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THE TRENTON FAUNA OF WOLFE ISLAND, ONTARIO.

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West of the Frontenac axis in Ontario, the most easterly outcrops of Trenton limestone are those on Wolfe Island at the foot of Lake Ontario between Kingston, Canada, and Cape Vincent, New York. The strata exposed there are the northward continuations of the Ordovician rocks of northern New York and present quite a different succession from that in the Ottawa Valley. It is evident that the Frontenac axis even in mid-Ordovician time was sufficiently defined to influence the boundaries of land and sea.

The Trenton limestones on Wolfe Island rest upon somewhat similar formations of Black River age. All dip at a very low angle toward the southwest. The contact between Trenton and Black River strata is not exposed but is probably similar to that in the Cape Vincent-Watertown district, a few miles to the southeast in New York State. A distinct unconformity is there indicated* by the presence of a basal conglomerate and an irregular contact. Disconformity is strongly suggested on Wolfe Island by the marked change in fauna between the Black River limestones along the north shore and the Trenton strata which outcrop in the interior and along the southern shore.†

Prasopora simulatrix orientalis, Pachydictya acuta, Dalmanella rogata, and *Rafinesquina alternata* are the ubiquitous and characteristic members of the local fauna. They indicate its alliance to that of the "Prasopora zone" or true Trenton as that term is used by Raymond.‡ The fauna at hand has little in common with that of the Hull formation in Ottawa Valley or of the Glens Falls limestone in Mohawk

*H. P. Cushing, Geology of the Thousand Island Region; N. Y. State Mus. Bull. 145, p. 91, 1910.

†See geologic map by M. B. Baker, The Geology of the Kingston district; Ontario Bureau Mines, vol. 25, pt. 3, 1917. The Wolfe Island Trenton is described by E. M. Kindle in Appendix I. of the same report.

‡P. E. Raymond, The correlation of the Ordovician strata of the Baltic basin with those of eastern North America: Bull. Mus. Comp. Zool., vol 56, p. 255, 1916.

Valley. *Triplecia extans* and *Receptaculites occidentalis* are listed by Raymond as characteristic of the Rockland formation which underlies the Hull near Ottawa. Both are present in the Wolfe Island Trenton but are represented in the collections at hand by only two and one specimens respectively.

The collections and studies upon which this paper is based were made in part during the preparation of a report* on the geology of the Kingston district. After that report had gone to press, additional collections were made from the old as well as from new localities. The complete faunal list follows.

TRENTON FAUNA OF WOLFE ISLAND.

	Locality			Numbers		
	222	223	224	226	308	309
PORIFERA.						
Receptaculites occidentalis Salter	---	x	---	---	---	---
ANTHOZOA.						
Streptelasma corniculum Hall	---	---	---	x	---	---
BRYOZOA.						
Prasopora simulatrix orientalis Ulrich	x	---	x	x	x	x
Eridotrypa aedilis (Eichwald)	---	---	x	x	---	---
Eridotrypa aedilis minor (Ulrich)	---	---	x	x	---	---
Eridotrypa exigua Ulrich	x	---	---	---	---	---
Hallopora ampla (Ulrich)	---	x	---	---	---	---
Hallopora obliqua n.sp.	---	x	---	---	---	---
Hallopora varia n.sp.	---	---	---	x	---	x
Batostoma winchelli Ulrich	---	---	x	x	---	---
Stictoporella angularis Ulrich	---	---	x	---	x	x
Pachydictya acuta (Hall)	x	---	x	x	x	x
BRACHIOPODA.						
Trematis sp.	x	---	---	---	---	---
Schizocrania filosa (Hall)	---	---	---	x	---	---
Orthis tricenaria Conrad	---	x	---	x	---	---
Dalmanella rogata (Sardeson)	x	x	x	x	x	x
Dinorthis pectinella (Emmons)	---	x	---	x	---	---
Plectambonites curdsvillensis Foerste	---	---	?	x	x	---
Plectambonites punctostriatus n.sp.	x	---	---	---	x	---
Rafinesquina alternata (Emmons)	---	x	x	x	---	x
Rafinesquina deltoidea (Conrad)	x	---	---	x	---	---

*M. B. Baker, The geology of the Kingston district, with appendices by E. M. Kindle, Alice E. Wilson, and Kirtley F. Mather; Ontario Bureau Mines, Vol. 25, part 3, 1917.

