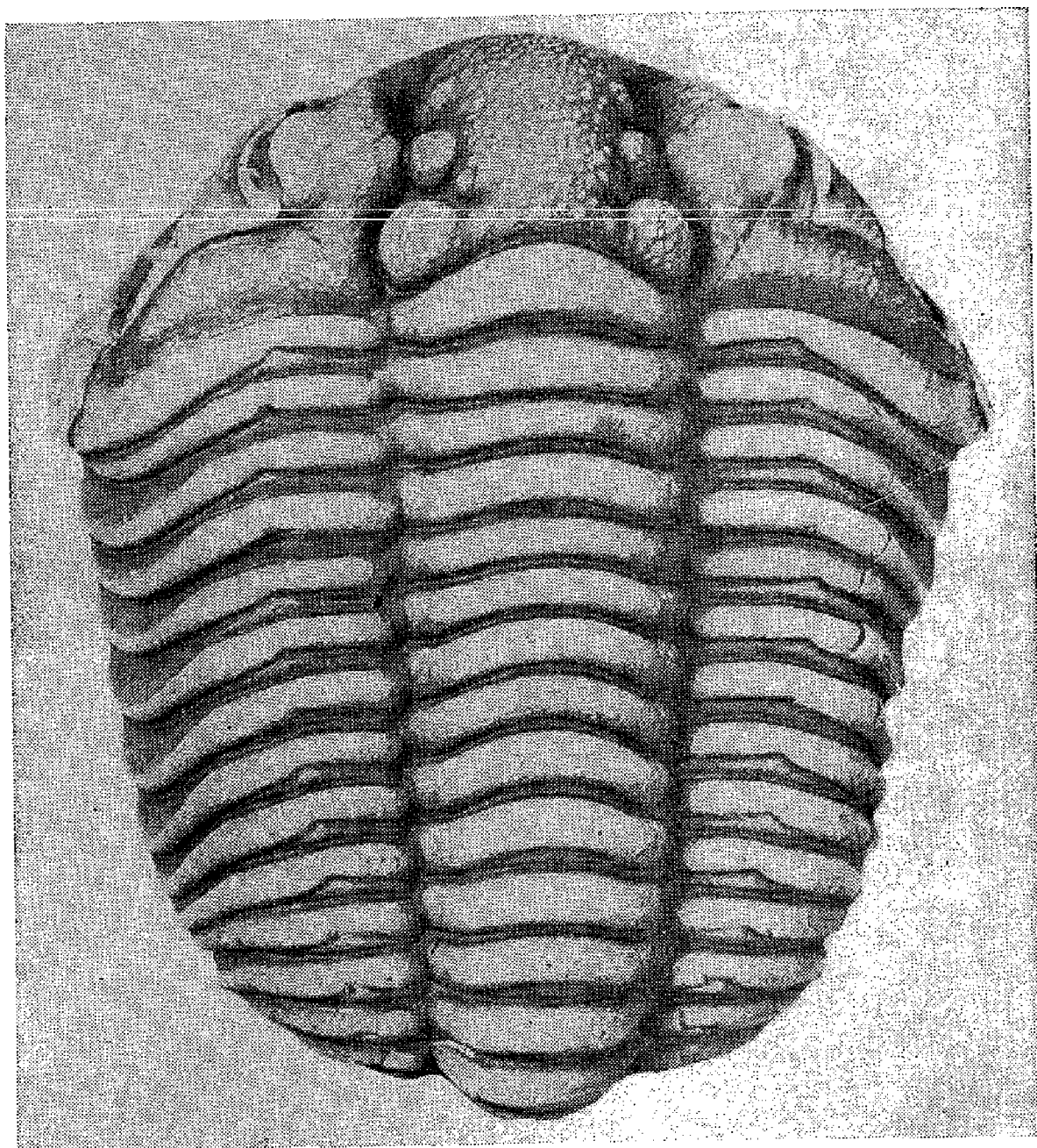


OKLAHOMA GEOLOGY NOTES



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Color Transparencies of Microfossil Species Types and Typical Specimens

During the past two years the palynological laboratory of the Oklahoma Geological Survey has been assembling a collection of 35 mm color transparencies of microfossil species types and typical specimens. These illustrations consist of spores, pollen, hystrichosphaerids, chitinozoans, and other microfossils. Because color transparencies are excellent illustrations and are conveniently handled, they have become an important part of the Survey microfossil depository. The photomicrographs are made at various magnifications and focal levels in order that the morphological features can be studied as projections. The microscopes used in the photography are the Leitz Ortholux and the Zeiss Photomicroscope. Two or more illustrations are usually made of each specimen and at present the collection consists of several hundred transparencies.

These illustrations are used for quick comparison of study materials with type specimens. It is anticipated that these transparencies may be of interest to other investigators and they will be loaned since microslides containing species types are not permitted outside of the laboratory. Copies of the 35 mm color transparencies are also available by exchange or purchase. These can be secured from the Oklahoma Geological Survey and will cost one dollar each. A list of the present available transparencies can be secured from the Geological Survey. The list will be revised periodically.

