Some Late Pennsylvanian (Virgilian) Crinoids from Southeastern Nebraska and Southwestern Iowa

Roger K. Pabian
University of Nebraska

Harrell L. Strimple
University of Iowa

Let us know how access to this document benefits you

Copyright ©1980 Iowa Academy of Science, Inc.
Follow this and additional works at: https://scholarworks.uni.edu/pias

Recommended Citation
Available at: https://scholarworks.uni.edu/pias/vol87/iss1/3

This Research is brought to you for free and open access by the Iowa Academy of Science at UNI ScholarWorks. It has been accepted for inclusion in Proceedings of the Iowa Academy of Science by an authorized editor of UNI ScholarWorks. For more information, please contact scholarworks@uni.edu.
Some Late Pennsylvanian (Virgilian) Crinoids from Southeastern Nebraska and Southwestern Iowa

ROGER K. PABIAN and HARRELL L. STRIMPLE

Conservation and Survey Division, IANR, University of Nebraska, Lincoln, Nebraska 68588 and Department of Geology, The University of Iowa, Iowa City, Iowa 52242

Virgilian age rocks of Iowa and Nebraska contain important crinoid faunas and current collections help to establish distributions and tentative ranges of numerous species. A middle limestone-core shale fauna from the Cass Formation of Nebraska provides small, usually inomate species with close Missourian affinities. Other crinoids studied are from outside shales and upper limestones of the cyclothem and these are usually large, ornate species. Biserial arms are reported for the first time for Subglobocrinus Knapp. The first report of flexible crinoids from Virgilian strata of the Iowa-Nebraska area is made here. Current collections of crinoids contain 40 species and 31 genera representing 19 families: new species or subspecies are; Isoallagecrinus bassleri intermedius, Graffhamierinus gratesquus, Arrectocrinus iowensis, Pyndoxocrinus inornatus, Subglobocrinus kaseri, Contocrinus invaginatus, Apographeocrinus platybasis. The species Aesiocrinus luxoris is referred to the genus Moundocrinus.

INDEX DESCRIPTORS: Crinoids; Pennsylvanian, Missourian, Virgilian; Shoemaker Limestone, Haskell Limestone, Cass Formation; Plattsmouth Limestone, Oread Formation; Jackson Park Shale, Stull Shale, Kanwaka Formation; Doniphan Shale, Beil Limestone, Avoca Limestone, Lecompton Formation; Ost Limestone, Tecumseh Formation; Ervine Creek Limestone, Deer Creek Formation; Calhoun Shale. Cass County, Nebraska, Mills, Montgomery, Fremont Counties, Iowa.

A large number of Virgilian crinoid species have been described from the North American midcontinent region by Moore (1939, 1940), Moore and Plummer (1940) and Strimple (1947, 1948, 1949a and b, 1951b and c, 1952, 1963) but practically all of these species were reported from Kansas, Oklahoma, or Texas. Very few crinoids of Virgilian age have been reported from extensive exposures in Iowa and Nebraska. Geinitz (1866) described Deloericinus (Clyathocrinus) inopinus from Nebraska. Strimple and Priest (1969) described Graffhamierinus from the Stull Shale of Nebraska, and Pabian and Strimple (1974a, 1974b, 1977b) described Virgilian crinoids from the Beil, Ervine Creek, and Coal Creek Limestones, and the Stull Shale of Nebraska and Iowa, as well as three species of Arrectocrinus Knapp from Nebraska and Iowa. Neither the geographic nor stratigraphic distribution of these fossils is well documented in Iowa and Nebraska. This study embraces nearly 200 specimens that have been collected mainly from upper limestones and outside shales of cyclothems as defined by Heckel and Baesemann (1975) and Heckel (1977). As is the case with Missourian crinoid faunas studied by Pabian and Strimple (unpublished manuscript), Virgilian crinoids tend to show the greatest abundance and diversity near the cores of cyclothems. These crinoids are normally small, inornate species. Such a fauna occurs in the transgressive facies of the Cass Formation. Virgilian crinoids from the outside shales and regressive, upper limestones are usually large, ornate species as represented by their Missourian predecessors.

The crinoids described or reported in this study were collected from the locations shown in Text-fig. 1 and given in Appendix I. Stratigraphic correlations were determined from data of Hershey et al (1960), Burchett and Reed (1967), Schott (1966), and unpublished sections of Burchett, Burchett and Prichard, Dixon and Erdenberger, and Wood.

The transgressive facies of the Cass Formation (Shoemaker Limestone, Little Pawnee Shale, and lower Cass Limestone) seems to mark an important crisis point in crinoid evolution. Pabian and Strimple (1978) indicated that crinoids in the lower part of the South Bend Limestone of Nebraska showed Missourian affinities. The crinoids from the core of the Cass cyclothem consists of species that were present in Missourian strata. None of the Cass crinoid species have been found in younger strata. The data on hand suggests that crinoids began their transition from Missourian to Virgilian forms in South Bend time and completed the transition in Cass time. Sedimentologic factors complicate the picture. The lower South Bend crinoids are of a transgressive assemblage normally associated with middle limestone, core shale, and basal upper limestones whereas those of the upper South Bend are a regressive assemblage that is normally associated with the upper limestone. We believe that the transition of Missourian to Virgilian crinoids is not well understood partly because the South Bend Limestone of Nebraska may have been misinterpreted by earlier workers. The cyclothem model put forth by Heckel and Baesemann (1975) and Heckel (1977) appears to hold throughout deposition of Douglas and Shawnee sediments. We have examined the evolution of crinoids in both the transgressive and regressive facies of the cyclothem as separate entities. We suggest that evolution of transgressive crinoid faunas may have shown somewhat different trends, because there is greater stability of physical factors found at maximum transgression (depth) than for crinoids found in the outside shales or upper limestones where physical factors are usually more variable.

Measurements for holotype specimens of new clad inadunate species are given in Appendix II.

Ranges of Pennsylvanian crinoids are often difficult to establish because of sporadic distribution and provincialism of these fossils.

Text-fig. 1. Index map showing locations from which fossil crinoids were collected.

Pabian and Strimple (1979, in press) have shown that some of these problems can be overcome by observing systematic changes in populations. Increased volume of specimens in our collections have provided more insight into the matter. Tentative ranges are given in the discussion of most species.

DISCUSSION

A single dorsal cup with a few proximal brachials and two plates in the posterior interray is available for study. The specimen appears to have close affinity with Paramphicrinus oklahomaensis which species has been fully documented by Strimple (1939) from the Wann Formation (Missourian) of Oklahoma and by Strimple and Moore (1971) from the Bond Formation (Missourian) of Illinois.
Externally the entire infrabasal and basal circlets, as well as proximal portions of the basals, are covered by the broad columnar cicatrix. Internally there is no evidence of infrabasals which have apparently been completely fused with and/or absorbed by the basals. A depressed area, which is roughly in the form of five lobes, together with a complex of radiating grooves (nerve channels?) occupy the area. Posterior (CD) basal is larger and considerably longer than the other four basals. Anal X is rather large with facets above for reception of two subequal anal plates.

