

CONTRIBUTIONS FROM THE MUSEUM OF PALEONTOLOGY

UNIVERSITY OF MICHIGAN

Vol. XV, No. 15, pp. 349-363 (4 pls.)

DECEMBER 1, 1960

MIDDLE ORDOVICIAN BLACK RIVER OSTRACODS
FROM MICHIGAN
PART II, *LEVISULCULUS* AND *EURYCHILINA*

BY
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INTRODUCTION

A REMARKABLE FEATURE of the Middle Ordovician Black River ostracod fauna from Michigan is the association of genera not present outside North America with genera previously thought to be restricted to northern Europe, as pointed out in the introduction to this series of papers (Kesling, Crafts, Darby, Shubak, and Smith, 1960, p. 294). The two genera described here emphasize this association. Both belong to the superfamily Eurypphilinacea, but until now they have not been found together. *Levisulculus* has been reported only from Scandinavia and Estonia, whereas *Eurypphilina* has been recognized only from North America and, possibly, India (Reed, 1912, p. 115, Pl. 16, Fig. 7; 1936, p. 64, Pl. 5, Fig. 13) and Siberia (Abushik, 1958, pp. 248-49, Pl. 1, Figs. 12-13). One species of *Levisulculus* is sufficiently well represented and distinctly different from those previously described, so that it is made a new species. Three others are probably new, but they are too incompletely known for the erection of new species. Two species of *Eurypphilina*, although not new, are described in greater detail. A third, listed as *Eurypphilina* sp., from the Ogontz member of the Upper Ordovician Stonington beds, is illustrated to show the structure of the eurypphilinid frill.

The resemblance of the Michigan fauna to the Baltoscandian is further heightened by the occurrence of *Oepikella* Thorslund, *Euprimites* Hessland,

numerous specimens of *Platybolbina* Henningsmoen, a small species very closely allied to, if not actually, *Hesperidella* Öpik, and one best characterized as a weakly-sulcate version of *Laccochilina*, probably a new subgenus.

In this paper I have followed the suprageneric classification proposed by Jaanusson (1957). The addition of the new species to *Levisulculus* does not modify the genus in any character of the diagnosis. Similarly, the new information about the type species of *Eurychilina* does not alter the concept of the genus nor that of the subfamily, family, and superfamily based on it.

All specimens listed and illustrated are from Delta County, Michigan. *Eurychilina* sp., used only to demonstrate the eurychilinid frill, is from the Ogontz member of the Upper Ordovician Stonington beds exposed on Stonington Peninsula. All other specimens are from unit 4 of Hussey's measured section (see Kesling and others, 1960, pp. 295-96, for details of locality and stratigraphy).

The manuscript of this paper was critically read by Dr. George M. Ehlers and Dr. Chester A. Arnold. The specimens are catalogued and deposited in the Museum of Paleontology of the University of Michigan.

SYSTEMATIC DESCRIPTIONS

Suborder PALEOCOPA Henningsmoen, 1953

Superfamily Eurychilinacea Ulrich and Bassler, 1923

Family Piretellidae Öpik, 1937

The velate structures in ostracods of this family do not appear to be internally divided by septa into radial tubules, as are those in the Eurychilinidae. Dimorphism is expressed in the form of the velate structures. These are absent in some males and present in others, but are well developed in all females. Where velate structures are found in both dimorphs, those in the female are attached higher onto the domicilium than those of the male (Jaanusson, 1957, p. 275). *Dicranella* has been placed in this family (Jaanusson, 1957, p. 294), although its dimorphism has yet to be established.

In most genera the valves appear to be unisulcate. The sulcus in *Rakverella* should perhaps be classed as a fusion of S1 and S2, inasmuch as it is bordered by a structure in the shape of a script W representing L1, L2, and L3 (Kesling, 1955, pp. 263-64). Species of *Tvaerenella*, however, are nonsulcate or, at most, provided with a faint sulcal depression, and those of *Levisulculus* have only a shallow sulcus (Jaanusson, 1957, pp. 296, 320).

Subfamily Tvaerenellinae Jaanusson, 1957

The original author (Jaanusson, 1957, p. 294) gave the following diagnosis: "Dolon [incurved frill of the female] faintly to moderately convex, its peripheral edges not in contact [with that of the opposite valve] in closed carapaces, but separated [from it] by a broad or moderately broad space." The subfamily differs from the Piretellinae in lacking strong convexity of the frills in the female, and from the Euprimitiinae in having the velate structure developed as a frill instead of a ridge.

Genus *Levisulculus* Jaanusson, 1957

Type species.—By original designation, *L. lineatus* Jaanusson, 1957, p. 320.

Diagnosis.—Valves elongate, distinctly plenate anteriorly (preplete), thus effecting a definite swing. S2 a narrow, curved depression or shallow sulcus. L2 a low, faint node immediately in front of the sulcus. Hinge line exceptionally long for a piretellid ostracod. Velate structure widest anteroventrally, decreasing gradually toward the rear, not reaching the posterior corner; in male, narrow to moderately broad, flared outward; in female, broad and strongly convex in anteroventral and particularly in anterior region, abruptly continuing like that in male anterodorsally to anterior corner, merging posteriorly into structure like that in male. (Based on diagnosis by Jaanusson, 1957, pp. 320–21.)

