SOME PENNSYLVANIAN OSTRACODES
FROM THE HENRIETTA FORMATION OF EASTERN MISSOURI

by

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TABLE OF CONTENTS

Abstract	Pages	1-
Introduction	"	1-4
Systematic Paleontology	"	4-80
Family Aparchitidae	"	4-
Genus paraparchites	"	4-5
Paraparchites claytononsis Knight	"	5-7
" ladoncis "	"	7-8
Super Family Beyrichiacea	"	8
Family Primitiidae	"	8-
Genus Aechmina	"	8-9
Aechmina(?) gibberosa Knight	"	9-10
Family Beyrichiidae	"	10
Genus Hollina	"	10-
Hollina buehleri Knight	"	11-12
" fortucottensis Knight	"	13-
" ulrichi Knight	"	14-16
" bassleri Knight	"	16-17
Family Kloedenellidae Knight	"	18
Genus Jonesina	"	18
Jonesina gregaria Ulrich and Bassler	"	18-21
Jonesina arcuata Bean	"	21-23
Family Kirkbyidae	"	23-33
Genus Ulrichia Jones	"	33-
Ulrichia mortosa Knight	"	33-35
Genus Kirkbya Jones	"	35-
Kirkbya voluta Knight	"	35-38
" lacinata Knight	"	38-40
" scaphula Knight	"	40-41
" cymbula Knight	"	41-43
Genus Amphissites	"	43
Amphissites contronotus Ulrich and Bassler	"	43-46
" girtyi Knight	"	46-50
" roundyi Knight	"	50-52
" pinguis Ulrich and Bassler	"	52-55
" allorismoides Knight	"	55-58
" simplissimus Knight	"	58-60
Super Family Cypridacea	"	60
Family Bairdiidae	"	60-
Genus Bairdia	"	60-61
Bairdia moorei Knight	"	61-63
" auricula Knight	"	63-65
" seminalis Knight	"	65-66
" citriformis Knight	"	66-68
" subcitriformis Knight	"	68-69
" altifrons Knight	"	69-70

Bairdia haworthi Knight	Pages	70-71
" glennensis Harlton	"	71-72
" subelongata (?) Jones and Kirkby	"	72-73
Genus Bythocypris	"	73
Bythocypris pediformis Knight	"	74-75
" paralella Knight	"	75-76
" (?) rostrata Knight	"	76-78
Genus Healdia	"	78-79
Healdia nucleolata Knight	"	79-80
" leguminiidea Knight	"	80-81
" longa Knight	"	82-83
" limacoidea Knight	"	83-85
Family Cytherellidae	"	85
Genus Cytherella	"	85
Cytherella missouriensis Knight	"	85-87
Super Family Cytheracea	"	87
Family Cytheridae	"	87
Genus Carbonia	"	87
Carbonia(?) lenticularia Knight	"	88-89
Range of Ostracode species in the Henrietta Formation	"	90
Register of localities	"	91-92
Plates 1, 2, 3, 4, 5.		

ABSTRACT

The Pennsylvanian rocks of the St. Louis (Missouri) outlier are in part abundantly fossiliferous. Both megascopic and microscopic forms are represented. Detailed study of the fauna has been undertaken by the writer, the ostracodes being described in this paper. The collections were obtained from the Henrietta formation. The evidence for correlations is to be presented later. Thirty-eight species of ostracodes are described, of which thirty-one are new. Discussions of the Genera Kirkbya, Amphissites and Ulrichia are presented. Kirkbya and Amphissites are redefined and Ulrichia is referred to the Kirkbyidae.

INTRODUCTION

The ostracodes described in the following pages were collected during the fall and winter of 1927 while engaged in the study of the fauna and correlation of the Pennsylvanian outlier located in St. Louis and St. Louis County, Missouri. Considerable paleontological material, both megascopic and microscopic has been assembled, which is being studied for publication sometime in the near future. The plan contemplates in part the working up and publication from time

to time of natural groups of the fauna from this interesting area which may be regarded as a connecting link between the Eastern and Western interior basins of Pennsylvanian deposition.

The collections are all from the Henrietta Fromation (Lower Marmaton of the Kansas Survey) which includes the upper and lower Fort Scott limestones with their included shale, the Labette shale and the Pawnee limestone. Comparatively thin sections of the underlying Cherokee and the overlying Pleasanton formation are present but except for one horizon in the Cherokee they have not yielded marine fossils. Because of their coals or fossil plants both are considered largely non-marine as represented in the area.

In working over the collections of microscopic fossils the abundance and excellent state of preservation of the ostracodes was most striking and in view of their growing use in sub-surface correlation in the Mid-continent oil fields it was decided to proceed with their study first. It is hoped that as other workers publish investigations in this field the ostracodes may come to be recognized as valuable index fossils in the Pennsylvanian.

As time did not permit the exhaustive search of all the material on hand two collections, one from shale partings in the upper Ft. Scott limestone and the other from the lower

two feet of the Pawnee limestone were chosen and worked thoroughly. The forms noted in these two collections were found to be present in some of the collections from other horizons and from the same horizons of other localities by a more cursory examination. All forms noted in any collection were present in one or both of these two.

In identifying and describing species the value of careful discrimination has been constantly held in mind. Errors in the direction of refinement of discrimination are easily corrected when more information is forthcoming whereas when similarities are over-emphasized as appears to have been done all too often in the past, stratigraphic value is impaired if not lost altogether. In other words I have recognized as species those forms in which constant differentiating characters could be ascertained. If future work in other areas and horizons establishes a relatively short time value for the closely related forms so discriminated it will give them real value for close correlation.

I wish to express my gratitude to Dr. Raymond C. Moore of the University of Kansas under whom I have studied for the past year for much valuable counsel and advice as well as for the use of the University facilities. He has done everything within his power to further and facilitate my

work. I am also much in debt to Miss Betty Kellett, a fellow worker, for the use of a most complete bibliography of the Ostracodes painstakingly compiled by her and for many helpful suggestions. The identifications made and conclusions reached are however entirely my own.

It is my intention to deposit the types of new species described with the National Museum, although they will be retained at the University of Kansas for a while.

SYSTEMATIC PALEONTOLOGY

Family APARCHITIDAE Ulrich and Bassler

Genus PARAPARCHITES Ulrich and Bassler

The genus Paraparchites is quite primitive in aspect having much in common with its Ordovician ancestors. Lack of specialization with its consequent difficulty of discrimination has led to much confusion. Many species as now constituted are apparently composed of several, often many perhaps closely related but probably specifically distinct forms, thus giving to such species a false aspect of great stratigraphic range and wide geographic

distribution. The tendency at least until a comprehensive study of the entire genus has been made should be to discriminate rather than to associate. It is only by this means that the members of the genus can become of much value to the stratigrapher.

Two typical members of this genus are represented in my collections.

Paraparchites claytonensis n. sp.

Plate 2 figs. 8 a-d

Carapace leperditoid in outline; hinge-line straight or nearly so, from 54 to 58 percent of the length of the entire carapace; ends broadly rounded, meeting the hinge-line at an obtuse angle and rounding evenly into the ventral margin which is more flatly curved; the posterior end somewhat higher than the anterior and swinging farther out (posterior) from the hinge-line. As seen from above the form is sub-lanceolate with the sides somewhat flattened, with the flattened area a little closer to the anterior so that the posterior profile is slightly sharper than the anterior. Near both the anterior and posterior margins of one or both valves in most specimens there is also a slight sub-marginal flattening paralleling the curvature of the margin, most marked near the hinge-line and dying out about one-third the way down.

Right valve the larger, overlapping the left ventrally and extending beyond it at the ends. At the hinge-line the left valve extends a little above the right. Surface smooth and in the younger individuals quite evenly rounded, except for the low blunt or rounded tubercle on the antero-dorsal shoulder of the left valve. The older and larger individuals are also smooth-surfaced but their contours are not quite so simple, the profile of the hinge-line being somewhat convex over the anterior half and relatively shorter, and with the greatest thickness below mid-height, giving a baggy appearance.

The dimensions of two individuals, the first slightly smaller than average size and the second very large are:-

Length	1.23 mm	2.50 mm.
Height	.86	1.87
Thickness	.58	------

This very handsome species is represented in the collection by a number of individuals ranging in size from about 1 mm. in length up to the size of the large one whose measurements are shown above. Despite difference in size there can be little question but that all belong to one species.

This species resembles P. okeni Munster and P. nicklesi Ulrich rather closely but has somewhat different outlines

from each. It is typically more nearly subquadrate than P.okeni in side view and more gibbous and less drawn out when viewed from above. It is less oblique than P.nickiesi as figured by Ulrich. It's sides are also flatter.

All specimens were found in the lower foot or two of the Pawnee limestone at Locality 6.

Paraparchites laduensis n. sp.

Plate 2 fig. 7.

Carapace sub-oval in side view; hinge-line short and straight; posterior extremity the higher. The posterior border meets the hinge-line at an obtuse angle and rounds in almost a semi-circle into the ventral border, which is more rounded than that of P.claytonensis. The anterior border is also evenly rounded but meets the hinge-line at a less obtuse angle than the posterior. My only specimen is somewhat mashed and does not show its true proportions as seen from above but that part of the curvature preserved suggests a narrow lanceolate outline with rather sharp ends and without the flattening of the sides shown by P. claytonensis.

The right valve overlaps the left slightly at the ventral margin and extends slightly beyond it at the ends.

The left valve extends a little above the right at the hinge-line. Surface smooth and without a tubercle on either valve.

Dimensions:

Lenght	1.10 mm.
Height	.80 mm.

This species resembles Leperditia (Paraparchites) scotoburdigalensis (Hibbert) as figured by Jones and Kirkby in Ann.Mag.N.H.(5)v18.pl.7 fig.4 as to its side view and quite possibly as to its dorsal view as well. However it does not agree with figures of specimens identified by these authors as the same forms in some earlier publications which show greater relative height, less obliquity and a rostrum-like protrusion of the antero-dorsal angle. On this account, and as their specimens are from the Carboniferous of a distant area I consider this specifically different.

Locality and horizon. Upper Ft. Scott limestone, locality #38.

Super Family BEYRICHIACEA Ulrich and Bassler.

Family PRIMITIIDAE Ulrich and Bassler.

Genus AECHMINA Jones and Holl

The occurrence of a member of this genus in the Pennsylvanian, assuming that the reference is sustained,

is interesting. The single form so referred is perhaps not typical of Aechimina but resembles it in all essential particulars such as outline, and complete lack of ornamentation except the lobe, truly not spine-like in this species, arising from the side of each valve in a mid-dorsal position.

Aechmina (?) gibberosa n. sp.

Plate 2 figs. 9 a-b.

Carapace very small, hinge-line long and nearly straight with rounded cardinal angles. A conspicuous but low and rounded hump rises dorsally from the mid-dorsal region of each valve with the hinge-line impressed between, giving in end view a cardiform outline. These humps blend smoothly with the contours of the sides and do not protrude outwards, so that the dorsal aspect is obtusely sub-lanceolate. The ends are sub-equal and rather sharply rounded while the gently rounded ventral line swings well up toward the angles. The two valves are almost if not quite equal and the surface is smooth without ornamentation or pits of any kind. I am at a loss to choose an orientation for this little shell. The ends are almost identical and the humps have an almost imperceptable obliquity toward one end.

I know of no Carboniferous ostracods that resembles this curious species in any way. It's straight hinge-line, entirely unornamented surface and mid-dorsal humps (= spines?) suggest the genus Aechmina to which I am provisionally referring it.

It's dimensions are:

Lenght	.466 mm.
Height	.28 mm.
Width	.24 mm.

A single perfect specimen was secured from the lower two feet of the Pawnee limestone at Locality 6.

Family BEYRICHIIDAE Jones, emend Ulrich and Bassler

Genus HOLLINA Ulrich and Bassler

This genus is represented in my collections by four species, three of which would certainly have been referred to the species H. radiata Jones and Kirkby a few years ago under the extremely loose definition of that species by those authors. The fourth, although related to the more typical members by the closest bonds might be excluded because of its lack of a frill. The generic description should certainly be modified to admit forms such as my H. bassleri where the frill is reduced to a mere row of papillae or perhaps lost all together.

11.

Hollina buehleri n. sp.

Plate 2 figs. 1.

Carapace semi-ovate, oblique, about twice as long as high; hinge-line straight, anterior and rounded, posterior obliquely rounded, ventral margin curved rather flatly. Equivalved, but outer edge of margin of left valve (except at hinge-line) slightly beveled to fit under edge of right valve. This beveling on the left valve bordered by an even row of minute beads the like of which examination has failed to disclose on the right valve. A prominent dorsal sulcus slightly posterior to the middle extends down the valve about mid-way; upper end of the sulcus restricted in width by the bordering nodes. Surface of the valve posterior to the sulcus curved smoothly and rather flatly with a small node bordering and protruding into the upper two-thirds of the sulcus and barely extending above the curvature of the surface. Anterior to the sulcus a prominent circular to reniform node protruding into and constricting the sulcus opposite the posterior node. This node has considerable relief above the anterior surface of the valve. Lower surface of the valve in the form of a low, broad, poorly defined ridge connecting anterior and posterior surfaces and blending into them smoothly. A

rather narrow bilge-keel-like frill rises abruptly from a point on the anterior near the margin and about two-thirds the way down the antero-dorsal angle and extends around the valve above the margin, dying away close to the postero-dorsal angle. This frill is at an angle to the plane of juncture of the valves, the angle being greater anteriorly and flattening posteriorly. There is little or no convexity to the posterior part of the frill. The anterior margin of the valve as far down as the point at which the frill arises carries a few short irregular spines. The surface is minutely granular.