	Locality			Numbers		
	222	223	224	226	308	309
Triplecia extans (Hall)	x	x	---	---	---	---
Parastrophia hemiplicata (Hall)	---	x	---	x	---	---
GASTROPODA.						
Sinuites cancellatus (Hall)	x	x	---	---	---	---
Liospira vitruvia (Billings)	---	x	---	x	---	---
Hormotoma gracilis (Hall)	x	---	---	x	---	x
Hormotoma trentonensis Ulrich and Scofield	---	---	---	x	---	---
CONULARIDA.						
Conularia trentonensis multicosta Ruedemann	---	---	---	x	---	---
CEPHALOPODA						
Orthoceras junceum Hall	x	---	---	x	---	x
Endoceras proteiforme Hall	---	---	---	x	---	---
TRILOBITA.						
Isotelus gigas De Kay	x	---	---	x	---	---
Bumastus sp.	---	x	---	---	---	---
Calymene senaria Conrad	x	---	---	x	---	x
Ceraurus dentatus Raymond and Barton	x	---	---	---	---	---
Ceraurus pleurexanthemus Green	x	x	---	---	---	---
OSTRACODA.						
Leperditia sp.	---	x	---	---	---	---

Locality List.

Station 222—Lower five feet of Trenton limestone, four miles south-west from Marysville, Wolfe Island. Lot 2, north, Con. III.

Station 223—Trenton limestone, probably ten or twelve feet above the base of the formation, one and one-half miles southeast from Marysville, Wolfe Island. Lot 1, north, Con. VIII.

Station 224—Lower seven feet of Trenton limestone, immediately south of Cold Springs corner, Wolfe Island. Lot 3, Con. IX.

Station 226—Trenton limestone, probably twenty or thirty feet above its base, along southern shore of Bear Point at south-western extremity of Wolfe Island.

Station 308—Trenton limestone, probably fifteen or twenty feet above its base, in small ravine one and one-quarter miles south-east from Cold Springs corner, Wolfe Island. Lot 1, north, Con. IX.

Station 309—Trenton limestone, about fifteen feet above its base, along course of small brook tributary to Bayfield Bay. Lot 1, south, Con. X., Wolfe Island.

DESCRIPTION OF SPECIES.

Phyllum MOLLUSCOIDEA.
Class BRYOZOA.
Order TREPOSTOMATA.
Family HALLOPORIDAE.
Genus HALLOPORA Bassler.

HALLOPORA VARIA n. sp.

Plate I, figs. 3-7.

Zoarium composed of subcylindrical branches, 5 to 8 mm. in diameter, bifurcating at frequent intervals; one fragment 22 mm. long has given off five branches. Surface of branches gently undulatory but without conspicuous monticules or maculae. Zooecial apertures angular, about 10 in 3 mm.; walls ridge-like and thin; mesopores very few, generally occurring only in limited areas of the surface.

Tangential sections show the zooecia to be everywhere in contact with each other except in certain spots where small mesopores occupy the angles between zooecia. Vertical sections in the axial region display two sets of tubes, the smaller of which represents mesopores, and the proximal portion of zooecia; in the larger tubes the diaphragms are from 0.2 to 0.5 mm. apart, with an average distance of about 0.35 mm.; this is slightly greater than the diameter of the tubes, which almost invariably falls between 0.28 and 0.33 mm. The smaller tubes contain diaphragms which are only 0.11 to 0.17 mm. distant, generally about as far apart as the diameter of the tube. In the peripheral zone the tubes bend rather abruptly and proceed toward the surface with only slight obliquity; here the diaphragms are from one-third to one-half the diameter apart.

This form is most nearly related to *H. angularis* (Ulrich). The chief differences are the larger size of the branches, the greater distance between diaphragms in the axial portion of zooecial tubes, and the less pronounced crowding of diaphragms near the apertures.

Horizon and locality: Lower Trenton Limestone; Wolfe Island, Ontario, (Stations 226 and 309).

HALLOPORA OBLIQUA n. sp.

Plate 1, figs. 8-11.

Zoarium ramose, composed of slender cylindrical branches, 2 to 4 mm. in diameter, bifurcating at comparatively remote intervals; surface of branches slightly undulatory but without conspicuous monticules or maculae. Zooecial apertures polygonal, with thin smooth ridge-like walls, about eleven in 3 mm. Mesopores open at the surface, polygonal in cross-section, about as numerous as the zooecial apertures.

