Pseudoleperditia Schneider, 1956 (Ostracoda, Crustacea), an Early Mississippian Genus From Southwestern Nevada

GEOLOGICAL SURVEY PROFESSIONAL PAPER 643-C

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By I. G. SOHN

CONTRIBUTIONS TO PALEONTOLOGY

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Redefinition of the genus,
based on Pseudoleperditia poolei *n. sp.,*
the youngest described representative of
the Paleozoic Beyrichicopina

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PSEUDOLEPERDITIA SCHNEIDER, 1956 (OSTRACODA, CRUSTACEA), AN EARLY MISSISSIPPIAN GENUS FROM SOUTHWESTERN NEVADA

By I. G. SOHN

ABSTRACT

Pseudoleperditia Schneider, 1956, described from the Tournaisian of Russia, is redefined. Silicified specimens from the Narrow Canyon and lower Mercury Limestones in southwestern Nevada, representing growth stages and adults of *P. poolei* n. sp., demonstrate that the genus is dimorphic and asymmetrical with regard to the anterior spines. This genus is the first known Early Mississippian representative of the Beyrichicopina, which formerly was restricted to rocks of early Paleozoic age.

INTRODUCTION

The presence of a new species of the Early Mississippian (Tournaisian) genus *Pseudoleperditia* Schneider, 1956, in southwestern Nevada, as silicified specimens in the Narrow Canyon Limestone and the Mercury Limestone, is significant for the following reasons: It aids in the age determination of the North American rocks, and, because of its abundance and mode of preservation, the new species clarifies the identity of the previously monotypic genus, which is the end member of a Paleozoic group of dimorphic genera in the Beyrichicopina.

I am grateful to the following U.S. Geological Survey colleagues: F. G. Poole and Mackenzie Gordon, Jr., for taking me to the outcrops in Nye and Clark Counties, Nev., in October 1966, where all but one of the collections were made. In 1965, these men collected the sample of Narrow Canyon Limestone (USGS colln. 22446) that demonstrated the presence of silicified ostracodes in the unit. Jean M. Berdan aided materially by discussions and critical review of the paper. The photographs are by Robert H. McKinney, and the plate was composed by Elinor Stromberg.

REGISTER OF LOCALITIES

USGS loc. No.	*Field No.*	*Description of locality, stratigraphic position, collector, and date*
22446–PC	65G26	North slope of Timpi Canyon at lat 36°38′06″ N.; long 115°57′14″ W., Mercury 7½-minute quadrangle, Nye County, Nev. (fig. 1, loc. 3). Lowest limestone bed of Narrow Canyon Limestone exposed above fault, 70 to 75 feet below the top of the formation. Collected by Mackenzie Gordon, Jr., and F. G. Poole, Sept. 17 and 18, 1965.
12866–PC	10/30/2	West Sandy Wash, Spotted Range, Mercury 7½-minute quadrangle, Nye County, Nev. (fig. 1, loc. 2). Knotty, argillaceous limestone 6 to 7 feet thick, 85 feet below the top of the Narrow Canyon Limestone. Collected by Mackenzie Gordon, Jr., F. G. Poole, and I. G. Sohn, Oct. 30, 1966.
12867–PC	10/30/3	West Sandy Wash, Spotted Range, Mercury 7½-minute quadrangle, Nye County, Nev. (fig. 1, loc. 2). Limestone 6 inches thick, 15 feet above USGS locality 12866–PC, or 70 feet below the top of the Narrow Canyon Limestone. Collected by Mackenzie Gordon, Jr., F. G. Poole, and I. G. Sohn, Oct. 30, 1966.
12872–PC	10/30/7	West Sandy Wash, Spotted Range, Mercury 7½-minute quadrangle, Nye County, Nev. (fig. 1, loc. 2). Limestone, 5-foot bed near top of Narrow Canyon Limestone. Collected by Mackenzie Gordon, Jr., F. G. Poole, and I. G. Sohn, Oct. 30, 1966.
12875–PC	10/30/12	West Sandy Wash, Spotted Range, Mercury 7½-minutes quadrangle, Nye County, Nev. (fig. 1, loc. 2). Mercury Limestone, approximately 21 feet above the base. Collected by Mackenzie Gordon, Jr., F. G. Poole, and I. G. Sohn, Oct. 30, 1966.
12879–PC	10/31/5	Narrow Canyon Wash, approximate lat 36°42′10″ N.; long 115°53′27″ W., Mercury 7½-minute quadrangle, Clark County, Nev. (fig. 1, loc. 1). Type locality of the Narrow Canyon Limestone, 4-foot limestone bed, 152 feet above the base of the formation. Collected by Mackenzie Gordon, Jr., F. G. Poole, and I. G. Sohn, Oct. 31, 1966.