L. R. W.

Censorship on Water Resources in Israel

Nigev is the Hebrew word meaning "dry land" or "Southland". Today it designates the arid southern half of the State of Israel. In ancient times it applied to a broader area stretching from the foothills of Judea and Edom (in present Jordan) to the confines of Egypt proper in the "Wilderness of Shur" and reaching through the "Wilderness of Pa'ran" into that peninsula which became known as Sinai only in post-biblical days. Whatever its precise boundaries, the Negev is the only land bridge connecting Africa and Asia.

The Geological Survey of Israel issued Sheet 19, the 'Arava Valley Quadrangle Series A, the Nigev. The report, consisting of 66 pages written in English by Yaacov K. Bentor, Geological Survey of Israel and Hebrew University and 'Aqiba Vroman, also of the Survey and of the Institute of Technology (Technion), was published in Jerusalem in 1957 by the Government Printer. It is the 78th contribution from the Geological Survey and includes geological and structural maps on the scale of 1:100,000, maps showing drainage basins and geomorphological units on a scale of 1:250,000, and a plate with four cross sections. It contains descriptions of stratigraphy, tectonics, and economic geology, and includes a chapter entitled paleogeographic summary which discusses areal distribution of time-rock units and geologic history.

The geographical introduction reviews the geomorphology of the area, drainage system and hydrology of springs. Springs are enumerated and the rate of discharge is given as well as the amount of chlorine in the water. It is here that the censor has used jet black thick ink or paint to cover the important economic information for such an area, the rate of flow per hour and the amount of chlorine per liter.

L. J.

CRINOIDS FROM THE MISSOURIAN NEAR BARTLESVILLE, OKLAHOMA

HARRELL L. STRIMPLE

PREFACE

The author privately published a small paper on November 21, 1938, and distributed some 250 copies to various paleontologists, museums and institutions of learning. In order to make the study perpetually available, the paper is here reprinted with revisions. A few annotations and current designations are used where necessary. A brief explanation of the abbreviations and symbols used in the original paper is given here:

Radial plate—R, plural RR

Basal plate—B, plural BB

Infrabasal plate—IB, plural IBB

Radianal—Ra

Right posterior—r. post. or RP (as a prefix)

Left posterior—l. post. or LP (as a prefix)

Right anterior—r. ant. or RA (as a prefix)

Left anterior—l. ant. or LA (as a prefix)

Anterior—ant. or A (as a prefix)

Brachial—Br

First brachial (primibrach)—IBr

Second brachial, after first branching (secundibrach)

The original introduction with modifications is given below:

INTRODUCTION

In some of the formations of northeastern Oklahoma, conditions were favorable for the preservation of some larviform and immature crinoids, along with those more typical of the Pennsylvanian period. It is hoped that with consistent collecting and study, considerable material of much biologic and stratigraphic interest will be brought to light. Presented herein is the following:

Allagecrinus bassleri Strimple, 1938 named in slight token of respect to Dr. R. S. Bassler, U. S. National Museum, whose guidance, assistance and friendship has made my work in this field possible; a study of the growth of *Apographiocrinus typicalis* Moore and Plummer (*Graphiocrinus carbonarius*) and *Erisocrinus typus*; *Synbathocrinus melba* Strimple, 1938 dedicated to its finder, my wife, Mrs. Melba Strimple, whose marvelous collecting ability has brought forth a good portion of the material herein; *Paragassizocrinus* (*Agassizocrinus*) *tarri* Strimple, 1938 named for my good friend and collaborator in field work, Mr. Tom Tarr, who originally found the location with the occurrence of this species; and two new species of *Ethelocrinus* particularly interesting in their lack of spectacular ornamentation which has been associated with the genus, designated as *Ethelocrinus plattsburgensis* Strimple, 1938, and *Ethelocrinus expansus* Strimple, 1938. We thus have the smallest and the largest species occurring in this locale. I take this opportunity to acknowledge the invaluable technical aid of Dr. Edwin Kirk¹, of the U. S. Geological Survey.

¹Deceased.

DESCRIPTIONS

ALLAGECRINIDAE Carpenter and Etheridge, 1881

ALLAGECRININAE Moore, 1940

ALLAGECRINUS Carpenter and Etheridge, 1881, emend. J.

Wright, 1932

ALLAGECRINUS BASSLERI Strimple, 1938

Plate 1, figures 18 to 23

The dorsal cup is bowl shaped, rather high in immaturity, depressed in maturity. The largest observed cup has a diameter of approximately 6.0 mm, the smallest about one-third as large. The height of the cup is approximately one-half the diameter. Mature cups are slightly elliptical when viewed from above or below, maximum diameter from L. post. to R. ant. Young specimens are substellate in outline, mature specimens pentalobate.

The basal disk is tripartite with the plates normally very difficult to discern. In all observed instances, the smallest plate is L. post. in position, the sutures to RPR, LPR, and AR.

