

GEOLOGICAL
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DEPARTMENT OF ENERGY,
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PAPER 72-43

OSTRACODA FROM THE ELLIS BAY FORMATION
(ORDOVICIAN), ANTICOSTI ISLAND, QUEBEC

M. J. Copeland

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(ORDOVICIAN), ANTICOSTI ISLAND, QUEBEC

(Report, 9 figures and 9 plates)

M. J. Copeland

DEPARTMENT OF ENERGY, MINES AND RESOURCES

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Abstract

The 200- to 300-foot-thick Ellis Bay Formation on Anticosti Island has yielded a well preserved and distinctive ostracode fauna. This fauna is closely related to that of the underlying Vauréal Formation and contains elements common to the Porkuni beds of Estonia and the Dalmanitina Series (5a, 5b) of Norway. The Late Ordovician age of these faunas is indicated.

Résumé

La formation d'Ellis Bay accuse une épaisseur de 200 à 300 pieds et renferme des ostracodes remarquables et bien préservés. Cette faune se rapproche beaucoup de celle de la formation sous-jacente de Vauréal et elle renferme des éléments qui sont communs dans les lits de Porkuni dans les séries de Dalmanitina et Estonia (5a, 5b) de Norvège. L'auteur précise que ces faunes sont de l'Ordovicien supérieur.

OSTRACODA FROM THE ELLIS BAY FORMATION (ORDOVICIAN),
ANTICOSTI ISLAND, QUEBEC

INTRODUCTION

Strata of the Ellis Bay Formation occur on Anticosti Island in a narrow band some 100 miles long from Junction Cliff on the southwest coast to Fox Point on the northeast coast. The formation, from 200 to 300 feet thick, comprises six members, named in numerical order and described in detail by Bolton (1972). Natural exposures of the formation occur only on the coasts and along Salmon and Vauréal Rivers. Elsewhere, because of their usual argillaceous lithology, Ellis Bay strata are rare except where logging or fishing operations have required the construction of roads. As shown by Bolton (1972, map 2-1971 shows the collecting localities and geographic features mentioned here), Ellis Bay rocks were freshly exposed in 1966 and 1969 on several access roads trending south from the main haulage road. These strata yielded excellent fossil collections then but are now becoming overgrown. The Becscie, Lac Faure, Ste. Marie, Baillie River, Rivière-a-la-Loutre, Jupiter River and Vauréal Falls roads have been studied in detail.

The six members of the Ellis Bay Formation are distinguishable lithologically and faunally (Bolton, 1961). Members 1, 3 and 5 are more argillaceous and recessive-weathering than are Members 2, 4 and 6, which are more calcareous and ridge-forming. Thus a low, undulatory topography is developed over the formation, the ridges and depressions striking generally east-west. Faunally, the six members are characterized by the following fossils (Bolton, 1972, Table I): 1- *Eospirigerina praemarginalis*, 2- *Hesperorthis laurentina*, 3- *Schuchertoceras* spp., 4- *Hebertella maria*, 5- *Hormotoma gigantea* and 6- "Coral bioherms" overlain by *Parastrophinella reversa*.

Because of their argillaceous composition, many of the Ellis Bay strata weather rapidly into clay or friable shale. Larger fossils are released, become readily visible and are easily recovered from the surface of exposures. Microfossils, incorporated in the shaly interbeds, are released from the adhering clay by gentle agitation in water. Small brachiopods, pelecypods and echinoderms are present together with ostracodes, tentaculites, sponge spicules and miscellanea.

Stratigraphy

Ellis Bay strata conformably overlie uppermost beds of the Vauréal Formation. The contact of these formations is rarely visible. To the west, recessive-weathering Ellis Bay shale of Member 1 (Fig. 1) lie on rubbly, thin-bedded upper Vauréal dolomitic limestone. North of Jupiter River, nodular Vauréal limestone passes upward into friable sandy shale with calcareous matrix; farther east, Twenhofel (1928) considered these basal Ellis Bay beds as calcareous sandstone but Bolton (1961, p. 7) did not recognize such on Salmon River. Ellis Bay Members 2 to 5 (Figs. 1 to 6), a sequence of thin-bedded, rubbly limestone and shale beds, contain diagnostic megafossil assemblages and exhibit an alternation of predominantly calcareous (Members 2, 4) and argillaceous (Members 3, 5) units. Members 2 and 4 are cliff-forming in natural exposures and preserve the soft, more easily eroded underlying units. Member 6 (Figs. 6 to 8) is distinguished at many places by the concentration of small bioherms near its base and undulatory super- and inter-reef strata (Bolton, 1961; Dixon, 1970). Higher beds of Member 6 are more calcarenitic with minor shale; the calcarenitic phase becomes more predominant upward and passes into the granular and conglomeratic limestone phase of the basal Becscie Formation.

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Figure 1. Junction Cliff, looking south. Ellis Bay Formation, Members 1 and 2. (GSC Photo 127640)



Figure 2. East side of Cape Henry, west shore of Ellis Bay, looking south. Ellis Bay Formation, Member 3 capped by Member 4. (GSC Photo 118023)



Figure 3. White Cliff, Port Menier quarry, east side of Ellis Bay. Ellis Bay Formation, Members 3 and 4. (GSC Photo 127644)



Figure 4. Anse aux Navets, east shore of Ellis Bay, looking south. Ellis Bay Formation, Member 5. (GSC Photo 127643)

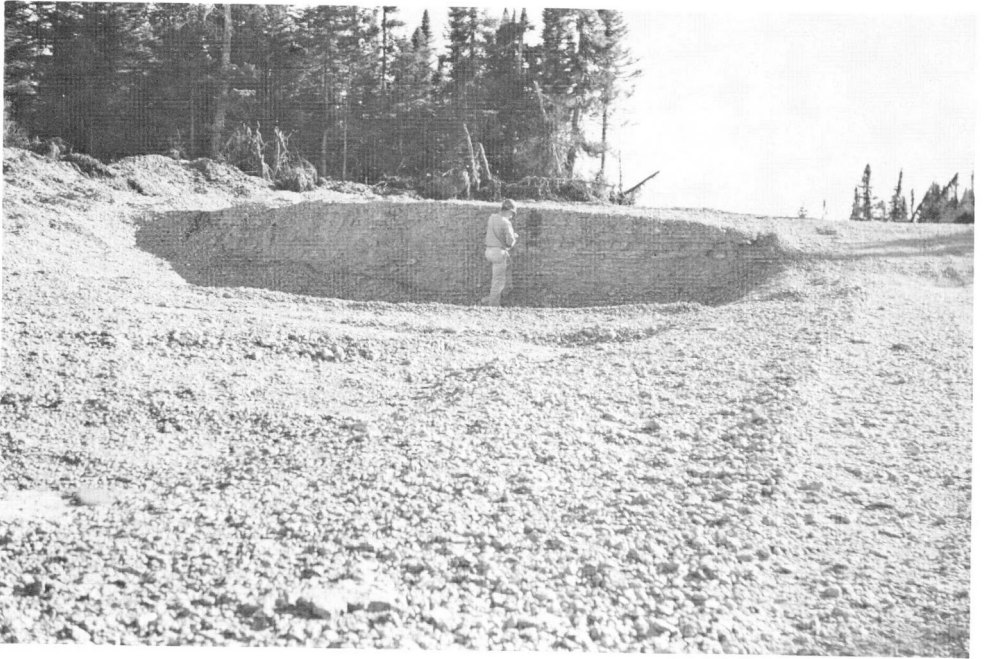


Figure 5. Roadside exposure, two miles south of Lac Faure. Ellis Bay Formation, Member 5. (GSC Photo 158956)



Figure 6. Bear Point, east shore of Ellis Bay, looking south. Ellis Bay Formation, Members 5 and 6. (GSC Photo 127642)

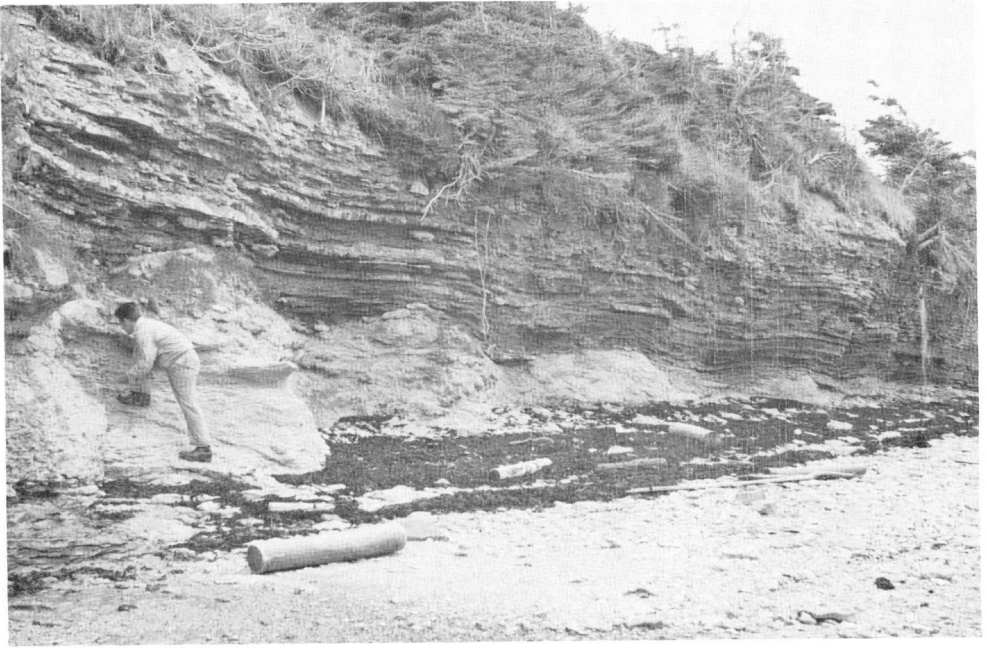


Figure 7. Pointe Laframboise, looking south. Bioherms at base of Ellis Bay Formation, Member 6. (GSC Photo 127667)



Figure 8. Salmon River, falls 14 miles above mouth, looking southwest. Ellis Bay Formation, Member 6, upper part. (GSC Photo 127619)

FORMATION	VAU- RÉAL	ELLIS BAY					
		1	2	3	4	5	6
MEMBER							
ZONE OSTRACODE		<i>Jonesites semilunatus</i>					
OSTRACODE SUB-ZONES OF THE ELLIS BAY FORMATION							
	SPECIES	UNDIFFERENTIATED (see Copeland, 1970b)	<i>Carinobolbina richardsoni</i>	<i>Foramenella phippsi</i>	<i>Anticostiella ellisensis</i>	<i>Eographiodactylus hyatti</i>	<i>Platybolbina shaleri</i>
<i>Aechmina maccormicki</i> n. sp.		•	•	•	•	•	•
<i>A. richmondensis</i> Ulrich and Bassler	•	•	•	•	•	•	•
<i>Anticostiella ellisensis</i> n. gen., n. sp.				•	•	•	
<i>Bolbiprimitia</i> ? <i>schmitti</i> n. sp.					•	•	
" <i>Bythocypris</i> " <i>lindstroemi</i> ? Jones	•	•	•		•		
" <i>B.</i> " <i>cylindrica</i> (Hall)	•	•	•	•	•	•	•
" <i>B.</i> " <i>subcylindrica</i> (Ulrich)	•	•	•	•	•		•
<i>Carinobolbina richardsoni</i> n. sp.			•				
<i>Chilobolbina</i> ? sp.			•				
<i>Cryptophyllus</i> sp. cf. <i>C. oboloides</i> (Ulrich and Bassler)					•	•	•
<i>Ctenobolbina maclearni</i> n. sp.					•		
<i>Daleiella caleyi</i> n. sp.					•		
<i>Diplopsis</i> sp. cf. <i>D. frequens</i> (Steusloff)				•		•	
<i>Eographiodactylus hyatti</i> n. sp.				•	•		
<i>Eokloedenella canadensis</i> (Bassler)	•		•			•	
<i>E.</i> sp.			•				
<i>Euprimitia gamachei</i> n. sp.							•
<i>Faurella cartieri</i> n. gen., n. sp.				•	•	•	•
<i>Foramenella phippsi</i> n. sp.			•	•	•	•	
<i>Jonesites semilunatus</i> (Jones)	•	•	•	•	•	•	•
<i>Krausella</i> ? sp.			•				
<i>Leperditella</i> ? sp.	•	•	•			•	
<i>Macrocyproides trentonensis</i> (Ulrich)	•	•	•		•	•	•
<i>Milleratia twenhofeli</i> Copeland	•						•
<i>Monoceratella castorensis</i> Copeland	•			•		•	
<i>Neoschmidtella granti</i> n. sp.					•	•	
<i>Paraschmidtella irregularis</i> Keenan	•	•	•	•		•	•
<i>Platybolbina shaleri</i> n. sp.			•	•		•	
<i>Platyrhomboides</i> ? <i>subcylindrica</i> (Jones)	•	•	•		•	•	
<i>P</i> ? <i>dixoni</i> n. sp.					•	•	
<i>Primitiella unicornis</i> (Ulrich)			•				
<i>Primitiella</i> sp.			•				
<i>Pseudulrichia simplex</i> (Ulrich)		•					
<i>Schmidtella sublenticularis</i> (Jones)	•	•				•	
<i>S. robervali</i> n. sp.		•	•	•	•	•	
<i>Tetradella</i> sp.	•	•				•	
<i>T. thomasi</i> n. sp.				•		•	
<i>T. anticostiensis</i> n. sp.						•	
<i>Tubulibairdia jolieti</i> n. sp.	?	•	•	•	•	•	

GSC

Table I. Stratigraphic occurrence of Ostracoda, Ellis Bay Formation, Anticosti Island, Quebec.

Age and Zonation

Thirty-nine ostracode species of 30 genera are recognized from the Ellis Bay Formation; of these, 15 species of 13 genera occur in the underlying Vauréal Formation (Copeland, 1970b). At present, only a few generalized, non-diagnostic ostracodes are known from the lower part of the overlying Becscie Formation. Ostracode faunas from the upper part of the Becscie Formation are highly distinctive however, and replete with species of several genera of Silurian Beyrichiacea.

Samples from upper Ellis Bay strata at Cape Henry and Cap a l'Aigle (on the west and east sides of Ellis Bay, respectively) contain fauna typical of Member 6 elsewhere. However, the exact stratigraphic relationship of these strata with respect to the base of the Becscie Formation is uncertain. Fine-grained limestone and intraformational limestone conglomerate occupy the 35- to 50-foot interval between the highest occurrence of Member 6 ostracodes and the lowest occurrence of *Virgiana barrandei* (Billings). This Silurian brachiopod is present throughout 200 feet of Becscie strata and, in its upper range zone, occurs with *Zygobursa praecursor* Copeland, an association similar to that of *Virgiana decussata* (Whiteaves) and *Zygocosta williamsi* (Ulrich and Bassler) which marks the base of the Ontarian Stage in the northern mid-continent region of North America (Copeland, 1970a, 1971).