AGE OF THE SPECIES

The Narrow Canyon Limestone was originally described as "Upper Devonian and Lower Mississippian" (Johnson and Hibbard, 1957, p. 356). At the type-locality (fig. 1, loc. 1), the formation is 175 feet thick and consists of dark-gray silty limestone that weathers into

thin buff-colored plates which form talus slopes. No fossils were recorded in the original description of the formation; later, however, Poole, Houser, and Orkild (1961, p. D108) recorded the linguloid brachiopod *Barroisella* and dictyospongid fragments and spicules. More recently, Poole and others (1967, p. 885) considered the Narrow Canyon Limestone to be Early Mississippian (Kinderhookian) because of the presence of the conodont *Siphonodella* sp. The Mercury Limestone overlies the Narrow Canyon Limestone with a gradational contact. Johnson and Hibbard (1957, p. 356) described this unit as cherty crinoidal limestone that forms resistant ledges and is dark gray, buff weathering, and poorly bedded. The Mercury Limestone is incomplete at the type-locality where 115 feet is exposed below a fault. The megafossils were reported to be similar to those of the Tin Mountain Limestone nearby in the Funeral Mountains, Calif. (fig. 1, loc. 4).

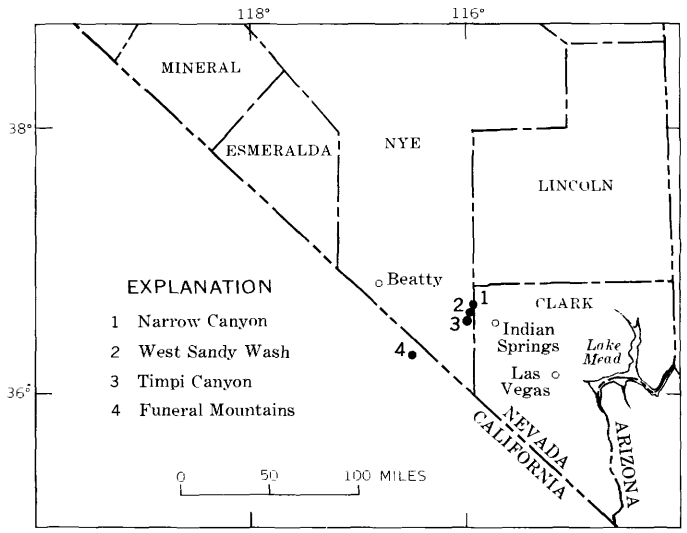

FIGURE 1.—Index map of southern Nevada, showing the collecting localities.

Both units contain abundant poorly silicified ostracodes that are similar on the generic level; they have some species in common, including the new species. Based on the classification in Moore (1961), a preliminary list of ostracodes for those units contains representatives of the following families: Aechminellidae, Kirkbyellidae, Hollinidae, Kirkbyidae, Amphissitidae, Beyrichiopsidae, Paraparchitidae, Bairdiidae, Berounellidae, and Quasillitidae. Additional genera, some of which are new, are not yet classified on the family level. The genera are similar to an undescribed silicified assemblage from the Tin Mountain Limestone of California, considered by Poole and others (1967, p. 885) as equivalent in age to the Narrow Canyon Limestone. These genera resemble also the ostracodes described from the Banff Formation, Alberta, Canada, of early Osagean and Kinderhookian age (Green, 1963). The Tin Mountain Limestone and Banff Formation, however, do not contain *Pseudoleperditia* Schneider, 1956. This genus was described from the Tournaisian of Russia. The new species described in this paper is Early Mississippian (Kinderhookian).