MATERIAL STUDIED

Hypotype, UNSM-16668, Calhoun Shale, Location 11.

Subclass NADUNATA Wachsmuth & Springer, 1885
Order DISPARIDA Moore & Laudon, 1943
Superfamily ALLAGECRINACEA Carpenter & Etheridge, 1881
Family ALLAGECRINIDAE Carpenter & Etheridge, 1881
Genus ISOALLAGECRINUS Strimple, 1966
Type species: Isoallagecrinus bassleri (Strimple, 1938)

DISCUSSION

Isoallagecrinus bassleri, type species of the genus, is relatively distinctive and common in upper Missourian rocks of northeastern Oklahoma and southeastern Kansas. Strimple, 1951, reported Isoallagecrinus bassleri var. (sub. sp.) nodosus from the Lake Bridgeport Shale (= Wolf Mountain Shale, Grapford Formation) of Wise County, Texas, and also described a coexisting form as I. bassleri status. Strimple, 1966, elevated the subspecies status to the specific level. The only readily apparent difference between mature specimens of status and nodosus is the nodose exterior of the radial plates in the latter.

The inornate species I. graffhamicrinus (Strimple) occurs in the Stull Shale (Virgilian) of Kansas and I. eageli Strimple in the Red Eagle Formation (Oklahoma) and Bird Spring Formation (Nevada) of Wolfcampian (Lower Permian) age. Mature specimens of I. graffhamicrinus are smaller than those of I. bassleri or I. status whereas I. eageli is much larger than any of the other three species.

With the discovery of another form which has surface ornamentation, in this instance coalesced nodes, it appears desirable to propose a subspecific division pending a better understanding of the interrelationships. The name I. bassleri intermedius new subspecies is described below.

RANGE


ISOALLAGECRINUS BASSLEI INTERMEDIUS Strimple & Pa­bian, new subspecies.

Text-figs. 2 a-b

DIAGNOSIS

Like Isoallagecrinus bassleri s.s except radials do not project below summit of basals, nodes on radials are coalesced, and there may be one or two less arms than found in specimens of the basic species of comparable size (i.e. 10 as compared to normal compliment of 11 or 12 arms).

DESCRIPTION

Cup moderately low, asymmetrical with shortest diameter from posterior to anterior. Basals three, smallest in BC interradius, circlet broad-based with short lateral sides; columnar attachment area of proximal columnal is smooth except for short crenulations just inside a rim marking the perimeter of the segment; lumen quinquelobate with lobes in radial positions; lateral sides of basal circlet expand slightly and are readily visible in side view of cup. Proximal ends of five radials are subhorizontal with a sharp demarcation between basals and radials; pronounced curvature of radials take place as the maximum width of cup is approached which, together with sharply incised interradial sutures and decided increase in distal width of multiple arm bearing plates, creates an almost spherical contour to those elements in their lower portions. Multiplicity of arms requires expansion of the distal portions of involved radials with additions apparently taking place from right to left, the most bizarre being E radial with three arm facets and which enroaches strongly on A radial which has only one large arm. Mid-portions of radials bear nodes which have coalesced; the transverse ridges on the articular surfaces are accentuated by outer ligament pits and each ridge bears a pore (nerve canal?) in mid-length. The left shoulder of C radial bears a diagonal facet for reception of the anal plate and the right side of D radial is also slightly affected; a wedge-shaped gap, termed a parabolic notch by Kirk (1936) extends toward the interior. Arm facet distribution is: A ray-1, B ray-3, C ray-1 plus anal, D ray-2, E ray-3. The right arm facet on E ray is larger than other arms of the ray.

DISCUSSION

Only two specimens of the new subspecies are available. One is too poorly preserved to be more than supportive and has been designated a paratype. Plates of the posterior side of the other specimen, the holotype, are partially dislocated but in other respects it is well preserved. They are of comparable size and are judged to be adult. The specimens are in the size range of young adults of I. bassleri or I. status, however, both of those species have one or two more arms at a comparable size (stage of development).

Measurements of holotype in millimeters; maximum width of cup 5.7, height of cup 3.1, height of basal circlet 0.4, diameter of proximal columnal 2.3.

MATERIAL STUDIED

Holotype, UNSM-16775 and paratype, UNSM-16676, Curzon Limestone Member, Topeka Formation, Location 3.

Order CLADIDA Moore & Laudon, 1943
Suborder POTERIOCRININA Jaekel, 1918
Superfamily ERISCOFRINACEA Wachsmuth & Springer, 1886
Family DIPHUKIRINIDAE Strimple & Knapp, 1966
Genus GRAFFHAMICRINUS Strimple, 1961
GRAFFHAMICRINUS MAGNIFICUS Strimple, 1947
Plate 1, figs. 1-3

DISCUSSION

Graffhamicrinus magnificus is one of the most widespread, long-ranging species in the Virgilian. The present study embraces 17 cups. It is known to occur in rocks as old as Late Missourian age (Stanton Formation) of Nebraska and in rocks as young as Middle Virgilian (Deer Creek Formation). Graffhamicrinus magnificus is a large, ornate species that is normally restricted to the outside shales or upper limestones of the Midcontinent cyclothems. All samples of G. magnificus studied to date show individuals that have a tendency to eliminate or expel the anal X plate from the CD interradius. This tendency is not exhibited in G. subcoronatus, the other Graffhamicrinus species in Virgil age rocks of Nebraska and Iowa.

MATERIAL STUDIED


GRAFFHAMICRINUS SUBCORONATUS (Moore & Plummer) 1940
Plate 1, figs. 4-6

DISCUSSION

This species is represented by 28 cups, and, as is the case in most other Virgilian age units, Graffhamicrinus subcoronatus is more prolific than G. magnificus. Like G. magnificus, G. subcoronatus is essentially confined to the outside shales and upper limestones of the midcontinent cyclothems as defined by Heckel and Baesemann (1975) and Heckel (1977). This species appears to have a more widespread geographic distribution than does G. magnificus; the holotype of G. subcoronatus was collected from the lower Missourian Keechi Creek Member of the Mineral Wells Formation of Palo Pinto County, Texas. Both G. magnificus and G. subcoronatus are successful, long-ranging species that are most commonly found in the early, transgressive and late, regressive facies of the Nebraska-Iowa cyclothem.