The individual figured measures:

Length	1.23 mm.
Height	.65 mm.

This species most nearly resembles H. emaciata Ulrich and Bassler from which it may be distinguished by the absence of the curved ridge in the post-dorsal angle and the rim-like border along the dorsum and anterior end. The anterior node is also more dorsal in position. It also resembles H. Fortscottensis but has a narrower, flatter frill and the granulations of the surface on the latter are more minute and less conspicuous.

Specimens were secured from the Upper Fort Scott limestone at localities 2 and 38. It is nowhere abundant.

I take pleasure in nameing this species for Dr. H. A. Buehler, Director of the Missouri Bureau of Geology and Mines and State Geologist of Missouri.

13.

Hollina fortscottensis n. sp.

Plate 2 figs. 2.

Form and general expression very similar to H.buehleri. It differs in that the frill is two to two and one half times wider than that of H.buehleri, is marketly convex posteriorly, is so elevated anteriorly that it may be said in the case of some individuals at least, to begin with a spine, and is faintly radially plicated. The anterior node is also somewhat more prominant and gibbous, and the granules on the surface of the valves are less conspicuous. It differs from H.emaciate Ulrich and Bassler in the same respects as does H.buehleri and also by the much greater width and faint plications of the frill.

This form is unquestionably distinct from H.buehleri as no intergrading forms having been noted, but whether the differences are varietal or specific is not so clear. For a number of reasons which need not be stated here, I am inclined to give constant and recognisable differences specific value, and have done so in this case.

The dimensions of the specimen figured are:

Length	1.30 mm.
Height	.75 mm.

Not very abundant in the upper Ft. Scott limestone, locality 38.

Hollina ulrichi nom.nov.
Plate 2 figs. 4 a-b.
1906, Beyrichia (Hollina) radiata, Ulrich and Bassler
(non Jones and Kirkby) Proc.U.S.N.M. No.1446,v.XXX,p 156,pl.XI,fig.5.

The description of Ulrich and Bassler is as follows:-

"Length 1.06 mm., greatest height 0.67 mm., greatest thickness about 0.5mm.

Valves somewhat oblique, hinge-line long and straight, anterior end rounded and denticulate, posterior margin obliquely truncate, surface of valves with two rounded tubercles situated on the dorsal half, one on either side of a central depression, the anterior tubercle much larger than the posterior one. Small papillae arranged somewhat scatteringly over the entire surface. A wide free rim or flange, often marked more or less obscurely with radiating lines, overhangs the ventral and posterior borders of the valve. Usually this rim is delicate and nearly flat, but with age it thickens and sometimes, as in the specimen illustrated, the post-ventral part presents a swollen appearance.

The Kansas specimens referred to this species differ in no essential respect from some of the British examples figured by Jones and Kirkby. In the specimen here figured the radial lines on the flange are very obscure, but the condition is satisfactorily accounted for by the obviously senile state of the example."

The above description and the figure accompanying it fit my specimens (None of them, unfortunately, unbroken) except that I may add that in my specimens the papillae may be sparsely distributed over the surface or may be more crowded. Also the anterior end of the frill may in some specimens begin with a distinct spine, which may be the case with the specimens of Ulrich and Bassler. It however is neither mentioned by them nor shown by their figure. The outer edge of the ventral margin of the left valve is slightly beveled as in all of my Hollinas but examination has failed to disclose the minute beading shown by the others.

The description and figure by Ulrich and Bassler of the form which they identify as Beyrichia (Hollina) radiata of Jones and Kirkby certainly agree in a general way with that species as originally defined. However Jones and Kirkby's description is so broad and their figures so diagrammatic that other and certainly distinct bi-modate frilled Hollinae might also be referred to their species equally well. A close comparison of figures fails to convince one of the exact identity of this American form with that of Jones and Kirkby. The necessity for more refined discrimination is my justification for referring the American forms

here described to new species and for renaming that form previously referred by Ulrich and Bassler to B. radiata.

This species differs from all other binodate Hollinae known to me by the combination of a papillose surface with a broad, generally convex frill faintly marked with radial undulations.

The dimensions of two specimens (restored) are:

Length	1.10 mm.	1.03 mm.
Height	.63 mm.	.58 mm.

Specimens were secured from the Upper Ft. Scott limestone at localities 2 and 38. It is the most abundant of the Hollinae.

It gives me much pleasure to name this species for Dr. E. O. Ulrich of the United States Geological Survey who for many years has been to the forefront of those studying the Ostracoda, and the next following species for Dr. Ray S. Bassler of the United States Museum who has so often colaborated with him.

Hollina bassleri n. sp.

Plate 2. figs. 3.

Outline, neglecting the frill and nodes entirely similar to H. buehleri. The anterior node is however slightly less prominent; the frill is reduced to a linear row of papillae or short spines somewhat uneven in length, which occupies the

exact position of the frill in preceding species and unquestionably is its morphological equivalent. A second row of spines extends around the ventral and end margins close to the margin of the valve and reaches almost if not quite to the hinge-line at both ends. This latter row is irregularly two ranks deep. The ventral and end margins of the left valve are slightly beveled as in H.buehleri and also carry the marginal row of minute beads. I have no right valves. The surface of the valves is minutely but strikingly papillose.

This species is clearly differentiated from all other species known to me by the complete reduction of the frill to a single row of spinelets. H.grahamensis, Harlton has two submarginal rows of spines but these, as figured by this author, are much larger and more regular subconical spikes and furthermore are described as bordering a small marginal frill which lies between them.

The dimensions of the specimen figured are:

Length	.97 mm.
Height	.56 mm.

Specimens were secured from the Upper Ft. Scott limestone at locality 38.

Family KLOEDENELLIDAE Ulrich and Bassler

Genus JONESINA Ulrich and Bassler

This genus, characterized in its simpler expression by a straight and obscurely denticulate hinge-line, unequal valves, the left being the larger, a primitian sulcus somewhat behind the middle and with the greatest thickness in the anterior half, is represented in my collections by two species which I identify with previously described forms. I am unable to add anything to what has been said previously except to point out the spinelet on the posterior margin of the form identified with J.gregaria Ulrich and Bassler.

Jonsina Gregaria Ulrich and Bassler

1906 Beyrichiella gregaria, Ulrich and Bassler;Proc.U.S.N.M.No.1446, v.XXX,p.157,pl.XI,fig.18

1908 Jonasina gregaria, Ulrich and Bassler,Proc.U.S.N.M.No.1646, v.XXXV,pl.XLIV,fig.6.

Plate 2. figs. a-g.

Ulrich's and Bassler's description of this species from material from the Upper Carboniferous of Kansas City, Missouri is as follows:-

"Length 0.95 mm., height 0.58 mm.

Valves subelliptical in outline, the hinge line nearly straight and equaling in length about four-fifths of the longest diameter of the carapace, the cardinal extremities rather

obtusely angular, the two ends subequal and rounding regularly into the ventral margin. The latter part of the outline varies in different specimens, being distinctly convex in some (as in the figured example) and quite straight in the middle third in others. Except the portion of the main vertical sulcus, which is well marked and located a little behind the center of the dorsal half, the surface markings exhibit considerable variation. The sulcus may be narrow with a broad swelling on either side, as in the figured specimen, or it may be wider, the increase being at the expense of the smaller (posterior) swelling. In the former case the posterior lobe is commonly divided medially by a faint vertical sulcus, the two sulci and the two intervening nodes giving an appearance that reminds us of the Silurian genus Kloendonia. The large anterior lobe rises abruptly from the median sulcus and is always the most prominent part of the valve. Usually a small spine, occasionally of larger size than in the figure, rises from the antero-dorsal slope, while a faint vertical sulcus is sometimes distinguishable just behind the spine. A large, ill defined, longitudinal swelling generally occupies the lower middle part of the valves, while beneath this a more or less obscure depression sets off a

vertical marginal flattening or flange. This marginal flange increases in width with age, young examples which then expose the denticulated contact edge of the valve, being without it. Although entire specimens have not been seen, the characters of the separated valves leave no doubt that the left valve is the larger and overlaps the ventral edge of the right.

"No American species with which this might be confused has been described. Compared with British species only Beyrichia arcuata Bean as figured by Jones and Kirkby, seems near enough to require care in discriminating between them. B. gregaria is proportionately higher, the anterior end especially being wider. The lobing of the valves seems to be more variable in the Kansas species, while no mention of the antero-dorsal spine is to be found in the description of B. (?) arcuata."

Most of my specimens conform very closely to the above description and the accompanying figure. Some however, grading into the more typical form, are more swollen anteriorly. Some of my more typical specimens show a minute spinelet on the posterior margin of the left valve a little below the middle. There is an indication of such a spinelet on the right valve of only one specimen (a complete one)

but as the specimen is not quite clean, I cannot be sure of its presence even rarely on this valve.

In addition to the similar species noted in the quotation from Ulrich and Bassler there is a form described by Girty from the Caney shale of Oklahoma under the name of Entomis unicornis that perhaps should be included in the synonomy. It superficially resembles my specimens very closely even to a spinelet on the posterior margin but it is proportionately longer and the sulcus is described and figured as being in front of the middle. Specimens of Girty's species would have to be examined to carry conviction as to identity or difference.

The dimensions of six measured specimens average:

Length	.783 mm.
Height	. 488 mm.

This species is fairly abundant in the Upper Ft. Scott limestone at locality 38. A single complete but rather imperfect specimen doubtfully referable to the species was found in the lower two feet of the Pawnee limestone at locality 6.

Jonesina arcuata Bean

Plate 2 figs. 6a-b.

1836 Cypris arcuata Bean, Ann. Mag. N.H., v.9, p.377, fig.55.

1866 Beyrichia arcuata Jones and Kirkby, Geol. Mag., v. 3, Dec. 3, p. 437.
1908 Jonesina arcuata Ulrich and Bassler, Proc. U.S.N.M. No. 1646, v. XXXV, pl. XLIV.
1927 Jonesina arcuata Harlton, Jo. Paleo. v. 1, No. 3, Dec. p. 205, pl. 32, figs. 6 a-c.

Outline of carapace in side view sub-oval, hinge-line straight, depressed between anterior swellings of valves. Ends rounded, as is ventral margin to a less degree. Anterior end higher and thicker than posterior, broadly arched and rather flat medially but falling away steeply toward the margins, almost overhanging the dorsal margin. This area bordered posteriorly by a narrow sulcus extending from the dorsum down the sides not quite half way. Behind the sulcus there is a more or less indistinct node which scarcely rises above a flattened area similar to that in front. This flattened or rather gently arched area is not so prominent as that before the sulcus to which it is connected by a flatly arched ridge which blends into both. A shallow and very short sulcus extends from the dorsum posterior to the above mentioned node. The right, or smaller valve is not so arched as the left and is more oblique posteriorly. Along the venter of both valves is a low but distinct longitudinal ridge scarcely passing to the ends. Surface finely pitted or reticulated.

This species does not resemble closely any known to me.

It may be distinguished from J.craterigera Jones and Kirkby by its greater relative height and from J.gregaria Ulrich and Bassler by its lack of spines, by its pitted surface and by its sub-ventral longitudinal ridges.

The dimensions of the left valve figured are:

Length	.90 mm.
Height	.55 mm.

Rare in the Upper Ft. Scott limestone at locality 2 and 38.

Family KIRKBYIDAE Jones

This family as is remarked by Ulrich and Bassler is "a most variable and probably unnatural association of equivalved genera". My collections do not afford representatives of sufficient genera of the family to permit me to offer any suggestions as to the family as a whole. However they do afford sufficient species of two types formerly associated in the genus Kirkbya and sufficiently well preserved specimens of a third type which I will call the "Kirkbyan" Ulrichiae to permit some generalizations which it is hoped will help clear up some points that have caused trouble in the past to students of these forms.

The genus Kirkbya was established by Jones in 1859 "for the reception of the species K.permiana, Jones"[1] and at the same time K.urei Jones, a typical member of that group, later

1. Originally described by Jones as Dithyrocaris permiana in King, Paleontographical Soc.Mon.1850, pp.66, Tab.18, figs.1-a, b, c, & d.

set apart by Girty as Amphissites, was referred to the new genus. K.permiana is then the genotype. In his review of the genus Kirkbya in 1885 (2) and a number of times previously, Jones rediscribes K.permiana and lists all the species of the genus known, figuring many of them. Incidentally the form he refers to and figures as K.permiana in the last mentioned article appears to be specifically different from, though closely related to the form described and figured in 1850. (1) He also describes and figures several species of Kirkbyae that have since been set aside by Girty as Glyptopleura, as well as others either broadly or typically affiliated with the genus Amphissites.

I have no Glyptopleurae in my collections so except to say that there appears to be ample justification for their exclusion from the genus Kirkbya, I will not consider them further. I do have however four species of Kirkbyae that are so similar to K.permiana as described by Jones that there can be little doubt as to their representing the more typical Kirkbyae. I also have six species referable to Amphissites, one perhaps a little doubtfully and one species referable to Ulrichia but with a decided Kirkbyan aspect.

1. Originally described by Jones as Dithyrocaris permiana in King,Paleontographical Soc.Mon.1850,pp.66,Tab.18,fig.1-a,b,c,&d.