SILICIFICATION

The term "silicification," as applied to fossil shells obtained by dissolving limestone with dilute acid, does not necessarily imply that the entire shell was replaced by silica. If silica or some other acid-insoluble mineral replaces the outermost and innermost layers of the shell on the molecular level, the shell body between these replaced layers may become protected from further replacement and also may be protected from solution by acid. Thus, a perfect replica of a fossil that may consist mostly of acid-soluble minerals may be recovered when the matrix is dissolved. In other shells, impurities may retard their rate of solution by acid in relation to that of the limestone matrix, and fossils may therefore be recovered. The danger of dealing with silicified fossils, particularly microfossils, is that differential replacement or solution may create artifacts which have no morphologic meaning. The best example of artifacts is the formation of beekite (Wickes, 1910).

The silicified ostracodes in the Narrow Canyon and Mercury Limestones were preserved mostly because of replacement by silica of the outer surface of the shells and only rarely also of the interior surface (pl. 1, figs. 22, 27, 33, 35). The replacement was confirmed by treating a specimen with hydrofluoric acid (Sohn, 1956); the acid completely dissolved the specimen in 24 hours. Had the fossil contained calcium carbonate, it would have been converted to fluoride. The new species, *Pseudoleperditia poolei*, has hollow spines near the cardinal angles. These spines may have been hollow in the living animal, or the hollow may be an artifact due to incomplete replacement by silica.

DIMORPHISM

Jaanusson and Martinsson (1956, p. 402) introduced the terms "heteromorph" and "tecnomorph" to describe fossil ostracodes because sex determination based on soft parts and appendages is not feasible. Heteromorphs are those individuals that have dimorphic structures, which may be interpreted to indicate females; tecnomorphs are adult and preadult individuals that do not have the dimorphic structures and may represent either the adult males or immature females. Jaanusson (1957, p. 190, 197) distinguished three major groups of dimorphic Palaeocopida: (1) beyrichiid

type—characterized by a distinct swelling of the anteroventral or ventral part of the carapace in heteromorphs, (2) kloedenellid type—characterized by a greater width in the posterior part of the heteromorphs, and (3) velar or histial type—characterized by certain adventral ornamental extensions of the valves of heteromorphs. A more recent discussion of dimorphism in ostracodes is in Becker (1968a, b). The new species described in this paper has the beyrichiid type of dimorphism.

Beyrichiid dimorphism was hitherto unknown in ostracodes younger than the Devonian and was a convenient criterion for dividing ostracodes of early Paleozoic age from younger forms. The discovery of ostracodes that have beyrichiid dimorphism in Lower Mississippian rocks serves as a warning against the uncritical use of beyrichiid dimorphism as an indication of stratigraphic age.

SYSTEMATIC DESCRIPTIONS

Suborder ?BEYRICHICOPINA Scott, 1961

Superfamily Uncertain

Family Uncertain

Pseudoleperditia was questionably assigned to the Primitiidae Ulrich and Bassler, 1923, by Schneider (1956, p. 87) when she originally described the genus. Later, Zanina, Neckaja, and Polenova (1960, p. 304) tentatively referred this genus to the subfamily Euprimitiinae Hessland, 1949, in the Primitiidae. By working from the literature, I (Sohn, 1961, p. Q184) questionably referred this genus to the Geisinidae Sohn, 1961. The discovery of silicified specimens of *Pseudoleperditia* in collections from the Narrow Canyon and lower Mercury Limestones (Lower Mississippian) of Nevada clarified many of the characters of this genus, including its suprageneric affinities. The type of dimorphism and the large size, 1 mm (millimeter) to more than 2.5 mm in greatest length, exclude this genus from the Geisinidae.

My colleague, Jean M. Berdan, correctly pointed out to me the familial affinities of *Pseudoleperditia* and the Early Devonian genus *Myomphalus* Swartz and Whitmore, 1956. According to her, these and several additional early Paleozoic genera may belong to an as yet undescribed family.

Genus PSEUDOLEPERDITIA Schneider, 1956

Pseudoleperditia Schneider, 1956, VSEGEI Materialy, p. 87.

Type-species (original designations)—*P. tuberculifera* Schneider, 1956 (p. 87, pl. 22, figs. 1a, b). Tournaisian, northeastern Russian Platform.