Jonesites semilunatus (Jones) may be considered as zone ostracode of the Vauréal and Ellis Bay formations. It occurs throughout both units and is highly distinctive. Copeland (1970b) erected four microfaunal subzones in the Vauréal Formation, in ascending order: *Ulrichia nodosa*, foraminifer sp. indet., *Eographiodactylus billingsi* and *Eoleperditia vaurealensis*. These are now succeeded in the Ellis Bay Formation by six microfaunal subzones, each equivalent to a member of that formation, namely: 1- *Carinobolbina richardsoni*, 2- *Foramenella phippii*, 3- *Anticostiella ellisensis*, 4- *Eographiodactylus hyatti*, 5- *Platybolbina shaleri* and 6- *Euprimitia gamachei*. These reference ostracodes are presently restricted to the Ellis Bay Formation, with *Carinobolbina richardsoni* and *Euprimitia gamachei* being known only from the members they represent.

Copeland (1970b) considered the Vauréal-Ellis Bay ostracode assemblage as late Maysvillian-Richmondian. Certainly the Vauréal ostracode fauna seems to contain elements of both ages and half of these are present in the Ellis Bay. Several new elements in the Ellis Bay ostracode fauna bear resemblance to those of the Porkuni of Estonia (Sarv, 1962). Species of *Platybolbina*, *Tetradella*, *Diplopsis* (*Oepikella*) and *Foramenella* are common to both, but do not occur in younger strata of either area, or elsewhere in strata of known Silurian age. Also, the relative absence of Beyrichiacea (with the exception of *Bolbiprimitia? schmitti*), so characteristic of the Silurian, from the Porkuni and Ellis Bay seems to support the Ordovician age of these formations. This has also been noted by Henningsmoen (1954) in describing the ostracode fauna of the Upper Ordovician Dalmanitina Series (5a, 5b) of Oslo and Ringerike.

As previously stated, the Vauréal-Ellis Bay ostracode fauna has been traced to within a few feet (ca. 35?) of the top of the Ellis Bay Formation and, therefore, to within approximately 50 feet (Bolton, 1961) of the lowest occurrence of the Silurian brachiopod *Virgiana barrandei* (Billings). As there is no known stratigraphic hiatus between Ellis Bay and Becscie strata on Anticosti Island it appears that the Ordovician-Silurian transition should occur within this 35- to 50-foot interval.

SYSTEMATIC PALEONTOLOGY

Of the fifteen ostracode species common to the Vauréal and Ellis Bay formations (Table I), fourteen have been described and illustrated by Copeland (1970b). Specimens of these species from the Ellis Bay Formation are

illustrated herein but no additional descriptions are presented. One species, *Tubulibairdia jolieti* n. sp., has been obtained from uppermost strata of the Vauréal Formation on the Loon Lake-Bear Lake road. As this is its only presently known occurrence in Vauréal strata, the reliability of this collection may be questioned.

Leperditicoid ostracodes are not described in this report. A few broken specimens were obtained from the washed samples studied but more complete specimens are known to occur on limestone slabs with other macroscopic fossils. These will be studied in detail with leperditids from the Silurian Becscie, Gun River and Jupiter formations to determine their possible stratigraphic significance.

Superfamily Beyrichiacea Matthew, 1886

Family Beyrichiidae Matthew, 1886

Genus *Bolbiprimitia* Kay, 1940

Bolbiprimitia? *schmitti* n. sp.

Plate III, figures 29-31; Plate VIII, figure 4

Description. Domicilium subovate, anterior end broadly rounded, posterior end more narrowly rounded. Cardinal angles abrupt, separated from the lateral surface by a groove, posterior angle alate, about 90 degrees, anterior angle obtuse. Dorsum with a complete plica. S2 a prominent, deep, groove posterior of L2 and extending to below mid valve, comprised of four or five reticulæ, the most ventral one being deeper than the others. L2 a large, low lobe not extending to dorsum. L1, if present, indistinct. Lateral surface coarsely reticulate.

Frill smooth, narrow, complete, with tubulosity shown on broken surface. Dimorphism unknown. Subvealar furrow smooth, each valve with a marginal ridge.

Length of holotype, a carapace, GSC No. 31453, 1.22 mm, height 0.8 mm, width 0.5 mm.

Number of specimens studied, 5.

Types. Holotype, GSC No. 31453, paratypes, GSC Nos. 31454, 31455, 31544.

Occurrence. Ellis Bay Formation, Members 3 and 5, road south of Lac Faure and Vauréal River above Vauréal Falls, Anticosti Island, Quebec.

Remarks. Without heteromorphic specimens it is impossible to assign this species without question to a beyrichiid genus. If a beyrichiid, the ornamentation and frill would seem to indicate its position within the treposellinid lineage and, more exactly, intermediate between *Garniella* and *Bolbiprimitia*. Martinsson (1962, p. 190, 197) has indicated that a new genus consisting of *Bolbiprimitia limbata* Swartz and Whitmore and *Bolbiprimitia teresacula* Swartz and Whitmore occupies this position. It is with those two species, and *Bolbiprimitia?* *tamsaluensis* Sarv that *B.?* *schmitti* n. sp. finds its closest affinities.

The genus, as thus constituted, would appear to range in age from Late Ordovician (Ellis Bay Formation, Members 3 and 5), through Early Silurian (Tamsalu, G_{II} of Estonia) to Early Devonian (Manlius Limestone, New York and New Jersey). Only the Devonian species, however, are known to exhibit beyrichiid dimorphism.

Superfamily Hollinacea Swartz, 1936

Family Hollinidae Swartz, 1936

Genus *Anticostiella* n. gen.

Type species. *Anticostiella ellisensis* n. sp.

Description. Trilobate, lobes not connected. L2 prominent, isolated. S1 connecting ventrally with S2. S2 long, sigmoidal, tapering ventrally to velar ridge. L3 large, dissected by shallow furrows into two or more large tubercles. Tecnomorph with complete velum. Heteromorph with three large loculi, velum interrupted in the area of the loculi.

Species. *Anticostiella ellisensis* n. sp.
Tetradella sp. a Sarv, 1962, p. 118, pl. V, fig. 19.

Range. Upper Ordovician-Middle Silurian (Becschie to Jupiter Formations, Anticosti Island).

Remarks. This genus bears marked resemblance to *Bromidella* Harris, 1931 and *Eohollina* Harris, 1957. Dimorphism in these genera is expressed by a tecnomorphic velar ridge and a heteromorphic incurved frill forming a false pouch; dimorphism in *Anticostiella* is likewise expressed by a tecnomorphic velar ridge but heteromorphic specimens bear ventral loculi.

Anticostiella ellisensis n. sp.

Plate III, figures 12-17, 24; Plate VI, figure 5; Plate VII, figures 4-7

Description. Valves subelliptical in lateral view, dorsally truncated. Dorsum long, straight, sunken between dorsal humps of L1 and L3. Venter broadly convex, running smoothly into anterior margin and slightly convergent posteriorly with dorsum. Cardinal angles obtuse, rounded.

Trilobate, L1 crescentic, concave posteriorly, L2 a discrete pre-sulcal node, L3 divided near mid valve by a horizontal furrow into a prominent dorsal tubercle projecting above the dorsal margin and an elliptical ventral node directed slightly anteroventrally. S1 narrow, limiting anterior side of L2 and joining S2 dorsally and ventrally, S2 broad, deep, sigmoidal, tapering ventrally to contact with velar ridge. Valve surface posterior to L3 low, extralobate.

Velar ridge narrow and complete in tecnomorphic valves; subvelar area slightly channelled to free marginal ridge. Heteromorphic valves with velate ridge anterior and posterior to locular area. Three large loculi situated on anteroventral margin.

Hinge straight, long, sunken between low anterodorsal hump and high posterodorsal tubercle.

Length of holotype valve, GSC No. 31443, 0.72 mm, height 0.57 mm.
Number of specimens studied, 50.

Types. Holotype, GSC No. 31443, paratypes, GSC Nos. 31437-31442, 31498, 31527-31530.

Occurrence. Ellis Bay Formation, Members 3, 4 and 5, Anticosti Island, Quebec, at numerous localities.

Remarks. This species differs from *Anticostiella* (= *Tetradella*) sp. a of Sarv, 1962 in having L1 and L2 as individual lobes instead of "four small elongate oval tubercles" and L3 divided into two, not three tubercles. Sarv equated his specimen to *Tetradella* because of its similarity to *Tetradella extenuata* Sarv, 1962. The latter species apparently bears two loculi in heteromorphic specimens and has more typical tetradellid arrangement of L1; until *T. extenuata* is more fully studied, its relationship to *Tetradella* or *Anticostiella* is unknown.

Genus *Ctenobolbina* Ulrich, 1890

Ctenobolbina maclearni n. sp.

Plate V, figures 3-8

Description. Valves subovate in lateral view, truncated dorsally. Dorsum straight, slightly arched posteriorly. Hinge long, straight, slightly sunken. Cardinal angles obtuse, about 120 degrees. Anterior margin more broadly rounded than posterior. Venter evenly convex.

Unisulcate, S2 curved, concave anteriorly, deeper and almost pit-like posterior of L2, continuing to frill as a shallow geniculate furrow. L2 broad, knoblike, in dorsal half of valve and anteriorly only faintly set off from lateral surface. Broadest part of valve situated in ventral part of posterior lobe behind the ventral continuation of S2. Surface reticulate.

Complete velar frill, slightly larger on left valve. Subvelar field channelled, both valves with marginal ridge.

Length of holotype, GSC No. 31486, 0.6 mm, height 0.45 mm.

Number of specimens studied, more than 15.

Types. Holotype, GSC No. 31486, paratypes, GSC Nos. 31487-31491.

Occurrence. Ellis Bay Formation, Member 4, White Cliff, Port Menier quarry, Anticosti Island, Quebec.

Remarks. This species is more ovate, more coarsely reticulate and has L2 more dorsally situated than *C. obliqua* Ulrich (non Krause). Also, the ventral tubercle of *C. obliqua* Ulrich is, in *C. maclearni*, replaced by the much more pronounced ventral node.

Family Eurychilinidae Ulrich and Bassler, 1923

Genus *Euprimitia* Ulrich and Bassler, 1923

Euprimitia gamachei n. sp.

Plate IX, figures 1-11

Description. Valves subelliptical in lateral view, dorsally truncate; greatest height in posterior third, dorsal border slightly convex, dorsal crests present antero- and posteromedially. Cardinal angles abruptly obtuse, more than 110 degrees. Ventral border broadly convex; slightly preplete, anterior margin less broadly curved than posterior. Lateral surface moderately convex, bilobate nature of shell evident in dorsal view.

Bilobate, S2 in dorsal half, slightly anterior of median, straight, shallow, pit-like ventrally, reaching dorsum as a shallow depression and forming sinuosity in dorsal crest. Presulcal node indistinct, small, limited anterodorsally by a faint, shallow groove. Surface coarsely reticulate, punctae angular, distributed unevenly or indistinctly aligned somewhat concentrically about S2. Anterocardinal corner impunctate on most specimens, posterocardinal corner less commonly impunctate. Velate ridge prominent, extending from antero-dorsal corner to near posterodorsal corner, nearly in contact with sinuous dorsal crest, in contact with free margin near cardinal angles but with a pronounced subvelar channel ventrally. Lateral surface reticulation crossing velate ridge and extending onto subvelar channel in a scale-like pattern.

Hinge straight, long, contact edge may be a narrow groove expanded distally on both valves. Free margin smooth, simple.

Length of holotype carapace, GSC No. 31556, 0.6 mm, height 0.43 mm, width 0.26 mm.

Number of specimens studied, 24.

Types. Holotype, GSC No. 31556; paratypes, GSC Nos. 31555, 31557-31565.

Occurrence. Ellis Bay Formation, Member 6, Becscie River road, 6.5 miles south of main highway, Anticosti Island, Quebec.

Remarks. *Euprimitia gamachei* n. sp. is closely related to the Middle Ordovician species *E. linepunctata* (Kay), *E. labiosa* (Ulrich) and *E. sanctipauli* (Ulrich), the type species. From *E. linepunctata* (Kay) it differs in the less regular alignment of reticulæ and more pronounced velate ridge; from *E. labiosa* (Ulrich) it differs in its preplete form, more pit-like and ventrally situated S2, and angular reticulæ; from *E. sanctipauli* (Ulrich) it differs in having larger, more regularly distributed reticulæ, preplete form and more prominent and reticulate velate ridge.

No dimorphism has been recognized in this species. In ventral aspect, some specimens exhibit more widely separated velate ridges (Pl. IX, figs. 6, 7) but no definite indication of a velar channel-like pouch has been seen.

Genus *Platybolbina* Henningsmoen, 1953

Platybolbina shaleri n. sp.

Plate I, figure 30; Plate III, figures 32-34; Plate VI, figures 16-18;
Plate VII, figures 11-15

Description. Domicilium elongate, ends subround. Dorsum long, straight; cardinal angles sharp, set off by oblique grooves, posterior angle about 90 degrees, anterior angle slightly obtuse. No sulcation, lobation or dorsal plica. Muscle spot at or slightly below mid valve, ovate or lacrimiform, with a centrally located pit. Lateral surface ornamented with distinct, fine reticulation.

Frill broad anteriorly, becoming narrow and ridge-like along posterior border. Radially striate, with concentric crests on the radial elements.

Length of holotype, GSC No. 31511, 1.1 mm, height 0.75 mm.

Number of specimens studied, more than 25.

Types. Holotype, GSC No. 31511, paratypes, GSC Nos. 31386, 31456-31458, 31509, 31510, 31534-31538.

Occurrence. Ellis Bay Formation, Members 1, 3 and 5, widespread, Anticosti Island, Quebec.

Remarks. This species most nearly resembles *Platybolbina omphalota* Kesling in ornamentation, muscle spot and frill. *P. shaleri* n. sp. lacks the dorsal plica of *P. omphalota*. Dimorphism is not certainly established in *P. shaleri*. It is thought that holotype GSC No. 31511 may be a heteromorph and paratype GSC No. 31457 a tecnomorph. The heteromorph frill is broad and without a convex portion.

Family Chilobolbinidae Jaanusson, 1957

Genus *Chilobolbina* Ulrich and Bassler, 1923

Chilobolbina? sp.

Plate I, figures 31, 32

Description. Domicilium elongate, ends subround, posterior cardinal angle more than 90 degrees. Greatest length and height median. No S2, L2 or dorsal plica;

in position of S2, walls of two or three contiguous reticulae breached to form an elongate, vertically oriented reticule.

