

1975

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Recommended Citation

Strimple, H. L. (1975) "Erisocrinids (Crinoidea-Inadunata) from Middle Pennsylvanian Rocks of Iowa and Colorado," *Proceedings of the Iowa Academy of Science*: Vol. 82: No. 2, Article 14.
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Erisocrinids (Crinoidea-Inadunata) from Middle Pennsylvanian Rocks of Iowa and Colorado

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STRIMPLE, H. L. (Department of Geology, The University of Iowa, Iowa City, Iowa 52242). Erisocrinids (Crinoidea-Inadunata) from Middle Pennsylvanian rocks of Iowa and Colorado. *Proc. Iowa Acad. Sci.* 82(2): 126-129, 1975.

Erisocrinus knoxvillensis n. sp. is described from rocks of the Desmoinesian Stage exposed near Knoxville, Marion County, Iowa. Two specimens from the Madera Formation, Desmoinesian Stage, Heurfano Park, Colorado, reported by Tischler, 1963, as belonging

The primary purpose of the present paper is documentation of a specimen of *Erisocrinus* found in Desmoinesian rocks near Knoxville, Marion County, Iowa, and mentioned by Knapp, 1969, in discussion of a proposed subfamily Erisocrininae, as well as to consider some related matters. The specimen in question is described as *Erisocrinus knoxvillensis*, n. sp. Subfamilial taxa have not been accepted in the section dealing with the Poteriocrinina, of which *Erisocrinus* is a member, in Section T of the *Treatise on Invertebrate Paleontology* (in preparation) but the remarks of Knapp (*ibid.*, p. 359) affect the family Erisocrinidae Miller, 1889, and are repeated here: "It is possible that *Erisocrinus* may have been derived from a crinoid bearing upflared infrabasals as figured by Tischler (1963, p. 1066, Text-fig. 6A, B) from the Madera Formation. However, recently a cup has been found in the Desmoinesian of Iowa, which is identical to *Erisocrinus* but has a distinct basal concavity." The import of this statement is that Knapp was postulating that the ancestor of *Erisocrinus*, and many other inadunate crinoid genera of Pennsylvanian age, was the Mississippian genus *Phanocrinus* which normally has a distinct basal concavity. In fact Knapp (*ibid.*, p. 351) proposed an order Declinida on this premise. I personally opposed the very concept of the order Declinida and it has been universally rejected.

Strimple and Moore (1971, p. 9) suggested the family Erisocrinidae represents a direct lineage leading from the geologically older family Scytalocrinidae, which is the current concept, and the principal was suggested as an alternative by Knapp. Erisocrinids having mildly upflared infrabasals were referred to *Exaetocrinus* Strimple and Watkins (1969, p. 181); however, those authors thought such forms were regressive because only species of Missourian (Upper Pennsylvanian) age were known at that time. The previously mentioned specimen from the Madera Formation was illustrated with rough line drawings by Tischler, 1963, as *Erisocrinus typus* and was not seriously considered by this writer until examined at first hand. The specimen is now described as *Exaetocrinus maderaensis*, n. sp.

Another specimen, identified by Tischler, 1963, as *Erisocrinus typus* from the Madera Formation, appears to be clear-

ly related to *Paradelocrinus wapanucka* Strimple (1961b, p. 225), which species is from the Wapanucka Formation (Morrocan) of Pontotoc County, Oklahoma. Knapp (*ibid.*, p. 352) proposed the genus *Pontotocrinus*, with *P. wapanucka* as the type species, which was synonymized with *Erisocrinus* by Moore and Strimple (1973, p. 61). Although *Pontotocrinus* will not be accepted as a valid genus in the forthcoming Section T, Echinodermata, of the *Treatise on Invertebrate Paleontology*, this writer considers it to be a viable taxon. The specimen from the Madera Formation is described as *Pontotocrinus coloradoensis*, n. sp.

INDEX DESCRIPTORS: Middle Pennsylvanian; Desmoinesian; Madera Formation; Madera County, Colorado; Marion County, Iowa; Crinoidea; Erisocrinidae; *Erisocrinus knoxvillensis*; *Exaetocrinus maderaensis*; *Pontotocrinus coloradoensis*; *Erisocrinus typus*.