MATERIAL STUDIED

Hypotypes UNSM-16705 — UNSM-16709, SUI-45838-SUI-45840, Plattsmouth Limestone Member, Oread Formation, Location 1. UNSM-16599, UNSM-16600, Beil Limestone Member, Lecompton Formation, Location 2. UNSM-16653-UNSM-16660, Doniphan Shale Member, Lecompton Formation, Location 2. UNSM-16716, UNSM-16717, Doniphan Shale Member, Lecompton Formation, Location 4. UNSM-16719 — UNSM-16721, Spring Branch Limestone Member, Lecompton Formation, Location 4. UNSM-15705, Beil Limestone Member, Lecompton Formation, Location 5. UNSM-15714, UNSM-15715, Kanwaka Shale Formation, Location 5; UNSM-16676 — UNSM-16677, Doniphan Shale Member, Lecompton Formation, Location 8. UNSM-16746, UNSM-16747, Ervive Creek Limestone, Deer Creek Formation, Location 10. UNSM-16672, Plattsmouth Limestone Member, Oread Formation, Location 16. UNSM-15717, Shoemaker Limestone, Cass Formation, Location 18.

GRAFFHAMICRINUS PAUCINODUS (Moore & Plummer) 1940
Plate 1, figs. 7-9

DISCUSSION

Current collections reveal that this species does not range above the Heumader Shale Member, Oread Formation, in the midcontinent (See Pabian and Strimpe, 1974a, p. 265). The holotype was collected from the Palo Pinto Limestone (Middle Missourian) in Wise County, Texas. Graffhamicrinus paucinodus may be in the lineage including G. subcoronatus, the latter differing by having a deeper, more roughened cup.

MATERIAL STUDIED

Hypotype, UNSM-16796, Haskell Limestone, Cass Formation, Location 17.

GRAFFHAMICRINUS DECAPODOS (Strimpe & Priest), 1969

DISCUSSION

Current collections indicate that Graffhamicrinus decapodos ranges from late Missourian age (Stanton) units through early Virgilian (Kanwaka) age units. The species is well documented in Nebraska and Kansas but is unknown from the Iowa section.

MATERIAL STUDIED

Hypotype, UNSM-16797, Haskell Limestone Member, Cass Formation, Location 17.

GRAFFHAMICRINUS GROTESQUUS Pabian & Strimpe, new species
Plate 1, figs. 10-12

DESCRIPTION

This species is based on a single cup with a deep, broad, funnel-like basal concavity. Five infrabasals form a hemispherical circler with a pentagonal outline that is confined to the upper third of the concavity.

CRINODIS FROM NEBRASKA AND IOWA

The proximal quarter of each of the five basals is confined to the basal concavity; the medial half of the basals are nearly flat-lying and extend outward to form nearly horizontal, spinose projections. The distal quarter of the basals recurve sharply to form deep dimples at the basel-interradial confluence. Such a dimple also occurs at the radial-interbasal confluence. The CD basal is hexagonal and truncated to receive the rectangular anal X plate; all others are pentagonal. The five radials are tapered pentagons; their proximal tips reach almost to the basal plane of the cup; the medial portions are bulbous and have 3 or 4 horizontally extended nodes, C and D are separated by an anal X.

The radial articular facets are plenary. The outer marginal ridge is sharp and separated from a well-defined, denticulate transverse ridge by a deep, narrow, ligament pit furrow. The articular facets are level, but impressed below the cup summit. There is a deep lateral furrow that is bounded by a short oblique ridge. The lateral ridge is well-defined and the adsutural slope is about 45 degrees. Lateral lobes are parabolic

This species appears to be derived from an undescribed species of Missourian age from Nebraska which has the horizontal projections confined to the basal plates only. *G. grotesquus* is the only described species of *Grafjhamicrinus* to have pronounced horizontal projections of basal and radial plates.

**MATERIAL STUDIED**

Holotype, UNSM-16748, Ervine Creek Limestone Member, Deer Creek Formation, Location 9.

Family CATACRINIDAE Knapp, 1969

Genus ARRECTOCRINUS Knapp, 1969

ARRECTOCRINUS STANLEYI Pabian & Strimple, 1977b

**DISCUSSION**

The specimens at hand show that the dorsal cup of *A. stanleyi* may reach a maximum diameter of about 25 mm. This is nearly twice as large as the holotype. The known range of the species is from the Doniphan Shale through the Beil Limestone.

**MATERIAL STUDIED**

Hypotypes, UNSM-16618 — UNSM-16622, Doniphan Shale Member, Lecompton Formation, Location 2.

ARRECTOCRINUS HOPPERI Pabian & Strimple, 1977

**DISCUSSION**

The known range for this species is from the Ervine Creek Limestone through the Curzon Limestone; *Arrectocrinus hopperi* differs from *A. stanleyi* in having a low cup.

**MATERIAL STUDIED**

Hypotypes, UNSM-16736 — UNSM-16739, Curzon Limestone Member, Topeka Formation, Location 3.

ARRECTOCRINUS COMMINUTUS Pabian & Strimple, 1974a

**DISCUSSION**

Tentative range zone of *Arrectocrinus comminatus* is from the Plattsmouth Limestone, Oread Formation, through the Curzon Limestone, Topeka Formation.

**MATERIAL STUDIED**

Hypotypes, SUI-45858 — SUI-45859, Plattsmouth Limestone Member, Oread Formation, Location 1.

ARRECTOCRINUS IOWENSIS Pabian & Strimple, new species

Plate 1, figs. 13-14; Plate 2, figs. 1-3

**DESCRIPTION**

This species is based on ten dorsal cups. The infrabasal circlert contains five, kite-shaped plates that are confined to a broad, but shallow, basal concavity. The round stem impression is crenulated and forms a nearly vertical well in the infrabasal circlert. AB, BC, DE, and EA basals are pentagonal; CD is hexagonal, to receive a barrel-shaped anal X plate; the proximal third of the basals slopes gently out of the basal concavity, the medial third forms the basal plane of the cup, and the distal third rises upward in a parabolic arc to about half the height of the cup. The five radials are epaulette shaped; they extend to about ¼ the distance to the cup base; the proximal part slopes upward at about 80 degrees and the medial area is nearly vertical; they recurve inward near the cup summit. C and D radials are separated by a barrel-shaped anal X plate.

Radial articular facets are level and plenary. Outer marginal ridge is well defined and is separated from a sharp, denticulate transverse ridge by a deep ligament pit furrow and ligament pit; the lateral furrow is well impressed and bounded by an oblique ridge. The lateral ridge is sharp and the adsutural slope is quarter-round in cross section. Muscle area grades into a semi-circular lateral lobe and slopes inward gently to a broad, shallow central pit that connects to a short intramuscular notch by a short furrow.

**DISCUSSION**

*A. iowensis* appears to be most closely related to *A.
comminatus from which it differs in having smooth plates rather than being finely granulose; *A. hopperi* has a very low profile and *A. stanleyi* has non-spinose primibrachials.

**MATERIAL STUDIED**

Holotype, UNSM-16698; paratypes, UNSM-16692 — UNSM-16697, UNSM-16699 — UNSM-16701, SUI-45841 — SUI45849, Plattsouth Limestone Member, Oread Formation, Location 1. Hypotype, UNSM-16789, Haskell Limestone Member, Cass Formation, Location 17.