Muscle spot subcentral, a large, deep, lacrimiform pit. Surface ornamented with distinct, coarse, deep reticulation.

Frill narrow, continuous; radially striate; with a thick peripheral rim; anteroventral part slightly flared out.

Length of figured specimen, GSC No. 31387, 1.25 mm, height 0.7 mm.

Number of specimens studied, 3.

Types. Figured specimens, GSC Nos. 31387, 31388.

Occurrence. Ellis Bay Formation, Member 1, creek south of Port Menier airport, Loon Lake-Bear Lake road and Junction Cliff, Anticosti Island, Quebec.

Remarks. This species is only known from broken specimens. Their inclusion in *Chilobolbina* is based primarily on the large central pit. Dimorphism is unknown.

Family Tetradellidae Swartz, 1936

Genus *Tetradella* Ulrich, 1890

Tetradella thomasi n. sp.

Plate III, figures 35-37; Plate VI, figure 14;
Plate VII, figures 16, 17; Plate VIII, figure 5

Tetradella lunatifera (Ulrich), Bassler in Twenhofel, 1928, p. 342.

Description. Valves subelliptical, dorsally truncate; dorsal margin long, four-fifths greatest length; free margin evenly convex; cardinal angles obtuse, anterior greater than posterior. Greatest length and height near median. Valves slightly preplete.

Lateral surface with four vertical lobes connected ventrally, with sharply elevated crests. L1 projecting above dorsum, anterior and posterior crests joined, posterior crest vertical. L2 prominent, expanded dorsally into preadductor node, near vertical, crest at anterior edge of preadductor node. L3 lunate, projecting above dorsum, anterior and posterior crests confluent dorsally, anterior crest straight, projecting slightly posterodorsally, posterior crest straight to gently curved. L4 a fine crest, extending to dorsum. Histial ridge sharp, prominent. Valve surface smooth with two prominent dorsal tubercles, one above L2 in direct line with the crest of L2 and one (generally smaller) above S2 midway between the first mentioned tubercle and dorsal projection of L3. Sulci apparently of near equal depth, that of S2 larger than S1 or S3.

Tecnomorph. Velum entire, uninterrupted. Subhistial field channelled, divided anteriorly by a vertical crest or partition extending from the base of the posterior crest of L1 to the velar ridge.

Heteromorph. Four anteroventral loculi, each with complete circumlocular crest. Adjacent locular crests each joined distally by a single short crest parallel with the free margin. Loculi not visible in lateral view except as flattened areas on anteroventral part of velar ridge.

Juvenile. Similar to tecnomorph but without crest dividing subhistial field. Dorsal part of L3 prominent.

Length of holotype valve, GSC No. 31539, 1.3 mm, height 0.82 mm.
Number of specimens studied, 15.

Types. Holotype, GSC No. 31539, paratypes, GSC Nos. 31459-31461, 31507, 31540, 31545.

Occurrence. Ellis Bay Formation, Members 3 and 5, Anticosti Island, Quebec.

Remarks. These specimens were at first considered as *Tetradella* sp. of *T. lunatifer* (Ulrich), but recently Guber (1971) redefined *T. lunatifer* (Ulrich) on the basis of neotypic material from Manitoba provided by Dr. Jean M. Berdan of the United States Geological Survey. Several morphological differences were immediately evident: *T. lunatifer* (Ulrich) has tubercles ventrally on L2 and the anterior crest of L3, no crest on L2, a prominent crest on L4, and, apparently, lacks both anteroventral vertical partition (buttress) dividing the subhstial area of tecnomorphs and interocular crests joining adjacent loculi in heteromorphs.

Guber (1971, p. 15, text-fig. 6) has shown that *Tetradella ellipsilira* Kay and *Tetradella quadrilirata* (Hall and Whitfield) each bear a tecnomorphic subhstial partition (buttress) but their heteromorphs bear double interocular crests of varying shape between each adjacent loculus. *Tetradella simplex* (Ulrich) also bears a subhstial partition but its lobation is distinctive. *Tetradella scotti* Guber bears single interocular crests between loculi 1, 2 and 3 and a double interocular crest between loculi 3 and 4. The locular sculpture of *Tetradella thomasi* n. sp., therefore, falls within this morphological series (ibid., text-fig. 7) but to the right (younger) of *Tetradella scotti* Guber. Whether *Tetradella lunatifer* (Ulrich), which has no interocular crests, is next in this series or is the final result of progressive loss (anterior to posterior) of interocular crests remains to be ascertained.

Tetradella anticostiensis n. sp.

Plate VIII, figures 6-15; text-figure 9, la-c

Tetradella simplex (Ulrich), Bassler in Twenhofel, 1928, p. 343.

Description. Valves subelliptical, truncated dorsally, dorsum straight, long, four-fifths greatest length; greatest length in dorsal half, greatest height median. Cardinal angles obtuse, anterior angle rounded, posterior angle with small alate projection.

Lateral surface with four uncrested vertical lobes. L1 lunate, bifurcate, anterior and posterior elements joined dorsally, anterior element curved parallel with anterior margin of valve, posterior element slightly sickle-shaped, concave posteriorly in dorsal two-thirds. L2 short, expanded dorsally into preadductorial node, originating at juncture of handle and blade of sickle-shaped posterior element of L1. L3 prominent, a single element, club-shaped dorsally, confluent with L4 at or above dorsum. L4 often tuberculate, parallel with posterior margin.

S1 and S2 prominent, connected dorsally, S1 deep, comma-shaped, occupying the concave area between L1 and L2. S2 deep, curved, rectangular, extending slightly anteroventrally from mid dorsum to hstial ridge. S3 a closed linate sulcus similar to lunate area enclosed by L1. Area posterior of L4, low, subhstial.

Tecnomorph and juvenile. Velate ridge entire, uninterrupted. Subhstial field channelled, widest posteriorly.

Heteromorph. Three large, anteroventral loculi; circumlocular crests in complete contact, formed proximally by concave segments of histium and distally by concave segments of velum. Loculi 1 and 2 constricting median depression of L1.

Length of holotype valve, GSC No. 31554, 0.73 mm, height 0.5 mm.
Number of specimens studied, 35.

Types. Holotype, GSC No. 31554, paratypes, GSC Nos. 31546-31553.

Occurrence. Ellis Bay Formation, Member 3, Becscie River road and Member 5, Vauréal River, Anticosti Island, Quebec.

Remarks. This species is somewhat similar to *Tetradella egorowi* Neckaja in the shape of L1 and L2, but *T. anticostiensis* n. sp. has a complete L3, not bifurcated. Neckaja (1953, pl. III, fig. 2) indicates, however, that *T. egorowi* Neckaja may have the anterior and posterior elements of L3 relatively closely appressed rather than completely open. *Tetradella regularis* Keenan is also somewhat similar to *T. anticostiensis* n. sp. as illustrated by Guber (1971, pl. 4, fig. 3). *T. regularis* has a similar arrangement of L3 and L4 as *T. anticostiensis* but has a complete, not bifurcated L1. Also, heteromorphic valves of *T. regularis* Keenan are unknown.

In tetradellid species in which L3 is non-bifurcate it is difficult to ascertain whether we are dealing with tri- or quadrilobate individuals. If trilobate, what are considered here as L3 and L4 comprise only L3. Also, heteromorphic valves of *T. anticostiensis* bear three, not four, loculi. Possibly, with discovery and study of additional tetradellid species bearing some or all of these characteristics, a new generic or subgeneric grouping would be advisable.

Genus *Foramenella* Stumber, 1956

Foramenella phippii n. sp.

Plate I, figures 14, 15; Plate II, figures 20-36; Plate IV, figures 10-13;
Plate VI, figures 6, 19; Plate VII, figures 2, 3, text-figure 9, 3a-f

Description. Valves subelliptical in lateral view, dorsally truncate; greatest length in dorsal half, greatest height median, greatest width slightly posterior of mid valve. Dorsal margin straight, long; cardinal angles abrupt, obtuse, with small alate projections, approximately 110 degrees. Slightly preplete, ventral margin broadly convex, joining smoothly with anterior and posterior margins.

Quadrilobate, all lobes joining ventrally, L1 and L3-L4 projecting dorsally above hinge, crested in dorsal view. Hinge four-fifths greatest length, sunken.

Juvenile. Quadrilobate, L1 with broader anterior and short, thinner posterior crest, the latter rising from base of nodular portion of L2. L2 anterior of mid valve, with short ventral portion and swollen dorsal node. L3 long, reaching dorsum, anteriorly concave. L4 long, thin, parallel with velate structure, not reaching dorsum. S1 and S3 short, slit-like, S2 broad, deep, reverse comma-shaped. Velate ridge complete, subvelar channel, marginal ridge prominent. Right valve overlapping left ventrally.

Tecnomorph. Quadrilobate, S1 and S4 almost obsolete. L1 low, broad, with no crests. L2 similar to juvenile but only partly set off from L1. L3 as in juvenile but with dorsal crest projecting anteriorly and enclosing dorsal part of S2. L4 low, only partly distinguishable from L3. S2 deep, concave anteriorly, pit-like in some specimens. Velar and marginal structures as in juvenile.

Heteromorph. Lobate structures combining some aspects of both juvenile and tecnomorph. Posterior crest of L1 present as in juvenile, anterior crest of L1 very low, partly hidden by anterior loculus. S3 present but indistinct as in tecnomorph. Straight velate ridge anterior and posterior of locular area. Five large loculi (sometimes 4) present on anteroventral and ventral margins, visible in lateral and ventral views, with complete circumlocular crests meeting smoothly along dividing lines between adjacent loculi. Straight velate ridge connecting smoothly with mid anterior locular crest of loculus 1 and mid posterior locular crest of posterior loculus (5 or 4). Sublocular channel and complete marginal ridge.

Length of holotype valve, GSC No. 31417, 0.75 mm, height 0.51 mm.
Number of specimens studied, 60.

Types. Holotype, GSC No. 31417, paratypes, GSC Nos. 31370, 31371, 31408-31416, 31418-31424, 31472-31475, 31499, 31512, 31525, 31526.

Occurrence. Ellis Bay Formation, Members 1 to 5, various localities, Anticosti Island, Quebec.

Remarks. *Foramenella phippsi* n. sp. is more lobate than other species of the genus (*Foramenella parkis* (Neckaja), *Foramenella porkuniensis* Sarv). As in those species, *Foramenella phippsi* n. sp. has a prominent S2 and, usually, 5 prominent anteroventral and ventral loculi visible in lateral and ventral views of heteromorphic specimens. There, the general morphological similarity ends.

Unlike most dimorphic species, juvenile specimens of *Foramenella phippsi* n. sp. are not similar, but smaller, than tecnomorphic specimens. Juveniles, tecnomorphs and heteromorphs of *F. phippsi* are morphologically distinct. The heteromorphic specimens combine characters of both other forms that are lacking in each other. For example, the posterior crest of L1 occurs on juveniles and heteromorphs but not on tecnomorphs; S3 is nearly obsolete on tecnomorphs and heteromorphs but is deep and slit-like on juveniles. Attempts to separate two foramenellid species from within the same fauna (and collection) could only succeed if relatively less lobate tecnomorphs and heteromorphs were equated as one species and more ornamented heteromorphs were equated with smaller (i.e. juvenile) specimens. This is not considered justified on morphologic or taxonomic grounds.

Family Sigmoidesidae Henningsmoen, 1953

Genus *Carinobolbina* Henningsmoen, 1953

Carinobolbina richardsoni n. sp.

Plate I, figures 21-29

Description. Valves subelliptical in lateral view, dorsally truncate; greatest height in anterior third, greatest length median and greatest width slightly ventral of mid valve. Dorsal margin straight, long; cardinal angles abrupt, obtuse, approximately 120 degrees. Preplete, ventral margin slightly convex, inclined toward dorsum posteriorly; posterior margin narrowly rounded, anterior margin more broadly rounded. Lateral surface moderately convex, abruptly elevated from free margin.

Trilobate, sulci directed anteroventrally. S1 small, indistinct, in dorsal quarter of valve, barely disrupting L1-L2. S2 a shallow furrow extending from dorsum anteroventrally to the histial ridge; with a deep, reverse comma-shaped pit near mid valve. Presulcal tubercle present, invaginating anterior edge of central pit. L3 a large, triangular area occupying the posterior half of the valve, flat dorsally but forming a distinct, anteroventrally directed suprahistial lobe ventral of the median pit. Surface of valve

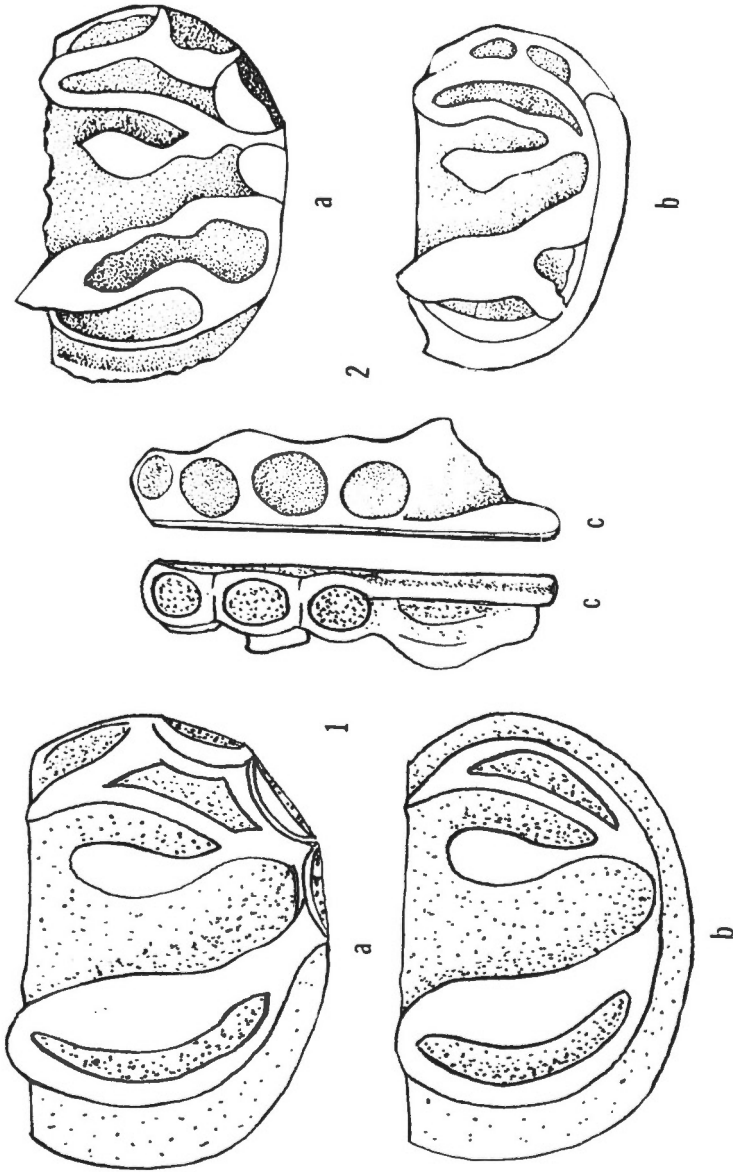


Figure 9. 1. *Tetradella antiochiensis* n. sp., x75.
a, c. Right lateral and ventral views of a heteromorphic valve.
b. Right lateral view of a tecomorphic valve.

