PLATES AND EXPLANATIONS.

PLATE I.

CALYMENE PLATYS.

Page 1.

See Plate 25.

Fig. 1. An imperfect specimen wanting the posterior portion of the body, but preserving the movable cheeks in place.

Schoharie grit. *Schoharie county.*

Fig. 2. A nearly entire individual somewhat below the average size; drawn from an impression of a natural mould of the dorsal surface. The obscure third pair of glabellar lobes are distinctly seen in the specimen but do not appear in the drawing. The specimen belongs to the cabinet of the Albany Institute and is the original of Dr. Green's description.

Schoharie grit. *Albany county.*

Fig. 3. An individual with a portion of the cephalon removed, showing the hypostoma in its normal position.

Schoharie grit. *Schoharie county.*

Fig. 4. A very large, nearly entire example, retaining only a small portion of the crust. The third glabellar lobes do not appear in the drawing.

Schoharie grit. *Schoharie county.*

Fig. 5. A large individual retaining most of the crust upon the thorax.

Schoharie grit. *Schoharie county.*

Fig. 6. The glabella and fixed cheeks of a large individual preserved as a cast of the lower surface. The first and third pairs of glabellar lobes are not indicated in the drawing.

Schoharie grit. *Knox, Albany county.*

Fig. 7. The hypostoma. Drawn from an impression of the lower surface obtained from fig. 3, and restored upon the anterior margin.

Fig. 8. The pygidium of a large individual drawn from a cast of the lower surface and showing the impression of the doublure along the posterior margin. The annulations upon the posterior portion of the axis are made to appear too conspicuous in the drawing.

Schoharie grit. *Schoharie county.*

Fig. 9. A smaller pygidium. The posterior edge has been broken away in the specimen, leaving the outline less strongly emarginate than is normal.

Schoharie grit. *Schoharie county.*

CALYMENE NIAGARENSIS.

Fig. 10. A nearly entire individual, showing the first and inconspicuous third pair of glabellar lobes. Introduced for comparison with *Calymene platys.*

Niagara group. *Waldron, Indiana.*

Fig. 11. The under side of the cephalon, showing the epistomal doublure and the hypostoma in place.

Niagara group. *Waldron, Indiana.*

Fig. 12. An entire individual of average size.

Niagara group. *Waldron, Indiana.*

Fig. 13. The under side of the cephalon, showing the upper surface of the hypostoma.

Niagara group. *Waldron, Indiana.*

Fig. 14. The hypostoma, enlarged to two diameters.

Niagara group. *Waldron, Indiana.*

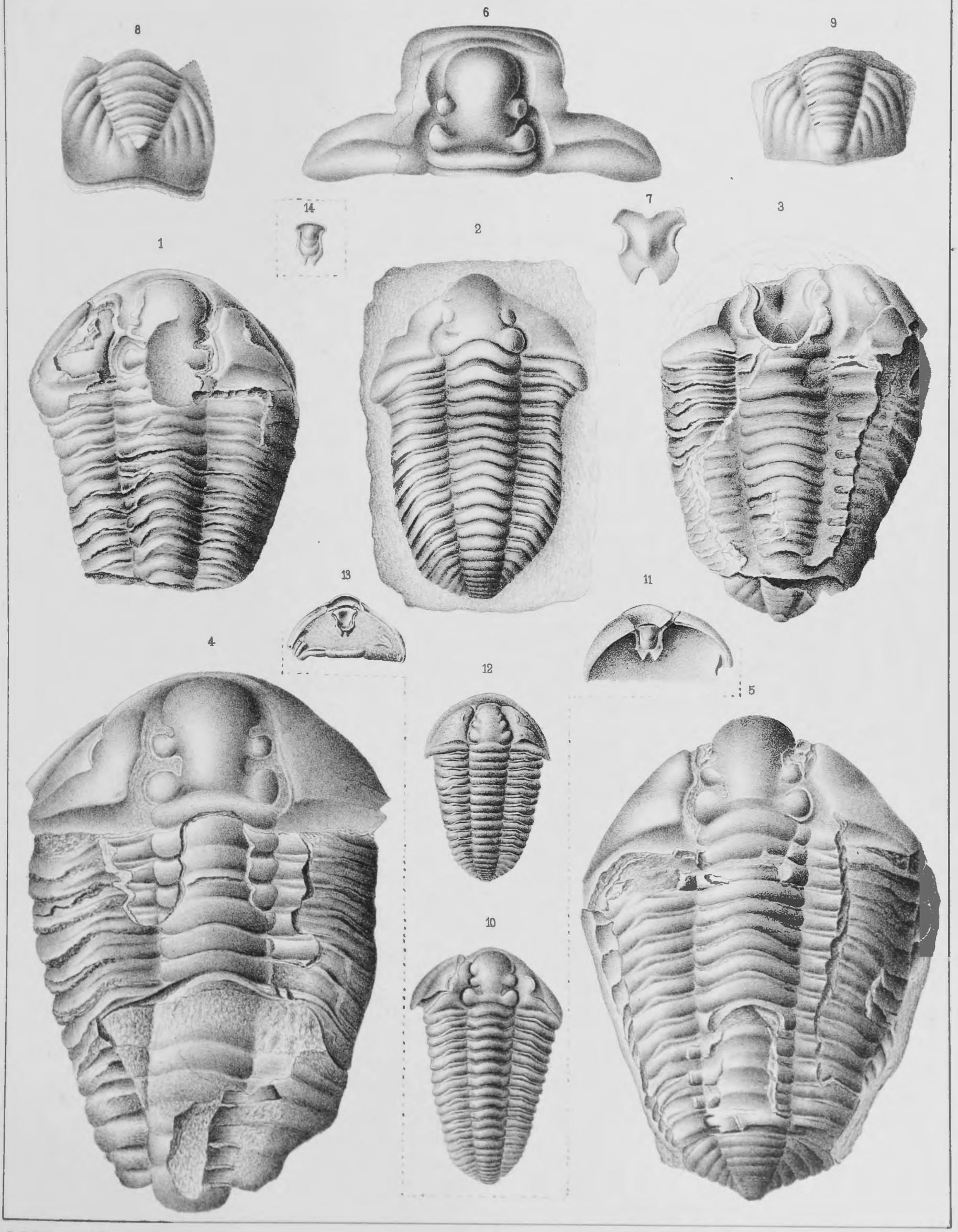
UPPER HELDERBERG GROUP.

[Schoharie Grit.]

(CALYMENIDÆ)

Palæontology of NY.

Plate I.



G.B.Simpson del.

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PLATE II.

HOMALONOTUS DEKAYI.

Page 7.

See Plates 3, 4 and 5.

Fig. 1. A very young, partially dismembered individual, showing a strongly annulated and trilobate pygidium.

Hamilton group. *Madison county.*

Fig. 2. A young, distinctly trilobate and nearly entire individual.

Hamilton group. *Ladd's quarry, near Sherburne, Chenango county.*

Fig. 3. Anterior aspect of a somewhat larger, enrolled individual.

Fig. 4. Posterior aspect of the same.

Hamilton group. *Near Hamilton, Madison county.*

Fig. 5. An individual in a still more advanced stage of growth, retaining the trilobate pygidium. The figure has been somewhat restored upon the left side.

Hamilton group. *Onondaga county.*

Fig. 6. An enrolled and uncompressed individual, preserved as an internal cast.

Hamilton group. *Madison or Otsego county.*

Fig. 7. An individual of about the average normal adult size attained by specimens from the arenaceous shales. The specimen is preserved as a cast of the lower surface, and shows the conspicuous transverse grooves upon the segments of the thorax. The annulations of the pygidium are much more obscure than they are made to appear in the drawing.

Hamilton group. *Madison county.*

Fig. 8. An individual showing but ten, instead of thirteen thoracic segments. The cephalon has apparently been pushed back so as to cover the first three segments.

Fig. 9. Profile of the same, showing the elevation of the body and the prolongation of the anterior and posterior extremities.

Hamilton group. *Madison county.*

Fig. 10. A small, imperfect cephalon.

Hamilton group. *East Worcester, Otsego county.*

Fig. 11. A cephalon from the soft shales, in which the facial suture is somewhat thrown backward at the anterior extremity by the crushing of the frontal doublure. The anterior portion of the suture is more transverse in the specimen than is represented in the drawing.

Hamilton group. *Darien, Genesee county.*

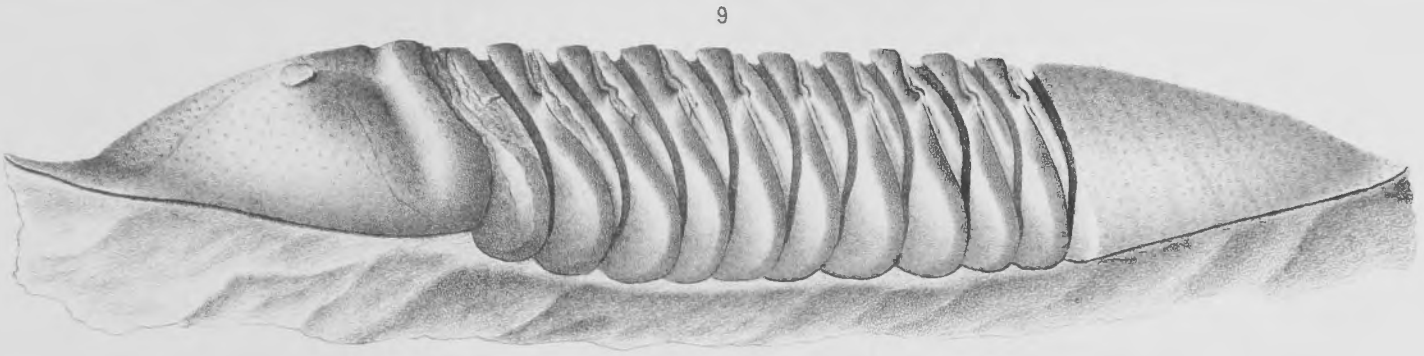
Fig. 12. The hypostoma.

Hamilton group. *Cazenovia, Madison county.*

HAMILTON GROUP.

(CALYMENIDÆ.)

Palæontology of N.Y. Plate II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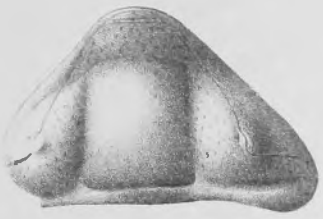
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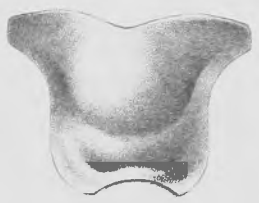
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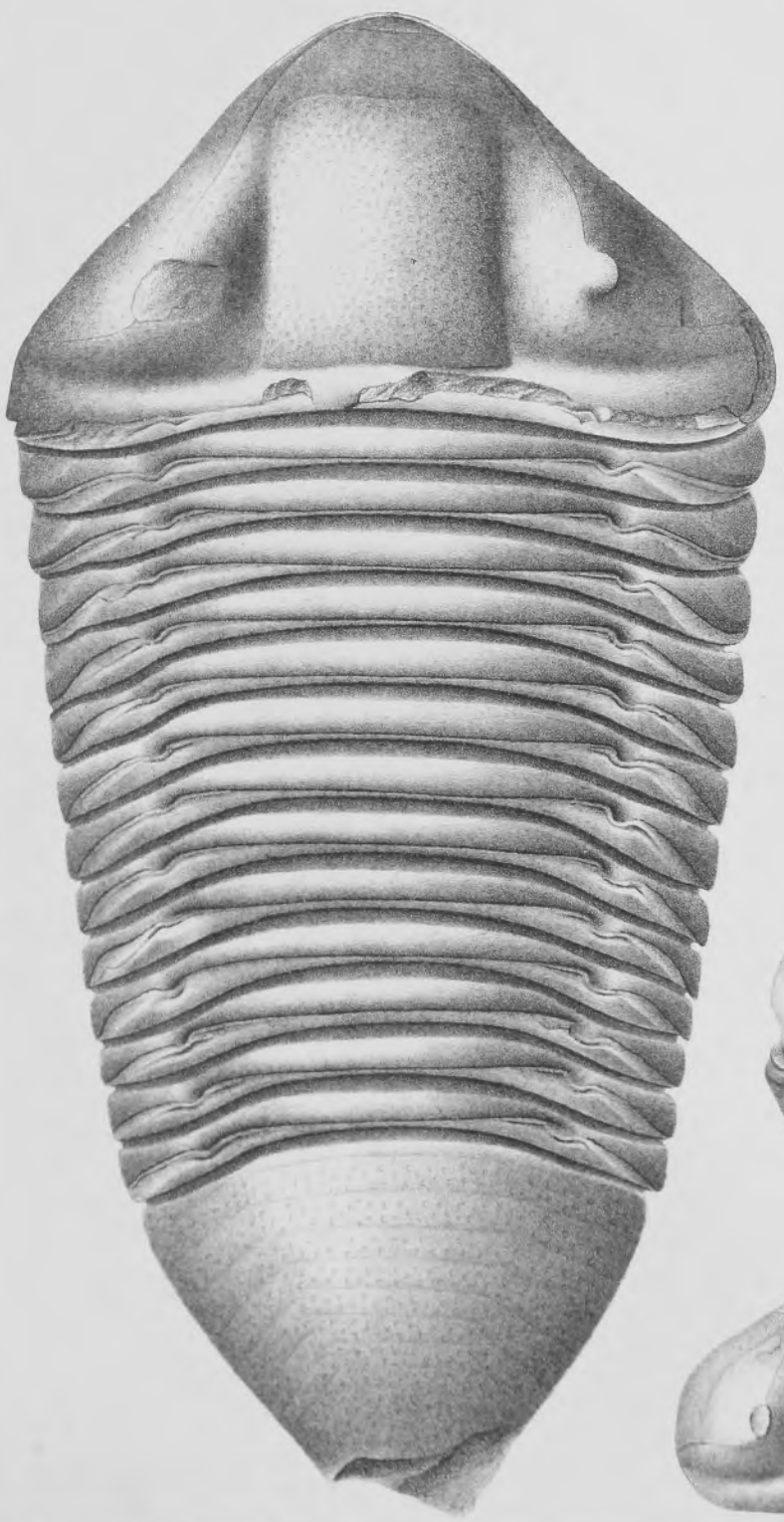
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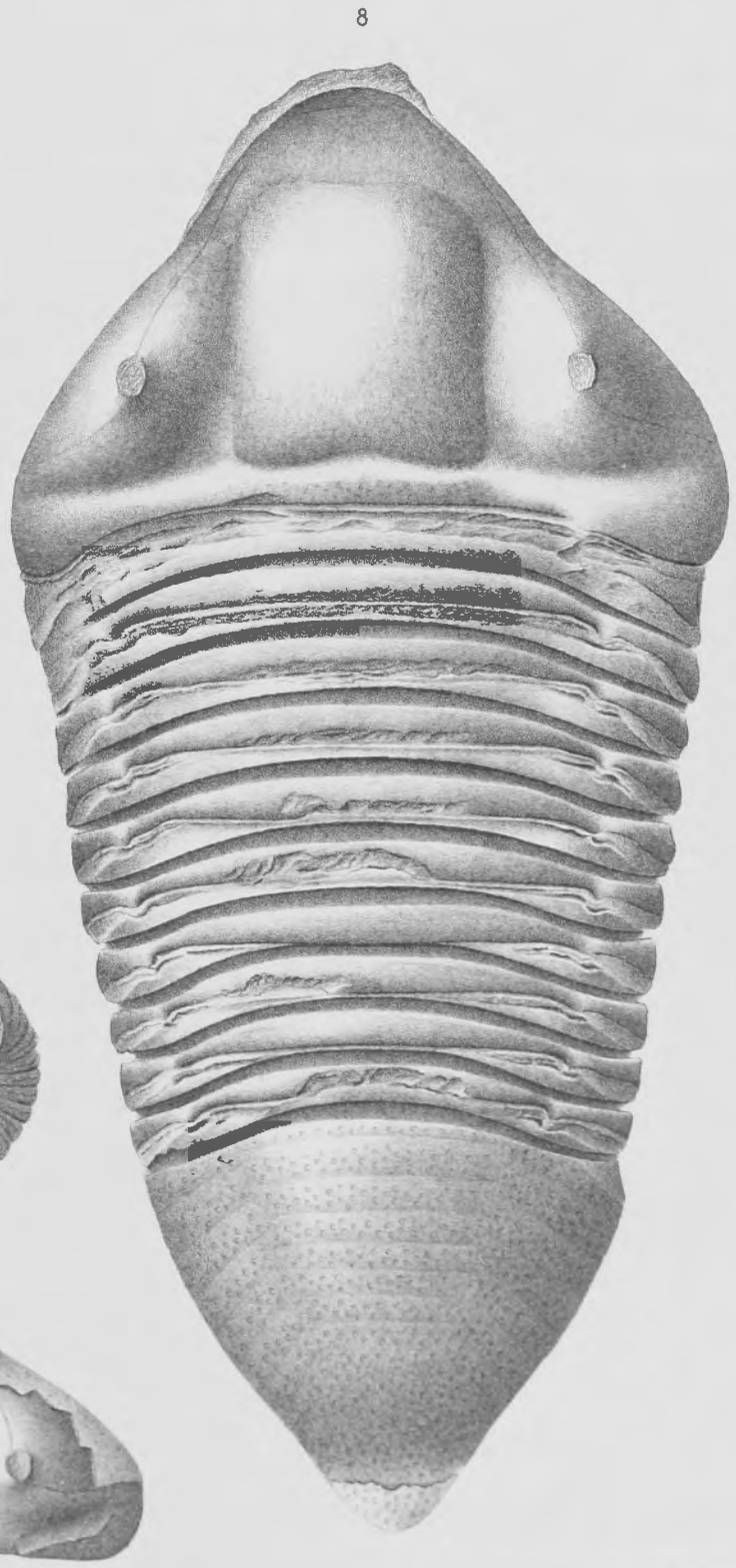
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PLATE III.

HOMALONOTUS DEKAYI.

See Plates 2, 4 and 5.

Fig. 1. A small individual from the soft shales, retaining a portion of the crust and showing the median frontal plate enclosed by the branches of the facial sutures upon the epistomal doublure. In the drawing the annulations of the pygidium are too strongly represented.

Hamilton group. *Bellona, Yates county.*

Fig. 2. A cast of the lower surface of a larger individual, showing the median plate and a portion of the hypostoma displaced from its normal position.

Hamilton group. *Near Leonardsville, Madison county.*

Fig. 3. A cast of the lower surface of an almost entire specimen.

Hamilton group. *Madison county.*

Fig. 4. A specimen from the soft shales, retaining twelve thoracic segments with the pygidium, and preserving the crust.

Hamilton group. *Canandaigua Lake.*

Fig. 5. A block of arenaceous shale, showing the dismembered parts of a large individual.

Hamilton group. *Madison county.*

HAMILTON GROUP.

(CALYMENIDÆ.)

Palæontology of N.Y.

Plate III.

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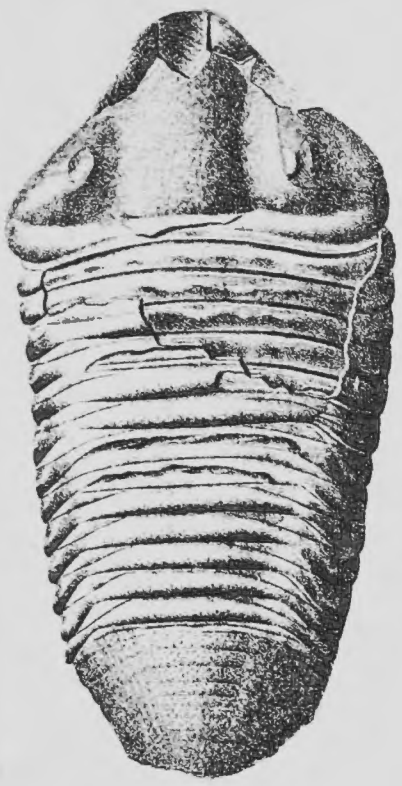

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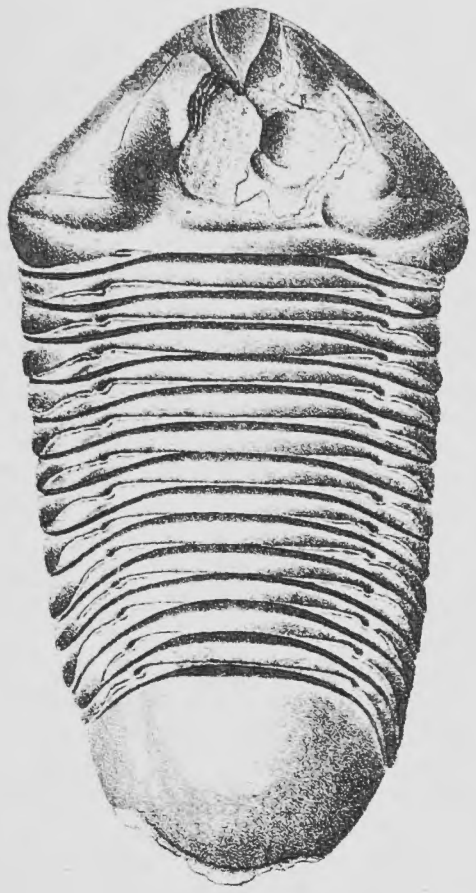

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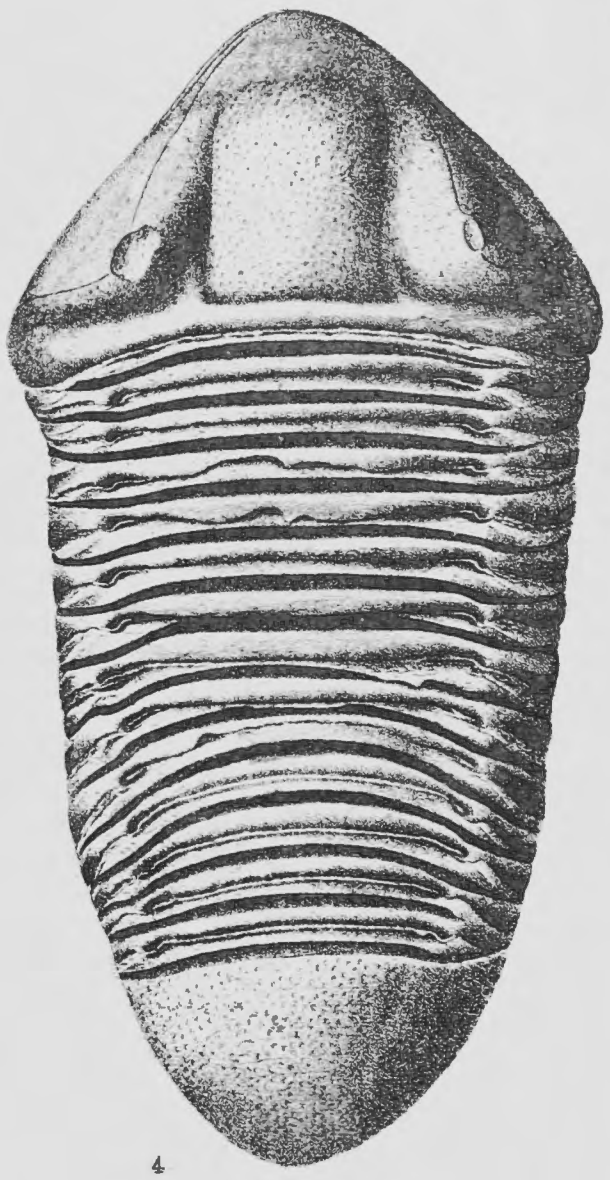

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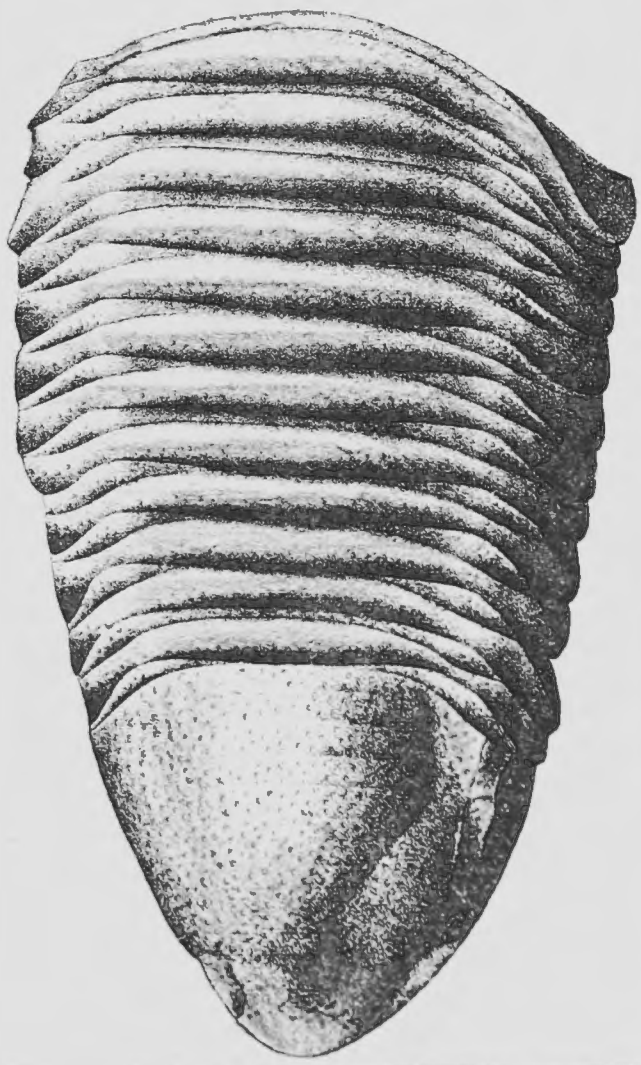

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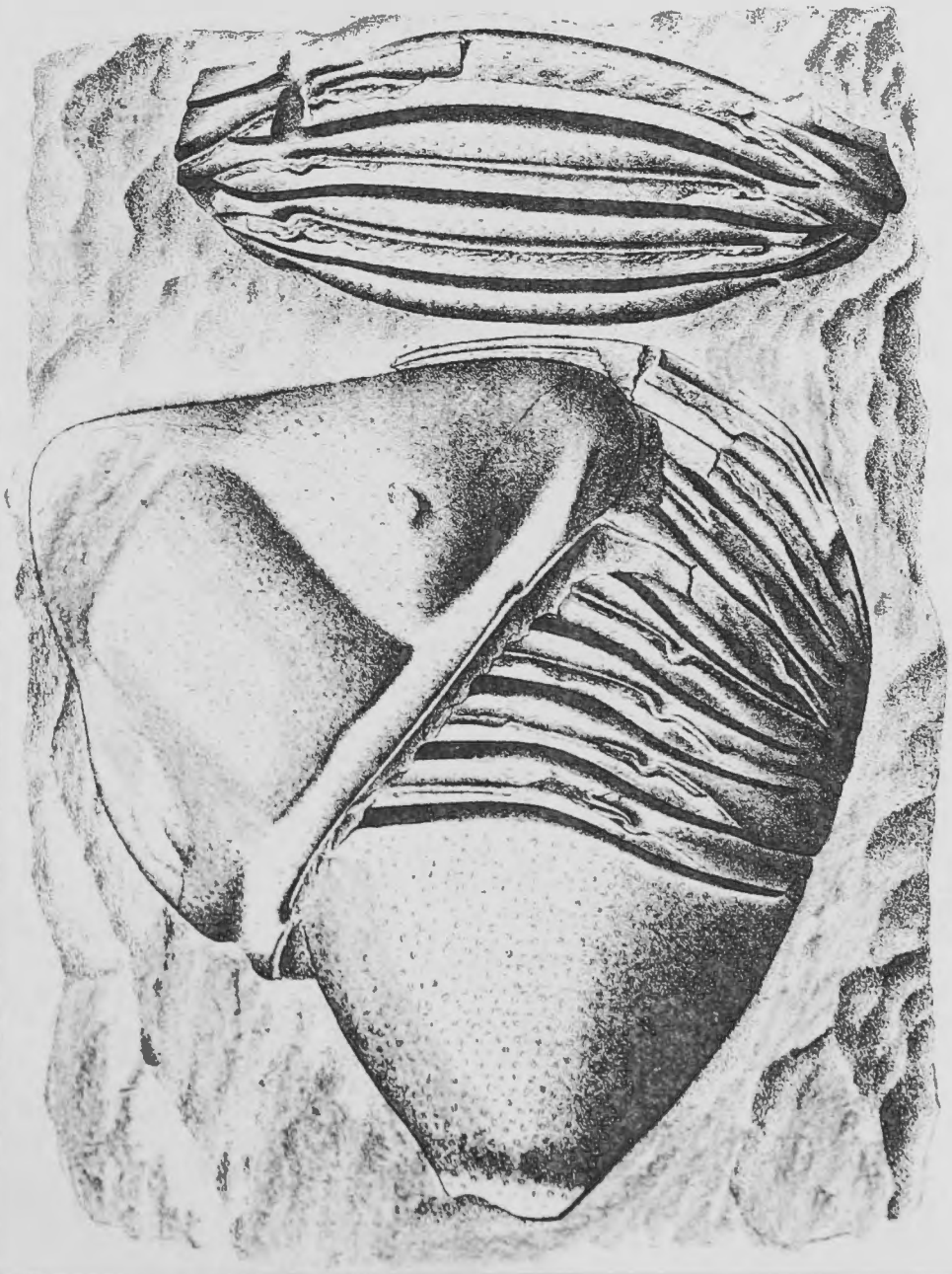

G B Simpson del

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PLATE IV.

HOMALONOTUS DEKAYI.

See Plates 2, 3 and 5.

Fig. 1. Profile view of an unusually large enrolled individual, a cast of the lower surface.

Fig. 2. Anterior aspect of the same, showing the pygidial doublure.

Fig. 3. Posterior aspect of the same.

Hamilton group. *Madison county.*

Fig. 4. Dorsal aspect of a normal cephalon.

Fig. 5. Lower aspect of the same, showing the doublure, the branches of the facial sutures and the median frontal plate.

Hamilton group. *Madison county.*

Fig. 6. An enlargement, to five diameters, of the under surface of the test, of a specimen from the soft shales, showing the openings and projecting edges of the large vertical tubules.

Hamilton group. *Canandaigua Lake.*

Fig. 7. A similar enlargement of the under surface of a specimen from the limestone, showing the elevated edge of the tubules and the openings of the minute tubulipores.

Hamilton group. *Canandaigua Lake.*

HAMILTON GROUP.

(CALYMENIDÆ.)

Palæontology of N.Y. Vol VII

Plate IV

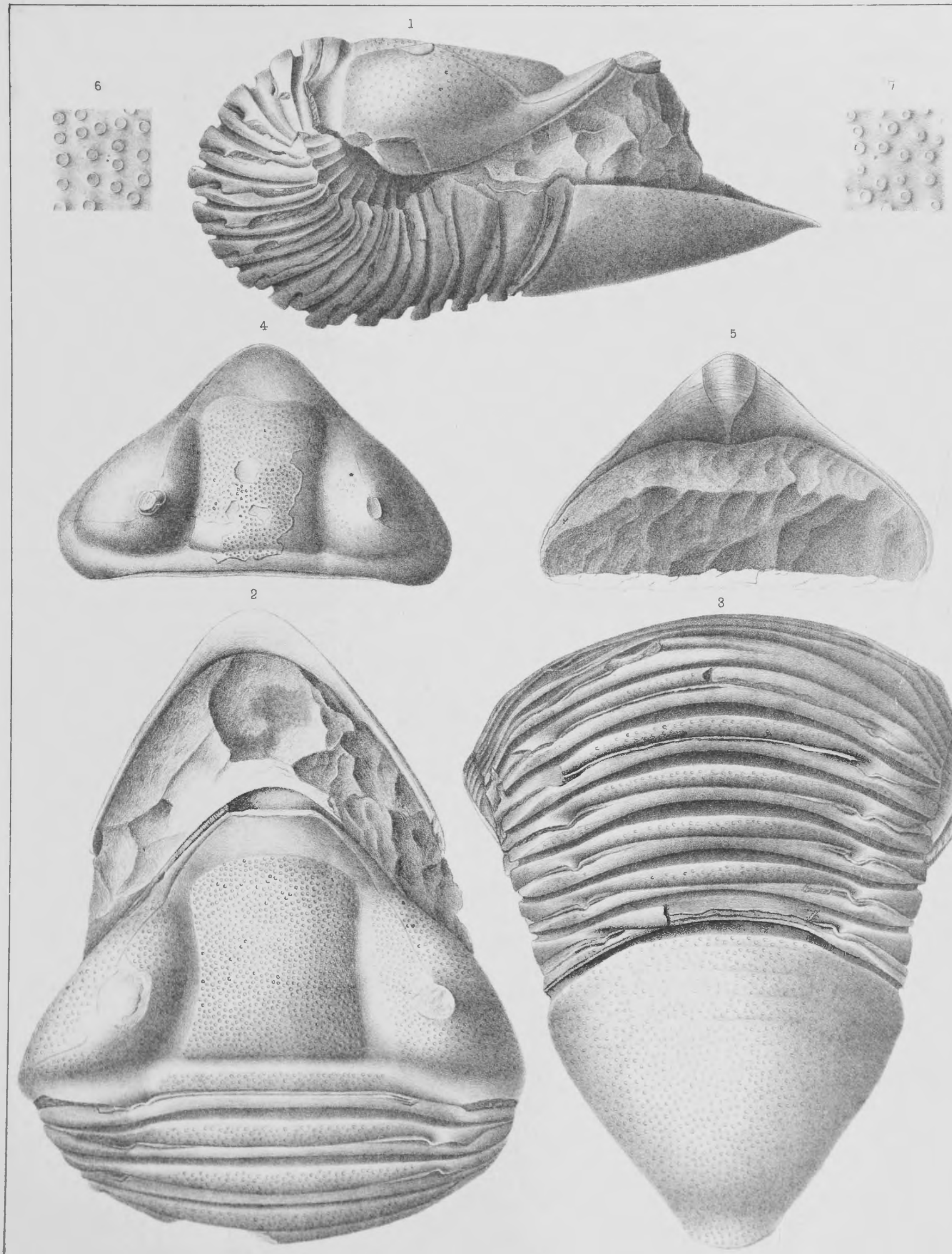

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PLATE V.

HOMALONOTUS DEKAYI.

See Plates 2, 3 and 4.

Fig. 1. A very young individual, showing the faint lateral furrows on the glabella.
Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 2. Profile view of an uncompressed, partially enrolled, entire individual, retaining the crust and the visual surface of the eyes.

Fig. 3. Front view of the same, showing the elevation of the eyes.
From the limestone of the Hamilton group. *Canandaigua lake.*

Fig. 4. Profile view of an enrolled and compressed specimen from the shales.

Fig. 5. Anterior aspect of the same.

Fig. 6. Posterior aspect of the same.
Hamilton group. *Western New York.*

Fig. 7. A cephalon of medium size.

Fig. 8. Profile view of the same.
Hamilton group. *Madison county.*

Fig. 9. An imperfect cephalon. This specimen is the original of Eaton's *Nuttainia sparsa* and was obtained by the author in March, 1832, at Stephen's Mill in the town of Coeymans, Albany county. The occipital ring was regarded by Eaton as the anterior border of the head, corresponding to that of *Trinucleus (Nuttainia) concentricus.* (See Eaton's Geological Text-book, page 34, 1832.)

Fig. 10. A small pygidium from the limestone, retaining normal convexity.

Fig. 11. Profile view of the same.
Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 12. Profile view of a pygidium, a cast of the lower surface.

Fig. 13. Dorsal aspect of the same, showing the usual character of the annulations.
Hamilton group. *Madison county.*

Fig. 14. A cast of the lower surface of a pygidium upon which the annulations are abnormally distinct for so advanced a stage of growth.
Hamilton group. *Madison county.*

HAMILTON GROUP.

(CALYMENIDÆ)

Palæontology of N.Y., Vol VII. Plate V.

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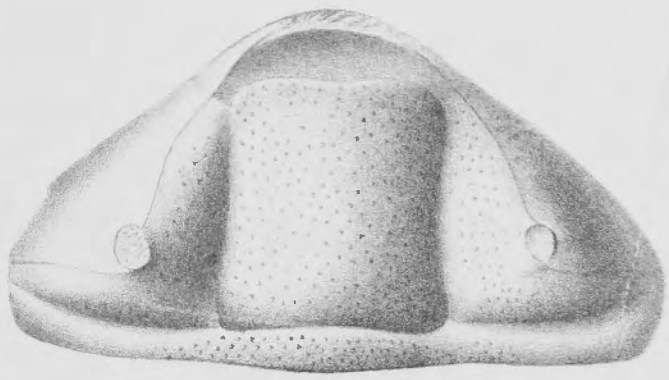

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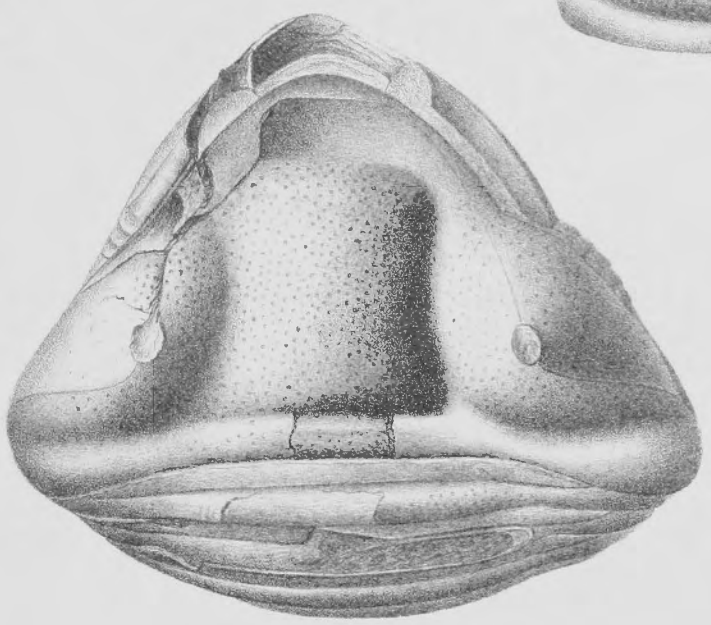

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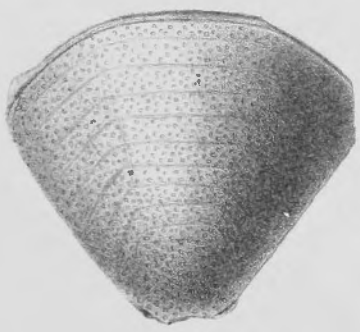

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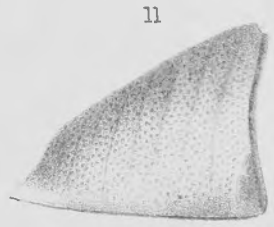

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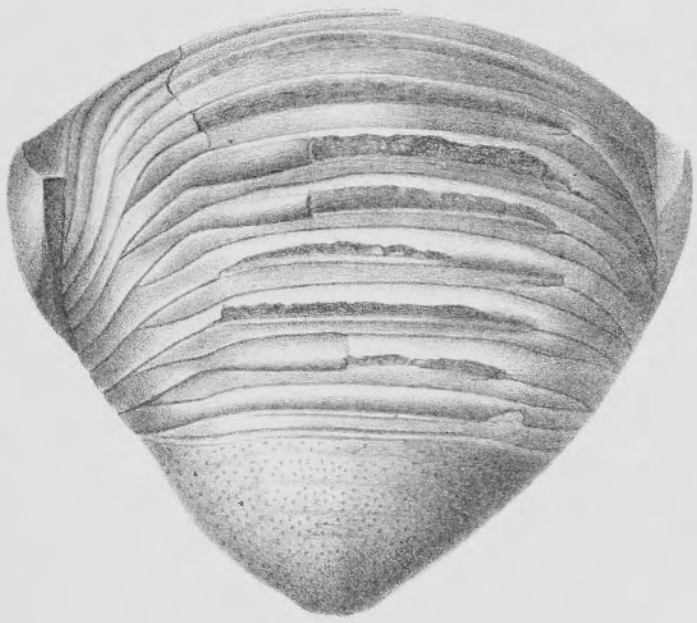

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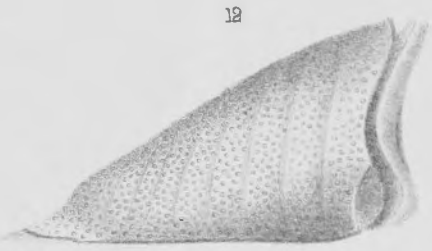

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PLATE V A.

HOMALONOTUS MAJOR.

Page 4.

Fig. 1. The larger of the two specimens known, retaining, as a cast of the lower surface, the pygidium in a slightly distorted condition, and seven thoracic segments, with portions of three others. A restoration of the original length of the animal is carried out in outline in order to give a conception of the great size attained by the species.

Oriskany sandstone. *Bank of the 4th Binnewater, Rosendale, Ulster county.*

DRIFT SANDSTONE.

(CALYMENIDÆ.)

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PLATE V B.

HOMALONOTUS VANUXEMI.

Page 11.

Fig. 1. Dorsal view of a fragment of a very large individual retaining the thorax entire and portions of eleven thoracic segments. The dorsal portion of the thorax has been removed by exposure to the weather, but the remaining parts retain their normal convexity. The pygidium is slightly distorted in the original, but is represented in the figure with its natural proportions, in order to allow the restoration in outline of the wanting parts. In this restoration the character of the cephalon is derived from a single fragment obtained at Port Jervis, Orange county.

Fig. 2. Profile of the same, showing the convexity of the body, the extremely long and broad articulating surfaces of the thoracic segments, and the abrupt slope of the post-axial area.

Lower Helderberg group. *Kingston, Ulster county.*

DEVONIAN HELDERBERG GROUP.

(CALYMENIDÆ.)

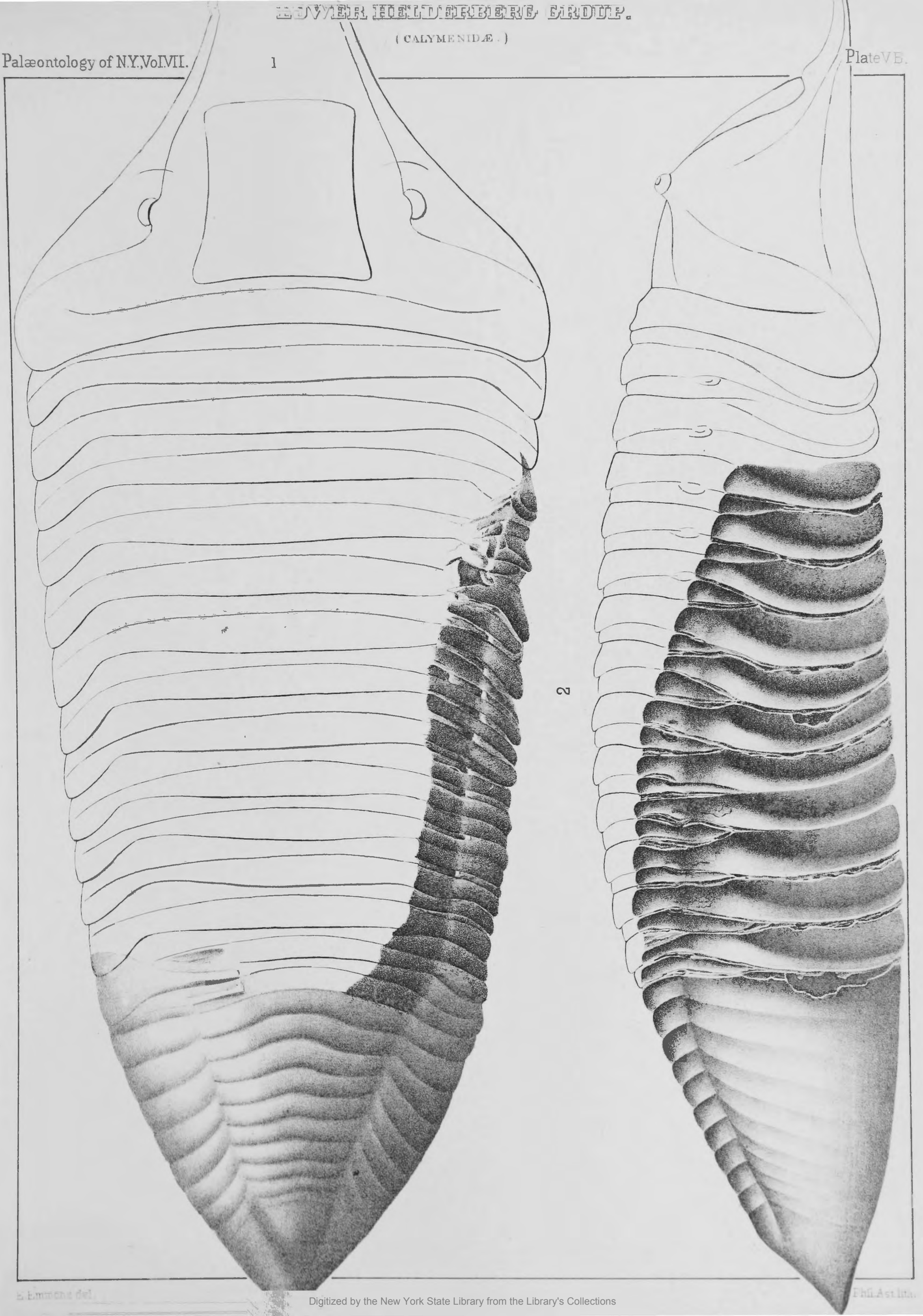

PLATE VI.

PHACOPS CRISTATA.

Page 14.

See Plate 8 A.

Fig. 1. The cephalon. A cast of the lower surface, somewhat flattened and restored at the left genal angle.
Schoharie grit. *Knox, Albany county.*

Fig. 2. Profile view of another cephalon. A cast, slightly flattened upon the glabella.
Schoharie grit. *Near Clarksville, Albany county.*

Fig. 3. Profile view of an uncompressed cephalon, showing the normal convexity and the strong genal spine.

Fig. 4. Dorsal aspect of the same.
Schoharie grit. *Near Clarksville, Albany county.*

Fig. 5. Lower aspect of a cephalon, showing the protuberance of the glabella, the frontal sulcus and epistoma. The drawing fails to represent the crenulations upon the sulcus near the genal extremities.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 6. Profile view of a small cephalon ; a cast of the interior.

Fig. 7. Dorsal aspect of the same.
Schoharie grit. *Albany county.*

Fig. 8. A cephalon referred with doubt to this species.
Schoharie grit. *Albany county.*

Fig. 9. A fragment of a young individual, composed of the thorax and pygidium and retaining the crust. The specimen is enlarged to two diameters and shows the axial row of spines.
Schoharie grit. *Near Clarksville, Albany county.*

Fig. 10. A nearly entire individual, drawn from an impression obtained from a natural mould of the dorsal surface. In the drawing the axial spines and the right genal spine are not given sufficient prominence.
Schoharie grit. *Albany county.*

Fig. 11. A fragment retaining a portion of the thorax and pygidium, showing the axial spines and the duplicate pleural annulations on the pygidium.
Corniferous limestone. *Indian quarries, Onondaga county.*

Fig. 12. A pygidium retaining a portion of the crust and showing the character of the pleural annulations.

Fig. 13. Profile view of the same.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 16. A cephalon retaining the normal convexity of the glabella and impressions of the tubercles upon its surface, but not showing the occipital or the cheek-spines.

Fig. 17. Front view of the same.

Fig. 20. The under surface of the same.

Fig. 21. Profile view of the same.
Corniferous limestone. *Helderberg mountains.*

Fig. 18. A cephalon denuded of its crust, and showing the cheek-spines.

Fig. 19. Profile of the same, showing the crenulations upon the frontal sulcus.
Corniferous limestone.

Fig. 22. A smaller cephalon, retaining normal convexity and showing the tubercles upon the glabella.

Fig. 23. The under surface of the same, showing the broad doublure. The crenulations upon the lateral branches of the frontal sulcus are not made sufficiently conspicuous, and they do not appear on the frontal limits of this sulcus, as represented in the drawing.
Upper Helderberg limestone. *Clarence Hollow, Erie county.*

Fig. 24. A small cephalon partly denuded of its crust, showing strong genal spines.

Fig. 25. Profile view of the same.
Upper Helderberg limestone. *Cayuga, Province of Ontario.*

PLATE VI—Continued.

Fig. 26. A fragment of a cephalon, showing the hypostoma in place.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 27. A cast of the lower surface of a pygidium, showing traces of the grooves upon the pleural annulations.
Schoharie grit. *Near Clarksville, Albany county.*

Fig. 28. A cast of a larger pygidium, showing the simple pleural annulations; their usual appearance in an impression of the lower surface.
Upper Helderberg limestone. *Schultz's farm, near Clarence, Erie county.*

Fig. 29. A very large pygidium in the same condition of preservation.
Schoharie grit. *Schoharie, Schoharie county.*

PHACOPS RANA?

Fig. 14. Dorsal view of a specimen retaining the parts in juxtaposition. The head is slightly displaced and somewhat imperfect.

Fig. 15. Profile of the same, showing the elevation of the body.
Upper Helderberg limestone. *Ohio.*

UPPER HELDERBERG GROUP.

Palæontology of N.Y. (PHACOPIDÆ) Plate VI

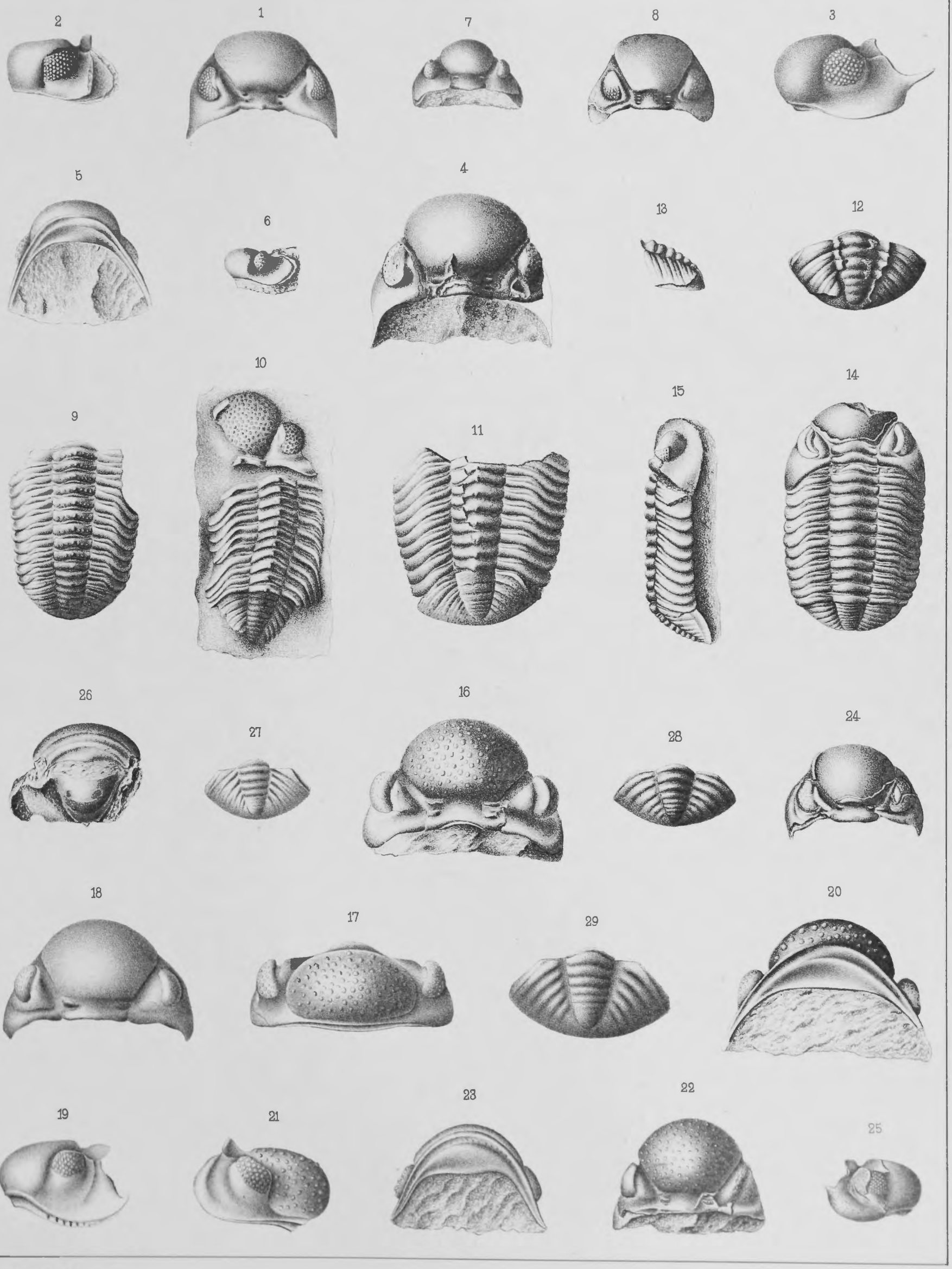

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PLATE VII.

PHACOPS RANA.

Page 19.

See Plates 6, 8, 8 a, and 25.

Fig. 1. A specimen of average size, retaining the crust, and showing the general characters of the species.

Hamilton shales. *Geneseo, Livingston county.*

Fig. 2. A somewhat smaller specimen, retaining the parts in juxtaposition.

Hamilton shales. *Eighteen-mile Creek, Erie county.*

Fig. 3. Anterior view of a large, enrolled individual.

Fig. 4. Posterior view of the same.

Hamilton shales. *Canandaigua Lake.*

Fig. 5. Anterior view of a still larger, enrolled specimen.

Hamilton shales. *Darien, Genesee county.*

Fig. 6. A somewhat imperfect cephalon of a very large individual.

Hamilton shales. *Near Geneseo, Livingston county.*

Fig. 7. A specimen showing two individuals of nearly equal size, lying one upon the other.

Fig. 8. The same, with the upper individual removed. The emarginate outline of the pygidium in the lower specimen is due to compression, and the sulci represented on the annulations of the left pleura do not exist.

Hamilton shales. *Canandaigua Lake.*

Fig. 9. A large individual partly restored on the left side.

Hamilton shales. *Canandaigua Lake.*

Fig. 10. A very large, entire individual. This is the largest entire specimen yet observed.

Fig. 11. Profile of the same, showing the glabella flattened from compression in the shales.

Hamilton shales. *Canandaigua Lake.*

HAMILTON GROUP.

(PHACOPIDÆ)

Palæontology of N.Y.,Vol.VII. Plate VII.