Transverse sections show that the axial region is composed of two sets of tubes; the larger average 0.25 mm. in diameter and are hexagonal to octagonal in outline; the smaller are generally between 0.1 and 0.15 mm. in diameter and display triangular or quadrangular outlines. Peripheral region comparatively thin, less than 0.4 mm. in width in a section across a branch with a diameter of 3.9 mm.

Longitudinal sections display slightly flexuous zooecial tubes which intercept the surface quite obliquely and lack the decided curvature commonly found in other species of the genus. Mesopores are indistinguishable from the proximal portion of zooecial tubes and doubtless the two had similar functions. Diaphragms numerous and quite regularly spaced, crossing zooecial tubes in proximal and axial regions at distances equal to from one to two times the diameter of tube. Near the surface diaphragms are more numerous and generally two or three of them occur in a space equal to their diameter.

That the specimens at hand are mature individuals, even though the zooecial tubes aproach the surface obliquely with little curvature from axial to peripheral regions, is evident from the closer spacing of the outermost two or three diaphragms in each tube as well as from the thickening of the wall near the aperture.

In comparison with *H. angularis,* which it resembles in the angular appearance of apertures, this species is distinguished by its smaller zooecia, the generally more slender branches of the zoarium, and the obliquity of the zooecial tubes. *H. obliqua* is probably more nearly related to *H. ampla* and *H. goodhuensis* than to any other described member of the genus. Its branches are on the average slenderer than the smaller of those two species while its zooecia are intermediate in size between them. More significant, however, is the much fewer number of diaphragms in the peripheral zone of the material at hand.

Horizon and locality: Lower Trenton limestone; Wolfe Island, Ontario, (Station 224).

Class BRACHIOPODA.
Order NEOTREMATA.
Family TREMATIDAE.
Genus TREMATIS Sharpe.

TREMATIS sp.

The shell thus identified is imperfectly preserved but undoubtedly represents a new species of this genus. The specimen is very small, about 3 mm. long and 4 mm. wide, and consists of a pedicle valve, from which the apex is broken away, revealing a portion of the interior of the brachial valve. The apex appears to have been much nearer the posterior margin than the center of the valve. Surface markings are of the *T. umbonata* type and consist of radiating rows of circular pits

separated by flat interspaces which are generally broader than the diameter of the pits. Between 15 and 20 rows occur in the space of 1 mm. The general outline of the valves is transversely elliptical, somewhat similar to that of *T. punctostriata.*

Horizon and locality: Lower Trenton limestone; Wolfe Island, Ontario, Station 222.

Order PROTREMATA.

Family STROPHOMENIDAE.

Genus PLECTAMBONITES Pander.

PLECTAMBONITES PUNCTOSTRIATUS n. sp.

Plate I, figs. 15-17.

Shell of medium size, transversely semi-elliptical in outline, cardinal angles slightly acute but not auriculate; adult shells varying in width between 16 and 21 mm., in length between 9.5 and 12 mm. Surface of both valves marked by fine, thread-like, radiating lirae, 4 to 6 of which occur in the space of 1 mm.; every second or third lira slightly more prominent than the intermediate, newly developed ones; depressions between lirae occupied by rows of minute punctures which give the whole surface a finely rugose aspect. Dimensions of four typical specimens are: width, 14.1, 16.0, 18.3, and 20.8 mm.; length, 7.8, 9.6, 10.3, and 11.7 mm.

Pedicle valve more convex than in *P. curdsvillensis,* with the point of greatest convexity a little behind the mid-length of the shell; beak and cardinal area as in the general *P. sericeus* type; lateral margins rounding broadly into the convex anterior margin. A low, narrow, mesial fold originates near the beak and broadens anteriorly; in most individuals this is a fairly conspicuous feature of the shell, but in a few it is scarcely perceptible. Cardinal margin crenulated by a series of oblique wrinkles which in most specimens make their appearance within 2 mm. of the beak and become progressively longer toward the cardinal extremities; about 4 or 5 wrinkles occur in the space of 3 mm. and the angle between them and the hinge line is generally between 30° and 40°; in some individuals the crenulations are scarcely perceptible but they are rarely entirely lacking. Interior of valve not known.

Brachial valve not positively identified.

The shells subsumed here are most nearly related to *P. rugosus* (Meek), but the present species differs from that one most conspicuously in the presence of a mesial fold and sinus as well as in the greater equality of its radiating lirae.

Horizon and locality: Lower Trenton limestone; Wolfe Island, Ontario, Stations 222 and 308.

PLECTAMBONITES CURDSVILLENSIS Foerste.

Plate I, figs. 12, 13.

