulrich, American Geologist, III, 1889, p. 377, fig. 1.—Hall and
Clarke, Pal. New York, VIII, Pt. I, 1892, p. 12, pl. 1, figs. 5-7.
Loc. Versailles, Indiana; Covington and Burgin, Kentucky.
Obs. An examination of the type specimen led to the above synonymy.

Lingula varsaviensis Worthen. Warsaw (L. Carb.).
24;—Geol. Survey Illinois, VIII, 1890, p. 104, pl. 11, fig. 8.

Lingula waverlyensis Herrick=Glossina waverlyensis.

Lingula whitfieldi Ulrich. Lorraine (Ord.).
Lingula whitfieldi Ulrich, American Geologist, III, 1889, p. 381, fig. 3 on p. 378.
Loc. Covington, Kentucky.

Lingula whitei Walcott. Lower Devonian.
Lingula whitii Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 109, pl. 13, fig. 3.—
Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 11, pl. 1, fig. 31.
Loc. Eureka district, Nevada.

Lingula winona Hall=Lingulella winona.

Lingulasma Ulrich, American Geologist, III, 1889, p. 383.—Hall and Clarke, Pal.
New York, VIII, Pt. I, 1892, pp. 24, 46, 163.—Winchell and Schuchert, Min-
New York State Geologist, 1894, p. 335.

Lingulasma galenaense Winchell and Schuchert. Galena (Ord.).
Lingulasma galenaense Winchell and Schuchert, American Geol., IX, 1892, p.
Loc. Fillmore and Goodhue counties, Minnesota; Decorah, Iowa; Neenah and
Oshkosh, Wisconsin.
Lingulasma schucherti Ulrich.


Lingulasma schucherti Miller, N. American Geol. Pal., 1889, p. 351.

Loc. Wilmington and Savanna, Illinois.

LINGULELLA Salter.

Genotype Lingula davisi McCoy.


Lingulella affinis Billings—Lingulobolus affinis.

Lingulella ampla (Owen).


Loc. Trempealeau, Wisconsin; Winona, Minnesota.

Lingulella aurora Hall.


Loc. Mazomanie, Wisconsin; Oseola, Wisconsin, and Otisville, Minnesota (Sar-deson).

Lingulella(?) billingsana (Whiteaves).


Loc. Conception Bay, Newfoundland.

Lingulella celata (Hall).

Orbicula celata Hall, Pal. New York, I, 1847, p. 290, pl. 79, fig. 9.


Lingulella cincinnatiensis Hall and Whitfield = Lingula cincinnatiensis.

Lingulella(?) cuneata Matthew.

Lingulella(?) cuneata Matthew, Trans. Royal Soc. Canada, X, 1894, p. 92, pl. 16, fig. 5.


Lingulella dawsoni Matthew.


Loc. Portland, etc., New Brunswick.
Lingulella ella (Hall and Whitfield). Lower and Middle Cambrian.
Lingulepis ella Hall and Whitfield, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 232, pl. 1, fig. 8.
Loc. Wasatch Range, Utah; near Pioche, Nevada.

Lingulella granvillensis Walcott. Lower Cambrian.

Lingulella inflata Matthew. Middle Cambrian.
Loc. Hanford Brook, St. Martins, New Brunswick.

Lingulella inflata var. ovalis Matthew. ? Middle Cambrian.
Loc. Hanford Brook, New Brunswick.

Lingulella irene (Billings). Upper Cambrian and Calciferous.
Loc. Point Levis, Canada.

Lingulella laevis Matthew. Upper Cambrian.
Lingulella laevis Matthew, Trans. Royal Soc. Canada, IX, 1892, p. 39, pl. 12, figs. 4a, 4b.

Lingulella lamborni Meek. ? Upper Cambrian.
Loc. Madison County, Missouri.

Lingulella linguloides Matthew. Middle Cambrian.
Lingulella linguloides Matthew, Trans. Royal Soc. Canada, III, 1886, p. 34, pl. 5, fig. 8.

Lingulella macconelli Walcott. Middle Cambrian.

Lingulella martinensis Matthew. Middle Cambrian.
Loc. Hanford Brook, New Brunswick.

Lingulella minuta Hall and Whitfield. Up. Camb. and Pogonip (Ord.).
Loc. Eureka district, Nevada.

Bull. 87—17
Lingulella(?) paliformis Hall.

Lingula paliformis Hall, Pal. New York, IV, 1867, p. 8, pl. 1, fig. 7.—Whitfield, Geol. Wisconsin, IV, 1882, p. 324, pl. 25, fig. 10.
Lingulella? paliformis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 59, 64, pl. 2, figs. 6-8.
Loc. Cayuga Lake, New York; Milwaukee, Wisconsin.

Lingulella radula Matthew.

Lingulella radula Matthew, Trans. Royal Soc. Canada, VIII, 1891, p. 147, pl. 15, figs. 7, 8.

Lingulella roberti Matthew.

Loc. Cape Breton, Nova Scotia.

Lingulella selwyni Matthew.

Loc. Cape Breton, Nova Scotia.

Lingulella? spissa=Spherobolus spissus.

Lingulella starri Matthew.


Lingulella starri minor Matthew.


Lingulella stoneana Whitfield.

Lingulella stoneana Whitfield, Geol. Wisconsin, IV, 1882, p. 334, pl. 27, figs. 6, 7.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 2, figs. 9-11.
Loc. Prairie du Sac and Mazomanie, Wisconsin.

Lingulella winona (Hall).

Loc. Lansing, Iowa; Wisconsin.

LINGULEPIS Hall.

Genotype Lingula pinnaiformis Owen.

Obs. The essential difference between Lingulepis and Lingulella is that the ventral beak of the former is often much attenuated. The amount of attenuation, however, is often a very changeable feature in specimens of a species from a locality. It is this variation and the want of large collections that has lead to the making of too many species of Lingulepis.
Lingulepis acuminata (Conrad). Upper Cambrian.
Glossisina acuminata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 1, figs. 1, 2.
Loc. Saratoga and Franklin counties, etc., New York; Lansdowne, Bastard, and Beverly, Canada.
Obs. The material of this species in the collection of the U. S. Geological Survey has specimens which are difficult to separate from L. pinniformis and L. dakotensis, and there is every gradation between these and L. acuminata. See L. pinniformis.

Lingulepis acutangulus (Roemer). Upper Cambrian.
Lingula acutangula Roemer, Texas, 1849, p. 420;—Kreidebildung Texas, 1852, p. 90, pl. 11, fig. 10.
Loc. Burnett and Llano counties, Texas.

Lingulepis affinis = Lingulobolus affinis.

Lingulepis cuneolus Whitfield. Upper Cambrian.
Loc. Red Canyon Creek, Black Hills, South Dakota.

Lingulepis dakotensis Meek and Hayden = L. pinniformis.

Lingulepis ella Hall and Whitfield = Lingulella ella.

Lingulepis (?) mera Hall and Whi tfield. Upper Cambrian.
Loc. Secret Canyon, Ruby Hill, and Eureka district, Nevada.

Lingulepis matinalis Hall. Upper Cambrian.
Obs. A distinct species occurring in numbers in a blue shale just above the trap at St. Croix Falls, Wisconsin.

Lingulepis minima Whitfield = L. prima.

Lingulepis minuta Hall and Whitfield = Obolella whitfieldi.

Lingulepis morsensis N. H. Winchell = Lingula morsel.

Lingulepis perattenuata Whitfield = L. cuneolus.

Lingula antiqua and prima (non Emmons, Hall, 1847) Foster and Whitney, Geol. Rep. Lake Superior Dist., II, 1851, p. 204, pl. 23, figs. 1, 2.—Hall, Geol. Wisconsin, I, 1862, p. 21, fig. 3.—Hayden, American Jour. Sci., 2d ser., XXXIII, 1863, p. 73.
Lingula pinniformis Owen, Geol. Survey Wisconsin, Iowa, Minnesota, 1862, p. 583, pl. 1B, figs. 4, 6, 8.—Hall, Geol. Wisconsin, I, 1862, pp. 21, 435, fig. 3.
Lingulepis pinniformis (Owen)—Continued.

Orbicula prima Owen, Geol. Survey Wisconsin, Iowa, Minnesota, 1852, figs. 17, 19.
Lingulepis pinniformis and dakotensis Meek and Hayden, Pal. Upper Missouri, Smithsonian Cont. to Knowl., XIV, 172, 1864, pp. 2, 3, pl. 1, fig. 1.

Loc. Falls of St. Croix, Hudson, etc., Wisconsin; Black Hills, South Dakota.
Obs. This species also occurs at Ausable Chasm and Whitehall, New York, and are there regarded as L. acuminata. It may be advisable to refer Owen's species to L. acuminata (Conrad).

Lingulepis prima Meek and Hayden=Obolella polita.

Lingulepis prima (Hall). Upper Cambrian.
Lingula prima (Conrad MS.) Hall, Pal. New York, I, 1847, p. 3, pl. 1, fig. 2.—
Lingulepis minima Whitfield, Ibidem, 1884, p. 141, pl. 14, figs. 1, 2.

Lingulepis primiformis Whitfield. Upper Cambrian.
Loc. Black Hills, South Dakota.

LINGULOBOLUS Matthew. Genotype Lingulella(?) affinis Billings.

Lingulobolus affinis (Billings). Lower Ordovician.
Lingulella affinis Billings, Canadian Nat. Geol., n. ser., VI, 1872, p. 468, fig. 4;—Pal. Fossils, II, 1874, p. 67, fig. 35.
Lingulepis affinis Walcott, American Jour. Sci., 3d ser., XXXVII, 1889, p. 381.
Loc. Bell Island, Newfoundland.

Lingulobolus affinis cuneata Matthew. Lower Ordovician.
Lingulobolus affinis var. cuneata Matthew, Trans. Royal Soc. Canada, 2d ser., I., 1896, p. 262, pl. 1, figs. 4e, 4d.
Loc. Great Bell Island, Conception Bay, Newfoundland.

LINGULODISCINA Whitfield. Genotype Lingula exilis Hall.

Lingulodiscina(?) connata (Walcott). Lower Carboniferous.
Discina connata Walcott, Mon. U. S. Geol. Survey, VII, 1884, p. 214, pl. 7, fig. 3.
Loc. Eureka district, Nevada.
**LINGULODISCINA exilis (Hall).**


*Loc.* Schoharie County, New York.

**LINGULODISCINA newberryi** (Hall).


Discina (Orbiculoidae) newberryi Meek, Pal. Ohio, II, 1875, p. 277, pl. 14, fig. 1.


*Observation.* This species should be compared with Orbiculoidea(?) capax (White.)

**LINGULODISCINA pleurites (Meek).**

Discina (Orbiculoidae) pleurites Meek, Pal. Ohio, II, 1875, p. 278, pl. 14, fig. 2.

Orbiculoidaea pleurites Herrick, Bull. Denison Univ., IV, 1888, pp. 12, 19, pl. 3, fig. 5; — Geol. Ohio, VII, 1895, pl. 22, fig. 12.

*Observation.* This species should be compared with Orbiculoidea(?) capax (White.)

**LINGULOPS Hall.**


**LINGULOPS granti Hall and Clarke.**


**LINGULOPS norwoodi (James).**


*Loc.* Covington, Kentucky.

**LINGULOPS whitfieldi Hall.**


*Loc.* Near Lattner’s, Dubuque County, Iowa.

**LINNARSSONIA Walcott.**

Genotype Obolella transversa Hartt.

Linnarssonia Walcott, American Jour. Sci., 3d ser., XXIX, 1885, p. 115; XXX, p. 21; — Matthew, Trans. Royal Soc. Canada, III, 1886, p. 35; — Hall and
LINNARSSONIA Walcott—Continued.


Linnarssonia belti Davidson.

Linnarssonia belti ? Matthew, Trans. Royal Soc. Canada, IX, 1892, p. 42, pl. 12, figs. 7a-7c.


Linnarssonia misera (Billings).


Loc. Trinity Bay, Newfoundland; St. Martins, New Brunswick.

Linnarssonia pretilosa (Billings).

Obolella pretiosa Billings, Pal. Fossils, I, 1862, p. 68, fig. 61;—Geol. Canada, 1863, p. 230, fig. 239.


Loc. Bridge of the Grand Trunk Railroad across the Chaudiere River; Cape Rouge; Little Metis; Sillery and Point Levis, Canada.

Linnarssonia sagittalis taconica Walcott. Lower and Middle Cambrian.


Loc. Washington County, New York; Mount Stephen, British Columbia.

Linnarssonia taconica Walcott=L. sagittalis taconica.

Linnarssonia transversa (Hartt).

Obolella transversa Hartt, Dawson, Acadian Geol., 2d ed., 1868, p. 64.—Walcott, Bull. U. S. Geol. Survey, 10, 1884, p. 16, pl. 1, fig. 5.*


LISSOPLEURA Whitfield.

Genotype Rhynchonella aequivalvis Hall.


Lissopleura aequivalvis (Hall).

Lower Helderberg (Dev.).


Loc. Helderberg Mountains, New York.

MARTINIA McCoy.

Genotype Anomites glabra Martin.

Martinia athyroides A. Winchell. Hamilton (Dev.).
Martinia athyroides A. Winchell, Rep. Lower Peninsula Michigan, 1866, p. 94.
Loc. Grand Traverse region, Michigan.

Martinia glabra (Martin). Upper Carboniferous.
Anomites glabra Martin, Petrefacta Derbiensia, 1809, pl. 48, figs. 9, 10.
Spirifera glabra Davidson, Quart. Jour. Geol. Soc. London, XIX, 1863, p. 170, pl. 9, figs. 9, 10.—Dawson, Acadian Geology, 3d ed., 1878, p. 291, fig. 89.
Loc. Europe; Pictou, Windsor, etc., Nova Scotia.

Martinia glabra contracta (Meek and Worthen). Kaskaskia (L. Carb.).
Spirifera (Martinia) contracta Whitfield, Geol. Ohio, VII, 1895, p. 471, pl. 9, figs. 17-19.
Loc. Chester, Illinois; Newtonville, Ohio; Lincoln County, Nevada.

Martinia glanscerasi (White). Hamilton (Dev.).
Loc. Iowa-City, Iowa.

Martinia (?) insolita A. Winchell. Huron (Dev.).
Loc. Port aux Barques, Michigan.

Martinia laevigata (Swallow). Keokuk (L. Carb.).
Loc. Iowa and Missouri.
Obs. Regarded by Keyes as a synonym for Spirifer logani.

Martinia maia (Billings). Corniferous (Dev.).
Athyris maia Billings, Canadian Jour. Sci., V, 1869, p. 276, figs. 33, 34;—Geol. Canada, 1863, p. 373, fig. 398.
Spirifera (Martinia) maia Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 141, pl. 14, fig. 13 (pl. 3, fig. 1).
Loc. St. Marys, Township of Blanchard, Ontario; Columbus and Delaware, Ohio; Enreka district, Nevada.

Martinia meristoides Meek. Middle Devonian.

Martinia planoconvexa Meek and Hayden = Amboccelia planicouvexa.

Martinia sublineata Meek. Middle Devonian.
Spirifera (Martinia) sublineata Meek, Trans. Chicago Acad. Sci., I, 1868, p. 103, pl. 14, fig. 1.
Loc. Great Slave Lake, British America.
**Martinia subumbona** (Hall).  
Hamilton-Portage (Dev.).  
Spirifer subumbona Hall, Pal. New York, IV, 1867, p. 234, pl. 33, figs. 22-30.  
Loc. Shore of Lake Erie, Tully, and McKinneys Station, New York.  
Obs. Professor Williams says this species is a synonym for Ambocella gregaria.

**MEEKELLA** White and St. J. Genotype Plicatula striatocostata Cox.  
Meekella White and St. John, Trans. Chicago Acad. Sci., I, 1868, p. 120, figs. 4-6.—  

**Meekella occidentalis** (Newberry).  
Upper Carboniferous.  
Streptorhynchus occidentalis Newberry, Ives’s Rep. Colorado River of the West, 1861, p. 126, pl. 1, fig. 5.  
Meekella occidentalis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 266, pl. 11B, figs. 18, 19.  
Loc. Canyon of Cascade River.  
Obs. See Meekella pyramidalis.

**Meekella (?) occidentalis** (Swallow).  
Upper Carboniferous.  
Orthisina occidentalis Swallow, Trans. St. Louis Acad. Sci., II, 1863, p. 82.  
Loc. Caldwell County, Missouri.  
Obs. If a Meekella it should be compared with M. striatocostata. Regarded by Keyes as a synonym for M. striatocostata.

**Meekella pyramidalis** (Newberry).  
Upper Carboniferous.  
Loc. Colorado River.  
Obs. This species is quite distinct from M. striatocostata Cox, with which it has been confounded. M. occidentalis Newberry, however, may prove to be but a large individual of M. pyramidalis.

**Meekella striatocostata** (Cox).  
Upper Carboniferous.  
Plicatula striatocostata Cox, Owen’s Geol. Survey Kentucky, III, 1857, p. 568, pl. 8, fig. 7.  
Orthis striatocosta Geinitz, Carbon und Dyas in Nebraska, 1866, p. 48, pl. 3, figs. 22-24.  
Meekella striatocostata White and St. John, Trans. Chicago Acad. Sci., I, 1868, pp. 120, 122, figs. 4-6.—Meek, Final Rep. U. S. Geol. Survey Nebraska, 1872, p. 175, pl. 5, fig. 12.—Meek and Worthen, Geol. Survey Illinois, V, 1873, p. 571, pl. 26, fig. 21.—White, Wheeler’s Expl. Survey west 100th Merid., IV, 1875, p. 26, pl. 9, fig. 4.—Kayser, Riehthofer’s China, IV, 1883, p. 179, pl. 23, fig. 8.—White, Thirteenth Rep. State Geol. Indiana, 1884, p. 130, pl. 26, figs. 12-14.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 265, pl. 10, figs. 18-23; pl. 11B, figs. 20-22.—Keyes, Geol. Survey Missouri, V, 1895, p. 68, pl. 39, fig. 1.
Meekella striaticostata (Oox) Continued.
Loc. Hopkins County, Kentucky; Indiana; Illinois; Missouri; Iowa; Nebraska; New Mexico; Nevada; Utah; China.
Obs. See M. occidentalis (Swallow).

MEGALANTERIS Ehlert. Genotype Terebratula archiaci de Verneuil.
Meganteris Suess, Sitz. der k. k. Akad. der Wissensch. zu Wien, XVIII, 1855, p. 51.

Meganteris condoni (McChesney). Oriskany (Dev.).
Loc. West of Jonesboro, Union County, Illinois.

Meganteris ovalis Hall. Oriskany (Dev.).
Rensseleria ovalis Hall, Pal. N. Y., III, 1859, p. 458, pl. 106, fig. 2.—Billings, Geol. Canada, 1863, p. 962, fig. 471.
Loc. Albany and Schoharie counties, New York.

Meganteris æquiradiata Hall=Rensselæria æquiradiata.
Meganteris cumberlandiæ Hall=Rensselæria cumberlandiæ.
Meganteris elliptica Hall=Rensselæria elliptica.
Meganteris elongata Hall=Amphigenia elongata.
Meganteris lævis Hall=Meristella lævis.
Meganteris mutabilis Hall=Rensselæria mutabilis.
Meganteris ovalis Hall=Meganteris ovalis.
Meganteris ovoides Hall=Rensselæria ovoides.
Meganteris subtrigonalis Hall=Amphigenia elongata subtrigonalis.
Meganteris suessana Hall=Beachia suessana.
Megerlia dubitanda Cooper=Terebratella(?) dubitanda.

MERISTA Suess. Genotype Atrypa herculæa Barrande.

Merista arcuata Hall=Meristella arcuata.
Merista bella Hall=Meristella bella.
Merista bisulcata Hall=Whitfieldella bisulcata.
Merista crassirostra Hall=Whitfieldella cylindrica.
Merista cylindrica Hall=Whitfieldella cylindrica.
Merista elongata (Hall).
Camarium elongatum Hall, Pal. New York, III, 1859, p. 488, pl. 95A, fig. 4.
Loc. Cumberland, Maryland.
Obs. Probably only a variety of M. typa.
Merista houghtoni Winchell = Meristella houghtoni.
Merista laevis Hall = Meristella laevis.
Merista lata Hall = Meristella lata.
Merista lens Hall = Meristella lens.
Merista meeki Hall = Meristella meeki.
Merista princeps Hall = Meristella princeps.
Merista subquadrata Hall = Meristella subquadrata.

Merista tennesseensis Hall and Clarke.
Loc. Perry County, Tennessee.

Merista typus Hall.
Camarium typum Hall, Pal. New York, III, 1859, p. 487, pl. 95A, figs. 2a, 3, 5, 6.
Merista typus Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 42, figs. 7-12.
Loc. Cumberland, Maryland.

MERISTELLA Hall, 1860. Genotype Merista arcuata Hall.

Meristella arcuata Hall.
Meristella arcuata Hall, Ibidem, IV, 1867, p. 298, figs. 1, 2.—Hall and Clarke, Ibidem, VIII, Pt. II, 1885, pl. 43, figs. 1, 2; pl. 44, fig. 5.

Meristella barrisi Hall.
Marcellus-Hamilton (Dev.).
Meristella barrisi Hall, Thirteenth Rep. N. Y. State Cab. Nat. Hist., 1860, p. 84;—Pal. New York, IV, 1867, p. 304, pl. 49, figs. 5-22.—Tscherneyschev, Mémoires du Comité Géologique de St. Pétersbourg, III, 3, 1887, p. 55, pl. 9, figs. 12, 15; pl. 13, figs. 1, 2.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1885, pl. 43, figs. 25, 26; pl. 44, figs. 27-30.

Meristella bella (Hall).
Meristella bella Whitfield, Annals N. Y. Acad. Sci., V, 1891, p. 510, pl. 5, figs. 8-10.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1885, pl. 43, figs. 7-9; pl. 44, figs. 1-3.—Whitfield, Geol. Ohio, VII, 1895, p. 412, pl. 1, figs. 8-10.
Loc. Albany and Schoharie counties, New York; Greenfield, Ohio; Lake Temisconata, New Brunswick.
Meristella(?) blancha (Billings). Lower Helderberg (Dev.).
Meristina (?) blancha Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 68, pl. 41, figs. 22, 23.
Loc. Square Lake, Maine.
Obs. Compare with Meristella arcuata.

Meristella clusia (Billings). Corniferous (Dev.).
Loc. Cayuga, Ontario.

Meristella doris Hall. Upper Helderberg (Dev.).
Loc. Schoharie and Williamsville, New York; Cayuga, Ontario.

Meristella elissa Hall = Meristella nasuta.

Meristella haskinsi Hall. Hamilton (Dev.).
Loc. Seneca Lake, York, Moscow, etc., New York; Thedford, Ontario.

Meristella (?) houghtoni (A. Winchell). Huron (Dev.).
Loc. Port aux Barques, Michigan.

Meristella (?) incerta Simpson. Waverly (L. Garb.).
Obs. Based upon a crushed and broken specimen.

Meristella laevis (Vanuxem). Lower Helderberg (Dev.).
Atrypa laevis Vanuxem, Geol. New York; Rep. Third Dist., 1842, p. 120, fig. 2.—Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 825, fig. 642.
Meristella laevis Whitfield, Annals N. Y. Acad. Sci., V, 1891, p. 510, pl. 5, figs. 6, 7.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 43, figs. 3-6; pl. 44, fig. 4.—Whitfield, Geol. Ohio, VII, 1895, p. 411, pl. 1, figs. 6, 7.
Loc. Albany and Schoharie counties, New York; Greenfield, Ohio; Perry County, Missouri; Pennsylvania; Square Lake, Maine; St. Blandine, New Brunswick.

Meristella (?) laevis (Hall). Lower Helderberg (Dev.).
Rensselaeria laevis Hall, Pal. New York, III, 1859, p. 256, pl. 40, fig. 2.
Loc. Albany County, New York.

Meristella lata Hall. Oriskany (Dev.).
Merista lata Hall, Pal. New York, III, 1859, p. 431, pl. 101, fig. 3.
Loc. Albany and Schoharie counties, New York; Cayuga, Ontario.
Meristella lens (A. Winchell). Hamilton (Dev.).
Merista lens A. Winchell, Rep. Lower Peninsula Michigan, 1866, p. 94.

Loc. Grand Traverse region, Michigan.

Meristella lenta Hall. Oriskany (Dev.).

Loc. Cayuga, Ontario.

Meristella maria Hall = Meristina maria.

Meristella meeki Hall. Lower Helderberg (Dev.).

Loc. Perry County, Tennessee.

Meristella meta Hall. Hamilton (Dev.).
Meristella meta Hall, Pal. New York, IV, 1867, p. 308, pl. 49, figs. 1-4.—Hall and Clarke, Ibidem, VIII, Pt. II, 1895, pl. 43, figs. 29, 30.


Meristella nasuta (Conrad). Upper Helderberg (Dev.).
Terebratula valenciennii Castelnau, Essai Syst. Sil. l'Amérique Septentrionale, 1848, p. 39, pl. 13, fig. 6.


Loc. Schoharie, Clarence, Williamsville, etc., New York; Cayuga, Ontario; Columbus and Dublin, Ohio; Falls of Ohio; Lone Mountain, Nevada.

Meristella nucleolata Whitfield = Whitfieldella nucleolata.

Meristella princeps Hall. Lower Helderberg (Dev.).


Meristella rectirostra Hall = Meristina rectirostris.

Meristella riskowskyi A. Ulrich. Middle Devonian.
Meristella riskowskyi A. Ulrich, N. Jahrb. f. Mineral., Beilageband, VIII, 1892, p. 64, pl. 4, figs. 16-18.

Loc. Chahuarani and near Oconi, Bolivia.
Meristella rostrata Hall.  
Hamilton (Dev.).
Charionella rostrata Billings, Geol. Canada, 1863, p. 385, fig. 420.
Meristella rostrata Hall, Pal. New York, IV, 1867, p. 307, pl. 50, figs. 13-17.—
Loc. Eighteen Mile Creek, etc., New York; Bosanquet, Ontario.

Meristella subquadrata Hall.  
Lower Helderberg (Dev.)
Pal. New York, III, 1859, p. 249, pl. 40, fig. 3.
Meristella subquadrata Hall and Clarke, Ibidem, VIII, Pt. II, 1893, p. 78, pl. 43,
figs. 14, 15.

Meristella unisulcata Hall = Pentagonia unisulcata.

Meristella unisulcata biciplicata Hall = Pentagonia unisulcata biciplicata.
Meristella unisulcata uniplicata Hall = Pentagonia unisulcata uniplicata.

Meristella walcootti Hall and Clarke.  
Oriskany (Dev.).
Meristella walcootti Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pp. 77,
365, figs. 55, 56, pl. 43, figs. 16, 17; pl. 44, figs. 6-11, 23, 32.
Loc. Cayuga, Ontario.

MERISTINA Hall. Genotype Meristella maria Hall.

New York, IV, 1867, p. 299.—Nettelroth (partim), Kentucky Fossil Shells, Mem.
Kentucky Geol. Survey, 1889, p. 101.—Hall and Clarke, Pal. New York, VIII,
Whitfieldia Davidson, Supplement British Sil. Brach., Paleontographical Soc.,
1882, p. 107.—Beecher and Clarke, Mem. New York State Mus., I, 1889, p. 73.

Meristina maria Hall.  
Niagara (Sil.).
Athyris tumida Roemer, Sil. Fauna west. Tennessee, 1860, p. 70, pl. 5, fig. 12.
Meristella maria Hall, Trans. Albany Institute, IV, 1863, p. 212.—Hall and Whit-
132, pl. 7, figs. 5, 6.—Nettelroth, Kentucky Fossil Shells, Mem. Kentucky
Geol. Survey, 1889, p. 101, pl. 29, figs. 7-10.—Hall and Clarke, Pal. New
York, VIII, Pt. II, 1893, p. 67, pl. 41, figs. 1-17.

Meristella tumida Etheridge, Quart. Jour. Geol. Soc. London, XXXIV, 1878,
p. 597.

Hist., 1879, p. 159, pl. 25, figs. 8-12;—Eleventh Rep. State Geol. Indiana,
1882, p. 299, pl. 25, figs. 8-12.
Whitfieldia maria Beecher and Clarke, Mem. N. Y. State Mus., I, 1889, p. 73, pl. 7,
figs. 1-3.
Loc. Waldron, Indiana; Springfield, Ohio; Louisville, Kentucky; Perry County,
Tennessee; Bridgeport, Illinois; Racine, Wisconsin; Bessels Bay, 81° 6'.
Obs. This species is not identical with M. tumida Dalman.

Meristina nitida Hall = Whitfieldella nitida.

Meristina rectirostris Hall.  
Niagara (Sil.).
Meristella rectirostra Hall, Descriptions n. sp. Fossils from Waldron, Indiana,
1879, p. 15;—Eleventh Rep. State Geol. Indiana, 1882, p. 301, pl. 27, figs. 10-
N. Y. State Mus., I, 1889, p. 67, pl. 7, figs. 4, 5, 11-13.
Meristina rectirostris Hall—Continued.
Meristina rectirostra Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 68, figs. 52, 53, pl. 41, figs. 18-21.
Loc. Waldron, Indiana.

Meristina trisinuata (McChesney).
Athyris? trisinuatus McChesney, Trans. Chicago Acad. Sci., I, 1868, p. 33, pi. 8, fig. 2.
Loc. Milwaukee, Wisconsin.
Obs. Probably synonymous with Meristina maria.

METAPLASIA Hall and Clarke. Genotype Spirifer pyxidata Hall.

Metaplasia disparilis (Hall).

Metaplasia pyxidata Hall.
Spirifer pyxidata Hall, Pal. New York, III, 1859, p. 428, pl. 100, figs. 9-12.
Loc. Albany and Schoharie counties, New York; Cumberland, Maryland; Cayuga, Ontario.

Micromitra Meek=Iphidea.

MIMULUS Barrande. Genotype M. perversus Barrande.

Mimulus waldronensis (Miller and Dyer).
Spirifera (?) waldronensis Miller and Dyer, Jour. Cincinnati Soc. Nat. Hist., I, 1878, p. 37, pl. 2, fig. 3.
Streptis waldronensis Beecher and Clarke, Mem. New York State Mus., I, 1889, p. 30, pl. 3, figs. 9, 10.
Loc. Waldron, Indiana.

MONOMORELLA Billings. Genotype M. prisca Billings.

Monomorella egani Hall and Clarke.
Monomorella egani Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 42, 175, pl. 4C, fig. 16.
Loc. Near Grafton, Wisconsin.
Monomorella greenei Hall and Clarke. Niagara (Sil.).
Monomorella greenii Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 42, 174, pl. 4D, figs. 5-10.
Loc. Near Grafton, Wisconsin; Risingem, Ohio.

Monomorella kingi Hall and Clarke. Niagara (Sil.).
Monomorella kingi Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 42, 174, pl. 4D, figs. 1, 2.

Monomorella newberryi Hall and Whitfield. Niagara (Sil.).
Monomorella newberryi Hall and Whitfield, Pal. Ohio, II, 1875, p. 131, pl. 7, figs. 1, 2.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 4C, figs. 1, 2.
Loc. Genoa, Ohio.

Monomorella orbicularis Billings. Guelph (Sil.).
Monomorella ond. orbicularis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 4C, figs. 3-5.
Loc. Hespeler, Ontario; near Grafton, Wisconsin.

Monomorella ortoni Hall and Clarke. Niagara (Sil.).
Monomorella ortoni Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 42, 175, pl. 4C, figs. 14, 15.
Loc. Risingem, Wood County, Ohio.

Monomorella ovata Whiteaves. Guelph (Sil.).
Monomorella ovata Whiteaves, Pal. Fossils, III, 1884, p. 5, pl. 2, fig. 1; pl. 8, fig. 1.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 42, pl. 4D, figs. 13-15.

Monomorella ovata lata Whiteaves. Guelph (Sil.).
Monomorella ovata var. lata Whiteaves, Pal. Fossils, III, 1884, p. 6, pl. 2, fig. 2; pl. 8, fig. 2.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 4, figs. 11, 12; pl. 4C, figs. 17, 18.

Monomorella prisca Billings. Guelph (Sil.).
Loc. Hespeler and Elora, Ontario; Risingem, Wood County, Ohio; Hawthorne, Port Byron, and Cicero, Illinois.

NEWBERRYA Hall. Genotype Rensselaeria johanni Hall.
Obs. It is unfortunate that Rensselaeria johanni is the type for two generic names. Adhering strictly to the rules of nomenclature Rensselaeria will take precedence over Newberrya. The first term is, however, improperly constructed and is without meaning.
Newberrya claypolei Hall. Hamilton (Dev.).
Loc. Perry County, Pennsylvania.
Newberria? condoni McChesney = Megalanteris condoni.

Newberrya johannis Hall. Middle Devonian.
Rensselandia johanni Hall, Ibidem, 1867, at end of description.
Loc. Waterloo, Iowa.

Newberrya lasvis (Meek). Middle Devonian.
Rensseleria lasvis Meek, Trans. Chicago Acad. Sci., I, 1888, p. 108, pl. 13, fig. 8; pl. 14, fig. 4.
Newberria lasvis Hall, Cont. Canadian Pal., I, 1891, p. 237, pl. 30, figs. 3, 4.
Loc. Mackenzie, Onion, and Lookhart rivers, Canada.

Newberrya missouriensis Swallow. Hamilton (Dev.).
Loc. Moniteau County, Missouri.

NOTOTHYRIS Waagen. Genotype Terebratula subvesicularis David.

Notothyris (?) smithii Derby. Middle Devonian.
Loc. Head of the Paraguay in Matto-Grosso, Brazil.

NUCLEOSPIRA Hall. Genotype Spirifer ventricosa Hall.

Nucleospira barrisi White. Kinderhook (L. Carb.).
Loc. Burlington, Iowa.

Nucleospira concentrica Hall. Lower Helderberg (Dev.).
Loc. Decatur County, Tennessee.
Nucleospira concinna Hall. Cornerious-Hamilton (Dev.).
  Atrypa concinna Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 200, fig. 3.
  Loc. Moscou, Darien, etc., New York; Monroe County, Pennsylvania; Thedford, Ontario; Hardy County, Virginia; Columbus, Ohio; Falls of Ohio; Lone Mountain, Nevada.

Nucleospira elegans Hall. ? Niagara and L. Helderberg (Sil. and Dev.).
  Loc. Cherry Valley, New York; Cumberland, Maryland. In the Niagara near Louisville, Kentucky (Nettelroth).

Nucleospira indianensis Miller=Parazyga hirsuta.

Nucleospira pisiformis Hall. Niagara (Sil.).
Orthis pisum Hall (non Sowerby), Pal. New York, II, 1852, p. 250, pl. 2, fig. 1.
  Loc. Wolcott, New York; Waldron, Indiana; Louisville, Kentucky; Pike County, Missouri; Tshan-Tien, China.

Nucleospira rotundata Whitfield. Waterline (Sil.).
  Loc. Greenfield, Ohio.

Nucleospira ventricosa Hall. Lower Helderberg (Dev.).
Nucleospira ventricosa Hall, Pal. New York, III, 1859, p. 220, pl. 14, fig. 1; pl. 28B, figs. 2-9.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 145, figs. 128-130; pl. 48, figs. 2-6, 18;—pl. 84, figs. 39, 40.
  Loc. Schoharie, Cherry Valley, etc., New York; Cumberland, Maryland.

SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA. [BULL. 87.

OBOLELLA Billings—Continued.


Obolella ambigua Walcott═Elkania ambiguа.

Obolella atlantica Walcott. Lower Cambrian.


Loc. Conception Bay, Newfoundland; Attleboro, Massachusetts.

Obolella cælata Billings═Lingulella cælata.

Obolella chromatica Billings. Lower Cambrian.


Loc. Anse au Loup, Canada.

Obolella cingulata Billings═Kutorgina cingulata.

Obolella ciree Billings. Lower Cambrian.


Loc. Trois Pistoies, Canada.

Obolella crassa (Hall). Lower Cambrian.


Loc. Troy and Schodack Landing, New York; North Attleboro, Massachusetts; St. Simon and Bic Harbor, below Quebec, Canada.

Obolella desiderata Billings═Elkania desiderata.

Obolella desquamata Billings═Obolella crassa.

Obolella (?) discoidea Hall and Whitfield. Up. Camb. and Pogonip (Ord.).


Loc. Eureka district, Nevada.
Obolella gemma Billings.  
Lower Cambrian.  
Loc. Bic and St. Simon harbors, below Quebec, Canada; Troy, New York.

Obolella (?) gemmula Matthew.  
Upper Cambrian.  
Obolella (?) gemmula Matthew, Trans. Royal Soc. Canada, IX, 1892, p. 41, pl. 12, figs. 8a-8c.  

Obolella (?) ida Billings.  
Upper Cambrian and Calciferous (Ord.).  
Obolella ida Billings, Pal. Fossils, I, 1862, p. 71, fig. 63, on p. 68.  
Loc. Point Levis, Canada.

Obolella misera Billings=Linnavarssonia misera.

Obolella minuta (Hall and Whitfield).  
Upper Cambrian.  
Loc. Eureka district, Nevada.

Obolella nana Meek and Hayden.  
Middle Cambrian.  
Loc. Black Hills, South Dakota.

Obolella nitida Ford.  
Lower Cambrian.  
Loc. Troy, and Washington County, New York; Hanford Brook, New Brunswick.

Obolella pectenoides (Whitfield).  
Upper Cambrian.  
Obolus † pectenoides Whitfield, Powell’s Geol. Geogr. Survey Rocky Mountain Region, 1880, p. 338, pl. 2, figs. 18, 19.  
Loc. Black Hills, South Dakota.

Obolella polita Hall.  
Middle Cambrian.  
Obolus appolinus Owen (non Eichwald), Geol. Survey Wisconsin, Iowa, Minnesota, 1852, pl. 1B, figs. 9, 11, 15, 20.  
Lingulepis prima Meek and Hayden, Smithsonian Cont. to Knowl., XIV, 172, 1864, p. 3, pl. 1, fig. 2.  
Obolella polita Hall—Continued.


Loc. Trempealean, Wisconsin; Black Hills, South Dakota.

Obolella pretiosa Billings = Linnarssonia pretiosa.

Obolella prima Whitfield = Lingulepis prima.

Obolella transversa Hartt = Linnarssonia transversa.

Obolellina Billings = Dinobolus.

Obolellina canadensis Billings = Dinobolus canadensis.

Obolellina galtensis Billings = Rhinobolus galtensis.

Obolellina magnifica Billings = Dinobolus magnificus.

OBOLUS Eichwald. Genotype Obolus appolinus Eichwald.


Obs. Both Enobolus and Obolus are based upon the same species.

Obolus appolinus Owen (non Eichwald) = Obolella polita.

Obolus canadensis Billings, 1858 = Dinobolus magnificus.

Obolus canadensis Billings = Dinobolus canadensis.

Obolus conradi Hall = Dinobolus conradi.

Obolus galtensis Billings = Rhinobolus galtensis.

Obolus labradoricus Billings = Iphidea labradorica.

Obolus (?) major Matthew. Lower Cambrian.


Obolus (?) murrayi Billings. Cambrian.


Loc. Hare Bay, Newfoundland.

Obolus (?) pectenoides Whitfield = Obolella pectinoides.

Obolus pulcher Matthew = Botsfordia pulchra.

Obolus pristinus Matthew. Middle Cambrian.

Obolus pristinus Matthew, Trans. N. Y. Acad. Sci., XIV, 1895, p. 121, pl. 4, fig. 1.

Loc. Hanford Brook, New Brunswick.

Obolus (?) refulgens Matthew. Middle Cambrian.

Obolus refulgens Matthew, Trans. Royal Soc. Canada, IX, 1892, p. 44, pl. 12, figs. 6a-6d.


Galeertella Hall and Clarke = Lingulodiscina.

Orbicula Cuvier = Crania.

Orbicula Sowerby, 1830 = Discina.

Orbicula caelata Hall = Lingulella caelata.
Orbicula corrugata Hall = Lichenalia, a bryozoan.
Orbicula crassa Hall = Obolella crassa.
Orbicula deformata Hall = Crania deformata.

Orbicula excentrica Emmons.  Cambrian.
Orbicula excentrica Emmons, American Geology, Pt. II, 1855, p. 112, pl. 1, fig. 4.
Loc. Augusta County, Virginia.
Obs. Probably a gastropod.

Orbicula filosa Hall = Schizocrama filosa.

Orbicula grandis Vanuxem = Ramerella grandis.

Orbicula lamellosa Hall (non Broderip) = Orbiculoidea lamellosa.

Orbicula lugubris Conrad = Discinisca lugubris.

Orbicula minuta Hall = Orbiculoidea minuta.

Orbicula multilineata Conrad = Discinisca multilineata.

Orbicula parmulata Hall = Orbiculoidea parmulata.

Orbicula prima Owen = Lingulepis pinniformis.

Orbicula squamiformis Hall = Pholidops squamiformis.

Orbicula subtruncata Hall = Pholidops subtruncata.

Orbicula tenuilamellata Hall = Schizotreta tenuilamellata.

Orbicula terminalis Emmons = Trematis terminalis.

Orbicula truncata Emmons = Orbiculoidea lamellosa.

ORBICULOIDEA d’Orbigny.  Genotype Orbicula morrisi Davidson.


Discina Hall (non Lamarck), Pal. New York, III, 1859, p. 406, pi. 92, fig. 1.

Orbiculoidea ampla Hall = Discina ampla Hall, Ibidem, corrigenda in volume with plates, 1859.

Orbiculoidea baini (Morris and Sharpe.) Middle Devonian.


Loc. Falkland Islands; Taquaras, Matto-Grosso, Brazil; South Africa.
Orbiculoidea (?) capax (White).
Loc. Burlington, Iowa; Girard and Rockville, Ohio (A. Winchell).
Obs. This species should be compared with Lingulodiscina newberryi Hall.

Orbiculoidea capuliformis (McChesney).
Obs. Compare with O. convexa Shumard.

Orbiculoidea conica (Dwight=Schizotreta conica).

Orbiculoidea conradi (Hall).
Discina conradi Hall, Pal. New York, III, 1859, p. 161, pl. 9, figs. 16, 17; pl. 10A, fig. 2.

Orbiculoidea convexa (Shumard).
Loc. Valley of Verdigris River, Kansas; Kansas City, Missouri; Vermilion County, Indiana; Newark, Ohio.
Obs. See Orbiculoidea capuliformis McChesney.

Orbiculoidea discus Hall.
Orbiculoidea discus Hall and Clarke, Ibidem, 1892, pl. 4E, fig. 13.

Orbiculoidea doria (Hall).
Loc. Madison County, New York; Thedford, Ontario; Clark County, Indiana.

Orbiculoidea elmira (Hall).

Orbiculoidea gallaherl (A. Winchell).
Loc. Hillsdale, Michigan; Granville, Ohio; Shakers, Pennsylvania.

Orbiculoidea herzeri Hall and Clarke.
Waverly (L. Carb.).
Orbiculoidea pulchra Hall and Clarke, Ibidem, 1892, pl. 4E, fig. 19; pl. 4F, figs. 9-13, 30, (114-16).
Loc. Berea and Baconsburg, Ohio; Meadville, Pennsylvania.

Orbiculoidea humilis (Hall).
Marcellus and Hamilton (Dev.).
Loc. Bridgewater, Canandaigua Lake, etc., New York; Leroy, Ohio.
Orbiculoidae illinoisensis (Miller and Gurley).  Upper Carboniferous.
Obs. Closely related to O. convexa.

Orbiculoidae jervisensis (Barrett).  Oriskany (Dev.).

Orbiculoidae keokuk (Gurley).  Keokuk (L. Carb.).
Loc. Crawfordsville, Indiana.

Orbiculoidae lamellosa Hall.  Trenton and Lorraine (Ord.).
Orbicula lamellosa Hall (non Broderip, 1833), Pal. New York, I, 1847, p. 99, pl. 30, fig. 10.
Orbicula truncata Emmons, American Geology, Pt. II, 1855, p. 200, fig. 62.
Orbiculoidae lamellosa? Winchell and Schuckert, Minnesota Geol. Survey, III, 1893, p. 364, pl. 29, fig. 25.
Orbiculoidae lamellosa Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 4E, fig. 25.
Loc. Middleville and Lowville, New York; Bellville and Ottawa, Canada; Spring Valley, Minnesota.
Obs. Orbicula lamellosa Broderip, is the type species of Discinisca, and Hall’s name will therefore stand.

Orbiculoidae lodiensis (Vanuxem).  Genesee (Dev.).
Discina sp. a A. Ulrich, N. Jahrb. für Mineral., Beilageband, VIII, 1892, p. 81, pl. 5, fig. 10.
Orbiculoidae lodiensis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 4F, fig. 21.
Loc. Lodi, etc., New York; White Pine district, Nevada; Erere, Province of Para, Brazil; Chahuaran, Bolivia. In the Marcellus shale of Delaware County, Ohio (Whitfield).

Orbiculoidae lodiensis media Hall.  Marcellus-Chemung (Dev.).
Orbiculoidae media Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 4E, figs. 15-17.
Loc. Seneca and Canandaigua lakes, New York; Chemung group, Troopsburg, New York.

Orbiculoidae magnifica (Herrick).  Waverly (L. Carb.).
Loc. Wooster, and Ashland County, Ohio.
**Orbiculioidea manhattanensis** (Meek and Hayden). Upper Carboniferous.
Loc. Near Manhattan, Kansas.

**Orbiculioidea marginalis** (Whitfield).
Orbiculioidea marginalis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 127, pl. 4F, fig. 17.
Loc. Milwaukee, Wisconsin.

**Orbiculioidea minuta** (Hall).
Loc. Avon, New York; Delaware County, Ohio; near Eureka, Nevada.

**Orbiculioidea missouriensis** (Shumard).
Discina nitida† Meek and Worthen (non Phillips), Geol. Survey Illinois, V, 1873, p. 572, pl. 25, fig. 1.
Loc. Lexington, Missouri; Illinois; Carbon Hill and Flint Ridge, Ohio; Des Moines, Iowa; Vermilion County, Indiana.
Obs. This species is not D. nitida Phillips. It differs from it in form and in the muscular scars.

**Orbiculioidea (?) munda** (Miller and Gurley).
Loc. Kansas City, Missouri.
Obs. This species may be a Lingulodiscina, but since the ventral valve is unknown satisfactory generic reference can not be made.

**Orbiculioidea neglecta** (Hall).

**Orbiculioidea newberryi** Meek = Lingulodiscina newberryi.

**Orbiculioidea nitida** (Phillips).
Orbicula nitida Phillips, Geol. Yorkshire, II, 1836, p. 221, pl. 9, figs. 10-13.
†Discina nitida Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 213, pl. 7, fig. 4.
Loc. England; White Pine district, Nevada.
Orbiculoidea numulus Hall and Clarke. Waterlime (Sil.).

Orbiculoidea parmula Hall. Medina (Sil.).
Orbiculoidea parmula Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 48, fig. 4;—Pal. New York, II, 1852, pl. 4, fig. 3.

Orbiculoidea parvulata (Hall). Medina (Sil.).
Loc. Burlington, Iowa.

Orbiculoidea patellaris (A. Winchell). Kinderhook (L. Carb.).

Orbiculoidea pleurites Meek = Lingulodiscina pleurites.

Orbiculoidea randalli Hall. Hamilton (Dev.).
Orbiculoidea randalli Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 4E, fig. 18.

Orbiculoidea saffordi (A. Winchell). Lower Carboniferous.

Orbiculoidea sampsi (Miller). Chouteau (L. Carb.).
Loc. Sedalia, Missouri.

Orbiculoidea seneca (Hall). Hamilton (Dev.).

Orbiculoidea subplana (Hall). Arisaig (Sil.).
Loc. Arisaig, Nova Scotia.

Orbiculoidea subtrigoualis (McChesney). Upper Carboniferous.
Discina trigoualis McChesney, Ibisdem, 1865, pl. 2, fig. 19;—Trans. Chicago Acad. Sci., I, 1868, p. 24, pl. 2, fig. 19.
Loc. Lasalle, Illinois.

Orbiculoidea tenuilineata (Meek and Hayden). Upper Carboniferous.
Loc. Cottonwood Creek, Kansas.

Orbiculoidea tenuistriata (Ulrich). Utica (Ord.).
Loc. Covington, Kentucky.
Orbiculeoidea tullia (Hall).


Orbiculeoidea utahensis (Meek).

Discina sp. undet., Meek, King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 99, pl. 10, fig. 3.
Discina utahensis Meek, Ibidem, 1877, p. 99 (also see footnote, p. 9).
Loc. Weber Canyon, Wasatch Range, Utah.

Orbiculeoidea vanuxemi (Hall).

Discina vanuxemi Hall, Pal. New York, III, 1859, p. 162, pl. 8, fig. 1.

Orbiculeoidea varsoviensis (Worthen).

Discina varsoviensis Worthen, Bull. Illinois State Mus. Nat. Hist., 1890, p. 102, pl. 11, fig. 7.
Loc. Warsaw, Illinois.

ORISKANIA Hall and Clarke. Genotype O. navicella H. and C.


Oriskania navicella Hall and Clarke.


ORTHIDIUM Hall and Clarke. Genotype Orthis gemmicula Billings.


Orthidium gemmicula (Billings).

Orthidium gemmicula Billings, Pal. Fossils, I, 1862, p. 75, fig. 68.
Orthidium gemmicula Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 217, 244, pl. 7A, figs. 22-25.
Loc. Point Levis, Canada.

Orthis of authors.


ORTHIS Dalman (emend Hall and Clarke).

Genotype Orthis calligaramma Dalman.


Orthis æquivalvis Hall, 1847=Plectorthis æquivalvis.
Orthis æquivalvis Hall, 1857 (non 1847)=Orthis eryna.
Orthis æquivalvis Shaler (non Hall)=Rhipidomella iberis.

Orthis (? acuminata Billings.

Chazy (Ord.).
Orthis acuminata Billings, Canadian Nat. Geol., IV, 1859, p. 440, fig. 19.
Orthis acuminata Billings, Geol. Canada, 1863, p. 130, fig. 59.
Loc. Caughnawaga, Canada.
Orthis acutilirata Meek = Platystrophia acutilirata.
Orthis acutiloba Ringueberg = Bilobites acutilobus.
Orthis alata Shaler = Orthis davidsoni.
Orthis alsus Hall = Rhipidomella als.

Orthis (? ) alternans Castelnau. 
Orthis alternans Castelnau, Essai Syst. Sil. l'Amérique Septentrionale, 1843, p. 38, pl. 14, fig. 2.
Loc. "From an erratic block, Lake of the Woods." Undeterminable.

Orthis amœna N. H. Winchell = Dalmanella amœna.
Orthis anticostiensis Shaler = Dinorthis porcata.

Orthis (?) apicalis Billings. 
Loc. Point Levis and west end of Island of Orleans, Canada.

Orthis arachnuoides Roemer and Hall (non Phillips) = Derbya crassa.
Orthis armanda Billings = Syntrophia armanda.
Orthis assimilis Hall = Rhipidomella assimilis.
Orthis aurelia Billings = Plectorthis aurelia.
Orthis aymara Salter = Anoplotheca flabellites.
Orthis barabuensis Winchell = Syntrophia barabuensis.
Orthis battis Billings = Hebertella battis.
Orthis bellarugosa Conrad = Hebertella bellirugosa.
Orthis bellarugosa Hall, 1883 = Hebertella insculpta.
Orthis bellula Meek = Dalmanella bellula.

Orthis benedicti Miller. 
Loc. Hartsville, Indiana.

Orthis bicostatus Vanuxem = Reticularia bicostata.
Orthis biforata of authors = Platystrophia biforata.
Orthis biforata acutilirata White = Platystrophia acutilirata.
Orthis billingsi Hartt = Billingsella billingsi.
Orthis bifora Hall = Bilobites bilobus.
Orthis bisulcata Emmons = Cyclospira bisulcata.
Orthis borealis Billings = Hebertella borealis.

Orthis (?) buchi d'Orbigny. 
Loc. Yarbichambi, Bolivia.

Orthis calligramma Foerste (non Dalman) = Orthis flabellites.
Orthis calligramma davidsoni Nicholson and Hinde = Orthis davidsoni.

Orthis calligramma Kayser. 
Orthis calligramma Kayser (non Davidson), Palaeontographica, Suppl., III, 1876, pp. 18, 26, pl. 3, figs. 9-18.
Loc. Cordilloro San Juan, Argentine Republic.
Obs. These shells appear to be more closely related to O. plicatella than to O. calligramma.
Orthis canalis Hall = Dalmanella elegantula.
Orthis carbonaria Swallow = Rhipidomella pecosi.
Orthis carinata Hall = Schizophoria carinata.
Orthis carleyi Hall = Dinorthis retrorsa.

