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Three Ostracode Faunas from Lower and Middle Mississippian Strata in Southern Illinois

Richard H. Benson
Charles Collinson

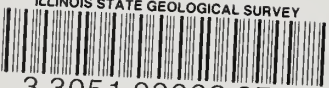
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THREE OSTRACODE FAUNAS FROM LOWER AND MIDDLE MISSISSIPPIAN STRATA IN SOUTHERN ILLINOIS

Richard H. Benson and Charles Collinson

ABSTRACT

Two outcrops in Union County have yielded ostracode faunas from three formations: The Springville Shale of the Valmeyer Series, and the Chouteau Limestone and Hannibal Shale of the Kinderhook Series.

The fauna of the Springville is confined to the State Pond Member and is abundant and well preserved. It contains 21 species that represent 12 genera, of which the genera *Graphiadactyllis*, *Kirkbya*, *Amphissites*, and *Roundyella* are most abundant. Two species, *Graphiadactyllis fernglenensis* Benson and *Mauryella mammillata* Ulrich and Bassler, seem to have stratigraphic significance. Four new species, *Tetrasacculus ? stewartae*, *Monoceratina ? elongata*, *Amphissites springvillensis*, and *Graphiadactyllis ? unionensis* are described. The fauna indicates that at least the lower part of the Springville (State Pond Member) is of the same age as the Fern Glen (early Valmeyer).

The fauna of the Chouteau also is abundant and contains 18 species that belong in 12 genera. Qualitatively, the fauna of the Chouteau is much like that of the Springville, but quantitatively it is distinctive in that *Waylandella*, *Tetrasacculus ?*, and *Kirkbyella* are important numerically. *Kirkbyella ozarkensis* appears to have special significance for correlation of the Chouteau. Two new species from the formation, *Waylandella dartyensis* and *Kirkbyella anensis*, are described.

The fauna of the Hannibal is meager and only six species referable to six genera were found. These species also are found in both the Springville and Chouteau Formations.

INTRODUCTION

Ostracode faunas of the lower and middle Mississippian rocks of North America have been virtually neglected by research workers. To date, less than half a dozen reports on the subject have been published, and much remains to be done before the fossils can be used effectively for stratigraphic or ecologic purposes.

The two most recent papers dealing with Mississippian ostracodes (Benson, 1955; Echols and Gouty, 1956) described a fauna from the Fern Glen Formation (lower Valmeyer) of Missouri, and the present work was undertaken as an extension of those reports. The fauna of the Springville Shale of southern Illinois was chosen for study because its stratigraphic position above the Chouteau

Limestone led us to suspect its early Valmeyer (Fern Glen) age. Prior to our study, which began in 1955, the Springville Shale had been considered to be Kinderhook in age (Weller et al., 1948; Weller and Sutton, 1940).

Investigation of two principal outcrops, one at State Pond (figs. 1, 3) and the other along Darty Creek (figs. 1, 2), yielded both ostracodes and conodonts not only from the Springville Shale but from the underlying Chouteau Limestone and Hannibal Shale. As the relationships and ages of the three lithologic units were undetermined, Collinson and Scott (1958) undertook a separate study designed to clarify the stratigraphy and to describe the conodont faunas. The stratigraphy used in this report follows their conclusions.

STRATIGRAPHY

The Springville, Chouteau, and Hannibal Formations of southern Illinois, which yielded the ostracodes for this study, crop out in a narrow, north-northwest trending belt that lies mostly within Union County but includes the northeast tip of Alexander County. The area is located on the east flank of the Ozark dome, and the formations are exposed in the west-central part of the county where they lap up onto the structure.

In the western third of the county they have been removed by erosion. To the east of the outcrop belt they dip beneath the Hartline Chert Member of the Burlington-Keokuk Formation and younger rocks, but they continue in the subsurface as far as southern Indiana where they crop out again. The Springville appears to be approximately equivalent to the New Providence, the Chouteau is the Rockford of Indiana, and the Hannibal is equivalent to at least part of the upper New Albany.

The State Pond Member of the Springville Shale is the uppermost and most productive of the ostracode-yielding formations. The Springville is referable to the lower part of the Valmeyer Series. It is a bluish to greenish gray shale that weathers to variegated colors - white, red, and brown. The lower few feet, for which Collinson and Scott proposed the name State Pond Member, are soft and argillaceous but the upper part is silicified and hard. The average thickness of the formation is about 60 feet. In most outcrops it unconformably overlies the Grassy Creek Shale and is unconformably overlain by the Hartline Chert of Valmeyer age.

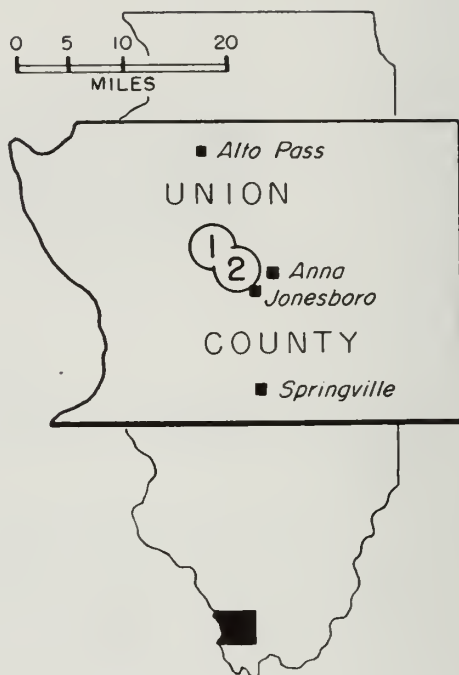


Fig. 1. - Maps of Illinois and Union County showing location of collecting localities. No. 1. - Darty Creek locality in NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, T. 12 S., R. 2 W. No. 2. - State Pond locality, center S $\frac{1}{2}$ sec. 14, T. 12 S., R. 2 W. Both are in the Jonesboro quadrangle.

The Chouteau Limestone, where present, directly underlies the State Pond Member (figs. 2, 3) and is the uppermost unit in the Kinderhook Series. It is thin and discontinuous, not more than two or three feet thick. It is a dense, light gray, fine-grained argillaceous limestone and locally contains numerous brachiopods. The macrofauna (Savage, 1920, p. 178) consists of *Productella concentrica* (Hall), *Brachythyris simplicata* Hall, *B. cf. B. peculiaris* (Shumard), *Ambocoelia unionensis* Weller, and *Cardiopsis cf. C. radiata* Meek & Worthen, and is compatible with the fauna of both the Rockford of Indiana and the Chouteau of western Illinois. At the State Pond locality (fig. 3), the Chouteau consists of discontinuous limestone lenses in a brown clay that yielded the ostracodes. At the Darty Creek locality (fig. 2), from which came the greater proportion of the total Chouteau ostracodes, the ostracodes were found principally in a thin shale bed about 9 inches above the base.

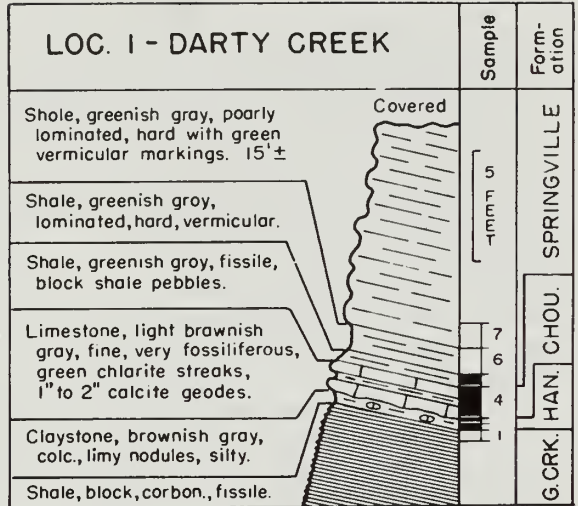


Fig. 2. - Collecting locality no. 1, Darty Creek, NW $\frac{1}{4}$ SW $\frac{1}{4}$ sec. 11, T. 12 S., R. 2 W., Jonesboro quadrangle, Union County, Illinois. Black sample intervals indicate zones that yielded ostracodes and/or conodonts. Bed 5 represents the State Pond Member of the Springville Shale.

The Hannibal Shale, like the Chouteau, has been recognized only in the State Pond and Darty Creek outcrops. The limited distribution may be the result of an unconformity beneath the Springville, that is, between the Valmeyer and Kinderhook Series. In places the unconformity cuts through the Grassy Creek Shale so that the Springville Shale lies directly on Alto-Lingle Limestone of Devonian age.

In southern Illinois the Hannibal is a greenish to brownish gray, slightly silty, soft shale or claystone. At Darty Creek it is a nonlaminated calcareous claystone and contains limy nodules. At State Pond, all but the upper three inches are laminated and some layers exhibit compaction laminae. Stratigraphic distribution of ostracodes and conodonts in the Hannibal are shown in figure 4.

OSTRACODE FAUNAS

Springville Shale

The fauna of the Springville is both abundant and well preserved, but nearly the entire collection studied came from the lowermost 6 inches of the State Pond Member. More than 400 specimens were examined and many more were left unpicked in the samples. The varied fauna represents 21 species and 12 genera. It is dominated by the genera *Graphiadactyllis*, *Kirkbya*, *Bairdia*, *Amphissites*, and *Roundyella* so its Middle Paleozoic aspect is readily apparent.

Three species numerically dominate the State Pond fauna (table 1). By far the most abundant is *Graphiadaetyllis fernglensis* Benson of which more than 150 specimens were examined. It is very abundant in the State Pond Shale but absent from the underlying Chouteau. The species is also found in the Fern Glen of Missouri, and it may prove to be a stratigraphic index for lower Valmeyer strata. Many more occurrences should be studied, however, before it is used without reservation as an index fossil.

The second most abundant species is *Graphiadaetyllis granopunctatus* (Ulrich & Bassler), which also occurs in the Fern Glen, Chouteau, and Bushberg? of Missouri and the Ridgetop of Tennessee. It is very abundant in the Chouteau in Union County but because of its stratigraphic range it appears to be of little value for detailed correlation.