Remarks.—*Levisulculus* differs strongly from other genera in the Tvaerenellinae in its elongate outline and in the exceptional development of the anteroventral and anterior convex part of the female frill. Jaanusson (1957, p. 321) included in *Levisulculus*, in addition to the type species, *Primitia ? extraria* Öpik, 1937, *P. troedssoni* Thorslund, 1940, and *P. granulosa* Thorslund, 1940. Including the new species described below, each species of *Levisulculus* bears its own distinctive type of ornamentation: *L. lineatus*, "anastomosing ridges, directed anteroventrally in front of the sulcus, and posteroventrally behind the sulcus" (Jaanusson, 1957, p. 322); *L. extraria*, "lineate and minutely granulated" (Öpik, 1937, p. 82); *L. troedssoni*, "faint reticulation, . . . also scattered tubercles can be seen in some specimens" (Jaanusson, 1957, p. 325); *L. granulosa*, "rather coarse tubercles and a minute granulation between the tubercles" (Jaanusson, 1957, p. 326); and *L. michiganensis*, sp. nov., distinct, fine-meshed reticulation.

Occurrence.—*L. lineatus*, *L. troedssoni*, and *L. granulosa*: Ludibundus limestone, Sweden. *L. extraria*: Kukruse formation, Estonia. *L. michiganensis*, sp. nov.: Bony Falls limestone, Michigan. From these records, it

appears that the genus was widespread but short-lived. The Michigan strata thus seem to be correlatives of the Ludibundus limestone of Sweden and the Kukruse formation of Estonia.

Levisulculus michiganensis, sp. nov.

(Pl. I, Fig. 2)

Female.—Valves small, about 1 mm long, elongate, posterodorsally attenuated, with a mucronate termination. Greatest length along the dorsal border, greatest height in front of L2, and greatest width through the summit of L2. As seen laterally, domicilium sublacriform, strongly plenate anteriorly (preplete), its dorsal border nearly straight but turned up slightly along the posterodorsal mucronate termination of the valve, its anterior and ventral borders forming an evenly curved, nearly circular arc, and its posteroventral border gently convex. L2 a small, distinct, vertically elongate, anterocentral node. S2 slightly sigmoid, consisting of a shallow sulcus extending down from dorsal border immediately above L2, thence curving around L2, and terminating in a pit at midheight of the domicilium. Low, indistinct convexity behind dorsal part of S2, probably representing L3. Domicilium covered by a fine-meshed reticulation except in pit and on posterodorsal mucronate termination.

Frill extending from posteroventral border nearly or possibly to, the anterior corner. Posterior part of frill slightly convex, the anteroventral and with the shape of a quarter of a sphere, reaching high up on the anterodorsal border of the domicilium. Frill faintly striate, with a flat lateral surface delineated by obtuse angulations subparallel to the free border.

Dimensions of holotype: length, including frill, 1.02 mm; height, including frill, 0.57 mm; and height of domicilium, 0.45 mm.

Remarks.—Only the holotype, a female left valve, is known. This was the only specimen of this species among approximately 2,000 ostracods studied to date from unit 4 of the Bony Falls limestone. It is not perfect. Part of the dorsal border is overhung by matrix, the anterior part of the frill is broken off (although its form is shown by an internal mold), and the hinge is buried in matrix. It is hoped that additional collections will disclose the male of this distinctive species.

As pointed out in the discussion of the genus, *L. michiganensis*, sp. nov., can be distinguished from previously described species of *Levisulculus* by its distinct reticulation. The meshes of this reticulation are about 0.025 mm in diameter, and show scarcely any tendency toward lineation.

Type.—Holotype, a female left valve, UMMP No. 37213.

Levisulculus sp. A

(Pl. I, Fig. 3)

This species, represented by one female left valve, is not sufficiently well known to be erected as new. The specimen, UMMP No. 37367, has the frill broken off and its posterior corner is not clearly defined. Although it strongly resembles *L. michiganensis* in size and shape of the domicilium, it has a larger L2 and smaller meshes in its reticulation. In the posterodorsal and posterior regions, the meshes show subvertical lineation, those near S2 aligned in rows sloping slightly anterior and those near the posterior end in rows sloping slightly posterior.

Levisulculus sp. B

(Pl. I, Fig. 1)

One male right valve, UMMP No. 37375, appears to belong to a new species, but it is too poorly preserved to permit a full and accurate description. The valve has been crushed in just behind the anterior corner, and most of the frill is missing. It shows some resemblances to *Levisulculus* sp. A in the size and arrangement of the meshes in the reticulation, but it is larger, its reticulation is very faint, and in place of a pit it has a shallow subcircular depression. Possibly, the crushing has deformed the sulcation in this specimen. A low ridge or crest, subparallel to the posterior border and extending to the posterior corner, seems to be the continuation of the velate structure. If this interpretation is correct, then the generic diagnosis will require modification. Additional evidence is needed.

Levisulculus sp. C

(Pl. I, Fig. 4)

A left valve, UMMP No. 37357, questionably an adult male, is smaller and less elongate than the other species of *Levisulculus* from the Bony Falls limestone. In lateral view it is subpyriform, rather strongly convex ventrally. S2 is distinct, slightly sigmoid, and terminates at about midheight in a pit. It is bordered anteriorly by a node (L2) and posterodorsally by a low, small hump (probably L3). The surface is covered by granules. No frill can be seen, nor is there visible any line indicating that a frill was broken off from the exposed part of the valve. Possibly, this valve was immature and lacked a velate structure.

The outline closely resembles that of *Levisulculus extraria* (Öpik, 1937, Pl. 10, Fig. 19). This specimen differs from *L. extraria*, as well as from *L. troedssoni* and *L. granulosus*, in having the sulcus much deeper, L2 located lower on the valve, and a low hump present behind the sulcus. Furthermore,

the ornamentation in this specimen shows no tendency to be "lineate," as described in *L. extraria* (Öpik, 1937, p. 82), nor to be "relatively coarsely granular," as described in *P. granulosa* (Thorslund, 1940, p. 164).