**Orthis carausii** Salter.
- Calciferous (Ord.).
  - Orthis carausii (Salter, M.S.) Davidson, Geol. Mag. London, V, 1868, p. 315, pl. 16, fig. 23.
  - **Loc.** England; near St. John, New Brunswick.

**Orthis (?) centrilineata** Hall.
- Lorraine (Ord.).
  - Orthis centrilineata Hall, Pal. New York, I, 1847, p. 289, pl. 79, fig. 5 e.
  - **Loc.** Lorraine and Turin, New York.

Orthis centrosa Miller = Platystrophia crassa.
Orthis charlottæ Winchell = Dinorthis pectinella.
Orthis cincinnensis Miller = Orthis? pumila.
Orthis (?) circularis N. H. Winchell = Dalmanella subæqua circularis.
Orthis circulus Hall = Rhipidomella circulus.
Orthis clarkensis Swallow = Rhipidomella clarkensis.
Orthis cleobis Hall = Rhipidomella cleobis.
Orthis clytie Hall = Heterorthis clytie.
Orthis coloradoensis Meek, 1870 = Orthis ? desmopleura.
Orthis coloradoensis Shumard = Billingsella coloradoensis.
Orthis concinna Hall = Dalmanella concinna.

**Orthis (?) concinna** Morris and Sharpe.
- Lower Devonian.
  - **Loc.** Falkland Islands.
  - **Obs.** Probably a species of Orthothetes.

Orthis conradi Castelmaur = Hipparionyx proximus.
Orthis conradi N. H. Winchell = Dalmanella subæquata conradi.
Orthis cooperensis Swallow = Rhipidomella dubia.
Orthis cora d'Orbigny = Schizophoria cora.

**Orthis corinna** Billings.
- Calciferous (Ord.).
  - **Loc.** Stanbridge, Quebec, Canada.

Orthis corpulentæ Sardeson = Dalmanella testudinaria meeki.

**Orthis costalis** Hall.
- Chazy (Ord.).
  - **Loc.** Chazy, New York.

Orthis costata Hall (non Sowerby) = Orthis pumila.
Orthis crassa James = Platystrophia crassa.
Orthis crenistria Geinitz = Derbya crassa.
Orthis crispata Emmons = Dalmanella crispata.
Orthis cumberlandia Hall = Rhipidomella cumberlandia.
Orthis cuneata Owen = Rhipidomella cuneata.
Orthis cyclas Hall = Rhipidomella cyclas.
Orthis cyclus James = Dalmanella testudinaria emacerata.
Orthis cyphata James = Platystrophia laticosta.
Orthis dalyana Miller = Rhipidomella dalyana.

Orthis davidsoni de Verneuil. Anticosti and Niagara (Sil.).
Loc. Europe; Anticosti; Dundas, Ontario.

Orthis daytonensis Foerste = Hebertella daytonensis.
Orthis deformis Hall = Orthothetes deformis.

Orthis (?) delicatula Billings. ? Calcareous (Ord.).
Loc. Pistolet Bay and near Portland Creek, Newfoundland.

Orthis desmopleura Meek (non Pander) = Platystrophia crassa.

Loc. Colorado City and Manitou, Colorado.

Orthis dichotoma Hall = Plectorthis dichotoma.
Orthis discus Hall = Rhipidomella discus.
Orthis disparilis Conrad = Orthis tricenaria.
Orthis disparilis Owen = Dalmanella testudinaria.

Orthis disparilis Kayser. Ordovician.
Orthis disparilis Kayser (non Conrad), Palaeontographica, Suppl., III, 1876, p. 26, pl. 3, figs. 4–8.
Loc. Potrero de los Angulos, etc., Argentine Republic.
Obs. Probably a new species.

Orthis dubia Hall = Rhipidomella dubia.
Orthis eboracensis Miller = Dalmanella lenticularis.
Orthis electra Billings = Dalmanella electra.
Orthis elegantula Dalman = Dalmanella elegantula.
Orthis elegantula parva Foerste = Dalmanella elegantula parva.
Orthis ella Hall = Plectorthis ella.
Orthis emacerata Hall = Dalmanella testudinaria emacerata.
Orthis emacerata Meek (non Hall) = Dalmanella testudinaria meeki.
Orthis emarginata Hall = Rhipidomella oblata emarginata.
Orthis eminens Hall = Rhipidomella eminens.
Orthis erratica Hall = Catazyga erratica.

Orthis (?) eryna Hall. Corniferous (Dev.).
Orthis idas Hall, Pal. New York, IV, 1867, p. 42, pl. 5, fig. 11.
Loc. Williamsville, New York.
Obs. Possibly a species of Hipparionyx.
Orthis (?) eudocia Billings.  
Orthis eudocia Billings, Pal. Fossils, I, 1862, p. 83, fig. 76.  
Loc. Point Levis, Canada.

Orthis (?) eurekaensis Walcott.  
Orthis eurekaensis Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 22, pl. 9, fig. 8.  
Loc. Eureka district, Nevada.

Orthis euryone Billings.  
Loc. Point Levis, Canada; near St. John, New Brunswick.

Orthis evadne Billings=Dalmannella evadne.  
Orthis fasciata Hall=Orthostrophia fasciata.  
Orthis fausta Foerste=Hebertella fausta.  
Orthis fissicosta Meek, and Miller=Plectorthis dichotoma.  
Orthis fissicosta Hall=Plectorthis fissicosta.

Orthis (?) fissiplica Roemer.  
Orthis fissiplica Roemer, Die silurische Fauna des west. Tennessee, 1860, p. 64, pl. 5, fig. 5.  
Loc. Perry County, Tennessee.

Orthis flabellata Hall=Orthis flabellites.

Orthis flabellites Foerste.  
Orthis flabellulum Hall (non Sowerby), Geol. N. Y.; Rep. Fourth Dist., 1843, p. 105, fig. 5.  
Orthis flabellulum var. Hall, Pal. New York, II, 1852, pp. 254, 255, pl. 52, figs. 6, 7.  
Orthis flabellulum Billings, Canadian Nat. Geol., I, 1856, p. 136, pl. 2, fig. 6.—Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 38, pl. 34, fig. 30.  
Orthis flabellata Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 34, figs. 41, 42; pl. 35, figs. 6-8.—Foerste, Bull. Denison Univ., I, 1885, p. 82, pl. 13, fig. 12.  
Orthis (Dinorthis) calligraphra Foerste, Geol. Ohio, VII, 1895, p. 570, pl. 25, figs. 12a, 12b; pl. 31, figs. 4, 5; pl. 37A, fig. 20.  
Loc. Lockport, Rochester, etc., New York; Dayton, Ohio; Osgood, Indiana; Louisville, Kentucky; Milwaukee, Wisconsin; Dundas, Ontario.

Orthis flabellites spania Hall and Clarke.  
Orthis flabellites var. spania Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 84, figs. 10.  

Orthis flabellulum Hall (non Sowerby)=Orthis flabellites.

Orthis (?) flava A. Winchell.  
Loc. Burlington, Iowa.

Orthis futilis Sardeson=Dalmannella testudinaria futilis.  
Orthis gemmicula Billings=Orthidium gemmicula.  
Orthis gibbosa Billings=Dalmannella subequata gibbosa.  
Orthis goodwini Nettelroth=Rhipidomella goodwini.
Orthis (?) glypta Hall and Clarke.  
Orthis (? glypta Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 359, pl. 84, figs. 8, 9.  

Orthis halli Safford = Orthostropheia strophomenoides.  
Orthis hamburgensis Walcott = Dalmanella hamburgensis.  
Orthis harttii Rathbun = Rhhipidomella hartti.

Orthis (?) highlandensis Walcott.  
Orthis highlandensis Walcott, Bull. U. S. Geol. Survey, 30, 1886, p. 119, pl. 8, fig. 3.  
Loc. Pioche and Highland Range, Nevada.

Orthis hipparionyx Hall = Hipparionyx proximus.

Orthis hippolyte Billings.  
Loc. Point Lewis and Philipsburg, Canada; Cow Head, Newfoundland; near Malade City, Utah.

Orthis (?) holstoni Safford.  

Orthis humboldti d’Orbigny.  
Orthis humboldtii d’Orbigny, Voyage dans l’Amérique Méridionale, Pal., 1842, p. 27.  
Spirifer humboldtii d’Orbigny, Ibidem, pl. 2, figs. 16-20.  
Loc. Bolivia.

Orthis huroniensis Castlenau = Rafinesquina alternata.  
Orthis hybrida Sowerby = Rhipidomella hybrida.  
Orthis idas Hall = Orthis eryna.  
Orthis idonea Hall = Rhipidomella idonea.  
Orthis ignota Sardeson = Dalmanella testudinaria ignota.  
Orthis imperator Billings = Hebertella imperator.  
Orthis impressa Hall = Schizophoria striatula.  
Orthis inequalis Hall = Orthothetes inequalis.  
Orthis inca d’Orbigny = Rhipidomella inca.  
Orthis infera Calvin = Dalmanella infera.  
Orthis insculpta Hall = Hebertella insculpta.  
Orthis insignis Hall = Scenidium insignis.  
Orthis interlineata Hall (non Sowerby) = Schizophoria tioga.  
Orthis interstriata Hall = Orthothetes interstriatus.  
Orthis iowensis Hall = Schizophoria striatula.  
Orthis iowensis furnarius Hall = Schizophoria striatula.  
Orthis iphigenia Billings = Dinorthis iphigenia.  
Orthis jamesi Hall = Plectorthis jamesi.  
Orthis jugosa James = Dalmanella testudinaria meeki.  
Orthis kankakensis McCchesney = Plectorthis kankakiensis.
Orthis kaskaskiensis McChesney = Derbya kaskaskiaensis.
Orthis kassubae Winchell = Dalmanella subaequata pervetus.
Orthis kennicotti McChesney = Dinorthis retrorsa.
Orthis keokuk Hall = Derbya keokuk.
Orthis lasallensis McChesney = Derbya crassa.
Orthis laticosta Meek = Platystrophia laticosta.

Orthis (?) laticostata d'Orbigny.
Orthis laticostata d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 39.

Loc. ? Bolivia.

Orthis laurentina Billings = Billingsella ? laurentina.

Orthis lenticularis Wahlenberg ?.
Orthis lenticularis var. atrypoides Matthew, Trans. Royal Soc. Canada, IX, 1892, p. 48, pl. 12, figs. 11a, 11b.


Orthis lenticularis lyocioides Matthew.
Orthis lenticularis var. lyocioides Matthew, Trans. Royal Soc. Canada, IX, 1892, p. 49, pl. 12, figs. 10a-10c.


Orthis lenticularis strophomenoides Matthew.
Orthis lenticularis var. strophomenoides Matthew, Trans. Royal Soc. Canada, IX, 1892, p. 49, pl. 12, figs. 12a, 12b.


Orthis lenticularis Vanuxem = Dalmanella lenticularis.
Orthis lentiformis Hall = Dalmanella lenticularis.
Orthis lentiformis Owen = Schizophoria striatula.
Orthis leonensis Hall = Dalmanella tenuilineata.
Orthis lepida Hall = Dalmanella lepida.

Orthis (?) leptænoides Emmons.

Loc. New York.

Obs. Undefined and figure too poor for identification.

Orthis leucosia Hall = Rhipidomella leucosia.
Orthis limitaris Vanuxem = Leiorhynchus limitare.
Orthis linneyi James = Orthorhynchula linneyi.
Orthis livia Billings = Rhipidomella livia.
Orthis lonensis Walcott = Hebertella lonensis.
Orthis loricula Hall = Dinorthis deflecta.
Orthis lucia Billings = Rhipidomella lucia.
Orthis lynx Eichwald = Platystrophia lynx and P. biforata.
Orthis maria Billings = Hebertella maria.
Orthis macfarlanii Meek = Schizophoria macfarlanii.
Orthis macleodi Whitfield=Dalmanella macleodi.
Orthis macrior Sardeson=Dalmanella testudinaria emacerata.
Orthis media Shaler=Rhipidomella media.
Orthis media N. H. Winchell=Dalmanella subëquata perventus.
Orthis meeki Miller=Dalmanella testudinaria meeki.

**Orthis menapie** Hicks.  
Calciferous (Ord.).


Loc. England; near St. John's, New Brunswick.

Orthis menrope Billings=Scenidium menrope.
Orthis michelini L'Evêillé=Rhipidomella michelini.
Orthis michelini Meek, 1877=Rhipidomella nevadaensis.
Orthis michelini burlingtonensis Hall=Rhipidomella burlingtonensis.

**Orthis (?) minna** Billings.  
Calciferous (Ord.).

*Orthis minna* Billings, Pal. Fossils, I, 1865, p. 303, fig. 294.

Loc. Stanbridge, Quebec, Canada.

Orthis minneapolis N. H. Winchell=Dalmanella subëquata.
Orthis minnesotensis Sardeson=Diorthidomella meedi si.

**Orthis missouriensis** Shumard.  
Cape Girardeau Limestone (Sil.).


Loc. Two miles above Cape Girardeau, Missouri.

Orthis missouriensis Swallow (non Shumard)=Rhipidomella missouriensis.

Orthis mitis Hall=Rhipidomella mitis.
Orthis morganiana Derby=Orthotichia morganiana.

**Orthis (?) morrowensis** James.  
Lorraine (Ord.).


Loc. Warren County, Ohio.

Orthis multisecta (James) Meek=Dalmanella multisecta.
Orthis multistriata Hall=Schizophoria multistriata.
Orthis musculosa Hall=Rhipidomella musculosa.

**Orthis (?) mycale** Billings.  
Calciferous (Ord.).


Loc. Point Levis, Canada.

Orthis neglecta James=Plectorthis dichotoma.
Orthis nettoana Rathbun=Dalmanella nettoana.
Orthis nevadensis Meek=Rhipidomella nevadaensis.

**Orthis (?) nisis** Hall and Whitfield.  
Niagara (Sil.).


Loc. Louisville, Kentucky.

Orthis nucleus Hall=Ambocolia umbonata.
Orthis oblata Hall=Rhipidomella oblata.

Bull. 87—19
Orthis oblata emarginata Hall = Rhipidomella oblata emarginata.

**Orthis obtusa** Pander. Ordovician.

Orthis obtusa (Pander) Kayser, Paleontographica, Suppl., III, 1876, p. 19, pl. 3, figs. 1, 2.

Loc. Europe; Cordillere San Juan, Argentine Republic.

Orthis occasus Hall = Rhipidomella occasus.

Orthis occidentalis Hall = Hebertella occidentalis.

Orthis orthambonites Billings = O. panderiana.

Orthis palmata Sharpe and Salter = Anoplotheca flabellites.

**Orthis pandcriana** Hall and Clarke. Calciferous (Ord.).


Loc. Point Levis and St. John, Canada.

Orthis parva de Verneuil = Dalmanella elegantula.

Orthis pecosi Marcon = Rhipidomella pecosi.

**Orthis (?) pectinata** d'Orbigny. Devonian.

Orthis pectinatus d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 39.


Loc. Lake Titicaca, Bolivia.

Obs. Probably a species of Orthothetes.

Orthis pectinella Emmons = Dinorthis pectinella.

Orthis pectinella Whitfield, 1882 = Plectorthis whitfieldi.

Orthis pectinella semiovalis Hall = Dinorthis pectinella.

Orthis peduncularis Hall = Schizophoria peduncularis.

Orthis peloris Hall = Rhipidomella peloris.

Orthis penelope Hall = Rhipidomella penelope.

Orthis penniana Derby = Rhipidomella penniana.

Orthis pennsylvanica Simpson = Rhipidomella pennsylvanica.

Orthis pepina Hall = Billingsella coloradoensis.

Orthis perelegans Hall = Dalmanella perelegans.

Orthis perversa Hall = Orthothetes chemungensis perversus.

Orthis perveta Conrad = Dalmanella subaequata pervetus.

Orthis perveta Hall, 1883 = Dalmanella subaequata.

Orthis petrse Sardeson = Dinorthis proavita.

**Orthis (†) pigra** Billings. Chazy (Ord.).

Orthis piger Billings, Canadian Nat. Geol., IV, 1859, p. 442.

Loc. Mingan Island.

Obs. This species is probably congeneric with Billingsella grandeva.

Orthis pisum Hall (non Murchison) = Nucleospira pisiformis.

Orthis plana Castelnau (non Pander) = Rafinesquina alternata.

Orthis planoconvexa Hall = Dalmanella planoconvexa.

Orthis platys Billings = Dinorthis platys.

Orthis plicata Vanuxem = Spirifer vanuxemi.
Orthis plicatella White (non Hall) = Orthis tricenaria.
Orthis plicatella Hall = Plectorthis plicatella.
Orthis pogoiiipensis Hall and Whitfield = Dalmanella pogonipensis.
Orthis porcata McCoy = Dinorthis porcata.

Orthis (?) porcia Billings. Chazy (Ord.).
Orthis porcia Billings, Canadian Nat. Geol., IV, 1859, p. 439, figs. 16-18; — Geol. Canada, 1863, p. 130, fig. 58.
Loc. Near Montreal, Canada.

Orthis porrecta Sardeson = Dalmanella testudinaria porrecta.
Orthis præumboua Hall = Ambocelia præumbona.
Orthis pratteni McChesney = Derbya pratteni.
Orthis pravus Hall = Orthothetes pravus.
Orthis propinqua Hall = Schizophoria propinqua.
Orthis propinqua Nettelroth = Schizophoria striatula.

Orthis (?) pumila Ulrich. Lorraine (Ord.).
Loc. Cincinnati, Ohio.

Orthis (?) punctostriatata Hall. Niagara (Sil.).
Orthis punctostriatata Hall, Pal. New York, II, 1852, p. 254, pl. 52, fig. 5.
Loc. Lockport, New York.

Orthis pyramidalis Hall = Scenidium pyramidalis.
Orthis quacoensis Matthew = Billingsella quacoensis.
Orthis quadrans Hall = Dalmanella quadrans.
Orthis quadricostata Vanuxem = Leiorhynchus quadricostatum.

Orthis (?) remnichai N. H. Winchell. Upper Cambrian.
Loc. Red Wing, Minnesota; Cold Creek Canyon, Burnett County, Texas.

Orthis resupinata Hall, 1843 (non Martin) = Schizophoria tulliensis.
Orthis resupinata Martin = Schizophoria resupinata.
Orthis resupinata latirostrata Toula = Schizophoria cora.
Orthis resupinoides Cox = Schizophoria resupinoides.
Orthis retrorsa Salter = Dinorthis retrorsa.
Orthis rhynchonelliformis Shaler = Rhipidomella rhynchonelliformis.
Orthis richmonda McChesney = Derbya crassa.
Orthis robusta Hall = Derbya robusta.
Orthis rogata Sardeson = Dalmanella testudinaria.

Orthis (?) rugiplicata Hall and Whitfield. Niagara (Sil.).
Loc. Louisville, Kentucky.
Orthis (?) ruida Billings.
Orthis ruida Billings, Catalogue Silurian Fossils of Anticosti, 1866, p. 42.
Loc. Anticosti.

Orthis (?) saffordi Hall and Clarke.
Loc. "East Tennessee."

Orthis (?) salemensis Walcott.
Loc. Washington County, New York; near Quebec, Canada.

Orthis saltensis Kayser.
Orthis saltensis Kayser, Paleontographica, Suppl., III, 1876, p. 8, pl. 1, fig. 16.
Loc. Province Salta and Jujuy, Argentine Republic.

Orthis (?) sandbergeri N. H. Winchell.
Loc. Red Wing, Minnesota.

Orthis schohariensis Castelnau=Strophonella schohariensis.
Orthis scovilli Miller=Hebertella scovilli.
Orthis sectostriata Ulrich=Plectorthis sectistriata.
Orthis semele Hall=Rhipidomella semele.
Orthis sinuata Hall=Hebertella sinuata.

Orthis (?) sola Billings.
Orthis sola Billings, Catalogue Silurian Fossils of Anticosti, 1866, p. 12.
Loc. Anticosti.

Orthis solitaria Hall=Rhipidomella solitaria.
Orthis stouensis Safford=Dalmanella stouensis.
Orthis striatocostata Geinitz=Meekella striaticostata.
Orthis striatula Emmons (non Schlotheim)=Dalmanella testudinaria.
Orthis striatula of authors=Schizophoria striatula.
Orthis strophomenoides Hall=Orthostrophia strophomenoides.
Orthis subaquata Conrad=Dalmanella subaquata.
Orthis subcarinata Hall=Dalmanella subcarinata.
Orthis subcircula Simpson=Rhipidomella subcircula.
Orthis subelliptica White and Whitfield=Rhipidomella subelliptica.
Orthis subjugata Hall=Hebertella occidentalis.

Orthis (?) subnodosa Hall.
Loc. Waldron, Indiana; Louisville, Kentucky.

Orthis suborbicularis Hall=Rhipidomella suborbicularis.
Orthis subquadrata Hall=Inorthic subquadrata.
Orthis subumbona Hall=Martiula subumbona.
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Orthis (?) sullivanti Morris and Sharpe. Lower Devonian.
Loc. Falkland Islands; South Africa.

Orthis sweeneyi Hall = Schizophoria sweeneyi.

Orthis (?) tenuidens Hall. Clinton (Sil.).
Orthis tenuidens Hall, Pal. New York, II, 1852, p. 58, pl. 20, fig. 9.
Loc. Oneida County, New York.
Obs. May be a species of Orthothetes.

Orthis (?) tenuis Morris and Sharpe. Lower Devonian.
Orthis tenuis Morris and Sharpe, Quart. Jour. Geol. Soc. London, II, 1846, p. 275, pl. 10, fig. 4; pl. 11, fig. 4.
Loc. Falkland Islands.
Obs. Similar to Chonostrophia complanata Hall.

Orthis (?) tenuistriata Hall. Portage (Dev.).
Orthis tenuistrata Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 245, fig. 3.
Loc. Shores of Crooked Lake, New York.
Obs. This is not an Orthis; probably a pelecypod.

Orthis tersus Sardeson = Dalmanella tersa.
Orthis testudinaria Dalman = Dalmanella testudinaria.
Orthis testudinaria Owen, 1844 = O. tricenaria.
Orthis thiemi White = Rhipidomella thiemi.
Orthis tioga Hall = Schizophoria tioga.

Orthis tricenaria Conrad. Trenton (Ord.).


Orthis testudinaria? Owen, Geol. Expl. Iowa, Wisconsin, and Illinois, 1844, pl. 15, fig. 11.

†Orthis plicatella White (non Hall), Wheeler's Expl. and Survey west 100th Merid., IV, 1875, p. 72, pl. 4, fig. 10.
Loc. Mineral Point, Wisconsin; Middleville, etc., New York; Kentucky; Tennessee; near Ottawa and Montreal, Canada; Mingan Islands; Lake Winnipeg, Manitoba; White Pine and Eureka districts, Nevada; Minneapolis, etc., Minnesota; Pike County, Missouri.

Obs. O. plicatella White and O. tricenaria Walcott may prove to be distinct from O. tricenaria Conrad.
Orthis (?) trinucleus Hall.
Orthis trinucleus Hall, Pal. New York, II, 1852, p. 58, pl. 20, fig. 8.
Loc. Wayne County, New York.

Orthis triplicate Meek = Plectorthis triplicate.

Orthis (?) tritonia Billings.
Loc. Point Levis, Canada.

Orthis tubulostriata Hall = Rhipidomella tubulistoriata.
Orthis tulliensis Vanuxem = Schizophoria tulliensis.
Orthis uberis Billings = Rhipidomella uberis.
Orthis umbonata Conrad = Ambocelia umbonata.
Orthis umbraculum Owen (non von Buch) = Derbya robusta.
Orthis umbraculum Hall, 1852, Newberry, 1861 = Orthothetes umbraculum.
Orthis unguiculus Hall, 1843 (non Phillips) = Ambocelia gregaria.
Orthis unguiformis Castelnau, and Emmons = Hipparionyx proximus.
Orthis vanuxemi Hall = Rhipidomella vanuxemi.
Orthis vanuxemi pulchella Herrick = Rhipidomella vanuxemi pulchella.
Orthis varica Conrad = Bilobites varicus.

Orthis vespertilio Sowerby.
Orthis vespertilio (Sowerby) Kayser, Paleontographica, Suppl., III, 1876, p. 27, pl. 3, figs. 22, 23.
Loc. Europe; Potrero de los Angulos, etc., Argentine Republic.

Orthis whitfieldi N. H. Winchell = Plectorthis whitfieldi.
Orthisina d'Orbigny = Clitambonites.
Orthisina alberta Walcott = Billingsella alberta.
Orthisina alternata Hall = Orthothetes chemungensis perversus.
Orthisina americana Whitfield = Clitambonites diversus.
Orthisina arctostriata Hall = Orthothetes chemungensis arctistriatus.
Orthisina crassa Meek and Hayden = Derbya crassa.
Orthisina diversa Shaler = Clitambonites diversus.
Orthisina festinata Billings = Billingsella festinata.
Orthisina grandaeva Billings = Billingsella grandaeva.
Orthisina missouriensis Swallow = Meekella striaticostata.
Orthisina transversa Walcott = Billingsella transversa.
Orthisina verneuili Billings = Clitambonites diversus.

ORTHORHYNCHULA Hall and C. Genotype Orthis (?) linneyi James.

Orthorhynchula linneyi (James).
Loc. Near Danville, etc., Kentucky; Cincinnati, Ohio; Nashville, Tennessee.
ORTHOSTROPHIA Hall. Genotype Orthis strophomenoides Hall.


Orthostrophia (?) fasciata Hall. Niagara (Sil.).

Orthis fasciata Hall, Pal. New York, II, 1852, p. 255, pl. 52, fig. 8.


ORTHOSTROPHIA strophomenoides Hall. Lower Helderberg (Dev.).


Orthis halli Safford, Geol. Tennessee, 1869, pp. 328, 333.

Orthostrophia strophomenoides Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 36, figs. 32-34.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 200, 223, pl. 5A, figs. 24-27; pl. 6, figs. 32-34.

Orthostrophia halli Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 5A, figs. 22, 23.

Loc. Albany and Schoharie counties, New York; Square Lake, Maine; Perry County, Tennessee.

ORTHOTHETES Fischer de Wald. Genotype Spirifera crenistria Phil.


Orthothetes agassizi (Rathbun). Middle Devonian.


Loc. Ererj Province of Para, Brazil.

Orthothetes anomalus (A. Winchell). Hamilton (Dev.).


Loc. Grand Traverse region, Michigan.

Orthothetes bellulus Clarke. Marcellus (Dev.).


Loc. Livonia salt shaft, Livonia, New York.

Orthothetes chemungensis (Conrad). Chemung (Dev.).


Strophomena bifurcata Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 266, fig. 2.

Strophomena pectinacea Hall, Ibidem, 1843, p. 266, fig. 4.


Streptorhynchus chemungensis var. pectinacea Hall, Pal. New York, IV, 1867, p. 73, pl. 10, fig. 6.
Orthothetes chemungensis (Conrad)—Continued.


Loc. New York and Pennsylvania; Eureka district, Nevada; Lake Winnipego-
sis, Canada; Waverly group of Ohio.

Orthothetes chemungensis arcstratiatus Hall.

Hamilton (Dev.).

Strophomena arcstratiata Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 266, fig. 3.

Orthisina arcstratiata Hall, Thirteenth Rep. N. Y. State Cab. Nat. Hist., 1860, pp. 80, 81, figs. 1, 2; p. 112.


Hemipronites chemungensis var. arcstratiata Meek, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 35, pl. 3, fig. 2.


Orthothetes chemungensis var. arcstratiata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 10, fig. 8.

Loc. New York; Falls of Ohio; Eureka district, Nevada.

Orthothetes chemungensis perversus (Hall).

Cornif. and Ham. (Dev.).


Streptorhynchus chemungensis var. perversus Hall, Pal. New York, IV, 1867, p. 72, pl. 9, figs. 13-17, 26.

Streptorhynchus chemungensis var. alternata Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 40, fig. 7.

Orthothetes chemungensis var. alternata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 10, fig. 7.

Loc. New York; Bosauquet, Ontario; Eureka district, Nevada.

Orthothetes crenistria (Phillips?).

Lower Carboniferous.


Hemipronites crenistria? Meek, Pal. Ohio, II, 1875, p. 279, pl. 10, fig. 5.

Hemipronites crenistria Meek, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 7, fig. 2.—Herrick, Bull. Denison Univ., III, 1888, p. 37, pl. 5, fig. 14; pl. 3, fig. 24; pl. 6, fig. 8; pl. 9, fig. 21; IV, p. 24, pl. 2, figs. 1, 5;—Geol. Ohio, VII, 1895, pl. 15, fig. 1; pl. 21, fig. 14.

Orthothetes crenistria Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 255, pl. 11A, fig. 15.

Loc. Medina and Granville, Ohio; Port aux Barques, Michigan; East River and Shubenacadie, Nova Scotia; Feilden Isthmus, lat. 82° 43'; White Pine dis-

Orb. These references are unsatisfactory identifications of Phillips's species. It may prove that more than a single species is here included.

Orthothetes deformis Hall.

Lower Helderberg (Dev.).


New York, III, 1859, p. 174, pl. 10A, fig. 13; pl. 15, fig. 3.
Orthothetes deformis Hall—Continued.
Streptorhynchus deformis Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 39, fig. 32.
Orthothetes deformis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 255, pl. 9, fig. 32.
Loc. Albany County, New York; Cumberland, Maryland.

Orthothetes deformis sinuatus Hall and Clarke. Lower Helderberg (Dev.).
Orthothetes deformis var. sinuata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 20, figs. 8, 9.
Loc. Cumberland, Maryland.

Orthothetes desideratus Hall and Clarke. Waverly (L. Carb.).
Loc. Medina County, Ohio.

Orthothetes flabellum (Whitfield). Corniferous (Dev.)
Loc. Columbus, Ohio.

Orthothetes hydraulicus (Whitfield). Waterlime (Sil.)
Loc. Bellville and Greenfield, Ohio.

Orthothetes inequalis Hall. Kinderhook (L. Carb.).
Orthis inequalis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 490, pl. 2, fig. 6.
Streptorhynchus inequalis Hall and Whitfield, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 252, pl. 4, figs. 1, 2.
Loc. Burlington, Iowa; Newark and Granville, Ohio; Shafers, Pennsylvania; Wasatch Range, Utah.

Orthothetes inflatus (White and Whitfield). Kinderhook (L. Carb.).
Loc. Burlington, Iowa; Dry Canyon, Oquirrh Mountains, Utah; Montana.

Orthothetes interstriatus (Hall). Coralline (Sil.)
Orthis interstriata Hall, Pal. New York, II, 1852, p. 326, pl. 74, figs. 1, 2.

Orthothetes lens (White). Kinderhook (L. Carb.).
Orthothetes lens (White)—Continued.

Loc. Clarksville, etc., Missouri; Hamburg, Illinois; Medina County, Ohio (Winchell).

Orthothetes pandora (Billings).

Streptorhynchus chemungensis var. pandora Hall, Pal. New York, IV, 1867, p. 68, pl. 4, figs. 11-19; pl. 9, figs. 18-25, 27;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 40, figs. 1-6.
Orthothetes chemungensis var. pandora Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 255, pl. 9, fig. 30; pl. 10, figs. 1-6.
Loc. Schoharie, Knoxville, Clarksville, etc., New York; Cayuga, Ontario; Columbus, Ohio (Whitfield); Eureka district, Nevada.

Orthothetes pravus Hall.

Orthothetes pravus Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 490.
Loc. Lime Creek, Worth County, Iowa.

Orthothetes subplanus (Conrad).

Leptena subplanca Hall, Pal. New York, II, 1852, p. 259, pl. 53, figs. 8-10.—Billings, Canadian Nat. Geol., I, 1856, p. 138, pl. 2, figs. 16, 17.
Strophomena pecten Roemer, Die Sil. Fauna west. Tennessee, 1860, p. 67, pl. 5, fig. 4.—Billings, Geol. Canada, 1863, p. 311, fig. 315;—Catalogue Silurian Fossils of Anticosti, 1866, p. 49.
Streptorhynchus (Strophodonta) subplanus Hall, Geol. Survey Wisconsin, I, 1862, p. 436.


Hemipronites propinquus Meek and Worthen, Ibidem, III, 1868, p. 351, pl. 6, fig. 6.
Orthothetes subplausa Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 255, pl. 9, figs. 21-24; pl. 9A, fig. 19; pl. 11A, figs. 9-12.
Loc. Lockport, Rochester, etc., New York; Thorold, Ontario; Waldron, Indiana; Louisville, Kentucky; Thebes, Alexander County, and Bridgeport, Illinois; Pike County, Missouri; Decatur County, Tennessee; Arisaig, Nova Scotia (Ami); Anticosti.

Orthothetes tapajotensis (Derby).

Streptorhynchus tapajotensis Derby, Bull. Cornell Univ., I, 1874, p. 37, pl. 5, figs. 3, 6, 7, 9, 10; pl. 8, fig. 9.

Orthothetes tapajotensis (Derby).
Orthothetes tapajotensis (Derby)—Continued.
Loc. Bomjardim and Itaituba, Brazil.

Orthothetes tenuis Hall.

Orthothetes umbraclum of authors (non von Buch). L. and Up. Carb.

Orthothetes woolworthanus Hall.
Loc. Schoharie, Carlisle, Clarksville, and Hudson, New York.

ORTHOTICHIA Hall and C. Genotype Orthis? morganiana Derby.

Orthotichia morganiana (Derby).
Orthis? morganiana Derby, Bull. Cornell University, I, 1874, p. 29, pl. 3, figs. 1–9, 11, 34; pl. 4, figs. 6, 14, 15.
Orthis morganiana Waagen, Palaeontologica Indica, Ser. XIII, I, 1884, p. 564.
Loc. Bonjardim and Itaituba, Brazil.

ORTHOTROPIA Hall and Clarke. Genotype O. dolomitica H. and C.

Orthotropia dolomitica Hall and Clarke.
Orthotropia dolomitica Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 84, figs. 3–7.
PARASTROPHIA Hall and C. Genotype Atrypa hemiplicata Hall.


Parastrophia divergens Hall and Clarke.

Loc. Wilmington, Illinois.

Parastrophia greenei Hall and Clarke.

Loc. Milwaukee, Wisconsin.

Parastrophia hemiplicata Hall.

Parastrophia hemiplicata Hall, Pal. New York, I, 1847, p. 144, pl. 33, fig. 10.—Billings, Canadian Nat. Geol., I, 1856, p. 208, figs. 20–23.


Camarella hemiplicata Billings, Geol. Canada, 1863, p. 168, fig. 154.


Loc. Middleville, Watertown, etc., New York; Center County, Pennsylvania; Wisconsin; Minnesota; Ottawa and Lake Winnipeg, Canada.

Parastrophia hemiplicata rotunda (Winchell and Schu.). Trenton (Ord.).

Loc. Cannon Falls, Minnesota; Decorah, Iowa.

Parastrophia latiplicata Hall and Clarke.

Loc. Milwaukee, Wisconsin.

Parastrophia multiplicata Hall and Clarke.

Loc. Milwaukee, Wisconsin.

Parastrophia (?) obscura (Hall and Whitfield).

Porambonites obscurus Hall and Whitfield, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 234, pl. 1, fig. 16.
Loc. White Pine district, Nevada.

Obs. Based upon a single ventral valve which is insufficient to determine whether it belongs to Parastrophia or some rhynchonellid. It is not a Porambonites.
Parastrophe ops (Billings).


Loc. Anticosti.

Obs. May be only a variety of P. reversa.

Parastrophe reversa (Billings).


Parastrophe reversa Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 63, figs. 8–14.

Loc. Anticosti.

Obs. Billings says this species is a large P. hemiplicata Hall. It appears, however, to be distinct. See P. ops Billings.

Parastrophe scofieldi (Winchell and Schuchert).


Loc. Near Cannon Falls, Minnesota.

Parazyga Hall and Clarke.

Genotype Atrypa hirsuta Hall.


Parazyga deweyi Hall.


Trematospira (Rhynchospira) deweyi Hall, Pal. New York, III, 1889, p. 216, pl. 36, fig. 3.

Parazyga deweyi Hall and Clarke, Ibidem, VIII, Pt. II, 1893, p. 128, fig. 112, pl. 49, figs. 40–46.

Loc. Albany and Schoharie counties, New York.

Parazyga hirsuta Hall.


Athyris † chloe Billings, Canadian Jour., n. ser., V, 1860, p. 282, figs. 45–47.

Renzia chloe Billings, Geol. Canada, 1863, p. 385, fig. 419.


Parazyga hirsuta Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 128, fig. 111; pl. 49, figs. 28–39.

Loc. New York; Thedford, Canada; Falls of Ohio; Bunker Hill, Indiana.

Paterina Beecher=Iphidea.

PATERULA Barrande.

Genotype Paterula bohemica Barrande.


Paterula amii n. sp.

Calciferous (Ord.).

Paterula species Hall and Clarke, VIII, Pt. I, p. 78, pl. 4K, fig. 1.

Loc. Quebec, Canada.
PENTAGONIA Cozzens. Genotype Pentagonia peersii Cozzens = Atrypa unisulcata Conrad.


Pentagonia peersii Cozzens = Pentagonia unisulcata.

Pentagonia unisulcata (Conrad). Oriskany to Hamilton (Dev.).


Pentagonia peersii Cozzens, Annals Lyceum Nat. Hist. N. Y., IV, 1846, p. 158, pl. 10, fig. 3.


Athryris unisulcata Billings, Geol. Canada, 1863, p. 373, fig. 396.

Meristella (Pentagonia) unisulcata varieties biplicata and uniplicata Hall, Pal. New York, IV, 1867, p. 309, pl. 50, figs. 18-35.


Pentagonia unisulcata Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 80, pl. 42, figs. 22-32.

Loc. New York; county of Haldimand and Bosanquet, Ontario; Falls of Ohio.

PENTAMERELLA Hall. Genotype Atrypa arata Conrad.


Pentamerella arata (Conrad). Upper Helderberg (Dev.).


Loc. New York; Cayuga, etc., Ontario; Columbus, Ohio; Falls of Ohio; ? Urals of Russia.

Pentamerella borealis (Meek). Hamilton (Dev.).

Pentamerus borealis Meek, Trans. Chicago Acad. Sci., I, 1868, p. 95, pl. 13, fig. 11.

Loc. Anderson River, British America.

Pentamerella (?) compressa Ringueberg. Niagara (Sil.).

Pentamerella (?) compressa Ringueberg—Continued.


*Obs.* May be a pathologic or compressed specimen of *Spirifer crispus* or *S. sulcatus*.

Pentamerella dubia Hall.

*Pentamerella* dubia Hall. ? Hamilton (Dev.).

Atrypa (n. sp.?) Owen, Geol. Survey Wisconsin, Iowa, Minnesota, 1852, pl. 3A, fig. 1. [See specimen in U. S. Nat. Mus., Cat., Invert. Foss., 17927.]


*Loc.* Iowa City, Iowa.

*Obs.* See Pentamerella micula Hall.

Pentamerella intralineata (A. Winchell).

*Pentamerella* intralineata A. Winchell, Geol. Rep. Lower Peninsula of Michigan, 1866, p. 94.


Pentamerella micula Hall.


*Loc.* Iowa City, Iowa.

*Obs.* Compare with Pentamerella dubia Hall.

Pentamerella obsolescens Hall.


*Loc.* Waterloo, Iowa.

Pentamerella pavilionensis Hall.


*Loc.* Seneca and Canandaigua lakes, etc., New York; Falls of Ohio.

Pentamerella thusnelda Nettelroth.


*Loc.* Near Louisville, Kentucky.

Pentamerella ventricosa Hall=Clorinda ventricosa.

PENTAMERUS Sowerby.

Genotype *P. levis* Sowerby.


Pentamerus arcuosus McChesney=Clorinda arcuosa.

Pentamerus aratus=Pentamerella arata.

Pentamerus barrandi Billings=Clorinda barrandei.

Pentamerus beaumonti Castelnau=P. oblongus.

Pentamerus bisinuatus McChesney=P. oblongus.

Pentamerus borealis Meek=Pentamerella borealis.

Pentamerus brevirostris Hall=Anastrophia brevirostris.
Pentamerus chicagensis Winchell and Marcy = Clorinda ventricosa.
Pentamerus colletti Miller = Conchidium colletti.
Pentamerus comis Meek and Worthen = Gypidula comis.
Pentamerus complanatus Nettelroth = Conchidium tenuicostatum.
Pentamerus conchidium = Conchidium biloculare.
Pentamerus coppingeri Etheridge = Gypidula coppingeri.
Pentamerus crassoradius McChesney = Conchidium crassiradiatum.
Pentamerus decussatus Whiteaves = Conchidium decussatum.
Pentamerus deshayessii Castelnau = Rensselaeria ovoides.
Pentamerus elongatus Vanuxem = Amphigenia elongata.
Pentamerus fornicatus Hall = Clorinda fornicata.
Pentamerus galeatiformis Meek and Worthen = Gypidula comis.
Pentamerus galeatus Hall = Gypidula galeata.
Pentamerus galeatus Hall and Whitfield = Gypidula nucleus.
Pentamerus globulosus Nettelroth = Gypidula globulosa.
Pentamerus hemiplicatus Billings = Parastrophia hemiplicata.
Pentamerus interplicatus Hall = Anastrophia interplicata.
Pentamerus intralineatus Winchell = Pentamerella intralineata.
Pentamerus knappi Hall and Whitfield = Conchidium knappi.
Pentamerus knighti Sowerby = Conchidium knighti.
Pentamerus knotti Nettelroth = Gypidula knotti.
Pentamerus laqueatus Conrad = Conchidium laqueatum.
Pentamerus lenticularis White and Whitfield = Camarophorella lenticularis.
Pentamerus littoni Hall = Conchidium littoni.
Pentamerus lotis Walcott = Gypidula lotis.
Pentamerus multicoostatus = Conchidium multicoostatum.
Pentamerus nobilis Emmons = Conchidium laqueatum.
Pentamerus nucleus Hall and Whitfield = Gypidula nucleus.
Pentamerus nysius var. crassicosta Hall = Conchidium nysius.
Pentamerus nysius var. tenuicostatus Nettelroth = Conchidium nysius.
Pentamerus nysius var. tenuicosta Hall = Conchidium tenuicosta.

Pentamerus oblongus Sowerby.Clinton and Niagara (Sil.).
Pentamerus oblongus Sowerby, Murchison’s Silurian System, 1839, p. 641, pl. 19, fig. 10.—Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 70, figs. 1-5.—Owen, Geol. Expl. Iowa, Wisconsin and Illinois, 1844, pl. 14, fig. 10.—Hall, American Jour. Sci., 2d ser., XX, 1849, p. 227;—Pal. New York, II, 1852, p. 79, pl. 25, fig. 1; pl. 26, fig. 1.—Billings, Canadian Nat. Geol., I, 1856, p. 58, pl. 1, figs. 2, 3,—Geol. Canada, 1863, p. 316, fig. 326.—Hall and Whitfield, Twenty-fourth Rep. N. Y. State Cab. Nat. Hist., 1872, p. 183;—Geol. Survey Ohio, Pal., II, 1875, p. 137, pl. 7, fig. 9.—Whitfield, Geol. Wisconsin, IV, 1882, p. 288, pl. 17, figs. 4-9.—Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 60, pl. 33, figs. 15-17.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 237, figs. 169-171; pl. 67, fig. 20; pl. 68, figs. 1-5; pl. 69, figs. 1, 4-7, 13, 14; pl. 70, figs. 1-4.
Pentamerus beaumonti Castelnau, Essai Syst. Sil. l’Amérique Septentrionale, 1843, p. 38, pl. 13, fig. 9.
Pentamerus oblongus Sowerby—Continued.

Pentamerus bisinnatus McChesney, Descriptions New Pal. Foss., 1861, p. 85;—Trans. Chicago Acad. Sci., I, 1868, pl. 9, fig. 1.—Whitfield, Geol. Wisconsin, IV, 1882, p. 290, pl. 17, fig. 3.

Loc. England; New York; Ohio; Indiana; Kentucky; Illinois; Iowa; Wisconsin; Thorold, Ontario; Anticosti.

Pentamerus oblongus cylindricus Hall and Whitfield. Niagara (Sil.).


Loc. Louisville, Kentucky.

Pentamerus oblongus maquoketa Hall and Clarke. Niagara (Sil.).


Pentamerus oblongus var. maquoketa Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 239, pl. 67, figs. 11-13.

Loc. Ashford, Wisconsin; near Dubuque and Hopkinton, Iowa.

Pentamerus oblongus subrectus Hall and Clarke. Niagara (Sil.).

Pentamerus oblongus var. subrectus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 238, 239, pl. 68, fig. 6; pl. 69, figs. 2, 3, 8-10; pl. 70, fig. 5.

Loc. Earlville, Iowa; Wisconsin.

Pentamerus occidentalis Hall, 1858 (non 1852)=Gypidula comis.

Pentamerus occidentalis Hall, 1852=Conchidium occidentale.

Pentamerus ovalis Hall. Clinton (Sil.).


Loc. New Hartford, Oneida County, New York; Cumberland Gap, Tennessee; Collinsville, Alabama.

Obs. Compare with P. oblongus.

Pentamerus papilionensis Hall=Pentamerella pavilionensis.

Pentamerus pergibbosus Hall and Whitfield. Niagara (Sil.).


Loc. Greenfield, Ohio; Louisville, Kentucky; Wisconsin (Whitfield).

Pentamerus pesovis Whitfield. Waterlime (Sil.).


Loc. Greenfield, Ohio; Louisville, Kentucky; Wisconsin (Whitfield).

Pentamerus pseudogaleatus Hall=Gypidula pseudogaleata.

Pentamerus reversus Billings=Parastrophia reversa.

Pentamerus salinensis Swallow=Conchidium saliense.

Pentamerus subglobosus Meek and Worthen=Gypidula subglobosa.

Pentamerus trisinuatus McChesney=Meristina trisinnata.

Pentamerus uniplicatus Nettelroth=Gypidula uniplicata.

Pentamerus ventricosus Hall=Clorinda ventricosa.

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Pentamerus verneuili Hall = Anastrophia verneuili.

**PHOLIDOPS** Hall.

Genotype *Oribacula squamiformis* Hall.


**Pholidops arenaria** Hall.

*Pholidops arenaria* Hall, Pal. New York, IV, 1867, p. 413, pl. 3, fig. 10.—Hall and Clarke, Ibidem, VII, Pt. I, 1892, pl. 41, fig. 24.

Loc. Albany County and Hudson, New York.

**Pholidops areolata** Hall.


**Pholidops bellula** Walcott.


Loc. Eureka district, Nevada.

**Pholidops calcicola** Hall and Clarke.


Loc. Falls of Ohio.

**Pholidops cincinnatensis** Hall.


Loc. Cincinnati, etc., Ohio.

**Pholidops greenei** Miller and Gurley.


Loc. Falls of Ohio.

**Pholidops hamiltoniae** Hall.


Loc. Darion, Moscow, Canandaigua Lake, etc., New York.

**Pholidops lamellosa** Hall = Pholidops oblata.

**Pholidops lepis** Hall and Clarke.


Loc. Not given.

Obs. A nomina nudum.

**Pholidops linguloides** Hall = Pholidops oblata.
Pholidops oblata Hall.  
Pholidops oblata Hall, Pal. New York, IV, 1867, p. 414, pl. 3, fig. 10.  
Pholidops (?) linguloides Hall, Ibidem, 1867, p. 414.  
Pholidops lariellusa Hall, Ibidem, 1867, pl. 3, fig. 11.  
Loc. Aurora and Canandaigua Lake, New York.

Pholidops ovalis Hall.  
York, IV, 1867, pl. 3, figs. 1, 2;—Twenty-eighth Rep. N. Y. State Mus. Nat.  
Hist., 1879, p. 149, pl. 21, figs. 1, 2;—Eleventh Rep. State Geol. Indiana, 1882,  
p. 284, pl. 21, figs. 1, 2.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892,  
p. 157, pl. 41, fig. 26.  
Loc. Waldron, Indiana; Arisaig, Nova Scotia (Ami).  
Obs. This species and P. squamiformis are probably identical with P. implicata  
Sowerby.

Pholidops ovata Hall.  
Pholidops ovata Hall, Pal. New York, III, 1859, p. 490, pl. 103B, fig. 7.  
Pholidops ovata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 157, pl. 41,  
figs. 22, 23.  
Loc. Albany County, New York; Square Lake, Maine.

Pholidops patina Hall and Clarke.  
Pholidops patina Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 182, pl. 41,  
figs. 27—29.  
Loc. De Ceuville, Ontario.

? Pholidops quadrangularis Walcott.  
Pholidops quadrangularis Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 114,  
pl. 2, fig. 7.  
Loc. Lone Mountain, Nevada.  
Obs. Apparently a plate of a crinoid.

Pholidops squamiformis Hall.  
1;—Pal. New York, II, 1852, p. 250, pl. 53, fig. 4.  
Pholidops squamiformis Hall, Pal. New York, III, 1859, p. 490, pl. 103B, fig. 6.—  
Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 156, pl. 41, fig. 21.  
Loc. Lockport, Rochester, etc., New York.  
Obs. See Pholidops ovalis Hall.

Pholidops subtruncata Hall.  
Pholidops subtruncata Hall, Descrip. n. sp. of Crinoidea and other Fossils, 1866,  
fig. 9.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 41, fig. 19.  
Loc. Lorraine and Turin, New York. In the Trenton at Ottawa, Canada (Ami).

Pholidops terminalis Hall.  
Pholidops terminalis Hall, Pal. New York, III, 1859, p. 490, pl. 103B, fig. 8.—  
Loc. Cumberland, Maryland.

Pholidops trentonensis Hall.  
Pholidops trentonensis Hall, Descrip. n. sp. of Crinoidea and other Fossils, 1866,  
fig. 8.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 157, pl. 41,  
fig. 17.  
Pholidops trentonensis minor Winchell and Schuchert. Trenton (Ord.).
Pholidops trentonensis var. minor Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 376, pl. 29, fig. 40.


PHOLIDOSTROPHIA Hall and Clarke. Genotype Strophodonta nacrea
Hall=Chonetes (?) iowensis Owen.


Pholidostrophia iowensis (Owen). Corniferous and Hamilton (Dev.).
Chonetes (?) iowensis Owen, Geol. Survey Wisconsin, Iowa, Minnesota, 1852, p. 584, pl. 3A, fig. 7. [See specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17942.]

Chonetes sp. undet. Owen, Ibidem, 1852, pl. 3A, fig. 17. [See specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17916.]


Strophomena lepida Hall, Geol. Iowa, I, 1858, p. 493, pl. 3, fig. 3.—Billings, Canadian Jour. Sci. Arts, VI, 1861, p. 344.


Stropheodonta (Pholidostrophia) nacrea Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 287, pl. 15, figs. 20–24; Pt. II, 1895, pl. 84, fig. 11.

Loc. Iowa City, Iowa; western New York; Columbus, Ohio; Falls of Ohio; Rock Island, Illinois; Alpena, Michigan; Ontario, Canada.

Obs. Owen's type specimens preserved in the United States National Museum prove to be identical with Strophomena lepida, which Hall in 1867 said is a synonym for Stropheodonta nacrea.

Plesiomys Hall and Clarke=Dinorthis.

PLATYSTROPHIA King. Genotype Terebratulites biforata Schlotheim.


Obs. It is doubtful whether all the various forms of Platystrophia can be regarded as species. This genus is nearly always abundantly represented by one or more forms throughout the American Ordovician and Silurian systems. When individuals of the same region or of widely separated localities are compared with each other it is apparent that the specific characters are very inconstant. Individuals of a stratum, however, are fairly constant in form, size, and plications, and it is this limited constancy that has served in many of the following species.

Platystrophia acuminata James.

Orthis (Platystrophia) acuminata James, The Paleontologist, I, 1878, p. 7.

Loc. Cincinnati, Ohio.

Platystrophia acutilirata (Conrad).


Orthis (Platystrophia) acutilirata Meek, Pal. Ohio, I, 1873, p. 119, pl. 10, fig. 5.

Platystrophia acutilirata (Conrad)—Continued.


Platystrophia biforata (Schlotheim).

Chazy-Niagara (Ord. and Sil.).

Terebratulites biforatus Schlotheim, Petrefactenkunde, 1820, p. 265.

Spirifer sheppardi Castelnau, Essai Syst. Sil. l’Amérique Septentrionale, 1843, p. 42, pl. 14, fig. 15.

Delthyris brachynota Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 70, fig. 6.