Kirkbya fernglensis Benson is abundant in the State Pond Shale and is common in the Chouteau and in the Fern Glen of Missouri. We consider it to have value as a low-Valmeyer - high-Kinderhook indicator.

The species that has greatest promise for use as a stratigraphic marker is *Mauriyella mammillata* Ulrich & Bassler. It is known from the Fern Glen of Missouri and the Ridgetop of Tennessee as well as from the State Pond, but it is not known to occur either above or below lowermost Valmeyer beds. It has the further advantage of a distinctive appearance that makes it recognizable even when poorly preserved. The fact that it is less than common in collections is, however, a disadvantage. *Graphiadaetyllis* aff. *G. lineatus* (Ulrich & Bassler) occurs in the same formations as *Mauriyella mammillata* Ulrich & Bassler but unfortunately is identifiable only when well preserved.

Six new species, *Waylandella dartyensis*, *Kirkbyella annensis*, *Tetrasacculus? stewartae*, *Monoceratina? elongata*, *Amphissites springvillensis*, and *Graphiadaetyllis? unionensis*, are known from the State Pond Member, but all are shared with the Chouteau and four are also found in the Hannibal. Holotypes of the last four are from the Springville.

In general aspect, the fauna of the Springville is essentially the same as that of the Fern Glen of Missouri, and there is little doubt in our minds that the State Pond Member of the Springville and the Fern Glen are correlative. Less

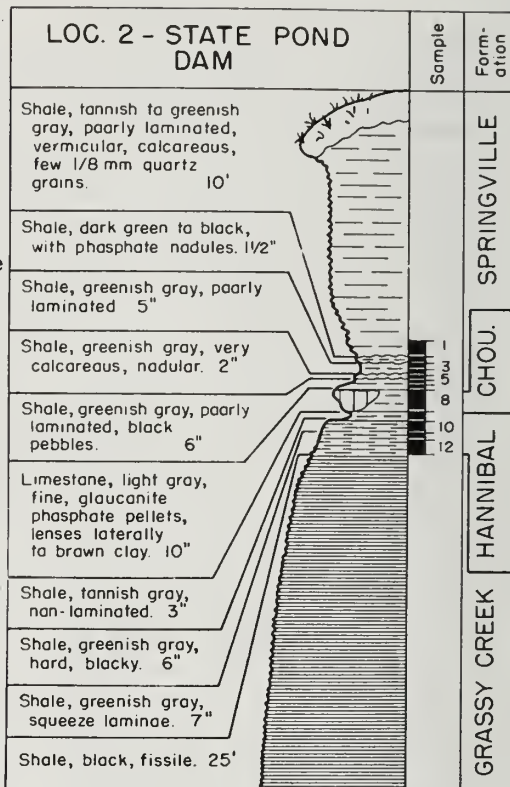


Fig. 3. - Collecting locality no. 2, State Pond, S $\frac{1}{2}$ sec. 14, T. 12 S., R. 2 W., Jonesboro quadrangle, Union County, Illinois. Black sample intervals indicate zones that yielded ostracodes and/or conodonts. Beds 2-7 are referable to the State Pond Member of the Springville Shale.

FORMATION		SPRINGVILLE							CHOU.	HANNIBAL			
STATE POND	SAMPLE NOS.	1	2	3	4	5	6	7	8	9	10	11	12
	<i>ostracodes</i>	U							R	R	U	U	C
	<i>conodonts</i>	U	C	C	VA	VA	VA	VA	VA	VA	U	U	U
DARTY CREEK	SAMPLE NOS.	7	6			5		4	3	2	1		
	<i>ostracodes</i>						VA	A	U	R			
	<i>conodonts</i>						VA	A	A	C			

Fig. 4. - Relative abundance of ostracodes and conodonts according to sample, formation, and outcrop. R = rare; U = uncommon; C = common; A = abundant; VA = very abundant.

certain is the correlation with the Ridgetop of Tennessee, although the presence of *Maurycella mammillata* in both seems significant. The only species which qualitatively differentiate the fauna of the State Pond from that of the underlying Chouteau are *Graphiadactylis fernglenensis* Benson, *G. aff. G. lineatus* (Ulrich & Bassler), and *M. mammillata* Ulrich & Bassler, but because *G. fernglenensis* is so abundant in the State Pond Shale, the general appearance of the two faunas is quite different.

Chouteau Limestone

Numerically, the Chouteau ostracodes are only slightly less abundant than those of the State Pond Member. The Chouteau fauna is also almost as varied, having 18 species referable to 12 genera (table 1). Six species are new. The holotypes of *Waylandella dartyensis* and *Kirkbyella annensis* are from the Chouteau.

All species of the southern Illinois Chouteau are found in the State Pond Shale, but differences in abundance of shared species give the two faunas distinctive appearance. For example, *Waylandella dartyensis*, n.sp., *Tetrasacculus ? stewartae*, n.sp., *Kirkbyella ozarkensis* Morey, and *Graphiadactylis moridgei* Benson are more than twice as abundant in the Chouteau as in the State Pond Member, and the very distinctive species, *Kirkbyella annensis*, n.sp., is abundant in the Chouteau but rare in the State Pond.

The most abundant species is *Graphiadactylis granopunctatus* (Ulrich & Bassler), of which more than a hundred specimens came from the Chouteau. *Bairdia* aff. *B. kinderhookensis* Morey and *B. aff. B. magnacurta* Morey are next in abundance, and they are followed by *Amphissites springvillensis*.

Seven of the eighteen species (table 1) found in the southern Illinois Chouteau also are present in the Chouteau of Missouri (Morey, 1936), which contains twelve species. In addition to the seven species common to both faunas, three other species, *Kirkbyella ? dubia* Morey, *Amphissites centronotus* (Ulrich & Bassler), and *Healdia decora* Morey, appear closely related to species in our fauna. The two faunas are therefore quite similar, even though it is likely that Morey's fauna came from Chouteau beds older than any present in Union County.

Table 1. - Stratigraphic Occurrences of Lower and Middle Mississippian Ostracode Species in Southern Illinois and Adjacent States

Fern Glen of Missouri	Chouteau of Missouri	Bushberg ? of Missouri	Ridgetop of Tennessee	Species	Springville (State Pond Member)	Chouteau	Hannibal
X	X	X	-	<i>Paraparchites nicklesi</i> (Ulrich)	R	R	R
X	X	-	-	<i>Bairdia</i> aff. <i>B. kinderhookensis</i> Morey	C	A	-
X	X	X	-	<i>B.</i> aff. <i>B. magnacurta</i> Morey	C	A	-
X	-	-	-	<i>Healdia</i> sp.	R	R	R?
?	-	-	-	<i>Waylandella dartyensis</i> , n. sp.	R	U	R
?	-	-	-	<i>Tetrasacculus ? stewartae</i> , n. sp.	U	C	U
-	-	-	-	<i>Monoceratina ? elongata</i> , n. sp.	U	U	U
-	-	-	-	<i>M.</i> cf. <i>M. ardmorensis</i> (Harlton)	U	U	-
X	-	-	-	<i>Kirkbya fernglenensis</i> Benson	A	C	-
-	-	-	-	<i>Kirkbyella annensis</i> , n. sp.	R	A	-
-	X	-	-	<i>K. ozarkensis</i> Morey	R	C	-
-	-	-	-	<i>Amphissites springvillensis</i> , n. sp.	C	A	R
X	-	-	-	<i>Graphiadactyllis ? unionensis</i> , n. sp.	U	R	-
X	X	X	X	<i>G. fayettevillensis</i> (Harlton)	U	R	-
X	-	-	-	<i>G. fernglenensis</i> Benson	VA	-	-
X	-	-	-	<i>G. moridgei</i> Benson	R	C	-
X	X	X	X	<i>G. granopunctatus</i> (Ulrich & Bassler)	A	VA	-
X	-	-	X	<i>G.</i> aff. <i>G. lineatus</i> (Ulrich & Bassler)	U	-	-
X	-	-	X	<i>Mauryella mammillata</i> Ulrich & Bassler	U	-	-
X	X	-	-	<i>Roundyella mopacifa</i> Benson	C	U	-
				<i>R. ? sp.</i>	U	U	-

R = rare (<5 per 1000 gms).

A = abundant (20-50 per 1000 gms).

U = uncommon (5-10 per 1000 gms).

VA = very abundant (50+ per 1000 gms).

C = common (10-20 per 1000 gms).

X = present.

Hannibal Shale

The ostracode fauna of the Hannibal Shale, the first to be described from the formation, is meager and has no significant stratigraphic implications. The fauna consists of six species referable to six genera (table 1). All are found in both the Chouteau and Springville Formations.

The ostracodes, in our opinion, probably come from the uppermost part of the Hannibal as the formation is developed in its type area of northeastern Missouri and western Illinois. The Hannibal in Union County therefore may be equivalent to some of the Chouteau beds in the Chouteau type area in western-central Missouri.

Table 2. - Stratigraphic Ranges of Genera Represented in the Collections from State Pond and Darty Creek Localities

Genus	Period						
	Ordovician	Silurian	Devonian	Mississippian	Pennsylvanian	Permian	Triassic
Kirkbya				—————			
Bairdia						—————	—————
Tetrasacculus				—————			
Kirkbyella				—————			—————
Graphiadactyllis				—————			
Amphissites				—————			
Paraparchites				—————			
Monoceratina				—————			—————
Mauryaella				—————			
Waylandella				—————			
Roundyella				—————			
Healdia				—————			

SYSTEMATIC PALEONTOLOGY

Family LEPERDITELLIDAE? Ulrich & Bassler, 1906

Genus PARAPARCHITES Ulrich & Bassler, 1906

Type species: *Paraparchites humerosus* Ulrich & Bassler

PARAPARCHITES NICKLESI (Ulrich), 1891

Plate 1, figure 9

Leperditia nicklesi ULRICH, 1891, Cincinnati Soc. Nat. Hist. Jour., v. 13, p. 200, pl. 18, figs. 1a-c.

Paraparchites nicklesi GRABAU & SHIMER, 1910, North American Index Fossils, p. 343, figs. 1657 c-f.