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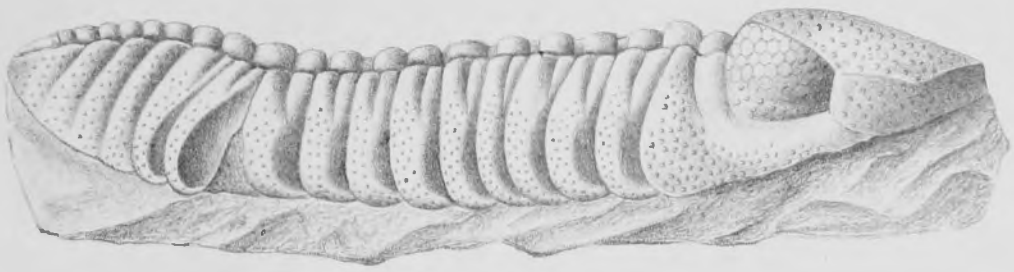

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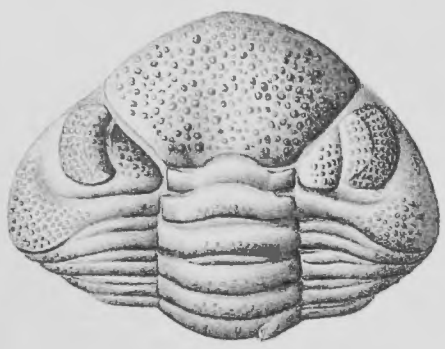

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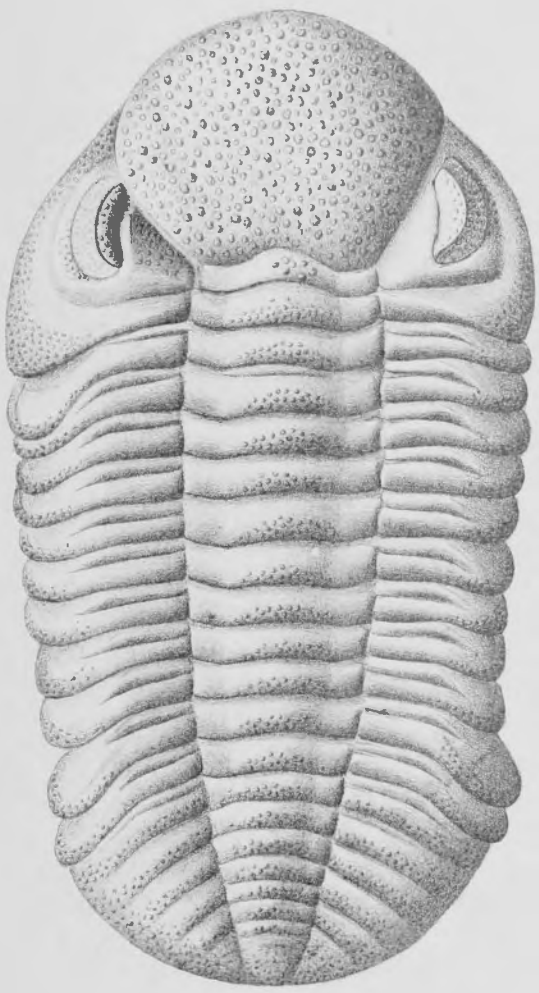

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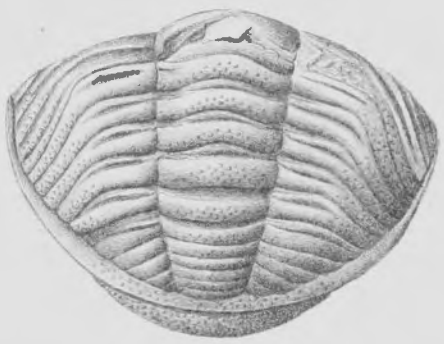

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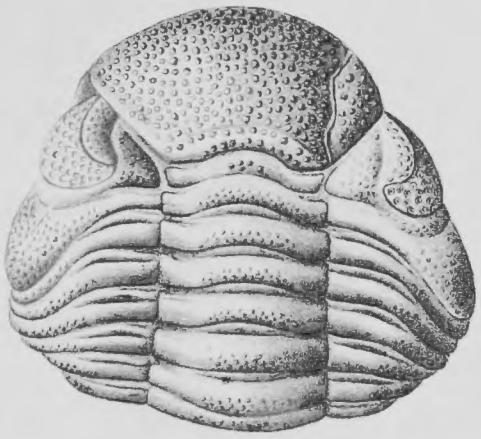

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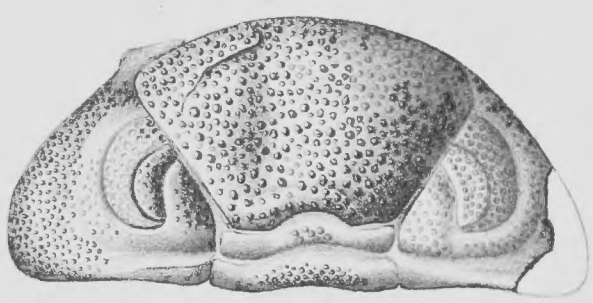

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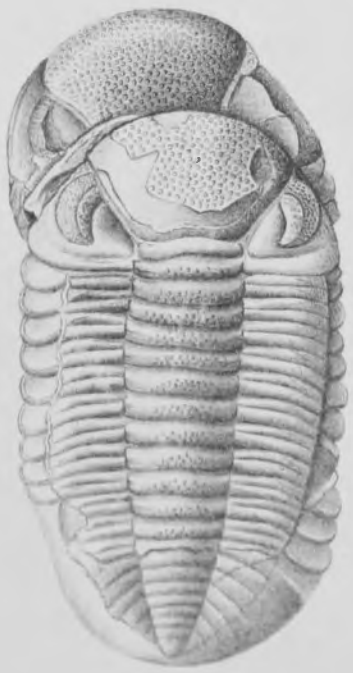

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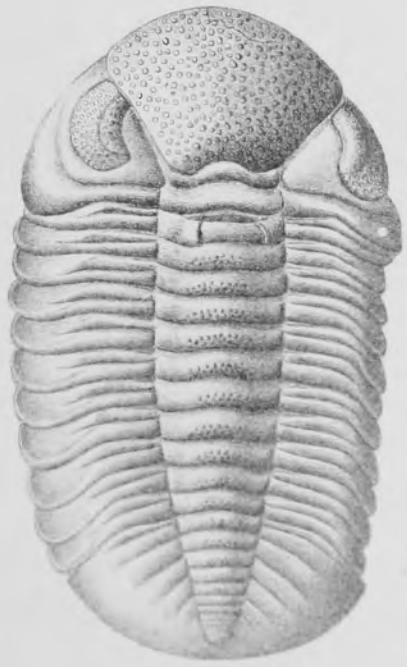

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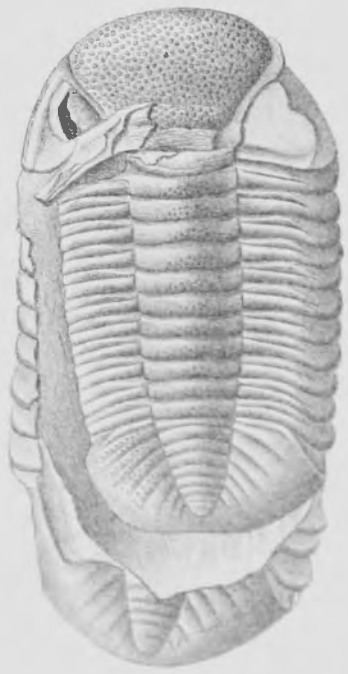

PLATE VIII.

PHACOPS RANA.

See Plates 6, 7, 8 a, and 25.

Fig. 1. A young individual, enrolled and showing two pairs of lateral furrows upon the glabella.
Fig. 2. Profile view of the same.
Fig. 3. Front view of the same.
Hamilton group. *Moscow, Livingston county.*
Fig. 4. Profile view of a small cephalon, showing normal proportions.
Fig. 5. Dorsal view of the same, showing the glabellar furrows.
Fig. 6. An eye of the same enlarged.
Hamilton group. *Eighteen-mile Creek, Erie county.*
Fig. 7. A young, enrolled individual, showing the glabellar furrows.
Hamilton group. *Eighteen-mile creek, Erie county.*
Fig. 8. Profile view of an enrolled, slightly crushed specimen.
Fig. 9. Dorsal view of the same.
Hamilton group. *Widder, Province of Ontario.*
Fig. 10. A larger, enrolled individual.
Hamilton group. *Canandaigua Lake.*
Fig. 11. A nearly entire, young individual.
Hamilton group. *Darien, Genesee county.*
Fig. 12. The eye of a small individual, enlarged to three diameters, showing more numerous lenses than in advanced stages of growth.
Hamilton group. *Eighteen-mile Creek, Erie county.*
Fig. 13. The eye of a larger individual, showing fewer lenses (similarly enlarged).
Hamilton group. *Geneseo, Livingston county.*
Fig. 14. The eye of a slightly weathered specimen, showing the cavities left by the removal of the lenses (similarly enlarged).
Hamilton group. *Near Geneva, Ontario county.*
Fig. 15. An obliquely compressed and distorted specimen, showing a common mode of occurrence.
Hamilton group. *Canandaigua Lake.*
Fig. 16. A large, entire cephalon.
Fig. 17. Profile view of the same.
Hamilton group. *Canandaigua Lake.*
Fig. 18. A fragment of the under side of the cephalon, showing a portion of the hypostoma in place.
Hamilton group. *Jaycox's Run, near Geneseo, Livingston county.*

PHACOPS CACAPONA.

Page 27.

Fig. 19. Dorsal view of a somewhat worn internal cast in chert.
Hamilton group. *Mouth of the Cacapon river, Virginia.*
Fig. 20. Profile of another example, similarly preserved.
Fig. 21. Dorsal view of the same.
Hamilton group. *Mouth of the Cacapon river, Virginia.*
Fig. 22. Front view of an enrolled specimen, referred with some hesitation to this species.
Fig. 23. Dorsal view of the same.
Fig. 24. Profile view of the same.
Hamilton group. *Locality doubtful.*

PLATE VIII—Continued

PHACOPS BUFO.

Page 26.

Fig. 25. Dorsal view of a plaster cast of Dr. Green's type specimen.

Fig. 26. Profile view of the same.

Hamilton group.

The original is said to have come from a dark-grayish limestone in New Jersey.

PHACOPS NUPERA.

Page 27.

Fig. 27. The type specimen, showing the cephalon and thorax.

Chemung group. *Chemung Creek, Chemung county.*

HAMILTON GROUP.

(PHACOPIDÆ)

Palæontology of N.Y. Plate VIII.

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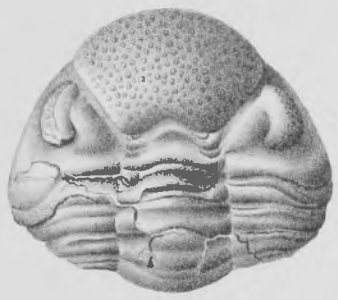

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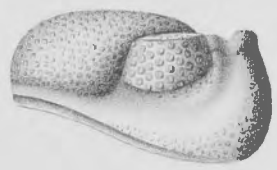

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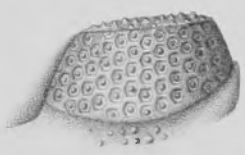

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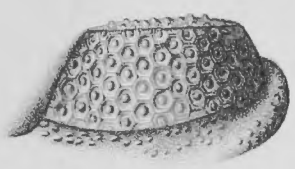

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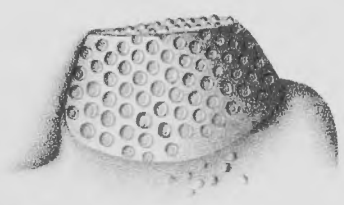

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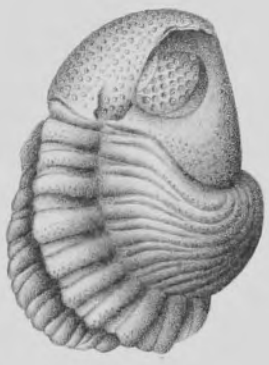

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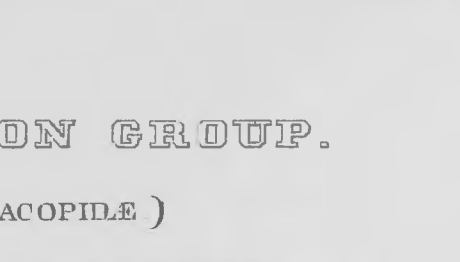

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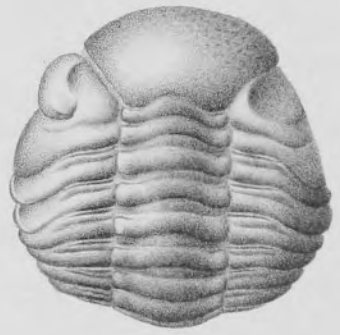

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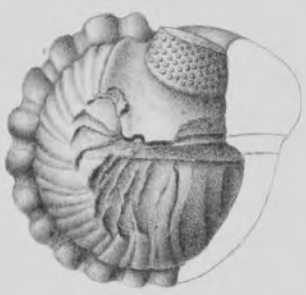

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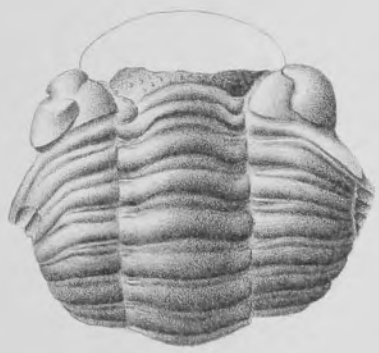

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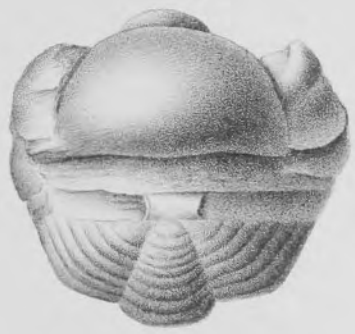

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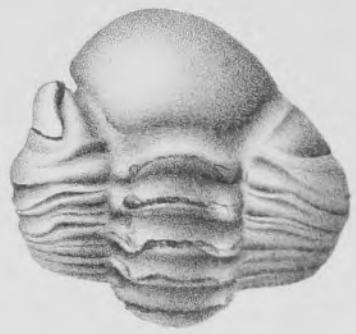

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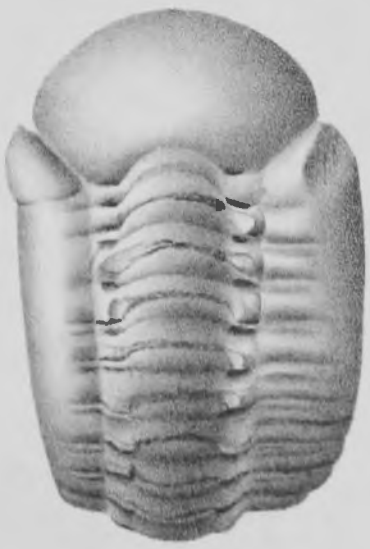

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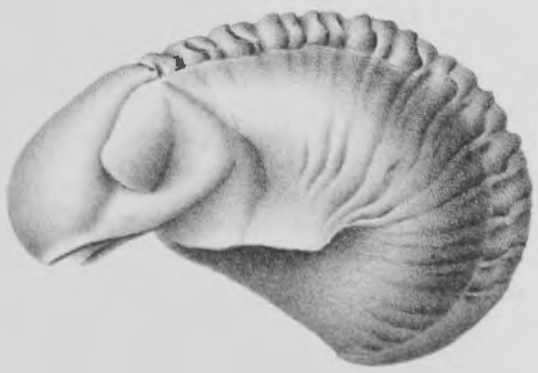

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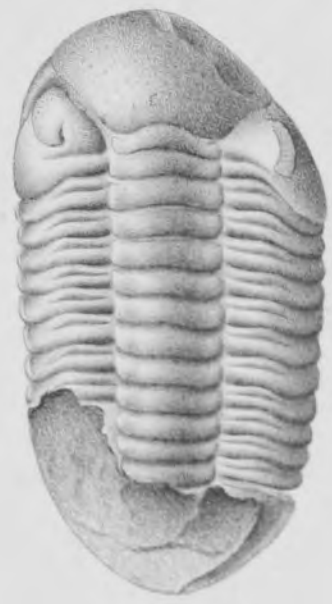

G.B. Simpson del. Phil. Ast. lith.

PLATE VIII A.

PHACOPS CRISTATA.

See Plate 6.

Fig. 1. Thorax and pygidium, drawn from a gutta-percha impression of a natural mould of the dorsal surface. The specimen is somewhat compressed laterally.

Fig. 2. Profile of the same, showing the elevation of the axial row of spines.
Schoharie grit. *Albany county.*

Fig. 3. The under portion of the cephalon, showing the epistomal doublure and the crenulations of the sub-frontal sulcus.
Schoharie grit. *Knox, Albany county.*

Fig. 4. An internal cast of the cephalon, enlarged one diameter; a portion of each cheek has been broken away to show the sub-frontal crenulations.
Schoharie grit. *Clarksville, Albany county.*

PHACOPS CRISTATA, var. PIPA.

Page 18.

Fig. 5. An entire, but somewhat crushed young individual, showing the proportions of this variety, and the genal spines.
Corniferous limestone. *LeRoy, Genesee county.*

Fig. 6. Front view of an internal cast of a small cephalon, enlarged one diameter; showing the rotundity of the glabella, the elevation of the occipital ring and the projection of the genal spines.

Fig. 7. Profile of the same, showing the protuberant glabella and the elevation of the genal spines.
Upper Helderberg limestone. *North Cayuga, Province of Ontario.*

Fig. 8. The internal surface of the cephalon, enlarged one diameter.
Corniferous limestone. *Falls of the Ohio.*

Fig. 9. An imperfect individual, retaining the cephalon and a portion of the thorax.
Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 10. A cephalon, drawn from a gutta-percha impression of the dorsal surface, and slightly restored on one side; showing the glabellar furrows, the broad and deep occipital furrow, and the stout genal spines. Enlarged one diameter.
Upper Helderberg limestone. *North Cayuga, Province of Ontario.*

Fig. 11. A large and characteristic pygidium, drawn from a gutta-percha impression of a natural mould of the dorsal surface.

Fig. 12. The internal surface of the same specimen, showing the simple pleural annulations corresponding to the duplicate ribs of the upper surface.
Upper Helderberg limestone. *Walpole, Province of Ontario.*

Fig. 13. A small, imperfect cephalon, showing the glabellar furrows.
Upper Helderberg limestone. *North Cayuga, Province of Ontario.*

Fig. 14. A pygidium of average size.
Corniferous limestone. *Lime Rock, near LeRoy, Genesee county.*

Fig. 15. A portion of a small pygidium, enlarged, to three diameters; showing the paired muscular scars, through the slightly weathered crust.
Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 16. A large cephalon, preserved as a cast of the internal surface, and showing the genal spines.
Oriskany sandstone. *Cayuga, Province of Ontario.*

Fig. 17. A pygidium, preserved as an internal cast, and found in association with cephala similar to the foregoing.
Oriskany sandstone. *Cayuga, Province of Ontario.*
This and the preceding specimen are referred with some hesitation to this variety, and may more properly be regarded as examples of the species itself.

Fig. 18. An hypostoma, found in association with fragments of this variety; enlarged to four diameters.
Corniferous limestone. *Canandaigua, Ontario county.*

PLATE VIII A—Continued.

PHACOPS LOGANI, Hall.

Fig. 19. The type specimen, figured in Palæontology of New York, vol. iii, pl. 73, fig. 15.
Introduced for comparison with the Upper Helderberg species of *Phacops*.

Fig. 20. A cephalon of this species, enlarged one diameter, retaining normal proportions and showing the glabellar furrows and genal spines.
Lower Helderberg group. *Schoharie, Schoharie county.*

PHACOPS RANA.

See Plates 6, 7, 8 and 25.

Fig. 21. A small individual, showing normal proportions and a perfect dorsal surface.
Hamilton group. *Eighteen-mile Creek, Erie county.*

Fig. 22. A larger and unusually perfect individual, showing the glabellar furrows on the dorsal surface.
Hamilton group. *Darien, Genesee county.*

Fig. 23. An individual retaining the crust in perfection, but not normally extended.

Fig. 24. Profile of the same.
Hamilton group. In the drift at *Ann Arbor, Michigan.*

Fig. 25. An individual, compressed laterally, parallel to the cleavage planes of the shales, a frequent mode of preservation.

Fig. 26. Anterior view of the same.
Hamilton group. *Eighteen-mile Creek, Erie county.*

Fig. 27. A very small enrolled individual.
Hamilton group. *Eighteen-mile Creek, Erie county.*

Fig. 28. A still smaller, enrolled example.
Hamilton group. *Canandaigua Lake.*

Fig. 29. The hypostoma of a large individual, retaining only a small portion of the crust.
Hamilton group. *Canandaigua Lake.*

Fig. 30. An internal cast of the cephalic doublure and a portion of the thorax, enlarged one diameter to show the crenulations of the sub-frontal sulcus.
Hamilton group. *Fultonham, Schoharie county.*

Fig. 31. A portion of the thorax, enlarged one diameter; showing the internal surface of the axial arches and their prolongation into the visceral supports or processes for the attachment of the ambulatory muscular apparatus.
Hamilton group. *Canandaigua Lake.*

Fig. 32. A vertical section through an enrolled individual, cut near the axial furrow, and showing the projection of the ventral axial processes through the translucent calcite with which the interior space is filled. The specimen also shows a section of the hypostoma, indicating the deep and abrupt deflection on its posterior margin. The drawing gives an enlargement to two diameters.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 33. A section of an enrolled example, cut along the middle line of the axis, retaining only the thoracic portion, and showing three of the ventral processes. The light line parallel with the upper margin may represent the ventral membrane beneath the viscera.
Hamilton group. *Canandaigua, Ontario county.*

BRONTEUS TULLIUS.

Page 12.

Fig. 34. The pygidium, natural size.

Fig. 35. The same, enlarged to two diameters.
Tully limestone. *Kingsley's Hill, near Otisco, Onondaga county.*

Fig. 36. The frontal doublure, probably belonging to the same species.
Tully limestone. *Borodino, Onondaga county.*

ORISKANY TO HAMILTON GROUP.

(PHACOPIDÆ & BRONTEIDÆ.)

Palæontology of N.Y., Vol VII

Plate VIII A

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Lower Helderberg

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E Emmons del.

Phil. Ast. lith.

PLATE IX.

DALMANITES (CHASMOPS) ANCHIOPS.

Page 59.

See Plate 10.

Fig. 1. A small cephalon, preserving the normal proportions, but denuded of most of the crust.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 2. A cephalon of average size, a cast of the interior.

Fig. 3. Profile view of the same specimen, showing the convexity of the glabella and the length and direction of the occipital spine.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 4. A small but quite perfect cephalon, retaining the crust, showing the true proportions and the coalesced glabellar lobes. The specimen is enlarged to two diameters.

Fig. 5. Profile view of the same, showing the elevation of the occipital spine.

Fig. 6. The right eye of the same enlarged to three diameters.
Schoharie grit. *Schoharie county.*

Fig. 10. An imperfect cephalon, with unusually long genal spines; referred with doubt to this species.
Schoharie grit. *Schoharie county.*

Fig. 12. The thorax and pygidium, drawn from a gutta-percha impression of a natural mould.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 13. The type of Dr. Green's description. This specimen is the only one yet observed retaining all the parts in juxtaposition, but the crust is for the most part wanting, and the occipital and caudal spines are broken away.
Schoharie grit. *Ulster county.*

DALMANITES (CHASMOPS) ANCHIOPS, var. ARMATUS.

Page 62.

See Plate 10.

Fig. 7. An imperfect cephalon, showing the long occipital spine.
Schoharie grit. *Schoharie county.*

Fig. 8. A very large cephalon, slightly unsymmetrical, showing the occipital spine and the obtuse genal angles.
Schoharie grit. *Near Clarksville, Albany county.*

Fig. 9. A fragment of the cephalon, showing the occipital spine.
Schoharie grit. *Schoharie, Schoharie county.*

DALMANITES (CHASMOPS) ANCHIOPS, var. SOBRINUS.

Page 62.

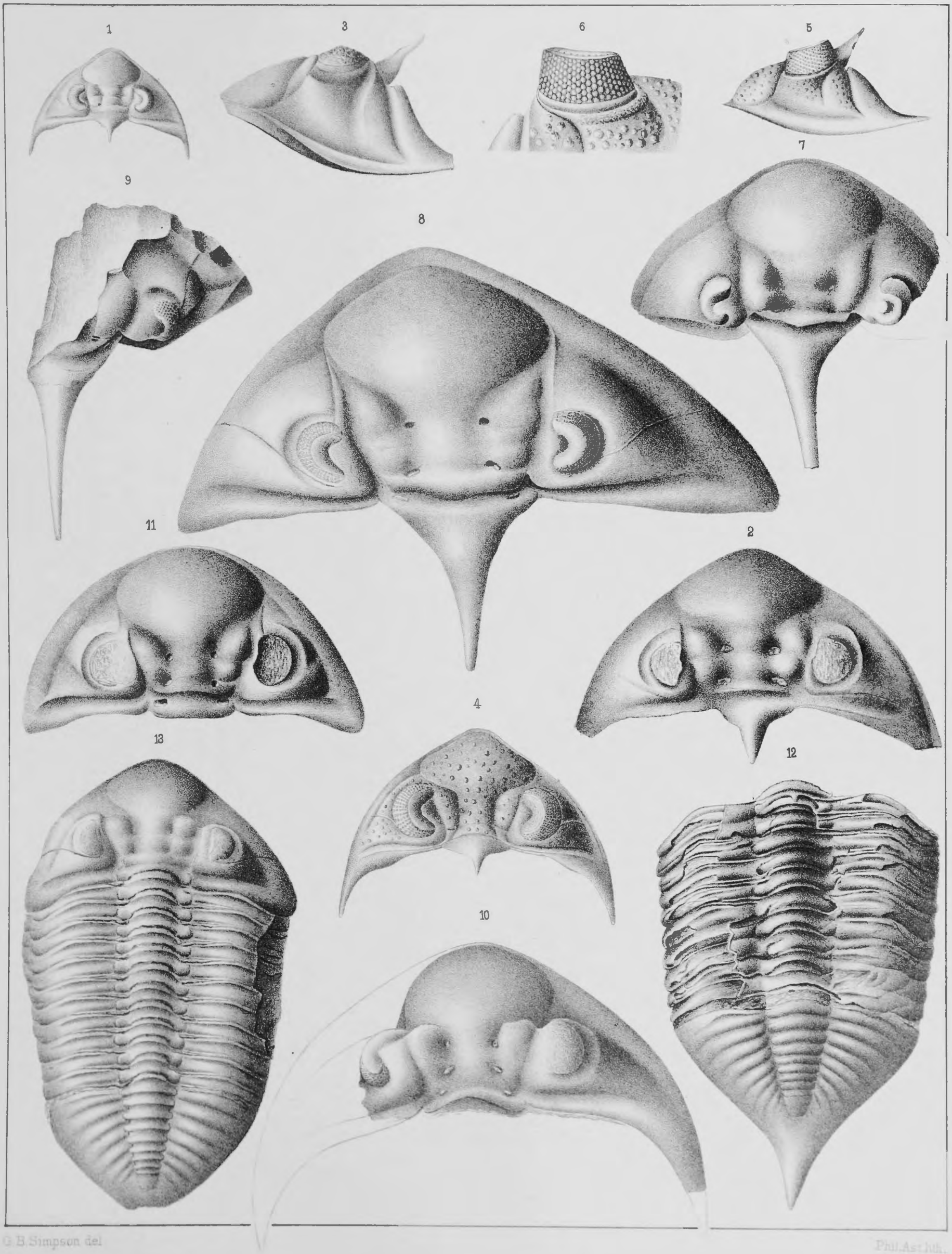
Fig. 11. A cephalon, showing the semicircular outline, convex glabella and obtuse genal extremities.
Schoharie grit. *Schoharie, Schoharie county.*

UPPER HELDERBERG GROUP.

Schoharie Grit.

(PHACOPIDÆ.)

Palæontology of N.Y. Plate IX



G.B.Simpson del. Phil.Ast.lith.

PLATE X.

DALMANITES (CHASMOPS) ANCHIOPS.

See Plate 9.

Fig. 1. An imperfect cephalon, retaining a portion of the crust.
Corniferous limestone. *Falls of the Ohio.*

Fig. 2. A large pygidium, in the condition of an internal cast, from which the doublure and spine have been removed. This figure is from a plaster cast of Green's original of *Asaphus laticostatus.*
Schoharie grit. *Ulster county.*

Fig. 3. A small pygidium, retaining the crust and showing oblique rows of nodes on the pleuræ.

Fig. 4. The same, enlarged one diameter.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 5. A small pygidium, retaining the crust and bearing an unusually long caudal spine.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 6. A larger pygidium.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 7. A pygidium, from which the tail-spine has been broken.
Oriskany sandstone. *From the vicinity of DeCewville, Province of Ontario.*

Fig. 8. A large pygidium.

Fig. 9. Profile of the same, showing the curvature and elevation of the spine.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 10. A small pygidium, preserved as an internal cast, and showing the impression of the doublure and spine.
Schoharie grit. *Knox, Albany county.*

Fig. 11. An enlargement to six diameters of the anterior extremity of the head represented on Plate 9, fig. 4, to show the crenulation of the frontal border.

Fig. 12. A very large imperfect pygidium restored in outline.
Schoharie grit *Schoharie, Schoharie county.*

Fig. 13. A large, nearly entire pygidium, showing the tendency to duplication in the pleural annulations.
Schoharie grit. *Schoharie, Schoharie county.*

DALMANITES (CHASMOPS) ANCHIOPS, var. ARMATUS.

See Plate 9.

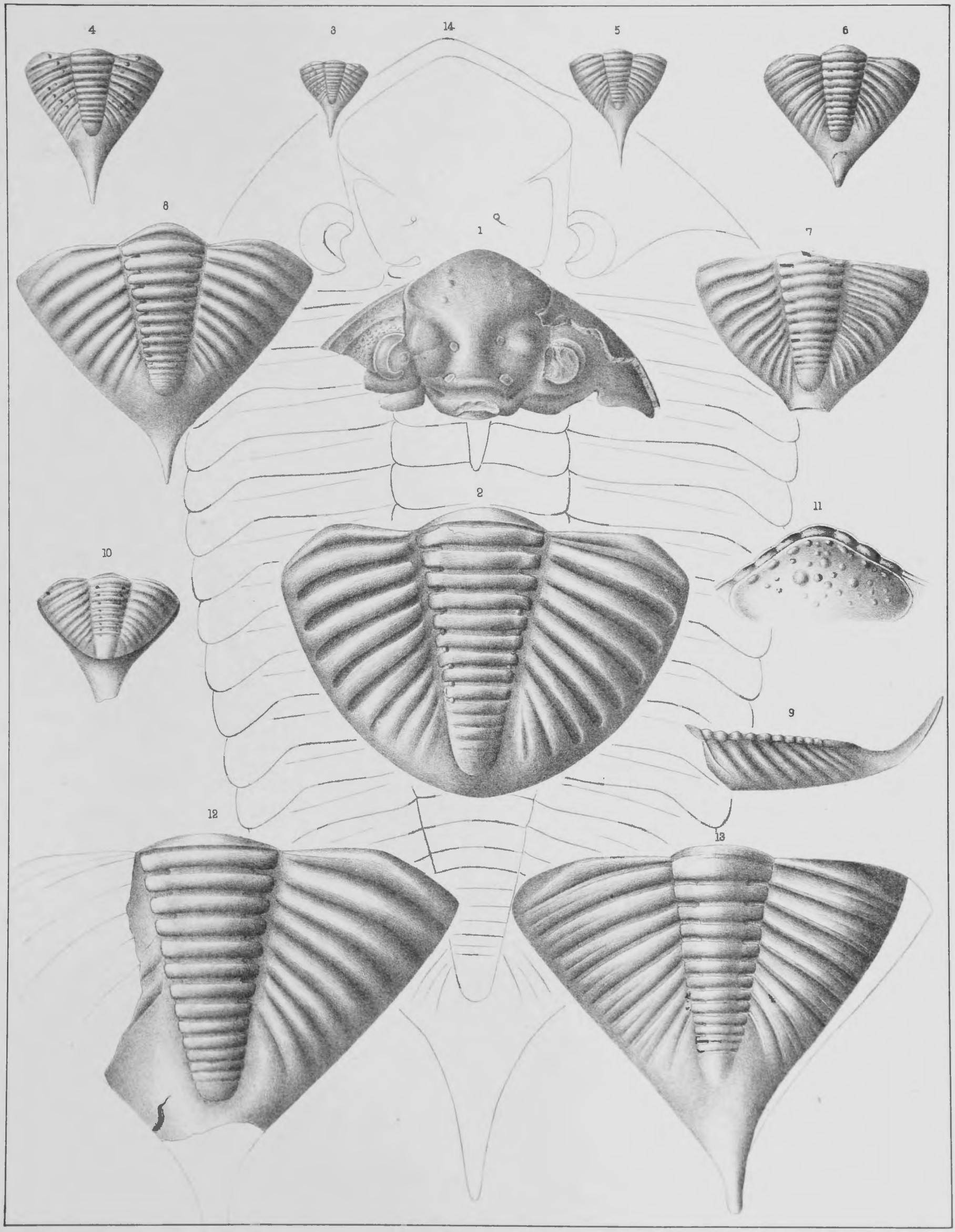
Fig. 14. A restoration in outline of the entire animal, from the cephalon figured on Plate 9, Fig. 8.

UPPER HELDERBERG GROUP.

[Schoharie Grit.]

(PHACOPIDÆ.)

Palæontology of N.Y., Vol VII. Plate X.



G.B. Simpson del.

P. Riemann lith.

PLATE XI.

DALMANITES (CORYCEPHALUS) REGALIS.

Page 55.

Fig. 1. A cephalon, showing the general proportions, the character of the border and the length of the genal spines The eyes, a portion of the glabella, the occipital ring and part of the right anterior margin have been destroyed by weathering.

Fig. 2. Profile of the same, showing the elevation of the head, the abrupt anterior slope and the direction of the marginal denticulations.

Fig. 3. Front view of the same.

Schoharie grit. *Knox, Albany county.*

Fig. 4. An imperfect cephalon, showing the eyes and the glabellar lobes.

Schoharie grit. *Knox, Albany county.*

DALMANITES (CORYCEPHALUS) PYGMÆUS.

Page 56.

Fig. 5. An imperfect cephalon, drawn in outline, natural size.

Fig. 6. The same, enlarged to ten diameters, showing the denticulate character of the frontal margin, the elongate glabella and narrow glabellar lobes.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 7. Another head of this species, natural size.

Fig. 8. The same, enlarged to ten diameters, showing the position of the eye, the denticulate lateral border, and the long cheek-spine.

Corniferous limestone. *Canandaigua, Ontario county.*

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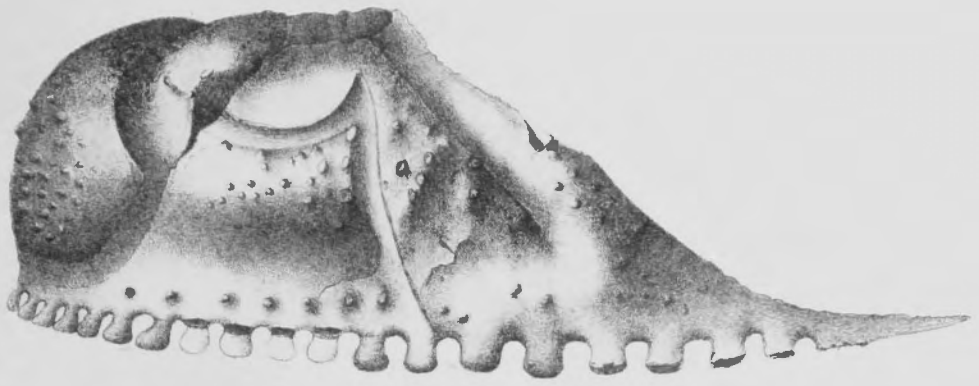

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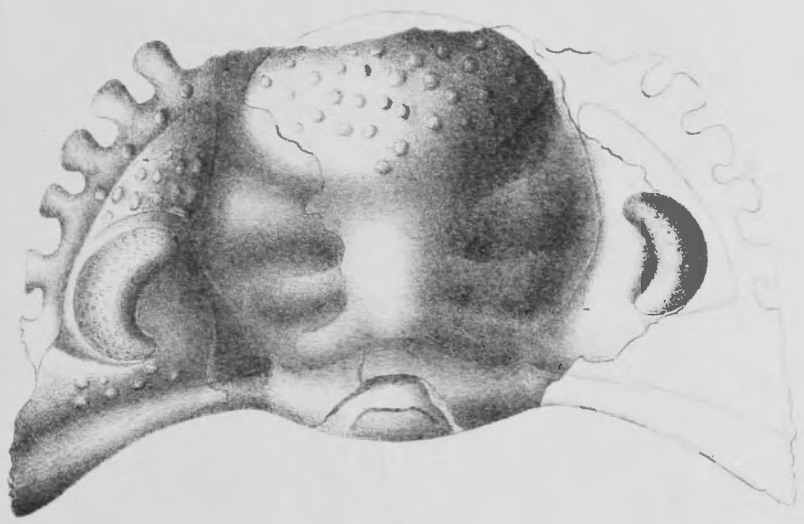

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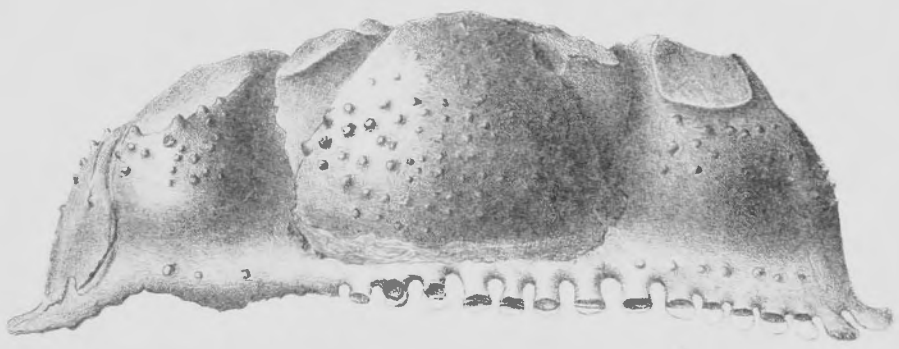

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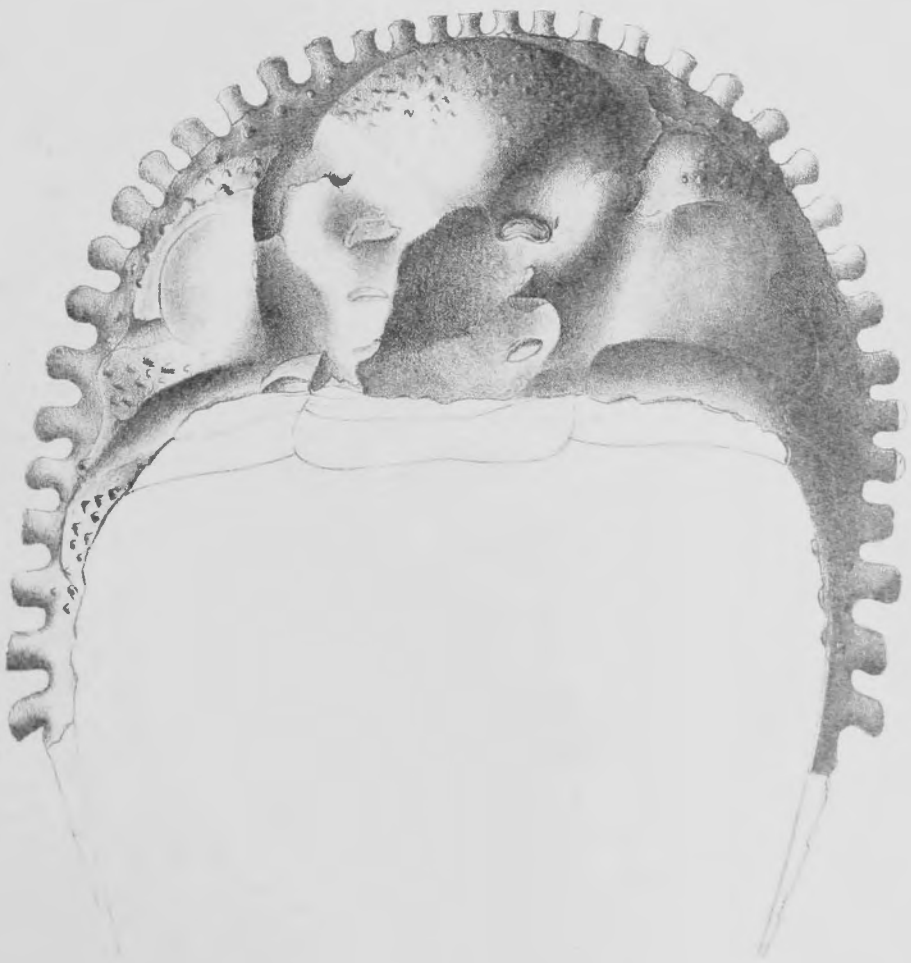

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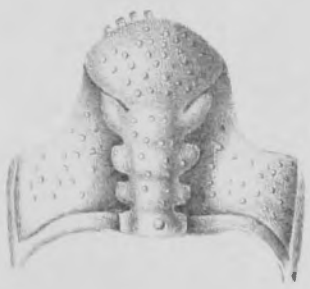

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G.B. Simpson del.

P. Hermann lith.

PLATE XI A.

DALMANITES (HAUSMANNIA) PLEUROPTYX.

Page 28.

Fig. 1. A cephalon of average size, showing the general proportions, the crenulations on the frontal border and the peculiar ornamentation of the cheeks. The left eye and a portion of the left cheek-spine are restored in the drawing.
Lower Helderberg group. *Near Clarksville, Albany county.*

Fig. 2. A cast of the under side of a pygidium regarded as belonging to this species.
Oriskany sandstone. *Cayuga, Province of Ontario.*

Fig. 3. A pygidium retaining most of the crust, and showing the normal characters of the species.
Corniferous limestone. *Lime Rock, Genesee county.*

DALMANITES (CORYCEPHALUS) DENTATUS.

Page 58.

Fig. 4. A somewhat imperfect individual, but the most complete yet found, and the only one observed in which the parts of the body are retained in conjunction.
Lower Helderberg group. *Port Jervis, Orange county.*

Fig. 5. A cephalon, nearly entire, showing the characteristic marginal ornamentation.
Lower Helderberg group. *Port Jervis, Orange county.*

Fig. 6. A pygidium, somewhat more flattened than that in fig. 4; showing the character of the surface ornamentation and the bifurcate pleural annulations.
Lower Helderberg group. *Port Jervis, Orange county.*

DALMANITES (CORONURA ?) EMARGINATUS.

Page 40.

Fig. 7. A fragment of a pygidium, enlarged to two diameters, showing the broadly emarginate posterior extremity, and the bifurcate, regularly tubercled ribs.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 8. Another imperfect pygidium, natural size, showing similar characters.
Schoharie grit. *Schoharie, Schoharie county.*
These two are the only specimens of this species observed.

DALMANITES (HAUSMANNIA) CONCINNUS.

Page 30.

Fig. 9. A small pygidium, enlarged to two diameters.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 10. A larger pygidium, also enlarged to two diameters, showing the broad, flat annulations and the conspicuous posterior border.

Fig. 11. A profile of the same, similarly enlarged.
Schoharie grit. *Schoharie, Schoharie county.*

DALMANITES (HAUSMANNIA) CONCINNUS, var. SERRULA.

Page 30.

Fig. 12. A very small pygidium, enlarged to three diameters. The specimen, in addition to the normal characters of *D. concinnus*, has a row of spinules on the lateral margins.
Upper Helderberg group. *North Cayuga, Province of Ontario.*

DALMANITES (CORONURA) MYRMECOPHORUS.

See Plates 13, 14, and 15.

Fig. 13. A large glabella, referred with doubt to this species.
Corniferous limestone. *Schoharie (?), Schoharie county.*

PLATE XI A—Continued.

DALMANITES (CHASMOPS) MACROPS.

Page 68.

Fig. 14. An imperfect cephalon, showing the character of the glabella, the coalesced lateral lobes, and the very prominent eye. This is the type specimen.

Fig. 15. Profile view of the same, showing the size and elevation of the eye.

Corniferous limestone. *Schoharie, Schoharie county.*

DALMANITES (CHASMOPS ?) ERINA.

Page 67.

Fig. 16. A pygidium preserving symmetry of form and showing the flat annulations and broad border.

Fig. 17. Profile view of the same.

Corniferous limestone. *Clarence Hollow, Erie county.*

Fig. 18. A larger pygidium, somewhat unsymmetrical in outline on account of the unequal width of the border.

Corniferous limestone. *From a boulder in the town of Naples, Ontario county.*

DALMANITES (CHASMOPS) CALYPSO.

Page 64.

Fig. 19. An entire individual, drawn from a gutta-percha impression of a natural mould of the dorsal surface; showing the general form and proportions, the coalesced glabellar lobes, the relatively large eyes, and the axial row of flattened spines on the pygidium.

Fig. 20. Profile of the same, showing the elevation of the body and the height of the pygidial spines.

Fig. 21. An hypostoma found in place with the foregoing specimen, somewhat imperfect on its posterior extremity, but showing its general character.

Corniferous limestone. *Sandusky, Sandusky county, Ohio.*

Fig. 22. An imperfect pygidium, the type of the species. The drawing does not show the characteristic angularity of the axis.

Corniferous limestone. *Falls of the Ohio.*

DALMANITES (HAUSMANNIA) PHACOPTYX.

Page 31.

Fig. 23. A fragment of a pygidium, natural size, showing the prominent caudal ridge and spine, and the acute tubercles and spinules covering the surface. The drawing is made from a gutta-percha impression of a natural mould of the dorsal surface.

Fig. 24. Profile of the same specimen, with the caudal spine drawn in its normal position, and showing the conspicuous spinules upon the annulations.

Upper Helderberg limestone. *North Cayuga, Province of Ontario.*

Fig. 25. A portion of the right side of a pygidium, drawn from a cast of the lower surface of the test.

Upper Helderberg limestone. *North Cayuga, Province of Ontario.*

Fig. 26. A portion of the left side of a pygidium, showing the normal curvature and the bifurcate character of the annulations.

Upper Helderberg limestone. *North Cayuga, Province of Ontario.*

Fig. 27. A large hypostoma found in association with the pygidia of this species.

Upper Helderberg limestone. *North Cayuga, Province of Ontario.*

DALMANITES (HAUSMANNIA) MEEKI.

Page 32.

Fig. 28. The glabella, showing the character of its lobation.

Fig. 29. Dorsal view of a pygidium, showing the number of annulations and character of the caudal spine.

Fig. 30. Profile view of the same specimen, showing the elevation of the caudal spine.

The above illustrations are from the type specimens of the species.

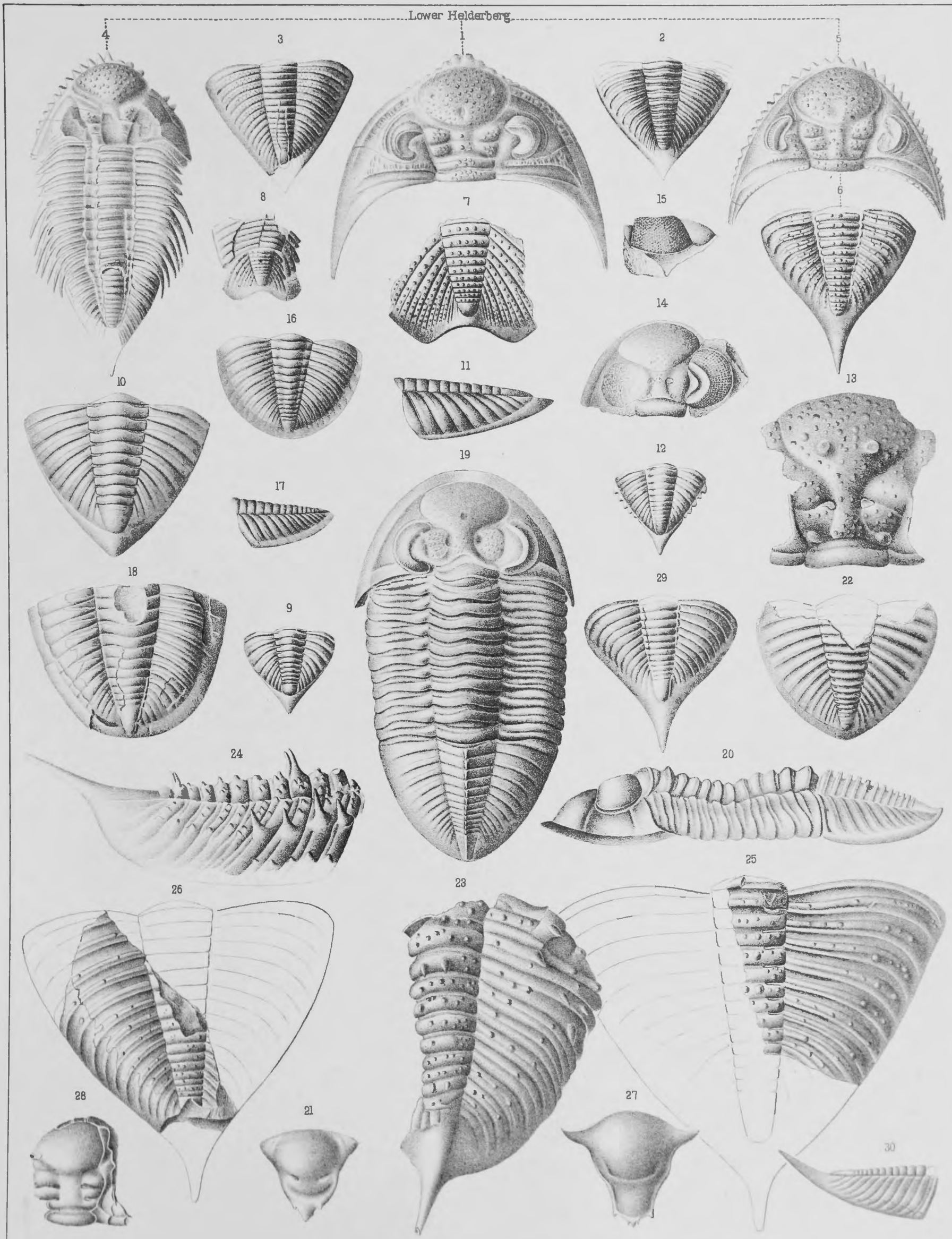
Lower Devonian limestone. *Eureka District, Nevada.*

UPPER HELDERBERG GROUP.

(PHACOPIDÆ)

Palæontology of N.Y., Vol VII. Plate XI A.

Lower Helderberg.



E. Emmons del.

Phil Ast lith.

PLATE XI B.

DALMANITES (ODONTOCEPHALUS) ÆGERIA.

Page 53.

Fig. 1. The cephalon. A cast of the internal surface from which the eyes have been broken; showing the eleven denticulations on the frontal margin and the long, slender genal spines.

Fig. 2. Profile of the same.

Upper Helderberg limestone. *Williamsville, Erie county.*

Fig. 3. A nearly entire individual, enlarged to two diameters, showing the distinguishing features of the species. The pygidium has been drawn too narrow and constricted near the posterior extremity, and the caudal spines too long.

Fig. 4. Profile of the same.

Corniferous limestone. *Chittenango, Madison county.*

Fig. 5. Dorsal view of the frontal cephalic border, enlarged to two diameters, showing the shape and number of the denticulations.

Upper Helderberg limestone. *Williamsville, Erie county.*

Fig. 6. Lower surface of the frontal doublure, enlarged to two diameters, showing the incisor-like form of the denticulations and the openings of the vertical tubuli pores.

Upper Helderberg limestone. *Williamsville, Erie county.*

Fig. 7. A pygidium, showing unusually long terminal spines.

Upper Helderberg limestone. *Williamsville, Erie county.*

Fig. 8. A smaller pygidium.

Fig. 9. Profile view of the same.

Upper Helderberg limestone. *Williamsville, Erie county.*

Fig. 10. A pygidium of average size, showing normal proportions.

Upper Helderberg limestone. *Schultz's Farm, near Clarence, Erie county.*

Fig. 11. The axis of the pygidium, drawn from an internal cast, to show the median depression and obsolescence of the annulations near the extremity. Enlarged to two diameters.

Upper Helderberg limestone. *Schultz's Farm, near Clarence, Erie county.*

DALMANITES (ODONTOCEPHALUS ?) CORONATUS.

Page 54.

Fig. 12. The pygidium and a portion of the thorax. The specimen shows the characteristic broadly emarginate, aspinose posterior extremity, and a somewhat shorter pygidium than in the associated species.

Corniferous limestone. *Near Auburn, Cayuga county.*

Fig. 13. The pygidium of the same specimen, introduced for comparison with the adjoining pygidia.

Fig. 14. An imperfect pygidium, referred with doubt to this species.

Corniferous limestone. *Schoharie, Schoharie county.*

DALMANITES (ODONTOCEPHALUS) SELENURUS.

Page 49.

See Plate 12.

Fig. 15. A pygidium preserving normal proportions and showing the divergent, slender terminal spines. One side of the figure is somewhat restored.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 16. A small pygidium having more nearly parallel spines; drawn from a cast of the internal surface.

Fig. 17. The same, viewed in profile, showing the elevation of the terminal spines.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 18. A somewhat imperfect pygidium with the terminal spines inclined slightly inward.

Corniferous limestone. *Phelps, Ontario county.*

PLATE XI B—Continued.

Fig. 19. A pygidium showing the lower surface, the extent of the doublure and the points of attachment of the pygidial appendages.
Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 20. A pygidium with comparatively short spines for this species.
Corniferous limestone. *Locality ?*

Fig. 21. The axis of a pygidium, drawn from an internal cast, showing the median depression and obsolescence of the annulations near the extremity.
Corniferous limestone. *Schoharie county.*

DALMANITES (ODONTOCEPHALUS) BIFIDUS.

Page 53.

Fig. 22. A small, imperfect pygidium, showing the extended, explanate posterior extremity and the stout terminal spines.
Corniferous limestone. *Columbus, Ohio.*

Fig. 23. Another pygidium of a young individual.
Corniferous limestone. *Lime Rock, near LeRoy, Genesee county.*

Fig. 24. A large pygidium, showing the normal features of this part. The crust on the original is partly broken away, but it has been restored in the drawing.

Fig. 25. The same, drawn in profile.
Corniferous limestone. *Lime Rock, near LeRoy, Genesee county.*

UPPER HELDERBERG GROUP.

(PHACOPIDÆ.)

Palæontology of N.Y., Vol. VII.

Plate XIB.

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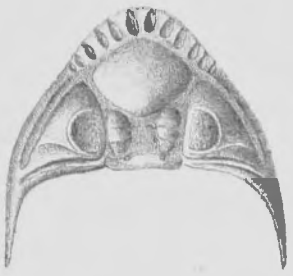

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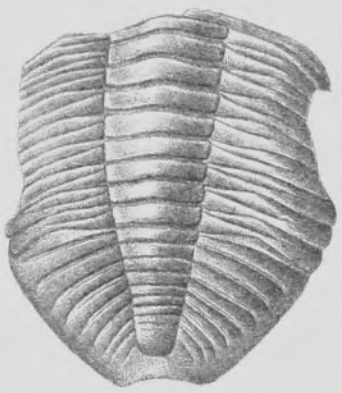

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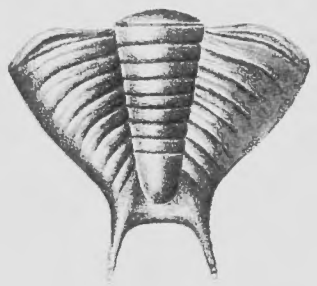

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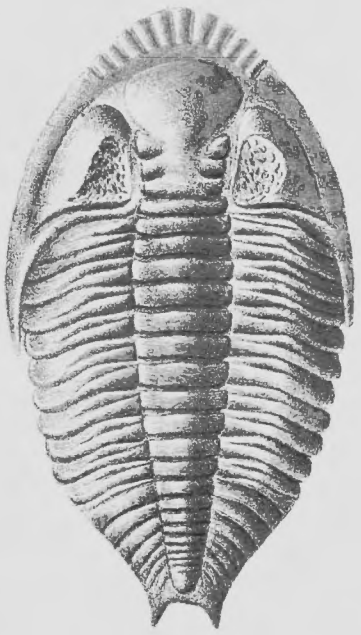

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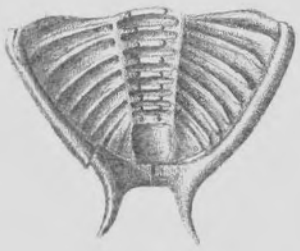

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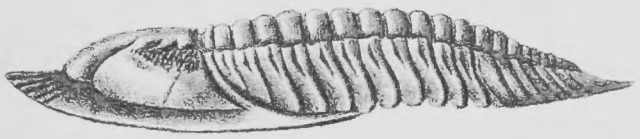

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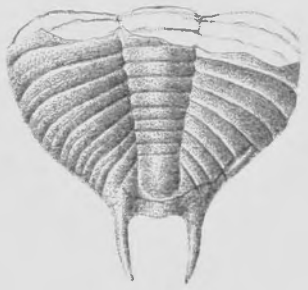

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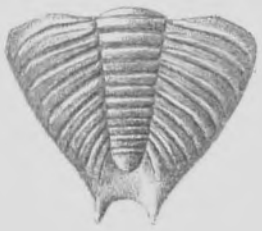

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E. Emmons del.

P. Riemann lith.

PLATE XII.

DALMANITES (ODONTOCEPHALUS) SELENURUS.

Page 49.

See Plate 11 B.

Fig. 1. An imperfect cephalon. Drawn from Green's cast No. 36 of the type specimen of *Calymene? odontocephala.*

Corniferous limestone. *Ulster county.*

Fig. 2. A large, nearly entire individual, retaining the crust and normal proportions over the thorax and pygidium, but somewhat crushed about the head.

Corniferous limestone. *Auburn, Cayuga county.*

Fig. 3. An individual of medium size from which a portion of the head and thorax has been broken away, exposing the hypostoma in place.

Corniferous limestone. *Waterville, Oneida county.*

Fig. 4. A distorted and partially dismembered example, retaining the crust and the eyes.

Corniferous limestone. *Near Auburn, Cayuga county.*

Fig. 5. A nearly entire cephalon drawn from an internal cast, retaining the eyes and showing the direction of the facial sutures. Enlarged to two diameters.

Fig. 6. Profile of the same, showing the elevation of the eye.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 7. A cephalon, an impression of the interior, showing the casts of tubulipores on the anterior margin. Enlarged to two diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 8. Anterior view of a large, enrolled individual retaining a portion of the crust.

Fig. 9. Posterior view of the same, the pygidium truncated by the breaking away of the caudal spines.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 10. A small, enrolled individual from which the crust has been broken away.

Fig. 11. Profile view of the same. The left eye of this specimen has been restored in the drawing.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 12. A portion of the cephalic border, enlarged to three diameters, showing the shape of the denticulations and their strongly granulose anterior edges.

Corniferous limestone. *Lime Rock, near LeRoy, Genesee county.*

Fig. 13. A block of decomposed chert, bearing two nearly entire individuals and portions of several others, all preserved as internal casts.

Corniferous limestone. *From a loose boulder five miles south of Ovid, Seneca county.*

UPPER HELDERBERG GROUP.

(PHACOPIDÆ.)

Palæontology of N.Y., Vol. VII.

Plate XII.