Family Eurychiliniadae Ulrich and Bassler, 1923

This family is distinguished from others of the Eurychilinoidea by the structure of the frill, which is hollow and internally partitioned into tubules by radially directed septa between the outer and inner walls.

Subfamily Eurychilinae Ulrich and Bassler, 1923

The family Eurychiliniadae was divided by Jaanusson (1957, pp. 230–33) into three subfamilies, based on the dimorphism in the velate structure: the Eurychilinae, in which the female has a subdistal ridge on the inner surface of the frill; the Chilobolbininae, in which both dimorphs have frills (or distinct velate ridges) but neither has a subdistal ridge; and the Oepikellinae, in which the velate structure in the male is reduced to a bend (as described by Kesling, Crafts, Darby, Shubak, and Smith, 1960, pp. 301–2).

The subdistal ridge on the inner surface of the frill in *Eurychilina* (termed the "outer wall" by Ulrich, 1894, p. 659) should not be interpreted as an extraneous velate structure. Jaanusson (1957, p. 232) wrote: "The dolon [incurved frill of the female] is formed only by the proximal part of the frill, the peripheral part retaining its tectomorphic shape. On the internal side the dolon is surrounded by a distinct ridge." There is reason to regard this "distinct ridge," which I have termed the subdistal ridge, as an integral part of the incurved frill (dolon) rather than as a structure surrounding it.

In etching silicified fossils from the Upper Ordovician Ogontz limestone, I discovered an unusual specimen of *Eurychilina*, illustrated in Pl. IV, Figs. 4–5. It is a female left valve. The etching process exposed both external and internal surfaces, but dissolved some unsilicified parts of the frill and left the specimen extremely fragile. Because the etching may have removed surface ornamentation and because the valve will, in all probability, ultimately disintegrate, I decline to classify it. Later, I hope to find better-preserved examples of this large species. The specimen at hand is of special interest because the cylindrical convexities on the inner surface of the frill, marking the positions of the internal tubules, encroach onto the subdistal ridge (Pl. IV, Fig. 5). This seems to indicate that the tubules have tapering branches extending into the subdistal ridge. Thus, the subdistal ridge may be the sharply inturred part of the female frill, and the distal

rim, with its outer surface more or less continuous with the rest of the frill, may be an ornamental structure. In this ostracod the distal rim is not set off from the proximal part of the frill (Pl. IV, Fig. 4), but in most species of *Eurychilina* the rim is flared slightly outward or separated from the proximal part by a groove.

The similarities between the Eurychilinae and the Chilobolbinae are very strong. At present only the type genus is included in the Eurychilinae. If any species of *Eurychilina* should be found which lack a distal rim around the frill, the present basis for separating the two subfamilies would no longer be defensible, and Chilobolbinae would disappear as a junior synonym.

Genus *Eurychilina* Ulrich, 1889

Eurychilina reticulata Ulrich, 1889

(Pl. II, Figs. 1-3; Pl. III, Figs. 1-6; Pl. IV, Figs. 1-2)

Eurychilina reticulata Ulrich, 1889, p. 52, Pl. 52, Figs. 9, 9a; 1894, p. 660, Pl. 44, Fig. 1. Ruedemann, 1901, p. 76, Pl. 5, Fig. 3. There are numerous subsequent references to this species as the type of *Eurychilina* which do not add to the knowledge of morphology, description, illustration, or geographic and geologic occurrence.

Remarks.—In lateral view, both dimorphs have the striate frill set at an obtuse angle to the domicilium. The junction of frill and domicilium forms a sharp angulation through most of its extent, especially ventrally, but posterodorsally it becomes more shallow and less distinct. The domicilium displays three different areas of ornamentation: the strongly convex parts of the lobation are reticulate; a surrounding band is nearly smooth, particularly in S2 and the corner areas, with only a few scattered punctae; and the anterior, ventral, and posterior margins have deep punctae. The extent of each area of ornamentation varies from one individual to another. In some (Pl. III, Fig. 3) the smooth band is wide, but in others (Pl. III, Fig. 4) it is very narrow.

In many specimens the reticulate part of the valve adheres to the matrix and is torn out. The interstices of the reticulation are deep, forming a close bond with the matrix and creating a peripheral line of weakness. Apparently, the area is torn away when the rock is split, much in the same manner that paper tears along a line of perforations. As a result, one part of the specimen consists of the internal mold of the reticulate area and the rest of the valve (Pl. III, Figs. 1, 3; Pl. IV, Fig. 1) and the other part consists of the reticulate area (with its inner surface exposed) and an external mold of the rest of the outer surface of the valve including the frill (Pl. III,

Figs. 5-6; Pl. IV, Fig. 2). A few specimens cleave cleanly from the matrix (Pl. III, Figs. 2, 4). No female valve was found showing the extent of the subdistal ridge.

The frills are clearly dimorphic. That of the male is flat or slightly concave, flared outward, whereas that of the female is convex, except for the distal rim, which resembles the male frill in being flared outward. Posterodorsally, the frill of the female (Pl. IV, Fig. 1) is much wider than that of the male (Pl. III, Figs. 1, 3). Distally, the frill of the male is bordered by a fringe of long (about 0.12 mm) discrete cylindrical denticles (Pl. II, Figs. 1, 3; Pl. III, Figs. 1, 3). These denticles do not appear to bear any relation to the tubules within the frill. As can be seen on the external molds (Pl. III, Figs. 5-6; Pl. IV, Fig. 2), the frill of the female bears a distinct groove between the convex proximal part and the nearly flat, flared distal part. The cylindrical convexities marking the external positions of the tubules continue onto the distal rim (Pl. III, Fig. 4). Female frills have a smooth border, without denticles.

