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OSTRACODS FROM THE NORWAY POINT
FORMATION OF MICHIGAN

BY

ROBERT V. KESLING and MARTIN WEISS



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INTRODUCTION

THE ostracods listed and described in this paper are from the Norway Point formation of the Middle Devonian Traverse group in Michigan. They come from seven localities and the occurrence of the species is listed by locality. The fauna includes sixteen families, thirty genera, and forty-nine species, of which two genera and eighteen species are new. The only previous work done on the ostracod fauna of the Norway Point formation in Michigan is a preliminary study of that of the Traverse group by A. S. Warthin, Jr. (1934). The material was collected by G. M. Ehlers, A. S. Warthin, Jr., E. C. Stumm, and R. V. Kesling.

The distribution and abundance of species of ostracods that have been collected from the Norway Point formation are listed in Table I.

The authors express their thanks to Dr. C. A. Arnold, Dr. G. M. Ehlers, and Dr. L. B. Kellum for their criticism of this paper.

All specimens listed and described are catalogued and deposited in the Museum of Paleontology of the University of Michigan.

REGISTER OF LOCALITIES

Collections were made from the following localities of Norway Point exposures:

LOCALITY:

1. Shale exposure on southwest bank of Thunder Bay River about 1 mile downstream from Four Mile Dam (also called Fletcher Dam, Three Mile Dam,

- and Broadwell's Saw Mill), Alpena County, Michigan. Layers of this exposure much contorted and destroyed by slumping. Sample collected from slumped material at the surface. Collected by G. M. Ehlers, E. C. Stumm, and R. V. Kesling in 1949.
2. Layers of Norway Point formation at the shale exposure of Locality No. 1, about 19 feet above river level in mid-July of 1926. Collected by A. S. Warthin, Jr., in 1926.
 3. Layers of Norway Point formation at the shale exposure of Locality No. 1, about 14 feet above river level in mid-July of 1926. Collected by A. S. Warthin, Jr., in 1926.
 4. Layers of Norway Point formation at the shale exposure of Locality No. 1, about 9 feet above river level in mid-July of 1926. Collected by A. S. Warthin, Jr., in 1926.
 5. Layers of Norway Point formation at the shale exposure of Locality No. 1, about 4 feet above river level in mid-July of 1926. Collected by A. S. Warthin, Jr., in 1926.
 6. Beds of Norway Point formation containing numerous specimens of *Spinocyrtia granulosa* (Conrad) near water level on the southwest bank of Thunder Bay River just downstream from Norway Point Dam (also called Seven Mile Dam), Alpena County, Michigan, in NE. $\frac{1}{4}$ sec. 12, T. 31 N., R. 7 E. Collected by G. M. Ehlers, E. C. Stumm, and R. V. Kesling in 1949.
 7. Clay shale beds of Norway Point formation overlying beds of Locality No. 6. Collected by G. M. Ehlers, E. C. Stumm, and R. V. Kesling in 1949.

SYSTEMATIC DESCRIPTIONS

Phylum ARTHROPODA

Class CRUSTACEA

Order OSTRACODA

Superfamily Beyrichiacea

Family Primitiidae Ulrich and Bassler 1923, emended Swartz 1936

Genus *Punctoprimitia* Stewart and Hendrix

Genotype.—*Haploprimitia simplex* Stewart, 1936, p. 743, by subsequent designation of Stewart and Hendrix, 1945*a*, p. 90.

Punctoprimitia subaequalis Swartz and Oriel

(Pl. III, Figs. 2-7)

Punctoprimitia subaequalis Swartz and Oriel, 1948, pp. 550-51, Pl. 79, Figs. 4-5.

Punctoprimitia subaequalis Kesling, 1925*b*, p. 25, Pl. 2, Figs. 2-4.

Occurrence.—Localities 1 and 3 to 6.

Types.—Hypotypes, one right valve, No. 27330, and four left valves, Nos. 27331, 27333, 27334, and 27336.

Genus *Halliella* Ulrich

Genotype.—*Halliella retifera* Ulrich, 1891, p. 184, Pl. 15, Figs. 5a–e, by subsequent designation of Miller, 1892, p. 707.

Halliella bellipuncta (Van Pelt)

(Pl. III, Figs. 21–22)

Amphissites bellipunctus Van Pelt, 1933, p. 332, Pl. 39, Figs. 37–40.

Halliella bellipuncta Warthin, 1934, p. 208, Pl. 1, Fig. 2.

Halliella bellipuncta Stewart, 1936, p. 746, Pl. 100, Figs. 15–16.

Kirkbyella bellipuncta Warthin, 1937, Card 80, Figs. 37–40.

Halliella bellipuncta Turner, 1939, p. 12, Pl. 1, Fig. 3.

Kirkbyella bellipuncta Shimer and Shrock, 1944, p. 671, Pl. 282, Figs. 43–44.

Halliella bellipuncta Kesling, 1952b, p. 26, Pl. 1, Figs. 16–25.

Occurrence.—Localities 1 and 3 to 6.

Types.—Hypotypes, two right valves, Nos. 27337 and 27339.

Family Hollinidae Swartz 1936

Genus *Hollinella* Coryell

Genotype.—By original designation, *Hollinella dentata* Coryell, 1928, p. 378, Pl. 51, Fig. 1.

Hollinella labrosa, sp. nov.

(Pl. II, Figs. 1–4)

Description.—Valves elliptical in outline. Dorsal border straight, anterior border round, ventral border slightly round, and posterior border subround. Lobation with strong relief, consisting of elongate L1 extending from anterior corner to central anterior area of each valve; elongate L2 extending from slightly below the dorsal border to the anteroventral part of the frill; subtriangular ventral lobe with its apex below the deep S2 and

TABLE I

"C" indicates 5 or more specimens to each 10 pounds of shale; "X" that there were fewer than 5.

SPECIES	LOCALITY						
	1	2	3	4	5	6	7
Superfamily Beyrichiacea							
Family Primitiidae Ulrich and Bassler 1923, emended Swartz 1936							
<i>Punctoprimitia subaequalis</i> Swartz and Oriel	C	..	C	C	C	C	..
<i>Halliella bellipuncta</i> (Van Pelt)	C	..	C	C	C	C	..
Family Hollinidae Swartz 1936							
<i>Hollinella labrosa</i> , sp. nov.	X	..	..	..	X	..	..
<i>Hollinella ampla</i> , sp. nov. ....	..	..	..	..	X	..	..
<i>Hollinella tendilobata</i> , sp. nov. ....	..	..	..	..	X	X	..
<i>Hollinella inclinissulcata</i> , sp. nov. ....	..	..	..	C	..	X	..
<i>Hollinella</i> sp. A.	X	..	..	..	X	..	..
<i>Hollinella</i> sp. B. ....	..	..	..	..	X	..	..
<i>Tetrasacculus paeneloculatus</i> , sp. nov.	X	..	..	..	X	X	..
<i>Parabolbina acinina</i> , sp. nov.	X	..	..	..	..	X	..
<i>Ctenoloculina cicatricosa</i> (Warthin)	C	C	C	C	C	C	C
<i>Falsipollex equipapillatus</i> , sp. nov. ....	..	..	..	C	X	X	..
<i>Subligaculum trullatum</i> , sp. nov. ....	..	..	..	..	X	X	..
<i>Subligaculum biorthogonium</i> , sp. nov. ....	..	..	..	..	C	X	..
<i>Ruptivelum bacculatum</i> , sp. nov. ....	..	..	..	X	..	..	..
Family Acronotellidae Swartz 1936							
<i>Monoceratina casei</i> Warthin	C	C	C	..	C	C	X
Family Drepanellidae Swartz 1936							
<i>Ulrichia spinifera</i> Coryell and Malkin	X	..	X	C	C	C	..
<i>Ulrichia fragilis</i> Warthin	X	C	C	C	C	C	C
Family Aechminidae Swartz 1936							
<i>Aechmina</i> sp. A. ....	..	..	..	..	..	X	..
<i>Aechmina</i> sp. B. ....	..	..	..	..	..	X	..
<i>Aechmina choanobasota</i> Kesling	X	X	..	..	..	X	..
Family Kirkbyidae Ulrich and Bassler 1906							
<i>Arcyzona diademata</i> (Van Pelt) .....	..	..	C	X	C	..	..
<i>Arcyzona aperticarinata</i> , sp. nov.	X	X	..	X	X	..	..
<i>Arcyzona</i> sp. ....	..	..	..	C	C	..	..
<i>Reticestus acclivitatus</i> , sp. nov. ....	..	X	..	X	..	..	..
Family Kloedenellidae Ulrich and Bassler 1923							
<i>Eukloedenella doverensis</i> Turner	X	X	C	C	X	..	X
<i>Dizygopleura euglyphea</i> Warthin	C	..	C	C	C	C	..
Family Glyptopleuridae Girty 1910							
<i>Glyptopleura bipunctata</i> , sp. nov. ....	..	..	X	X	..	..	..

SPECIES	LOCALITY						
	1	2	3	4	5	6	7
Superfamily Cypridacea							
Family Bairdiidae Sars 1887							
<i>Lucasella mundula</i> Stewart	X	C	C	..	..	..	..
<i>Bythocypris parsonia</i> Wilson .....	..	X	..	..	..	..	..
<i>Bythocypris subquadrata</i> Stewart	X	..	X	X	X	..	X
<i>Bythocypris devonica borealis</i> Warthin .....	..	..	X	..	..	..	..
Family Healdiidae Harlton 1933							
<i>Healdia gibba</i> , sp. nov.	X	..	X	X	X	X	..
<i>Healdia</i> sp. ....	..	..	..	..	..	X	..
Family Thlipsuridae Ulrich 1894							
<i>Euglyphella sigmoidalis</i> (Jones)	C	C	C	C	C	C	C
<i>Euglyphella compressa</i> Coryell and Malkin ....	..	..	..	X	..	..	..
<i>Euglyphella simplex</i> , sp. nov. ....	..	..	X	X	X	X	..
<i>Octonaria quadricostata</i> Van Pelt	C	C	X	C	C	C	C
<i>Octonaria crescentiformis</i> Van Pelt	C	..	..	C	C	C	..
<i>Hypasmaphora textiliger</i> a Van Pelt	X	..	..	..	..	X	..
Family Quasillitidae Coryell and Malkin 1936							
<i>Quasillites ornatus</i> Swartz and Oriel	X	..	X	..	..	..	..
<i>Quasillites jubatus</i> , sp. nov.	X	X	..	..	..	..	X
<i>Quasillites lobatus</i> Swartz and Oriel	X	..	..	..	..	..	..
<i>Quasillites binodosus</i> Swartz and Oriel	X	X	X	..	..	..	..
<i>Quasillites</i> cf. <i>Q. ornatus</i> Swartz and Oriel	X	..	..	..	..	..	..
<i>Quasillites obliquus</i> Coryell and Malkin	X	..	..	..	..	..	..
<i>Jenningsina catenulata</i> (Van Pelt)	C	X	X	C	C	X	C
<i>Jenningsina scalpta</i> , sp. nov.	X	..	..	..	..	..	..
Family Ropolonellidae Coryell and Malkin 1936							
<i>Ropolonellus papillatus</i> Van Pelt .....	..	..	..	..	..	X	..
<i>Ropolonellus plenus</i> , sp. nov. ....	..	..	..	X	..	..	..
Family Barychilinidae Ulrich 1891							
<i>Barychilina labyrinthica</i> Kesling and Kilgore ....	..	..	X	..	..	..	..
<i>Barychilina embrithes</i> Kesling and Kilgore .....	..	..	X	..	..	..	..
<i>Barychilina</i> sp. ....	..	..	X	..	..	..	..
Family Cytherellidae Sars 1865							
<i>Birdsallella delawarensis</i> Stewart	X	..	X	X	X	X	..
<i>Birdsallella tumida</i> Stewart	X	..	X	X	X	X	X
<i>Ponderodictya punctulifera</i> (Hall)	X	C	C	C	..	..	X
<i>Ponderodictya</i> sp. ....	..	..	..	X	..	..	..
Superfamily Leperditiaacea							
Family Leperditellidae Ulrich and Bassler 1906							
<i>Coelonella scapha</i> (Stewart) .....	..	..	X	..	..	X	..

its base extending to the ventral part of the frill; large knoblike L3 extending slightly above the hinge line; and small elongate L4 extending from the dorsal border to the central posterior area. Dorsal end of L2 distinctly pointed. All lobes sharply delineated by deep sulci. S1 slanting forward and downward from the dorsal border, dorsally confluent with S2; S2 broad and deepest of all the sulci; S3 moderately broad and well defined. Frill relatively narrow but very thick, separated from the contact margin by a shallow channel.