2. Ann.& Mag.Nat.Hist.Ser.5,Vol.15,pp.174-191,1885.

The matter of orientation among the Beyrichiaceae is more or less arbitrary. No one knows which end was actually anterior or posterior. It is only important that the orientation chosen places the various characters of morphological importance in the same relative position in all forms in which such characters are found. Jones usually orientated all forms so that the thicker or blunter end was considerdd to be the posterior. As Ulrich and Bassler have observed, this criterion is uncertain, as indeed is any other when considered alone. Now, if typical specimens of Kirkbya of the K.permiana type, a "Kirkbyan" Ulrichia and Kirkbyae of the Amphissites type, all of which I have in my collection are oriented with the end showing the widest or thickest latero-dorsal point as the anterior;* then in addition to characters possessed by all three forms to a greater or less degree regardless of oriention, they have in common the following:-

1. A slight rabbetting of the inner edge of the "free margins" of the left valve to take the edge of the right thus effecting a slight overlap of the left valve over the right. This overlap is in none of them sufficiently strong to permit of its being readily seen from the outside when the valves are closed.
See Plate 1, figs B, a,b,c.

*It should be mentioned that all of these forms as represented in my collection do have such a thicker or wider point toward one end.

2. The widest latero-dorsal point is found to constitute a node, very obscure in the K.permiana type, quite prominent in the "Kirkbyan" Ulrichiae and varying from prominant to obscure in the Amphissites group.

3. Behind the above mentioned node and separated by a more or less obscure sulcus is a second node, again very obscure in the K.permiana type and situated close to the dorsum, prominant in the "Kirkbyan" Ulrichiae and farther down the side and either prominent or obscure in the Amphissites group and typically sub-centrally located on the side. At the base of this node and a little to the front of it is the "Kirkbyan" pit or muscle spot.

In addition to the above nodes common to all, the Amphissites group develops to a greater or less degree a third node, posterior in our orientation, often obscure but more often distinct and similar to but never so prominant near the dorsum as the node called anterior.

When thus orientated there is an agreement of other characters in all three groups that is too striking to be

overlooked, and is seemingly significant. If these forms, as compared, are properly oriented with respect to one another it remains to inquire which end is anterior in the accepted sense. Examination discloses that such species as exhibit clearly the usual criteria for orientation such as obliquity and sharpness of angulation confirm that the end we have chosen as anterior conforms to the usual definitions. Confusion in the past has resulted from the fact that little attempt seems to have been made to correlate features within the group and that many species exhibit the usual criteria only obscurely.

It seems clear that the two nodes developed in all three of the Kirkbyid types described are respectively the Beyrichian anterior and median nodes and that the "sulcus" between them, marked by the pit or muscle spot, is the Beyrichian median sulcus associated with attachment of the adductor muscles. Only in Amphissites is there a tendency to develop a Beyrichian posterior node. These correlations and homologies are illustrated diagrammatically in Plate I. figure A.

Having established the above correlations and orientation we are faced with the fact that Jones defines Kirkbya as

having the right valve slightly over-lapping the left, thus letting down the bars for the reference of many unrelated forms to the genus, some of them with widely over-lapping right valves. This is easily accounted for when it is recalled that Jones oriented with the thicker end as posterior thus reversing the present concept of right and left as applied to Kirkbya.(4) We are also faced by the fact that Girty in establishing the genus Amphissites(3) differentiated it from Kirkbya of Jones largely because of its supposed lack of overlap. This can only be accounted for by assuming that Girty did not consider the rabbetting of one valve to receive the edge of the other as constituting overlap. Perhaps on the other hand his specimens were not sufficiently well preserved or free from matrix to permit the rabbetting or slight overlap to be seen. Then again perhaps this character was not developed in A. rugosus, the genotype. This latter supposition is however extremely unlikely for it is well developed in all of my species quite certainly referable to the genus on all other grounds. This genus does however constitute a natural grouping within the Kirkbyidae and should be retained.

3. Annals of the N.Y.Acad. of Sciences Vol.XX,No.3,Part II,p.235,1910
4. One may be readily convinced of the probable correctness of this explanation by referring to the really excellent figures of several forms referred to K.permiana by Jones and Kirkby in their paper "On Permian Entomostroca from the Shell-Limestone of Durham", Trans.Tyneside Naturalist's Field Club,Vol.IV,No.XIV,pp. 122-171.

In view of the foregoing I propose the following re-definitions of the Genera Kirkbya and Amphissites.

Genus Kirkbya Jones - Genotype Kirkbya permiana Jones

Kirkbyidae with relatively long carapace, long straight hinge line, rather sharp cardinal angles, ends meeting the ventral line smoothly. Ventral line gently rounded to nearly straight. The ends sub-equal or one, generally the anterior, somewhat more obliquely pointed than the other, both of approximately the same height but sometimes one, generally the posterior, the higher. The left valve is slightly rabbetted on its inner edge to take the edge of the right, otherwise equivalved with simple hingement. There is a marked tendency to develop two sub-marginal, generally carinate flanges roughly following the free margins. The outer flange separated from the edges by a narrow margin and the inner from the outer by a linear generally reticulated area which tapers off as the cardinal angles are approached. The area within the inner flange typically reticulate and developing near the dorsal line two extremely obscure nodes, the anterior being higher and forming the widest part of the dorsal area and the posterior or "median" node the least developed. The downward extensions of these nodes may be obscurely

riged and may meet medienly to form a faint festoon-like ridge. A muscle spot is developed on the median-ventral slope of the inner area and may be in the form of a depressed pit, flush with the ridges of the reticulations or even protruding. It is round or sub-eliptical.

The above redefinition is intended to limit the genus to types conforming rather closely to the genotype.

Genus Amphissites Girty - Genotype Amphissites rugosus Girty
Plate figs.

Kirkbyidae with relatively short carapace, straight hinge line, rather obtuse cardinal angles. Ends typically rounded bluntly and meeting the ventral line roundly and smoothly. The ends sub-equal but one or the other may be somewhat the higher, generally the posterior and often the posterior extending obliquely downward and backward. The left valve is slightly rabbetted on its inner edge to take the edge of the right; otherwise equivalved with simple hingement. There is a tendency often wholly or in part repressed to develop two submarginal, often carinate flanges roughly following the free margins. The outer flange separated from the edges by a narrow margin and the inner from the outer by a linear typically reticulated area which tapers off as the cardinal angles are approached. The area within the inner flange typically reticulate and with a tendency to develop, often conspicuously an anterior

node forming the widest point on the dorsal margin a median node often sub-centrally situated and rounded or again lengthened into a ridge slanting obliquely upward and forward, and a posterior node, often similar in appearance to the anterior node but never approaching the dorsal area at its widest point. Any or all of these three nodes may be repressed or very obscure, particularly the median and posterior ones. The nodes have a marked tendency to develop as ridges, often carinate and often meeting one another to form loops. A muscle spot or pit, general sub-elliptial in shape is developed below and a little to the front of the median node.

The above definition of the genus Amphissites is intended to include Kirkbyae (in the wider sense) other than those conforming to that genus as redefined, and more particularly those species with the tendencies so well expressed in the genotype, A. rugosus. There is much uncertainty as to the position of some forms, mostly Devonian, so briefly described and poorly figured in the older works that I am at a loss to know many details of their makeup. Perhaps study of the actual specimens would suggest the establishment of still another genus for their reception. While what one can learn of them from the literature certainly suggests their affinities with the Kirkbyidae and possibly more specifically with Amphissites it is not at all certain that they would fall

with either Kirkbya or Amphissites as redefined.

We now come to the genus Ulrichia referred by authorities to an entirely different family, the Primitiidae. The close affinity of at least some of the Ulrichiae to the Kirkbyae has been noted before by Jones and Kirkby.(4) I am strongly of the opinion that some species, and among them possibly the genotype U.conradi Jones should be referred to the Kirkbyidae rather than the Primitiidae. However the all too brief descriptions and rather poor figures of some of the earlier workers leave me in doubt as to the presence or absence of critical characters bearing on the question. There are also many forms, referred to the genus which apparently neither actually or potentially have diagnostic Kirkbyan characters such as flanges, reticulations or a "pit", and which may well be left with the Primitiidae possibly under a new genus. Definite determination of those points, will have to await further study of actual specimens. I shall in this paper tentitavely refer the Genus to the Kirkbyidae because of the very close relationship of at least the reticulate flanged and pitted carboniferous forms to Kirkbya itself.

An interesting speculation is that the Ordovician primitia-line Ulrichiae may be in the direct ancestry of the

4. Jones and Kirkby, "On the Carb.Ostracoda from Ireland". Sci. Trans.Roy.Dublin.Soc.Vol.VI (Ser.2) 1898; pp.191-192.

of the Kirkbyidae which become so abundant in the later paleozoic and which develop in their later stages both an atavistic group, the Kirkbyae in the strict sense, and a goup with a tendency to over elaboration, Amphissites, both foretelling early extinction, yet still accompanied by the more primitive type under a new guise.

Genus ULRICHIA Jones

Ulrichia montosa n. sp.

Plate 3 figs. 1. a-b.

Outline in side view sub-semicirculer. The hinge straight and conspicuously elongate, almost if not quite equal to the greatest length, antero-dorsal angle sharp mostly so in the young, the outline of the anterior end curving downward and backward obliquely to meet the ventral line smoothly. The ventral outline nearly straight to gently convex. The post-dorsal angle slightly obtuse but sharp. The posterior end curves roundly with only a slight forward obliquity and meets the ventral line smoothly. The dorsum when viewed from the end is very narrow and sharp while the ventor is wide, concave and flanged. The inner edge of the leftvalve is rabbetted to take the beveled edge of the right thus effecting a slight overlap. A smooth margin encircles the

valves from angle to angle. Just within the margin and following it for its full length is a low carinate outer flange. Within this flange and separated from it by from three to four rows of reticulations is a prominant carinate inner flange which extends below and hides the ventral segment of the outer flange from view when seen from the side. The area between the flanges is perpendicular to the plane of juncture of the valves and wedges out toward the cardinal angles as the two flanges approach each other and meet at the angles. From the upper half of the area within the inner flange arise two very prominent nodes separated from each other by a valley-like depression and surrounded by the gently arched surface of the valves. The deparession between the nodes is not carried below the general contour of the valves. The anterior node has its lowest relief ventrally and rises upward (dorsally) with a slight backward obliquity, its narrowly rounded tip protruding a little above the hingeline. The posterior node has more relief ventrally than the anterior, does not project dorsally beyond the hinge line, is sub-triangular in shape and ends dorsally in a narrowly rounded protuberance similar to that of the anterior node. There is a rounded but not depressed "Kirkbyan" pit or muscle spot of about the diameter of two reticulation pits just

below and a little to the front of the posterior node. The entire surface of the valve including that of the two nodes is neatly reticulate with the pits arranged roughly about the two nodes. The pits of the row next the inner flange are considerably larger than those of the other rows.

This species is distinct from any other Carboniferous form known to me. It perhaps most nearly resembles Ulrichia bituberculata McCoy but differs in its sharper antero-dorsal angle and sharper more elevated nodes.

The dimensions of two specimens are:

Length	1.05	.80 mm.
Height	.50	.40 mm.

Fairly abundant in the Upper Ft. Scott limestone at locality 38. Also noted in collections from the same horizon at locality 2 and from the upper part of the Pawnee limestone at locality 7. A specimen somewhat doubtfully referable to the species was found near the top of the intermediate Ft. Scott shale at locality 43.

Genus KIRKBYA Jones

Kirkbya voluta n. sp.

Plate 3 figs. 3 a-b

Outline sub-oblong with long straight hinge-line, constituting the widest part of the carapace; ends rather squarely rounded. Cardinal angles approximately ninety

degrees, the ends sub-equal in angle, height and outline, with the anterior generally a very little higher than the posterior. Beginning at the cardinal angles the ends pass for a short way almost straight down with only a slight inward obliquity, then swing inward with a rounded curve to meet the nearly straight venter. The edges of the only left valve in my collections are obscured by matrix and I have therefore been unable to observe the rabbetting which I have observed on the left valves of others of the rather closely related K.permiana group. There is no other evidence of overlap of even the slightest degree. The smooth margin is very narrow but is continuous ventrally from angle to angle. Next to the margin is a single row of small, short, bead-like spinelets evenly spaced and of the same height. They certainly constitute the outer flange and perhaps are the broken remnants of a thin continuous carinate flange which, weakened by the usualy row of pits from each side of its base, has broken away in all of my specimens. Within and above the outer flange and separated from it by three rows of reticulation pits is a wide and conspicuous carinate inner flange passing from angle to angle and extending outward far enough to hide the outer flange when the carapace is viewed from the side. The linear area between the flanges

is widest ventrally tapering towards the angles. The noding within the inner flange by its peculiar concentrically and irregularly corrugated arrangement suggests draping from two high points along the cardinal line. One of these points, the most conspicuous and situated farthest in from the nearest cardinal angle I regard as the anterior node, homologous with the similar feature on Ulrichia montosa and with the anterior node of Amphissites. The other high point, not so prominantly developed and closer to the adjucent angle, homologise with the smaller, lower, posterior node of Ulrichia montosa and the median node of Amphissites. The most conspicuous corrugation then passes from one of these nodes to the other looping down the side of the carapace between and demarking a plateau like flattened area within the loop. Between the outer edges of this loop and the inner flange may be seen one or two, discontinous and inconspicuous concentric corrugations. On the ventral slope of the more conspicuous corrugation and somewhat behind the middle (i.e. just below and a little to the front of the homologue of the median node) is to be found the "Kirkbyan" pit or muscle spot. The pit is circular, not depressed, and of about the diameter of three reticulation pits. There is a faint indication of a cardinal ridge or carina extending close to the

hinge between the two nodes. This can only be seen from the reverse side.