Orthis and Delthyris Owen, Geol. Expl. Iowa, Wisconsin, Illinois, 1844, pl. 15, figs. 3, 7.

Delthyris lynx Hall (partim; non Eichwald), Pal. New York, I, 1847, p. 133, pl. 32D, fig. 1.

Spirifer biforata var. lynx Hall, Ibidem, II, 1852, p. 65, pl. 22, fig. 1.


Orthis (Platystrophia) biforata Meek, Pal. Ohio, I, 1873, p. 112.—Foerste, Geol. Ohio, VII, 1895, p. 579, pl. 25, figs. 7, 8.

Orthis (Platystrophia) biforata var. lynx Hall, Second Ann. Rep. N. Y. State Geologist, 1883, pl. 35, figs. 11-14 (non figs. 9, 10, 15 of pl. 35 and fig. 30, pl. 34 = P. biforata lynx).

Orthis biforata var. lynx forma reversata and daytonensis Foerste, Bull. Denison Univ., I, 1885, pp. 81, 82, pl. 13, figs. 7, 8.

Platystrophia lynx Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 202, 223, pl. 5B, fig. 10.—Keyes, Geol. Survey Missouri, V, 1895, p. 64, pl. 39, fig. 5.


Loc. Throughout the horizons mentioned above in North America; also in England, Scotland, Ireland, Gotland, Scandinavia, Oeland, and Russia.

Platystrophia crassa James.

Lorraine (Ord.).

Orthis (Platystrophia) dentata?? Meek (non Pander), Pal. Ohio, I, 1873, p. 117, pl. 10, fig. 3.

Orthis (Platystrophia) crassa James, Cincinnati Quart. Jour. Sci., I, 1874, p. 20.

Orthis dentata Miller, Ibidem, II, 1875, p. 27.


Loc. Cincinnati, Ohio; Spring Valley, Minnesota; Lake Winnipeg, Manitoba.

Platystrophia laticosta Meek.

Lorraine (Ord.).

Orthis (Platystrophia) laticosta (James) Meek, Pal. Ohio, I, 1873, p. 116, pl. 10, fig. 4.

Orthis (Platystrophia) cypha James, Cincinnati Quart. Jour. Sci., I, 1874, p. 20.
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Platystrophia laticosta Meek—Continued.

Orthis laticosta Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 27.

Platystrophia biforata var. laticosta Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 223, pl. 5B, figs. 5-9.

Loc. Cincinnati, etc., Ohio.

Platystrophia lynx (Eichwald).


Delthyris lynx (partim) Hall, Pal. New York, I, 1847, p. 133, pl. 32D, fig. 1.—Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 820, fig. 616.

Orthis (Platystrophia) biforata var. lynx Meek, Pal. Ohio, I, 1873, p. 114, pl. 10, fig. 1.—Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 35, figs. 9, 10, 15.


Orthis biforata Nicholson, Pal. Province Ontario, 1875, p. 16, fig. 5.

Orthis (Platystrophia) lynx Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 34, fig. 30.


Loc. Cincinnati, Ohio, and elsewhere in the Ohio Valley.

Platystrophia regularis Shaler = Platystrophia biforata.


Plectambonites arca Shaler = Plectambonites transversalis.

Plectambonites gibbosus Winchell and Schuchert. Trenton (Ord.).


Loc. Mantorville, Old Concord, and near Cannon Falls, Minnesota.

Plectambonites glaber Shaler. Anticosti (Sil.).


Loc. Anticosti.

Plectambonites plicatellus (Ulrich). Utica (Ord.).


Plectambonites plicatella Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 15A, figs. 34, 35.

Loc. Cincinnati, Ohio; Covington, Kentucky.

Plectambonites productus Hall and Clarke. Niagara (Sil.).

Plectambonites producta Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 360, pl. 84, figs. 23-25.

Loc. Yellow Springs, Ohio.

Plectambonites sericeus (Sowerby). Trenton to Clinton (Ord.-Sil.).

Leptena sericea J. de C. Sowerby, Murchison's Silurian System, 1839, pl. 19, figs. 1, 2.—Hall, Pal. New York, I, 1847, pp. 110, 287, pl. 31B, fig. 2; pl. 79, fig. 3;—Ibidem, II, 1852, p. 59, pl. 21, fig. 1.—Billings, Canadian Nat. Geol., I, 1856, p. 41, fig. 2.—Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 818, fig. 599.—Billings, Géol. Canada, 1863, p. 163, fig. 139.—Meek, Pal. Ohio, I, 1873, p. 70, pl. 5, fig. 3.—Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 57.—Kayser, Palaeontographica, Suppl., III, 1876, p. 21, pl. 3, fig. 19.—Hall, Second Ann. Rep.
Plectambonites sericeus (Sowerby)—Continued.
Leptena sericea? White, Wheeler's Expl. Survey west of the 100th Merid., IV, 1875, p. 70, pl. 4, fig. 7.
Leptena recurvus Sardeson, Ibidem, 1892, p. 330, pl. 4, figs. 29-32.
Leptena saxea Sardeson, Ibidem, 1892, p. 330, pl. 4, figs. 33-35.
Loc. England; New York; Ohio; Indiana; Kentucky; Missouri; Wisconsin; Minnesota; Manitoba; Talacastra, Argentine Republic.
Plectambonites tenera Shaler=Plectambonites transversalis.
Plectambonites transversalis (Wahlenberg).—Clinton-Niagara (Sil.).
Strophomena elegantula Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 72, fig. 1.
Strophomena transversalis Hall, Ibidem, 1843, p. 105, fig. 4.
Plectambonites transversalis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 298, pl. 15, figs. 34-36.—Foerste, Geol. Ohio, VII, 1895, p. 566, pl. 25, fig. 5; pl. 30, fig. 31, fig. 6.
Loc. Europe; New York; Osgood, Indiana; Wisconsin; Dundas and Hamilton, Ontario; Anticosti; Lake Temiscouata, New Brunswick.
Plectambonites transversalis alabamaensis (Foerste).—Clinton (Sil.).
Loc. Collinsville, Alabama.
Plectambonites transversalis prolongatus (Foerste).—Clinton (Sil.).
Leptena prolongata Foerste, Bull. Denison Univ., I, 1885, p. 79, pl. 13, fig. 5.
Loc. Dayton, Ohio; Wildwood Station, Georgia.
PLECTORTHIS Hall and Clarke. Genotype Orthis plicatella Hall.
Plectorthis equivalvis (Hall).—Lorraine (Ord.).
Orthis equivalvis Hall (non Davidson, 1847), Pal. New York, I, 1847, p. 120, pl. 32, fig. 6.
SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA. [BULL. 87.

Plectorthis æquivalvis (Hall)—Continued.


Loc. Cincinnati, Ohio; Wisconsin (Whitfield).

Plectorthis (?) aurelia (Billings). Oriskany (Dev.).

Orthis aurelia Billings, Pal. Fossils, II, 1874, p. 34, pl. 3, fig. 3.


Loc. Indian Cove, Gaspé.

Plectorthis dichotoma Hall. Lorraine (Ord.).

Orthis dichotoma Hall, Pal. New York, I, 1847, p. 125, pl. 32, fig. 13.—Miller, American Pal. Fossils, 1877, p. 117.

Orthis fissicosta Meek (non Hall), Pal. Ohio, I, 1873, p. 106, pl. 8, fig. 6.—Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 30.


Plectorthis dichotoma Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 221, pl. 5, fig. 21.

Loc. Cincinnati, Ohio.

Plectorthis ella Hall. Lorraine (Ord.).


Plectorthis (?) ella Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 221, pl. 5, figs. 22, 23.

Loc. Cincinnati, Ohio.

Plectorthis fissicosta Hall. Lorraine (Ord.).

Orthis fissicosta Hall, Pal. New York, I, 1847, p. 121, pl. 32, fig. 7.


Loc. Cincinnati, Ohio.

Plectorthis jamesi Hall. Lorraine (Ord.).


Loc. Cincinnati, Ohio.

Plectorthis kankakiensis (McChesney). Lorraine (Ord.).

Orthis kankakiensis McChesney, New Pal. Fossils, 1861, p. 77;—Trans. Chicago Acad. Sci., I, 1868, p. 29, pl. 9, fig. 3.


Loc. Wilmington, Illinois; Wisconsin (Whitfield).

Plectorthis plicatella Hall. Trenton-Lorraine (Ord.).


Orthis plicatella Billings, Geol. Canada, 1863, p. 165, fig. 145.


Orthis (Plectorthis) plicatella Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 436, pl. 33, figs. 5–7.

Loc. Cincinnati, Ohio; Middleville and Watertown, New York; Burgin, Kentucky; Cannon Falls, Kenyon, etc., Minnesota; Wisconsin.
Plectorthis sectistriata (E. O. Ulrich). Lorraine (Ord.).
Loc. Cincinnati, Ohio.

Plectorthis triplicatella (Meek). Lorraine (Ord.).
Loc. Cincinnati, Ohio.

Plectorthis whitfieldi (N. H. Winchell). Lorraine (Ord.).
Orthis pectinella Whitfield (partim, non Emmons non Hall), Geol. Wisconsin, IV, 1882, p. 259, pl. 12, fig. 8.
Orthis (Plectorthis) whitfieldi Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 437, pl. 33, figs. 8-13.
Loc. Spring Valley and Granger, Minnesota; Delafield, Wisconsin; Lattner’s, Iowa; Savanna, Illinois.

PLETHORHYNCHA Hall and Clarke. Genotype Rhyuchonella speciosa Hall.

Porambonites Pander, Beitrage zur Geognosie des Russ. Reiches, 1830, p. 95, pl. 3, fig. 9.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 225.
Obs. Not represented in America.

Porambonites Pander, Beitrage zur Geognosie des Russ. Reiches, 1830, p. 95, pl. 3, fig. 9.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 225.
Obs. Not represented in America.

Proboscidella (?) clava (Norwood and Pratten). Upper Carboniferous.

Loc. Graysville, Illinois.
SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA. [BULL. 87.

PRODUCTELLA Hall. Genotype Productus subaculeatus Murchison.


Productella arctirostrata Hall. Chemung (Dev.).


Productella arcuata Hall. Kinderhook (L. Carb.).


Loc. Burlington, Iowa; Granville, Newark, etc., Ohio; Hannibal, Missouri.

Obs. See P. cooperensis.

Productella bivalvata Hall. Chemung (Dev.).


Productella boydi Hall. Kinderhook (Dev.).


Loc. Phillipsburg, Elmira, etc., New York.

Productella concentrica (Hall). Kinderhook (L. Carb.).


Loc. Burlington, Iowa; Port aux Barques, Michigan; Rockford, Indiana; Sciotoville, etc., Ohio.

Obs. Compare with Productella shumardana.

Productella costatula Hall. Chemung (Dev.).


Productella costatula strigata Hall. Chemung (Dev.).


Loc. Near Cadiz, New York.

Productella dumosa Hall. Hamilton (Dev.).


Loc. Delphi, Bellona, Moscow, Hamilton, etc., New York.
Productella (?) eriensis Nicholson. Corniferous (Dev.).
Loc. Port Colborne and Hagersville, Ontario.
Obs. See Anoplia nucleata Hall.

Productella exanthemata Hall. Corniferous and Hamilton (Dev.).
Productella exanthemata Hall, Pal. New York, IV, 1867, p. 163, pl. 23, figs. 45, 46;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 48, fig. 17.—Hall and
Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 17, fig. 17.
Productus exanthematus Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 412, pl. 16, fig. 3.
Loc. Tinkers Falls and Seneca Lake, New York; Jackson and Union counties,
Illinois.

Productella hallana Walcott. Upper Devonian.
Productus dissimilis Hall (non de Koninck, 1846), Geol. Survey Iowa, I, Pt. II,
1858, p. 497, pl. 3, fig. 7.—Meek, Trans. Chicago Acad. Sci., I, 1868, p. 91, pl. 13, fig. 3.
Productus Meek, Ibidem, 1868, p. 91, pl. 13, fig. 4.
Productus (Productella) hallanus Walcott, Mon. U. S. Geol. Survey, VIII, 1884,
pl. 130, pl. 13, fig. 17.
Productus hallanus Tschernyschew, Mémoires du Comité Géologique de St.
Productus hallanum Williams, Bull. Geol. Soc. America, I, 1890, pl. 12, figs. 8, 9.
Productella dissimilis Whiteaves, Cont. Canadian Pal., I, 1891, p. 216.
Productella hallana and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 17A,
figs. 11, 12.
Loc. Rockford, Iowa; High Point, New York; Eureka district, Nevada; Atha-
basca River, Canada; Urals of Russia.

Productella hirsuta Hall. Chemung (Dev.).
Strophomena membranacea Vanuxem (non Productus membranaceus von Buch),
Geol. N. Y.; Rep. Third Dist., 1842, p. 179, figs. 4, 5.
Productus hirsutus Hall, Tenth Rep. N. Y. State Cab. Nat. Hist., 1857, p. 175,
figs. 1–3.
Productella hirsuta Hall, Pal. New York, IV, 1867, p. 166, pl. 24, figs. 17–29;—
Second Ann. Rep. N. Y. State Geol., 1883, pl. 48, figs. 28, 39.—Hall and
Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 17, figs. 28, 39, 45.

Productella hirsuta rectispina Hall. Chemung (Dev.).
Productella hirsuta var. rectispina Hall, Pal. New York, IV, 1867, p. 168, pl. 24,
figs. 30–37;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 48, fig. 37.—Hall and
Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 17, fig. 37.

Productella hirsutiformis (Walcott). Upper Devonian.
2, fig. 10.
Loc. Eureka and White Pine districts, Nevada.

Productella hystricula Hall = Strophalosia hystricula.

Productella lachrymosa (Conrad). Chemung (Dev.).
1842, p. 256, pl. 14, fig. 9.
Productella lachrymosa (Conrad)—Continued.
Loc. Factoryville, Bath, Ellington, etc., New York.

Productella lachrymosa lima (Conrad).
Productus (Productella) lachrymosus var. limus Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 132, pl. 13, fig. 18.
Loc. Randolph, Ellington, etc., New York; Eureka district, Nevada; Mackenzie River, Canada.

Productella lachrymosa stigmata Hall. Chem. and Wav. (Dev. and L. Car.).
Productella lachrymosa var. stigmata Hall, Pal. New York, IV, 1867, p. 174, pl. 25, figs. 33-41.
†Productus †Meek, Trans. Chicago Acad. Sci., I, 1868, p. 91, pl. 13, fig. 5.
Loc. Olean, Conewango, and Randolph, New York; Licking County, Ohio; Eureka district, Nevada; Northwest Territory, Canada.

Productella macuruenensis Rathbun.
Loc. Province of Para, Brazil.

Productella marquessi Rowley.
Loc. Callaway County, Missouri.

Productella minneapolis Sardeson=Trematis huronensis.

Productella murchisoniana (de Koninck).

Productella navicella Hall.
Loc. Scholharie County, Moscow, and Pavilion, New York; Eureka district, Nevada.

Productella onusta Hall.
Productella papulata Hall. Hamilton (Dev.).
Productella papulata Hall, Ibidem, 1867, corrigenda.
Loc. Bellona, Yates County, New York.

Productella productoides (Murchison). Hamilton (Dev.).
Strophalosia productoides Whiteaves, Cont. Canadian Pal., I, 1889, p. 112, pl. 15, fig. 2.—Ibidem, I, 1891, p. 216.
Productella productoides var. membranacea Whiteaves, Cont. Canadian Pal., I, 1892, p. 282.
Loc. Europe; Athabasca River, Lake Manitoba, and Thedford, Canada.

Productella pyxidata Hall. Kinderhook (L. Carb.).
Loc. Hamburg, Illinois; Louisiana, Missouri.
Obs. Compare with Productella shumardana.

Productella rarispina Hall. Chemung (Dev.).

Productella semiglobosa Nettelroth. Corniferous (Dev.).
Producta semiglobosa Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 70, pl. 26, fig. 7.
Loc. Falls of Ohio.

Productella shumardana Hall. Kinderhook (L. Carb.).
Productus shumardianus Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 499, pl. 3, fig. 9; pl. 7, fig. 2.
Productus (Productella) shumardianus Herrick, Bull. Denison Univ., III, 1888, p. 32, pl. 6, fig. 16; pl. 7, fig. 18.
Loc. Clarksville, Missouri; Burlington, Iowa; Licking County, Ohio.
Obs. The identifications of this species from Devonian horizons are here referred to P. spinulicosta. P. shumardana is probably synonymous with P. pyxidata Hall.

Productella speciosa Hall. Portage, Chem., and Kinderh. (Dev.-L. Carb.).
Productella speciosa Hall—Continued.

Loc. Leon, New Albion, and Ithaca, New York; Licking County, Ohio; Burlington, Iowa; Eureka district, Nevada.

Productella spinulicosta Hall.  
Corniferous to Hamilton (Dev.).
Productella spinulicosta Hall, Pal. New York, IV, 1867, p. 160, pl. 23, figs. 6-8, 25-34;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 48, figs. 3-6.—Whiteaves, Cond. Canadian Pal., I, 1891, pl. 29, fig. 3; pl. 31, fig. 1.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 17, figs. 3-6.
Productus (Productella) subaculeata Walcott, Mon. U. S. Geol. Survey, VIII, 1884, pp. 128, 214, pl. 7, fig. 2; pl. 13, figs. 19, 20.
Productella subaculeata var. cataracta Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 69, pl. 17, figs. 5-9.—Whiteaves, Cond. Canadian Pal., I, 1891, p. 217.
Loc. New York; Ohio; Falls of Ohio; Illinois; Iowa; Wisconsin; Eureka district, Nevada; Utah; Mackenzie and Hay rivers; and Lake Manitoba, Canada.
Obs. Some authors are disposed to regard as synonyms of this species, besides the above, P. pyxidata, P. shumardana, and P. concentrica, and all of these forms are thought to be identical with P. subaculeata Murchison. For the present it is preferable to retain the name P. spinulicosta for these American Devonian forms. P. pyxidata, P. shumardana, and P. concentrica are here arranged as species, but will probably be shown to be synonymous with P. spinulicosta.

Productella striatula Hall.  
Chemung (Dev.).
Productella subaculeata of American authors = Productella spinulicosta.  
Productella subaculeata cataracta Hall and Whitfield = Productella spinulicosta.

Productella subalata Hall.  
Middle Devonian.
Loc. Rock Island, Illinois; Callaway County, Missouri; Spring Valley, Minnesota.
Productella truncatea Hall = Strophalosia truncatea.

Productella tullia Hall. Hamilton (Dev.).

Productella tullia Hall, Pal. New York, IV, 1867, p. 164, pl. 23, figs. 41-44.

Loc. Tully and Delphi Falls, New York.

**PRODUCTUS** Sowerby. Genotype Anomites productus Martin = Productus martini Sowerby = Productus semireticulatus (Martin).


Productus equicostatus Shumard = Productus cora.

**Productus alternatus** Norwood and Pratten. Keokuk (L. Carb.).


Loc. Rocky Run, Hancock County, Illinois; Keokuk, Iowa; Burlington group, Burlington, Iowa.

**Productus altonensis** Norwood and Pratten. St. Louis (L. Carb.).


Productus americanus Swallow = Productus cora.

**Productus andii** d’Orbigny = Orthis buchi.

Productus arctirostratus Hall = Productella arctirostrata.

Productus arcuatus Hall = Productella arcuata.

Productus asperus McChesney = Productus nebrascensis.

**Productus auriculatus** Swallow. **t**Upper Carboniferous.


Loc. Formation and locality not given. (“Near Kansas City, Missouri,” H. and C.)

**Productus batesianus** Derby. Upper Carboniferous.

Productus batesianus Derby, Bull. Cornell Univ., I, 1874, p. 54, pl. 1, figs. 2, 10-13, 15; pl. 2, fig. 14; pl. 6, figs. 4, 7, 9.

Loc. Bonjardim and Itaituba, Brazil.

**Productus biseriatus** Hall. St. Louis (L. Carb.).


Loc. Alton, Illinois; Bloomington and Spergen Hill, Indiana; Crittenden County, Kentucky; Missouri.
Productus blairi Miller. Chouteau (L. Carb.).
Productus blairi Miller, Seventeenth Rep. State Geol. of Indiana, 1891, p. 79, pl. 13, figs. 16, 17.
Loc. Sedalia, Missouri.

Productus boliviensis d'Orbigny. Upper Carboniferous.
Productus boliviensis d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 52, pl. 4, figs. 5-9.—de Koninck, Mém. de la Soc. Royale des Sci. Liège, IV, 1847, p. 177, pl. 8, fig. 2;—Recherches sur les Animaux Fossiles, Pt. I, 1847, p. 76, pl. 8, fig. 2.—Norwood and Pratten, Jour. Acad. Nat. Sci. Philadelphia, III, 1854, p. 11.
Loc. Yarbichambi and Lake Titicaca, Bolivia; near Richmond, Missouri.

Productus boonensis Swallow. Upper Carboniferous.
Loc. Near the mouth of Platte River; Kansas and Missouri.
Obs. Compare with Productus undiferus de Koninck.

Productus boonensis elevata Swallow. Upper Carboniferous.
Loc. Near the mouth of Platte River, Missouri.

Productus boydi Hall=Productella boydi.

Productus buchianus de Koninck. Upper Carboniferous.
Loc. Belgium; Big Creek, Posey County, Indiana.

Productus burlingtonensis Hall. Burlington (L. Carb.).
Productus burlingtonensis Keyes, Geol. Survey Missouri, V, 1895, p. 41.
Loc. Burlington, Iowa; Quincy, Illinois; Missouri; Oquirrh Mountains, Utah.
Obs. Compare with P. mesialis.

Productus calhounianus Geinitz (non Swallow)=Productus cora.
Productus calhounianus Swallow=Productus semireticulatus.
Productus calhounianus kansasensis Swallow=Productus semireticulatus kansasensis.
Productus callawayensis Swallow=Productella subalata.
Productus cancricini Geinitz=Productus pertenuis.
Productus cancricini Gabb=Productus boliviensis.

Productus capacii d'Orbigny. Upper Carboniferous.
Productus capacii d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 50, pl. 3, figs. 24-26.
Loc. Yarbichambi, Bolivia.
Productus carbonarius de Koninck. Carboniferous.
Loc. Belgium; Fountain Bluff, Illinois.

Productus cestriensis Worthen = Productus fasciculatus.

Productus chandlessii Derby. Upper Carboniferous.
Loc. Itaituba, Brazil; Yampopata, Bolivia.
Obs. Compare with Productus boliviaensis d’Orbigny.

Productus clarkianus Derby. Upper Carboniferous.
Productus clarkianus Derby, Bull. Cornell Univ., I, 1874, p. 59, pl. 6, fig. 6; pl. 9, figs. 12, 13.
Loc. Itaituba and Bomjardim, Brazil.

Productus clavus Norwood and Pratten = Proboscidella clava.
Productus concentricus Hall = Productella concentrica.

Productus confragosus Conrad. Upper Carboniferous.
Loc. Alleghany Mountains, Pennsylvania.
Obs. Not well established.

Productus cooperensis Swallow. Kinderhook (L. Carb.).
Loc. Cooper County, Missouri; Burlington, Iowa; Sciotoville, Ohio.
Obs. Keyes regards this species as a synonym for Productella arcuata.

Productus cora d’Orbigny. Upper Carboniferous.
Productus cfr. cora Toula, Sitzb. der k. k. Akad. der Wissensch. zu Wien, LIX, 1869, p. 9.

Productus cora? Derby, Bull. Cornell Univ., I, 1874, p. 49, pl. 2, fig. 17; pl. 6, fig. 17.

Productus lyelli de Verneuil, Lyell’s Travels in North America, II, 1845, p. 221.—Dawson, Acadian Geology, 1855, p. 219, fig. g.
Productus sp. Christy, Letters on Geology, 1848, pl. 5, fig. 1.
Bull. 87—21
Productus cora d’Orbigny—Continued.

Productus semireticulatus Hall, Stansbury’s Expl. and Survey Valley Great Salt Lake, Utah, 1852, p. 411, pl. 3, figs. 3, 5.

Productus prattianius Norwood, Jour. Acad. Nat. Sci. Philadelphia, III, 1854, p. 17, fig. 10.—Meek, Final Rep. U. S. Geol. Survey of Nebraska, 1872, p. 163, pl. 2, fig. 5; pl. 5, fig. 13; pl. 8, fig. 10.—White, Wheeler’s Expl. and Survey west 100th Meridian, IV, 1875, p. 113, pl. 7, fig. 1.—Meek,King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 72, pl. 7, fig. 7.


Productus flemingi Geinitz (non de Koninck), Carbon und Dyas in Nebraska, 1866, p. 52, pl. 4, figs. 1–4.

Productus koninckianns Geinitz (non de Verneuil), Ibidem, 1866, p. 53, pl. 4, fig. 5.

Productus calhounianns Geinitz (non Swallow), Ibidem, 1866.

Loc. Throughout the Upper Carboniferous of North America; Itaituba and Barreirinha, Brazil; Yampopata, Cochabamba, and Lake Titicaca, Bolivia; Kashmore.

Obs. See Productus nodosus and P. hildrethianus.

Productus cora mogoyoni Marcou. Upper Carboniferous.

Productus cora var. mogoyoni Marcou, Geol. North America, 1858, p. 45, pl. 6, fig. 5.

Loc. Sierra de Mogoy, or Sierra Blanca, near the extinct volcano San Francisco, Arizona.

Productus coriformis Swallow. St. Louis (L. Carb.).


Loc. Cooper County, Missouri.

Obs. Keyes regards this species as a synonym for P. lavicostas.

Productus costatoides Swallow. Upper Carboniferous.


Loc. Kansas; banks of Colorado River.

Obs. Keyes regards this species as identical with P. longispinus.

Productus costatus (Sowerby ?) de Koninck. Upper Carboniferous.

Productus costatus Sowerby, Mineral Conchology, VI, 1827, p. 115, pl. 560, fig. 1.

Productus costatus de Koninck, Recherches sur les Animaux Fossiles, Pt. I, 1847, p. 92, pl. 8, fig. 3; pl. 10, fig. 3; pl. 18, fig. 3.—Norwood and Pratten, Jour. Acad. Nat. Sci. Philadelphia, III, 1854, p. 11.—Marcou, Geol. North America, 1858, p. 43, pl. 5, fig. 5.—Geinitz, Carbon und Dyas in Nebraska, 1866, p. 51.—Meek, Final Rep. U. S. Geol. Survey Nebraska, 1872, p. 159, pl. 6, fig. 6.—White, Wheeler’s Expl. and Survey West 100th Meridian, IV, 1875, p. 109, pl. 8, fig. 2;—Second Ann. Rep. Indiana Bureau of Statistics and Geol., 1880, p. 516, pl. 8, figs. 7, 8;—Tenth Rep. State Geol. Indiana, 1881, p. 148, pl. 8, figs. 7, 8.—Hall, Second Ann. Rep. N. Y. State Geol., 1893, pl. 50, figs. 8–13.—White, Thirteenth Rep. State Geol. Indiana, 1894, p. 124, pl. 24, figs. 4–6; pl. 29, figs. 3–5.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 19, figs. 8–13.—Keyes, Geol. Survey Missouri, V, 1895, p. 51, pl. 36, fig. 1.
Productus costatus (Sowerby?) de Koninck—Continued.
Productus costatus var. Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 712, pl. 28,
figs. 3, 4.—Meek, King’s U. S. Geol. Expl. 40th Parl., IV, 1877, pl. 7, fig. 4.
Productus portlockianus Norwood and Pratten, Jour. Acad. Nat. Sci. Philadel-
phia, III, 1854, p. 15, pl. 1, fig. 9.
Loc. Europe; throughout the Upper Carboniferous of North America; Yampopa-
ta, Bolivia.
Obs. Sowerby’s species is of uncertain value. The above synonymy is based
upon P. costatus as redefined and illustrated by de Koninck.

Productus curtirostratus A. Winchell. Kinderhook (L. Carb.).
p. 114.
Loc. Burlington, Iowa.

Productus delawarei Marcou. Carboniferous.
Productus delawarii Marcou, Geol. North America, 1858, p. 45, pl. 5, fig. 3.
Loc. Foot of Delaware Mountain, Texas.
Obs. Compare with Productus cora d’Orbigny.

Productus depressus Swallow. Keokuk (L. Carb.).
Loc. Fenton, St. Louis County, Missouri.

Productus dissimilis Hall (non de Koninck) = Productella hallana.

Productus dolorosus A. Winchell. Waverly (L. Carb.).
Loc. Weymouth, Medina County, Ohio.

Productus dumosus Hall = Productella dumosa.

Productus duplicostatus A. Winchell. Waverly (L. Carb.).
p. 113.—Herrick, Bull. Denison Univ., IV, 1888, p. 21, pl. 11, figs. 26, 29.
Loc. Knox and Licking counties, Ohio; Battlecreek, Michigan.

Productus elegans Norwood and Pratten (non McCoy) = Productus fascicu-
latus.

Productus exanthematus Hall = Productella exanthemata.

Productus fasciculatus McChesney. Kaskaskia (L. Carb.).
Productus elegans Norwood and Pratten (non McCoy), Jour. Acad. Nat. Sci.
Philadelphia, III, 1854, p. 13, fig. 7.—Whittlefield, Annals N. Y. Acad. Sci., V,
1891, p. 581, pl. 13, figs. 15-16;—Geol. Ohio, VII, 1895, p. 469, pl. 9, figs. 15, 16.
Productus cestriencis Worthen, Trans. St. Louis Acad. Sci., I, 1860, p. 570.—
Keyes, Geol. Survey Missouri, V, 1895, p. 44.
¿Productus elegans Hall and Whittlefield, King’s U. S. Geol. Expl. 40th Parl., IV,
1877, p. 268, pl. 5, figs. 3, 4.
Loc. Chester and Kaskaskia, Illinois; Leavenworth and Washington County,
Indiana; Missouri; Monongalia County, West Virginia; Caldwell County,
Kentucky; Newtonville, Ohio; ¿Oquirrh Mountains, Utah,
Productus fentonensis Swallow. Keokuk (L. Carb.).
Loc. Fenton, St. Louis County, Missouri.
Obs. Keyes says this is a synonym for P. māgnus.

Loc. Alton, Illinois; Posey County, Indiana; Feilden Isthmus, lat. 82° 43'.
Obs. Compare with Productus alternatus Norwood and Pratten.

Productus Flemingi Geinitz (non de Koninck) = Productus cora.
Productus Flemingi Marcou, and Roemer = Productus longispina.
Productus Flemingi Burlingtonensis Hall = Productus burlingtonensis.

Productus flemingi Marcou, and Roemer = Productus cora.
Productus flemingi Marcou, and Roemer = Productus longispina.
Productus flemingi Burlingtonensis Hall = Productus burlingtonensis.

Productus flexistria McCoy. Kaskaskia (L. Carb.).
Loc. Chester, Kaskaskia, and Fountain Bluff, Illinois; Stephensport, Kentucky.

Productus giganteus (Martin). Upper Carboniferous.
Anomites giganteus Martin, Petrefacta Derbieusia, 1809, p. 6, pl. 15, fig. 1.
Loc. Europe; McCloud River, Shasta County, California.

Productus gracilis A. Winchell. Waverly (L. Carb.).
Loc. Near Cuyahoga Falls, Sciotoville, and Granville, Ohio.

Productus gradatus Swallow. Keokuk (L. Carb.).
Loc. Keokuk, Iowa; Lewis and St. Louis counties, Missouri.
Obs. Keyes regards this species as identical with P. vittatus = P. alternatus.

Productus granulosus Phillips. Keokuk (L. Carb.).

Productus hepar Morton. Upper Carboniferous.
Loc. Junior Furnace, Scioto County, Ohio.
Obs. Not recognizable.

Productus hildrethianus Norwood and Pratten. Upper Carboniferous.
Loc. Charboniere, Missouri.
Obs. Keyes regards this form as a synonym for P. cora.

Productus hirsutiforme Walcott = Productella hirsutiforme.
Productus hirsutus Hall = Productella hirsuta.
Productus horridus (non Sowerby) = Productus longispina.
Productus humboldti d’Orbigny. Upper Carboniferous.
Productus humboldti d’Orbigny, Voyage dans l’Amérique Méridionale, Pal., 1842, p. 54, pl. 5, figs. 4-7.—de Koninck, Recherches sur les Animaux Fossiles, Pt. I, 1847, p. 114, pl. 12, fig. 2.—Toula, Sitzb. der k. k. Akad. der Wissensch., XVIII, 1873, p. 16, pl. 2, fig. 3.—Waagen, Palaeontologica Indica, Ser. XIII, I, 1884, p. 695, pl. 76, figs. 1-3.
Productus humboldti ? de Keyserling, Reise in das Petschora-Land, 1846, p. 201, pl. 4, fig. 3.
Loc. Yarichamba, Bolivia; south end of Spitzbergen; Nishnei-Irginsk, Russia; India; Kashmir.

Productus inca d’Orbigny = Productus semireticulatus.
Producta incurvata Shepard = Strophomena incurvata.

Productus indianaensis Hall.
Loc. Spergen Hill, Indiana.

Productus inflatus McChesney.
Loc. Leavenworth, Indiana.

Productus ivesi Newberry.
Loc. Colorado River near mouth of Diamond River.

Productus konincikianus Geinitz (non de Verneuil) = Productus cora.

Productus laevicosta White.
Productus laevicostus ? Hall and Whitfield, King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 266, pl. 5, figs. 7, 8.
Loc. Burlington, Iowa; Louisiana, Missouri; Oquirrh Mountains, Utah.
Obs. Compare with P. coraiformis.

Productus lasallensis Worthen.
Loc. Lasalle, Illinois.

Productus latissimus Sowerby.
Loc. Europe; Vancouver Island.

Productus leuchtenbergensis de Koninck.
Loc. Europe; Masons Landing, Jersey County, Illinois.

Productus longispina Sowerby.
† Productus longispinus Sowerby, Mineral Conchology, I, 1814, p. 154, pl. 68, fig. 1.
Productus longispină Sowerby—Continued.

6, fig. 7; pl. 8, fig. 6.—Meek and Worthen, Geol. Survey Illinois, V, 1873, p. 569, pl. 25, fig. 10.—White, Wheeler’s Expl. and Survey west 100th Meridian, IV, 1875, p. 118, pl. 8, fig. 5.—Meek, King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 78, pl. 8, fig. 4.—Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 50, figs. 1–4.—White, Thirtieth Rep. State Geol. Indiana, 1884, p. 127, pl. 24, figs. 10, 11.—Herrick, Bull. Denison Univ., II, 1887, p. 48, pl. 2, figs. 25, 27, 28.—Keyes, Geol. Survey Missouri, V, 1885, p. 45, fig. 4.

Productus flemingianus Roemer (non de Koninck), Kreidebildung Texas, 1852, p. 89, pl. 11, fig. 8.—Marcon, Geol. North America, 1858, p. 47, pl. 6, fig. 7.


Productus horridus Geinitz, Carbon und Dyas in Nebraska, 1866, p. 55, pl. 4, fig. 7.

Productus orbignyanus Geinitz (non de Koninck), Ibidem, 1866, p. 56, pl. 4, figs. 8–11.


Loc. Throughout the Upper Carboniferous of the United States; Bolivia.

Obs. Since considerable uncertainty exists as to Sowerby’s species, it may be better to adopt P. orbignyanus de Koninck for the above synonymy. P. costatoioides is also regarded by Keyes as a synonym for P. longispinus.

Productus longus Meek. Carboniferous.

Productus sp. undet. Meek, King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 67.

Productus longus Meek, Ibidem, 1877, end of description.

Productus ivosi Meek, Ibidem, 1877, pl. 7, fig. 6.

Loc. White Pine district, Nevada.

Productus lyelli de Verneuil = Productus cora.

Productus magnicostatus Swallow. Upper Carboniferous.


Loc. Johnson County, Missouri.

Obs. Keyes regards this species as a synonym for P. semireticulatus.

Productus magnus Meek and Worthen. Keokuk (L. Carb.).


Loc. Monroe County, Illinois; St. Genevieve County, Missouri.

Obs. Compare with P. fentonensis.

Productus margaritaceus Phillips. Upper Carboniferous.

Producta margaritacea Phillips, Geol. Yorkshire, II, 1836, p. 215, pl. 8, fig. 8.


Loc. Near Richmond, Missouri.

Productus marginicinctus Prout. St Louis (L. Carb.).

Productus marginicinctus Prout, Trans. St. Louis Acad. Sci., I, 1857, p. 43, pl. 2, figs. 1–16.—Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 674, pl. 24, fig. 3.—Keyes, Geol. Survey Missouri, V, 1885, p. 43.

Loc. St. Louis, Missouri; Milan, Illinois.

Obs. See Productus worthenii Hall.
Productus martini Sowerby = Productus semireticulatus.

Productus mesialis Hall. Keokuk (L. Carb.).

Productus mesialis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 636, pl. 19, fig. 2;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 49, figs. 9, 10.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 18, figs. 9, 10.
Loc. Keokuk, Iowa; Nauvoo, Illinois.
Obs. Keyes regards this species as identical with P. burlingtonensis.


Loc. Europe; Feilden Isthmus, lat. 82° 43'.

Productus mexicanus Shumard. Upper Carboniferous.

Productus mexicanus? White, Wheeler's Expl. and Survey west 100th Meridian, IV, 1875, p. 120, pl. 8, fig. 6.
Loc. Guadalupe Mountains, New Mexico; Lincoln County, Nevada; Lo-Ping, China.

Productus morbillionus A. Winchell. Burlington (L. Carb.).

Loc. Burlington, Iowa; Sciotoville, Ohio.

Productus multistriatus Meek. Carboniferous.

Productus multistriatus Meek, Simpson's Rep. Expl. Great Basin Terr. Utah, 1876, p. 350, pl. 1, fig. 8;—King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 76, pl. 8, fig. 3.
Loc. Utah and Nevada.

Productus muricatus Norwood and Pratten. Upper Carboniferous.

Loc. Pike County, Illinois; near Richmond, Missouri; Des Moines Valley, Iowa; Flint Ridge, Ohio; Lake County, Colorado; northern New Mexico.
Obs. Since Phillips's P. muricatus is regarded as a synonym for P. costatus, there is no need for another specific name for Norwood and Pratten species.

Productus nanus Meek and Worthen. Upper Carboniferous.

Loc. Jefferson County, Iowa; northern New Mexico (White).

Productus nebraskensis Owen. Upper Carboniferous.

Productus nebrascensis Owen, Geol. Rep. Wisconsin, Iowa, and Minnesota, 1852, p. 584, pl. 5, fig. 3.—McChesney, Trans. Chicago Acad. Sci., I, 1868, p. 24, pl. 1, fig. 7.—Meek, Final Rep. U. S. Geol. Survey Nebraska, 1872, p. 165, pl. 2, fig. 2; pl. 4, fig. 6; pl. 5, fig. 11.—Meek and Worthen, Geol. Survey Illinois, V, 1873, p. 569, pl. 25, fig. 8.—White, Wheeler's Expl. and Survey west 100th Meridian, IV, 1875, p. 116, pl. 8, fig. 3.—Meek, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 65.—White, Thirteenth Rep. State Geol. Indiana, 1884, p. 122, pl. 24, figs. 7-9.—Herrick, Bull. Denison Univ., II, 1887, p. 49, pl. 2,
Productus nebraskensis Owen—Continued.

**fig. 30.**—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 19, figs. 5–7.—Keyes, Geol. Survey Missouri, V, 1895, p. 48, pl. 37, fig. 3.

**Productus nebrascensis?** Herrick, Bull. Denison Univ., III, 1888, p. 31, pl. 1, fig. 24; pl. 3, fig. 23.


**Strophalosia horrescens** Geinitz (non Murchison Vern. and Keyser.), Carbon und Dyas in Nebraska, 1866, p. 49.

**Loc.** Bellevue, Missouri; Illinois; Indiana; Ohio; Nebraska; New Mexico; Nevada; Arizona; Utah.

**Obs.** Compare with *P. norwoodi*.

**Productus nevadaensis** Meek. Upper Carboniferous.

**Productus nevadensis** Meek, King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 64, pl. 8, fig. 2.

**Loc.** White Pine district, Nevada.

**Obs.** Compare with *Productus punctatus* (Martin).

**Productus newberryi** Hall. Waverly (L. Carb.).


**Loc.** Medina County and Newark, Ohio.

**Productus newberryi annosus** Herrick. Waverly (L. Carb.).

**Productus newberryi var. annosus** Herrick, Bull. Denison Univ., IV, 1888, p. 20, pl. 3, fig. 17;—Geol. Ohio, VII, 1895, pl. 23, fig. 13.

**Loc.** Alexandria, Ohio.

**Productus nodicostatus** Herrick. Waverly (L. Carb.).


**Loc.** Rushville, Ohio.

**Productus nodosus** Newberry. Upper Carboniferous.

**Productus nodosus** Newberry, Ives’s Rep. Colorado River of the West, 1861, p. 124, pl. 1, fig. 7;—Macomb’s Rep. Expl. Exped. Santa Fe to the Great Colorado River of the West, 1876, p. 140, pl. 3, fig. 3.

**Loc.** Santa Fe, New Mexico.

**Obs.** Probably a synonym for *Productus cora* d’Orbigny.

**Productus norwoodi** Swallow. Upper Carboniferous.

**Productus (Strophalosia?) norwoodii** Swallow, Trans. St. Louis Acad. Sci., I, 1858, p. 182.


**Loc.** Cottonwood Valley, Kansas.

**Obs.** Compare with *Productus pustulosus* Phillips and *P. scabriculus* (Martin).

Regarded by Keyes as a synonym for *P. nebraskensis*.
Productus occidentalis Newberry. Upper Carboniferous.
Productus occidentalis Newberry, Ives’s Rep. Colorado River of the West, 1861, p. 122, pl. 2, figs. 9, 10.
Loc. Banks of Cascade River near the junction of Great and Little Colorado rivers.

Productus orbignyanus Geinitz (non de Koninck) = Productus longispinus.

Productus ovatus Hall. St. Louis (L. Carb.)
Loc. Ottumwa and Keosauqua, Iowa.

Productus papilio Gabb. Upper Carboniferous.
Loc. Lake Titicaca, Bolivia.

Productus papulatus Hall = Productella papulata.

Productus parvulus A. Winchell. Kinderhook (L. Carb.)
Loc. Burlington, Iowa.

Productus parvus Meek and Worthen. Kaskaskia (L. Carb.)
Loc. Chester, Illinois; Mountain Spring, Nevada.

Productus (?) pectinoideus Shepard.
Producta pectenoidea Shepard, American Jour. Sci., XXXIV, 1838, p. 150, fig. 4.
Obs. The geological position of this species may be Trenton or Upper Carboniferous. The illustration is unsatisfactory.

Productus pertenuis Meek. Upper Carboniferous.
Productus cancriui Geinitz (non de Verneuil), Carbon und Dyas in Nebraska, 1866, p. 54, pl. 4, fig. 6.
Productus pertenuis Meek, Final Rep. U. S. Geol. Survey Nebraska, 1872, p. 164, pl. 1, fig. 14; pl. 8, fig. 9.
Loc. Nebraska City, Nebraska; Leavenworth, Kansas; Kansas City, Missouri.

Productus peruvianus d’Orbigny. Upper Carboniferous.
Productus peruvianus d’Orbigny, Voyage dans l’Amérique Méridionale, Pal., 1842, p. 52, pl. 4, fig. 4.
Loc. Yarbichambi, Bolivia.
Obs. Probably a synonym for Productus semireticulatus.

Productus phillipsi Norwood and Pratten. Carboniferous.
Loc. Big Canyon, Humboldt River, Utah.

Productus pileiformis McCchesney = Productus cora.

Productus pileolus Shumard. Upper Carboniferous.
Loc. Guadalupe Mountains, Texas.
Productus pocillum Morton. Upper Carboniferous.
Productus pocillum Morton, Amer. Jour. Sci., XXIX, 1836, p. 150, pl. 2, fig. 2.
Loc. Putnam Hill, Ohio.
Obs. Not recognizable.

Productus popei Shumard. Upper Carboniferous.
Productus popei Shumard, Trans. St. Louis Acad. Sci., I, 1858, p. 290, pl. 11, fig. 8.
Loc. New Mexico and Texas.

Productus portlockianus Norwood and Pratten = Productus costatus. Productus prattenianus Norwood = Productus cora.

Productus punctatus (Martin). Upper Carboniferous.

Anomites punctatus Martin, Petrefacta Derbyensia, 1809, p. 8, pl. 37, fig. 6.


Loc. Europe; Ohio; Indiana; Illinois; Missouri; Arkansas; Nebraska; Iowa; Nevada; New Mexico; Feilden Isthmus, lat. 82° 43'.

Productus punctata Phillips, Geol. Yorkshire, II, 1836, p. 216, pl. 7, fig. 15.

Productus tubulosus Marcy, Geol. North America, 1858, p. 48, pl. 6, fig. 1.—Geinitz, Carbon und Dyas in Nebraska, 1866, p. 55.
Productus pyxidiformis Marcy, Geol. North America, 1858, p. 48, pl. 6, fig. 3.
Loc. Europe; Leavenworth, Kansas; Tigaras, New Mexico.
Obs. See Productus norwoodii.

Productus pustulosus Hall = Productella pyxidata.

Productus pyxidatus Hall = Productella pyxdata.

Productus pyxidiformis de Koninck = Productus pustulosus.

Productus rariocostatus Herrick. Waverly (L. Carb.).
Loc. Moores Run, Ohio.

Productus rarispinus Hall = Productella rarispina.
Productus reticulatus Gabb.  Upper Carboniferous.
Loc. Lake Titicaca, Bolivia.

Productus rhomianus Derby.  Upper Carboniferous.
Loc. Bomjardim and Itaituba, Brazil.

Productus rogersi Norwood and Pratten = Productus nebraskaensis.

Productus rushvillensis Herrick.  Waverly (L. Carb.).
Productus rushvillensis Herrick, Bull. Denison Univ., IV, 1888, p. 22, pl. 3, fig. 15.—Geol. Ohio, VII, 1895, pl. 23, fig. 15.
Loc. Rushville, Newark, and Londonville, Ohio.

Productus scabriculus (Martin).  Lower and Upper Carboniferous.
Anomites scabriculus Martin, Petrefacta Derbiensia, 1809, p. 8, pl. 36, fig. 5.
Productus scabriculus? Geinitz, Carbon und Dyas in Nebraska, 1866, p. 54.
Loc. Europe; Pecos Village and Santa Fe, New Mexico; Plattsmouth, Nebraska; Caldwell County, Kentucky; Kashmere.

Productus scitulus Meek and Worthen.  St. Louis (L. Carb.).

Productus semipunctatus Sheppard = Productus punctatus.
Productus semireticulatus Hall, 1852 (non Martin) = Productus cora.

Productus semireticulatus (Martin).  Lower and Upper Carboniferous.
Anomites semireticulatus Martin, Petrefacta Derbiensia, 1809, p. 7, pl. 32, figs. 1, 2; pl. 33, fig. 4.
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Productus semireticulatus (Martin)—Continued.

fig. 6.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 17A, figs. 16-18; pl. 18, figs. 11-13; pl. 19, figs. 19-23.—Keyes, Geol. Survey Missouri, V, 1895, p. 50, pl. 36, fig. 4.


Productus setigerus Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 638, pl. 19, fig. 3.

Productus setigerus var. keokuk Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 639, pl. 19, fig. 4.


Productus magnus Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 17A, fig. 15.

Loc. Europe; throughout the Carboniferous of North America; Feilden Isthmus, lat. 82° 43'; Vixixil and Sansiguan, Guatemala; Yarichambii, Bolivia; Bomjardim and Itaituba, Brazil; Tibet and Kashmere.

Obs. See Productus peruvianus d'Orbigny and P. magnicostatus.

Productus semireticulatus kansasensis Swallow. Upper Carboniferous.


Loc. Kansas and Missouri.

Productus semistriatus Meek. Upper Carboniferous.


Loc. Utah and northern New Mexico.

Productus setigerus Hall=Productus semireticulatus.

Productus setigerus var. keokuk Hall=Productus semireticulatus.

Productus shumardianus Hall=Productella shumardana.

Productus speciosus Hall=Productella speciosa.

Productus spinulicostatus Hall=Productella spinulicosta.

Productus splendens Norwood and Pratten=Productus longispiua.

Productus subaculeatus of American authors=Productella spinulicosta.

Productus subalatus Hall=Productella subalata.

Productus subhorridus Meek. Carboniferous.

Productus subhorridus Meek, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 75, pl. 7, fig. 3.

Loc. Wasatch Mountains, Utah.

Productus sulcatus Castelnau=Leptäna rhomboidalis.

Productus sulcifer de Verneuil=Leptäna rhomboidalis.

Productus swallovi Beecher. Kaskaskia (L. Carb.).


Loc. Barretts Station, St. Louis County, Missouri.

Productus symmetricus McChesney. Upper Carboniferous.

Productus symmetricus McChesney, New Pal. Fossils, 1860, p. 35;—Trans. Chicago Acad. Sci., I, 1868, p. 25, pl. 1, fig. 9.—Meek, Final Rep. U. S. Geol. Survey of Nebraska, 1872, p. 167, pl. 5, fig. 6; pl. 8, fig. 13.—White, Thirteenth Rep. State Geol. Indiana, 1884, p. 123, pl. 25, figs. 1 and 2.—Hall and
Productus symmetricus McChesney—Continued.


Loc. Lasalle and Springfield, Illinois; Iowa; Missouri; Nebraska; Indiana.

Productus tenuicostatus Hall.

Productus tenuicostatus Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 675, pl. 24, fig. 2.—Second Ann. Rep. N. Y. State Geol., 1883, pl. 49, fig. 18.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 18, fig. 18.—Keyes, Geol. Survey Missouri, V, 1895, p. 44.


Productus truncatus Hall=Strophalosia truncata.

Productus tubulospinus Sheppard=Productus punctatus.

Productus undiferus de Koninck. Upper Carboniferous.


Loc. Europe; Caseyville, Illinois; Posey County, Indiana.

Obs. See Productus boonensis Swallow.

Productus villiersi d’Orbigny. Upper Carboniferous.


Loc. Yarbichambi, Bolivia; Keg Creek, Missouri.

Productus viminalis White. Burlington (L. Carb.).


Loc. Burlington, Iowa.

Obs. White regards this species as a synonym for Productus costatus Sowerby.

Productus vittatus Hall=Productus alternatus.

Productus wabashensis Norwood and Pratten=Productus longispina.

Productus wallacianus Derby. Upper Carboniferous.

Productus wallacianus Derby, Bull. Cornell Univ., I, 1874, p. 57, pl. 3, figs. 46-48; pl. 6, fig. 5.

Loc. Bomjardim and Itaituba, Brazil.

Productus wilberanus McChesney=Productus nebraskaensis.

Productus wortheni Hall. Keokuk (L. Carb.).

Productus wortheni Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 635, pl. 19, fig. 1.


Obs. Compare with Productus marginicinctus Prout.

Productus weyprechti Toula. Upper Carboniferous.

Productus weyprechti Toula, Sitzb. der k. k. Akad. der Wissensch. zu Wien, 1873, p. 138, pl. 1, fig. 4.


Loc. Cape Joseph Henry, lat. 82° 50’.

PROTORHYNCHA Hall and Clarke. Genotype Atrypa dubia Hall.

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Protorhyncha (?) antiquata (Billings). Lower Cambrian.

Protorhyncha dubia Hall. Chazy (Ord.).
Atrypa dubia Hall, Pal. New York, I, 1847, p. 21, pl. 4 bis, fig. 5.

Protorhyncha (?) minor (Walcott). Lower Cambrian.
Obs. May be the type of a new genus. Its affinities are rather with the Rhynchonellidae than with Pentameridae.

Protorhyncha Hall and Clarke=Billingsella.

Protosiphon Matthew. Genotype P. kempanus Matthew.
Protosiphon Matthew, Geol. Mag., dec. IV, IV, 1897, p. 70.

Protosiphon kempanus Matthew. Lower Cambrian.
Protosiphon kempanum Matthew, Geol. Mag., dec. IV, IV, 1897, p. 70, figs. 1-4. Loc. Long Island, Kings County, New Brunswick.

Protozyga Hall and Clarke=Zygospira.
Pseudocrania anomala A. Winchell=Orthothetes anomalus.

Ptychospira Hall and C. Genotype Terebratula ferita von Buch.

Ptychospira sexplicata (White and Whitfield.) Waverly (L. Garb.).

Pugnax Hall and C. Genotype Rhynchonella acuminata (Martin).
Pugnax (?) dawsoniana (Davidson). Upper Carboniferous.
Pugnax (?) dawsonianus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 214, pl. 62, figs. 30-33. Loc. Lennox Passage, Nova Scotia,
Pugnax globulina (Phillips sp.?)(Davidson). Upper Carboniferous.

