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Cover Picture

Dougherty Anticline

Areas of intensely folded surface structures are limited in Oklahoma, for the most part to the southeast quarter of the State. However, many of these structures are quite impressive and are "textbook" examples. The Dougherty anticline, in Tps. 1, 2 S., R. 2 E., Murray County, is illustrated on this month's cover by an oblique aerial photograph. The view is toward the southeast with the town of Dougherty just beyond upper right edge of the picture. The structure is an anticline plunging toward the southeast, with a small faulted syncline on the northeast flank. The lighter colored narrow outer band consists of carbonates of the Hunton Group; the slightly grayer broad inner band is the Viola limestone, separated from the Hunton by the Sylvan Shale, which supports a dense cover of vegetation. The core of the anticline exposes rocks of the Simpson Group. Displacement along a southeastward-trending fault is clearly discernible on the northeast flank of the syncline where the Hunton is in contact with the Viola.

(Photograph courtesy of F. A. Melton)

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Petrology, origin and trace element geochemistry of the Ada Formation, Seminole and Pontotoc Counties, Oklahoma, by Assad Iranpanah.

—L. F.

APHELECRINIDAE, A NEW FAMILY OF INADUNATE CRINOIDS

HARRELL L. STRIMPLE*

The genus *Cosmetocrinus* Kirk, 1941, has a distinctive type species, *Cosmetocrinus gracilis* Kirk, 1941, from the upper Borden Limestone of Indian Creek, Montgomery County, Indiana. Kirk ascribed some species to the genus despite the fact that they did not agree closely with the characteristics of *C. gracilis* (i. e., the arms of the type species branch with the first primibrach in all rays and branch isotomously in all arms one more time, with yet a third division taking place in most arms). In these cases Kirk considered the presence of two primibrachs in some species as being abnormal, a conclusion which does not seem reasonable. It is thought that the progenetor of *Cosmetocrinus* should have two or more primibrachs. *Cosmetocrinus indianensis* (Meek and Worthen, 1865) has two primibrachs in each posterior arm, but only one in the left anterior arm. Arms of the other rays have not been observed in the holotype (monotype). The arms of *C. indianensis* are smooth-sided, as in *C. gracilis*, but I do not believe the two species are congeneric.

A new generic assignment as *Paracosmetocrinus* is proposed to include those forms that have several nonaxillary primibrachs in the anterior arm and axillary first primibrachs in the other four arms. *Aphelecrinus madisonensis* Laudon and Severson, 1953, *Cosmetocrinus crawfordsvillensis* (Miller and Gurley, 1890), and *Pachylocrinus cirrifer* Laudon, 1933, are included in the new genus because they have several primibrachs in the anterior arm.

In *Cosmetocrinus delicatus* (Meek and Worthen, 1869), the articulating facets of the radial plate are narrow and do not begin to fill the superior face. The species is placed with reservation under *Aphelecrinus* Kirk, 1944.

Following Laudon and Severson (1953), *Cosmetocrinus elegantulus* (Wachsmuth and Springer, 1889), *C. meeki* Kirk, 1941, and *C. richfieldensis* (Worthen, 1873) are referred to *Aphelecrinus* primarily because they have 20 arms, bifurcating with the first primibrach in all rays. When Kirk (1944) proposed the genus *Aphelecrinus* he did not mention any relationship with *Cosmetocrinus*, but Laudon and Severson (1953) thought that the two forms had a common progenetor; however, this was under the assumption that *Aphelecrinus* was the younger genus. All species except the type of the genus and *Cosmetocrinus crineus* (Hall), from the Waverly Group of Ohio, have now been removed from *Cosmetocrinus*, and the latter species demonstrates a third bifurcation in only one half-ray which could be a case of *portentum* (i. e., an apparent abnormality that later is found to be a normal characteristic in subsequent forms). The species *crineus* is better referred to *Aphelecrinus*.

