

**Article XI.**—DESCRIPTIONS OF NEW SPECIES OF  
SILURIAN FOSSILS FROM NEAR FORT CASSIN  
AND ELSEWHERE ON LAKE CHAMPLAIN.

By R. P. WHITFIELD.

PLATES IV AND V.

The following new forms of fossils, with others, have been collected and sent to me for determination by Profs. H. M. Seely and G. H. Perkins, in connection with the Geological Survey of Lake Champlain, made under the direction of the Faculties of Middlebury College and the State University. They are, with two or three exceptions, from the horizon of the Fort Cassin Beds, and indicate that the fauna of that period is not yet fully known, as there are several species of which no examples have been obtained sufficiently perfect for description and illustration.

***Rhinopora prima*, n. sp.**

PLATE IV, FIGS. 5 AND 6.

Bryozoum forming a thin cup-shaped or open funnel-formed body, composed of a thin expansion of film of not more than half and mostly less than half a millimeter in thickness ; on the outer surface this film is closely covered with small mammiform elevations or tubercles arranged in curving lines, or quincunx order. These tubercles are about .5 mm. in diameter or sometimes slightly more, so that they measure two to the millimeter or three and a half tubercles in 3 mm. Each tubercle when examined under a lens is seen to have a small round pore in its summit, which opens into a larger cavity below. The cup formed by the bryozoum has been nearly an inch in diameter, but is open on one side.

The specimen was supposed to belong to the genus *Calathium* (a sponge), but I think there is no question that it properly belongs to the Bryozoa, and is very closely related to if not exactly identical generically with *Rhinopora verrucosa* Hall, from the Clinton Group.

*Formation and locality.*—In the limestones at Fort Cassin, Vt.

**Protorthis cassinensis**, n. sp.

PLATE IV, FIGS. 1 AND 2.

*Protorthis* sp.? HALL, Pal. N. Y. Vol. VIII, Pt. ii, Plate lxxxiv, Figs. 1 and 2.

Shell small, seldom attaining to more than 10 mm. in its extreme width, and the distance from beak to base about two-thirds that of the width. Valves nearly equally convex and moderately arcuate, with a proportionally long hinge-line; cardinal angles rounded; beaks small and incurved; dorsal valve with a perceptible mesial sinus. Surface marked by extremely fine hair-like radiating striæ, difficult to perceive except under a fairly strong magnifying power. Shell substance distinctly fibrous without any appearance of punctæ even under strong magnification; but the fibers are quite crystalline, and the punctæ, if any have existed, may have been destroyed by this change.

In the interior, as shown by Prof. Hall in the work cited above, there appears to be a triangular cavity formed by the dental lamellæ of the ventral valve, and also proportionally strong muscular markings.

*Formation and locality.*—In the limestones at Fort Cassin, Vt. Not very common.

**Protorthis minima**, n. sp.

PLATE IV, FIGS. 3 AND 4.

Shell small, almost minute, varying in size from 1 mm. to 4 mm. in transverse diameter, and on the ventral valve the length from beak to base is about equal to the transverse diameter, but on the dorsal side almost one-third less. Valves subquadrangular in outline, with broadly rounded front and lateral angles. Ventral valve the most ventricose, in fact quite prominently so, with a rather large beak and a fairly well-marked mesial sinus along the middle. Dorsal valve more regularly and less prominently ventricose. Surface marked by radiating lines, so fine in their texture as to represent only the fibers of the shell structure.

This differs from *P. cassinensis* in the very quadrangular outline and in its greater convexity.

*Formation and locality.*—Abundant in some layers of the Fort Cassin limestones at Fort Cassin, Vt.

This and the preceding species are certainly congeneric. Prof. Hall has figured the first species in the work cited at the head of that description to illustrate his genus *Protorthis*, founded on *Orthis billingsi* Hartt, from the St. John's group, which is pre-Potsdam, while this is from a very much higher position, even if we admit that it may be Calciferous, which is by no means certain. So far as I can see, the two forms, *Orthis billingsi* and the present two species, are entirely unlike each other, and represent two very distinct groups of the Orthidæ. I should be much more inclined to refer the two species here described to the group of *Orthis*, typified by *O. elegantula*, *O. subcarinata*, and others of similar character; while *O. billingsi* is much more nearly related to such forms as *O. fasciata* of the Niagara group and *O. strophomenoides* of the Lower Helderberg, called by Hall *Orthostrophia*. I do not think, however, that they are worthy of a distinct generic name, or it would be the easiest way to dispose of them.