Paraparchites cf. *P. nicklesi* (Ulrich) BENSON, 1955, Jour. Paleontology, v. 29, p. 1038, pl. 108, figs. 8, 14.

Diagnosis. - This species can be recognized by the presence of a small, sometimes very indistinct, node or spine (formerly referred to as an eye spot) located on the postero-dorsal side of the right valve.

Remarks. - The postero-dorsal spine or node is very subdued in the specimens found in the Springville but can be found on all right valves of mature instars.

Stratigraphic occurrence. - Chouteau, Fern Glen, Springville (State Pond Member), and Warsaw Formations and strata up to and including lower Pennsylvanian.

Material studied. - Only six specimens were found. Reposited under catalog numbers 9P1 (figured specimen) and 9P2 (other specimens).

Family BAIRDIIDAE Sars, 1887

Genus BAIRDIA McCoy, 1844

Type species: *Bairdia curta* McCoy

BAIRDIA aff. *B. KINDERHOOKENSIS*

Morey, 1936

Plate 1, figures 7, 8

Bairdia kinderhookensis MOREY, 1936,
 Jour. Paleontology, v. 10, p. 120,
 pl. 17, figs. 13, 15.

Diagnosis. - This species can be recognized by its long, gently concave, postero-dorsal slope and acuminate posterior end. The central portion of the carapace is strongly tumid.

Remarks. - The specimens in our collections are almost identical to those originally described from the Chouteau by Morey (1936) except that the break in slope of the anterior end is not as pronounced. This slight difference is not thought to be sufficient to warrant description of a new species. Morey's specimens are also somewhat larger (1.91 mm. by 1.10 mm. by 0.70 mm.) than those figured here (1.10 mm. by 0.70 mm. by 0.55 mm.). Only one specimen was found that came near the size he described. It is probable that our small specimens represent young instars and that only one mature specimen was found.

Stratigraphic occurrence. - Chouteau Limestone of Missouri and Illinois; Springville Shale of Illinois.

Material studied. - Thirty-five specimens were examined. Reposited under catalog numbers 9P3, 9P4 (figured specimens) and 9P5 (other specimens).

BAIRDIA aff. *B. MAGNACURTA* Morey, 1935

Plate 1, figures 10, 11

Bairdia magnacurta MOREY, 1935, Jour. Paleontology, v. 9, p. 323, pl. 28, fig. 22; *ibid.*, 1936, v. 10, p. 118, pl. 17, figs. 16, 18.

Diagnosis. - This species can be recognized by its rather short and acute posterior end, evenly arched dorsal margin, short anterior end, and over-all rounded shape.

Remarks. - The specimens found in the Springville (State Pond Member) and Chouteau Formations are very close to *B. magnacurta* from the Bushberg? as illustrated by Morey (1935). Our specimens differ, however, by possessing a slightly higher posterior end that gives the venter a more rounded outline in

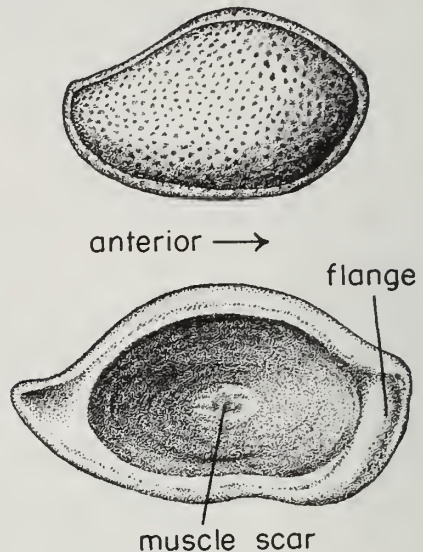


Fig. 5. - *Bairdia* aff. *B. kinderhookensis* Morey. Top, lateral view illustrating valve overlap and punctate surface texture. Bottom, interior of left valve showing shape of flange and hinging and location of muscle scar. X30 and X40 respectively.

side view. Our forms are much closer to representatives from the Chouteau Formation figured by Morey (1936, pl. 17, fig. 18). In addition to the above characteristics the Springville specimens have a punctate surface and exhibit a wide, welded duplicature as well as a partial bairdioid muscle scar pattern. The hinge is short and partially obscured because of poor preservation.

Our species is similar to *B. beedei* Ulrich and Bassler as illustrated by Cooper (1946, p. 41, pl. 1, figs. 35-40) except that the ventral and dorsal overlap is not as great in our species. Our specimens are closer to *B. augusta* Cooper (1946, p. 41, pl. 1, figs. 41-44) whose surface is smooth.

Stratigraphic occurrence. - Bushberg? of Missouri, Chouteau Formation of Missouri and Illinois, and the Springville (State Pond Member) Formation of Illinois; all of lower Mississippian age.

Material studied. - Thirty-five specimens were found. All are repositied under catalog numbers 9P6, 9P7 (figured specimens) and 9P8 (other specimens).

Family HEALDIIDAE, Harlton, 1933

Genus WAYLANDELLA Coryell & Billings, 1932

Type species: *Waylandella spinosa* Coryell & Billings

Waylandella CORYELL & BILLINGS, 1932, Am. Midland Naturalist, v. 13, no. 4, p. 175; COOPER, 1946, Illinois Geol. Survey Bull. 70, p. 63.

WAYLANDELLA DARTYENSIS Benson & Collinson, n.sp.

Plate 1, figures 4, 5, 6

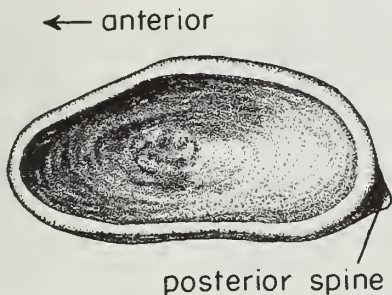


Fig. 7. - Interior view of right valve of *Waylandella dartyenssis*, n.sp., showing the inner margin, lack of duplicature, and simple hinge. X40.

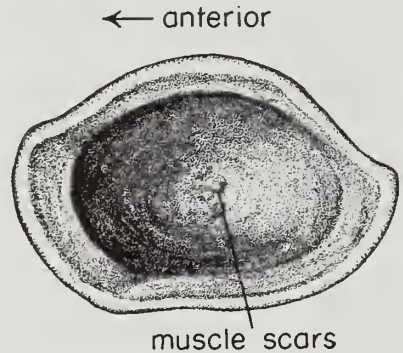


Fig. 6. - Interior view of right valve of *Bairdia* aff. *B. magna-curta* Morey showing the duplicature as well as location of muscle scars. X40.

Diagnosis. - This species can be recognized by the high, broadly arched dorsum of the left valve and the presence of a small spine on the postero-venter.

Description. - Carapace small to medium sized, subovate to elliptical in lateral view; oblong to ovate in dorsal view with the outline broken only by the two projecting posterior spines. Dorsum of right valve broadly arched; higher and more sharply arched in left valve; venter is straight to slightly concave dorsally; ends of both valves rounded in adult instars but posterior may be blunt in immature stages.

Surface smooth except for the presence of a small spine on the postero-venter near the margin of both valves. In-

terior features were obscure but the hinge structure appeared to be very simple and no duplicature was observed. Left valve appears to over-reach but does not overlap right valve. Holotype length, 1.05 mm.; height, 0.63 mm.; width, 0.50 mm.

Remarks. - Representatives of this genus are uncommon in the lower and middle Mississippian. *Waylandella dartyensis* is very similar to *W. obesa* Cooper and *W. symmetrica* Cooper (1946, p. 65, pl. 7, figs. 17-76), which were described from the Pennsylvanian of Illinois. Thus, the genus has a long stratigraphic range. Our species is quite different from the type *W. spinosa* Coryell & Billings, which might be confused with some representatives of the genus *Cvellingia*. Obviously more work needs to be done on the genus *Waylandella* before it can be considered very useful. We have placed it in the family Healdiidae because of the apparent direction of over-reach and the presence of posterior spines and an arched dorsum.

Derivation of name. - Darty Creek locality from whence the type specimens came.

Stratigraphic occurrence. - Hannibal, Chouteau, and Springville (State Pond Member) Formations of southern Illinois.

Material studied. - Fifteen specimens were considered. Specimens deposited under catalog numbers 9P9, 9P10 (cotypes from sample 4, Darty Creek locality), 9P11 (figured paratype) and 9P12 (unfigured paratypes).

Family PRIMITIIDAE Ulrich & Bassler, 1923

Genus TETRASACCULUS Stewart, 1936

Type species: *Tetrasacculus bilobus* Stewart

Tetrasacculus STEWART, 1936, Jour. Paleontology, v. 10, p. 744.

TETRASACCULUS ? STEWARTAE Benson & Collinson, n.sp.

Plate 4, figures 1-5

Diagnosis. - This species can be recognized by the development of three pairs of large, spherical brood pits or scalloped swellings along the anterior and ventral margins of the female, plus a shallow sulcus; the male possesses a small antero-ventral spine on each valve.

Description. - Carapace small to medium in size; subquadrate to subovoid in lateral view. Greatest length just ventral to dorsum; greatest height just anterior to midpoint; hinge line straight, occupying all of dorsal margin; free margin broadly arched, skewed toward the antero-venter. Subovate in dorsal view of male, obovate in female.

Surface finely reticulate with a simple but pronounced linear sulcus gently curving toward the antero-venter from the dorsum and emphasized by the slight swelling in the posterior end that forms an elongate lobe. No nodes are present. Female has three pairs of large, spherical brood pits along the anterior and ventral margins; male is almost identical to the female but possesses small spines in lieu of the brood pits and is slightly smaller.

Valves are equal. Internal structures and hinge were obscure. Length of holotype 0.80 mm.; height, 0.48 mm.; width, 0.50 mm.

Remarks. - We are somewhat dubious about placing this species in the genus *Tetrasacculus* because, even though it is very similar to other species of this genus, it contains only three pairs of brood pits instead of four. It may be possible, however, that the specimens studied were not mature and if an

adult had been found it might have had four pairs of brood pits. The smaller or younger female instars found possessed only two pairs of brood pits. The presence of brood pits on the younger females casts doubt on the theory that these structures were used by the female to carry her young. It also may be evidence that reproduction is not always confined to the last instar stage.