Anterior cardinal angle approximately 150 degrees; posterior cardinal angle, not well defined, approximately 130 degrees.

Surface of valve finely granulose, not well preserved in the specimens examined.

Dimensions of holotype, a right valve, No. 27371: length, 1.51 mm.; height, .81 mm.; and width, .50 mm. Thickness of frill approximately .10 mm.

Remarks.—The dimorphism of this species is not known. The species is distinguished by the high relief and distinctive pattern of the lobes and by the thick, liplike frill.

The name of this species is derived from Latin *labrosus* ("large-lipped") and refers to the form of the frill.

Occurrence.—Localities 1 and 5. Holotype from locality 5.

Types.—Holotype, a right valve, No. 27371; paratypes, two right valves, Nos. 27372 and 27373.

Hollinella ampla, sp. nov.

(Pl. II, Fig. 27)

Description.—Valve subpyriform. Dorsal border straight, anterior border round, ventral border gently curved, and posterior border gently tapering to posterior corner. L1 with low relief, ventrally confluent with L2; L2 a small elongate node, ventrally confluent with L1 and the anterior part of the ventral lobe; L3 a round knob extending slightly above the hinge line, ventrally separated from the posterior part of the ventral lobe by a shallow furrow; L4 low and gently arched. S1 short, extending from the dorsal border about one-fifth the distance to the anteroventral border; S2 slanting from dorsal border forward and downward to the frill, deepest in its dorsal half; S3 shallow. Frill wide, extending from anterior corner to posteroventral part of the valve.

Anterior cardinal angle approximately 130 degrees; posterior cardinal angle approximately 100 degrees.

Surface of valve finely papillose. Surface of frill smooth.

Dimensions of holotype, No. 27355, a left valve and the only specimen: length, 1.80 mm.; height, 1.10 mm.; and width, .44 mm. Width of frill in its ventral part, .25 mm. Diameter of L3, about .40 mm.

Remarks.—This large species is distinguished by the papillose ornamentation, smooth frill, and the unusual furrow-like ventral extension of L2, which appears to bisect the ventral lobe.

The name of this species is derived from Latin *amplus* ("large") and refers to the size of the valve.

Occurrence.—Locality 5.

Type.—Holotype, a left valve, No. 27355.

Hollinella tendilobata, sp. nov.

(Pl. II, Figs. 23–26)

Female.—Valves subquadrate in outline. Dorsal border straight, anterior border round, ventral border gently curved, and posterior border subround. L1 low, confluent ventrally with L2 and the ventral lobe; L2 a small vertically elongate node terminating dorsally below the hinge line; L3 a horizontally elongate elliptical lobe, nearly tangent to the hinge line at its dorsal border, separated from the ventral lobe below by a shallow groove; L4 low, evenly arched, ventrally confluent with the ventral lobe. S1 shallow; S2 well defined, reaching from the dorsal border to the central part of the valve, there truncated by the ventral lobe; S3 a shallow groove extending around the ventral border of L3 and anteriorly confluent with S2. Frill relatively narrow, confluent with the lateral surface of the valve, separated from the free edge of the valve by a narrow channel.

Anterior cardinal angle approximately 130 degrees; posterior cardinal angle approximately 115 degrees.

Surface of valve relatively smooth, ornamented by small granules.

Dimensions of holotype, a female left valve, No. 27379: length, .95 mm.; height, .58 mm.; and width, .25 mm. Range for three specimens: length, .91 to .95 mm.; and height, .49 to .58 mm.

Male.—General outline, lobation, and surface ornamentation same as those of female. Frill relatively narrow, flared sharply outward and distinctly set off from lateral surface.

Dimensions of allotype, a male left valve, No. 27380: length, 1.10 mm.; height, .60 mm. Width of an entire carapace, .51 mm.

Remarks.—This species is related to *Hollinella magnilobata* Kesling and McMillan (1951, p. 60, Pl. I, Figs. 11–13), from which it differs in

having a narrower frill and in having the posterior corner subround instead of acute.

The name of this species is derived from Latin *tendus* ("stretched") and *lobus*, m. ("lobe") and refers to the horizontally elongate L3.

Occurrence.—Localities 5 and 6. Holotype from locality 6.

Types.—Holotype, an adult female left valve, No. 27379; allotype, an adult male left valve, No. 27380; paratype, an adult female right valve, No. 27378.

***Hollinella inclinisulcata*, sp. nov.**

(Pl. II, Figs. 5-8)

Male.—Valve subpyriform in outline. Dorsal border straight, anterior border subround, ventral border gently curved, posterior border subround. Greatest height of valve approximately through L2. L1 low, ventrally confluent with ventral lobe; L2 a vertically elongate node nearly confluent with L1 along its anterior border, but sharply set off by deep sulci on its dorsal, posterior, and ventral borders; L3 a round knob extending only slightly above hinge line; L4 low, evenly tapering to posterior border, separated from ventral lobe by a very shallow depression. S1 a very short, shallow groove; S2 wide, deepest of all the sulci, terminating against ventral lobe, with an extension of the sulcus forward and down below L2; S3 a distinct groove curving around L3 and confluent with S2. Frill moderately wide, extending from anterior corner to posteroventral part of valve, sharply set off from lateral surface, flared outward, anterior tip of frill extending slightly above the hinge line.

Anterior cardinal angle approximately 120 degrees; posterior cardinal angle approximately 115 degrees.

Surface of valves finely granulose with scattered papillae. Papillae particularly well developed in posterior half of each valve, many present as marginal structures along the posterior free edge.

Dimensions of holotype, a left valve, No. 27357: length, 1.16 mm.; height, .60 mm.; and width, .23 mm.

Female.—Outline, lobation, and surface ornamentation same as those of the male. Frill slightly incurved, delineated from lateral valve surface by shallow rounded groove; frill widest in anteroventral part, nearly .2 mm. in paratype No. 27362.

Dimensions of paratype, a left valve, No. 27362: length, 1.25 mm.; height, .73 mm.; and width, .27 mm.

Remarks.—This species resembles *Hollinella bullata* Kesling and Mc-

millan (1951, p. 58, Pl. I, Figs. 8-9) but differs from it in having greater length, a more prominent frill, a smaller posterior termination of the frill, and less prominent L1.

The name of this species is derived from Latin *inclinus* ("bending, or leaning over") and *sulcus*, m. ("a furrow") and refers to the orientation of S2.

Occurrence.—Localities 4 and 6. Holotype from locality 6.

Types.—Holotype, a male left valve, No. 27357; allotype, a female right valve, No. 27356; paratypes, a female right valve and a female left valve, Nos. 27358 and 27362.

Hollinella sp. A

(Pl. I, Figs. 19-20)

Description.—Valves subpyriform in outline. Dorsal border straight, anterior border subround, ventral border subround, posterior border very gently round; posterior part of valve tapering to posterior corner. L1, L2, and L3 developed as small nodes elevated slightly above rest of valve. S1 and S2 short, moderately deep; S3 a shallow groove. Velate structure consisting of short, rounded spine in anteroventral part of each valve and long, rounded spine in posteroventral part of valve approximately below L3.

Anterior cardinal angle approximately 115 degrees; posterior cardinal angle approximately 110 degrees.

Surface granulose except L1, L2, and L3 which have less prominent ornamentation.

Dimensions of a carapace, No. 27352: length, .70 mm.; height, .40 mm.; and width, .21 mm.

Remarks.—These specimens are assumed to be immature instars of a species of *Hollinella*.

Occurrence.—Localities 1 and 5.

Types.—Two carapaces, Nos. 27352 and 27353.

Hollinella sp. B

(Pl. I, Fig. 21)

Description.—Valves subquadrate in outline. Left valve strongly overlapping right valve. Dorsal border straight, anterior border subround, ventral border nearly straight, posterior border subround. L1 large, gently round, ventrally confluent with ventral lobe, separated from L2 by a shallow indistinct groove; L2 a vertically elongate node; L3 an indistinct node;

L4 low, gently rounded confluent with ventral lobe. S1 and S3 shallow grooves; S2 distinct deep sulcus curving downward and forward. Anteroventral part of valve extended as a small beak, terminating in a low rounded velate protuberance. Posterior velate structure a small protuberance on the posteroventral part of valve, ventral to L3.

Cardinal angles indistinct, corners round.

Surface granulose.

Dimensions of a carapace, No. 27354: length, 1.00 mm.; height, .40 mm.; and width, .25 mm.

Remarks.—This specimen is assumed to be an immature instar of a species of *Hollinella*. The only specimen is slightly deformed.

Occurrence.—Locality 5.

Type.—A male carapace, No. 27354.

Genus *Tetrasacculus* Stewart

Genotype.—By original designation, *Tetrasacculus bilobus* Stewart, 1936, p. 745, Pl. 100, Figs. 8–11.

***Tetrasacculus paeneloculatus*, sp. nov.**

(Pl. I, Figs. 14–18)

Female.—Valves subpyriform in outline. Dorsal border straight, anterior border subround, ventral border gently curved, and posterior border tapering and subround. S2 (median sulcus) extending from dorsal border downward and forward to junction with frill. Frill with three complete loculi on the anteroventral and ventral parts of each valve and one incomplete loculus in the posteroventral part. Each loculus surrounded by distinct rim and separated from the free margin by a narrow channel.

Anterior cardinal angle approximately 110 degrees; posterior corner rounded.

Surface finely reticulate. Edge of frill smooth.

Dimensions of holotype, an incomplete right valve, No. 27350: height, .32 mm.; and width, .23 mm. Dimensions of left valve, paratype No. 27349: length, .61 mm.; diameter of loculus, .12 mm.

Male.—General outline, lobation, and surface ornamentation same as those of female. Posteroventral and anteroventral part of valve inflated adjacent to the median sulcus. Slight development of the velate ridge.

Dimensions of allotype, a right valve, No. 27351: length, .65 mm.; height, .32 mm.; and width, .20 mm.

Remarks.—This species differs from *Tetrasacculus magnivelatus* Kelling and McMillan (1951, p. 51, Figs. 6–7), to which it is closely related, in lacking an L2 and in having a greater part of the frill along the side of the incomplete loculum.

The name of this species is derived from Latin *paene* (“almost”) and *loculus* (“a loculus”) and refers to the nearly complete posterior loculus.

Occurrence.—Localities 1, 5, and 6. Holotype from locality 6.

Types.—Holotype, a broken female right valve, No. 27350; paratype, a female left valve, No. 27349; allotype, a male right valve, No. 27351.

Genus *Parabolbina* Swartz

Genotype.—*Ctenobolbina granosa* Ulrich 1900, p. 183, Pl. 8, Fig. 12, by subsequent designation of Swartz, 1936, pp. 570–73.