The shell of the male, as seen in centrally exfoliated specimens (Pl. III, Figs. 1, 3), is much thinner than that of the female (Pl. IV, Fig. 1). I estimate the anterocentral part of the male valve to be about 0.015 mm thick, and the corresponding part of the female valve to be about 0.038 mm.

One wonders if the combination of thin shell and delicate denticles fringing the frill may indicate that the male was nektonic for much of its existence, and the combination of thick shell and smooth-bordered frill that the female was benthonic for the most part.

An immature valve (Pl. III, Fig. 2) has L2 less clearly defined than that in adult valves, but, if an ontogenetic change exists, it needs to be substantiated by additional specimens.

Illustrated specimens.—Two female left valves, UMMP Nos. 37215 and 37255; two female right valves, Nos. 37216 and 37219; one male left valve, No. 37218; one male right valve, No. 37220; and one right valve of the ultimate immature instar, No. 37217.

Eurychilina subradiata Ulrich, 1890

(Pl. IV, Fig. 3)

Eurychilina subradiata Ulrich, 1890, p. 126, Pl. 9, Figs. 1a-c, 2a-c; 1894, p. 661, Pl. 44, Figs. 3, 4, 4a. Ulrich and Bassler, 1908, p. 299, Fig. 49. Ruedemann, 1912, Pl. 9, Fig. 16. Butts, 1926, p. 124, Pl. 30, Fig. 5. Bassler, 1932, Pl. 10, Fig. 14.

Remarks.—Although the only specimen illustrated (Pl. IV, Fig. 3) lacks anterior parts of the domicilium and the frill, it is the best preserved of the specimens found in the Bony Falls limestone. It shows most of the

characteristics of the species. The lateral surface of the domicilium is marked by a central horizontal angulation, such as that found in *Eurychilina subradiata* and also in *E. subradiata* var. *rensselaerica* Ruedemann (1901, p. 77, Pl. 5, Figs. 4-7, 13). The domicilium in this specimen does not have an acute anterodorsal corner like that illustrated by Ruedemann. Therefore, I am of the opinion that, if Ruedemann's figures are correct in this respect, *rensselaerica* is distinct from *subradiata* and could be elevated to the rank of species.

The frill in *E. subradiata* joins the domicilium at a very sharp angle and, just as sharply, turns distally. Between the domicilium and the flat lateral surface of the frill is a narrow shelflike or ledgelike section of the frill. This is only one of the ways in which *E. subradiata* differs from *E. reticulata*. In addition, *E. subradiata* has a dorsal plication or ridge and its domicilium is smooth except for a row of low, obscure tubercles in the groove between the dorsal plication and the rest of the lateral surface.

The dimorphism in this species has not been established. By comparison with *E. reticulata*, all specimens of *E. subradiata* that have been described to date may be presumed to be females. Immature specimens are unknown. More work needs to be done on this species.

Illustrated specimen.—A left valve, UMMP No. 37256.

LITERATURE CITED

- ABUSHIK, A. F. 1958. *In*: Mikrofauna CCCP, Vol. 9, Voprosy Sistematiki i Opisanie Novich Vidov, Rodov i Podsemeistv Foraminifer i Ostrakod. Trudy Vses. Neft. Naugno-issled. Geol. Institut. (VNIGRI), Leningrad, pp. 232-87, 6 pls., 4 figs. [Russian].
- BASSLER, R. S. 1932. The Stratigraphy of the Central Basin of Tennessee. Tenn. State Dept. Educ., Div. Geol., Bull. 38, 268 pp., 49 pls., 4 figs.
- BUTTS, CHARLES. 1926. The Paleozoic Rocks. *In*: Adams, G. I., Butts, C., Stephenson, L. W., and Cooke, W. The Geology of Alabama. Ala. Geol. Surv., Spec. Rept. No. 14, pp. 40-230, Pls. 3-76, Figs. 2-4.
- JANUSSON, VALDAR. 1957. Middle Ordovician Ostracods of Central and Southern Sweden. Bull. Geol. Institut. Univ. Uppsala, Vol. 37, pp. 173-442, 15 pls., 46 figs. [Also reprinted as Publ. Palaeontol. Institut. Univ. Uppsala, No. 17.]
- KESLING, R. V. 1955. Notes on Two Ordovician Ostracods from Estonia. Contrib. Mus. Paleontol. Univ. Mich., Vol. 12, No. 13, pp. 259-72, 1 pl., 1 fig.
- , CRAFTS, F. C., DARBY, D. G., SHUBAK, K. E., and SMITH, R. N. 1960. Middle Ordovician Black River Ostracods from Michigan, Introduction and Part I, The Nature of Macronotella. *Ibid.*, Vol. 15, No. 14, pp. 293-314, 3 pls.
- ÕPIK, A. A. 1937. Ostracoda from the Ordovician Uhaku and Kukruse Formations of Estonia. Loodusuurijate Seltsi Aruanded, Vol. 43, pp. 65-138, 15 pls., 8 figs. [Also reprinted as Publ. Geol. Institut. Univ. Tartu, No. 50.]