2. *Tetradella egorowi* Neckaja, x60.
a, c. Right lateral and left ventral views of heteromorphic valves
(after Neckaja, 1953, pl. III, figs. 3, 5).
b. Right lateral view of a juvenile valve (after Neckaja, 1953,
pl. III, fig. 2).

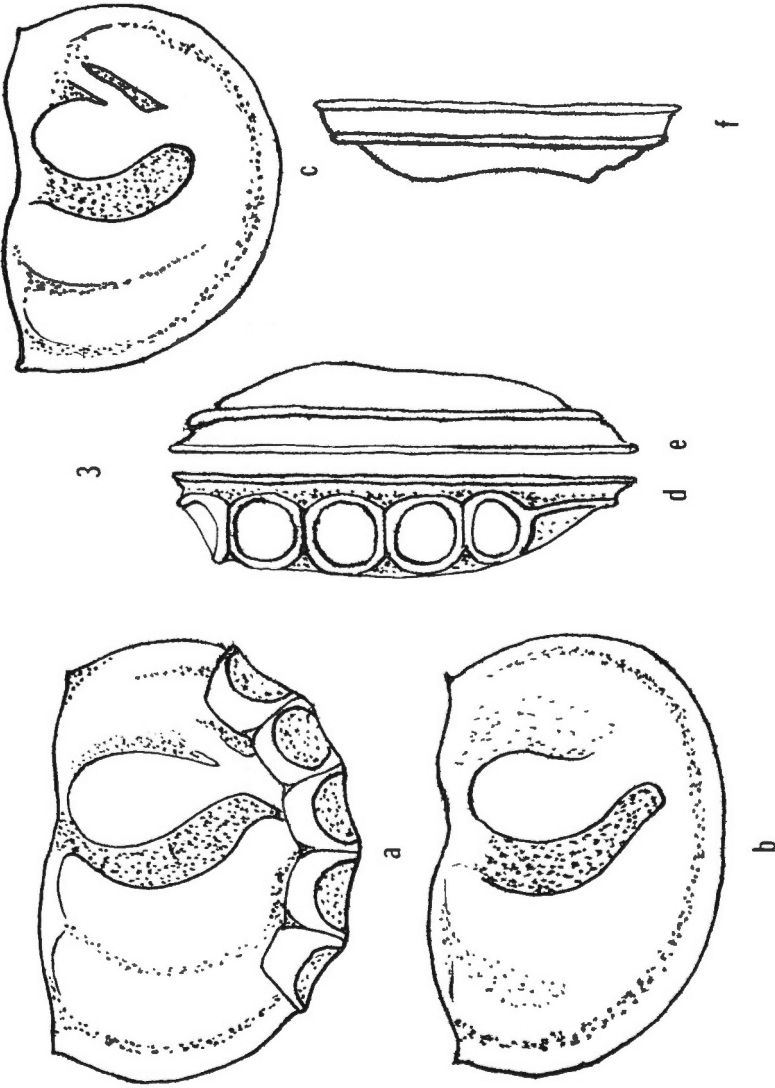


Figure 9. 3. *Foramenella phippii* n. sp., x75.
a, d. Right lateral and ventral views of a heteromorphic valve.
b, e. Right lateral and left ventral views of tecomorphic valves.
c, f. Right lateral and ventral views of a juvenile valve.

granulose with a few scattered large tubercles, most on anteroventral part of L1-L2 and posterior part of L3 but several along the dorsal margin, the most prominent of which are two on L2 directly above the median pit and one mid dorsally on L3.

Histial ridge narrow, situated at bend of valve and extending from anterodorsal angle to posteroventral corner, posteriorly breaking into three or more coarse tubercles arranged linearly parallel to the posterior margin. Histial ridge more prominent on heteromorphic valves, thin, thread-like on tectomorphic specimens. Velate ridge unknown, presumed absent. Marginal ridge prominent, present on both valves as a row of small confluent tubercles.

Hinge straight, long, slightly incised but not sunken between tuberculate dorsal margins.

Length of holotype carapace, GSC No. 31377, 0.85 mm, height 0.52 mm, width 0.31 mm.

Number of specimens studied, 20.

Types. Holotype, GSC No. 31377, paratypes, GSC Nos. 31378-31385.

Occurrence. Ellis Bay Formation, Member 1, Junction Cliff, Anticosti Island, Quebec.

Remarks. This species differs from others of the genus in the presence of a median, pit-like portion of S2. *Carinobolbina kuckersiana* (Bonnema), *Carinobolbina aspera* (Öpik) and *Carinobolbina richardsoni* n. sp. each bear prominent S2 and apparently lack S3. Each is pustulose and has a presulcal node, but only *C. richardsoni* n. sp. bears prominent posteroventral and dorsal tubercles.

Superfamily Oepikellidae Jaanusson, 1957

Family Oepikellidae Jaanusson, 1957

Genus *Diplopsis* Levinson, 1961

Diplopsis sp. cf. *D. frequens* (Steusloff)

Plate VI, figure 30; Plate VIII, figure 3

Isochilina frequens Steusloff, 1894, Zeit. Deutsch. Geol. Ges., bd. 46, p. 784, pl. 58, fig. 4.

Aparchites (?) *frequens* (Steusloff), Kummerow, 1924, Jahr. Preuss. Geol. Landes., bd. 44, p. 415, pl. 21, fig. 4.

Öpikella frequens (Steusloff), Henningsmoen, 1954, Norsk. Geol. Tidsskr., bd. 33, Nos. 1-2, p. 93, pl. 5, figs. 7-9; Kraft, 1962, Geol. Soc. Amer., Mem. 86, p. 32, pl. 3, figs. 15a-c; pl. 4, figs. 1-14; text-figs. 7, 1-o.

Diplopsis sp. cf. *D. frequens* (Steusloff), Copeland, 1965, Geol. Surv. Canada, Bull. 127, p. 28, pl. IX, figs. 9-20.

Description. Shell subovate in lateral view, dorsally truncate; greatest height, length and width median. Dorsal border gently convex; hinge about two-thirds length; cardinal angles rounded, obtuse; ventral border broadly convex, converging slightly with dorsum posteriorly; anterior and posterior borders evenly but narrowly convex. Valves nearly equal, but overlapping ventrally.

Shell surface smooth, with a narrow, smooth velate ridge, shallow subvelar channel and fine marginal ridge. Velate ridge wide and extending from mid posterior to mid anterior borders on heteromorphic specimens, thinner on

tecnomorphic valves, more pronounced ventrally and that of the right valve slightly deflected laterally to form a short, flat subvelar field.

Number of specimens studied, 5 tecnomorphic carapaces.

Types. Hypotypes, GSC Nos. 31523, 31543.

Occurrence. Norway (5a, 5b), Esthonia (Porkuni Limestone), Virginia (Edinburg Formation), Oklahoma (Bromide and Tulip Creek formations), Ontario (Bucke and Ottawa formations), Quebec (Ellis Bay Formation, Members 3, 5), etc.

Remarks. This wide-ranging species appears to bear greater similarity to *Diploopsis socialis* Levinson than to *Oepikella tvarensis* Thorslund. The latter bears a large adductor scar and the heteromorph bears an anteroventrally situated velate frill. *D. socialis* Levinson is more similar to the present species in being smooth and having a ventrally directed velate frill.

Superfamily Drepanellacea Ulrich and Bassler, 1923

Family Richinidae Scott, 1961

Genus *Pseudulrichia* Schmidt, 1941

Pseudulrichia simplex (Ulrich)

Plate I, figures 11-13

Dicranella simplex Ulrich, 1894, Minn. Geol. Nat. Hist. Surv., vol. III, pt. II, p. 666, pl. 44, figs. 24, 25, pl. 46, fig. 42.

Bollia simplex (Ulrich), Kay, 1940, J. Pal., vol. 14, No. 3, p. 258, pl. 32, figs. 33, 34.

Pseudulrichia simplex (Ulrich), Copeland, 1965, Geol. Surv. Canada, Bull. 127, p. 9, pl. XI, figs. 13, 14, 17.

Description. Valves subovate in lateral view, truncated dorsally. Hinge-line long, straight, cardinal angles obtuse, free margin evenly rounded.

Bilobate, S2 shallow, in dorsal half of valve, only slightly depressed in lateral surface. L2 a large, low node extending to, but rarely above, the dorsal margin. L3 larger than L2, extending above dorsal margin as a short, blunt spine. Surface smooth.

Length of specimen, hypotype, GSC No. 31367, 0.6 mm, height 0.45 mm.
Number of specimens studied, 17.

Types. Hypotypes, GSC Nos. 31367-31369.

Occurrence. Ellis Bay Formation, Member 1, Junction Cliff, Anticosti Island, Quebec.

Remarks. This species occurs typically in Middle Ordovician strata of mid-continental North America. Apparently it is a generalized form of long stratigraphic range.

Family Aechminidae Bouček, 1936

Genus *Aechmina* Jones and Holl, 1869

Aechmina maccormicki n. sp.

Plate I, figure 8; Plate III, figures 5-7

? *Aechmina* aff. *bovina* Jones, Neckaja, 1966, VNIGRI, v. 251, p. 26, pl. IV, fig. 4.

Description. Carapace ovate in lateral view, truncated dorsally. Dorsum straight, free margin evenly convex. Large, prominent posterolaterally curved, horn-shaped spine in anterodorsal quarter. Spine with broad base, smoothly confluent with lateral surface or lateral surface slightly depressed anterior and posterior of spine. Anteroventral quarter of valve, beneath spine, swollen. Surface smooth.

Length of holotype valve, GSC No. 31430, 0.7 mm, height 0.6 mm.
Number of specimens studied, 15.

Types. Holotype, GSC No. 31430, paratypes, GSC Nos. 31364, 31429, 31431.

Occurrence. Ellis Bay Formation, Members 1 to 5, Junction Cliff, Pte. Laframboise and Baillie River road, Anticosti Island, Quebec. Upper Ordovician, northwest part of the Russian platform.

Remarks. This species is most closely allied to *Aechmina bovina* Jones, 1887. The distinctive shape and curvature of the spine is similar in both species but the spine of *A. bovina* is near mid valve, not anterodorsal as in *A. maccormicki*, and *A. bovina* is less elongate.

Genus *Faurella* n. gen.

Type species. *Faurella cartieri* n. sp.

Description. Like *Aechmina*; with distinct dorsal spine joined ventrally to well-defined marginal ridge. No pit at base of spine.

Species. *Faurella cartieri* n. sp.

Range. Upper Ordovician, Ellis Bay Formation.

Remarks. The genus appears intermediate between the simple *Aechmina*, in which the prominent spine is confluent with the lateral surface of the valve, and the more complex *Paraechmina*, which bears a discrete spine with anteroventral pit, separated from a distinct marginal ridge. The lateral surface of *Faurella*, therefore, exhibits what superficially resembles sulcation, a condition that later became modified to the U-shaped supramarginal depression of *Paraechmina*.

Faurella cartieri n. sp.

Plate III, figures 8-10, 18

Description. Valve ovate in lateral view, dorsally truncated. Dorsum straight, long, about four-fifths greatest length. Cardinal angles obtuse. Free margin plain, evenly convex.

Prominent horn-shaped spine anterior of mid length of valve, extending well above dorsum, curved posteriorly and slightly laterally. Spine joined ventrally to broad complete marginal ridge. Anterodorsal area between marginal ridge and spine a slit-like depression; depressed area in same position posterior of spine, broad and rounded-triangular. Both depressed areas (in position of S2 and S3?) extend uninterruptedly to dorsum. Surface smooth.

Length of holotype valve, GSC No. 31432, 0.68 mm, height 0.55 mm.
Number of specimens studied, 30.

Types. Holotype, GSC No. 31432, paratypes, GSC Nos. 31433-31435.

Occurrence. Ellis Bay Formation, Members 3 to 6, widespread.

Remarks. The shape and orientation of the spine of this species resembles that of *Aechmina bovina* Jones and *A. maccormicki*, n. sp. Surface ornamentation of the valves, however, is much different.

Superfamily Kloedenellacea Ulrich and Bassler, 1908

Family Kloedenellidae Ulrich and Bassler, 1908

Genus *Eokloedenella* Kraft, 1962

Eokloedenella sp.

Plate IX, figure 19

Description. Carapace elongate, ovate. Dorsum curved, anterior and posterior margins evenly rounded, venter slightly concave. Left valve slightly overlapping right antero- and posteroventrally. Contact margin plain. Hinge-line curved, left valve overlapping right anterodorsally, with a broad, curved stragular process, hinge sunken posteriorly.

Valves unisulcate. S2 pit-like, deeply incised, in dorsal and anterior half of valve. Valve surface abruptly terminated posteriorly, overhanging as a ridge the depressed posterior margin. Posterior projection curved almost parallel with posterior margin, nearly indistinguishable in lateral view.

Length of figured specimen, a carapace, GSC No. 31573, 1.15 mm, height 0.6 mm, width 0.55 mm.

Number of specimens studied, 9.

Type. Figured specimen, GSC No. 31573.

Occurrence. Ellis Bay Formation, Member 1, road east of Loon Lake, Anticosti Island, Quebec.

Remarks. This species is most similar to *Eokloedenella canadensis* (Bassler) but is proportionately longer, has a shorter posterior ridge and a smaller, nearly circular S2. The figured specimen, a presumed heteromorph, appears to have a slightly granulose surface (the large granules on the specimen are adhering matrix) whereas *E. canadensis* is smooth.

Superfamily Leperditellacea Ulrich and Bassler, 1906

Family Leperditellidae Ulrich and Bassler, 1906

Genus *Cryptophyllus* Levinson, 1951

Cryptophyllus sp. cf. *C. oboloides* (Ulrich and Bassler)

Plate VI, figure 15

Description. Carapace small, umbonate, umbo bilobed, S2 a slight depression dorsally. Antero- and posterodorsal shoulders long, sloping at about 90 degrees to each other and joining the broadly curved ventral margin smoothly. Surface smooth, with two concentric ridges parallel to the free margin. Carapace in end view heart-shaped, dorsal view with short hinge sunken between larger umbo of right valve and smaller umbo of left valve.