This form is closely related to Ulrichia mantosa and to the genus Amphissites but closest of all to K.permiana Jones. From the latter it differs in its concentrically wrinkled surface and plateau-like area within the corrugations.

The dimensions of the specimens figured are:

Length	1.13 mm.
Height	.60 mm.

This species is rather rare in the Upper Ft. Scott limestone at locality 38.

Kirkbya laciniata n.sp.

Plate 3 figs. 5 a-b

Outline in side view canoe-shaped with long straight hinge-line, rather sharp ends and flatly curved ventral margin. My specimens, being somewhat obscured by matrix, do not show the rabbetted inner edge of the left valve but one may safely assume its presence. Edges bordered by a very narrow smooth margin followed by a row of indistinct bead-like spinelets representing the outer flange. Within this row of spinelets and separated from it by three rows of reticulation pits is an inner

flange with a wide, thin and conspicuous carina. The rows of pits just below and above this flange are as usual larger than the average, and perhaps due to the thinness of the carina it has a ruffled appearance. The carina extends outward ventrally and hides the outer flange when the carapace is viewed from the side. The area within the inner flange is gently convex and very obscurely noded or ridged in a roughly concentric manner. Two obscure nodes bordering the dorsal region may be observed, connected along the hinge-line by a low almost obsolete cardinal ridge and by another obscure ridge draped or looped down over the side. The anterior node is farthest in from its adjacent cardinal angle and is slightly more prominent than the posterior. It should be emphasized that the nodes and ridges within the inner flange are very obscure and are not revealed by casual examination. On the ventral slope of the shell a little back of the middle may be seen, with some difficulty, a small, elevated, rounded tubercle, of a little less than the diameter of two reticulation pits, which evidently marks the point of attachment for the adductor muscles and represents an inverted "Kirkbyan" pit. The entire surface is finely reticulate with no

observable definite pattern, except that the large row of pits just within the inner flange is followed by a second row, somewhat smaller than the outer row but larger than those of the general surface.

This species is closely related to K.voluta from which it differs by its lack of conspicuous concentric lateral corrugations, its more pointed ends and smaller size. It also resembles K.scaphula and K. cymbula but differs most in its more frill-like outer flange. From all of these and from any other similar form known to me it differs in its inverted tubercle-like "Kirkbyan" pit or muscle spot.

The dimensions of two specimens, both somewhat restored as to length are:

Length	.86	.84
Height	.41	.40

Rare in the Upper Ft. Scott limestone at locality 38, and 13.

Kirkbya scaphula n.sp.

Plate 3 figs. 4 a-b.

Form outline and general appearance rather similar to K.laciniata but with the ends more obtusely rounded, the curvature of the area within the inner flange more marked and the inner flange itself thicker, less extended and

not frilled. It differs also in that the outer flange is a low continuous carina and in the possession of relatively large impressed "Kirkbyan" pit, elongated parallel with the hinge-line and about three reticulation pits in length. Furthermore the noding of the central area is perhaps even more obscure with no indication of a festoon-like corrugation down over the side. The reticulation is also similar but lacks the conspicuously enlarged row of pits next the inner flange.

This species also resembles K.cymbula quite closely but is clearly distinguished from that species by the fact that its inner flange extends outward and downward so as to hide the outer flange whereas in K.cymbula the inner flange is short and does not hide the outer flange.

The dimensions of the example figured, restored as to length are:

Length	.90 mm.
Height	.45 mm.

Far from common in the Upper Ft. Scott limestone at locality 38.

Kirkbya cymbula n.sp.

Plate 3. fig#. 2.

This species resembles K.scaphula very closely

indeed in all characters but one. The inner flange on this species is shorter and as also the area between the flanges is not so steeply inclined to the plane of juncture of the valves, it is further up on the sides, leaving the low but distinct outer flange in sight when viewed from the side. The "Kirkbyan" pit is unfortunately covered by adhering matrix in both of my two specimens so that its character can only be surmised to be typical of the genus. It is interesting to note that one of my specimens is a left valve with the edge well preserved and free from matrix, thus displaying the slight rabbetting that is expected.

The ends of this and the preceding species are so much alike that almost the only criterion valuable in orientation is the slightly more pronounced elevation of the anterior or shoulder node as compared with the posterior node. This can only be clearly seen when the separated carapace is viewed from the reverse side and from a point above the hinge so as to see the contours of the very obscure nodes compared directly with the straight hinge edge itself.

This is the only member of the genus Kirkbya that closely conforming in outline with K.permiana Jones has an inner flange so little extended as to permit the observer to see distinctly the outer flange without upward

tilting of the specimen.

The dimensions are:

Length	.66 mm.
Height	.43 mm.

Rather rare in the upper Ft. Scott limestone of locality 38.

Genus AMPHISSITES Girty
as redefined

Members of this genus because of their more or less elaborate ornamentation should be exceptionally valuable for purposes of correlation. They are an important element in most Carboniferous ostracode faunae. Only a few species of the genus have been described as yet and the stratigraphic range of none of them has been established. It is to be hoped that workers particularly in the mid-continent oil fields will find opportunity to publish their findings not only relative to members of the genus Amphissites but all other ostracodes as well.

Amphissites centronotus Ulrich and Bassler

1906-Kirkbya centronota Ulrich and Bassler
Proc.U.S.N.M.Bull.No.1446,vol.30,p.159,Pl.XI,figs.16-17.

1927-Amphissites centronota Harlton
Jour.Paleo.vol.1,No.3,Dec.1927,p.207,pl.32,fig.10,a-b.

Plate 3. figs. 6.a - e.

Carapace sub-oblong in side view; cardinal angles a little greater than ninety degrees and almost equal, in some specimens one, in others the other, being the sharper. The anterior cardinal angle bears an obscure spine-like projection best seen when examined from the reverse side. The ends round more or less smoothly in the ventral outline which is flatly convex. Obliquity slight and obscure, variable. Hinge-line straight and a little less than the greatest length, slightly depressed. The edge of the left valve is rabbetted to take the beveled edge of the right thus effecting a slight overlap of the left over the right. The margin is narrow, without reticulations and continuous around the free edges from angle to angle, but narrower on the ends than on the venter. A carinate outer flange borders the margin for its entire length being separated from it by a single narrow row of reticulation pits. Separated from the outer flange by typically four, sometimes three and on the ends fewer rows of reticulation pits is an inner flange, conspicuously carinate in older specimens and passing within and above the outer flange from angle to angle. The anterior and posterior nodes are ridge like and carinate. They may be said to arise at the salients of the cardinal ridge about one third the way in from each angle and passing down the sides curving slightly inwardly die out

about the width of two reticulation pits before meeting the inner flange. There is a well developed carinate cardinal ridge formed as if by the protruding edges of the narrow dorsal plate, which bends outward in sharp salients at the juncture with the ends of the ridge like anterior and posterior nodes, the farthest at the juncture with the end of the anterior. The dorsal plate itself is narrow and suggests a fleur-de-lis in outline ~~dwn~~ seen from above, with theprotruding median nodes doing duty as the cross bar. It slopes from both sides to the impressed hinge and bears a single row of indistinct, lengthened reticulation pits near its edges at the base of the protruding carina of the cardinal ridges. Located subcentrally is the most conspicuous feature of the shell, a rounded almost hemispherical median node from three to four of the body reticulation pits in diameter. The surface of the valve within the inner flange and cardinal ridge is neatly reticulated in no describable pattern except a roughly concentric arrangement. The surface of the median node is reticulated, the pits being conspicuously smaller than those elsewhere. A sub-elliptical "Kirkbyan" pit or muscle spot is found just below and a little to the front of the median node with its long axis tilted obliquely upward and forward. The length of the pit is about that of two reticulation pits and it is

well impressed below the meshes of the reticulations.

A. centronotus resembles most closely A.girtyi from which it may be readily differentiated by the lack of the bar connecting the median node with the lower end of the posterior node in that species. It differs from A.rugosus Girty in its more restricted and sharply defined median node and in the fact that its anterior and posterior nodes are not joined below the median node as in that species. From A.chappelensis Roundy it differs in the more sharply defined median node and by the fact that the anterior node in that species is considerably shorter than the posterior. The dimensions of four specimens are:

Length	.62	.65	.63	.66
Height	.51	.46	.39	.—
Width	.—	.—	.—	.32

This is perhaps the most abundant ostracode in the Upper Ft. Scott limestone at locality 38. It has been found at the same horizon at localities 2, 12 and 13, and in the Lower Ft. Scott limestone at locality 11, also in the Upper two feet of the Labette shale at locality 43.

Amphissites girtyi n.sp.

Plate 3 figs. 7 a.-b.

Carapace sub-oblong in side view; hinge straight and slightly shorter than the greatest length; cardinal

angles a little greater than ninety degrees and nearly equal one being the sharper in some specimens and the other in others. The ends are rounded, the posterior less so and somewhat oblique and with an almost sub-angular juncture with the posterior end of the ventral profile, itself very slightly concave. The edge of the left valve is rabbetted to take the beveled edge of the right thus overlapping it slightly. The margin is narrow, most so as the angles are approached, and without reticulations. A carinate outer flange, thickened distally, borders the margin for its entire length and is separated from it by only a narrow very indistinct row of reticulation pits. Separated from the outer flange by typically four rows of reticulation pits, fewer as the angles are approached, is an inner flange conspicuously carinate and passing within and above the outer flange from angle to angle. Both the anterior and posterior nodes are defined by well developed carinae. The anterior may be said to originate at the salient of the cardinal ridge formed at the juncture of the two. It passes obliquely downward and backward with only a slight curve dying out about two rows of reticulation pits from the inner flange. The carina of the posterior node may be said to originate in the same way as

the anterior except somewhat closer to the nearby angle. It passes obliquely downward and backward, paralleling the anterior until at the level of the central node where it turns sharply forward to meet the central node in the form of a horizontal bar. The carinae of the anterior and posterior nodes together with the included segment of the cardinal ridge and the median node form a recumbant capital G, reversed on the left valve. There is a well developed carinate cardinal ridge formed as if by the projecting edges of the narrow dorsal plate. The carinate cardinal ridge projects outward in salients at its juncture with the dorsal ends of the anterior and posterior nodes. The narrow dorsal plate is much wider at the anterior salient than at the posterior which is obscure; it slopes sharply to the impressed hinge and is bordered at the base of the carina of the cardinal ridge by a single row of reticulation pits. The sides bear somewhat behind the middle a small but prominent sub-hemispherical median node joined as mentioned above to the lower end of the posterior node by a horizontal carina. Just below and a little in front of the median node is a sub-elliptal "Kirkbyan" pit or muscle spot, about the

length of two reticulation pits and with its long axis obliquely upward and forward. The entire area bounded by the inner flange and cardinal ridge is neatly reticulated but without recognizable pattern except that as in all carinate members of the genus known to me the pits bordering the carinae are larger than the others and seem to control their pattern. The median node is reticulated but on a much smaller scale than the rest of the carapace.

This form is clearly differentiated from A.centronotus which it most nearly resembles, by its smaller median node, the horizontal carina connecting that node and carina of the posterior node, by its relatively greater length and more oblique posterior profile. Its carinae are also more thickened distally, its dorsal plate narrower particularly posteriorly, and the ventral profile concave.

Average dimensions of two specimens are:

Length	.71 mm.
Height	.40 mm.

Moderately abundant in the Upper Ft. Scott limestone at locality 38. It is also present at the same horizon at locality 2.

It seems fitting that this handsome species should be named for Dr. George H. Girty and the next following

for Dr. P. V. Roundy, both members of the United States Geological Survey and both having made valuable contributions to the literature on this interesting group.

Amphissites roundyi n. sp.

Plate 3. figs. 8 a-b.

Carapace sub-oblong in side view, hinge straight or slightly concave, slightly shorter than the greatest length, depressed. Cardinal angles sub-equal and rather obtuse. Ends evenly rounded, the posterior somewhat the higher. The ventral profile is slightly concave medially and rounds smoothly into the ends. The edge of the left valve is obscurely rabbetted to take the sharper or beveled edge of the right thus overlapping it slightly. The margin is narrow but distinct and blends dorsally with the narrow dorsal plate, thus together encircling the valve. The outer flange is poorly developed and is represented by a narrow carina bordering the margin from angle to angle. It is widest at the curvature joining the ends and venter and narrowest mid-ventrally and as the cardinal angles are approached. Within and above the outer flange about the width of two reticulations is a poorly developed inner

flange which is not carinate and is almost if not quite crossed by the reticulation meshes. It is best developed ventrally dying away just before reaching the antero-cardinal angle and is absent or only faintly developed posteriorly. The posterior node is very faintly developed to obsolete. The anterior node is represented by a rounded non-carinate ridge of some relief, particularly on its anterior side. It may be said to originate at the shoulder a little behind the antero-dorsal margin and extend down the side, curving slightly backward and dying out about the width of two reticulation pits before reaching the inner flange. The non-carinate dorsal ridge is short and is confined to the shoulder area. The median node has low relief and is prolonged as a low rounded non-carinate ridge obliquely forward and upward till it blends with the short cardinal ridge of the shoulder which is itself formed by confluence of the extended median node, the cardinal ridge and the anterior node. The dorsal plate is narrow and appears as a continuation of the margins. It does not extend on to the shoulders as a clearly defined non-reticulated plate. The "Kirkbyan" pit or muscle spot is sub-elliptical in outline, and about the length of two reticulation pits. It is sub-centrally

located below and in front of the lower end of the median node and its long axis lies parallel to that of the node. The entire surface of the valve except for the narrow margin and dorsal plate is reticulate with no discernable pattern.