- REED, F. R. C. 1912. Himalayan Fossils: Ordovician and Silurian Fossils from the Central Himalayas. Mem. Geol. Surv. India, Palaeontologia Indica, Ser. 15, Vol. 7, No. 2, v + 168 pp., 20 pls.
- 1936. The Lower Palaeozoic Faunas of the Southern Shan States. *Ibid.*, new ser., Vol. 21, No. 3, x + 130 pp., 7 pls.
- RUEDEMANN, RUDOLPH. 1901. Trenton Conglomerate of Rysedorph Hill, Rensselaer County, New York, and Its Fauna. N. Y. State Mus. Bull., Vol. 49, Paleontol. Papers 2, pp. 71-94, Pls. 5-7.
- 1912. The Lower Siluric Shales of the Mohawk Valley. *Ibid.*, Vol. 162, pp. 1-151, 10 pls.
- THORSLUND, PER. 1940. On the Chasmops Series of Jemtland and Södermanland (Tvären). Sver. Geol. Unders., Avh., Stockholm, Ser. C, No. 436 (Årsb. 34, No. 6), pp. 3-191, Pls. 1-15, 58 figs.
- ULRICH, E. O. 1889. On Some Polyzoa (Bryozoa) and Ostracoda from the Cambro-Silurian Rocks of Manitoba. Geol. and Nat. Hist. Surv. Canada, Contrib. Micro-palaeontol. Cambro-Silurian Rocks Canada, Part 2, pp. 27-57, Pl. 9, Figs. 4-14.
- 1890. New and Little Known American Paleozoic Ostracoda. Journ. Cincinnati Soc. Nat. History, Vol. 13, p. 104-37 (cont. on pp. 173-211 in 1891), 8 pls.
- 1894. The Lower Silurian Ostracoda of Minnesota. Final Rept. Geol. and Nat. Hist. Surv. Minnesota, Vol. 3, pp. 629-93, Pls. 43-46, Figs. 46-52. [Advance edition in 1894; entire report in 1897.]
- , and BASSLER, R. S. 1908. New American Paleozoic Ostracoda. Preliminary Revision of the Beyrichiidae, with Descriptions of New Genera. Proc. U. S. Nat. Mus., Vol. 35, pp. 277-340, Pls. 37-44, 61 figs.

Submitted for publication July 25, 1960

PLATES

EXPLANATION OF PLATE I

(All figures $\times 50$)

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<p>FIG. 1. Lateral stereogram of male right valve, UMMP No. 37375. Specimen crushed in just behind the anterior corner. Low, narrow ridge extending from the posteroventral region to the posterior corner is thought to be the continuation of the velate structure.</p>	
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<p>FIG. 2. Lateral stereogram of holotype, a female left valve, UMMP No. 37213. The anterior part of the frill is represented by an internal mold.</p>	
<i>Levisulculus</i> sp. A.	353
<p>FIG. 3. Lateral stereogram of female left valve, UMMP No. 37367. Most of the frill is broken off.</p>	
<i>Levisulculus</i> sp. C.	353
<p>FIG. 4. Lateral stereogram of left valve, questionably an adult male, UMMP No. 37357. No frill can be seen.</p>	