### **Murchisonia cassina, n. sp.**

PLATE IV, FIG. 7.

Shell below a medium size, slender and with a rapidly ascending spire, consisting of seven or more volutions, which are strongly rounded between sutures, and but little more than half as high as their transverse diameter; last two or three volutions subangular in the middle and showing evidence of having possessed a well-marked band just below the middle of the height. Surface of the shell not visible, but as seen through its substance, where preserved in the matrix, it would seem to have been rather smooth.

In its slender spire, strongly rounded volutions with deep, sharp sutures, this species differs from any other species known in these beds. It somewhat resembles *M. gracilis* of the Trenton and Hudson River formations, but is less oblique and more slender.

*Formation and locality.*—In the limestone beds at Fort Cassin, Lake Champlain.

### **Straparollina minima, n. sp.**

PLATE IV, FIGS. 10-12.

Shell minute, its greatest diameter being only 6 mm., the height about 4 mm., and consisting of three volutions. Apical angle about 105°; volutions only slightly convex between sutures and rather rapidly expanding, the last one

distinctly angular on the periphery, but hardly carinate. On the underside the last volution is nearly as convex as on the upper surface, and presents a rather broad umbilical opening with subangular margin. Aperture a little transverse, subangular at the outer margin, the lip somewhat receding below and outward from the suture. Surface of the shell too much weathered to show growth-lines.

Two examples of this shell have been found at Colchester, Vt., on Lake Champlain, by Prof. G. H. Perkins, and are probably near the horizon of the Beekmantown Calciferous.

### ***Maclurea affinis* Bill.**

PLATE IV, FIGS. 8 AND 9.

*Maclurea affinis* BILL. Pal. Foss. Vol. I, p. 238, Fig. 224.

Some examples of this species have been obtained preserving the external shell, which has not hitherto been described. The shell substance is of moderate thickness and marked on the exterior by a series of comparatively regular varices, which are more or less distant on the inner coils with projecting lamellar edges and with concave interspaces. On the outer volution they become more rounded and take on the form of undulations of the surface, and finally near the aperture of adult specimens are quite irregular, presenting the appearance of old age characters. On the inner whorls these varices sometimes look like the septa of a Nautiloid shell, and would be very readily mistaken for such, but on closer examination they are seen to be surface-markings only.

The examples have been furnished by Profs. G. H. Perkins and H. M. Seely, and were collected from the Fort Cassin Beds at the mouth of Otter Creek, Vt.

### ***Ecculiomphalus compressus*, n. sp.**

PLATE IV, FIG. 13.

Shell of medium size, consisting of a little more than one volution, volutions quite rapidly expanding, the inner half very slender and thin, while the last third is more rapidly expanded and the outer portion straightened. Section of the volution ovate, acutely rounded on the dorsal edge and more broadly

rounded on the inner side. Surface of the shell marked by very strong growth-lines, irregular and curving strongly backward toward the outer edge of the volution, indicating a strong, deep notch in the outer margin of the aperture.

The nearest allied form is found in *Ecculiomphalus canadensis* Bill., from the Calciferous rocks at Phillipsburg, Canada, from which it differs in its more rapidly expanding shell and in the compressed ovate section and obtusely angular back, whereas that one is nearly circular in section.

*Formation and locality.*—In the Calciferous sandrock at Colchester, Vt. Received from Prof. G. H. Perkins.

### ***Bucania champlainensis*, n. sp.**

PLATE IV, FIGS. 14-16.

Shell of medium size for the genus, with the outer volution broadly expanded and much thickened, being somewhat heart-shaped on the margin of the lip. Inner volutions rounded and involved within the lip of the outer one to the extent of nearly or quite one-third of its diameter, but showing deep umbilical cavities on the sides. Number of volutions, three or four. Surface of the shell, so far as can be determined, smooth.