Five large radials constitute the majority of the cup, and are definitely asymmetrical in maturity. Largest and most robust is the LPR. The left shoulder of the RPR is slightly lowered and carries the brachial-like anal plate, as is characteristic of the genus. Observed positions of the arms are summarized as follows:

		RPR	RAR	AR	LAR	LPR
		robust	small	small	robust	small
		arms	arms	arms	arms	arms
Smallest observed						
specimen-----	8 arms	1	2	1	1	3
	9 arms	1	2	2	1	3
	10 arms	1	2	3	1	3
Medium						
specimens-----	12 arms	1	3	3	1	4
	13 arms	1	3	3	1	5
Largest observed						
specimen-----	14 arms	1	3	4	1	5

The only observed variation to the above is in the largest observed crown, wherein the LAR carries a single small arm in addition to the normal robust one, and the LPR only carries four small arms instead of the normal five for this size specimen. Articulation facets are well developed inward, forming an uninterrupted articulation shelf save for the parabolic notch of the posterior side. The position of each arm is well marked by a shallow depression bounded by converging ridges.

Articulation between radials and brachials is rather weak, as it is also between brachials, so that the arms are seldom found in absolute alignment, and rarely in their entirety. In the robust arms there is consistently a short primibrach followed by a long brachial, with subsequent brachials variable in length when present. In the small, thread-like arms the primibrach is followed by slightly longer brachials of fairly consistent length. Averaging many measurements, it is found that in the robust arms the length of the first primibrach is approximately 0.9 mm, of the later brachi-

als 4.2 mm. For the small arms the length of the brachials averages 1.0 mm. The robust arms are highly convex, tending toward a triangular back, whereas the small arms are almost flat.

The surface of the entire crown is granular, each granulation supporting five or six web partitions and forming a reticulate meshwork about pores. This characteristic is not so apparent on mature cups.

For a limited distance from the cup, the proximal columnals taper rapidly; however, they change entirely from thin segments to rather elongate bead-like segments, which are apparently slowly tapering.

This species is closely related to *Allagecrinus strimplei* Kirk from which it is most easily distinguished by its two robust rays, all other rays being small. It is not to be confused with any other known form.

All specimens were collected at the Bartlesville Mound, Bartlesville, Oklahoma. Type specimens are in the Springer Collection, U. S. National Museum. The legal description of the exposure is SE $\frac{1}{4}$ sec. 3, T. 26 N., R. 12 E., Osage County, Oklahoma. The exposure is considered to be a crinoidal facies of the Wann formation, Ochelata group, Missourian series. The specimens are U. S. N. M. number S 4285.

APOGRAPHIOCRINIDAE Moore and Laudon, 1943

APOGRAPHIOCRINUS Moore and Plummer, 1940

APOGRAPHIOCRINUS TYPICALIS Moore and Plummer, 1940

Plate I, figures 1 to 11; Plate II, figure 1.

The study presented by me in 1938 covered a growth series of a species reservedly assigned to *Graphiocrinus carbonarius* (Meek and Worthen), 1861. Moore and Plummer (1940) described the species as *Apographiocrinus typicalis* Moore and Plummer and noted that my specimens were probably referable to their species, which was taken as the genotype species of *Apographiocrinus* Moore and Plummer. Later the family Apographiocrinidae Moore and Laudon (1943) was established for the reception of these forms. Subsequent observation of innumerable specimens from various horizons has not revealed any necessity for any change in the original discussion, which is given below.

The species is an excellent stratigraphic marker for the Missourian series and is geographically widespread. It is especially prevalent in the Ochelata group of Oklahoma and comparable strata of adjacent states.

The material closely studied, measured, and used in the preparation of this paper consists in the main of 25 crowns and 10 cups. Innumerable specimens have received cursory examination over a period of years. It is not my purpose to redescribe this well-known species but to merely point out facts disclosed by a study of the growth. The specimens have fundamentally five small IBB confined to a basal concavity, five large BB with their lower extremity composing the sides of the basal concavity, five large RR, and a single anal plate within the cup.

Crowns range in length from 4.0 mm to 22.0 mm, of which the cup comprises some 20 percent in immaturity or 15 percent in maturity, the loss due to greater development of width in the plates and slight increase in proportionate length of arms. The cup is inclined to be turbinate in immaturity, definitely bowl shaped in maturity, the change effected by greater development in width of plates. development of tumidity in the BB and RR, and absorption of the lower extremity of BB in the expanding

basal concavity. IBB comparatively small, in all cases confined to the basal cavity (whereas in very young specimens they are difficult to discern, when preserved), and form internally a small dome. The RR develop from 1.0 mm width by 0.95 mm height, to a width of 6.0 mm by 4.7 mm height. A tooth-like projection, well shown by plate I, figure 10, is present at the meeting of the inward-developed articulation shelves of the RR, in all stages of development. Anal X is primarily elongo-quadrangular save for truncation of the upper extremity for the reception of two smaller anal plates. There is considerable variation in the exact displacement of this plate; however, this fact is not of apparent biologic importance. Normally the plate is half in, half out of the cup, becoming tumid in maturity, particularly the upper extremity, which tends to spread out. In one young specimen, what appears to be at least one ray of an arm-like continuation of the anal system has been observed.