The genus *Cosmetocrinus* is restricted here to *C. gracilis*, and *Carinocrinus eventus* Strimple is here assigned to the genus. It is con-

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sidered herein to be a direct derivative of older aphelecrinid stock through the addition of arms. It has a long, slender, distinctive crown. *Carinocrinus eventus* is now known to have axillary primibrachs in all five rays, which allows it to be placed under *Cosmetocrinus*.

Aphelecrinus has its origin in the early Kinderhookian and has been reported throughout the Mississippian up into the Fayetteville Shale (late Chesterian). An undescribed species is known from the Pitkin Limestone of Oklahoma. It is not appreciably different from *Cosmetocrinus*. The genus appears to be a direct descendent of *Paracosmetocrinus*.

SYSTEMATIC DESCRIPTIONS

Family APHELECRINIDAE, new family

A natural assemblage of genera is afforded by this group which is first recognized in the Wassonville Chert, or the Madison Formation, whichever is older, of the early Kinderhookian, and it has been reported from rocks as young as the Fayetteville Shale of the late Chesterian.

Genera.—*Aphelecrinus* Kirk; *Cosmetocrinus* Kirk; *Paracosmetocrinus* Strimple, new genus.

Description.—Dorsal cup low, conical, composed of five small infrabasals readily visible in side view of cup, five relatively short basals, five radials and three anal plates in normal (primitive) arrangement.

Arms are uniserial, 20 in older forms to 30 in some younger forms, first branching taking place with the first primibrach in all rays except the anterior, the latter being unbranched to at least the second primibrach. The lateral sides of the arms are evenly smooth when viewed from the exterior in older forms, but tend to develop lateral projections of the pinnule-bearing upper sector of a brachial in younger species (e. g., *Aphelecrinus limatus* Kirk, 1944, and *A. planus* Strimple, 1951). The brachials are evenly spaced in older species but have sloping sutures in some younger ones which may even give a biserial appearance (e. g., *A. crassus* Kirk, 1944). Pinnules are long and stout.

Where known, the anal tube is composed of several vertical series of small, hexagonal, plicate plates. The distal end of the sac is composed of a number of nodose to subspinose, fairly large plates. An exception is found in *A. limatus*, wherein the ventral sac is reflexed and is relatively short. In lateral view the sac is broad in its reflexed portion.

The column is round and in some older species is cirriferous, with the long cirri extending up around the crown. Only one species of the family, *A. mundus* Kirk, 1944, is reported to have a subpentagonal stem.

Genus *Paracosmetocrinus* Strimple, new genus

Type species.—*Paracosmetocrinus strakai*, new species.