This species is similar to *T. oculata* (Ulrich), formerly placed in the genus *Ctenobolbina* (Ulrich, 1900, p. 184), which possesses four pairs of brood pits and is found in the Ridgetop Shale of Tennessee.

Derivation of name. - In honor of Grace Anne Stewart.

Stratigraphic occurrence. - Hannibal, Chouteau, and Springville (State Pond Member) Formations of southern Illinois and possibly the Fern Glen Formation of Missouri.

Material studied. - Thirty specimens were considered. Specimens deposited under catalog numbers 9P13, 9P14 (cotypes from sample 5 at Darty Creek locality), 9P15-17 (figured paratypes), and 9P18 (unfigured paratypes).

Family ACRONOTELLIDAE Swartz, 1936

Genus MONOCERATINA Roth, 1928

Type species: *Monoceratina ventrale* Roth

MONOCERATINA ? ELONGATA Benson & Collinson, n.sp.

Plate 3, figure 14

Diagnosis. - This species can be recognized by its long hinge and the presence of a node anterior to the midventer. Alae are characteristic of the genus.

Description. - Carapace small, fragile, long and narrow in lateral and dorsal views. Hinge straight with a broadly arched ventral margin skewed toward the anterior end, forming a long pointed posterior end and a shortly rounded anterior. Both cardinal angles obtuse; small, short alae project from the midventer. Hinge structure obscure.

Surface finely granulose with a node located just anterior to midventer. Length of holotype, 0.65 mm.; height, 0.28 mm.; width, 0.25 mm.

Remarks. - This species is doubtfully assigned to the genus *Monoceratina*; may be a form intermediate between *Monoceratina* and the genus *Triceratina*. The former typically has no nodes, whereas the latter has two. Our species bears one node and is more elongated than typical *Monoceratina*, somewhat like the elongate forms of *Triceratina*.

Derivation of name. - From its elongate shape.

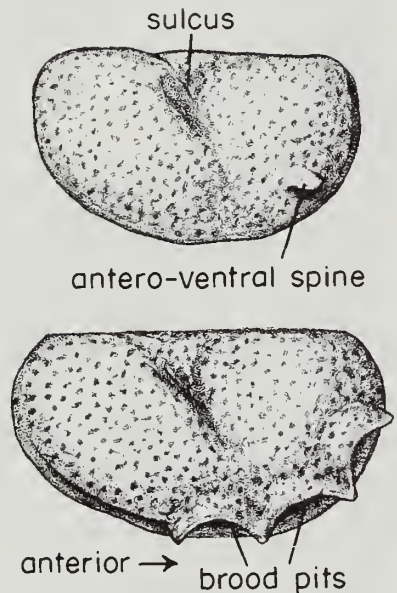


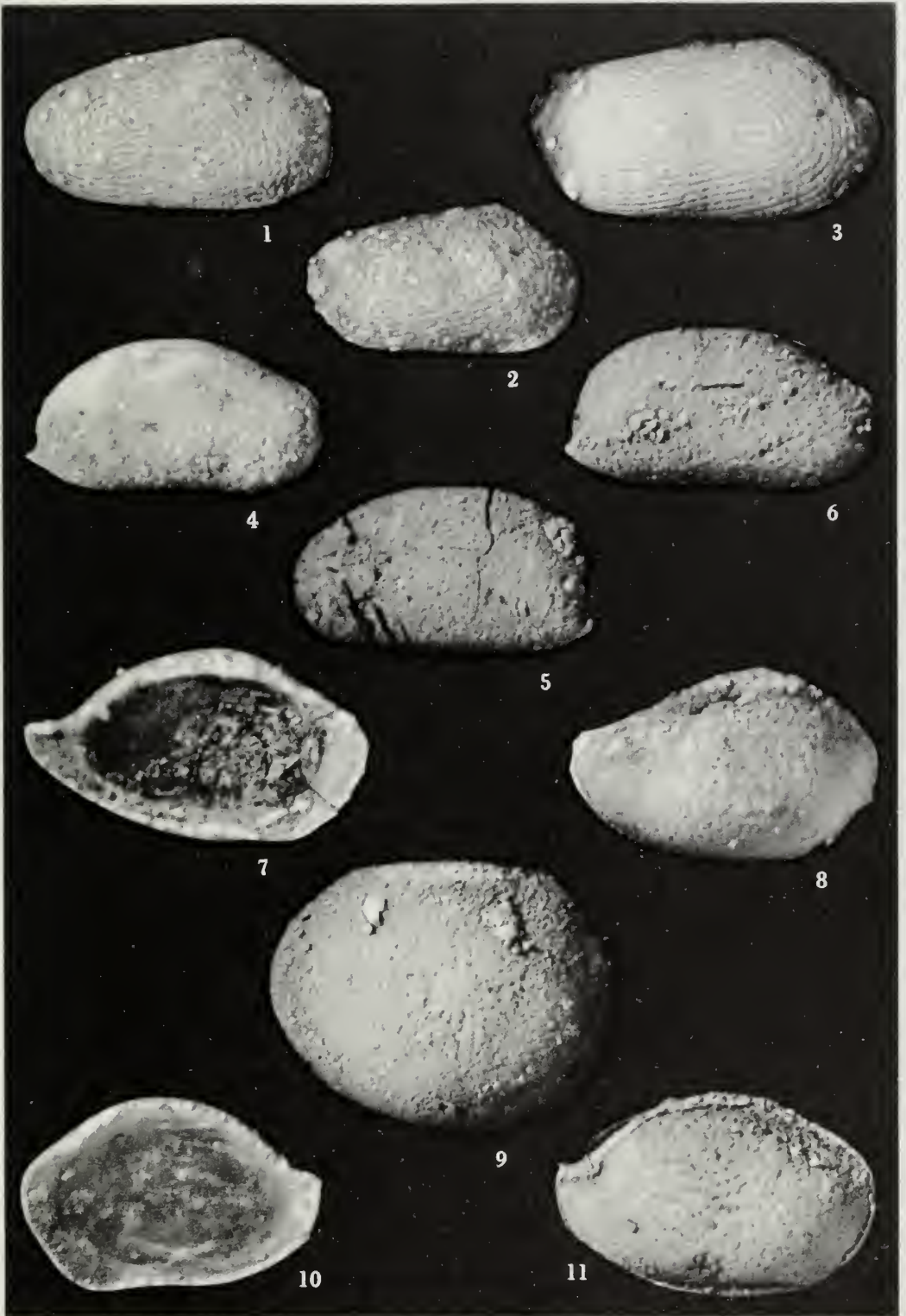
Fig. 8. - *Tetrasacculus stewartae*, n.sp. Top, lateral view of right valve of male carapace showing sulcus and anterior spine. Bottom, right lateral view of female carapace showing brood pits. All X40.