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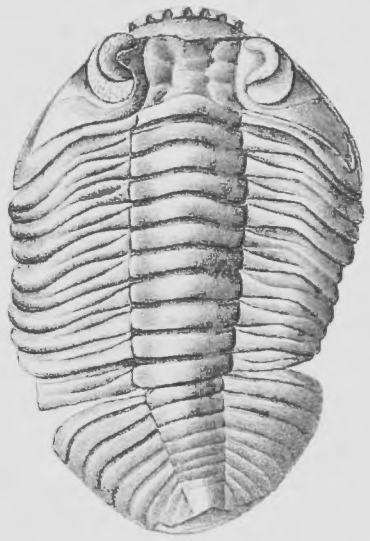

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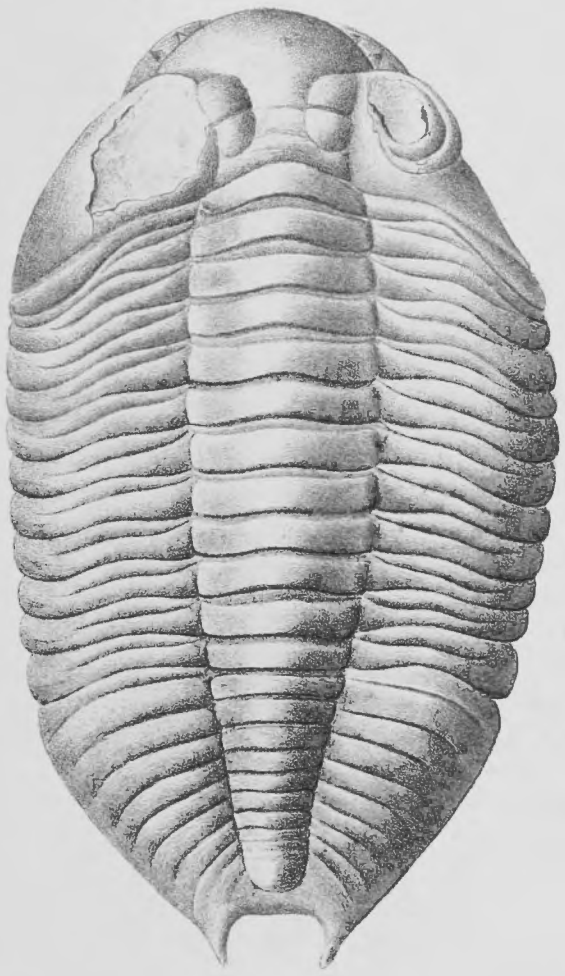

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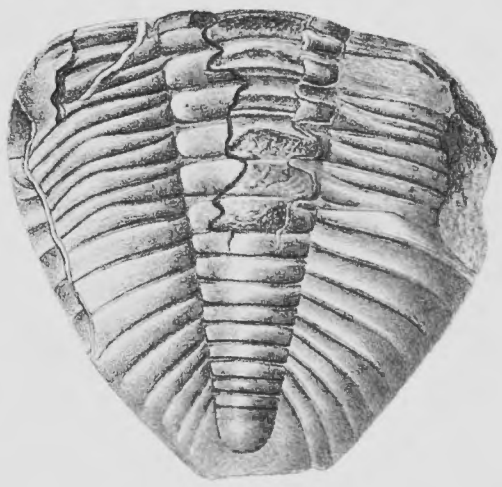

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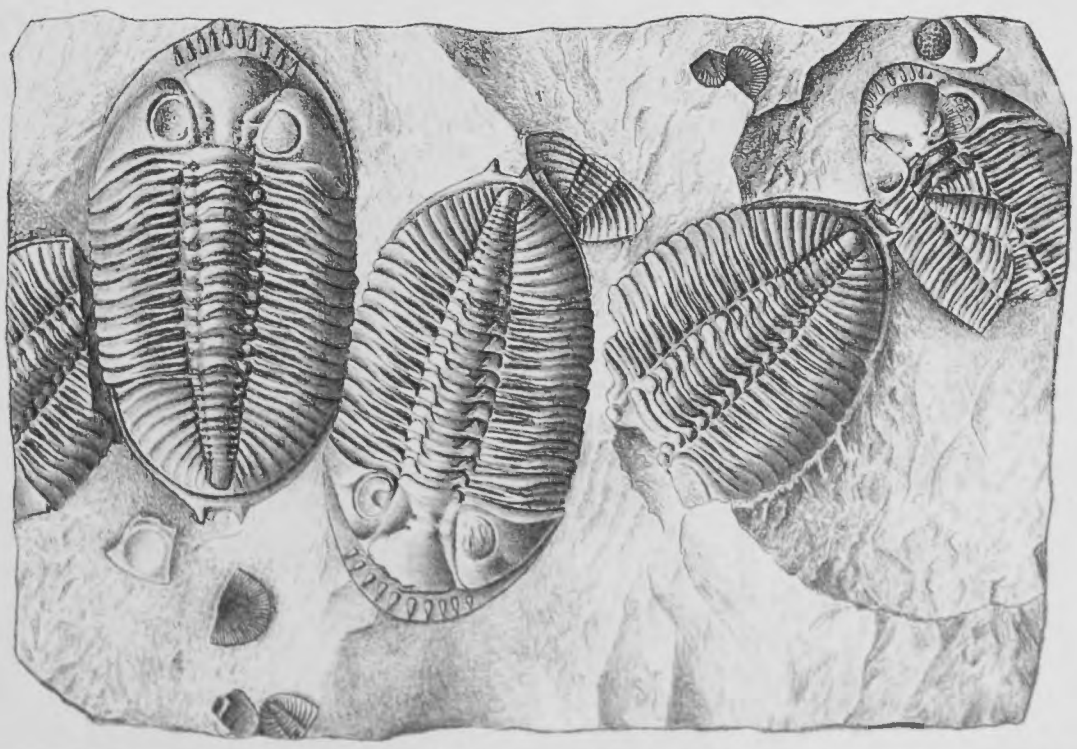

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C. B. Simpson del.

P. Riemann lith.

PLATE XIII.

DALMANITES (CORONURA) ASPECTANS.

Page 33.

Fig. 1. A fragment of the cephalon, showing the left cheek, the eye and a portion of the glabella.
Corniferous limestone. *Columbus, Ohio.*

Fig. 2. The left movable cheek, with the visual surface of the eye attached, showing the great elevation of this organ. This specimen is the original of Conrad's description.
Corniferous limestone. *Near Schoharie, Schoharie county.*

Fig. 3. A similar specimen, showing the eye.

Fig. 4. A portion of the visual surface of the last specimen, enlarged to six diameters.
Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 5. The pygidium of a small individual, showing the character of the surface ornamentation. The marginal spines and the posterior portion of the shield have been lost, and are restored in outline.
Corniferous limestone. *Columbus, Ohio.*

Fig. 6. A small pygidium, showing pathological deformity.
Corniferous limestone. *Columbus, Ohio.*

Fig. 7. A pygidium from which the surface and marginal ornamentation has been worn away. This is the specimen originally used in the description of *Dalmanites Helena*, Hall.
Corniferous limestone. *Columbus, Ohio.*

Fig. 8. A pygidium of average size retaining the marginal spines. The drawing is made from a gutta-percha impression from a natural mould of the dorsal surface, and the tubercles of the surface are obsolete.
Corniferous limestone. *Columbus, Ohio.*

Fig. 9. An entire pygidium, showing the normal length of the marginal spines. The surface ornamentation is obsolete.
Corniferous limestone. *Lime Rock, near LeRoy, Genesee county.*

Fig. 10. A large and somewhat imperfect pygidium, showing the characteristic ornamentation of the crust.
Corniferous limestone. *Columbus, Ohio.*

Fig. 11. A large pygidium, retaining portions of the marginal spines, and scattered tubercles over the surface.
Corniferous limestone. *Columbus, Ohio.*

Fig. 13. A fragment showing the terminal portion of a pygidium which is referred with some hesitation to this species. The surface ornamentation is similar to that in *D. aspectans*, and the marginal spines have been broken away, with the exception of the final pair which are unusually large. This form is believed to be identical with Mr. Conrad's *Asaphus? denticulatus*.
Corniferous limestone. *Schoharie, Schoharie county.*

DALMANITES (CORONURA) MYRMECOPHORUS.

Page 37.

See Plates 11 A, 14 and 15.

Fig. 12. The pygidium of a small individual, which shows a certain degree of similarity with that of *D. aspectans* in the somewhat regular arrangement of the surface tubercles. The specimen shows, however, the base of the strong terminal axial spine characteristic of *D myrmecophorus*.
Corniferous limestone. *Lime Rock, near LeRoy, Genesee county.*

UPPER HELDERBERG GROUP.

(PHACOPIDÆ.)

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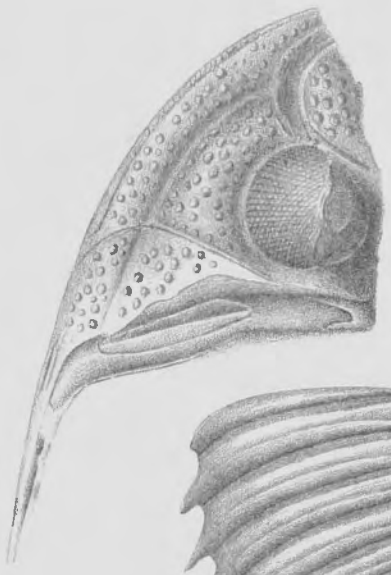

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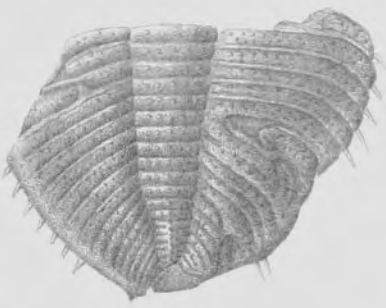

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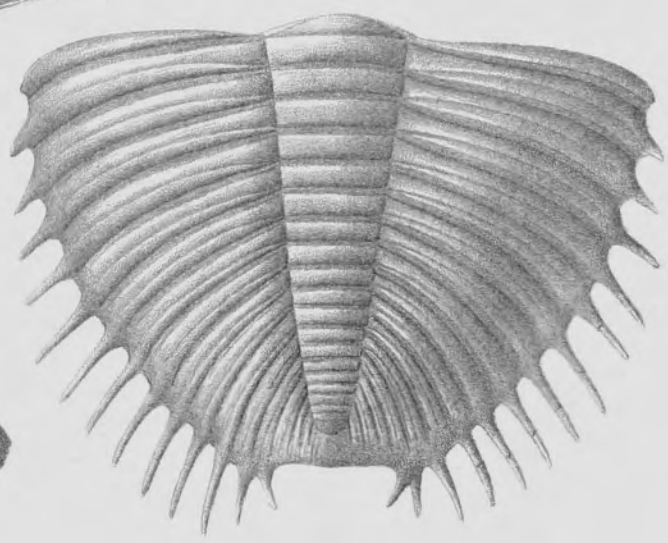

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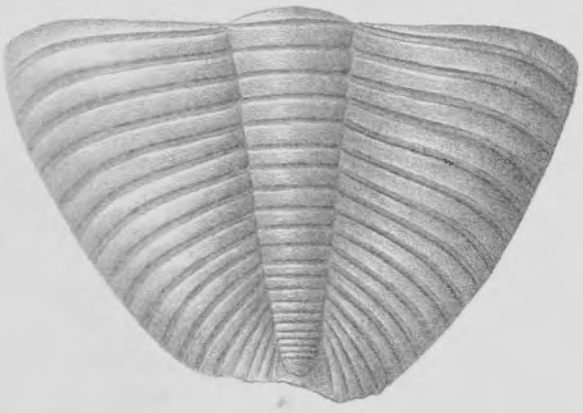

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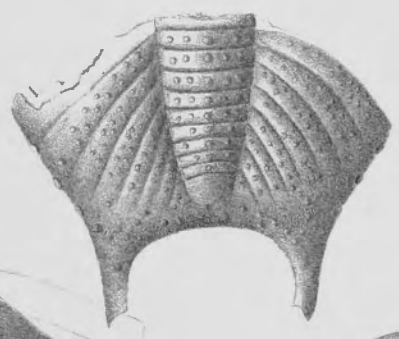

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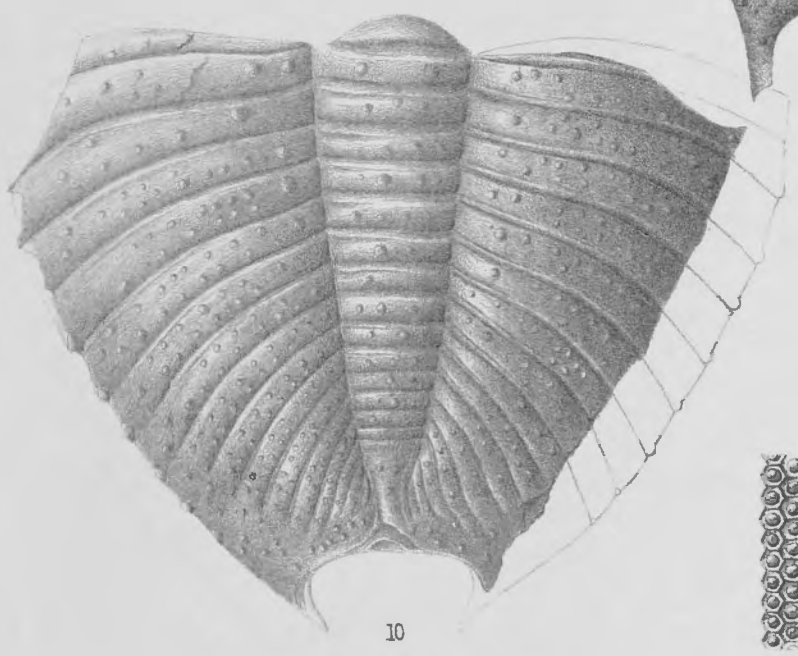

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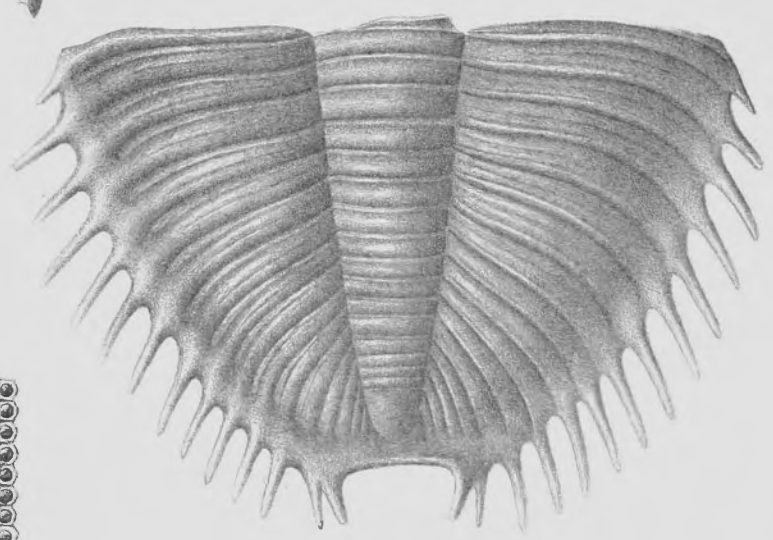

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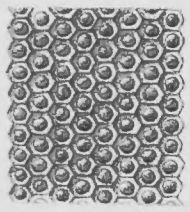

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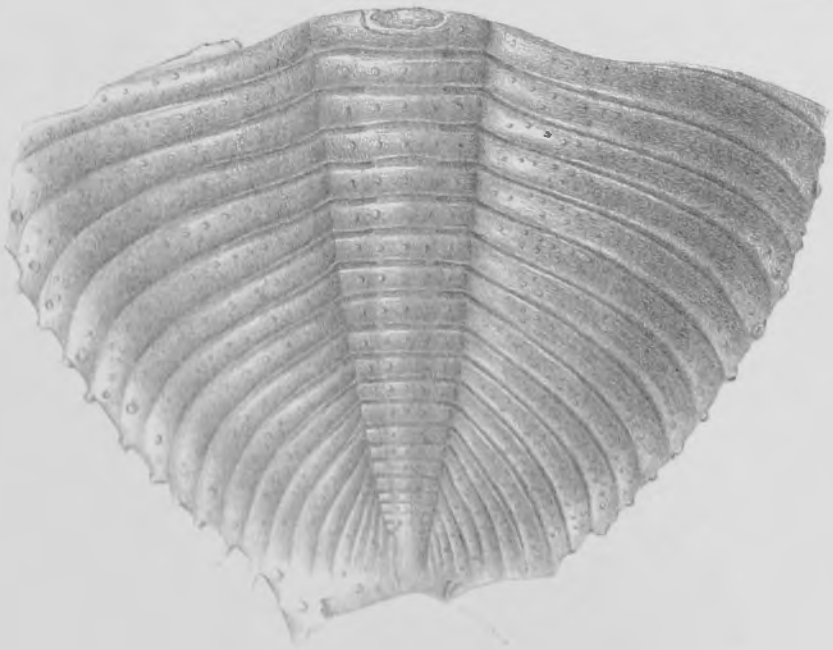

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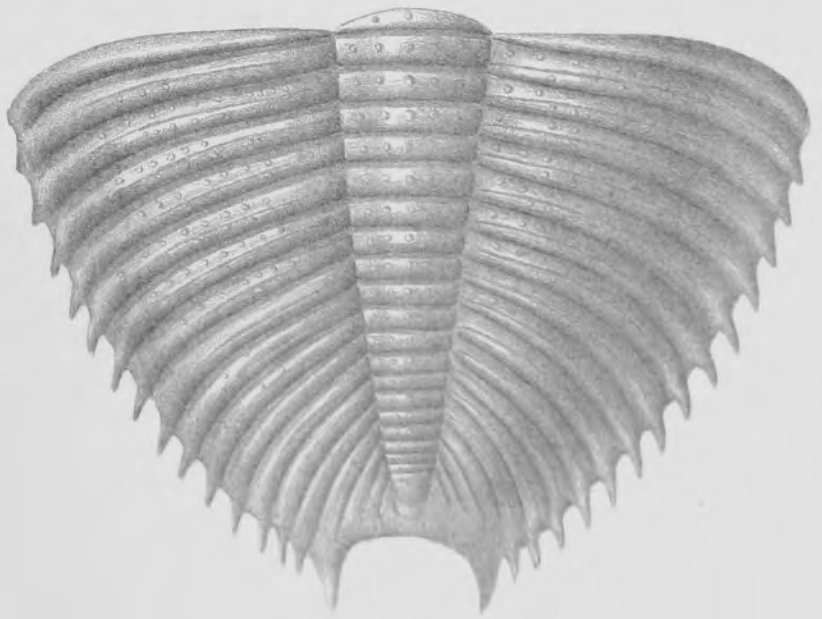

G.B. Simpson del. P. Riemann lith.

PLATE XIV.

DALMANITES (CORONURA) MYRMECOPHORUS.

Page 37.

See Plates 11 A, 13 and 15.

Fig. 1. An unusually perfect pygidium of about average size, showing the general convexity, the irregularly scattered nodes, and some of the marginal spines. The second spine on the right margin of the shield was apparently broken off and healed during the life of the animal.

Fig. 1a. A transverse section in outline near the anterior margin, to show the convexity of the axis and pleuræ, and the upward direction of the spines.

Corniferous limestone. *City Hall quarry, Kingston, Ulster county.*

Fig. 2. A fragment of the pygidium of a very large individual.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 3. A fragment of a smaller pygidium, showing the length and curvature of the marginal spines.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 4. A fragment, showing the terminal portion of the pygidium. This figure is from the original of Mr. Conrad's *Asaphus? acantholeurus*. The drawing does not make the base of the central spine sufficiently large.

Fig. 5. A side view of a gutta-percha impression made from the counterpart of the foregoing specimen, showing the length of the spines on the posterior border. The central spine is normally bifid, but this character is not perfectly retained in the impression.

Fig. 6. The same viewed from the front.

Corniferous limestone. "*Near Schoharie, in limestone with Odontocephalus* (*Onondaga limestone*)" (Conrad).

UPPER HELDERBERG GROUP.

(PHACOPIDÆ.)

Palæontology of N.Y. Vol. VII

Plate XIV.

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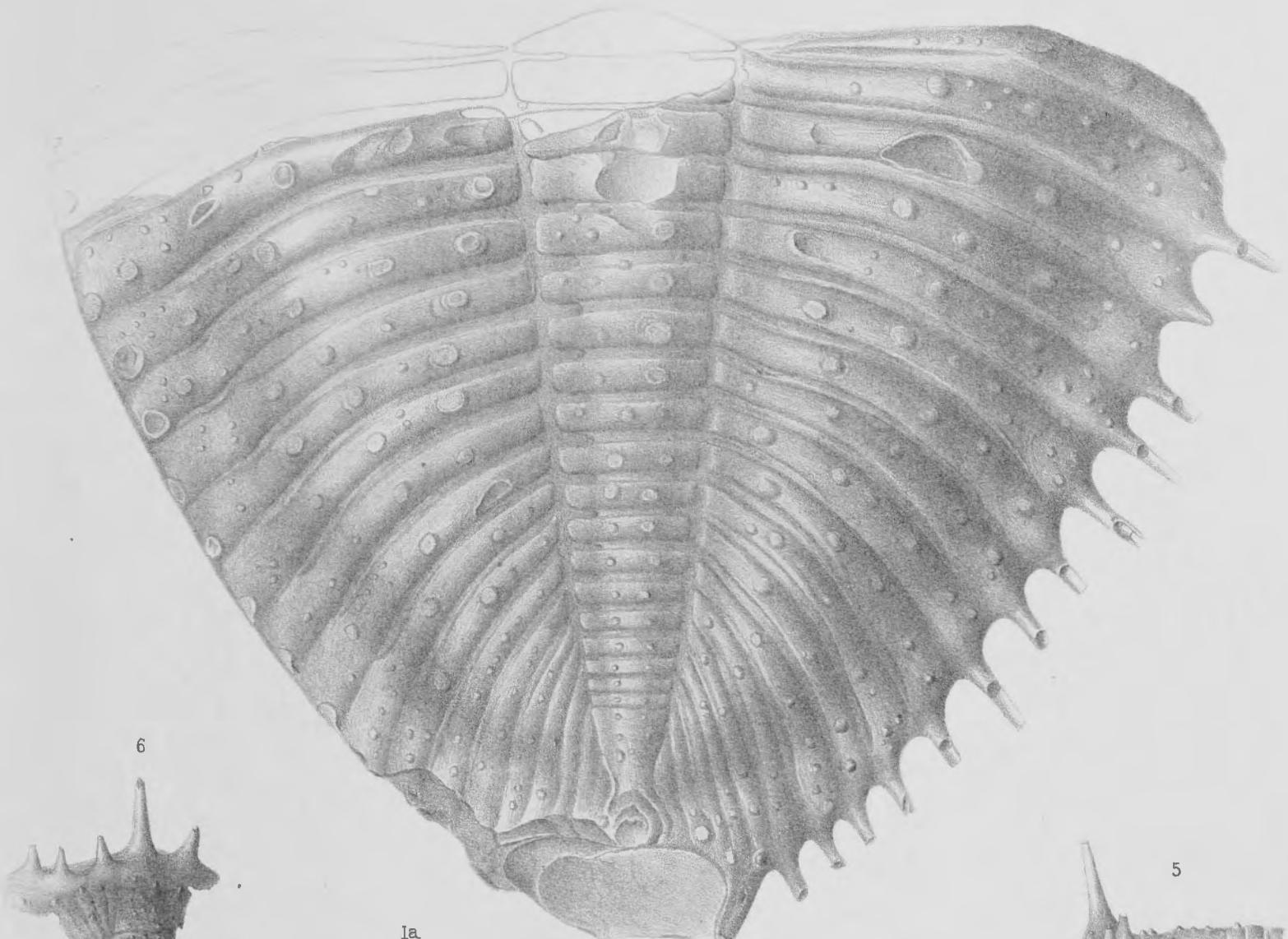

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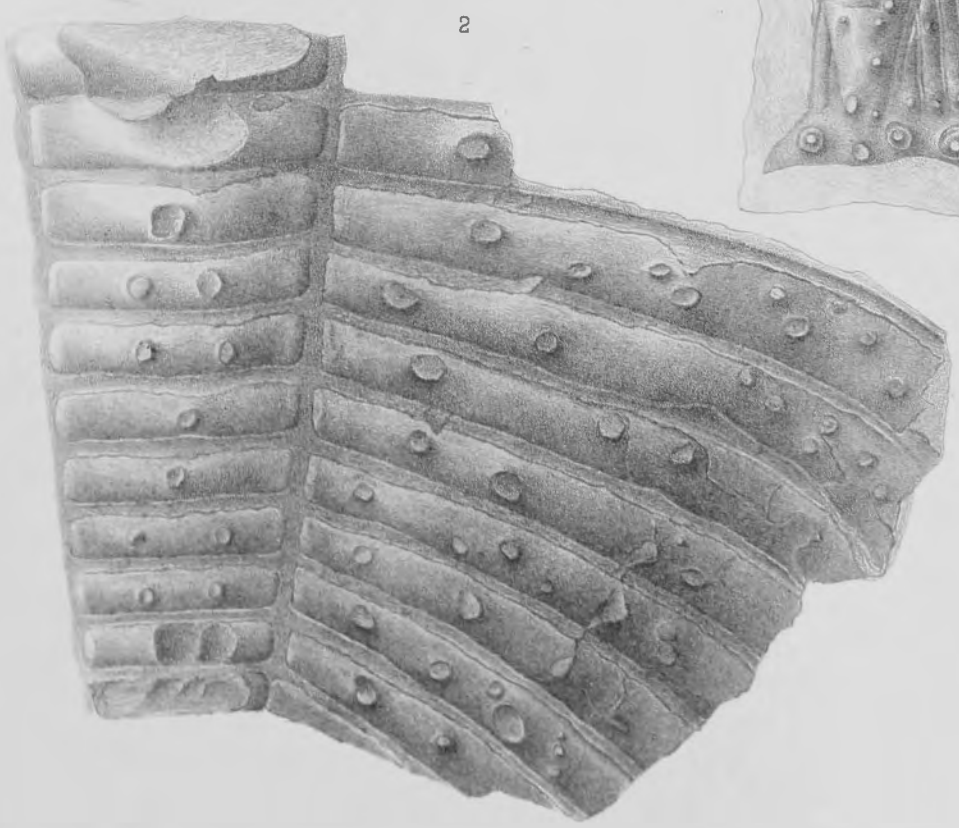

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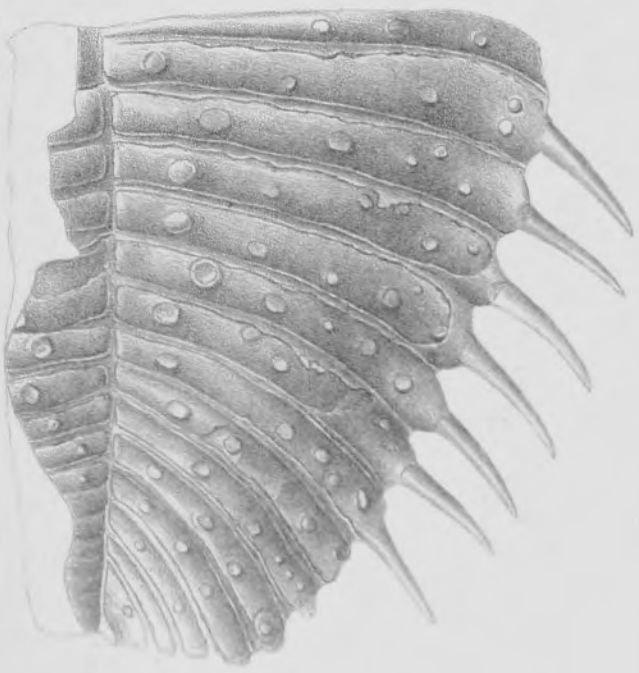

E. Emmons del.

P. Niemann lith.

PLATE XV.

DALMANITES (CORONURA) MYRMECOPHORUS.

See Plates 11 A, 13 and 14.

Fig. 1. A very large pygidium, natural size, accompanied by a restoration in outline of the other parts of the animal, to indicate its probable proportions when entire. This restoration is made from data supplied by fragmentary remains of the cephalon and thorax, and from careful comparison of the relative proportions of the different parts in entire individuals of various species of *Dalmanites*.
Corniferous limestone. *Near Clarksville, Albany county.*

Fig. 2. A profile of the terminal portion of the same specimen more carefully prepared, showing the continuation of the axis to the posterior border, and the elevated, spinose character of the latter.

Fig. 3. An outline profile of one-half the posterior border viewed from behind, showing the bifid central spine.

Fig. 4. Restoration from a fragment of the smallest individual observed; natural size.
Corniferous limestone. *Canandaigua, Ontario county.*

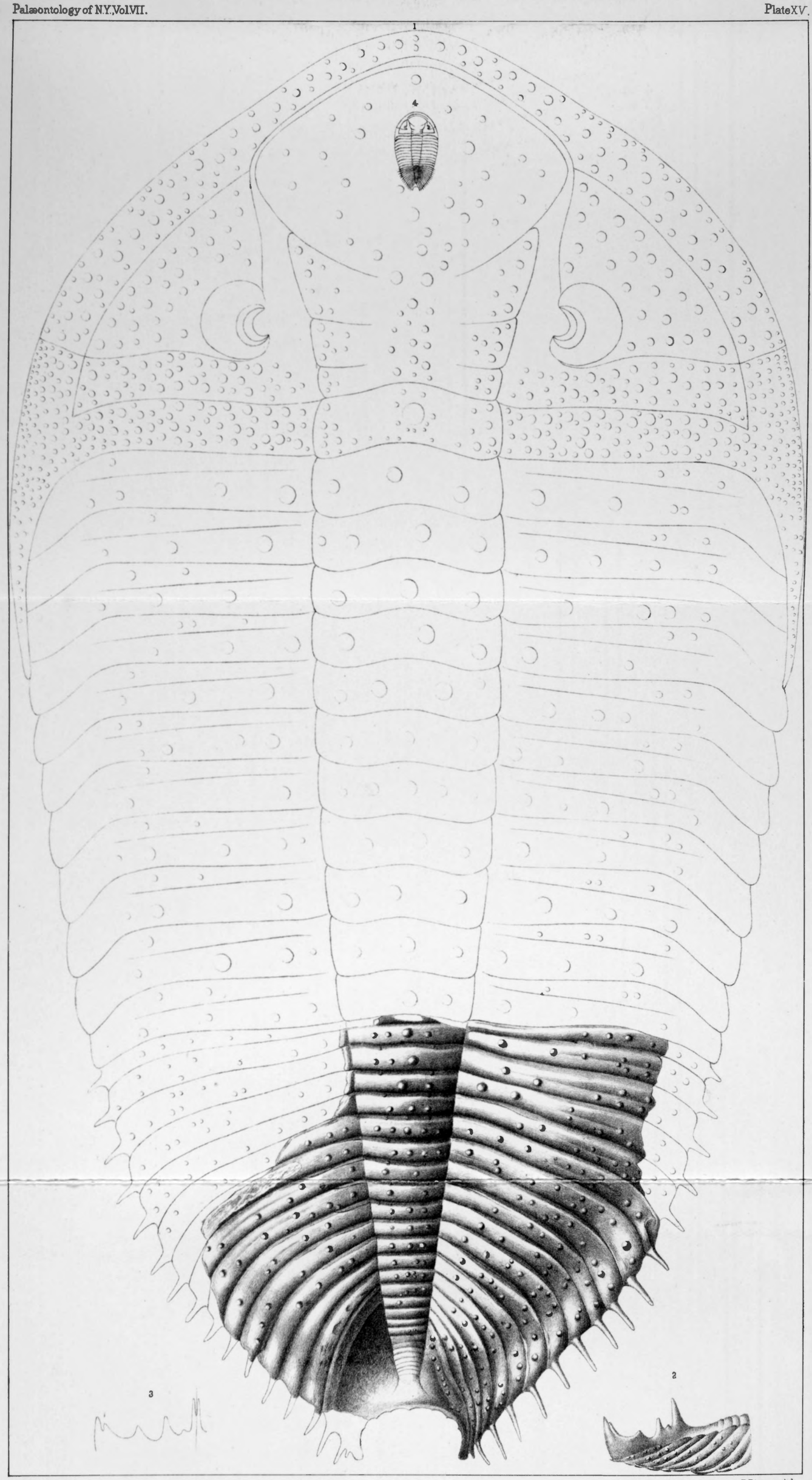

PLATE XVI.

DALMANITES (CRYPHÆUS) BOOTHI.

Page 42.

See Plate 16 A.

Fig. 1. An entire individual, of about average adult proportions, showing the short and broad genal spines, anodose axis and flattened caudal fimbria.

Fig. 2. Profile of the same, showing the broad, blunt and laterally flattened genal spines.
Hamilton group. *Canandaigua Lake.*

Fig. 3. A small cephalon, preserving normal proportions, one of the genal spines being restored.
Hamilton group. *Canandaigua Lake.*

Fig. 4. A fragmentary specimen, showing the usual characters of thorax and pygidium.
Hamilton group. *Canandaigua Lake.*

DALMANITES (CRYPHÆUS) BOOTHI, var. CALLITELES.

Page 45.

See Plate 16 A.

Fig. 5. A very young individual, drawn in outline and partially restored. This is the earliest stage of growth noticed, and an enlargement of the pygidium is given on plate 16 A, fig. 12.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 6. An individual in a later stage of development, partially restored. An enlargement of the pygidium is given on plate 16 A, fig. 13.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 7. An individual in a more advanced stage of growth than the preceding, partially restored. An enlargement of the pygidium is given on plate 16 A, fig. 14.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 8. A still larger individual, slightly incurved, and thus made to appear broader than normal.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 9. A slightly larger individual, also somewhat enfolded. This example preserves the axial row of nodes, and rounded, but pustulose caudal spines. The genal spines, however, are like those of the species *Boothi* rather than those of the variety *Calliteles*, and the specimen represents a form intermediate between normal examples of the species and its variety.
Hamilton group. *Canandaigua Lake.*

Fig. 10. An individual in a later stage of growth, showing the long, slender caudal spines.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 11. An individual, somewhat below the normal adult size, but showing all the characteristics of the variety.

Fig. 12. Profile of the same, showing the long, acute genal spines.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 13. A normal individual, of average size.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 14. The individual represented in fig. 9. Enlarged to two diameters.

Fig. 15. The same in profile, showing the character of the genal spines.

Fig. 16. A very large cephalon.
Hamilton group. *Canandaigua Lake.*

Fig. 17. A thorax and pygidium, of unusually large size.
Hamilton group. *Canandaigua Lake.*

Fig. 18. An enrolled individual, showing the caudal fimbria projecting beyond the frontal border.
Hamilton group. *Near LeRoy, Genesee county.*

Fig. 19. Anterior view of a smaller, partially enrolled individual.

Fig. 20. Lateral view of the same.

PLATE XVI—Continued.

Fig. 21. Posterior view of the same, showing the projection of the genal spines beyond the thorax. Hamilton group. *Canandaigua, Ontario county.*

Fig. 22. A block of shale, showing a group of trilobites, including *Dalmanites* (*Cryphæus*) *Boothi*, var. *Calliteles*, *Phacops rana* and *Cyphaspis craspedota*. In the upper left-hand individual, the right genal spine has been broken and healed before fossilization. A little to the right of the center of the block is shown the hypostoma of *Dalmanites* (*Cryphæus*) *Boothi*, var. *Calliteles*. Hamilton group. *Canandaigua, Ontario county.*

HAMILTON GROUP.

(PHACOPIDÆ.)

Palæontology of N.Y. Vol.VII.

Plate XVI.

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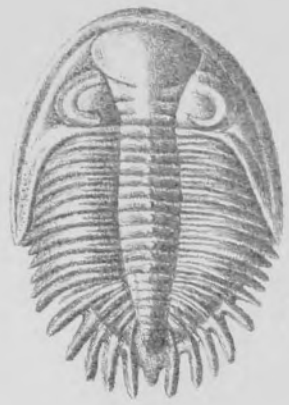

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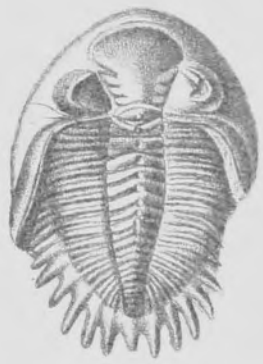

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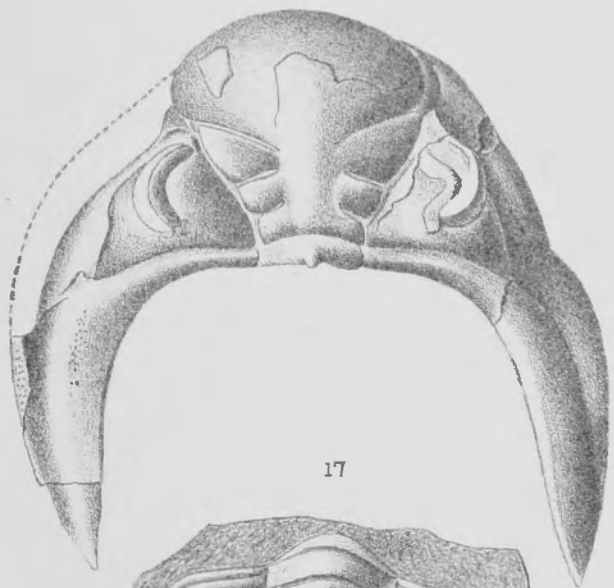

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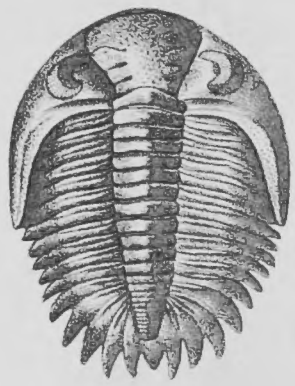

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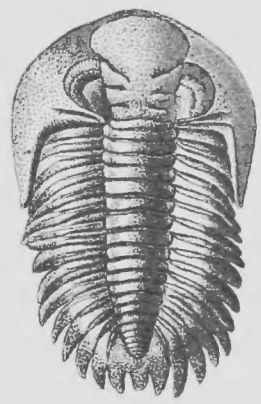

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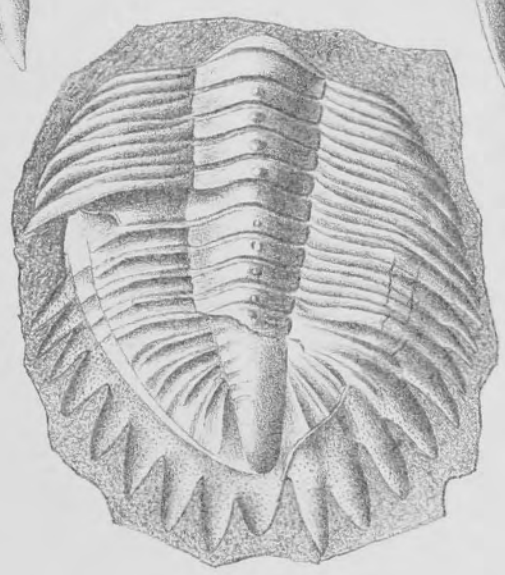

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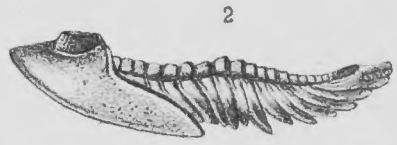

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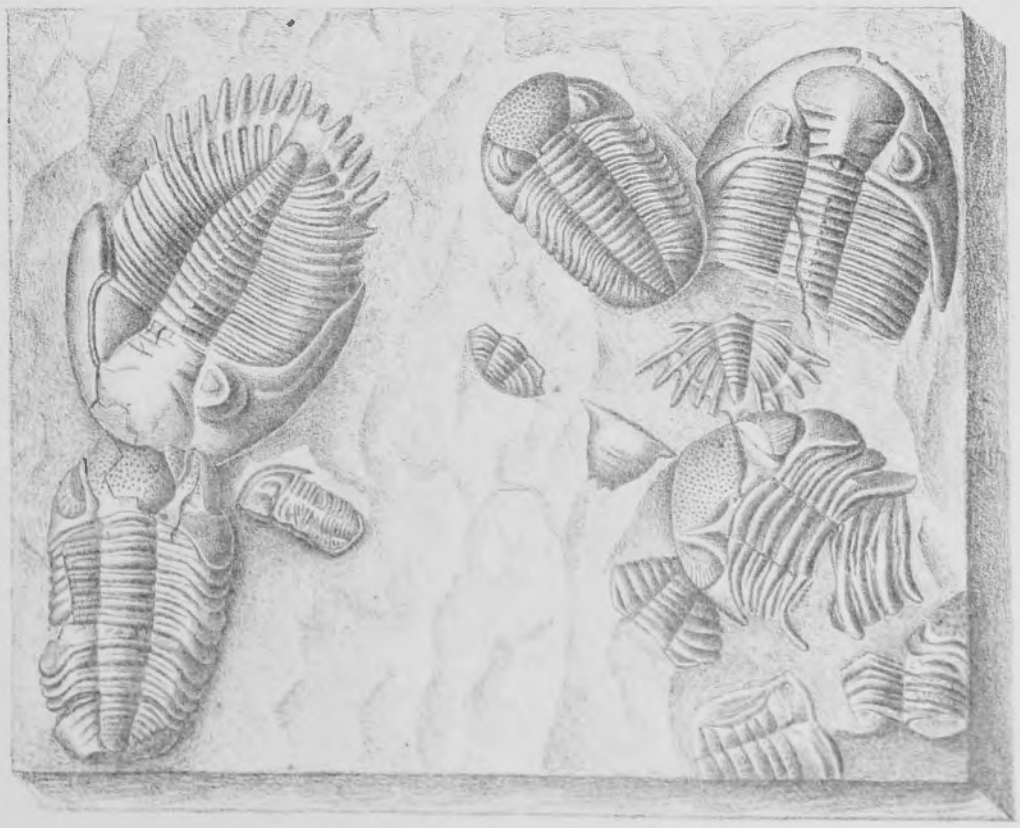

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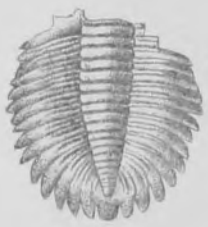

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E. Emmons del.

P. Riemann lith.

PLATE XVI A.

DALMANITES (CRYPHÆUS) COMIS.

Page 41.

Fig. 1. The internal cast of a pygidium, enlarged to three diameters, and considerably restored.
Upper Helderberg limestone. *Cayuga, Province of Ontario.*

DALMANITES (CRYPHÆUS) PLEIONE.

Page 41.

Fig. 2. View of the type specimen.
Corniferous limestone. *Falls of the Ohio.*

DALMANITES (CRYPHÆUS) BOOTHI.

See Plate 16.

Fig. 3. A small pygidium, showing the flattened marginal spines.
Hamilton group. *Darien, Genesee county.*

Fig. 4. A larger pygidium, in which the marginal spines are longer and gently rounded, and the terminal spine acute.
Hamilton group. *Canandaigua Lake.*

Fig. 5. The internal surface of a pygidium, in which the spines are broad and flat.
Hamilton group. *Near Geneseo, Livingston county.*

Fig. 6. Similar view of a smaller pygidium, with more elongate spines.
Hamilton group. *Near Geneseo, Livingston county.*

Fig. 7. A large pygidium, with spines of the normal character.
Hamilton group. *Canandaigua Lake.*

Fig. 8. Three of the marginal spines of the specimen represented on plate 16, fig. 1, enlarged to three diameters.

DALMANITES (CRYPHÆUS) BOOTHI, var. CALLITELES.

See Plate 16.

Fig. 9. An imperfect pygidium, referred with some hesitancy to this variety. The long, acute spines are different from those in the normal adult forms of either the species or the variety. No cephala accompanying such pygidia in the Hamilton shales have been observed.
Hamilton group. *Jaycox's Run, Livingston county.*

Fig. 10. A pygidium with similar characters. The associated cephala bear the diagnostic characters of this variety.
Tully limestone. *Goodwin's, Cayuga Lake.*

Fig. 11. A normal adult pygidium, enlarged to two diameters, showing the elevated, lanceolate marginal spines.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 12. The pygidium of the youngest individual observed (plate 16, fig. 5), enlarged to twelve diameters, showing the incurvature of the axis; the long, terete marginal spines, diminishing in length posteriorly, and the undeveloped terminal spine.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 13. An individual in a slightly advanced stage of growth (plate 16, fig. 6), enlarged to ten diameters, showing an approximation in the relative length of the spines.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 14. An individual in a later stage of growth (plate 16, fig. 7), enlarged to nine diameters, showing the approximately equal length of the spines, except in the last pair, and the increasing size of the terminal spine.

PLATE XVI A—Continued.

Hamilton group. *Canandaigua, Ontario county.*

Fig. 15. An individual in a still later, immature stage of growth, enlarged to seven diameters.

Hamilton group. *Hopewell, Ontario county.*

Fig. 16. A fragment representing the largest pygidium observed.

Hamilton group. *Canandaigua Lake.*

Fig. 17. Four marginal spines of a pygidium, similar to the one represented in fig. 9. Enlarged to three diameters.

DALMANITES (CRYPHÆUS) BARRISI.

Page 48.

Fig. 18. A pygidium, enlarged to three diameters, and showing the round, terete marginal spines, and the conspicuous terminal spine.

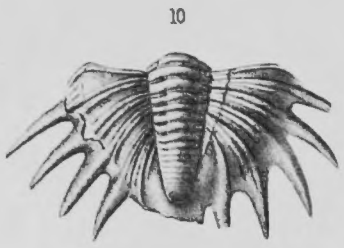
Hamilton group. *Davenport, Iowa.*

UPPER HELDERBERG & HAMILTON GROUPS.

(PHACOPIDÆ)

Palæontology of N.Y. Vol.VII.

Plate XVI A.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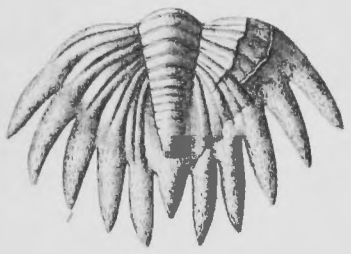
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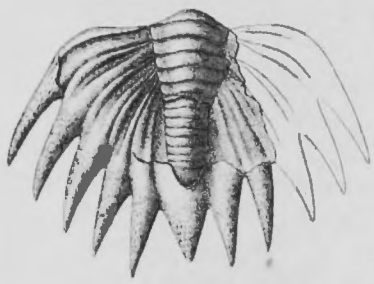
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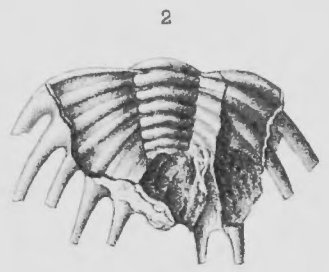
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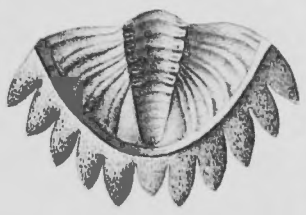
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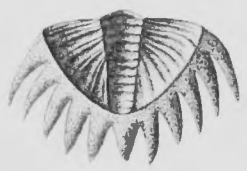
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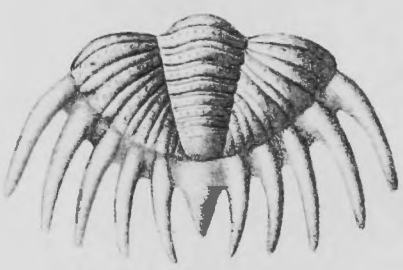
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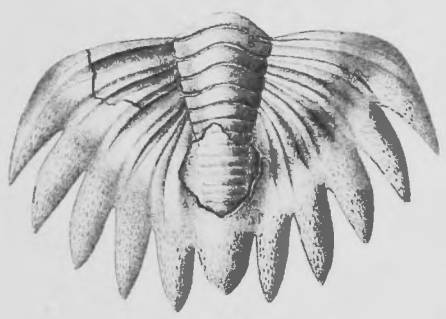
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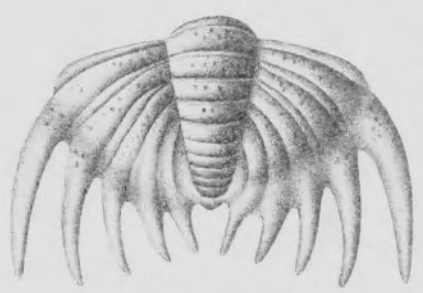
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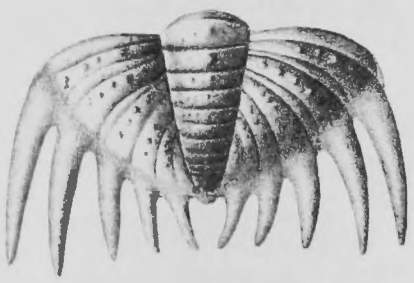
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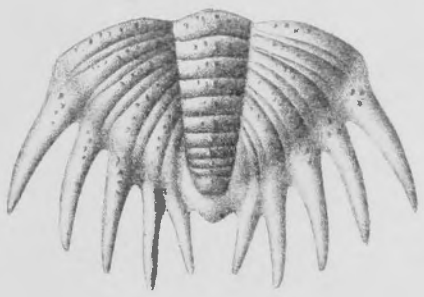
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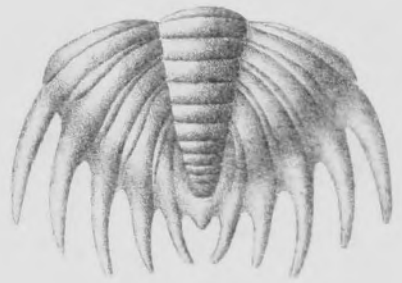
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E.Emmons del.

Phil.Ast.lith.

PLATE XVI B.

ACIDASPIS CALLICERA.

Page 69.

Fig. 1. An imperfect specimen, natural size, retaining the head and six thoracic segments.

Fig. 2. The same, enlarged to two diameters.

Corniferous limestone. *Camillus, Onondaga county.*

Fig. 3. A larger, more nearly entire individual, drawn to two diameters. The specimen is an internal cast in decomposed chert, and has the cephalon somewhat deflected.

Fig. 4. Profile of the same, similarly enlarged.

Fig. 5. An anterior view of the same, showing the elevation of the glabella and eye-lobes.

Fig. 6. The natural mould of the dorsal surface of the same specimen, similarly enlarged.

Fig. 7. A gutta-percha impression from this mould, showing the ornamentation of the surface.

Upper Helderberg limestone. *Cayuga, Province of Ontario.*

Fig. 8. The glabellar portion of a small cephalon, enlarged to two diameters.

Upper Helderberg limestone. *Cayuga, Province of Ontario.*

Fig. 9. The left movable cheek, showing the length of the marginal and genal spines. Enlarged to four diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 10. The glabellar portion of a head, enlarged to two diameters, showing the denticulations on the frontal margin.

Upper Helderberg limestone. *Cayuga, Province of Ontario.*

Figs. 11 and 12. Right and left movable cheeks, drawn from internal casts, and showing the number of marginal spines.

Upper Helderberg limestone. *Cayuga, Province of Ontario.*

Fig. 13. Lateral view of a left movable cheek, retaining the eye. Enlarged to two diameters.

Schoharie grit. *Near Clarksville, Albany county.*

ACIDASPIS, sp.

Page 71.

Fig. 14. An imperfect pygidium, enlarged to two diameters.

Upper Helderberg limestone. *Cayuga, Province of Ontario.*

ACIDASPIS ROMINGERI.

Page 71.

Fig. 15. A fragmentary pygidium, restored in outline to show the great length of the marginal spines. Enlarged to two diameters.

Fig. 16. The same in profile.

Fig. 17. A portion of the anterior marginal spine of the same specimen, to show the character of the ornamentation. Enlarged to six diameters.

Fig. 18. A similar enlargement of the terminal portion of the fourth marginal spine.

Hamilton group. *Little Traverse Bay, Michigan.*

UPPER HELDERBERG & HAMILTON GROUPS.

(ACIDASPIDÆ.)

Palæontology of N.Y. Vol VII.

Plate XVIB.


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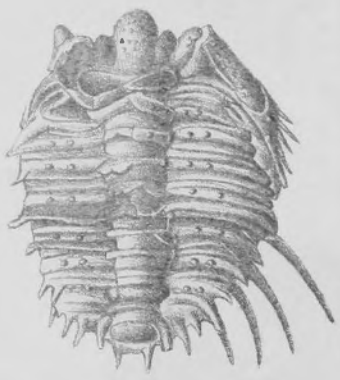
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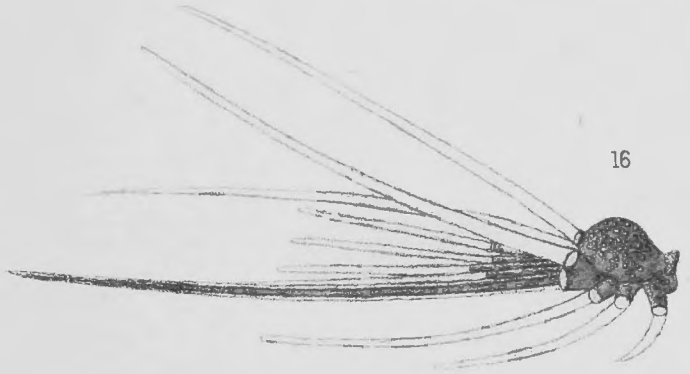
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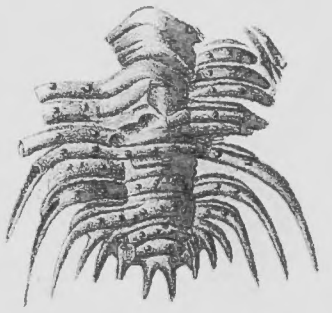
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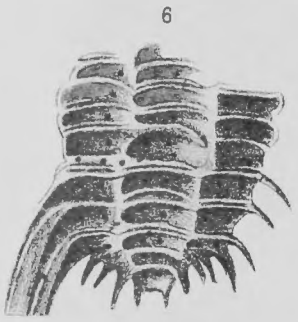
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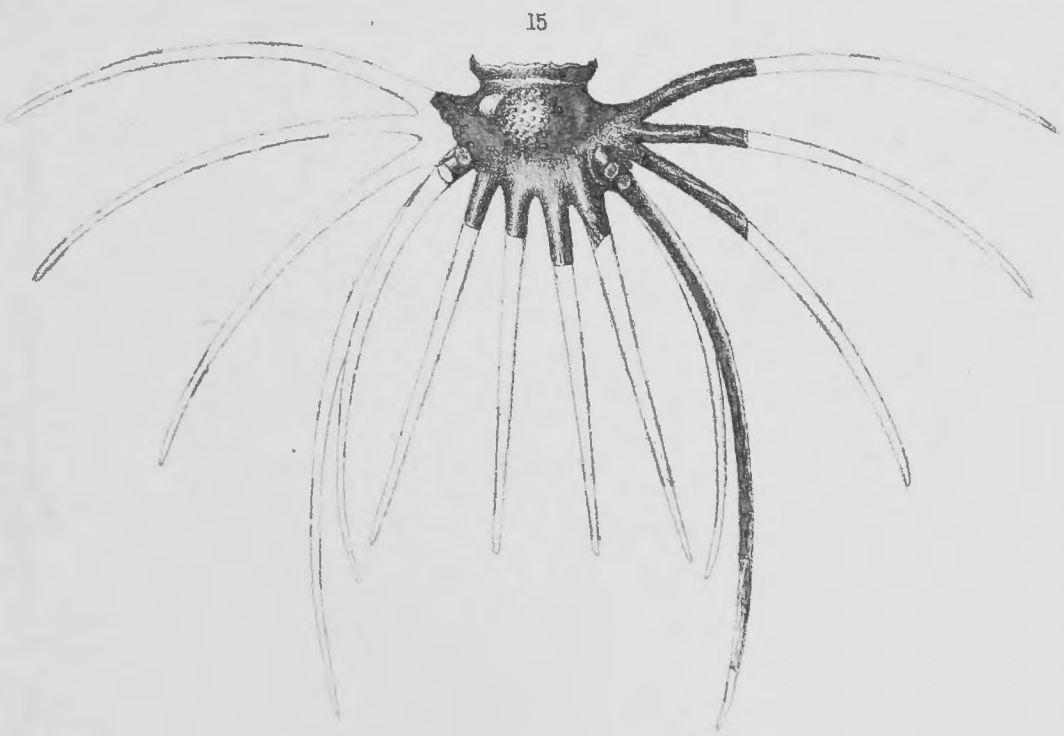
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E. Emmons del.

P. Riemann lith.

PLATE XVII.

LICHAS (TERATASPIS) GRANDIS.

Page 73.

See Plates 18 and 19.

Fig. 1. Profile of the cephalon represented on plate 18, showing the elevation of the glabella and one of the glabellar spines; the occipital ring, and the constriction about the base of the frontal lobe.
Upper Helderberg limestone. *Cayuga, Province of Ontario.*

Fig. 2. Dorsal view of a much weathered specimen of the cephalon, wanting the free cheeks.

Fig. 3. Profile of the same.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 4. The posterior portion of a large cephalon, showing the prominent lateral lobes and bases of the double glabellar spines, and the broad occipital ring with the clavate processes upon its posterior margin. The base of a strong spine lying just within the palpebral furrow, which is shown in the specimen, is not represented in the figure.

Fig. 5. The same viewed from behind, showing the elevation of the lateral lobes and of the processes upon the occipital ring.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 6. An imperfect pygidium, showing the pleural annulations and a portion of the marginal spines.
Schoharie grit. *Schoharie county.*

UPPER HELDERBERG GROUP.

(LICHADÆ.)

Palæontology of N.Y., Vol VII.

Plate XVII.