PLATE I

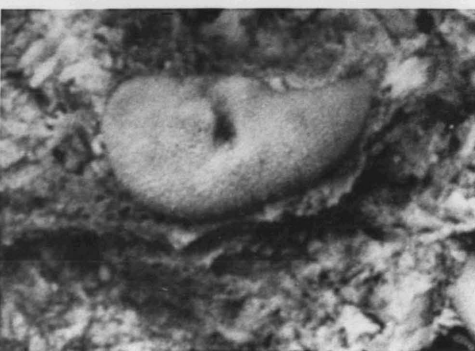
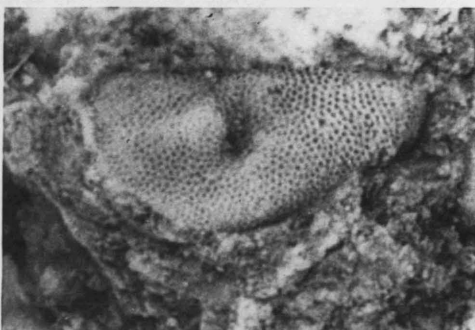
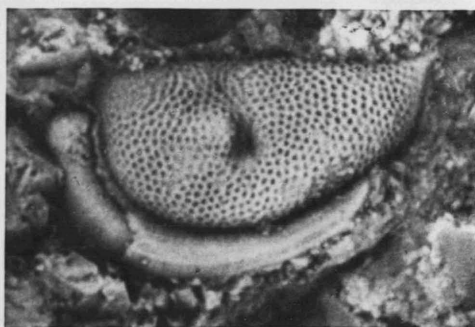
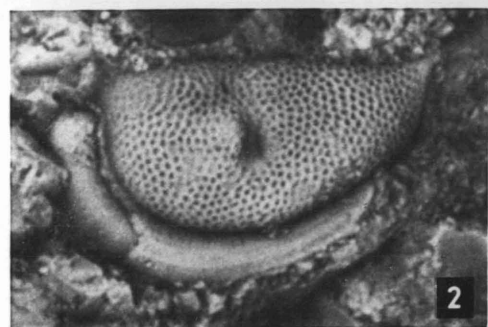
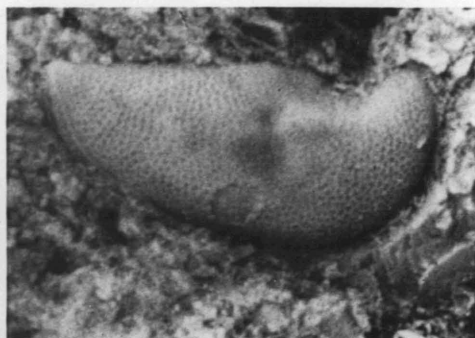
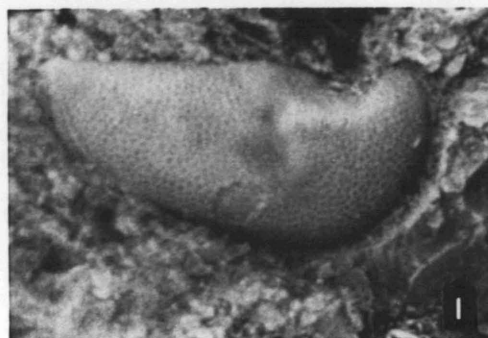
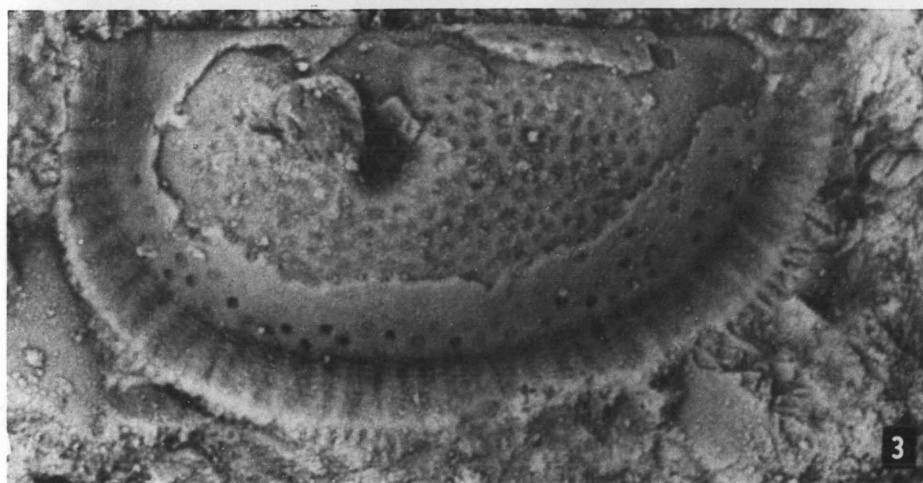
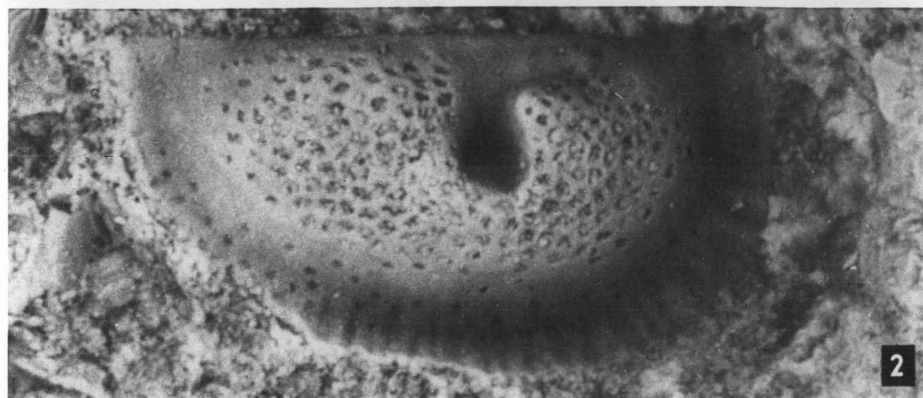
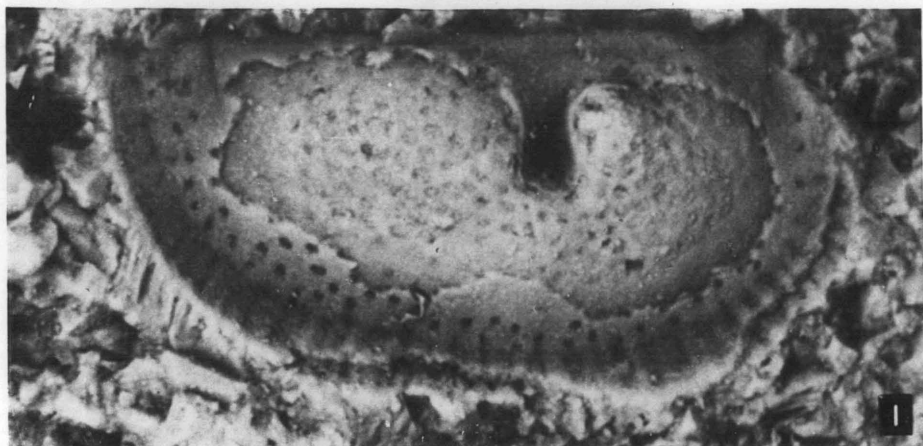


PLATE II



EXPLANATION OF PLATE II

(All figures $\times 50$)

PAGE

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FIG. 1. Lateral view of male right valve, UMMP No. 37220. The reticulate area of the domicilium is broken out, although its extent is indicated by markings on the internal mold. Where the outer wall of the frill is broken off anteriorly and ventrally, parts of the tubules can be seen on the exposed face of the inner wall. On the posteroventral border, the fringe of long denticles bordering the frill is preserved. A lateral stereogram of this valve is shown in Pl. III, Fig. 1.

FIG. 2. Lateral view of right valve of the ultimate immature instar, UMMP No. 37217. The posterior part of the frill is missing. The lateral surface of the domicilium is well preserved. A lateral stereogram of this valve is shown in Pl. III, Fig. 2.