Parabolbina acinina, sp. nov.

(Pl. II, Figs. 21–22)

Male.—Valves suboval in outline. Dorsal border straight, free border round. L1 and L2 apparently confluent; L3 slightly raised above rest of surface and projecting slightly above hinge line. S2 extending from dorsal border to central part of valve. Velate structure consisting of a short, blunt spine on anteroventral part of valve and a more elongate, straight spine in posteroventral part.

Both anterior and posterior cardinal angles approximately 125 degrees.

Surface covered with papillae of strong relief.

Dimensions of holotype, a right valve, No. 27365: length, .55 mm.; height, .36 mm.; and width, .14 mm.

Female unknown.

Remarks.—This small species is distinguished by its suboval outline and papillose surface.

The name of this species is derived from Latin *acinus*, m. (“berry”) and refers to the texture of the surface.

Occurrence.—Localities 1 and 6. Holotype from locality 1.

Types.—Holotype, male right valve, No. 27365; paratype, male right valve, No. 27364.

Genus *Ctenolocolina* Bassler

Genotype.—*Tetradella cicatricosa* Warthin, 1934, p. 209, Pl. 1, Figs. 4–6, by subsequent designation of Bassler, 1941, pp. 22–23.

Ctenolocolina cicatricosa (Warthin)

(Pl. II, Figs. 9-14; Pl. III, Fig. 1)

Tetradella cicatricosa Warthin, 1934, p. 209, Pl. 1, Figs. 4-6.*Tetradella cicatricosa* Stewart, 1936, p. 748, Pl. 100, Figs. 23-24.*Tetradella cicatricosa* Warthin, 1937, Card 54.*Ctenolocolina cicatricosa* Bassler, 1941, pp. 22-23.*Ctenolocolina cicatricosa* Shimer and Shrock, 1944, p. 667, Pl. 281, Figs. 36-37.*Ctenolocolina cicatricosa* Stewart and Hendrix, 1945*b*, p. 102, Pl. 11, Fig. 11.*Ctenolocolina acanthophora* Swartz and Oriol, 1948, p. 553, Pl. 79, Figs. 8-14.*Ctenolocolina cicatricosa* Kesling, 1951, Pl. 13, Figs. 1*a-b*, 2.*Ctenolocolina cicatricosa* Kesling and McMillan, 1951, pp. 49-50, Pl. IV, Figs. 9-10.*Ctenolocolina acanthophora* Moore, Lalicker, and Fischer, 1952, p. 530, Fig. 8.*Tetradella cicatricosa* Moore, Lalicker, and Fischer, 1952, p. 531, Figs. 12*a-b*.*Ctenolocolina cicatricosa* Kesling, 1952*a*, pp. 247-90, Pls. 1-3.*Occurrence*.—Localities 1 to 7.*Types*.—Topotypes, adult male left valve, adult female carapace, immature male carapace, and broken male left valve, Nos. 27935, 27933, 27934, and 27937, respectively.Genus *Falsipollex* Kesling and McMillan*Genotype*.—By original designation, *Falsipollex altituberculatus* Kesling and McMillan, 1951, pp. 68-69, Pl. 3, Figs. 1-3.*Falsipollex equipapillatus*, sp. nov.

(Pl. I, Figs. 1-13)

Female.—Valves subpyriform in outline. Hinge line straight, anterior border subround, ventral border gently round, posterior border subround. L1 extending slightly above hinge line, ventrally confluent with ventral lobe; L2 a vertically elongate node, ventrally confluent with ventral lobe, separated from L1 by a shallow indistinct groove; L3 a large bulb extending above hinge line; L4 a low, evenly rounded lobe confluent with ventral lobe. S1 short, dorsally confluent with S2; S2 deep, extending to middle of valve; S3 a curved groove around the posterior and ventral parts of L3. Frill wide, confluent with lateral surface, incurved in its distal part.

Anterior cardinal angle approximately 115 degrees (measured from interior view). Posterior cardinal angle approximately 120 degrees.

Surface ornamented by high papilli, all of approximately same diameter, the height of the papilli decreasing toward the distal edge of the frill.

Dimensions of holotype, a female right valve, No. 27327: length, 1.20 mm.; height (including L3 and frill), .75 mm.; and width, .40 mm.

Male.—Outline, lobation, and surface ornamentation same as those of the female. Velate structure consisting of two flattened spurs on each valve, the one on the anteroventral part of valve slightly larger than the one on the posteroventral part. Posterior spur extremely variable in form and constricted at its junction with valve.

Dimensions of allotype, a male right valve, No. 27328: length, 1.08 mm.; height, .75 mm.; and width, .38 mm.

Remarks.—This species resembles *Falsipollex altituberculatus* Kesling and McMillan, 1951, the genotype, but differs from it in having greater posterior height, more uniform diameter of the papilli, and more distinct lobation. The male of this species, moreover, differs from the male of the genotype in having somewhat flattened velate spurs. It is closely related to *F. valgus* Kesling (1952c, p. 52, Pl. II, Figs. 19–26), from the Middle Devonian Ferron Point formation in northern Michigan, but both dimorphic forms can be readily distinguished from those of *F. valgus*. The female of *F. equipapillatus* has a long frill, whereas that of *F. valgus* has a short frill and a posteroventral spurlike protuberance. The male of *F. equipapillatus* has nearly vertical spurs, whereas the male of *F. valgus* has spurs directed outward at an angle.

The name of this species is derived from Latin *aequus* (“equal”), and *papillatus* (“papillose”) and refers to the uniform distribution and size of the papillae.

Occurrence.—Localities 4, 5, and 6. Holotype from locality 4.

Types.—Holotype, a female right valve, No. 27327; allotype, a male right valve, No. 27328; paratypes, three female right valves, one female left valve, one broken male right valve, and two broken male left valves, Nos. 27329, 27332, 27338, 27335, 27340, 27342, and 27343, respectively.

Genus *Subligaculum* Kesling and McMillan

Genotype.—By original designation, *Subligaculum scrobiculatum* Kesling and McMillan, 1951, pp. 65–66, Pl. 2, Figs. 1–4; Pl. 7, Figs. 1–8.

Subligaculum trullatum, sp. nov.

(Pl. II, Figs. 15–17)

Male.—Valves subquadrate in outline. Dorsal border straight, anterior border subround, ventral border nearly straight, posterior border subround.

L1 evenly round, confluent with ventral lobe; L2 a circular node; L3 and L4 confluent. S1 a shallow groove around L2, confluent with S2; S2 slightly deeper than S1 and ventrally bifurcating with the anterior branch joining S1 and the posterior branch joining a distinct broad subcircular pit in the posterior part of the valve. Velate structures consisting of a ridge extending from anterior to posteroventral part of valve, anterior part of ridge developed as a small frill and posterior tip of ridge projecting as a small pointed spur.

Anterior cardinal angle approximately 125 degrees; posterior cardinal angle approximately 110 degrees.

Surface with large discrete granules.

Dimensions of holotype, a left valve, No. 27367: length, .75 mm.; height, .40 mm.; and width, .17 mm.

Female.—Known only from anterior half of right valve. Surface ornamentation same as that of male. Frill of fragment contains three convex scalloped parts.

Remarks.—*Subligaculum trullatum*, sp. nov., resembles the genotype, *S. scrobiculatum*, but differs from it in having more elongate valves, narrower anteroventral frill, smaller posteroventral spur, and in the lack of a distinct sulcus connecting the posterior pit with the posteroventral border.

The name of this species is derived from Latin *trulla*, f. ("a ladle") and refers to the broad pit in the posterior half of the valve.

Occurrence.—Localities 5 and 6. Holotype from locality 6.

Types.—Holotype, a male left valve, No. 27367; paratypes, a male left valve and a broken female right valve, Nos. 27368 and 27370.

Subligaculum biorthogonium, sp. nov.

(Pl. II, Figs. 18–20)

Female.—Valves subpyriform in outline. Dorsal border straight, anterior border subround, ventral border gently round, posterior portion of valves tapering to posterior corner. The median sulcus distinctly shaped like an inverted T, extending from dorsal border to central part of valve. Frill with four scallops.

Anterior cardinal angle approximately 120 degrees; posterior cardinal angle approximately 110 degrees.

Surface ornamented with prominent discrete granules except for median sulcus, posterior part of the valve, and frill, which are relatively smooth.

Male unknown.

Dimension of holotype, No. 27390: length, .76 mm.; height, .48 mm.; width, .22 mm.

Remarks.—This species is distinguished by the centrally located sulcus shaped like an inverted T and by the unornamented posterior part of the valve.

The name of this species is derived from Latin *bi-* (“double”) and *orthogonius* (“right-angled”) and refers to the shape of the sulcus.

Occurrence.—Localities 5 and 6. Holotype from locality 6.

Types.—Holotype, a female left valve, No. 27390; paratypes, a female left valve, and a female right valve, Nos. 27389 and 27391.

Ruptivelum, gen. nov.

Genotype.—*Ruptivelum bacculatum*, sp. nov.

Male.—Valves quadrilobate with large L3. Velate structures consisting of a short ventral frill and a short anteroventral frill confluent with L1.

Female.—Valves quadrilobate with large L3 and general hollinid lobation. Wide incurved frill, dorsally confluent with L1.

Remarks.—*Ruptivelum* is distinguished by the unusual velate structure of the male, which appears to be intermediate in form between that of *Hollinella* and that of *Falsipollex*. The male of *Ruptivelum* differs from that of *Hollinella* in having the velate structure divided into two distinct segments; it differs from that of *Falsipollex* in having a larger velate structure and in having the anterior velate structure confluent with L1.

The name of this genus is derived from Latin *ruptus* (“broken”) and *velum*, n. (“curtain”) and refers to the form of the male velate structure.

Ruptivelum bacculatum, sp. nov.

(Pl. I, Figs. 22–30)

Hollinella sp. Kesling, 1951, Pl. 14, Figs. 1–2.

Male.—Valves subpyriform in outline. Hinge line straight, anterior border round, ventral border gently round, posterior part of valve tapering to posterior corner. L1 a raised lobe, ventrally confluent with anterior velate structure dorsally extending slightly above hinge line; L2 a small node; L3 a prominent bulb extending above hinge line; L4 slightly raised above surface and confluent with ventral lobe. S1 short, dorsally confluent with S2; S2 deep, prominent, extending to middle of the valve; S3 a groove around L3. Anterior velate structure, a frill confluent with L1. Posterior velate structure, a short frill aligned with anterior velate structure but distinctly separated from it. Marginal tubercles present along free edge.

Anterior cardinal angle approximately 120 degrees; posterior cardinal angle approximately 115 degrees.

Most of surface granulose; L1, L3, dorsal part of L4, and the area of the velate structure papillose, with the low papillae grading into the granulose texture of the rest of the surface.

Dimensions of the holotype, a left valve, No. 27346: length, 1.03 mm; height, .50 mm.; and width, .27 mm.

Female.—General outline and lobation same as those of the male. Ornamentation like that of the male except for scattered tubercles along junction of frill and lateral surface. Frill broad, flat, dorsally confluent with L1.

Dimensions of allotype, a left valve, No. 27344: length, 1.18 mm.; height, .72 mm.; and width, .25 mm.

Remarks.—The name of this species is derived from Latin *baccula*, f. ("a berry") and refers to the resemblance of the surface texture to that of a berry.

Occurrence.—Locality 4. Holotype from locality 4.

Types.—Holotype, a male left valve, No. 27346; allotype, a female left valve, No. 27344; paratypes, a male left valve, a male right valve, and a female left valve, Nos. 27347, 27348, and 27345, respectively.