Length of carapace, hypotype, GSC No. 31508, 0.8 mm, height 0.7 mm, width 0.42 mm.

Number of specimens studied, 6.

Types. Hypotype, GSC No. 31508.

Occurrence. Ellis Bay Formation, Members 4, 5 and 6, Pte. Laframboise, Port Menier quarry, White Cliff and Lac Faure road.

Remarks. This species appears very similar to the type species *C. oboloides* (Ulrich and Bassler, 1923) which is widespread in Middle Ordovician strata of the midcontinent region of North America. The size of the specimens and number of annulae are somewhat variable between *C. oboloides* and the present specimens and present difficulty in making more exact identification.

Genus *Schmidtella* Ulrich, 1892

Schmidtella robervali n. sp.

Plate I, figures 9, 10; Plate II, figure 18; Plate III, figure 23; Plate V, figures 1, 2

Description. Valves subovate in lateral view, slightly umbonate dorsally. Equivalved, most specimens somewhat postplete, marginal area may be flattened ventrally. Hinge about one-half greatest length of valves, sunken between dorsal elevations of both valves. Hingement apparently consisting of a groove in each valve.

Surface smooth; adductor scar slightly above mid valve, either a smooth depression or circular with a low, central elevation. Distinct circular pit dorsal of adductor scar, midway between scar and dorsum. Pit joined to adductor scar by a shallow groove.

Length of holotype, GSC No. 31365, 0.8 mm, height 0.6 mm.

Number of specimens studied, more than 50.

Types. Holotype, GSC No. 31365, paratypes, GSC Nos. 31366, 31406, 31448, 31484, 31485.

Occurrence. Ellis Bay Formation, Members 1 to 5, in all collections, Anticosti Island, Quebec.

Remarks. This species is similar in shape and dimensions to *S. sublenticularis* (Jones), a species occurring throughout the Vauréal Formation and Members 1 and 5 of the Ellis Bay Formation. *S. sublenticularis*, however, is smooth, lacking an adductor impression and dorsal pit.

Genus *Neoschmidtella* Sarv, 1962

Neoschmidtella granti n. sp.

Plate IV, figures 15-17; Plate VI, figures 1-4; Plate VII, figures 8-10

Description. Carapace truncate-oval in lateral view, slightly preplete. Dorsal margin straight, cardinal angles projecting slightly as short spines. Greatest length dorsal, greatest height in anterior half, greatest width near median. Valves equal, right overlapping left around free margin. Marginal ridge on left valve comprised of numerous small denticles against which the right valve closes. S2 prominent, shallow, in dorsal third. Preadductor node small, relatively indistinctly separated from anterior part of valve. Surface finely reticulate.

Length of holoype carapace, GSC No. 31479, 0.62 mm, height 0.4 mm, width 0.3 mm.

Number of specimens studied, 20.

Types. Holotype, GSC No. 31479, paratypes, GSC Nos. 31477, 31478, 31494-31497, 31531-31533.

Occurrence. Ellis Bay Formation, Members 4 and 5, Port Menier quarry, White Cliff, Lac Faure and Becscie River roads and Pte. Laframboise.

Remarks. This species differs from the type species, *Neoschmidtella antica* Sarv, 1962 in being much smaller, reticulate, having a shorter and shallower S2 and a more pronounced presulcal node. Both species bear marginal denticles on the right valve. Certain resemblance exists between *N. granti* n. sp. and species of *Saccolatia* Kay, 1940 which, however, are nonsulcate.

Genus *Primitiella* Ulrich, 1894

Primitiella unicornis (Ulrich)

Plate IX, figures 17, 18

Leperditia unicornis Ulrich, 1879, J. Cincinnati Soc. Nat. Hist., v. II, p. 10, pl. VII, fig. 4.

Primitiella unicornis (Ulrich), Ulrich, 1894, Minn. Geol. Nat. Hist. Surv., v. III, pt. II, p. 649, pl. XLIII, figs. 75-77.

Description. Valves ovate in lateral view. Dorsum long, straight to slightly concave near mid valve. Cardinal angles obtuse, rounded. Free margin evenly rounded, anterior margin more narrowly rounded than posterior. Surface of valve smooth. S2 a slight depression near mid valve, in dorsal third. Small, posterolaterally directed spine near posterior margin of each valve, at or slightly ventral of mid height of valve.

Length of figured specimen, GSC No. 31571, 0.82 mm, height 0.45 mm.

Number of specimens studied, 12.

Types. Figured specimens, GSC Nos. 31571, 31572.

Occurrence. Ellis Bay Formation, Member 2, Becscie River road, Anticosti Island, Quebec.

Remarks. The Anticosti Island specimens are conspecific with those figured by Ulrich from the region near Cincinnati, Ohio. They bear little resemblance to *Eokloedenella canadensis* (Bassler) or *Aparchites unicornis* var. Ulrich, species which have previously been referred to *P. unicornis* by some authors.

Superfamily Healdiacea Harlton, 1933

Family Krausellidae Berdan, 1961

Genus *Krausella* Ulrich, 1894

Krausella? sp.

Plate II, figures 8-10

Description. Carapace elongate, greatest length ventral, greatest height in anterior half. Dorsum lowly arched, sloping to pointed posterior end, anterior narrowly rounded, venter straight to slightly convex.

Left valve overlapping right near mid dorsum and ventrally. Each valve acuminate posteriorly.

Length of figured specimen, GSC No. 31398, 0.84 mm, height 0.32 mm.

Number of specimens studied, 14.

Types. Figured specimens, GSC Nos. 31396-31398.

Occurrence. Ellis Bay Formation, Member 2, Pte. Laframboise and Becscie River road, Anticosti Island, Quebec.

Remarks. It would appear that the posterior spine of the left valve of this species may extend farther than that of the right. If this is true, reference of these specimens to *Krauseella*? is highly tenuous.

Family Pachydomellidae Berdan and Sohn, 1961

Genus *Tubulibairdia* Swartz, 1936

Tubulibairdia jolieti n. sp.

Plate I, figure 4; Plate III, figures 1-4; Plate IV, figure 1;
Plate V, figures 9, 10; Plate VI, figure 8

Description. Carapace subovate in lateral view, round in cross-section; dorsum arched, shoulders sloping to narrowly curved anterior and posterior margins, venter concave medially. Greatest length in ventral half, greatest height and width median.

Left valve larger than right, overlapping right except posteroventrally. Both valves abruptly compressed near posteroventral margin, compressed area forming a flat shelf or groove. Dorsal valve contact curved, ventral contact incised medially.

Hinge short, simple, about half greatest length of valve, sloping posteroventrally, sunken between high dorsal elevation of left valve and lower dorsum of right.

Surface smooth to coarsely punctate. Right valve smooth in anterior half but with twenty or less large punctae in posterior half. Left valve usually smooth in anterior third but with up to forty or more large punctae in posterior two-thirds, some specimens with few anterior near-marginal punctae.

Length of holotype, a carapace, GSC No. 31360, 0.7 mm, height 0.42 mm.

Number of specimens studied, more than 100.

Types. Holotype, GSC No. 31360, paratypes, GSC Nos. 31425-31428, 31463, 31492, 31493, 31501.

Occurrence. Ellis Bay Formation, Members 1-5, widespread.

Remarks. This species differs from other species of the genus in being externally punctate. Also, the variation in number of punctae, fewer on the right valve than on the left valve, is another distinguishing characteristic.

Superfamily Quasillitacea Coryell and Malkin, 1936

Family Quasillitidae? Coryell and Malkin, 1936

Genus *Eographiodactylus* Kraft, 1962

Eographiodactylus hyatti n. sp.

Plate III, figures 25-28; Plate IV, figures 18-21

Description. Valves subquadrate in lateral view, preplete. Dorsum long, straight, nearly equal to greatest length. Venter slightly convex, rounding smoothly into anterior margin and converging posteriorly towards dorsum; posterior margin nearly straight, joining dorsum at 90 degrees. Cardinal angles abrupt, anterior obtuse and posterior drawn into a posterodorsally directed spine.

Velate ridge on both valves, extending from anterodorsal corner to posteroventral margin where it terminates in a pronounced blunt spine; velate ridge broadest at anteroventral corner. Subvelar field shallow, right valve overlapping left ventrally, with a thin marginal ridge.

Bilobate, S2 a shallow depression near mid length, extending from dorsum to mid valve. Presulcal lobe indistinct. Surface reticulate, reticulae arranged somewhat linearly parallel to anterior and posterior margins, becoming more randomly oriented near mid valve.

Hinge straight, long, slightly sunken along its entire length.

Length of holotype carapace, GSC No. 31481, 0.7 mm, height 0.4 mm, width 0.3 mm.

Number of specimens studied, 16.

Types. Holotype, GSC No. 31481, hypotypes, GSC Nos. 31449-41452, 31480, 31482, 31483.

Occurrence. Ellis Bay Formation, Member 3, Pte. Laframboise and Member 4, White Cliff, Port Menier quarry, Anticosti Island, Quebec.

Remarks. This species differs from *E. eos* Kraft, the type species, and *E. billingsi* Copeland in having a reticulate surface. Also, *E. eos* Kraft bears an anteroventral velate spine at the position of the widest part of the velate ridge of *E. hyatti*. *E. billingsi* lacks the posteroventral velar spine present on specimens of both other species.

Kraft's (1962) assertion that the genus *Eographiodactylus* may be the root stock from which *Graphiadaactyllis* and *Quasillites* developed may be further strengthened in that the generic description of *Eographiodactylus* may now be emended to include reticulate or otherwise ornamented specimens.

Family unknown

Genus *Daleiella* Bouček, 1937, emend Morris and Hill, 1952

Daleiella caleyi n. sp.

Plate IV, figures 6, 7

Description. Valves assymmetric; left larger than right, projecting above hinge, right overlapping left ventrally. Left valve broadly convex posteriorly, more narrowly convex anteriorly, dorsum highly arched in median third. Right valve ovate, postplete, dorsum straight. Hinge slightly sunken. Surface smooth.

Length of holotype carapace, GSC No. 31469, 0.5 mm, height 0.4 mm.

Number of specimens studied, 6.

Types. Holotype, GSC No. 31469, paratype, GSC No. 31468.

Occurrence. Ellis Bay Formation, Member 4, White Cliff, Port Menier quarry, Anticosti Island, Quebec.

Remarks. *Daleiella caleyi* n. sp. is not as obese in end view as the type species *Daleiella corbuloides* Jones and Holl, 1869, *Daleiella americana* Morris and Hill, 1952 or *Daleiella? canadensis* Copeland, 1962. Unlike *D. americana* and *D.? canadensis*, *D. caleyi* n. sp. is not posteriorly acuminate.

Family unknown

Genus *Platyrhomboides* Harris, 1957

Platyrhomboides? dixonii n. sp.

Plate IV, figures 8, 9; Plate VI, figures 23-25; Plate VII, figure 1

Description. Carapace elongate-ovate in lateral view. Left valve overreaching right dorsally. Greatest length ventral, greatest height near mid valve, greatest width ventral in posterior half. Carapace flat-iron-shaped in ventral view, venter flat; free margin of left valve slightly overlapping right ventrally. Surface smooth.

Length of holotype carapace, GSC No. 31520, 1.1 mm, height 0.6 mm, width 0.8 mm.

Number of specimens studied, 30.

Types. Holotype, GSC No. 31520, paratypes, GSC Nos. 31470, 31471, 31521, 31522, 31524.

Occurrence. Ellis Bay Formation, Members 4 and 5, Pte. Laframboise, White Cliff, Port Menier quarry, Becscie and Lac Faure roads.

Remarks. *P.? dixonii* n. sp. is larger than most species of *Platyrhomboides* and does not bear a flange at the lateroventral valve juncture. The flattened venter of *P.? dixonii* is extremely broad posteriorly.

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PLATES I to IX

PLATE I

Member 1 - *Carinobolbina richardsoni* subzone

- Figures 1, 2. *Paraschmidtella irregularis* Keenan
Left and right lateral views of two specimens, x33. Junction
Cliff, GSC locality 76177. Hypotypes, GSC Nos. 31357, 31358.
- Figure 3. "*Bythocypris*" *lindstroemi*? Jones
Left lateral view of a carapace, x31. Junction Cliff, GSC
locality 76177. Hypotype, GSC No. 31359.
- Figure 4. *Tubulibairdia jolieti* n. sp.
Left lateral view of a carapace, x30. Junction Cliff, GSC
locality 76177. Holotype, GSC No. 31360.
- Figures 5, 6. *Schmidtella sublenticularis* (Jones)
Left lateral views of two carapaces, x34 and x25. Junction
Cliff, GSC locality 76177, and Loon Lake-Bear Lake road,
GSC locality 76286. Hypotypes, GSC Nos. 31361, 31362.
- Figure 7. *Aechmina richmondensis* Ulrich and Bassler
Left lateral view of a specimen, x30. Junction Cliff, GSC
locality 76177. Hypotype, GSC No. 31363.
- Figure 8. *Aechmina maccormicki* n. sp.
Left lateral view of a specimen, x30. Junction Cliff, GSC
locality 76177. Paratype, GSC No. 31364.
- Figures 9, 10. *Schmidtella robervali* n. sp.
Left and right lateral views of two carapaces, x30. Junction
Cliff, GSC locality 76177. Holotype, GSC No. 31365, para-
type, GSC No. 31366.
- Figures 11-13. *Pseudulrichia simplex* (Ulrich)
Right and left lateral views of three specimens, x30.
Junction Cliff, GSC locality 76177. Hypotypes, GSC Nos.
31367-31369.
- Figures 14, 15. *Foramenella phippii* n. sp.
Left lateral views of an immature and a heteromorphic speci-
men, x30. Junction Cliff, GSC locality 76177. Paratypes,
GSC Nos. 31370, 31371.
- Figures 16-19. *Jonesites semilunatus* (Jones)
Two right and two left lateral views of four valves. 16, 17.
Junction Cliff, GSC locality 76177, x30. 18, 19. Loon Lake-
Bear Lake road, GSC locality 76286, x25. Hypotypes, GSC Nos.
31372-31375.
- Figure 20. *Tetradella* sp.
Right lateral view of an incomplete valve, x30. Junction
Cliff, GSC locality 76177. Figured specimen, GSC No. 31376.
- Figures 21-29. *Carinobolbina richardsoni* n. sp.
Two left, four right, one dorsal and two ventral views of
nine carapaces, x30. Junction Cliff, GSC locality 76177.
Holotype (Fig. 27), GSC No. 31377, paratypes (Figs. 21-26,
28, 29 in numerical order), GSC Nos. 31378-31385.
- Figure 30. *Platybolbina shaleri* n. sp.
Left lateral view of a carapace, x25. Loon Lake-Bear Lake
road, GSC locality 76286. Paratype, GSC No. 31386.
- Figures 31, 32. *Chilobolbina*? sp.
Left and right lateral views of two valves, x20 and x24.
One-quarter mile south of main road near airport, on south
bank of creek flowing into Lake Gamache at Port Menier, GSC
locality 62168, and Loon Lake-Bear Lake road, GSC locality
76286. Figured specimens GSC Nos. 31387, 31388.