Diagnosis.—Large, straightbacked, essentially unisulcate, dimorphic ostracodes that have a subdued preadductorial lobe in front of the sulcus; large single spines at or near the dorsoanterior and dorsoposterior angles of the right valve, and only one spine near the dorsoposterior angle of the left valve. Crumina does not inflate; rounded, fairly obscure velar bend. Tongue and groove hinge, left valve overlaps slightly on free margins, fits into groove along hinge margin. A narrow calcified inner lamella along free margins of both valves. An adductor-muscle scar that is drop shaped and consists of multiple flecks is at the base of the sulcus.

Description.—The following is a translation of the original diagnosis and discussion (Schneider, 1956, p. 87):

> Large sized shell, up to 1.50 mm long and 1.00 mm high; subrectangular form, almost equivalved, relatively convex. Anterior and posterior ends widely rounded, forming with the straight dorsal margin almost right angles. Ventral margin convex, transition to end margins arc-like. Convexity of valves equally developed in middle part, less convex on terminal ends. In the mid-dorsal part or in the center of both valves there is developed a rounded relatively large node, behind which there is a shallow transverse sulcus of loop-like shape. The surface is smooth or sometimes pitted. The anterior and posterior dorsal angles have clearly visible single spines, occasionally absent on one of the angles.
>
> Distinguishing features of the genus. The genus *Pseudoleperditia* is characterized by distinct systematic features which differentiate it from the other known Paleozoic genera. It is most similar to *Leperditia* in the following features: straight dorsal margin, presence of anterior and posterior dorsal angles, smooth or finely punctuate surface. It differs in the presence of a distinct transverse median sulcus, in front of which there is developed a large rounded node, and the presence of anterior and posterior dorsal spines.

Discussion.—Schneider (1956) stated that the type-species was based on "well preserved carapaces and single valves." Because the largest specimen of the type-species is less than 2 mm in greatest length, and the dimorphism observed in the new species is in specimens 2 mm long or larger, that feature may not have been noted by Schneider. In more than 50 silicified specimens of the new species from five collections, I saw no indication of an anterior dorsal spine on any of the 23 left valves or the left valves of the four carapaces. This observation, plus the fact that Schneider's illustration of a carapace in dorsal view (1956, pl. 22, fig. 1b) clearly indicates that there is no dorsoanterior spine on the left valve of the type-species, are evidence that the genus is asymmetrical with regard to dorsoanterior spines. Whether reversal of overlap and hingement occurs in this genus remains to be seen. The presence of a structure tentatively interpreted as a rudimentary inner lamella (pl. 1, figs. 19, 27, 33, 35) may be significant and is the reason for the uncertain suprageneric classification.

Blumenstengel (1968, p. 194) illustrated, but did not identify, a silicified right valve from the Upper Devonian of Thuringia that probably belongs to *Pseudoleperditia*.

This genus was misinterpreted when it was questionably referred to the Geisinidae (Sohn, 1961, p. Q184).

Stratigraphic range.—Upper Devonian (?), Lower Mississippian (Tournaisian).

Ecology.—Marine.

Pseudoleperditia Poolei Sohn, n. sp.

Plate 1, figures 1–35

Name.—In honor of F. G. Poole, U.S. Geological Survey, with whom the collections that contain this species were made.

Holotype.—USNM 163510.

Paratypes.—USNM 163511–163537.

Material.—More than 50 carapaces, valves, and fragments representing various stages of growth, from five collections in three localities.

Type-locality.—Type-locality of the Narrow Canyon Limestone, in Narrow Canyon Wash, approximate lat 36°42′10″ N.; long 115°53′27″ W., Clark County, Nev.

Type-level.—Limestone, 4 feet thick, 152 feet above the base of the Narrow Canyon Limestone (USGS loc. 12879-PC).

Diagnosis.—Differs from *P. tuberculifera* Schneider, 1956, in that the subcentral node and sulcus do not extend below the midheight of the valve. Another difference from *P. tuberculifera* is that the dorsoanterior spine of the right valve is so close to the corner in lateral outline that the anterior margin in most specimens appears to continue in an unbroken line with the front end of the spine.