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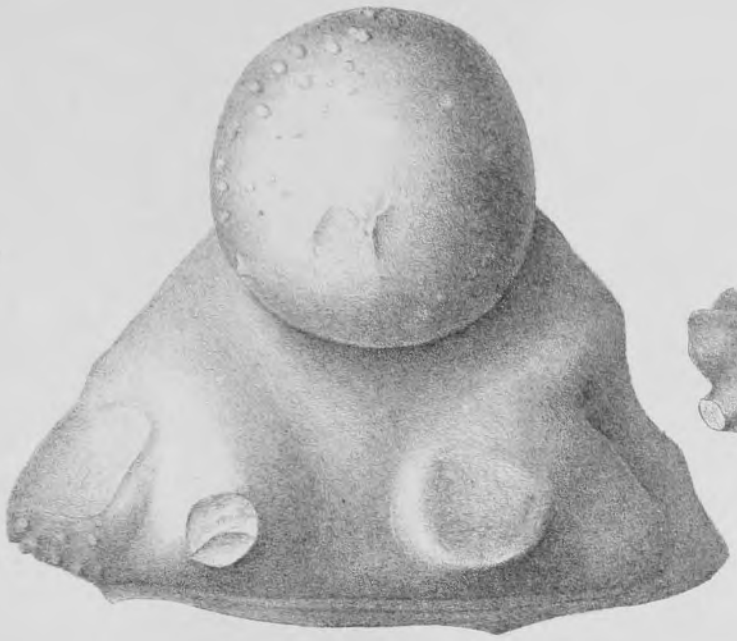

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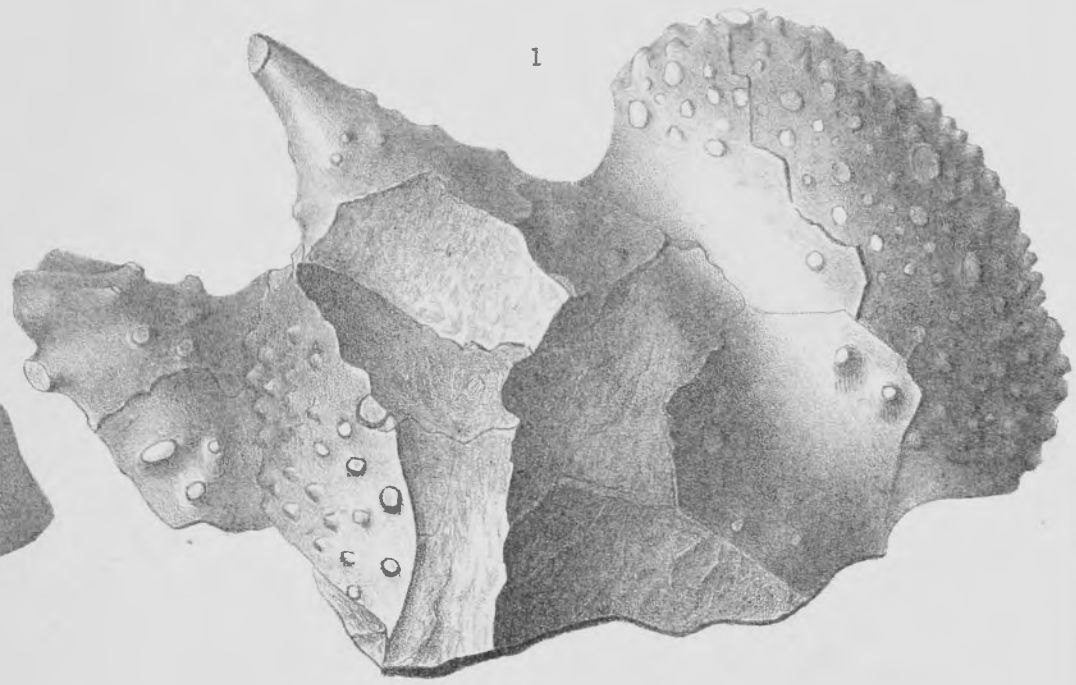

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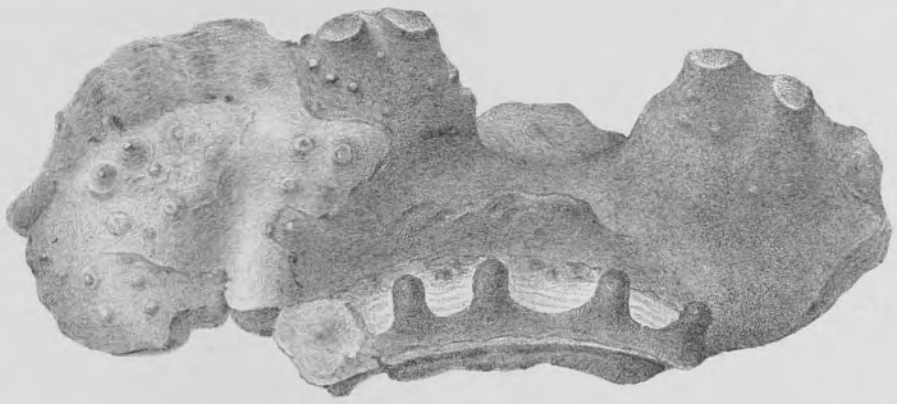

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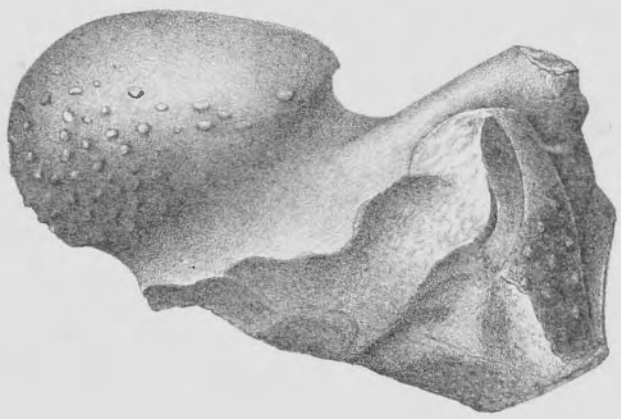

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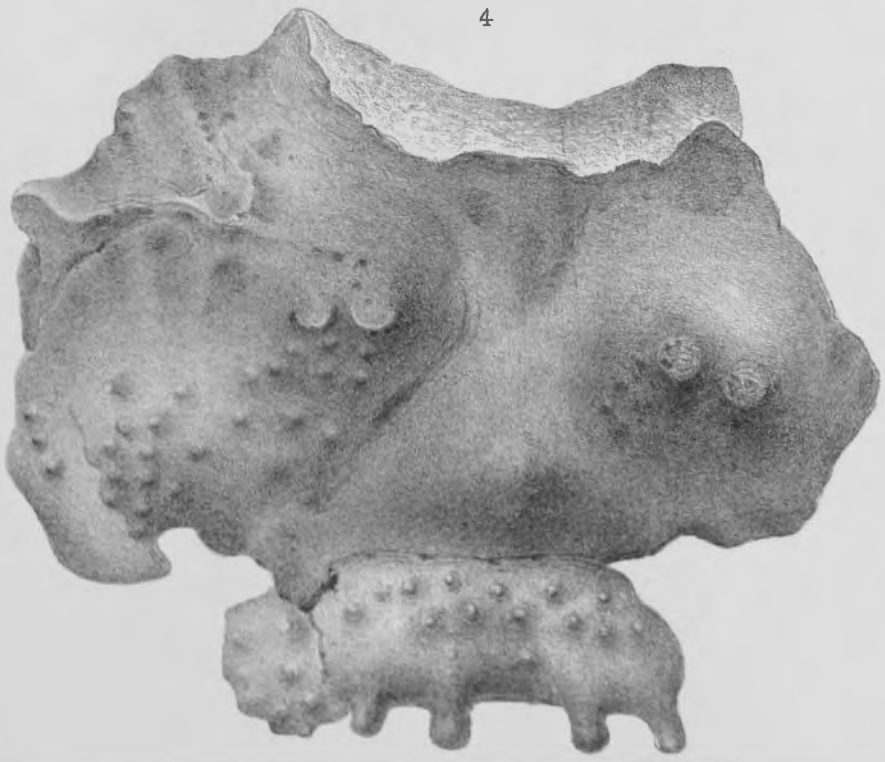

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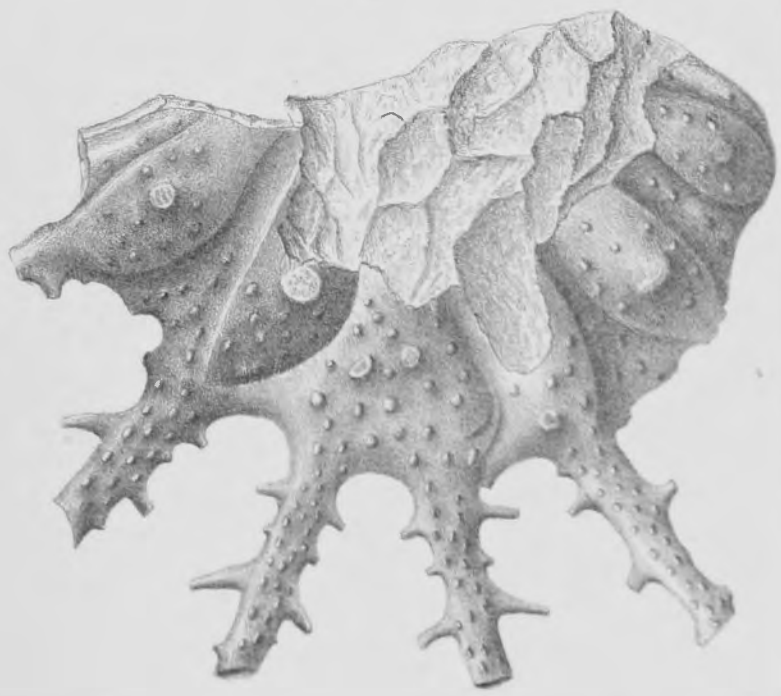

G.B. Simpson del.

P. Riemann lith.

PLATE XVIII.

LICHAS (TERATASPIS) GRANDIS.

See Plates 17 and 19.

Fig. 1. Dorsal view of a very large cephalon wanting the movable cheeks, showing the double spines on the lateral lobes, and the very broad occipital ring, with the clavate processes upon the posterior margin restored in outline. The specimen shows the base of a strong spine situated just within the palpebral furrow, but this is not represented in the drawing.

Fig. 2. The same viewed from behind, showing the elevation of the frontal and lateral lobes.

Upper Helderberg group. *Cayuga, Province of Ontario.*

UPPER HELDERBERG GROUP.

(LICHADÆ.)

Palæontology of N.Y., Vol. VII.

Plate XVIII

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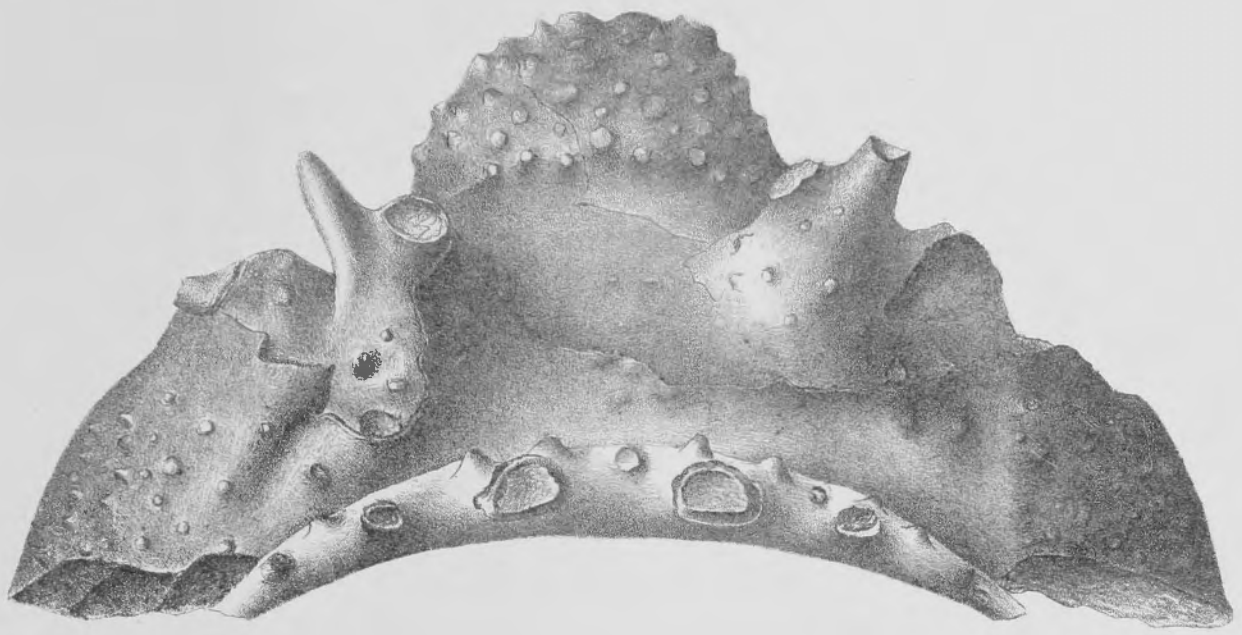

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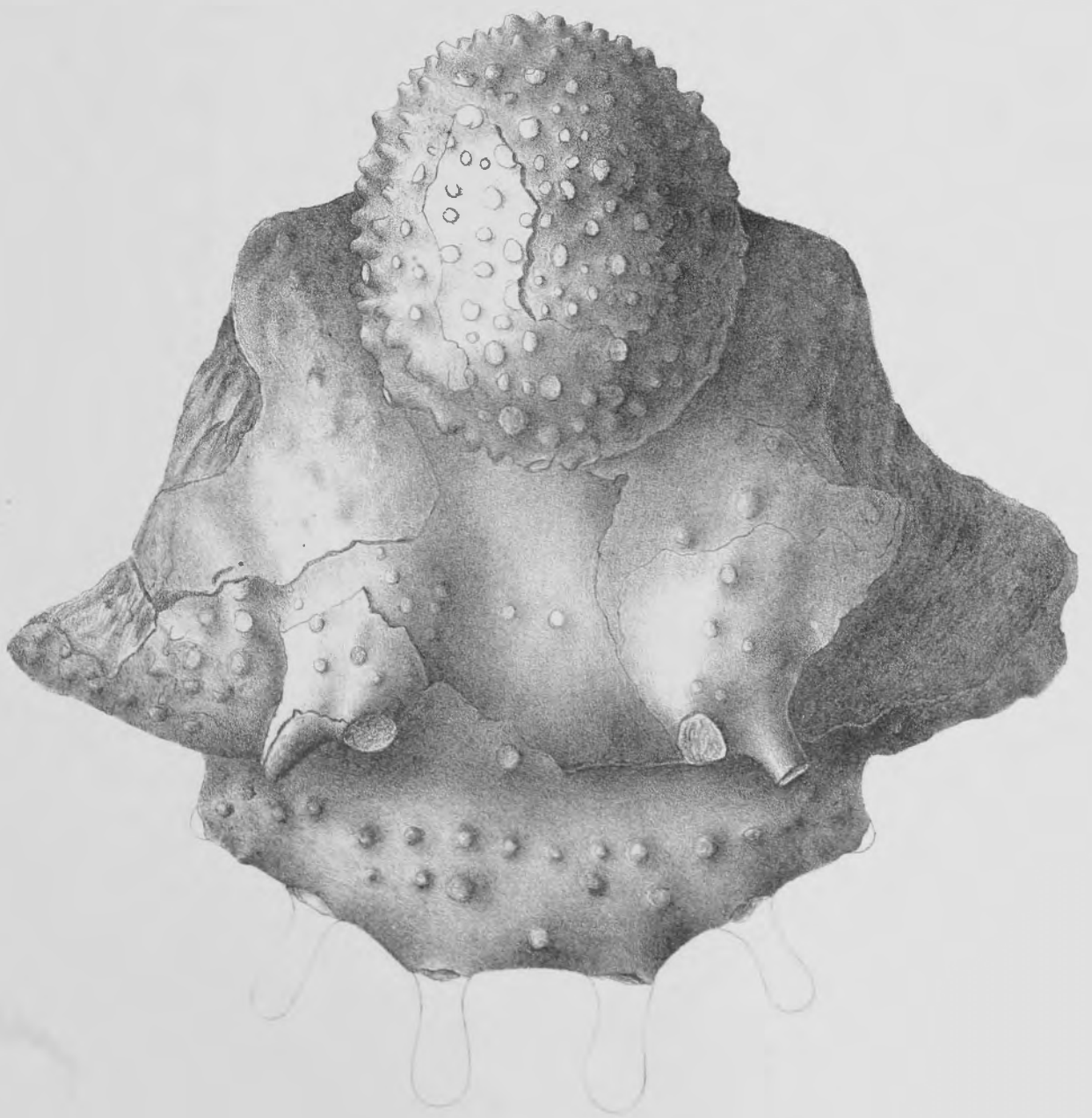


G.B. Simpson del.

P. Riemann lith.

PLATE XIX.

LICHAS (TERATASPIS) GRANDIS.

See Plates 17 and 18.

Fig. 1. A fragment of the pygidium, retaining one of the terminal spines and a portion of the other, showing the size and distribution of the spinules upon their surface. The drawing is made from a gutta-percha impression of the dorsal surface.
Schoharie grit. *Near Clarksville, Albany county.*

Fig. 2. An imperfect pygidium, retaining a portion of the crust, and showing the character of the axis and post-axial area.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 3. An imperfect pygidium of average size, showing the internal surface and retaining portions of the spines, the missing parts being restored in outline. This specimen is in the Ward Museum of Rochester University.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 4. A very small pygidium, in which the axis and lateral annulations extend to the margin. Referred with some doubt to this species.
Schoharie grit. *Near Clarksville, Albany county.*

Fig. 5. The frontal lobe of a small individual, with a portion of the cheek attached.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 6. The axial arch of a large thoracic segment, showing the strong divergent spines. The figure is drawn from a gutta-percha impression from a natural mould of the dorsal surface.
Schoharie grit. *Knox, Albany county.*

Fig. 7. A thoracic segment of a smaller individual, drawn in profile, showing the axial spines.
Schoharie grit. *Near Thompson's Lake, Albany county.*

LICHAS (CONOLICHAS) PUSTULOSUS.

Page 80.

Fig. 8. A pygidium, retaining a portion of the crust, showing the broad doublure, the two pairs of lateral spines and the conspicuous terminal lobe.
Lower Helderberg group. *Near Clarksville, Albany county.*

Fig. 10. The left free cheek of a large example.
Lower Helderberg group. *Schoharie, Schoharie county.*

Fig. 11. The right free cheek of an individual of about the same size as the preceding.
Lower Helderberg group. *Schoharie, Schoharie county.*

LICHAS (CONOLICHAS ?), sp. ?

Page 80.

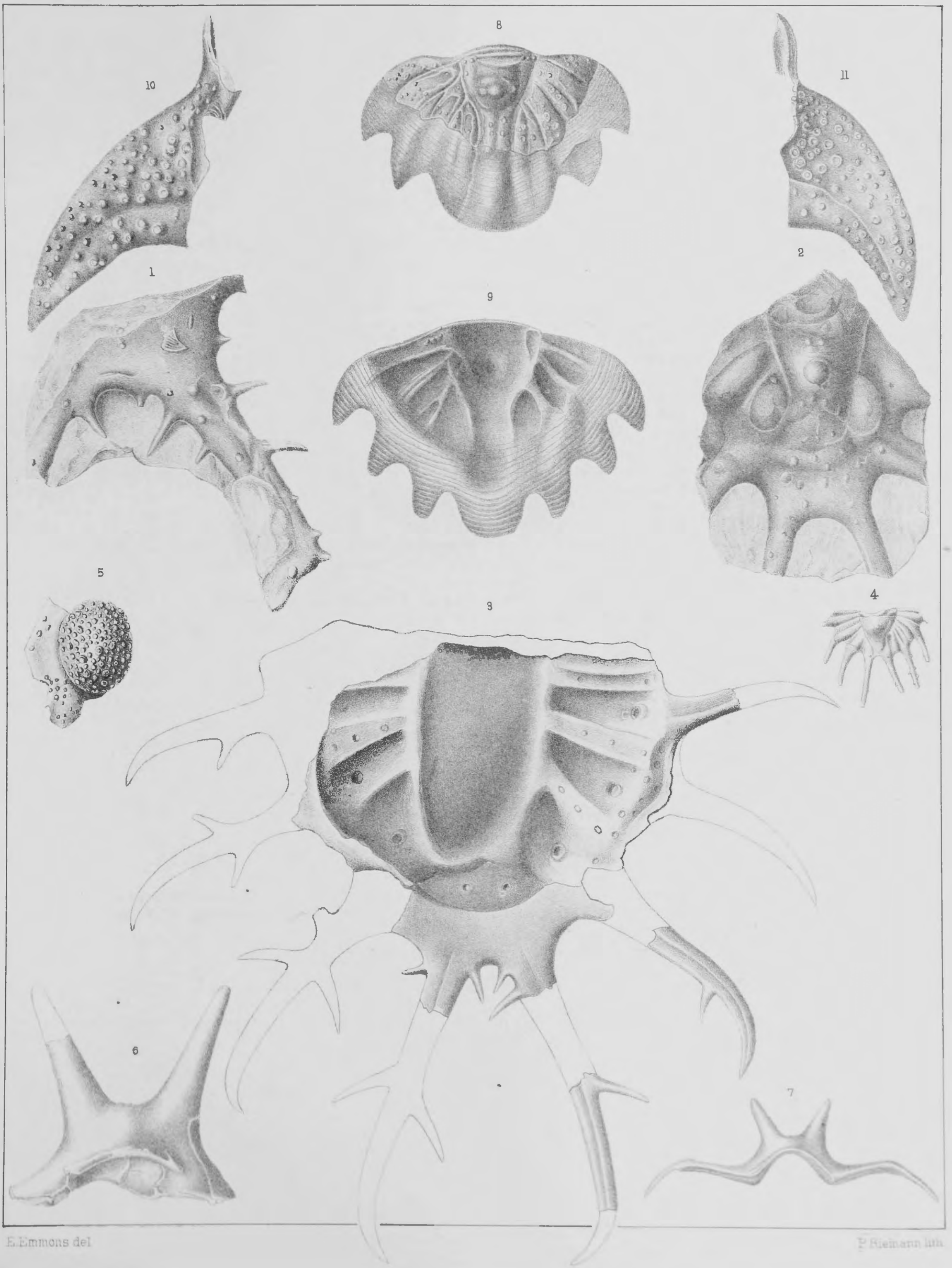
Fig. 9. A pygidium, showing the internal surface, three pairs of lateral lobes and a relatively narrow terminal lobe. This specimen was incorrectly figured in Palæontology of New York, vol. iii, pl. 78, fig. 7, and was there referred to *Lichas pustulosus*.
Lower Helderberg group. *Schoharie, Schoharie county.*

LOWER & UPPER HELDERBERG GROUPS.

(LICHADÆ.)

Palæontology of N.Y., Vol.VII.

Plate XIX.



E. Emmons del

P. Steinam lith

PLATE XIX A.

LICHAS (CONOLICHAS) BIGSBYI (?).

Page 80.

Fig. 1. A very large pygidium, drawn from a gutta-percha mould of the internal surface. One of the terminal spines in the specimen has been broken. This form of pygidium was formerly referred to the species *Lichas pustulosus*, but as the cephalon of that species is now known to have been accompanied by the form of pygidium represented on plate 19, fig. 8, this is referred with some hesitation to the species *Lichas Bigsbyi*, Hall.

Lower Helderberg group. *Schoharie, Schoharie county.*

LICHAS (CONOLICHAS) ERIOPIS.

Page 78.

Fig. 2. The intra-sutural portion of a cephalon, natural size, retaining the right palpebrum and a portion of the crust.

Fig. 3. The same, enlarged to two diameters.

Fig. 4. The same, viewed from the front, showing the comparative elevation of the glabellar lobes. Similarly enlarged.

Fig. 5. The same, viewed in profile. Similarly enlarged.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 6. A fragment of a smaller cephalon, enlarged to two diameters.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 7. The right movable cheek, enlarged to two diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 8. Another specimen of the right cheek, somewhat distorted; enlarged to two diameters. This and the preceding figures are drawn from gutta-percha casts of natural moulds in decomposed chert.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 9. A pygidium, showing the general proportions and the broken bases of the axial and pleural spines. Enlarged to two diameters.

The marginal spines have been drawn with disproportionate lengths, the first pair being much too short, the second and third pairs not long enough and the terminal pair too long. For the correct representation of these spines, see fig. 15.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 10. An imperfect pygidium, natural size.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 11. An imperfect pygidium, showing the internal surface.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 12. A fragment of a very large pygidium.

Upper Helderberg limestone. *Williamsville, Erie county.*

Fig. 13. A pygidium, showing the axial spine, and the length of the pleural and marginal spines. The original is an internal cast in decomposed chert. Enlarged to two diameters.

Fig. 15. A restoration of the pygidium, drawn from the preceding specimen, showing the normal character of the axial, pleural and marginal spines.

Fig. 16. Profile view of the same, showing the length of the axial spine.

Corniferous limestone. *Canandaigua, Ontario county.*

LICHAS (CONOLICHAS) HISPIDUS.

Page 77.

Fig. 14. A pygidium, natural size, showing the aspinose surface and the short marginal spines.

Fig. 17. The same, enlarged to two diameters. The larger tubercles upon the pleural annulations do not represent the bases of spines.

Schoharie grit. *Schoharie, Schoharie county.*

Fig. 18. An imperfect pygidium, natural size, drawn from a cast in decomposed chert.

Corniferous limestone. *LeRoy, Genesee county.*

UPPER HELDERBERG GROUP.

(LICHADÆ.)

Palæontology of N.Y., Vol.VII. Plate XIX A.

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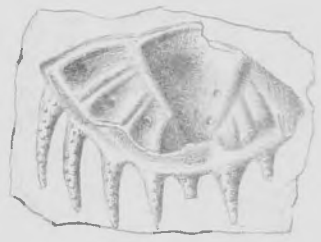

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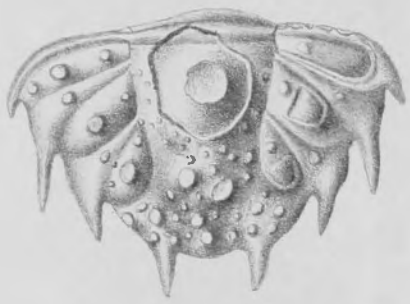

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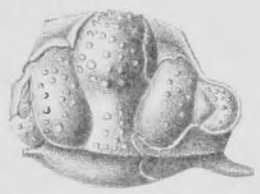

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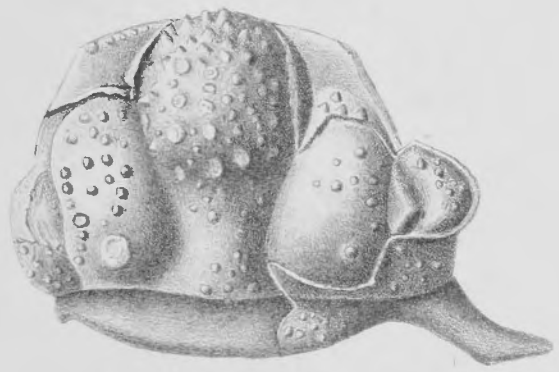

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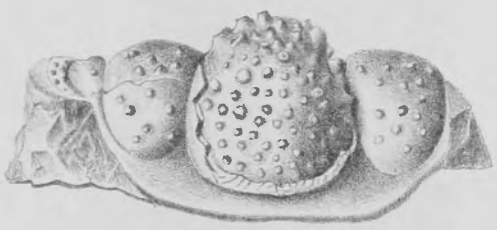

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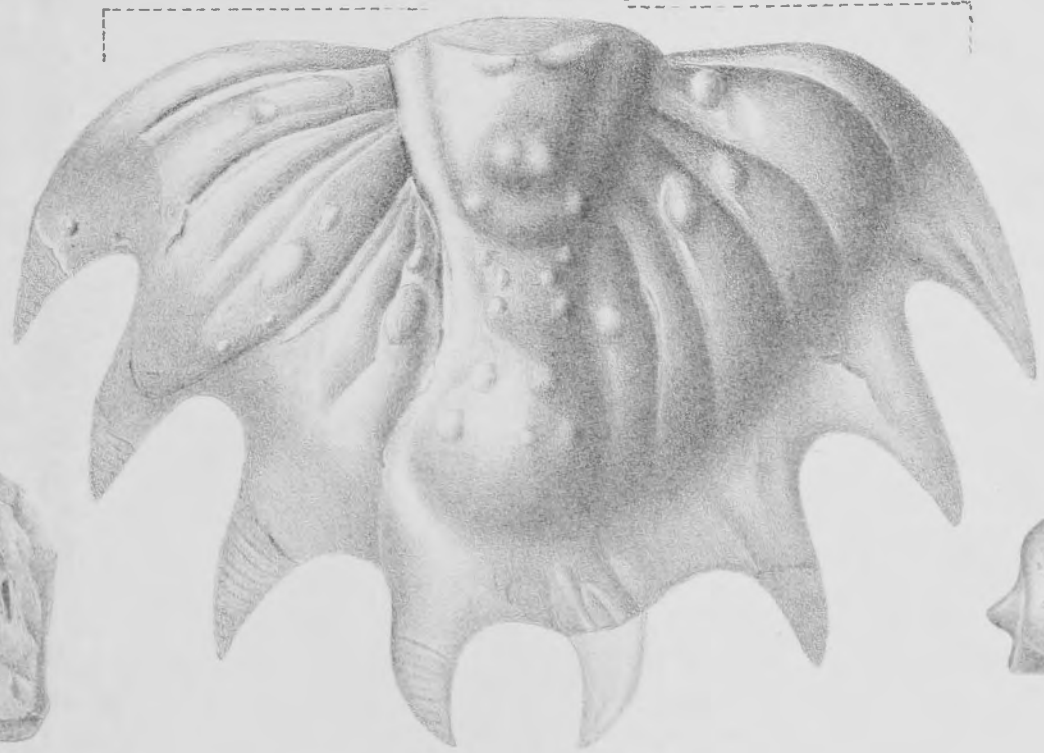
Lower Helderberg



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G.B.Simpson del.

P.Siemans lith.

PLATE XIX B.

LICHAS (HOPLOLICHAS) HYLÆUS.

Page 81.

See Plate 25.

Fig. 1. An imperfect cephalon, wanting the movable cheeks and the occipital ring, but showing the character of the glabellar lobes.

Fig. 2. Profile of the same, showing the elevation of the frontal and lateral glabellar lobes.

Upper Helderberg limestone. *Province of Ontario.*

LICHAS (ARGES) CONTUSUS.

Page 83.

Fig. 3. A cephalon, wanting the movable cheeks; showing the elongate frontal lobe, the short and broad lateral lobes, and the relatively broad genal areas. The original is a cast of the internal surface, which makes the cephalic furrows appear broader and deeper than when the crust is retained. Enlarged to two diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 4. A cephalon, wanting the movable cheeks, but retaining a portion of the crust.

Fig. 5 The same, enlarged to two diameters.

Fig. 6. The same in profile, enlarged to two diameters, showing the regular convexity of the frontal lobe, its elevation above the lateral lobes for its entire length, the convexity of the genal area, and the elevation of the occipital ring.

Corniferous limestone. *Near Clarksville, Albany county.*

LICHAS (CERATOLICHAS) GRYPS.

Page 84.

Fig. 7. The intra-sutural portion of a cephalon, retaining the crust and showing the gently undulate frontal border, the short, abruptly elevated frontal lobe, the depressed lateral lobes, and also the bases of two spines on the frontal lobe; of one spine on each cheek just within the eye-node, and a single long recurved and slightly incurved spine on the occipital ring, accompanied by the base of a second, the latter spine being restored in outline. Enlarged to two diameters.

Fig. 8. A profile of the same similarly enlarged, the broken spines being restored in outline.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 9. A small cephalon, showing the bases of the three pairs of spines. The specimen is inclined forward somewhat more than in the drawing of fig. 7, foreshortening the frontal lobe. The original is an internal cast in decomposed chert. Enlarged to three diameters.

Fig. 10. The same, in profile.

Fig. 11. The same, viewed from the front.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 12. A fragment of the middle lobe of the glabella, showing the length and character of its spines.

Fig. 12a. The same, enlarged to two diameters.

Fig. 13. The same, similarly enlarged and viewed in profile, showing the length and curvature of the glabellar spines.

Corniferous limestone. *Canandaigua, Ontario county.*

PLATE XIX B—Continued.

LICHAS (CERATOLICHAS) DRACON.

Page 85.

Fig. 14. An imperfect cephalon, showing the transverse frontal margin, the short frontal glabellar lobe, the four spine-bases on the posterior extremity of this lobe and the spine-bases near the eye-nodes.

Fig. 15. A profile view of the same, the outline of the cephalon being restored, and showing in restoration the probable length of the four pairs of spines.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 16. A portion of the frontal lobe of the glabella enlarged to two diameters; showing part of one spine of the outer pair, the bases of the other one and of the inner pair.

Fig. 17. The same, in profile.

Corniferous limestone. *Schoharie, Schoharie county.*

Fig. 18. A very small glabella, retaining the inner pair of spines and portions of the others.

Fig. 18b. The same enlarged to three diameters.

Corniferous limestone. *LeRoy, Genesee county.*

LICHAS (DICRANOGMUS) PTYONURUS.

Page 86.

Fig. 19. The intra-sutural portion of the cephalon, enlarged to two diameters; showing the form and character of the glabellar lobes and furrows.

Niagara group (Coralline limestone). *Schoharie, Schoharie county.*

Fig. 20. A pygidium, accompanied by the last thoracic segment, enlarged to two diameters.

Niagara group (Coralline limestone). *Schoharie, Schoharie county.*

Fig. 21. A smaller but more perfect pygidium, enlarged to two diameters, preserving the margin entire, and showing the number and character of the marginal spines.

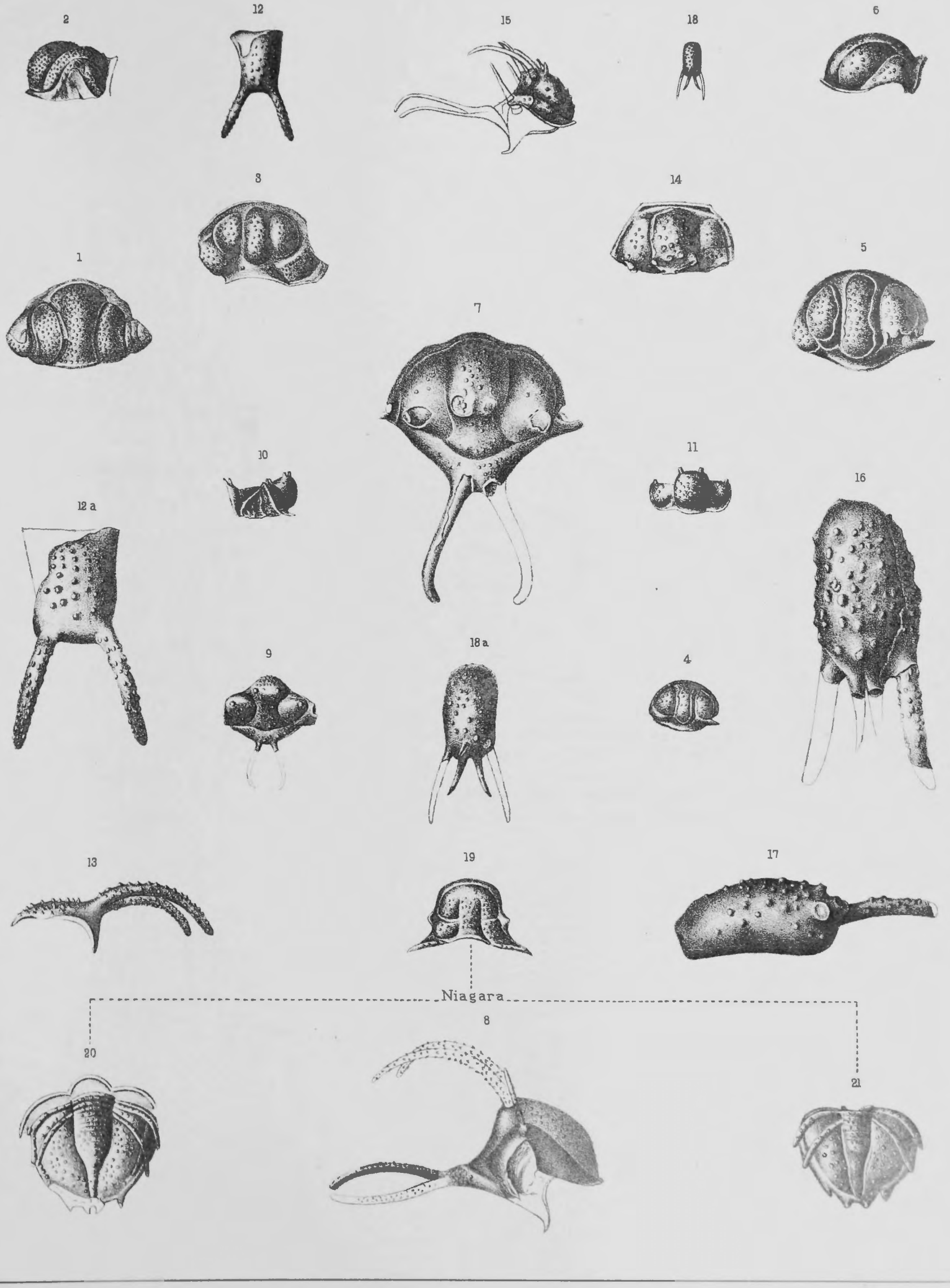
Niagara group (Coralline limestone). *Schoharie, Schoharie county.*

UPPER HELDERBERG GROUP.

(LICHADÆ.)

Palæontology of N.Y. Vol VII.

Plate XIX B.



E. Emmons del.

P. Siemons lith.

PLATE XX.

PROËTUS ANGUSTIFRONS.

Page 91.

See Plate 22.

Fig. 1. A portion of the cephalon, showing the glabella. The crust is mostly broken away, and the base of the glabella is made too wide in the drawing.
Schoharie grit. *Albany county.*

Fig. 2. The pygidium. The drawing fails to represent the faint grooves on the pleural annulations.
Schoharie grit. *Albany county.*

Fig. 3. Profile view of a smaller pygidium, enlarged to two diameters.
Schoharie grit. *Albany county.*

Fig. 4. A small pygidium, showing a slight emargination at the posterior extremity. Enlarged to two diameters.

Fig. 5. Profile view of the same.
Schoharie grit. *Albany county.*

PROËTUS CONRADI.

Page 89.

See Plates 21 and 22.

Fig. 9. A pygidium of average size retaining the crust, and enlarged to two diameters. The pleural annulations are rarely so distinct as in this figure.
Schoharie grit. *Albany county.*

PROËTUS CANALICULATUS.

Page 107.

See Plate 23.

Fig. 10. The glabella and fixed cheeks enlarged to two diameters. The faint first pair of glabellar furrows is not represented in the drawing.

Fig. 11. Profile view of the same.
Corniferous limestone. *Falls of the Ohio.*

PROËTUS CLARUS.

Page 104.

See Plate 22.

Fig. 12. A nearly entire individual, natural size.

Fig. 13. Profile view of the same.
Corniferous limestone. *Stafford, Genesee county.*

Fig. 14. A small individual, showing a somewhat broader border and longer cheek-spines. Enlarged to two diameters.
Corniferous limestone. *Stafford, Genesee county.*

PROËTUS HESIONE.

Page 93.

Fig. 15. The pygidium on which this species was established, showing the greater length and more numerous annulations than in associated species.

Fig. 16. Profile view of the same.
Schoharie grit. *Schoharie, Schoharie county.*

PLATE XX—Continued.

CYPHASPIS MINUSCULA.

Page 140.

See Plate 24.

Fig. 17. An entire individual, enlarged to three diameters. The outline of the pygidium is incorrectly represented, and through an oversight has been left untinted. The cheek spines are also made to appear shorter than in the specimen.

Corniferous limestone. *Schoharie, Schoharie county.*

PROËTUS VERNEUILI.

Page 108.

Fig. 18. The original specimen, showing a portion of the thorax, the pygidium, and the characteristic nodes on the pygidial border. Enlarged to three diameters.

Fig. 19. Profile view of the same.

Upper Helderberg limestone. *Williamsville, Erie county.*

PROËTUS CRASSIMARGINATUS.

Page 99.

See Plates 22 and 25.

Fig. 6. The pygidium as a cast of the internal surface, showing the doublure and the obscure annulations. This usual condition of preservation in the Schoharie grit.

Schoharie grit. *Near Clarksville, Albany county.*

Fig. 7. Profile view of a larger pygidium, an internal cast, upon which the annulations are obsolete.

Fig. 8. Dorsal view of the same.

Schoharie grit. *Albany county.*

Fig. 20. An imperfect glabella with the crust nearly all removed.

Fig. 21. Profile view of the same.

Corniferous limestone. *Falls of the Ohio.*

Fig. 22. A very large glabella.

Upper Helderberg limestone. *Near Clarence, Erie county.*

Fig. 23. The left free cheek.

Fig. 24. Lateral view of the same.

Upper Helderberg limestone. *Near Clarence, Erie county.*

Fig. 25. A small pygidium.

Corniferous limestone. *Falls of the Ohio.*

Fig. 26. A larger pygidium, showing the characteristic curves of the axial annulations.

Corniferous limestone. *Falls of the Ohio.*

Fig. 27. A large pygidium. The drawing fails to represent the proper degree of rotundity.

Upper Helderberg limestone. *Cayuga, Province of Ontario.*

Fig. 28 (23 in error). A large, elongate pygidium.

Upper Helderberg limestone. *Williamsville, Erie county.*

Fig. 29. An unusually large pygidium.

Upper Helderberg limestone. *Williamsville, Erie county.*

Fig. 30. Profile view of the pygidium represented in fig. 28.

Fig. 31. Profile view of the pygidium represented in fig. 29.

PROËTUS (?) LONGICAUDUS.

Page 131.

Fig. 32. Anterior aspect of the type specimen.

Fig. 33. Profile view of the same.

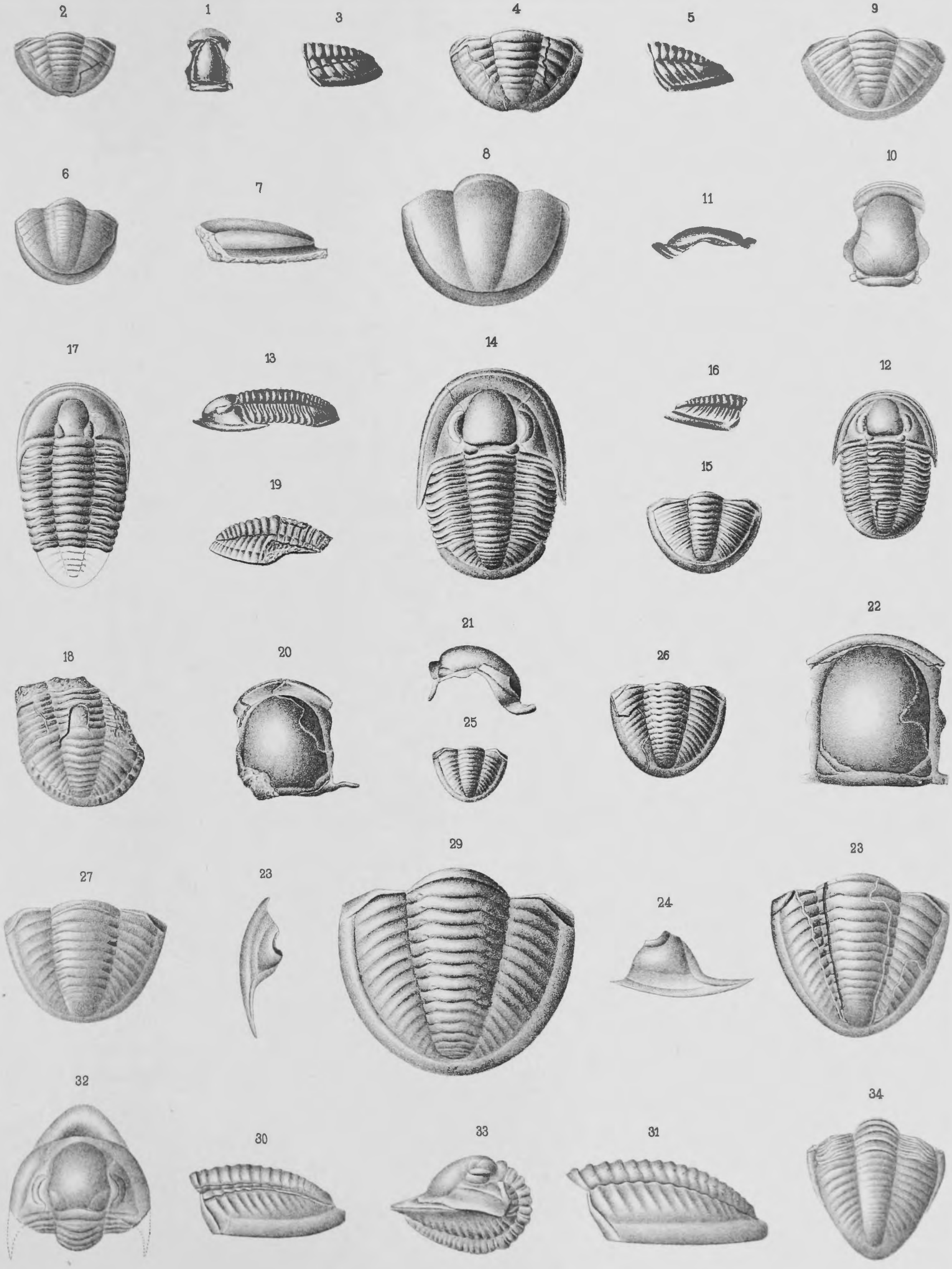
Fig. 42. Posterior aspect of the same.

Hamilton group? *Locality doubtful; from some point north-east of Des Moines, Iowa.*

[Probably of Lower Carboniferous age.]

UPPER HELDERBERG GROUP.

Palæontology of N.Y. (PROETIDÆ) Plate XX.



G.B.Simpson del. Phil.Ast lith.

PLATE XXI.

CYPHASPIS ORNATA.

Page 145.

See Plate 24.

Fig. 1. A fragment of the cephalön, showing the characteristic border. Enlarged to three diameters.
Hamilton group. *Eighteen-mile Creek, Erie county.*

PROËTUS ROWI.

Page 119.

See Plate 23.

Fig. 2. Anterior view of an obliquely crushed specimen.
Fig. 3. Posterior view of the same.
Hamilton group. *Summit, Schoharie county.*
Fig. 4. The original of Dr. Green's description, drawn from a cast.
Hamilton group. *Otsego county.*
Fig. 5. An imperfect specimen, drawn from an impression of a natural mould of the dorsal surface.
Hamilton group. *Otsego county.*
Fig. 6. A small, imperfect example, enlarged to two diameters.
Hamilton group. *Western New York.*
Fig. 24. An entire individual, enlarged to two diameters. In the drawing the border is made to appear too convex, and the faint lateral glabellar furrows are not represented.
Tully limestone. *Near Ovid, Seneca county.*
Fig. 25. A smaller individual enlarged to two diameters. The crust is broken away from the glabella, showing the lateral furrows very distinctly.
Fig. 26. Profile view of the same, showing the normal convexity.
Tully limestone. *Near Ovid, Seneca county.*

PROËTUS HALDEMANI.

Page 113.

See Plate 23.

Fig. 7. The original specimen, enlarged to two diameters.
Fig. 8. Profile view of the same, similarly enlarged.
Hamilton group. *Pennsylvania.*
Fig. 9. A small pygidium, enlarged to two diameters.
Hamilton group. (Goniatite limestone.) *Cherry Valley, Otsego county.*

PLATE XXI—Continued.

PROËTUS MACROCEPHALUS.

Page 116.

See Plate 23.

Fig. 10 An obliquely crushed individual, retaining the right eye and fixed cheek.
Hamilton group. *Canandaigua Lake.*

Fig. 11. A large imperfect individual.
Hamilton group. *Jaycox's Run, near Geneseo, Livingston county.*

Fig. 12 An imperfect specimen, wanting the free cheeks as is usual.
Hamilton group. *Cayuga Lake.*

Fig. 13. A portion of the cephalon, showing, by compression, the glabellar furrows.
Hamilton group. *York, Livingston county.*

Fig. 14. An entire cephalon, also showing some of the glabellar furrows.
Hamilton group. *Canandaigua Lake.*

Fig. 15. The pygidium of a small individual, enlarged to two diameters.
Hamilton group. *Near Geneseo, Livingston county.*

Fig. 16. A pygidium from the limestone, similarly enlarged.
Hamilton group. *Eighteen-mile Creek, Erie county.*

Fig. 17. A pygidium, showing the internal surface and the doublure.
Hamilton group. *Canandaigua Lake.*

Fig. 18. A pygidium enlarged to two diameters, showing the axial nodes which give the annulations the appearance of being medially angulated.
Hamilton group. *Locality?*

Fig. 19. A large pygidium.
Hamilton group. *North Bristol, Ontario county.*

Fig. 20. Profile view of the pygidium represented in fig. 15.

Fig. 21. Profile view of the pygidium represented in fig. 16.

PROËTUS OCCIDENS.

Page 130.

Fig. 22. A small pygidium retaining the crust, but not in such condition as to show the annulations with distinctness.
Hamilton group? *New Buffalo, Iowa.*

Fig. 23. A large imperfect specimen.
Hamilton group? *New Buffalo, Iowa.*

PROËTUS CONRADI.

Page 89.

See Plates 20 and 22.

Fig. 27. Anterior view of an enrolled, somewhat imperfect individual, showing the proportions of the glabella and the wide, sloping border.

Fig. 28. Posterior view of the same. The axis of the body is made to appear too broad and stout.
Schoharie grit. *Schoharie, Schoharie county.*

CYPHASPIS LÆVIS.

Page 150.

Fig. 29. The cephalon enlarged to twelve diameters.
Chemung group. *Chemung county.*

HAMILTON GROUP.

Palæontology of N.Y. (PROETIDÆ.) Plate XXI.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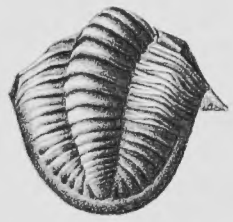
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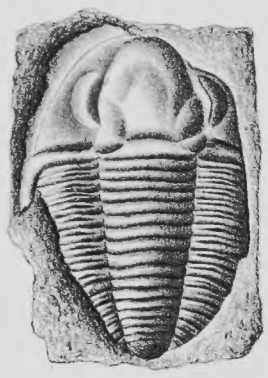
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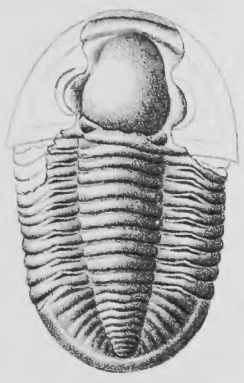
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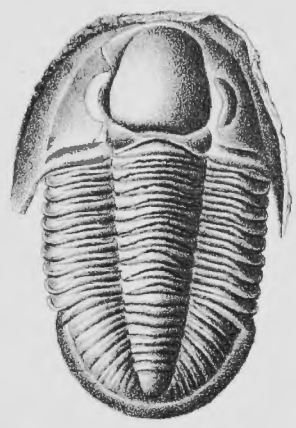
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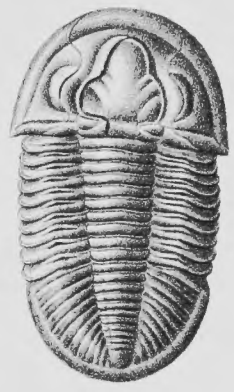
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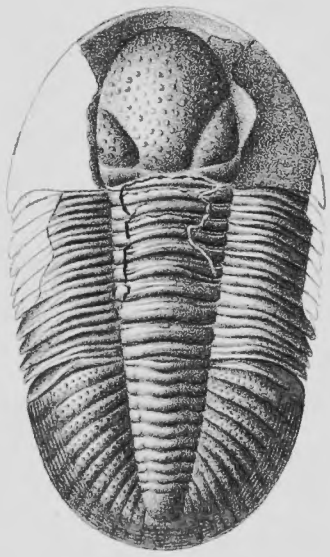
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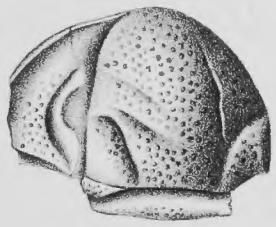
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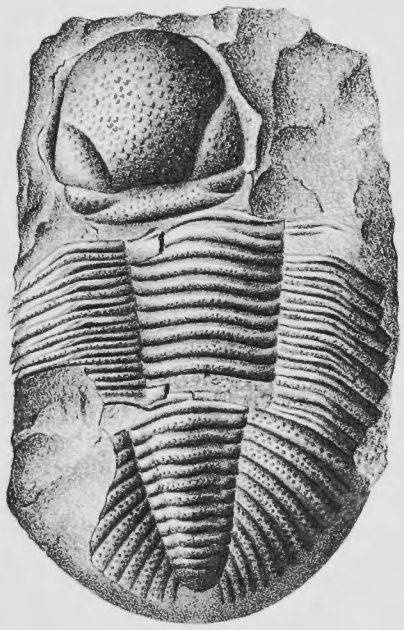
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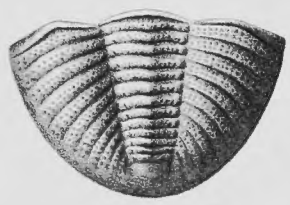
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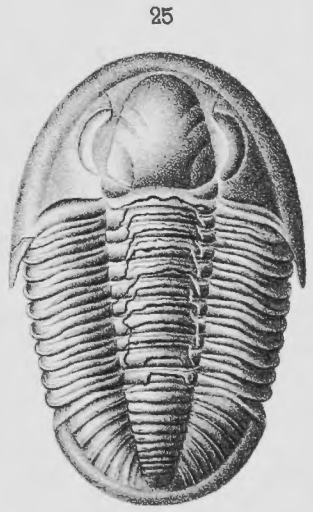
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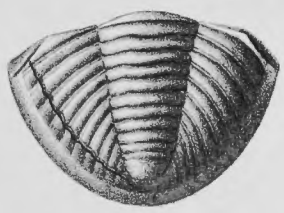
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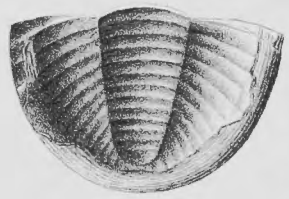
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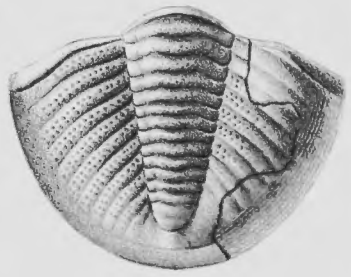
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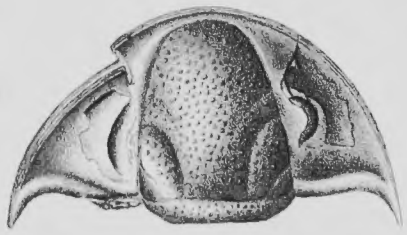
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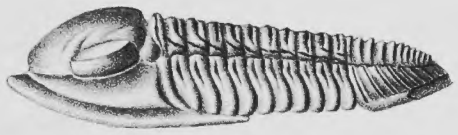
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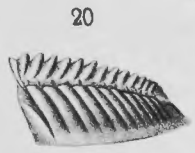
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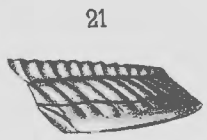
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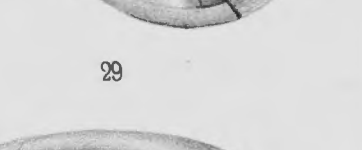
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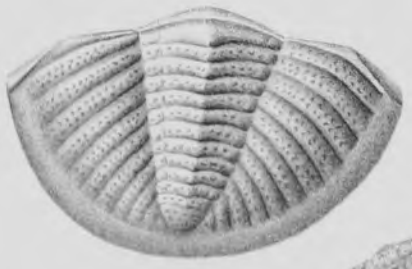
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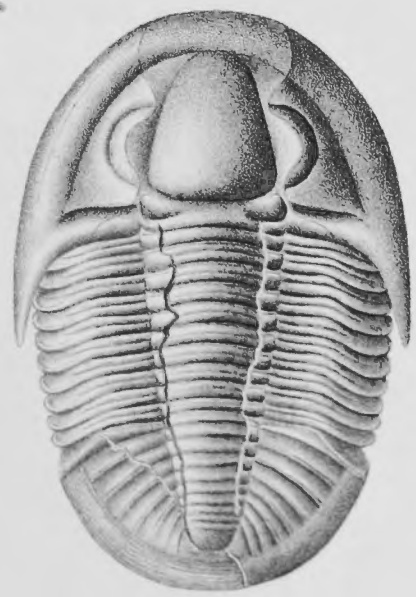
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G.B.Simpson del. Phil.Ast lith.

PLATE XXII.

PROËTUS ANGUSTIFRONS.

Page 91.

See Plate 20.

Fig. 1. The intra-sutural portion of the cephalon, retaining the crust, showing the form of the glabella, the sloping frontal border and preserving indications of three pairs of lateral furrows. Enlarged to two diameters.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 2. The movable cheeks, preserving the visual surfaces of the eyes, showing the character of the genal spines and the direction of the suture upon the frontal doublure. Enlarged to two diameters.
Schoharie grit. *Near Clarksville, Albany county.*

Fig. 3. A small pygidium showing the distinctly sulcate and finely tubercled annulations, and the broad, smooth border. Enlarged to two diameters.
Schoharie grit. *Near Clarksville, Albany county.*

PROËTUS CONRADI.

Page 89.

See Plates 20 and 21.

Fig. 4. A pygidium, showing the general convexity and the sloping borders. The lateral annulations, which are usually quite indistinct in this species, have been given too much prominence in the drawing. Enlarged to two diameters.
Schoharie grit. *Schoharie, Schoharie county.*

PROËTUS, sp.

Page 94.

Fig. 5. An imperfect cephalon retaining a portion of the crust and showing a more convex glabella and a broader and flatter border than in either of the foregoing species. Enlarged to two diameters.
Schoharie grit. *Schoharie, Schoharie county.*

Fig. 6. An internal cast of a pygidium which differs from that of the preceding species in the fewer annulations. Enlarged to two diameters.
Schoharie grit. *Knox, Albany county.*

PROËTUS LATIMARGINATUS.

Page 97.

Fig. 7. A large glabella, natural size, showing the lateral furrows and the broad, flat frontal border.
Schoharie grit. *Pendleton, Indiana.*

Fig. 8. The left movable cheek referred to this species.
Schoharie grit. *Pendleton, Indiana.*

Fig. 9. The right movable cheek.
Schoharie grit. *Pendleton, Indiana.*

Fig. 10. A very imperfect individual, indicating the form and proportions of the body.
Schoharie grit. *Pendleton, Indiana.*

Fig. 11. The pygidium, showing the essential characters of this part of the body.
Schoharie grit. *Pendleton, Indiana.*

Fig. 12. The pygidium and a portion of the thorax of a large individual.
Schoharie grit. *Pendleton, Indiana.*

PROËTUS CURVIMARGINATUS.

Page 94.

Fig. 13. A somewhat imperfect example, retaining a portion of the crust and showing the relative proportions of the species.
Schoharie grit. *Pendleton, Indiana.*

Fig. 14. The intra-sutural portion of a cephalon, showing the conate form of the glabella, the recurved frontal border and the four pairs and the accessory pair of lateral furrows.