Diagnosis.—The number of plates by circlets is given in the

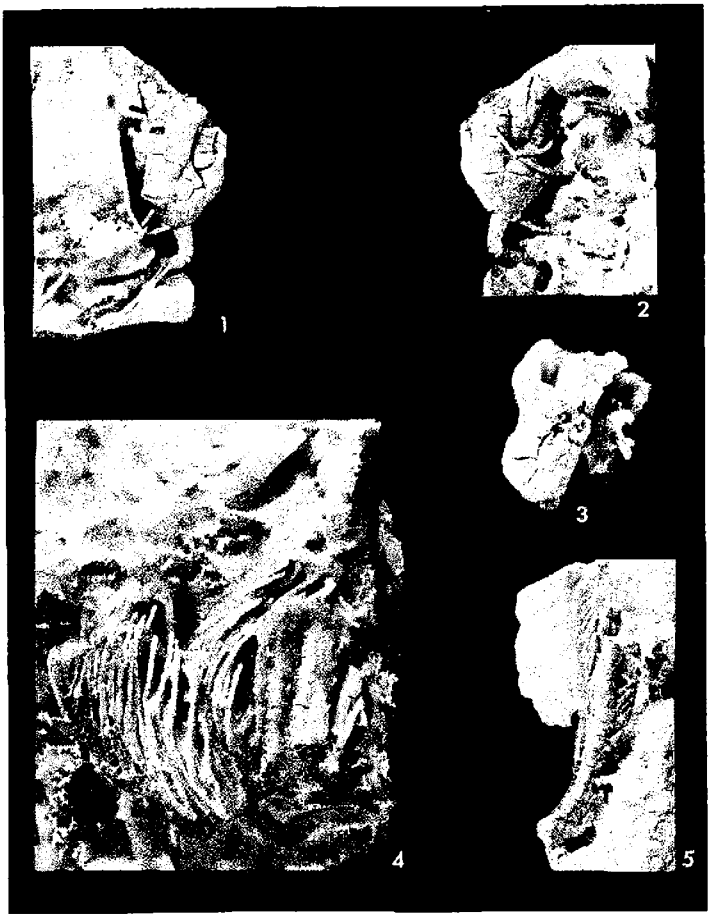

Plate I

Paracosmetocrinus strakai, new species

Figures 1, 2. Holotype SUI 31806, x2, from posterior and anterior.
Figure 3. Paratype SUI 31807, x2, partial crown from posterior.
Figure 4. Paratype SUI 31808, x4, distal portion of anal sac and arms with pinnules.
Figure 5. Paratype SUI 31809, x2, two arms in side view.

(Magnifications are approximate)

familial description. The three anal plates in the posterior interradius are in normal (primitive) arrangement. There are no appreciable gaps between articulating facets of the radials and the primibrachs.

All arms branch with the axillary primibrach, except the anterior arm, which may branch with the seventh primibrach in the oldest species but branches with the third secundibrach in some younger species. As many as 30 arms are developed in *P. cirrifer*. The lateral sides of the arms are even, with the pinnular facets directed inwardly. Sutures between brachials are horizontal. Pinnules are long and relatively stout.

The anal sac is known to be composed of several vertical series of small hexagonal plates, with the distal end club-shaped and lacking any highly specialized distal plates.

The column is round, and in at least two species it has elongate, round cirri which extend up around the crown.

Remarks.—The oldest known species is *Paracosmetocrinus madisonensis* (Laudon and Severson, 1953) from 15 feet above the base of the Lodgepole Formation. This species has 20 arms, and the anterior ray has seven primibrachs. *P. strakai*, new species, from the Wassonville Chert, still has 20 arms, but the number of primibrachs in the anterior arm is reduced to four. *P. cirrifer* (Laudon) from the Gilmore City Formation has a greater number of arms (30) through endotomous branching, and the number of primibrachs in the anterior arm is reduced to 3.

Paracosmetocrinus crawfordsvillensis of the Borden Formation is included in the genus as a matter of expediency to avoid proposing a new monotypic genus. The anterior ray does not appear to have ever branched, yet there are at least 20 primibrachs preserved. There are also gaps between the distal ends of the radials, which is atypical of *Paracosmetocrinus*.

Paracosmetocrinus strakai Strimple, new species

Plate I, figures 1-5

Paracosmetocrinus strakai, new species, is represented in the collections by two partial crowns, several sets of arms, and the distal part of the anal sac, all from one small chert nodule.

The dorsal cup is low and conical, with a rather broad infrabasal circlet. All cup plates are normal for the genus, with those of the posterior interradius in normal (primitive) arrangement. The suture between the radial and primibrach is gaped, and the articular facet fills the upper surface of the radial plate. A radial plate has slipped out of position in a paratype and shows the plate to be rather thick.

Axillary primibrachs are not elongated nor appreciably constricted in midsection. The nonaxillary first primibrach of the anterior appears to be elongated but this is due to the difference in its shape (i. e., it is quadrangular, whereas the other four are pentagonal). Subsequent brachials are quadrangular, with slightly curved exteriors and flattened lateral sides, unless axillary. There is a tendency toward cuneiformity.