Description.—The anterior spine on the right valve extends dorsally above the hinge line and trends more toward the top than toward the side; the distance between the dorsoanterior corner and the spine is less than the diameter of the base of the spine. The posterior spines are symmetrically placed near the dorsoposterior corner of each valve; they are equidistant from the dorsal and posterior margins by approximately the width of the base of the spine. These posterior spines trend laterally; they have a slight upward curve so that the ends of the spines are above the hinge margins. On a few specimens, the posterior spine curves slightly backward so that it covers the posterior cardinal angle, and on at least one valve the spine bends slightly forward so that the posterior cardinal angle is exposed in lateral view. The direction in which these spines point varies with individuals.

Specimens 2 mm or larger in greatest length have beyrichiid dimorphism; the heteromorph has a broad anteroventral swelling that is not present in smaller specimens and adult tecnomorphs. The ventral surface of the crumina is smooth.

Measurements (in mm) of paratypes, unless stated otherwise.—

Fig. No. (pl. 1) or USNM No.	Maximum length (parallel to dorsal margin)	Maximum height (normal to dorsal margin)
1	0.50	0.32
2	.60	.37
3	.75	.45
4	.90	.56
5	.94	.60
6	1.07	.68
7, 8	1.12	.76
163532A	1.44	.92
9	1.47	.95
10	1.46	1.05
11	1.73	1.11
12–14	1.74	1.09
163532B	1.78	1.08
15, 16	1.83	1.17
17–19 (holotype)	2.13	1.38
20–22	2.27	1.43
23, 24	2.06	1.28
163533	2.07	1.23
25	2.22	1.39
26	2.10	1.33
27, 28	2.30	1.45
29–31	2.52	1.65

Discussion.—In addition to the illustrated specimens, I measured six right valves and 12 left valves. Figure 2 shows the size distribution of the measured specimens; the range in greatest length is from 0.50 mm to 2.52 mm, and fragments indicate that even larger individuals may have existed. Growth stages cannot be discerned on this diagram. The specimens illustrated on plate 1 as figures 32–35 were not measured because they are broken valves.

Although some of the adhering silica grains and smaller ostracodes were removed with a fine needle, several specimens were broken in the process; consequently, adhering matter was not removed from all the illustrated specimens (pl. 1, figs. 1, 3, 10, 14, 15, 22, 28). Silicification of parts of the inner shell layers is illustrated on plate 1, figures 22, 27, 33, 35. The adductor muscle scar that is drop shaped and consists of multiple flecks is shown on plate 1, figures 11, 18, 24, 26 and 32.

Blumenstengel (1968, p. 194, fig. 2) illustrated an undescribed Late Devonian assemblage of silicified ostracodes from a borehole, "Bohrung Mandelholz 18/65," in Thuringia, Germany. The third specimen from the top near the right margin of the figure appears to be the right valve of a *Pseudoleperditia* on which the dorsoposterior spine was broken. If my identification of the photograph is correct, the Late Devonian specimen differs from *P. tuberculifera* Schneider and *P. poolei* n. sp. in lateral outline and in that its dorsoposterior spine is a greater distance in front of the posterior cardinal angle than are those of the two known species.