EXPLANATION OF PLATE 1

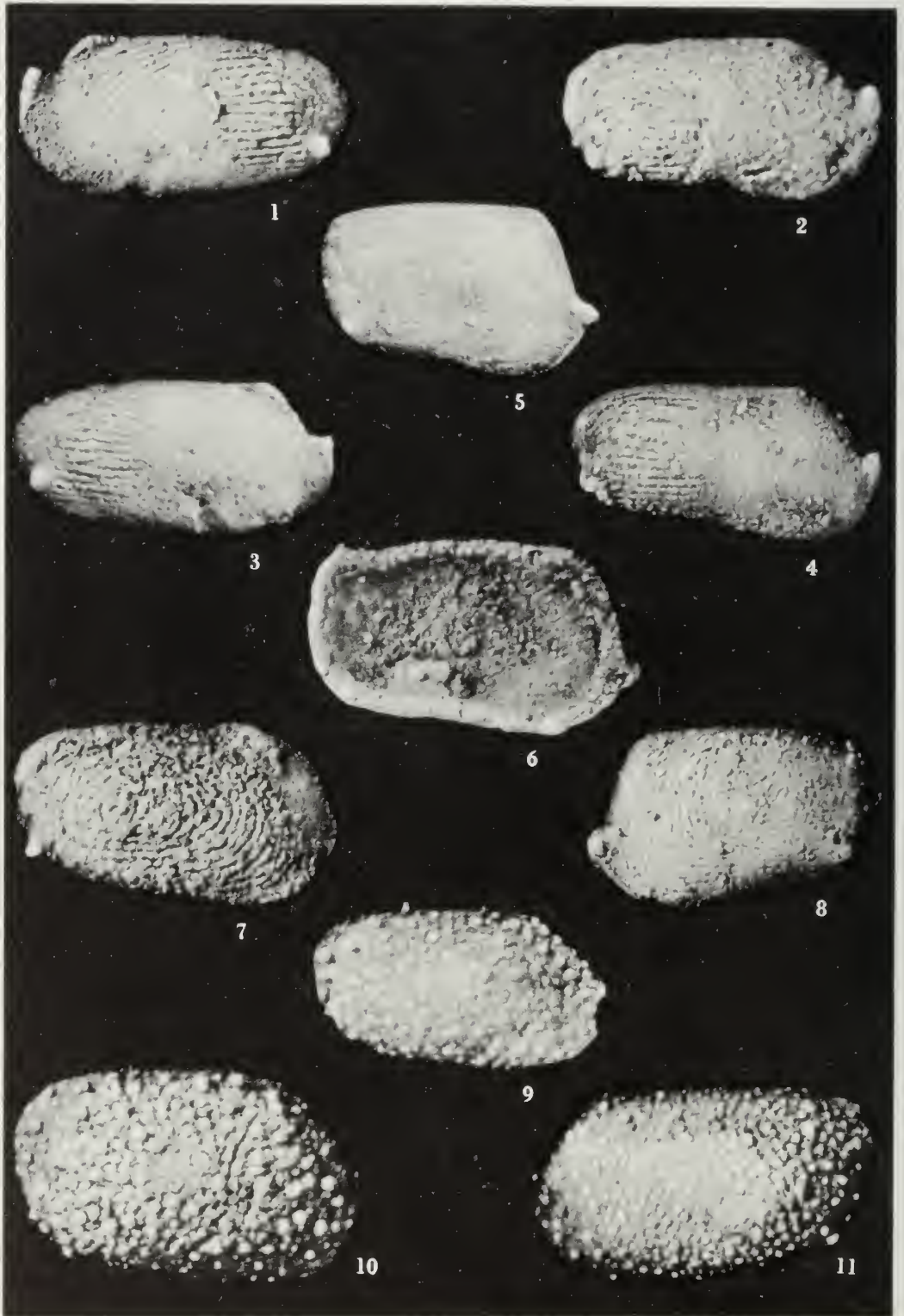
All magnifications X40

Figure

- 1, 2. - *Graphiadactyllis fayettevillensis* (Harlton).
1. - Exterior of right valve showing fingerprint surface pattern and postero-dorsal spine. 2. - Exterior of right valve of late instar.
3. - *Graphiadactyllis* aff. *G. lineatus* (Ulrich & Bassler).
Exterior of right valve showing variation in fingerprint surface pattern and small postero-ventral spine.
- 4-6. - *Waylandella dartiensis* Benson & Collinson, n.sp.
4, 5. - Exterior of right valves showing outline, surface texture and posterior spine. 6. - Exterior of left valve showing shape of valve with posterior spine. 5 and 6 are cotypes.
- 7, 8. - *Bairdia* aff. *B. kinderhookensis* Morey. 7. - Left valve showing marginal area. 8. - Exterior of right valve showing overreach of left valve and long postero-dorsal slope (specimen canted slightly with dorsum toward viewer).
9. - *Paraparchites nicklesi* (Ulrich). Exterior of right valve of mature instar showing postero-dorsal spine accentuated by coating (foreign matter in antero-dorsal region).
- 10, 11. - *Bairdia* aff. *B. magnacurta* Morey. 10. - Interior of right valve showing marginal features. 11. - Exterior of a right valve showing shape, overreach, and surface texture.



BENSON & COLLINSON — THREE OSTRACODE FAUNAS FROM SOUTHERN ILLINOIS



BENSON & COLLINSON — THREE OSTRACODE FAUNAS FROM SOUTHERN ILLINOIS

EXPLANATION OF PLATE 2

All magnifications X40

Figure

- 1-4. - *Graphidactyllis moridgei* Benson. 1. - Exterior of left valve showing fingerprint-like pattern, elongate shape, and anterior and posterior spines. 2-4. - Exterior views of right valves showing surface pattern and shape.
- 5-8. - *Graphidactyllis unionensis* Benson & Collinson, n. sp. 5. - Exterior of right valve of holotype showing faint fingerprint surface pattern and posterior and anterior spines. 6. - Interior view of left valve of paratype showing the narrow marginal area and the hinge. 7. - Exterior of right valve of paratype. 8. - Exterior of left valve of paratype.
- 9-11. - *Graphidactyllis granopunctatus* (Ulrich & Bassler). 9. - Exterior view of late instar. 10. - Exterior of right valve of adult. 11. - Exterior of left valve of adult. All show granopunctate surface texture and the central smooth spot over the muscle scar.

Stratigraphic occurrence. - Hannibal, Chouteau, and Springville (State Pond Member) Formations of southern Illinois.

Material studied. - Nineteen specimens were considered, all single valves. Reposited under catalog numbers 9P19 (holotype from sample 5 at Darty Creek locality) and 9P20 (paratypes).

MONOCERATINA cf. *M. ARDMORENSIS*
(Harlton), 1927
Plate 3, figure 13

Cythereis ? ardmorensis HARLTON, 1927, Jour. Paleontology, v. 1, p. 211, pl. 33, figs. 14 a-c; Am. Jour. Sci., ser. 5, v. 5, p. 270, pl. 2, figs. 18 a, b.

Monoceratina ardmorensis HARLTON, 1933, Jour. Paleontology, v. 7, p. 21, pl. 7, figs. 14 a, b.

Description. - Carapace small, elongate, subrectangular in lateral view; elliptical, modified by development of curved alae, in dorsal view. Hingeline straight, running almost full length of the carapace, ventral margin broadly arched, both ends blunt, alae swing posteriorly from the anterior end terminating in close to the postero-venter of the main part of the carapace. Maximum length along midline; greatest height and width just posterior to midpoint. Surface smooth. Length of figured specimen 0.58 mm.; height, 0.25 mm.; width, 0.50 mm.

Remarks. - Many forms have been assigned to *Monoceratina ardmorensis* Harlton that probably should be distinct species in their own right. However, because the number of specimens related to this form are always few in any faunal collection, not enough is known about its true variability and stratigraphic range to subdivide it properly at this time. For this reason our specimens are conditionally considered comparable to this species. They are more elongate and less triangular in dorsal view than *M. ardmorensis* and lack the spines but are similar in marginal outline.

Stratigraphic occurrence. - This species is usually found in lower Pennsylvanian strata. Found also in Springville (State Pond Member) and Chouteau Formations of southern Illinois.

Material studied. - Twelve specimens were found. Reposited under catalog numbers 9P21 (figured specimen) and 9P22 (all others).

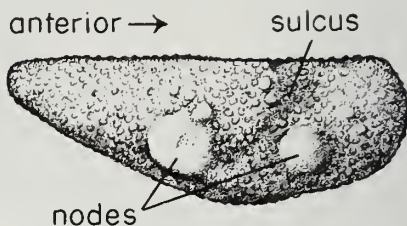


Fig. 9. - *Monoceratina ? elongata*, n. sp. Lateral view of right valve showing sulcus, nodes, and surface texture. X40.

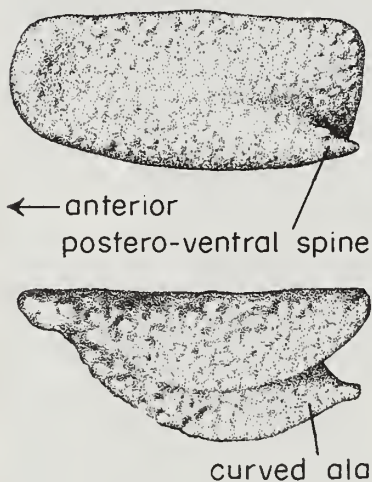


Fig. 10. - *Monoceratina* cf. *M. ardmorensis* (Harlton). Top, lateral view of left valve showing postero-ventral spine and illustrating the surface texture. Bottom, ventral view of right valve showing well developed curved ala. X40.

Family KIRKBYIDAE Ulrich & Bassler, 1916

Genus KIRKBYA Jones, 1859

Type species: *Kirkbya permiana* (Jones)

KIRKBYA FERNGLENENSIS Benson, 1955

Plate 4, figures 12-14

Kirkbya fernglenensis BENSON, 1955, Jour. Paleontology, v. 29, p. 1036, pl. 107, figs. 11, 13, 17, 18.

Diagnosis. - This species can be recognized by its large size, distinct shoulders, wide velum, and large kirkbyan pit.

Stratigraphic occurrence. - Originally described from the Fern Glen Formation and now found in the Springville and Chouteau Formations of southern Illinois.

Material studied. - Sixty specimens found, all single valves, representing all instar stages. Reposited under catalog numbers 9P23-26 (figured specimens) and 9P27 (all other specimens).

Genus KIRKBYELLA Coryell & Booth, 1933

Type species: *Kirkbyella typa* Coryell & Booth

Kirkbyella CORYELL & BOOTH, 1933, Am. Midland Naturalist, v. 15, no. 3, p. 262.

KIRKBYELLA ANNENSIS Benson & Collinson, n. sp.

Plate 4, figures 9-11

Diagnosis. - This species can be distinguished from others of its genus by the lack of a pronounced lateral ridge and by the development of a short blunt spine on the postero-ventral part of each valve.

Description. - Carapace medium-sized, subrectangular in lateral view. Greatest length through the mid-portion; dorsum and venter are approximately parallel and straight; both ends are about equally subrounded tangent to the venter, forming obtuse cardinal angles. Subovate in dorsal view, altered slightly by postero-ventral spines; subtriangular as viewed from anterior.

Only individual valves were found, and valve relationship is therefore not known. The valve walls are moderately thick, but not robust.

The surface is ornamented by a closely reticulate pattern punctuated by a short blunt postero-ventral spine and a shallow but well defined S_2 sulcus. Unlike many species of the genus, this one has no prominent ridge developed parallel to the venter. Internal features were obscure in the specimens examined. Young instars exhibited all of the features characteristic of the species but the spine is not well developed until the later stages. Length of holotype 0.83 mm.; height, 0.45 mm.; width, 0.35 mm.

Remarks. - This species is similar in appearance to *K. unicornis* Coryell & Malkin (1936, p. 5, fig. 13) except for the lack of the conspicuous ridge extending toward the anterior from the posterior spine. *K. annensis* differs from the type species, *K. typa*, in its lack of ridge development and the presence of a postero-ventral spine.