The arms are 10, branching taking place on the IBr, following number of brachials ranging from one to 16 in those crowns observed. Unquestionably of most interest are the extreme variations exhibited in the primibrachs. cursory examination led me to the belief that these plates follow a consistent formula: one long, two slightly shorter, and two equally the shortest. Actual measurements show that in some specimens this does not hold true; however, by taking an average, the following facts are disclosed:

In 60 percent of the crowns the ant. IBr is longest

In 68 percent of the crowns the l. ant. IBr is shortest

In the smallest observed crown the mean length of the IBr is 2.3 mm, width 0.6 mm.

Average length of IBr—	r. post.	r. ant.	ant.	l. ant.	l. post.
	2.943	2.743	3.188	2.535	2.846 mm

Thus, in average, the ant. is longest, r. ant. and l. ant. comparable, and r. post. and l. post. comparable.

The slender, elongated IBr of immaturity develop only laterally, so that they become short and rather squat, due of course to the increasing

EXPLANATION OF PLATE I

Figs. 1-11. *Apographiocrinus typicalis* Moore and Plummer, growth stages. 1, 5 and 8, anterior views; 4, 6 and 7, posterior views; 2 and 9, l. ant. radials to fore; 3a, r. post. radial to fore; 3b diagonal view of same from below; 10, view of mature cup from above; 11, same from below. All figures X2.

Figs. 12 and 13. *Synbathocrinus melba* Strimple. 12, view from side; 13, view from below. Figures X2.

Figs. 14-17. *Erisocrinus typus* Meek and Worthen, growth stages. Figures X2.

Figs. 18-23. *Allageocrinus bassleri* Strimple. Fig. 18, youngest crown, right ant. radius to fore. Fig 19, basal view of young individual. Fig. 20, intermediate stage, right anterior radius to fore. Figs. 21 and 22, mature cups; 21, view from above; 22, view from below. Fig. 23, largest crown, left post. radius to fore. All figures X3.

PLATE I



1.



2.



3 a



3 b



4.



5.



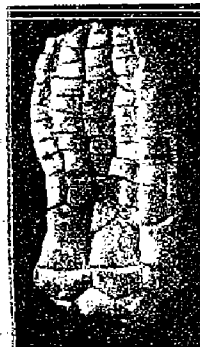
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23.

weight of the arms. In immaturity the IBr first constrict, then widen and thicken, which was sufficient for the support of the few brachials. With the additional weight of brachials the apex of the IBr develops outward. It is easy to understand the development of elongate projections in some crinoids when one observes these growth series. Internally, not shown when first secundibrachs are in place, the apex develops a tooth-like projection similar to those observed on the articulation shelves of the radials. In the very young, all brachials are rather elongate, but with subsequent addition, the secundibrachs become rather quadrangular, wider than high, with almost flat backs, the main tapering in all cases taking place in the last few brachials.

Ornamentation is apparently a mark of youth in this species, and consists of a granular surface, together with a definite raised ray running the length of the RR and the arms. First to disappear is the ray on the RR and the granulation of the cup, then the granulation of the arms, and lastly the ray on the arms.

The few attached columnals observed are round low plates, alternately expanded, crenulated about the circumference, and pierced by a minute round axial canal.

All specimens were collected at the Bartlesville Mound, Bartlesville, Oklahoma, and are in the Springer Collection of the U. S. National Museum. The legal description of the exposure is the SE $\frac{1}{4}$ sec. 3, T. 26 N., R. 12 E., Osage, County, Oklahoma. The exposure is considered to be a crinoidal facies of the Wann formation, Ochelata group, Missourian series. The specimens are U. S. N. M. number S 4288.

ERISOCRINIDAE S. A. Miller, 1889

ERISOCRINUS Meek and Worthen, 1865

ERISOCRINUS TYPUS Meek and Worthen, 1865

Plate I, figures 14 to 17; Plate II, figures 2 to 5

A Study of the Growth Stages

A study of the *Erisocrinus* specimens of this locale discloses that we are dealing with at least two species, one *E. typus*, the other similar in appearance to *E. planus* White (1880); that is, more rounded as in *Delocrinus*. At this time only those specimens assignable to *E. typus* are under consideration.

As the species is well known there is no object in more than a brief diagnosis. Five small IBB, five large BB, five large RR, no anal in cup; heavy biserial arms, ten in number, branching on the first brachial. The rapid widening of the cup from a small rather flat basal area comprises the main basis of distinction herein.

In the specimens at hand the IBB form in main the basal area, which is normally rather flat, the outer sharply upcurved edges being formed by the lower extremity of the BB together with the apex of the IBB. One is not to be confused by finding apparent depression, as this area was apparently very weak and is usually found crushed inward. Interiorly the IBB form the slightly convex floor of the cup.

The specimens vary from a cup 2.1 mm high with a mean diameter of 3.45 mm, to a normal cup 9.7 mm high with a diameter of 21.0 mm.