Genus PYNDAXOCRINUS Knapp, 1969

PYNDAXOCRINAS INORNATUS Pabian & Strimple, new species

**DESCRIPTION**

This species is based on a flat-based dorsal cup. The infrabasal circler is pentagonal and nearly covered by a round columnar cicatrix with a pentalobate lumen. AB, BC, DE and EA basals are pentagonal, CD being truncated to receive a six-sided anal X plate. The proximal area of the basals is confined to a very shallow, broad concavity; the medial areas form the cup base, and the distal areas rise about 2/5 the height of the cup in a circular arc. Five radials are epaulette shaped; the proximal tip reaches the basal plane; they rise upward in a circular cross section about ¼ the cup height and then recurve near the summit. C and D radials are separated by anal X. Cup plates smooth.

Radial articular facets plenary, nearly level. Wide, outer ligament ridge separated from transverse ridge by ligament pit and furrow. Oblique ridge and lateral ridge form a prominent swelling that is bounded by admuscular slope and lateral furrow, and blunt lateral lobe that grades into a broad muscle area that slopes to a central pit leading to the intramuscular notch through a narrow furrow.

**DISCUSSION**

*Pyndaxocrinus inornatus* has a cup of low profile compared to *P. gerdesi*, which is also covered by many fine granules. *P. separatus* is covered with fine granules and has a shallowly impressed base.

**MATERIAL STUDIED**

Holotype, UNSM-16749, Ervine Creek Limestone, Deer Creek Formation, Location 10.

Genus ENDELOCRINUS Moore & Plummer, 1940

ENDELOCRINUS TUMIDUS (Strimple), 1939

**DISCUSSION**

*Endelocrinus tumidus* appears to be a rather long ranging species. In the midcontinent it first appears in the lower Missourian age Winterset Limestone, and ranges upward at least to the Church Member, Howard Limestone, of Virgilian age. *Endelocrinus tumidus* occurs with *E. allegheniensis* (Burke) in Virgil strata; the former has more tumid plates than the latter, and only slightly protruded primibrachials as compared to spinose PBrl in *E. allegheniensis*.

**DISCUSSION**

*Endelocrinus allegheniensis* is not common in the midcontinent but has a tentative range from the Doniphan Shale Member, Lecompton Formation, through Ervine Creek Limestone, Deer Creek Formation. The range of *E. allegheniensis* may be sufficiently short to be fairly effective in correlation between the midcontinent and Appalachian region. It may occur with *Delocrinus vulgaris* Moore & Plummer but *E. allegheniensis* is easily differentiated by having spinose primibrachials and dimples at plate junctions, compared to non-spinose primibrachials and smooth plate junctions in *D. vulgaris*.

**MATERIAL STUDIED**

Hypotypes; SUI-45874 — SUI-45875, Plattsouth Limestone Member, Oread Formation, Location 1. UNSM-16729, Beil Limestone, Lecompton Formation, Location 3. UNSM-16791 — UNSM-16792, Haskell Limestone Member, Cass Formation, Location 17.

ENDELOCRINUS sp. cf. E. ALLEGENIENSIS (Burke) 1932

**DISCUSSION**

*Delocrinus vulgaris* has the widest range of any species of *Delocrinus* found in rocks of Virgilian age. Current collections indicate that it ranges through almost the entire Virgilian sequence; the lowest occurrence is probably in the Haskell Limestone Member of the Cass Formation and it occurs as high as the Brownville Limestone Member of the Wood Side Formation. Although *D. hemisphericus* (Shumard) occurs in rocks as young as the Coal Creek Limestone Member, Topeka Formation, it appears to have given way to *D. vulgaris* in very early Virgilian time. *Delocrinus vulgaris* seems to have developed from *D. hemisphericus* by reducing the protrusion and height of the primibrachials and growing a much larger cup in fully mature individuals. Throughout its range, *D. vulgaris* shows a tendency to expel the anal X plate but this appears to have been fortuitous as no descendant...
lineages entirely lacking anal X plates are known.

**MATERIAL STUDIED**

Hypotypes: UNSM-16710 — UNSM-16712, SUI-45865 — SUI-45869, Plattsmouth Limestone Member, Oread Formation, Location 1. UNSM-16638 — UNSM-16649, Doniphan Shale Member, Lecompton Formation, Horizon 9, Location 2. UNSM-16601 — UNSM-16606, Beil Limestone Member, Lecompton Formation, Location 3. UNSM-16732, Beil Limestone Member, Lecompton Formation, Location 4. UNSM-16722 — UNSM-16724, Spring Branch Limestone Member, Lecompton Formation, Location 4. UNSM-16714 — UNSM-16715, Doniphan Shale Member, Lecompton Formation, Location 5. UNSM-15703 — UNSM-15704, Beil Limestone Member, Lecompton Formation, Location 6. UNSM-16767 — UNSM-16770, Stull Shale Member, Kanwaka Formation, Location 8. UNSM-16678, Doniphan Shale Member, Lecompton Formation, Location 9. UNSM-16756, Ervine Creek Limestone Member, Deer Creek Formation, Location 10. UNSM-16750, Ervine Creek Limestone Member, Deer Creek Formation, Location 13. UNSM-16674, Plattsmouth Limestone Member, Oread Formation, Location 13.

**DELOCRINUS HEMISPHERICUS** (Shumard), 1858

Plate 3, figs. 1-3

**DISCUSSION**

*Delocrinus hemisphericus* appears to be a very long-ranging, successful form that survived through much of the Desmoinesian, all of the Missourian, and the lower half of the Virgilian. The success of *D. hemisphericus* may lie in the fact that the species does not seem to have been environmentally controlled; it is found in practically all depositional environments of the cyclothem. It is interesting to note that adults of *D. hemisphericus* from upper limestone and outside shales become significantly larger than adults from cyclothem cores.

**MATERIAL STUDIED**

Hypotypes: UNSM-16785 — UNSM-16787, Haskell Limestone Member, Cass Formation, Location 17.

Family PARADELOCRINIDAE Knapp, 1969

Genus *NEOCATACRINUS* Knapp, 1969

*NEOCATACRINUS* sp. cf. *N. PROTENSUS* (Moore & Plummer), 1940

Plate 3, figs. 4-5

**DESCRIPTION**

Dorsal cup low bowl-shaped. Infrabasals five, confined to broad and fairly shallow concavity. Basals five, pentagonal; proximal end in basal concavity, medial area makes up basal plane of cup, distal half rises in circular arc about half the cup height. Radials five, epaulette-shaped, with tips reaching almost to basal plane; they rise upward at about 60 degrees and recurve inward near cup summit. Cup plates probably originally smooth though as preserved roughened due to weathering. Stem round. Anal X not observed.