Plectambonites curdsvillensis Foerste, Bull. Sci. Lab. Denison Univ., Vol. 17, p. 122, pl. 10, figs. 15a, b, 1912. Curdsville bed, Glenn Creek Station, Woodford country, Ky.

Shell of medium size, transversely semi-elliptical in outline, ordinarily between 16 and 21 mm. in width and from 9 to 11.5 mm. long; cardinal angles slightly acute, but not produced; surface of each valve marked by exceedingly fine, hair-like, radiating lirae, 5 to 7 of which occur in the space of 1 mm., with every third or fourth liration slightly more prominent than the intermediate ones. The dimensions of three typical individuals are: width, 16.4, 18.6, and 20.9 mm.; length, 9.0, 10.1, and 11.4 mm.

Pedicle valve moderately convex, with regular curvature of surface both longitudinally and transversely; beak and cardinal area conforming to the general *P. sericeus* type; lateral margins converging slightly from the cardinal extremities forward to the mid-length of the valve and then rounding broadly into the anterior margin; a faint, broad, median sinus generally developed in front of the middle of the shell, causing the anterior outline to be straightened or even slightly emarginated.

Brachial valve moderately concave, with curvature of surface and outlines conforming to the opposite valve; a faint, broad, median fold developed in many individuals corresponding to the ventral sinus. "The interior of the brachial valve is thickened near the anterior and lateral margins, the thickening beginning about 2 or 2½ mm. from the margin and extending to within 1 mm. of the latter. However, between the thickened border and the margin of the valve, the shell is much thinner and is traversed, in the same direction as the radiating striae, by a series of short, vascular grooves, of which about 7 occur in a width of 2 mm. . . . The two median ridges separating the two adductor areas usually are prominent and sharp, as in the less mature stages of *P. rugosus,* although sometimes thickened anteriorly. The lateral outlines of the adductor areas tend to be crescentic." (Foerste).

Foerste has called attention to the fact that the oblique wrinkles along the hinge lines of many individuals belonging to this genus are not characters of specific value. Nevertheless, it is evident that certain species show a marked tendency toward developing these wrinkles while others display just as marked an antipathy to them. Among the fifteen specimens referred to *P. curdsvillensis,* for example, only one shows any trace of oblique wrinkles and on it they are scarcely perceptible. Additional characters which distinguish it from allied species are the absence of a mesial fold on pedicle and sinus on brachial valve, the low convexity of pedicle valve, the absence of

cardinal auriculations, the thickened border in the interior of brachial valve, and the sharp prominent ridges along the axial margins of the adductor muscle scars.

Horizon and locality: Lower Trenton limestone; Wolfe Island, Ontario. Stations 224?; 226, and 308.

EXPLANATION OF PLATE.

PRASOPORA SIMULATRIX ORIENTALIS.

Figures 1, 2—Vertical and tangential sections, X 10, of an average specimen. Queen's University Paleontologic Museum No. 1263.

HALLOPORA VARIA.

Figures 3, 4, 5—Tangential, vertical and transverse section, X 10, of the holotype. Queen's University Paleontologic Museum No. 1272.
Figures 6, 7—Two of the plesiotypes, natural size. Queen's University Paleontologic Museum No. 1270.

HALLOPORA OBLIQUA.

Figures 8, 9—Vertical and transverse sections, X 10, of one of the cotypes.
Figures 10, 11—Two of the cotypes, natural size. Queen's University Paleontologic Museum No. 1276.

PLECTAMBONITES CURDSVILLENSIS.

Figure 12—A pedicle valve showing the faint mesial sinus commonly observed on the shells thus identified.
Figure 13—The interior of a brachial valve from the same locality. Queen's University Paleontologic Museum No. 1269.

RAFINESQUINA DELTOIDEA.

Figure 14—A pedicle valve. Queen's University Paleontologic Museum No. 1262.

PLECTAMBONITES PUNCTOSTRIATUS.

Figures 15, 16, 17—Three of the cotypes, pedicle valves. Queen's University Paleontologic Museum No. 1277.

NOTES ON THE LAND MOLLUSCA OF DE GRASSI POINT, LAKE SIMCOE, AND OTHER ONTARIO LOCALITIES.

