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A MIDDLE DEVONIAN SPECIES OF THE
OSTRACOD GENUS *ANTIPARAPARCHITES*

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A MIDDLE DEVONIAN SPECIES OF THE
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INTRODUCTION

A NEW species of *Antiparaparchites*, which is characterized by a suboval outline and a very short hinge line, has been found in the Middle Devonian Rockport Quarry limestone in Alpena County, Michigan. Although numerous ostracods occur in this formation, the only species actually described from it is a beyrichiid, *Phlyctiscapha rockportensis* Kesling (1953, pp. 221-29). The discovery of *Antiparaparchites* in Middle Devonian strata greatly extends the known range of the genus. The only previously described species is the type, *A. reversus* Coryell and Rogatz (1932, p. 388), and that is from the Permian Arroyo formation of Tom Green County, Texas.

Antiparaparchites differs from the very closely related genus *Paraparchites* only in the direction of overlap around the free edge and along the hinge. As a result of the new find, both of these genera are now known to be coextensive and to extend from Middle Devonian to Permian. They are not equally represented in the paleontologic record. Only two species of *Antiparaparchites* have been discovered, both from North America, whereas numerous Mississippian and Pennsylvanian species of *Paraparchites* are known from North America and Europe, one Devonian species from North America and another from Europe, and a Permian species has been reported from North America.

The exact nature of the overlap in *Paraparchites* is not clear from its original description. Certain discrepancies in the original descriptions of

the genus and the type species and in the explanation of the plate for the original figures are therefore analyzed in this paper. Demonstrably, the overlap in species of *Paraparchites* is R/L around the free edge and L/R along the hinge.

Because *Antiparaparchites* does differ from *Paraparchites* only in the direction of overlap, one might well question whether the ostracods of the former, with different overlap, should be placed in a different genus or included in the latter. I regard *Antiparaparchites* as a valid and useful genus.

The manuscript of this paper was reviewed by Dr. Lewis B. Kellum, Dr. George M. Ehlers, and Dr. Chester A. Arnold, who offered helpful criticisms.

The specimens used in this study are catalogued and deposited in the Museum of Paleontology of the University of Michigan. All specimens described in this paper are from the same locality.

LOCALITY

Abandoned quarry of the Kelley's Island Lime and Transport Company, Rockport, Alpena County, Michigan, in the NW. $\frac{1}{4}$ sec. 6, T. 32 N., R. 9 E.; west bank of a drainage ditch about $\frac{1}{4}$ mile west-northwest of the quarry buildings. Shale, highly fossiliferous, very calcareous, buff, weathering to brown; lowest 1 foot of the Rockport Quarry limestone, immediately above the contact with the underlying Bell shale. Sample collected by George M. Ehlers, Porter M. Kier, and Robert V. Kesling in 1951.

OVERLAP IN *Paraparchites*

Confusion concerning the orientation of ostracods of the genus *Paraparchites* was introduced by the original description and figures of the genus and its type species, *P. humerosus* Ulrich and Bassler. Ulrich and Bassler (1906, pp. 149–50) describe *Paraparchites* as follows: "Carapace small, . . . leperditoid or subovate in shape; surface smooth, sometimes with a small tubercle or spine in anterocardinal third of each valve; right valve with ventral edge rabbeted so as to slightly overlap the simply beveled edge of the left valve; dorsal edges of valves usually unequal, the left slightly the more prominent and commonly overlapping the right or receiving its edge in a shallow groove."

Note that in their diagnosis of the genus the overlap around the free edge is said to be R/L, but that along the hinge is said to be L/R. In the description of *Paraparchites humerosus*, however, Ulrich and Bassler (1906, p. 151) state the reverse. They say: "Left valve with dorsal edge straighter than in right valve, the edge in the latter being convex in outline and thickened so that it projects above the hinge line of the left valve." Thus, overlap along the hinge is given as R/L! In the illustrations of the

type species (their Plate 11) Ulrich and Bassler (1906, p. 163) explain Figure 2 as an "Anterior view showing overlap of right valve dorsally [that is, overlap L/R], and slight ventral overlap of left valve [that is, overlap R/L]." The explanation agrees with the generic description but not with the specific description. If Figure 2 is an anterior view, as Ulrich and Bassler state, it shows an R/L overlap along the hinge (which fits the specific description but not the generic nor the explanation of the plate) and an L/R overlap around the free edge. Figure 4 on their plate is an interior view of a valve with a dorsal prominence, described in the explanation of plate (p. 163) as an "Interior of a right valve exhibiting dorsal prominence and linear socket for reception of corresponding portion of left valve." This statement implies a R/L overlap along the hinge and agrees with the description of the type species but is directly opposed to the one of the genus.