Radial articular facets poorly defined, plenary, nearly level. Outer marginal ridge, ligament pit furrow, ligament pit, and transverse ridge faint. Lateral ridges blunt, but adsumal slopes large and deep.

**DISCUSSION**

This species differs from *Neocatacerinus protensus* (Moore & Plummer) in having a comparatively broad and shallow basal concavity rather than the deep constricted one of the latter species. Because of poor preservation we hesitate to assign it to *N. protensus* or to propose a new species.

**MATERIAL STUDIED**

Hypotypes, UNSM-15707, Beil Limestone, Lecompton Formation, Location 5; UNSM-16760, Ervine Creek Limestone Member, Deer Creek Formation, Location 9; UNSM-15716, Shoemaker Limestone Member, Cass Formation, Location 18.

Genus *SUBLOCALOCRINUS* Knapp, 1969

SUBLOCALOCRINUS KASERI Pabian & Strimple, new species

Plate 3, figs. 6-10

**DESCRIPTION**

This species is represented by 38 low, discoid, and decidedly pentagonal dorsal cups with a deep, narrow, funnel-like basal concavity. The five infrabasals are small and are almost entirely covered by the surrounding cup. AB, BC, DE, and EA basals are pentagonal. CD basal is truncated to receive anal X. Five radials are epaulette shaped and rise in a circular arc nearly to the cup summit before recurving inward. C and D radials separated by anal X which may or may not be seen in posterior view of cup; anal X is hexagonal in the former case, and wedge shaped in the latter. Cup plates are smooth to finely granulose.

Radial articular facets are plenary and flat to sloping outward up to 20 degrees. Outer marginal ridge is sharp and separated from denticulate transverse ridge by a deep, narrow ligament pit and ligament pit furrow. Lateral furrow is deepened and bounds a high oblique ridge that joins with the lateral ridge. Adsumal slope about 45 degrees but not deep. Lateral lobes round and slope into broad central pit that connects to a deep intramural notch by a short furrow.

PB1 plates spinose, axillary. SB1 is trapezoidal and SB2 is cuneiform. Biserial branching is attained by SB3 in A ray of holotype.

**DISCUSSION**

This species is easily distinguished by its discoid, pentagonal cup. Arms found associated with a hypotype, UNSM-16623, are biserial and they swell midway, indicating a pyriform crown for *S. kaseri*. The
specimen also indicates full biseriality was attained by SBr5. The arm structure may indicate a close relationship to Lobalocrinus Knapp.

Some of the specimens show a strong tendency to expel the anal X plate. This tendency is illustrated by the holotype of the type species of Sublobalocrinus (Paradelocrinus iolaensis Strimple). Sublobalocrinus kaseri differs from S. iolaensis in having more distinct plate sutures and from S. planus (White) by having a decidedly pentagonal outline.

The species is named for Kaser Construction Company which firm has allowed the authors access to their quarries.

**MATERIAL STUDIED**


Family DECODOCRINIDAE Bather, 1890
Genus GLAUKOSOCRINUS Strimple, 1951
GLAUKOSOCRINUS sp.
Plate 3, fig. 12

**DISCUSSION**

Because of poor preservation, we refrain from assigning this specimen to a species of Glaukosocrinus. This same species occurs in the Stoner Limestone (Missourian) of Nebraska and we will withhold the specific name for a subsequent study. The species is characterized by a smooth cup and heavy arms with an axillary PBr1 followed by 6 or more zig-zag arranged SBr plates.

**MATERIAL STUDIED**

Hypotype, UNSM-16795, Haskell Limestone, Cass Formation, Location 17.

Family ERISOCRINIDAE Wachsmuth & Springer, 1886
Genus ERISOCRINUS Meek & Worthen, 1865
ERISOCRINUS TYPUS Meek & Worthen, 1865
Plate 4, figs. 1-3

**DISCUSSION**

*Erisocrinus typus* is a very long ranging form of doubtful strati-
present the two genera are readily separable because **Contocrinus** retains uniserial (cuneate secundibrachs) arms and **Endocrinus** has biserial arms.

**MATERIAL STUDIED**

Holotype, UNSM-16590, paratypes, UNSM-16587 — UNSM-16589, Beil Limestone Member, Lecompton Formation. UNSM-16666, Doniphan Shale, Lecompton Formation, Location 2: hypotypes, SUI-45860, Plattsmouth Limestone Member, Oread Formation, Location 1. UNSM-15712, Beil Limestone Member, Lecompton Formation, Location 5. UNSM-16764 — UNSM-16765, Beil Limestone Member, Lecompton Formation, Location 6.

Superfamily APOGRAPHIOCRINACEA Moore & Laudon, 1943

Family APOGRAPHIOCRINIDAE Moore & Laudon, 1943

Genus APOGRAPHIOCRINUS Moore & Plummer, 1940

APOGRAPHIOCRINUS TYPICALIS Moore & Plummer, 1940

**DISCUSSION**

This species is long-ranging and appears to be of little value in making refined correlations. **Apographiocrinus typicalis** may prove to be of some paleoecological importance as it normally occurs in association with large, diverse echinoderm and other invertebrate faunas which are associated with a time of maximum transgression.

**MATERIAL STUDIED**


APOGRAPHIOCRINUS PLATYBASIS Pabian & Strimple, new species

Plate 4, figs. 7-9

**DESCRIPTION**

This species is based on a single cup with a broad, nearly flat base. The infrabasal disk is a large, flat element composed of five, kite-shaped plates; the stem impression is about half the diameter of the disk and is deeply impressed. The lumen is round. The stem impression is coarsely crenulated. The surface of the infrabasal disk is somewhat rugose. The proximal third of the five basals are confined to a very shallowly concave to nearly flat base; the medial third of the basals is rounded; the distal third is nearly vertical, giving the basals a quarter-round appearance in cross section. The AB, BC, DE, and EA basals are pentagonal, and rise about ½ the height of the cup, CD is hexagonal, larger, and rises to about 2/3 the height of the cup, and is truncated for reception of a seven-sided anal X plate. The five radials are epauletteshaped; their proximal tip extends nearly to the cup base; the radials rise upwards very steeply and recurve inward near the cup summit. At the AB, BC, DE, and EA interradial, the radials are extended into inwardly projecting prongs; C and D are separated by anal X. With the exception of the infrabasal circlet, cup plates are smooth. Radial articular facets are well defined. Outer marginal ridge is sharp but small. Outer ligament furrow is deep, grading into deep, wide ligament pit. Muscle areas are broad, sloping inward to large central pit.

**DISCUSSION**

**Apographiocrinus platybasis** is defined by the flat, broad base of the cup. This species appears most closely related to *A. facetus* Moore & Plummer, found in the Missourian of Texas, from which it differs by having a much flatter, broader base and in lacking ornamentation near the radial articular facets.

**MATERIAL STUDIED**

Hypotype, UNSM-16774, Beil Limestone, Lecompton Formation, Location 3.