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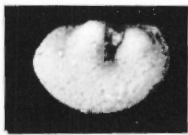
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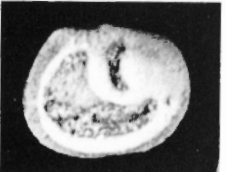
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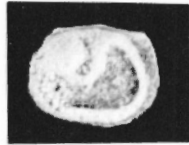
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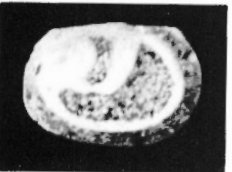
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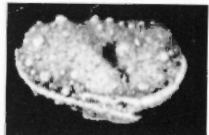
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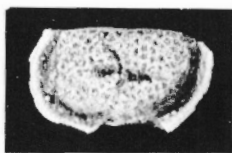
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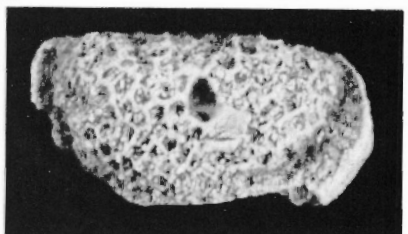
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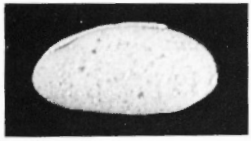
PLATE II

Member 1 - *Carinobolbina richardsoni* subzone

- Figure 1. "*Bythocypris*" *subcylindrica* (Ulrich)
Right lateral view of a carapace, x25. Loon Lake-Bear Lake road, GSC locality 76286. Hypotype, GSC No. 31389.
- Figures 2, 3, 6. *Macrocyproides trentonensis* (Ulrich)
Left and two right lateral views of three carapaces, x30. Junction Cliff (Figs. 2, 3), GSC locality 76177, and Loon Lake-Bear Lake road, GSC locality 76286. Hypotypes, GSC Nos. 31390-31392.
- Figure 4. "*Bythocypris*" *lindstroemi*? Jones
Right lateral view of a carapace, x30. Junction Cliff, GSC locality 76177. Hypotype, GSC No. 31393.
- Figures 5, 7. "*Bythocypris*" *cylindrica* (Hall)
Right and left lateral views of two carapaces, x30. Junction Cliff, GSC locality 76177. Hypotypes, GSC Nos. 31394, 31395.

Member 2 - *Foramenella phippii* subzone

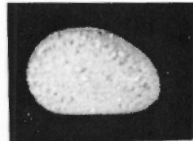
- Figures 8-10. *Krausella*? sp.
Right and left lateral views of three carapaces, x30. One mile south of Junction Cliff, GSC locality 62245. Figured specimens, GSC Nos. 31396-31398.
- Figures 11-15. *Aechmina richmondensis* Ulrich and Bassler
Three left, right and dorsal views of five carapaces, x30. One mile south of Junction Cliff, GSC locality 62245. Hypotypes, GSC Nos. 31399-31403.
- Figures 16, 17. *Jonesites semilunatus* (Jones)
Ventral and dorsal views of two carapaces, x30. One mile south of Junction Cliff. GSC locality 62245. Hypotypes, GSC Nos. 31404, 31405.
- Figure 18. *Schmidtella robervali* n. sp.
Left lateral view of a carapace, x30. One mile south of Junction Cliff, GSC locality 62245. Paratype, GSC No. 31406.
- Figure 19. *Lepeditella*? sp.
Right lateral view of a carapace, x30. One mile south of Junction Cliff, GSC locality 62245. Figured specimen, GSC No. 31407.
- Figures 20-36. *Foramenella phippii* n. sp.
One mile south of Junction Cliff, GSC locality 62245, all x30.
- 20, 21. Right lateral views of two tecnomorphic specimens. Paratypes, GSC Nos. 31408, 31409.
- 22, 23. Right lateral views of two heteromorphic specimens. Paratypes, GSC Nos. 31410, 31411.
- 24, 26. Right lateral, dorsal and left lateral views of three tecnomorphic specimens. Paratypes, GSC Nos. 31412-31414.
27. Left lateral view of a heteromorphic specimen with four loculi. Paratype, GSC No. 31415.
28. Left lateral view of a tecnomorphic specimen. Paratype, GSC No. 31416.
29. Left lateral view of a heteromorphic specimen. Holotype, GSC No. 31417.
30. Right lateral view of a heteromorphic specimen. Paratype, GSC No. 31418.
- 31, 32. Ventral views of tecnomorphic and heteromorphic specimens. Paratypes, GSC Nos. 31419, 31420.
- 33, 34. Right interior and exterior views of two heteromorphic specimens. Paratypes, GSC Nos. 31421, 31422.
- 35, 36. Left lateral and ventral views of two tecnomorphic specimens. Paratypes, GSC Nos. 31423, 31424.



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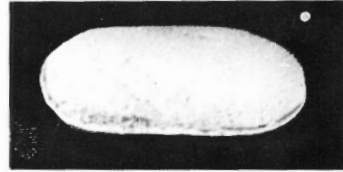
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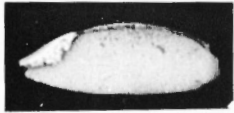
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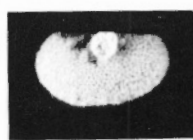
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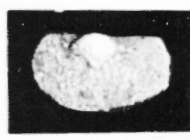
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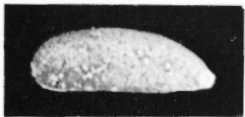
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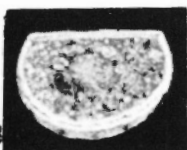
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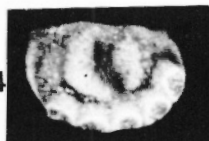
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PLATE III

Member 3 - *Anticostiella ellisensis* subzone

- Figures 1-4. *Tubulibairdia jolieti* n. sp.
Right, left, dorsal and ventral views of four carapaces, x30. One mile south of Junction Cliff, GSC locality 62245. Paratypes, GSC Nos. 31425-31428.
- Figures 5-7. *Aechmina maccormicki* n. sp.
Two left and one right lateral views of three specimens.
5, 6. One mile south of Junction Cliff, GSC locality 62245, x30. Paratype, GSC No. 31429, holotype, GSC No. 31430.
7. Baillie River road, south of Lac Cailloux, GSC locality 76255, x24. Paratype, GSC No. 31431.
- Figures 8-10, 18. *Faurella cartieri* n. sp.
Three right and one left valves. Road south of Lac Faure, GSC locality 76258, x25. Holotype (Fig. 8), GSC No. 31432, paratypes, GSC Nos. 31433-31435.
- Figure 11. *Paraschmidtella irregularis* Keenan
Right lateral view of a specimen, x30. One mile south of Junction Cliff, GSC locality 62245. Hypotype, GSC No. 31436.
- Figures 12-17, 24. *Anticostiella ellisensis* n. sp.
12, 15. Right and left lateral views of two tecomorphic specimens, x25. Baillie River road, south of Lac Cailloux, GSC locality 76253. Paratypes, GSC Nos. 31437, 31438.
13. Right lateral view of a heteromorphic specimen, x25. Road south of Lac Faure, GSC locality 76258. Paratype, GSC No. 31439.
14, 16, 17. Left lateral views of three heteromorphic specimens, x25. Baillie River road, south of Lac Cailloux, GSC locality 76255. Paratypes, GSC Nos. 31440-31442.
24. Right lateral view of a heteromorphic specimen, x25. Baillie River road, south of Lac Cailloux, GSC locality 76255. Holotype, GSC No. 31443.
- Figures 19-21. *Eokloedenella canadensis* (Bassler)
Right and two left lateral views of three specimens, x25. Baillie River road, south of Lac Cailloux, GSC locality 76255. Hypotypes, GSC Nos. 31444-31446.
- Figure 22. *Monoceratella castorensis* Copeland
Right lateral view of a specimen, x25. Baillie River road, south of Lac Cailloux, GSC locality 76255. Hypotype, GSC No. 31447.
- Figure 23. *Schmidtella robervali* n. sp.
Right lateral view of a specimen, x30. One mile south of Junction Cliff, GSC locality 62245. Paratype, GSC No. 31448.
- Figures 25-28. *Eographiodactylus hyatti* n. sp.
Two left lateral, dorsal and ventral views of four carapaces, x30. One mile south of Junction Cliff, GSC locality 62245. Paratypes, GSC Nos. 31449-31452.
- Figures 29-31. *Bolbiprimitia? schmitti* n. sp.
Left and two right lateral views of three specimens, x25. Road south of Lac Faure, GSC locality 76258. Holotype (Fig. 29), GSC No. 31453, paratypes (Figs. 30, 31), GSC Nos. 31454, 31455.
- Figures 32-34. *Platybolbina shaleri* n. sp.
Right lateral views of three specimens, x25. Baillie River road, south of Lac Cailloux, GSC locality 76255. Paratypes, GSC Nos. 31456-31458.
- Figures 35-37. *Tetradella thomasi* n. sp.
Right and two left lateral views of a tecomorphic and two heteromorphic specimens, x25. Baillie River road, south of Lac Cailloux, GSC locality 76255. Paratypes, GSC Nos. 31459-31461.
- Figure 38. "*Bythocypris*" *cylindrica* (Hall)
Right lateral view of a carapace, x25. Road south of Lac Faure, GSC locality 76258. Hypotype, GSC No. 31462.

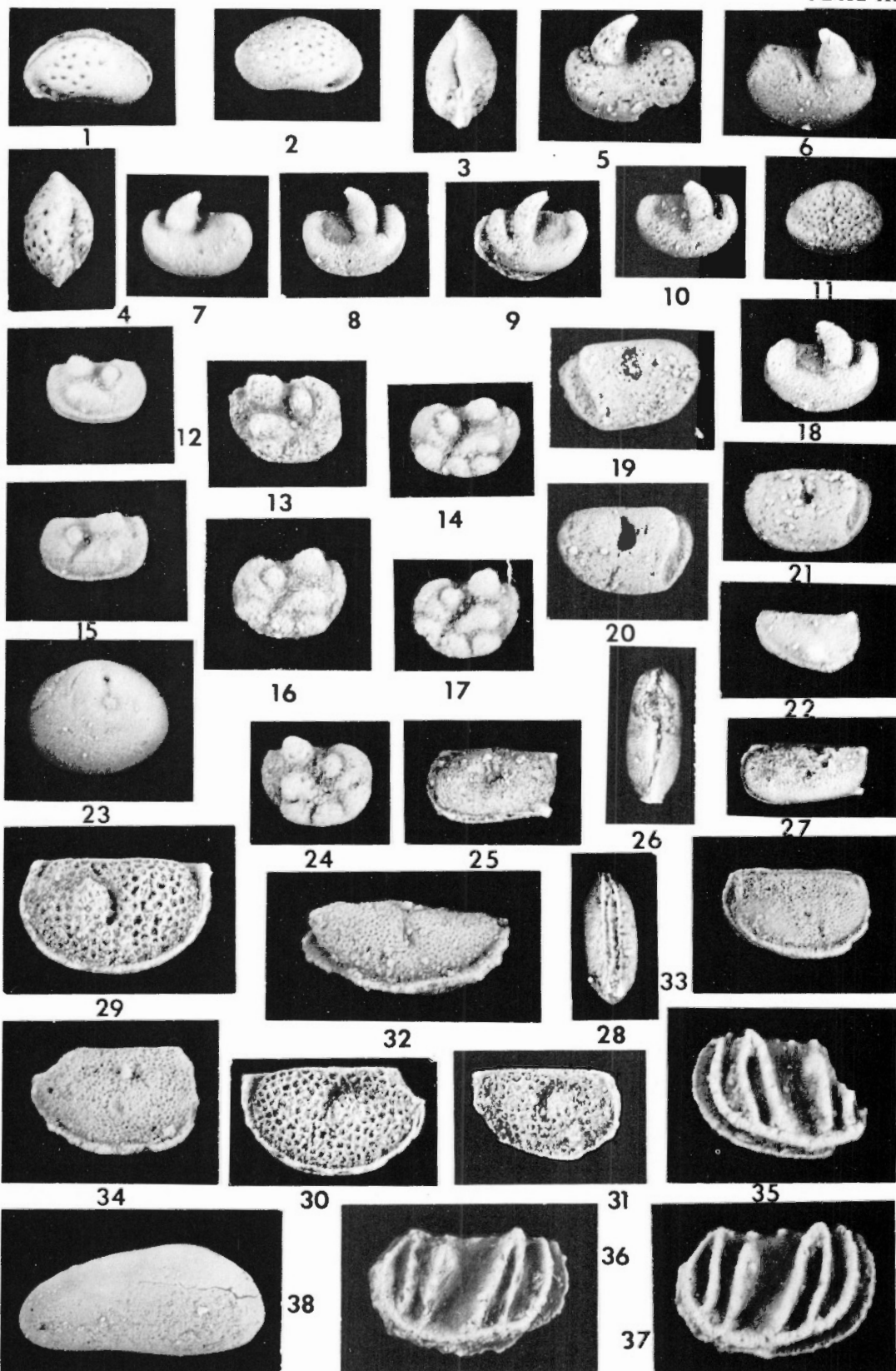


PLATE IV

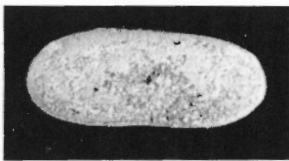
Member 4 - *Eoglyphodactylus hyatti* subzone

(All specimens from White Cliff, Port Menier quarry, east side of Ellis Bay, GSC locality 84469)

- Figure 1. *Tubulibairdia jolietii* n. sp.
Left valve interior view, x25. Paratype, GSC No. 31463.
- Figure 2. "*Bythocypris*" *cylindrica* (Hall)
Right lateral view of a carapace, x20. Hypotype, GSC No. 31464.
- Figures 3, 5. "*Bythocypris*" *subcylindrica* (Ulrich)
Left lateral views of two carapaces, x20 and x35. Hypotypes, GSC Nos. 31465, 31466.
- Figure 4. *Platyrhomboides?* *subcylindrica* (Jones)
Right lateral view of a specimen, x14. Hypotype, GSC No. 31467.
- Figures 6, 7. *Daleiella caleyi* n. sp.
Left and right lateral views of two carapaces, x17. Paratype, GSC No. 31468, holotype, GSC No. 31469.
- Figures 8, 9. *Platyrhomboides?* *dixonii* n. sp.
Dorsal and right lateral views of two carapaces, x23. Paratypes, GSC Nos. 31470, 31471.
- Figures 10-13. *Foramenella phippii* n. sp.
Left exterior and interior, right and dorsal views of four heteromorphic specimens, x24. Paratypes, GSC Nos. 31472-31475.
- Figure 14. *Primitiella?* sp.
Right lateral view of a carapace, x23. Figured specimen, GSC No. 31476.
- Figures 15-17. *Neoschmidtella grantii* n. sp.
15, 16. Dorsal and ventral views of two carapaces, x25. Paratypes, GSC Nos. 31477, 31478.
17. Left lateral view of carapace, x100. Holotype, GSC No. 31479.
- Figures 18-21. *Eoglyphodactylus hyatti* n. sp.
Left, right, ventral and dorsal views of four carapaces, x100. Paratype, GSC No. 31480, holotype (Fig. 19), GSC No. 31481, and paratypes, GSC Nos. 31482, 31483.