Family Acronotellidae Swartz 1936

Genus *Monoceratina* Roth

Genotype.—By original designation, *Monoceratina ventralis* Roth, 1928, pp. 15–19, Text Figs. 1a–c.

Monoceratina casei Warthin

(Pl. III, Figs. 8–11)

Monoceratina casei Warthin, 1934, p. 207, Pl. 1, Fig. 1.

Monoceratina casei Warthin, 1937, Card 16.

Occurrence.—Localities 1 to 3 and 5 to 7.

Types.—Topotypes, two carapaces, Nos. 27374 and 27375.

Family Drepanellidae Swartz 1936

Genus *Ulrichia* Jones

Genotype.—By original designation, *Ulrichia conradi* Jones, 1890b, p. 544, Text Fig. 2.

Ulrichia spinifera Coryell and Malkin

(Pl. III, Figs. 32-35)

Ulrichia conradi Warthin, 1934, p. 213, Pl. 1, Fig. 10.*Ulrichia spinifera* Coryell and Malkin, 1936, pp. 1-2., Figs. 1-2.*Ulrichia conradi* Stewart, 1936, p. 747, Pl. 100, Figs. 17-18.*Ulrichia conradi* Warthin (*partim*), 1937, Card 94, Figs. 1, 1a, 2.*Ulrichia spinifera* Kesling, 1952b, p. 27, Pl. 4, Figs. 9-12.*Occurrence.*—Localities 1, 3, 4, 5, and 6.*Types.*—Hypotypes, three right valves, Nos. 27359, 27360, and 27361.*Ulrichia fragilis* Warthin

(Pl. III, Figs. 23-26)

Ulrichia fragilis Warthin, 1934, pp. 213-14, Pl. 1, Fig. 11.*Ulrichia fragilis* Stewart, 1936, p. 747, Pl. 100, Figs. 19-20.*Ulrichia fragilis* Warthin, 1937, Card 95.*Ulrichia fragilis* Kesling, 1952b, p. 27, Pl. 4, Figs. 22-24.*Occurrence.*—Localities 1 to 7.*Types.*—Topotypes, one carapace and two left valves, Nos. 27341, 27363, and 27369, respectively.

Family Aechminidae Swartz 1936

Genus *Aechmina* Jones and Holl*Genotype.*—By original designation, *Aechmina cuspidata* Jones and Holl, 1869, p. 218, Pl. 14, Fig. 8, Text Fig. 2.*Aechmina* sp. A

(Pl. III, Figs. 12-13)

Description.—Subelliptical in outline. Greatest height without spine, just anterior of center, greatest length midway between hinge line and lowest venter point, greatest width in anterior portion with noticeable ventral swelling. Hinge line less than greatest length.

Anterior cardinal angle approximately 120 degrees; posterior cardinal angle approximately 125 degrees.

Surface convex, smooth with denticles on ventral border; denticles increasing in size and spacing toward the anterior.

Spine extending above valve surface a distance little more than that from the dorsal to the ventral border; spine increasing greatly in diameter

toward the base and with an additional swelling on the anterior part of its base, making the lower part of the spine asymmetric in lateral view.

Dimensions of specimen, a right valve, No. 29827: length, .63 mm.; height without spine, .39 mm.; height of spine above valve surface, .40 mm.; and diameter of spine at its base, .30 mm.

Remarks.—Whether the orientation employed here is correct is by no means certain, inasmuch as the greatest height and the greatest width are in the same end of the valve.

Occurrence.—Locality 6.

Specimens.—Two right valves, Nos. 29827 and 29894.

Aechmina sp. B

(Pl. III, Fig. 14)

Description.—Carapace subquadrate. Greatest length through the center, greatest height slightly front of the center, greatest width midway between dorsal and ventral borders. Cardinal angles distinct.

Anterior and posterior cardinal angles equal, approximately 120 degrees.

Surface convex, smooth with the exception of the free margin. Free margin denticulate, with the denticles uniformly distributed in a low border on the entire free edge.

Large, uniformly tapering spine extending from valve surface approximately a distance equal to that from the hinge line to the ventral border, oriented away from the hinge line at an angle of about 45 degrees and perpendicular to the valve surface.

Dimensions of specimen, a carapace, No. 29828: length, .65 mm.; height without spine, .48 mm.; height of spine above valve surface, .42 mm.; and diameter of base of spine, .30 mm.

Remarks.—Only one somewhat distorted carapace found.

Occurrence.—Locality 6.

Specimen.—A carapace, No. 29828.

Aechmina choanobasota Kesling

(Pl. III, Figs. 15–16)

Aechmina choanobasota Kesling, 1952b, pp. 29–30, Pl. 2, Figs. 15–25; Pl. 3, Figs. 1–20.

Occurrence.—Localities 1, 2, and 6.

Types.—Hypotypes, two right valves, Nos. 29829 and 29830.

Family Kirkbyidae Ulrich and Bassler 1906

Genus *Arcyzona* Kesling

Genotype.—*Amphissites diadematus* Van Pelt, 1933, p. 329, Pl. 39, Figs. 11, 14, and 15, by subsequent designation of Kesling, 1952*b*, pp. 30–31.

Arcyzona diademata (Van Pelt)

(Pl. III, Figs. 39–41)

Amphissites diadematus Van Pelt, 1933, p. 329, Pl. 39, Figs. 11, 14, and 15.

Amphissites diadematus Coryell and Malkin, 1936, p. 4, Fig. 10.

Amphissites subquadratus Warthin (*partim*), 1937, Card 102, Figs. 11, 14, and 15.

Arcyzona diademata Kesling, 1952*b*, p. 31, Pl. 2, Fig. 14, Pl. 4, Figs. 34–38; Pl. 5, Fig. 1.

Occurrence.—Localities 3, 4, and 5.

Types.—Hypotypes, a carapace and a right valve, Nos. 29831 and 29832.

Arcyzona aperticarinata, sp. nov.

(Pl. III, Figs. 42–49)

Amphissites subquadratus Warthin (*partim*), 1934, p. 214, Pl. 1, Fig. 12.

Description.—Carapace subquadrate. Greatest height posterior, greatest length through the center. Dorsal border straight, about three-fourths of the greatest length. Anterior border round, ventral border straight and the posterior border subround. Lateral surface gently convex with a slight swelling in the central portion of the valve posterior to the pit. Pit, large and deep near center of valve; diameter of the pit about one-sixth the height of the valve. Thick velate ridge from anterior to posterior corner; anterior part of ridge subround, ventral part straight, posterior part gently curved. Corners subround. Lateral surface coarsely reticulate with the ridges of the reticulation uniformly and distinctly raised. Velate ridge ornamented by closely spaced subparallel ridges with short, shallow, elongate fissure-like pits between adjacent ridges. Pit surrounded by a raised rim.

Carina well developed, sloping outward and ventrad, extending from its contact with the velate ridge on the anterior end to a point three-fourths of the length of the valve toward the posterior end. Carina formed by two parallel ridges imposed upon the general ridge level and separated by a distance approximately equal to the diameter of the pit. The outer ridge of the carina attached by short oblique ridges to the inner ridge of the

carina. These short ridges directed downward and forward in the anterior part of the carina and downward and backward in the part of the carina behind the pit. Deltiform pit in the carina ventral to the central pit formed at the place where this direction changes. Carina separated from velate ridge by a distance equal to the diameter of the pit. Marginal ridge small, low.

Dimensions of holotype, a right valve, No. 29834: length, .98 mm.; height, .57 mm.; and width, .17 mm.

Remarks.—This species is distinguished by the complete velate ridge and by the form of the carina.

The name of this species is derived from Latin *apertus* ("open") and *carina*, f. ("keel") and refers to the open framework forming the carina.

Occurrence.—Localities 1, 2, 4, and 5. Holotype from locality 1.

Types.—Holotype, a right valve, No. 29834; paratypes, a carapace, one right valve, and one left valve, Nos. 29833, 29835, and 29836.

Arcyzona sp.

(Pl. III, Figs. 37–38)

Description.—Small, subquadrate in outline. Dorsal and ventral borders straight. Anterior and posterior borders symmetrically and gently round. Hinge line three-fourths of total length. Centrally located pit, about the size of three of the reticulations which uniformly cover the lateral surfaces. Low marginal ridge present. Valves equal.

Dimensions of a carapace, No. 27383: length, .60 mm.; height, .40 mm.; and width, .18 mm.

Remarks.—These small specimens are believed to be early instars of a species of *Arcyzona*. Characters which would permit specific determination are not well developed.

Occurrence.—Localities 4 and 5.

Specimens.—Two carapaces, Nos. 27382 and 27383.

Reticestus, gen nov.

Genotype.—*Reticestus acclivitatus*, sp. nov.

Description.—Valve subovate in lateral view. Dorsal border straight, middle part of ventral border straight, anterior and posterior borders round. Large pit near center of valve. Dorsum and marginal surface separated from lateral surface by a distinct bend. No carina or distinct velate

ridge present. Low, flat, platform-like area on the posterior part of valve, crescent-shaped, reaching the posterior border.

Bend smooth, the rest of the lateral surface coarsely reticulate.

Remarks.—Kellett (1933, pp. 97–99) included within the genus *Knightina* ostracods which have an outer flange along the free edge and an inner flange just inside and usually directly above it. The genus *Reticestus* established here resembles *Knightina* in having a distinct posterior platform-like area, reticulate surface, and subovate outline in lateral view, but differs from that genus in lacking flanges like those mentioned by Kellett. The absence of both a carina and a velate ridge excludes this ostracod from the genera of the Amphissitinae, as given by Cooper (1941, pp. 47–48), and from *Arcyzona* (Kesling, 1952*b*, pp. 30–31).

The name of this genus is derived from Latin *rete*, n. (“a net”) and *cestus*, m. (“a girdle”) and refers to the ornamentation of the valve.

***Reticestus acclivitatus*, sp. nov.**

(Pl. III, Fig. 36)

Description.—Valve large, subovate with corners equally obtuse and ends round. Dorsal border straight, middle part of ventral border straight. Greatest length midway between dorsal and ventral borders. Greatest height one-third of length from posterior border. Greatest thickness one-third of length from the posterior border. Lateral surface gently convex with faint swellings on each side of the large, centrally located, subpyriform pit. Lateral surface joined to marginal surface and to dorsum by a bend. Low, flat, platform-like area on posterior part of the valve, approximately one-eighth the valve length, crescent-shaped, bounded on its convex side by the posterior border.

The surface, including the platform-like area, coarsely reticulate; some ridges of the reticulation forming a concentric pattern about the median pit. The peripheral bend smooth.

Teeth and sockets in hinge poorly developed.

Dimensions of holotype, a right valve, No. 27385: length, 1.22 mm.; height, .78 mm.; and width, .33 mm.

Remarks.—The name of this species is derived from Latin *acclivis* (“ascending”), and refers to the elevation of the rest of the valve above the low platform-like area.

Occurrence.—Localities 2 and 4. Holotype from locality 4.

Type.—Holotype, a right valve, No. 27385.

Family Kloedenellidae Ulrich and Bassler 1923

Genus *Eukloedenella* Ulrich and Bassler

Genotype.—By original designation, *Eukloedenella umbilicata* Ulrich and Bassler, 1923, p. 669, Pl. 57, Figs. 8–12.

Eukloedenella doverensis Turner

(Pl. III, Figs. 17–20)

Eukloedenella doverensis Turner, 1939, p. 20, Pl. 1, Figs. 5, 8.

Occurrence.—Localities 1 to 5 and 7.

Types.—Hypotypes, one female left valve and one male left valve, Nos. 27376 and 27377.