The anal tube is partially preserved in a paratype (partial crown)

and the distal part of a sac is preserved in conjunction with another paratype (set of arms). The anal tube is composed of several vertical series of hexagonal plates, with the distal end shaped like a club and composed of some thickened, subspinose plates.

The column is large and round, tapers rapidly for a short distance, and is composed of alternately expanded and thickened columnals. Cirri are preserved a short distance from the cup and are borne by about every eighth columnal, all of which are nodals. The cirri swirl up about the crown and intermingle with the arms.

Measurements of holotype in millimeters.—

Height of dorsal cup	3.6
Width of dorsal cup (maximum)	7.0
Length of radial plate	1.3
Width of radial plate	3.0
Length of basal plate	1.7
Width of basal plate	2.0
Height of infrabasal circlet	0.5
Width of infrabasal circlet	3.1
Diameter of proximal columnal	1.5

Occurrence.—The specimens are silicified and were first found embedded in a weathered chert nodule by Joe Straka, a graduate student at the University of Iowa, near the base of the Wassonville Chert, Kinderhookian, in a bluff across from the location formerly occupied by Maple Mill on the English River, which is the type locality of the Maple Mill Shale, near Wellman, Washington County, Iowa (SE¼ sec. 8, T. 77 N., R. 8 W.).

The balance of the chert nodule was recovered by a field party on December 11, 1965, made up of W. M. Furnish, B. F. Glenister, Joe Straka, and the author. One partial crown (figured paratype) and several sets of arms were recovered. Nodules from the same horizon were obtained and processed with a jet of dolomite powder from an S. S. White Airbraisive machine, but no other crinoids were found other than a minute partial cup which could be the same species.

Types.—Holotype SUI 31806 and paratypes SUI 31807-31809 in the repository of the Department of Geology, University of Iowa, Iowa City.

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Laudon, L. R., and **Severson, J. L.,** 1953, New crinoid fauna, Mississippian, Lodgepole formation, Montana: Jour. Paleontology, vol. 27, p. 505-536, pls. 51-55.

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Geographic and Stratigraphic Distribution of *Oklahomacrinus*

Carl C. Branson

The crinoid genus *Oklahomacrinus* was described by Moore (1939, p. 255) with type species *O. supinus* Moore, new species, from the Brownville Limestone, latest Pennsylvanian, of Osage County, Oklahoma. Other species described at that time are *O. loeblichi* Moore, new species, from the Francis Shale, Missourian, of Pontotoc County, Oklahoma; *O. bowsheri* Moore, new species, from a crinoid colony below the Wildhorse Dolomite (latest Missourian) of Osage County, Oklahoma, and *O. stevensi* Moore, new species, from the same level and locality.

O. discus was described by Strimple (1947, p. 6, pl. 2, figs. 2, 3) from the Stull Shale of the Virgil Series from near Melvern, Osage County, Kansas. *O. regularis* Strimple, 1951, is from the Wann Shale (Missourian) from Bartlesville Mound on the Osage-Washington county line, Oklahoma.

Burke (1966) has described *O. ohioensis* from the Ames Limestone, Conemaugh Series of Guernsey County, Ohio. Burke also transferred *Delocrinus expansus* Wanner, 1916, to *Oklahomacrinus* (1966, p. 467). This species is from the Basleo beds of Timor. Burke (p. 465) stated that the genus is known from the Middle and Upper Pennsylvanian and from the Lower Permian of North America. All recorded occurrences are from the Upper Pennsylvanian, none from Middle Pennsylvanian or Lower Permian in his cited references. Strimple (1962, p. 71) described *O. cirriferous* from the Admire Group of Wabaunsee County, Kansas. The unit is Gearyan, Lower Permian(?).

The genus *Oklahomacrinus* is now reported from Upper Pennsylvanian rocks of Oklahoma, Kansas, and Ohio, from Gearyan rocks of Kansas on evidence of a single cup, from the Basleo beds of Timor on the basis of Wanner's illustrations.