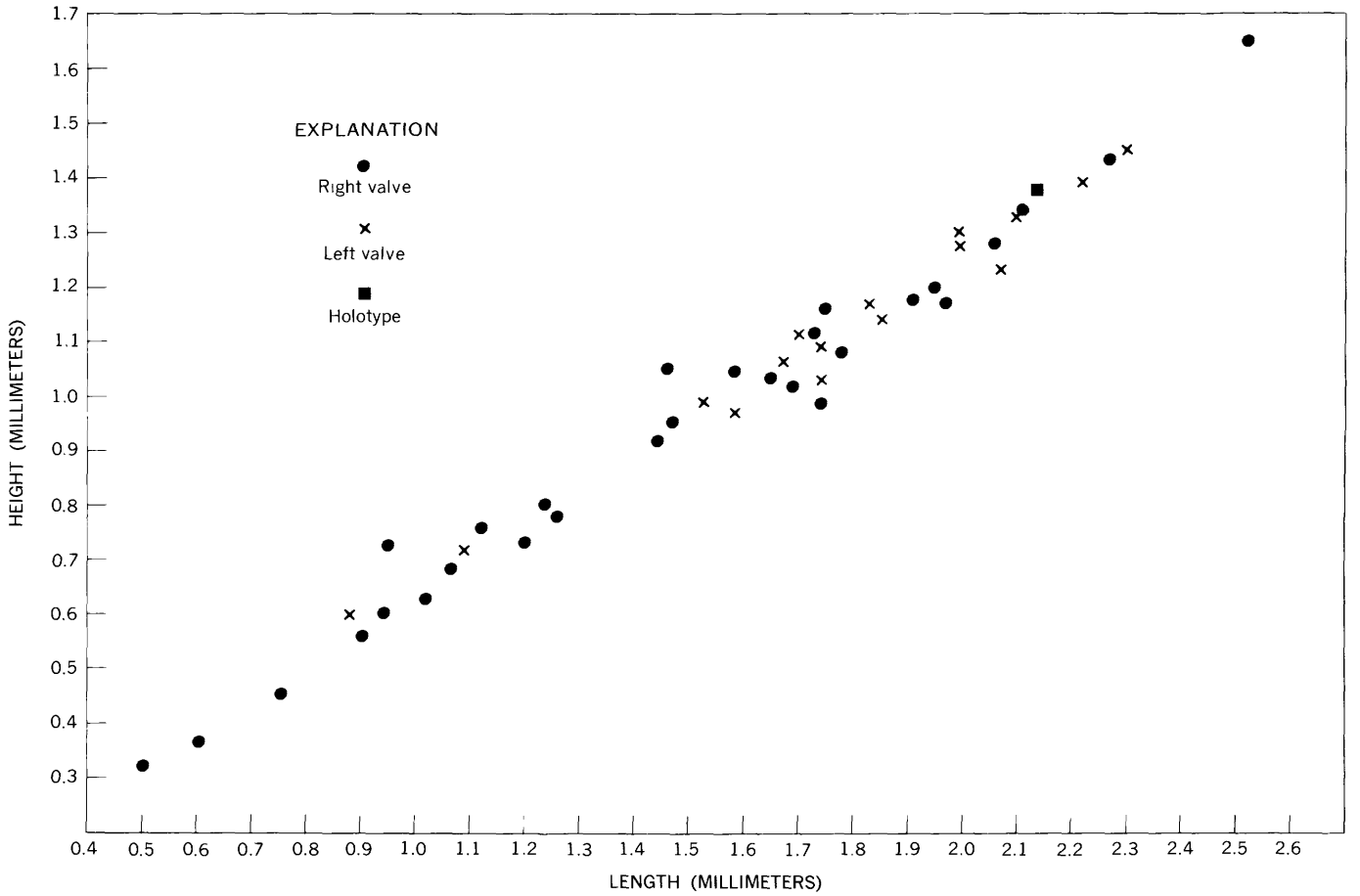

FIGURE 2.—Length-height plot of right and left valves of *Pseudoleperditia poolei* n. sp.

Based on the Thuringian specimen, the stratigraphic range of the genus is given as Upper Devonian(?) to Lower Mississippian.

Distribution.—Rare in Narrow Canyon Limestone (USGS colln. 12866, 12867, and 12872); common in Narrow Canyon Limestone (USGS colln. 22446 and 12879) and in lower Mercury Limestone (USGS colln. 12875).

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PLATE 1

PLATE 1

[Magnification approximately X 15]

FIGURES 1–35. *Pseudoleperditia poolei* Sohn, n. sp.