Fig. 15. Outline profile of the same, showing the elevation of the glabella and the curvature of the border.
Schoharie grit. *Pendleton, Indiana.*

Fig. 16. A smaller, imperfect individual drawn from a gutta-percha impression from a natural mould of the internal surface in the sandstone.
Schoharie grit. *Pendleton, Indiana.*

Fig. 17. A small pygidium, showing the character of the annulations and the curvature of the border.
Schoharie grit. *Pendleton, Indiana.*

PLATE XXII—Continued.

Fig. 18. A large pygidium.

Fig. 19. Profile of the same.
Schoharie grit. *Pendleton, Indiana.*

PROËTUS CRASSIMARGINATUS.

Page 99.
See Plates 20 and 25.

Fig. 20. A small pygidium, retaining the thickened border.
Schoharie grit. *Near Clarksville, Albany county.*

Fig. 21. A pygidium, preserved as a cast of the internal surface and showing the annulations with unusual distinctness.
Schoharie grit. *Near Clarksville, Albany county.*

Fig. 22. A fragmentary individual of large size, preserved as a cast of the internal surface.
Upper Helderberg limestones. *Cayuga, Province of Ontario.*

Fig. 23. Profile view of a small pygidium, showing an abnormal prominence of the extremity of the axis.
Corniferous limestone. *Falls of the Ohio.*

Fig. 24. Profile view of an enrolled individual, from which most of the crust has been removed.

Fig. 25. Anterior view of the same specimen, showing the internal casts of the glabellar furrows, through the partially removed crust.
Corniferous limestone. *Sandusky, Ohio.*

Fig. 26. A normal pygidium.
Corniferous limestone. *Williamsville, Erie county.*

PROËTUS STENOPYGE.

Page 110.

Fig. 27. A pygidium, showing the short, broad, convex and obtuse axis. Enlarged to three diameters.
Corniferous limestone. *Phelps, Ontario county.*

PROËTUS CLARUS.

Page 104.
See Plate 20.

Fig. 28. An internal cast of the glabella, showing the lateral furrows.
Upper Helderberg limestone. *De Cewville, Province of Ontario.*

Fig. 29. An entire individual, somewhat flattened, but showing the characters of the species.
Corniferous limestone. *Lime Rock, Genesee county.*

Fig. 30. An imperfect pygidium.
Corniferous limestone. *Falls of the Ohio.*

PROËTUS OVIFRONS.

Page 110.

Fig. 31. An internal cast of the glabella, showing its form and convexity, the size of the basal lobes, and the recurved frontal border. Enlarged to three diameters.
Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 32. A glabella, preserving the dorsal surface and showing the pustulose character of the crust. Enlarged to three diameters.
Corniferous limestone. *Canandaigua, Ontario county.*

PROËTUS MICROGEMMA.

Page 109.

Fig. 33. A normal pygidium, showing the characteristic ornamentation, and the broad border. Enlarged to two diameters.
Corniferous limestone. *Phelps, Ontario county.*

Fig. 34. A very small pygidium, referred with some doubt to this species. The annulations are more distinct and more numerous than in the preceding specimen, a feature which may be due to a less advanced stage of growth. The axis is covered with fine pustules, which are not represented in the figure. The relatively large size of the axial nodes give an appearance of angularity to the annulations. Enlarged to six diameters.
Corniferous limestone. *Canandaigua, Ontario county.*

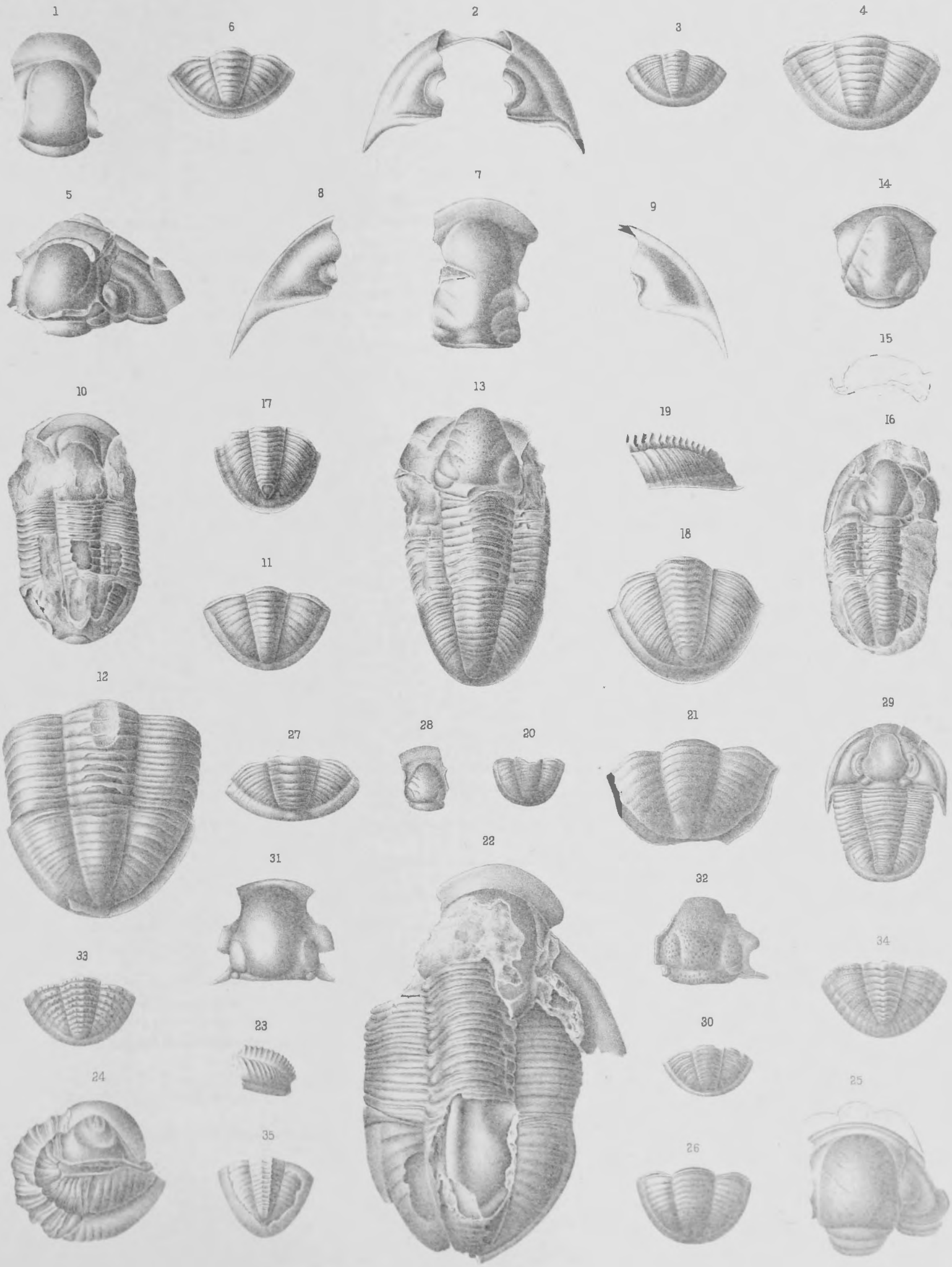
PHILLIPSIA, sp. ?

Fig. 35. The pygidium. A specimen from which a portion of the crust has been removed.
Lower Carboniferous limestone. *Near Grand Rapids, Michigan.*

UPPER HELDERBERG GROUP.

(PROETIDÆ.)

Palæontology of N.Y., Vol. VII. Plate XXII.



E. Emmons del.

Phil. Ast. lith.

PLATE XXIII.

PROËTUS DELPHINULUS.

Page 111.
See Plate 25.

Fig. 1. The cephalon, natural size, drawn from a cast of the internal surface.

Fig. 2. The same enlarged to three diameters, showing the short glabella and broad, concave border. The right side of the glabella has been somewhat restored in this drawing.

Upper Helderberg group. *Port Colborne, Province of Ontario.*

PROËTUS FOLLICEPS.

Page 101.

Fig. 3. An individual retaining the parts in juxtaposition, but preserving the crust in a fragmentary state. The specimen shows the general proportions of the species, the convex glabella and the glabellar furrows.

Fig. 4. Profile of the same, showing the convexity of the body.

Corniferous limestone. *Near LeRoy, Genesee county.*

Fig. 5. A somewhat fragmentary individual retaining the test.

Corniferous limestone. *Near LeRoy, Genesee county.*

Fig. 6. A cephalon wanting the right cheek, showing the furrows of the glabella. The drawing is made from an internal cast in chert.

Fig. 7. Outline profile of the same.

Corniferous limestone. In the drift. *Ann Arbor, Michigan.*

Fig. 8. The pygidium represented in fig. 3, showing the peculiar markings on the internal cast of the axis, noticed in the description of the species. An enlargement to two diameters.

PROËTUS TUMIDUS.

Page 113.

Fig. 9. The intra-sutural portion of a cephalon, showing the tumid, rapidly tapering glabella and the broad flat border.

Upper Helderberg limestones. *Port Colborne, Province of Ontario.*

PROËTUS CANALICULATUS.

Page 107.
See Plate 20.

Fig. 10. The dorsal surface of the movable cheeks, showing their form and the termination of the facial sutures at the anterior margin of the doublure.

Fig. 11. The internal surface of the same, showing the doublure and its excavation at the bases of the cheek spines.

Corniferous limestone. *Falls of the Ohio.*

PROËTUS (?) PLANIMARGINATUS.

Page 112.

Fig. 12. A view of the type specimen. (Pal. Ohio, vol. i, pl. xxiii, fig. 3.)

Corniferous limestone. *Sylvania, Lucas county, Ohio.*

PROËTUS HALDEMANI.

Page 113.
See Plate 21.

Fig. 13. An imperfect cephalon, retaining the crust and showing the characteristic glabellar furrows, but having a strongly reflexed frontal border. Enlarged to two diameters.

Devonian limestones. *Rescue Hill, Eureka District, Nevada.*

Fig. 14. A pygidium of a large individual.

Hamilton group. *Long Lake, Michigan.*

Fig. 15. The type specimen represented on plate 21, figs. 7 and 8, natural size.

PLATE XXIII—Continued.

PROËTUS PROUTI.

Page 126.

Fig. 16. A nearly entire individual from which a portion of the side of the cephalon and thorax has been broken away.

Fig. 17. A profile of the same, showing the elevation of the body.

Hamilton group. *Smith's quarry, Davenport, Iowa.*

Fig. 18. An imperfect individual, showing the axial nodes on the posterior thoracic segments.

Hamilton group. *Cook's quarry, Davenport, Iowa.*

The specimens represented in these two figures are the originals of *Proëtus Davenportensis*, Barris.

PROËTUS NEVADÆ.

Page 129.

Fig. 19. A nearly entire individual, showing the elongate body, narrow glabella and small eyes.

Devonian limestones. *Comb's Peak, Eureka District, Nevada.*

PROËTUS ROWI.

Page 119.

See Plate 21.

Fig. 20. A large entire individual.

Hamilton group. *Centerfield, Ontario county.*

Fig. 21. A somewhat imperfect specimen, retaining the crust and showing the glabellar furrows.

Hamilton group. *Eighteen-mile Creek, Erie county.*

Fig. 22. A smaller, nearly entire individual.

Hamilton group. *Centerfield, Ontario county.*

Fig. 23. A young individual, showing the very large eyes.

Hamilton group. *Centerfield, Ontario county.*

Fig. 24. A still younger example.

Hamilton group. *Centerfield, Ontario county.*

Fig. 25. A small individual in which two of the thoracic segments have been pushed forward beneath the cephalon.

Hamilton group. In the drift, *Ann Arbor, Michigan.*

Fig. 26. Two entire individuals of average size.

Hamilton group. *Centerfield, Ontario county.*

Fig. 27. The specimen figured on plate 21, fig. 25, drawn natural size.

Tully limestone. *Near Ovid, Seneca county.*

Fig. 28. A small individual, retaining a portion of the test and showing the essential features of the species.

Tully limestone. *Near Ovid, Seneca county.*

Fig. 29. An hypostoma.

Hamilton group. *Centerfield, Ontario county.*

PROËTUS MACROCEPHALUS.

Page 116.

See Plate 21.

Fig. 30. A nearly entire individual.

Hamilton group. *Canandaigua Lake.*

Fig. 31. The pygidium of a very large example.

Hamilton group. *Canandaigua Lake.*

PROËTUS MISSOURIENSIS.

Page 133.

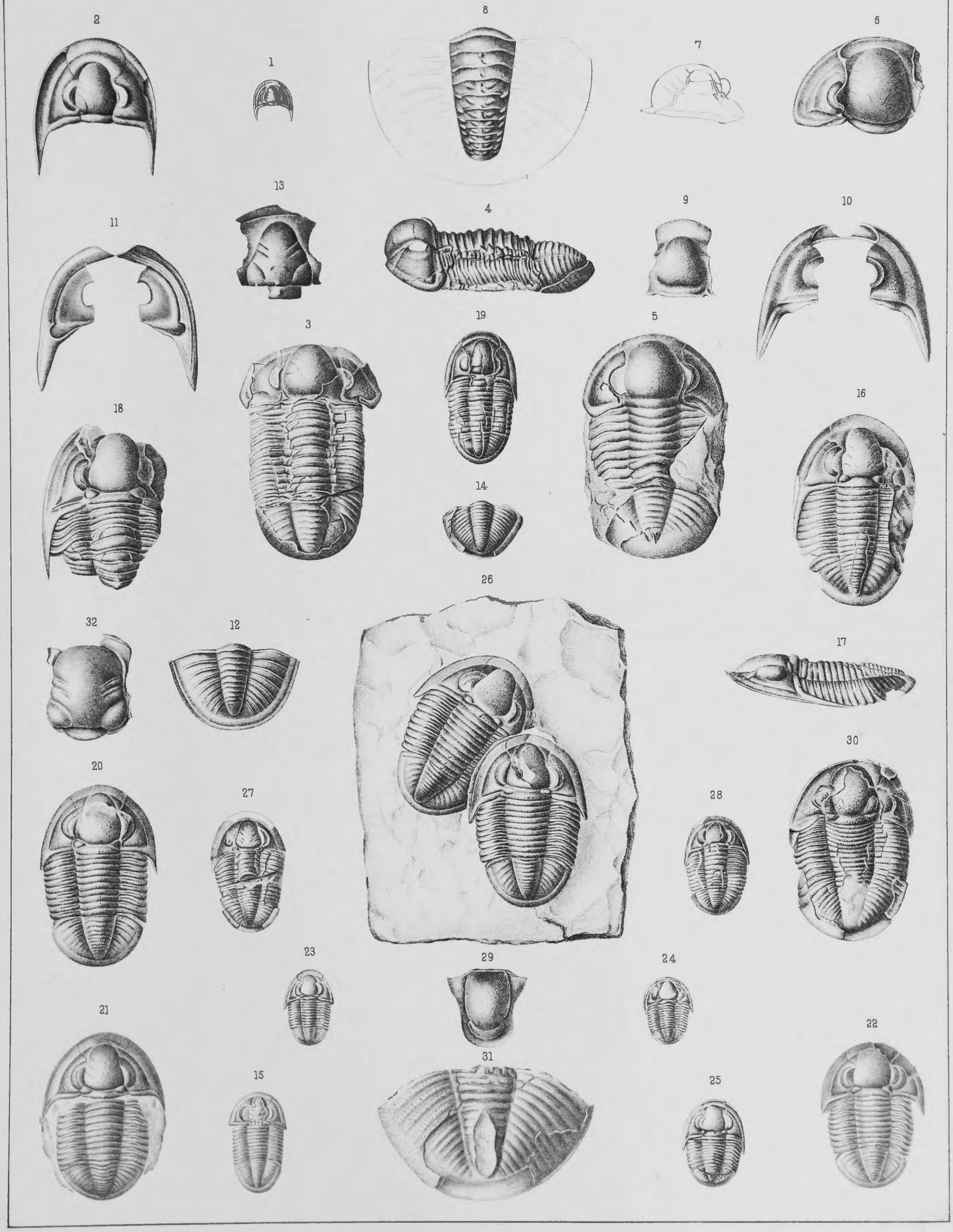
Fig. 32. A portion of the cephalon.

This specimen is the original of *Proëtus auriculatus*, Hall (Fifteenth Rept. N. Y. State Cab. Nat. Hist., p. 107, 1862), from the Waverly group, Licking county, Ohio.

UPPER HELDERBERG & HAMILTON GROUPS.

(PROETIDÆ.)

Palæontology of N.Y., Vol. VII. Plate XXIII



E Emmons del.

Phil. Ast. lith.

PLATE XXIV.

CYPHASPIS CŒLEBS.

Page 151.

Fig. 1. An imperfect specimen, the drawing having been made from a gutta-percha impression of the internal surface, showing the great length of the genal spine, and the broad and rapidly tapering axis. Enlarged to three diameters.

Lower Helderberg group. *Schoharie, Schoharie county.*

CYPHASPIS STEPHANOPHORA.

Page 142.

Fig. 2. A cephalon, having the cheeks slightly depressed along the sutures; showing the upper row of marginal spines. Drawn from a natural cast of the internal surface. Enlarged to three diameters.

Fig. 3. The same, drawn in profile; showing the elevation of the glabella, the convexity of the frontal area. The figure is slightly restored to show the double row of marginal spines.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 4. An imperfect cephalon, showing the bases of the upper row of marginal spines, and of the three short spines on the occipital ring. Enlarged to three diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 5. The internal surface of an imperfect cephalon, showing the length of the upper row of marginal spines. Enlarged to three diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 6. An imperfect cephalon, showing the bases of the upper row of marginal spines and two spines of the lower row. Enlarged to three diameters.

Fig. 6a. Outline profile of the same, with the marginal spines restored.

Corniferous limestone. *Canandaigua, Ontario county.*

CYPHASPIS MINUSCULA.

Page 110.

See Plate 20.

Fig. 7. The intra-sutural portion of the cephalon. Enlarged to three diameters.

Schoharie grit. *Near Clarksville, Albany county.*

Fig. 8. A similar fragment, showing the tubercles on the occipital ring. Enlarged to three diameters.

Fig. 8a. Outline profile of the same, showing the elevation of the glabella and the slope of the frontal area.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 9. An entire individual, preserved as an internal cast in decomposed chert; showing the general form and proportions of the parts. Enlarged to three diameters.

Fig. 10. The same, drawn in profile.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 11. A larger and less perfect individual. Enlarged to three diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 12. An internal impression, showing the hypostoma slightly displaced from its normal position. Enlarged to three diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

CYPHASPIS DIADEMA.

Page 141.

Fig. 13. A portion of the cephalon, showing the strongly tubercled surface, and the single row of pustules across the frontal area. Enlarged to six diameters.

Fig. 13a. Outline profile of the same, showing the depressed frontal area, and the elevated margin.

Corniferous limestone. *Canandaigua, Ontario county.*

PLATE XXIV—Continued.

CYPHASPIS HYBRIDA.

Page 144.

Fig. 14. A fragment of the cephalon, showing the pustulose glabella, and the strongly punctate frontal area. Enlarged to three diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

CYPHASPIS CRASPEDOTA.

Page 148.

Fig. 15. A fragment of limestone, showing one entire individual and the cephalon of another, accompanied by two nearly entire specimens of *Dalmanites Boothi* var. *Calliteles*.

Hamilton group. *Canandaigua, Ontario county.*

Fig. 16. The entire specimen in the foregoing figure, enlarged to three diameters, retaining the crust, with the exception of the eyes and two of the axial spines, and showing the proportions and characters of the species.

Fig. 17. Profile of the same, with the thoracic spines restored.

Fig. 18. An enrolled individual, viewed in profile. Enlarged to three diameters.

Fig. 19. Front view of the same, showing the elevation of the eyes, which have been restored from another specimen.

Hamilton group. *Canandaigua, Ontario county.*

Fig. 20. A pygidium. Enlarged to six diameters.

Hamilton group. *Canandaigua, Ontario county.*

CYPHASPIS ORNATA.

Page 145.

See Plate 21.

Fig. 21. A portion of the cephalon, showing the bead-like tubercles on the frontal margin. Enlarged to three diameters.

Fig. 21a A profile of the same in outline, showing the frontal depression and elevated margin.

Hamilton group. *Canandaigua, Ontario county.*

CYPHASPIS ORNATA, var. BACCATA.

Page 146.

Fig. 22. A fragment of a cephalon, enlarged to three diameters. The drawing fails to show with sufficient emphasis the axial elevation of the glabella, which serves as a varietal feature.

Fig. 22a. Outline profile of the same, showing the contour of the head-shield.

Hamilton group. *Canandaigua, Ontario county.*

Fig. 23. A portion of the right free cheek, showing the marginal ornamentation and the broad, rapidly tapering spine. Enlarged to three diameters.

Hamilton group. *Canandaigua, Ontario county.*

PHAËTHONIDES MACROBIUS.

Page 139.

Fig. 24. The intra-sutural portion of the cephalon, natural size. The drawing shows one pair of lateral glabellar furrows, but fails to indicate the fainter anterior pair.

Fig. 24a. Outline profile of the same, showing the position of the lateral glabellar furrows.

Lower Helderberg group. *Square Lake, Maine.*

Fig. 25. A pygidium of this species. Enlarged to three diameters.

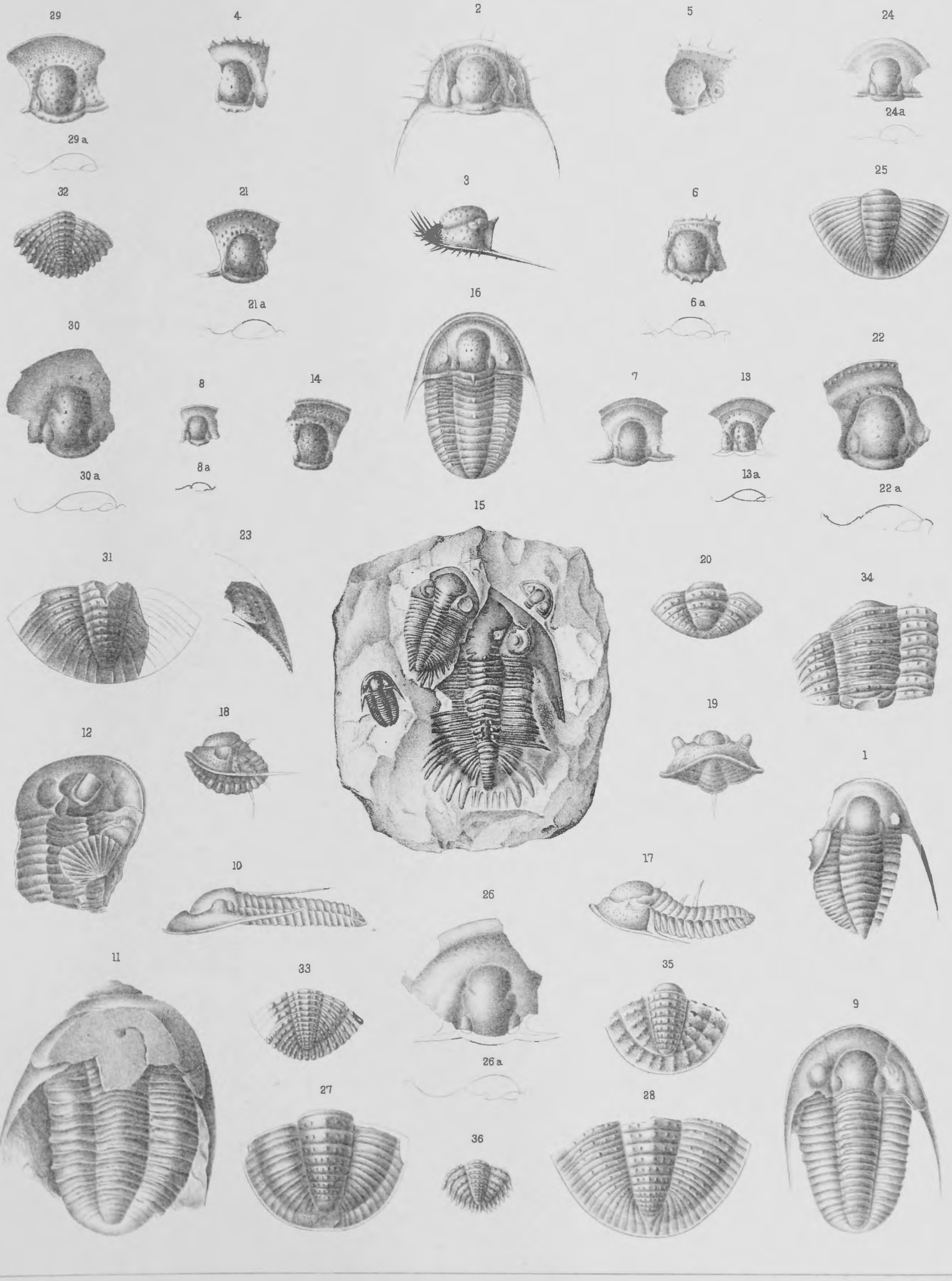
Lower Helderberg group. *Square Lake, Maine.*

These figures are introduced for comparison with the New York species of this genus.

LOWER & UPPER HELDERBERG & HAMILTON GROUPS.

(PROETIDÆ.)

Palæontology of N.Y., Vol VII. Plate XXIV.



E. Emmons del.

Phil. Ast lith.

PLATE XXIV—Continued.

PHAËTHONIDES CYCLURUS.

Page 137.

See Plate 25.

Fig. 26. A fragment of the cephalon, showing the lateral furrows of the glabella a little too strongly. Enlarged to three diameters.

Fig. 26a. Outline profile of the same.

Lower Helderberg group. *Near Clarksville, Albany county.*

Fig. 27. A pygidium, drawn from a gutta-percha impression of the internal surface. The axial row of tubercles should be represented as duplicate at the fifth annulation, as in fig. 28. Enlarged to three diameters.

Lower Helderberg group. *Near Clarksville, Albany county.*

Fig. 28. Another pygidium retaining the crust and showing the character of the dorsal surface. Enlarged to three diameters.

Lower Helderberg group. *Near Clarksville, Albany county.*

PHAËTHONIDES VARICELLA.

Page 135.

Fig. 29. The intra-sutural portion of a cephalon, showing the tubercled and punctate surface. Enlarged to three diameters.

Fig. 29a. Outline profile of the same, showing the depressed frontal area and elevated margin.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 30. An imperfect cephalon, drawn from a natural cast of the internal surface. Enlarged to three diameters.

Fig. 30a. Outline profile of the same.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 31. A pygidium, drawn from a natural cast of the internal surface. Enlarged to three diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

PHAËTHONIDES GEMMÆUS.

Page 136.

Fig. 32. A pygidium, showing the characteristic ornamentation. Enlarged to two diameters.

Hamilton group. *Canandaigua, Ontario county.*

Fig. 33. Another pygidium. The axial node on the posterior margin is made too distinct in the drawing. Enlarged to two diameters.

Hamilton group. *Eighteen-mile Creek, Erie county.*

Fig. 34. A fragment, showing seven segments of the thorax. Enlarged to two diameters.

Hamilton group. *Canandaigua Lake.*

Fig. 35. A pygidium, drawn from a gutta-percha impression of the internal surface which retains the doublure, showing the strongly punctate character of the surface between the ribs. Enlarged to three diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

Fig. 36. A small pygidium in which the marginal tubercles are unusually conspicuous and become spiniform. Enlarged to two diameters.

Corniferous limestone. *Canandaigua, Ontario county.*

PLATE XXV.

CALYMENE PLATYS.

Page 1.

See Plate 1.

Fig. 1. An extremely large pygidium, retaining only a small portion of the crust. Accompanying this is an outline restoration drawn upon the basis of this pygidium, to indicate the dimensions the animal may have attained when entire. Normally the pygidium of the animal is somewhat incurved, as shown in fig. 2. In this drawing the pygidium is viewed from behind, and not from above, appearing therefore detached from the restored thorax.

Corniferous limestone. *Falls of the Ohio.*

Fig. 2. A large, somewhat imperfect individual, retaining the parts in juxtaposition.

Upper Helderberg limestone. *Hagersville, Province of Ontario.*

[?] PHACOPS RANA.

Page 19.

See Plates 7, 8 and 8 A.

Fig. 3. A cephalon from which the crust has been removed; showing the glabellar furrows, the deep and broad occipital furrow, made more conspicuous by the obsolescence of the third or basal lobes.

Fig. 4. A profile view of the same, showing the somewhat protuberant and slightly flattened glabella, the subangulate genal extremities and the elevated occipital ring.

This specimen is from the Eureka District, Nevada, and shows a close relationship to *Phacops cristata* in the broad and deep occipital furrow and other features. (See page 25.)

LICHAS (HOPLOLICHAS) HYLÆUS.

Page 81.

See Plate 19 B.

Fig. 5. An hypostoma, found in association with the cephalon of this species. Enlarged to two diameters.

Upper Helderberg limestone. *North Cayuga, Province of Ontario.*

PROËTUS DELPHINULUS.

Page 111.

See Plate 23.

Fig. 6. The cephalon represented on plate 23, figs. 1 and 2; drawn from a gutta-percha impression from a natural mould of the dorsal surface, showing the character of the glabellar lobes and furrows. Enlarged to three diameters.

PROËTUS JEJUNUS.

Page 124.

Fig. 7. The pygidium enlarged to two diameters; showing the axial row of nodes and the broad pleuræ with their bifurcate annulations.

Hamilton group. *Albany county.*

PROËTUS CRASSIMARGINATUS.

Page 99.

See Plates 20 and 22.

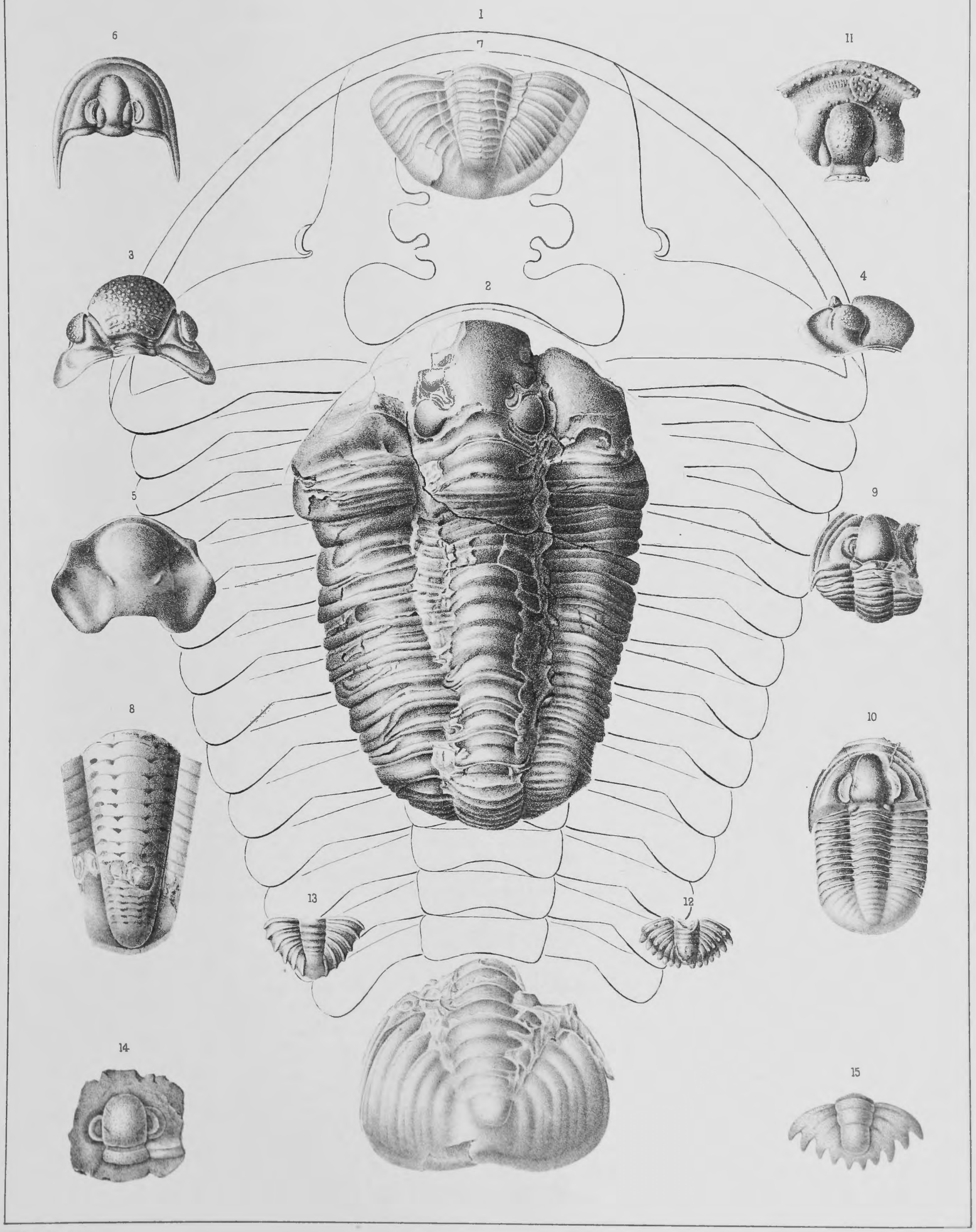
Fig. 8. The axis of the pygidium enlarged to two diameters. The internal cavity of the axis has been filled with transparent calcite, and by the removal of the outer portion of the test, the position and character of the muscular scars upon the lower surface are very distinctly shown.

Corniferous limestone. *Falls of the Ohio.*

UPPER HELDERBERG & HAMILTON GROUPS.

(TRILOBITA MISCELLANEA)

Palæontology of N.Y., Vol. VII. Plate XXV.



E. Emmons del.

Phil. Ast. lith.

PLATE XXV—Continued.

PROËTUS PHOCION.

Page 125.

Fig. 9. A very imperfect enrolled specimen, retaining the crust, showing the broad sulcate border and the flattened, sharply ridged cheek.

Hamilton group. *Indian Cove, Gaspé, Province of Quebec.*

Fig. 10. The type specimen; an entire individual preserved as an internal cast, showing the relatively stout body, the sharply ridged cheeks and the sparsely annulated pygidium.

Hamilton group. *Indian Cove, Gaspé, Province of Quebec.*

PHAËTHONIDES CYCLURUS.

Page 137.

See plate 24.

Fig. 11. The intra-sutural portion of the cephalon, showing the character of the surface ornamentation.

Lower Helderberg group. *Near Clarksville, Albany county.*

PHAËTHONIDES ARENICOLUS.

Page 134.

Fig. 12. An imperfect pygidium, enlarged to three diameters, showing the conspicuous axis, the marginal spinules and the bases of other spinules on the annulations.

Schoharie grit. *Schoharie county.*

Fig. 13. A larger pygidium, preserved as an internal cast and referred with much hesitation to this species. Enlarged to two diameters.

Upper Helderberg limestone. *North Cayuga, Province of Ontario.*

PHAËTHONIDES (?) DENTICULATUS.

Page 139.

Fig. 14. A portion of the cephalon, showing the Proëtoid glabella with its distant lateral furrows.

Fig. 15. The pygidium which is taken as the type form of the species.

These figures are reproduced from the original engravings (U. S. Geol. Expl. Fortieth Parallel, pt. 1, Palæontology, pl. 1, figs. 10 and 10a), and are enlarged to about one and one-half diameters. The specimens have not been accessible for study and the species is referred with great doubt to the genus *Phaëthonides.*

Devonian. *Steptoe Valley, Nevada.*

PLATE XXVI.

STYLONURUS EXCELSIOR.

Page 158.

View of the cephalon described. The drawing has been made from a plaster cast taken from a natural mould of the dorsal surface.

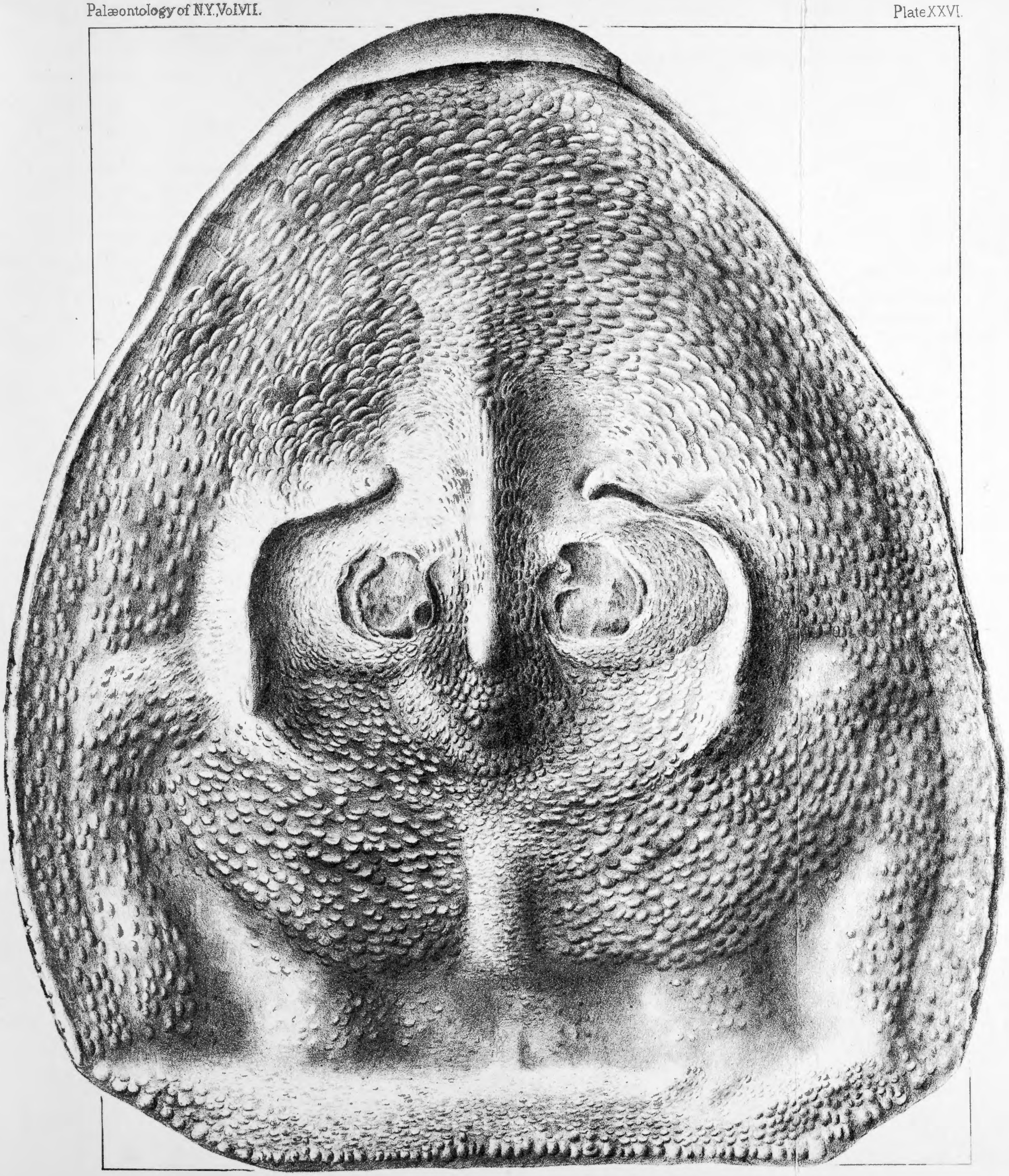
Catskill group. *Andes, Delaware county.*

CATSKILL GROUP.

(EURYPTERIDÆ.)

Palæontology of N.Y., Vol VII.

Plate XXVI.



E. Emmons del et lith.

PLATE XXVI A.

STYLONURUS EXCELSIOR.

Pages 156, 221.

See Plate 26.

Fig. 1. The lower surface of the type specimen of *Dolichocephala Lacoana*, Claypole, showing portions of the cephalic appendages. These have all been pushed somewhat forward from their proper position beneath the carapace, but as far as they are retained, appear to lie normally with reference to one another. The restored parts, where their outline is not indicated by the specimen itself, are drawn from figures of *Stylonurus* given by Woodward (Palæontographical Society, 1872).

A. A fragment of an appendage preserved as an impression upon the edge of the slab, and drawn in from a gutta-percha cast It probably represents a portion of a long first pair of gnathopods.

B. The right member of the second pair of gnathopods, showing the long basal joint, a portion of which is buried beneath the matrix, its denticulate mandibular edge, and the long recurved palpus. A portion of the basal joint of the left member of this pair is also visible.

C. A chelate terminal joint, possibly belonging to the first pair of appendages.

D. The basal joint of the left member of the third pair, showing the double lamellate mandibular processes.

E. A portion of the basal joint of the left member of the fourth pair, showing the mandibular margin.

F. The left basal joint of the fifth pair of gnathopods, showing the broad surface, the conspicuous mandibular denticles, and the prominent surface of articulation.

G. The position of the mouth.

H. The outline of the carapace as it lies on the other side of the specimen.

Fig. 2. The terminal portion of the median dorsal ridge, drawn from the same specimen, showing the *ocelli*, which are separated by a sharply impressed line and are slightly distorted. No evidence of this feature is shown upon the specimen represented on plate 26.

Fig. 3. A portion of the carapace, natural size, showing the conspicuous, elongate tubercles, and, over the surface where the thin crust has been removed, impressions of the sharply defined, semicircular squamæ upon its lower side.

Catskill group. *Meshoppen, Wyoming county, Pennsylvania.*

CATSKILL GROUP.

(EURYPTERIDÆ.)

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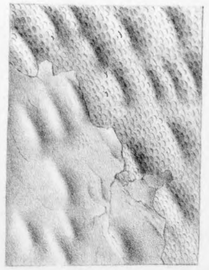


E. Emmons del.

Phil. Ast. lith.

PLATE XXVII.

PROTOLIMULUS ERIENSIS.

Page 153.

Fig. 1. A view of the ventral surface from the original cast in sandstone, showing the condition of preservation of the different parts.

Chemung group. *LeBœuf, Erie county, Pennsylvania.*

Fig. 2. A diagram of the same:

cd. Cephalic doublure.
s. Genal spines.
x. Hypostoma (?), or axial angulation of cephalic doublure.
m. Position of mouth.
ca. Cephalic appendages.
f. Foliaceous terminations of the last pair of cephalic appendages.
tp. Thoracic plate.
r. Longitudinal abdominal ridges.
m. Marginal abdominal spines.
t. Telson.

EURYPTERUS PROMINENS.

Page 157.

Fig. 3. The cephalon, showing the prominent and anteriorly situated eyes, the ocelli, the flattened dorsal surface, and the oblique postero-lateral pits.

Fig. 4. Profile view of the same, showing the elevation of the shield, the position of the eyes and the extension of the postero-lateral angles.

Clinton group. *From the northern part of Cayuga county.*

EURYPTERUS BEECHERI.

Page 156.

Fig. 5. Dorsal view of the original specimen, showing the form of the body, the number, size and ornamentation of the somites, and portions of the large swimming appendages. The drawing is made from a plaster cast taken from a natural mould of the dorsal surface.

Chemung group. *Warren, Warren county, Pennsylvania.*

EURYPTERUS APPROXIMATUS, n. sp.

Fig. 6. Dorsal view of the original, showing the cephalon and nine somites, also the conspicuous marginal spines and the characteristic ornamentation of the surface.

Waverly group. *Three miles south of Warren, Warren county, Pennsylvania.*

This species differs from *E. Pennsylvanicus*, C. E. Hall, in the absence of genal spinules and conspicuous nodes on the posterior margin of the cephalon, and in the more closely appressed eyes. In *E. Mansfieldi*, C. E. Hall, from the Coal Measures, the cephalon is longer, the eyes more distant, and the abdominal segments scarcely as broad.

PLATE XXVII—Continued.

STYLONURUS (?) (ECHINOCARIS ?) WRIGHTIANUS.

Page 160.

Fig. 7. Dorsal view of the type specimen of *Equisetides Wrightianus*, Dawson. The specimen consists of two abdominal somites of this crustacean, preserved as an internal cast in sandstone and showing the pustulose ornamentation, the conspicuous ridges along the posterior margin of each somite and the character of the articulation between the somites. On the anterior surface of the last somite several longitudinal impressions are seen, apparently made by the long posterior spines of the preceding somite.

Fig. 8. Side view of the same specimen, showing the character of the articulation, the strong marginal ridges and the smooth ventral surface. The specimen has been slightly flattened, vertically making the convexity of the somites somewhat less than it should normally be.

Fig. 9. An enlargement of the surface to show the character of the ornamentation.

Portage group. *Italy, Yates county.*

ECHINOCARIS PUNCTATA.

Page 166.

See Plates 28 and 29.

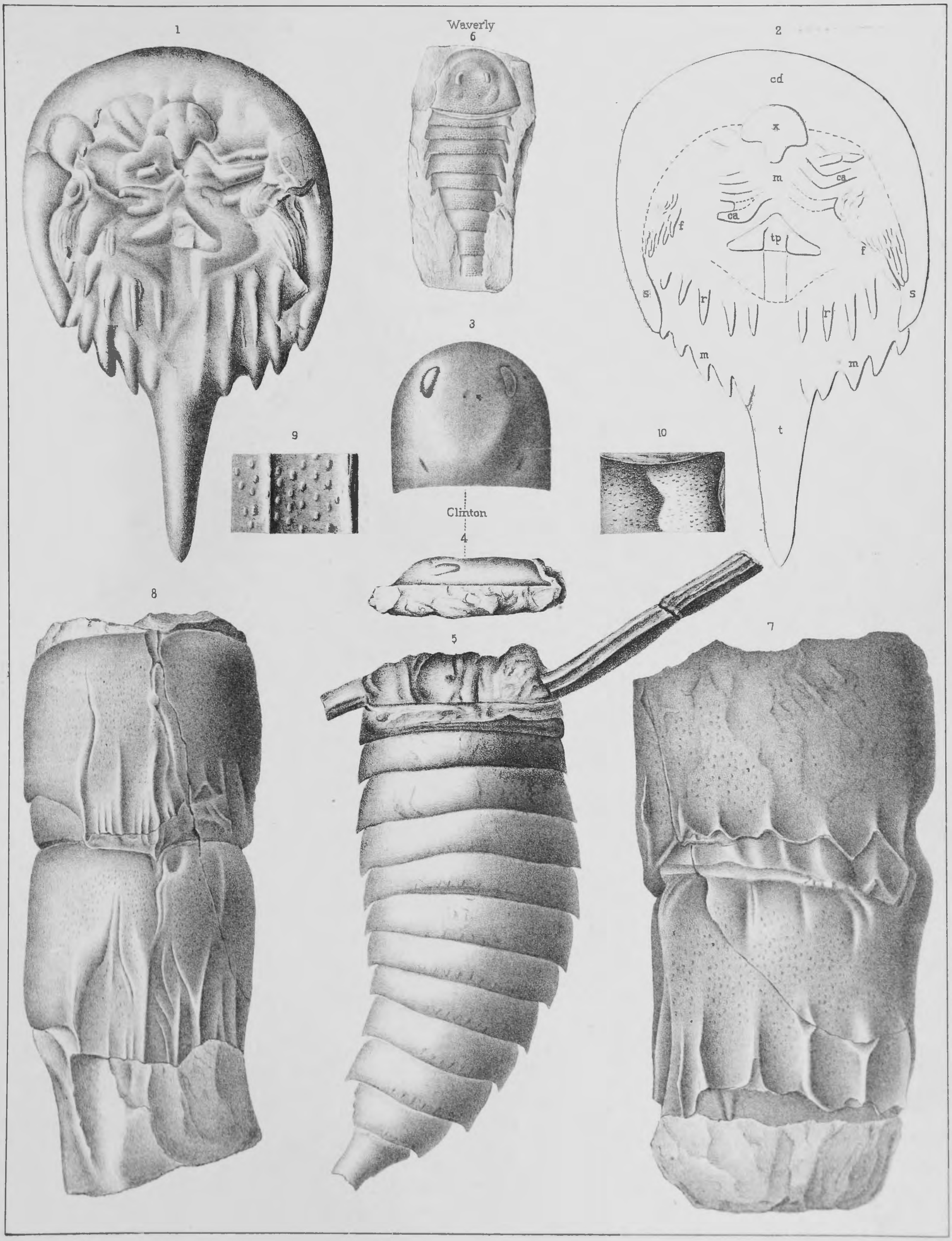
Fig. 10. An enlargement of the surface of an abdominal somite from the specimen represented on plate 28, fig. 4. Introduced for comparison with the preceding figure.

Hamilton group. *Tichenor's Point, Canandaigua Lake.*

CHEMUNG GROUP.

(LIMULIDÆ & EURYPTERIDÆ.)

Palæontology of N.Y., Vol VII. Plate XXVII



E. Emmons del.

Phil. Ast. lith.

PLATE XXVIII.

ECHINOCARIS PUNCTATA.

Page 166. .

See Plates 27 and 29.

Fig. 1. The left valve of a specimen of average size, showing the normal outline and proportions, preserving the nodes and ridges of the surface in perfection, and retaining the faint, elevated lines radiating from the lower edge of the carina. The specimen is preserved as an internal cast and consequently shows a finely punctate surface.

Fig. 2. The right valve of the same individual.

Hamilton group. *In the sandy shales at Fabius, Onondaga county.*

Fig. 3. A nearly entire individual, slightly distorted about the cephalothorax; showing the six abdominal somites, the spine-bases on their posterior margins, the caudal plate and portions of the caudal spines. These spines are restored in outline to their proper length.

Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 4. Ventral aspect of a very large individual, showing the lower edge of the right valve of the cephalothorax, the large mandibles in nearly their normal position, the fourth, fifth, sixth and a portion of the third abdominal somites, and the caudal plate with its spines. The posterior margin of the somites is so broken as to show only the lateral spinules, and the caudal spines appear to be somewhat shorter than is usual.

Hamilton group. *Menteth's Point, Canandaigua Lake.*

Fig. 5. The ventral surface of a small, quite imperfectly preserved specimen, showing the mandibles in place.

Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 6. Dorsal aspect of the posterior portion of a large individual, preserving the fifth, sixth and a portion of the fourth somites, with the caudal plate and spines nearly entire. The spinules upon the somites are in part restored in the figure, but their character is well shown.

Fig. 7. Ventral aspect of the same specimen, showing the absence of spinules upon the posterior margins of the somites, and the character of the articulation between the last somite and the caudal plate is well shown.

Hamilton group. *Menteth's Point, Canandaigua Lake.*

HAMILTON GROUP.

(CERATIOCARIDÆ.)

Palæontology of N.Y., Vol VII. Plate XXVIII.

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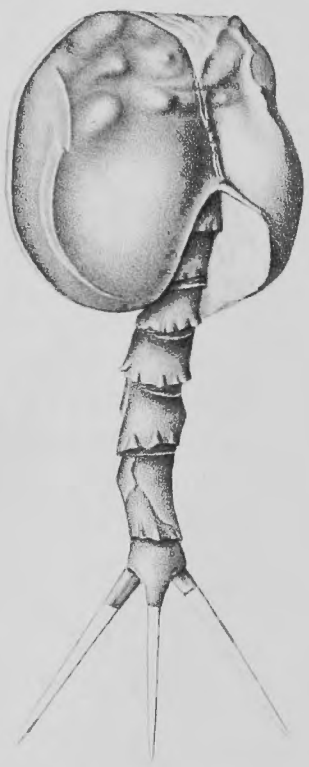

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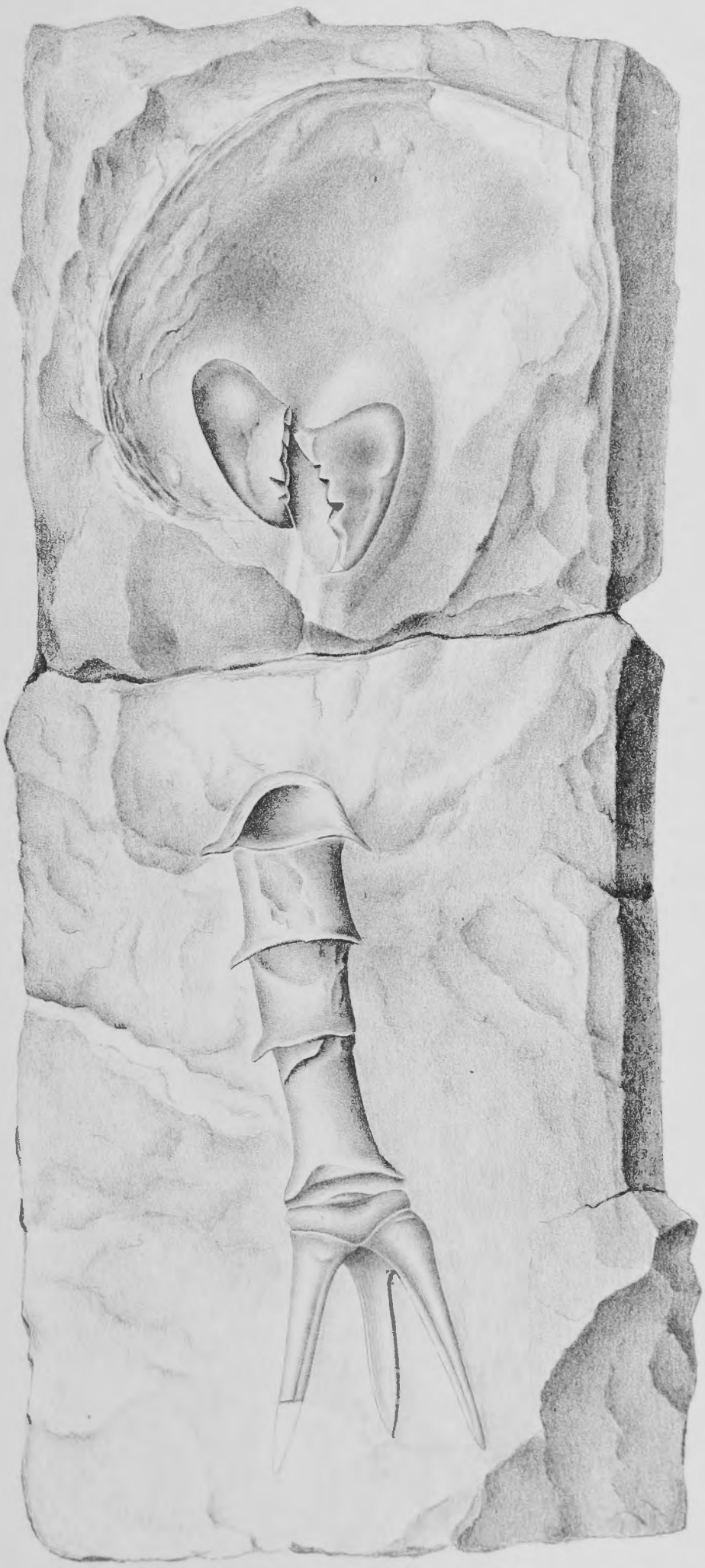

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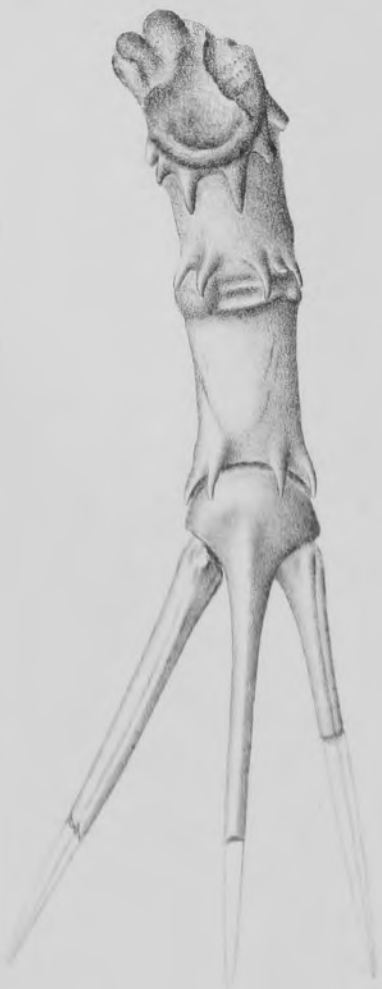

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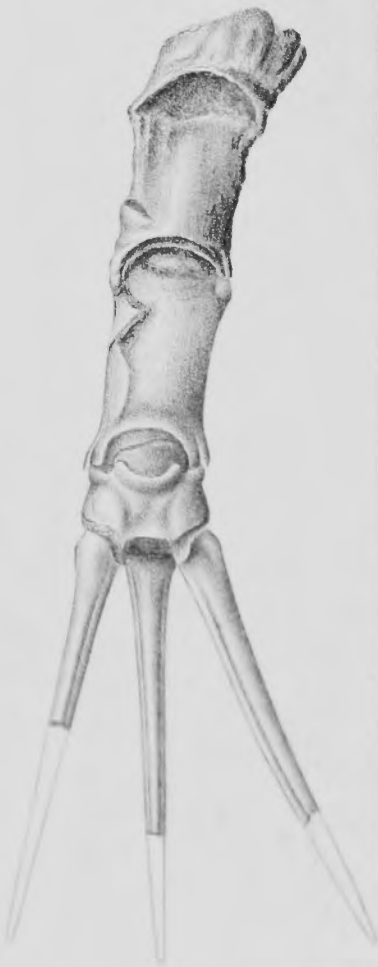

E. Emmons del.

Phil. Ast. lith.

PLATE XXIX.

ECHINOCARIS PUNCTATA.

See Plates 27 and 28.

Fig. 1. An enrolled individual of average size, having the carapace somewhat compressed, but showing the position of the optic spots (e), the number and disposition of the nodes, a well-defined nuchal furrow and the tubercles along the posterior portion of the hinge-line. A single caudal spine is seen projecting from beneath the anterior portion of the carapace.

Fig. 2. Profile view of the same, showing a portion of the enrolled abdomen.

Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 3. A nearly entire individual, showing the valves of the carapace fully expanded and the six abdominal somites, which are detached from the carapace. The caudal parts are missing and are restored in outline.

Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 4. A specimen showing the post-abdomen and a portion of the internal surface of the last two somites of the abdomen.

Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 5. An expanded carapace covered with individuals of *Discina media*, Hall, not an infrequent mode of occurrence at this locality.