This species is perhaps nearest to A.pinguis but is easily distinguished by its concave ventral profile, its carinate outer flange and its better defined ridges and nodes. It differs from A. dattonensis Harlton by its lack of a carina at the position of the median node and in that its inner flange is not only non-carinate but weaker posteriorly and stronger anteriorly. In making comparison with this latter species I reverse Harlton's orientation.

This species forms an interesting connecting link between the more typical members of the genus with well developed generic characters and those such as A.pinguis with these characters less well developed or more obscure.

The dimensions of two representative specimens average:

Length	.68 mm.
Height	.385 mm.

Fairly abundant in the Upper Ft. Scott limestone at locality 2, 37 and 38.

Amphissites pinguis Ulrich and Bassler

1906- Kirkbya pinguis Ulrich and Bassler
Proc.U.S.N.Mus.No.1446,Vol.XXX,p.159,pl.XI,figs.13-15

Plate 3 fig. 9.

Carapace strongly arched and thick; sub-oblong in side view; hinge straight, impressed between the shoulders, somewhat shorter than greatest length. Ends evenly rounded, ventral profile almost flat in the middle, rounded toward the ends. The cardinal angles are obtuse and sub-equal, the anterior perhaps slightly more marked. Having but a single very perfect right valve and no left in my collections I have not observed the rabbetting of the edge of the left but the edge of the right suggests the usual overlap of the left. The margin which extends from angle to angle is narrow but distinct and is broader ventrally than on the ends. The outer flange is represented ventrally and anteriorly by a low but sharp rise away from the margin. It is only very slightly carinate close to the antero dorsal margin and is not developed on the posterior end. The inner flange is vaguely but recognizably expressed ventrally and anteriorly by a more abrupt curvature of the surface of the valve four or five rows of reticulation pits up from the outer flange. It is unrecognizable posteriorly, non-carinate and crossed by the meshes of the reticulations. The posterior node is obsolete while the anterior is present but low, broad and rounded. It is expressed as a rounded node at the

shoulder gradually blending into the contours of the valve until just below the level of the "pit" it becomes indistinguishable. Its anterior and dorsal relief is considerable but is scarcely to be recognized posteriorly. The cardinal ridge expressed only near the anterior end is short and indistinct. It enters with the anterior node into the formation of the shoulder. The dorsal plate as a clearly defined flattish non-reticulate area is entirely wanting but is probably represented by the inner slope of the shoulder toward the hinge. The median node is low and ill defined with its longer axis sloping obliquely upward and foward. It extends as an obscure low ridge to the cardinal ridge at the shoulder. The "Kirkbyan" pit or muscle spot is large being about as long as three reticulation pits. It is sub-elliptical in outline, depressed and with its long axis obliquely upward and forward. It is sub-centrally located just below and to the front of the median node. The entire surface excepting the margin is neatly reticulated.

This species is distinguished from A.roundyi which it resembles somewhat by its more obscure ridging and noding and by its greater relative height and convexity.

The dimensions are:

Length	.80 mm.
Height	.48 mm.

It will be noted that my specimen is considerably larger than those originally described by Ulrich and Bassler. It does not differ, however, in any other respect and hardly warrants the establishment of a variety based on size alone. Certainly not until more specimens of each are studied to learn whether or not the difference in size is constant. It will be noted that I have reversed the original orientation of Ulrich and Bassler.

Rare in the Upper Ft. Scott limestone at locality 38.

Amphissites allorismoides n. sp.

Plate 3 figs. 10 a.-c.

Outline sub-oblong in side view suggesting that of the pelecypod genus Allorisma. Hinge-line straight, nearly equal to the greatest length, impressed for nearly its full length. Cardinal angles obtuse, approximately equal. The ends rounded, the anterior more sharply than the posterior which is the higher. Ventral profile long and nearly straight but somewhat concave at the middle. Left valve with its edge rabbetted to take the edge of the right, thus slightly overlapping it. This overlap is observed with difficulty

when the two valves are closed. A narrow unreticulated margin extends from angle to angle and is widest ventrally. The margins are slightly thickened at the edge or contact to form an indistinct flange not to be confused with the typical flanges of the genus. Just outside the margin and separated from it by a narrow groove is a low but distinct carinate outer flange passing from angle to angle. Within and above this is another low but distinct flange, the inner flange, which also passes from angle to angle. The two flanges are separated by three rows of reticulation pits arranged rather strikingly in alternate series and persisting as smaller pits well up toward the angles. Within the inner flange and between it and the central nodiferous area is a flat band three rows of reticulation pits wide, which is clearly defined ventrally and anteriorly but which blends out on the posterior end. The rounded and non-carinate anterior node is quite prominent on its anterior face and less so posteriorly. It may be said to arise from the rounded cardinal ridge

at the shoulder and pass down the side of the valve with a slight backward curve, dying out rather suddenly at the flat band or border within the inner flange. The posterior node is less clearly defined than the anterior and passes from the cardinal ridge downward and forward bordering the flat band and obscurely joining the lower end of the obscurely ridge-like median node. This latter extends thence upward and forward to join the cardinal ridge just behind the dorsal end of the anterior node. All are non-carinate. The anterior and posterior nodes, one blending into the upper end of the obliquely elongated median node through the cardinal ridge and the other to its lower end, suggest an obscure recumbent letter S, reversed on the left valve. The cardinal ridge is long, rounded and non-carinate forming the shoulder anteriorly at its juncture with the anterior node and the upper end of the median node. There is no true dorsal plate although the dorsal outline is elongate cardiform. The sub-circular scarcely impressed "Kirkbyan pit" or muscle spot, a little larger than one reticulation pit, is located medially somewhat below

the center in a dimple-like depression below the lower anterior slope of the median node.

The entire surface within the inner flange is conspicuously reticulated with large open meshes. The meshes of the reticulations cross all ridges and nodes except the two flanges.

The development of the noding in this species suggests most closely perhaps A.rcundyi. It is easily differentiated from that species, however, by its greater relative length, and its two conspicuous carinate flanges. Its allorisma-like shape is also very distinctive.

Dimensions of two specimens are:

Length	.73 mm.	.62 mm.
Height	.38	.41

This form is rather abundant in the upper Ft. Scott limestone at locality 38. It has also been found at the same horizon at locality 32.

Amphiscites simplissimus n. sp.

Plate 3 figs. 11.a-d.

Form sub-oblong with rounded almost semi-circular ends so nearly alike that it is impossible to tell one from the other. The angles at the junctures of the ends with the straight hinge-line obscure and alike without a

uniformly more distinct angle at either end. Ventral line straight and very similar to dorsal except that it joins the ends more smoothly. Dorsal view narrowly sub-oblong with parallel sides and bluntly rounded ends. Valves slightly unequal, the left being rabbetted on its inner edge around the free margins to take the edge of the other. There is a narrow smooth margin, widest on the left valve which passes completely around the valves. No sulci, nodes or flanges are developed, except that the antero-dorsal region is slightly wider than the post-dorsal which slopes to the dorsum more flatly. The surface of the valves except on the margins is, typically, obscurely reticulated though the reticulations may be in part or almost entirely lacking, being in such examples either undeveloped or exfoliated. A circular "Kirkbyan" pit or muscle spot of about the diameter of two reticulation pits and not impressed below the surface is located at the center of each valve. Short spinolets arise irregularly from the points of juncture of the meshes of the reticulations, or may be absent from non-development or exfoliation. These are often most prominent next to the ventral and end margins and may be homologous with the carinate outer flange of some Amphissitidae.

Attempts to discover other linear arrangement of spinelets over the surface of the valve were unsuccessful.

My reference of this species to the genus Amphissites is obviously not because it possesses the characteristic noding, but because of its straight-line, rounded ends, rabbetted and slightly overlapping left valve, "Kirkbyan pit" and reticulated surface. This form may represent the complete repression of the more typical noding and ridging of the genus and therefore be its simplest and least typical expression.

This species resembles no other known to me from the Carboniferous. Its extreme simplicity of outline and contour taken in connection with its obscure reticulations, "pit" and spinelets set it off to itself.

The average dimensions of several specimens are:

Length	.65 mm.
Height	.36 mm.
Width	.25 mm.

Abundant in the Upper Ft.-Scott limestone at locality 38. Also noted from the same horizon at locality 37.

Super-family CYPRIDACEA

Family BAIRDIIDAE

Genus BAIRDIA McCoy

This ubiquitous genus is well represented in my

collections, there being nine species all distinct and not intergrading. Members of the genus would no doubt be more valuable than they are to the practical stratigrapher were it not for the fact that their generic characters are so very much more marked and conspicuous than the specific that the finer specific discrimination is often difficult to make. It has often been said that "all Bairdias look alike". This difficulty is however more apparent than real and close and critical comparison of good material soon shows up distinctions that are specifically constant and with a little practice are readily recognized.

Such discrimination has not always been practiced and there is considerable difficulty in properly referring forms to the more or less composite species of the older authors.

Bairdia moorei n. sp.

Plate 4, figs. 1 a-c.

Outline in side view rather like that of an obese sun-perch with its fins removed, typically bairdian. Dorsal outline of the larger (left) valve rather sharply arched and quite thick over the hinge-line, falling away from the posterior end of the hinge obliquely in a nearly straight line with an indistinct upward tendency

at the bluntly acuminate posterior "beak". The ventral line curves gently downward and forward flattening somewhat for the middle half of its length and curving smoothly and gently upward to meet the rather narrowly rounded anterior end. The antero dorsal slope is very slightly concave. The smaller "right" valve has a narrower outline and a gently convex to flat hinge-line which is about half the length of the carapace. The posterior end of the hinge is more definitely angled than that of the left valve and the posterior beak is sharper and more projecting. The antero dorsal line follows closely the outline of the left valve but continues to the anterior and more straightly forming a sub-angular juncture with it. The ventral curve is gentle but has a marked re-entrant sinuosity slightly back of the middle. The overlap of the left valve is distinct except at the anterior end where the left valve extends only slightly beyond the right. It is most pronounced in the sub-triangular area above the hinge-line and along the sinuosity of the ventral margin of the right valve where it is almost angular. The outline when viewed from above is lanceolate with smoothly rounding sides. The greatest thickness is at about the middle. In end view the greatest

thickness is somewhat below the middle.

This form resembles B. beedei Ulrich and Bassler, as to general proportions and outline but differs in being more extended anteriorly and in the more marked and almost angular overlap in the ventral sinuosity of the right valve.

The dimensions of the two perfect specimens are:

Length		1.45 mm.	1.43 mm.
Height	R.V.	.72	.70
	L.V.	.86	—
Width		.65	—

Common but not abundant in the upper Ft. Scott limestone at locality 38, and 2. A somewhat doubtful specimen was noted from locality 9.

This species is named for Dr. Raymond C. Moore of the University of Kansas, State Geologist of Kansas, under whom it has been my pleasure to have studied for the past year.

Bairdia auricula n. sp.

Plate 4 figs. 3 a-b.

Outline in side view sub-ovate. The larger (left) valve is a little over one and one half times as long as high. Dorsal outline roundly arched with the highest point about midway between the ends. Posterior dorsal slope straight from rounded central portion to posterior end

of the hinge-line over which a low obtuse curve is formed and below which the margin falls away obliquely backwards to the rounded protruding posterior beak. From the beak the ventral margin passes downward and forward for a short distance meeting the straight ventral portion evenly. The anterior end is high and broadly rounded with a slight upward obliquity. The rather short dorso-anterior margin is straight and blends smoothly with the anterior end. The smaller (right) valve has a narrower outline but except dorsally follows the outlines of the right quite closely. There is an obscure and broad re-entrant concavity in front of the middle. The hinge-line is comparatively long being about seventy percent of the total length and is gently and broadly arched. The left valve overlaps only slightly and extends an appreciable distance beyond the right only above the hinge-line.

This species differs from B.moorei in its greater relative height, its more rounded outlines, particularly that of the anterior end, in its flatter ventral line and its longer hinge-line. It differs in much the same respects from B.beedei. From B.seminalis by its straighter ventral line, rounder anterior, less rounded post-dorsal line and greater size.

The dimensions are:

Length		1.10 mm.
Height	L.V.	.70 mm.
	R.V.	.65 mm.

Rare in the Upper Ft. Scott limestone at locality 38.

Bairdia seminalis n.sp.
Plate 4. figs. 2 a-d.