Genus *Dizygopleura* Ulrich and Bassler

Genotype.—By original designation, *Dizygopleura swartzi* Ulrich and Bassler, 1923, pp. 682, 693, Pl. 62, Figs. 1–8.

Dizygopleura euglyphea Warthin

(Pl. III, Figs. 30–31)

Dizygopleura euglyphea Warthin, 1934, p. 210, Pl. 1, Fig. 7.

Dizygopleura euglyphea Warthin, 1937, Card 57.

Dizygopleura euglyphea Stewart and Hendrix, 1945a, p. 90, Pl. 10, Figs. 6–8.

Occurrence.—Localities 1, 3, 4, 5, and 6.

Type.—Topotype, a left valve, No. 27381.

Family Glyptopleuridae Girty 1910

Genus *Glyptopleura* Girty

Genotype.—By original designation, *Glyptopleura inopinata* Girty, 1910, p. 236–37.

Glyptopleura bipunctata, sp. nov.

(Pl. III, Figs. 27–29)

Description.—Valves subelliptical in outline. Dorsal border straight, ventral border strongly convex, anterior border strongly round to arcuate, posterior border round. Valves very slightly acuminate anteriorly. Great-

est height in center; greatest width in posterior half; greatest length half-way between dorsal and ventral borders. Pit located slightly dorsal and anterior to center. Dorsal border extending above hinge line.

Anterior cardinal angle about 140 degrees; posterior cardinal angle round.

Surface of the valve completely covered with inosculating ridges in sharp relief. Near the edge of the valve several of these ridges more or less parallel to periphery of the valve. Ventrocentral ridges truncated at their front ends by a set of parallel anastomosing ridges trending anteroventrad to posterodorsad. Two rows of small punctae in each furrow between adjacent ridges.

Hingement consisting of subtriangular areas at the corners of both valves, with projections in the left valve and corresponding depressions in right valve. Left valve overlaps the right.

Dimensions of holotype, a left valve, No. 27388: length, .90 mm.; and height, .60 mm.

Remarks.—This species resembles *G. cracens* Kesling and Kilgore (1952, p. 9, Pl. 2, Fig. 21) in general outline and shape; *G. bipunctata*, however, has two rows of punctae between adjacent ridges, whereas *G. cracens* has only one row. There are small differences in the patterns of ridges in the two species.

The name of this species is derived from Latin *bi-* (“double”) and *punctatus* (“spotted by little holes”) and refers to the two rows of punctae between adjacent ridges.

Occurrence.—Localities 3 and 4. Holotype from locality 3.

Types.—Holotype, a left valve, No. 27388; paratype, a right valve, No. 27387.

Superfamily Cypridacea

Family Bairdiidae Sars 1887

Genus *Lucasella* Stewart

Genotype.—By original designation, *Lucasella mundula* Stewart, 1936, p. 761, Pl. 102, Figs. 18–19.

Lucasella mundula Stewart

(Pl. IV, Figs. 32–33)

Lucasella mundula Stewart, 1936, p. 761, Pl. 102, Figs. 18–19.

Lucasella mundula Wright, 1948, p. 108, Pl. 13, Figs. 37–38.

Occurrence.—Localities 1, 2, and 3.

Type.—Hypotype, a carapace, No. 29837.

Genus *Bythocypris* Brady

Genotype.—By original designation, *Bythocypris reniformis* Brady, 1880, p. 45.

Bythocypris parsonia Wilson

(Pl. V, Figs. 7–8)

Bythocypris parsonia Wilson, 1935, p. 645, Pl. 78, Figs. 9a–c.

Occurrence.—Locality 2.

Type.—Hypotype, a carapace, No. 27384.

Bythocypris subquadrata Stewart

(Pl. V, Figs. 1–3)

Bythocypris subquadrata Stewart, 1936, p. 755, Pl. 101, Figs. 18–19.

Remarks.—This species has an unusual shape for a member of the genus. Specimens are common in the Norway Point formation.

Occurrence.—Localities 1, 3, 4, 5, and 7.

Types.—Hypotypes, two carapaces, Nos. 29838 and 29839.

Bythocypris devonica borealis Warthin

Bythocypris devonica borealis Warthin, 1934, p. 221, Pl. 1, Fig. 23.

Occurrence.—Locality 3.

Type.—Topotype, a carapace, No. 29840.

Family Healdiidae Harlton 1933

Genus *Healdia* Roundy

Genotype.—By original designation, *Healdia simplex* Roundy, 1926, p. 8, Pl. 1, Figs. 11a–c.

***Healdia gibba*, sp. nov.**

(Pl. V, Figs. 9–10, 12)

Description.—Valves tumid, broad, subreniform in lateral view. Dorsal border arched, ventral border gently concave, anterior border round, posterior border sharply round to subacute. Greatest length one-third of the valve height from the ventral border; greatest height in the anterior third;

greatest width in the posterior quarter. Surface strongly convex. Anterior view cuneiform.

Two gentle swellings on lateral surface producing a faint depression in the center of the lateral surface. The posterior swelling slightly greater terminating in a faint ridge bearing the two healdian spines; ridge descending rapidly and uniformly to the posterior border. The part of the valve posterior to this ridge approximately one-sixth of the total length of valve. Dorsal spine extending forward as a low ridge for a distance equal to about one-third of the length of valve.

Dimensions of holotype, a carapace, No. 29841: length, .73 mm.; height, .48 mm.; and width, .33 mm.

Remarks.—This species resembles *H. arkonensis* Coryell and Malkin, 1936, but differs from it in having lower relief on the vertical ridge and the posterior spines directed outward at a greater angle to the surface of the valve.

The name of this species is derived from Latin *gibbus* ("humped") and refers to the curvature of the dorsal border.

Occurrence.—Localities 1, 3, 4, 5, and 6. Holotype from locality 1.

Types.—Holotype, a carapace, No. 29841; paratypes, a carapace, No. 29842, and a left valve, No. 29843.

Healdia sp.

(Pl. V, Fig. 4)

Description.—Valve subpyriform. Dorsal margin broadly convex, ventral margin straight to gently convex, ends rounded. greatest length midway between dorsal and ventral borders. Greatest height just anterior of center. Greatest thickness undetermined due to the crushed condition of part of posterior region.

Well-developed posterior ridge bearing small healdian spine on ventral part and a sharp bend on the dorsal part of this ridge. A distinct anterior ridge parallel to anterior end.

Surface smooth.

In dorsal view the two ridges in strong relief above the general valve surface level.

Dimensions of specimen, a right valve, No. 29844: length, .75 mm.; height, .40 mm.

Occurrence.—Locality 6.

Specimen.—A right valve, No. 29844.

Family Thlipsuridae Ulrich 1894

Genus *Euglyphella* Warthin

Genotype.—*Strepula sigmoidalis* Jones, 1890a, p. 11, Pl. 2, Fig. 4, by subsequent designation of Warthin, 1934, p. 220, Pl. 1, Fig. 21.

Euglyphella sigmoidalis (Jones)

(Pl. IV, Figs. 12–15)

Strepula sigmoidalis Jones, 1890a, p. 11, Pl. 2, Fig. 4.*Strepula plantaris* Jones, 1890b, p. 540, Pl. 20, Figs. 8a–b.*Strepula sigmoidalis* Grabau and Shimer, 1910, p. 350, Fig. 1660o.*Octonaria percarinata* Van Pelt, 1933, p. 335, Pl. 39, Figs. 52–54.*Euglyphella sigmoidalis* Warthin, 1934, p. 220, Pl. 1, Fig. 21.*Euglyphella sigmoidalis* Bassler and Kellett, 1934, pp. 37, 311, Fig. 16.*Euglyphella sigmoidalis* Coryell and Malkin, 1936, p. 7, Fig. 17.*Euglyphella sigmoidalis* Shimer and Shrock, 1944, p. 681, Pl. 286, Fig. 7.*Euglyphella sigmoidalis* Warthin, 1945, Card 78, Fig. B.*Euglyphella sigmoidalis* Wright, 1948, p. 101, Pl. 12, Figs. 36–37.*Euglyphella sigmoidalis* Kesling and Kilgore, 1952, p. 10, Pl. 3, Figs. 30–36.*Occurrence*.—Localities 1 to 7.*Types*.—Hypotypes, a carapace, No. 29847, and two left valves, Nos. 29848 and 29849.*Euglyphella compressa* Coryell and Malkin

(Pl. IV, Fig. 16)

Euglyphella compressa Coryell and Malkin, 1936, p. 7, Fig. 19.*Euglyphella compressa* Wright, 1948, p. 101, Pl. 13, Fig. 2.*Occurrence*.—Locality 4.*Type*.—Hypotype, a right valve, No. 29850.*Euglyphella simplex*, sp. nov.

(Pl. IV, Figs. 8–11)

Description.—Carapace small, elongate, subtriangular. Left valve larger, overlapping the right on all sides. Hinge line very gently convex. Dorsal and ventral borders convex dorsally. The interior of the left valve grooved to receive the right valve. Left valve extending above the hinge area as a flat flangelike ridge.

The posterior border of each valve subround. Anterior border of each

valve curved, somewhat acuminate below its mid-point. Greatest length midway between dorsal and ventral surfaces; greatest height in anterior half; and greatest width in posterior half. Lateral surface terminating abruptly at its posterior edge, the surface there descending sharply onto the flat posterior one-eighth of the valve.

Ornamentation on both valves similar, consisting of a complete high ridge approximately parallel to the periphery of the valve, enclosing two equispaced ridges parallel to the dorsal border. Of the two inner ridges, the upper one confluent with the enclosing ridge at its posterior end; the lower one confluent with the enclosing ridge at both ends.

Flat posterior area larger on left valve than on the right valve, on the left valve confluent with the flat flangelike ridge extending above the hinge line.

Dimensions of the holotype, a carapace, No. 29851: length, .60 mm.; height, .25 mm.; and width, .20 mm.

Remarks.—These small specimens apparently belong to a distinct species and are not immature instars of *Euglyphella sigmoidalis* (Jones). *E. simplex* has a much simpler pattern of ridges than *E. sigmoidalis*.

The name of this species is derived from Latin *simplex* ("simple, plain") and refers to the uncomplicated pattern of ridges.

Occurrence.—Localities 3, 4, 5, and 6. Holotype from locality 4.

Types.—Holotype, a carapace, No. 29851; paratypes, a carapace and a left valve, Nos. 29852 and 29853.

Genus *Octonaria* Jones

Genotype.—By original designation, *Octonaria octoformis* Jones, 1887, p. 404, Pl. 12, Figs. 2a-b.

Octonaria quadricostata Van Pelt

(Pl. IV, Figs. 1-4)

Octonaria quadricostata Van Pelt, 1933, p. 336, Pl. 39, Figs. 41-51.

Octonaria quadricostata Warthin, 1934, p. 217, Pl. 1, Figs. 16-17.

Octonaria quadricostata Stewart, 1936, p. 751, Pl. 101, Figs. 5-6.

Strepulites quadricostatus Coryell and Malkin, 1936, p. 5.

Strepulites quadricostatus Warthin, 1945, Card 41, Figs. 41-51.

Occurrence.—Localities 1 to 7.

Types.—Hypotypes, three carapaces. Nos. 29854, 29855, and 29856.