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SYSTEMATIC PALEONTOLOGY

Subclass INADUNATA Wachsmuth and Springer, 1855

Order CLADIDA Moore and Laudon, 1943

Suborder POTERIOCRININA Jaekel, 1918

Superfamily ERISOCRINACEA Wachsmuth and Springer, 1886

Family ERISOCRINIDAE Wachsmuth and Springer, 1886

Genus ERISOCRINUS Meek and Worthen, 1865

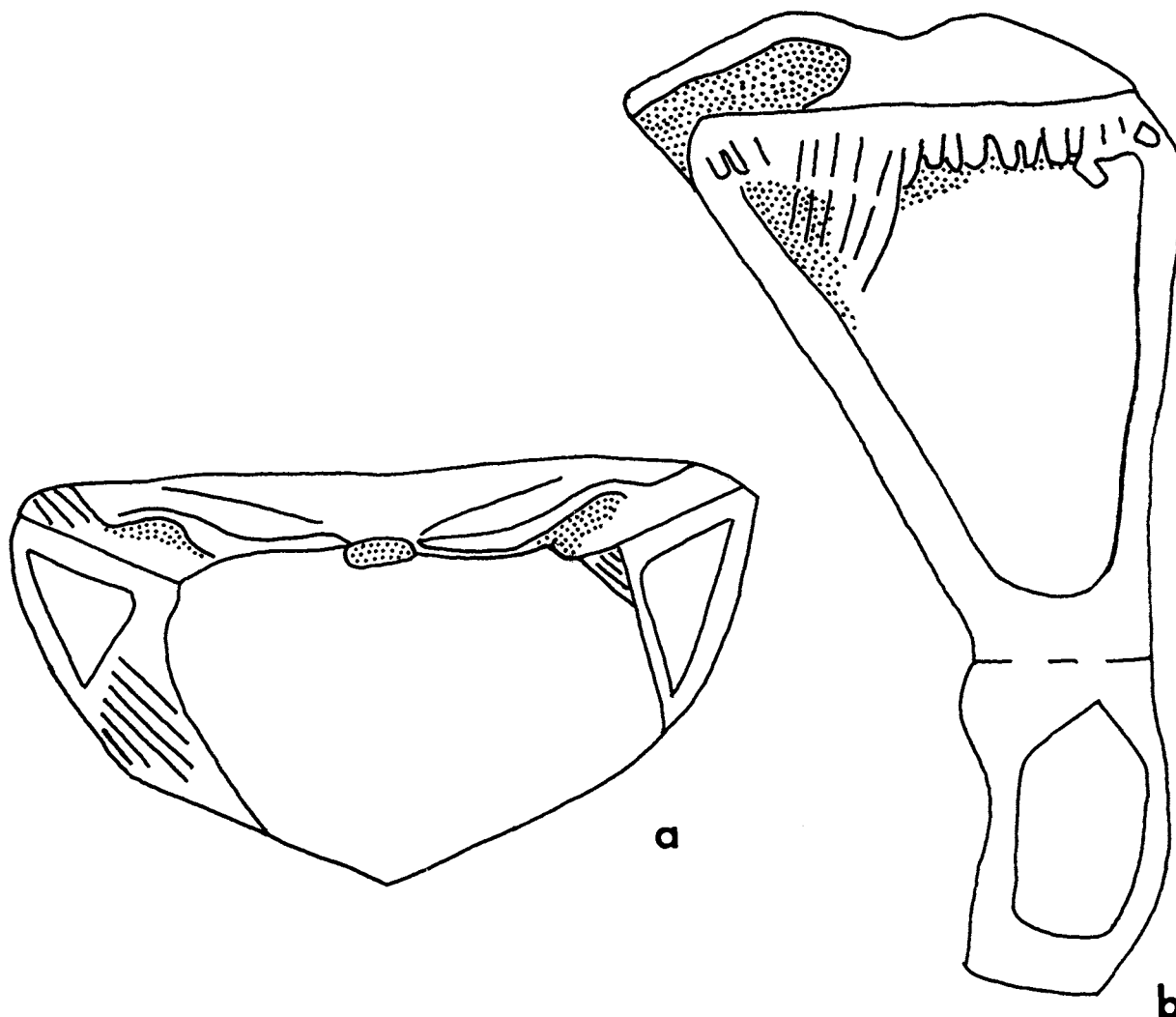
ERISOCRINUS KNOXVILLENSIS Strimple, new species
Plate 1, Figures 9-11; Text-Figure 1.