Outline of the larger (left) valve sub-oval, the entire carapace having a seed-like aspect. Dorsal outline roundly curved, slightly flattened on the antero-dorsal and less so on the post-dorsal slope. No angulation over the post-dorsal end of the hinge. Posterior beak bluntly, angular but not conspicuous. Ventral outline roundly and gently curved for its posterior three quarters and more abruptly upward to the somewhat more sharply rounded anterior end. Outline when viewed from above broadly lanceolate and gently convex, the broadest point being about mid-way. The outline of the smaller (right) valve is considerably narrower and sub-oblong. The hinge-line is comparatively short being about fifty-five percent of the total length. The dorsal margin of the right valves is flatly arched with a backward slope along the hinge with a steeply rounded post-dorsal and more gradual antero-dorsal slope. The anterior end is somewhat drawn out. The overlap

of the left valve is rather pronounced, particularly along the dorsal line. It is even more conspicuous than usual ventrally. The produced anterior end of the right valve however extends forward almost as far as that of the left.

This small Bairdia is easily differentiated from any Carboniferous form with which I am familiar by its small size, rounded outlines, inconspicuous "beak" and marked overlap.

The dimensions of two specimens are:

Length	.75 mm.	.78 mm.
Height L.V.	.48 mm.	.53 mm.
Width	.35 mm.	___ mm.

It is fairly abundant in the Upper Ft. Scott limestone of locality 38. It is also present and often abundant in the same horizon at localities 2, 9, 12, 13, and 37, from the Lower Fort Scott limestone at locality 28, from the upper two feet of the Labette shale at locality 43, and from the upper part of the Pawnee limestone at locality 7.

Bairdia citriformis n. sp.

Plate 4 figs. 4 a.-c.

Outline, when seen from the side sub-triangular to sub-oval and from above sub-lanceolate, broadly sub-elliptical. The pointed and drawn out ends with the tendency to obesity suggest the outline of a lemon from either view. The dorsal line arched usually

smoothly and more or less highly. Both the anterior and posterior dorsal line is either slightly convex or convawe. The ventral line is gently curved to nearly flat medially, curving upwards more sharply toward the ends. The posterior beak is typically rather sharp and drawn out and is well down toward the ventral line. The anterior beak is also typically sharp and drawn out but is located obliquely well above the basal line. There is a tendency toward obesity exaggerated in some and repressed in other individuals. The overlap of the left valve is slight but continuous and even from beak to beak along the dorsal line. Ventrally the overlap is confined to a narrow median area. Owing to the inflation of the two valves the dorsal line and the ventral overlapped area are conspicuously impressed. These two latter characters taken in connection with the pointed beaks and the tendency to obesity are the most characteristic features of this rather variable species.

This species in its shorter, more rotund expression resembles B.brevis Jones and Kirkby rather closely but the more rotund outline with attenuated beaks when viewed from above will serve to distinguish it.

The dimensions of two individuals close to the extremes

of variation are:

Length	.93 mm.	1.00 mm.
Height	.53	.47
Width	.45	

Abundant in the lower two feet of the Pawnee limestone at locality 6.

Bairdia subcitriformis n. sp.

Plate 4 figs. 5 a-b.

This species has much in common with B.citriformis but is probably distinct. It is possible that the differences are sexual or represent extreme individual variation but this is not likely. The larger specimens of B.citriformis are more obese than the younger specimens, whereas my three specimens of B.subcitriformis are all larger than the largest of the other and are not noticeably inflated. This species has in common with B.citriformis but to a less degree, the pointed ends as seen both from above and from the side, the impressed hinge-line and the even and slight overlap confined to the dorsal line and the median-ventral area. It differs from B.citriformis in its more angular outline and even more extended and almost upturned anterior beak. It is also not nearly so inflated.

The dimensions slightly restored are:

Length	1.53 mm.
Height	.75 mm.

Only moderately abundant in the lower two feet of the Pawnee limestone at locality 6.

Bairdia altifrons n. sp.

Plate 4 figs. 6.a-b.

Outline of larger (left) valve sub-oblong. Dorsal outline gently bowed from the anterior to the posterior end of the hinge where it curves somewhat more strongly but roundly downward and is again nearly straight before reaching the bluntly pointed and short posterior "beak". Proceeding forward from this point the ventral line curves gently downward and foreward for a short distance. The median two-thirds of the ventral line is nearly straight but with a broad re-entrant curve medially. The anterior end is high and meets the anterio-dorsal line in a sharp curve extending thence downward and obliquely backward. The overlap of the left valve is slight being greatest along the dorsum and least at the anterior end. The hinge-line is about 65% of the greatest length and gently arched. The smaller (right) valve is somewhat more elongate than the left but follows its outlines quite closely. The outline

when viewed from above is elongate lanceolate, the thickest point being rather behind the middle.

This species resembles closely no Carboniferous form known to be. It has some similar outlines to B. subelongata var. major Jones and Kirkby but is much smaller and not nearly so elongated, nor so angular. It does not have the sharply upturned "beak" of B. texana of Harlton.

The dimensions of the figured specimen are:

Length	1.08 mm.
Height	.56 mm.

This form is rare in the Upper Ft. Scott limestone at locality 38.

Bairdia haworthi n. sp.

Plate 4 figs. 7 a-b.

Outline as viewed from the side roughly sub-eliptical. Dorsal outline gently curved and low, the highest point posterior to the middle, and passing from that point to the ends in nearly straight lines. The beak of my one otherwise perfect specimen is broken but one may infer that it is bluntly pointed. The anterior end is narrowly but not acutely rounded. The ventral margin is gently convex near the ends and gently concave medianly. The right valve is shaped much like the left as the

overlap is slight. As viewed from above the outline is narrow lanceolate, the sides being gently convex from end to end.

This form differs from B.glennensis in its lesser relative length, more nearly straight dorsal outline and less atenuated anterior end. From B.altifrans is easily distinguished by its greater relative length and rounder lower anterior end.

The dimensions of the specimen figured after restoring the "beak" are:

Length	1.15 mm.
Height	.35 mm.

This form is rare in the Upper Ft. Scott limestone at locality 38.

Bairdia glennensis Harlton

1927 Harlton, Jour. of Paleont. Vol. 1, No. 3, Dec. 1927, P. 210, Pl. 33. fig. 10

Plate 4. figs. 8.a-b.

Outline in side view broadly and unequally sub-lanceolate. The dorsal outline forms an almost unbroken gentle curve from end to end with the highest point at about the middle. The posterior "beak" broken on my single otherwise nearly perfect specimen is inferred to be bluntly rounded. The ventral outline curving gently forward and downward

from the beak is nearly straight for the greater part of its length. The anterior end is rather extended and sharply but not acutely rounded. As the overlap is slight the smaller (right) valve follows closely the curvature of the left. The greatest ventral overlap is expressed as a short rounded flap about halfway from each end. The outline as seen from above is narrow lanceolate with the gentle curvature continued to the ends. As seen from the ends the outline is sub-ovate with the greatest thickness below the mid-line.

This species is very distinct from any other in my collections. Its reference to B.glennonsis depends somewhat on the accuracy of my restoration of the missing posterior beak. If not identical it is closely related.

The dimensions of my only specimen as restored are:

Lenght	1.45 mm.
Height	.53 mm.

This species is rare in the Pawnee limestone at locality 6.

Bairdia subelongata (?) Jones and Kirkby

Bairdia subelongata, Jones and Kirkby, Jour.Geol.Soc.London,1879. pp.573-73,Pl.30,figs.1-11,16.

Bairdia subelongata,Harlton,Jour.ofPaleont.Vol.1,No.3,Dec.1927 pp.210-211,pl.33,fig.11.

Plate 4. fig. 9.

This species is represented by a single right valve, slightly broken. Its outline is sub-elliptical. Dorsal line nearly straight, curving roundly at the posterior end of the hinge to meet the obtusely rounded "beak" with a short straight line. Anterior end rather narrowly rounded. Ventral margin slightly concave medially and gently curved to meet the ends. Anterior end narrowly rounded.

This form is certainly distinct from B.glennennis, the dorsal curve being much flatter and the posterior end less drawn out. Its reference to B.subelongata must of course be doubtful based as it is on a single right valve.

Dimensions of the only specimen are:

Length	1.00 mm.
Breadth	.38 mm.

Found in the upper Ft. Scott limestone at locality 2.

Genus BYTHOCYPRIS

This genus is represented in my collections by two rather typical and one doubtful species. While not rare they are far from being a conspicuous element in the Ostracode fauna and are perhaps of minor importance to the stratigrapher.

Bythocypris pediformis n. sp.

Plate 5. figs. 3.a-c.

Outline suggesting roughly the imprint of a broad moccasined human foot, the anterior margin forming the heel and the post-ventral "beak" the great toe. Posterior and dorsal margin form an unbroken curve from the posterior beak which is in line with the ventral margin to just anterior to the centrally located highest point where the curve flattens very slightly and then curves roundly out to a short radius around the end. The curve of the anterior end meets that of the ventral margin smoothly and that of the ventral margin itself is straight to very slightly concave for its anterior three-fifths, then proceeding posteriorly shows a slight convexity a little behind the middle after which it proceeds nearly straight to the beak. The beak is almost blunt-pointed and gives the appearance of pointing downward. The left valve is the larger extending beyond and overlapping the right a small amount all around, more ventrally than elsewhere. The surface is smooth. The dorsal aspect is narrow ovate, heavier posteriorly and rather fine anteriorly.

This species resembles B.paralella Knight rather closely but is more arched dorsally. It is less arched than B.pyrula, Jones and Kirkby and differs in outline

from forms described by these authors as B.cuneola under which designation are possibly figured as many as three bythocyprids and what appears to be a Healdia or two. It does not closely resemble any described American Carboniferous species known to me. If I were called upon to differentiate this form from B.silicula described from the Cretaceous by Jones and Hinde* I could say only that my form is more bluntly rounded posteriorly when seen from above.

Dimensions of two individuals are:

Length	.65	.61 mm.
Height	.36	.36
Width	.__	.22

Not very abundant in the Upper Ft. Scott limestone at locality 13 and 38.

Bythocypris paralella n. sp.
Plate 5 figs. 2 a-b.

Posterior margin commencing at the "beak" well arched and curving roundly into the slightly arched to nearly straight dorsal margin on which the highest point is in front of the middle. Anterior end rounds in almost a semi-circle smoothly, from the dorsal to ventral margin which is straight to slightly concave in the middle. Beak a little less pointed and prominent than

* A supplementary monograph of the Cretaceous Entomostraca of England and Ireland, Paleontographical Society, Vol. XLIII, P. 13.

in B.pediformis. Dorsal view is narrow ovate and a little thinner and with sides more nearly parallel than in B.pediformis. The surface is smooth, the left valve larger than the right and overlapping it slightly.

This species may be erroneously established on individual variants of B.pediformis but this does not appear to me to be probable. It is represented in my collections by several specimens all having in common as distinct from that form the flatter and nearly parallel dorsal and ventral margins as well as sides. The "beak" is less prominent and the anterior end is proportionately higher. It also exhibits greater relative length as compared with height. It has some resemblance to one of the forms described by Jones and Kirkby as B.cuneola but has a squarer anterior outline.

Dimensions of two specimens:

Length	.63 mm.	.62 mm.
Height	.34 mm.	.30 mm.

Not at all abundant in the Upper Ft. Scott limestone at locality 2 and 38.

Bythocypris (?) rectrata n. sp.

Plate 5 figs. 1 a.-c.

77. Outline in side view sub-cuneiform, the posterior and being much lower than the anterior. The dorsal profile is only slightly arched but obliquely tilted backward throughout the greater part of its length. The postero-dorsal line meets the dorsal roundly and proceeds obliquely backward and downward to meet the ventral line at a rather sharp point. The anterior profile is of course higher and more roundly curved obliquely forward meeting the ventral line at a sharp anterior "beak" which gives a down-turned effect without actually being extended downward. The ventral line is nearly straight but curves upward slightly as the pointed ends are approached with the longest up curve anteriorly. The dorsal view is sub-eliptical with flatly curved sides carrying the fullness well out toward the ends, then curving to the ends forming a rather wide angle. Both ends are pointed but the anterior beak extends outward the more as a sharp keel when seen edge-wise. The end view is sub-cylindrical with roundly curved sides and back but with a conspicuously flat bottom particularly near the posterior end. The valves are nearly equal with the

left slightly the larger. The surface is smooth and unornamented unless the keel-like beak can be considered ornamentation.

The sharply angled "beak" at the anterior-ventral corner of this species is quite unique within the genus Bythocypris but as the species conforms in all other respects I am provisionally referring it to that genus. This species is clearly differentiated from other Bythocyprids known to me by its more pointed ends and flat venter. It resembles Cypris (?) porbeckensis Forbes somewhat but has more inflated sides and sharper ends.

The dimensions of a typical specimen are:

Length	.68 mm.
Height	.30 mm.
Width	.32 mm.

Not at all common in the lower two feet of the Pawnee limestone at locality 6.

Genus HEALDIA Roundy

This genus, doubtfully referable to the Family Bairdiidae, is represented in my collections by four species, two of moderate size and two very small forms, all typical of the genus but only one carrying well developed posterior spines. This somewhat

recently established and interesting genus gives promise of some value in stratigraphic work. Its members appear to be abundant and easily differentiated.

Healdia nucleolata n. sp.

Plate 5 figs. 4 a.-c.