Terebratula globulina Phillips, Encyl. Metr., IV, 1834, pl. 3, fig. 3.

Camarophoria globulina Davidson, Quart. Jour. Geol. Soc. London, XIX, 1863, p. 171, pl. 9, figs. 11, 12.

Camarophoria globulina? Dawson, Acadian Geology, 3d ed., 1878, p. 293, fig. 92.


Pugnax grossenori Hall. St. Louis (L. Carb.).


Loc. Spergen Hill and Bloomington, Indiana; Alton, Illinois; near Princeton, Kentucky.

Pugnax mutata Hall. Keokuk and St. Louis (L. Carb.).


Pugnax mutata Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 204, pl. 60, figs. 18-22.

Loc. Alton and Warsaw, Illinois; Boonville, Missouri.

Pugnax ottumwa (White). St. Louis (L. Carb.).


Loc. Ottumwa and Oskaloosa, Iowa; Clark County, Missouri.

Pugnax pugnus (Martin). Upper Devonian.

Conchylolithus Anomites pugnus Martin, Petrefacta Derbiensia, 1809, tab. 22, figs. 4, 5.

Terebratula pugnus Sowerby, Mineral Conchology, 1825, pl. 425, figs. 1-6.


Pugnax pugnus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 203, pl. 60, figs. 6-10.

Loc. Europe; High Point, New York; Eureka district, Nevada; Mackenzie and Athabasca rivers, Canada; in the Carboniferous of Windsor and East River, Nova Scotia (Dawson); San Saba Valley, Texas (Roemer).

Pugnax pugnus alta (Calvin). Upper Devonian.

Rhynchonella alta Calvin; paper read before the Iowa Acad. Sci., and a named photographic plate distributed.

Rhynchonella pugnus var. alta Williams, Bull. Geol. Soc. America, I, 1890, pl. 12, figs. 5-7.

Pugnax altaus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 203, pl. 60, figs. 1-5.

Loc. Solon, Iowa.
Pugnax pugnus missouriensis (Shumard).  
Waverly (L. Carb.).
Rhynchonella missouriensis Shumard, Geol. Rep. Missouri, 1855, p. 204, pl. 5C, fig. 5a (non figs. 5b, 5c = Pugnax striaticostata). — Meek and Worthen, Geol. Survey Illinois, II, 1866, p. 153, pl. 14, fig. 4. — Keyes, Geol. Survey Missouri, V, 1895, p. 100.
Pugnax missouriensis Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 204, pl. 60, figs. 33, 34; pl. 62, figs. 44, 45.  
Loc. Cooper County, Missouri; Burlington, Iowa; Rockford, Indiana; Scioto-ville and Richfield, Ohio.

Pugnax rockymontana (Marcou).  
Upper Carboniferous.
Terebratula rockymontana Marcou, Geol. N. America, 1858, p. 50, pl. 6, fig. 13.  
Rhynchonella rockymontana White, Wheeler’s Expl. and Survey west 100th Merid., IV, 1875, p. 131, pl. 9, fig. 1.  
Pugnax eatoniformis Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 204, pl. 60, figs. 11, 12.  
Loc. Pecos Village, New Mexico; Cedar Range, Utah; Graysville, Illinois.

Pugnax striaticostata (Meek and Worthen).  
Kinderhook (L. Carb.).
Loc. Cooper County, Missouri.

Pugnax swallowana (Shumard).  
Upper Carboniferous.
Camarophoria swallowana Shumard, Trans. St. Louis Acad. Sci., I, 1859, p. 394, pl. 11, fig. 1.  
Pugnax swallowana Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 204, pl. 60, figs. 27-32.  
Loc. Guadalupe Mountains of New Mexico and Texas.

Pugnax utah (Marcou).  
Upper Carboniferous.
Terebratula utah Marcou, Geol. N. America, February, 1858, p. 51, pl. 6, fig. 12.  
Rhynchonella species Salter, Quart. Jour. Geol. Soc. London, XVII, 1861, p. 64, pl. 4, fig. 5.  
Camarophoria globulina Geinitz (non Phillips), Carbon und Dyas in Nebraska, 1866, p. 38, pl. 3, fig. 5.  
Rhynchonella osagensis Meek, Final Rep. U. S. Geol. Survey Nebraska, 1872, p. 179, pl. 1, fig. 9; pl. 6, fig. 2.—Meek and Worthen, Geol. Survey Illinois, V, 1873, p. 571, pl. 26, fig. 22.  
Pugnax utah Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 204, pl. 60, figs. 39-42.  
Rhynchonella uta Keyes, Geol. Survey Missouri, V, 1895, p. 103, pl. 41, fig. 7.  
Loc. Salt Lake City, Utah; Indiana; Illinois; Iowa; Missouri; Kansas; Arkansas; Nebraska.  
Obs. Compare with Pugnax pleurodon.
RAFINESQUINA Hall and C. Genotype Strophomena alternata Emmons.


RAFINESQUINA alternata (Emmons). Trenton to Lorraine (Ord.).

Leptajna alteruata Conrad, Second Ann. Rep. N. Y. Geol. Survey, 1838, p. 115 (undefined).—Hall, Pal. New York, I, 1847, pp. 102, 286, pl. 31, fig. 1; pl. 31A, fig. 1; pl. 79, fig. 2.—Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 818, fig. 600.


Orthis huroniensis Castelnau, Essai Système Silurien l'Amérique Septentriionale, 1843, p. 37, pl. 14, fig. 6.

Orthis plana Castelnau (non Pander), Ibidem, 1843, p. 38, pl. 14, fig. 1.

Strophomena angulata? Owen, Geol. Expl. Iowa, Wisconsin, and Illinois, 1844, pl. 18, figs. 1, 3.


Rafinesquina alternata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 282, pl. 8, figs. 6-11, 27, 28; Pt. II, 1895, pl. 84, figs. 17, 18.—Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 404, pl. 31, figs. 32-34.—Whiteaves, Pal. Foss., III, Pt. III, 1897, p. 171.

Loc. New York; Ohio; Indiana; Illinois; Missouri; Wisconsin; Minnesota; Canada; Manitoba; Anticosti.

Obs. This species was not defined or figured by Conrad. The first illustration was given by Emmons, and in the following year it was figured and defined by Castelnau as Orthis huroniensis.

RAFINESQUINA alternata alternistriata Hall. Lorraine (Ord.).

Leptajna alternistriata Hall, Pal. New York, I, 1847, p. 109, pl. 31B, fig. 1.


Loc. Cincinnati, Ohio; Maysville, Kentucky; Madison, Indiana.

Obs. Meek regarded this variety as a synonym for S. alternata.

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Synopsis of American Fossil Brachiopoda.

Rafinesquina alternata fracta (Meek).
Strophomena alternata var. fracta Meek, Pal. Ohio, I, 1873, p. 91, pl. 7, fig. 3.
Loc. Cincinnati, Ohio.

Rafinesquina alternata loxorhytis Winchell and Schuchert = R. kingi.
Rafinesquina alternata loxorhytis (Meek).
Loc. Cincinnati, Ohio.

Rafinesquina alternata nasuta (Conrad).
Loc. Jefferson County, New York; Cincinnati, Ohio.

Rafinesquina (?) atava (Matthew).
Strophomena atava Matthew, Trans. Royal Soc. Canada, 1893, p. 102, pl. 7, fig. 8.
Loc. Mary Island, near St. John, New Brunswick.

Rafinesquina aurora (Billings).
Loc. Table Head, etc., Newfoundland.

Rafinesquina ceras (Billings).
Loc. Anticosti.

Rafinesquina deltoides (Conrad).
Leptena camerata Hall, Pal. New York, I, 1847, p. 106, pl. 31A, fig. 2.
Leptena delta Hail, Ibidem, 1847, p. 106, pl. 31A, fig. 3.
Streptorhynchus (Strophonella) delta Hall, Second Ann. Rep. New York State Geol., 1883, pl. 42, figs. 1, 2, 4 (non fig. 3).
Loc. Trenton Falls, etc., New York; St. Paul, Cannon Falls, etc., Minnesota; Oshkosh, Wisconsin; Dubuque, Iowa; Pike County, Missouri; Ottawa and Lake Winnipeg, Canada.

Rafinesquina fasciata Hall.
Leptena fasciata Hall, Pal. New York, I, 1847, p. 20, pl. 4 bis, fig. 3.
Loc. Chazy, Clinton County, New York.
Obs. Should be compared with R. alternata.

Rafinesquina imbrex (Pander).
Strophomena imbrex(?), Billings, Pal. Fossils, I, 1862, p. 128, fig. 106.
Loc. Europe; Anticosti.
Rafinesquina incrassata (Hall). Chazy and Black River (Ord.).
Stryphomena incrassata Billings, Canadian Nat. Geol., IV, 1859, p. 443.
Loc. Chazy, New York; Mingan Island, Canada.

Rafinesquina kingi (Whitfield). Lorraine (Ord.).
Rafinesquina alternata var. loxorhytis Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 407, pl. 31, figs. 35-37;—pl. 32, figs. 59, 60.
Loc. Delafield, Wisconsin; near Spring Valley, Minnesota.

Rafinesquina lata Whiteaves. Lorraine (Ord.).
Loc. Red River Valley and Lake Winnipeg, Manitoba.

Rafinesquina mesicosta (Shumard). Trenton (Ord.).
Loc. Cape Girardeau, Missouri.

Rafinesquina minnesotaensis (N. H. Winchell). Trenton (Ord.).
Strophomena deltoidea Owen (non Conrad), Geol. Expl. Iowa, Wisconsin, and Illinois, 1844, pl. 16, fig. 8;—pl. 17, fig. 6.
Lepttena deltoidea Owen, Geol. Rep. Wisconsin, Iowa, and Minnesota, 1862, p. 620, tab. 2B, fig. 10 (not the middle figure).
Strophomena incrassata Hall (non 1847), Geol. Wisconsin, I, 1882, p. 42, fig. 16.—Hall (non 1847), Second Ann. Rep. N. Y. State Geol., 1883, pl. 38, figs. 1-5.
Loc. Minneapolis, etc., Minnesota; Beloit, Wisconsin; Decorah and McGregor, Iowa; central Kentucky; Lebanon, Tennessee.
Obs. This species is probably not identical with R. incrassata (Hall) of the Chazy terrane.

Rafinesquina minnesotaensis inquisa (Sardeson). Trenton (Ord.).
Rafinesquina minnesotaensis var. inquassa Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 403, pl. 31, figs. 27, 28.
Loc. Minneapolis and St. Paul, Minnesota; Mineralpoint, Wisconsin.

Rafinesquina nitens (Billings). Lorraine (Ord.).
Loc. Anticosti.

Rafinesquina (?) obscura Hall. Clinton (Sil.).
Lepttena obscura Hall, Pal. New York, II, 1852, pp. 62, 103, pl. 21, figs. 2, 6.
Rafinesquina squamula (James). Lorraine (Ord.).
Rafinesquina squamula James, Cincinnati Quart. Jour Sci., I, 1874, p. 335.
Loc. Cincinnati, Ohio.

Rafinesquina tenuilineata (Conrad). Trenton (Ord.).
Rafinesquina tenuilineata Hall and Clarke, Pal. New York, I, 1847, p. 115, pl. 31B, fig. 8.
Loc. "Occurs in Trenton limestone."

Rafinesquina ulrichi (James). Utica (Ord.).
Strophomena (?) ulrichi James, The Palaeontologist, I, 1878, p. 6.
Loc. Cincinnati, Ohio.

RENSSELÆRIA Hall. Genotype Terebratula ovoides Eaton.

RENSSELÆRIA aeruquiradiata (Conrad). Lower Helderberg (Dev.).

RENSSELÆRIA cayuga Hall and Clarke. Oriskany (Dev.).
RENSSELÆRIA cayuga Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pp. 258, 370, pl. 75, figs. 1, 2.
Loc. Cayuga, Ontario.

RENSSELÆRIA condoni McCheesney=Megalanteris condoni.

RENSSELÆRIA cumberlandiae Hall. Oriskany (Dev.).
Loc. Cumberland, Maryland.

RENSSELÆRIA elliptica Hall. Lower Helderberg (Dev.).
Loc. Schoharie County, New York.

RENSSELÆRIA elongata Hall=Amphigenia elongata.

RENSSELÆRIA intermedia Hall. Oriskany (Dev.).
Loc. Cumberland, Maryland.

RENSSELÆRIA johanni Hall=Newberrya johannis.
Rensselaria levis Hall = Meristella levis.
Rensselaria levis Meek = Newberrya levis.
Rensselaria marylandica Claypole = Newberrya claypolei.

**Rensselaria marylandica** Hall.
  - Loc. Cumberland, Maryland.

**Rensselaria mutabilis** Hall.
- Rensselaria mutabilis Hall, Pal. New York, III, 1859, p. 254, pl. 45, fig. 2.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 258, 259, figs. 178, 179; pl. 76, figs. 1-3a, 21, 22.

**Rensselaria ovalis** Hall = Megalanteris ovalis.

**Rensselaria ovulum** Hall and Clarke.
- Rensseleria ovulum Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 75, figs. 3, 4.
  - Loc. Cayuga, Canada.

**Rensselaria portlandica** Billings = Trigeria portlandica.
**Rensselaria suessana** Hall = Beachia suessana.

**Rensselaeria** McCoy. Genotype Terebratula imbricata Sowerby.

**Reticularia** McCoy, Carboniferous Fossils of Ireland, 1844, p. 142.—Waagen, Palaeontologica Indica, Ser. XIII, I, 1883, p. 538.

**Reticularia bicostata** (Vanuxem).
- Orthis bicostatus Vanuxem, Geol. N. Y.; Rep. Third Dist., 1842, pp. 91, 94. 
- Spirifer bicostatus Hall, Pal. New York, II, 1852, p. 263, pl. 54, fig. 4.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 19, 37, pl. 36, fig. 7. 
- Spirifera bicostata Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 61, fig. 7. 
  - Loc. Vernon Center, New York; Louisville, Kentucky.

**Reticularia bicostata petila** (Hall).
- Spirifera bicostata var. petila Hall, Descrip. n. sp. of Fossils from Waldron, Indiana, 1879, p. 15. 
Reticularia bicostata petilata (Hall)—Continued.
Spirifer bicostatus var. petilus Beecher and Clarke, Mem. N. Y. State Mus., I, 1889, p. 75, pl. 6, figs. 1-3.
Loc. Waldron, Indiana.

Reticularia canandaigeae (Hall and Clarke).

Reticularia clara (Swallow).
Loc. St. Genevieve County, Missouri.

Reticularia cooperensis (Swallow).
Spirifer cooperensis Swallow, Trans. St. Louis Acad. Sci., I, 1860, p. 643.—
Meek and Worthen, Geol. Survey Illinois, II, 1866, p. 155, pl. 14, fig. 5.—
Keyes, Geol. Survey Missouri, V, 1895, p. 78.
Loc. Chouteau Springs, etc., Missouri; Rockford, Indiana; Burlington, Iowa; Hickman County, Tennessee.

Reticularia fimbriata (Conrad).
Spirifer fimbriatus Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 505, pl. 4, fig. 5.—
Billings, Canadian Jour., VI, 1861, p. 257, figs. 68-70;—Geol. Canada, 1863, p. 372, fig. 393.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 17, 20, 21, 33, 37, pl. 36, figs. 17-22; pl. 38, figs. 9, 10.
Spirifer fimbriata Hall, Pal. New York, IV, 1867, p. 214, pl. 33, figs. 1-11;—
Spirifer compactus Meek, Trans. Chicago Acad. Sci., I, 1868, p. 102, pl. 14, fig. 11.
Spirifer (Martinia) richardsoni Meek, Trans. Chicago Acad. Sci., I, 1868, p. 104, pl. 14, fig. 2.
Spirifer (M.) richardsoni Whiteaves, Cont. Canadian Pal., I, 1891, p. 226;—
Ibidem, 1892, p. 287, pl. 37, fig. 7.
Spirifer (M.) undifera Walcott, Mon. U. S. Geol. Survey, VIII, 1884, pl. 3, figs. 3, 6; pl. 14, fig. 11.
Loc. New York; Ohio; Falls of Ohio; Illinois; Iowa; Maryland; Virginia; Eureka district, Nevada; Ontario and lakes Manitoba and Winnipegosis; Mackenzie River, Northwest Territory, Canada.

Obs. Mr. Walcott is correct in regarding this species the same as Spirifer undiferus Roemer. Conrad’s species, however, was published in 1842, while that of Roemer is two years later, or in 1844. S. richardsoni is a young specimen of S. compacta which Mr. Walcott has shown to be a synonym for S. undiferus. See Reticularia knappiana.
Reticularia franklini (Meek).
Hamilton (Dev.).
Spirifer (Martinia) franklini Meek, Trans. Chicago Acad. Sci., I, 1868, p. 107, pl. 14, fig. 12.
Loc. Mackenzie River, Northwest Territory, Canada.
Obs. The type specimen in the U. S. National Museum collection proves to be closely related to Reticularia levii Hall.

Reticularia guadalupensis (Shumard).
Upper Carboniferous.
Loc. Guadalupe Mountains, Texas.

Reticularia knappiana (Nettelroth).
Corniferous (Dev.).
Loc. Falls of Ohio.
Obs. Probably the same as R. fimbriata.

Reticularia levii (Hall).
Portage (Dev.).
Delthyris levii Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 245, fig. 1.
Spirifer levii Hall, Pal. New York, IV, 1867, p. 239, pl. 39, figs. 1-12.

Reticularia modesta (Hall).
Lower Helderberg (Dev.).
Loc. Cumberland, Maryland.

Reticularia nevadaensis (Walcott).
Upper Devonian.
Spirifer (M.) glabra var. nevadensis Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 139, pl. 3, fig. 5; pl. 14, fig. 14.
Loc. Eureka district, Nevada.

Reticularia (?!) nympha (Billings).
Lower Helderberg (Dev.).
Loc. Masardis, Maine.

Reticularia perplexa (McChesney).
Upper Carboniferous.
Spirifer lineatus? Meek, Geol. Survey California, I, 1864, p. 13, pl. 2, fig. 6.
Spirifer (Martinia) perplexa Derby, Bull. Cornell Univ., I, 1874, p. 16, pl. 3, figs. 27, 39, 40, 45, 50; pl. 8, fig. 13.
Reticularia perplexa (McChesney)—Continued.
Spirifer (Martinia) lineata var. White, Wheeler's Expl. and Survey west 100th Meridian, III, Appendix, 1881.
Spirifer (Martinia) lineata White, Eleventh Rep. State Geol. Indiana, 1882, p. 372, pl. 42, figs. 4-6;—Thirteenth Rep. State Geol. Indiana, 1884, p. 133, pl. 27, figs. 4-6.—Herrick, Bull. Denison Univ., II, 1887, p. 46, pl. 1, fig. 13.—White, Annals N. Y. Acad. Sci., V, 1891, p. 603, pl. 16, figs. 3-5.—Ohio, VII, 1895, p. 488, pl. 12, figs. 3-5.
Spirifer perplexa Keyes, Geol. Survey Missouri, V, 1895, p. 84.
Loc. Ohio; Indiana; Illinois; Missouri; Iowa; Kentucky; California; Texas; Pecos and Tígeras, New Mexico; Shasta County, California; Bon Jardim and Itaituba, Brazil.
Obs. This species is not identical with Reticularia lineata Martin, as found in England and Belgium. Reticularia pseudolineata (Hall) is more closely allied to that species than R. perplexa (McChesney).

Reticularia perplexa striatolineata (Swallow). Upper Carboniferous.
Loc. Missouri.
Obs. Regarded by Keyes as a synonym for R. perplexa.

Reticularia præmatura (Hall). Chemung (Dev.).
Martinia præmatura Herrick, Geol. Ohio, VII, 1895, p. 23, fig. 12.
Loc. Meadville and Oil Creek, Pennsylvania.

Reticularia pseudolineata (Hall). Burlington-Keokuk (L. Carb.).
Spirifer lineatoides and pseudolineata Keyes, Geol. Survey Missouri, V, 1895, pp. 81, 82, pl. 40, fig. 5.
Loc. Keokuk, Iowa; Warsaw, Illinois; Crawfordsville, Indiana; Missouri.
Obs. See R. perplexa (McChesney).

Reticularia setigera (Hall). Kaskaskia (L. Carb.).
Spirifer setigerus Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 706, pl. 27, fig. 4.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 21, 37, pl. 36, figs. 26-27.
Loc. Kaskaskia and Chester, Illinois; Caldwell and Crittenden counties, Kentucky; Oquirrh Mountains, Utah.
Obs. See R. translata.

Reticularia subundifera (Meek and Worthen). Hamilton (Dev.).
Spirifer subundifera Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 434, pl. 10, fig. 5.
Reticularia subundifera (Meek and Worthen)—Continued.

Reticularia (?) temeraria (Miller). Lower Carboniferous.
Loc. Lake Valley mining district, New Mexico.

Reticularia tenuispinata (Herrick). Waverly (L. Carb.).
Spirifer (Martinia) tenuispinata Herrick, Bull. Denison Univ., IV, 1888, p. 27, pl. 2, fig. 4.
Spirifer tenuispinatus Herrick, Geol. Ohio, VII, 1895, pi. 15, fig. 4.
Loc. Granville, Ohio.

Reticularia translata (Swallow). Kaskaskia (L. Carb.).
Loc. Chester, Illinois; St. Marys, Missouri.
Obs. Regarded by Keyes as a synonym for R. setigera.

RETZIA King. Genotype Terebratula adrieni de Verneuil.
Obs. It is very probable that all of the species here referred to Retzia will prove to belong to other genera.

Retzia altirostris White=Eumetria altirostris.
Retzia chloe Billings=Parazyga hirsuta.
Retzia (?) circularis Miller. Chouteau (L. Carb.).
Retzia circularis Miller, Eighteenth Ann. Rep. Geol. Survey Indiana, 1894, p. 316, pl. 9, figs. 32-34.
Loc. Sedalia, Missouri.
Retzia compressa Meek=Hustedia mormoni.
Retzia dubia Billings=Trematospira dubia.
Retzia electra Billings=Rhynchospira electra.
Retzia eugenia Billings=Rhynchospira eugenia.
Retzia evax Hall=Homeospira evax.
Retzia formosa Whitfield=Rhynchospira formosa.

Retzia (?) granulifera Meek. Lorraine (Ord.).
Loc. Cincinnati, Ohio.
Obs. This species is probably a rhynchonelloid.

Retzia hippolyte Billings=Trematospira hippolyte.

Retzia (?) jamesiana Rathbun. Middle Devonian.
Retzia (?) jamesiana Derby, Archives do Museu Nacional do Rio de Janeiro, IX, 1890, p. 79.
Loc. Erere and Rio Maecuru, Province of Para, Brazil; Bolivia.
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Retzia marcyi Shumard=Eumetria marcyi.
Retzia meekana Shumard=Hustedia meekana.
Retzia mormoni Marcou=Hustedia mormoni.
Retzia osagensis Swallow=Acambona osagensis.
Retzia papillata Shumard=Hustedia papillata.

Retzia (?) plicata Miller.
Loc. Sedalia, Missouri.

Retzia polypleura A. Winchell.
Loc. Port aux Barques, Michigan.

Retzia (?) popeana Swallow.
Loc. Locality and formation not given.

Retzia punctulifera Shumard=Hustedia mormoni.
Retzia radialis Walcott (non Phillips)=Hustedia mormoni.
Retzia sexplicata White and Whitfield=Ptychospira sexplicata.
Retzia sobrina Beecher and Clarke=Homoeospira sobrina.

Retzia (?) subglobosa Hall.
Retzia subglobosa Miller, N. American Geol. and Pal., 1889, p. 367.

Retzia subglobosa McChesney=Hustedia mormoni.
Retzia triangularis Miller=Hustedia triangularis.
Retzia vera Hall=Eumetria marcyi.
Retzia vera costata Hall=Eumetria marcyi costata.
Retzia verneuiliana Hall=Eumetria marcyi.
Retzia ? wardiana Rathbun=Trigeria wardiana.
Retzia woosteri White=Eumetria woosteri.


Rhinobolus davidsoni Hall and Clarke.
Loc. Near Grafton, Wisconsin.

Rhinobolus galtensis (Billings).
Trimerella minor Dall, American Jour. Conch., VII, 1871, p. 83, pl. 11, fig. 6.
Rhinobolus galtensis (Billings)—Continued.
Trimerella (?) galtensis Davidson and King, Quart. Jour. Geol. Soc. London, XXX, 1874, p. 151, pl. 18, fig. 13; pl. 19, fig. 4.
Rhinobolus galtensis Whiteaves, Pal. Fossils, III, 1884, p. 7, pl. 2, fig. 1; pl. 8, fig. 3.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 45, pl. 4B, figs. 7–9.

Rhipidomella Ėhlert. Genotype Terebratula michelini L'Éveillé.

Rhipidomella alsas Hall. Schoharie (Dev.).
Loc. Albany County, New York.
Obs. Probably a synonym for R. peloris Hall.

Rhipidomella assimilis Hall. Lower Helderberg (Dev.).
Orthis assimilis Hall, Pal. New York, III, 1859, p. 175, pl. 15, fig. 1.

Rhipidomella burlingtonensis Hall. Burlington (L. Carb.).
Orthis michelini var. burlingtonensis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 596, pl. 12, fig. 4.
Rhipidomella burlingtonensis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 225, pl. 6A, fig. 13; pl. 20, figs. 5, 6.
Orthis burlingtonensis Keyes, Geol. Survey Missouri, V, 1895, p. 63, pl. 38, fig. 7.
Loc. Burlington, Iowa; Quincy, Illinois; Hannibal, Missouri.

Rhipidomella circulus Hall. Clinton (Sil.).
Orthis circulus Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 71, fig. 1;—Pal. New York, II, 1852, p. 56, pl. 20, fig. 6.—Billings, Canadian Nat. Geol., I, 1856, p. 134, pl. 2, fig. 1.
Rhipidomella circulus Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 210, 224, pl. 6A, figs. 1, 2.

Rhipidomella clarkensis (Swallow). Keokuk (L. Carb.).
Loc. Clark County, Missouri.
Obs. Keyes regards this species as a synonym for Schizophoria swallovi.

Rhipidomella cleobis Hall. Onondaga (Dev.).

Rhipidomella cumberlandiæ Hall. Oriskany (Dev.).
Loc. Cumberland, Maryland.
Rhipidomella (? cuneata (Owen).

Orthis cuneata Owen, Geol. Survey Wisconsin, Iowa, and Minnesota, 1852, p. 585, pl. 3A, fig. 10.
Loc. New Buffalo, Iowa

Rhipidomella cyclas Hall.

Loc. York, Pavilion, Bellona, etc., New York.

Rhipidomella dubia Hall.

Orthis cooperensis Swallow, Trans. St. Louis Acad. Sci., II, 1863, p. 82.
Orthis dubia Keyes, Geol. Survey Missouri, V, 1895, p. 64.
Loc. Hudson, Catskill, etc., New York; Square Lake, Maine.

Rhipidomella eminens Hall.

Loc. Schoharie, Carlisle, etc., New York.

Rhipidomella goodwini (Nettelroth).

Loc. Falls of Ohio.

Rhipidomella harti (Rathbun).

Loc. Province of Para, Brazil.

Rhipidomella hybrida (Sowerby).

Rhipidomella hybrida (Sowerby)—Continued.


Rhipidomella hybrida Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 210, 224, pl. 6, figs. 1-5.

Orthis (Rhipidomella) hybrida Foerste, Geol. Ohio, VII, 1895, p. 584, pl. 25, fig. 10.

Loc. Europe; Lockport, etc., New York; Waldron, Indiana; Dayton, Ohio; Louisville, Kentucky; Perry County, Tennessee; Perry County, Missouri; Arisaig, Nova Scotia (Ami).

Rhipidomella idonea Hall. Hamilton (Dev.).

Orthis idonea Hall, Pal. New York, IV, 1867, p. 52, pl. 63, figs. 1-5.


Loc. Moscow and Eighteen Mile Creek, New York.

Rhipidomella inca (d'Orbigny). Devonian.

Orthis inca d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 38.

Spirifer inca d'Orbigny, Ibidem, 1842, pl. 2, figs. 10-12.

Loc. Cochabamba, Bolivia.

Rhipidomella leucosia Hall. Hamilton (Dev.).


Rhipidomella leucosia Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 225, pl. 6, fig. 16; pl. 6A, fig. 9.

Loc. Eighteen Mile Creek, Canandaigua Lake, etc., New York; Cumberland, Maryland.

Rhipidomella livia (Billings). Corniferous (Dev.).


Loc. Walpole, Ontario; New York; Columbus, Ohio; Falls of Ohio; Indian Cove, Gaspé.

Rhipidomella lucia (Billings). Oriskany (Dev.).

Orthis lucia Billings, Pal. Fossils, II, 1874, p. 35, pl. 3, fig. 4.


Loc. Indian Cove, Gaspé.

Rhipidomella media (Shaler). Anticosti (Sil.).


Loc. Anticosti.

Rhipidomella michelini (L'Éveillé). Waverly (L. Carb.).


Rhipidomella michelini (L'Éveillé)—Continued.
Loc. South of Louisville, and near Lebanon, Kentucky; Newark, Granville, etc., Ohio; Shafers, Pennsylvania; Lake Valley mining district, New Mexico.
Obs. It is probable that the American identifications of this species are the same as R. oweni Hall and Clarke.

Rhipidomella missouriensis (Swallow). Chouteau (L. Carb.)
Loc. Cooper and Marion counties, Missouri.

Rhipidomella (?) mitis (Hall). Schoharie (Dev.)
Loc. Albany and Schoharie counties, New York.

Rhipidomella musculosa Hall. Oriskany (Dev.)
Rhipidomella musculosa Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 190, 210, 225, pl. 6A, fig. 5.
Loc. Schoharie and Albany counties, New York; Cumberland, Maryland.

Rhipidomella nevadaensis (Meek). Carboniferous
Orthis michelini (non L'Éveillé) var. Meek, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 63, pl. 7, fig. 1.
Orthis nevadensis Meek, Ibidem, 1877; end of description.
Loc. White Pine district, Nevada.

Rhipidomella oblata Hall. Lower Helderberg (Dev.)
Loc. Schoharie, Carlisle, Hudson, etc., New York; Waunakee, Wisconsin.

Rhipidomella oblata emarginata (Hall). Lower Helderberg (Dev.)
Loc. Cumberland, Maryland.

Rhipidomella occasus Hall. Kinderhook (L. Carb.)
Loc. Rockford, Indiana.
Obs. Compare with R. thiemiei White.

Rhipidomella oweni Hall and Clarke. Waverly (L. Carb.)
Orthis (Rhipidomella) oweni Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 342, pl. 6, figs. 19–21.
Loc. Buttonmould Knobs, south of Louisville, Kentucky.
Obs. See R. michelini L'Éveillé.
Rhipidomella pecosi (Marcou).
Orthis pecosi Marcou, Geol. N. America, February 1858, p. 48, pl. 6, fig. 14.—White, Wheeler’s Expl. Survey west 100th Meridian, IV, 1875, p. 125, pl. 9, fig. 5.—Kayser, Richthofen’s China, IV, 1883, p. 177, pl. 24, fig. 1.—Waagen, Palaeontologica Indica, Ser. XIII, I, 1884, p. 573, pl. 56, figs. 1-3.—White, Thirteenth Rep. State Geol. Indiana, 1884, p. 129, pl. 32, figs. 20-22.—Keyes, Geol. Survey Missouri, V, 1895, p. 64.—Smith, Proc. American Phil. Soc., XXXV, 1897, p. 27 (extract).
Loc. Throughout the Upper Carboniferous of North America; Lo-Ping, China; Amb, India.

Rhipidomella peloris Hall.
Obs. Probably the same as R. alsa Hall.

Rhipidomella penelope Hall.
Rhipidomella penelope Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 211, 225, pl. 6, figs. 6-13; pl. 6A, fig. 10 (?11).

Rhipidomella penniana (Derby).
Orthis penniana Derby, Bull. Cornell Univ., I, 1874, p. 26, pl. 5, figs. 13, 15, 17, 19-22; pl. 8, fig. 2.
Rhipidomella penniana Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 210, 225, pl. 7, figs. 5-10.
Loc. Bomjardim and Itaituba, Brazil.

Rhipidomella pennsylvanica (Simpson).
Loc. Tioga and McKean counties, Pennsylvania.

Rhipidomella rhynchonelliformis (Shaler).
Loc. Anticosti.
Obs. Probably a variety of Rhipidomella uberis (Billings).

Rhipidomella semele Hall.
Loc. Erie County, New York; Columbus, Ohio.
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**Rhipidomella solitaria Hall.**
Hamilton (Dev.).


**Rhipidomella subcirculus (Simpson).**
Clinton (Sil.).

Loc. Mifflin and Huntington counties, Pennsylvania.

**Rhipidomella subelliptica (White and Whitfield).**
Kinderhook (L.Carb.).


Loc. Burlington, Iowa.

**Rhipidomella suborbicularis Hall.**
Hamilton (Dev.).

Orthis suborbicularis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 486, pl. 2, fig. 1.


**Rhipidomella thiemei (White).**
Chemung (Dev.) and Kinderhook (L. Carb.).


Orthis thiemii? Hall, Pal. New York, IV, 1867, p. 63, pl. 8, fig. 2.

Loc. Burlington, Iowa; In the Chemung group at Leon, Napoli, and New Albion, New York.

**Rhipidomella tubulostriata Hall.**
Lower Helderberg (Dev.).


Loc. Albany County, New York.

**Rhipidomella uberis (Billings).**
Anticosti (Sil.).


Loc. Anticosti.

Obs. See Rhipidomella rhynchonelliformis (Shaler).

**Rhipidomella vanuxemi Hall.**
Corniferous-Hamilton (Dev.).

Rhipidomella vanuxemi Hall—Continued.
Rhipidomella vanuxemi Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 225, pl. 6, figs. 14, 15; pl. 6A, figs. 7, 8.
Loc. New York; Columbus, Ohio; Falls of Ohio; Rock Island, Illinois; Buffalo, Iowa; Bosanquet, Ontario; Huron group, Port aux Barques, Michigan.

Rhipidomella vanuxemi pulchella (Herrick.) Waverly (L. Carb.).
Orthis vanuxemi var. pulchella Herrick, Bull. Denison Univ., III, 1888, p. 38, pl. 6, fig. 9.
Orthis vanuxemi var. gracilis Herrick, Geol. Ohio, VII, 1895, pl. 21, fig. 9.
Loc. Granville, Ohio.

RHYNCHONELLA Fischer de Waldheim. Genotype R. loxia Fischer de Waldheim.

Rhynchonella aenigma (d'Orbigny.) Jurassic.
Terebratula concinna (non Sowerby) Bayle and Coquand, Mém. Soc. Géol. France, ser. ii, IV, 1851, p. 23, pl. 8, figs. 4-6.
Rhynchonella aenigma Gottschel, Palaeontographica, Suppl., III, 1878, p. 34.
Loc. Guasco, Coquimbo, Dona Ana, Chile; Copiapo, Caracoles, and Iquique, Peru.

Rhynchonella æquiplicata Gabb. Triassic.
Rhynchonella æquiplicata Gabb, Geol. Survey California, Pal., I, 1864, p. 35, pl. 6, fig. 37.
Loc. Cinnabar district, Humboldt Mountain, Nevada.

Rhynchonella æquiradiata Miller=Camaratœchia æquiradiata.
Rhynchonella æquivalvis Hall=Lissopleura æquivalvis.
Rhynchonella abrupta Hall=Uncinulus abruptus.

Rhynchonella acadiensis Davidson. Upper Carboniferous.
Loc. Brookfield, Nova Scotia.

Rhynchonella acinus Hall=Camaratœchia acinus.
Rhynchonella acinus convexa Foerste = Camaratœchia acinus convexa.

Rhynchonella æutiplicata Hall. Lower Helderberg (Dev.).
Bull. 87—23
Rhynchonella (?) acutirostris Hall. Chazy (Ord.).
Atrypa acutirostra Hall, Pal. New York, I, 1847, p. 21, pl. 4 bis, fig. 6.
Obs. This species is referred to Zygospira by Whitfield.
Rhynchonella ainsliei Winchell = Rhynchotrema ainsliei.
Rhynchonella algeri McCchesney. Upper Carboniferous.
Rhynchonella allegania Williams. Chemung (Dev.).
Rhynchonella alta Calvin = Pugnax pugnus alta.
Rhynchonella altiplicata Hall = Camarotecta plena.
Rhynchonella altiplicata Hall. Lower Helderberg (Dev.).
Loc. Albany and Schoharie counties, New York.
Rhynchonella alveata Hall = Centronella alveata.
Rhynchonella ambigua Calvin. Middle Devonian.
Loc. Independence, Iowa.
Rhynchonella anduin Gottsche. Jurassic.
Rhynchonella anduin Gottsche, Palaeontographica, Suppl., III, 1878, p. 34, pl. 4, figs. 4-7.
Loc. Iquique, Portezuelo de Manflas, and Cordillera de Dona Ana, Chile.
Rhynchonella angulata Geinitz (non Linné) = Enteletes hemiplicatus.
Rhynchonella (?) anticiostensis Billings. Lorraine (Ord.).
Rhynchonella anticiostensis Billings, Pal. Fossils, I, 1862, p. 142, fig. 119;—Geol. Canada, 1863, p. 211, fig. 212.
Rhynchonella (?) anticiostensis Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 464, fig. 34.
Loc. Anticosti; Wilmington and Savanna, Illinois; Lattimers, Iowa; Wisconsin; Manitoba.
Rhynchonella (?) anticiostensis (d'Orbigny). Lower Devonian.
Terebratula anticiostensis d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 36, pl. 2, figs. 26-28.
Loc. Cochabambamba, Tarabuco, Bolivia.
Rhynchonella antonii Gabb. Cretaceous.
Loc. Cerro de San Antonio, and near Chota, Peru.

Rhynchonella arctirostrata Swallow. St. Louis (L. Carb.).
Loc. Cooper County, Missouri.
Obs. Regarded by Keyes as a synonym for R. subcuneata = Camarophoria subcuneata.

Rhynchonella (?) argentea Billings. Anticosti (Sil.).
Rhynchonella ? argentea Billings, Catalogue Silurian Fossils Anticosti, 1866, p. 43.
Loc. Anticosti.

Rhynchonella argenturbica White = Rhynchotreta inaequivalvis.

Rhynchonella aspasia Billings. Lower Helderberg (Dev.).
Loc. Square Lake, Maine.

Rhynchonella barquensis A. Winchell. Marshall (L. Carb.).
Loc. Port aux Barques, Michigan.

Rhynchonella barrandi Hall = Camarotoechia barrandei.

Rhynchonella (?) belliformis Nettelroth. Niagara (Sil.).
Loc. Louisville, Kentucky.

Rhynchonella belemnitica Quenstedt. Jurassic.
For locality and observations see R. plicatissima.

Rhynchonella bialveata Hall. Lower Helderberg (Dev.).
Loc. Albany County, New York; Square Lake, Maine.

Rhynchonella (?) bidens Hall. Clinton (Sil.).
Atrypa bidens Hall, Pal. New York, II, 1852, p. 69, pl. 23, fig. 3.
Loc. Lockport, New York.

Rhynchonella (?) bidentata (Hisinger). Niagara (Sil.).
Terebratula bidentata HISINGER, KONGL. SVENSKA VET.-AKAD. HANDL., FÖR 1825, 1826, p. 343, pl. 7, fig. 5.
Atrypa bidentata Hall, Pal. New York, II, 1852, p. 276, pl. 57, fig. 3.
Loc. Lockport, New York.

Rhynchonella billingsi Hall = Camarotoechia billingsi.
Rhynchonella boensis Shumard = Leiorhynchus boonense.
Rhynchonella brevirostris Billings = Anastrophia brevirostris.
Rhynchonella camerifera A. Winchell. Marshall (L. Carb.),
Loc. Port aux Barques, Michigan.

Rhynchonella campbellana Hall = Uncinulus campbellanus.
Rhynchonella camura Hall = Trematospira camura.
Rhynchonella capax Hall = Rhynchotrema capax.
Rhynchonella caput-testudinis White = Camarophoria caput-testudinis.

Rhynchonella caracolensis Gottsche.
Loc. Iquique, Chile; Caracoles, Bolivia.

Rhynchonella carbonaria McChesney. Upper Carboniferous.

Rhynchonella carica Hall = Camarotetia carica.
Rhynchonella carolina Hall = Camarotetia carolina.
Rhynchonella castanea Meek = Hypothyris castanea.
Rhynchonella congregata Hall = Camarotetia congregata.
Rhynchonella contracta Hall = Camarotetia contracta.
Rhynchonella contracta var. saxatilis Hall = Camarotetia contracta saxatilis.

Rhynchonella colletti Miller. Niagara (Sil.).
Loc. Wabash, Indiana.

Rhynchonella cooperensis Shumard. Kinderhook (L. Carb.).
†Camarophoria cooperensis Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 224, pl. 18, fig. 6.
Loc. Cooper County, Missouri; Eureka district, Nevada.

Rhynchonella (?) corinthia Billings. Calciferous (Ord.).
Loc. Table Head, Newfoundland.

Rhynchonella dawsoniana Davidson = Pugnax dawsoniana.

Rhynchonella (?) decemplicata Sowerby. Clinton (Sil.).

Rhynchonella dentata Hall = Rhynchotrema dentatum.
Rhynchonella dotis Hall = Camarotetia dotis.

Rhynchonella dryope Billings. Oriskany (Dev.).
Rhynchonella dryope Billings, Pal. Fossils, II, 1874, p. 37, pl. 3A, fig. 1.
Loc. Grand Greve, Gaspé.
Rhynchonella dubia Hall = Protorhynchia dubia.
Rhynchonella duplicata Hall = Camarotoechia duplicata.
Rhynchonella eatoniiformis McChesney = Pugnax rockymontana.

Rhynchonella emacerata Hall.

Rhynchonella eminens Hall.
Loc. Albany County, New York.

Rhynchonella emmonsi Hall and Whitfield = Hypothyris emmonsi.
Rhynchonella endlichii Meek = Camarotoechia endlichii.

Rhynchonella ererensis Rathbun.
Loc. Erere, Province of Para, Brazil.

Rhynchonella eurekaensis Walcott.
Loc. Eureka district, Nevada.

Rhynchonella (?) eva Billings.
Rhynchonella eva Billings, Catalogue Sil. Foss. Anticosti, 1866, p. 44.
Loc. Anticosti.

Rhynchonella evangelina Hartt.
Loc. Windsor, Nova Scotia.
Obs. Compare with Puguax pugnus as identified by Davidson, from the same locality.

Rhynchonella excellens Billings.
Loc. Indian Cove, Gaspé.

Rhynchonella eximia Hall = Camarotoechia eximia.
Rhynchonella explanata McChesney = Camarophoria explanata.

Rhynchonella fitchana Hall.

Rhynchonella formosa Hall = Rhynchotrema formosum.
Rhynchonella fringilla Billings = Camarotoechia fringilla.

Rhynchonella gainesi Nettleroth.
Loc. Jefferson County, Kentucky.

Rhynchonella glacialis Billings = Camarotoechia glacialis.
Rhynchonella glansfagea Hall = Centronella glansfagea.
Rhynchonella gnathophora Meek. Jurassic.
Rhynchonella gnathophora Meek, Geol. Survey California, Pal., I, 1864, p. 39, pl. 8, fig. 1.
Rhynchonella gnathophora Hall and Whitfield, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 284, pl. 7, fig. 6.
Loc. Plumas County, California; Uinta Range, Utah.

Rhynchonella greenana Ulrich = Leiorhynchus greeneanum.

Rhynchonella guadalupae Shumard. Upper Carboniferous.
Rhynchonella guadalupae Shumard, Trans. St. Louis Acad. Sci., I, 1858, p. 295, pl. 11, fig. 6.
Loc. Guadalupe Mountains, New Mexico and Texas.

Rhynchonella halli Gabb. Triassic.
Loc. Bath County, Virginia.

Rhynchonella heteropsis A. Winchell. Kinderhook (L. Carb.).
Loc. Burlington, Iowa; Hamburg, Illinois; Medina County, Ohio.

Rhynchonella horsfordi Hall = Camarotoechia horsfordi.

Rhynchonella hubbardi A. Winchell. Marshall (L. Carb.).
Loc. Marshall and Port aux Barques, Michigan; Summit County, Ohio.

Rhynchonella huronensis A. Winchell. Huron (Dev.).
Loc. Port aux Barques, Michigan.

Rhynchonella huronensis precipua A. Winchell. Huron (Dev.).
Loc. Port aux Barques, Michigan.

Rhynchonella (? ) hydraulica Whitfield. Waterlime (Sil.).
Loc. Greenfield, Ohio.

Rhynchonella ida Hartt. Upper Carboniferous.
Loc. Windsor, Nova Scotia.

Rhynchonella illinoisensis Worthen. Upper Carboniferous.

Rhynchonella increbescens Hall, 1860 (non 1847) = Rhynchotrema capax.
Rhynchonella increbescens Hall = Rhynchotrema inaequivalve.

Rhynchonella indentata Shumard. Upper Carboniferous.
Loc. Guadalupe Mountains, New Mexico.

Rhynchonella indianensis Hall = Camarotoechia indianaensis.
Rhynchonella inequiplicata Hall. Upper Helderberg (Dev.).
Loc. "Western New York."

Rhynchonella intermedia Barris = Hypothyris emmonsi.

Rhynchonella inutilis Hall. Lower Helderberg (Dev.).
Loc. Albany County, New York.

Rhynchonella (?) janea Billings. Lorraine and Anticosti (Ord. and Sil.).
Loc. Anticosti; Collinsville, Alabama.

Rhynchonella kokomoensis Miller = Wilsonia kokomoensis.

Rhynchonella lacunosa (Schlotheim). Jurassic.
Terebratulites lacunosa Schlotheim, Leonhardt's Min. Tasch., VII, 1813, pl. 1, fig. 2.
Loc. Europe; Rancho Alamitos, Sierra de Catorce, Mexico.

Rhynchonella lacunosa arolica Oppel. Jurassic.
Rhynchonella lacunosa var. arolica Aguilera, Datos para la Geologia de Mexico, 1893, p. 18; — Bol. Com. Geol6gica de Mexico, I, 1895, p. 1, pl. 1, figs. 14-25; pl. 2, figs. 1, 2.
Loc. Europe; Rancho Alamitos, Sierra de Catorce, Mexico.

Rhynchonella laevis Simpson. Clinton (Sil.).
Loc. Blair County, Pennsylvania.

Rhynchonella (?) lamellata Hall. Coralline (Sil.).
Atrypa lamellata Hall, Pal. New York, II, 1852, p. 329, pl. 74, fig. 11.

Rhynchonella laura Billings = Leiorhynchus laura.

Rhynchonella lingulata Gabb. Triassic.
Rhynchonella lingulata Gabb, Geol. Survey California, Pal., I, 1864, p. 34, pl. 6, fig. 36.
Loc. Humboldt County, Nevada.

Rhynchonella louisvillensis Nettelroth. Corniferous (Dev.).
Loc. Falls of Ohio.

Rhynchonella macra Hall. St. Louis (L. Carb.).
Rhynchonella mainensis Billings. Lower Helderberg (Dev.).
Loc. Square Lake, Maine.

Rhynchonella manflasensis Möricke. Jurassic.
Rhynchonella manflasensis Möricke, Neues Jahrb. f. Mineral., Beilageband, IX, 1894, p. 62, pl. 5, figs. 7a-7c.
Loc. Manflas and Melon, Chile.

Rhynchonella mansoni Salter=Atrypa mansoni.
Rhynchonella marshallensis A. Winchell=Camarotoechia marshallensis.

Rhynchonella maudensis Whiteaves, Mesozoic Fossils, Geol. Surv. Canada, I, 1884, p. 252, pl. 33, fig. 8.
Loc. Maud Island.

Rhynchonella medea Billings. Corniferous (Dev.).
Rhynchonella medea Billings, Canadian Jour., n. ser., V, 1860, p. 271; Geol. Canada, 1863, p. 370, fig. 388.
Loc. Township of Rainham, Ontario.

Rhynchonella medialis Simpson. Waverly (L. Garb.).

Rhynchonella (?) mica White. Upper Carboniferous.
Loc. Lincoln County, Nevada.
Obs. Probably an Uncinulus.

Rhynchonella mica Billings=Zygospira mica.

Rhynchonella (?) micropleura A. Winchell. Marshall (L. Carb.).
Loc. Battlecreek, Michigan.

Rhynchonella minnesotensis Sardeson=Rhynchotrema inaquivalentis.
Rhynchonella missouriensis Shumard, fig. 5a (non 5b, 5c)=Pugnax pugnus missouriensis.
Rhynchonella missouriensis Shumard, figs. 5b, 5c (non 5a)=Pugnax striaticostata.

Rhynchonella multistriata Hall. Oriskany (Dev.).
Loc. Helderberg Mountains, New York.

Rhynchonella mutabilis Hall=Uncinulus mutabilis.
Rhynchonella mutata Hall=Pugnax mutata.

Rhynchonella myrina Hall and Whitfield. Jurassic.
Rhynchonella species? Meek and Hayden, Smithsonian Cont. to Knowl., XIV, 172, 1855, p. 71, pl. 4, fig. 3.
Loc. Uinta Range, Utah; Black Hills, Dakota.
Rhynchonella neenah Whitfield. Lorraine (Ord.).
Rhynchonella neenah Whitfield, Geol. Wisconsin, IV, 1882, p. 265, pl. 12, figs. 19–22.
Rhynchonella (?) neenah Winchell and Schuchert, Geol. Survey Minnesota, III, 1893, p. 465, pl. 34, figs. 35–37.
Loc. Ironridge, Clifton, etc., Wisconsin; Savanna, Illinois; Lattners, Iowa.
Rhynchonella neglecta Hall = Camarotœchia neglecta.
Rhynchonella neglecta var. scobina Meek = Camarotœchia neglecta.
Rhynchonella nitens Dana = Terebratula nitens.
Rhynchonella nobilis Hall = Uncinulus nobilis.
Rhynchonella nucleolata Hall = Uncinulus nucleolatus.

Rhynchonella nucleola (Sowerby), Silurian.
Terebratula nucleola Sowerby, Murchison’s Silurian System, 1839, pl. 5, fig. 20.
Loc. England; Bessels Bay, lat. 81° 6’.

Rhynchonella nutrix Billings, Anticosti (Sil.).
Rhynchonella nutrix Billings, Catalogue Silurian Fossils Anticosti, 1866, p. 43.
Loc. Anticosti.

Rhynchonella oblata Hall. Oriskany (Dev.).
Pal. New York, III, 1859, p. 439, pl. 102, figs. 1, 2.
Loc. Albany and Schoharie counties, New York.

Rhynchonella obsolescens Hall. Kinderhook (L. Carb.).
Loc. Rockford, Indiana.

Rhynchonella obtusiplicata Hall = Camarotœchia obtusiplicata.

Rhynchonella occident Walcott. Lower Devonian.
Rhynchonella occident Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 152, pl. 15, fig. 3.
Loc. Eureka district, Nevada.

Rhynchonella opposita White and Whitfield. Kinderhook (L. Carb.).
Loc. Burlington, Iowa.

Rhynchonella orbicularis Hall = Camarotœchia orbicularis.

Rhynchonella orientalis Billings. Chazy (Ord.).
Rhynchonella orientalis Billings, Canadian Nat. Geol., IV, 1859, p. 443, fig. 21;—
Geol. Canada, 1863, p. 126, fig. 51.
Loc. Mingan Island.

Rhynchonella osagensis Swallow = Pugnax utah.
Rhynchonella ottumwa White = Pugnax ottumwa.
Rhynchonella parvini McChesney = Camarophoria subtrigona.
Rhynchonella perlamellosa Whitfield = Rhynchotrema perlamellosum.

Rhynchonella perrostellata Swallow. St. Louis (L. Carb.).
Loc. Cooper County, Missouri.
Rhynchonella persinuata A. Winchell. Kinderhook (L. Carb.).
Loc. Burlington, Iowa.

Rhynchonella phoca Salter=Atrypa phoca.

Rhynchonella pipira Derby. Upper Carboniferous.
Loc. Bomjardim and Itaituba, Brazil.

Rhynchonella pisa Hall and Whitfield. Niagara (Sil.).
Loc. Highland County, Ohio; Louisville, Kentucky.

Rhynchonella planiconvexa Hall. Lower Helderberg (Dev.).
Loc. Albany County, New York.