Description—Cup truncate cone-shaped with pronounced basal concavity, regularly pentagonal-shaped when viewed from above or below. Infrabasals downflared and extending only slightly beyond columnar cicatrix. Proximal portions of moderately large basals form walls of basal concavity, flexing to form basal plane of cup and forming part of the lateral cup walls. Large radials form most of cup height but the proximal ends are well above the basal plane. Distal edges of radials are sharply defined. Articular facets are subhorizontal except where elevated to form a socket for the triangular-shaped rudimentary anal plate in the CD interray. The columnar cicatrix is slightly impressed and is circular in outline.

Measurements of holotype in millimeters: height of cup 6.0, width 4.1; width of columnar attachment scar 2.9; width of infrabasal cirlet 4.3; width of CD (posterior) basal 5.0, length 4.7; width of A (anterior) radial 9.1, length 4.8; length of D radial articular facet at DE suture 3.6.

Discussion—*Erisocrinus typus* Meek and Worthen, 1865, is the type species of *Erisocrinus* Meek and Worthen (1865, p. 174); it was based on two syntypes from near Springfield, Illinois. Knapp (1969, p. 360, Text-Fig. 14b) designated the smaller undistorted specimen as the lectoholotype and illustrated it with a cross-section. The specimen is photographi-

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Text-Figure 1. Camera lucida sketches of cup plates of *Erisocrinus knoxvillensis*, n. sp. a. Radial plate from interior showing articular facet at top with stippled areas demonstrating slits passing from adsutural area into body cavity, X12. b. Radial plate, with basal plate below, from end showing depressed ligamental areas and fossae, as well as the previously mentioned slit passing under articular facet, X25.

cally illustrated here (Plate 1, Figs. 6, 8). Moore and Plummer (1940, p. 151) considered the horizon of the type of specimens to be lower Middle Pennsylvanian, which equates with Atokan or Lower Desmoinesian age. Knapp (*ibid.*, p. 360) considered it to be "basal Missourian?" in age, which seems more reasonable.

E. knoxvillensis differs from *E. typus* in having a more pronounced basal concavity; the columnar scar is proportionately larger; infrabasals do not extend beyond the cicatrix as far; and the distal ends of radials are further above the basal plane than found in *E. typus*. Most of the characteristics of *E. knoxvillensis* are closely similar to those of *E. georgeae* Strimble and Watkins (1969, p. 180) from the Soldiers Hole Member, Big Saline Formation, Atokan, of Mason County, Texas, with the exception of the basal concavity exhibited by

the former species, and the proximal tips of the radial plates, which more closely approach the basal plane than in the latter species.

Holotype—SUI 32481, collected by W. Youngquist, deposited in the Geology Department Repository, The University of Iowa, Iowa City.

Occurrence—Unnamed limestone, Desmoinesian, Middle Pennsylvanian; SE¼ sec. 35, T.76N., R.20W., about three-fourths of a mile northwest of Knoxville, Marion County, Iowa.