Hamilton group *Pratt's Falls, Onondaga county.*

Fig. 6. A portion of the surface of the carapace represented in plate 28, fig. 2, enlarged to two diameters to show the character of the ornamentation between the carina and the ventral margin. The specimen is a cast of the internal surface, and shows the strong punctæ which become still more conspicuous near the lower edge of the carina, and the elevated, undulating lines radiating from the carina. Upon the upper surface of the test the ornamentation is distinctly pustulose and the radiating lines are scarcely visible.

Hamilton group. *Fabius, Onondaga county.*

Fig. 7. An imperfect specimen, showing the internal surface of the left valve of the largest carapace observed. In the cephalic region there lies a single large mandible which shows no denticles, but bears a conspicuous *manubrium*. The posterior margin of the valve bears three strong tubercles, a feature usually but faintly developed in smaller individuals.

Hamilton group. *Vinegar Brook Glen, Cayuga Lake.*

Fig. 8. A large right valve, showing normal proportions and the position of the optic spot, but wanting the elevated lines on the ventral surface and the posterior marginal tubercles. This is the type specimen of *Ceratiocaris? punctata*, Hall, and was originally figured with a conspicuous node near the posterior extremity of the hinge-line; this, however, has proven to be a portion of the matrix.

Hamilton group. *Cayuga Lake.*

ECHINOCARIS PUSTULOSA.

Page 178.

Fig. 9. The type specimen; a right valve showing the number and disposition of the nodes, the character of the carina and the strong pustules upon the surface of the nodes. A portion of the cephalic region is broken away and is restored in outline.

Fig. 10. The same, enlarged to two diameters.

Erie shales. (Portage group.) ***Paine's Creek, Lake county, Ohio.***

PLATE XXIX—Continued.

ECHINOCARIS SUBLÆVIS.

Page 176.

Fig. 11. The type specimen; drawn from a gutta-percha impression of the internal surface of the left valve, the posterior portion being slightly restored; showing the number and arrangement of the nodes, the character of the carina and of the surface ornamentation.

Fig. 12. The same, enlarged to two diameters.

Erie shales. (Portage group.) *Paine's Creek, Lake county, Ohio.*

Fig. 13. A portion of the abdomen and post-abdomen belonging to the carapace; showing the relatively short somites, their conspicuous lateral and faint dorsal spines, the elevated caudal plate and comparatively short caudal spines. Enlarged to two diameters.

Erie shales. (Portage group.) *Paine's Creek, Lake county, Ohio.*

ECHINOCARIS CONDYLEPIS.

Page 173.

Fig. 14. The expanded valves of the carapace, natural size.

Fig. 15. The same, enlarged to three diameters, showing the outline of the valves, the number and disposition of the nodes upon the surface, and the character of the lateral carinæ.

Chemung group. *Belmont, Alleghany county.*

Fig. 16. A left valve somewhat compressed at right angles to the axial line and having the anterior extremity slightly broken.

Fig. 17. The same, enlarged to four diameters, showing the nodes to be somewhat elongated on account of distortion.

Chemung group. *Belmont, Alleghany county.*

ECHINOCARIS MULTINODOSA.

Page 180.

Fig. 18. The type specimen of the species, showing the features of the dorsal surface of the carapace. The lateral carina, which appears to be of similar character to that in *E. sublævis*, is not well preserved, as the specimen has suffered some distortion about the ventral margins.

Erie shales. (Portage group.) *Paine's Creek, Lake county, Ohio.*

Fig. 19. An imperfect specimen, showing with great distinctness the character of the nodes and ornamentation about the hinge.

Erie shales. (Portage group.) *Paine's Creek, Lake county, Ohio.*

ECHINOCARIS WHITFIELDI.

Page 172.

Fig. 20. The left valve of the carapace, showing the outline and proportions, the low, indistinct nodes upon the surface and the short antero-lateral carina. The fine scaly surface markings about the cephalic nodes is not shown.

This is the type specimen and is enlarged to two diameters.

Portage group. *Naples, Ontario county.*

Fig. 21. An imperfect specimen, natural size, retaining the caudal plate and two of the caudal spines; showing the strongly tuberculose surface.

Portage group. *Naples, Ontario county.*

HAMILTON PORTAGE & CHEMUNG GROUPS.

(CERATIOCARIDÆ.)

Palæontology of N.Y., Vol. VII. Plate XXIX.

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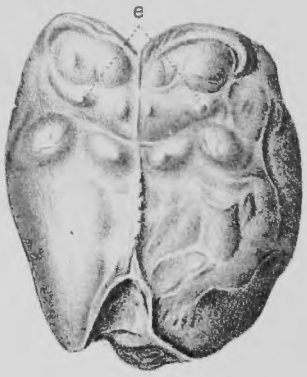

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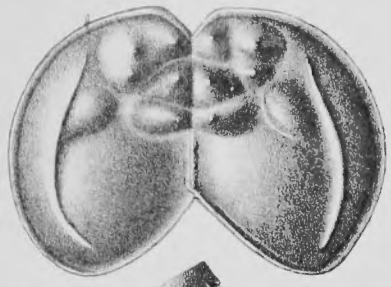

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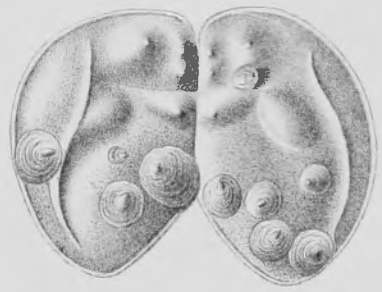

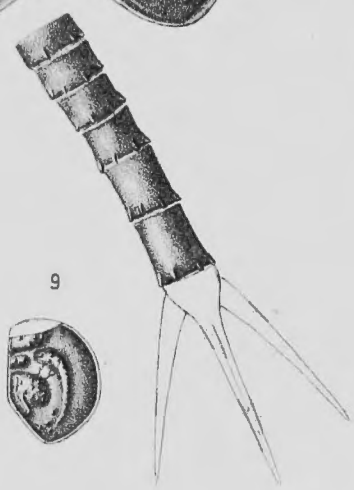

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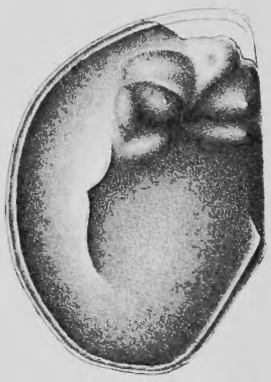

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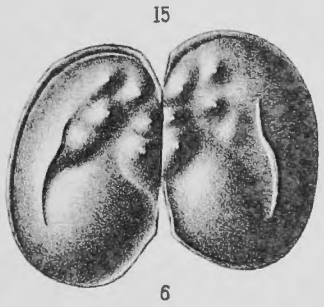

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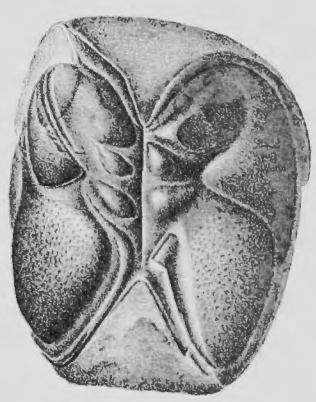

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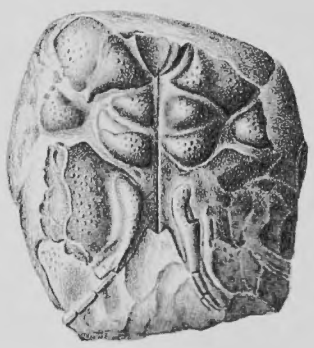

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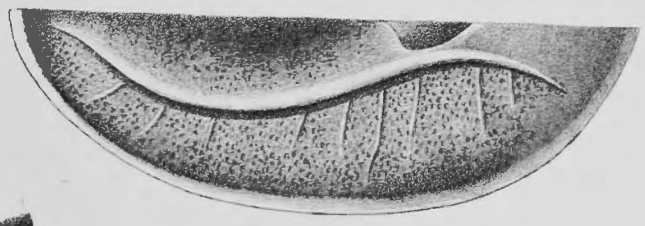

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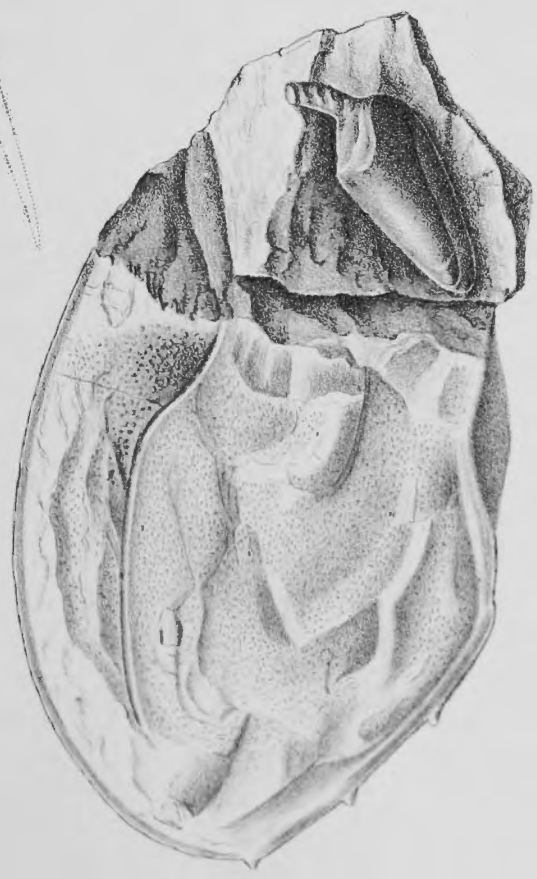

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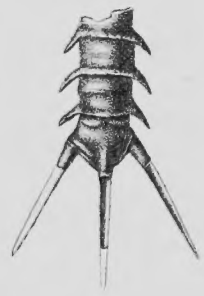

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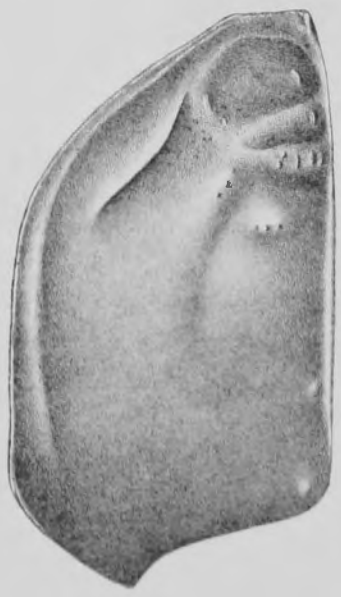

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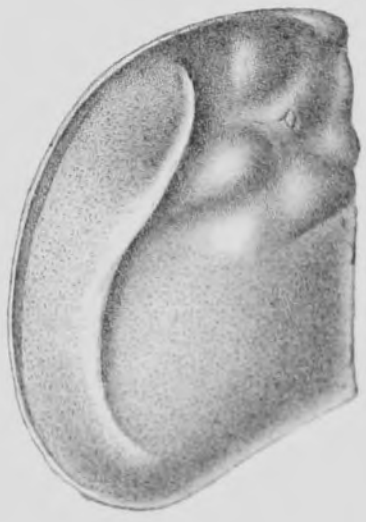

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PLATE XXX.

ECHINOCARIS SOCIALIS.

Page 174.

Fig. 1. A very young, entire individual representing the earliest stage of growth observed.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 2. A young individual in which the abdomen is bent dorsally.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 3. An example with the valves expanded and the abdomen protruding from the anterior margin of the carapace.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 4. An individual with the valves expanded and the abdomen closely curved around the posterior margin of the left valve.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 5. The expanded valves of a larger individual.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 6. A larger, expanded carapace somewhat enlarged, showing more distinctly the character of the surface ornamentation.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 7. A nearly entire mature example, enlarged to two diameters, showing the arrangement of the spinules on the abdominal somites, and the very slender caudal spines. The anterior portion of the carapace is somewhat restored in the drawing.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 8. The right valve of a large carapace with the abdomen attached.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 9. A fragment of shale preserving the remains of fifteen immature individuals, nine of which are visible on the side represented in the figure.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 10. An enlargement to three diameters of a portion of the postero-lateral surface of the right valve, showing the crenulated summit of the lower carina and the tuberculous character of the upper carina.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 11. Two abdominal segments, enlarged to two diameters, showing the bases of the spinules. The nodes across the middle of each segment ar spiniform when perfectly preserved.
Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 12. Three abdominal segments and the post-abdomen of a large individual.
Chemung group. *Warren, Warren county, Pennsylvania.*

MANDIBLES OF PHYLLOCARIDA.

Page 170.

Fig. 13. A large specimen, natural size, showing the molar-like appearance of all the denticles except the posterior one, which is sharp and composed of a single cusp.
Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 14. A specimen preserving the "manubrium" and showing the number and character of the cusps.
Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 15. The crown of a large example.
Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 16. A small example, showing but five cusps. In this specimen the basal portion of the mandible is not distinctly separated from the crown.
Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 17. A somewhat larger specimen, with a strong terminal cusp.
Hamilton group. *Pratt's Falls, Onondaga county.*

PLATE XXX—Continued.

Fig. 18. A larger example, retaining the "manubrium."
Hamilton group. *Pratt's Falls, Onondaga county.*

Fig. 19. A specimen in the shale, from which the crust has been removed, showing the thickness of this crust over the crown and its comparative tenuity on the basal portion of the mandible.
Hamilton group. *Pratt's Falls, Onondaga county.*

PALÆOPALÆMON NEWBERRYI.

Page 203.

Fig. 20. Lateral view of the type specimen, natural size.

Fig. 21. The same view, enlarged to two diameters, showing the somewhat crushed and broken carapace, the bases of the strong antennæ, the basal portion of an ocular peduncle, a joint of a maxillary palpus (?), and fragments of five pairs of ambulatory appendages. The abdomen is incurved, and is composed of five somites, the first two of which bear the bases of natatory appendages. The tail is expanded, and the posterior portion of it has been abraded.

Fig. 22. Dorsal view of the same specimen, natural size, showing the prominence of the antennæ, the carinæ on the carapace, and the incurvature of the abdomen.

Fig. 23. The tail, enlarged to two diameters, showing the broad, stout telson, the lateral spines with their short basal joints, and the flat, tenuous lamellar spines lying in the membranous expansion.
Erie shales. (Portage group.) *LeRoy, Lake county, Ohio.*

TROPIDOCARIS HAMILTONIÆ, n. sp.

Fig. 24. The type specimen, natural size.

Fig. 25. The same, enlarged to two diameters. The specimen is folded along the hinge-line, the edge of the right valve being seen within the ventral margin of the left. The outline of the carapace is closely similar to that of *T. bicarinata* of the Chemung group, being narrow near the anterior extremity, rapidly widening posteriorly. Both dorsal and ventral margins are elevated and ornamented by transverse striations. A single nearly straight carina lies on the middle of each valve, and this is also striated along its summit. An eye-node is visible near the anterior extremity of this carina.

This specimen was obtained too late to permit a notice of the species in its proper place in the text.
Hamilton group. In the uppermost beds of the shales. *Foster's, Canandaigua Lake.*

HAMILTON TO CHEMUNG GROUP.

(CERATIOCARIDÆ & CARIDIDÆ.)

Palæontology of N.Y.,Vol.VII. Plate XXX.


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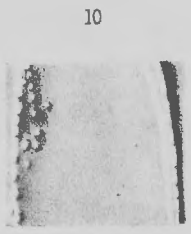
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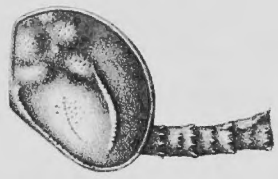
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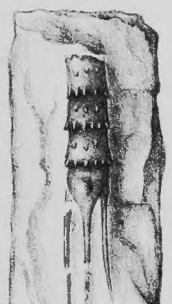
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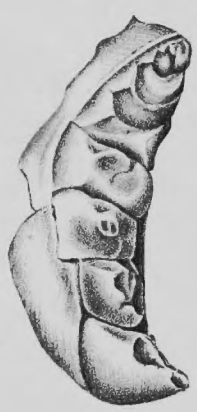
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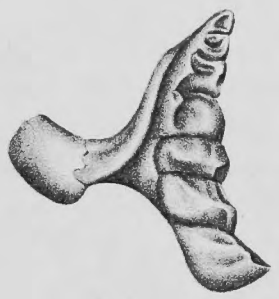
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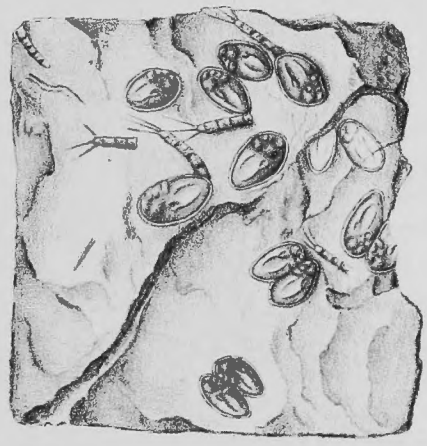
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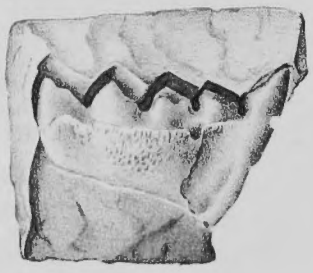
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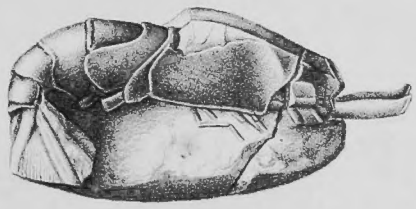
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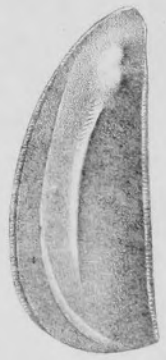
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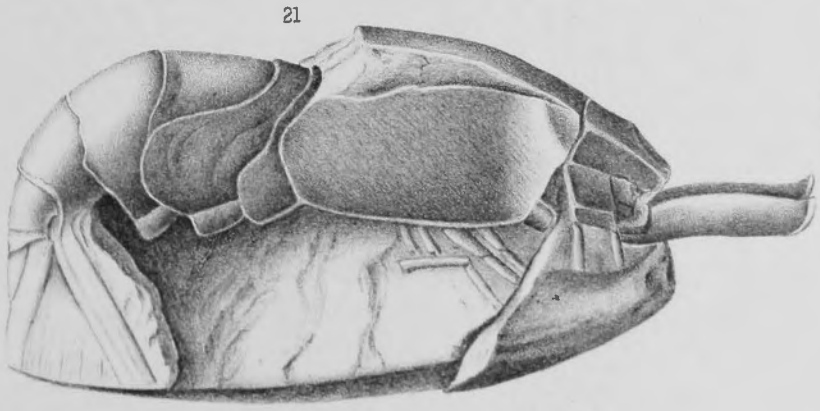
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E.Emmons del. Phil.Ast.lith.

PLATE XXXI.

CERATIOCARIS LONGICAUDA.

Page 163.

Fig. 1. The type specimen enlarged to two diameters, showing the last two somites and two of the caudal spines.

Genesee shales. *Bristol Center, Ontario county.*

CERATIOCARIS (?) SIMPLEX.

Page 165.

Fig. 2. The type specimen, natural size; an internal cast of the left valve of the carapace.

Portage group. *Naples, Ontario county.*

CERATIOCARIS BEECHERI.

Page 164.

Fig. 3. The type specimen, consisting of a portion of the abdomen and caudal spines; showing the absence of surface ornamentation and the short, relatively stout cercopods.

Portage group. *Son Yea, Livingston county.*

ELYMOCARIS CAPSELLA.

Page 181.

Fig. 4. A carapace, enlarged to two diameters; showing the siliquoid form of the valves, the minute spine at the anterior extremity of the left valve and the absence of surface ornamentation, with the exception of the characteristic longitudinal striæ near the margins.

Hamilton group. *Tichenor's Glen, Canandaigua Lake.*

ELYMOCARIS SILIQUA.

Page 182.

Fig. 5. A specimen showing the posterior portion of the carapace with the abdomen and post-abdomen. The anterior portion of the valves is restored in outline.

Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 6. The separated valves of a carapace, showing their form, the position of the eyes and the cephalic nodes.

Chemung group. *Warren, Warren county, Pennsylvania.*

TROPIDOCARIS BICARINATA.

Page 184.

Fig. 7. A carapace with the valves expanded, showing their form and proportions, the position of the eye-nodes, the character of the surface ornamentation and the size and of the rostral plate. The drawing is made from a plaster cast taken from a natural mould of the dorsal surface and is partially restored.

Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 8. A smaller carapace, the valves of which are somewhat crushed; showing the rostral plate, one of the eye-nodes and the large lunate nodes on the outer edge of the principal carina.

Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 9. The anterior portion of the specimen represented in fig. 7, enlarged to two diameters; showing the rostral plate, which bears a sharp carina along the axial line and a fainter one on either side. This plate in the specimen is tilted a little to the right.

Fig. 10. The anterior portion of the carapace represented in fig. 8, enlarged to two diameters, showing the rostral plate somewhat displaced and tilted, the spinule at the extremity of the right valve, and the surface markings of the carapace.

PLATE XXXI—Continued.

Fig. 11. The right valve of a small individual, slightly broken at the anterior extremity, but showing the sharply angular posterior extremity of the hinge. This valve is somewhat broader posteriorly than that represented in fig. 7, and as it appears to be uncompressed this outline is probably correct for the species.

Chemung group. *Warren, Warren county, Pennsylvania.*

Fig. 12. Two segments of the abdomen and a portion of the telson, referred with doubt to this species. The drawing is enlarged to two diameters to show the character of the surface markings.

Chemung group. *Warren, Warren county, Pennsylvania.*

TROPIDOCARIS INTERRUPTA.

Page 185.

Fig. 13. A right valve of the carapace, showing the form and surface ornamentation.

Chemung group. *Warren, Warren county, Pennsylvania.*

TROPIDOCARIS ALTERNATA.

Page 186.

Fig. 14. An imperfect left valve, showing the numerous carinæ and the nodes in the cephalic region.

Waverly group. *Warren, Warren county, Pennsylvania.*

Fig. 15. Another imperfect left valve, showing the carinæ and bearing the impression of plates of an echinoderm.

Both this and the preceding figure have been drawn from gutta-percha impressions taken from natural moulds of the dorsal surface.

Waverly group. *Warren, Warren county, Pennsylvania.*

RHINOCARIS COLUMBINA.

Page 195.

Fig. 16. A carapace which has been laterally compressed, but retains the prora. Near the dorsal margin is seen the line along which the carapace has been fractured. The surface shows no ornamentation except the faint striæ along the margins.

Fig. 17. The anterior portion of the same specimen, enlarged to two diameters to show the character of the prora. The carapace has been fractured near the base of the prora, but upon the dorsal surface the latter is continuous with the shield.

Hamilton group. *Tichenor's Glen, Canandaigua Lake.*

Fig. 18. A portion of the carapace upon which lies a very small mandible.

The specimen is enlarged to three diameters.

Hamilton group. *Vinegar Brook Glen, Cayuga Lake.*

Fig. 19. A fragmentary specimen, showing a portion of the carapace, three segments of the abdomen, the sub-conical caudal plate and telson, with the cercopods.

Hamilton group. *Vinegar Brook Glen, Cayuga Lake.*

Fig. 20. The posterior portion of a large carapace, showing the character of the posterior margin.

Hamilton group. *Tichenor's Glen, Canandaigua Lake.*

Fig. 21. An imperfect specimen retaining one side of the carapace, showing the last abdominal segment and the telson.

Hamilton group. *Eighteen-mile Creek, Erie county.*

RHINOCARIS SCAPHOPTERA.

Page 197.

Fig. 22. A view of the left side of a carapace which has been crushed along a line lying to the left of the axis, making this side appear narrower than is normal; showing the prora, the conspicuous lateral carina and the surface ornamentation.

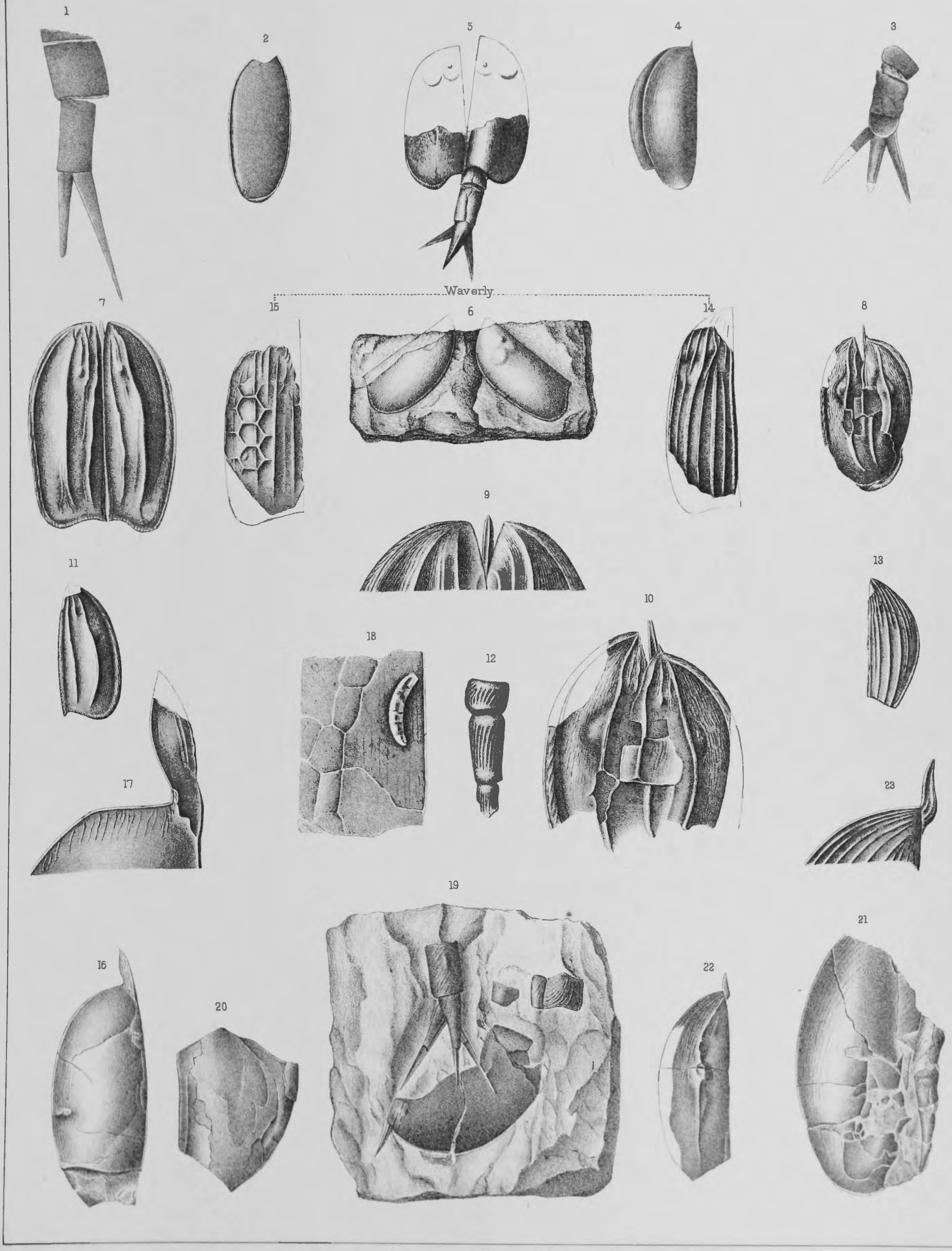
Fig. 23. The anterior portion of the same specimen, enlarged to two diameters to show the character of the prora, which is continuous with the carapace.

Hamilton group. *Tichenor's Glen, Canandaigua Lake.*

HAMILTON PORTAGE & CHEMUNG GROUPS.

(CERATIOCARIDÆ & RHINOCARIDÆ.)

Palæontology of N.Y., Vol. VII. Plate XXXI.



J. M. Clarke, del.

Phil. Ast lith.

PLATE XXXII.

MESOTHYRA OCEANI.

Page 187.

Fig. 1. An outline restoration drawn from the large right valve represented on plate 33, fig. 4, showing the probable character of the articulation of the valves of the carapace, the position and relative size of the rostral and dorsal plates, the number of abdominal segments and the setiferous caudal spines.

Fig. 2. The optic node of the specimen represented on plate 33, fig. 4, enlarged to three diameters, showing the deep circular pit at its summit.

Fig. 3. A similar enlargement of the optic node of the valve shown on plate 33, fig. 5.

Fig. 4. A portion of the carina on the valve represented upon plate 33, fig. 4, enlarged to three diameters. The lateral slopes are divided by a sharply impressed longitudinal line into a punctate lower portion and an impunctate, gently crenulated summit.

Fig. 5. A portion of the right cercopod of the post-abdomen shown on plate 34, fig. 4, enlarged to three diameters; showing the impressions of the setæ, their bases of attachment along the inner margin of the spine and the coarsely tubercled and ridged surface.

Fig. 6. The hinge angle of the right valve figured on plate 33, fig. 4, enlarged to three diameters; showing the thickened apex, curved upward and inward for articulation with the left valve, and the tubercled and punctate surface.

MESOTHYRA NEPTUNI.

Page 191.

Fig. 7. A portion of the right cercopod of the specimen represented on plate 33, fig. 1; drawn to show more distinctly the character of the surface ornamentation.

Hamilton group. *Plainfield, Otsego county.*

MESOTHYRA SPUMÆA.

Page 193.

Fig. 8. A nearly entire caudal spine of this species.

Fig. 9. A portion of the same, enlarged to three diameters, to show the character of the surface ornamentation.

Hamilton group. *Delphi, Onondaga county.*

HAMILTON & PORTAGE GROUPS.

Palæontology of N.Y., Vol. VII.

Plate XXXII.

(CERATIOCARIDÆ)

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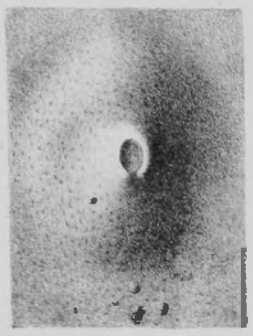

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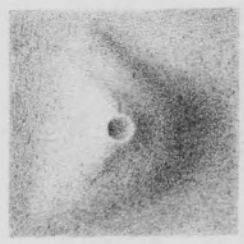

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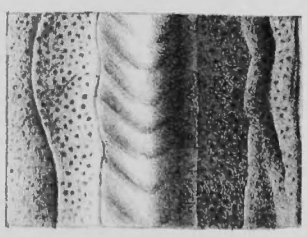

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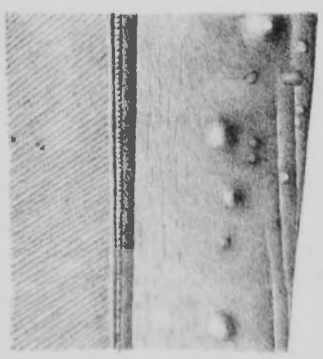

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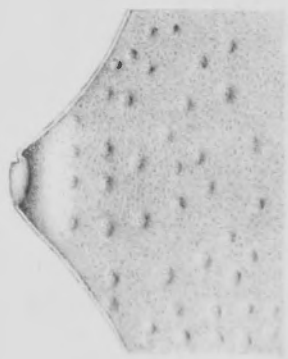

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E. Emmons del.

Phil Ast lith.

PLATE XXXIII.

MESOTHYRA NEPTUNI.

See Plate 32.

Fig. 1. View of the type specimen, natural size, showing the dimensions of the caudal plate and spines, the strongly striated surfaces of the latter and the ridges on the inner margins of the lateral spines for the attachment of the setæ.

Hamilton group. *Plainfield, Otsego county.*

MESOTHYRA SPUMÆA.

See Plate 32.

Fig. 2. Ventral aspect of the caudal plate and cercopods. The latter have been broken at about one-half their length, but the remaining portions show the faint pustules upon the surface accompanied by elevated striæ near the articular margins.

Hamilton group. *Pratt's Falls, Onondaga county.*

MESOTHYRA (DITHYROCARIS ?) VENERIS.

Page 193.

Fig. 3. The right valve of the carapace flattened in the shale, showing the outline, the acute anterior and posterior spines, the position of the eye-node and the faint lateral carina. The specimen also shows a longitudinal furrow just within the dorsal margin, which merges into the margin at a point directly opposite the eye-node.

Hamilton group. In the Marcellus shales on *Mud Creek, East Bloomfield, Ontario county.*

MESOTHYRA OCEANI.

See Plates 32 and 34.

Fig. 4. A very large, somewhat imperfect left valve, showing the prominent hinge-angle and its upwardly curved apex, the strong lateral carina and the ornamentation of its inner slope, and the conspicuous eye-node.

Portage group. *Ithaca, Tompkins county.*

Fig. 5. A smaller specimen of the left valve of the carapace, showing the characteristic surface features and the continuation of the thickened margin into the posterior spine which has been broken away.

Portage group. *Ithaca, Tompkins county.*

Fig. 6. A somewhat crushed and imperfect specimen of the abdomen and post-abdomen, showing the narrow anterior somite and the longer posterior somite with retrally directed striæ. The cercopods show the strong marginal striations and the coarse, scattered tubercles.

Portage group. *Ithaca, Tompkins county.*

Fig. 7. The post-abdomen, with a portion of the posterior somite ; showing the setæ attached to the inner margins of the cercopods.

The drawing fails to represent with sufficient prominence the striations and tubercles on the cercopods, and the telson, as represented, is considerably too short.

Portage group. *Ithaca, Tompkins county.*

HAMILTON & CHEMUNG GROUPS.

(CERATIOCARIDÆ.)

Palæontology of N.Y. Vol.VII. Plate XXXIII.

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G.B.Simpson del. P.Riemann lith.

PLATE XXXIV.

MESOTHYRA OCEANI.

See Plates 32 and 33.

Fig. 1. The carapace of a large individual, the left valve of which is quite imperfect. The right valve shows the characteristic features of the genus and species.

Portage group. *Ithaca, Tompkins county.*

Fig. 2. A right valve of the carapace, proportionally somewhat narrower than that in the preceding figure.

Portage group. *Ithaca, Tompkins county.*

Fig. 3. A specimen retaining the posterior abdominal somite and the post-abdomen; showing the true proportions and the characteristic ornamentation of these parts.

Fig. 4. The ventral aspect of a small post-abdomen, showing the triangular outline of the caudal plate, the characteristic surface ornamentation and the setaceous fimbriæ on the cercopods.

Portage group. *Ithaca, Tompkins county.*

Fig. 5. A small specimen retaining the abdomen and post-abdomen, enlarged to two diameters The parts of the abdomen are incorrectly represented as one piece, the articular surface of the two somites being at the broken line about one-third the length of the abdomen from the anterior margin. The cancellating striations on the posterior somite are partially due to lateral compression.

Portage group. *Ithaca, Tompkins county.*

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G.B.Simpson del P.Riemann lith.

PLATE XXXV.

SCHIZODISCUS CAPSA.

Page 209.

Fig. 1. A specimen retaining both valves of the carapace, and showing the characteristic features of the species. Enlarged to three diameters.

Fig. 2. Profile of the same, similarly enlarged, showing the elevation of the beaks. The surface is somewhat less convex in this specimen than is usual.

Hamilton group. *Near Centerfield, Ontario county.*

Fig. 3. A somewhat smaller and more convex carapace, the valves of which have been very slightly displaced. Enlarged to three diameters.

Fig. 4. The internal surface of the same specimen, similarly enlarged.

Hamilton group. *Near Centerfield, Ontario county.*

Fig. 5. The right valve of a carapace which is much narrower at the posterior extremity than is usual. Enlarged to three diameters.

Hamilton group. *Near Centerfield, Ontario county.*

Fig. 6. A small example, the valves of which are folded and slightly displaced, the posterior extremity of the right valve being broken away. Enlarged to three diameters.

Hamilton group. *Near Centerfield, Ontario county.*

Fig. 7. A very small carapace, natural size.

Fig. 8. The same, enlarged to three diameters.

Hamilton group. *Near Centerfield, Ontario county.*

Fig. 9. An individual of normal proportions, natural size.

Hamilton group. *Near Centerfield, Ontario county.*

ESTHERIA PULEX.

Page 206.

Fig. 10. A fragment of shale bearing several individuals of this species, and various OSTRACODA of other genera. The position of the individuals of *Estheria* are marked by a cross (×).

Fig. 11. A portion of the same fragment enlarged to twenty-five diameters, showing five valves of *Estheria*, the distances between which have been proportionally much diminished in the enlargement.

Hamilton group. *Miles' Gully, Hopewell, Ontario county.*

SPATHIOCARIS EMERSONI.

Page 199.

Fig. 12. A large individual which has been unsymmetrically folded along the dorsum.

Portage group. *Naples, Ontario county.*

Fig. 13. A very large example somewhat foreshortened in front, preserving normal convexity over the anterior and lateral areas, but compressed along the dorsum; showing the concentric lines and ridges and the fine radiating striæ upon the dorsum.

Portage group. *Naples, Ontario county.*

Fig. 14. A carapace which is symmetrically folded along the dorsum, showing the elevation of the apex and the relative length of the anterior cleft.

Portage group. *Naples, Ontario county.*

Fig. 15. The type specimen, showing the normal proportions of the species.

Portage group. *Naples, Ontario county.*

Fig. 16. A small, somewhat distorted example.

Portage group. *Naples, Ontario county.*

Fig. 17. An individual of about the same size as that represented in the preceding figure, but uncompressed.

Portage group. *Sparta, Livingston county.*

Fig. 18. A young example, showing the short carapace and very broad anterior cleft.

Portage group. *Naples, Ontario county.*

Fig. 19. The smallest carapace observed.

Portage group. *Naples, Ontario county.*

PLATE XXXV—Continued.

DIPTEROCARIS PES-CERVÆ.

Page 202.

Fig. 20. The type-specimen, natural size, showing the anterior and posterior clefts and the fine, concentric striæ.

Fig. 21. The same enlarged to three diameters, showing the characters more distinctly.

Chemung group. *Dansville, Livingston county.*

Fig. 22. A portion of the body-whorl of *Goniatites sinuosus*, which encloses a small body, bearing somewhat the proportions of the preceding specimen, but differing from it in the shorter anterior and posterior clefts, the pair of nodes at the anterior extremity, and from all the species of *Discinocaridæ* inthe absence of concentric striæ upon the surface. Of all the forms here illustrated this is the only example which has been observed in close association with any species of cephalopoda.

Fig. 23. The body in question enlarged to three diameters.

Portage group. *Naples, Ontario county.*

DIPTEROCARIS PENNÆ-DÆDALI.

Page 200.

Fig. 24. The type specimen of this species, showing the left *ala* of the carapace. The remainder of the carapace is restored in outline, indicating the relative proportions of the anterior and posterior clefts.

Portage group. *Canadice, Ontario county.*

DIPTEROCARIS PROCNE.

Page 201.

Fig. 25. The left *ala* of the carapace in a flattened condition, the right *ala* being restored in outline.

Portage group. *Canadice, Ontario county.*

Fig. 26. The entire carapace normally folded, showing the character of the anterior and posterior clefts.

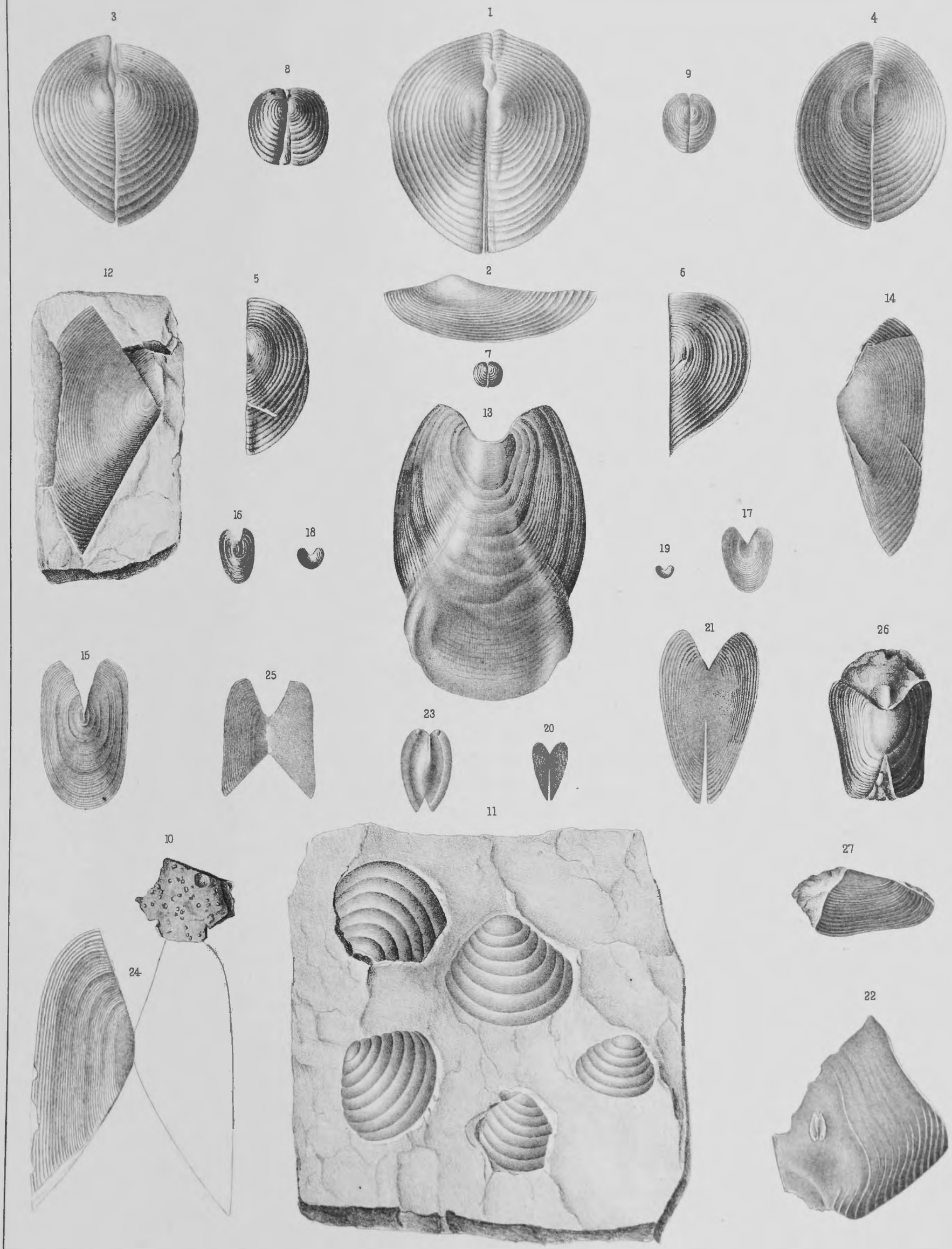
Fig. 27. The same in profile, showing the convexity of the carapace.

Chemung group. *Haskinsville, Steuben county.*

HAMILTON TO CHEMUNG GROUPS.

(LIMNADIADÆ & DISCINOCARIDÆ.)

Palæontology of N.Y., Vol.VII. Plate XXXV.



E. Emmons del. Phil. Ast. lith.

PLATE XXXVI.

TURRILEPAS FLEXUOSUS.

Page 215.

Fig. 1. A single minute plate, enlarged to ten diameters, showing the broad, sinuous median depression and the lamellose lines of growth. Near the apex of the plate the median depression becomes obsolete and the growth lines more closely crowded and transverse.
Corniferous limestone. *Canandaigua, Ontario county.*

TURRILEPAS CANCELLATUS.

Page 216.

Fig. 2. A single plate enlarged to ten diameters, showing the distant, elevated, concentric lines of growth, and the elevated, interrupted radiating lines.
Corniferous limestone. *Canandaigua, Ontario county.*

TURRILEPAS DEVONICUS.

Page 216.

Fig. 3. A plate of this species enlarged to six diameters, showing the median ridge and the plumose appearance of the surface, produced by the closely disposed lines of growth.
Hamilton group. *Canandaigua, Ontario county.*

TURRILEPAS NITIDULUS.

Page 218.

Fig. 4. A single plate, enlarged to six diameters, showing the very fine concentric striæ which become obsolete along the faint median depression, the posterior surface being smooth and ornamented with transversely parallel rows of conspicuous perforations. The apex of the plate is restored in outline.
Hamilton group. *Canandaigua, Ontario county.*

TURRILEPAS SQUAMA.

Page 217.

Fig. 5. A plate referred to this species, enlarged to four diameters, showing the deep deflection along the anterior margin, the regular and closely crowded concentric striæ, and the absence of a median depression.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 6. A *valve fénestrée* referred to this species, enlarged to four diameters. The nucleus is sub-apical, and the concentric striæ are somewhat more distant than in the associated plates of the species.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 7. A portion of an unusually large plate, enlarged to four diameters.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 8. A *valve fénestrée*, enlarged to four diameters, showing the sub-apical nucleus and the fine, closely crowded concentric striæ.
Hamilton group. *Canandaigua, Ontario county.*

TURRILEPAS TENER.

Page 219.

Fig. 9. A fragment of shale, showing the natural size of nine scattered plates referred to this species.
Hamilton group. *Canandaigua, Ontario county.*

Figs. 10, 11, 12, 13. Single plates taken from the group represented in the preceding figure, each enlarged to six diameters.
Hamilton group. *Canandaigua, Ontario county.*

Fig. 14. A smaller plate, also enlarged to six diameters, upon which the growth lines are more prominent and more distant than in the other specimens figured.
Hamilton group. *Canandaigua Lake.*

TURRILEPAS FOLIATUS.

Page 218.

Fig. 15. A single, somewhat imperfect plate, enlarged to four diameters. The outline of this plate is different from that observed in any other species, but its substance and surface markings are of similar character, and it is probably correctly referred to the same group of animals.
Hamilton group. *Canandaigua, Ontario county.*

PLATE XXXVI—Continued.

TURRILEPAS (?) NEWBERRYI.

Page 219.

Fig. 16. Two valves of this species in an uncompressed condition, natural size. The upper and more perfect specimen has a rounded dorsum, the unrepresented side being of the same character as that which is shown. There also appears to be evidence of a cleft extending from the apex to the anterior margin, as in *Spathiocaris*. Plates of this character are distinctly different from the others here represented under the term Turrilepas.

Cleveland shale (Chemung group). *Birmingham, Erie county, Ohio.*

Fig. 17. A large plate, natural size, showing the concentric surface markings, and a broad postero-lateral depression. This plate has the same outline as one side of the plates represented in the last figure; it is, however, impossible to determine from the specimen whether or not the plate was folded along the dorsal line.

Cleveland shale (Chemung group). *Sheffield, Erie county, Ohio.*

Fig. 18. A smaller plate, natural size, showing a different form and more closely crowded growth-lines.

Cleveland shale (Chemung group). *Sheffield, Erie county, Ohio.*

Fig. 19. A small plate having an outline similar to that represented in figure 17.

Cleveland shale (Chemung group). *Sheffield, Erie county, Ohio.*

The illustrations of this species have been drawn from the type specimens.

STROBILEPIS SPINIGERA.

Page 212.

Fig. 20. A nearly entire capitulum, in which the parts retain somewhat of their proper arrangement. The conical terminal plate is overlapped at its edges by three vertical ranges of plates, those of the left range lying in juxtaposition, while those of the right range have been considerably displaced. Of the axial range of smaller plates, three are shown in place, and a fourth plate of this range lies beneath the edge of the fourth plate of the left range. The range of spines has been pushed from its normal position around to the right, and the lower members of the row have been displaced. These spines were probably symmetrical in position with the axial row of plates. The specimen is enlarged to one and a half diameters.

Fig. 21. The last three spines of the undetached portion of the row, enlarged to two diameters. These spines are numerically the ninth, tenth and eleventh; the first two, like all those preceding them, bear a deep and conspicuous groove for nearly their entire length, while the eleventh and all those following, appear to have been inverted, showing a convex surface with a sharp axial carina, the lateral slopes being more or less incurved.

Fig. 22. An enlargement of a portion of the surface of one of the plates, showing their punctate structure, the quincunx arrangement, the oblique direction of the punctæ, and the concentric lines produced by the excavation of the shell about the aperture of each puncta.

Hamilton group. *Menteth's Point, Canandaigua Lake.*

PROTOBALANUS HAMILTONENSIS.

Page 209.

Fig. 23. The type specimen enlarged to fifteen diameters. This has been somewhat broken over the posterior portion, but shows the composition of the capitulum, its twelve discrete plates, consisting of the *carina, rostrum* and five pairs of *lateralia,* the radiating ridges upon the surface of these plates and the smooth radial areas. On the right side the peripheral portion of the shell has been somewhat flattened.

Hamilton group. *In the Marcellus shales at Avon, Livingston county.*

PALÆOCREUSIA DEVONICA.

Page 210.

Fig. 24. A view of the type specimen, natural size, showing the capitulum, the remainder of the shell being imbedded in a colony of *Favosites hemisphericus.*

Fig. 25. A constructive representation of the profile of this specimen, showing the long, tubular basis surrounded by cell tubes, and the elevation of the capitulum.

Fig. 26. The same view of the specimen as that presented in figure 24, enlarged to two diameters. The capitulum has been encroached upon by the walls of the cell tubes, which have apparently extended as far as the aperture, and subsequently been broken away. The surface of the plate shows faint radiating striæ, and a single furrow concentric with the margin. The aperture appears somewhat too large on account of the slight imperfection of its anterior margin.

Corniferous limestone. *LeRoy, Genessee county.*

UPPER HELDERBERG & HAMILTON GROUPS.

(LEPADIDÆ & BALANIDÆ.)

Palæontology of N.Y., Vol VII. Plate XXXVI.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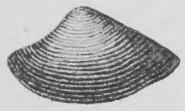
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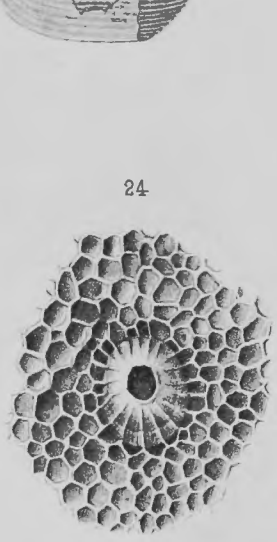
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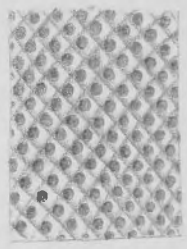
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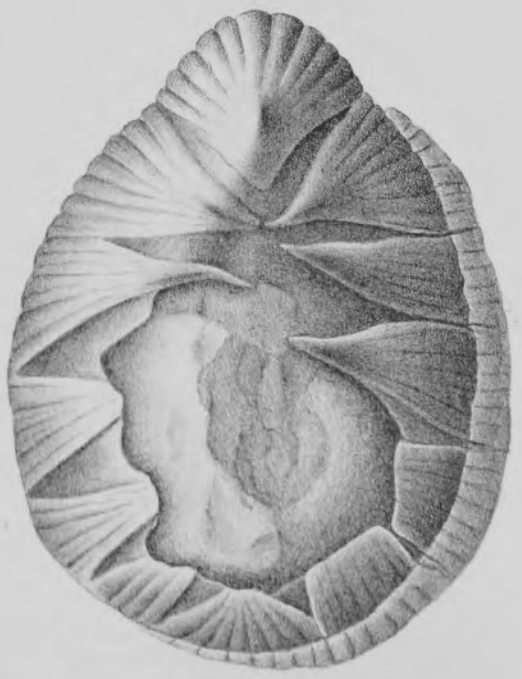
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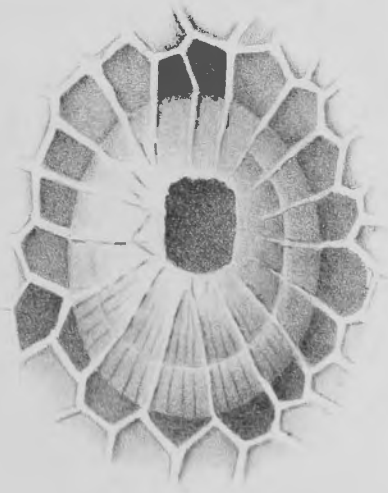
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E. Emmons del.

Phil Ast lith.

SUPPLEMENT.

PLATE CXIV.

TENTACULITES MINUTUS. Hall.

Page 5.

Fig. 1. An imperfect individual, enlarged to six diameters, and showing very faint longitudinal striæ.
Clinton group. *Rochester, Monroe county.*

Fig. 2. Two entire individuals of the same species, similarly enlarged, showing the regular equidistant annuli and the fine annulations.
Clinton group. *Rochester, Monroe county.*

TENTACULITES NIAGARENSIS, Hall, var. CUMBERLANDIÆ, n. var.

Page 5.

Figs. 3, 4, 5. Entire specimens, enlarged to six diameters, showing the slender, very terete form, the conspicuous, evenly rounded, irregularly distant annuli, and the fine, sharp interstitial annulations. The surface ornamentation is very similar to that of *T. Niagarensis*, but the annulations are much more conspicuous than in that species.
Niagara group. *Cumberland, Maryland.*

Fig. 6. A portion of another individual of this species, enlarged to nine diameters.
Niagara group. *Cumberland, Maryland.*

TENTACULITES GYRACANTHUS. Eaton.

Page 5.

Figs. 7, 8 and 9. Individuals of this species, enlarged to six diameters, showing the great variation in the intervals between the annuli. The ornamentation of this species, though similar to that of *T. Niagarensis, var. Cumberlandiæ*, is subject to greater variation, and the shell is stouter than in that variety. In figure 9, the shorter specimen has been flattened and made to appear relatively too broad.
Lower Helderberg group (Tentaculite limestone). *Schoharie, Schoharie county.*

Fig. 10. A block of the Tentaculite limestone, showing the abundance of these individuals and the variation in their surface ornamentation.
Lower Helderberg group. *Schoharie, Schoharie county.*

Fig. 11. Two large and somewhat flattened specimens referred with doubt to the same species.
Lower Helderberg group (Tentaculite limestone). *Jerusalem Hill, Herkimer county.*

Figs. 12 and 13. Longitudinal sections of individuals, enlarged to six diameters, showing the thinness of the shell, and the invagination of one shell within another. This is not an infrequent mode of occurrence in this formation where the rock is sometimes almost wholly made up of these bodies. In the specimens figured the annulations are unusually regular and closely set.
Lower Helderberg group (Tentaculite limestone). *Schoharie, Schoharie county.*

TENTACULITES ELONGATUS. Hall.

Page 6.

Fig. 14. An individual of this species, natural size, from which a portion of the shell has been broken, showing an apparently septate structure near the apex of the internal cavity, which is probably due to successive depositions of the filling matter.
Lower Helderberg group. *Schoharie? Schoharie county.*

TENTACULITES ACULA. n. sp.

Page 6.

Fig. 15. An individual of this species, natural size.

Fig. 16. The same, enlarged to five diameters, showing the regularity of the annuli and the comparatively few annulations on the intervals.
Lower Helderberg group. *Port Jervis, Orange county.*

Fig. 17. A larger individual of the same species, from which a portion of the shell has been broken, showing its thickness. Enlarged to six diameters.
Lower Helderberg group. *Port Jervis, Orange county.*

PLATE CXIV—Continued.

TENTACULITES DEXITHEA, n. sp.

Page 6.

Fig. 18. Three individuals of the species upon a block of sandstone.

Fig. 19. The specimen on the right of the block in the preceding figure, enlarged to two diameters. The upper portion of the specimen is preserved as a cast of the interior, the lower portion retaining the crust. The species differs from *T. scalariformis* in its much more elongate and slender form and its more sloping annuli.

Upper Helderberg group. *From the sandstones at the base of the Corniferous limestone at Pendleton, Indiana.*

TENTACULITES SCALARIFORMIS. Hall.

Page 6.

Fig. 20. A block of limestone bearing numerous individuals of this species, all of which are flattened and consequently made to appear relatively too broad.

Corniferous limestone. *Delaware, Delaware county, Ohio.*

HYOLITHES CENTENNIALIS. Barrett.

Page 6.

Fig. 21. A fragment of a small specimen of this species which was intended to represent the ventral side of the shell, but the left edge of the drawing is the axial line of the convex or dorsal surface, and the surface represented is the right dorsal slope. The specimen shows the faint longitudinal striæ near the lateral margin.

Lower Helderberg group. *Port Jervis, Orange county.*

Fig. 22. Dorsal view of a large individual, showing the character of the ornamentation, which consists of elevated, transverse, sinuous lines, becoming obsolete near margins. The edges of these striæ are sometimes faintly crenulate.

Fig. 23. A portion of the surface of another specimen enlarged to two diameters, showing the crenulation of the transverse striæ.

Lower Helderberg group. *Port Jervis, Orange county.*

HYOLITHES HEROS, n. sp.

Page 7.

Fig. 24. The ventral surface of a specimen from which the apical portion has been lost, showing the faint tranverse lines and two longitudinal furrows which extend nearly two-thirds the entire length of the shell.

Fig. 25. The dorsal surface of the same specimen, showing the fine longitudinal striæ and the broad marginal undulations.

Fig. 26. A portion of the dorsal surface, enlarged to two diameters, showing the character of the ornamentation.

Fig. 27. Transverse section of the same specimen, showing the degree of convexity of the dorsal and ventral surfaces.

Lower Helderberg group. *Near Clarksville, Albany county.*

STYLIOLA SPICA, n. sp.

Page 7.

Fig. 28. An individual enlarged to two diameters, showing the symmetrical uncompressed form and smooth surface. This species differs from *Styliola fissurella* in its comparatively great size, and the entire absence of indications of transverse annuli.

Hamilton group. *Hamburgh, Erie county.*

COLEOLUS HERZERI, n. sp.

Page 7.

Fig. 29. A nearly entire individual showing the gently incurved form and the faint obliquely transverse striæ. Waverly group. *Medina, Ohio.*

PHARETRELLA TENEBROSA, n. sp.

Page 7.

Fig. 30. An individual of this species, showing the Hyolithes-like form and the fine, sinuous, transverse striæ. The substance of the shell is extremely thin and delicate and the striæ are slightly imbricating.