In the very young specimens, the arms are uniserial, composed of narrow, elongate brachials, the primibrachs averaging 3.65 mm in length as against a width of approximately 2.0 mm. A slightly more developed stage has a crown 10.8 mm long with the primibrachs averaging 3.63 mm in length, 2.44 mm wide. It is of special interest that in this stage the arms are cuneiform. All subsequent stages possess biserial arms, with the occasional exception of the first secundibrachs retaining their cuneate nature. The subsequent widening of the primibrachs, indicated by the above measurements, is well shown by the figured specimens, and is of no particular interest save that the plates are elongate in immaturity whereas they are considerably wider than high in maturity. The variation in lengths of these plates in immaturity is considered of particular interest, as is also the variation in width of the radial plates.

In immaturity the IBr follow the same formula previously presented for *Graphiocrinus carbonarius*¹. One IBr is more elongate than the rest, comparable to the anterior of *G. carbonarius*¹; two of equal length, comparable to the shorter r. post. and l. post.; two comparatively short, comparable in orientation and size to r. ant. and l. ant.; and even the one designated as l. ant. is normally the shortest. This is not thought, however, necessarily to link these species, but rather to show possible common heritage.

Of the RR, in immaturity two adjoining plates are narrower than the remainder. Oriented by the formula presented before for the IBr these plates would be right and left posterior, one substantiating the other formula. This certainly indicates that in immaturity this species is still subject to the eliminated anal X. In maturity the RR are of equal width, the IBr of equal height, and pentamerous symmetry is attained.

All specimens from the Bartlesville Mound, Bartlesville, Oklahoma, and are in the Springer Collection of the U. S. National Museum. The legal description of the exposure is the SE $\frac{1}{4}$ sec. 3, T. 26 N., R. 12 E., Osage County, Oklahoma. The exposure is considered to be a crinoidal facies of the Wann formation, Ochelata group, Missourian series. The specimens are U. S. N. M. number S 4289.

SYNBATHOCRINIDAE S. A. Miller, 1889

SYNBATHOCRINUS Phillips, 1836

SYNBATHOCRINUS MELBA Strimple, 1938

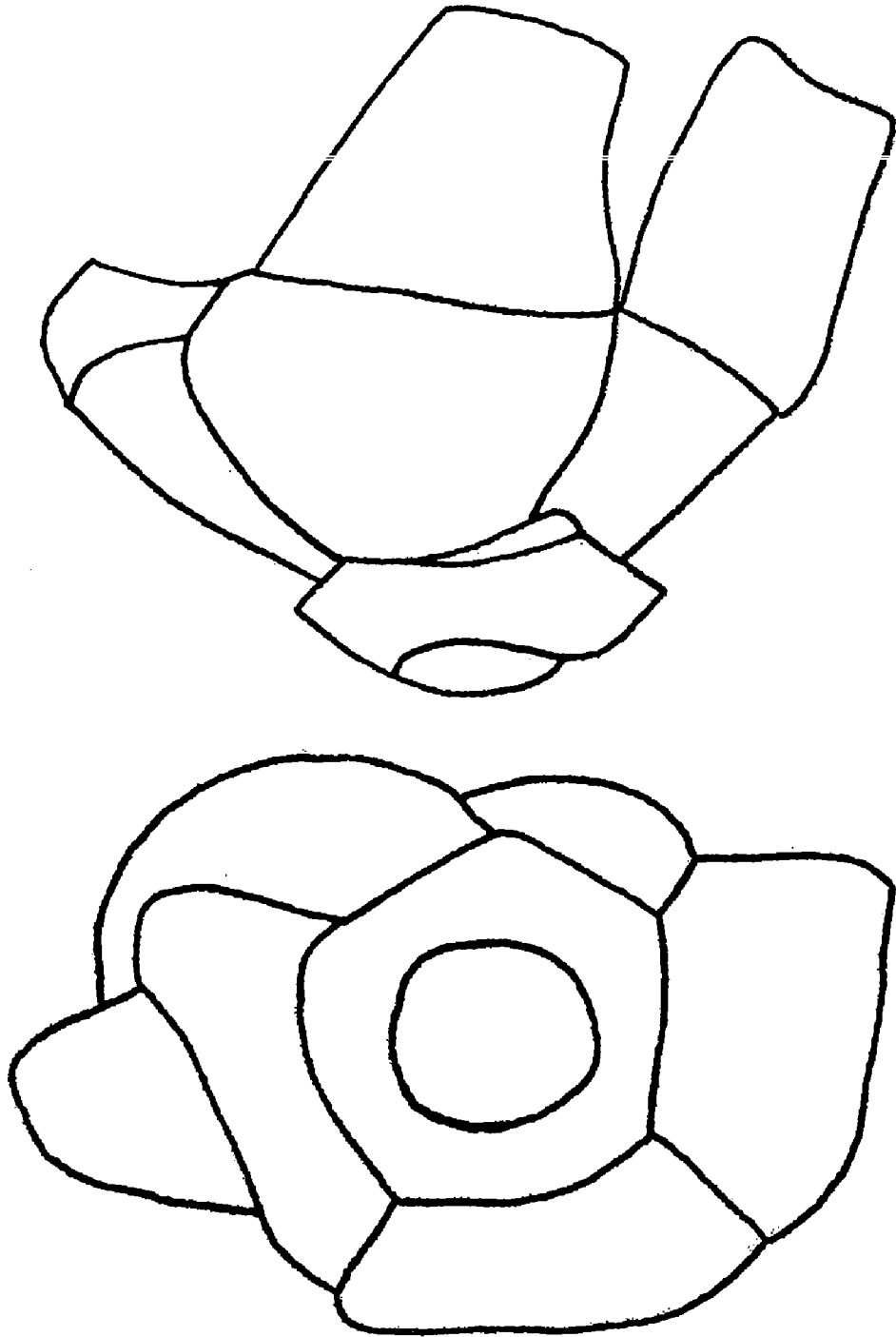
Plate I, figures 12 and 13, text-figures 1 and 2