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Warner, J., 1916, Die permischen Echinodermen von Timor: Paläontologie von Timor, Lief 6, Teil 11, 329 p.

New Oklahoma Core Catalog Issued

The University of Oklahoma Core and Sample Library has issued its new *Core Catalog 1,* which supersedes all listings of its holdings issued prior to February 1967. The catalog is a direct reproduction of the readout from the punch cards that constitute the accession file of the library. The listing is in the order of township, range, and section for the entire holdings and thus, in addition to its greater completeness, is more useful than the preceding lists, all of which should be discarded. The catalog is available upon request from The University of Oklahoma Core and Sample Library, School of Geology and Geophysics, The University of Oklahoma, Norman, Oklahoma 73069.

The Core and Sample Library is in building 139, Jenkins Ave. south of Constitution St., South Campus of The University of Oklahoma, Norman. It now has on file more than 69,000 feet of core from 768 wells. Well-cutting samples from approximately 23,000 wells are also on file, but only those not obtainable through commercial libraries are available for examination.

Mr. Wilbur E. Dragoo is manager of the library, which is open 8:00 A.M. to 12:00 noon and 1:00 P.M. to 5:00 P.M., Monday through Friday. His phone is area code 405, JEfferson 6-2049. For any additional information communicate with John F. Roberts, Oklahoma Geological Survey, room 161 Gould Hall, phone area code 405, JEfferson 6-1703.

Cores may be examined at the library for a service charge of $1.00 per box. Cores will be shipped to borrower, who pays all shipping charges, for a service charge of $1.50 per box for 21 days. Permission to use in excess of 21 days should be obtained; otherwise, a charge of $1.50 per box will be made for each additional 21 days or portion thereof.

Cores are added to the library through automatic contribution by numerous operators as the cores become available. Other operators, particularly those with storage problems, are urged to avail themselves of the storage facilities of the library (where the cores will be readily accessible) through donation of their Oklahoma cores. As the library is a nonprofit organization, assumption of the delivery costs by the donor would benefit both the donor and the library. In the cases of large donations, financial aid for the cost of shelving would also be mutually beneficial.

Space is available in building 139 for a laboratory to accommodate slabbing equipment for detailed and more rapid examination. An ultimate goal is to have all the cores in the library slabbed and reboxed to save space as well as to shorten the time required for core examination. The donation of masonry-saw equipment or monies to acquire it would be mutually beneficial.

—John F. Roberts

Base of Fresh Ground Water in Southern Oklahoma

Hydrologic Investigations Atlas HA-223, *Base of Fresh Ground Water in Southern Oklahoma,* by Donald L. Hart, Jr., was published by the U. S. Geological Survey in December 1966. The atlas was prepared in cooperation with the Oklahoma Corporation Commission and the Oklahoma Water Resources Board. It comprises two maps, each at the scale of 1:250,000, with supplementary text and illustrations. The map of sheet 1 covers southwestern Oklahoma between longitudes 100° and 98° from the Red River to latitude 35°30′8′. The map of sheet 2 covers south-central Oklahoma between longitudes 98° and 96° from the Red River to latitude 36°.

The two maps depict the altitude of the base of fresh water by means of contour lines where sufficient data are available, and by means of patterns that indicate ranges of altitude where control is sparse. The contours and patterns are overprinted in blue on a topographic base of brown. Two smaller maps (approx. scale 1 in. = 40 mi.) on sheet 1 show the depth to the base of the fresh-water body and the areal distribution of the lowest bedrock units containing fresh water.

The bulk of the information was derived from inspection of electric logs and the term "fresh water" is broadly defined to include water suitable for human and stock consumption and for irrigation. Some slightly brackish water that may have future economic importance is also included. The purpose of the project is to define the ground water bodies of the State that may be subject to conservation and development projects in the future.

The maps come folded in a 9-inch by 12-inch manila envelope and may be purchased from the U. S. Geological Survey, Federal Center, Denver, Colorado 80225. The price is $1.25 per set.

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