Superfamily LOPHOCRINACEA Bather, 1899

Family LAUDONOCRINIDAE Moore & Strimple, 1973

Genus LAUDONOCRINUS Moore & Plummer, 1940

LAUDONOCRINUS sp. cf. *L. SUBSINUATUS* (Miller & Gurley), 1890

Plate 4, figs. 10-11

**DISCUSSION**

Although *Laudonocrinus* is fairly common in Missourian age rocks of the midcontinent, it is not well-known from Virgilian age strata. The specimen at hand is immature but most closely resembles *L. subsinusatus*. It is of interest to note that the proximal ends of the anal X and right tube plate rest directly upon the radianal. The articular facet on the C radial is somewhat underdeveloped due to the large right tube plate.

**MATERIAL STUDIED**

Hypotype, SUI-45870, Plattsmouth Limestone Member, Oread Formation, Location 1.

Family STELLAROCRINIDAE Strimple, 1961

Genus STELLAROCRINUS Strimple, 1961

STELLAROCRINUS sp. cf. *S. GEOMETRICUS* (Moore & Plummer), 1940

Plate 4, figs. 13-14

**DISCUSSION**

Pabian and Strimple (1977a) indicated that *Stellarocrinus* was very rare in Pennsylvanian strata of much of the midcontinent region, but rather common in Oklahoma, and abundant in the Bond Formation of Illinois. They indicated this distribution was of provincial importance in Missourian age strata. Such provincialism appears to hold through at least lower Virgil age units. Pabian and Strimple (in press) have further indicated that such provincialism may have been due, in part, to duration of transgression.

**MATERIAL STUDIED**

Hypotype, UNSM-15718, Haskell Limestone, Cass Formation, Location 18.

Family PELECOOCRINIDAE Kirk, 1941

Genus EXORIOCRINUS Strimple & Moore, 1971

EXORIOCRINUS sp.

Plate 4, fig. 12

**DISCUSSION**

This genus is quite rare in Virgilian age strata; it is represented here
by a single CD basal plate which bears a facet for a radianal plate.

**MATERIAL STUDIED**

- **Hypotype,** UNSM-16617, Beil Limestone Member, Lecompton Formation, Location 2.

  - Superfamily TEXACRINACEA Strimple, 1961
  - Family CYMBOCRINIDAE, Strimple & Watkins, 1969
  - Genus OKLAHOMACRINUS Moore, 1939
  - OKLAHOMACRINUS SUPINUS Moore, 1939
  - Plate 4, fig. 15

**DESCRIPTION**

This species is represented by three partial crowns on a single slab. Infrabasals five, forming a flat circle. Basals five, bulbous, forming basal plane of cup; proximal portion in slight basal concavity, distal ends rising about half the cup height; CD basal truncated to receive rectangular anal X. Radials five, tapered pentagons, nearly flat lying basal plane by a single CD basal plate which bears a facet for a radianal plate.

Radial articular facets slope at about 75 degrees outward. Facets indistinct in specimens at hand. PbBr1 and PbBr2 irregularly fused into single, wedge-shaped, axillary plates. Sbr1, Sbr2, Sbr3, and Sbr4 irregularly shaped trapezoids which decrease in size until Sbr5. These are followed by at least 7 cuneiform Sbr plates. Cup surface smooth. Stem round.

**DISCUSSION**

*Oklahomacrinus* is not well-known from complete cups or crowns in Nebraska but numerous loose plates assignable to this genus occur throughout the Pennsylvanian-Permian section.

**MATERIAL STUDIED**

- **Holotype,** NMNH-14106, Brownville Limestone, Wood Siding Formation, Osage County, Oklahoma. Hypotypes, UNSM-16762, Avoca Limestone, Lecompton Formation, Location 6. UNSM-16761, Ervine Creek Limestone Member, Deer Creek Formation, Location 9.

  - Genus MOUNDOCRINUS Strimple, 1939
  - MOUNDOCRINUS LUXURIS (Strimple, 1949a) new combination
  - Plate 5, figs. 1-3

**DISCUSSION**

Although originally described as *Aesiocrinus luxuris* the species is here referred to *Moundocrinus luxuris* (Strimple), new combination based on the short radial articular facets and the truncated distal end of anal X. *Aesiocrinus* is closely related to *Moundocrinus* but has longer radial articular facets and the distal end of anal X is faceted for the reception of two tube plates rather than one.

*Moundocrinus luxuris* appears to have a fairly long range. The holotype was collected from the Wann Formation exposed at the Mound west of Bartlesville, Oklahoma. Rocks here are probably equivalent in age to the Argentine Limestone Member of the Wyandotte Formation (Missourian). This species extends upward to at least the Curzon Member of the Topeka Formation (Virgilian).

**MATERIAL STUDIED**

- **Hypotype,** UNSM-16730, Beil Limestone, Lecompton Formation, Location 3. UNSM-16734 — UNSM-16735, Curzon Limestone Member, Topeka Formation, Location 3.

  - Family GALATEACRINIDAE Knapp, 1969
  - Genus GALATEACRINUS Moore, 1940
  - GALATEACRINUS sp. cf. G. GOSSAMER! Pabian & Strimple, 1974a

**DISCUSSION**

The specimen at hand is badly corroded and impossible to place in a described species. It is compared to *Galateacrinus gossameri* because of the narrow external ligament area. The holotype specimen (UNSM-7976) was collected from the Beil Limestone at Location 6. The collections at hand indicate that this species has an upward range into at least the basal Ervine Creek (Haynies) Limestone.

**MATERIAL STUDIED**

- **Holotype,** UNSM-7976, Beil Limestone Member, Lecompton Formation, Location 6. Hypotype, UNSM-15710, Beil Limestone Member, Lecompton Formation, Location 5.

  - Superfamily AGASSIZOCRINACEA S.A. Miller, 1890
  - Family AMPLEOCRINIDAE Kirk, 1942
  - Genus POLUSOCRINUS Strimple, 1951
  - POLUSOCRINUS ROSA Strimple, 1951
  - Plate 5, figs. 4-6

**DISCUSSION**

This species may prove to be of value in biostratigraphic correlation of Virgilian units between Iowa, Nebraska, and Oklahoma. It appears to have a fairly short range. The holotype was collected in a thin limestone in the shale about 35 feet below the Wildhorse Limestone Member of the Barnsdall Formation (Virgilian) exposed west of Skiatook, Osage County, Oklahoma.

**MATERIAL STUDIED**

- **Hypotype,** UNSM-16727, Beil Limestone Member, Lecompton Formation, Location 3.