The specimens representing this species, although numerous, are all sections in the limestone, and none of them show the entire form. The most of them have been imbedded and worn away so as to show the expanded aperture on the surface of the rock, with a section of the inner volutions more or less on one side of the center; and many show the lip open in front, indicating probably a broad notch in the front margin. The substance of the lip, as seen in section on the surface of the rock, is often 6.5 mm. ( $\frac{1}{4}$  inch) in thickness.

The species differs from *B. rotundata* Hall in its rounded volutions and very small umbilicus; and from *B. expansa* Hall in the small umbilicus and want of angular carina of the dorsum, as well as in the more compactly coiled volution.

*Formation and locality.*—In the Upper Chazy (Chazy "C" of Brainerd and Seely's section at Valcour Island and at Chazy, N. Y.), Lake Champlain.

***Nautilus perkinsi*, n. sp.**

PLATE V, FIGS. 1 AND 2.

Shell of moderate size, consisting of seven or more closely-coiled volutions, the outer ones slightly embracing the inner to about or less than one-quarter of the diameter, and very greatly increasing in their diameter with additional growth; very slightly flattened on the back and marked by strong, very oblique folds on the sides, which pass backward from the suture across the volution and become obsolete on the dorsum. These folds cross some five or six septa in their extent between the ventral and dorsal faces, are rounded on their surface and strongest on the middle of the sides. Surface marked by lines of growth, which have a broad sinus on the dorsal portion of the shell, and follow nearly the direction of the oblique folds on the sides. Septa rather deeply concave, arranged so as to include about five chambers in the space of an inch, measured on the dorsal surface of the outer volution. Siphon of moderate size, sub-central, nearest to the dorsal surface.

This species is somewhat closely related to *N. champlainensis* from the same beds, but differs principally in the presence of the oblique undulations of the surface.

*Formation and locality.*—Fort Cassin Beds at Fort Cassin, Vt. Collected and presented by Prof. G. H. Perkins.

***Harpes cassinensis*, n. sp.**

PLATE V, FIGS. 3 AND 4.

Specimens consisting of the cephalic shield only, which is on the whole decidedly horseshoe-shaped, with the posterior extremities of the cheek spines somewhat incurved and reaching within the width of the glabellar elevation; the anterior margin forward of the occipital furrow forms nearly a semicircle, while behind this point the curvature is less regular, and would, if continued, form the narrower portion of an ovate outline. Surface of the border concave between the dorsal furrow and the outer edge, the posterior limbs being pointed and incurved. Middle of the cephalic shield quite prominent, the glabellar lobe forming only about one-fifth of the width, and the fixed cheeks each about two-fifths of the space. Glabella cylindrically conical, rounded in front, marked by a single furrow near its base, with a smooth triangular space on each side passing outward to beyond the middle of the width of the fixed cheek. Fixed cheeks large, very prominent; ocular tubercles proportionally large, with a distinct ocular ridge uniting them with the glabella, and less dis-

tinct outside of the eye. Occipital furrow very narrow, and the occipital ring slight.

Surface of the head covered entirely by very fine punctæ, which on the fixed cheeks become confluent, forming ramifying lines like vascular markings. Extreme margin of the shield occupied by a very narrow elevated border.

This species is closely related to *H. ottawensis* Billings, from the Trenton limestones near Ottawa, Canada, differing principally in the more prominent central portion of the shield, more cylindrical and narrower glabella, and also in the proportions of the glabella as compared with the length of the entire head, it being in this case considerably less than half the length of the head, instead of five-ninths, as stated in the description of that species given in Pal. Foss., Canada, Vol. I, p. 182.

*Formation and locality.*—In the Fort Cassin Beds at Fort Cassin, Vt.

### ***Bathyrurus perkinsi*, n. sp.**

PLATE V, FIGS. 7 AND 8.