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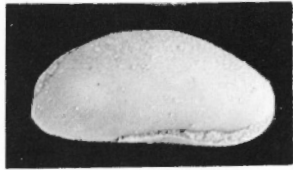
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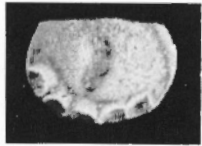
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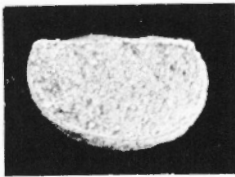
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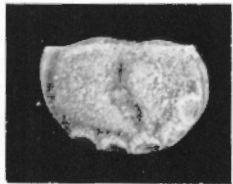
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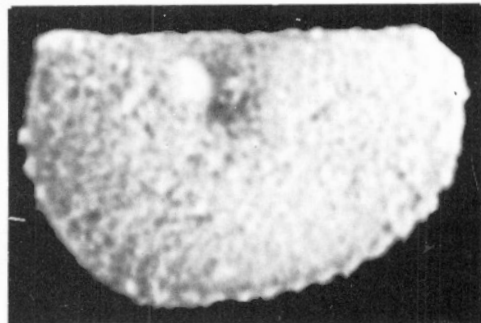
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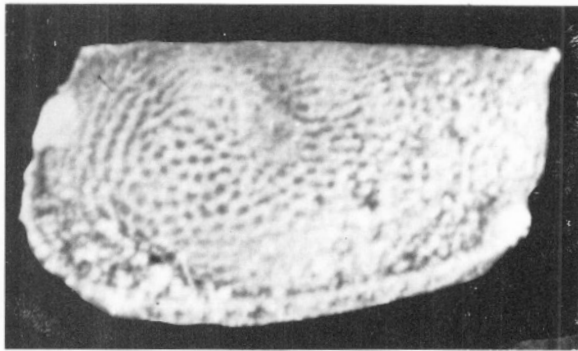
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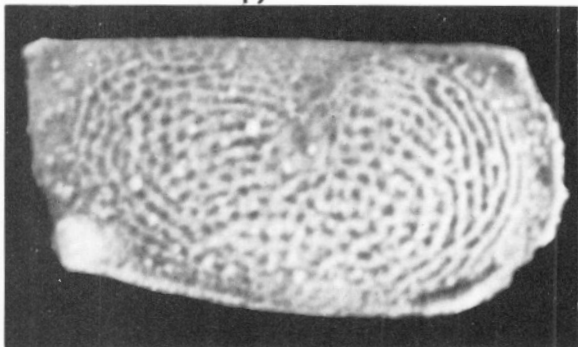
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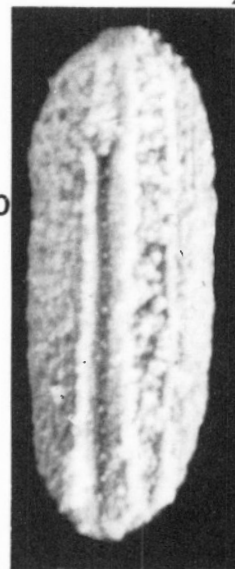
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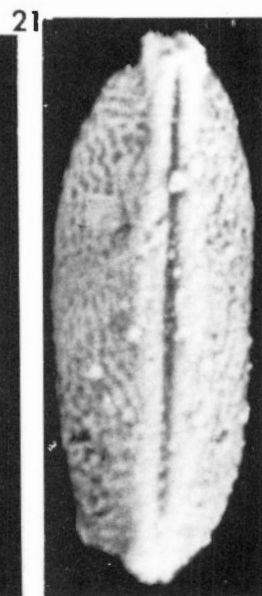
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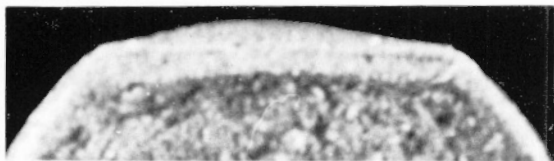
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PLATE V

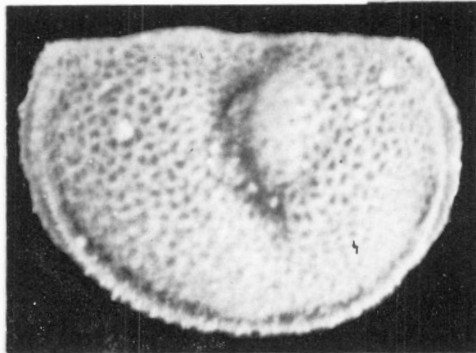
Member 4 - *Eoglyphiodactylus hyatti* subzone

(All specimens from White Cliff, Port Menier quarry, east side of Ellis Bay, GSC locality 84469)

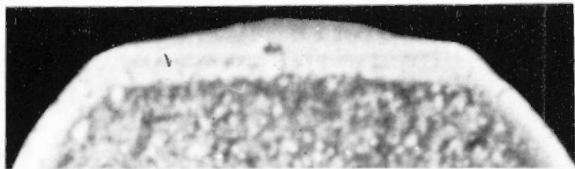
- Figures 1, 2. *Schmidtella robervali* n. sp.
Left and right interior views of hinge areas of two valves, x100. Paratypes, GSC Nos. 31484, 31485.
- Figures 3-8. *Ctenobolbina maclearni* n. sp.
3. Right lateral view of a carapace, x100. Holotype, GSC No. 31486.
4. Left lateral view of an immature carapace, x100. Paratype, GSC No. 31487.
5. Dorsal view of an immature carapace, x100. Paratype, GSC No. 31488.
6. Right lateral view of an immature carapace, x100. Paratype, GSC No. 31489.
7. Left lateral view of a carapace, x100. Paratype, GSC No. 31490.
8. Ventral view of a carapace, x100. Paratype, GSC No. 31491.
- Figures 9, 10. *Tubulibairdia jolieti* n. sp.
Right and left lateral views of two carapaces, x100. Paratypes, GSC Nos. 31492, 31493.



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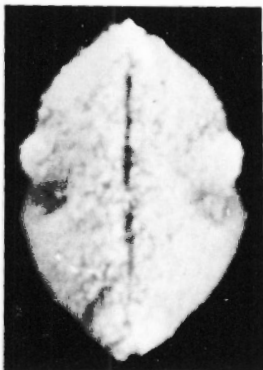
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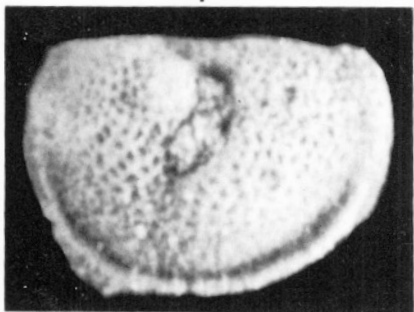
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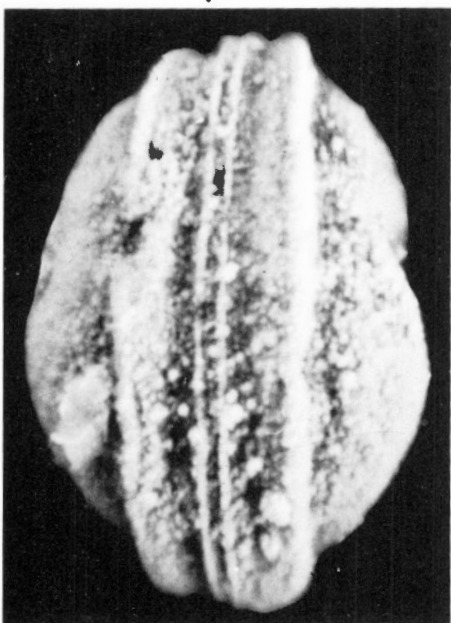
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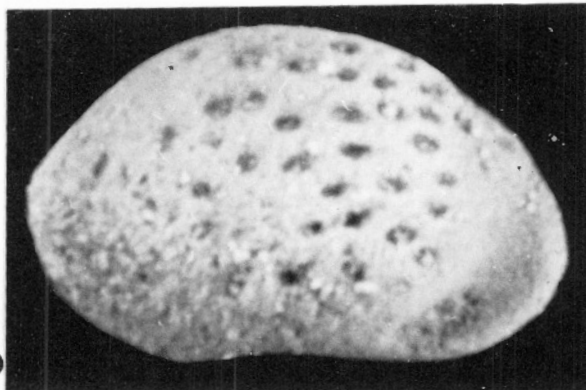
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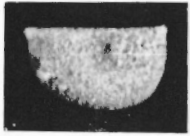


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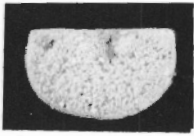
PLATE VI

Member 5 - *Platybolbina shalerei* subzone

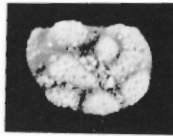
- Figures 1-4. *Neoschmidtella granti* n. sp.
Right lateral views of four carapaces.
1, 4. Pte. Laframboise, x30. Paratypes, GSC Nos. 31494, 31495.
2, 3. Road south of Lac Faure, GSC locality 76237, x25. Paratypes, GSC Nos. 31496, 31497.
- Figure 5. *Anticostiella ellisensis* n. sp.
Right lateral view of a valve, x24. Road south of Lac Faure, GSC locality 76237. Paratype, GSC No. 31498.
- Figure 6. *Foramenella phippii* n. sp.
Left lateral view of a heteromorphic valve, x25. Road south of Lac Faure, GSC locality 76237. Paratype, GSC No. 31499.
- Figure 7. "*Bythocypris*" *lindstroemi*? Jones
Right lateral view of a carapace, x25. Anse aux Navets, GSC locality 76140. Hypotype, GSC No. 31500.
- Figure 8. *Tubulbairdia jolietii* n. sp.
Right lateral view of a carapace, x25. Anse aux Navets, GSC locality 76140. Paratype, GSC No. 31501.
- Figure 9. *Macrocyproides trentonensis* (Ulrich)
Right lateral view of a carapace, x25. Anse aux Navets, GSC locality 76140. Hypotype, GSC No. 31502.
- Figures 10-13. *Eokloedenella canadensis* (Bassler)
Two right and two left lateral views of four valves, x24.
10, 11. Road south of Lac Faure, GSC locality 76237. Hypotypes, GSC Nos. 31503, 31504.
12, 13. Anse aux Navets, GSC locality 76140. Hypotypes, GSC Nos. 31505, 31506.
- Figure 14. *Tetradella thomasi* n. sp.
Right lateral view of a heteromorphic valve, x25. Anse aux Navets, GSC locality 76140. Paratype, GSC No. 31507.
- Figure 15. *Cryptophyllus* sp. cf. *C. oboloides* (Ulrich and Bassler)
Right lateral view of a carapace, x30. Pte. Laframboise. Hypotype, GSC No. 31508.
- Figures 16-18. *Platybolbina shalerei* n. sp.
16. Right lateral view of a valve, x25. Anse aux Navets, GSC locality 76140. Paratype, GSC No. 31509.
17, 18. Right and left lateral views of two valves, x25. Road south of Lac Faure, GSC locality 76237.
17. Paratype, GSC No. 31510.
18. Holotype, GSC No. 31511.
- Figure 19. *Foramenella phippii* n. sp.
Left lateral view of a tecomorphic valve, x30. Pte. Laframboise. Paratype, GSC No. 31512.
- Figure 20. *Lepeditella*? sp.
Left lateral view of a carapace, x20. Pte. Laframboise. GSC No. 31513.
- Figures 21, 22, 26-29. *Schmidtella sublenticularis* (Jones)
Three left, one right, one ventral and one dorsal views of six specimens.
21, 22, 26, 27. Pte. Laframboise, x20. Hypotypes, GSC Nos. 31514-31517.
28, 29. Anse aux Navets, GSC locality 76140, x25. Hypotypes, GSC Nos. 31518, 31519.
- Figures 23-25. *Platyrhomboides*? *dixonii* n. sp.
Ventral, right lateral and dorsal views of three carapaces, x30. Pte. Laframboise.
24. Holotype, GSC No. 31520.
23, 25. Paratypes, GSC Nos. 31521, 31522.
- Figure 30. *Diplopsis* sp. cf. *D. frequens* (Steusloff)
Left lateral view of a carapace, x24. Anse aux Navets, GSC locality 76140. Hypotype, GSC No. 31523.