The exact age represented by the limestone from which *E. knoxvillensis* was recovered is difficult to ascertain. Mikesh and Glenister (1966, p. 276, 277) in study of *Solenochilus springeri* from northeast of Knoxville concluded that strata in that area lay within the Cherokee Group, and almost certain-

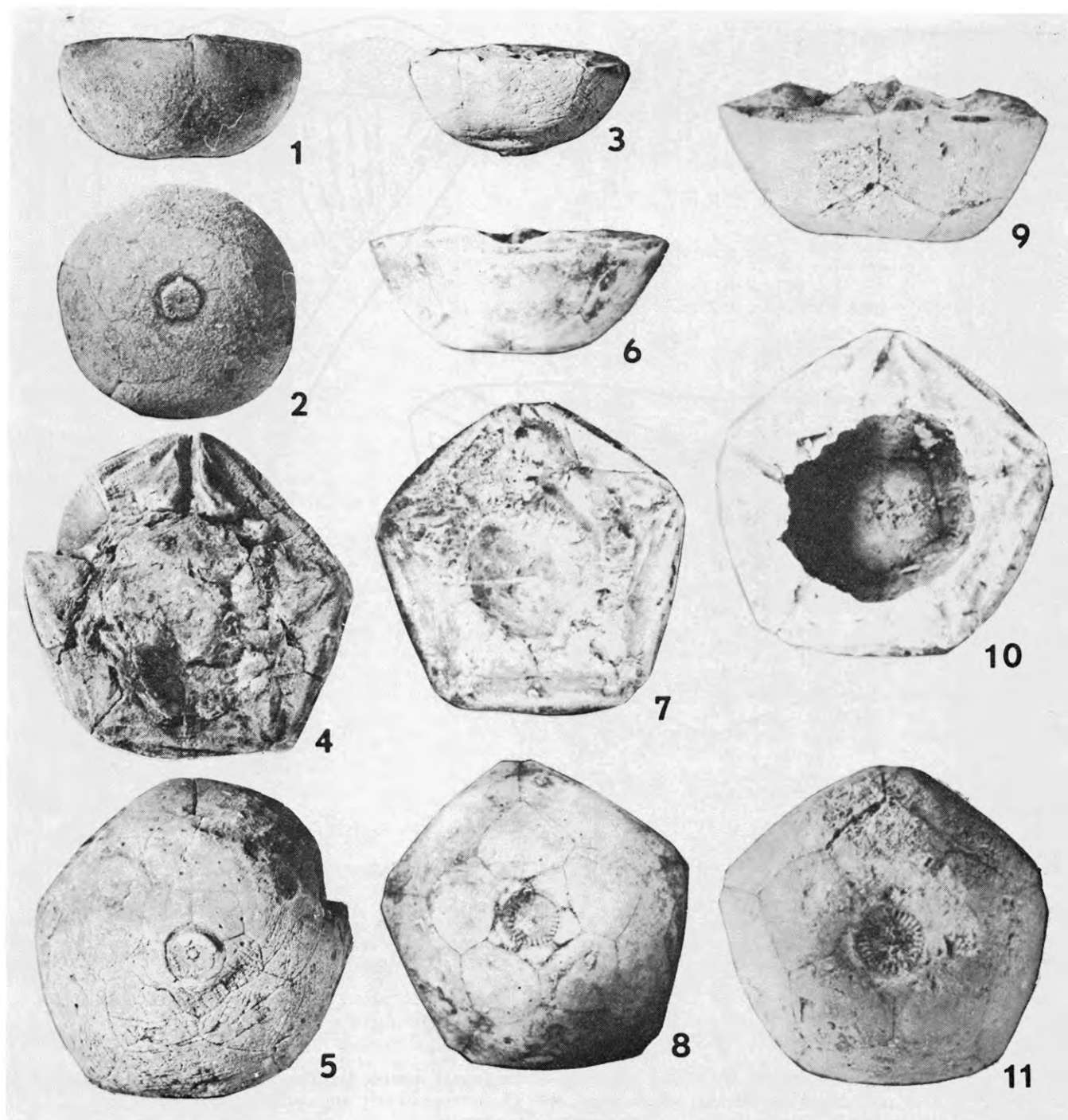


Plate 1. Erisocrinids from Iowa, Colorado and Missouri. 1, 2. *Pontotocrinus coloradoensis*, n. sp., holotype cup from Madera Formation, Colorado, viewed from *CD* interray (posterior) and from base, X3. 3-5. *Exaetocrinus maderaensis* n. sp., holotype cup from Madera Formation, Colorado, viewed from anterior (X2), summit and base, X3. 6-8. *Erisocrinus typus* Meek & Worthen, lectoholotype cup from Missourian Stage, Missouri, viewed from *CD* interray, summit and base, X3. 9-11. *Erisocrinus knoxvillensis*, n. sp. holotype cup from Desmoinesian Stage, Iowa, viewed from *CD* interray, summit and base, X3.