  - Family ANOBASICRINIDAE Strimple, 1961
  - Genus ANOBASICRINUS Strimple, 1961
  - ANOBASICRINUS BREVIS Strimple & Moore, 1971
  - ANOBASICRINUS BREVIS Strimple & Moore, 1971
  - Plate 5, figs. 7-9

**DISCUSSION**

The specimen of *Anobasicrinus brevis* at hand is the first recorded occurrence of this genus in Virgilian age strata. The holotype was described by Strimple & Moore (1971) from the LaSalle Limestone Member, Bond Formation, (Missourian), Livingston County, Illinois. The LaSalle Limestone is probably equivalent in age to the Iola Limestone of Oklahoma-Kansas.

**MATERIAL STUDIED**

- **Hypotype,** UNSM-16794, Haskell Limestone Member, Cass Formation, Location 17.

  - Family AMPELOCRINIDAE Kirk, 1942
  - Genus POLUSOCRINUS Strimple, 1951
  - POLUSOCRINUS ROSA Strimple, 1951
  - Plate 5, figs. 4-6

**DISCUSSION**

This species is represented by three partial crowns on a single slab. Infrabasals five, forming a flat circle. Basals five, bulbous, forming basal plane of cup; proximal portion in slight basal concavity, distal ends rising about half the cup height; CD basal truncated to receive rectangular anal X. Radials five, tapered pentagons, nearly flat lying basal plane by a single CD basal plate which bears a facet for a radianal plate.

Radial articular facets slope at about 75 degrees outward. Facets indistinct in specimens at hand. PbBr1 and PbBr2 irregularly fused into single, wedge-shaped, axillary plates. Sbr1, Sbr2, Sbr3, and Sbr4 irregularly shaped trapezoids which decrease in size until Sbr5. These are followed by at least 7 cuneiform Sbr plates. Cup surface smooth. Stem round.

**DISCUSSION**

*Oklahomacrinus* is not well-known from complete cups or crowns in Nebraska but numerous loose plates assignable to this genus occur throughout the Pennsylvanian-Permian section.

**MATERIAL STUDIED**

- **Holotype,** NMNH-14106, Brownville Limestone, Wood Siding Formation, Osage County, Oklahoma. Hypotypes, UNSM-16762, Avoca Limestone, Lecompton Formation, Location 6. UNSM-16761, Ervine Creek Limestone Member, Deer Creek Formation, Location 9.

  - Genus MOUNDOCRINUS Strimple, 1939
  - MOUNDOCRINUS LUXURIS (Strimple, 1949a) new combination
  - Plate 5, figs. 1-3

**DISCUSSION**

Although originally described as *Aesiocrinus luxuris* the species is here referred to *Moundocrinus luxuris* (Strimple), new combination based on the short radial articular facets and the truncated distal end of anal X. *Aesiocrinus* is closely related to *Moundocrinus* but has longer radial articular facets and the distal end of anal X is faceted for the reception of two tube plates rather than one.

*Moundocrinus luxuris* appears to have a fairly long range. The holotype was collected from the Wann Formation exposed at the Mound west of Bartlesville, Oklahoma. Rocks here are probably equivalent in age to the Argentine Limestone Member of the Wyandotte Formation (Missourian). This species extends upward to at least the Curzon Member of the Topeka Formation (Virgilian).
CRINOIDS FROM NEBRASKA AND IOWA

Superfamily CROMYOCRINACEA Bather, 1890
Family CROMYOCRINIDAE Bather, May, 1890
Genus AGLAOCRINUS Strimple, 1961
AGLAOCRINUS COMPACTUS (Moore & Plummer), 1940
Plate 5, fig. 10

DISCUSSION

Aglaocrinus compactus is present throughout most of the Missourian and Virgilian rocks of the midcontinent. One specimen at hand (UNSM-16614) shows axillary PBrl and SBr plates in the C and D rays, and axillary PBrl and non-axillary SBr in the A and D rays.

MATERIAL STUDIED

Hypotypes, UNSM-16614, Beil Limestone Member, Lecompton Formation, Location 2. UNSM-16755, Ervine Creek Limestone Member, Deer Creek Formation, Location 10.

Genus PARULOCRINUS Moore & Plummer, 1940
PARULOCRINUS sp. cf. P. BLAIRI (Miller & Gurley), 1890
Plate 5, fig. 13

DISCUSSION

Parulocrinus blairi is fairly important component throughout the Missourian and Virgilian age units of Nebraska and Iowa. It is easily distinguished by large, smooth cups with unimpressed sutures in adult forms. The cup base is either flat or very slightly concave. Since all of the specimens at hand are damaged, we refrain from definite assignment to a species.

MATERIAL STUDIED

Hypotypes, UNSM-16664, Doniphan Shale Member, Lecompton Formation, Location 2. UNSM-16593, Beil Limestone Member, Lecompton Formation, Location 2. UNSM-15709, Beil Limestone Member, Lecompton Formation, Location 5. UNSM-16689, Jackson Park Shale, Kanwaka Formation, Location 7. UNSM-16753 — UNSM-16754, Ervine Creek Limestone Member, Deer Creek Formation, Location 10. UNSM-16668, Ervine Creek Limestone Member, Deer Creek Formation, Location 15.

Family ULOCRIHIDIAE Moore & Strimple, 1973
Genus ULOCRIHUS Miller & Gurley, 1890
ULOCRIHUS sp.
Plate 5, figs. 11, 12

DISCUSSION

Ulocrinus is represented only by infrabasal circlets in the collections at hand and cannot be identified to species.

MATERIAL STUDIED

Hypotypes, UNSM-16591 — UNSM-16592, Beil Limestone, Lecompton Formation, Location 2.

Superfamily PIRASOCRINACEA Moore & Laudon, 1943
Family PIRASOCRINIDAE Moore & Laudon, 1943
Genus PLAXOCRINUS Moore & Plummer, 1938
PLAXOCRINUS CRASSIDISCUS (Miller & Gurley), 1894
Plate 6, figs. 1-4

DISCUSSION

Plaxocrinus crassidiscus is probably the most abundant and longest ranging of the pirasocrinids in the midcontinent. It is known to range from at least lower Missourian through middle Virgilian strata. This species seems to have suffered no ill effects from changes in depositional environments; it occurs in shales and limestones and is found in both outside and near-core environments of the midcontinent cyclothem.

MATERIAL STUDIED

Hypotypes, UNSM-16692 — UNSM-16693, and SUI-45871 — SUI-45873, Plattsouthsh Limestone Member, Oread Formation, Location 1. UNSM-16661 — UNSM-16663, Doniphan Shale Member, Lecompton Formation, Location 2. UNSM-16615 — UNSM-16616, Beil Limestone Member, Lecompton Formation, Location 2. UNSM-16728, Beil Limestone Member, Lecompton Formation, Location 3. UNSM-16731, Ervine Creek Limestone, Deer Creek Formation, Location 3. UNSM-16778 — UNSM-16782, Haskell Member, Cass Limestone, Location 17.