This is the only species of the genus reported from rocks of Pennsylvanian age in North America. The holotype was collected by Mrs. Melba Strimple from an exposure on the northeast side of the Bartlesville Mound, an exposure that no longer exists. It is the only representative of the species ever found. Dr. Porter Kier, U. S. National Museum, has been kind enough to prepare camera lucida drawings of the holotype, drawings which are presented herein to supplement the original illustrations.

Cup low, typical *Synbathocrinus* shape, composed of a BB disk and five RR. BB three unequal elements, firmly fused into a low disk, the center of which is excavated by a round, comparatively large, sharply slanting columnal scar. The columnal depression is radiately furrowed.

¹. Now *Apographiocrinus typicalis*.

RR are comparatively large, rather thin, very slightly convex, pentagonal plates. A minute crescentic slit occupies the upper extremity, widening at the median portion to show from a side view when the arms are not in place. No notch for the reception of anal plate has been observed; however, as the specimen is not perfectly preserved, its absence cannot be certain.



Text figures 1 and 2, *Synbathocrinus melba* Strimple, Camera lucida drawings prepared by Dr. Porter Kier, U. S. National Museum. Fig. 1, view from side; 2, view from below.

Two first brachials are all of the arms preserved. These are stout appearing, slightly tapering plates.

IBB disk has a diameter of approximately 1.3 mm, the columnal depression 0.8 mm. The RR are 1.7 mm wide by 1.1 mm long.

The specimen at hand is certain to be in a young stage of development. To the extent of my knowledge this is the first recording of *Synbathocrinus* from the Pennsylvanian of North America.

Material consists of the single figured cup, from the Bartlesville Mound, Bartlesville, Oklahoma. The holotype is in the Springer Collection, U. S. National Museum. The legal description of the exposure is the SE $\frac{1}{4}$ sec. 3, T. 26 N., R. 12 E., Osage County, Oklahoma. The exposure is considered to be a crinoidal facies of the Wann formation, Ochelata group, Missourian series. The specimen is U. S. N. M. number S 4285.

AGASSIZOCRINIDAE S. A. Miller, 1889

PARAGASSIZOCRINUS Moore and Plummer, 1940

PARAGASSIZOCRINUS TARRI (Strimple), 1938

Plate II, figures 7, 10 and 13

This species was described on the basis of two partial dorsal cups, one of which retained a few arm segments, and several infrabasal cones and isolated plates. It was assigned to *Agassizocrinus* Owen and Shumard, 1851. In 1940, Moore and Plummer used the species as the genotype species of their new genus *Paragassizocrinus*. They give a very wide geographic distribution to the species based on infrabasal cones and isolated plates with the exception of one hypotype from the Stanton formation near Wayside, Kansas, which was a complete dorsal cup with some arm segments attached.

Cup high, turbinate, slightly elliptical, composed of IBB cone, five large BB, all pentagonal save post., five comparatively small pentagonal RR, and a single anal plate. As the two figured specimens with associated plates are of comparable size, measurements are presented as a complete cup; maximum width from right to left-18.0 mm, maximum width from post. to ant.-12.0 mm, height-20.45 mm. The IBB cones show no evidence of plate sutures. There is no evidence of columnar attachment save in the smallest observed cone, which does possess a minute depression at its apex. This may be considered as evidence of columnar attachment at some younger stage; however, it is more likely hereditary influence in immaturity as previously pointed out in *Erisocrinus typus*, where the influence of the eliminated anal plate is still shown by the immature specimens. The anal plate is six-sided, two-thirds in cup, upper one-third faceted for the reception of three tube plates.

RR depend almost entirely on their natural thickness for arm articulation facet. Small crescentic facet to the fore, shallow muscle scars to the right and left of facet, broken by very low incurved ridges. Shallow median groove to the notch in interior edge. The radials do not exhibit that definite variation in width formulated by Springer (1926, p. 59), as the ant. R in this specimen is one of the larger.

	r. post.	r. ant.	ant.	l. ant.	l. post.
After Springer	5.6	7.05	6.2	7.15	5.8 mm
Figured specimen	8.0	8.75	8.65	8.1	8.15 mm

Of the arms we have only the first few brachials of three rays. The three first primibrachs (r. post., r. ant. and ant.), have a width twice their height, the two second primibrachs (r. post. and r. ant.), are comparable in size and are truncated for the reception of two secundibrachs. From this evidence it is safe to assume that the species followed the normal generic ten, possibly nine arms, heavy, composed of low, wide brachials.

Anal proboscis unknown.