Comparatively very small. Outline in side view sub oval; the post dorsal slope flattened. The end margins are smoothly rounded; dorsal line arcuate with the highest point at about the middle, ventral margin gently arched to flat. Dorsal aspect wedge shaped, thickest near the posterior end on which the sides converge at an angle of about 100°. The sides arch gently to the acute angled anterior end. Valves quite convex. About one eighth the total length in front of the posterior margin of each valve is a curved ridge with its convexity posterior, reaching not quite to the dorsal margin. This ridge is rather narrow and is indistinct but has a slight relief on the forward side as well as the greater on the posterior. Occasionally the generic tendency to develop a pair of spines near the ends of this ridge is expressed in extremely indistinct posterior bulgings as though the beginnings of spines were present. The valves are

unequal the left being larger than the right and overlapping it slightly all around except along the post-dorsal slope. Surface smooth with rarely a very slight depression at the centrally located point of attachment of the muscle.

This small Healdia is smaller than any other described form known to me except H.oisconsis Harlton and H.boggyensis Harlton from the former of which it differs in being much less arched dorsally and having a greater ratio of length to height. From the latter it differs in having a less pointed anterior end. From both it apparently differs in having even less developed spines. In several ways my form appears to be intermediate between Harlton's two species mentioned above. H.leguminoides is proportionately longer and has a concave venter.

The average dimensions of four specimens are:

Length	.442 mm.
Height	.283 mm.

Very abundant in the Upper Ft. Scott limestone at locality 38. Found also in the same horizon at locality 2.

Healdia leguminoidea n. sp.

Plate 5. figs. 7 a-b.

Outline sub-reniform or bean shaped. The dorsal

margin is gently arched, the highest point being posterior to middle; the post dorsal slope short and straight. The ends are rounded and rather low. The ventral margin is slightly concave. Dorsally the outlines are wedge shaped, blunt posteriorly and tapering anteriorly. Quite close to the posterior end the surface of the valve rises rapidly forming a curved and rounded obscure escarpment bluntly angular near the post-dorsal and ventral margins. The surface is smooth bearing no other ornamentation except that a slight dimpling of the carapace is noted at the point of attachment of the central muscle.

This species is differentiated from H.nucleolatus, H.eiscoensis Harlton and H.bassyensis Harlton, by its less arched dorsum, its concave ventral line and its longer slimmer appearance; the posterior curved ridge is also somewhat less distinct. From all others known to me it differs by its small size.

Its dimensions are:

Length	.52 mm.
Height	.29 mm.
Width	.21 mm.

Only one very perfect speciman was found in the Upper Ft. Scott limestone at locality 38, and another in the same horizon at locality 2.

Healdia longa n. sp.

Plate 5 figs. 6 a.-c.

Form in side view elongate, sub-elliptical, appearing as though the posterior dorsal edge of the ellipse were chopped off. Anterior end narrowly rounded curving evenly into the rather flat ventral margin. About two-thirds the way back the ventral margin begins to curve upwards at first gradually and then more abruptly to the rounded "beak" which is situated about three-fifths the way above the ventral margin. The posterior outline curves sharply around the "beak" and then in a nearly straight or slightly convex line to the top of the rounded dorsal "hump", thence with a slight convexity till it meets and blends with the anterior margin. The dorsal aspect is lanceolate-oval with the thickest part about one-fifth the length in front of the posterior end, the sides curving in rapidly from this point with a slight concavity before reaching the end. The concentric ridge so common in this genus bordering the posterior thickened area is present but is very inconspicuous. The surface is smooth without spines or ornamentation of any kind. The left valve is larger than and slightly overlaps the right except along the post-dorsal slope.

This species is longer and thinner in outline than any other of any acquaintance except perhaps H.ampla Roundy from which it may be differentiated by its lack of posterior spines and considerably smaller size.

Dimensions of two specimens are:

Length	.71	.71 mm.
Height	.37	.34
Width	.30	.—

This species is rather rare in the Upper Ft. Scott limestone at locality 38.

Healdia limacoidea n. sp.

Plate 5 figs. 5 a.-c.

The appearance of a single valve is strongly suggestive of a slug with rounded instead of pointed posterior. Anterior end roundly curved, the dorsal margin convex, a little more flatly so posteriorly than anteriorly; the highest and sharpest point of the curve being a little back of the middle. The posterior end is more sharply rounded than the anterior, most sharply so near its juncture with the dorsal margin. The ventral margin is straight or slightly bowed, either in or out. It joins the curvature of the ends in a more or less even curve. The ratio of height to length is somewhat variable, some individuals being over twice as long as high and others hardly more than one

and one half times, with all degrees of variation in between. The specimens figured are of the most characteristic proportions. The dorsal aspect is narrowly wedge shaped, the outlines posteriorly meeting at an angle of about 75°. The widest point is about one fifth the length in front of the posterior end tapering forward to an acute angle at the anterior end. Except for the ends this outline is not angular but smoothly curved. Near the posterior end the contours of the widest section fall away to that end over an indistinct crescentic ridge from near each end of which protrudes a spine directly backwards; both diverging somewhat from the median line and slightly curved. The length of the spines varies from a mere tubercle to somewhat longer than in the specimens figured. The surface of the valves is otherwise smooth and unornamented except that in some specimens the centrally located muscle spot is discernable as a slight depression with indistinct radiating canals extendng a short distance out. The left valve is the larger overlapping the right slightly except on the post dorsal slope.

This species is differentiated from H.ampla Roundy in its smaller size and rounder outline, from H.oklahomensis Harlton and H.overbrookensis Harlton by the presence of two

spines on each valve, symetrically arranged on each.

The dimensions of these individuals are:

Length	.70	.70	.74 mm.
Height	.45	.40	-
Breadth	-	-	.27

This species is rather abundant in the Upper Ft. Scott limestone at localities 13 and 38.

Family CYTHERELLIDAE Sars

Genus CYTHERELLA Jones

Cytherellids are abundant in numbers in my collections though not in species. The individuals referred to C.missouriensis may represent several species but if so I am at a loss to know how to discriminate between them except by size - and even Ostracodes were once young.

Cytherella missouriensis n. sp.

Plate 5 figs. 8 a-i.

The outline of right (larger) valve as seen from the side is sub-elliptical to sub-oval. The dorsal outline being generally but not always more prominently convex than the ventral. The anterior margin is semi-circularly rounded, the posterior end is usually slightly more sharply rounded than the anterior and usually with the most posterior point slightly and obliquely

above the center line. The left (smaller) valve is gently arched dorsally, rounded posteriorly, slightly concave ventrally and more narrowly and obliquely rounded posteriorly with the most posterior point obliquely above the center line. The last feature is generally more distinct on the left than the right valve. The dorsal view gives a rounded sub-cuneiform outline with the posterior end the thickest and obtusely rounded and the anterior straighter sided and more acute.

The right valve is considerably larger than the left with thickened dorsal and ventral margins reflexing on the left side. The margin of the right valve is rabbetted all around to take the edges of the left valve which fit into it and in some specimens a narrow irregular and very thin flange extending slightly over the edges of the right, especially dorsally. The surface is smooth and unornamented.

This species resembles rather closely C.subrenifromis Jones and Kirkby in some respects particularly in the rather deeply reflexed ventral and dorsal margins of the right and concave ventral margin of the left valve. However Jones and Kirkby's species has a lanceolate outline when seen from above whereas my species is distinctly cuneiform.

It differs from C.bennie var. intermedia Jones and Kirkby in the wider reflexed margins of my species and in the more obtusely rounded posterior end.

I have quite a number of specimens in my collection all of which conform to the above description but which are quite variable in size and which appear to be mature and young specimens of the same species. Several representative dimensions are:

Length	R.V.	1.15	1.14	.97	—	.61	—
	L.V.	—	—	—	.92	.57	.57
Height	R.V.	.77	.72	.62	—	.39	.—
	L.V.	.62	.57	—	.48	.34	.32
Width		.46	—	—	—	—	—

Abundant in the Upper Ft. Scott limestone at locality 38.

Super-family CYTHERACEA

Family CYTHERIDAE Zenker

Genus CARBONIA Jones

This supposedly fresh or brackish water genus appears to be represented in my collections, all from typically marine beds, by one species. Its reference to the genus on that account alone may be questioned. Nevertheless while rather a characterless little shell, as far as generic features are concerned it agrees more closely with Carbonia than other genera.

Carbonia (?) lenticularis n. sp.

Plate 5 figs. 9 a.-b.

Small, dorsum highly arched, ventral line gently convex to nearly straight. Anterior end broadly rounded, meeting the ventral line smoothly but with a slight backward obliquity. Posterior end falls downward from the dorsal line with a flat curve almost to the ventral line where it rounds sharply but smoothly into the venter. Outline when viewed from above sub-ovate. End view acutely sub-ovate with the greatest width above the middle and with the lines of the sides converging ventrally rather flatly. Valves almost equal with the right possibly very slightly the larger but not overlapping. Surface smooth and without ornamentation. A very obscure sub-central stellate muscle spot can be made out in some specimens.

This species agreeing morphologically with Carbonia supposedly a brackish water form, is referred tentatively to that genus as its associations are entirely marine. It resembles somewhat Carbonia fabulina Jones and Kirkby and the variety sub-angulata of the same authors, but is more rounded in side views. Its side view is quite similar to that of Bythocypris (?) thraso Jones and Kirkby but it is thinner in edge view.

The dimensions are:

Length	.57	.51 mm.
Height	.43	— mm.
Width	—	.27 mm.

Fairly abundant in the lower two feet of the Pawnee limestone at locality 6.

RANGE OF OSTRACODE SPECIES IN THE HENRIETTA FORMATION

		A		B	C						D	E	F
		11	28	43	2	9	12	13	37	38	43	6	7
Paraparchites	claytonensis											X	
"	laduensis									X			
Aechmina (?)	gibberosa											X	
Hollina	bauhleri				X		X			X			
"	fortscottensis									X			
"	ulrichi				X					X			
"	bassleri									X			
Jonesina	gregaria									X		?	
"	arcuata				X					X			
Ulrichia	montosa			?	X	X				X			X
Kirkbya	voluta									X			
"	laciniata							X		X			
"	scaphula									X			
"	cymbula									X			
Amphissites	centronotus	X			X			X	X	X	X		
"	girtyi				X					X			
"	roundyi				X				X	X			
"	pinguis									X			
"	allorismoides				X					X			
"	simplissimus								X	X			
Bairdia	moorei				X	?				X			
"	auricula									X			
"	seminalis		X		X	X	X	X	X	X	X	—	X
"	citriformis		?									X	
"	subcitriformis											X	
"	altifrons									X			
"	haworthi									X			
"	glennensis											X	
"	subelongata				X								
Bythocypris	pediformis							X		X			
"	paralella				X					X			
"	rostrata											X	
Healdia	nucleolata				X					X			
"	leguminoidea				X					X			
"	longa									X			
"	limacoidea							X		X			
Cytherella	missouriensis				X					X			
Carbonia	lenticularis											X	

A = Lower Ft. Scott limestone
B = Intermediate Ft. Scott shale
C = Upper Ft. Scott limestone
D = Upper two feet of Labette shale
E = Lower two feet of the Pawnee limestone
F = Pawnee limestone above lower two feet

The numbers heading the columns refer to localities.

REGISTER OF LOCALITIES FROM WHICH OSTRACODES WERE COLLECTED

Locality No. 2. Shaley upper surface of the Upper Ft. Scott limestone exposed in vacant lot of northwest corner of Gustine and MacDonald Streets, St. Louis.

6. Decomposed blocks and residual from lower two feet of Pawnee limestone exposed in street making in Davis Place subdivision, Clayton, St. Louis County. First (unnamed) street west of Kirkwood-Ferguson trolley tracks and 200 feet north of Clayton Road.

7. Shale partings in the upper part of the Pawnee limestone in cut of the C.R.I.& P.R.R. in Clayton, St. Louis County. Under traffic bridge 200 yards east of station.

9. Shale partings in the Upper Ft. Scott limestone on the north wall of the Hydraulic Pressed Brick Company shale pit east of the Ballas Road and between the Conway and Olive Street Roads, St. Louis County.

11. Shale partings in the Lower Ft. Scott limestone exposed in the shale pit of the Alton Brick Company about 1 mile southeast of Costello, St. Louis County.

12. Shale partings in the Upper Ft. Scott limestone exposed in the Charbonnier Bluff on the Missouri River. Survey No. 276.

13. Shaley upper surface of the Upper Ft. Scott limestone exposed in Belt Line (T.R.R.A.)cut south of Clayton Road and west of Hanley Road, St. Louis County.

28. Shale partings in the Lower Ft. Scott limestone exposed in subdivision grading just east of Tamm Avenue and north of Manchester Avenue, Cheltenham district, St. Louis.

37. Shale partings in Upper Ft. Scott limestone exposed in T.R.R.A. cut 500 yards north of Manchester Avenue and 200 yards west of Macklind Avenue, Cheltenham district, St. Louis.

38. Shale partings in Upper Ft. Scott limestone exposed in south bank of creek east of Price Road and south of Ladue road, St. Louis County.

43. Two collections. One from upper two feet of the Ft. Scott intermediate shale and the other from the upper two feet of Labette shale exposed along creek in hollow just north of right/angle west turn of north end of Denny Road, 1/2 mile southwest of Lackland station on the C.R.I. & P. and three-quarters of a mile north of Stratman, St. Louis County.

PLATE 1 All figures x 30

A. Correlation of nodes and sulci in the Kirkbyidae under discussion. All right valves.

a. Kirkbya voluta Knight, representing Kirkbya in the restricted sense.
b. Ulrichia montosa Knight, representing the "Kirkbyan" Ulrichiae.
c. Amphissites centronotus Ulrich and Bassler, representing the more typical expression of Amphissites.
d. Amphissites pinguis Ulrich and Bassler representing the more repressed type of Amphissites.