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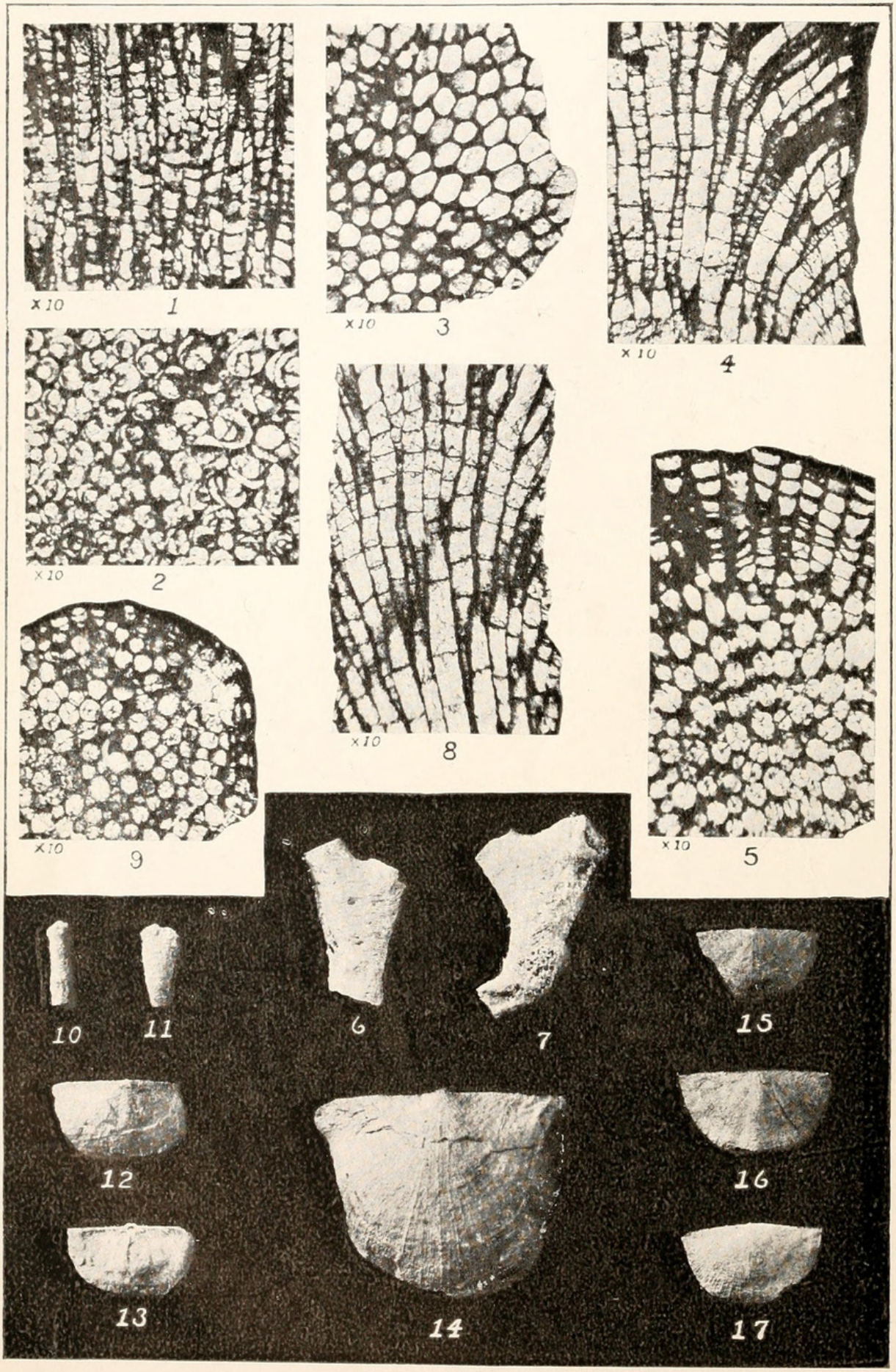
(*Continued from page* 22.)

22. *Zonitoides arborea* (Say). The commonest of all our land Mollusca, occurring in the woods everywhere, from the tamarack swamp to the hardwood forests. Toronto, May-October; De Grassi Point, April 27th—September; Go Home Bay, July 15th-17th; Giant's Tomb Island, July 20th; St. William's, September 3rd.

23. *Zonitoides exigua* (Stimpson). This minute ribbed species is common at De Grassi Point under leaves and rubbish in the woods. It was also taken at Go Home Bay and the Giant's Tomb Island.

24. *Zonitoides milium* (Morse). Toronto, De Grassi Point and the Giant's Tomb Island, not rare under leaves in woods.



ILLUSTRATING "The Trenton Fauna of Wolfe Island, Ontario," by Kirtley F. Mather.