FIG. 3. Lateral view of male left valve, UMMP No. 37218. The reticulate area is broken out. Although most of the denticles are broken, the bases of many can be seen along the anteroventral, ventral, and posteroventral edges of the frill. A lateral stereogram of this valve is shown in Pl. III, Fig. 3.

EXPLANATION OF PLATE III

(All figures $\times 20$)

	PAGE
<i>Eurychilina reticulata</i> Ulrich	355
<p>FIGS. 1, 3. Lateral stereograms of male right and left valves, UMMP Nos. 37220 and 37218. Part of the fringe of denticles on the frill are preserved in each specimen. Enlarged views of these valves are shown in Pl. II, Figs. 1, 3.</p>	
<p>FIG. 2. Lateral stereogram of right valve of the ultimate immature instar, UMMP No. 37217. An enlarged view of the valve is shown in Pl. II, Fig. 2.</p>	
<p>FIG. 4. Lateral stereogram of female left valve, UMMP No. 37255.</p>	
<p>FIGS. 5-6. Lateral stereograms of female right and left valves, UMMP Nos. 37216 and 37215. Both specimens are represented by the reticulate areas of the valve, viewed from the interior, and an external mold of the outer surface of rest of the valve. The opposite part of UMMP No. 37216 is shown in Pl. IV, Fig. 1.</p>	