1. Anterior node

2. Position of median sulcus

3. Median node

4. Position of posterior sulcus

5. Posterior node.

B. Un-retouched photomicrographs showing rabbetting of inner edge of free margins of left valve in the Kirkbyidae under discussion.

a. Ulrichia montosa Knight
b. Kirkbya cymbula Knight
c. Amphissites centronotus Ulrich and Bassler.

1. Inner side of the outer flange

2. The overlapping edge of the (left) valve

3. The "shelf", against which the edge of the right valve abuts.

a
2 1 3
b
1 2 3
c
3 2 1
5
c
b
a

PLATE 2 All figures X 30.

Fig. 1 Hollina buehleri n. sp. right valve

2 Hollina fortscottensis n. sp. left valve

3 Hollina bassleri n. sp. left valve

4 a-b Hollina ulrichi nom. nov.
a. right valve, restored
b. left valve of sparsely papillose individual showing spine at anterior end of frill

5 a-g Jonesina gregaria Ulrich and Bassler
a. right valve of average type
b. right valve of specimen showing anterior inflation
c. right valve of narrow flat individual
e. right side of complete specimen
f. left valve with more rounded venter
g. left valve with flatter venter

6 a-b Jonesina arcuata Bean
a. left valve
b. right valve

7 Paraparchites laduensis n. sp. left side

8 a-d Paraparchites claytonensis n. sp.
a. dorsal aspect of specimen of slightly less than average size
b. left side of same
c. right side of same
d. left side of very large individual

9 a-b Aechmina(?) gibberosa n. sp.
a. dorsal aspect
b. side view

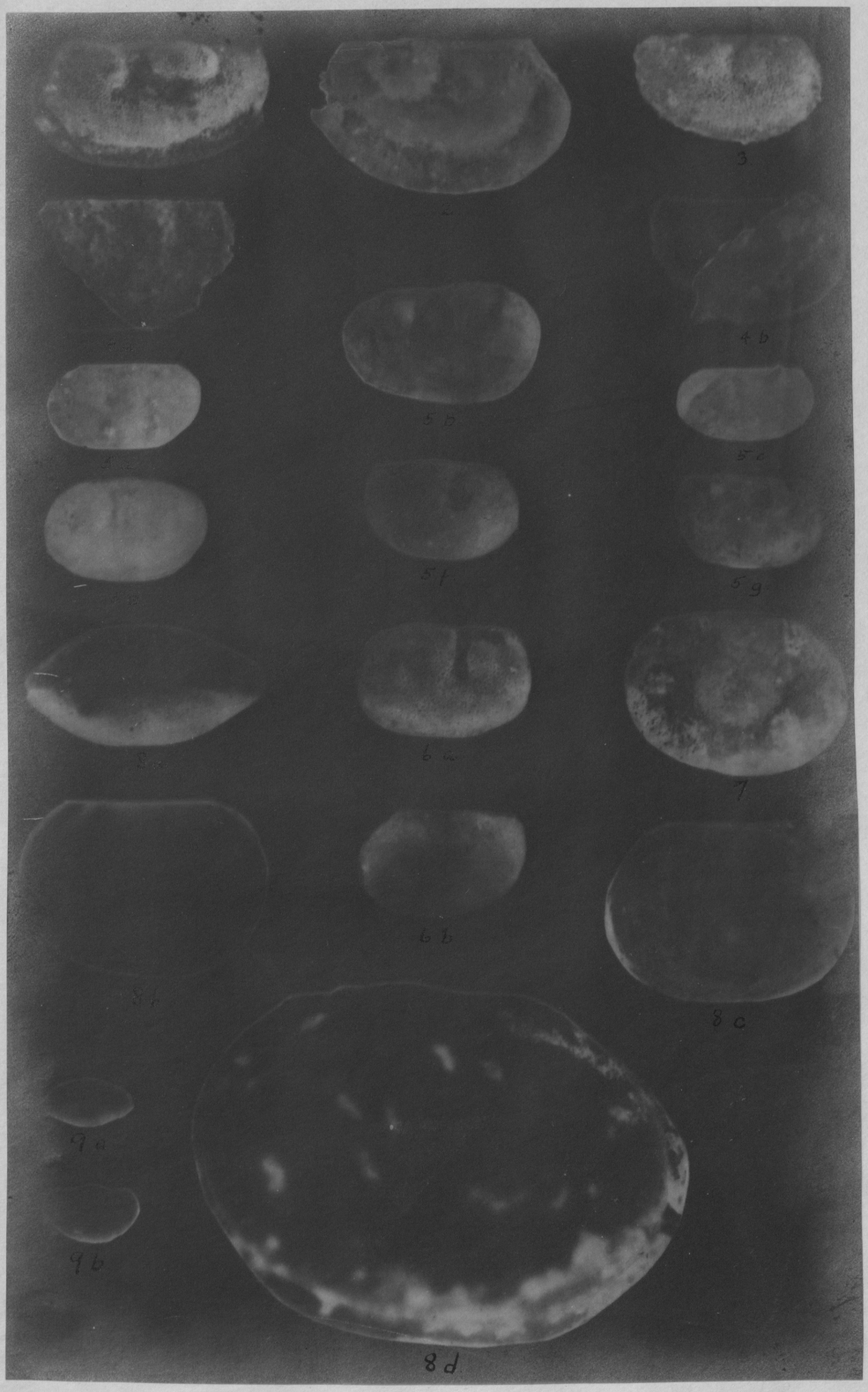
3
2
4b
5b
5c
5f
5g
6a
7
6b
8c
9a
9b
8d

PLATE 3 All figures X 30.

Fig. 1 a-b Ulrichia montosa n. sp.
a. right valve of large individual
b. left valve of small specimen

2 Kirkbya cymbula n. sp. right valve

3 a-b Kirkbya voluta n. sp.
a. right valve
b. left valve

4 a-b Kirkbya scaphula n. sp.
a. right valve, restored
b. perfect right valve but somewhat obscured by matrix

5 a-b Kirkbya laciniata n. sp.
a. right valve, restored anteriorly
b. left valve restored posteriorly

6 a-e Amphissites centronotus Ulrich and Bassler
a. dorsal aspect, anterior end up
b. ventral aspect, anterior end up
c. left valve
d. left valve
e. right valve

7 a-b Amphissites girtyi n. sp.
a. left valve
b. left valve of another specimen somewhat obscured by matrix

8 a-b Amphissites roundyi n. sp.
a. right valve
b. left valve

9 Amphissites pinguis Ulrich and Bassler, right valve

10 a-c Amphissites allorismoides n. sp.
a. right valve of small specimen
b. left valve of average sized specimen
c. same tilted up to show contours and reticulations between flanges

11 a-d Amphissites simplissimus n. sp.
a. right valve
b. left valve
c. right valve
d. ventral aspect anterior end up


1b
2.
4a
3b.
4b
6a
5a
5b
6b
6c
6d
6e
7a
7b
8a
8b
9.
10a
10b
10c
11a
11b.
11c
11d.

PLATE 4 All figures X 30.

Fig. 1 a-c Bairdia moorei n. sp.
a. right side
b. dorsal aspect
c. separate right valve

2 a-d Bairdia seminalis n. sp.
a. left valve
b. interior of same
c. right side of complete specimen
d. dorsal aspect of same specimen

3 a-b Bairdia auricula n. sp.
a. interior of left valve
b. exterior of same specimen

4 a-c Bairdia citriformis n. sp.
a. right side
b. left side
c. dorsal aspect, all of same specimen

5 a-b Bairdia subcitriformis n. sp.
a. right side
b. dorsal aspect of same specimen

6 a-b Bairdia altifrons n. sp.
a. exterior and
b. interior of same left valve

7 a-b Bairdia haworthi n. sp.
a. right side
b. dorsal aspect of same specimen

8 a-b Bairdia glennensis Harlton
a. right side
b. dorsal aspect of same specimen, beak restored

9 Bairdia subelongata (?) Jones and Kirkby, right valve, only specimen

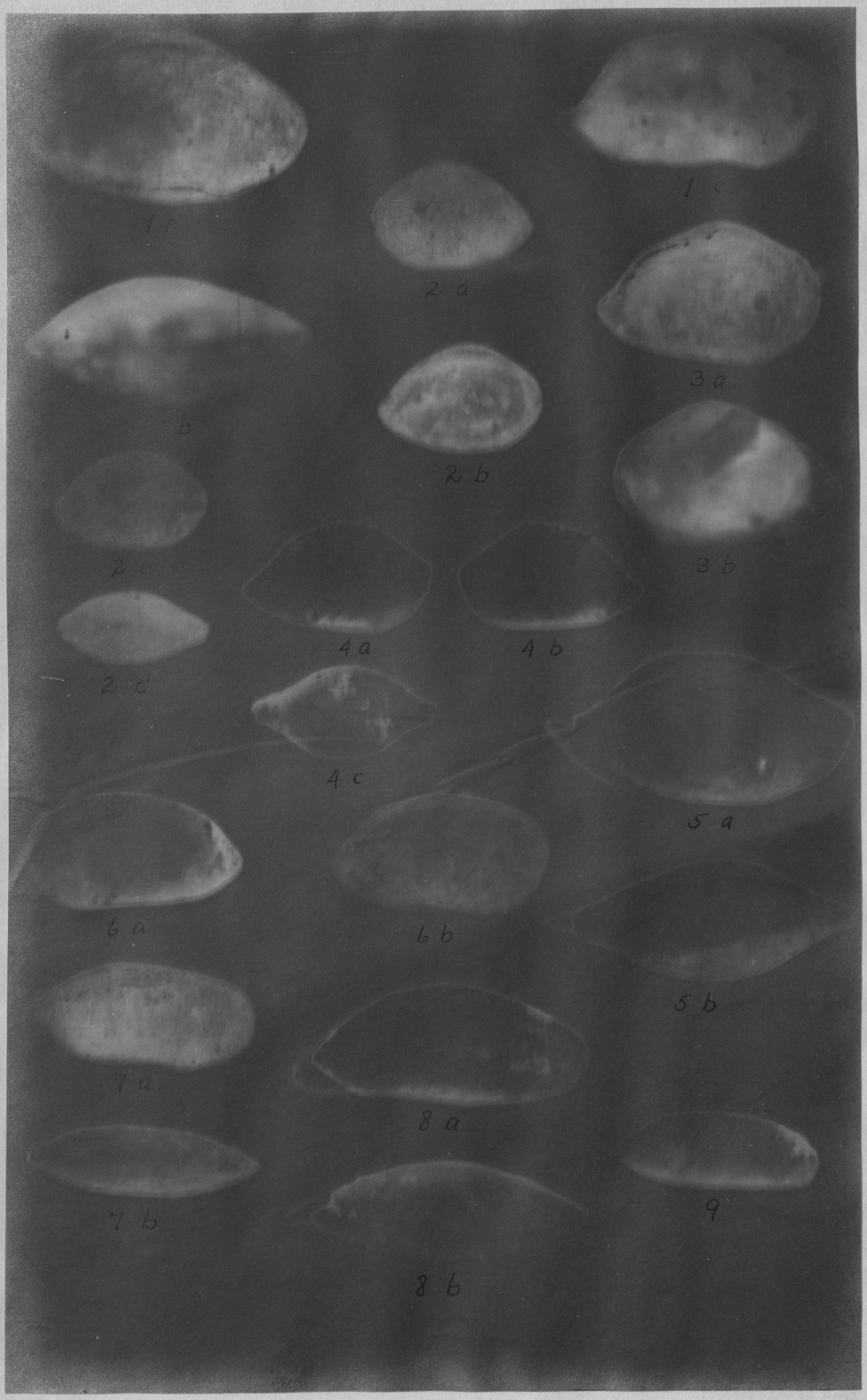
1 c
1 c
2 a
1 b
3 a
2 b
2 c
3 b
4 a
4 b
2 d
4 c
5 a
6 a
6 b
5 b
7 a
8 a
7 b
9
8 b

PLATE 5 All figures X 30.

Fig. 1 a-c Bythocypris rostrata n. sp.
a. right side
b. ventral aspect
c. dorsal aspect

2 a-b Bythocypris paralella n. sp. a & b. right sides of two specimens

3 a-c Bythocypris pediformis n. sp.
a. left side
b. dorsal aspect
c. right side of latter specimen

4 a-c Healdia nucleolata n. sp.
a. dorsal aspect
b. right side of same specimen
c. right side of another specimen

5 a-c Healdia limacoidea n. sp.
a. dorsal aspect
b. left valve
c. right valve

6 a-c Healdia longa n. sp.
a. dorsal aspect
b. left side
c. right side, all of same specimen

7 a-b Healdia leguminoidea n. sp.
a. dorsal aspect
b. right side of same specimen

8 a-i Cytherella missouriensis n. sp.
a. left valve of large individual
b. dorsal aspect
c. right valve of moderate sized individual
d. right valve of about same size
e. right side of same specimen as 8 B
f. interior of large right valve
g. left valve of small specimen
h. right valve of small specimen
i. left side of same specimen as 8 b

9 a-b Carbonia (?) lenticularis n. sp.
a. right side
b. dorsal aspect


1a
2a
3a
1b
2b
3b
1c
3c
4a
5a
6a
7a
4b
5b
6b
7b
4c
5c
6c
8a
8b
8c
8d
8e
8f
8g
9a
8h
8i
9b