1. Lateral view of right valve, youngest growth stage available. From Narrow Canyon Limestone (fig. 1, loc. 2), USGS collection 12866; paratype, USNM 163511.
2. Lateral view of right valve, slightly larger growth stage. From lower Mercury Limestone (fig. 1, loc. 2), USGS collection 12875; paratype, USNM 163512.
3. Lateral view of right valve, slightly larger growth stage. From Narrow Canyon Limestone (fig. 1, loc. 3), USGS collection 22446; paratype, USNM 163513.
4. Lateral view of right valve, slightly larger growth stage. From lower Mercury Limestone (fig. 1, loc. 2), USGS collection 12875; paratype, USNM 163514.
5. Lateral view of right valve, possibly the same growth stage as fig. 4 above. From Narrow Canyon Limestone (fig. 1, loc. 2), USGS collection 12866; paratype, USNM 163515.
6. Lateral view of broken right valve, possibly the same growth stage as fig. 5 above. From Narrow Canyon Limestone (fig. 1, loc. 2), USGS collection 12867; paratype, USNM 163516.
7, 8. Dorsal and lateral views of right valve, slightly larger growth stage. From Narrow Canyon Limestone (fig. 1, loc. 3), USGS collection 22446; paratype, USNM 163517.
9. Lateral right view of crushed carapace, slightly larger growth stage. From Narrow Canyon Limestone (fig. 1, loc. 1), USGS collection 12879; paratype, USNM 163518.
10. Lateral view of broken right valve, possibly same growth stage as fig. 9 above. From Narrow Canyon Limestone (fig. 1, loc. 1), USGS collection 12879; paratype, USNM 163519.
11. Lateral view of right valve, slightly larger growth stage. Note adductor muscle-scar pattern that is drop shaped and consists of multiple flecks. From Narrow Canyon Limestone (fig. 1, loc. 1), USGS collection 12879; paratype, USNM 163520.
12–14. Right, left, and posterior views of carapace, same growth stage as above. The surface, including the area of the posterior spines, is covered with adhering silica. From Narrow Canyon Limestone (fig. 1, loc. 1), USGS collection 12879; paratype, USNM 163521.
15, 16. Dorsal and lateral views of left valve. The lighter object below the posterior spine is an adhering silica grain. From lower Mercury Limestone (fig. 1, loc. 2), USGS collection 12875; paratype, USNM 163522.
17–19. Ventral, outside, and inside views of left valve of heteromorph. From Narrow Canyon Limestone (fig. 1, loc. 1), USGS collection 12879; holotype, USNM 163510.
20–22. Lateral, ventral, and inside views of right valve of tecnomorph. Note hinge and adductor muscle scar. From Narrow Canyon Limestone (fig. 1, loc. 1), USGS collection 12879; paratype, USNM 163523.
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34. Lateral view of broken right valve of heteromorph. From Narrow Canyon Limestone (fig. 1, loc. 1); USGS collection 12879, paratype, USNM 163530.
35. Inside view of broken right valve of heteromorph. From Narrow Canyon Limestone (fig. 1, loc. 1); USGS collection 12879, paratype, USNM 163531.


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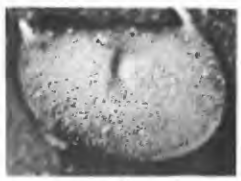
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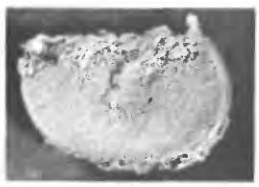
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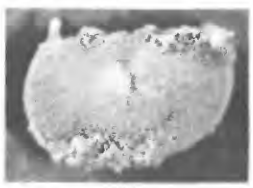
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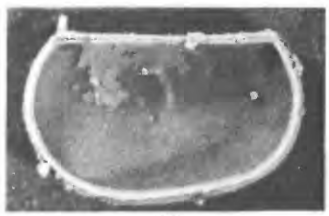
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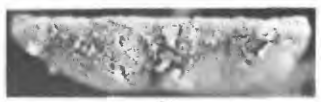
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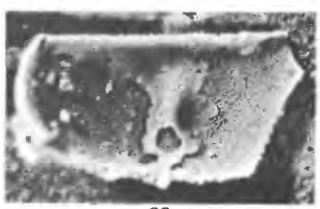
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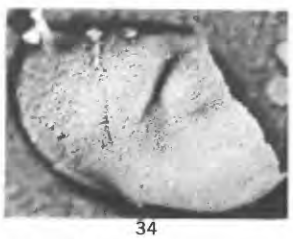
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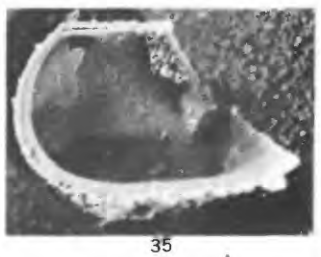
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