PLATE III

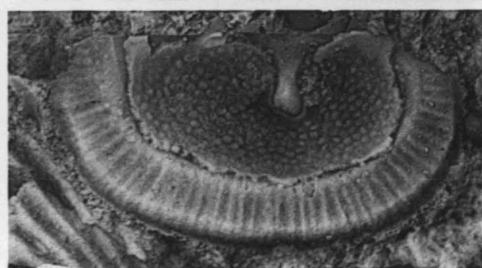
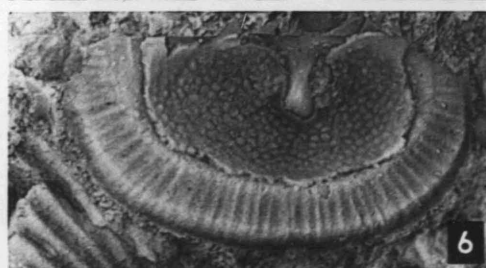
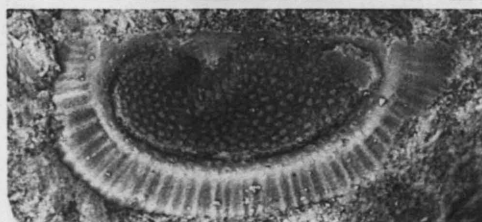
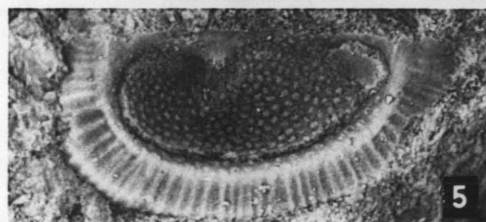
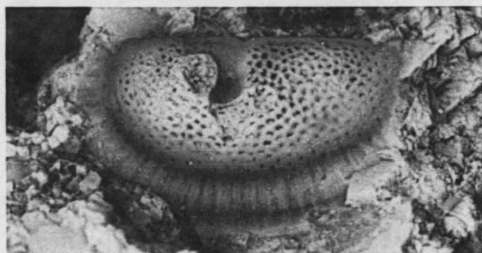
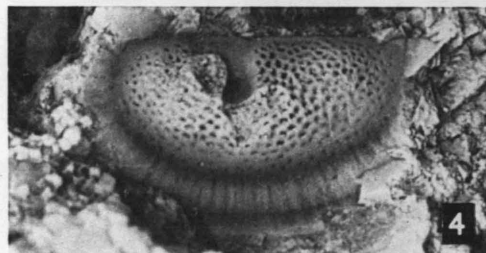
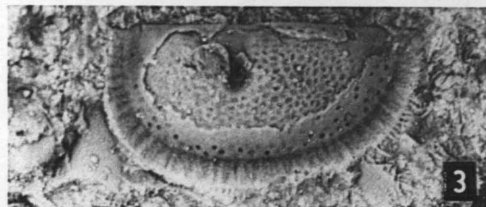
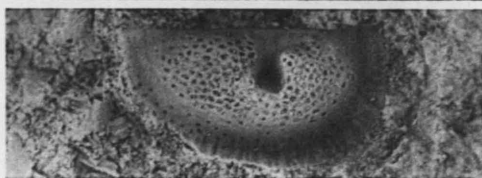
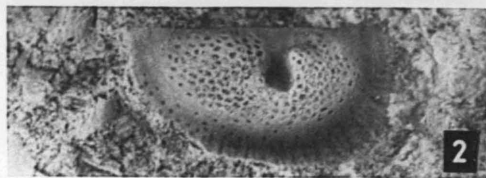
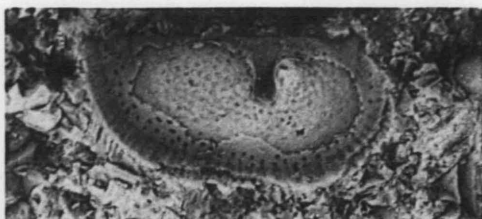
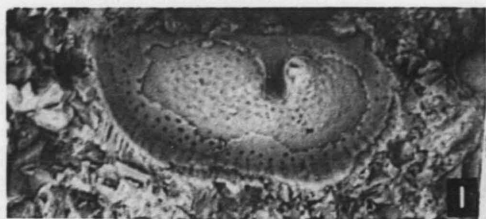
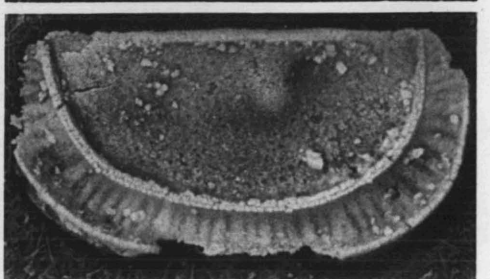
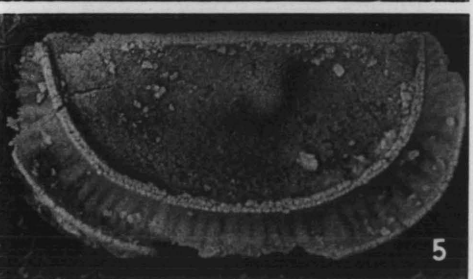
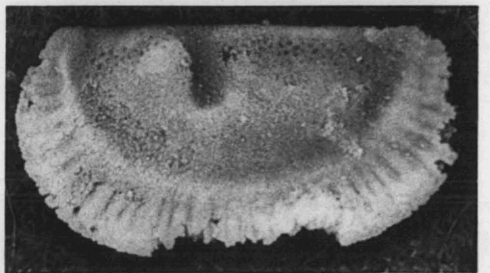
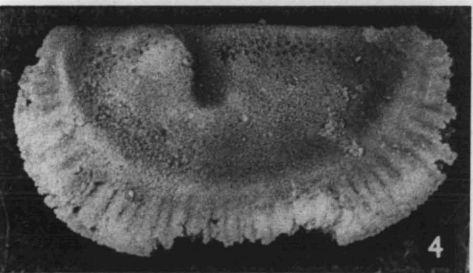
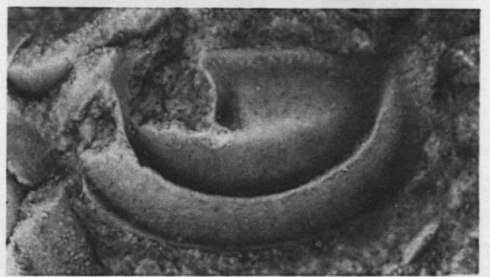
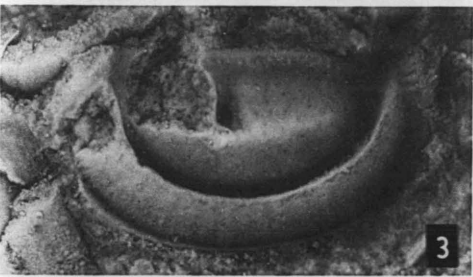
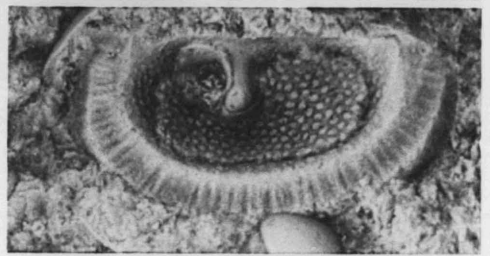
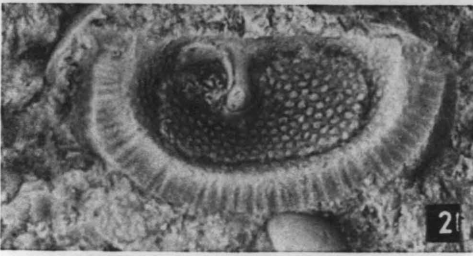
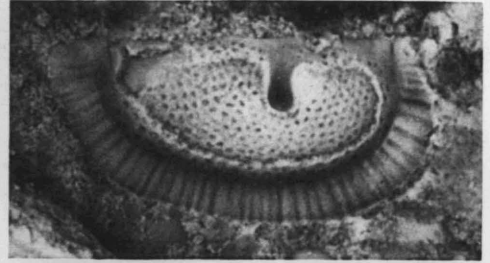
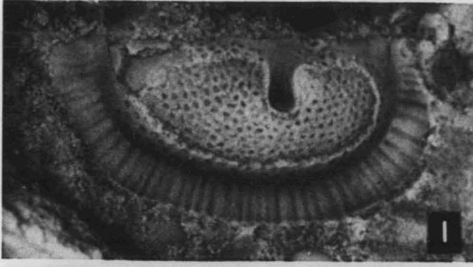


PLATE IV



EXPLANATION OF PLATE IV

(All figures $\times 20$)

PAGE

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FIG. 1. Lateral stereogram of female right valve, UMMP No. 37216. The opposite part of the specimen, consisting of the reticulate area and an external mold of the rest of the valve, is shown in Pl. III, Fig. 5.

FIG. 2. Lateral stereogram of female right valve, UMMP No. 37219. Specimen consists of reticulate area of the valve, viewed from the interior, and an external mold of the outer surface of the rest of the valve.

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FIG. 3. Lateral stereogram of a left valve, UMMP No. 37256.

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FIGS. 4-5. Lateral and interior stereograms of female left valve. Specimen was etched from a piece of the Ogontz member of the Upper Ordovician Stonington beds collected from SE $\frac{1}{4}$ sec. 26, T. 39 N., R. 22 W., from exposures on the west side of Stonington Peninsula facing Little Bay de Noc, Delta County, Michigan. Because the very fragile valve will, in all probability, ultimately disintegrate, it has not been catalogued. It is illustrated only to show certain characteristics of the eurychilinid frill.