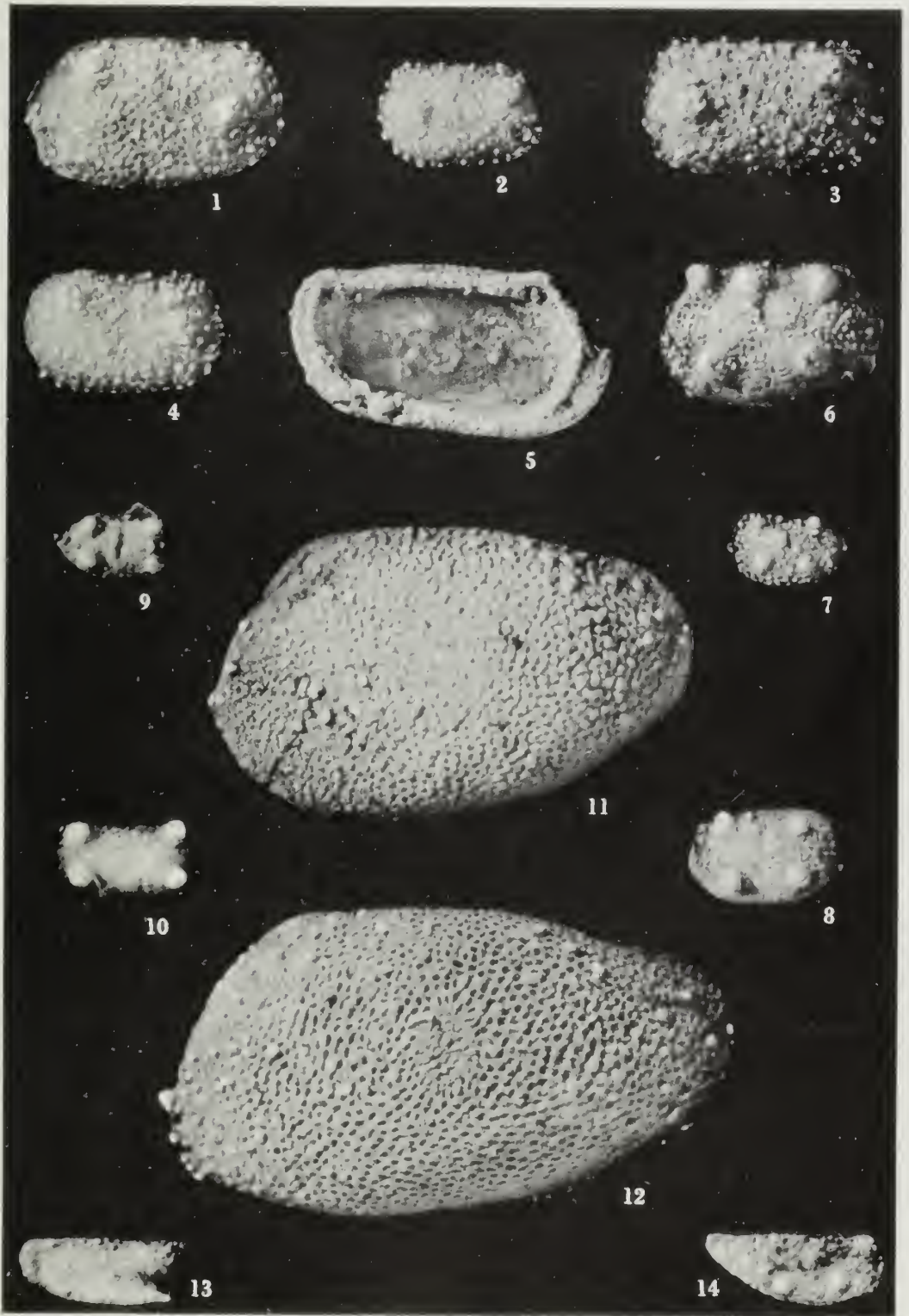
Derivation of name. - From the city of Anna in southern Illinois near the collecting locality.

EXPLANATION OF PLATE 3

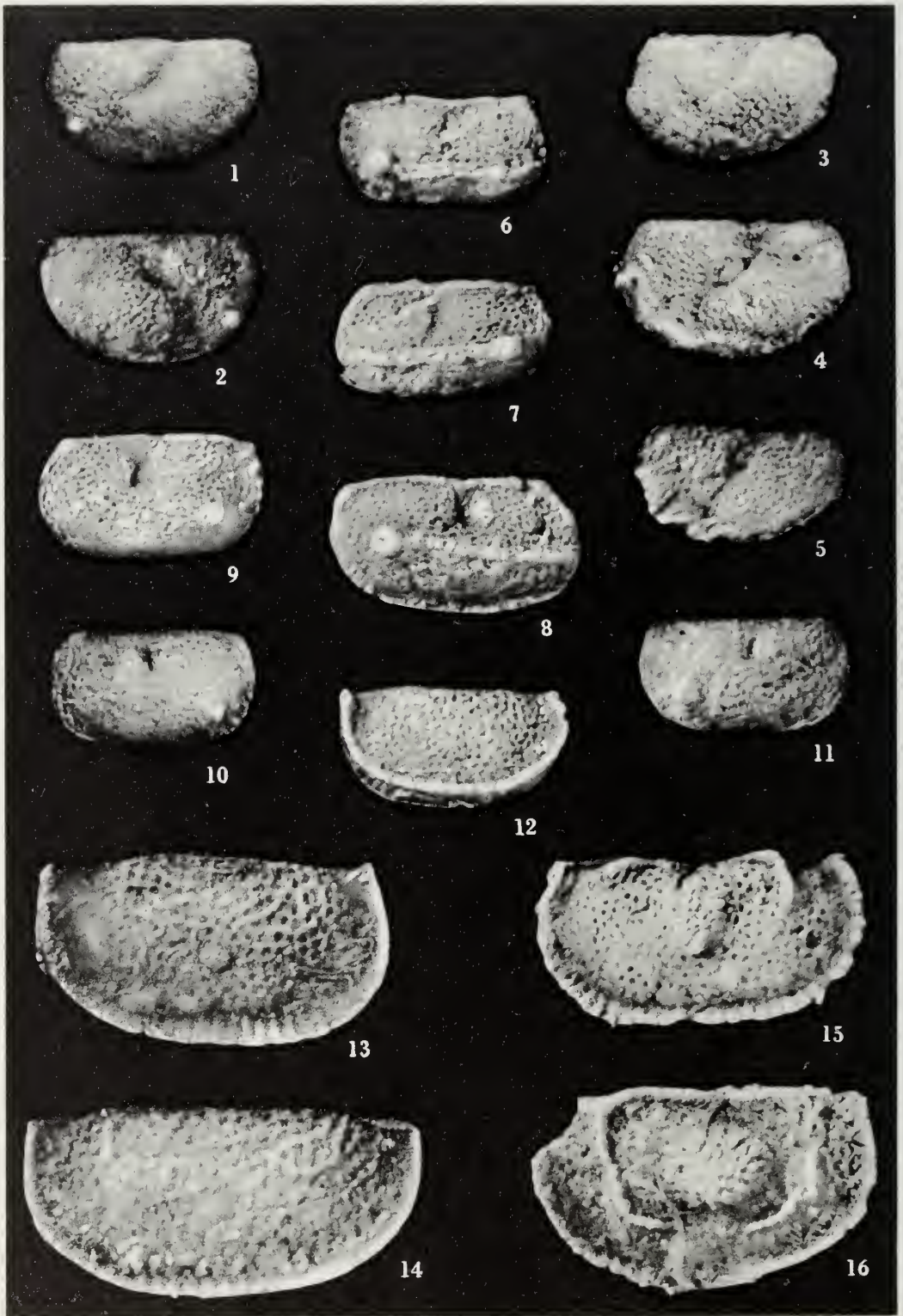
All magnifications X40

Figure

- 1-4. - *Roundyella mopacifa* Benson. 1. - Exterior of left valve showing slightly expanded anterior end and nodes. 3. - Exterior of right valve. 2, 4. - Exterior views of respective right and left valves of instars.
5. - *Graphiadactyllis moridgei* Benson. Interior view of left valve showing the development of the margin, the hinge, and the faint trace of the muscle scar.
- 6-8. - *Mauriyella mammillata* Ulrich & Bassler. 6. - Exterior view of left valve showing node development, surface texture, and shallow sulcus. 7. - Exterior left valve of early instar with only five nodes. 8. - Exterior left valve of late instar showing faint sixth node.
- 9, 10. - *Roundyella* ? Sp. Exterior views of left ? valves showing development of four nodes in early and late instars.
- 11, 12. - *Graphiadactyllis fernglenensis* Benson. 11. - Exterior of left valve of late instar. 12. - Exterior view of left valve of adult showing detailed surface pattern with differentiation around area of muscle scar.
13. - *Monoceratina* cf. *M. ardmoresis* (Harlton). Exterior view of left valve.
14. - *Monoceratina* ? *elongata* Benson & Collinson, n. sp. Exterior view of right valve of holotype.



BENSON & COLLINSON — THREE OSTRACODE FAUNAS FROM SOUTHERN ILLINOIS



BENSON & COLLINSON — THREE OSTRACODE FAUNAS FROM SOUTHERN ILLINOIS

EXPLANATION OF PLATE 4

All magnifications X40

Figure

- 1-5. - *Tetrasacculus ? stewartae* Benson & Collinson, n.sp.
1. - Exterior of right valve of male with posterior spine. 2. - Exterior of left valve of male (cotype) with posterior spine. 3, 4, 5. - Exterior views of left valves of females illustrating the development of the brood pouch; 4 represents a cotype.
- 6-8. - *Kirkbyella ozarkensis* Morey. 6. - Exterior view of right valve of a late instar. 7. - Exterior view of a left valve of a late instar. 8. - Exterior of right valve of adult showing the lateral spine, ridge and sulcus.
- 9-11. - *Kirkbyella annensis* Benson & Collinson, n.sp.
9. - Exterior left valve of the holotype. 10. - Exterior of left valve of late instar. 11. - Exterior of right valve of late instar. All show the posterior spine and sulcus.
- 12-14. - *Kirkbya fernglenensis* Benson. 12. - Exterior of right valve of early instar. 13. - Exterior of right valve of late instar. 14. - Exterior of left valve of adult. 13 and 14 show development of kirkbyan pit.
- 15-16. - *Amphissites springvillensis* Benson & Collinson, n.sp. 15. - Exterior right valve of late instar showing incomplete development of the carina. 16. - Exterior of right valve showing the chipped holotype with complete development of the carina.

Stratigraphic occurrence. - Chouteau and Springville (State Pond Member) Formations of southern Illinois.

Material studied. - About 35 specimens were considered. Specimens repositied under catalog numbers 9P28 (holotype), 9P29, 9P30 (figured paratypes) and 9P31 (unfigured paratypes).

KIRKBYELLA OZARKENSIS Morey, 1936
Plate 4, figures 6-8

Kirkbyella ozarkensis MOREY, 1936, Jour. Paleontology, v. 10, p. 118, pl. 17, fig. 1.

Diagnosis. - This species is distinguished by its broad, shallow sulcus and its long prominent ridge that is located below the sulcus and runs parallel to the dorsum. The ridge terminates in a blunt spine near the posterior.

Stratigraphic occurrence. - Originally described from the Chouteau Formation of Green and Boone counties in Missouri. Also found in the Springville (State Pond Member) and Chouteau Formations of southern Illinois.