Fig. 31. A portion of the surface of the same specimen enlarged to two diameters, showing the character of the ornamentation.

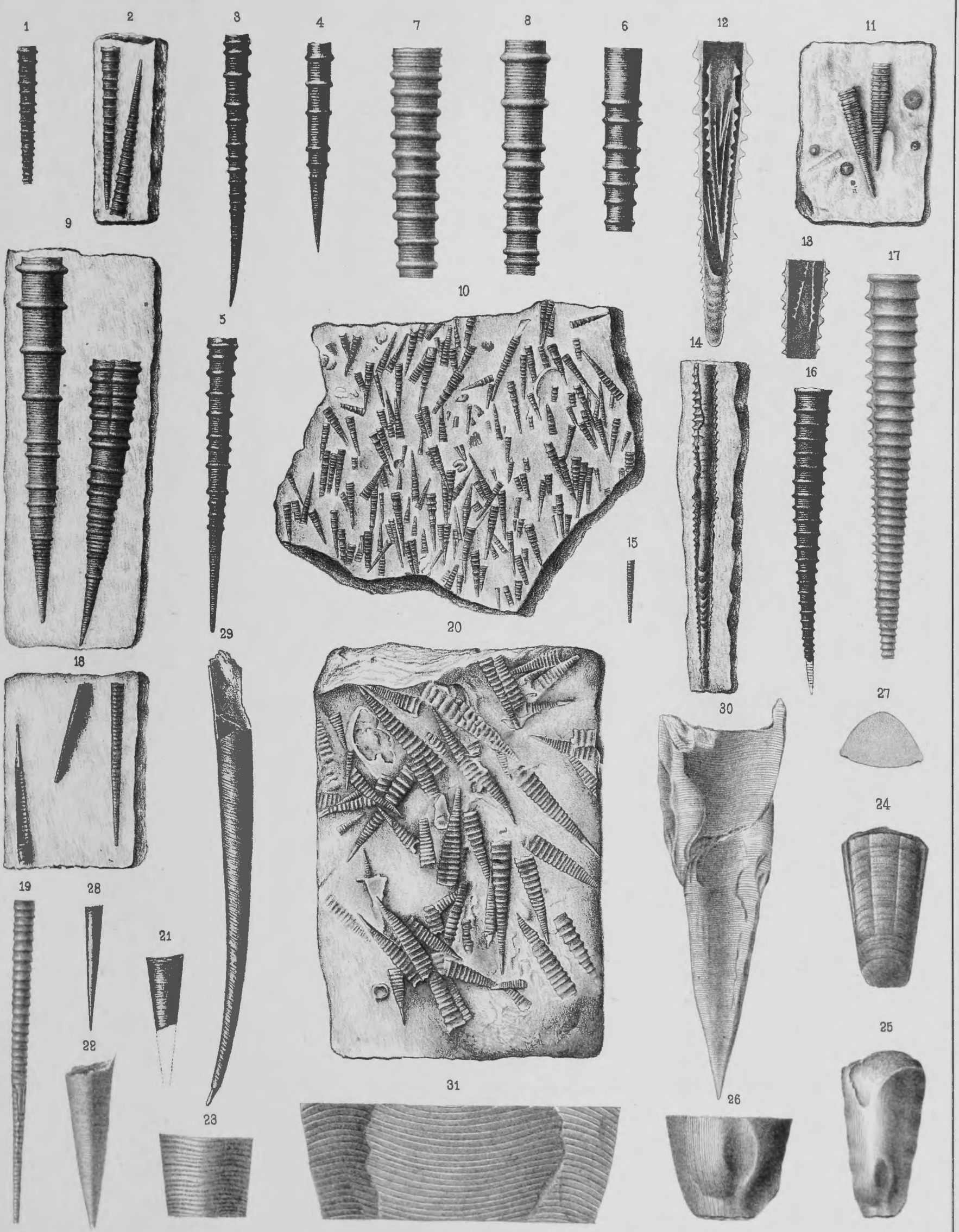
Hamilton group (Genesee shales). *Genesee county.*

LOWER HELDERBERG TO HAMILTON GROUP.

[Pteropoda.]

Palæontology of N.Y., Vol.V, Pt.II. Supplement.

PlateCXIV.



G.B. Simpson del

Phil. Ast. lith.

PLATE CXV.

TUBICOLAR ANNELIDA OF THE HUDSON RIVER GROUP CORNULITES; IN VARIOUS STAGES OF DEVELOPMENT.

Pages 8-18.

Fig. 1. A portion of the surface of a much macerated *Orthoceras*, showing the earliest stages of growth observed.

Fig. 2. The same specimen, enlarged to three diameters, the relative distances between the tubes being diminished in the drawing. The tubes show every variation in form, from the completely enrolled helicoidal condition, suggestive of *Spirorbis*, to the partially enrolled or serpuloid stage, and to the more elongate, sinuous form characteristic of *Cornulites*. The *Spirorbis Cincinnatiensis*, Miller and Dyer, probably represents the earliest or coiled condition of these bodies In the smallest examples here illustrated the surface is entirely smooth, but with advancing growth becomes first faintly and then more strongly annulated. The largest of the specimens also show faint longitudinal striæ. In these latter tubes the embryonal tips have been broken off.
Hudson River group. *Cincinnati, Ohio.*

Fig. 3. Tubes in about the same condition of growth as those described in the preceding specimen, enlarged to three diameters, showing the distinct transverse annulations. The tubes are all attached for their entire length to a valve of *Strepto rhynchus plano-convexus*. This is ths stage of development represented by the species *Ortonia minor*, Nicholson.
Hudson River group. *Cincinnati, Ohio.*

Fig. 4. A fragment of *Monticulipora*, bearing numerous tubes in the Serpuloid condition represented in fig. 2. Each of these tubes is finely but distinctly annulated, but the longitudinal striæ are but partially developed. Enlarged to three diameters.
Hudson River group. *Cincinnati, Ohio.*

Fig. 5. A single, slightly flexuous tube, natural size, with strong, somewhat irregular annulations and very fine longitudinal striæ. This is the condition of growth represented by the species *Tentaculites Sterlingensis* of Meek and Worthen.
Hudson River group. *Cincinnati, Ohio.*

Fig. 6. The same stage of growth exhibited by three tubes attached to one another and, at their bases, to a fragment of a crinoidal stem.

Fig. 7. The same, enlarged to three diameters, showing the longitudinal striæ.
Hudson River group. *Cincinnati, Ohio.*

Fig. 8. Three tubes of somewhat larger size and more flexuous form, attached to a crinoidal fragment. These specimens show an increasing irregularity in the annulations.
Hudson River group. *Cincinnati, Ohio.*

Fig. 9. An isolated group of similar tubes, attached to one another for their entire length and growing upon the fragment of a crinoidal column. Natural size.

Fig. 10. The opposite side of the same specimen.
Hudson River group. *Cincinnati, Ohio.*

Fig. 11. A group of adnascent tubes attached to a valve of *Strophomena alternata*.
Hudson River group. *Cincinnati, Ohio.*

Fig. 12. Two larger tubes attached to a single crinoidal segment. In this form the annulations have become more irregular and obsolescent, and the longitudinal striæ much more conspicuous.
Hudson River group. *Cincinnati, Ohio.*

Fig. 13. Two adnascent tubes in which the annulations are extremely irregular, and have become obsolescent.
Hudson River group. *Cincinnati, Ohio.*

Fig. 14. A group of smaller tubes, showing the increasing irregularity and obsolescence of the annulations.
Hudson River group. *Cincinnati, Ohio.*

Fig. 15. A large tube, having a surface of similar character to that represented in the last three figures. Enlarged to two diameters.

Fig. 16. A longitudinal section through the same specimen, showing the dense cellular wall and the folds on the internal surface, corresponding to the external annulations.
Hudson River group. *Cincinnati, Ohio.*

Fig. 17. A group of simple tubes in a very early stage of development, having a common point of attachment and a radiating habit of growth.
Hudson River group. *Cincinnati, Ohio.*

Fig. 18. The under or basal side of a silicified specimen, affording a more perfect illustration of this mode of growth. The outer walls of the tubes where shown are distinctly annulated.

Fig. 19. The upper surface of the same specimen, showing the apertures of the connate tubes, the entire colony presenting a strikingly favositoid appearance.

Fig. 20. The view represented in fig. 8, enlarged to three diameters.
Hudson River group. *Cincinnati, Ohio.*

Fig. 21. Basal view of a similar specimen, in a somewhat more advanced stage of growth, showing the point of attachment and the annulated surfaces of the tubes.

Fig. 22. The upper surface of the same specimen.

Fig. 23. The same, enlarged to three diameters, showing the apertures and concentrically annulated internal surface of the tubes.
Hudson River group. *Cincinnati, Ohio.*

PLATE CXV—Continued.

Fig. 24. A later stage in the development of the tubes, exhibiting the same mode of growth. In this specimen the irregular annulations and the fine longitudinal striæ are very distinct.
Hudson River group. *Cincinnati, Ohio.*

Fig. 25. The upper surface of an isolated colony, the tubes of which are of unusually large size and are not wholly connate.

Fig. 26. The under surface of the same specimen, showing the point of attachment of the tubes, the ornamentation of the outer walls and a younger colony attached near the apices of the larger tubes.
Hudson River group. *Cincinnati group.*

Fig. 27. A large colony representing the adnascent habit of growth, attached to a valve of *Strophomena alternata.* The specimen has been somewhat weathered, the walls of the tubes being largely eroded. This is the stage of development seen in the species *Ortonia conica*, Nicholson, and *Conchicolites corrugatus*, Nicholson.
Hudson River group. *Cincinnati, Ohio.*

Fig. 28. A stage of growth in which the tubes are gently flexuous and mostly free, the annulations quite regular and the longitudinal striæ distinct. This is a condition directly comparable to that represented in figures 5, 6 and 7, and has been described by Mr. S. A. Miller, under the name *Tentaculites Richmondensis.* The same or a closely similar condition of development is represented by the species *Tentaculites tenuistriatus*, Meek and Worthen.
Hudson River group. *Richmond, Indiana.*

Fig. 29. Another specimen representing the same stage of development.
Hudson River group. *Richmond, Indiana.*

Fig. 30. A third specimen, enlarged to three diameters, showing more distinctly the character of the surface markings.
Hudson River group. *Richmond, Indiana.*

Fig. 31. Tubes in a condition of growth closely similar to that of the preceding specimens, the annulations being somewhat less regular. This is the *Tentaculites incurvus* of Shumard, page 18.
Hudson River group. *Near Cape Girardeau, Missouri.*

Fig. 32. A longitudinal section of the tube of *Tentaculites Sterlingensis*, Meek and Worthen, enlarged to five diameters, showing the thickness of the walls.
Hudson River group. *Cincinnati, Ohio.*

Fig. 33. Longitudinal sections of two adnascent tubes similar to those represented in figures 9 and 10. enlarged to three diameters showing the thickness of the walls.
Hudson River group. *Cincinnati, Ohio.*

Fig. 34. Longitudinal sections of portions of two similar tubes, enlarged to three diameters, showing thicker and coarsely cellular walls.
Hudson River group. *Cincinnati, Ohio.*

Fig. 35. A small specimen of the *Tentaculites Richmondensis*, Miller, showing the thick walls. The apparent transverse septa are the edges of the internal annulations. Enlarged to three diameters.
Hudson River group. *Richmond, Indiana.*

Fig. 36. A longitudinal section of the *Tentaculites Richmondensis*, Miller, enlarged to six diameters, showing the cellular structure of the thick wall.
Hudson River group. *Richmond, Indiana.*

Fig. 37. A longitudinal section of the same form of growth, enlarged to five diameters.
Hudson River group. *Richmond, Indiana.*

Fig. 38. Longitudinal sections of two individuals of the *Tentaculites Richmondensis*, Miller, enlarged to three diameters, showing the thickness of the walls.
Hudson River group. *Richmond, Indiana.*

Fig. 39. Sections of tubes in a similar stage of development, enlarged to three diameters. The apparent septate character of the apical portion of the longer tube is due to successive depositions of the calcareous filling.
Hudson River group. *Richmond, Indiana.*

Fig. 43. A broken tube attached to a valve of *Streptrohynchus plano-convexus*, showing the annulations on the inner surface of the wall, which give an apparent septate character to the tube.
Hudson River group. *Cincinnati, Ohio.*

CORNULITES IMMATURUS.

Page 18.

Fig. 40. Tubes in a very early serpuloid stage of development, similar to that represented in figs. 2 and 4, attached to the surface of *Orthoceras.*
Utica slate. *Holland Patent, Oneida county.*

CORNULITES FLEXUOSUS.

Page 18.

Fig. 41. The original specimen of *Tentaculites? flexuosus*, Hall. exhibiting a diffusely radiating mode of growth, the character of the tubes being similar to that represented in figures 9, 10 and 11, the tubes being more slender and proportionally more elongate. The individuals are attached to a valve of *Strophomena alternata.* Enlarged to two diameters.
Trenton limestone. *Lowville, Lewis county.*

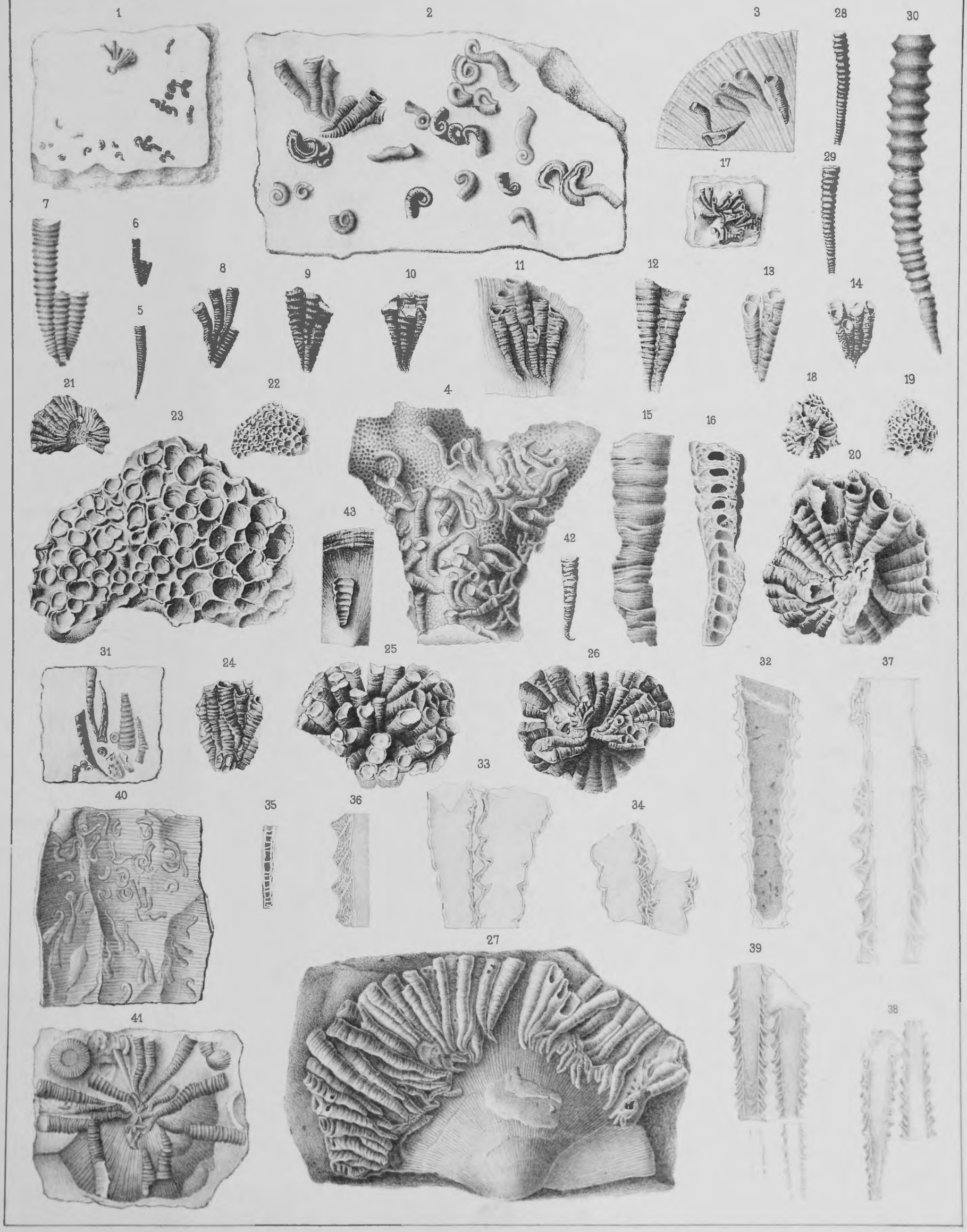
Fig. 42. A single tube of this form, enlarged to two diameters and retaining the embryonal tip.
Trenton limestone. *Lowville, Lewis county.*

TRENTON & HUDSON RIVER GROUPS.

Supplementary to the Pteropoda

Palæontology of N.Y.Vol.V.Pt.II

Plate C XV.



G.B.Simpson del.

Phil.Ast lith.

PLATE CXVI.

CORNULITES PROPRIUS. Hall.

Page 19.

Fig. 1. A single young individual attached to the shell of *Strophostylus cyclostomus*. The transverse annulations are very conspicuous, but the longitudinal striæ are scarcely developed.

Fig. 2. A group of three individuals in the same stage of development, attached to the shell of *Platyostoma Niagarense*.

Fig. 3. A group of young individuals attached to a gastropod shell and exhibiting an irregularly circular arrangement in their mode of growth.

Fig. 4. A young individual attached for its entire length to a branch of *Trematopora*.

Fig. 5. A later stage of growth, in which the transverse annulations are less regular and the longitudinal striæ distinctly visible. This tube is attached to a fragment of *Lichenalia*, and retains its incurved apical portion.

Fig. 6. A specimen in a similar stage of growth, also retaining the apical portion of the tube.

Fig. 7. A somewhat crushed individual attached to the shell of *Rhynchonella Stricklandi*.

Fig. 8. Two large tubes attached by their apices to a shell of *Platystoma Niagarense*, leaving the body of the tube nearly free. In this stage of development the annulations are obsolescent and less regular, and the longitudinal striæ conspicuous. The terminal portion of left tube is restored in the drawing.

Fig. 9. A somewhat larger individual attached to the calyx of *Eucalyptocrinus crassus*. The attached portion of the tube is flattened and united by nearly its entire width to the crinoidal plates. The annulations are obsolete.

Fig. 10. A very large individual, showing the characters of the fully developed form, in which the annulations have become very irregular and obsolescent, and the longitudinal striæ correspondingly prominent.

Fig. 11. A somewhat crushed specimen, showing very irregular growth, a strongly striated surface, and the repair of injuries received during the life of the animal.

Fig. 12. Another specimen, showing similar characters.

Fig. 13. An enlargement of the surface of the last specimen, showing the character of the longitudinal striæ and the abrupt change at one of the concentric ridges.

Fig. 14. An enlarged longitudinal section of a young tube, in which the annulations are well developed; showing the thickness of the vesicular wall.

Fig. 15. A longitudinal section of a larger individual, natural size, showing the thickness of the vesicular wall and the annular ridges of the internal surface.

Fig. 16. A longitudinal section of a large tube, in which the vesicular wall is quite thin, and the inner surface strongly annulated.

Fig. 17. A longitudinal section of a large tube, the vesicular walls of which are very thick.

Fig. 18. An enlargement of a portion of the left wall, represented in fig. 17, showing more distinctly the vesicular structure of the walls and the formation of a layer of vesicular tissue over the annulations of the internal surface.

Fig. 19. A transverse section of a tube, natural size, showing the thickness of the walls. On the upper margin, and on the right hand lower margin are intervals where the cellular tissue has not been developed.

Fig. 20. A similar transverse section, enlarged.

Fig. 21. A still greater enlargement from the same specimen.

[The specimens illustrated in the preceding figures 1–21 are all from the Niagara group. *Waldron, Indiana.*

CORNULITES CLINTONI. Hall.

Page 18.

Fig. 22. An internal cast of a tube, showing impressions of the strong annulations upon the inner surface. Clinton group. *Near Lockport, Niagara county.*

PLATE CXVI—Continued.

CORNULITES DISTANS. Hall.

Page 18.

Fig. 23. An enlarged individual, showing the slightly flexuous form of the tube, and the distant, regular annulations.

Clinton group. *Rochester, Monroe county.*

CORNULITES, sp. ?

Page 19.

Fig. 24. A portion of an individual enlarged, doubtfully referred to this species, showing the strong annulations and the smooth interspaces.

Fig. 25. Lateral view of the same specimen, showing that the tube is narrower in one diameter than in the other.

Clinton group. *Near Lockport, Niagara county.*

CORNULITES CHRYSALIS, n. sp.

Page 20.

Fig. 26. An individual enlarged, in which the annulations are very regular and present the appearance of a series of closely set, inverted and ensheathed cones.

Lower Helderberg group. *Locality doubtful.*

Fig. 27. A much enlarged example, showing more distinctly the features exhibited in preceding figure.

Lower Helderberg group. *Locality doubtful.*

Fig. 28. A very small tube, enlarged to ten diameters, attached for its entire length to a branch of *Tremapora regularis*. The form is slightly flexuous and the annulations nearly obsolete.

Lower Helderberg group. *Near Clarksville, Albany county.*

CORNULITES CINGULATUS, n. sp.

Page 20.

Fig. 29. A small flexuous tube, enlarged, showing the unequally distant annulations which are sharply angled toward the aperture but evenly rounded toward the apex.

Lower Helderberg group. *Locality doubtful.*

CORNULITES TRIBULIS, n. sp.

Page 20.

Fig. 30. Two individuals of this species, growing in an adnascent condition, enlarged to three diameters, showing the low irregular annulations and the fine longitudinal striæ.

Hamilton group. *Hopewell, Ontario county.*

CORNULITES INCURVUS.

Page 18.

See Plate 115, fig. 31.

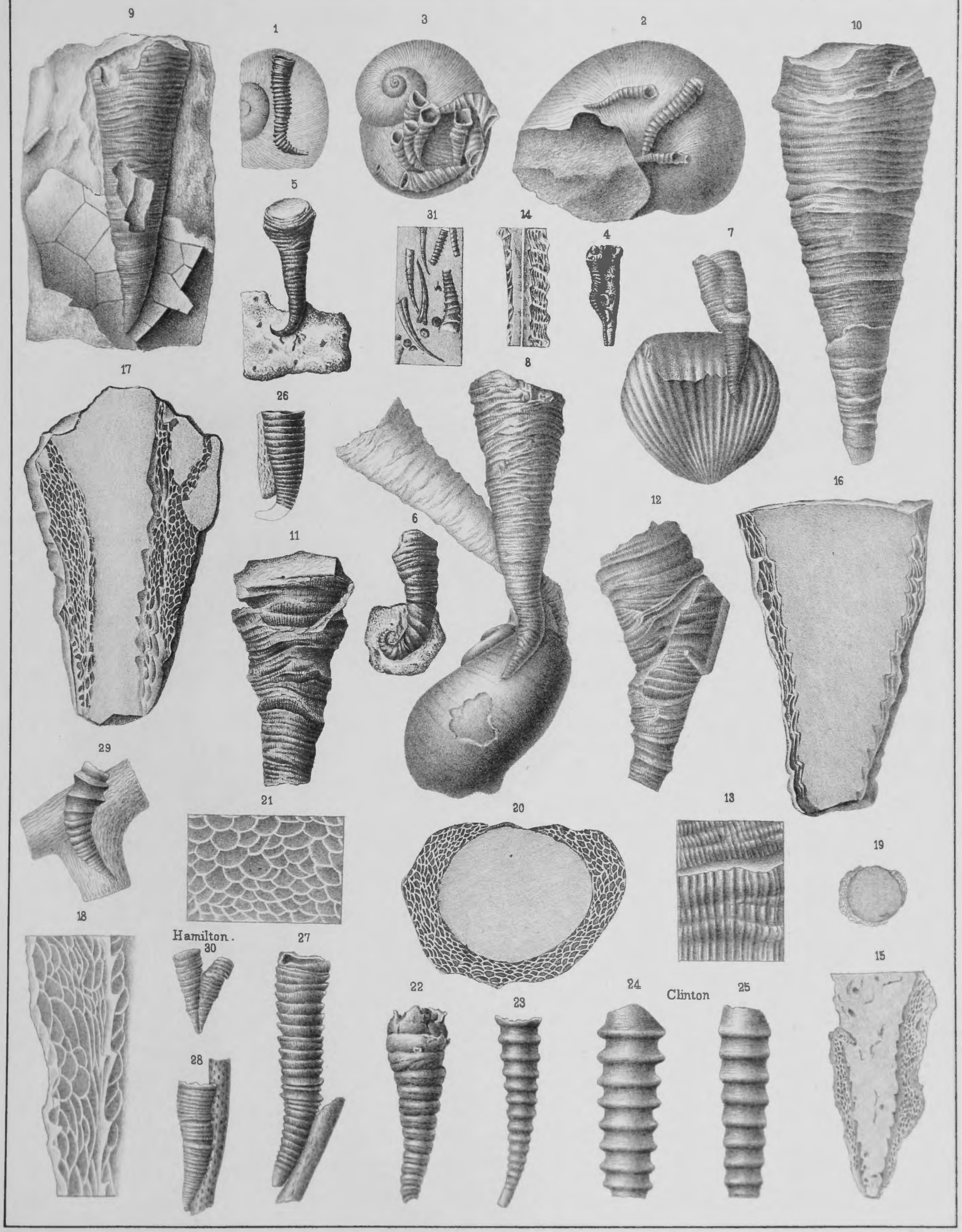
Fig. 31. A fragment of rock, showing several tubes of this species, natural size.

NIAGARA & LOWER HELDERBERG GROUPS.

[Supplementary to the Pteropoda]

Palæontology of N.Y., Vol.V, Pt.II. Supplement.

Plate CXVI.



GB Simpson del.

PhilAst lith.

PLATE CXVI A.

CORNULITES SERPULARIUS.

Page 21.

Fig. 1. (= f. 5, Sow., *loc. cit.*)* A [Brachiopod (Athyris?) having two young individuals of the fossil attached to its surface throughout their entire length.

Fig. 2. (= f. 5a, Sow., *loc. cit.*) A group of three individuals in the young state, attached for their entire length to the shell of a Brachiopod?

Fig. 3. (= f. 6, Sow., *loc. cit.*) A group of two adnascent individuals in an advanced stage of growth, showing them to be composed of successive rings, as described in the text. The surface has been cut or worn so as to expose the interior cavity.

Fig. 4. (= f. 7, Sow., *loc. cit.*) The distal or free portion of a tube, the upper portion of which is distinctly striated, while the test has been partially removed, showing the interior rings or cups; the cast of the interior.

Fig. 5. (f. = 8, Sow., *loc. cit.*) A more mature example, preserving the curved initial extremity. The test has been partially removed by weathering or maceration.

Fig. 6. (f. = [8], Sow., *loc. cit.*) A larger individual, in a similar condition to the preceding, wanting the the initial extremity.

Fig. 7. (f. = 8, Sow., *loc. cit.*) A longitudinal section of a tube, showing, on the inner side, the projecting edges of the successive rings, and the incipient and developed tissue of the walls.

Fig. 8. (f. = 9, Sow., *loc. cit.*) A portion of a mature tube partially exfoliated, showing the vesicular structure on the right side, with the external striated test upon the upper left-hand side.

CORNULITES ARCUATUS.

Page 19.

Fig. 9. *Cornulites arcuatus*, Conrad. Jour. Acad. Nat. Sci., vol. viii, p. 276, [pl. xvii, fig. 8. 1842. (A copy of Mr. Conrad's figure.)

Near Albion (Wayne county, in error), N. Y.

From the Niagara limestone.

CORNULITES CLINTONI.

Page 18.

Corrected from *C. flexuosus* (Pal. N. Y., vol. ii, p. 98) in Twenty-eighth Rept. N. Y. State Mus. Nat. Hist., p. 184. 1879.

Fig. 10. (Fig. 12a, vol. ii, *loc. cit.*) A mature example, preserving the initial point, and the test, which has been somewhat macerated.

Fig. 11. (Fig. 12c, vol. ii, *loc. cit.*) A cast of the interior of a large individual, where the initial point is wanting.

CORNULITES BELLASTRIATUS, n. sp.

Page 20.

Cornulites ———, Pal. N. Y., vol. ii, p. 353, pl. lxxxv, figs. 15 and 16.

Fig. 12. An adult specimen, imperfect toward the base, preserving the test and showing the transverse and longitudinal striæ with obsolescent annulations.

Fig. 13. An adult, nearly entire individual, preserving the striated test with distinct annulations. The specimen is compressed toward the outer extremity.

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* The figures are reversed from the position given by Mr. Sowerby, in order to have them conform to the illustrations on plates cxv and cxvi, and in accordance with their natural position or mode of growth from the narrow apex to the aperture.

PLATE CXVI A—Continued.

CORNULITES MAJOR, Barrande.

Fig. 14. An individual imbedded or adhering to some foreign body for its entire length.
The several figures under other names given by Barrande may be immature stages of the same species.

The following illustrations are given by Mr. Nicholson, in his paper on "ORTONIA, a New Genus of Fossil Tubicolar Annelides," etc. Geol. Mag., vol. ix, p. 447. 1872:

ORTONIA CONICA.

Page 23.

Fig. 15. (Fig. 1—A.) Tubes of *Ortonia conica*, Nich., growing upon the valve of *Strophomena alternata*, natural size.

Fig. 16. (Fig. B.) A single tube of the same, enlarged.

The following illustrations are given by Mr. Nicholson, in his "Description of Two New Species of Fossil Tubicolar Annelides." Geol. Mag., vol. x, pp. 54–57, pl. iv, figs. 2, 3. 1873:

CONCHICOLITES CORRUGATUS.

Page 23.

Fig. 17. (Fig. 2 a,*) [= fig. 3 on plate]. "A group of the tubes of *Conchicolites corrugatus*, growing upon *Pleurotomaria bilix*, natural size."

Fig. 18. (— b,) [= fig. 3a of plate]. "A single tube of the same, enlarged."

ORTONIA MINOR.

Page 24.

Fig. 19. (Fig. 3—a,) [= 2a of plate]. "Tubes of *Ortonia minor*, Nich., growing upon a *Strophomena*, natural size."

Fig. 20. (—b,) [= 2a on plate]. "One of the tubes, enlarged."

* The references to figures of plate iv, Geol. Mag., p. 57, are reversed in the explanation.

HUDSON RIVER CLINTON NIAGARA

WENLOCK.

Supplementary to the Pteropoda

Palæontology of N.Y., Vol.V. Pt.II. Supplement. Plate CXVIA.

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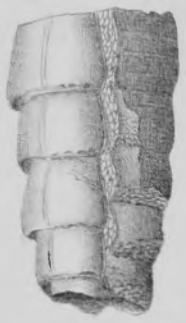

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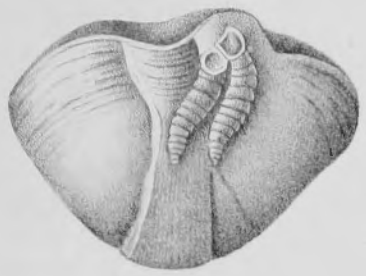

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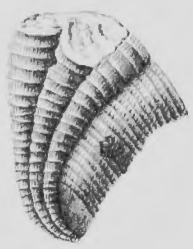

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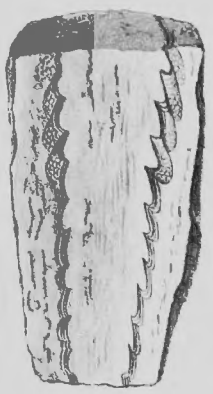

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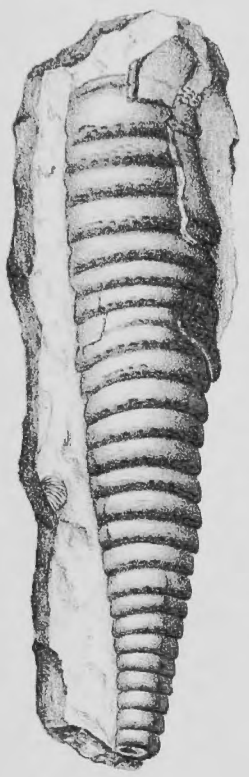

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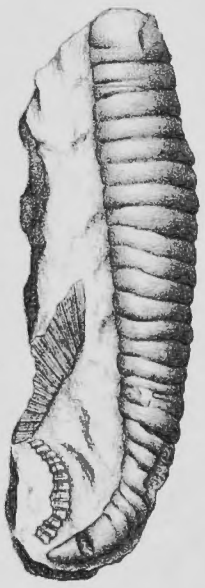

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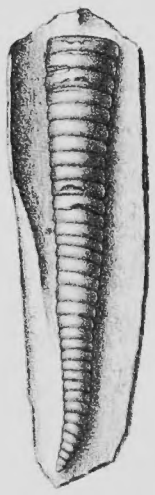

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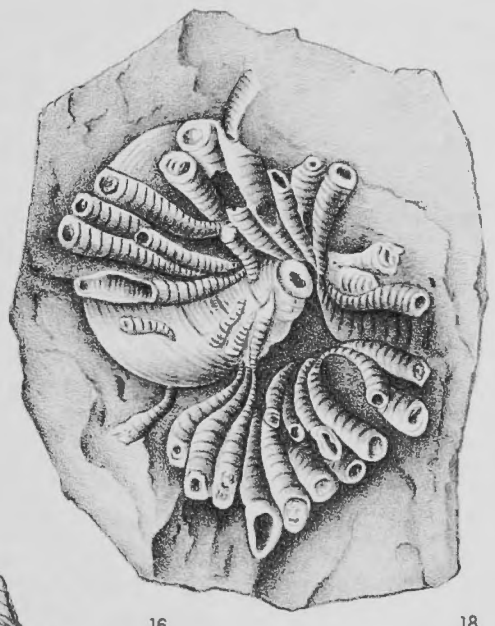

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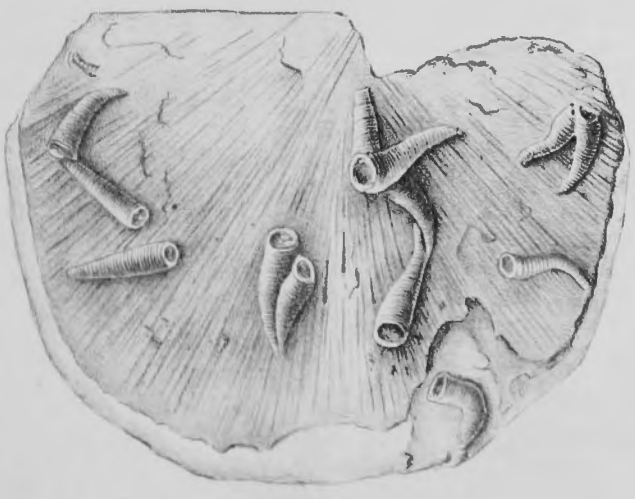

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E.Emmons del.

Phil.Ast lith.

PLATE CXVII.

ORTHOCERAS DURAMEN.

Page 25.

Fig. 1. A septate fragment, showing the rapid enlargement of the tube, and the depth of the air-chambers.
Schoharie grit. *Clarksville, N. Y.*

ORTHOCERAS SCEPTRUM.

Page 26.

Fig. 2. An individual preserving a large portion of the chamber of habitation and about thirty air-chambers. The specimen is an internal mould and shows an organic deposit in the air-chambers toward the apex where the walls have been dissolved. The organic deposit is represented by concavities in the filling of the air-chambers and increases in amount toward the apex. The marked curvature of the tube is apparently normal and not the result of compression.
Upper Helderberg limestone. *Cherry Valley, N. Y.*

TROCHOCERAS (GONIOCERAS?) PANDUM.

Page 37.

Fig. 3. A specimen preserving ten air-chambers, showing four very shallow chambers at the larger extremity and probably close to the chamber of habitation.

Fig. 4. *Id.* Section showing the lentiform transverse section of the tube.

Fig. 5. The apical portion of an individual, showing the enlargement of the tube and the shallow air-chambers toward the apex, as mentioned in the description of the species.
Schoharie grit. *Albany county, N. Y.*

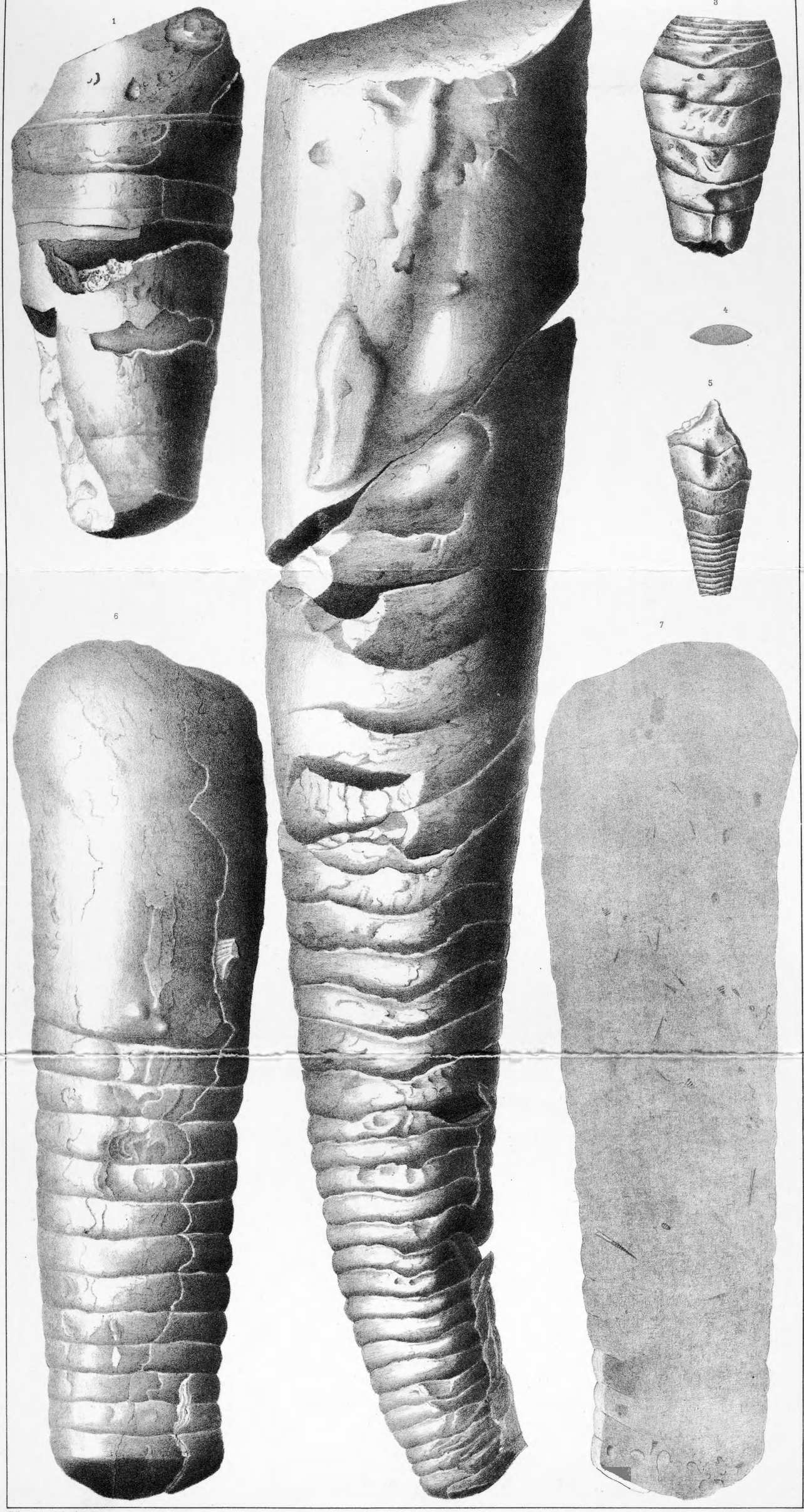
ORTHOCERAS DIRECTUM.

Page 27.

Fig. 6. An example preserving a large part of the chamber of habitation with twelve attached air-chambers. The suture lines are deeply impressed from weathering and the solution of the septal margins.

Fig. 7. *Id.* Longitudinal sections, showing the septa to have been broken down and obliterated on the interior of the tube, notwithstanding the marked indications of septa shown on the exterior of the specimen.
Corniferous limestone. *Delaware, Delaware county. O.*

UPPER HELDERBERG GROUP.



E.Emmons, del. et lith.

PLATE CXVIII.

ORTHOCERAS RUDENS.

Page 28.

Fig. 1. A portion of the chamber of habitation, showing the numerous regular annulations of the tube and the longitudinal striæ of the test.

Hamilton group? *Livingston county, N. Y.*

ORTHOCERAS EXPOSITUM.

Page 29.

Fig. 2. An imperfect individual preserving the greater part of the chambered portion of the tube, and portion of the chamber of habitation.

Iron ore bed of the Chemung group. *Canton, Bradford county, Pennsylvania.*

ORTHOCERAS CONSORTALE.

Page 29.

Fig. 3. The air-chambers and lower portion of the chamber of habitation, showing the enlargement of the tube and the depth of the air-chambers. Some traces of the surface markings are preserved on different parts of the tube.

Fig. 4. *Id.* A natural longitudinal section of five air-chambers, showing the moniliform siphuncle and the rays on the upper bead at its contract with the septum.

Fig. 5. *Id.* A septum showing the position of the siphuncle, and exhibiting the effects of a slight compression of the tube.

Chemung group. *Near Panama, Chautauqua county, N. Y.*

ORTHOCERAS INDIANENSIS.

Page 30.

Fig. 6. A longitudinal section of three air-chambers, showing the small passage made by the siphuncle through the septa, and the reflection of the margin indicating a moniliform siphuncle.

Fig. 7. A fragment showing the enlargement of the tube, and depth of the air-chambers.

Fig. 8. The chamber of habitation showing its extent, and a broad constriction near the aperture.

Fig. 9. *Id.* The last septum showing the position of the siphuncle.

Fig. 10. A fragment showing the characters of the organic deposit on the walls of the air-chambers and septa.

Goniatite limestone. *Rockford, Indiana.*

ORTHOCERAS ICARUS.

Page 31.

Fig. 11. The chamber of habitation with four attached air-chambers, showing the form of the tube and the depth of the chambers.

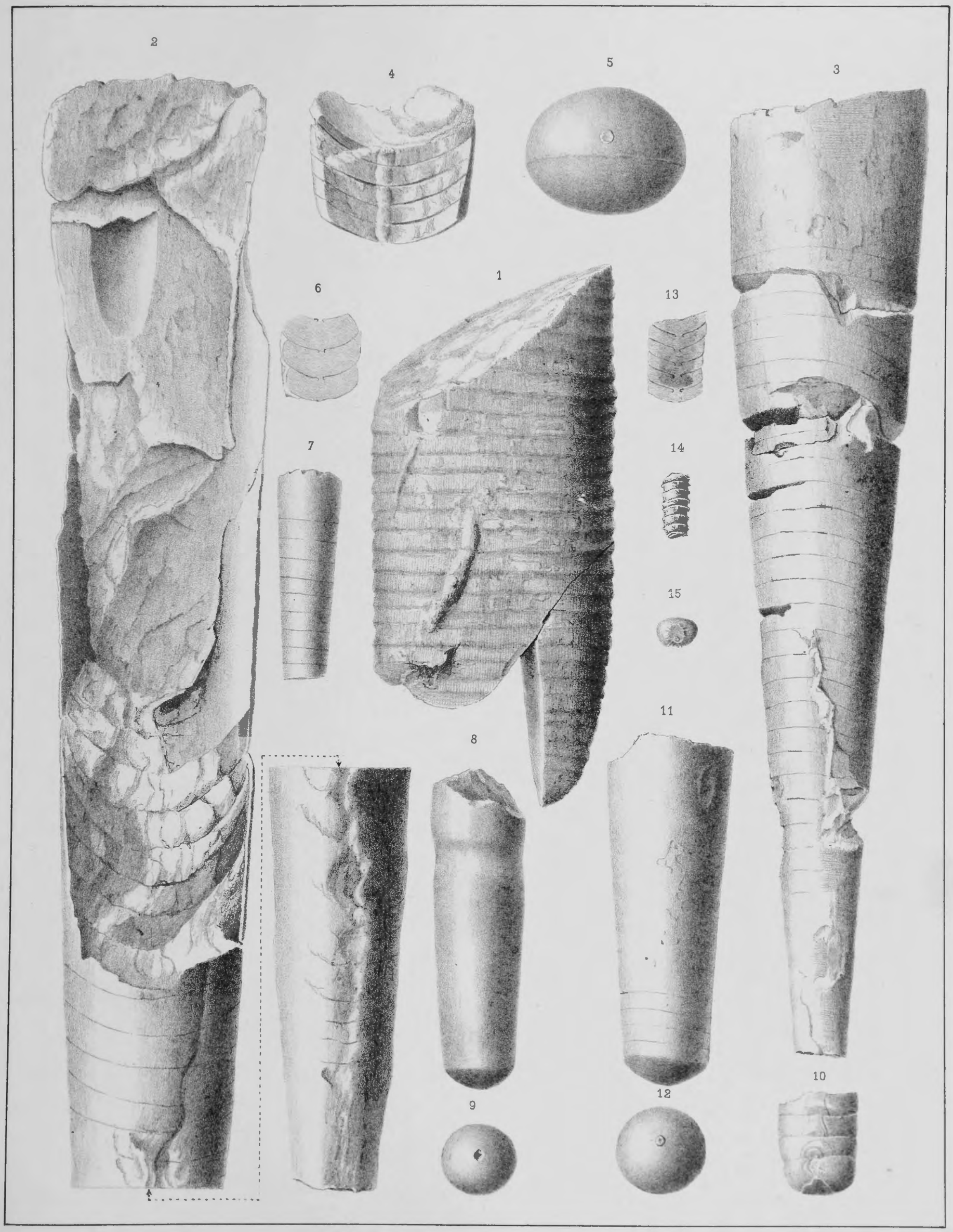
Fig. 12. *Id.* Septum showing the position of the siphuncle, and the circular transverse section of the tube.

Fig. 13. Longitudinal section of a chambered fragment showing the passage for the siphuncle through the septa.

Fig. 14. An enlargement to two diameters of the internal mould of a small imperfect specimen, to show the concave walls of the air-chambers from the solution of an organic deposit, and a line of nodes indicating the ventral side of the tube.

Fig. 15. A septum of another individual enlarged two diameters, showing an elevated areola with a furrowed margin surrounding the siphuncle, produced by the solution of the organic deposit on the septum.

Goniatite limestone. *Rockford, Indiana.*



E Emmons del et lith.

PLATE CXIX.

GOMPHOCERAS MITRA.

Page 32.

An internal mould of a large nearly entire individual, showing the essential features of the species. The figure is a dorsal view of the specimen and shows the broad flat margin of the large aperture.

Corniferous limestone. *Lexington, Scott county, Indiana.*

E. Emmons del. et lith.

PLATE CXX.

GOMPHOCERAS EXIMIUM.

Page 32.

See Plate 121.

Fig. 1. An outline representing the size and form of a large individual, showing the point of greatest gibbosity and the frequency of the septa.

Fig. 2. Longitudinal section of a fragment showing the nummuloid siphuncle and the septa. Many of the septa have been removed by the process of maceration before being imbedded, and the course of the siphuncle toward the apex is indicated by a discoloration of the filling of the air-chambers. In the upper portion of the siphuncle, at the extremities of the cusps where the tube penetrates the septa, are seen several indications of an organic deposit, or a thickening of the walls of the siphuncle.

Fig. 3. *Id.* The end of the siphuncle showing the radiate appearance of the deposit mentioned under the preceding figure.

Upper Helderberg limestone. *Columbus, Ohio.*

GOMPHOCERAS IMPAR.

Page 32.

See Plate 121 A.

Fig. 4. View of the specimen described, preserving the chamber of habitation and a portion of seventeen air-chambers. The tube shows three constrictions or undulations which apparently represent a normal condition of growth.

Upper Helderberg limestone. *Columbus, Ohio.*

GOMPHOCERAS NASUTUM.

Page 34.

See Plate 121.

Fig. 5. Ventral view, showing the form of the chamber of habitation, and the sinus and reflection of the margin, forming the small aperture. Traces of the crenulated zone are shown at the base of the grand chamber where the tube suddenly contracts forming a shoulder at its junction with the septate portion.

Fig. 6. *Id.* View of the aperture, showing its broad elliptical form and the sinus in the margin corresponding to the ventral or small aperture.

Fig. 7. *Id.* Transverse section representing the position and size of the siphuncle.

Chemung group. *Belmont, Allegany county, N. Y.*

Palæontology of N.Y., Vol V, Pt II Supplement

Plate CXX.

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E.Emmons del et lith.

PLATE CXXI.

GOMPHOCERAS EXIMIUM.

Page 32.

See Plate 120.

Fig. 1. Ventral view of a medium sized specimen, retaining the test over the whole exterior of the tube, and showing the form of the shell and the broad gentle sinus in the lines of growth, indicating the position of the siphuncle.

Corniferous limestone. *Columbus, Ohio.*

Fig. 2. A fragment of the septate portion, in which the siphuncle has been partially uncovered by the removal of a portion of the filling of the air-chambers.

GOMPHOCERAS MITRA.

Page 32.

See plate 120.

Fig. 3. A large septate fragment with the siphuncle as exposed in the process of weathering of the air-chambers, showing the moniliform character of the siphuncle, and the furrowed cinctures of its tube.

Corniferous limestone. *Columbus, Ohio.*

UPPER HELDERBERG GROUP.

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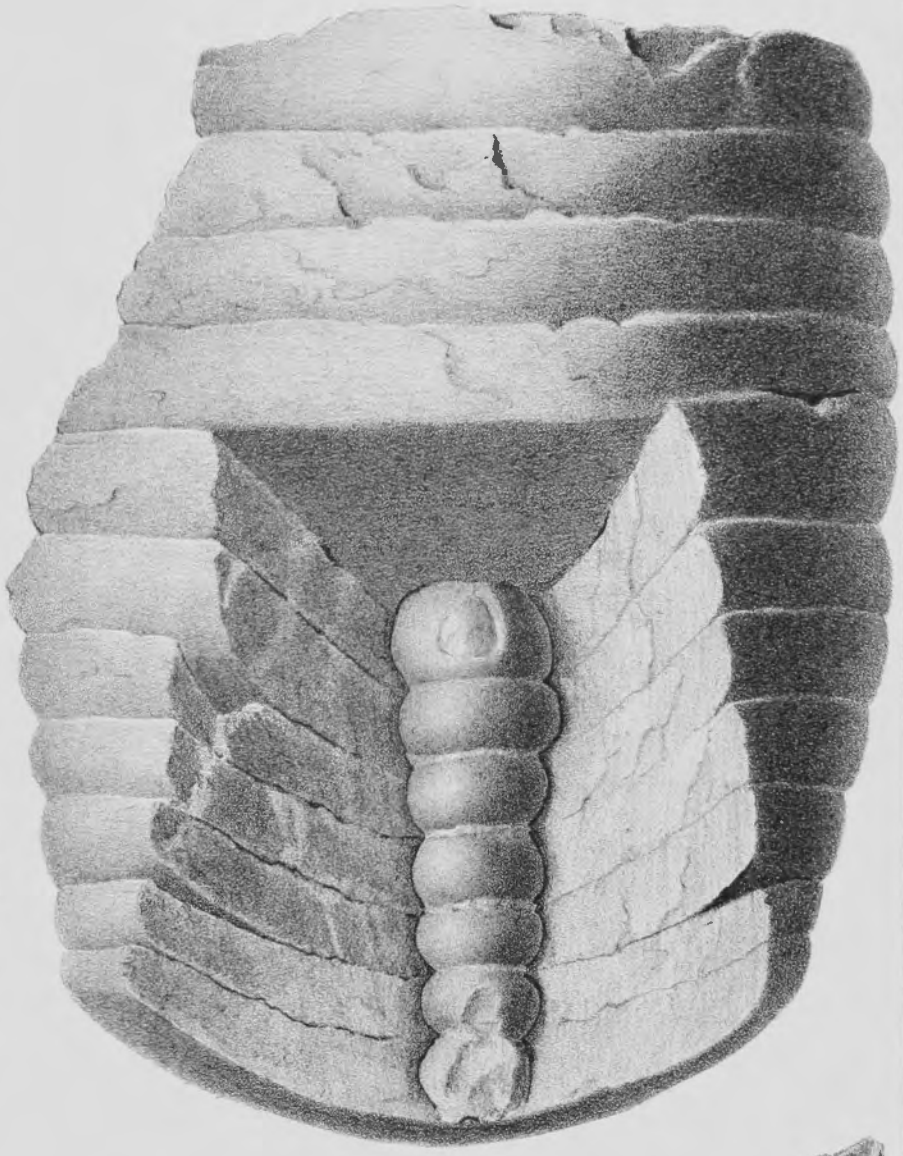

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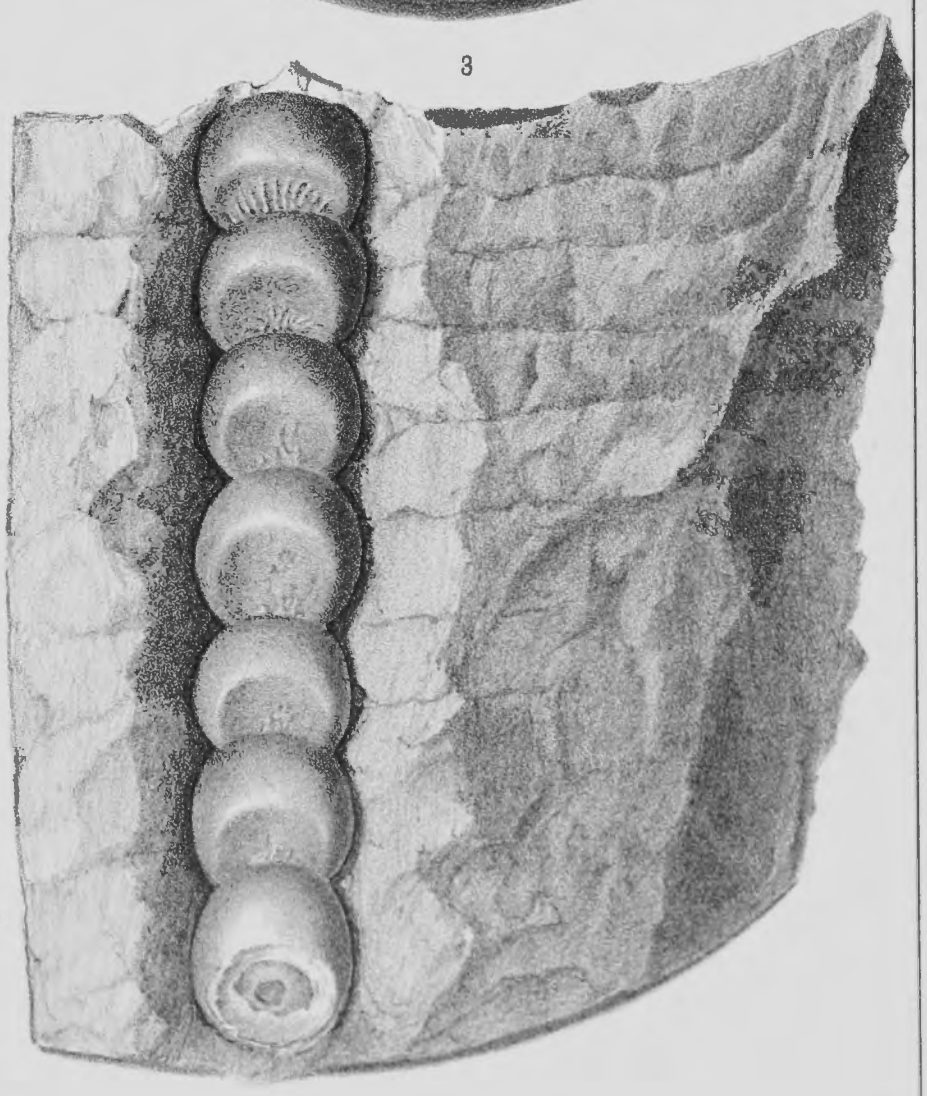


PLATE CXXI A.

GOMPHOCERAS IMPAR. Hall.

Page 32.

See Plate 120.

Fig. 1. Ventral view of an individual preserving the chamber of habitation and a large part of the septate tube, showing the characters of the siphuncle as exposed in the process of weathering. Near the grand chamber, there were several very shallow air-chambers, as indicated by the beads of the siphuncle.

Corniferous limestone. *Columbus, Ohio.*

GOMPHOCERAS CRENATUM.

Page 33.

Fig. 2. Lateral view of the fragment, showing the form of the tube, and the furrows of the crenulated band, which are continued over the walls of the air-chambers.