It is interesting to note that this species demonstrates the generic elimination of the anal plates from the cup, by having only one plate left. Unfortunately we have no other suitable material from the Pennsylvanian System with which we may compare the present species, save for a few IBB cones (*Agassizocrinus magnus* and *A. caliculus* Moore and Plummer, 1938), none of which is similar. The legal description is NE $\frac{1}{4}$ sec. 1, T. 25 N., R. 12 E., Washington County, Oklahoma. Specimens in the Springer Collection of the U. S. National Museum.

The exposure is a molluscan faunal facies of the Wann formation, Ochelata group, Missourian series. There is a weak limestone several feet below the shale horizon that might be the equivalent of the Stanton limestone of Kansas, as propounded by Moore and Plummer (1940, p. 342). It is my understanding, from discussion with the senior author, that their dorsal cup was found in the shale bed a few feet above the limestone exposed near Wayside, Kansas, which shale does contain a molluscan fauna. A thin, highly calcareous shale immediately overlying the Stanton at Wayside, Kansas, is highly crinoidal, but does not contain agassizocrinid remains.

The syntypes are U. N. N. M number S 4290.

EXPLANATION OF PLATE II

- Fig. 1. *Apographiocrinus typicalis* Moore and Plummer, l. ant. radial to fore. Largest observed crown. 4/5 natural size.
- Figs. 2-5. *Erisocrinus typus* Meek and Worthen. 2 to 4, side views showing later stages of growth. 5, mature cup shown from below. 4/5 natural size.
- Figs. 6, 9 and 12. *Ethelocrinus plattdsburgensis* Strimple. 6, view of cup from above; 9, same from below; 12, same from posterior side. 4/5 natural size.
- Figs. 7, 10 and 13. *Paragassizocrinus tarri* (Strimple). 7a, infrabasal cone from above; 7b, same from below; 10, associated cup plates combined into one illustration posterior view; 13, same, anterior view. 4/5 natural size.

PLATE II.



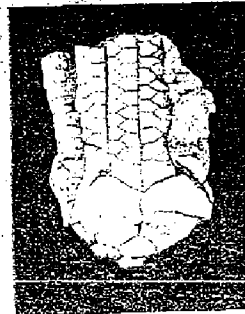
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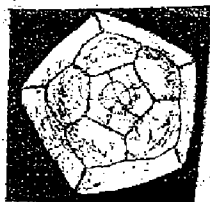
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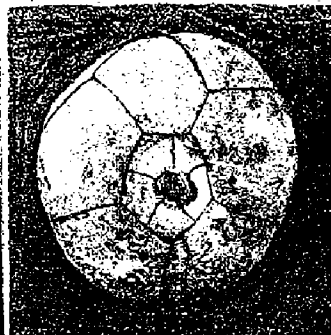
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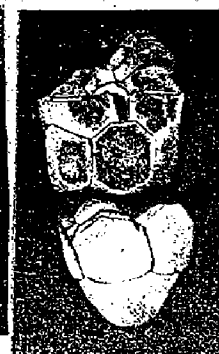
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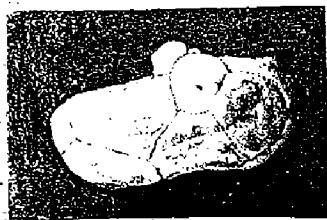
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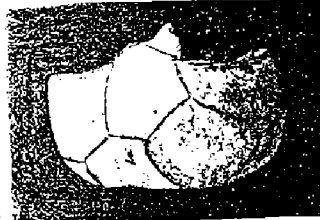
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13.

EUPACHYCRINIDAE S. A. Miller, 1889
ETHELOCRINUS Kirk, 1937
ETHELOCRINUS PLATTSBURGENSIS Strimple, 1938
Plate II, figures 6, 9 and 12

The original description of this species is adequate with the exception of that of the articulating facets of the radials. The inner edges of these plates were crushed and distorted, and I erroneously interpreted a narrow facet with azygous plates protruding from under the facet.

In 1940, Moore and Plummer proposed the genus *Parulocrinus* with *Ulocrinus blairi* Miller and Gurley as the genotype species. The arms for that species are not known, but the arms of *Parulocrinus marquisi* Moore and Plummer (1940) were considered by those authors to represent the genus. The arms are ten, of biserial structure. I am inclined to believe that *Ulocrinus blairi* is a bona fide representative of *Ulocrinus*, which is not known to have ten uniserial arms (Wright and Strimple, 1945). In any event the present species is now known to have more than ten biserial arms and can not be referred to *Parulocrinus* as proposed by Moore and Plummer (1940, p. 363).

Cup low, bowl shaped, 14 mm high, 18 mm diameter. IBB five, circlet in basal cavity occupying an area with a mean diameter of 10.5 mm. Proximal columnals of stem attached, diameter approximately 3.0 mm, apparently regular segments with rounded edges. BB five, large, lower extremity completing the basal concavity, Posterior B supporting very large radial on its right, the anal x above. Posterior B supports the lower extremity of the Ra. RR five, large, upper extremity developed inward slightly as articulation facets. The upper edge of RR has a long thin slit with slightly raised lips, back of which, in the facet proper, is another smaller slit not running the width of the plate. Muscle scars faint. The usual notch is so pronounced that the median portion of the facet is only about the normal thickness of the plates. A row of azygous plates protrudes from under the articulation shelves in this specimen. Anal X large, six-sided, two-thirds in cup. Ra more or less quadrangular with lower portion expanded at the expense of the posterior B. All plates have smooth surfaces and are rather thick.