Octonaria crescentiformis Van Pelt

(Pl. IV, Figs. 5-7)

Octonaria crescentiformis Van Pelt, 1933, pp. 334-35, Pl. 39, Figs. 55-60.*Octonaria crescentiformis* Warthin, 1934, p. 218, Pl. 1, Fig. 18.*Strepulites crescentiformis* Coryell and Malkin, 1936, p. 5.*Strepulites crescentiformis* Warthin, 1945, Card 35, Figs. 55-60.*Octonaria crescentiformis* Stewart and Hendrix, 1945a, p. 91, Pl. 10, Figs. 15-17.*Octonaria crescentiformis* Kesling and Kilgore, 1952, p. 9, Pl. 3, Figs. 27-28.*Occurrence*.—Localities 1, 4, 5, and 6.*Types*.—Hypotypes, two left valves and one right valve, Nos. 29857, 29858, and 29859.Genus *Hyphasmaphora* Van Pelt*Genotype*.—By original designation, *Hyphasmaphora textiliger*a Van Pelt, 1933, p. 340, Pl. 39, Figs. 3-7.*Hyphasmaphora textiliger*a Van Pelt

(Pl. IV, Figs. 34-36)

*Hyphasmaphora textiliger*a Van Pelt, 1933, p. 340, Pl. 39, Figs. 3-7.*Hyphasmaphora textiliger*a Warthin, 1934, p. 219, Pl. 1, Fig. 20.*Hyphasmaphora textiliger*a Warthin, 1945, Card 80, Figs. 3-7.*Hyphasmaphora textiliger*a Wright, 1948, p. 96, Pl. 11, Fig. 46.*Hyphasmaphora textiliger*a Moore, Lalicker, and Fischer, 1952, pp. 531, Fig. 5.*Occurrence*.—Localities 1 and 6.*Types*.—Hypotypes, two right valves, Nos. 29860 and 29861.

Family Quasillitidae Coryell and Malkin 1936

Genus *Quasillites* Coryell and Malkin*Genotype*.—By original designation, *Quasillites obliquus* Coryell and Malkin, 1936, p. 18, Figs. 36-36a.*Quasillites ornatus* Swartz and Oriel

(Pl. IV, Figs. 22-24, 31)

Quasillites ornatus Swartz and Oriel, 1948, pp. 558-59, Pl. 80, Figs. 11-17.*Occurrence*.—Localities 1 and 3.*Types*.—Hypotypes, three carapaces and a right valve, Nos. 29862, 29863, 29864, and 29865.

Quasillites jubatus, sp. nov.

(Pl. IV, Figs. 17-21)

Description.—Carapace suboblong; dorsal and ventral borders straight; anterior and posterior borders round. Greatest length through the center of the valve, greatest height in anterior half, and greatest width in posterior half. Left valve larger than right. Box-shaped dorsal view produced by the sharp descent of the valves to thin platform-like structures in the anterior and posterior parts. The anterior structure is distinctly denticulate. A strong spine in the posteroventral corner. A shallow median depression seen in dorsal view, produced by faint swellings just anterior and posterior to the center. Small central pit.

Anterior and posterior corners round.

Surface of the valve completely covered by equispaced fine ridges, like those on the surface of a human finger, the outer set parallel to the margins of the valve near the border but gradually becoming oblique to the border toward the center. In the center of the pattern the whorls ventrally truncated by short ridges parallel to the ventral border. The ridges connected throughout by thin cross bars.

Dimensions of the holotype, a left valve, No. 29866: length, .75 mm.; height, .42 mm.; and width, .19 mm.

Remarks.—This species resembles *Q. fordei* Coryell and Malkin (1936, pp. 18-19, Fig. 38), from which it differs in having a large denticulate platform-like anterior structure and a more elliptical instead of circular pattern of small ornamenting ridges.

The name of this species is from Latin *jubatus* ("maned, crested") and refers to the denticulate thin platform-like anterior structure.

Occurrence.—Localities 1, 2, and 7. Holotype from locality 1.

Types.—Holotype, a left valve, No. 29866; paratypes, two carapaces, Nos. 29867 and 29868.

***Quasillites lobatus* Swartz and Oriel**

(Pl. IV, Fig. 28)

Quasillites lobatus Swartz and Oriel, 1948, pp. 556-57, Pl. 80, Figs. 1-8, 18.

Quasillites lobatus Moore, Lalicker, and Fischer, 1952, p. 531, Fig. 9.

Occurrence.—Locality 1.

Type.—Hypotype, a right valve, No. 29869.

Quasillites binodosus Swartz and Oriol

(Pl. IV, Figs. 27, 29-30)

Quasillites binodosus Swartz and Oriol, 1948, pp. 559-60, Pl. 79, Figs. 18-21.*Occurrence.*—Localities 1, 2, and 3.*Types.*—Hypotypes, a right valve and a left valve, Nos. 29870 and 29871.*Quasillites* cf. *Q. ornatus* Swartz and Oriol

(Pl. IV, Figs. 25-26)

Remarks.—This specimen has the characteristics of *Quasillites ornatus*, but it is smaller in height and is elongate.*Occurrence.*—Locality 1.*Specimen.*—A carapace, No. 29872.*Quasillites obliquus* Coryell and Malkin

(Pl. IV, Figs. 50-51)

Quasillites obliquus Coryell and Malkin, 1936, p. 18, Figs. 36, 36a.*Quasillites obliquus* Turner, 1939, pp. 25-26, Pl. 1, Figs. 15, 18.*Occurrence.*—Locality 1.*Type.*—Hypotype, a carapace, No. 29873.Genus *Jenningsina* Coryell and Malkin*Genotype.*—*Graphiodactylus catenulatus* Van Pelt, 1933, p. 333, Pl. 39, Figs. 31-32, by subsequent designation of Coryell and Malkin, 1936, p. 19, Fig. 35.*Jenningsina catenulata* (Van Pelt)

(Pl. IV, Figs. 40-41, 44-49)

Graphiodactylus catenulatus Van Pelt, 1933, p. 333, Pl. 39, Figs. 31-32.*Jenningsina catenulata* Coryell and Malkin, 1936, p. 20, Fig. 35.*Jenningsina catenulata* Wright, 1948, p. 126, Pl. 16, Fig. 20.*Graphiodactylus catenulatus* Moore, Lalicker, and Fischer, 1952, p. 533, Fig. 10.*Occurrence.*—Localities 1 to 7.*Types.*—Hypotypes, two carapaces, two right valves, and two left valves, Nos. 29874, 29875, 29876, 29877, 29878, and 29879.

Jenningsina scalpta, sp. nov.

(Pl. IV, Figs. 42-43)

Description.—Valve small, subreniform. Dorsal border straight; ventral border gently concave; posterior border gently convex, nearly vertical; and anterior border symmetrically round. Greatest length through center, greatest height in anterior half, and greatest thickness posterior.

Cardinal angles obtuse.

Surface covered by fine ridges, ridges concentric around the central posterior area in posterior half, irregularly inosculating in anterior part. The ridges connected by regularly spaced cross bars. Small circular pit in center of the valve.

Surface convex gradually rising to a line near the posterior end, there descending rapidly to a narrow posterior platform.

Dimensions of holotype, a left valve, No. 29880: length, .55 mm.; height, .30 mm.; and width, .12 mm.

Remarks.—This species resembles *Jenningsina catenulata* (see Van Pelt, 1933, p. 333) in size and general outline, but it may be easily distinguished by its very different ridge pattern.

The name of this species is derived from Latin *scalptus* ("engraved, carved") and refers to the elaborate pattern of ornamental ridges.

Occurrence.—Locality 1.

Type.—Holotype, a left valve, No. 29880.

Family Ropolonellidae Coryell and Malkin 1936

Genus *Ropolonellus* Van Pelt

Genotype.—By original designation, *Ropolonellus papillatus* Van Pelt, 1933, p. 339, Pl. 39, Figs. 29-30.

Ropolonellus papillatus Van Pelt

(Pl. IV, Figs. 37-38)

Ropolonellus papillatus Van Pelt, 1933, p. 339, Pl. 39, Figs. 29-30.

Ropolonellus papillatus Coryell and Malkin, 1936, p. 6, Fig. 15.

Ropolonellus papillatus Warthin, 1945, Card 82, Figs. 15, 29-30.

Occurrence.—Locality 6.

Type.—Hypotype, a right valve, No. 29881.

Ropolonellus plenus, sp. nov.

(Pl. IV, Fig. 39)

Description.—Valve subtriangular; dorsal border straight, ventral border converging upwards toward an attenuated anterior end. Dorsal part of posterior border straight, forming angles of about 135 degrees with the hinge line and with the rest of the free border; this part of the valve appearing to be sharply truncated.

Surface smooth except for papillae on narrow anterior border and on a limited area on the posterior end just ventral to the truncation.

Greatest length through the center, greatest height slightly posterior to center, and greatest width slightly posterior of center.

Dimensions of holotype, a right valve, No. 29882: length, .55 mm.; height, .38 mm.; and width, .18 mm.

Remarks.—*Ropolonellus plenus*, sp. nov., differs from *R. papillatus* Van Pelt in having a larger height/length ratio and a straight posterodorsal border. The orientation of ostracods of this genus is uncertain. No muscle scars were observed in the specimens from this formation.

The name of this species is derived from Latin *plenus* ("full") and refers to the great height in the posterior part of the valve.

Occurrence.—Locality 4.

Type.—Holotype, a right valve, No. 29882.

Family Barychilinidae Ulrich 1891

Genus *Barychilina* Ulrich

Genotype.—By original designation, *Barychilina punctostriata* Ulrich, 1891, p. 199, Pl. 13, Figs. 1a-e, 2a-c.

Barychilina labyrinthea Kesling and Kilgore

(Pl. IV, Figs. 54-56)

Barychilina labyrinthea Kesling and Kilgore, 1952, p. 11, Pl. 2, Figs. 31-35.

Occurrence.—Locality 3.

Type.—Hypotype, a carapace, No. 29883.

Barychilina embrithes Kesling and Kilgore

(Pl. IV, Fig. 52)

Barychilina embrithes Kesling and Kilgore, 1952, p. 12, Pl. 2, Figs. 36-44.

Occurrence.—Locality 3.

Type.—Hypotype, a left valve, No. 29884.

Barychilina sp.

(Pl. IV, Fig. 53)

Remarks.—This species has fewer ridges and is smaller than *Barychilina embrithes* Kesling and Kilgore. Only one specimen was found.

Occurrence.—Locality 3.

Specimen.—A left valve, No. 29885.

Family Cytherellidae Sars 1866

Genus *Birdsallella* Coryell and Booth

Genotype.—By original designation, *Birdsallella simplex* Coryell and Booth, 1933, p. 271, Pl. 5, Figs. 6–7.

Birdsallella delawarensis Stewart

(Pl. V, Figs. 17–20)

Birdsallella delawarensis Stewart, 1950, pp. 664–65, Pl. 86, Figs. 26–28.

Remarks.—The granulose surface which Stewart (1950, p. 665) postulated for this species is seen in these specimens.

Occurrence.—Localities 1, 3 to 6.

Types.—Hypotypes, two carapaces, Nos. 29845 and 29846.

Birdsallella tumida Stewart

(Pl. V, Figs. 5–6)

Birdsallella tumida Stewart, 1936, p. 763, Pl. 102, Figs. 27–28.

Occurrence.—Localities 1 and 3 to 7.

Type.—Hypotype, one carapace, No. 27386.

Genus *Ponderodictya* Coryell and Malkin

Genotype.—*Cytherella? bispinulatus* Stewart, 1927, p. 60, Pl. 5, Figs. 18–19, by subsequent designation of Coryell and Malkin, 1936, p. 15, Figs. 28, 28a, 29–30; the species *bispinulatus* was subsequently considered by its original author, Stewart, 1936, pp. 756–57, to be a synonym of *Leperditia punctulifera* Hall, 1860, p. 92.