In summary, Ulrich and Bassler's original article on *Paraparchites* and its type species gives the overlap along the hinge L/R in the generic description (pp. 149-50) and in the explanation of Plate 11, Figure 2 (p. 163), but as R/L in the description of the type, *P. humerosus* (p. 151), and in the explanation of Plate 11, Figure 4 (p. 163), and shows this overlap in Figure 2 (if the view, as stated in the explanation of the plate, is an anterior one).

What in reality is the nature of the overlap in *Paraparchites*? In the Upper Mississippian and Pennsylvanian species of this genus the posterior end is plenate and the hinge is nearer to the anterior end than to the posterior (Cooper, 1941, 1946). With this orientation, which I believe to be correct, the overlap around the free edge is R/L and the overlap along the hinge is L/R. This is the kind of overlap described in the original generic description. If the figures of *P. humerosus* given by Ulrich and Bassler (1906, Pl. 11, Figs. 1-4) are oriented with the hinge nearer to the anterior end, Figure 1 represents a left valve (not a right, as they stated); Figure 2, a posterior view (not an anterior); and Figure 4, the interior of a left valve (not a right). Thus considered, the illustrations of *P. humerosus* show the species to agree with the generic description. The errors are in the substitution of "left" for "right" and of "right" for "left" in the specific description and in the explanation of Plate 11.

Antiparaparchites AS A GENUS

The genus of concern here, *Antiparaparchites*, was created by Coryell and Rogatz (1932, pp. 387-88) for an ostracod with an L/R overlap around the free edge and an R/L along the hinge, a situation exactly the

reverse of that in *Paraparchites*. In fact, the type species of *Antiparaparchites*, *A. reversus* Coryell and Rogatz (1932, pp. 387–88, Pl. 35, Figs. 3–4), is nearly a mirror image of *Paraparchites oviformis* Coryell and Rogatz (1932, p. 387, Pl. 35, Figs. 1–2) from the same formation; apart from overlap, the two could well be placed in the same species. One may well question whether *Antiparaparchites* is a valid genus.

In all Devonian, Mississippian, and Pennsylvanian species of *Paraparchites* so far described the overlap is constant in all specimens. All specimens have the overlap around the free edge R/L. Since each of the ten specimens of the proposed new species of *Antiparaparchites*, from the Rockport Quarry limestone, has the overlap around the free edge L/R, it seems highly improbable that two species, this one in Middle Devonian and *A. reversus* in Permian time, would have diverged from the *Paraparchites* stock as mutants with reversed overlap.

Until the paleontologic record is more complete, the synonymy of *Antiparaparchites* and *Paraparchites* must remain in doubt. For the present, although poorly represented in the record, I regard *Antiparaparchites* as a valid genus. Furthermore, despite their remarkable similarity in shape, I consider *Antiparaparchites reversus* and *Paraparchites oviformis* to be distinct species.

SYSTEMATIC DESCRIPTION

Order OSTRACODA

Suborder PALEOCOPE Henningsmoen, 1953

Superfamily Beyrichiacea Ulrich and Bassler, 1923

Family Aparchitidae Jones, 1901

The genus *Antiparaparchites* unquestionably belongs to the same family as *Paraparchites*, but there is no clear consensus of opinion as to which family the latter belongs. *Paraparchites* has been variously assigned to Aparchitidae Jones, 1901 (Příbyl, 1950, pp. 104, 144; Příbyl, 1955, pp. 166, 216, 262; and Pokorný, 1954, p. 375); Leperditellidae Ulrich and Bassler, 1906 (Ulrich and Bassler, 1906, p. 149; Bassler and Kellett, 1934, p. 16; Kummerow, 1939, p. 9; Bassler, 1941, p. 22; Cooper, 1941, p. 61; Scott, 1942, p. 153; Cooper, 1946, p. 120; Kummerow, 1953, p. 10; and Stover, 1956, p. 1132); Aparchitidae Ulrich and Bassler, 1923 (Ulrich and Bassler, 1923, p. 297; Warthin, 1930, p. 55); and to the subfamily Kloedenellinae of the family Kloedenellidae Ulrich and Bassler, 1908 (Henningsmoen, 1953, p. 271). Most of the seeming confusion is not disagreement on the nature or affinities of *Paraparchites*, but is due to a