Corniferous limestone. *Delaware county, Ohio.*

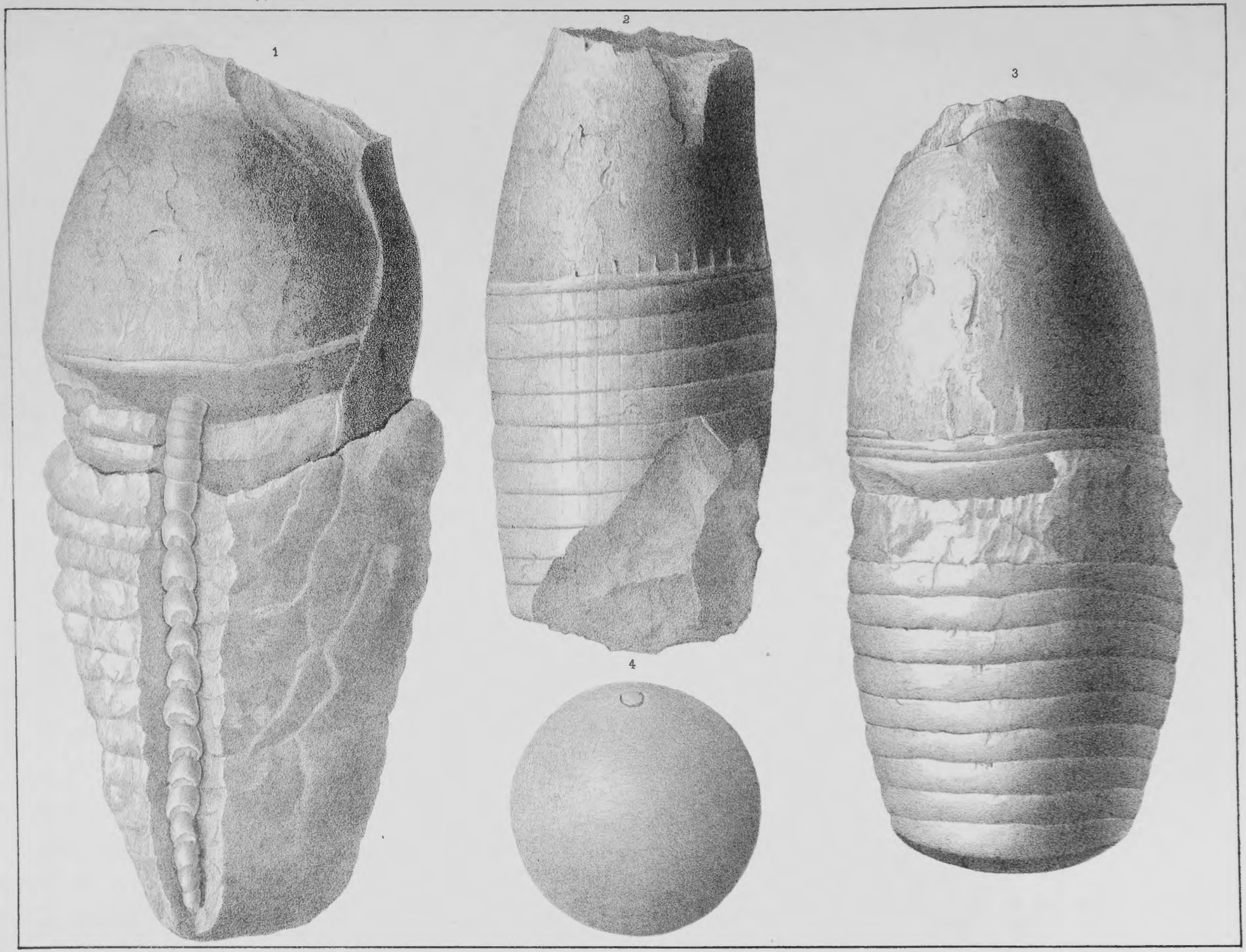
GOMPHOCERAS PLENUM.

Page 33.

Fig. 3. Lateral view of a specimen which preserves the chamber of habitation with about fifteen attached air-chambers, showing the form of the shell and depth of the air-chambers, of which there are several shallow ones near the grand chamber.

Fig. 4. *Id.* Septum showing the circular transverse section of the tube and the position of the siphuncle.

Corniferous limestone. *Columbus, Ohio.*



E.Emmons, del et lith

PLATE CXXII.

GOMPHOCERAS ABSENS.

Page 32.

Fig. 1. Septum showing the transverse section of the tube, and the position of the siphuncle.
Schoharie grit. *Schoharie, N. Y.*

Fig. 2. Septum of a larger individual than the preceding, showing a more elliptical transverse section.
Schoharie grit. *Schoharie, N. Y.*

Fig. 3. Ventral view of the chamber of habitation, showing its form and the sinus in the margin constituting the small aperture.
Corniferous limestone. *Clarence Hollow, Erie county, N. Y.*

GOMPHOCERAS MINUM.

Page 34.

Fig. 4. Dorsal view of the specimen, showing its ovoid form and small aperture. The substance of the shell has been replaced by silica, which obscures the extent of the chamber of habitation, and surface-markings.
Hamilton group. *Ohio Falls, near Louisville, Kentucky.*

GOMPHOCERAS FAX.

Page 32.

Fig. 5. A compressed specimen, preserving the chamber of habitation and about eighteen air-chambers, showing the point of greatest gibbosity and the gradual taper of the tube toward the apex.
Schoharie grit. *Schoharie, N. Y.*

GOMPHOCERAS ILLÆNUS.

Page 32.

Fig. 6. Ventral view of the chamber of habitation, showing the small aperture and the lateral extensions of the large aperture.
Schoharie grit. *Schoharie, N. Y.*

GOMPHOCERAS CAMMARUS.

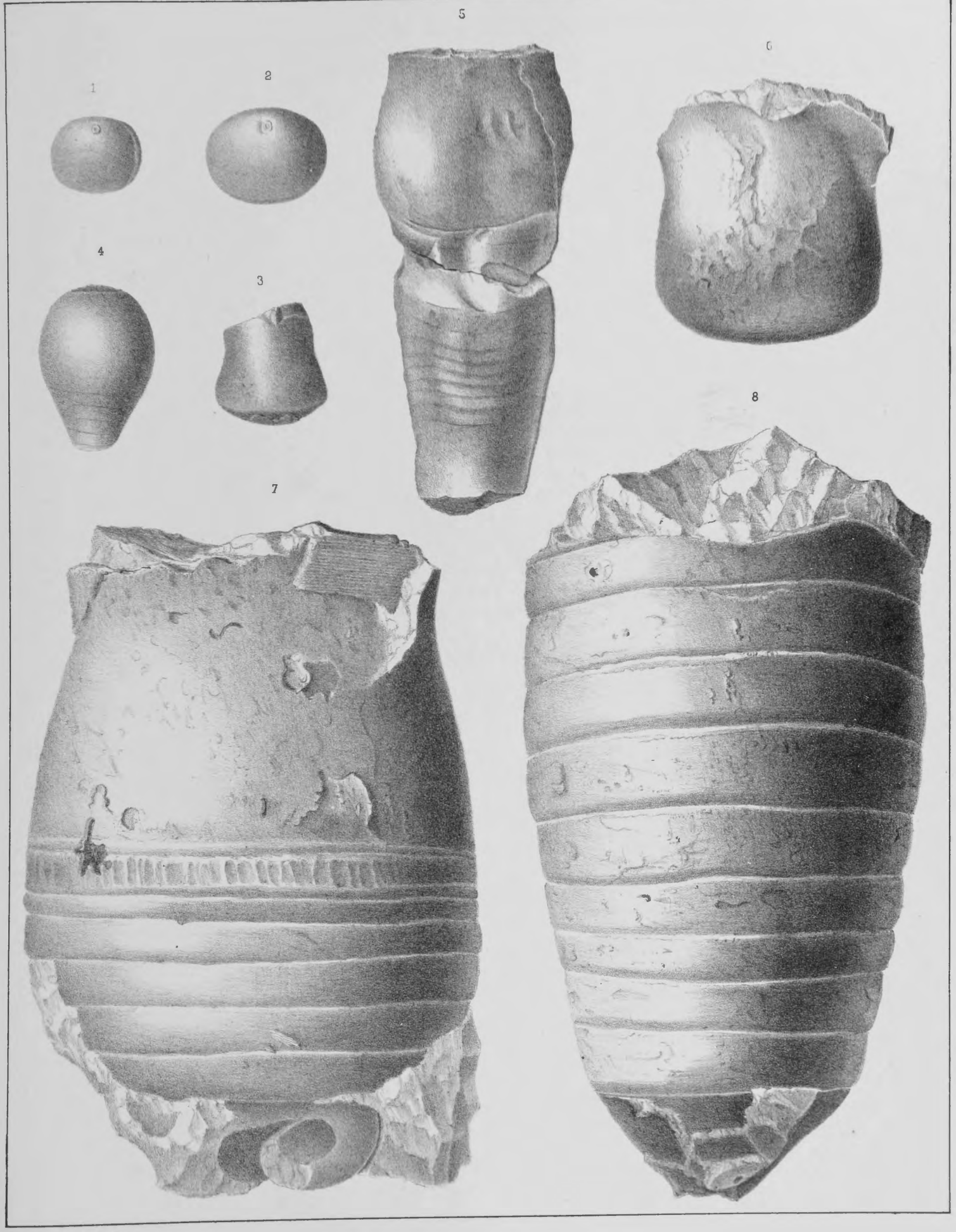
Page 32.

Fig. 7. Dorsal view of the chamber of habitation with five attached air-chambers, showing the crenulated zone, and a portion of the strong test adhering to the internal mould at the margin of the aperture.
Limestone of the age of the Hamilton group. *Lexington, Scott county, Indiana.*

GOMPHOCERAS POTENS.

Page 35.

Fig. 8. The internal mould of the septate portion of an individual, showing the form of the tube and the great depth of the air-chambers. The septum toward the apex is crushed and the true position of the siphuncle cannot be determined. Its position as it appears in the specimen is represented in the figure.
Waverly group. *Medina, Medina county, Ohio.*



E.Emmons del et lith.

PLATE CXXIII.

GOMPHOCERAS GOMPHUS.

Page 32.

Fig. 1. Lateral view, showing the air-chambers, undulations of the tube, the crenulated zone, and chamber of habitation. Some of the crenulations are seen extending over the walls of the chamber on the right side of the figure. The impression of the ventral valve of a *Crania* is preserved upon the chamber of habitation.

Corniferous limestone. *Delhi, Delaware county, Ohio.*

GOMPHOCERAS MANES.

Page 34.

Fig. 2. View of the specimen described, showing its extremely compressed condition, and the depth of the air-chambers. The surface shows several branches of polyzoa and young brachiopods which were probably attached to the shell.

Genesee slate. *South of Alden, Erie county.*

UPPER HELDERBERG GROUP.

&
Genesee slate.

Palæontology of N.Y.,Vol.V.,Pt.II Supplement.

Plate CXXIII.

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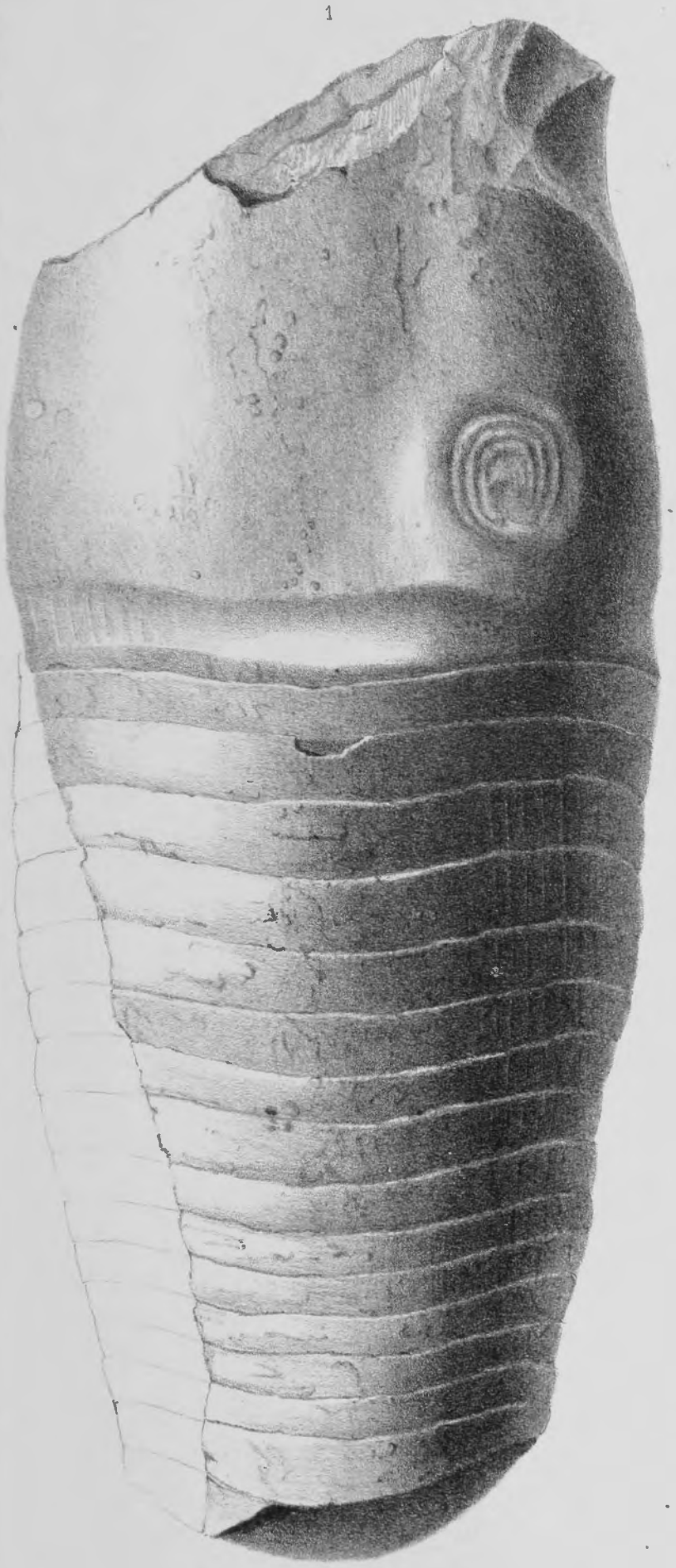

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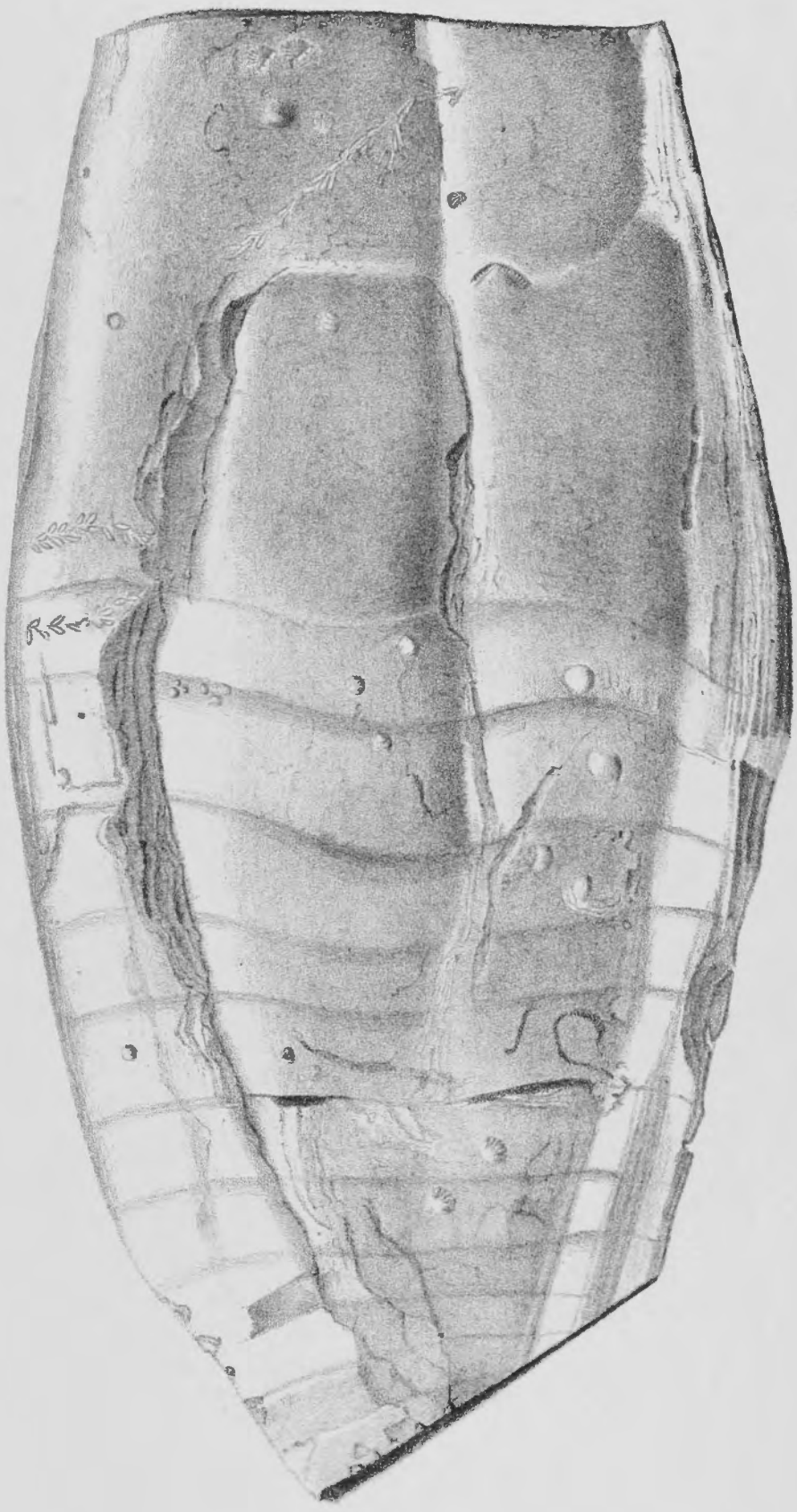

E.Emmons del.et lith.

PLATE CXXIV.

CYRTOCERAS CITUM.

Page 36.

Fig. 1. A specimen retaining the test and its ornamentation over the entire exterior of the tube.
Upper Helderberg limestone. *LeRoy, Genesee county.*

Fig. 2. The internal mould of an individual, showing the revolving furrows of the crenulations, and the transverse markings corresponding to the foliate expansions of the test.
Upper Helderberg limestone, *Falkirk, Erie county.*

Fig. 3. The retral sinus in the expansions of the test, as shown on the convex or ventral side of a specimen. This figure is taken from a gutta-percha impression of a natural mould and enlarged two diameters.
Upper Helderberg limestone. *Cayuga, Ontario, Canada.*

GYROCERAS NEREUS.

Page 36.

Fig. 4. An enlargement to two diameters, of the ornamentation of the test on the ventral side of the tube, showing a marked difference in the sinus of the ornamentation from that represented in figure 3 of this plate.
Corniferous limestone. *Cherry Valley, Otsego county.*

GYROCERAS LACINIOSUM.

Page 36.

Fig. 5. Lateral view of the specimen, showing the curvature of the tube and the transverse ridges corresponding to the ornaments of the test. The matrix preserves the characters and shows the extent of the fimbria.

Fig. 6. *Id.* Outline, showing the transverse section of the tube.
Corniferous limestone. *Cherry Valley, Otsego county.*

CYRTOCERAS JASON.

Page 36.

Fig. 7. Lateral view of the internal mould of a large individual, showing the transverse ridges and rows of nodes corresponding to the expansions and tubular spines of the test. Several of the transverse lamellæ are seen in the matrix adhering to the dorsal side of the tube.
Schoharie grit. *Clarksville, Albany county.*

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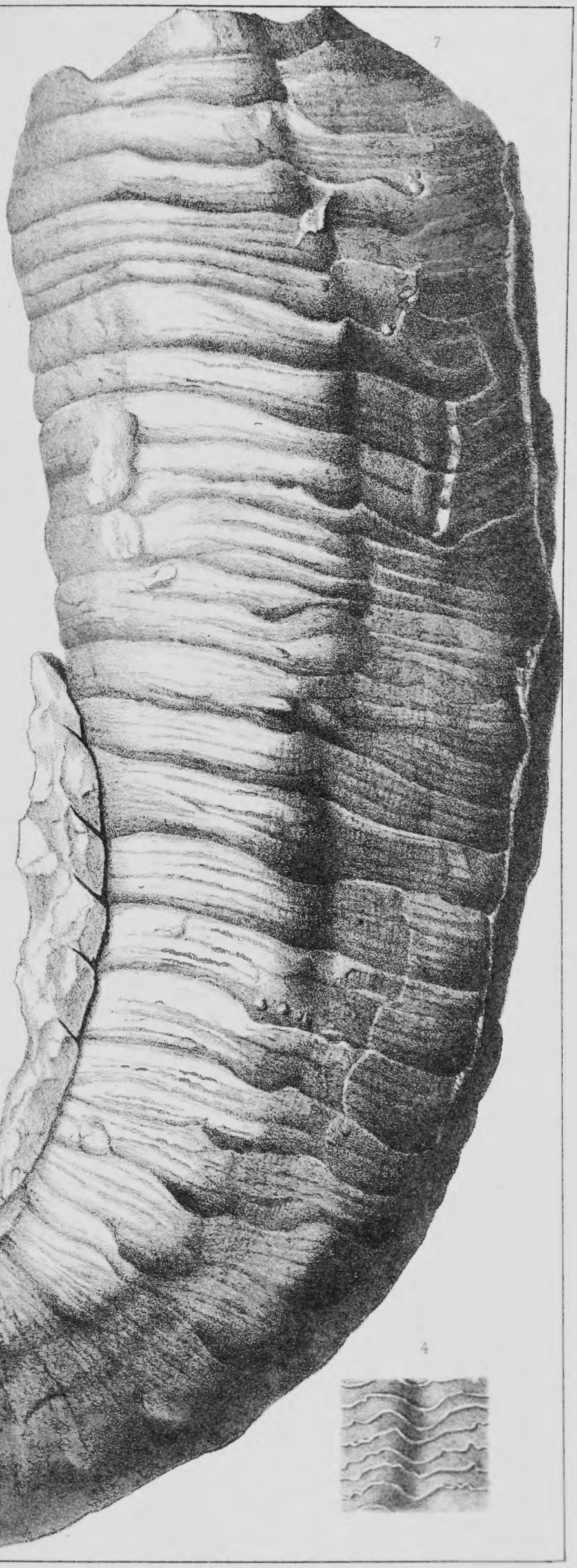

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E.Emmons del et lith.

PLATE CXXV.

NAUTILUS (DISCITES) AMMONIS.

Page 38.

Lateral view of the internal mould, showing the expanded aperture, the extent of the chamber of habitation, the depth of the air-chambers, the direction of the septa, and the large open umbilicus.

Upper Helderberg limestone. *In the drift, Ann Arbor, Michigan.*

UPPER HELDERBERG GROUP.

Palæontology of N.Y.Vol.V Pt.II Supplement. Plate CXXV.

E. Emmons del et lith.

PLATE CXXVI.

NAUTILUS HYATTI.

Page 37.

Fig. 1. Dorsal view of a plaster cast, taken from the natural mould, showing the form of the tube, and the well-preserved surface ornamentation.

Hamilton group. *Cumberland, Maryland.*

NAUTILUS ORIENS.

Page 37.

Fig. 2. Longitudinal section of the individual figured on plate 106, Pal. N. Y., vol. v, pt. ii, showing the capacity of the grand chamber, the septa, and remains of the moniliform siphuncle. The inner volution has been filled with calcite, and the septa removed, but a portion of the beaded siphuncular tube remains *in situ.*

Hamilton shales. *Richmondville, Schoharie county.*

NAUTILUS PARALLELUS.

Page 38.

Fig. 3. Ventral view of the specimen, showing the gradual enlargement of the tube and the parallel revolving ridges of the test.

Fig. 4. *Id.* Lateral view, showing the curvature of the tube, the angular periphery, and the concavity of the last septum. The parallel revolving ridges are seen to be less frequent than on the ventral side.

Fig. 5. *Id.* The last septum, as preserved in the specimen, showing the subcentral position of the siphuncle, and the lenticular transverse section of the tube. The dorsal side is more convex than the ventral, and the carinations of the lateral angles are directed upward and outward,

Coal measures ? *Ohio ?*

NAUTILUS (DISCITES) MARCELLENSIS.

Page 39.

Fig. 6. Dorsal view of a well-preserved individual, illustrating the essential features of this species. The variation in the enlargement of the dorsal, ventral and lateral sides is well contrasted. The dorso-lateral margin is continuous and slightly reflected, while the ventral angles are marked by a row of nodes. A single revolving line over the siphuncle indicates its position and that of the ventral side. Four segments of the siphuncle are exposed, showing its concave sides within the cavities of the air-chambers. A portion of the test is adhering to the ventrum, preserving the cancellate ornaments and the broad sinus of the concentric striæ over this side of the tube.

Goniatite limestone. *Manlius, Onondaga county.*

GYROCERAS STEBOS.

Page 36.

Fig. 7. Lateral view, showing the enrollment of the tube and the strong elevated nodes ornamenting the lateral angles. Traces of the transverse striæ are preserved near the aperture.

Waverly group. *Warren, Pennsylvania.*

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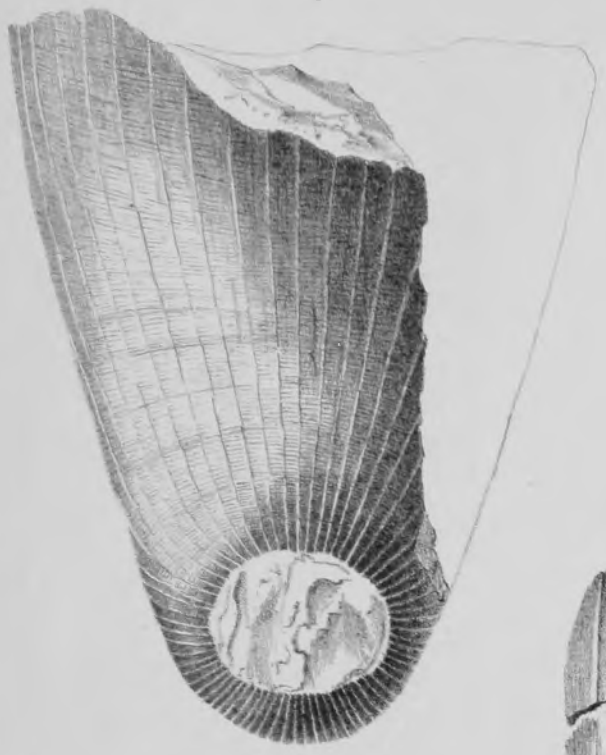

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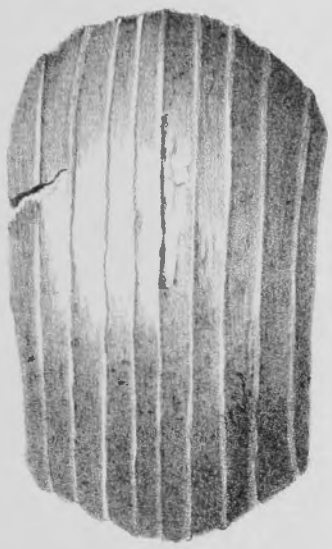

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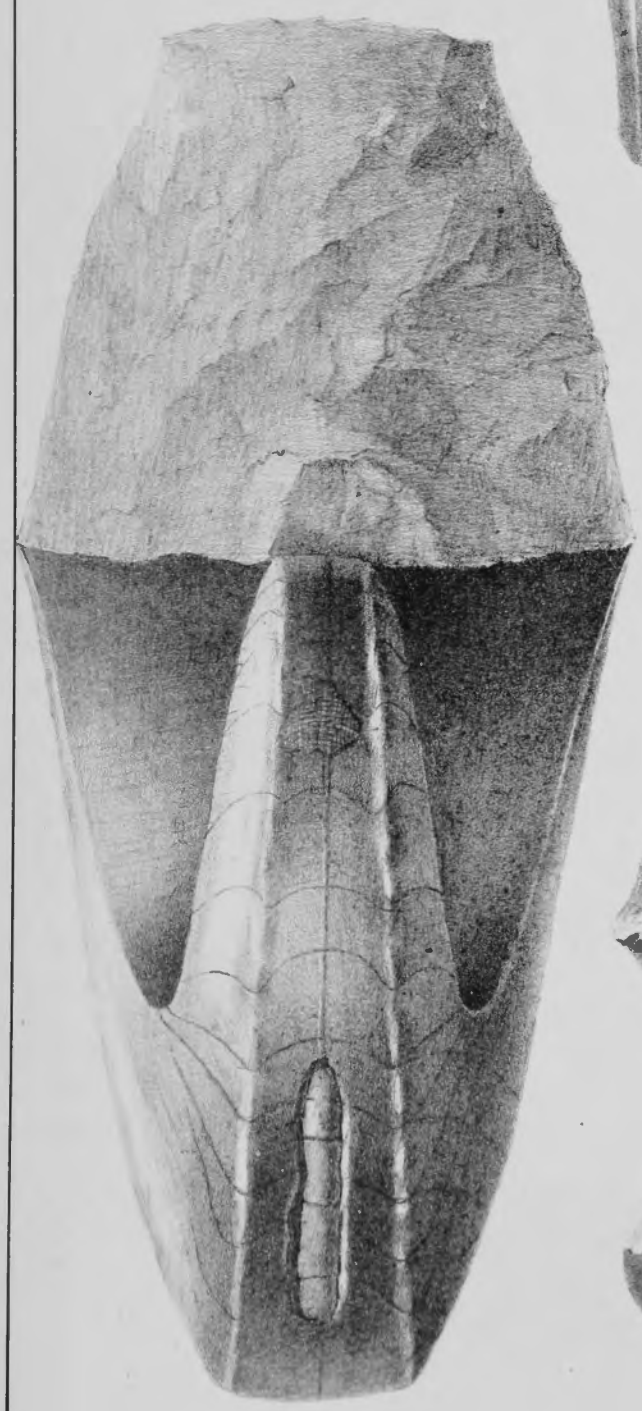

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E.Emmons del. et lith.

PLATE CXXVII.

GONIATITES AMPLEXUS.

Page 39.

Fig. 1. Lateral view, showing the chamber of habitation, comprising nearly an entire volution, the surface-markings, one of the revolving ridges on the periphery and the direction of the sutures as exhibited in the last septum.

Tully limestone. *Lodi Landing, Seneca lake.*

GONIATITES COMPLANATUS.

Page 40.

Fig. 2. An illustration, similar to fig. 8, pl. 70, Pal. N. Y., vol. v, pt. ii, to show the direction and disposition of the septal lines.

Hamilton group. *Geneseo, Livingston county.*

GONIATITES VANUXEMI.

Page 39.

Fig. 3. View of the septa of two chambers of adjacent volutions, showing the transverse section of the tube, the size of the siphuncle and the embracing of the volutions.

Goniatite limestone. *Manlius, Onondaga county.*

Fig. 4. Lateral view of a small example, showing the umbilicus and inner volutions.

Goniatite limestone.

Fig. 5. *Id.* Preserving the bulb which forms the initial extremity of the tube.

Goniatite limestone.

Fig. 6. Ventral view of a young individual, showing the double revolving ridges of the periphery and the ventral lobes of the septa. A portion of the test is preserved with the broad sinus in the striæ over the ventrum.

Goniatite limestone. *Manlius, Onondaga county.*

GONIATITES VANUXEMI, var. NODIFERUS.

Page 39.

Fig. 7. Lateral view of a specimen found in the shales of the Hamilton group, showing the surface striæ and septa, and a row of rounded nodes on the umbilical side of the lateral face.

Hamilton shales. *Cherry Valley, Otsego county.*

GONIATITES PATERSONI.

Page 40.

Fig. 8. Ventral view of a fragment, showing the ventral lobes with the line of the siphuncle, and the disposition of the septa.

Fig. 9. A septum drawn from the reverse of the end of the preceding, showing the lobes and saddles.

Portage group. *Paterson's Creek, Livingston county.*

GONIATITES UNIANGULARIS.

Page 39.

Fig. 10. An enlargement to three diameters, of a specimen showing the direction of the septal lines. The air-chambers covering the smaller part of the visible volution have been removed, leaving the inners walls of the chambers exposed, which are striated by peculiar wrinkled or interrupted lines of organic nature.

Hamilton group. *Pratt's Falls, Onondaga county.*

GONIATITES DISCOIDEUS.

Page 39.

Fig. 11. Lateral view of a specimen, showing the surface markings, the form of the aperture, and the striated filling or area around the umbilicus.

Fig. 12. *Id.* An enlargement of the umbilical area, showing more in detail the character of the concentric interrupted striæ.

Hamilton group. *Western New York.*

Palæontology of N.Y.Vol.V.Pt.II. Supplement. Plate CXXVII.

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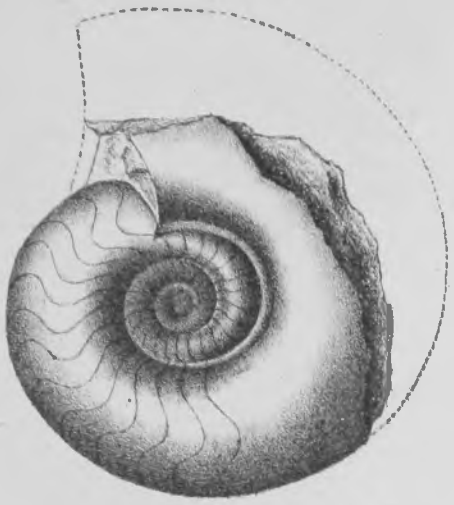

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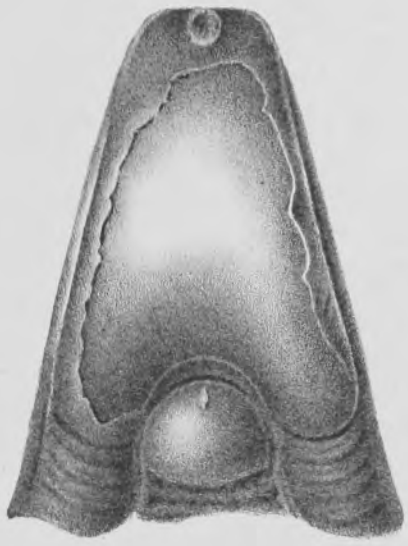

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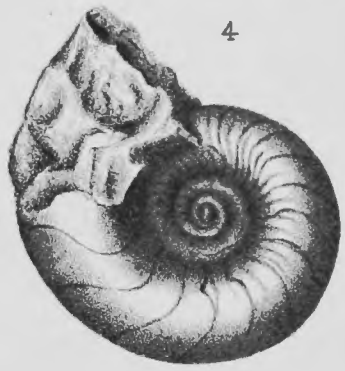

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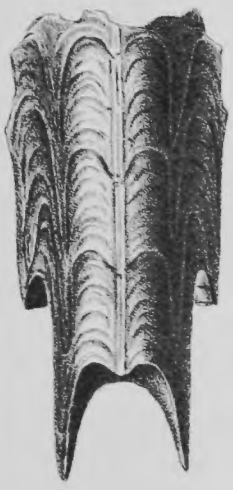

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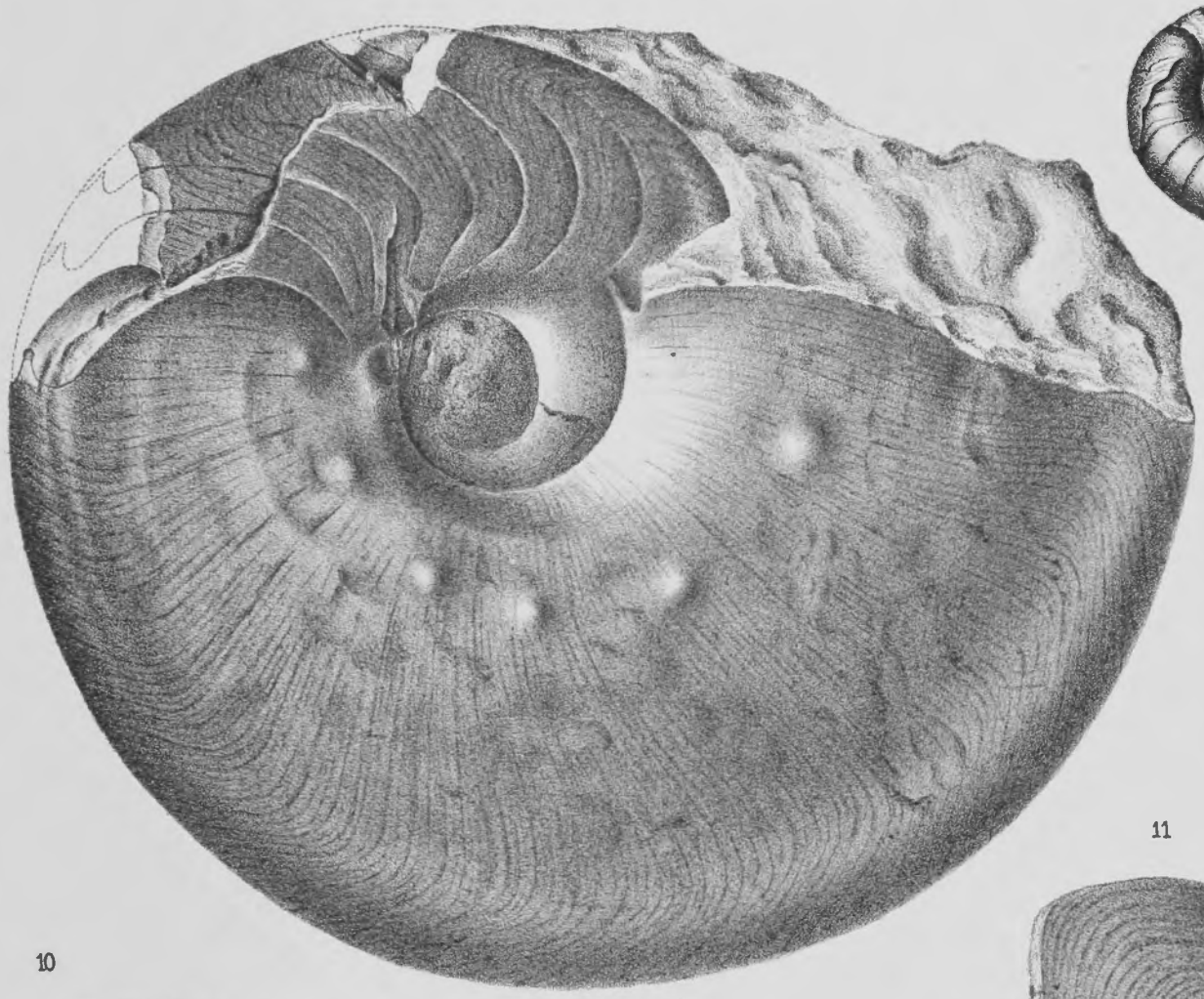

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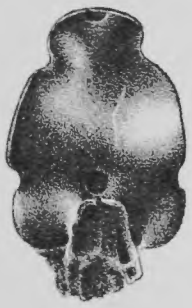

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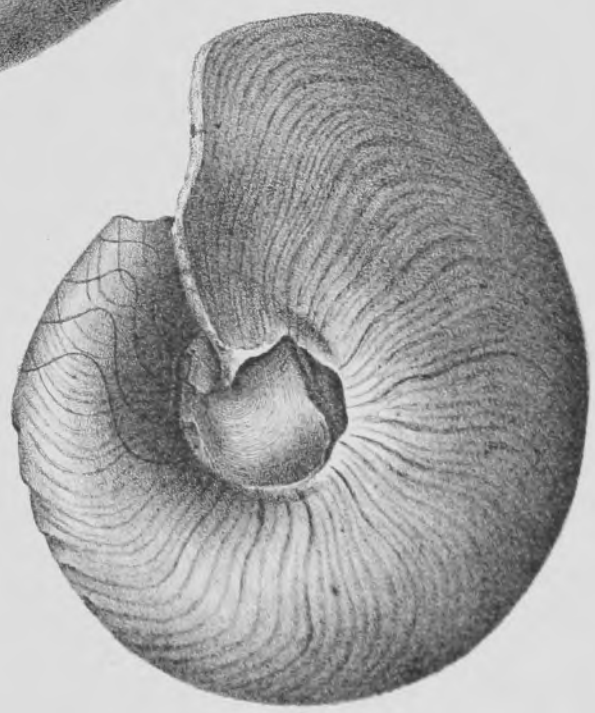

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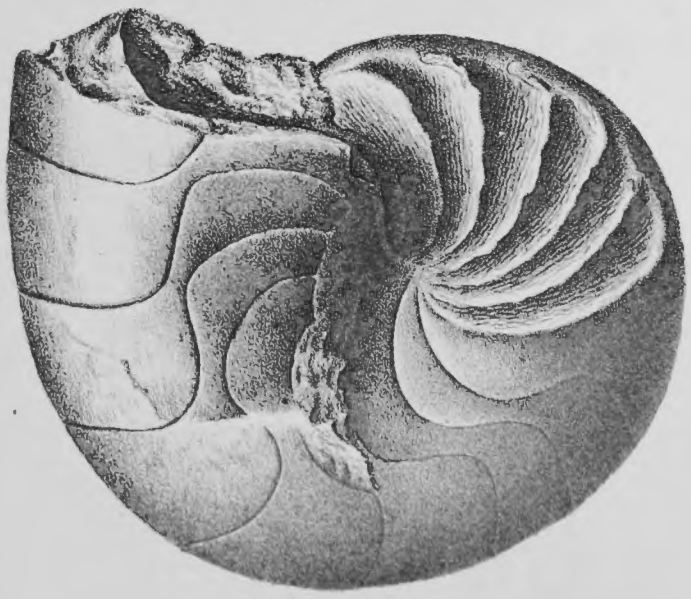

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PLATE CXXVIII.

GONIATITES SINUOSUS.

Page 40.

Fig. 1. Lateral view of a large well-preserved specimen, retaining the test and ornaments over the grand chamber, and showing the suture-lines of the septate portion.

Fig. 2. The internal mould of a portion of the outer volution of an example, showing a somewhat broader saddle in the middle of the lateral face, than the preceding. Indications of the strong lamellose lines of the ornamentation are preserved toward the periphery of the chamber of habitation.

Portage group. *Ithaca, Tompkins county.*

GONIATITES IXION.

Page 40.

Fig. 3. Longitudinal section, showing the depth of the air-chambers, and where the section is through the median line, the reflection and extension of the septa for the passage of the siphuncle is also shown.

Goniatite limestone. *Rockford, Indiana.*

GONIATITES OWENI.

Page 40.

Fig. 4. Longitudinal section of a large example similar on the exterior to fig. 7, pl. 73, Pal. N. Y., vol v, pt. ii, showing the great extent of the chamber of habitation as presented in this species.

Fig. 5. *Id.* Of a small individual, showing the septate portion to the initial extremity. The chamber of habitation appears to occupy the greater part of the outer volution as preserved.

Fig. 6. *Id.* Through the median line, showing the space between the termination of the septa and the inner wall of the shell, for the passage of the siphuncle.

Fig. 7. *Id.* Similar to the preceding, but showing the siphuncular tube indicated by a difference in the color of the material filling the air-chambers. The walls of the siphuncle as thus indicated are not calcareous, but form an organic connection between the septa.

Goniatite limestone. *Rockford, Indiana.*

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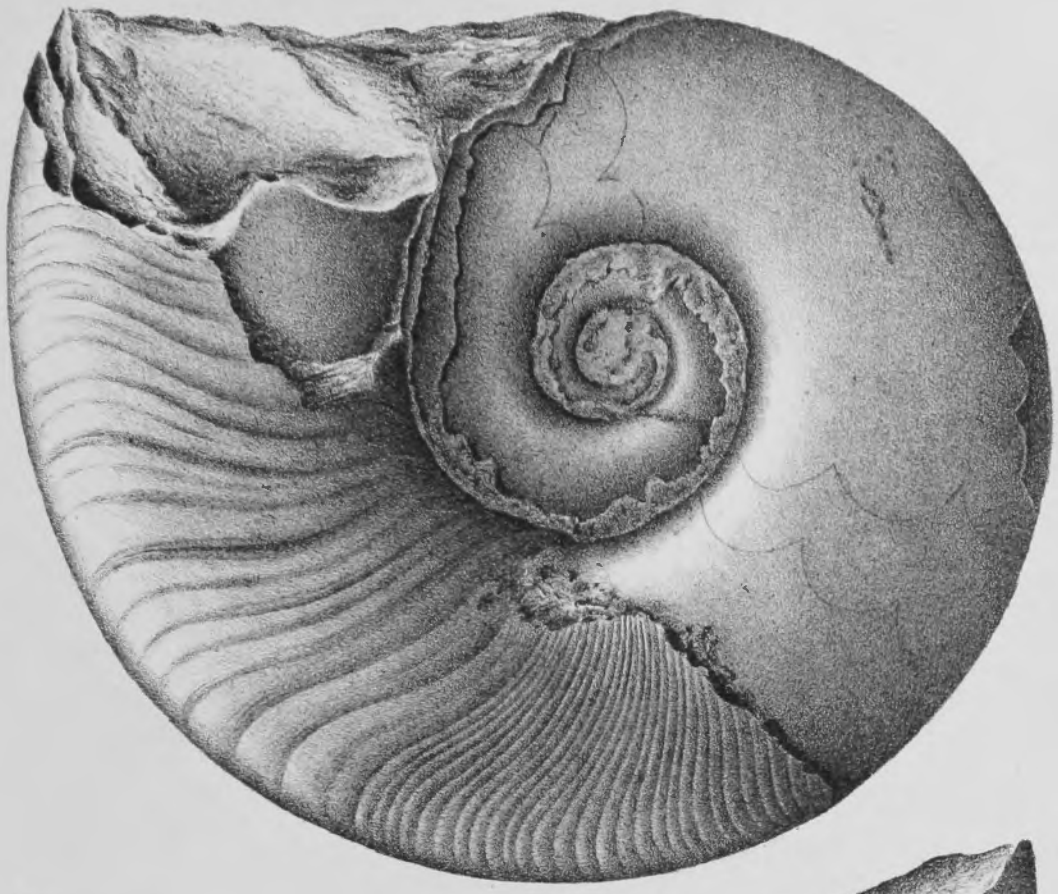

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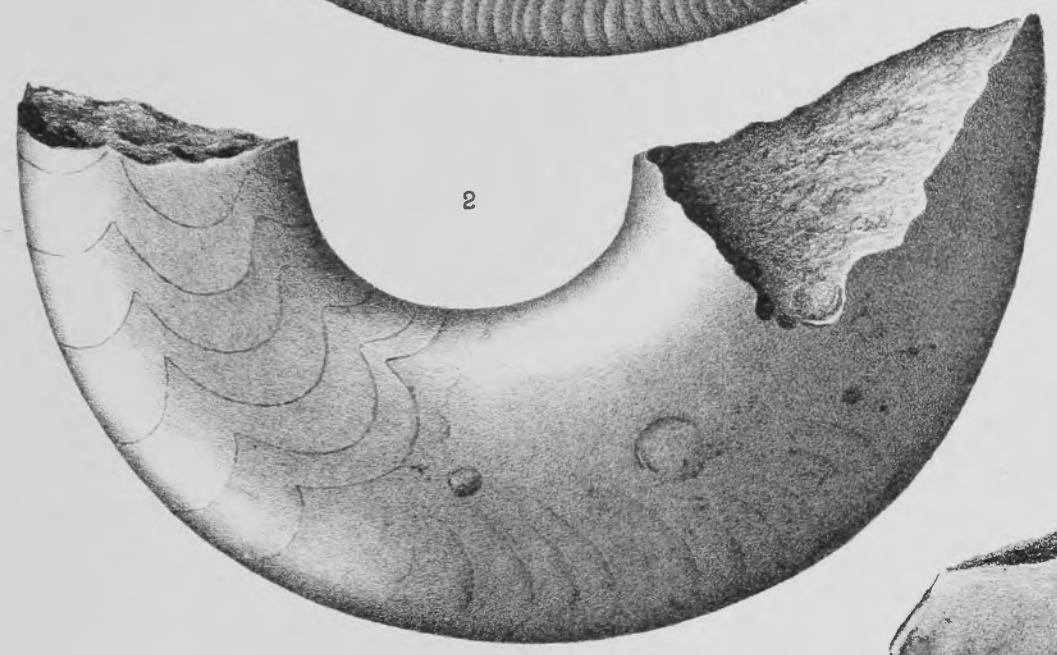

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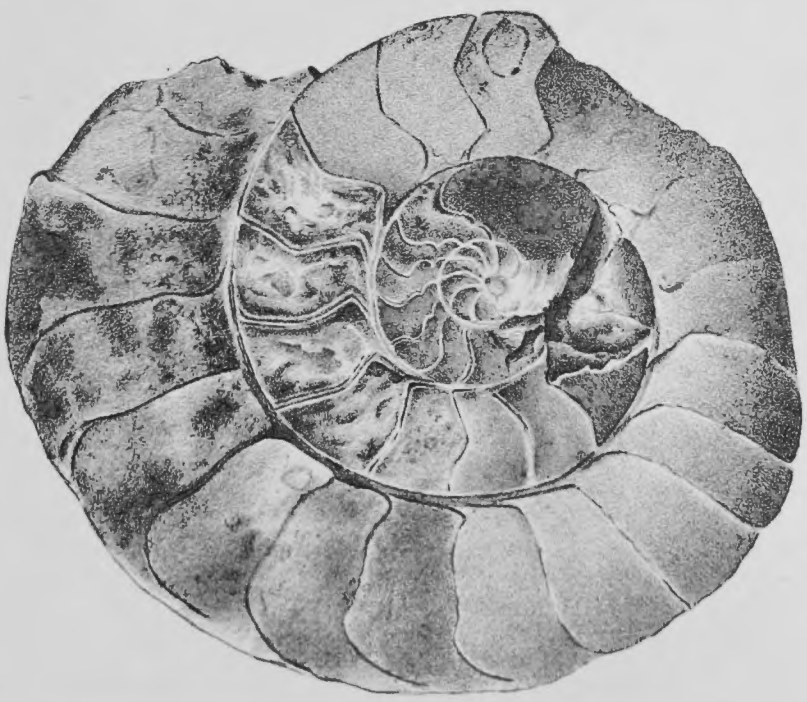

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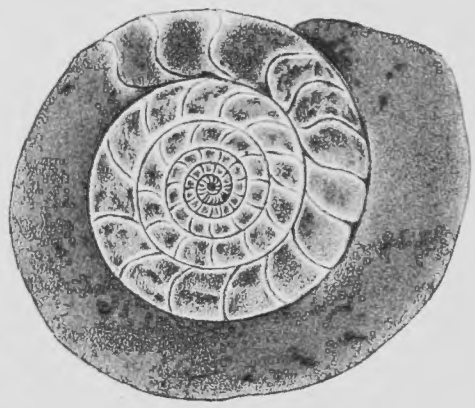

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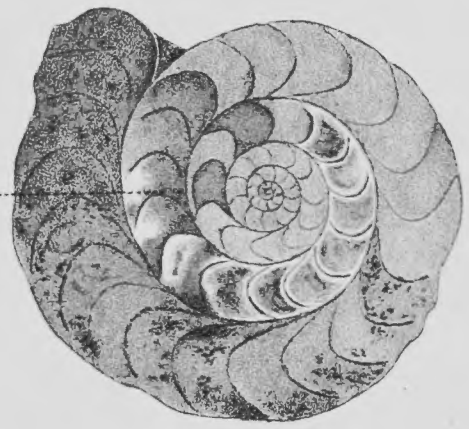

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PLATE CXXIX.

Orthoceras Dagon.

Page 28.

Fig. 1. The septate portion, showing the enlargement of the tube, and the depth of the air-chambers. Corniferous limestone. *Columbus, Ohio.*

Cyrtoceras subcompressum.

Page 35.

Fig. 2. Longitudinal section of a nearly entire individual, showing the curvature of the tube, the extent of the chamber of habitation, the depth of the air-chambers and the characters of the nummuloid siphuncle.

Limestone of the Clinton group. *Piqua, Ohio.*

Fig. 3. Septum of another specimen, showing the excentric position of the siphuncle. The vertical diameter of the figure is the ventro-dorsal.

UPPER HELDERBERG & CLINTON GROUPS.

Palæontology of N.Y., Vol.V, Pt.II. **Supplement**. PlateCXXIX.

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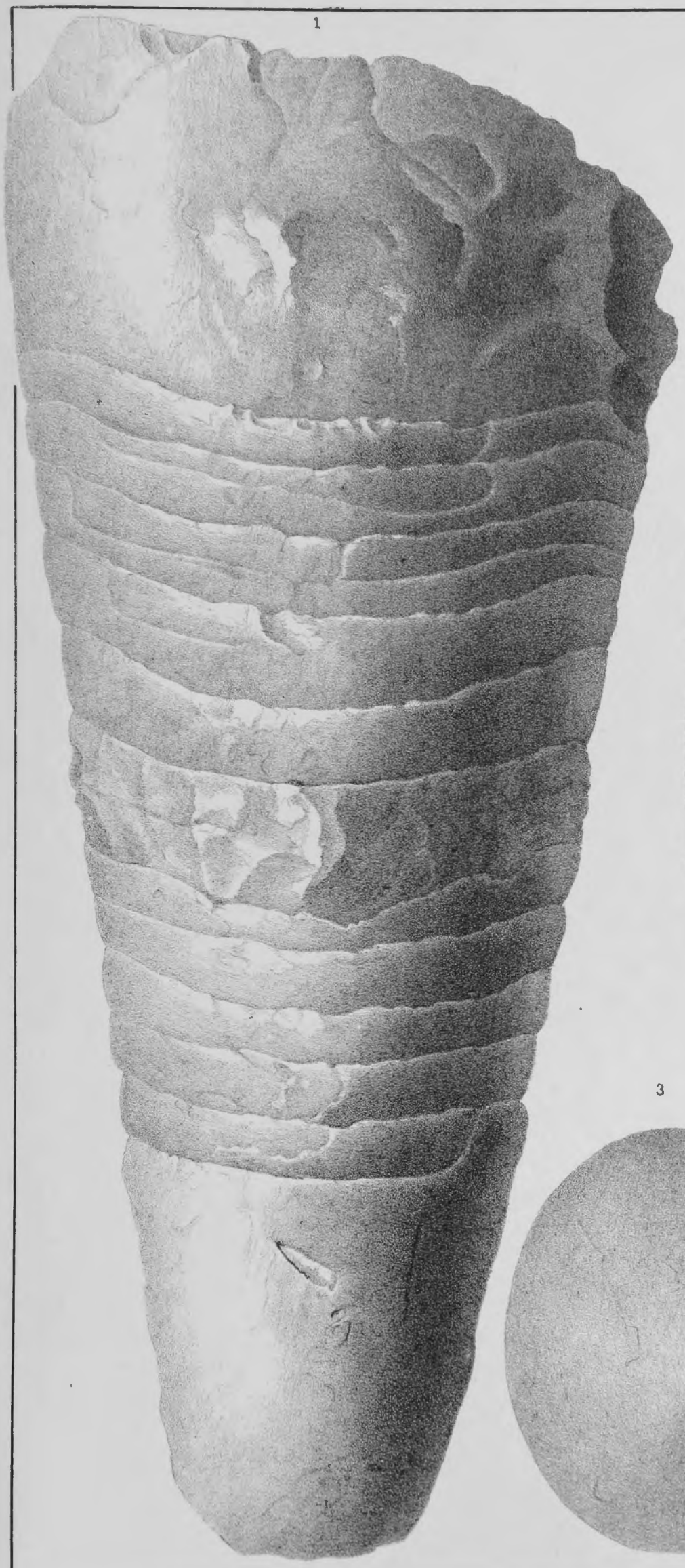

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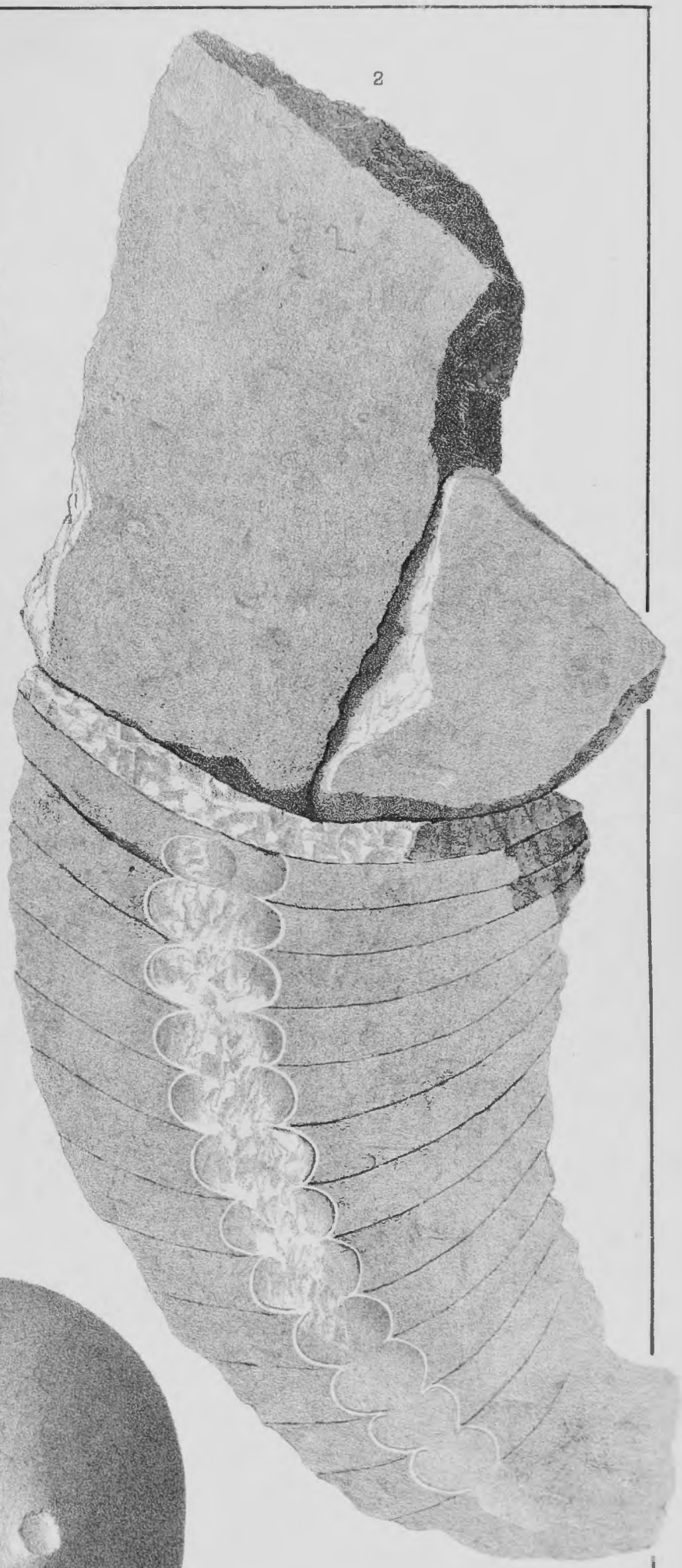

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