Genus PERIMESTOCRINUS Moore & Plummer, 1938
PERIMESTOCRINUS NODULIFER (Miller & Gurley), 1894
Plate 2, fig. 10; Plate 3, fig. 11

DISCUSSION

Perimestocrinus nodulifer is a fairly important component in late Missourian age crinoid faunas and its range is probably from the Argentine Limestone Member, Wyandotte Formation (Missourian) through the Haskell Limestone Member, Cass Formation (Lower Virgilian). The species is easily recognized by its flattened, impressed infrabasals and bulbous basals as well as the relatively small size of mature cups.

MATERIAL STUDIED

Hypotypes, UNSM-16783 — UNSM-16784, Haskell Limestone Member, Cass Formation, Location 17. UNSM-15718, Haskell Limestone Member, Cass Formation, Location 18.

Genus RETUSOCRINUS Knapp, 1969
RETUSOCRINUS LAXUS (Strimple), 1951a
Plate 6, figs. 5-9

DISCUSSION

Retusocrinus laxus is typically known from the Lake Bridgeport Shale of northcentral Texas. The species may range as high as the middle Virgilian Ervine Creek Limestone.

MATERIAL STUDIED

Hypotypes, UNSM-15697, Ervine Creek Limestone Member, Deer Creek Formation, Location 16. UNSM-16777, Haskell Limestone Member, Cass Formation, Location 17.

Genus VERTIGOCRINUS Knapp, 1969
VERTIGOCRINUS GLOUKOSENSIS (Strimple), 1951b
Text-fig. 2E

DISCUSSION

Next to Plaxocrinus crassidiscus, Vertigocrinus gloukosensis is
probably the most common and long-ranging pirasocrinid in the midcontinent. This species shows a strong tendency to expel the anal plates from the cup and one specimen (SUI-45861) has only a radial plate in the anal X position (Text-fig. 2E). *Vertigocrinus gioukosensis* also does not appear to have suffered environmental restriction since its distribution parallels that of *Plaxocrinus crassidiscus*.

**MATERIAL STUDIED**

Hypotypes, SUI-45861, Plattsmouth Limestone Member, Oread Formation, Location 1. UNSM-16665, Doniphan Shale Member, Lecompton Formation, Location 2. UNSM-16733, Beil Limestone Member, Lecompton Formation, Location 3. UNSM-16740, Ervine Creek Member, Deer Creek Formation, Location 10.

Genus *SCIADIocrinus* Moore, 1938

*SCIADIocrinus* sp. cf. *S. HUMILIS* Strimple, 1951a

Plate 6, figs. 10-12

**DISCUSSION**

*Sciadiocrinus humilis* is known from a number of Virgilian age outcrops in the midcontinent. The holotype was collected from the Stull Shale Member, Kanwaka Formation, and it is also known to occur as high as the Ervine Creek Limestone Member, Deer Creek Formation.

**MATERIAL STUDIED**

Hypotypes, UNSM-15708, Beil Limestone Member, Lecompton Formation, Location 5. UNSM-16757—UNSM-16758, Ervine Creek Limestone Member, Deer Creek Formation, Location 9.

Superfamily *SCYTALocrinacea* Moore & Laudon, 1943

Family *BLOTHOCRINIDAE* Moore, 1940

Genus *ELIBATOCRINUS* Moore, 1940

*ELIBATOCRINUS* sp.

**DISCUSSION**

*Elabatocrinus* was probably a rather common crinoid in Virgilian time; this is based on the abundance of infrabasal circlets that can be attributed confidentially to this genus. Because of thin cup plates, *Elabatocrinus* cups or crowns are rarely preserved intact.

**MATERIAL STUDIED**

Hypotypes (infrabasal circlets only) UNSM-16726, Avoca Limestone Member, Lecompton Formation, Location 3. UNSM-16763, Stull Shale Member, Kanwaka Formation, Location 6. UNSM-16741—UNSM-16743, Ervine Creek Limestone Member, Deer Creek Formation, Location 15. UNSM-15721, Shoemaker Limestone Member, Cass Formation, Location 18.

Subclass *CAMerata* Wachsmuth & Springer, 1885

Order *MONOBATHrida* Moore & Laudon, 1943

Family *PLATyCRINIDAE* Bassler, 1938 (1942)

Genus *PLATyCRINITES* Miller, 1821

*PLATyCRINITES* sp.

Plate 6, figs. 13-14

**DISCUSSION**

Columns of several species of *Platycrinites* occur throughout Pennsylvanian and Permian strata of the midcontinent. Such stems appear to be confined to the regressive facies of upper limestones in the cyclothem model of Heckel and Baeseemann (1975).

**MATERIAL STUDIED**

Hypotypes, SUI-45862 — SUI-45864, Plattsmouth Limestone Member, Oread Formation, Location 1.

**REFERENCES**


SCROTT, R. O. 1966. Paleocology and stratigraphy of the Lecompton


APPENDIX 2

Measurements in MM of holotype specimens of cladid inadunate crinoids. All measurements are based on Pabian and Strimple (1974, p. 43, 44, Figure 20, Table 1)

<table>
<thead>
<tr>
<th>Species</th>
<th>Dpa</th>
<th>Dibb</th>
<th>Ha</th>
<th>L_ab</th>
<th>W_ab</th>
<th>L_a</th>
<th>W_a</th>
<th>L_ax</th>
<th>W_ax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Graeffhamicrinus grossus</td>
<td>14.9</td>
<td>2.7</td>
<td>3.7</td>
<td>6.7</td>
<td>4.9</td>
<td>4.8</td>
<td>8.6</td>
<td>1.6</td>
<td>1.4</td>
</tr>
<tr>
<td>Arrectocrinus lowensis</td>
<td>18.6</td>
<td>3.2</td>
<td>7.4</td>
<td>9.1</td>
<td>10.4</td>
<td>6.3</td>
<td>10.8</td>
<td>4.2</td>
<td>3.2</td>
</tr>
<tr>
<td>Pyndactocrinus inornatus</td>
<td>14.3</td>
<td>2.6</td>
<td>4.8</td>
<td>5.4</td>
<td>6.4</td>
<td>5.4</td>
<td>8.8</td>
<td>3.5</td>
<td>2.7</td>
</tr>
<tr>
<td>Sublobalocrinus kasi</td>
<td>14.4</td>
<td>2.1</td>
<td>4.8</td>
<td>—</td>
<td>4.6</td>
<td>5.0</td>
<td>8.6</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Contocrinus invaginatus</td>
<td>13.8</td>
<td>2.6</td>
<td>4.7</td>
<td>6.1</td>
<td>6.0</td>
<td>5.1</td>
<td>8.6</td>
<td>2.7</td>
<td>2.6</td>
</tr>
<tr>
<td>Apographiocrinus platybasis</td>
<td>9.4</td>
<td>3.0</td>
<td>4.0</td>
<td>3.4</td>
<td>4.4</td>
<td>3.7</td>
<td>6.3</td>
<td>2.8</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Published by UNI ScholarWorks, 1980