Ponderodictya punctulifera (Hall)

(Pl. V, Figs. 21-29)

- Leperditia punctulifera* Hall, 1860, p. 92.
Primitiopsis punctulifera Jones, 1890a, p. 9, Pl. 2, Figs. 7, 12-13.
Primitiopsis punctulifera Grabau and Shimer, 1910, p. 345, Figs. 1660e-g.
Cytherella? bispinulatus Stewart, 1927, p. 60, Pl. 5, Figs. 18-19.
Primitiopsis unicornis Van Pelt, 1933, p. 326, Pl. 39, Figs. 23-28.
Cytherellina punctulifera Warthin, 1934, p. 222, Pl. 1, Figs. 24-25.
Ponderodictya bispinulata Coryell and Malkin, 1936, p. 16, Figs. 28, 28a, 29-30.
Hamiltonella punctulifera Stewart, 1936, p. 756, Pl. 102, Figs. 1-5.
Ponderodictya unicornis Coryell and Malkin, 1936, p. 16, Figs. 31, 31a.
Ponderodictya punctulifera Turner, 1939, p. 23, Pl. 1, Fig. 7.
Ponderodictya bispinulata Shimer and Shrock, 1944, p. 687, Pl. 288, Figs. 55-58.
Ponderodictya unicornis Stewart and Hendrix, 1945a, p. 94, Pl. 10, Figs. 30-31.
Ponderodictya bispinulata Wright, 1948, p. 120, Pl. 15, Figs. 35-38.
Ponderodictya unicornis Wright, 1948, Pl. 15, Figs. 39-40.
Cytherellina punctulifera Moore, Lalicker, and Fischer, 1952, p. 530, Fig. 14.

Remarks.—This type of ostracod is conspicuous and abundant in the Norway Point formation. The limits of species of this genus have been extremely difficult to define. Van Pelt (1933, p. 327), referring to some of the difficulties, said, "It seems doubtful, if the variation in numbers and location of the tubercles is consistent in a single species. The variation in shape, length of the hinge line, and manner of hingement seem inconsistent within a single genus." Turner (1939, pp. 23-24) referred to "three more or less distinct types," which she defined in terms of coarseness of reticulation and presence and size of spines and nodes. She also noted additional variations, not included in the three fundamental types.

No correlation has yet been established between the number, size, and position of the spines, ridges, and nodes and the surface texture and shape of the valves. Many combinations are present. It is apparent that much more work will be required to evaluate these differences and to determine the exact nature of the vexing species of *Ponderodictya*. Possibly, the Michigan specimens belong to several species of very similar form, all of which lived together in the same geographic province over a long period. The specimens figured in Plate V illustrate some of the variations.

Occurrence.—Localities 1, 2, 3, 4, and 7.

Types.—Hypotypes, two right valves and three carapaces, Nos. 29886, 29887, 29888, 29889, and 29890.

Ponderodictya sp.

(Pl. V, Fig. 11)

Remarks.—This specimen may be an early instar of *Ponderodictya punctulifera*.

Occurrence.—Locality 4.

Type.—Figured specimen, No. 29891.

Superfamily Leperditioacea

Family Leperditellidae Ulrich and Bassler 1906

Genus *Coelonella* Stewart

Genotype.—*Isochilina? scapha* Stewart, 1930, p. 57, Pl. 1, Figs. 11–12, by subsequent designation of Stewart, 1936, pp. 742–43.

Coelonella scapha (Stewart)

(Pl. V, Figs. 13–16)

Isochilina? scapha Stewart, 1930, p. 57, Pl. 1, Figs. 11–12.

Coelonella scapha Stewart, 1936, pp. 742–43, Pl. 100, Figs. 1–2.

Coelonella scapha Wright, 1948, p. 22, Pl. 2, Figs. 7–8.

Occurrence.—Localities 3 and 6.

Types.—Hypotypes, two carapaces, Nos. 29892 and 29893.

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PLATES

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PLATE I

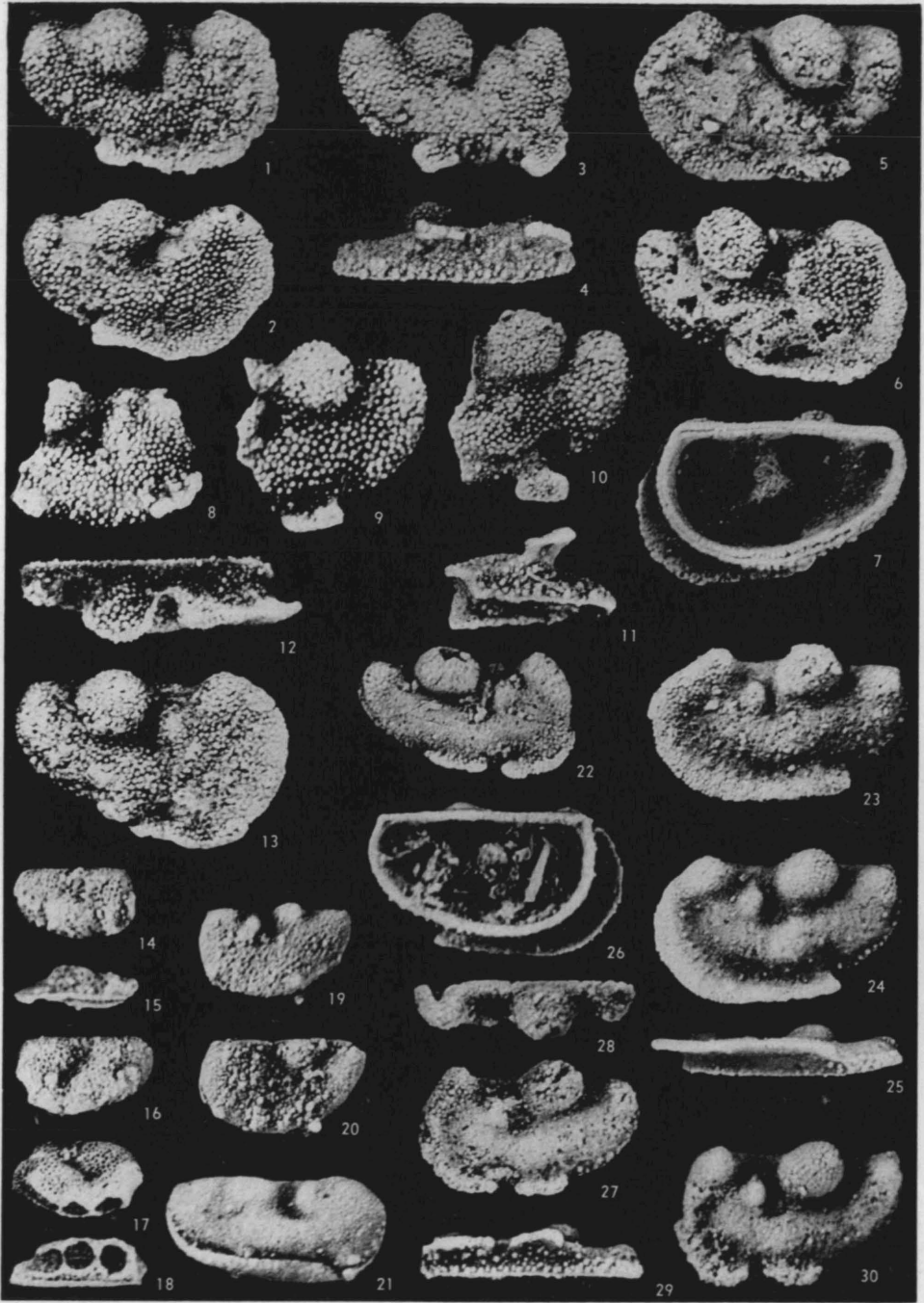
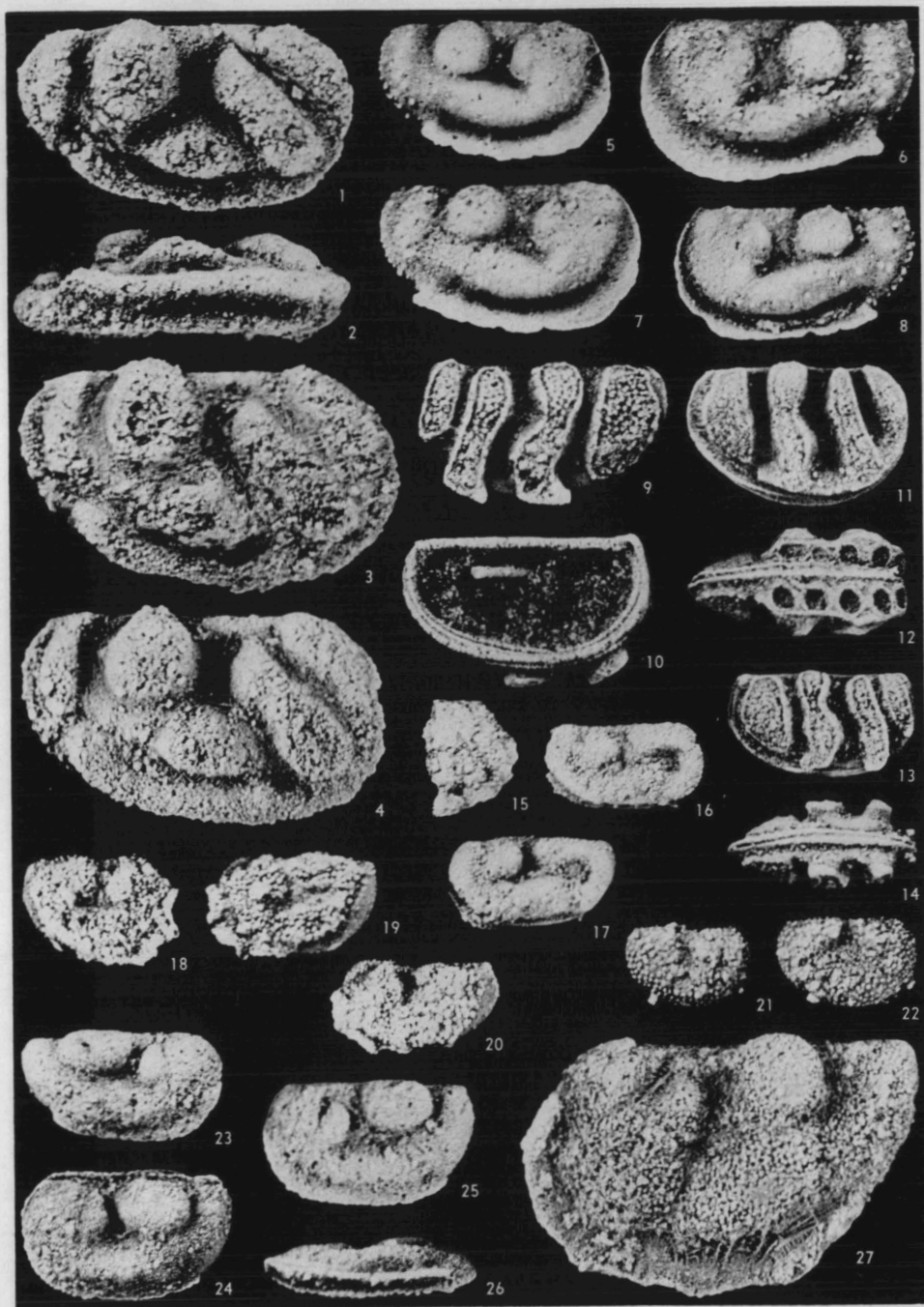


PLATE II



EXPLANATION OF PLATE II

(All figures $\times 30$)