puzzling taxonomic situation. Three families have been proposed with apparently the same content: Aparchitidae Jones, 1901; Leperditellidae Ulrich and Bassler, 1906; and Aparchitidae Ulrich and Bassler, 1923.

The first use of *Aparchites* for a suprageneric category is by T. R. Jones (in Chapman, 1901, table on page 147), who listed "Family Leperditidae, Jones / Subfamily Aparchitinae, nov." The table is in an article by Chapman, but there is no question that Jones was the author of it. Chapman (1901, p. 146) stated that, "The following table of the grouping, which has been kindly drawn up by our best authority on the subject, Prof. T. Rupert Jones, F. R. S., . . ." Jones, therefore, is the author of Aparchitidae and the date of the family is 1901.¹

In 1906 (p. 149), Ulrich and Bassler described the family Leperditellidae. In 1923 (p. 297), they described the family Aparchitidae as "new" and, furthermore, assigned *Leperditella* to their "new" family. It is conceivable that Ulrich and Bassler in 1906 and 1923 were unaware of Jones' subfamily Aparchitinae of 1901, or they may have believed that the author of the subfamily should not be credited with the family name. They did not mention Jones' usage at any time. The incredible part is why did Ulrich and Bassler in 1923 assign *Leperditella* to their supposed new family Aparchitidae, when 17 years previously they had used *Leperditella* as type genus of their own family Leperditellidae. Surely, one would think, Ulrich and Bassler remembered their earlier publication. If any conclusion can be drawn, it is that they intended the content of their families Leperditellidae and Aparchitidae to be the same. This is not the place to decide whether the family Aparchitidae Jones should be revised. If it is shown that the differences of *Aparchites* and *Leperditella* are of familial significance, then two families already exist into which the several genera now grouped in the Aparchitidae could be divided.

Antiparaparchites primaevus, sp. nov.

(Pl. I, Figs. 1-13)

Adult.—Carapace lentoid, biconvex, smooth; in lateral view, oval with smaller end posteroventral, the axis inclined at an angle of about 25 degrees to the hinge line; in dorsal and in end views, lanceolate. Greatest width central, equal to about one-half the length. Greatest height slightly anterior, equal to about 85 per cent of the length. Overlap L/R around entire free edge, but R/L along the hinge; in a complete carapace, dorsal border formed by right valve only and free border by left valve only.

¹ According to the Revision of Rules suggested for action by the Copenhagen (1953) Congress of the International Commission on Zoological Nomenclature.

Hinge line straight, very short, only about one-third of the length, located nearer to the anterior than to the posterior end.

Dorsal border in the right valve convex, smoothly confluent with the free border; in the left valve straight, meeting the free border with strongly obtuse cardinal angles, the anterior about 145 degrees and the posterior about 155 degrees.

Immature instars.—If the adult is regarded as the fifth instar, the four successively younger instars found may be referred to as the first to fourth. Still younger instars probably exist, but have not been discovered. Each immature instar has about the same shape as the adult, as shown by the rather remarkable agreement of proportions of height/length and

TABLE I

DIMENSIONS AND RATIOS OF CARAPACES OF *Antiparaparchites primaevus*, SP. NOV.
All measurements in millimeters.

Catalogue Number	Instar	Length	Height	Width	Hinge	Height/Length	Width/Length	Hinge/Length
34799	5	1.65	1.41	0.81	0.48	0.86	0.49	0.29
34800	5	1.54	1.34	0.80	0.50	.87	.52	.32
*	4	1.41	1.15	0.62	0.45	.82	.44	.32
34801	4	1.32	1.13	0.63	0.43	.86	.48	.33
34802	4	1.19	1.00	0.59	0.37	.84	.50	.31
34803	4	1.15	1.00	0.52	0.35	.87	.45	.30
34804	3	0.98	0.83	0.49	0.33	.85	.50	.34
34805	3	0.94	0.82	0.45	0.31	.87	.48	.33
34806	2	0.79	0.67	0.39	0.29	.85	.49	.37
34807	1	0.63	0.63	0.31	0.24	.87	.49	.38

* Specimen destroyed in making polished surfaces for study of hinge.

width/length (see Table I). The hinge, insofar as judged from the specimens, seems to be slightly longer in the very young instars.