Loc. Europe; “Common in the Carboniferous rocks of America,” Davidson; Bolivia; Feilden Isthmus, lat. 82° 43'.
Obs. Compare with Pugnax utah (Marcou).

Rhynchonella plicata Hall. Medina (Sil.).
Atrypa plicata Hall, Pal. New York, II, 1852, p. 10, pl. 4, fig. 6.
Loc. Lockport, New York.

Rhynchonella plicatella (Linne'). Niagara (Sil.).
Atrypa plicatella Hall, Pal. New York, II, 1852, p. 279, pl. 58, figs. 3, 4.
Atrypa plicatella Miller, N. American Geol. Pal., 1889, p. 337.
Loc. Europe; Wolcott, New York.

Rhynchonella plicatilis (Sowerby). Cretaceous.
Terebratula plicatilis Sowerby, Mineral Conch., V, 1825, p. 167, tab. 503, fig. 1.
Loc. England; Alaska.

Rhynchonella plicatissima Quenstedt. Jurassic.
Loc. Sierra de la Ternera, Coquimbo, Guasco, and Copiapo, Chile.
Obs. Möricke says that Terebratula enigma Forbes in great part belong to this species and R. belemnitica.
Rhynchonella plicifera Hall = Camarotoechia plena.

**Rhynchonella principalis Hall.**


Rhynchonella prolifica Hall = Camarotoechia prolifica.

Rhynchonella pugnus of authors = Pugnax pugnus.

Rhynchonella pustulosa White = Rhynchorpora pustulosa.

Rhynchonella pyramidata Hall = Uncinulus pyramidatus.

**Rhynchonella pyrrha Billings.**

Rhynchonella pyrrha Billings, Catalogue Sil. Foss. Anticosti, 1866, p. 44.

*Loc.* Anticosti.

**Rhynchonella ramsayi Hall.**


*Loc.* Cumberland, Maryland.

**Rhynchonella (?) raricosta Whitfield.**


*Loc.* Columbus, Ohio.

Rhynchonella reticulata Hall = Dictyonella reticulata.

**Rhynchonella ricinula Hall.**


Rhynchonella ringens Swallow = Camarophoria ringens.

**Rhynchonella robusta Hall.**

Atrypa robusta Hall, Pal. New York, II, 1852, p. 71, pl. 23, fig. 7.


Rhynchonella rockymontana Marcou = Pugnax rockymontana.

**Rhynchonella royana Hall.**

Rhynchonella (?) (Stenocisma?) royana Hall, Pal. New York, IV, 1867, p. 338, pl. 54, figs. 20-23.


**Rhynchonella rudis Hall.**


**Rhynchonella rugicosta Nettelroth.**


*Loc.* Louisville, Kentucky.

Rhynchonella saffordi Hall = Wilsonia saffordi.

Rhynchonella saffordi var. depressa = Wilsonia saffordi depressa.

Rhynchonella sageriana A. Winchell = Camarotoechia sageriana.

Rhynchonella sancta Sardesou = Rhynchorreta inæquivalve laticostatum.

Rhynchonella sappho Hall = Camarotoechia sappho.
Rhynchonella schucherti Stanton.  Upper Cretaceous (Knoxville).
Loc. Paskenta, California.

Rhynchonella scobina Meek=Camarotoechia neglecta.

Rhynchonella semiplicata (Conrad).  Lower Helderberg (Dev.).

Rhynchonella septata Hall.  Oriskany (Dev.).
Rhynchonella septata Hall, Pal. New York, III, 1859, p. 443, pl. 103, fig. 2.
Loc. Albany County, New York.

Rhynchonella sordida Hall.  Trenton (Ord.).
Atrypa sordida Hall, Pal. New York, I, 1847, p. 148, pl. 33, fig. 16.
Loc. Not given.

Rhynchonella speciosa Hall=Camarotoechia speciosa.
Rhynchonella stephani Hall=Camarotoechia stephani.

Rhynchonella (?) striata Simpson.  Waverly (L. Carb.).
Obs. Compare with Camarophoria ringens and C. caput-testudinis.

Rhynchonella striatocostata Meek and Worthen=Pugnax striaticostata.
Rhynchonella stricklandi Sowerby=Uncinulus stricklandi.

Rhynchonella subacuminata Webster.  Chemung (Dev.).
Rhynchonella subacuminata Webster, American Naturalist, XXII, 1888, p. 1015.
Loc. Near Rockford, Iowa.

Rhynchonella subcircularis A. Winchell.  Marshall (L. Carb.).
Loc. Port aux Barques, Michigan.

Rhynchonella subcuneata Hall=Camarophoria subcuneata.

Loc. Portezuelo de Manplas and Cordillera de Dona Ana at an altitude of 13,432 feet above the ocean.

Rhynchonella subtrigona Meek and Worthen=Camarophoria subtrigona.

Rhynchonella subtrigonalis Hall.  Trenton (Ord.).
Atrypa subtrigonalis Hall, Pal. New York, I, 1847, p. 145, pl. 33, fig. 12.
Loc. Turin, New York.
Obs. Compare with Rhynchochrema inaequivalve.
Rhynchonella sulciplicata Hall.  
Lower Helderberg (Dev.).
Loc. Albany County, New York.

Rhynchonella tayloriana (Lea).  
? Jurassic.
Loc. Habana, Cuba.

Rhynchonella tennesseensis Hall (non Roemer) = Uncinulus stricklandi.

Rhynchonella tennesseensis Roemer.  
Niagara (Sil.).
Loc. Perry County, Tennessee; Louisville, Kentucky; Yellow Springs, Ohio.

Rhynchonella tethys Billings = Camarotectia tethys.

Rhynchonella tetraedra (Sowerby).  
Liassic.
Loc. Europe; Portezuelo Ancho, Argentine Republic; Mansfias, Las Amolanas, etc., Chile.

Rhynchonella (?) tetraptyx A. Winchell.  
Kinderhook (L. Carb.).
Loc. Rockford, Indiana.

Rhynchonella tenni striata Nettelroth.  
Corniferous (Dev.).
Rhynchonella tenni striata Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1859, p. 82, pl. 7, figs. 27-29.
Loc. Falls of Ohio.

Rhynchonella texana Shumard.  
Upper Carboniferous.
Loc. Mouth of Delaware Creek, Texas.

Rhynchonella thalia Billings = Camarotectia billingsi.

Rhynchonella thera Walcott = Camarophoria thera.

Rhynchonella transversa Hall.  
Lower Helderberg (Dev.).
Loc. Albany County, New York.

Rhynchonella triplicata Quenstedt.  
Jurassic.
Loc. Europe; Quebrada de la Iglesia, etc., Chile.
Rhynchoonella tuta Miller. Burlington (L. Carb.).
Loc. Lake Valley mining district, New Mexico.

Rhynchoonella unica A. Winchell. Kinderhook (L. Carb.).
Loc. Burlington, Iowa.

Rhynchoonella unisulcata Hall = Pentagonia unisulcata.
Rhynchoonella utah of authors = Pugnax utah.
Rhynchoonella vellicata Hall = Uncinulus vellicatus.
Rhynchoonella ventricosa Hall = Camaroto3chia ventricosa.
Rhynchoonella venustula Hall = Hypothyris cuboides.

Rhynchoonella vicina Billings. Anticosti (Sil.).
Rhynchoonella vicina Billings, Catalogue Sil. Foss. Anticosti, 1866, p. 44.
Loc. Anticosti.

Rhynchoonella (?) warrenensis Swallow. Lower Devonian.
Loc. Callaway County, Missouri.

Rhynchoonella wasatchensis White = Seminula wasatchensis.
Rhynchoonella whitiana Miller = Camaroto3chia whitei.
Rhynchoonella whitii Hall (non Winchell) = Camaroto3chia whitei.

Rhynchoonella whitei A. Winchell. Marshall (L. Carb.).

Rhynchoonella whitneyi Gabb. Cretaceous (Shasta).
Terebratella whitneyi Gabb, Geol. Survey California, Pal., II, 1869, p. 35, pl. 2, fig. 62.
Loc. Napa and Colusa counties, California.

Rhynchoonella wilmingtonensis (Lyell and Sowerby). Eocene.
Rhynchoonella wilmingtonensis Conrad, American Jour. Conch., I, 1865, p. 35.
Loc. Wilmington, North Carolina.

Rhynchoonella wilsoni Sowerby = Wilsonia wilsoni.
Rhynchoonella wortheni Hall = Camarophoria wortheni.

RHYNCHOPORA King. Genotype Terebratula geinitziana de Verneuil.

Rhynchorpora pustulosa (White). Kinderhook (L. Carb.).
Loc. Burlington, Iowa; Wasatch Range, Utah; Lake Valley mining district; New Mexico (Miller).
RHYNCHOSPIRA Hall. Genotype Waldheimia formosa Hall.


Retzia Billings, Canadian Journal, VI, 1861, p. 147.

Rhynchospira (?) acadiae (Hall). Arisaig (Sil.).

Trematospira acadiae Hall, Canadian Nat. Geol., V, 1860, p. 146, fig. 4.—Dawson, Acadian Geology, 3d ed., 1878, p. 597.


Rhynchospira aprinis Hall = Homeospira apriniformis.

Rhynchospira (?) ashlandensis Herrick. Waverly (L. Carb.).

Rhynchospira ashlandensis Herrick, Bull. Denison Univ., IV, 1888, p. 25, pi. 3, fig. 16;—Geol. Ohio, VII, 1895, pl. 23, fig. 16.

Loc. Lyon Falls, Ohio.

Rhynchospira electra (Billings). Lower Helderberg (Dev.).


Loc. Square Lake, Maine.

Rhynchospira equiradiata Hall = Camarotocchia æquiradiata.

Rhynchospira (?) eugenia (Billings).

Retzia eugenia Billings, Canadian Jour., VI, 1863, p. 147, fig. 58;—Geol. Canada, 1863, p. 373, fig. 395.

Rhynchospira (?) eugenia Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 111, pl. 50, figs. 41-43.

Loc. Walpole, Ontario.

Rhynchospira evax Hall = Homeospira evax.

Rhynchospira formosa Hall. Lower Helderberg (Dev.).


Trematospira (Rhynchospira) formosa Hall, Pal. New York, III, 1859, p. 215, pl. 36, fig. 2;—Pal. 95A, figs. 7-11.


Loc. Helderberg Mountains, New York; Square Lake, Maine; Greenfield, Ohio.

Rhynchospira globosa Hall.

Lower Helderberg (Dev.).


Trematospira (Rhynchospira) globosa Hall, Pal. New York, III, 1859, p. 215, pl. 36, fig. 1.


Loc. Helderberg Mountains, New York.

Rhynchospira (?) helena (Nettelroth).

Niagara (Sil.).


Loc. Louisville, Kentucky.

Rhynchospira lepida Hall = Trigeria lepida.
Rhynchospira nobilis Hall = Cyclorhina nobilis.

**Rhynchospira rectirostris** Hall.
Trematospira (Rhynchospira) rectirostra Hall, Pal. New York, III, 1859, p. 217, pl. 95A, fig. 1, and p. 485.
Loc. Cumberland, Maryland.

**Rhynchospira scansa** Hall and Clarke.
Rhynchospira scansa Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 50, fig. 45.
Loc. McKean County, Pennsylvania.

**Rhynchospira (?) sinuata** Hall.
Loc. Arisaig, Nova Scotia.

Rhynchospira subglobosa Hall = Retzia subglobosa.

**RHYNCHOTREMA** Hall. Genotype Rhynchonella capax Conrad.

**Rhynchotrema ainsliei** N. H. Winchell.
Loc. Minneapolis, St. Paul, etc., Minnesota; Decorah, Iowa.

**Rhynchotrema capax** (Conrad).
Rhynchonella increbescens (partim) Hall, Geol. Wisconsin, I, 1862, p. 123, pl. 11, fig. 2.
Loc. Richmond, Indiana; Oxford, etc., Ohio; Wilmington, Illinois; Cape Girardeau, Missouri; Stockbridge, Ironridge, etc., Wisconsin; Lattners, Iowa; Spring Valley, Minnesota; Anticosti; Lake Winnipeg, Manitoba; Fort Churchill, Hudson Bay.
Rhynchotrema dentatum Hall.  
Trenton and Lorraine (Ord.).
Rhynchonella dentata Keyes, Geol. Survey Missouri, V, 1895, p. 100, pl. 41, fig. 3. Loc. Turin, New York; Dayton and Oxford, Ohio; Richmond, Indiana; near Nashville, Tennessee.

Rhynchotrema formosum (Hall).  
Lower Helderberg (Dev.).

Rhynchotrema inaequivalve (Castelnau).  
Trenton (Ord.).
Spirifer inaequivalvis Castelnau, Essai Système Sil. de l’Amérique Septentrionale, 1843, p. 40, pl. 14, fig. 8.
Atrypa inerencesens (partim) Hall, Pal. New York, I, 1847, pp. 146, 289, pl. 33, figs. 13a-13h;—pl. 79, fig. 6.
Trematospira (?) quadruplicata Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 60, figs. 6, 7.
Loc. Drummonds Island (Castelnau); New York; Kentucky; Tennessee; Illinois; Wisconsin; Iowa; Minnesota; Silver City, New Mexico; Ottawa, Canada; Lake Winnipeg, Manitoba. 
Obs. Compare Rhynchonella subtrigonalis.

Rhynchotrema inaequivalve laticostatum Win. and Schuch.  
Trenton (Ord.).
Rhynchotrema inaequivalvis var. laticostata W. and S., American Geol., IX, April 1, 1892, p. 293;—Minnesota Geol. Survey, III, 1893, p. 461, pl. 34, figs. 20-29.
Loc. Cannon Falls, Minnesota.

Rhynchotrema ottawaense (Billings).  
Trenton (Ord.).
Porambonites ottawaensis Billings, Pal. Fossils, I, 1862, p. 140, fig. 117. 
Bull. 87—24
Rhynchotrema ottawaense (Billings)—Continued.
Loc. Pauquette Rapids, Canada; near Murfreesboro, Tennessee.

Rhynchotrema perlamellosum (Whitfield).

Log. Pauquette Rapids, Canada; near Murfreesboro, Tennessee.

Rhynchotrema perlamellosa (Whitfield). Lorraine (Ord.).


RHYNCHOTRETA Hall. Genotype Rhynchonella cuneata Dalman.


Rhynchotrema cuneata americana Hall.

Log. Lockport, etc., New York; Hamilton, Ontario; Waldron and Osgood, Indiana; Louisville, Kentucky; Milwaukee, Wisconsin.

Rhynobolus Hall.—Rhynobolus.

RÖMERELLA Hall and Clarke. Genotype Orbicula grandis Vanux.


Römerella grandis (Vanuxem).

Log. Cazenovia and Pratts Falls, New York; Columbus, Ohio; Falls of Ohio.

ROMINGERINA Hall and Cl. Genotype Centronella julia A. Winchell.


Romingerina julia (A. Winchell). Waverly (L. Carb.).

Romingerina julia (A. Winchell)—Continued.


Loc. Port Aux Barques, Michigan; Cuyahoga and Licking counties, Ohio. *In the Chemung at Rushford, New York (Williams).


Scaphiocelcia boliviaensis Whitfield. Middle Devonian.


Loc. Serecre or Quechista, Bolivia.

SCENIDIUM Hall. Genotype Orthis insignis Hall.


Scenidium anthonense Sardesou. Trenton (Ord.).

Scenidium halli Safford, Geol. Tennessee, 1869, p. 287 (undefined).


Scenidium anthonensis Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 381, figs. 20-23.


Scenidium devonicum Walcott=Dalmanella devonica.

Scenidium halli Safford=S. anthonense.

Scenidium devonicum Hall. Lower Heldenberg (Dev.).


Scenidium (Orthis) insignis Hall, Ibidem, 1859, pl. 10A, figs. 13-15.


Scenidium insignis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 242, pl. 7, figs. 31-35.

Loc. Helderberg Mountains, New York; Perry County, Tennessee.

Scenidium (?) merope (Billings). Trenton and Lorraine (Ord.).


Scenidium merope Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 242, pl. 7A, figs. 31, 32.

Loc. Ottawa, Canada; Cincinnati, Ohio; Burgin, Kentucky.

Scenidium pyramidalis Hall. Niagara (Sil.).

Orthis pyramidalis Hall, Pal. New York, II, 1852, p. 251, pl. 52, fig. 2.


Scenidium pyramidale Hall—Continued.

Scenidium pyramidale Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 242, pl. 7, figs. 29, 30; pl. 7A, figs. 40-42.


Schizambon (?) dodgei Winchell and Schuchert. Trenton (Ord.).

Schizambon (?) dodgeii W. and S., Minnesota Geol. Survey, III, 1893, p. 361, pl. 30, figs. 5-7.

Loc. Sandyhill, New York.

Schizambon (?) fissus canadensis (Ami). Utica (Ord.).


Siphonotreta scotica var. canadensis Ami, Ottawa Naturalist, I, 1887, p. 124.

Schizambon (?) fissus var. canadensis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 115, pl. 4, figs. 32-36.

Loc. Gloucester, Ontario.

Schizambon (?) lockei Winchell and Schuchert. Lorraine (Ord.).

Schizambon (?) lockii Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 362, pl. 30, figs. 8-10.

Loc. Cincinnati, Ohio.

Schizambon typicalis Walcott. Pogonip or Calciferous (Ord.).


Loc. Eureka district, Nevada; Manitou, Colorado.

SCHIZOBOLUS Ulrich.

Genotype Discina truncata Hall=Lingula concentrica Vanuxem.


Schizobolus concentricus (Vanuxem). Genesee (Dev.).

Lingula concentrica Vanuxem, Geol. N. Y.; Rep. Third Dist., 1842, p. 168, fig. 4.—Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 223, fig. 4.


Loc. Ogdens Ferry, Cayuga Lake, etc., New York; Falls of Ohio; Madison County, Kentucky.

SCHIZOCRANIA Hall and Whitfield. Genotype Orbicula ? filosa Hall.

Schizocrania filosa Hall.

*Trematis (?) filosa* Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 15.
*Loc.* Middleville, Utica, etc., New York; Ottawa, Canada; Cincinnati, Ohio; Cannon Falls and Minneapolis, Minnesota.

Schizocrania (?) helderbergia Hall.


Schizocrania (?) rudis Hall.

*Loc.* Clifton, Tennessee.

Schizocrania schucherti Hall and Clarke.

*Loc.* Covington, Kentucky.

Schizocrania superincrreta Barrett.


**SCHIZOPHORIA** King.

*Genotype Orthis resupinata* (Martin).

**Schizophoria carinata** Hall.

*Loc.* Painted Post, High Point, etc., New York.

**Schizophoria cora** (d'Orbigny).

Orthis resupinata var. latirostrata Toula, *Sitzungsb. der k. k. Akad. der Wissens. zu Wien*, LIX, 1869, p. 8, pl. 1, fig. 7.—*Derby, Bull. Cornell Univ.*, I, 1874, p. 63.
*Loc.* Yarichambahi and Cochabamba, Bolivia.

**Schizophoria macfarlani** (Meek).

Schizophoria macfarlanii (Meek)—Continued.
Schizophoria macfarlanii Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 190, 212, 223, pl. 6A, figs. 28–32.
Loc. Independence, Iowa; Howard and High Point, New York; Mackenzie River, Canada; Lower Devonian, Eureka district, Nevada; Southwestern China.

Schizophoria manitobaensis Whiteaves. Upper Devonian.
Orthis (Schizophoria) manitobensis Whiteaves, Cont. Canadian Pal., I, 1892, p. 283, pl. 37, figs. 3, 4, 5.
Loc. Lake Winnipegosis, Canada.

Schizophoria multistriata Hall. Lower Helderberg (Dev.).
Schizophoria multistriata Hall and Clarke, Ibident, VIII, Pt. I, 1892, pp. 212, 226, pl. 6A, fig. 25.
Loc. Schoharie and Catskill, New York.

Schizophoria (? peduncularis Hall. Lower Helderberg (Dev.).
Orthis peduncularis Hall, Pal. New York, III, 1859, p. 174, pl. 13, fig. 16.
Loc. Helderberg Mountains, New York.

Schizophoria propinqua Hall. Upper Helderberg (Dev.).
Schizophoria propinqua Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 212, 226, pl. 6, fig. 30.
Loc. New York; Columbus, Ohio.

Schizophoria resupinata (Martin). Carboniferous.
Orthis resupinata Hall and Whitfield, King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 265, pl. 5, figs. 1, 2.
Loc. Ouquirrh Mountains, Utah; Lake Valley mining district, New Mexico.

Schizophoria resupinoides (Cox). Upper Carboniferous.
Orthis resupinoides Cox, Owen’s Geol. Survey Kentucky, II, 1857, p. 570, pl. 9, fig. 1.—Worthen, Geol. Survey Illinois, VIII, 1890, p. 106, pl. 11, fig. 4.
Orthis resupinoides? White, Wheeler’s Expl. and Survey west 100th Meridian, Appendix, 1881, p. xxiii.
Loc. Hancock County, Kentucky; Manuelitos Creek, New Mexico; ?White and Conway counties, Arkansas.
Obs. Probably identical with Schizophoria resupinata.

Schizophoria senecta Hall and Clarke. Clinton (Sil.).
Orthis (Schizophoria) senecta Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 343, pl. 6A, figs. 23, 24.
Schizophoria striatula (Schlotheim).

Middle and Upper Devonian.

Anomia Terebratulites striatulus Schlotheim, Min. Taschenbuch, VIII, 1813, pl. 1, fig. 6.

Orthis striatula Davidson, Brit. Devonian Brach., Pal. Soc., 1865, p. 87, pl. 17, figs. 4-7.—Whitesaves (non Schlotheim), Cont. Canadian Pal., I, 1891, pp. 218, 283.


Orthis lentiformis? Owen (non Hall), Geol. Survey Wisconsin, Iowa, Minnesota, 1852, pl. 3, figs. 10, 10a, young specimen. [See specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17918.]


Orthis iowensis var. furnarius Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 489, pl. 2, fig. 5.—Meek and Worthen, Geol. Survey Illinois, III, 1888, p. 424, pl. 13, fig. 9.


Orthis propinqua Nettelroth (non Hall), Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 43, pl. 16, figs. 1-3, 7-11.

Schizophoria iowensis Hall and Clarke, Pal. New York, VIII, Pt. 1, 1892, pp. 212, 226, pl. 6A, fig. 29.

Schizophoria impressa Hall and Clarke, Ibidem, 1892, pp. 212, 216, pl. 6, fig. 31; pl. 6A, figs. 26, 27.

Loc. New York; Falls of Ohio; Illinois; Iowa; Milwaukee, Wisconsin; Pike County, Missouri; Eureka district, Nevada; Mackenzie River Valley, North-west Territory, Canada.

Obs. The writer has compared American forms with O. striatula from the Eifel, Germany, and he agrees with authors in regarding both as one species. Orthis (Schizophoria) macfarlani is often found associated with O. striatula and may be only a variety of it.

Schizophoria swallowi Hall.

Burlington (L. Carb.).

Orthis swallowi Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 597, pl. 12, fig. 5;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 36, figs. 23, 24.—Keys, Geol. Survey Missouri, V, 1895, p. 63, pl. 38, fig. 5.


Loc. Burlington, Iowa; Quincy, Illinois; Pike County, Missouri.

Obs. Compare with Rhpidomella clarkensis.

Schizophoria tioga Hall.

Portage and Chemung (Dev.).

Orthis interlineata Hall (non Sowerby), Geol. N. Y.; Rep. Fourth Dist., 1843, p. 267, figs. 3, 4.

Orthis tioga Hall, Pal. New York, IV, 1867, p. 59, pl. 8, figs. 20-29;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 36, figs. 17, 18.—Whitfield, Annals N. Y. Acad. Sci., V, 1891, p. 561, pl. 12, fig. 3;—Geol. Ohio, VII, 1895, p. 453, pl. 8, fig. 3.

Schizophoria tioga Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 212, 226, pl. 6, figs. 17, 18.

Loc. Factoryville, Elmira, etc., New York; Lake County, Ohio.
SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA. [BULL. 87.]

**Schizophoria tulliensis** (Vanuxem).
- Tullis tulliensis Vanuxem, Geol. N. Y.; Rep. Third Dist., 1842, p. 164, fig. 2.—
  Hall, Pal. New York, IV, 1867, p. 55, pl. 7, fig. 5.—Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 115, pl. 2, fig. 12.—Williams, Bull. Geol. Soc. America, I, 1890, p. 492, pl. 12, fig. 16.
- Orthis resupinata Hall (non Martin), Geol. N. Y.; Rep. Fourth Dist., 1843, p. 215, fig. 2.

**Loc.** Tully, Tinkers Falls, and Ovid, New York; Eureka district, Nevada.

**SCHIZOTRETA** Kutorga.
- Genotype S. elliptica Kutorga.
- Schizotreta conica (Dwight). Trenton (Ord.).
  - Orbiculoidea conica Dwight, American Jour. Sci., 3d ser., XIX, 1880, p. 452, pl. 21, figs. 1–11.
  - Schizotreta conica Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 126, 135, pl. 4E, figs. 6–8; pl. 4F, fig. 7.
- Schizotreta minuta Winchell and Schuchert. Lorraine (Ord.).
  - Schizotreta minuta Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 366, fig. 28.
  - Loc. Near Granger, Minnesota.
- Schizotreta ovalis Hall and Clarke. Trenton (Ord.).
  - Orbiculoidea (Schizotreta) ovalis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 177, pl. 4E, figs. 4, 5.
- Schizotreta pelopea (Billings). Trenton and Lorraine (Ord.).
  - Discina pelopea Billings, Pal. Fossils, I, 1862, p. 52, fig. 56;—Geol. Canada, 1863, p. 159, fig. 124.
  - Loc. Montreal, Canada; Mantorville, Old Concord, and Spring Valley, Minnesota; Dubuque, Iowa; Neenah, Wisconsin; in the Utica at Ottawa, Canada (Ami).
- Schizotreta tenuilamellata (Hall). Niagara (Sil.).
  - Orbiculoidea tenuilamellata Hall, Pal. New York, II, 1852, p. 250, pl. 53, fig. 3.
  - Discina solitaria Ringueberg, American Naturalist, 1882, p. 175, figs. a–e.
  - Discina clara Spencer, Bull. Univ. State Missouri, 1, 1884, p. 56;—Trans. St. Louis Acad Sci., IV, 1886, p. 606, pl. 8, fig. 5.
  - Schizotreta tenuilamellata Beecher, American Jour. Sci., 3d ser., XLI, 1891, p. 327, pl. 17, fig. 11.
  - Orbiculoidea (Schizotreta?) tenuilamellata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 127, 135, pl. 4E, figs. 9–11; pl. 4F, figs. 2–6.
SELENELLA Hall and Clarke. Genotype S. gracilis Hall and Clarke.


Selenella gracilis Hall and Clarke. Corniferous (Dev.).


Loc. Ontario.

SEMINULA McCoy emend Hall and Clarke.

Genotype Terebratula pentædra Phillips= Athyris ambiguæ (Phillips).


Seminula argentea (Shepard). Upper Carboniferous.

Terebratula argentea Shepard, American Jour. Sci., XXXIV, 1838, p. 152, fig. 8.

Terebratula roissyi d'Orbigny (non L’Eveillé), Voyage dans l’Amérique Méridionale, Pal., 1842, p. 46.

Terebratula antiscenæs d'Orbigny, Ibidem, 1842, p. 46 (non p. 36).

Terebratula peruviana d’Orbigny, Ibidem, 1842, pl. 3, figs. 17-10 (non p. 36).

Terebratula subtilita Hall, Stansbury’s Exped. Great Salt Lake of Utah, 1852, p. 409, pl. 4, figs. 1, 2.—Shumard, Marcy’s Rep. U. S. Expl. Red River of Louisiana, 1853, p. 202, pl. 4, fig. 8.—Schiel, Pacific Railroad Rep., II, 1855, p. 108, pl. 1, fig. 2.—Hall, Ibidem, III, 1856, p. 101, pl. 2, figs. 3-5.—Marcon, Geol. N. America, 1858, p. 52, pl. 6, fig. 9.—Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 714.

Terebratula (?) subtilita Davidson, Mon. British Carboniferous Brach., Pal. Soc., 1857, p. 18, pl. 1, figs. 21, 22;—1860, p. 86;—1862, p. 217, pl. 17, figs. 8-10.


Spirigerula (Athyris) subtilita Toula, Sitzungsb. der k. k. Akad. der Wissensch. zu Wien, LIX, 1869, p. 6, pl. 1, fig. 5.


Athyris argentea Keyes, Geol. Survey Missouri, V, 1895, p. 92, pl. 39, fig. 11.

Loc. Throughout the Upper Carboniferous of North America; Brazil and Bolivia; South America; England; India; Thibet and Kashmir.

Seminula caput-serpentis (Swallow). Upper Carboniferous.
Loc. Missouri and Kansas.
Obs. Regarded by Keyes as a synonym for S. argentea.

Seminula charitonensis (Swallow). Upper Carboniferous.
Loc. Chariton and Randolph counties, Missouri.
Obs. Probably a synonym for Seminula argentea.

Seminula claytoni (Hall and Whitfield). Kinderhook (L. Carb.).
Athyris claytoni Hall and Whitfield, King's U. S. Geol. Expl. 40th Parl., IV, p. 256, 1877, pl. 4, figs. 15-17.
Loc. Little Cottonwood, Wasatch Range, Utah.

Seminula dawsoni Hall and Clarke. Upper Carboniferous.
Seminula dawsoni Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pp. 95, 96, 364, figs. 69-71; pl. 47, figs. 32-34.
Loc. Windsor, Nova Scotia.

Seminula formosa (Swallow). Keokuk (L. Carb.).
Athyris formosa Keyes, Geol. Survey Missouri, V, 1895, p. 91.
Loc. Boonville, Missouri.

Seminula hawni (Swallow). Upper Carboniferous.
Loc. Missouri.
Obs. Probably a synonym for Seminula argentea.

Seminula maconensis (Swallow). Upper Carboniferous.
Loc. Montgomery County, Missouri.

Seminula parva (Swallow). Keokuk (L. Carb.).
Terebratula cooperensis Miller, N. American Geol. and Pal., 1889, p. 384.
Loc. Keokuk, Iowa; Monroe and Cooper counties, Missouri.
Obs. Specimens of this species in Professor Hall’s collection seen by the writer do not show a punctate shell structure, but are distinctly fibrous.

Seminula persinuata (Meek). Carboniferous.
Athyris (? persinuata Meek, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 81, pl. 9, fig. 4.
Loc. White Pine district, Nevada.

Seminula (?) plattensis (Swallow). Upper Carboniferous.
Loc. Missouri; Kansas; Nebraska.

Seminula (?) rogersi Hall and Clarke. Upper Helderberg (Dev.).
Loc. Pendleton, Indiana.

Seminula singletonii (Swallow). Upper Carboniferous.
Loc. Boone and Andrain counties, Missouri.
Obs. Probably a synonym for Seminula argentea.
Seminula subquadrata Hall.


Seminula subquadrata Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 95, pl. 47, figs. 7-9, 15, 16; pl. 84, figs. 30, 31.

Loc. Chester, Illinois; Crittenden County, Kentucky; Newtonville and Maxville, Ohio; Oquirrh Mountains, Utah.

Obs. See Cleiothyris clintonensis.

Seminula tetricacaensis (Gabb).


Loc. Lake Tetically, Bolivia.

Seminula trinucleus Hall.

Terebratula trinucleus Hall, Trans. Albany Institute, IV, 1858, p. 7;—Geol. Survey Iowa, I, Pt. II, 1858, p. 659, pl. 23, figs. 4, 5.


Seminula trinuclea Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 94, 95, fig. 65; pl. 47, figs. 5, 6, 10-14.

Loc. Bloomington and Spergen Hill, Indiana; Alton, Illinois; Boonville, Missouri; Princeton, Kentucky.

Obs. See Cleiothyris reflexa.

Seminula wasatchensis (White).

Rhynchonella wasatchensis White, Wheeler's Expl. and Survey west of 100th Meridian, Prel. Rep. 1874, p. 19;—Ibidem, Final Rep., 1875, p. 130, pl. 9, fig. 3.

Loc. Wasatch Range, near Provo, Utah.

Obs. Is related to S. subtilita. The great anterior thickening is due to old age.

Sieberella (Ehlert, and Hall and Clarke=Gypidula.

Obs. It may prove that Sieberella will be useful as a subgenus of Gypidula.

Siphonotre-de Yern. Genotype Crania unguiculata Eichwald.


Siphonotreta (?) micula McCoy.


Loc. Great Britain; near Laevia, Canada.

Siphonotreta (?) minnesotaensis Hall and Clarke.


Loc. Minneapolis, Minnesota.

Siphonotreta scotica Whiteaves=Schizambon fissus americanus.

Sphaerobolus Matthew. Genotype Lingulella spissa Billings.

Sphaerobolus spissus (Billings).

Lingulella ? spissa Billings, Canadian Nat. Geol., n. ser., VI, 1872, p. 468, fig. 5;—Pal. Fossils, II, 1874, p. 67, fig. 36.


Loc. Bell Island, Newfoundland.

SPIRIFER Sowerby.

Genotype Anomites striatus Martin.


Spirifer acaenopterus (Conrad).


Loc. Oneonta, Otsego County, New York.

Spirifer acuminatus (Conrad).

Corniferous and Hamilton (Dev.).


Terebratula acuminatissima Castelnau, Essai Syst. Silurien l'Ame'rique Septent-

trionale, 1843, p. 40, pl. 14, fig. 16.

Spirifer caliphyngatus Yandell and Shumard (non Roemer, 1844), Cont. Geol. Ken-

tucky, 1847, p. 10.


Spirifera acuminata Hall, Pal. New York, IV, 1867, pp. 198, 234, pl. 29, figs. 9-18; pl. 35, fig. 24.—Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 105, pl. 8, figs. 1-8:


Loc. Schoharie, Williamsville, Clarence Hollow, Hamilton, Madison, etc., New York; Columbus and Sandusky, Ohio; Falls of Ohio.

Spirifer acuticostatus de Koninck.

Upper Carboniferous.


Loc. Europe; Brookfield and Shubenacadie, Nova Scotia.

Spirifer agelaius Meek.

Lower Carboniferous.


Loc. Near Virginia City, Montana.

Spirifer alatus Castelnau (non Schlotheim)=Spirifer aliformis.
Spirifer aliformis de Verneuil. Upper Helderberg (Dev.).
Spirifer alatus Castelnau (non Schlotheim), Essai Système Silurien l'Amérique Septentrionale, 1843, p. 42, pl. 12, fig. 4.
Obs. Compare with Spirifer arenosus.

Spirifer alba-pinensis Hall and Whitfield. Kinderhook (L. Carb.).
Spirifera alpapinensis Hall and Whitfield, King's U. S. Geol. Expl., 40th Parl., IV, 1877, p. 255, pl. 4, figs. 7, 8.
Loc. Wasatch Range, Utah.
Obs. Appears to be a synonym of S. centronatus.

Spirifer aldrichi Etheridge. Devonian.
Loc. Dana Bay, lat. 82° 42'.

Spirifer alta Hall=Cyrtia alta.

Spirifer amarus Swallow. Hamilton (Dev.).
Loc. On page 658 it is given as Callaway County, Missouri, in association with Hamilton terrane fossils. It is probably the same as S. annae Swallow.

Spirifer angustus Hall. Hamilton and Portage (Dev.).
Loc. Livingston and Genesee counties, and Ithaca, New York; Portage group of New York (Williams); Milwaukee, Wisconsin.

Spirifer annae Swallow. Hamilton (Dev.).
Loc. Callaway County, Missouri.
Obs. See S. amarus.

Spirifer annectans Walcott. Lower Carboniferous.
Spirifera annectans Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 216, pl. 18, fig. 7.
Loc. Eureka district, Nevada.

Spirifer antarcticus Morris and Sharpe. Lower Devonian.
Loc. Falkland Islands.
Obs. Compare with S. bolivianensis, S. chuquisaca, and S. orbignyi.

Spirifer arata Hall=Spirifer granulosus.

Spirifer arcticus Houghton. Devonian.
Obs. The writer has not seen this journal.

Spirifer arctisegmentum Hall. Upper Helderberg (Dev.).
Spirifera arctisegmenta Hall, Pal. New York, IV, 1867, p. 208, pl. 31, figs. 9, 10;—
Spirifer arctisegmentum Hall—Continued.

Spirifer arctisegmentus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 36, pl. 34, figs. 10-12.
Loc. Stafford and Genesee counties, New York; Falls of Ohio.

Spirifer arenosus (Conrad).
Delthyris arenaria Vanuxem, Geol. N. Y.; Rep. Third Dist., 1842, p. 123, fig. 1; p. 124, fig. 5.
Spirifer unica Hall, Pal. New York, IV, 1867, p. 203, pl. 30, fig. 21; pl. 55, fig. 8.
Spirifer arenosus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 24, 27, 37, pl. 29, figs. 1-4; pl. 30, figs. 3-8.
Loc. Schoharie, Clarence Hollow, etc., New York; Cumberland, Maryland; Virginia; Frankstown, Pennsylvania; Cayuga, Ontario.

Spirifer argentarius Meek=Spirifer pinonensis.
Spirifer arrectus Hall=Spirifer murchisoni.

Spirifer asper Hall.
Spirifer asper Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 598, pl. 4, fig. 7.
Spirifer (Cyrtina) aspera Whitfield, Geol. Wisconsin, IV, 1882, p. 331, pl. 26, figs. 1, 2.
Loc. Independence and Rockford, Iowa; Rock Island, Illinois; Milwaukee, Wisconsin; Canandaigua, New York.

Spirifer asperatus Ringueberg.
Loc. Lockport, New York.

Spirifer atwateranus Miller=Spirifer iowaensis.

Spirifer audaculus (Conrad).
Spirifer mediais Hall, Ibidem, 1857, p. 164, fig. 1.
Spirifer mediais var. eatoni Hall, Pal. New York, IV, 1867, pl. 38, figs. 12-18.
Spirifer audacula Whitfield, Geol. Wisconsin, IV, 1882, p. 329, pl. 25, figs. 25, 26.
Spirifer audacula Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 29-31, 39, pl. 24, figs. 1-13; pl. 29, fig. 5.
Loc. Otsego, Cayuga, Moscow, Darien, etc., New York; Falls of Ohio; Milwaukee, Wisconsin.
Spirifer audaculus macronotus Hall. Hamilton (Dev.).
Delthyris macronota Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 206, fig. 5.
Spirifera inacronota Hall, Pal. New York, IV, 1867, p. 231, pl. 88A, figs. 1–22.—
Spirifer audaculus var. macronotus Hall and Clarke, Pal. New York, VIII, Pt. II,
1895, pl. 24, figs. 18–27.
Loc. Bristol, Moscow, Darien, etc., New York.

Spirifer buarquianus Rathbun. Middle Devonian.
Loc. Rio Macuru, Province of Para, Brazil.

Spirifer belphegor Clarke. Genesee (Dev.).
Loc. Ontario County, New York.

Spirifer bicostatus Hall=Reticulara bicostata.
Spirifer bicostatus var. petilus Hall=Reticularea bicostata petila.

Spirifer bidorsalis Winchell. Hamilton (Dev.).
Loc. Grand Traverse district, Michigan.

Spirifer biforatus var. lynx Hall=Platystrophia biforata.
Spirifer bifurcatus Hall=Spirifer leidyi.

Spirifer billingsanus Miller. Oriskany (Dev.).
Spirifera superba Billings (non Eichwald), Pal. Fossils, II, 1874, p. 45, pl. 3A, fig. 3.
Loc. Indian Cove, Gaspé.

Spirifer bilobus Hall=Bilobites bilobus.

Spirifer bimesialis Hall. Upper Devonian.
Spirifera bimesialis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 507, pl. 4, fig. 6.—Hall
Loc. Independence, Iowa; Naples, New York (Clarke).

Spirifer biplicatus Meek (non Hall)=Spirifer cenronatus. Kinderhook (L. Carb.).
Spirifer biplicata Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 519, pl. 7, fig. 5.
Spirifer biplicata Herrick, Bull. Denison Univ., III, 1888, p. 45; IV, 1888, p. 25,
pl. 2, fig. 8.
Spirifer biplicatus Herrick, Geol. Ohio, VII, 1895, pl. 15, fig. 8.
Loc. Burlington, Iowa; Quincy, Illinois; Richfield, etc., Ohio.

Spirifer boliviaensis d’Orbigny. Devonian.
Spirifera boliviensis d’Orbigny, Voyage dans l’Amérique Méridionale, Pal., 1842,
p. 37, pl. 2, figs. 8, 9.
Loc. Cochabamba and Chuquisaca, Bolivia.
Obs. Compare with S. antarcticus and S. hawkinsi.

Spirifer boonensis Swallow. Upper Carboniferous.
Loc. Boone, Randolph, and Monroe counties, Missouri.
Obs. Regarded by Keyes as a synonym for S. rockymontanus.
Spirifer byrnesi Nettlroth.  
Hamilton (Dev.).
Loc. Falls of Ohio.

Spirifer cameratus Derby (non Morton) = Spirifer condor.

Spirifer cameratus Morton.  
Upper Carboniferous.
Spirifer menesebachanus Roemer, Kreidebildung Texas, 1852, p. 88, pl. 11, fig. 7.
Spirifer triplicatus Hall, Stansbury's Expl. Survey of the Valley of Great Salt Lake, Utah, 1852, p. 410, pl. 4, fig. 5.
Spirifer fasiger Owen (non Keyserling), Ibidem, 1852, pl. 5, fig. 4.
Spirifer striatus var. triplicatus Marcou, Geol. N. America, 1858, p. 49, pl. 7, fig. 3.
Spirifer species Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 833, fig. 694.
Spirifer (Trigonotreta) camerata Meek, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 91, pl. 9, fig. 2.
Loc. Putnam Hill, Ohio; throughout the Upper Carboniferous of North America; western side of Spitzbergen (Toula).
Obs. S. cameratus is often regarded as identical with S. striatus (Martin). The latter species, however, is closely and finely reticulated with concentric growth lines, while in S. cameratus the plications are crowded with small pustules arranged in radiating lines. See S. condor and S. striatus.

Spirifer cameratus var. kansasensis Swallow = Spirifer cameratus.

Spirifer cameratus percussus Swallow.  
Upper Carboniferous.
Loc. Missouri and Kansas.
Obs. Regarded by Keyes as a synonym for S. cameratus.
Spirifer capax Hall = Spirifer euryteines.
Spirifer canandaiguae Hall and Clarke = Reticularia canandaigae.
Spirifer carteri Hall = Syringothyris carteri.
Spirifer carteri Meek (non Hall) = Syringothyris texta.
Spirifer catskillensis Emmons = Spirifer mesistrialis.
Spirifer cedarensis Owen = S. iowaensis.

**Spirifer centronatus A. Winchell.**
Waverly (L. Carb.).
Spirifer (Trigonotreta) biplicata (Hall??) Meek, Pal. Ohio, II, 1875, p. 290, pl. 14, fig. 5.
Spirifer centronata Hall and Whitfield, King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 254, pl. 4, figs. 5, 6.
Loc. Cuyahoga Falls, Ohio; Black Hills, South Dakota; Wasatch Range, Utah; Mountain Spring, Nevada; Yellowstone Park.
Obs. See S. alba-pinensis.

Spirifer chilensis Forbes = Spiriferina rostrata.

**Spirifer chuquisaca A. Ulrich.**
Middle Devonian.
Loc. Chahuarami, Tarabuco, etc., Bolivia.
Obs. Compare with S. boliviaensis and S. antarcticus.

Spirifer clarus Swallow = Reticularia clara.

**Spirifer clavatulus McChesney.**
Burlington (L. Carb.).
Spirifer clavatula McChesney, New Pal. Fossils, 1861, p. 84;—Trans. Chicago Acad. Sci., I, 1868, p. 36, pl. 6, fig. 5.
Loc. Burlington, Iowa.

Spirifer clin toni Hall = Spirifer granulosus.
Spirifer clio Hall = Delthyris consobrina.
Spirifer compactus Meek = Reticularia fimbriata.

**Spirifer concinna Hall.**
Lower Helderberg (Dev.).
Spirifer concinna Hall, Pal. New York, III, 1859, p. 200, pl. 25, fig. 2; pl. 28, fig. 7;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 55, figs. 1, 2.
Spirifer concinna Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 24, 27, 38, pl. 30, figs. 1, 2.
Loc. Helderberg Mountains, New York.

**Spirifer condor d’Orbigny.**
Upper Carboniferous.
Spirifer condor d’Orbigny, Voyage dans l’Amérique Méridionale, Pal., 1842, p. 46, pl. 5, figs. 11-14.—Waagen, Palæontologica Indica, Ser. XIII, I, 1883, p. 514.
Spirifer striatus var. multicostatus Toula, Sitzungs. der kais. Akad. der Wissensch. zu Wien, 1869, p. 3, pl. 1, figs. 2-4.
Loc. Bolivia; Bomjardim and Itaituba, Brazil; Yampopata and the Island of Titicaca, Bolivia; Pichis River, Peru.
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Spirifer condor d'Orbigny—Continued.

Obs. "It has for a long time been considered a synonym of S. striatus and later of S. cameratus. It is distinct, however, from the former by the lamellose striae of growth and from the latter by these as well by the nearly entire absence of bundling of the ribs" (Waagen).

Spirifer conradanus Miller = Reticularia fimbriata.

Spirifer consobrina d'Orbigny = Delthyris consobrina.

Spirifer consors A. Winchell. Hamilton (Dev.).


Loc. Grand Traverse district, Michigan.

Spirifer cooperensis Waagen = Reticularia cooperensis.

Spirifer corticosus Hall. Hamilton (Dev.).


Loc. Cumberland, Maryland.

Obs. Compare with S. granulosus.

Spirifer (?) costalis Castelnau. ? Upper Helderberg (Dev.).

Spirifer costalis Castelnau, Essai Système Silurien l'Amérique Septentrionale, 1843, p. 41, pl. 14, fig. 7.


Spirifer crispatus Hall and Clarke. Niagara (Sil.).

Spirifer crispatus Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 360, pl. 36, figs. 9, 10.

Loc. "Maryland."

Spirifer crispus (Hisinger). Niagara and Coralline (Sil.).

Terebratula crispa Hisinger, Svenska Vet.-Akad. Handlingar, 1826, tab. 7, fig. 4.

Delthyris staminea Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 105, fig. 3.

Spirifer crispus Hall, American Jour. Sci., XX, 1849, p. 228;—Pal. New York, II, 1852, p. 262, pl. 54, fig. 3;—p. 328, pl. 74, fig. 9.—Beecher and Clarke, Mem. N. Y. State Mus., I, 1889, p. 75, pl. 6, figs. 6, 7.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 19, 20, 36, pl. 36, figs. 1-6.


Loc. Europe; Lockport, Lewiston, and Schoharie, New York; Hamilton and Arisaig, Nova Scotia (Ami); Ontario; Waldron, Indiana.

Spirifer crispus simplex Hall. Niagara (Sil.).


Spirifer crispa var. simplex Beecher and Clarke, Mem. N. Y. State Mus., I, 1889, p. 75, pl. 6, figs. 4, 5.

Loc. Waldron, Indiana; Louisville, Kentucky.

Spirifer cultrijugatus Yandell and Shumard = Spirifer acuminatus.

Spirifer cumberlandiæ Hall. Oriskany (Dev.).

Spirifer cumberlandiae Hall—Continued.
Spirifer cumberlandiae Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 58, figs. 16-23.
Loc. Cumberland, Maryland.

Spirifer cuspidatus of American authors=Syringothyris carteri.

Spirifer cuspidatiformis Miller=Syringothyris texta.

Spirifer cyclopterus Hall. Lower Helderberg and Oriskany (Dev.).
Spirifer cyclopterus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 36, pl. 36, figs. 12, 15.
Loc. Helderberg Mountains, New York; Gaspé and New Brunswick.

Spirifer cyrtinaformis Hall and Whitfield=Cyrtia cyrtiniformis.

Spirifer davisi Nettelroth. Hamilton (Dev.).
Loc. Falls of Ohio.

Spirifer deltoideus Herrick. Waverly (L. Carb.).
Spirifer deltoidea Herrick, Bull. Denison Univ., IV, 1888, p. 27, pl. 2, fig. 7.
Spirifer deltoideus Herrick, Geol. Ohio, VII, 1895, pl. 15, fig. 7.
Loc. Licking County, Ohio.

Spirifer desideratus Walcott. Lower Carboniferous.
Loc. Eureka district, Nevada.

Spirifer disjunctus Sowerby. Chemung (Dev.).
Delthyris prolata Vanuxem, Geol. N. Y.; Rep. Third Dist., 1842, p. 179, fig. 3.
Delthyris cuspidata Hall (non Martin), Geol. N. Y.; Rep. Fourth Dist., 1843, p. 270, fig. 1.—Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 829, fig. 683.
Delthyris disjuncta? Hall, Geology N. Y.; Rep. Fourth Dist., 1843, p. 269, fig. 3.
Delthyris acanthota Hall, Ibidem, 1843, p. 270, fig. 2.
Delthyris inermis Hall, Ibidem, 1843, p. 270, fig. 4.
Spirifer disjunctus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 21, 24, 27, 37, 49, pl. 30, figs. 14, 15, 17.—Herrick, Geol. Ohio, VII, 1895, pl. 23, fig. 11.
Loc. Europe; New York; Pennsylvania; Eureka district, Nevada; Peace, Hay, and Liard's rivers, Canada.

Spirifer disjunctus occidentalis Whiteaves. Upper Devonian.
Spirifer disjuncta var. occidentalis Whiteaves, Cont. Canadian Pal., I, 1891, p. 222, pl. 29, fig. 5.
Loc. Hay River, Canada.
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Spirifer disjunctus sulcifer Hall and Clarke. Chemung (Dev.).
Spirifer disjunctus var. sulcifer Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 361, pl. 30, fig. 16.

Spirifer disparilis Hall = Metaplasia disparilis.

Spirifer divaricatus Hall. Corniferous and Hamilton (Dev.).
Spirifer divaricata Hall, Pal. New York, IV, 1867, p. 213, pl. 32, figs. 1-6.—Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 113, pl. 11, figs. 6-11; pl. 12, figs. 5-11.
Loc. Schoharie, Stafford, Williamsville, York, etc., New York; Port Colborne, Canada; Falls of Ohio; Lebanon, Kentucky.
Obs. Compare with S. multicostatus Castelnau.

Spirifer dubius Hall = Pentamerella dubia.

Spirifer dubius Nettelroth. Niagara (Sil.).
Loc. Louisville, Kentucky.

Spirifer duodenarius (Hall). Upper Helderberg (Dev.).
Delthyris duodenaria Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 171, fig. 5.
Loc. New York, Ontario, Columbus, Ohio; Falls of Ohio; Rio Maecuru, Province of Para, Brazil.

Spirifer duplicatus Hall = Spirifer duplilicatus.

Spirifer duplicicostas Phillips, Geol. Yorkshire, II, 1829, p. 218, pl. 10, fig. 1.
Loc. Europe; Feilden Isthmus, lat. 82° 43'.

Spirifer duplicicostatus (Conrad). Hamilton (Dev.).
Spirifer duplicata Hall, Pal. New York, IV, 1867, pp. 223, 236.
Obs. Compare with S. granulosus Conrad.

Spirifer eatoni Hall = Spirifer audaculus.

Spirifer elizæ Rathbun. Middle Devonian.
Spirifer elize (Hartt MS.) Rathbun, Bull. Buffalo Soc. Nat. Sci., I, 1874, p. 239, pl. 8, figs. 15, 21; pl. 9, fig. 22.
Loc. Erere, Province of Para, Brazil.
Spirifer engelmanni Meek and Worthen (non Meek) = Spirifer worthenanus.

Spirifer engelmanni Meek.  
Middle Devonian.
King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 41, pl. 3, fig. 3.
Loc. Neils Valley, Utah; White Pine district, Nevada.

Spirifer eudora Hall.  
Niagara (Sil.).
Rep. Wisconsin, I, 1863, p. 69, pl. 5; p. 436; — Trans. Albany Inst., IV, 1863,  
5, 7; — Ibidem, Twenty-eighth Rep., 1879, p. 156, pl. 24, figs. 13-18; — Eleventh  
N. Y. State Geol., 1883, pl. 51, figs. 19-21, 29.
Spirifer eudora Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 13, 35,  
pl. 21, figs. 19-21, 29.
Loc. Racine, Wisconsin; Waldron, Indiana; Louisville, Kentucky.

Spirifer euruteine Hall (non Owen) = Spirifer fornacula.
Spirifer euruteine var. fornacula Hall = Spirifer fornacula.