Glabella and fixed cheeks quadrangular in outline, but considerably longer than wide, the glabella alone being slightly longer than wide, its surface nearly smooth, slightly angular along the center and very faintly marked, in the best specimen, by a single pair of furrows a little behind the middle of its length; anterior margin of the glabella roof-shaped, forming an angle of about one hundred and ten degrees. Frontal limb of moderate width, narrowest in the middle and convex on the surface, grooved in front with a distinctly elevated, narrow margin, which becomes obsolete at the dorsal sutures. Fixed cheeks quite narrow, in fact nearly obsolete at the angles of the palpebral lobes. Postero-lateral limbs short, narrowly triangular, and distinctly grooved by the occipital furrow. Occipital ring comparatively broad. Other parts of the organism unknown.

This species bears a general resemblance to *B. quadratus* Bill., Pal. Foss., Vol. I, p. 411, fig. 396; but differs in the broader frontal limb, roof-shaped front of the glabella, narrower fixed cheeks, and small lateral limbs.

*Formation and locality.*—In the Fort Cassin Beds at the mouth of Otter Creek, Vt. Collected by Prof. G. H. Perkins and Prof. H. M. Seely.

**Nileus striatus, n. sp.**

PLATE V, FIGS. 5 AND 6.

Species recognized by the glabella and fixed cheeks only. Length of the head, excluding the occipital ring, equal to 3.5 mm., and with the occipital ring about 4 mm. Width across the head from the limits of the palpebral lobes almost 5 mm. Width of the glabella, 3 mm. Head very prominent, the glabella nearly or quite destitute of lateral furrows and nearly quadrangular in outline, broadly rounded in front and very slightly thickened on the anterior border. Fixed cheeks not visible in front of the eye lobe, but the lobe having a width equal to slightly more than one-third of the width of the glabella, and equal to fully one-half the length of the glabella, regularly curved on the outer margin and convex on the surface. Lateral limbs narrow antero-posteriorly, and considerably longer laterally than the width of the palpebral lobe. Occipital ring prominent, rounded, and the furrow distinct.

Surface of the crust of the glabella marked by very fine, transverse, raised striae, invisible to the naked eye, and rather broadly bent forward in the middle of their length.

The species differs entirely from any of the species described in Pal. Foss., Canada, in size and form.

*Formation and locality.*—In the limestones at Fort Cassin, Lake Champlain. From Prof. H. M. Seely.





## EXPLANATION OF PLATE IV.

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*Protorthis cassinensis* Whitf. Page 178.

Figs. 1 and 2.—Views of the ventral and dorsal valve, each enlarged two diameters.

*Protorthis minima* Whitf. Page 178.

Figs. 3 and 4.—Views of two valves having quite different outlines, each enlarged six times.

*Rhinopora prima* Whitf. Page 177.

Figs. 5 and 6.—View of the specimen natural size, and an enlargement showing character of pustules.

*Murchisonia cassina* Whitf. Page 179.

Fig. 7.—View of the specimen described.

*Maclurea affinis* Billings. Page 180.

Figs. 8 and 9.—View of edge showing surface of the shell, enlarged two diameters, and surface of another specimen two diameters, showing undulations of surface.

*Straparollina minima* Whitf. Page 179.

Fig. 10.—Side view of a small specimen.