One immature specimen was sacrificed to make polished surfaces. These surfaces show that the dorsal edge of the left valve fits into a groove in the right valve to form the hinge. They also reveal that part of the specimen is a replica, with no distinguishable line of contact between the shell and the steinkern; other parts have crystalline calcite in both the replaced shell and the steinkern, but with a distinct boundary between the two.

Growth rates.—"Ideal" growth series of length, height, and width have been computed (Table II) by increasing each dimension successively by

1.26, the rate proposed by Przi Bram (1931, p. 26). The observed mean values agree very well with the "ideal" mean values in each instar. Although the number of specimens available is admittedly very small, it appears that each instar is distinctly separated from the previous and succeeding instars. Only two of the measurements listed in Table I vary from the "ideal" mean for the instar by more than 10 per cent.

Remarks.—Only two species of *Antiparaparchites* are so far known, one from Devonian and one from Permian strata. Why, one wonders, has none been found in Mississippian and Pennsylvanian rocks? It may, however, be pointed out that the Rockport Quarry limestone and the Arroyo formation, in which the two species occur, are both highly calcareous.

TABLE II

OBSERVED MEANS AND "IDEAL" MEANS OF *Antiparaparchites primaevus*, SP. NOV.
All measurements in millimeters.

In- star	Number of Specimens	Observed Means				"Ideal" Means*			
		Length	Height	Width	Product	Length	Height	Width	Product
5	2	1.60	1.38	0.81	1.79	1.60	1.38	0.78	1.72
4	4	1.27	1.07	0.59	0.80	1.27	1.09	0.62	0.86
3	2	0.96	0.83	0.47	0.37	1.01	0.87	0.49	0.43
2	1	0.79	0.67	0.39	0.21	0.80	0.69	0.39	0.22
1	1	0.63	0.55	0.31	0.11	0.64	0.55	0.31	0.11

* "Ideal" means are series conforming to Przi Bram's theory that during each ecdysis a crustacean doubles in volume. In such series, each dimension increases from one instar to the next by a factor of 1.26, and the product of length, height, and width increases by a factor of 2.

Very few Paleozoic limestones have been searched for ostracods. It is possible that other species of *Antiparaparchites* have been overlooked because they were buried in calcareous rocks. The surfaces of all specimens of *A. primaevus* are pitted and imperfect. Other species of ostracods in the Rockport Quarry limestone are similarly poorly preserved.

Types.—Holotype, an adult carapace, No. 34799. Paratypes, an adult carapace, No. 34800; three carapaces in the fourth instar, Nos. 34801–34803; two carapaces in the third instar, Nos. 34804 and 34805; one carapace in the second instar, No. 34806; and one carapace in the first instar, No. 34807.

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PLATE

EXPLANATION OF PLATE I

(All figures approximately $\times 30$)

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FIGS. 1-2. Right lateral and left lateral views of an adult carapace. Holotype No. 34799.	
FIGS. 3-4. Right lateral and left lateral views of an adult carapace. Paratype No. 34800.	
FIG. 5. Left lateral view of a carapace in the fourth instar. Specimen destroyed in making polished surfaces for study of the hinge.	
FIGS. 6-7. Left lateral and dorsal views of a carapace in the fourth instar. Paratype No. 34801. In the dorsal view (Fig. 7), the left valve is at the top.	
FIG. 8. Left lateral view of carapace in the fourth instar. Paratype No. 34803.	
FIGS. 9-10. Right lateral and left lateral views of a carapace in the fourth instar. Paratype No. 34802.	
FIGS. 11-12. Left lateral and dorsal views of a carapace in the third instar. Paratype No. 34804. In the dorsal view (Fig. 12), the left valve is at the top.	
FIG. 13. Left lateral view of a carapace in the first instar. Paratype No. 34807.	

PLATE I