Material studied. - Twenty-three specimens were found. Reposited under catalog numbers 9P32-34 (figured specimens) and 9P35 (all other specimens).

Subfamily AMPHISSITINAE Knight, 1928
Genus AMPHISSITES Girty, 1910
Type species: *Amphissites rugosus* Girty

Amphissites GIRTY, 1910, N. Y. Acad. Sci. Ann., v. 20, p. 235; KELLETT, 1936, Jour. Paleontology, v. 10, p. 772.

AMPHISSITES SPRINGVILLENSIS Benson & Collinson, n.sp.
Plate 4, figures 15-16

Diagnosis. - This species can be distinguished from others of its genus because the subcentral node is almost completely enveloped by carinae that join at the dorsum and are separate below the subcentral node.

Description. - Carapace large, in general robust but with delicate carinae and vela, subrectangular in lateral view. Greatest length just above midline; greatest height near mid-length; hingeline straight, ventral margin gently arched with both ends curving and terminating in a slightly obtuse angle with the hingeline.

Elongate subrectangular in dorsal view; widest in the region of the subcentral node. Blunt, wedge-shaped in end view.

Valve relationship not known because only single valves were found. Valve walls moderately thick. Interior structures are a simple reflection of the exterior with such details as hinge and muscle scar obscured; preservation of these structures poor.

Surface ornamentation is an irregular reticulate pattern out of which the carinae are developed. The pattern covers the subcentral node and tends to be carried into the wide velum that originates at the cardinal angles and continues around the venter subparallel to the free margin. The subcentral node has a reticulate surface pattern and is fairly large in diameter and prominent in some specimens. In others it tends to be smaller in diameter but remains high. The carinae are best developed at the quarter lengths along the hingeline, continuing

(in the more mature forms) to join along the dorsum, tending to circumscribe the subcentral node to form an enclosing rectangle, but remaining unclosed below the subcentral node. The anterior portion of this carina generally is more prominently developed than the posterior.

The kirkbyan pit is very subdued and sometimes difficult to observe. Three to four rows of network openings separate the velum from the ventral margin in the mature instars; there are fewer rows in the immature stages. This feature is difficult to determine in most specimens. The development of the carinae also show quite a bit of variability. Length of holotype 1.30 mm.; height, 0.83 mm.; width, 0.60 mm.

Remarks. - This species bears a close resemblance, and may be related, to *A. similaris* Morey (1936) described from the Chouteau Formation of Missouri. In the Missouri species, however, the velum is carried much higher on the side of the valve than in our species. *A. rugosus* Girty, described from the Fayetteville Shale of Arkansas, is quite different from ours. It has a relatively larger but more subtle subcentral node and carinae that surround the node and appear to be almost like secondary vela. Unfortunately, the young instars of *A. springvillensis* are difficult to identify, and only a few good fully mature specimens were found.

Derivation of name. - From the village of Springville.

Stratigraphic occurrence. - Hannibal, Chouteau, and Springville (State Pond Member) Formations of southern Illinois.

Material studied. - Forty-nine specimens were considered. Specimens repositied under catalog numbers 9P35 (holotype from sample 5 at Darty Creek locality), 9P36 (figured paratype) and 9P37 (unfigured paratypes).

Family QUASILLITIDAE Coryell & Malkin, 1936

Genus GRAPHIADACTYLLIS Roth, 1929

Type species: *Graphiadactyllis arkansana* (Girty)

Graphiodactyllis ROTH, 1929, Wagner Free Inst. Sci. Publ. no. 1, p. 10.

Graphiadactyllis Roth, BENSON, 1955, Jour. Paleontology, v. 29, p. 1033.

GRAPHIADACTYLLIS ? UNIONENSIS Benson & Collinson, n.sp.

Plate 2, figures 5-8

Graphiadactyllis cf. *G. cornutus* (Ulrich & Bassler) BENSON, 1955, Jour. Paleontology, v. 29, p. 1035, pl. 107, figs. 1-3, 9.

Diagnosis. - This new species can be recognized by the angularity of the outline of the carapace as seen in lateral view; the lack of convexity of the valves as seen from the dorsal view; the delicate fingerprint-like surface pattern, and the usual presence of two small spines on the postero-dorsum and venter.

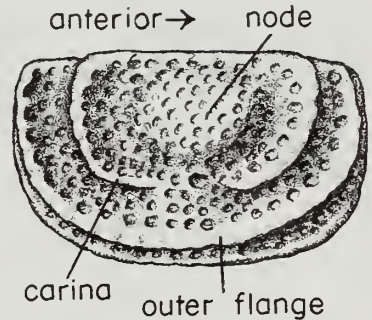


Fig. 11. - *Amphissites springvillensis*, n.sp. Lateral view showing large subcentral node, well developed inner carinae with ventral extensions and wide, plain, outer flange. X40.

Description. - Carapace small to medium sized, compressed in dorsal view, subquadrate in lateral view. Hingeline straight, venter straight converging toward dorsum posteriorly, both ends straight and subparallel, corner rounded at antero-venter. Greatest length just below the midline; greatest height in anterior end; greatest thickness in posterior end.

Surface ornamented with the fingerprint-like pattern commonly found in the genus *Graphiadactyllis*. Two small spines are located on the postero-dorsum and venter of each valve. Several specimens exhibit a third spine on the antero-ventral margin.

The hinge is not as boldly developed as is typical of the genus *Graphiadactyllis*. No duplicature or pore canals could be seen but a rough circular muscle scar, typical of the family Quasillitidae, was observed. Length of holotype 1.00 mm.; height, 0.48 mm.; width, 0.25 mm.

Remarks. - The poorly preserved specimens described from the Fern Glen Formation as *Graphiadactyllis* cf. *G. cornutus* (Ulrich & Bassler) are sufficiently similar to this species to be included in it. The similarity should be noted between *G. unionensis* and certain variations in the species described by Swartz and Oriel (1948, pl. 79, fig. 21; pl. 80, fig. 6) as *Quasillites binodosus* and *Q. lobatus* from the Windom Beds (Devonian) of New York. This serves to point out the relationship between the genera *Quasillites* and *Graphiadactyllis* and illustrates the difficulty of separating some of the species of the two genera.

Derivation of name. - From Union County, Illinois.

Stratigraphic occurrence. - Chouteau and Springville (State Pond Member) Formations of southern Illinois and the Fern Glen Formation of Missouri.

Material studied. - Eleven specimens were considered. Re deposited under catalog numbers 9P38 (holotype from bed 5 at Darty Creek locality), 9P39-41 (figured paratypes) and 9P42 (unfigured paratypes).

GRAPHIADACTYLLIS FAYETTEVILLENSIS (Harlton), 1929

Plate 1, figures 1, 2

Bassleria fayettevillensis HARLTON, 1929, Am. Jour. Sci., ser. 5, v. 18, p. 256, pl. 1, figs. 2a-c.

Paracythere cornuta ULRICH & BASSLER, 1932, Tennessee Div. Geol. Bull. 38, pl. 27, fig. 13.

Graphiadactyllis tenuis COOPER, 1941, Illinois Geol. Survey Rept. Inv. 77, p. 45, pl. 9, figs. 7-8; SWAIN, 1953, Jour. Paleontology, v. 27, p. 271.

Diagnosis. - This species can be recognized by its unique outline, the pattern of fingerprint-like riblets, and especially by its postero-dorsal spine.

Remarks. - Bassler and Kellett (1934, p. 321) erroneously included this species with *Graphiadactyllis arkansana* (Girty) which has a slightly different surface pattern and possesses no postero-dorsal spine. Ulrich and Bassler (in Bassler, 1932) overlooked Harlton's (1929) previous work and proposed *Paracythere cornuta*. Morey (1936) used Ulrich and Bassler's species name *P. cornuta* for specimens from the Chouteau Formation of Missouri that we believe are referable to a new species. Cooper (1941, p. 45) proposed a new species, *G. tenuis*, erected on specimens from Fayetteville Shale of Oklahoma and included in his synonymy Harlton's (1929) species *B. fayettevillensis* and the holotype of *Kirkbya lindahli arkansana* Girty (Roundy, 1926, pl. 1, figs. 14a-c), later selected by Roth (1929, p. 10) as the type species for his new genus

Graphiadauctylis. We believe that *G. fayettevillensis* (Harlton) is a valid species and holds priority over *G. tenuis*.

Stratigraphic occurrence. - Identified from the Springville Shale (State Pond Member) and Chouteau Limestone of Illinois, the Fayetteville Shale (Ches-ter) of Oklahoma and Arkansas, and the Ridgetop Shale of Tennessee.

Material studied. - Eighteen specimens were identified and are reposit-ed under catalog numbers 9P43, 9P44 (figured specimens) and 9P45 (all other spec-imens).

GRAPHIADACTYLLIS FERNGLENENSIS Benson, 1955

Plate 3, figures 11, 12

Graphiadauctylis fernglenensis BENSON, 1955, Jour. Paleontology, v. 29, p. 1033, pl. 108, figs. 5, 11, 13, 15-17.

Diagnosis. - This species can be distinguished from others of its genus by its large size and subreticulate surface pattern.

Remarks. - Since the original description of this species was published (Benson, 1955), many better preserved specimens, which show the internal features and some new external ones, have been found in the Springville Shale. The adductor muscle scar is circular and reflects through the carapace wall as a smooth spot in an otherwise subreticulate exterior surface. The hinge is composed of a bar with two crenulate teeth on either end in the right valve, with complementary structures in the left valve. The selvage of the right valve ap-pears to be set inside that of the left valve, but there is no general valve over-lap. The right valve was not described originally and is quite different in lateral outline from the left. The right valve is smaller with a broadly arched dorsum, a long antero-dorsal slope and a slight concavity in the venter. Some specimens found were 2.10 mm. long, and 1.13 mm. high.

Stratigraphic occurrence. - Origin-ally described from the Fern Glen For-mation and here reported from the Spring-ville Formation (State Pond Member), both lower Osage.

Material studied. - Very abundant; more than 100 specimens found. Repos-ited under catalog numbers 9P46, 9P47 (figured specimens) and 9P48 (all other specimens).