Spirifer euruteines Owen.  
Hamilton (Dev.).
Delthyris euruteines Owen, Rep. Geol. Expl. Iowa, Wisconsin, and Illinois, 1844,  
p. 69, pl. 12, fig. 9.
Spirifer euruteine Owen, Geol. Survey Wisconsin, Iowa, and Minnesota, 1852, p.  
586, pl. 3, figs. 2, 6. [See specimens in U. S. Nat. Mus., Cat. Invert. Foss.,  
17924.]
Spirifer parryana Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 509, pl. 4, fig. 8. —  
Keyes, Geol. Surv. Missouri, V, 1895, p. 77, pl. 40, fig. 4.
Spirifer capax Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 520, pl. 7, fig. 7.
Spirifer parryana Billings, Canadian Jour., VI, 1861, p. 261, pl. 32, figs. 77-78; — Geol.  
Canada, 1863, p. 386, fig. 422. — Hall, Second Ann. Rep. N. Y. State Geol., 1883,  
Spirifer fornacula Meek and Worthen (non Hall), Geol. Survey Illinois, III,  
1868, p. 433, pl. 13, fig. 8.
Spirifer parryana Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 137, pl. 14,  
fig. 10.
Spirifer parryanus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 39, 31, 39,  
pl. 22, figs. 8, 9, 15-17.
Loc. Pine Creek and elsewhere in Iowa; Eureka district, Nevada; Bosanquet,  
Ontario, Canada.

Obs. Owen described this species in 1839, but it was not published until 1844.  
In 1841 Owen sent Professor Hall specimens from the Falls of the Ohio labeled  
The Ohio and Columbia, Ohio.  Professor Hall is correct in regarding the Ohio  
localities as distinct from those of the Mississippi Valley, but is in error in  
thinking that figures 6-6b of the 1852 report are drawn from an Ohio Falls  
specimen. These figures are of the same specimen as of figure 9 of the 1844  
report, which is from Pine Creek, Iowa. The type specimens are in the  
National Museum collection. Owen's figure 2 is the same species as Hall's  
S. capax, while his figure 6 is a small individual of S. parryana Hall. Pro­  
fessor Calvin has shown these two species to be identical. Therefore it  
follows that S. euruteines must be restricted to the specimens from the  
Mississippi Valley. For the specimens from the Falls of the Ohio S. forna­  
culus Hall will be the proper name.
Spirifer extenuatus Hall = Syringothyris extenuata.
Spirifer fasciger Owen (non Keyserling) = Spirifer cameriatus.
Spirifer fastigatus Meek and Worthen (non Morton) = Spirifer mortonanus.

**Spirifer fastigatus Morton.**

?Lower Carboniferous.
Spirifer fastigatus Morton, American Jour. Sci., XXIX, 1836, p. 152, pl. 14, fig. 35.
Loc. Junior Furnace, Scioto County, Ohio.
Obs. Not recognizable.

**Spirifer filicosta A. Winchell.**

Hamilton (Dev.).
Spirifer filicosta A. Winchell, Report Lower Peninsula of Michigan, 1866, p. 94.
Loc. Grand Traverse district, Michigan.

**Spirifer (?) fimbriatus Morton.**

Upper Carboniferous.
Spirifer fimbriatus Morton, American Jour. Sci., XXIX, 1836, p. 150, pl. 2, fig. 1.
Loc. Putnam Hill, Ohio.
Obs. Not recognizable.

**Spirifer fimbriatus Hall = Ereticulina fimbriata.**

Spirifer fischeri Castelnau = Spirifer macropleura.

**Spirifer foggi Nettelroth.**

Niagara (Sil.).
Loc. Louisville, Kentucky.

**Spirifer forbesi Norwood and Pratten.**

Burlington (L. Carb.).
Spirifer forbesi Norwood and Pratten, Jour. Acad. Nat. Sci. Philadelphia, III, 1854, p. 73, pl. 9, fig. 3.—Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 600, pl. 13, fig. 1.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 26, 38, pl. 37, fig. 18.
Spirifer forbesi Keyes, Geol. Survey Missouri, V, 1895, p. 80, pl. 40, fig. 3.
Loc. Burlington, Iowa; Hannibal, Louisiana, and Sedalia, Missouri.

**Spirifer formosus Hall.**

Hamilton (Dev.).
Spirifer formosa Hall, Pal. New York, IV, 1867, p. 220, pl. 28, figs. 12-16.

**Spirifer fornacula Meek and Worthen (non Hall) = Spirifer euryteines.**

**Spirifer fornax Hall.**

Hamilton (Mid. Dev.).
Spirifer euruteines var. fornacula Hall, Pal. New York, IV, 1867, p. 211, pl. 31, figs. 11-13.—Whitfield, Geol. Wisconsin, IV, 1882, p. 330, pl. 25, fig. 22.—Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 117, pl. 6, figs. 8, 10, 18-20.
Loc. Jackson County, Illinois; Falls of Ohio; Columbus, Ohio; Milwaukee, Wisconsin (Whitfield).
Obs. See remarks on S. euryteines Owen.

**Spirifer fornax Hall.**

Hamilton (Dev.).
Loc. Illinois.
Spirifer franklini Meek = Reticularia franklini.

Spirifer fultonensis Worthen. Upper Carboniferous.

Spirifer fultonensis Worthen, Geol. Survey Illinois, V, 1873, p. 572, pl. 25, fig. 5.

Spirifer gaspensis Billings. Oriskany (Dev.).

Spirifer gaspensis Billings, Pal. Fossils, II, 1874, p. 44, pl. 3, fig. 8.
Loc. Gaspé.

Spirifer gibbosus Hall. Niagara (Sil.).

Loc. Racine, Wisconsin.
Obs. Probably the same as S. euclora Hall.

Spirifer glabrus Davidson = Martinia glabra.
Spirifer glabrus var. contractus Meek and Worthen = Martinia glabra contracta.

Spirifer glabrus nevadensis Walcott = Reticularia nevadaensis.
Spirifer glanscerasus White = Martinia glanscerasi.
Spirifer graniferus Hall = Spirifer granulosus.

Spirifer granulosus (Conrad). Hamilton (Dev.).
Spirifer huronensis Castelnau, Essai Systéme Silurien l’Amérique Septentrionale, 1843, p. 41, pl. 12, fig. 6.
Loc. Schoharie, Moscow, Darien, Canandaigua, etc., New York; Pennsylvania; Cumberland, Maryland; Virginia; Falls of Ohio; Alpena, Michigan.

Spirifer gregarius Clapp. Upper Helderberg (Dev.).
Delthyris gregaria Yandell and Shumard, Cont. Geol. Kentucky, 1847, pp. 9, 10. (Nomina nudum.)
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**Spirifer gregarius** Clapp—Continued.

Spirifer gregarius Hall and Clarke, Pal. New York, VIII, Pt. II, 1883, pp. 17, 36, pl. 29, fig. 7; pl. 37, figs. 11, 12.

*Loc.* Falls of Ohio; Columbus, Ohio; Genesee and Erie counties, New York; Ontario.

**Spirifer grieri** Hall.


Spirifer grieri Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 55, figs. 9-13.—Nettelroth, Kentucky Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 120, pl. 9, figs. 8-14.

*Loc.* Clarence, Williamsville, etc., New York; Columbus, Ohio; Falls of Ohio.

**Spirifer grimesi** Hall.


Spirifer allied to grimesi Etheridge, Quart. Jour. Geol. Soc. London, XXXIV, 1878, p. 628, pl. 25, fig. 5.


*Loc.* Burlington, Iowa; Quincy, Illinois; Fielden Isthmus, lat. 82° 43'; Hannibal, Louisiana, Sedalia, etc., Missouri.

**Spirifer guadalupensis** Shumard.—Reticularia guadalupensis.

**Spirifer hantibalisensis** Swallow=Syreneothyrus carteri.

**Spirifer hartii** Rathbun.


*Loc.* Rio Maceuru, Province of Para, Brazil.

**Spirifer hawkinsi** Morris and Sharpe.


*Loc.* Falkland Islands.

**Spirifer hemicyclus** Meek and Worthen.

Spirifer hemicyclus Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 399, pl. 8, figs. 6, 7.


**Spirifer hemiplicatus** Hall=Enteletes hemiplicatus.

**Spirifer hesione** Billings=Deltthyris raricosta.

**Spirifer hirtus** White and Whitfield=Reticularia cooperensis.

**Spirifer hobbsi** Nettelroth.

Spirifer varicosa var. Hall, Pal. New York, IV, 1867, p. 206, pl. 31, fig. 23.


*Loc.* Falls of Ohio.

**Spirifer homfrayi** Gabb=Spiriferina homfrayi.

**Spirifer hungerfordi** Hall.


*Loc.* Rockford, Iowa.
Spirifer huroniensis Castelnau = Spirifer granulosus.

**Spirifer huroniensis A. Winchell.**


Loc. Port aux Barques, Michigan.

**Spirifer imbrex Hall.**

Spirifer imbrex Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 601, pl. 13, fig. 2.


Loc. Port aux Barques, Michigan.

**Spirifer imbrex Hall.**

Spirifer imbrex Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 602, pl. 13, fig. 3.

Loc. Burlington, Iowa.

**Spirifer inconstans Hall = Spirifer nobilis.**

**Spirifer increbescens Hall.**

Spirifer increbescens Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 708, pl. 27, fig. 6.


Loc. Illinois and Missouri.

**Spirifer increbescens americanus Swallow.**


Loc. Illinois and Missouri.

**Spirifer increbescens transversalis Hall.**

Spirifer increbescens transversalis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 708, pl. 27, fig. 6.


**Spirifer inequicostatus Owen = Spirifer cameratus.**

**Spirifer inutilis Hall.**

Spirifer inutilis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 506, pl. 3, fig. 1.

Spirifer inutilis Whiteaves, Cont. Canadian Pal., I, 1891, p. 223.

Loc. Independence, Iowa; Athabasca River, Canada.

**Spirifer iowensis Owen.**

Spirifer iowensis Owen, Geol. Survey Iowa, Winconsin, and Minnesota, 1852, p. 585, pl. 3, fig. 1. [See specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17925.]

Spirifer pennatus Owen (non Atwater), Ibidem, 1852, p. 585, pl. 3, figs. 3, 8. [Ibidem, Cat., 17919, 17920.]

Spirifer iowaensis Owen—Continued.

Spirifer cedarensis Owen, Geol. Survey Iowa, Wisconsin, and Minnesota, 1852, p. 586, pl. 3, fig. 5. [See specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17923.]

Spirifer pennata Hall, Geol. Survey, Iowa, I, Pt. II, 1858, p. 510, pl. 5, fig. 1.


Loc. New Buffalo, Independence, etc., Iowa; Rock Island, Illinois; Milwaukee, Wisconsin; Falls of Ohio; south of Cape Joseph Henry, lat. 82° 42'.

Owen's type specimens of S. iowaensis, S. pennatus, S. ligus, and S. cedarensis are preserved in the National Museum collection. The six specimens of these species show, when compared with a large series of similar shells from Iowa, that they are but variations of a very variable and widely distributed Spirifer of the Devonian of the Mississippi Valley. The width and degree of curvature of the ventral area and the length of the cardinal line are extremely variable features in S. iowaensis. Upon these characters Owen has based his species. The name S. iowaensis has been selected not only because it is very appropriate but also since it is the first one described. S. parryanus is another closely allied species, but can be separated generally by its wider ventral area and in the cardinal lines not being drawn out into more or less mucronate extensions.

Spirifer kelloggi Swallow.


Spirifera kelloggi Safford, Geol. Tennessee, 1869, p. 360.

Loc. Keokuk, Iowa; Tennessee.

Spirifer kennicotti Meek.

This species is much like S. pennatus Miller, but with the fold and sinus plicated. It is unlike S. disjunctus, to which it has been referred by Whitseaves, in its shallow visceral cavity.

Spirifer kentuckiensis Shumard=Spiriferina cristata.

Spirifer kentuckiensis var. propatula Swallow=Spiriferina cristata.

Spirifer keokuk Hall.

Spirifer striatus? var. attenuatus? Owen (non Sow.), Geol. Survey Wisconsin, Iowa, Minnesota, 1852, pl. 3A, fig. 8. [See specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17944.]


Spirifer keokuk var. Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 676, pl. 24, fig. 4.


Spirifera kelloggi Keyes, Geol. Survey Missouri, V, 1895, p. 81, pl. 40, fig. 2.

Loc. Keokuk, Iowa; Nauvoo and Warsaw, Illinois; Utah; Rushville and Londonville, Ohio (Herrick).

Owens. See S. littoni.
Spirifer keokuk shelbyensis Swallow. Warsaw (L. Carb.).
Loc. Shelby County, Missouri.

Spirifer knappanus Nettelroth = Reticularia knappiana.

Spirifer lateralis Hall. Warsaw (L. Carb.).
Spirifer lateralis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 661, pl. 23, fig. 7.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 32, figs. 1-3; pl. 37, fig. 19.
Loc. Clifton and Warsaw, Illinois.

Spirifer laterior Swallow. Chouteau (L. Carb.).
Loc. Cooper County, Missouri.
Obs. Compare with S. marioneus.

Spirifer laevigatus Swallow = Martinia laevigata.
Spirifer laevis Hall = Reticularia laevis.

Spirifer laminosus Geinitz (non McCoy) = Spiriferina cristata.

Spirifer leidyi Norwood and Pratten. St. Louis (L. Carb.).
Spirifer leidyi Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 55, figs. 25, 26.—Walcott, Mon. U. S. Geol. Survey, VIII, 1884, pl. 216, pl. 18, fig. 4.—Keyes, Geol. Survey Missouri, V, 1895, p. 82.
Loc. Chester, Illinois; Spergen Hill, Indiana; Princeton, Kentucky; Utah; Eureka district, Nevada.

Spirifer leidyi chesterensis Swallow. Kaskaskia (L. Carb.).
Loc. "Above the St. Louis limestone," Missouri.
Obs. Regarded by Keyes as a synonym for S. leidyi.

Spirifer leidyi merimacensis Swallow. Warsaw (L. Carb.).
Loc. Barrets Station, St. Louis County, Missouri.
Obs. Regarded by Keyes as a synonym for S. leidyi.

Spirifer ligus Owen = S. iowaensis.
Spirifer lineatoides Swallow = Reticularia pseudolineata.
Spirifer lineatus of American authors = Reticularia perplexa.
Spirifer lineatus striatolineatus Swallow = Reticularia perplexa striatolineata.

Spirifer linguiferoides Forbes = Spiriferina rostrata.

Spirifer littoni Swallow. St. Louis (L. Carb.).
Loc. St. Louis County, Missouri.
Obs. Regarded by Keyes as a synonym for S. keokuk.
Spirifer logani Hall. Keokuk (L. Carb.).
Spirifer logani Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 647, pl. 20, fig. 7; pl. 21, figs. 1, 2.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 25, 38, pl. 32, figs. 7, 8.
Loc. Nauvoo, Illinois; Clark County, Missouri; Tennessee.

Spirifer lyelli de Verneuil=Spirifer pennatus.

Spirifer macbridei Calvin. Upper Devonian.
Loc. Rockford, Iowa.

Spirifer macconathii Nettelroth. Hamilton (Dev.).
Loc. Falls of Ohio.

Spirifer macra Meek (non Hall)=Spirifer strigosus.

Spirifer macra Hall. Upper Helderberg (Dev.).
Spirifer macra Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 17, 36, pl. 34, figs. 1–3.
Loc. Schoharie, Williamsville, etc., New York; Columbus, Ohio.

Spirifer macronotus Hall=S. audaculus macronotus.

Spirifer macropleura (Conrad). Lower Helderberg (Dev.).
Spirifer macropleurus Castelnau, Essai Système Silurien l'Amérique Septentri- onale, 1843, p. 41, pl. 13, fig. 5.
Spirifer fischeri Castelnau, Ibidem, 1843, p. 42, pl. 13, fig. 4.
Spirifer macropleura Hall, Pal. New York, III, 1859, p. 202, pl. 27, fig. 1; pl. 28, fig. 8.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 13, 35, pl. 20, figs. 22–24, 27.
Loc. Schoharie, Carlisle, Catskill, etc., New York; Square Lake, Maine; Cumberland, Maryland; Perry County, Tennessee.

Spirifer macrothyris Hall. Upper Helderberg (Dev.).
Loc. Williamsville and Clarence Hollow, New York; Cayuga, Ontario; Columbus, Ohio.
Spirifer maecuruensis Rathbun.
Loc. Rio Maecuru, Province of Para, Brazil.

Spirifer maus Billings = Martinia maia.

Spirifer manni Hall.
Spirifer manni Hall, Pal. New York, IV, 1867, p. 211, pl. 31, figs. 20-30.
Loc. Sandusky and Columbus, Ohio; Williamsville, New York.

Spirifer marcoui Waagen.
Spirifer striatus Marcou (non Martin), Geol. North America, 1858, p. 49, pl. 7, fig. 2.
Spirifer marcoui Waagen, Palaeontologica Indica, Ser. XIII, I, 1883, p. 510, pl. 47.
Loc. Shasta County, California; Tigoras, New Mexico; Vancouver Island.

Spirifer marcyi Hall.
Loc. Covington; Cayuga and Seneca lakes, New York; Columbus, Ohio (Whitfield).

Spirifer marionensis Shumard.
Loc. Louisiana and Hannibal, Missouri; Portsmouth, Sciotoville, etc., Ohio; Falls of Ohio.
Obs. Compare with S. osagensis, S. missouriensis, and S. vernonensis.

Spirifer medialis Hall = Spirifer audaculus.

Spirifer meeki Swallow.
Loc. Pettis and Saline counties, Missouri.

Spirifer meristoides Meek = Martinia meristoides.
Spirifer mesacostalis Hall = Delthyris mesicostalis.

Spirifer mesistrialis Hall.
Spirifer mesistrialis Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 269, fig. 1.
Loc. Schoharie, Cortlandville, Cayuta Creek, and Ithaca, New York.

Spirifer metus Hall = Cyrtia meta.
Spirifer meusebachanus Roemer = Spirifer cameratus.
**Spirifer mexicanus** Shumard. 
Upper Carboniferous.


*Loc.* Guadalupe Mountains, New Mexico and Texas.

**Spirifer missouriensis** Swallow. 
Chouteau (L. Carb.).


*Loc.* Cooper County, Missouri.

*Obs.* Regarded by Keyes as a synonym for *S. marioneusis*.

**Spirifer modestus** Hall = Reticularia modesta.

**Spirifer mortonanus** Miller. 
Keokuk (L. Carb.).

*Spirifer mortonanus* Hall and Clarke, Pal., New York, VIII, Pt. II, 1893, pp. 26, 38, pl. 38, figs. 18, 19.

*Loc.* Crawfordsville, Indiana; Kings Mountain and Lebanon, Kentucky.

**Spirifer mucronatus** Conrad = Spirifer pennatus.

**Spirifer multistriata** Hall = Trematospira multistriata.

**Spirifer mundulus** Rowley. 
Burlington (L. Carb.).

*Spirifera mundula* Rowley, American Geologist, XII, 1893, p. 307, pl. 14, figs. 10-12.

*Loc.* Louisiana, Missouri.

**Spirifer murchisoni** Castelnau. 
Oriskany (Dev.).

*Spirifer murchisoni* Castelnau, Essai Système Silurien l’Amérique Septentrionale, 1843, p. 42, pl. 12, fig. 3.


*Obs.* See *S. divaricatus*.

**Spirifer multigranosus** Worthen = Spirifer texanus.

**Spirifer multistriata** Hall = Trematospira multistriata.

**Spirifer mysticensis** Meek. 
Lower Carboniferous.


*Loc.* Outlet of Mystic Lake, Montana.

**Spirifer neglectus** Hall. 
Keokuk (L. Carb.).

*Spirifer neglectus* Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 643, pl. 20, fig. 5.

*Spirifera neglecta* Meek and Worthen, Geol. Survey Illinois, VI, 1875, p. 523, pl. 30, figs. 1c, 2a.—Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 217, pl. 18, fig. 10.
Spirifer neglectus Hall—Continued.


Loc. Keokuk, Iowa; Warsaw and Nauvoo, Illinois; Eureka district, Nevada; Belgium.


Loc. Keokuk, Iowa; Warsaw and Nauvoo, Illinois; Eureka district, Nevada; Belgium.

Spirifer newberryi Hall.

Spirifer newberryi Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 56, figs. 9, 10.

Spirifer newberryi Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 362, pl. 31, figs. 9, 10.

Loc. Northern Ohio.

Spirifer niagarensis (Conrad).


Spirifer niagarensis Hall, Pal. New York, II, 1852, p. 264, pl. 54, fig. 5.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 14, 35, pl. 21, figs. 1-4, 25; pl. 37, fig. 1.


Loc. Lockport, Rochester, etc., New York; Osgood, Indiana.

Spirifer niagarensis oligoptycphus Roemer.

Spirifer niagarensis var. oligoptycphus Roemer, Sil. Fauna West. Tennessee, 1860, p. 68, pl. 5, fig. 8.

Spirifer macropleurus Safford, Geol. Tennessee, 1869, p. 321.

Loc. Decatur County, Tennessee.

Obs. Compare with S. eudorus Hall and S. macropleurus Conrad.

Spirifer nictauvensis Dawson.


Spirifer nobilis Barrande.

Spirifer nobilis Barrande, Ueber die Brach. der Sil. Schicht von Böhmen, 1847.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 14, 35, pl. 29, fig. 16; pl. 37, figs. 2, 3.

Spirifer racinensis McChesney, New Pal. Fossils, 1861, p. 84.


Spirifer racinensis McChesney, New Pal. Fossils, 1868, p. 84.

Loc. Racine, Wisconsin; Chicago, Illinois.

Spirifer norwoodana Hall=Spiriferina norwoodana.

Spirifer norwoodii Meek=Cyrtia norwoodii.

Spirifer nova-mexicanus Miller.


Loc. Lake Valley mining district, New Mexico.

Spirifer nymphus Billings=Reticularia nympha.

Spirifer obtusus Gabb=Spiriferina obtusa.
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Spirifer octocostatus Hall. Lower Helderberg (Dev.).
Loc. Cumberland, Maryland.

Spirifer octoplicatus Hall = Spiriferina cristata.
Spirifer opimus Hall = Spirifer rockymontanus.

Spirifer orbignyi Morris and Sharpe. Lower Devonian.
Spirifer orbignii Morris and Sharpe, Quart. Jour. Geol. Soc. London, II, 1846, p. 276, pl. 11, fig. 3.
Loc. Falkland Islands.
Obs. Probably identical with S. antarcticus.

Spirifer oregonensis Shumard. Upper Carboniferous.
Loc. Near Fort Filmore, New Mexico.

Spirifer orestes Hall and Whitfield. Chemung (Dev.).
Spirifer orestes Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 27, 38, pl. 30, fig. 20.
Loc. Rockford, Iowa; Naples, New York.
Obs. Compare with S. strigosus.

Spirifer osagensis Swallow. Carboniferous.
Loc. Pettis County, Missouri.
Obs. Regarded by Keyes as a synonym for S. marionensis.

Spirifer paradoxus (Schlotheim). Corniferous (Dev.).
Terebratula paradox Schlotheim, Petrefactenkunde, VII, 1813, p. 249, tab. 2, fig. 6.
Spirifer paradoxus? Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 415, pl. 10, fig. 2.
Loc. Europe; Union and Jackson counties, Illinois.

Spirifer parryana Hall = S. euryteines Owen.

Spirifer peculiaris Shumard. Kinderhook (L. Carb.).
Spirifer (Martinia) peculiaris White, Wheeler's Expl. and Survey west 100th Meridian, IV, 1875, p. 90, pl. 5, fig. 7.
Loc. Cooper County, Missouri; Mountain Spring, Nevada.

Spirifer pedroanus Rathbun. Middle Devonian.
Loc. Erere and Province of Para, Brazil.

Spirifer pennatus Owen = Spirifer iowaensis.
Spirifer pennatus (Atwater). Marcellus, Hamilton, and Chemung (Dev.).
Terebratula pennata Atwater, American Jour. Sci. Arts, II, 1820, p. 244, pl. 1, figs. 2, 3.
Spirifer sowerbyi Castelnau, Essai Syst. Silurien l'Amérique Septentrionale, 1843, pl. 13, fig. 1 (non Fischer).
Spirifer lyelli de Verneuil, Ibidem, 1843, p. 43.
Spirifer mucronatus Billings, Canadian Nat. Geol., I, 1856, p. 474, pl. 7, figs. 9, 10.—Rogers, Geol. Pennsylvania, II, 1858, p. 828, fig. 668.
Spirifer mucronatus var. Williams, Bull. Geol. Soc. America, I, 1890, pl. 12, fig. 13.
Spirifer mucronatus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 14, 17, 36, pl. 29, fig. 8; pl. 34, figs. 13–22.
Loc. New York, Pennsylvania, Maryland, Virginia; Bosanquet, Ontario; Milwaukee, Wisconsin.
Obs. Atwater's specimen was found in the drift of Ohio. Mr. Miller is correct in regarding it the same as the well-known S. mucronatus.

Spirifer pennatus posterus Hall and Clarke. Chemung (Dev.).
Delthyris mucronata (partim) Hall, Geol. New York; Rep. Fourth Dist., 1843, p. 270, fig. 3.
Loc. Tompkins County, New York.

Spirifer pennatus tulliensis Williams. Tully (Dev.).
Spirifer mucronatus var. tulliensis Williams, Bull. Geol. Soc. America, I, 1890, p. 491, pl. 12, fig. 12.
Loc. Tinkers Falls, New York.

Spirifer pentlandi d'Orbigny. Carboniferous.
Spirifer pentlandi d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 48, pl. 5, figs. 15.
Loc. Lake Titicaca, Bolivia.

Spirifer perforata Hall= Trematospira perforata.

Spirifer perextensus Meek and Worthen. Corniferous (Dev.).
Spirifera perextensa Meek and Worthen, Geol. Survey Illinois, III, 1888, p. 414, pl. 10, fig. 1.
Obs. Regarded by Keyes as a synonym for S. ligus=S. iowaensis.

Spirifer perlamellosus Hall= Delthyris perlamellosa.
Spirifer perplexus McChesney= Reticularia perplexa.

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Spirifer pertenuis Hall. Hamilton (Dev.).
Spirifer perextensa Hall, Pal. New York, IV, 1867, p. 236.
Loc. Cumberland, Maryland (Whitfield).
Obs. Compare with S. macronota Hall.

Spirifer pharovicinus A. Winchell. Huron (Dev.).
Loc. Port aux Barques, Michigan.

Spirifer pinonensis Meek. Lower to Upper Devonian.
Spirifer (Trigonotreta) argentarius Meek, King's U.S. Geol. Expl. 40th Parl., IV, 1877, p. 42, pl. 4, fig. 4.
Loc. White Pine and Eureka districts, Nevada.

Spirifer planoconvexus Shumard=Ambocelia planiconvexa.

Spirifer plenus Hall=Syringothyris plena.

Spirifer plicatella of authors=Spirifer radiatus.

Spirifer pluto Clarke. Genesee (Dev.).
Spirifer pluto Clarke, Bull U. S. Geol. Survey, 16, 1885, p. 31, pl. 3, fig. 12.
Loc. Ontario County, New York.
Obs. See Leiorhynchus hecate Clarke.

Spirifer præmatura Hall=Reticularia præmatura.
Spirifer propinquus Hall=Syringothyris texta.
Spirifer prorus Conrad=Spirifer acuminatus.
Spirifer pseudolineatus Hall=Reticularia pseudolineata.
Spirifer pulchra Meek=Spiriferina pulchra.
Spirifer pyramidalis Hall=Cyrtina pyramidalis.
Spirifer pyxidatus Hall=Metaplasia pyxidata.

Spirifer quichus d'Orbigny. Devonian.
Spirifer quichua d'Orbigny, Voyage dans l'Amérique Méridionale, Pal., 1842, p. 37, pl. 2, fig. 21.
Loc. Chuquisaca, Bolivia.

Spirifer raciniensis McChesney=Spirifer nobilis.

Spirifer radiatus Sowerby. Clinton and Niagara (Sil.).
Spirifer plicatella var. radiata Sowerby, Mineral Conchology, V, 1825, p. 493, figs. 1, 2.
Delthyris radiata Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 105, fig. 2.
Spirifer radiata Hall, Pal. New York, II, 1852, pp. 66, 265, pl. 22, figs. 2d-25 (non 2a-2c=Cyrtia meta); pl. 54, fig. 6.
Spirifer radiata Billings, Canadian Nat. Geol., I, 1856, p. 135, pl. 2, figs. 2, 3, 10.
**Spirifer radiatus** Sowerby—Continued.


**Spirifer radiatus** Beecher and Clarke, Mem. N. Y. State Mus., I, 1889, p. 77, pl. 6, figs. 9-11.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 13, 35, pl. 21, figs. 5, 9-13, 26 (114-18).

**Spirifer tenuistratius** Shaler (non Hall), Bull. Mus. Com. Zool., 4, 1865, p. 70.

**Spirifer rectiplicatus** (Conrad). 


Loc. "Helderberg Mountains in Middle Silurian limestone."

Obs. May be the same as Metaplasia pyxidata Hall.

**Spirifer rockymontanus** Marcou. Upper Carboniferous.

**Spirifer rockymontani** Marcou, Geol. North America, March, 1858, p. 50, pl. 7, fig. 4.

**Spirifer opima** Hall, Geol. Survey Iowa, I, Pt. II, December, 1858, p. 711.

**Spirifera subventrosa** McChesney, New Pal. Fossils, 1860, p. 44; Trans. Chicago Acad. Sci., I, 1868, p. 35, pl. 1, fig. 4.

**Spirifera opima** Derby, Bull. Cornell University, I, 1874, p. 15, pl. 1, fig. 4; pl. 2, fig. 7; pl. 4, fig. 12.—Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 56, figs. 4-7.—Herick, Bull. Denison Univ., II, 1887, p. 44, pl. 2, fig. 23.

**Spirifera (Trigonotreta) opima** Meek, Pal. Ohio, II, 1875, p. 329, pl. 19, figs. 14a-14d (114e); King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 88, pl. 9, fig. 6.


**Spirifer opimus** Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 27, 39, pl. 31, figs. 4-7.

Loc. Tigras and Canyon of San Antonio, New Mexico; Oquirrh Range, Utah; Arkansas; Iowa; Missouri; Illinois; Indiana; Ohio; Maryland; West Virginia; Bomjardim and Itaituba, Brazil; Chester group at Newtonville, Ohio (Whitfield).

Obs. See S. boonensis.

**Spirifer rostellatus** Hall. Keokuk (L. Carb.).

**Spirifer rostellata** Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 641, pl. 20, fig. 2.

**Spirifer rostellatus** Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 26, pl. 32, fig. 5.

Loc. Skunk River, Iowa.
Spirifer rostellum Hall and Whitfield. Niagara (Sil.).
Loc. Louisville, Kentucky; Collinsville, Alabama.

Spirifer rostratus Morton. Upper Carboniferous.
Spirifer rostrata Morton, American Jour. Sci. Arts, 1836, p. 152, pl. 14, fig. 34.
Loc. Junior Furnace, Scioto County, Ohio.
Obs. Poorly defined. May be a species of Athyris.

Spirifer rugicostus Hall=Delthyris rugicosta.

Spirifer saffordi Hall. Lower Helderberg (Dev.).
Spirifer saffordi Hall, Pal. New York, III, 1859, p. 203, pl. 28, fig. 2.
Loc. Decatur County, Tennessee; Hudson, New York.

Spirifer scobina Meek. Carboniferous.
Spirifer (Spiriferina?) scobina Meek, Simpson's Rep. Expl. Great Basin Terr. Utah, 1876, p. 351, pl. 2, fig. 5.
Spirifer (Trigonotreta) scobina Meek, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 90, pl. 9, fig. 1.
Loc. Divide between Long and Ruby Valleys, Utah.

Spirifer sculptilis Hall=Delthyris sculptilis.

Spirifer segmentum Hall. Upper Helderberg (Dev.).
Loc. Falls of Ohio; Columbus, Ohio.

Spirifer semiplacatus Hall=Reticularia cooperensis.
Spirifer setigerus Hall=Reticularia setigera.

Spirifer sheppardi Castelnau=Platystrophia biforata.

Spirifer sillanus A. Winchell. Waverly (L. Garb.).
Loc. Near Cuyahoga Falls, Ohio.

Spirifer similior Winchell and Marcy. Niagara (Sil.).
Obs. This shell has spirals.

Spirifer solidirostris White=Spiriferina solidirostris.
Spirifer sowerbyi Castelnau (non Fischer)=Spirifer pennatus.
Spirifer spinosus Norwood and Pratten=Spiriferina spinosa.

Spirifer striatiformis Meek. Waverly (L. Carb.).
Spirifer (Trigonotreta) striatiformis Meek, Pal. Ohio, II, 1875, p. 280, pl. 14, fig. 8.
Spirifer striatiformis Herrick, Bull. Denison Univ., III, 1888, p. 44, pl. 3, fig. 26; pl. 6, figs. 6, 7.—Geol. Ohio, VII, 1895, pl. 15, fig. 9.
 Loc. Sciotoville and Licking County, Ohio.
Spirifer striatus Marcou (non Martin) = Spirifer marcoui.

**Spirifer striatus (Martin).** Carboniferous.


*Loc.* Mountain Spring, Nevada; Oquirrh Mountains, Utah; Lake Valley mining district, New Mexico; Windsor, Nova Scotia.

Spirifer striatus attenuatus Owen = S. keokuk.

Spirifer striatus multicostatus Toula = Spirifer condor.

Spirifer striatus triplicatus Marcou = Spirifer camaratus.

**Spirifer strigosus Meek.** Devonian.

Spiriferi striata Marcou, Petrefacta Derbiensia, 1809, pl. 23.


*Loc.* Mountain Spring, Nevada; Oquirrh Mountains, Utah; Lake Valley mining district, New Mexico; Windsor, Nova Scotia.

Spirifer subequalalis Hall. Warsaw (L. Carb.).


Spirifer subbassinalis Hall. Chemung and Marshall (Dev.-L. Carb.).


Spirifer subenucronata Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 504, pl. 4, fig. 3.


Spirifer subcardiformis Hall. Warsaw (L. Carb.).

Spirifer subcardiformis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 669, pl. 23, fig. 6.


Spirifer subcuspoidatus Hall = Syringothyris texta.

Spirifer subdecussatus Whiteaves. Hamilton (Dev.).

Spirifer subdecussatus Whiteaves, Cont. Canadian Pal., I, 1889, p. 114, pl. 15, fig. 3.

*Loc.* Moravian Town Thames River, Canada.

Spirifer subelliptica MeChesney = Spiriferina subelliptica.

Spirifer sublineata Meck = Martinia sublineata.

Spirifer submucronata Hall, 1858 (non 1857) = Spirifer subbassinalis.
Spirifer submucronatus Hall. 
**Oriskany (Dev.).**
Pal. New York, III, 1859, p. 419, pl. 96, fig. 7.
Spirifer submucronata Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 58, figs. 5-7.
Spirifer submucronatus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 17, 36, pl. 33, figs. 5-7.
**Loc.** Cumberland, Maryland.
**Obs.** Possibly the young of Spirifer cumberlandia.

Spirifer suborbicularis Hall. 
**Keokuk (L. Carb.).**
Spirifer suborbicularis Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 644.
Spirifer suborbicularis Meek and Worthen, Geol. Survey Illinois, VI, 1875, p. 523, pl. 30, fig. 1.
**Loc.** Keokuk, Iowa; Warsaw and Nauvoo, Illinois.

Spirifer subrotundatus Hall. 
**Kinderhook (L. Carb.).**
Spirifer subrotundata Hall (non McCoy, 1855), Geol. Survey Iowa, I, Pt. II, 1858, p. 521, pl. 7, fig. 8.
Spirifer subrotundata Keyes, Geol. Survey Missouri, V, 1895, p. 78.
**Loc.** Burlington, Iowa; Sciotoville, Ohio (Winchell).
**Obs.** This specific name was first used by McCoy in 1855 but is usually regarded
as a synonym for S. pinguis Sowerby. De Koninck, however, retains
McCoy's name as late as 1887.

Spirifer substrigosus Webster. 
**Chemung (Dev.).**
Spirifer substrigosa Webster, American Nat., XXII, 1888, p. 1101.
**Loc.** Near Rockford, Iowa.

Spirifer subsulcatus Hall. 
**Arisaig (Sil.).**
Spirifer subsulcata Hall (non Dalman, 1828), Canadian Nat. Geol., V, 1860, p. 145.
Spirifer subsulcata Dawson, Acadian Geology, 3d ed., 1878, p. 597.—Miller, N.
American Geol. and Pal., 1889, p. 376.
**Loc.** Arisaig, Nova Scotia.

Spirifer subumb bona Hall=Martinia subumb bona.
Spirifer subundifera Meek and Worthen=Reticaria subundifera.

Spirifer subvaricosus Hall and Whitfield.  
?Hamilton (Dev.).
**Loc.** Waterloo, Iowa.

Spirifer subventricosus McCchesney=Spirifer rockymontana.
Spirifer sulcatus Hall=Delthyris sulcata.

Spirifer sulcifer Shumard.  
Upper Carboniferous.
Spirifer sulcifera Shumard, Trans. St. Louis Acad. Sci., I, 1838, p. 293, pl. 11, 
fig. 3.
**Loc.** Guadalupe Mountains, New Mexico.

Spirifer superbus Billings (non Eichwald)=Spirifer billingsana.

Spirifer taneyensis Swallow.  
Chouteau (L. Carb.).
Spirifer taneyensis Keyes, Geol. Survey Missouri, V, 1895, p. 78.
**Loc.** Taney County, Missouri.

Spirifer temeraria Miller=Reticaria temeraria.
Spirifer tenuicostatus Hall. Keokuk and Warsaw (L. Carb.).
Spirifer tenuicostata Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 662, pl. 23, fig. 8.
Loc. Keokuk, Iowa; Warsaw and Dallas, Illinois.

Spirifer tenuimarginatus Hall. Keokuk (L. Carb.).
Spirifer tenuimarginata Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 641, pl. 20, fig. 1.
Loc. Warsaw, Illinois.

Spirifer tenuis Hall. Hamilton (Dev.).
Spirifer tenuis Hall, Pal. New York, IV, 1867, p. 236.
Loc. Cumberland, Maryland.
Obs. Compare with Spirifer granulosus Conrad.

Spirifer tenuispinatus Herrick = Reticularia tenuispinata.
Spirifer tenuistratns Shaler (non Hall) = Spirifer radiatus.

Spirifer tenuistriatus Hall. Lower Helderberg (Dev.).
Spirifer tenuistriata Hall, Pal. New York, III, 1859, p. 204, pl. 29, fig. 3.
Spirifer tenuistriata Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 61, fig. 8.
Spirifer tenuistriata Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 36, fig. 8.
Loc. Decatur County, Tennessee.

Spirifer texanus Meek. Upper Carboniferous.
Spirifer (Trigonotreta?) texanus Meek, Macomb's Rep. Expl. Exped. from Santa Fe to the Great Colorado of the West, 1876, p. 129, pl. 3, fig. 5.
Spirifer multigranosa Worthen, Geol. Survey Illinois, VIII, 1890, p. 105, pl. 11, fig. 5.
Spirifer texanus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 26, 38, pl. 37, figs. 16, 17.
Loc. Young and Jack counties, Texas; Springfield, Illinois.

Spirifer textus Hall = Syringothyris texta.
Spirifer translatus Swallow = Reticularia translata.
Spirifer transversus McChesney = Spiriferina transversa.

Spirifer tribulis Hall. Oriskany (Dev.).
Loc. Cumberland, Maryland.
Obs. Possibly the young of Spirifer murchisoni.

Spirifer triradialis Meek (non Phillips) = Spirifer agelaius.
 SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA. [BULL. 87.

Spirifer troosti Castelnau. 
†Formation.
Spirifer troosti Castelnau, Essai Système Silurien l'Amérique Septentrionale, 1843, p. 41, pl. 12, fig. 5.
Loc. “Kentucky.”

Spirifer tullius Hall. 
Hamilton (Dev.).
Spirifera tullia var. Whiteaves, Cont. Canadian Pal., I, 1891, p. 224, pl. 32, fig. 1.
Spirifer tullius Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 14, 35, pl. 22, fig. 18; pl. 37, figs. 6, 7.
Loc. Tully, Apulia, etc., New York; Athabasca River, Canada.

Spirifer tumidus Bayle and Coquand=Spiriferina rostrata.

Spirifer undiferus Eoemer=Reticularia undifera.

Spirifer unica Hall=Spirifer arenosus.

Spirifer urbanus Calvin. 
Hamilton (Dev.).
Loc. Iowa City and Linn County, Iowa.

Spirifer utahensis Meek=Cyrtia norwoodi.

Spirifer valenteana Rathbun. 
Middle Devonian.
Loc. Erere, Province of Para, Brazil.

Spirifer vanuxemi Hall. 
Tentaculite (Sil.).
Orthis plicata Vanuxem (non Sowerby), Geol. New York; Rep. Third Dist., 1842, p. 112, fig. 1.
Orthis† (Delthyris) plicatus Hall, Ibidem, Fourth Dist., 1843, p. 142, fig. 1.
Spirifer vanuxemi Hall, Pal. New York, III, 1859, p. 198, pl. 8, figs. 17-23;—Second Rep. N. Y. State Geol., 1883, pl. 61, fig. 11.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 19, 36, pl. 36, fig. 11.—Whitfield, Geol. Ohio, VII, 1895, p. 411, pl. 1, figs. 4, 5.
Loc. Albany and Schoharie counties, New York; Put in Bay Island, Lake Erie.
Obs. Vanuxem’s specific name is restored, since Sowerby’s species is an Orthis.

Spirifer varicosus Hall. 
Corniferous (Dev.).
Spirifer varicosus Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 17, 36, pl. 34, figs. 4-8.
Loc. Williamsville, New York; Woodstock, Canada; Columbus, Ohio; Louisville, Kentucky; Eureka district, Nevada.

Spirifer ventricosa Hall=Nucleospira ventricosa.

Spirifer venustus Hall=Spirifer divaricatus.

Spirifer vernonensis Swallow. 
Chouteau (L. Carb.).
Loc. St. Louis County, Missouri.
Obs. Regarded by Keyes as a synonym for S. marionensis.
Spirifer vernonensis ozarkensis Swallow. Chouteau (L. Carb.).
Loc. Taney County, Missouri.
Obs. Regarded by Keyes as a synonym for S. marionensis.

Spirifer vogeli von Ammon. Middle Devonian.
Loc. Taquarassu, Mato Grosso, Brazil.

Spirifer waldronensis Miller and Dyer = Mimulus waldronensis.

Spirifer waverlyensis A. Winchell. Waverly (L. Carb.).
Loc. "Newark, Ohio" (A. Winchell's MS.).

Spirifer whitneyi Hall. Chemung (Dev.).
Spirifer whitneyi Hall, Geol. Survey Iowa, I, Pt. II, 1868, p. 502, pl. 4, fig. 2.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 24, 37, pl. 30, figs. 18, 19.
Loc. Rockford, Iowa; North Saskatchewan, Canada; Russia.

Spirifer williamsi Hall and Clarke. Chemung (Dev.).
Spirifer williamsi Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 361, pl. 37, figs. 20–22.
Loc. Allegany County, New York.

Spirifer winchelli Herrick. Waverly (L. Carb.).
Spirifer winchelli Herrick, Bull. Denison Univ., III, 1888, p. 46, pl. 5, figs. 2, 3; pl. 2, fig. 16;—Geol. Ohio, VII, 1895, pl. 21, figs. 2, 3.
Loc. Granville, Ohio.

Spirifer worthenanus Schuchert. Oriskany (Dev.).
Spirifera engelmani Meek and Worthen (non Meek, 1860), Geol. Survey Illinois, III, 1868, p. 398, pl. 8, fig. 5.
Spirifera wortheni Meek (non Hall, 1857), King’s U. S. Geol. Expl. 40th Parl., IV, 1877, p. 42.
Loc. Union County, Illinois.

Spirifer wortheni Meek (non Hall) = Spirifer worthenanus.

Spirifer wortheni Hall. Hamilton (Dev.).
Loc. Calhoun County, Illinois.

Spirifer ziczac Hall (non Roemer) = Delthyris consobrina.

SPIRIFERINA d’Orbigny.
Genotype Spirifer walcotti Sowerby = S. rostrata (Schlotth.)
**Spiriferina aciculifera** (Rowley). Kinderhook (L. Carb.).
*Loc.* Louisiana, Missouri.

**Spiriferina (?) alia** Hall and Whitfield. Triassic.
*Spiriferina* (Spiriferina?) *alia* Hall and Whitfield, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 281, pl. 6, fig. 17.

**Spiriferina billingsi** Shumard. Upper Carboniferous.
*Loc.* Guadalupe Mountains, New Mexico and Texas.

**Spiriferina binacuta** A. Winchell. Burlington (L. Carb.).
*Loc.* Burlington, Iowa.

**Spiriferina borealis** Whiteaves. Triassic.
*Spiriferina borealis* Whiteaves, Cont. Canadian Pal., I, 1888, p. 128, pl. 17, fig. 1, abstract.
*Loc.* Liard River, Canada.

**Spiriferina clarksvillensis** A. Winchell. Chouteau (L. Carb.).
*Loc.* Clarksville, Missouri.

**Spiriferina cristata** Walcott = *S. spinosa*. Upper Carboniferous.
*Terebratulites cristatus* Schlotheim, Beit. zur Naturg. der Verst.; Akad. der Wiss. zu München, 1816, pl. 1, fig. 3.
*Spirifer octoplicata* Hall (non Sowerby), Stansbury's Exped. Great Salt Lake of Utah, 1852, p. 409, pl. 4, fig. 4.
*Spirifer laminosus* Geinitz (non McCoy), Carb. und Dyas in Nebraska, 1866, p. 45, pl. 3, fig. 19.
*Spiriferina octoplicata* Toula, Sitzungsb. der kais. Akad. der Wissenschaft. zu Wien, LIX, 1869, p. 5.
*Spirifer* (Spiriferina) kentuckyensis Hall, Second Rep. N. Y. State Geol., 1883, pl. 61, figs. 14–16.
Spiriferina cristata (Schlotheim)—Continued.

Loc. Europe; Kentucky; Indiana; Illinois; Missouri; Iowa; Kansas; Arkansas; Nebraska; Texas; New Mexico; Utah; Arizona; Nevada; Nova Scotia; Cape Joseph Henry, lat. 82° 43′; near Cochabamba, Bolivia.

Obs. See Spiriferina octoplicata and S. norwoodana.

Spiriferina depressa Herrick.

Spiriferina depressa Herrick, Bull. Denison Univ., III, 1888, p. 47, pl. 10, fig. 3.
Loc. Near Granville, Ohio.

Spiriferina goniouota Meek.

Spiriferina sp. undet. Meek, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 84, pl. 8, fig. 5.
Spiriferina goniouota Meek, Ibidem, 1877, at end of description.
Loc. Diamond Mountains, Nevada.
Obs. Compare with Spiriferina laminosa (McCoy).

Spiriferina homfrayi (Gabb).

Spirifer homfrayi Gabb, Geol. Survey California, Pal., I, 1864, p. 35, pl. 6, fig. 38.
Spiriferina homfrayi Hall and Whitfield, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 281, pl. 6, fig. 18.
Loc. Star Canyon, Humboldt County, Nevada; Dun Glen Pass, Pah-Ute Range, Nevada.

Spiriferina kentuckyensis Slminard=Spiriferina cristata.
Spiriferina kentuckyensis propatula Swallow=Spiriferina cristata.

Spiriferina cf. munsteri Davidson.

Loc. Europe; Cordillere of Copiapo, Chile.

Spiriferina norwoodana (Hall).

Loc. Spergen Hill, Indiana; Alton, Illinois; Princeton, Kentucky.
Obs. Probably identical with Spiriferina cristata.

Spiriferina obtusus (Gabb).

Spirifer obtusus Gabb, American Jour. Conch., V, 1870, p. 17, pl. 7, fig. 16.

Spiriferina octoplicata (Sowerby).

Spirifer octoplicata Sowerby, Mineral Conch., 1827, p. 120, pl. 562, figs. 2–4.
Spiriferina octoplicata White, Ibidem, Final Rep., 1875, p. 139, pl. 10, fig. 8.
Loc. Europe; Santa Fe, New Mexico; northern Colorado; Lincoln County, Nevada.
Obs. Probably identical with Spiriferina cristata.

Spiriferina pulchra Meek.

Spiriferina pulchra Meek, Pal. Upper Missouri, Smithsonian Cont. to Knowl., XIV, 1864, 172, p. 19;—King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 85, pl. 8, fig. 1; pl. 12, fig. 12.
Spiriferina pulchra Meek—Continued.


Loc. White Pine district, Nevada; Long and Ruby valleys, Utah.

Spiriferina rostrata Schlotheim.

Spirifer chilensis Forbes, Darwin's Geol. Observations S. America, 1846, p. 267, pl. 5, figs. 15, 16.
Spirifer linguiferoides Forbes, Ibidem, 1846, p. 267, pl. 5, figs. 17, 18.

Loc. Europe; Sierra de la Ternera, Las Amolanes, Rio Claro, Tres Cruces, Manflas, Cordillera de Guasco, and Juntas, Chile.

Spiriferina solidirostris White.


Loc. Burlington, Iowa; Hamburg, Illinois; Newark and Sciotovalle, Ohio.

Spiriferina spinosa (Norwood and Pratten).

Spiriferina spinosa Norwood and Pratten, Jour. Acad. Nat. Sci. Philadelphia, 2d ser., III, 1856, p. 71, pl. 9, fig. 1.—Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 706, pl. 27, fig. 5.
Spiriferina spinosa† Derby, Bull. Cornell Univ., I, 1874, p. 23, pl. 6, figs. 8, 13, 14.
†Spiriferina spinosa Herrick, Bull. Geol. Soc. America, II, 1891, p. 46, pl. 1, fig. 19.

Loc. Kaskaskia, Alton, and Chester, Illinois; Bloomington, Indiana; Crittenden County, Kentucky; Itaituba, Brazil.

Spiriferina spinosa campestris White=Spiriferina octropicata.

Spiriferina subelliptica (McChesney).

Spiriferina subelliptica Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 54, pl. 35, figs. 21, 22.

Loc. Buttonmould Knob, Kentucky; New Providence, Indiana.

Spiriferina subtexta White.


Loc. Burlington, Iowa.

Spiriferina transversa (McChesney).

Spiriferina transversa (McChesney)—Continued.
Spiriferina transversa Derby, Bull. Cornell Univ., I, 1874, p. 21, pl. 2, figs. 4, 5, 6, 13; pl. 13, figs. 12-14, 17; pl. 5, fig. 4.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pp. 46, 61, pl. 35, figs. 19, 20, 23-25.
Loc. Buzzards Roost, Alabama; Litchfield, Kentucky; Bomjardim and Itaituba, Brazil.

Spirigerella d’Orbigny = Athyris.
Spirigerella eborea A. Winchell = Athyris fultonensis.
Spirigerella planosulcata White (non Phillips) = Cleiothyris crassicardinalis.

SPIRIGERELLA Waagen. Genotype S. derbyi Waagen.

Spirigerella derbyi Waagen. Upper Carboniferous.
Athyris subtilita (partim) Derby, Bull. Cornell Univ., I, 1874, p. 7, pl. 1, fig. 7 (not the other figures).
Spirigerella derbyi Waagen, Palaeontologica Indica, Ser. XIII, I, 1883, p. 453, pl. 35, figs. 4-7, 9-13; pl. 37, figs. 11-13.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 99, fig. 73.
Loc. Bomjardim and Itaituba, Brazil.

Stenochisma Ėhlert (non Conrad or Hall) = Camarophoria.

STENOCHEISMA Conrad. Genotype Terebratulites schlotheimii Conrad (non von Buch) = Rhynchonella formosa Hall.
Obs. The above synonymy is retained for historical purposes. The only species left in the genus by Hall and Clarke is the type species, Rhynchonella formosa, which seems to be nothing more than a Rhynchotrema. This will leave Stenocisma without a species. This name, however, should not displace either Rhynchotrema or Camarotcechia, since it was not defined, and in addition to this was founded by Conrad upon an erroneous identification. Nor can the view of Ėhlert be adopted, i. e., that Stenochisma should displace Camarophoria King, because Conrad gave as the type C. schlotheimii. This name did not apply to von Buch's species, but to the shell now known as Rhynchonella formosa Hall.

All the species formerly referred to Stenochisma will be found under Camarotcechia except R. formosa, which is referred to Rhynchotrema.

Stenocisma Hall, 1857 (non Conrad, 1839, Hall, 1867) = Zygospira.