The species is typically *Ethelocrinus* but is easily distinguished from other species by the smooth plates, lack of depression at sutures, and large almost flat BB and RR.

Specimens studied consisted of the single figured cup, numerous dissociated plates, particularly the BB and RR, which are rather common at this horizon. Specimens collected at the Bartlesville Mound, Bartlesville, Oklahoma. The type specimens are in the Springer Collection, U. S. National Museum. The legal description of the exposure is the SE $\frac{1}{4}$ sec. 3, T. 26 N., R. 12 E., Osage County, Oklahoma. The exposure is considered to be a crinoidal facies of the Wann formation, Ochelata group, Missourian series. The holotype is U. S. N. M. number S 4287.

ETHELOCRINUS EXPANSUS Strimple, 1938

Plate II, figures 8 and 10

Cup low, bowl shaped, 12.5 mm high, 28.0 mm mean diameter. IBB five, small, circlet occupies an area with a mean diameter of 8.0 mm. BB five, large, comprising major area of cup, lower portion curved under to form sides of basal concavity. Posterior B carries the large quadrangular radianal on the right, the anal x on its upper edge. Right posterior B supports lower edge of Ra. RR are comparatively small pentagonal plates. The anal x and Ra have almost obliterated one facet of the r. post. R. All plates are tumid, thick, rather smooth and are strongly depressed at point of meeting. Sutures are regularly bridged across, leaving the impression of pores rather than sutures. Arm articulation shelves of the RR too poorly preserved for adequate description. Anal x six sided, two-thirds in cup, one-third above, truncated for reception of two tube plates.

In general structure this species may be compared with *E. tuberculatus* (Meek and Worthen), 1866, but is easily distinguished by the lack of spectacular ornamentation.

Material studied consists of one cup and several dissociated plates, all collected at the Bartlesville Mound, Bartlesville, Oklahoma. Specimens are in the Springer Collection, U. S. National Museum.

The legal description of the exposure is SE $\frac{1}{4}$ sec. 3, T. 26 N., R. 12 E., Osage County, Oklahoma. The exposure is considered to be a crinoidal facies of the Wann formation, Ochelata group, Missourian series. The specimens are U. S. N. M. number S 4286.

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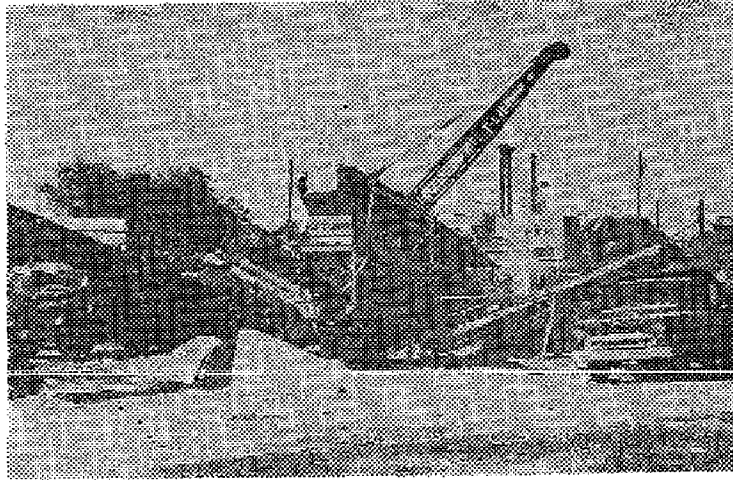
New Rock Crusher in Kay County

PHILIP P. CHANDLER

The Ponca Rock Company, owned and operated by W. L. and Gene Auterson of Ponca City, is currently operating portable rock crushing equipment three miles southwest of Ponca City. The quarry is on a four and a half acre lease on the Walter Mullins farm in the NW $\frac{1}{4}$ NW $\frac{1}{4}$ of section 17, T. 25 N., R. 2 E.

In addition to the rock crusher, manufactured by the Rogers Iron Works of Joplin, Missouri, the company has two loaders and a number of trucks. Six people are employed by the company.

The temporary quarry produces crushed rock from the Permian Herington limestone, which is the uppermost formation of the Wolfcampian series in northern Oklahoma and Kansas. The limestone is gray to red, dense, and ranges in thickness from three to six feet.



Operations in Ponca Rock Company quarry.

The operation involves the blasting of the limestone and its removal by truck to the crusher where it is broken up into sizes ranging from one-half inch to two inches in diameter. The crushed rock is hauled by truck to the location where the aggregate is used as base material for asphalt roads now under construction in Ponca City.

The Ponca Rock Company plans to remain at its present location for only a short time and then to move to a Herington limestone site north of Ponca City for further operations.



Working face in Ponca Rock Company quarry.