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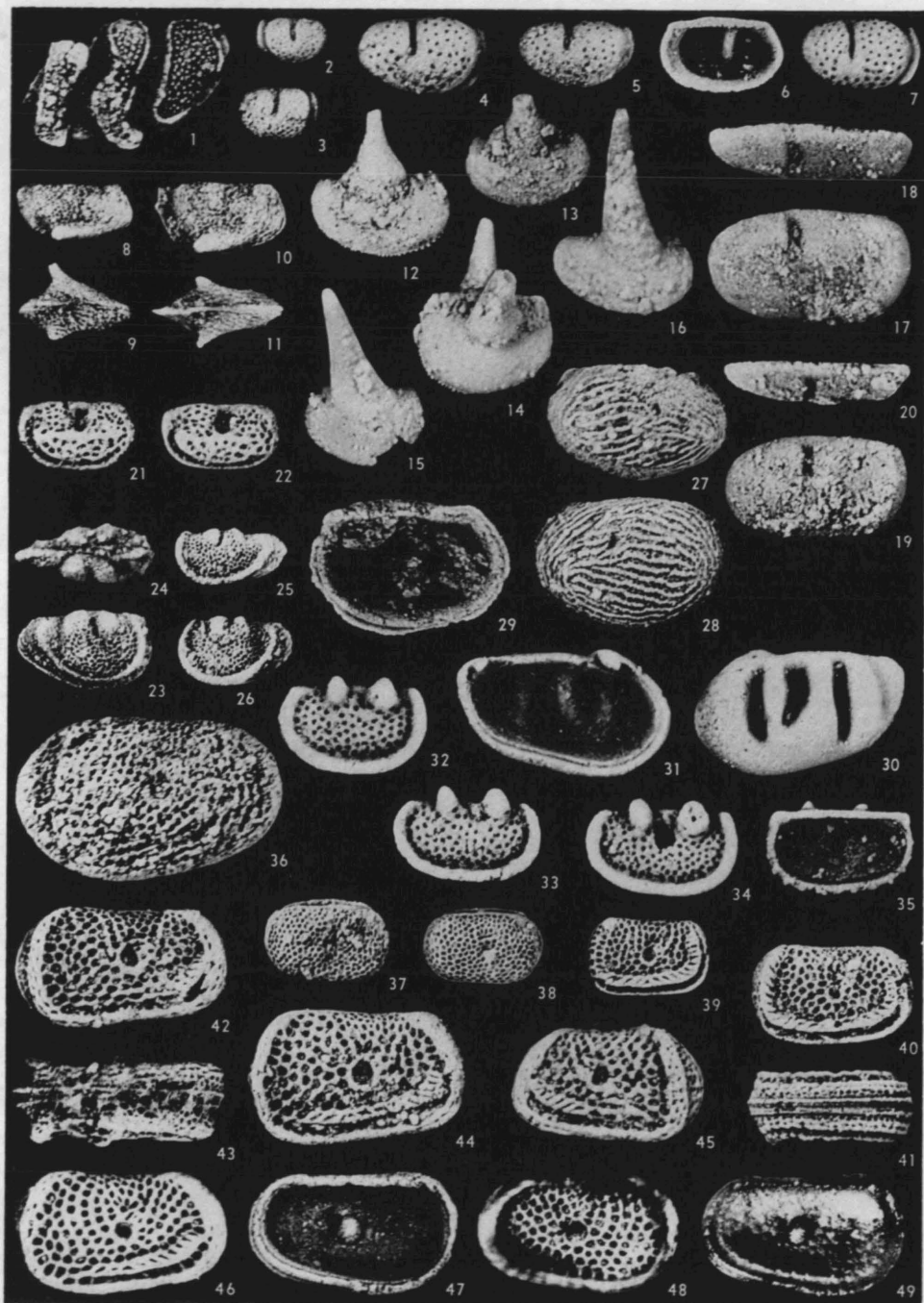
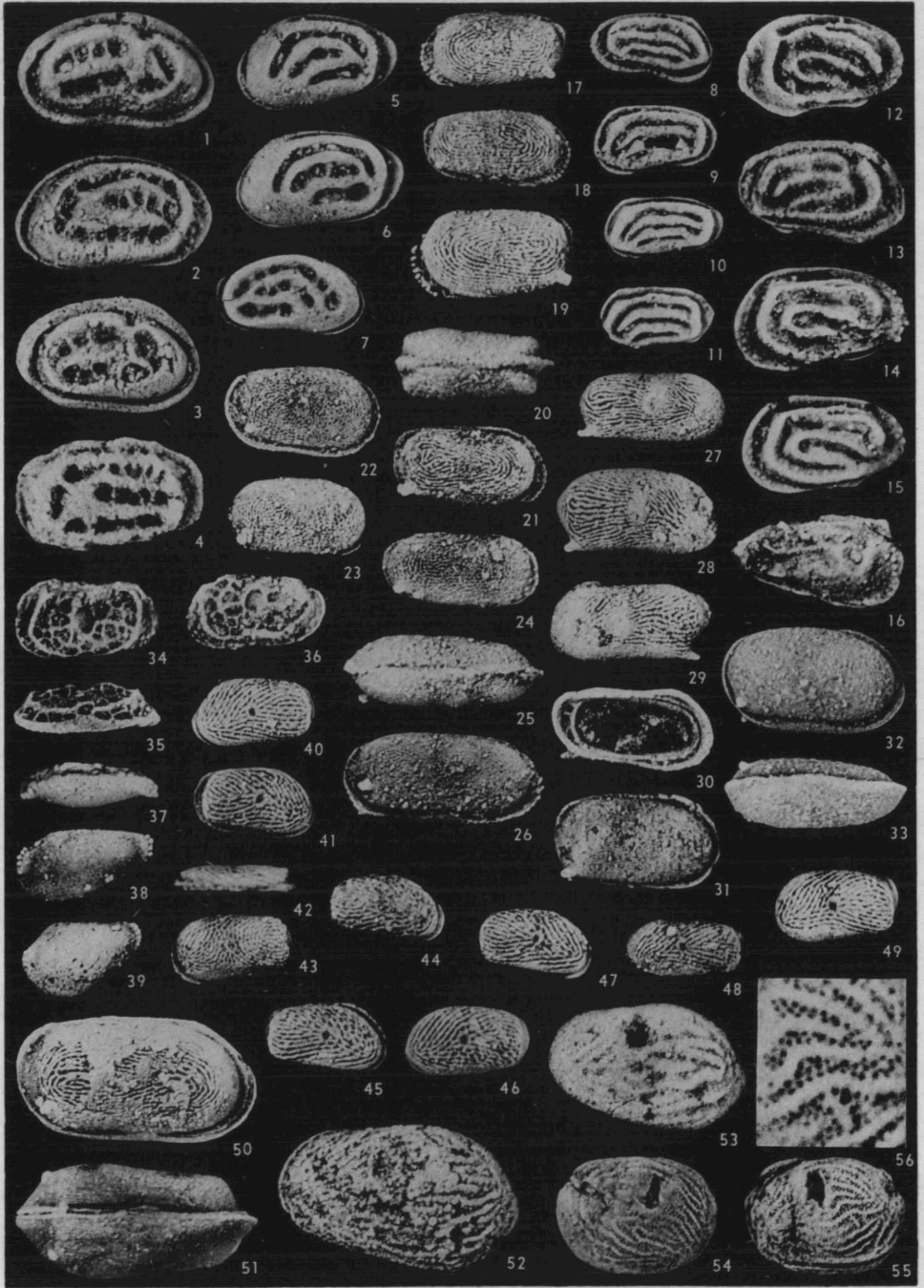


PLATE IV



EXPLANATION OF PLATE IV

(All figures $\times 30$ except Fig. 56)

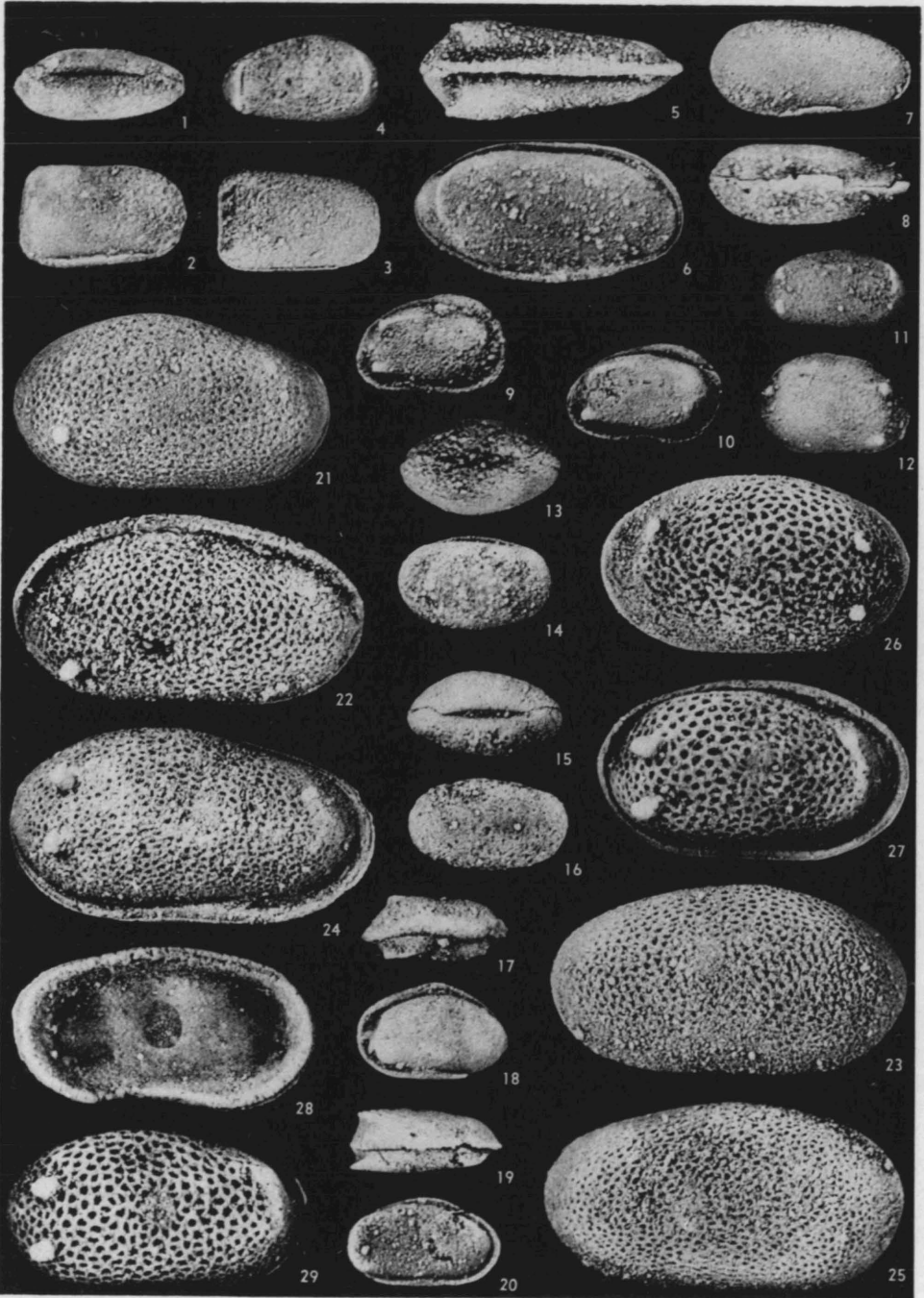
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PLATE V



VOLUME XI

1. Ostracods of the Family Aechminidae from the Arkona Shale of Southern Ontario, by Robert V. Kesling. Pages 1-10, with 1 plate. Price \$.35.
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