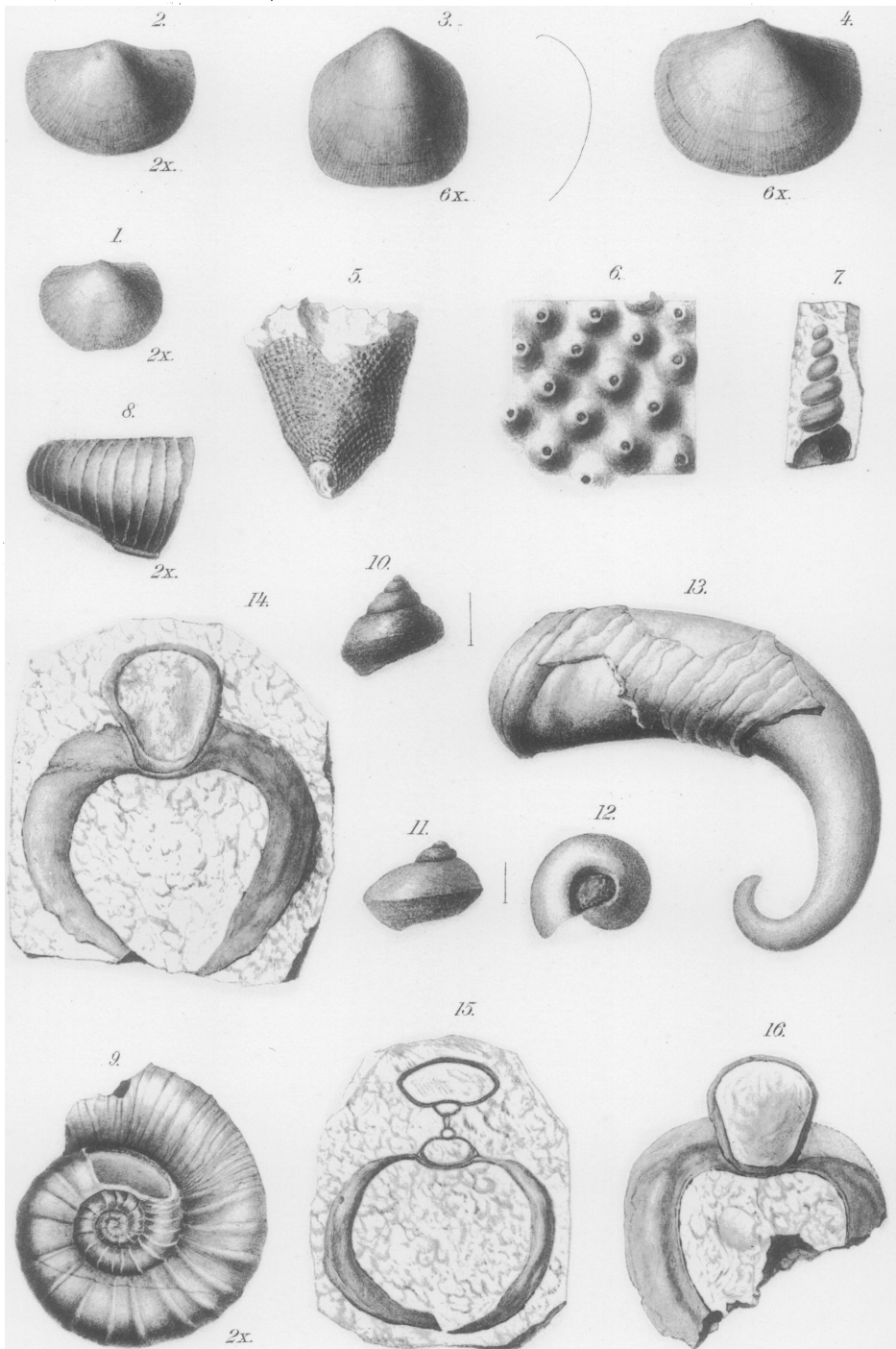
Figs. 11 and 12.—Two views of a still smaller individual.

*Ecculiomphalus compressus* Whitf. Page 180.

Fig. 13.—View of the side of a specimen retaining part of the shell.

*Bucania champlainensis* Whitf. Page 181.

Figs. 14-16.—Views of three specimens, as they appear in the rock, showing aperture, etc.







## EXPLANATION OF PLATE V.

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### *Nautilus perkinsi* Whitf.

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Fig. 1.—Side view of a very fine specimen.

Fig. 2.—View of a larger but imperfect specimen, showing the undulations of the surface more distinctly.

### *Harpes cassinensis* Whitf.

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Figs. 3 and 4.—View of a nearly entire head, enlarged two diameters, and a profile of the same.

### *Nileus striatus* Whitf.

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Fig. 5.—View of the head three times enlarged.

Fig. 6.—Profile, showing the rotundity.

### *Bathyurus perkinsi* Whitf.

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Figs. 7 and 8.—View of the best glabella and fixed cheeks, twice enlarged, and a profile view of the same.