STREPTIS Davidson.
Genotype Terebratula grayi Davidson.

Streptis grayi Davidson. Niagara (Sil.).
Streptis grayi Davidson—Continued.


Loc. England; Batesville, Arkansas.

Streptis waldronensis Beecher and Clarke = Mimulus waldronensis.

STREPTORHYNCHUS King.

Genotype Terebratulites pelargonatus Schlotheim.


Streptorhynchus approximatus Hall = Orthothetes inaequalis.

Streptorhynchus agassizii Rathbun = Orthothetes agassizii.

Streptorhynchus approximatus James = Strophomena approximata.

Streptorhynchus arctostriata Walcott = Orthothetes chemungensis arctostriata.

Streptorhynchus biloba Hall = Derby a biloba.

Streptorhynchus cardinale Whitfield = Strophomena cardinalis.

Streptorhynchus chemungensis Hall = Orthothetes chemungensis.

Streptorhynchus coreanus Derby = Derby a coreana.

Streptorhynchus crenistria Keyes (non Phillips) = Derby a crassa.

Streptorhynchus crenistrius American authors = Orthothetes crenistria.

Streptorhynchus elongatus James = Strophomena rugosa.

Streptorhynchus filitextus Hall = Strophomena incurvata.

Streptorhynchus filabellum Whitfield = Orthothetes filabellum.

Streptorhynchus hallianus Derby.

Upper Carboniferous.

Streptorhynchus hallianus Derby, Bull. Cornell Univ., I, 1874, p. 35, pl. 5, figs. 1, 2, 5, 8, 12, 14, 16, 18; pl. 8, fig. 3.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 268, pl. 11, figs. 6-17.

Loc. Bomjardim and Itaituba, Brazil.

Streptorhynchus hallianum Miller = Strophomena halli.

Streptorhynchus hemiaster Winchell and Marcy = Orthothetes subplanus.

Streptorhynchus hydraulicum Whitfield = Orthothetes hydraulicus.

Streptorhynchus inaequalis Winchell = Orthothetes inaequalis.

Streptorhynchus inflatus White and Whitfield = Orthothetes inflatus.

Streptorhynchus lens White = Orthothetes lens.

Streptorhynchus minor Walcott = Strophomena minor.

Streptorhynchus (?) multistriata (Meek and Hayden).

Upper Carboniferous.


Orthisina multistriata Meek and Hayden, Ibidem, 1859, at end of description.

Loc. Fort Riley, Kansas.

Streptorhynchus neglectus James = Strophomena neglecta.

Streptorhynchus occidentalis Newberry = Meekella occidentalis.
Streptorhynchus pandora Billings = Orthothetes pandora.
Streptorhynchus perversus = Orthothetes chemungensis perversus.
Streptorhynchus planoconvexus Hall = Strophomena planiconvexa.
Streptorhynchus planumbonns Hall = Strophomena rugosa.
Streptorhynchus primordiale Whitfield = Billingsella primordialis.
Streptorhynchus pyramidalis Newberry = Meekella pyramidalis.
Streptorhynchus robusta Hall = Derbya robusta.
Streptorhynchus subplanus Hall = Orthothetes subplanus.
Streptorhynchus subsulcatum Sardeson = Strophomena scofieldi.
Streptorhynchus subtenta Hall, 1883 = Strophomena trentonensis.
Streptorhynchus tapajotensis Derby = Orthothetes tapajotensis.
Streptorhynchus tennis Hall = Orthothetes tennis.

Streptorhynchus ulrichi Hall and Clarke. Kaskaskia (L. Carb.).
Streptorhynchus ulrichi Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 268, 351, pl. 11B, fig. 15.
Loc. Crittenden County, Kentucky.

Streptorhynchus umbraculura Winchell = Orthothetes umbraculum.
Streptorhynchus vetusta James = Strophomena vetusta.
Streptorhynchus woolworthianus Hall = Orthothetes woolworthianus.
Stricklandia Billings = Stricklandinia.
Stricklandia arachne Billings = Syntrophia arachne.
Stricklandia arethusa Billings = Syntrophia arethusa.

**STRICKLANDINIA** Billings. Genotype Stricklandia gaspensis Bill.

**Stricklandinia anticostiensis** Billings. Anticosti (Sil.).
Stricklandinia anticostiensis Billings, Canadian Nat. and Geol., VIII, 1863, p. 370.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 251, pl. 73, figs. 12–14.
Loc. Anticosti.

**Stricklandinia billingsiana** Dawson. Arisaig (Sil.).
Stricklandinia billingsiana Dawson, Canadian Nat. and Geol., 2d ser., IX, 1880, p. 341.

**Stricklandinia brevis** Billings. Anticosti (Sil.).
†Spirifer species? Hall, Pal. New York, II, 1852, p. 66, pl. 22, fig. 3.
Stricklandinia brevis Billings, Canadian Nat. and Geol., IV, 1859, p. 135.
Stricklandinia brevis Billings, Pal. Fossils, II, 1874, p. 84, pl. 6, fig. 2.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 251.
Loc. Anticosti; †Sodus, Wayne County, New York.
Stricklandinia canadensis Billings. Clinton (Sil.).
Stricklandinia canadensis Billings, Canadian Nat. and Geol., IV, 1859, p. 135.
Stricklandinia canadensis Billings, Pal. Fossils, II, 1874, p. 81.—Hall and Clarke,
Loc. Near Thorold, Ontario.

Stricklandinia castellana White.
Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 251, pl. 73, figs. 3-7.
Loc. Castle Grove, Jones County, Iowa.

Stricklandinia chapmani Hall and Clarke.
83, fig. 40.

Stricklandinia davidsoni Billings. Anticosti (Sil.).
Stricklandinia davidsoni Billings, Geol. Mag., V, 1868, p. 59, pl. 4, figs. 1-1d;—
Pal. Fossils, II, 1874, p. 86, pl. 6, fig. 1.—White, Proc. U. S. Nat. Mus., III,
1880, p. 48.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 251, pl. 73,
fig. 15.
Loc. Anticosti; eastern Canada; Ringgold, Catoosa County, Georgia.

Stricklandinia elongata Billings=Amphigenia elongata.
Stricklandinia elongata curta Meek and Worthen=Amphigenia curta.

Stricklandinia gaspiensis Billings. Gaspé (Sil.).
Stricklandinia gaspiensis Billings, Canadian Nat. and Geol., IV, 1859, p. 134.
Stricklandinia gaspiensis Billings, Pal. Fossils, II, 1874, p. 83, fig. 49;—Hall and
Clarke, Pal. New York, VIII, Pt. II, 1893, p. 251, pl. 73, fig. 11.
Loc. Bay of Chaleurs, Canada.

Stricklandinia lens (Sowerby).
Atrypa lens Sowerby, Murchison's Silurian System, 1839, pl. 21, fig. 3.
Stricklandinia lens Billings, Catalogue Sil. Foss. Anticosti, 1866, p. 45.—Foerste,
Loc. England; Anticosti; Collinsville, Alabama.

Stricklandinia lirata (Sowerby). Silurian.
Spirifer liratus Sowerby, Murchison's Silurian System, 1839, pl. 22, fig. 6.
Stricklandinia lirata Davidson, Mon. British Sil. Brach., Pal. Soc., 1867, p. 159,
pl. 20, figs. 1-13.—Billings, Cat. Sil. Foss. Anticosti, 1866, p. 45.
Loc. Europe; Anticosti.

Stricklandinia (?) louisvillensis Nettelroth.
Stricklandinia louisvillensis Nettelroth, Kentucky Fossil Shells, Mem. Kentucky
Geol. Survey, 1889, p. 65, pl. 34, figs. 31-34.
Loc. East of Louisville, Kentucky.

Stricklandinia melissa Billings. Anticosti (Sil.).
Stricklandinia melissa Billings, Pal. Fossils, II, 1874, p. 89, pl. 7, fig. 4.—Hall
Loc. Anticosti.
Obs. Probably the same as S. deformis.
Stricklandinia multilirata Whitfield. Guelph (Sil.).
Loc. Sheboygan, Wisconsin.

Stricklandinia salteri Billings. Anticosti (Sil.).
Loc. Anticosti; Ringgold, Catoosa County, Georgia.

Stricklandinia (?) subquadrata Herrick. Upper Carboniferous.
Loc. Flint ridge, near Newark, Ohio.
Obs. Probably a terebratuloid.

Stricklandinia triplesiana Foerste. Clinton (Sil.).
Loc. Dayton, Ohio.

STRINGOCHEPHALUS Defrance. Genotype S. burtini Defrance.
Styrgeocephalus Defrance, Dict. Sci. Nat., LI, 1827, p. 102, pl. 75, fig. 1.

STRINGOCHEPHALUS burtoni Defrance. Middle Devonian.
Styrgeocephalus burtoni Defrance, Dict. Sci. Nat., LI, 1827, p. 102, pl. 75, fig. 1.
Loc. Europe; Lakes Manitoba and Winnipegosis and the “Ramparts,” Mackenzie River, British America. Two loose specimens have been found near Devonian rocks in southern Minnesota.

STROPHALOSIA King. Genotype Orthis excavata Geinitz.

Strophalosia beecheri Rowley. Kinderhook (L. Carb.).
Strophalosia beecheri Rowley, American Geologist, XII, 1893, p. 308, pl. 14, figs. 18, 19.
Loc. Louisiana, Missouri.

Strophalosia cornelliana Derby. Upper Carboniferous.
Strophalosia cornelliana Derby, Bull. Cornell Univ., I, 1874, p. 45, pl. 3, figs. 28, 30, 32, 33, 35–38; pl. 4, fig. 5; pl. 8, fig. 17; pl. 9, figs. 10, 11.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 15B, figs. 36, 37.
Loc. Bonjardim, Brasil.

Strophalosia cymbula Hall and Clarke. Keokuk (L. Carb.).
Loc. Near Louisville and Lebanon, Kentucky.
Bull. 87—27
Strophalosia (?) guadalupensis (Shumard). Upper Carboniferous.
Anolesteges guadalupensis Shumard, Trans. St. Louis Acad. Sci., I, 1858, p. 292, pl. 11, fig. 5; p. 390.
Loc. Guadalupe Mountains, New Mexico and Texas.

Strophalosia horrescens Geinitz (non Murchison, de Verneuil, and Keyserling)=Productus nebraskaensis.

Strophalosia hystricula Hall. Chemung (Dev.).
Strophalosia hystricula Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 316, pl. 15B, fig. 31; pl. 17, figs. 29, 30.
Loc. Forestville, Conewango, and East Randolph, New York.

Strophalosia keokuk Beecher. Keokuk (L. Carb.).
Loc. Keokuk, Iowa.

Strophalosia muricata (Hall). Chemung (Dev.).
Chonetes nmricata Hall, Pal. New York, IV, 1867, p. 143, pl. 22, figs. 29-43.
Chonetes (Productella?) muricata Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 47, figs. 12, 16, 30, 38, 42.
Strophalosia muricata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 316, pl. 16, figs. 12, 16, 30, 38, 42.

Strophalosia nummulina A. Winchell. Kinderhook (L. Carb.).
Loc. Burlington, Iowa.

Strophalosia radicans (A. Winchell). Hamilton (Dev.).
Loc. Grand Traverse region, Michigan.

Strophalosia rockfordensis Hall and Clarke. Upper Devonian.
Strophalosia rockfordensis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pp. 316, 353, pl. 17A, figs. 1-3; Pt. II, 1895, pl. 84, figs. 20-22.
Loc. Rockford, Iowa.

Strophalosia scintilla Beecher. Chouteau (L. Carb.).
Loc. Pike County, Missouri.

Strophalosia spondyloformis (White and St. John). Upper Carboniferous.
Strophalosia spondyliformis (White and St. John)—Continued.


Loc. Appanoose and Pottawattamie counties, Iowa.

Strophalosia truncata (Hall). Hamilton, Portage, and Ithaca (Dev.).

Strophomena pastulosa Hall (non Productus pastulosus Phillips), Geol. N. Y.; Rep. Fourth Dist., 1843, p. 189, fig. 4.


Productus (P.) truncatus Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 131, pl. 14, fig. 2.

Productella (Strophalosia?) truncata Whiteaves, Cont. Canadian Pal., I, 1889, p. 112, pl. 16, figs. 1, 2.


Loc. New York; Thedford, Ontario; Eureka district, Nevada.

STROPHODONTA Hall. Genotype Strophomena demissa Conrad.


Strophodonta acanthoptera (Whiteaves). Upper Silurian.

Strophomena acanthoptera Whiteaves, Canadian Rec. Sci., 1891, p. 294, pl. 3, figs. 1, 2.

Loc. District of Saskatchewan and Lake Winnipegosis, Canada.

Strophodonta alveata Hall. Upper Helderberg (Dev.).


Loc. Albany County, New York.

Strophodonta arcuata Hall. Chemung (Dev.).


Loc. Rockford, Iowa; Naples, New York; Eureka district, Nevada; Lake Winnipegosis, Canada.

Strophodonta beckii Hall. Lower Helderberg (Dev.).


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Stropheodonta bekei Hall—Continued.

Loc. Albany and Schenectady counties, New York; Kennedy Channel, Arctic region.

Stropheodonta blainvillei (Billings).
Stropheodonta (Leptostrophia) blainvillei Billings, Pal. Fossils, II, 1874, p. 28, pl. 2, fig. 1; pl. 3, fig. 1.

Loc. Gaspé, Canada.

Obs. Compare with S. perplana.

Stropheodonta callawayensis Swallow.

Loc. Callaway County, Missouri.

Obs. See S. navalis.

Stropheodonta callosa Hall.
Stropheodonta callosa Hall, Sixteenth Rep. N. Y. State Cab. Nat. Hist., 1863, p. 36;—Pal. New York, IV, 1867, p. 82, pl. 11, figs. 4-10; pl. 12, figs. 8, 9.

Chonetes (Stropheodonta?) callosa Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 47, fig. 37.

Stropheodonta callosa Hall and Clarke, VIII, Pt. I, 1892, pl. 16, fig. 37.

Loc. Albany County, New York.

Stropheodonta calvini Miller.


Loc. Rockford and Independence, Iowa; Eureka district, Nevada.

Stropheodonta canace Hall and Whitfield.

Loc. Rockford, Iowa; White Pine district, Nevada; Naples, New York.

Stropheodonta cincta A. Winchell.

Loc. Grand Traverse region, Michigan.

Obs. Insufficiently defined to be recognized.

Stropheodonta concava Hall.


Loc. New York, from Cayuga Lake westward to Lake Erie.

Stropheodonta corrugata (Conrad).
INDEX AND BIBLIOGRAPHY.

Stropheodonta corrugata (Conrad)—Continued.

Leptotena corrugata Hall, Pal. New York, II, 1852, p. 59, pl. 21, figs. 2a–2c.
Stropheodonta corrugata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 15, fig. 1; Pt. II, 1895, pl. 84, fig. 14.
Loc. Rochester, Wolcott, etc., New York; Cumberland Gap, Tennessee.

Stropheodonta (?) corrugata pleuristriata (Foerste.) Clinton (Sil.).

Leptotena corrugata (partim) Hall, Pal. New York, II, 1852, p. 59, pl. 21, figs. 2d, 2e.


Stropheodonta (?) costata Owen. Hamilton (Dev.).

Strophodonta (?) costata Owen, Geol. Survey Wisconsin, Iowa, and Minnesota, 1852, p. 585, pl. 3A, fig. 5; pl. 3, figs. 11, 11a.
Loc. Davenport, Iowa.

Stropheodonta crebristiata Hall. Upper Helderberg (Dev.).

Loc. Albany and Schoharie counties, New York.

Stropheodonta demissa (Conrad). Middle and Upper Devonian.


Stropheodonta demissa Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 14, figs. 7–12.

Loc. New York; Pennsylvania; Ohio; Indiana; Kentucky; Illinois; Iowa; Wisconsin; Ontario; Mackenzie and Athabasca rivers, Canada; Eureka district, Nevada.

Stropheodonta demissa imitata Winchell. Hamilton (Dev.).

Loc. Grand Traverse region, Michigan.
SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.  

Stropheodonta erratica A. Winchell.  
Hamilton (Dev.).  
Stropheodonta erratica and varieties solidicosta and fissicosta A. Winchell, Rep.  
Lower Peninsula Michigan, 1866, p. 93.  
Loc. Grand Traverse region, Michigan.  
Obs. This species may prove to be only a local variation of S. costata Owen.

Stropheodonta feildeni Etheridge.  
Lower Devonian.  
Loc. Cape Hilgard, lat. 79° 41'.  
Obs. This species may prove to be only a local variation of S. magnifica of the Oriskany sandstone the horizon is probably Lower Devonian.

Stropheodonta galatea (Billings).  
Lower Devonian.  
Strophomena galatea Billings, Pal. Fossils, II, 1874, p. 20, fig. 9.  
Loc. Indian Cove, Gaspé, Canada.

Stropheodonta (?) geniculata (Shaler).  
Anticosti (Sil.).  
Loc. Near Southwest Point, Anticosti.

Stropheodonta (?) gilpeni (Dawson).  
Upper Arisaig (Sil.).  
Loc. Nova Scotia, Canada.

Stropheodonta hemispherica Hall.  
Upper Helderberg (Dev.).  
Strophomena (Stropheodonta) hemispherica Hall, Tenth Rep. N. Y. State Cab.  
Loc. New York; Ohio; Indiana; Kentucky; Ontario.

Stropheodonta inequiradiata Hall.  
Upper Helderberg (Dev.).  
Strophomena (Stropheodonta) inequiradiata Hall, Tenth Rep. N. Y. State Cab.  
Nat. Hist., 1857, p. 113, figs. 1-3.  
Strophomena inequiriacta Billings, Canadian Jour. Sci. Arts, VI, 1861, p. 338,  
fig. 113;—Geol. Canada, 1863, p. 367, fig. 375;—Pal. Fossils, II, 1874, p. 24, fig. 13;  
pl. 2, fig. 4; p. 240.  
Strophodonta inequiradiata Hall, Pal. New York, IV, 1867, p. 87, pl. 11, figs. 24-31;  
pl. 12, fig. 12; pl. 13, figs. 6-11;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 45,  
figs. 13, 14.—Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 120, pl. 11, fig. 11.  
Stropheodonta inequiradiata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892,  
pl. 14, figs. 13, 14.  
Loc. Albany and Schoharie counties, New York; Columbus, Ohio; Eureka district, Nevada; Gaspé Bay, Canada.

Stropheodonta inequiiactia (Conrad).  
Corniferous to Hamilton (Dev.).  
p. 254, pl. 14, fig. 2.—Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 200, fig. 4.—  
Billings, Canadian Jour. Sci. Arts, VI, 1861, p. 338, figs. 113, 114;—Geol. Can­  
da, 1863, p. 367, fig. 375.  
Strophomena (Stropheodonta) inequiradiata Hall, Tenth Rep. N. Y. State Cab.  
Stropheodonta inequiradiata Hall, Pal. New York, IV, 1867, p. 93, pl. 12, figs. 6-8;  
p. 106, pl. 18, fig. 2;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 45, figs. 1-6.—  
145, pl. 17, figs. 10, 11.
Stropheodonta inaequirostrata (Conrad)—Continued.
Stropheodonta (Douvillina) inaequirostrata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 289, pl. 14, figs. 1-6; pl. 15B, fig. 9.
Loc. Caledonia, Moscow, Darien, etc., New York; Ontario, Canada; Milwaukee, Wisconsin; Falls of Ohio.

Stropheodonta indenta (Conrad).
Stropheodonta indenta Miller, American Pal. Fossils, 1877, p. 135.
Loc. "Helderberg Mountains," New York; Square Lake, Maine; Gaspe, Canada.

Stropheodonta interstrialis (Phillips).
Stropheodonta interstrialis Whiteaves, Cont. Canadian Pal., I, 1892, p. 286, pl. 37, fig. 6.
Loc. Europe; Lake Winnipegosis, Canada.

Stropheodonta interstrialis (Vanuxem).
Strophomena interstrialis Vanuxem (non Phillips), Geol. N. Y.; Rep. Third Dist. 1842, p. 174, fig. 1.
Stropheodonta mucronata Hall, Pal. New York, IV, 1867, p. 111, pl. 15, figs. 13, 14.
Obs. My attention was directed to the above synonymy by Professor Williams and as well that of S. mucronata Conrad (non Hall).

Stropheodonta iowaensis Owen.
Stropheodonta iowaensis Owen, Geol. Survey Wisconsin, Iowa, and Minnesota, 1852, p. 585.
Loc. Pine Creek, near Rockford, Iowa.

Stropheodonta irene (Billings).
Strophomena irene Billings, Pal. Fossils, II, 1874, p. 27, pl. 2, fig. 5.
Loc. Grand Greve, Gaspe Bay, Canada.

Stropheodonta junia Hall.
Stropheodonta (Leptostrophia) junia Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 288, pl. 15, fig. 16.
Loc. York, Moscow, Darien, etc., New York.

Stropheodonta kemperi Swallow.
Loc. Callaway County, Missouri.

Stropheodonta(? ) leda (Billings).
Strophomena leda Billings, Canadian Nat. and Geol., V, 1860, p. 55, figs. 2, 3;—Pal. Fossils, I, 1862, p. 120, figs. 98, 99;—Geol. Canada, 1863, p. 311, fig. 316.
Loc. East Point, Anticosti, Lake Winnipeg, Manitoba.
Stropheodonta lincklæni Hall.


Loc. Albany and Schoharie counties, New York.

Stropheodonta macra (Winchell and Marcy).


Stropheodonta macrostriata (Walcott).


Loc. Eureka district, Nevada.

Obs. The type material proves it to be a Stropheodonta.

Stropheodonta magnifica Hall.

Stropheodonta magnifica Hall, Tenth Rep. N. Y. State Cab. Nat. Hist., 1857, p. 54;—Pal. New York, III, 1859, pp. 414, 482, pl. 93, fig. 4; pl. 94, fig. 2; pl. 95, fig. 8; pl. 95A, figs. 15-19;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 44, figs. 27, 28.


Loc. Albany and Schoharie counties, New York; Cumberland, Maryland; county of Haldimand, Ontario, Canada.

Stropheodonta magniventer Hall.


Loc. Albany and Schoharie counties, New York; Cayuga, Ontario, and Gaspé Bay, Canada.

Stropheodonta mucronata (Conrad).


Strophomena interstrialis Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 266, fig. 5.


Stropheodonta (Douvillina) cayuta Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 289, pl. 15, figs. 18, 19; pl. 15B, figs. 7, 8; Pt. II, 1895, pl. 84, fig. 13.

Loc. Steuben County, New York.

Obs. See S. interstrialis.

Stropheodonta navalis Swallow.


Strophodonta cymbiformis Keyes, Geol. Survey Missouri, V, 1895, p. 74.

Loc. Callaway County, Missouri.

Obs. The ten species of Stropheodonta described in this transaction by Swallow are all from one locality and appear to be nothing more than peculiar variations of S. demissa Conrad. No other locality is known where a species
Stropheodonta navalis Swallow—Continued.

of Brachiopoda has taken on as many variations as has S. demissa in the vicinity of Fulton, Missouri. Mr. D. K. Greger has furnished the writer over one hundred examples of this species and no two are exactly alike. Swal­low’s ten species are here reduced to three and one variety: S. navalis and var. boonensis, S. kemperi, and S. callawayensis.

Keyes (Geol. Survey Missouri, V, 1895) regards S. navalis, callawayensis, quadrata, and equicostata as synonyms for S. demissa, while S. cymbiformis, subcymbiformis, kemperi, inflexa, and boonensis are regarded by him as but one species, S. cymbiformis. S. altidorsata is regarded as “insufficiently described.”

Stropheodonta navalis boonensis Swallow.

Hamilton (Dev.).
Loc. Callaway County, Missouri.

Stropheodonta nearpassi Barrett.
Lepttena—Hall, Pal. New York, II, 1852, pl. 74, fig. 3.

Stropheodonta parva Owen.

Hamilton (Dev.).
Stropheodonta parva Owen, Geol. Survey Wisconsin, Iowa, and Minnesota, 1852, p. 584, pl. 3A, fig. 9.
Loc. New Buffalo, Iowa.
Obs. This may prove to be young S. demissa.

Stropheodonta parva Hall.

Upper Helderberg (Dev.).
Loc. Albany and Schoharie counties, New York.

Stropheodonta patersoni Hall.

Oriskany to Corniferous (Dev.).
Stropheodonta patersoni Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 14, fig. 15.
Loc. Schoharie, Stafford, Williamsville, etc., New York; Columbus, Ohio; Bake­oven, Illinois; Eureka district, Nevada; county of Halidmand, Ontario, Canada.

Stropheodonta perplana (Conrad). Upper Helderberg-Chemung (Dev.).
Strophomena crenistria Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 171, fig. 4.
Stropheodonta perplana (Conrad)—Continued.


Stropheodonta (Stropheodonta) fragilis Hall, Ibidem, 1857, p. 143.

Stropheodonta fragilis Hall, Geol. Iowa, I, Pt. II, 1858, p. 496, pl. 3, fig. 6.


Loc. New York; Pennsylvania; Maryland; Ohio; Indiana; Kentucky; Illinois; Iowa; Wisconsin; Eureka district, Nevada; Square Lake, Maine; Ontario and Peace River, Canada; Rio Maucuru and Rio Curua, Province of Para, Brazil.

Stropheodonta perplana nervosa Hall. Portage and Chemung (Dev.).

Stropheodonta nervosa Hall, Geol. N. Y.; Rep. Fourth Dist., 1843, p. 266, fig. 1.


Loc. Ithaca, Bath, Campbelltown, etc., New York.

Stropheodonta perplana tulliensis Williams. Tully (Dev.).


Stropheodonta planulata Hall. Lower Helderberg (Dev.).

Stropheodonta planulata Hall, Pal. New York, III, 1859, p. 184, pl. 16, figs. 9-12.


Stropheodonta plicata Hall. Hamilton (Dev.).


Loc. Iowa City and Independence, Iowa; Thedford, Ontario; Falls of Ohio.

Stropheodonta prisca Hall. Clinton (Sil.).

Stropheodonta prisca Hall, Pal. New York, II, 1852, p. 63, pl. 21, fig. 9.

Loc. Kirkland, Oneida County, New York.

Stropheodonta profunda Hall. Clinton and Niagara (Sil.).

Leptena profunda Hall, Pal. New York, II, 1852, p. 61, pl. 21, figs. 4, 5.


Stropheodonta profunda Hall—Continued.
Stropheodonta (Brachyprion) profunda Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 13, figs. 1–5 († 19, 20); pl. 20, figs. 29–31; Pt. II, 1895, pl. 84, fig. 12.
Loc. Lockport, New York; Waldron, Indiana; Bridgeport, Illinois; Racine, Wisconsin; Louisville, Kentucky.

Stropheodonta textilis Hall.
Stropheodonta textilis Hall, Pal. New York, II, 1852, p. 327, pl. 74, fig. 6.

Stropheodonta tullia (Billings).
Strophomena tullia Billings, Pal. Fossils, II, 1874, p. 29, pl. 2, fig. 6.
Loc. Mount Joli and Split Rock, Percé, Canada.

Stropheodonta variabilis Calvin.

Stropheodonta varistriata (Conrad).
Strophomena impressa Conrad, Ibidem, 1842, p. 255.
Stropheodonta varistriata Hall, Pal. New York, III, 1859, p. 180, pl. 8, figs. 1–16; pl. 16, figs. 1–8;—Second Ann. Rep. N. Y. State Geol., 1883, pl. 44, figs. 6–16 († figs. 21, 22).
Stropheodonta (Brachyprion) varistriata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 13, figs. 6–16, 21, 22.
Loc. Albany and Schoharie counties, New York; Dalhousie, New Brunswick, and Gaspé, Canada.

Stropheodonta varistriata arata Hall.
Stropheodonta varistriata var. arata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 13, figs. 17, 18.
Loc. Hudson and Albany counties, New York; Arisaig, Nova Scotia (Ami).

Stropheodonta vasculaaria Hall.
Stropheodonta vascularia Hall, Pal. New York, III, 1859, p. 412, pl. 92, fig. 4; pl. 95, fig. 10 († pl. 93, fig. 2).
Loc. Albany County, New York.

Stropheodonta (?) ventricosa (Shaler).
Loc. Southwest Point, Anticosti.

Stropheodonta aquicostata Swallow=S. callawayensis.
Stropheodonta altidorsata Swallow=S. navalis.
Stropheodonta ampla Hall=Strophonella ampla.
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Strophodonta boonensis Swallow = S. navalis boonensis.
Strophodonta cælata Hall = Strophonella cælata.
Strophodonta cavumbona Hall = Strophonella cavumbona.
Strophodonta cayuta Hall = Strophodonta mucronata.
Strophodonta cymbiformis Swallow = S. navalis.
Strophodonta exîlis Calvin = Strophodonta calvini.
Strophodonta fragilis Hall = S. periplana.
Strophodonta geniculata Hall = Strophonella geniculata.
Strophodonta headleyana Hall = Strophonella headleyana.
Strophodonta hybrida Hall and Whitfield = Strophonella reversa.
Strophodonta imitata A. Winchell = S. demissa imitata.
Strophodonta inflexa Swallow = S. navalis boonensis.
Strophodonta intermedia Hall = Hipparionyx proximus.
Strophodonta leavenworthana Hall = Strophonella leavenworthana.
Strophodonta mucronata Hall = S. interstrialis.
Strophodonta naecraa Hall = Pholidostrophia iowaensis.
Strophodonta punctulifera Hall = Strophonella punctulifera.
Strophodonta quadrata Swallow = S. callawayensis.
Strophodonta quadrata Calvin (non Swallow) = S. calvini.
Strophodonta reversa Hall = Strophonella reversa.
Strophodonta striata Hall = Strophonella striata.
Strophodonta subcymbiformis Swallow = S. navalis.
Strophodonta subdemiissa Hall = S. demissa.
Strophodonta textilis Hall, 1857 (not 1852) = S. junia.

STROPHOMENA (Rafinesque) Blainville. Genotype S. rugosa Blainv.


Obs. This genus is characteristic of the Ordovician, and probably does not extend into the Silurian, where Orthothetes replaces Strophomena. A number of Silurian species are still left under Strophomena since their generic characters are unknown.

Strophomena acanthoptera Whiteaves = Stropheodonta acanthoptera.
Strophomena acutiradiata Hall = Chonetes acutiradiatus.
Strophomena alternata Emmons = Rafinesquina alternata.
Strophomena alternata fracta Meek = Rafinesquina alternata fracta.
Strophomena alternata loxorhytis Meek = Rafinesquina alternata loxorhytis.
Strophomena alternistriata Hall = Rafinesquina alternata alternistriata.
Strophomena (?) alterniradiata Shaler. Anticosti (Sil.).
Loc. Southwest Point, Anticosti.

Strophomena ampla Hall = Strophonella ampla.
Strophomena anologa Davidson, 1863 = Leptaea rhomboidalis.
Strophomena angulata Owen = Rafinesquina alternata.
Strophomena anticostiensis Shaler = Rafinesquina alternata.

Strophomena (?) antiquata Sowerby. Anticosti (Sil.).
Loc. Europe; Anticosti; forks of the Chatts River, Gaspé.
Obs. This identification is doubtful.

Strophomena approximata (James). Lorraine (Ord.).
Streptorhynchus approximata James, The Paleontologist, 5, 1881, p. 43; 2, 1878, p. 15.
Loc. Dearborn County, Indiana.
Obs. Not defined so as to be recognizable.

Strophomena arctostriata Hall = Orthothetes chemungensis arctostriatus.

Strophomena (?) arcuata Shaler. Anticosti (Sil.).
Loc. Ellis Bay, Anticosti.

Strophomena (?) arethusa Billings. Lorraine (Ord.).
Loc. Observation Cape, Anticosti.

Strophomena atava Matthew = Rafinesquina atava.
Strophomena aurora Billings = Rafinesquina aurora.
Strophomena bifurcata Hall = Orthothetes chemungensis.

Strophomena billingsi Winchell and Schuchert. Trenton (Ord.).
Strophomena recta Billings (non Conrad), Pal. Fossils, I, 1862, p. 130, fig. 108.
Loc. Ottawa, Canada; St. Paul, Cannon Falls, and Fountain, Minnesota; East Selkirk, Manitoba.

Strophomena (?) bipartita Hall. Coralline (Sil.).
Leptaea bipartita Hall, Pal. New York, II, 1852, p. 326, pl. 74, figs. 4, 5.

Strophomena blainvillii Billings = Stropheodonta blainvillei.
Strophomena camerata Conrad = Rafinesquina deltoidea.

Strophomena cardinalis (Whitfield). Lorraine (Ord.).
Streptorhynchus cardinalis Whitfield, Geol. Wisconsin, IV, 1882, p. 261, pl. 12, figs. 9, 10.
Loc. Delafield, Wisconsin.

Strophomena carinata Conrad, 1838 = Tropidooleptus carinatus.
Strophomena carinata Conrad, 1842 (non 1838) = Chonetes coronatus.
Strophomena ceras Billings = Rafinesquina ceras.
Strophomena chemungensis Conrad = Orthothetes chemungensis.
Strophomena concava Hall = Stropheodonta concava.
Strophomena conradi Hall (1859) = Strophonella conradi.

**Strophomena conradi** Hall and Clarke.  
Trenton (Ord.).
Strophomena conradi Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 344,  
pl. 9A, fig. 3; pl. 20, figs. 32, 33.

Strophomena convexa Owen = S. incurvata.
Strophomena cornuta Hall = Chonetes cornutus.
Strophomena corrugata Conrad = Stropheodonta corrugata.
Strophomena crebristriata Conrad = Stropheodonta crebristriata.
Strophomena crenistria Hall = Stropheodonta perplana.

**Strophomena (?) declivis** James.  
Lorraine (Ord.).
Loc. Boyds Station, Kentucky.

Strophomena deflecta Conrad = D. deflecta.
Strophomena delthyris Conrad = Stropheodonta perplana.
Strophomena deltoidea Conrad = Rafinesquina deltoidea and R. minnesotaensis.
Strophomena demissa Conrad = Stropheodonta demissa.
Strophomena depressa Vanuxem = Leptæna rhomboidalis.
Strophomena depressa ventricosa Hall = Leptæna rhomboidalis ventricosa.

**Strophomena (?) doneti** Salter.  
Silurian.
Strophomena doneti Salter, Jour. of a Voyage in Baffins Bay and Barrow Straits,  
1852.
Loc. Wellington Channel.

Strophomena elegantula Hall = Plectambonites transversalis.

**Strophomena (?) elliptica** Conrad.  
Niagara (Sil.).

**Strophomena (?) elongata** Conrad.  
Lower Helderberg (Dev.).
p. 259.

**Strophomena emaciata** Winchell and Schuchert.  
Trenton (Ord.).
Strophomena emaciata W. and S., American Geol., IX, 1892, p. 287; — Minnesota  
Loc. Near Cannon Falls, Minnesota.

Strophomena euglyphya Conrad, and Roemer = Strophonella punctulifera.
Strophomena fasciata Hall = Rafinesquina fasciata.
Strophomena filitexta Meek, White, and Hall = S. neglecta or S. incurvata.

**Strophomenes flexilis** Rafinesque.  
"Limestone of Ohio."
Same paper as for S. levigata, 1831, p. 4.
Obs. Not defined so as to be recognizable.
Strophomena fluctuosa Billings.


Loc. Charlevoix Point, Anticosti; Spring Valley, etc., Minnesota.

Strophomena fontinalis White = Dinorthis fontinalis.

Strophomena fragilis Hall = Stropheodonta perplana.

Strophomena galatea Billings = Stropheodonta galatea.

Strophomena gibbosa James = Leptena rhomboidalis.

Strophomena (?) gibbosa Conrad.


Loc. Helderberg Mountains, New York.

Strophomena gigaseni Dawson = Stropheodonta gigaseni.

Strophomena hallie Miller = Stropheodonta hallie.

Strophomena hallie Sarsden = Leptena charlotte.

Strophomena hallie Miller, Utica (Ord.).


Loc. Cincinnati, Ohio.

Strophomena hanoverensis Foerste = Strophonella striata.

Strophomena hecuba Billings.


Loc. Anticosti.

Strophomena hemispheriea Hall = Stropheodonta hemispherica.

Strophomena (?) imbecilis Billings = Calculiferous (Ord.).


Loc. Near Portland Creek, Newfoundland.

Strophomena imbrex Billings = Rafinesquina imbrex.

Strophomena impressa Conrad = Stropheodonta varistriata.

Strophomena inaquiradiata Hall = Stropheodonta inaquiradiata.

Strophomena incurvata (Shepard). = Rafinesquina incurvata and R. minnesotaensis.

Strophomena incurvata (Shepard).


Strophomena convexus Owen, Geol. Expl. Iowa, Wisconsin, and Illinois, 1844, p. 70, pl. XVII, fig. 2.

Leptena filicincta Hall, Pal. New York, I, 1847, pl. 111, pl. 31B, fig. 3.

SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.

Strophomena incurvata (Shepard)—Continued.


Loc. New York; Kentucky; Tennessee; Missouri; Wisconsin; Iowa; Minnesota; Manitoba; Canada.

Strophomena incurvata Sardeson = Rafinesquina minnesotaensis inquassa.

Strophomena interstrialis Hall = Stropheodonta mucronata.

Strophomena interstrialis Vanuxem, and Hall = Stropheodonta interstrialis.

Strophomena irenc Billings = Stropheodonta irene.

Strophomena ithacensis Vanuxem = Atrypa reticularis.

Strophomena (?) julia Billings. Anticosti (Sil.).


Loc. Anticosti.

Strophomena kingi Whitfield = Rafinesquina kingi.

Strophomena laevis Emmons. Birdseye (Ord.).


Loc. Great Bend, Jefferson County, New York.

Strophomena lachrymosa Conrad = Productella lachrymosa.

Strophomena leda Billings = Stropheodonta leda.

Strophomena lepida Hall = Pholidostrophya iowensis.

Strophomenes levigata Rafinesque. "Kentucky limestone."

Enumeration and Account of Some Remarkable Natural Objects in the Cabinet of Professor Rafinesque, 1831, p. 4.

Obs. Not defined so as to be recognizable.

Strophomena lima Conrad = Productella lachrymosa lima.

Strophomena lineata Conrad = Chonetes lineatus.

Strophomena macra Winchell and Marcy = Stropheodonta macra.

Strophomena magnifica Billings = Stropheodonta magnifica.

Strophomena maguiventra Billings = Stropheodonta magniventer.

Strophomena membranacea Vanuxem = Productella hirsuta.

Strophomena minnesotensis Winchell = Rafinesquina minnesotaensis.

Strophomena (?) minor (Walcott). Pogonip (Ord.).

Streptorhynchus minor Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 75, pl. 11, fig. 9.

Loc. Eureka district, Nevada.

Strophomena (?) modesta Conrad. ? Clinton (Sil.).


Obs. Compare with Plectambonites sericea and P. elegantula.

Strophomena mucronata Hall (non Conrad) = Chonetes mucronatus.

Strophomena mucronata Conrad (non Hall) = Stropheodonta mucronata.

Strophomena nacrea Hall = Pholidostrophya iowensis.

Strophomena (?) nassula Conrad. Carboniferous.


Strophomena nasuta Conrad = Rafinesquina alternata nasuta.

Strophomena neglecta (James). Lorraine (Ord.).
Strophomena filitexta Meek (non Hall), Pal. Ohio, I, 1873, p. 83, pl. 6, fig. 5.
† Strophomena filitexta White, U. S. Geol. and Geogr. Survey west 100th Merid., IV, 1875, p. 69, pl. 4, fig. 8.
Hemipronites filitextus Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 43.
Streptorhynchus neglectus James, The Paleontologist, 5, 1881, p. 41.
Streptorhynchus filitextus (partim) Hall, Second Ann. Rep. N. Y. State Geol., 1883, pl. 42, figs. 10, 15 (non figs. 11-14); pl. 39, figs. 1-7.
Strophomena filitexta Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 9A, figs. 10, 15 (non figs. 11-14); pl. 11A, fig. 3.
Loc. Oxford, Clarksville, Waynesville, etc., Ohio; Richmond, Versailles, etc., Indiana; Savanna, Illinois; † Silver City, New Mexico.

Strophomena neglecta acuta Winchell and Schuchert. Lorraine (Ord.).
Strophomena neglecta var. acuta W. and S., Minnesota Geol. Survey, III, 1893, p. 388, pl. 31, figs. 6, 7.
Loc. Spring Valley, Minnesota.

Strophomena † nemea Hall and Whitfield = Dalmanella pognipensis.
Strophomena nervosa Hall = Stropheodonta perplana nervosa.
Strophomena niagarensis Winchell and Marcy = Stropheodonta profunda.
Strophomena nitens Billings = Rafinesquina nitens.

Strophomena nutans Meek. Lorraine (Ord.).
Strophomena (Hemipronites) nutans (James) Meek, Pal. Ohio, I, 1873, p. 77, pl. 6, fig. 1.
Strophomena nutans Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 251, pl. 8, fig. 11; pl. 9A, figs. 5-7; pl. 11A, figs. 6, 7.
Loc. Oxford, Clarksville, etc., Ohio; Richmond, Versailles, etc., Indiana.

Strophomena obscura Hall = Rafinesquina obscura.

Strophomena (?) orthididea Hall. Clinton (Sil.).
Leptajusa orthididea Hall, Pal. New York, II, 1852, p. 62, pl. 21, fig. 7.
Loc. Kirkland, Oneida County, New York.

Strophomena patenta Hall = Strophonella patenta.
Strophomena patersoni Hall = Stropheodonta patersoni.
Strophomena pecten Roemer, and Billings = Orthothetes subplanus.
Strophomena pectinacea Hall = Orthothetes chemungensis.
Strophomena perplana Conrad = Stropheodonta perplana.

Strophomena philomela Billings. Anticosti (Sil.).
Loc. Anticosti.

Strophomena planiconvexa Hall. Lorraine (Ord.).
Leptajusa planiconvexa Hall, Pal. New York, I, 1847, p. 114, pl. 31B, fig. 7.
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Strophomena planiconvexa Hall—Continued.


Strophomena (Hemipronites) planoconvexa Meek, Pal. Ohio, I, 1873, p. 82, pl. 6, fig. 2.


Loc. Cincinnati, Ohio.

Strophomena planidorsata Winchell and Schuchert. Lorraine (Ord.).

Strophomena planodorsata W. and S., American Geol., IX, 1892, p. 286;—Minnesota Geol. Survey, III, 1893, p. 393, pl. 31, figs. 8-10.

Loc. Spring Valley, Minnesota; Iron Ridge, Wisconsin; Wilmington, Illinois.

Strophomena planumbona Hall = S. rugosa.

Strophomena plicata Meek = S. rugosa subtenta.

Strophomena plicifera Hall = Dalmanella plicifera.

Strophomena pleuristriata Conrad = Stropheodonta perplana.

Strophomena profunda Hall = Stropheodonta profunda.

Strophomena punctulifera Vanuxem = Strophonella punctulifera.

Strophomena radiata Vanuxem = Strophonella radiata.

Strophomena recta Conrad = Dinorthis deflecta.

Strophomena rect allateraria Meek and Worthen = Strophonella cavumbona.

Strophomena rectilat eris Conrad = Stropheodonta varistriata.

Strophomena (?! reticulata Shaler. Niagara (Sil.).


Loc. Anticosti.

Strophomena rhomboidalis = Leptæna rhomboidalis.

Strophomena rugosa Hall (nón Blainville) = Leptæna rhomboidalis.

Strophomena rugosa (Rafinesque MS.) Blainville. Lorraine (Ord.).


Leptæna planumbona Hall, Pal. New York, I, 1847, p. 112, pl. 31, fig. 4.

Leptæna (n. sp. ?) Owen, Geol. Survey Wisconsin, Iowa, Minnesota, 1852, pl. 2B, fig. 21. [See specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17876.]


Strophomena (Hemipronites) planumbona Meek, Pal. Ohio, I, 1873, p. 79, pl. 6, fig. 3.
Strophomena rugosa ( Rafinesque MS.) Blainville—Continued.


Streptorhynchus (Strophomena) elongata James, Cincinnati Quart. Jour. Sci., I, 1874, p. 240.


Strophomena squamula James = Rafinesquina squamula.
Strophomena striata Hall = Strophonella striata.
Strophomena subplana Conrad = Orthothetes subplanus.
Strophomena subtenta Conrad = S. rugosa subtenta.

**Strophomena sulcata** (Verneuil).
Strophomena sinuata Enmons, American Geol., I, 1855, p. 199, fig. 61.
Strophomena (Hemipronites?) sulcata Meek, Pal. Ohio, I, 1873, p. 85, pl. 5, fig. 4.
Hemipronites sulcata Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 48, fig. 5.
Strophomena sulcata Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, pl. 9, figs. 8, 9; pl. 11A, fig. 8.
Loc. Oxford, Clarksville, etc., Ohio; Richmond, Indiana.

Strophomena syrtalis Conrad = Chonetes coronatus.

**Strophomena (?) talacastrensis** Kayser.
Strophomena talacastrensis Kayser, Paleontographica, Suppl., III, 1876, p. 20, pl. 3, fig. 20.
Loc. Talacastra, Cordillere San Juan, Argentine Republic.

Strophomena tenuilineata Conrad = Rafinesquina tenuilineata.
Strophomena tenuistriata = Leptena rhomboidalis.
Strophomena textile Hall = Stropheodonta junia.

**Strophomena thalia** Billings.
Loc. Ottawa, Canada.

Strophomena transversalis Hall = Plectambonites transversalis.

**Strophomena trentonensis** Winchell and Schuchert.
Strophomena subtenta Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 251, pl. 9, fig. 18.
Strophomena trentonensis W. and S., Minnesota Geol. Survey, III, 1893, p. 389, pl. 39, fig. 41.
Loc. Cannon Falls, Minneapolis, and Fountain, Minnesota; Janesville and Beloit, Wisconsin; Frankfort, Kentucky; Nashville, Tennessee; Trenton Falls, New York.

**Strophomena trilobata** (Owen).
Leptena trilobata Owen, Geol. Survey Wisconsin, Iowa, Minnesota, 1852, p. 584, pl. 2, figs. 17, 18. [See specimens in U. S. Nat. Mus., Cat. Invert. Foss., 17875.]
Loc. Turkey River, Iowa; Goodhue County, Minnesota; Lake Winnipeg, Manitoba.

Strophomena tullia Billings = Stropheodonta tullia.
Strophomena ulrichi James = Rafinesquina ulrichi.
Strophomena unicostata Meek and Worthen = Rafinesquina unicostata.
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Strophomena undulatus Vanuxem=Leptæna rhomboidalis.
Strophomena undulosa Conrad=Leptæna undulosa.
Strophomena varistriata Conrad=Strophedonta varistriata.

**Strophomena vetusta** James.
Loc. Upper part of Cincinnati group in Ohio and Indiana.

**Strophomena winchelli** Hall and Clarke.
Streptorhynchus (Strophonella?) deltoidea Hall (non Leptæna deltoidea 1847), Second Ann. Rep. N. Y. State Geol., 1888, pl. 39, figs. 10, 12-14 (non fig. 11=S. nutans).
Strophomena winchelli Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 344, pl. 9, figs. 10, 12-14; pl. 20, fig. 26.—Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 394, pl. 31, fig. 11.
Loc. Janesville, Clifton, and Oshkosh, Wisconsin.

**Strophomena wisconsinensis** Whitfield.
Strophomena wisconsinensis Whitfield, Geol. Wisconsin, IV, 1882, p. 263, pl. 12, figs. 11-13.
Strophomena wisconsinensis Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 251, pl. 11A, figs. 1, 2.
Loc. Delafield, Wisconsin.

Strophomena woolworthana Hall=Orthothetes woolworthana.

**STROPHONELLA** Hall. Genotype Strophomena semifasciata Hall.

**Strophonella ampla** Hall.
Strophodonta ampla Hall, Pal. New York, IV, 1867, p. 93, pl. 14, fig. 1.
Loc. Albany and Schoharie counties, Cherry Valley, Williamsville, etc., New York; Columbus, Ohio; Ontario, Canada.
Obs. Compare with S. schohariensis (Castelnau).

**Strophonella caelata** Hall.
Strophodonta caelata Hall, Pal. New York, IV, 1867, p. 112, pl. 19, figs. 6, 7.

**Strophonella cavumbona** Hall.
Strophomena (Strophodonta) cavumbona Meek and Worthen, Geol. Surv. Illinois, III, 1868, p. 374, pl. 7, fig. 10.
Strophonella cavumbona Hall—Continued.

Strophomena rectilaterraria Meek and Worthen, Ibidem, 1868, p. 375.


Loc. Schoharie, Hudson, and Catskill, New York; Perry County, Missouri.

Obs. Probably synonymous with S. punctulifera.

Strophonella costatula Hall and Clarke.

Strophonella costatula Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, p. 399, pl. 84, figs. 15, 16.

Loc. Louisville, Kentucky.

Strophonella (?) conradi Hall.


Strophonella crassa Rowley.


Strophonella geniculata (Hall).


Strophonella headleyana Hall.


Strophonella leavenworthana Hall.


Strophonella (?) patenta Hall.

Strophonella punctulifera (Conrad). Lower Helderberg. (Dev.).
Roemer, Sil. Fauna d. West. Tennessee, 1860, p. 66, pl. 5, fig. 3.—Etheridge,
Strophomena punctulifera Vanuxem, Geol. N. Y.; Rep. Third Dist., 1842, p. 122,
fig. 5.—Rogers, Geol. Pennsylvania, II, Pt. II, 1858, p. 825, fig. 648.—Billings,
p. 597, fig. 448;—Pal. Fossils, II, 1874, p. 31, pl. 3, fig. 2.
Strophomena (Strophodonta) punctulifera Hall, Tenth Rep. N. Y. State Cab. Nat.
Hist., 1857, p. 50, fig. 1.
Strophodonta punctulifera Hall, Pal. New York, III, 1859, p. 188, pl. 21, fig. 4; pl.
23, figs. 4–7.—Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 121, pl. 13, fig. 10.
Loc. Albany and Schoharie counties, New York; Square Lake, Maine; Pennsyl-
vania; Decatur County, Tennessee; Dalhousie, New Brunswick, and Gaspé,
Canada; Eureka district, Nevada; Cape Hilgard and Cape Louis Napoleon,
Arctic regions.
Obs. See S. cavumbona Hall.

Strophonella (?) radiata (Vanuxem). Lower Helderberg (Dev.).
Strophomena radiata Vanuxem, Geol. N. Y.; Rep. Third Dist., 1842, p. 122, fig.
New York, III, 1859, p. 193, pl. 21, figs. 8, 9; pl. 18, fig. 3.

Strophonella reversa Hall. Chemung (Dev.).
Strophodonta reversa Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 494, pl. 3, fig. 4.
Nat. Hist., 1879, p. 239.
Strophonella reversa Hall, Twenty-eighth Rep. N. Y. State Mus. Nat. Hist., 1879,
Strophonella? (Strophodonta) reversa Hall, Second Ann. Rep. N. Y. State Geol.,
1883, pl. 43, figs. 16–20.
Loc. Rockford, Iowa; Naples, New York.

Strophonella schohariensis (Castelnau). ? Upper Helderberg (Dev.).
Orthis schohariensis Castelnau Essai Syst. Sil. l'Amerique Septentriionale, 1843,
p. 36, pl. 14, fig. 5.
Obs. Compare with S. ampla.

Strophonella semifasciata Hall. Niagara (Sil.).
Strophomena (Strophodonta?) semifasciata Hall, Trans. Albany Inst., IV, 1863,
1879, p. 154, pl. 22, figs. 1–3; pl. 23, figs. 7, 8;—Eleventh Rep. Indiana State
Geol., 1882, p. 292, pl. 22, figs. 1–3; pl. 23, figs. 7, 8;—Second Ann. Rep. N. Y.
State Geol., 1883, pl. 43, figs. 4, 5.—Hall and Clarke, Pal. New York, VIII, Pt.
I, 1892, pl. 12, figs. 4, 5.
Loc. Waldron, Indiana; Wisconsin.
Strophonella striata Hall.

Niagara (Sil.).


Leptena striata Hall, Pal. New York, II, 1852, p. 259, pl. 53, fig. 7.


Strophomena (Orthothetes) hanoverensis Foerste, Geol. Ohio, VII, 1895, p. 567, pl. 27, fig. 34; pl. 31, fig. 1.

Loc. Lockport, New York; Waldron and Hanover, Indiana; Louisville, Kentucky.

Syntriela.sina Meek and Worthen = Enteletes.

SYNTROPHIA Hall and Clarke. Genotype Triplesia lateralis Whitfield.


Syntrophia arachne (Billings). Upper Cambrian.