← anterior

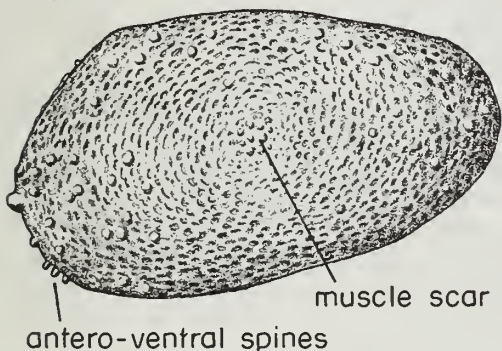


Fig. 12. - Lateral view of left valve of *Graphiadauctylis fernglenensis* Benson showing reticulate surface pattern surrounding circular muscle scar area and small antero-ventral spines on the free margin. X40.

GRAPHIADACTYLLIS MORIDGEI

Benson, 1955

Plate 2, figures 1-4; plate 3, figure 5

Graphiadauctylis moridgei BENSON, 1955, Jour. Paleontology, v. 29, p. 1035, pl. 108, figs. 1-2.

Diagnosis. - This species can be recognized by its long slim outline, small spines on the anterior margin and postero-venter, and a fingerprint-like riblet design.

Remarks. - Since publication of the original description of this species from the Fern Glen Formation of Missouri, many well preserved examples have been found in the Chouteau Formation of southern Illinois. Left valves of the species possessing an anterior spine not found in the original study have been found in our collections. Larger specimens, some possessing a small postero-ventral spine, were found in the present study indicating that the cotypes from the Fern Glen are not mature instars. Specimens showing well preserved interiors also were found. In them the anterior flange is divided into the flange proper and a small ridge that terminates in the anterior spine. The hinge structure is typical of the genus *Graphiadactyllis*. The dimensions of the Springville adult instars are: length, 1.28 mm.; height, 0.68 mm.; width, 0.50 mm.

Stratigraphic occurrence. - Springville (State Pond Member) and Chouteau Formations from southern Illinois; Fern Glen Formation from Missouri.

Material studied. - Twenty-two specimens were examined. Reposited under catalog numbers 9P49-9P54 (figured specimens) and 9P55 (all other specimens).

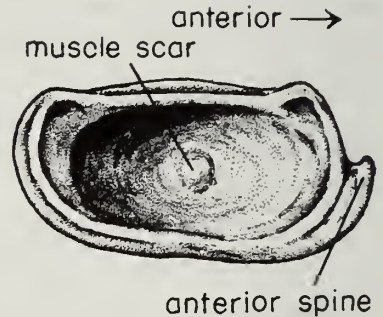


Fig. 13. - Interior view of left valve of *Graphiadactyllis moridgei* Benson showing details of the margin and hinge structure. The muscle scar is also visible. X40.

GRAPHIADACTYLLIS GRANOPUNCTATUS (Ulrich & Bassler), 1932
Plate 2, figures 9-11

Paracythere granopunctata ULRICH & BASSLER, 1932, Tennessee Div. Geol. Bull. 38, pl. 27, fig. 4; BASSLER, 1939, Jour. Washington Acad. Sci., v. 25, p. 409.

Graphiadactyllis granopunctata BENSON, 1955, Jour. Paleontology, v. 29, p. 1034, pl. 108, figs. 7, 9, 10, 12.

Diagnosis. - This species can be recognized by its granopunctate exterior surface, which has a smooth spot over the region of the muscle scar.

Stratigraphic occurrence. - Chouteau and Fern Glen Formations of Missouri, Ridgetop Shale of Tennessee, and Hannibal, Chouteau, and Springville (State Pond Member) Formations of southern Illinois.

Material studied. - Very abundant; more than 150 specimens found. Reposited under the catalog numbers 9P56-9P58 (figured specimens) and 9P59 (all other specimens).

GRAPHIADACTYLLIS aff. G. LINEATUS (Ulrich & Bassler), 1932
Plate 1, figure 3

Barychilina lineata ULRICH & BASSLER, 1932, [part], Tennessee Div. Geol. Bull. 38, pl. 27, figs. 2, 3; BASSLER, 1939, Jour. Washington Acad. Sci., v. 25, p. 409.

? *Graphiodactylus*, sp. aff. *G. lineatus* SWAIN, 1953, Jour. Paleontology, v. 27, pl. 270, pl. 38, figs. 11b, d.

Graphiadactyllis aff. *G. lineatus* BENSON, 1955, Jour. Paleontology, v. 29, p. 1034, pl. 108, figs. 3, 4, 6.

Remarks. - The specimens from the Springville (State Pond Member) Formation are very close morphologically to those described from the Fern Glen.

Material studied. - Eight specimens were found. Re deposited under catalog numbers 9P60 (figured specimen) and 9P61 (all other specimens).

Family Uncertain

Genus MAURYELLA Ulrich & Bassler, 1923

Type species: *Mauryella mammillata* ULRICH & BASSLER

Mauryella ULRICH & BASSLER, 1923, Maryland Geol. Survey, Silurian, p. 316.

MAURYELLA MAMMILLATA Ulrich & Bassler, 1923

Plate 3, figures 6-8

Diagnosis. - Adult instars of the type species and the genus can be recognized primarily by the presence of six rounded nodes, a reticulate surface pattern on a straight hinged, anteriorly swung carapace with a very subdued S_2 sulcus.

Description. - Although this species has been described by Ulrich and Bassler (1923), certain additional information can be added. Carapace medium to small in size, comparatively fragile, subovate in lateral view, and highly ornamented. Greatest length along the midline; greatest height in the anterior end in mature specimens, more central in others. Hingeline straight, free margin gently curved, skewed toward anterior. Elliptical in dorsal view, varied by the development of nodes. Only single valves found, valve size relationships unknown.

Outer surface of adult instars ornamented with six nodes, early instars and older but still immature instars have five nodes; sixth node only partially developed at maturity. Slight sulcus previously referred to by Ulrich and

Bassler as a subcentral pit is present in adult instar but difficult to observe in the immature forms. Hinge appears to be simple but was not well preserved; other interior structures were obscured by poor preservation. Length of hypotype, 0.80 mm.; height, 0.50 mm.; approximate width, 0.40 mm. Length of smallest observed instar, 0.40 mm.; height, 0.28 mm.; width, 0.25 mm.

Remarks. - There is no direct evidence as to why Ulrich and Bassler placed this genus in the family Kirkbiidae. They described it as like *Kirkbya* but without a false border. None of the Kirkbyan characteristics, such as kirkbyan pit or hinge, were seen and therefore the familial classification of this genus is left in doubt.

Stratigraphic occurrence. - Springville (State Pond Member) Formation of Illinois and Ridgetop Shale of Tennessee.

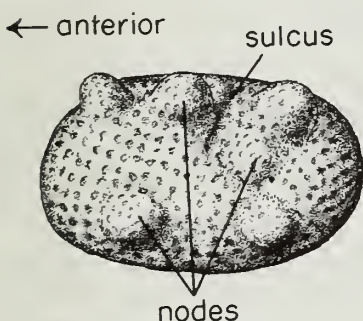


Fig. 14. - Lateral view of left valve of *Mauryella mammillata* Ulrich & Bassler showing the six nodes and slight sulcus developed on fully mature specimens. X40.

Material studied. - Eleven specimens were studied. Re deposited under catalog numbers 9P62-9P64 (figured specimens) and 9P65 (all other specimens).

Family Uncertain

Genus ROUNDYELLA Bradfield, 1935

Type species: *Roundyella simplicissimus* (Knight)

Roundyella BRADFIELD, 1935, Bull. Am. Paleontology, v. 22, no. 73, p. 66;

COOPER, 1946, Illinois Geol. Survey Bull. 70, p. 108.

Scabernia BRADFIELD, 1935, *ibid.*, p. 67.

ROUNDYELLA MOPACIFA Benson, 1955

Plate 3, figures 1-4

Roundyella mopacifa BENSON, 1955, Jour. Paleontology, v. 29, no. 6, p. 1037, pl. 107, figs. 4-6, 8, 10.

Diagnosis. - This species is distinguished from others of its genus by the prominent nodes on both ends of each valve.

Remarks. - It is now believed that the holotype of this species described from the Fern Glen Formation (Benson, 1955, p. 1037) was not oriented correctly and the orientation is actually the reverse of that indicated in the original description. In several of the Springville specimens one end is slightly higher than the other. Both ends of the Fern Glen specimen were of equal height. We believe that the higher end should be the anterior. Thus the anterior end is the one with the node near the dorsum, not near the venter as formerly stated. Both ends are of about equal thickness.

Stratigraphic occurrence. - Identified from the Fern Glen Formation of Missouri and the Chouteau and Springville (State Pond Member) Formations of southern Illinois.

Material studied. - Twenty-four specimens were found. Re deposited under catalog numbers 9P66-9P69 (figured specimens) and 9P70 (all other specimens).

Genus ROUNDYELLA ? Sp.

Plate 3, figures 9, 10

Description. - Carapace small, subrectangular in lateral view; oblong in dorsal and anterior views. Straight hingeline, broadly arched venter and rounded ends, surface reticulate with four large nodes protruding from the four corners as viewed from the side. Length of figured specimen, 0.43 mm.; height, 0.25 mm.; width, 0.23 mm.

Remarks. - Several interesting specimens were found during this study that deserve comment even though they are not common enough nor well enough understood at this time to warrant establishing a species. The genus *Roundyella* Bradfield (1935) was not originally proposed to include species having nodes on the exterior surface, and for this reason, *R. mopacifa* Benson (1955), which has two nodes, was placed in this genus with some hesitation. Although the specimens from the Springville that we refer to *Roundyella* ? sp. may not be mature, they appear to represent a species that has four nodes and that may be a link between the genera *Mauriyella* and *Roundyella*, both of which at present have poorly understood family relationships. Early instars of *Mauriyella* have five nodes, whereas these specimens are of slightly different outline and have only four nodes.

Material studied. - Nine specimens found. Revisited under catalog numbers 9P71, 9P72 (figured specimens) and 9P73 (all other specimens).

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