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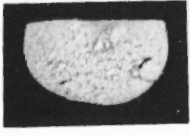
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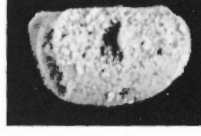
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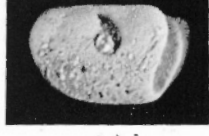
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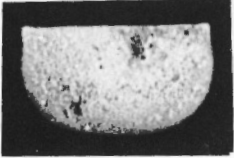
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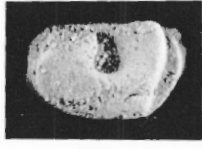
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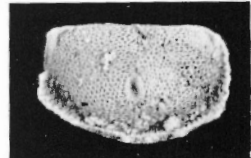
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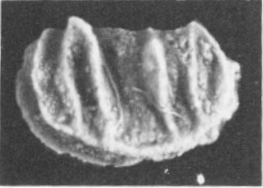
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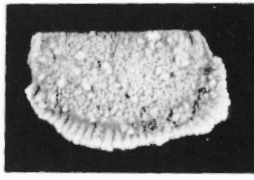
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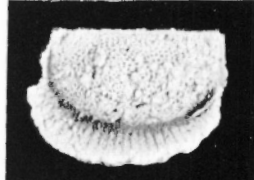
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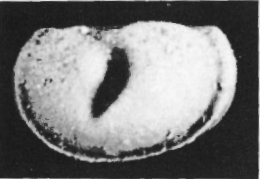
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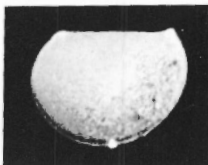
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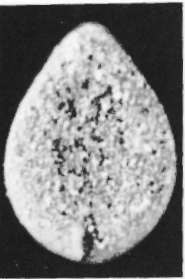
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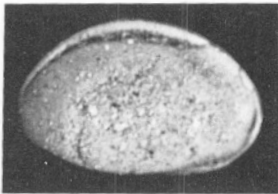
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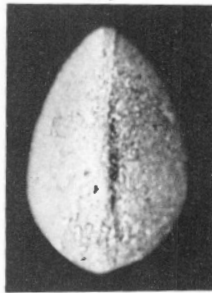
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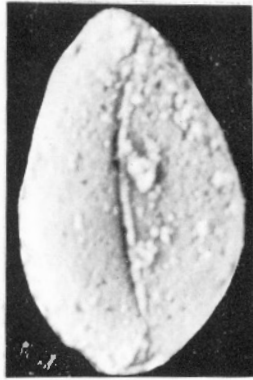
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PLATE VII

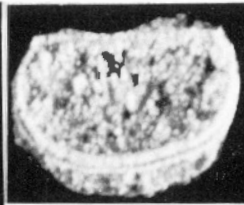
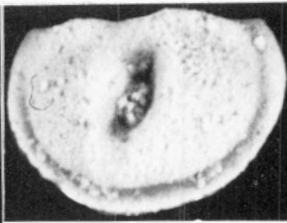
Member 5 - *Platybolbina shaleri* subzone

(All specimens from Becscie River road, 4 miles south of main road, GSC locality 84479)

- Figure 1. *Platyrrhomboides? dixonii* n. sp.
Ventral view of a carapace, x45. Paratype, GSC No. 31524.
- Figures 2, 3. *Foramenella phippii* n. sp.
Left and right lateral views of two valves, x43. Paratypes, GSC Nos. 31525, 31526.
- Figures 4-7. *Anticostiella ellisensis* n. sp.
4, 6, 7. Right interior, left and right lateral views of three heteromorphic valves, x43. Paratypes, GSC Nos. 31527-31529.
5. Right lateral view of a tecomorphic valve, x43. Paratype, GSC No. 31530.
- Figures 8-10. *Neoschmidtella grantii* n. sp.
Two left and one right lateral views of three carapaces, x45. Paratypes, GSC Nos. 31531-31533.
- Figures 11-15. *Platybolbina shaleri* n. sp.
Three right and two left lateral views of five valves, x43. Paratypes, GSC Nos. 31534-31538.
- Figures 16, 17. *Tetradella thomasi* n. sp.
Left lateral views of two heteromorphic valves, x43. Holotype, GSC No. 31539, paratype, GSC No. 31540.

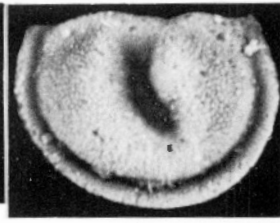


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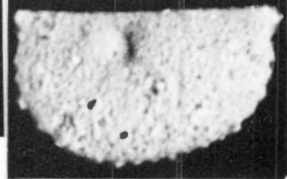


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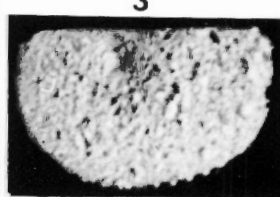
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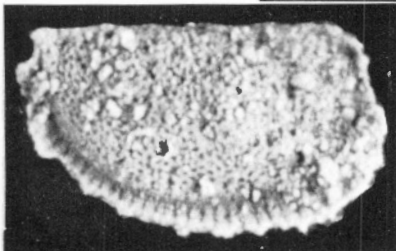
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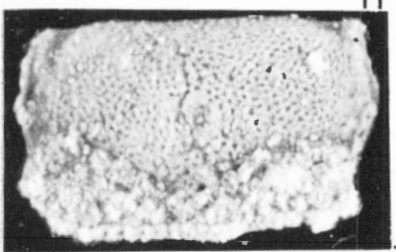
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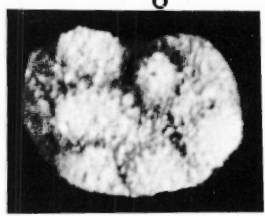
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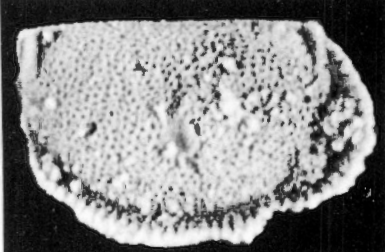
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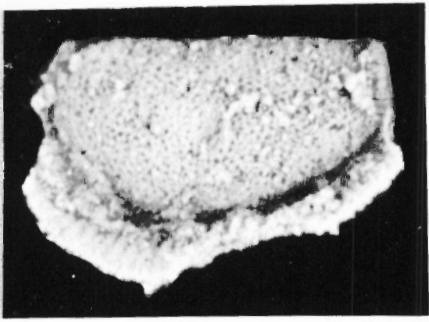
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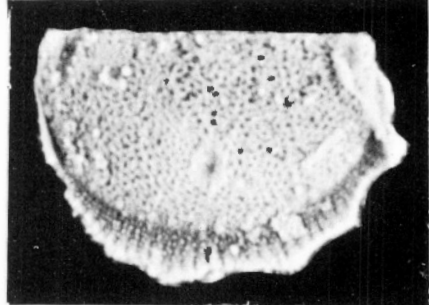
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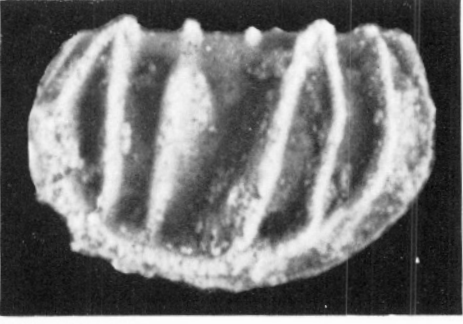
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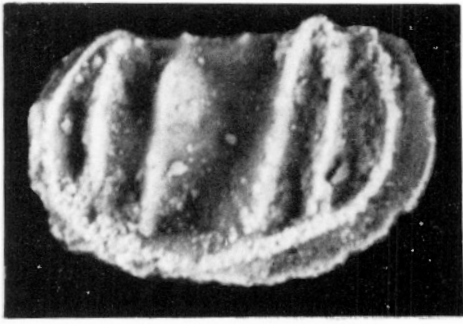
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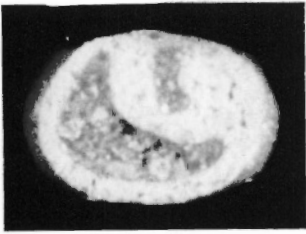
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PLATE VIII

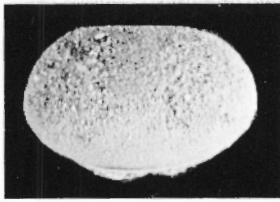
Member 5 - *Platybolbina shaleri* subzone

(Figures 3 and 5 are from Becscie River road, GSC locality 84479; all other specimens from Vauréal River, 2 miles above Vauréal Falls, GSC locality 84354)

- Figures 1, 2. *Jonesites semilunatus* (Jones)
Right and left lateral views of two valves, x45. Hypotypes, GSC Nos. 31541, 31542.
- Figure 3. *Diplopsis* sp. cf. *D. frequens* (Steusloff)
Left lateral view of a carapace, x15. Hypotype, GSC No. 31543.
- Figure 4. *Bolbiprimitia? schmitti* n. sp.
Right lateral view of a valve, x25. Paratype, GSC No. 31544.
- Figure 5. *Tetradella thomasi* n. sp.
Left lateral view of a tecnomorphic valve, x43. Paratype, GSC No. 31545.
- Figures 6-15. *Tetradella anticostiensis* n. sp.
6-8. Left and two right tecnomorphic valves, x38 and x50. Paratypes, GSC Nos. 31546-31548.
9-14. Lateral views of five right heteromorphic valves, x40 (Figs. 9, 11) and x50. (Figs. 12 and 14 are the same specimen whitened and nearly natural, showing the disruption of the posterior branch of L3). Paratypes, GSC Nos. 31549-31553.
15. Right lateral view of a tecnomorphic valve, x50. Holotype, GSC No. 31554.



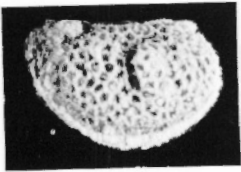
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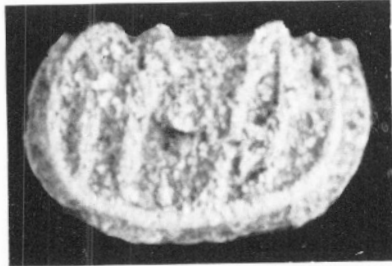
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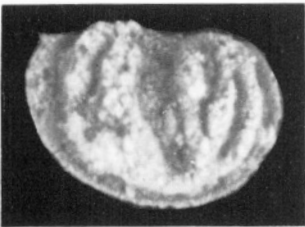
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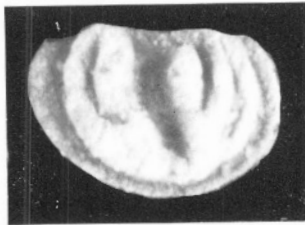
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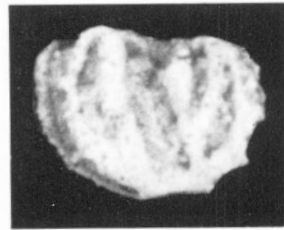
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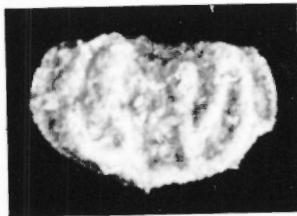
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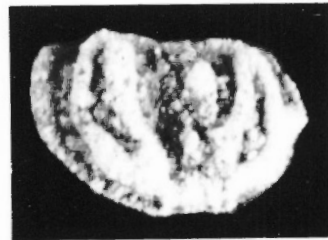
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PLATE IX

Member 6 - *Euprimitia gamachei* subzone

(Figures 1-14, 16 from the Becscie River road, 6.5 miles south of main road)

- Figures 1-11. *Euprimitia gamachei* n. sp.
1-3. Right lateral views of three carapaces, x43. Paratype, GSC No. 31555, holotype (Fig. 2), GSC No. 31556 and paratype, GSC No. 31557.
4, 5. Dorsal views of two carapaces, x40. Paratypes, GSC Nos. 31560, 31561.
8-11. Left lateral views of a valve and three carapaces, x40. Paratypes, GSC Nos. 31562-31565.
- Figures 12, 13. *Paraschmidtella irregularis* Keenan
Left lateral view of a valve and right lateral view of a carapace, x42. Hypotypes, GSC Nos. 31566, 31567.
- Figure 14. *Jonesites semilunatus* (Jones)
Left lateral view of a valve, x40. Hypotype, GSC No. 31568.
- Figure 16. *Milleratia twenhofeli* Copeland
Right lateral view of a carapace, x40. Hypotype, GSC No. 31569.

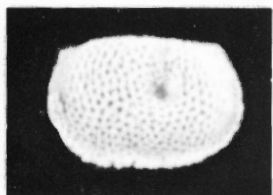
Member 2 - *Foramenella phippi* subzone

(Figs. 15, 17, 18 - Becscie River road, 3.5 miles south of main road, GSC locality 84478)

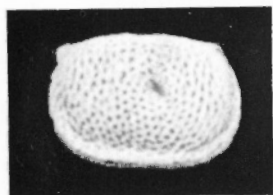
- Figure 15. *Leperditella?* sp.
Left lateral view of a carapace, x10. Figured specimen, GSC No. 31570.
- Figures 17, 18. *Primitiella unicornis* (Ulrich)
Right lateral views of two carapaces, x43. Hypotypes, GSC Nos. 31571, 31572.

Member 1 - *Carinobolbina richardsoni* subzone

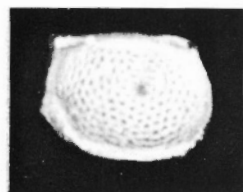
- Figure 19. *Eokloedenella* sp.
Left lateral view of a carapace, x40. Road east of Loon Lake, GSC locality 76286. Figured specimen, GSC No. 31573.



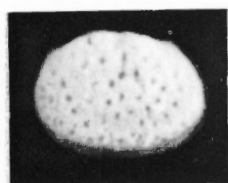
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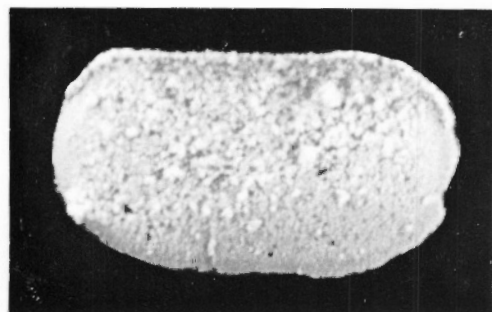
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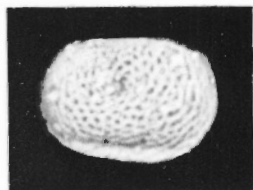
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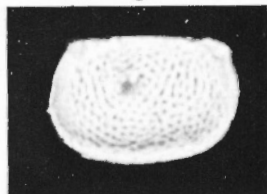
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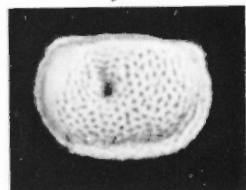
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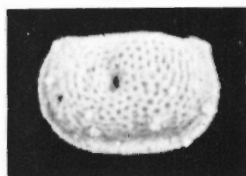
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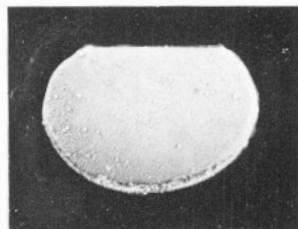
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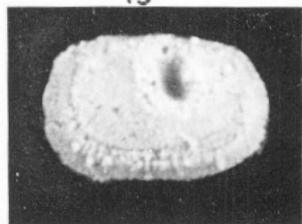
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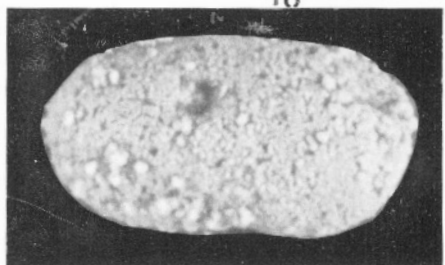
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