Stricklandia arachne Billings, Pal. Fossils, I, 1862, p. 85, fig. 7.


Loc. Point Levi's, Canada.

Syntrophia arethusa (Billings).

Stricklandinia arethusa Billings, Pal. Fossils, I, 1862, p. 85, fig. 78.


Loc. Point Levi's, Canada.

Syntrophia (?) armanda (Billings).

Upper Cambrian.


Loc. Phillipsburg, Canada.

Obs. This species may prove to be a Billingsella. In the interior of the ventral valve "the dental plates seem to form an imperfect triangular chamber" (Billings). If there is present a true spondylium and the foramen is "apparently open" O. armanda will prove to be more nearly related to Syntrophia than to any other genus. If, however, there is present only an imperfect triangular chamber and the foramen closed by a deltidium, then the species is probably a Billingsella.

Syntrophia barabuensis (A. Winchell).

Orthis barabuensis A. Winchell, American Jour. Sci., 2d ser., XXXVII, 1864, p. 228.

Leptena barabuensis Whitfield, Ann. Rep. Geol. Survey Wisconsin, 1877, p. 60;—Geol. Wisconsin, IV, 1882, pp. 171, 195, pl. 1, figs. 6, 7; pl. 3, fig. 6.


Loc. Near Baraboo, Wisconsin.

Syntrophia calcifera (Billings).

Upper Cambrian.

Syntrophia calcifera (Billings)—Continued.

Triplesia calcifera Walcott, Mon. U. S. Geol. Survey, VIII, 1884, p. 75, pl. 11, figs. 7, 8.


Loc. Point Levis and Phillipsburg, Canada; Cow Head, Newfoundland; near Malade City, Utah; Eureka district, Nevada; Carter County, Missouri (Keyes).

Syntrophia lateralis (Whitfield).


Loc. Fort Cassin, Vermont.

Syntrophia primordialis (Whitfield).


Loc. Adams County, Wisconsin.

SYRINGOTHRYS A. Winchell.


Syringothyris alta Schuchert = Cyrtia alta.

Syringothyris angulata Simpson.

Waverly (L. Carb.).


Syringothyris carteri (Hall).

Waverly and Burlington (L. Carb.).


Syringothyris hannibalensis Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 25, figs. 33-35.

Loc. Licking County and Bedford, Ohio; Burlington, Iowa; Marion and Pike, counties, Missouri; White Pine and Eureka districts, Nevada; near Clendenin, Moutana.
SYNOPSIS OF AMERICAN FOSSIL BRACHIOPODA.  [BULL. 87.]

Syringothyris cuspidatus Walcott, and Herrick=S. carteri.

Syringothyris extenuata (Hall).  Waverly (L. Carb.).
Spirifer extenuatus Hall, Geol. Survey Iowa, I, Pt. II, 1858, p. 520, pl. 7, fig. 6.—White, Wheeler's Expl. and Surv. west 100th Merid., 1875, p. 88, pl. 5, fig. 9.
Loc. Burlington, Iowa; Clarksville, Missouri; Battlecreek, Michigan; Mountain Spring, Nevada.

Syringothyris gigas (Troost).  Subcarboniferous.
Loc. Harpeth River, Tennessee.

Syringothyris halli Winchell=S. carteri extenuata.

Syringothyris herricki Schuchert.  Waverly (L. Carb.).
Syringothyris cuspidatus Herrick (partim), Bull. Denison Univ., III, 1888, pl. 5, figs. 4-7 (not pls. 1, 2).
Loc. Granville, Ohio.

Syringothyris missouri Hall and Clarke.  Chouteau (L. Carb.).
Loc. Chouteau Springs, Missouri.

Syringothyris (?) plena (Hall).  Burlington (L. Carb.).
Spirifer plena Hall, Geol. Survey Iowa, I, 1858, p. 603, pl. 13, fig. 4.
Syringothyris plena Keyes, Geol. Survey Missouri, V, 1895, p. 88, pl. 40, fig. 8.
Loc. Burlington, Iowa; Hannibal, Missouri; Quincy, Illinois.

Syringothyris randalli, Simpson.  Waverly (L. Carb.).

Syringothyris texta (Hall).  Waverly to Keokuk (L. Carb.).
Spirifer subcuspidatus Hall, Geol. Survey Iowa, I, 1858, p. 646, pl. 20, fig. 5.—Pal. New York, IV, 1867, p. 249.
Spirifer propinquus Hall, Geol. Survey Iowa, I, 1858, p. 647.—Meek and Worthen, Geol. Survey Illinois, 1868, III, p. 530, fig. 19, fig. 8.
Spirifer carteri Meek (partim), Pal. Ohio, II, 1875, pl. 14, fig. 7.
Syringothyris subcuspidatus and texta Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 50, pl. 26, figs. 8, 11 (fig. 12); pl. 27, figs. 4-12, 18.
Loc. New Albany and New Providence, Indiana; near Louisville, Kentucky; Sciotoville, Ohio; Keokuk, Iowa; Warsaw and Nauvoo, Illinois.
Syringothlyris typa Winchell=S. carteri.

**TEREBRATELLA** d'Orbigny.

Genotype Terebratula chilensis Brod.=Terebratula dorsata Gmelin.


Terebratella californica Stanton. Upper Cretaceous (Knoxville).


Loc. Cottonwood Creek, Tehama County, California.

Terebratella (?) dubitanda (Cooper). ?Upper Cretaceous.

Megerlia dubitanda Cooper, Bull. California State Mining Bureau, 4, 1894, p. 50, pl. 3, figs. 48, 49.

Loc. Lajolla and Point Loma, California.

Terebratella (?) imbricata (Cooper). ?Upper Cretaceous.

Megerlia imbricata Cooper, Bull. California State Mining Bureau, 4, 1894, p. 51, pl. 3, figs. 50, 51.

Loc. Lajolla, California.

Terebratella obesa Gabb. Cretaceous (Chico).

Terebratella obesa Gabb, Geol. Survey California, Pal., I, 1864, p. 205, pl. 26, fig. 194.

Terebratella obesa Whitesaves, Mesozoic Fossils, Geol. Survey Canada, I, 1884, p. 245.

Loc. Texas Flat, Placer County, California; Queen Charlotte Island.

Terebratella plicata (Say). Cretaceous.


Loc. New Jersey.

Terebratella vanuxemi (Lyell and Forbes). Cretaceous.


Terebratella vanuxemi Hollick, Trans. N. Y. Acad. Sci., XI, 1892, p. 98, pl. 1, fig. 6.

Loc. New Jersey; Tottenville, Staten Island.

Terebratella whitneyi Gabb=Rhynchoella whitneyi.

**TEREBRATULA** Llhwyd. Genotype T. perovalis Sowerby.


Terebratula ãëigrama d'Orbigny=Rhynchoella ãëigrama.
Terebratula ænigma Darwin = Rhynchonella anduin.
Terebratula acuminatissima Castelnau = Spirifer acuminatus.
Terebratula andii d'Orbigny = Entelethes andii.
Terebratula antissiensis d'Orbigny = Rhynchonella antissiensis.
Terebratula atlantica Morton = Terebratulina atlantica.
Terebratula arcuata Swallow (non Roemer) = Dielasma shumardanum.

**Terebratula augusta** Hall and Whitfield. Triassic-Jurassic.

*Loc.* Shoshone Springs, Nevada; Triassic, southwestern Idaho.

**Terebratula bicanaliculata** Schlotheim. Jurassic.

*Loc.* Europe; Dona Ana, Chile.

**Terebratula bisacula** McCchesney. Kaskaskia (L. Car.)
Terebratula bisacula McCchesney, Descriptions New Fossils, 1861, p. 82.


**Terebratula borealis** Castelnau = Clitambouites borealis.
Terebratula borealis Castelnau = Terebratula borealis, Morton = Dielasma borealis.

**Terebratula brevilobata** Swallow. Warsaw (L. Car.).
Terebratula brevilobata Swallow, Trans. St. Louis Acad. Sci., II, 1863, p. 84.


**Terebratula burlingtonensis** White = Dielasma burlingtonensis.
Terebratula camila Morton = T. harlani.

**Terebratula canipes** Ravenel. Jackson (Eocene).

*Loc.* South Carolina.

**Terebratula carneoida** Guppy. Eocene.

*Loc.* San Fernando, Trinidad.

*Obs.* May be the same as living Terebratula cubensis Pourtales (Dall) = Liothyris sphenoides (Philippi). The latter also occurs fossil in the Pliocene of Calabria and Sicily (Davidson).

**Terebratula chilensis** d'Orbigny. Quarternary.
Terebratula chilensis d'Orbigny, Voyage dans l'Amérique Mérid., Pal., 1842, p. 163.

*Loc.* Coquimbo, Chile.

**Terebratulachoctawensis** Shumard = Kingina wacoensis.
Terebratula concinna Bayle and Coquand = Rhynchonella ænigma.

**Terebratula cooperensis** Miller = Seminula parva.

**Terebratula copiapensis** Mörckke. Jurassic.
Terebratula copiapensis Mörckke, Neues Jahrb. f. Mineral., Beilageband, IX, 1894, p. 63, pl. 2, figs. 5a-5c.

*Loc.* Quebrada de Mariqunga, Chile.
Terebratula demissirostris Conrad.  
Eocene.  
Loc. Wilmington, North Carolina.

Terebratula derbyana Rathbun.  
Middle Devonian.  

Loc. Erere, Province of Para, Brazil.

Terebratula domeykana Bayle and Coquand.  
Jurassic.  

Loc. Sierra de la Ternera, Dona Ana, and Juntas, Chile.

Terebratula elongata of American authors = Dielasma bovidens.

Terebratula emarginata Sowerby.  
Jurassic.  
Terebratula emarginata (Sowerby) Bayle and Coquand, Mémo. Soc. Géol. France, 2d ser., IV, 1851, p. 32, pl. 8, figs. 7-9.

Loc. Europe; Dona Ana, Chile.

Terebratula ficoides Bayle and Coquand.  
Jurassic.  

Loc. Dona Ana, Chile.

Terebratula floridana Morton = Terebratulina floridana.  
Terebratula formosa Hall = Dielasma formosum.  
Terebratula fragilis Morton = Terebratula harlani.  
Terebratula gaudryi d'Orbigny = Enteletes gaudryi.  
Terebratula geniculosa McChesney = Dielasma bovidens.  
Terebratula glossa Conrad = Terebratulina atlantica.  
Terebratula gorbyi Miller = Dielasma gorbyi.

Terebratula gottschei Steinman.  
Jurassic.  

Loc. Caracoles, Bolivia.

Terebratula gracilis Swallow (non Von Buch) = T. swallovanæ.  
Terebratula guadalupe Roemer = Terebratulina guadalupæ.  
Terebratula halliana Gabb = Terebratulina atlantica.

Terebratula harlani Morton.  
Upper Cretaceous.  
Terebratula harlani Morton—Continued.


Terebratula harlani var. rectilatera Morton, Ibidem.


Loc. New Jersey; Delaware and South Carolina.

Terebratula harmonia Hall = Eunella harmonia.

Terebratula hastata of American authors = Dielasma bovidens.

Terebratula helena Whitfield. Upper Cretaceous.


Loc. North of Belle Fourche, South Dakota.

Terebratula hochstetteri Toula = Dielasma hochstetteri.

Terebratula hohmanni Mörick. Jurassic.

Terebratula hohmanni Mörick, Neues Jahr. f. Mineral., Beilageband, IX, 1894, p. 64, pl. 6, figs. 4a, 4b.

Loc. Quebrada de Mariungua, Chile.

Terebratula humboldtensis Gabb. Triassic.

Terebratula humboldtensis Gabb, Geol. Survey California, Pal., I, 1864, p. 34, pl. 6, fig. 35.—Hall and Whitfield, King's U. S. Geol. Expl. 40th Parl., IV, 1877, p. 282, pl. 6, figs. 22–24.—Whiteaves, Cont. Canadian Pal., I, 1889, p. 129.

Loc. Star Canyon, Humboldt County, and Dun Glen Pass, Pah-Ute Range, Nevada; Nicola Lake, Canada.

Terebratula ignaciana d'Orbigny. Jurassic.


Loc. Cordillere du Chili, South America.

Terebratula inca Forbes = T. pereovalis.

Terebratula inconstans Herrick = Cryptonella inconstans.

Terebratula inornata McChesney. "Keokuk to Coal Measures."


Loc. Sangamon County, Illinois.

Terebratula itaitubensis Derby = Dielasma itaitubense.

Terebratula jucunda Hall. Miöödle Devonian.


Loc. Waterloo, Iowa; Jefferson and Clark counties, Indiana.

Terebratula lachryma Morton = Terebratulina lachryma.
Terebratula lacunosae Schl.  
**Loc.** Europe; Dona Ana, Chile.

Terebratula lapillus Morton.  
_Terebratula lapillus_ Morton, American Jour. Sci., XXIX, 1836, p. 153, pl. 26, fig. 36. 
**Loc.** Junior Furnace, Scioto County, Ohio. 
**Obs.** Not determinable.

Terebratula lecta Guppy.  
_Terebratula lecta_ Guppy, Quart. Jour. Geol. Soc. London, XXII, 1866, p. 296, pl. 19, fig. 3. 
**Loc.** San Fernando, Trinidad.

Terebratula lens Hall=Cryptonella lens. 
Terebratula leonensis Conrad=Kingena leonensis.

Terebratula liardensis Whiteaves.  
_Terebratula liardensis_ Whiteaves, Cont. Canadian Pal., I, 1889, p. 130, pl. 17, fig. 2. (Abstract of same pub. 1888.) 
**Loc.** Liard River, Canada.

Terebratula lincklæni Hall=Eunella lincklæni. 
Terebratula marcyi Shumard=Emetria marcyi.

Terebratula meridionalis Conrad.  
**Loc.** Cordillera de Dona Ana, Chile.

Terebratula mesogona Castelnau.  
_Terebratula mesogona_ Castelnau (non Phillips), Essai Syst. Sil. l'Amérique Septentrionale, 1843, p. 40, pl. 13, fig. 3. 
**Loc.** Vicinity of Quebec, Canada. 
**Obs.** Undeterminable.

Terebratula mexicana Hall.  
**Loc.** Not given. 
**Obs.** Undefined. Compare with Seminula argentea.

Terebratula millipunctata Hall=Dielasma bovidens. 
Terebratula mormoni Marcou=Hustedia mormoni. 
Terebratula navicella Hall=Centronella navicella.

Terebratula nitens Conrad.  
_Terebratula nitens_ Dana, Wilkes's U. S. Exped., X, 1849, p. 726, pl. 19, fig. 1. (Conrad's earlier description I have not found.) 

Terebratula nuciformis Morton.  
_Terebratula nuciformis_ Morton, American Jour. Sci., XXIX, 1836, p. 150, pl. 2, fig. 5. 
**Loc.** Putnam Hill east of Flint Ridge, Ohio. 
**Obs.** Not defined so as to be recognizable.

Terebratula nucula Sowerby=Rhynchonella nucula. 
Terebratula occidentalis Miller=Dielsam occidentale. 
Terebratula ovoides Eaton=Rensselaeria ovoides.
Terebratula ontario Hall. Hamilton (Dev.).

Terebratula ornithocephaia Bayle and Coquand = T. subovoides.
Terebratula parva Swallow = Seminula parva.

Terebratula patagonica Sowerby. Tertiary.
Terebratula patagonica Sowerby, Darwin’s Geol. Observations on South America, 1846, p. 252, pl. 2, fig. 25.

Terebratula pennata Atwater = Spirifer pennatus.

Terebratula (Zeilleria) perforata Piette. Jurassie.
Loc. Europe; Sierra de la Ternera, Chile.

Terebratula perinflata Shumard. Upper Carboniferous.
Loc. Guadalupe Mountains, Texas.

Terebratula perovalis Eaton (non Sowerby) = Rensselaeria ovoides.
Terebratula perovalis Morton (non Sowerby) = T. harlani.

Terebratula poeyana Lea. Jurassic.
Loc. Habana, Cuba.

Terebratula prisca = Atrypa reticularis.

Terebratula punctata Sowerby. Liasie.
Loc. Europe; Portezuelo Ancho, Argentine Republic; Manflas, Juntas, Chile.

Loc. Near Ollon, Peru.
Terebratula reticularis = Atrypa reticularis.
Terebratula rectirostra Hall = Cryptonella rectirostris.

**Terebratula repellini d’Orbigny.**
Jurassic.
Terebratula repellini Anguilera, Datos para la Geología de Mexico, 1893, p. 18.
Loc. Europe; Mexico.

**Terebratula robusta** Whiteaves.
Jurassic (?Cretaceous).
Terebratula robusta Whiteaves, Cont. Canadian Pal., I, 1889, p. 163, pl. 22, figs. 1, 2.
Loc. Rocky Mountains, near Devils Lake, Canada.
Obs. The horizon of this locality is probably Jurassic (Stanton).

Terebratula rockymontana Marcou = Pugnax rockymontana.
Terebratula romingeri Hall = Crai8ena romingeri.
Terebratula rowleyi Worthen = Dielasma rowleyi.
Terebratula royssii d’Orbigny (non L’Éveillé) = Seminula argentea.
Terebratula royssii Marcou = Cleiothyris roissyi.
Terebratula sacculus Dawson, and Davidson = Dielasma sacculus.

**Terebratula semisimplex** White.
Triassic.
Loc. Southeastern Idaho.

Terebratula serpentina Owen = Eumetria marcyi.
Terebratula shumardana Miller = Dielasma shumardanum.
Terebratula simulator Hall = Eunella simulator.
Terebratula spiriferoides Eaton = Athryis spiriferoides.

**Terebratula subexcavata** Conrad.
Oolite or Cretaceous.
Terebratula subexcavata Conrad, U. S. Astronomical Exped. to the Southern Hemisphere, 1855, p. 282, pl. 41, fig. 4.
Loc. Cordillera de Dona Ana, Chile.

Terebratula subfragilis d’Orbigny = T. harlani.

**Terebratula subovoides** Roemer.
Lias (Jurassic).
Terebratula ornithocephala (non Sowerby) Bayle and Coquand, Mém. Soc. Géol. France, 2d ser, IV, 1851, p. 18, pl. 8, figs. 12-14.
Loc. Europe; Valle lenas amorillas, Rio Salado, Argentine Republic; Mine Amolanas, Manflas, and Tres Cruces, Chile.

**Terebratula subnumismalis** Davidson?.
Lias (Jurassic).
Terebratula subnumismalis Davidson, British Oolitic and Liassic Brach., Pal. Soc., 1852, p. 36, pl. 51, fig. 10.
Loc. Europe; Rio Salado, Argentine Republic.

**Terebratula subretziforma** McChesney.
Kaskaskia (L. Carb.).
Terebratula subretziforma McChesney, Descrip. New Fossils, 1861, p. 82.
Loc. Fountain Bluff, Illinois.

Terebratula subtetraedra Conrad = Rhynchonella anduin.
Terebratula subtilita Hall = Seminula argentea.
Terebratula sullivanti Hall = Eunella sullivanti.
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Terebratula swallovana Miller. Kaskaskia (L. Carb.).
Loc. St. Marys, Missouri; Chester, Illinois.

Terebratula tayloriana Lea = Rhynchonella tayloriana.
Terebratula tetradra Sowerby = Rhynchonella tetradra.
Terebratula titicacensis Gabb = Seminula titicacensis.

Terebratula traversensis A. Winchell. Hamilton (Dev.).
Terebratula traversensis A. Winchell, Rep. Lower Peninsula Michigan, 1866, p. 95.
Loc. Grand Traverse region, Michigan.

Terebratula trinitatensis Guppy. Eocene.
Loc. Sanfernando, Trinidad.

Terebratula trinucleus Hall = Seminula trinucleus.
Terebratula turpia Verneuil = Clitambonites borealis.
Terebratula utah Marcou (non Hall and Whitfield) = Pugnax utah.

Terebratula (?) utah Hall and Whitfield. Lower Carboniferous.
Terebratula utah Hall and Whitfield, King's Geol. Expl. 40th Parl., IV, 1877, p. 258, pl. 4, fig. 18.
Obs. Not well established. Based upon a single dorsal valve. May be a Dielasma.

Terebratula valenciennii Castelnau = Meristella nasuta.
Terebratula wacoensis Roeiner = Kingena wacoensis.
Terebratula wilmingtonensis Lyell and Sowerby = Rhynchonella wilmingtonensis.

Terebratula (?) cfr. zieteni Loriol. Jurassic.
Terebratula cfr. zieteni Aguiler, Bol. Com. Geológica de Mexico, I, 1895, p. 1, pl. 2, figs. 6, 7.
Loc. Rancho Alamitos, Sierra de Catorce, Mexico.

TEREBRATULINA d'Orb. Genotype Anomia caputserpentis Linné.

Terebratulina glossa Conrad, American Jour. Conch., V, 1869, p. 42, pl. 1, fig. 22.
Loc. New Jersey; Tottenville, Staten Island.

Terebratulina filosa Conrad, American Jour. Conch., II, 1866, pp. 77, 105, pl. 9, figs. 4, 5.
Loc. Uniontown, Alabama.
Terebratulina floridana (Morton). Cretaceous.
   Terebratula floridana Morton, Syn. Cret. U. S., 1834, p. 72, pl. 16, fig. 17.
   Loc. Prairie Bluff, Alabama.

Terebratulina gracilis (Schlotheim). Eocene.
   Terebratula gracilis Schlotheim, Die Petrefactenkunde, 1820, p. 270.
   Loc. Europe; Alabama.

Terebratulina guadalupae (Roemer). Upper Cretaceous.
   Loc. New Braunfels, Austin, and 200 miles north in Dallas County; Texas (Hill).

Terebratulina halliana Gabb = T. atlantica.

Terebratulina lachryma (Morton). (Cretaceous?) Eocene?.
   Terebratula lachryma Morton, Syn. Cret. U. S., 1834, p. 72, pl. 10, fig. 11; pl. 16, fig. 6.
   Loc. New Jersey; Claiborne, Alabama.

TORYNIFER Hall and Clarke. Genotype T. criticus Hall and Clarke.
   Torynifer Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, explanation to pl. 84.

Torynifer criticus Hall and Clarke. St. Louis (L. Carb.).
   Torynifer criticus Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 84, figs. 34, 35.

TREMATIS Sharpe.
   Genotype Orbicula terminalis Sharpe (non Emmons) = T. millipunctata Hall.

Trematis crassipuncta Ulrich. Lorraine (Ord.).
   Trematis crassipuncta Ulrich, American Geologist, IV, 1889, p. 22; III, p. 378, fig. 7.
   Loc. Cincinnati, Ohio.

Trematis (?) dyeri Miller. Lorraine (Ord.).
   Loc. Cincinnati, Ohio.

Trematis filosa Billings = Schizocrania filosa.

Trematis fragilis Ulrich. Trenton (Ord.).
   Loc. Near Covington, Kentucky.
Trematis huronensis Billings. Black River (Ord.).
Trematis huronensis Billings, Pal. Fossils, I, 1862, p. 53, fig. 59 on p. 52;—Geol. Canada, 1863, p. 159, fig. 130.
Trematis huronensis? Winchell and Schuchert, Minnesota Geol. Survey, III, 1893, p. 388, fig. 29.
Loc. Pallideau Islands, Lake Huron; Minneapolis, Minnesota.

Trematis millepunctata Hall. Utica and Lorraine (Ord.).
Loc. Cincinnati, Ohio.
Obs. See T. quincuncialis and T. reticularis.

Trematis montrealensis Billings. Trenton (Ord.).
Trematis montrealensis Billings, Pal. Fossils, I, 1862, p. 52, fig. 57;—Geol. Canada, 1863, p. 159, fig. 128.
Loc. Montreal, Canada.

Trematis oblata Ulrich. Utica and Lorraine (Ord.).
Trematis punctostriata Hall and Whitfield (non Hall, 1873), Pal. Ohio, II, 1875, p. 70, pl. 1, figs. 8, 9.
Loc. Cincinnati, Ohio.

Trematis ottawaensis Billings. Trenton and Lorraine (Ord.).
Loc. Ottawa, Canada; Anticosti; Trenton Falls, New York; Frankfort, Kentucky; St. Paul, Minnesota.

Trematis? pannulus White=Iphidea pannulus.
Trematis punctostriata Hall and Whitfield=T. oblata.

Trematis punctistriata Hall. Lorraine (Ord.).
Loc. Clifton, Tennessee.

Trematis (?) pustulosa Hall. Lorraine (Ord.).
Loc. Near Horicon, Wisconsin.

Trematis quincuncialis Miller and Dyer. Lorraine (Ord.).
Trematis quincuncialis Miller and Dyer, Cont. to Pal., II, 1878, p. 8, pl. 3, fig. 9.
Loc. Lebanon, Ohio.
Obs. Seems to be only a variety of T. millepunctata occurring at a higher horizon.
Trematis reticularis (Miller).

*Crani*a reticularis Miller, Cincinnati Quart. Jour. Sci., II, 1875, p. 280, fig. 1.

**Loc.** Brookville, Indiana.

**Obs.** The type specimens have been examined and appear to be young *T. millipunctata*.

Trematis rudis Hall=Schizocrania rudis.

**Trematis terminalis** Emmons.

Orbicula terminalis Emmons, Geol. New York; Rep. Second Dist., 1842, p. 395, fig. 4.—Hall, Pal. New York, I, 1847, p. 100, pl. 30, fig. 11.

Trematis terminalis Emmons, American Geologist, Pt. II, 1855, p. 201, fig. 63.—Billings, Geol. Canada, 1863, p. 159, fig. 127.—Hall and Clarke, Pal. New York, VIII, Pt. I, 1892, p. 139, pl. 4G, figs. 1, 2.


**Loc.** Middleville, Trenton Falls, Watertown, and elsewhere in New York.

Trematis truncata Hall=Schizoebolus concentricus.

Trematis umbonata Ulrich.


**Loc.** Covington, Kentucky; Cincinnati, Ohio.

**TREMATOBOLUS** Matthew. Genotype *T. insignis* Matthew.


**Trematobolus insignis** Matthew. Middle Cambrian.

Trematobolus insignis Matthew, Canadian Record Science, 1893, p. 276, fig. 1;—Trans. Royal Soc. Canada, Vol. XI, 1894, p. 88, pl. 16, fig. 4a-d;—Trans. N. Y. Acad. Sci., XIV, 1895, p. 122, pl. 4, fig. 2.

**Loc.** St. Martins, New Brunswick.

**TREMATOSPIRA** Hall. Genotype *Spirifer? perforatus* Hall.


Trematospira acadiae Hall and Clarke=Rhynchospira acadiae.

**Trematospira camura** Hall. Niagara (Sil.).

Atrypa camura Hall, Pal. New York, II, 1852, p. 273, pl. 56, fig. 3.


Rhynchospira camura Billings, Geol. Canada, 1863, p. 315, fig. 322.

**Loc.** Lockport, New York.

Trematospira costata Hall. Lower Helderberg (Dev.).


**Loc.** Albany and Schoharie counties, New York.

Trematospira deweyi Hall=Parazyga deweyi.

Trematospira disparilis Hall=Atrypina disparilis.
Trematospira dubia (Billings). Lower Helderberg (Dev.).
Trematospira dubia Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 126, pl. 49, figs. 15, 16.
Loc. Square Lake, Maine.

Trematospira equistriata Hall and Clarke. Lower Helderberg (Dev.).
Trematospira equistriata Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 49, fig. 47.
Loc. Cumberland, Maryland.

Trematospira gibbosa Hall. Hamilton (Dev.).
Loc. Bellona, York, and Darien, New York.

Trematospira helena Nettelroth=Rhynchospira helena.

Trematospira hippolyte (Billings). Lower Helderberg (Dev.).
Trematospira hippolyte Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 126, pl. 49, figs. 7, 8.
Loc. Square Lake, Maine.

Trematospira hirsuta Hall=Parazyga hirsuta.
Trematospira imbricata Hall=Atrypina imbricata.

Trematospira (?) liniuscula A. Winchell. Hamilton (Dev.).
Loc. Grand Traverse region, Michigan.

Trematospira matthewsioni McChesney=Atrypa marginalis.

Trematospira maria (Billings). Lower Helderberg (Dev.).
Trematospira maria Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 126, pl. 49, fig. 21.
Loc. Square Lake, Maine.

Trematospira multistriata Hall. Lower Helderberg (Dev.).
Trematospira multistriata Hall, Pal. New York, III, 1859, p. 209, pl. 24, fig. 3; pl. 28A, fig. 5.—Ibidem, IV, 1867, p. 276, figs. 1-3.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 126, pl. 49, figs. 9-14.
Retzia multistriata Billings, Geol. Canada, 1863, p. 958, fig. 458.

Trematospira nobilis Hall=Cyclorhina nobilis.

Trematospira perforata Hall. Lower Helderberg (Dev.).
Loc. Albany and Schoharie counties and Hudson, New York.

Trematospira simplex Hall. Lower Helderberg (Dev.).
Trematospira simplex Hall, Pal. New York, III, 1859, p. 211, pl. 28A, fig. 2.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 49, figs. 17, 18.
Loc. Decatur County, Tennessee.
Trematospora quadriplicata Miller = Rhynchotrema imæequivale.

Trematospora tennesseensis Hall and Clarke. Lower Helderberg (Dev.).
Trematospora tennesseensis Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 83, figs. 21-23.
Loc. Perry County, Tennessee.

TRIGERIA (Bayle partim) Hall and Clarke.
Genotype Terebratula guerangeri de Verneuiil.

Trigeria gaudryi (Œhler). Oriskany (Dev.).
Ceptonella gaudryi Oehlert, Bull. de la Soc. d'Études Scientif. d'Angers, separate 1883, p. 2, pl. 10, fig. 8.—Bull, de la Soc. d'Études Scientif. d'Angers, separate 1883, p. 2, pl. 10-17.
Trigeria gaudryi Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 273, fig. 189, pl. 76, figs. 6, 7.
Loc. France; Cumberland, Maryland.

Trigeria (?) lepida Hall. Hamilton (Dev.).

Trigeria (?) margarida (Derby). Middle Devonian.
Centronella (?) margarida Derby, Archivos do Museu Nacional Rio de Janeiro, IX, 1890, p. 84, with figures in text.
Loc. Head of Paraguay; Matto Grosso, Brazil.

Trigeria (?) portlandica (Billings). Lower Helderberg (Dev.).
Trigeria (?) portlandica Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 273, pl. 76, figs. 4, 5.
Loc. Square Lake, Maine.

Trigeria (?) wardiana (Rathbun). Middle Devonian.
Retzia (?) wardiana Derby, Archivos do Museu Nacional do Rio de Janeiro, IX, 1890, p. 78.
Loc. Province of Para, Brazil.

Gotlandia Dall, American Jour. Conch., VI, 1870, p. 160.
Trimerella acuminata Billings. Guelph (Sil.).
Loc. Galt, New Hope, and Hespeler, Ontario; near Hillsboro, Ohio; Port Byron, Illinois; Gotland and Farö.

Trimerella billingsi Dall. Guelph (Sil.).
Loc. New Hope, Ontario, Canada.

Trimerella dalli Davidson and King. Guelph (Sil.).
Loc. Hespeler, Elora, and New Hope, Ontario, Canada.

Trimerella galtensis Hall = Rhinobolus galtensis. Guelph (Sil.).
Trimerella grandis Billings. Guelph (Sil.).
Loc. Galt, New Hope, and Elora, Hespeler, Ontario, Canada; near Hillsboro, Ohio; Wisconsin.

Trimerella minor Dall = Rhinobolus galtensis.

Trimerella ohioensis Meek. Niagara (Sil.).
Loc. Genoa, Ottawa County, Ohio; Port Byron, Illinois; Ontario, Canada.

TRIPLECIA Hall. Genotype Atrypa extans Emmons.

Triplecias cuspidata Hall. Trenton (Ord.).
Loc. Lowville, Lewis County, New York.
**Triplecia extans** (Emmons). Trenton (Ord.).


Triplesia extans, Hall, Ibidem, III, 1859, p. 523, figs. 1–3.


Loc. Watertown, Lowville, and Boonville, New York.

**Triplecia niagarmaensis** Hall and Clarke.


**Triplecia nucleus** Hall. Trenton (Ord.).

Atrypa nucleus Hall, Pal. New York, I, 1847, p. 138, pl. 33, fig. 2.


**Triplecia ortoni** Meek. Clinton (Sil.).


Triplesia ortoni Meek, Pal. Ohio, I, 1873, p. 178, pl. 15, fig. 1.


Loc. Dayton, Ohio; Newson, Tennessee.

**Triplecia (?) radiata** Whitfield. Calciferous (Ord.).


**Triplecia ulrichi** Winchell and Schuchert. Lorraine (Orel.).

Triplesia ulrichi W. and S., Minnesota Geol. Survey, III, 1893, p. 409, fig. 34.

Loc. Wykoff and Spring Valley, Minnesota.

Triplesia ambiguа Hall = Camarella ambiguа.

Triplesia calcifera Walcott = Syntrophia calcifera.

Triplesia congestа Hall = Hyattella congestа.

Triplesia lateralis Whitfield = Syntrophia lateralis.

Triplesia primordialis Whitfield = Syntrophia primordialis.

Triplesia putillus Hall = Minimus waldroneensis.

Triplesia quadricostata Hall = Hyattella congestа.

**Tropidoleptus** Hall. Genotype Strophomena carinata Conrad.


**Tropidoleptus carinatus** (Conrad). Marcellus and Hamilton (Dev.).


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Tropidoleptus carinatus (Conrad)—Continued.
Loc. New York; Falls of Ohio; Columbus, Ohio; Pennsylvania; Jackson County, Illinois; Erere, Province of Para, Brazil; Island of Coati, Lake Titicaca (Agassiz), and Rio Sicasica (Ulrich), Bolivia, South America; South Africa (Ulrich); France; Germany and England.

Tropidoleptus occidens Hall. Hamilton (Dev.).
Loc. Iowa City, Iowa.

Uncinulus Bayle. Genotype Rhynchoonella subwilsoni d'Orbigny.

Uncinulus abruptus Hall. Lower Helderberg (Dev.).
Uncinulus abruptus Hall and Clarke, VIII, Pt. II, 1893, p. 199, pl. 58, figs. 15-21.
Loc. Albany and Schoharie counties, New York.

Uncinulus campbellanus (Hall). Lower Helderberg (Dev.).
Loc. Albany County, New York.

Uncinulus mutabilis Hall. Lower Helderberg (Dev.).

Uncinulus nobilis Hall. Lower Helderberg (Dev.).
Uncinulus nobilis Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 58, fig. 26.
Loc. Albany and Schoharie counties, New York; Pennsylvania.

Uncinulus nucleolatus Hall. Lower Helderberg (Dev.).
Uncinulus nucleolatus Hall—Continued.
Loc. Schoharie and Carlisle, New York; Square Lake, Maine; St. Blandine, New Brunswick, Canada.

Uncinulus pyramidatus Hall.
Lower Helderberg (Dev.).
Uncinulus pyramidatus Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 58, figs. 27, 28.
Loc. Albany County, New York.

Uncinulus stricklandi (Sowerby).
Niagara (Sil.).
Terebratula stricklandi Sowerby, Murchison’s Sil. System, 1839, pl. 13, fig. 19.
Uncinulus (Uncinula) stricklandi Hall and Clarke, Pal. New York, VIII, Pt. II, 1895, pl. 58, figs. 38–40.
Loc. Europe; Waldoon, Indiana; Louisville, Kentucky.

Uncinulus vellicatus Hall.
Lower Helderberg (Dev.).
Loc. Albany and Schoharie counties, New York; Dalhousie, New Brunswick, Canada.

VITULINA Hall.
Genotype V. pustulosa Hall.

Vitulina pustulosa Hall.
Hamilton (Dev.).
Loc. Near Tully and Tinkers Falls, New York; Monroe County, Pennsylvania; Erere, Province of Para, and provinces Para and Matto Grosso, Brazil; island of Conti, Lake Titicaca, Tarabuco and Rio Sicasica, Bolivia; South Africa.

WALDHEMIA King.
Genotype W. flavescens Lamarck.

Waldheimia (?) catorcensis Aguilera.
Jurassic.
Waldheimia catorcensis Aguilera, Bol. Com. Geologica de Mexico, I, 1895, p. 1, pl. 2, fig. 8.
Loc. Rancho Alamitos, San Luis, Potosi, Mexico.
Waldheimia compacta White and St. John = Cryptacanthia compacta.
Waldheimia coutinhoana Derby = Harttina coutinhoana.
Waldheimia deweyi Hall = Parazyga deweyi.
Waldheimia formosa Hall = Rhynchospira formosa.
Waldheimia globosa Hall = Rhynchospira globosa.
Waldheimia imbricata Cooper = Terebratella imbricata.
Waldheimia kennedyi Dall. Miocene.
Waldheimia rectirostra Hall = Rhynchospira rectirostris.
Whitfieldia Davidson = Meristina.

**Whitfieldella** Hall and Clarke. Genotype Atrypa nitida Hall.


**Whitfieldella** (?) billingsana (Meek and Worthen). Niagara (Sil.).
Centronella billingsana Meek and Worthen, Geol. Survey Illinois, III, 1868, p. 392, figs. a, b, c; pl. 6, fig. 5.
Loc. Alexander County, Illinois.

**Whitfieldella** (?) bisulcata (Vanuxem). Lower Helderberg (Dev.).
Atrypa bisulcata Vanuxem, Geol. N. Y.; Rep. Third Dist., 1842, p. 112.
Loc. Litchfield, New York.

**Whitfieldella** cylindrica Hall. Clinton-Niagara (Sil.).
Atrypa cylindrica Hall, Pal. New York, II, 1852, p. 76, pl. 24, fig. 2.
Atrypa crassirostra Hall, Pal. New York, 1852, p. 269, pl. 53, fig. 4.
Athryris cylindrica Billings, Geol. Canada, 1863, p. 317, fig. 332; Geol. Canada, 1863, p. 317, fig. 332.
Meristella (Meristina) cylindrica Meek, Pal. Ohio, I, 1873, p. 180, pl. 15, fig. 2.
Loc. Lockport, New York; Hillsboro, Ohio; Hamilton, Ontario; Anticosti.

**Whitfieldella** (?) harpalyce (Billings). Lower Helderberg (Dev.).
Loc. Square Lake, Maine.

**Whitfieldella** hyale (Billings). Guelph (Sil.).
Charionella (?) hyale, Billings, Pal. Fossils, I, 1862, p. 166, fig. 150.
Charionella hyale Hall and Clarke, Ibidem, pl. 42, figs. 20, 21.
Loc. Galt and Elora, Ontario; Wisconsin (Whitfield).

**Whitfieldella** intermedia Hall. Clinton-Niagara (Sil.).
Whitfieldella intermedia Hall—Continued.

Whitfieldella intermedia Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 60, pl. 40, figs. 1, 2.

Loc. Lockport, New York; Thorold, Ontario; Pennsylvania.

Whitfieldella (?) julia (Billings).

Atrypa julia Billings, Pal. Fossils, I, 1862, p. 146, fig. 124.

Loc. Anticosti.

Whitfieldella (?) naviformis Hall.

Whitfieldella naviformis Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 60, pl. 40, fig. 3.

Loc. Rochester, Sodus, etc., New York; Dundas, Ontario; Anticosti.

Whitfieldella nitida Hall.

Atrypa nitida Hall, Geol. New York; Rep. Fourth Dist., Tables of Organic Remains, 13, 1843, fig. 5.—Pal. New York, II, 1852, p. 268, pl. 55, fig. 1.—Billings, Canadian Nat. Geol., I, 1856, p. 137, pl. 2, fig. 9.
Atrypa nitida Hall, Geol. Canada, 1863, p. 317, fig. 334.

Loc. Lockport, etc., New York; Hamilton, Ontario; Waldron, Indiana; Louisville, Kentucky; Anticosti.

Whitfieldella nitida oblata Hall.

Atrypa nitida var. oblata Hall, Pal. New York, II, 1852, p. 269, pl. 55, fig. 2.

Loc. Lockport, etc., New York.

Whitfieldella (?) nucleolata (Hall.)

Atrypa nucleolata Hall, Pal. New York, II, 1852, p. 328, pl. 74, fig. 10.
Meristella nucleolata Whitfield, Geol. Wisconsin, IV, 1882, p. 321, pl. 25, fig. 5.


Whitfieldella oblata Hall.

Atrypa oblata Hall, Pal. New York, II, 1852, p. 9, pl. 4, figs. 4, 5.

Loc. Lockport, New York.

Whitfieldella sulcata (Vanuxem).

Merista sulcata Miller, American Pal. Fossils, 1877, p. 115.

WILSONIA Kayser. Genotype Terebratula wilsoni Sowerby.
Wilsonia Kayser, Zeitschr. d. deutsch. geolog. Gesselsch., XXIII, 1871, p. 502.—
Uncinulina Bayle, Explic. de la Carte Géol. France, IV, 1878, Atlas, pl. 13,
figs. 13-16.
Obs. A subgenus of Camarotoechia.

Wilsonia kokomoensis (Miller). Waterlime (Sil.).
Rhynchonella kokomoensis Miller, Eighteenth Ann. Rep. Geol. Survey Indiana,
1894, p. 312, pl. 9, figs. 22-24.
Loc. Kokomo, Indiana.

Wilsonia saffordi Hall. Niagara and Lower Helderberg (Sil. and Dev.).
Rhynchonella saffordi Hall, Canadian Nat. Geol., V, 1860, p. 146.—Hall and
27-29.—Dawson, Acad. Geol., 3d ed., 1878, p. 598.—Nettelroth, Kentucky
Fossil Shells, Mem. Kentucky Geol. Survey, 1889, p. 79, pl. 27, figs. 22-24;
pl. 33, figs. 4-6.
58, figs. 5-14.
Loc. In the Arisaig group of Nova Scotia; Perry County, Tennessee; Louisville,
Kentucky.

Wilsonia saffordi depressa (Nettelroth). Niagara (Sil.).
Rhynchonella saffordi var. depressa Nettelroth, Kentucky Fossil Shells, Mem.
Kentucky Geol. Survey, 1889, p. 80, pi. 33, fig. 1-3.
Loc. Louisville, Kentucky.

Wilsonia wilsoni (Sowerby). Niagara (Sil.).
Terebratula wilsoni Sowerby, Mineral Conchology, 1818, p. 118, fig. 3.
Rhynchonella wilsoni Roemer, Sil. Fauna d. West. Tennessee, 1860, p. 71, pl. 5,
fig. 13.
Loc. Europe; Decatur County, Tennessee; Louisville, Kentucky; Lake Temis-
couata, New Brunswick.


Yorkia wanneri Walcott. Lower Cambrian.
Loc. Emigsville, Pennsylvania.

Yorkia (?) washingtonensis Walcott. Lower Cambrian.
Yorkia (?) washingtonensis Walcott, Proc. U. S. Nat. Mus., XIX, 1897, p. 715,
pl. 60, fig. 3.

ZYGOSPIRA Hall. Genotype Atrypa modesta Hall.
Stenocisma Hall (non Conrad), Pal. New York, I, 1847, p. 142.—Meek and Hay-
den, Pal. Upper Missouri, Smithsonian Cont. to Knowl., XIV, 1864, p. 16.
1, 2.—Billings, Canadian Nat. Geol., VII, 1862, p. 393.—Hall, Twentieth Rep.
1868, p. 377.—Davidson, Suppl. British Silurian Brachiopoda, Pal. Soc., 1882,
p. 122.—Winchell and Schuchert, Minnesota Geol. Survey, III, 1883, p. 465.—
ZYGOSPIRA Hall—Continued.


Zygospira aequula Sardeson = Z. nicoletti.
Zygospira anticostiensis Davidson = Catazyga erratica.

Zygospira cincinnatiensis Meek.
Zygospira cincinnatiensis (James) Meek, Pal. Ohio, I, 1873, p. 126, pl. 11, fig. 5.—Muller, Cincinnati Quart. Jour. Sci., II, 1875, p. 59.—Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, pl. 54, figs. 13, 14.

Loc. Cincinnati, Ohio.

Zygospira concentrica Ulrich.

Loc. Cincinnati, Ohio.

Zygospira deflecta Hall.
Atrypa deflecta Hall, Pal. New York, I, 1847, p. 140, pl. 33, fig. 4.

Loc. Lewis County, New York; Ottawa, Canada.

Zygospira exigua (Hall).
Atrypa exigua Hall, Pal. New York, I, 1847, p. 141, pl. 33, fig. 6.


Zygospira erratica Davidson = Catazyga erratica.
Zygospira headi Hall = Catazyga headi.

Zygospira kentuckiensis James.
Zygospira modesta var. kentuckiensis James, The Paleontologist, 1878, p. 7.

Loc. Oldham and Jefferson counties, Kentucky.

Zygospira (?) mica (Billings).
Rhynechonella mica Billings, Cat. Sil. Foss. Anticosti, 1866, p. 44.

Loc. Division 4 of the Anticosti group, Anticosti.

Zygospira (?) minima Hall.

Loc. Waldron, Indiana.

Zygospira modesta Hall.
Zygospira modesta Hall—Continued.

and Schuchert, Minnesota Geol. Survey, III, 1893, p. 467, pl. 34, figs. 42-44.—
Hall and Clarke, Pal. New York, VIII, Pt. II, 1893, p. 155, figs. 146-149, pl.
54, figs. 7-10, 12.—Keyes, Geol. Survey Missouri, V, 1895, p. 98.

Rynchonella? modesta Billings, Geol. Canada, 1863, p. 211, fig. 211.

Loc. Cincinnati, Ohio; Turin, etc., New York; Latners, Iowa; Spring Valley,
Minnesota; Wisconsin; St. Louis County, Missouri; Ottawa, Canada (Ami).

Zygospira nicoletti Winchell and Schuchert. Trenton (Ord.).

Hallina nicoletti W. and S., American Geol., IX, April 1, 1892, p. 293;—Minnesota
Geol. Survey, III, 1893, p. 474, pl. 34, figs. 59-62.

335, pl. 4, figs. 15-18.

Zygospira nicoletti Beecher and Schuchert, Biol. Soc. Washington, VIII, Pt. II,
1893, p. 71, pl. 10, fig. 23; pl. 11, figs. 11, 12.

Loc. Minneapolis, Rochester, and Fountain, Minnesota; Decorah, Iowa; Beloit,
Wisconsin; Auburn, Missouri.

Zygospira paupera Billings.

Zygospira paupera Billings, Cat. Sil. Fossils Anticosti, 1866, p. 46.—Hall and

Loc. Division 3 of Anticosti group, Anticosti.

Zygospira putilla Hall and Clarke. ?Lorraine (Ord.).

150, p. 365, pl. 54, figs. 35-37; pl. 83, figs. 29, 30.

Loc. Pike County, Missouri.

Zygospira recurvostris (Hall). Trenton (Ord.).

Atrypa recurvostris Hall, Pal. New York, I, 1847, p. 140, pl. 33, fig. 5.

Rynchonella recurvostris Billings, Geol. Canada, 1863, p. 168, fig. 152.

Acanthogyna recurvostris Davidson, Suppl. British Sil. Brachiopoda, Pal. Soc.,
1892, p. 129.

Zygospira recurvostris Winchell and Schuchert, Minnesota Geol. Survey, III,
1893, p. 466, pl. 34, figs. 38-41.—Beecher and Schuchert, Biol. Soc. Washington,
VIII, 1893, p. 71, pl. 10, figs. 7-21; pl. 11, figs. 1-10.—Hall and Clarke, Pal. New
York, VIII, Pt. II, 1895, pl. 54, figs. 1-6.—Whiteaves, Pal. Foss., III, Pt. III,
1897, p. 180.

Loc. New York; Kentucky; Iowa; Minnesota; Wisconsin; Ottawa, Canada;
Lake Winnipeg, Manitoba. According to Billings it occurs also in the Lorraine
group of Anticosti.

Zygospira saffordi Winchell and Schuchert. Trenton (Ord.).

Hallina saffordi W. and S., American Geol., IX, 1892, p. 292;—Minnesota Geol.
Survey, III, 1893, p. 473, pl. 34, figs. 55-58.—Hall and Clarke, Pal. New York,
VIII, Pt. II, 1895, pl. 83, figs. 36-38.

71, pl. 10, fig. 22; pl. 11, figs. 13, 13a.—Hall and Clarke, Pal. New York, VIII,
Pt. II, 1893, p. 151, figs. 139-141.

Loc. Lebanon, Tennessee; Highbridge, Kentucky.

Zygospira (?) subconcava Meek and Worthen. Lower Helderberg (Dev.).

Zygospira subconcava Meek and Worthen, Geol. Survey Illinois, III, 1888, p. 380,
pl. 7, fig. 1.

Loc. Perry County, Missouri.

Zygospira uphami W. and S. = Catazyga uphami.
The statute approved March 3, 1879, establishing the United States Geological Survey, contains the following provisions:

"The publications of the Geological Survey shall consist of the annual report of operations, geological and economic maps illustrating the resources and classification of the lands, and reports upon general and economic geology and paleontology. The annual report of operations of the Geological Survey shall accompany the annual report of the Secretary of the Interior. All special memoirs and reports of said Survey shall be issued in uniform quarto series if deemed necessary by the Director, otherwise in ordinary octavos. Three thousand copies of each shall be published for scientific exchanges and for sale at the price of publication; and all literary and cartographic materials received in exchange shall be the property of the United States and form a part of the library of the organization; and the money resulting from the sale of such publications shall be covered into the Treasury of the United States."

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— Flora of the Laramie and Allied Formations, by Frank Hall Knowlton.

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"Provided, That hereafter the reports of the Geological Survey in relation to the gauging of streams and to the methods of utilizing the water resources may be printed in octavo form, not to exceed one hundred pages in length and five thousand copies in number; one thousand copies of which shall be for the official use of the Geological Survey, one thousand five hundred copies shall be delivered to the Senate, and two thousand five hundred copies shall be delivered to the House of Representatives, for distribution."

Under this law the following papers have been published:

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VIII

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<td>38° 30'-38°</td>
<td>938</td>
<td>25</td>
</tr>
<tr>
<td>24</td>
<td>Three Forks</td>
<td>Montana.</td>
<td>110°-112°</td>
<td>45°-46°</td>
<td>3,354</td>
<td>25</td>
</tr>
<tr>
<td>25</td>
<td>London</td>
<td>Tennessee.</td>
<td>84°-84° 30'</td>
<td>35° 30'-36°</td>
<td>969</td>
<td>25</td>
</tr>
<tr>
<td>26</td>
<td>Pocahontas</td>
<td>Virginia.</td>
<td>81°-83° 30'</td>
<td>37° 37'-38°</td>
<td>951</td>
<td>25</td>
</tr>
<tr>
<td>27</td>
<td>Morristown</td>
<td>Tennessee.</td>
<td>83°-83° 30'</td>
<td>36°-36° 30'</td>
<td>963</td>
<td>25</td>
</tr>
<tr>
<td>28</td>
<td>Piedmont</td>
<td>Maryland.</td>
<td>7° 30'-7° 30'</td>
<td>39°-39° 30'</td>
<td>925</td>
<td>25</td>
</tr>
<tr>
<td>29</td>
<td>Nevada City:</td>
<td>Nevada City:</td>
<td>121° 00' 25''-121° 03' 45''</td>
<td>30° 13'-39° 30' 17'' 16'</td>
<td>11.65</td>
<td>50</td>
</tr>
<tr>
<td></td>
<td>Grass Valley</td>
<td>California.</td>
<td>121° 01' 35''-121° 05' 04''</td>
<td>30° 10'-39° 30' 15'' 50''</td>
<td>12.09</td>
<td>50</td>
</tr>
<tr>
<td>30</td>
<td>Yellowstone National Park: Gallatin</td>
<td>Wyoming.</td>
<td>110°-111°</td>
<td>40°-45°</td>
<td>3,412</td>
<td>75</td>
</tr>
<tr>
<td></td>
<td>Canyon</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td>Shoshone Lake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Pyramid Peak</td>
<td>California.</td>
<td>120°-120° 30'</td>
<td>38° 30'-39°</td>
<td>932</td>
<td>25</td>
</tr>
<tr>
<td>32</td>
<td>Franklin</td>
<td>West Va.</td>
<td>79°-79° 30'</td>
<td>38° 30'-39°</td>
<td>932</td>
<td>25</td>
</tr>
<tr>
<td>33</td>
<td>Gadsden</td>
<td>Alabama.</td>
<td>86°-86° 30'</td>
<td>34°-34° 30'</td>
<td>986</td>
<td>25</td>
</tr>
</tbody>
</table>

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"Provided, That hereafter the report of the mineral resources of the United States shall be issued as a part of the report of the Director of the Geological Survey."

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