ly belonged in the Lower Cherokee. They further concluded that their fossiliferous horizon was probably Desmoinesian, but did not rule out the possibility of an Atokan assignment. A Lower Desmoinesian age is postulated for *E. knoxvillensis*.

Genus EXAETOCRINUS Strimple and Watkins, 1969
EXAETOCRINUS MADERAENSIS Strimple, new species
Plate 1, Figures 3-5.

Description—Cup bowl-shaped with slightly convex base. Five infrabasals extend well beyond the small columnar attachment area and are slightly upflared. Basals are large with gentle curvature. Radials are very large and are gently curved. The perimeter of the cup is sharply defined by the distal edges of radials when viewed from above and the outline is somewhat pentagonal, almost as pronounced as found in typical *Erisocrinus*. Interarticular notch for rudimentary anal plate is rather large and expands sharply as it approaches the body cavity.

Measurements of holotype in millimeters: maximum width of cup 17.7, height 8.7; width of infrabasal circlet 7.4, height 1.2; width of AE basal 5.7, length 4.6; width of A radial 9.8, length 6.0; diameter of proximal columnal (preserved in place) 2.5; length of interbasal suture of A ray 1.0, B ray 1.8.

Discussion—*Exaetocrinus* represents a holdover from the cone-shaped cup of ancestral *Scytalocrinus*. The cup has lost all anal plates and has changed to a low bowl shape as in *Erisocrinus* but the infrabasals have remained slightly upflared. *E. lustrum* (Strimple, 1951) from the Iola Formation, Kansas City Group, Missourian (Upper Pennsylvanian), exposed in the quarry of the Lehigh Cement Company just south of Iola, Kansas, has a taller cup with more evenly expanded sides than found in *E. maderaensis*.

It appears that *E. maderaensis* evolved directly from a species like *Stuartwellerocrinus praedecta* Strimple, 1961a, from the Wapanucka Formation, Morrowan of Pontotoc County, Oklahoma. *S. praedecta* has a broad bowl-shaped cup, and large radial plates the proximal tips of which reach the basal plane; an anal plate is retained in the cup. The anal plate has lost contact with the CD (posterior) basal. *S. praedecta* is atypical of *Stuartwellerocrinus* but is also atypical of *Exaetocrinus*, both of which genera typically have more cone-shaped cups. It seems possible that a divisionary lineage is represented by these two species with *E. lustrum* Strimple, 1951, a possible participant. However, all three species are monotypic so that no action is taken at this time.

Holotype—UMPL 37543, repositied Paleontology Museums, University of Michigan, Ann Arbor, Michigan.

Occurrence—Madera Formation, Desmoinesian, Lower Pennsylvanian; Heurfano Park, Colorado.

Genus PONTOTOCRINUS Knapp, 1969
PONTOTOCRINUS COLORADOENSIS Strimple,
new species
Plate 1, Figures 1-2.

Description—Cup moderately low, bowl-shaped with circular outline when viewed from above or below, base planate except for sharply impressed columnar socket. Curvature of cup sides even and gentle. Infrabasals extend well beyond columnar impression. Basals large, extending into lateral walls of cup. Radials very large and long so that proximal tips are close to the basal plane. Round proximal columnal is preserved in place and is slightly smaller than the invaginated socket.

Measurements of holotype in millimeters: normal cup width 13.0; width in anteroposterior radius 12.8; cup height 6.6.

Discussion—The infrabasal circlet is not regularly distributed in that the D infrabasal is longer than other infrabasals.

Pontotocrinus coloradoensis differs from *P. wapanucka* in lacking even a slight basal concavity and in the irregularity of infrabasal plates.

Holotype—UMPL 37544, repositied Paleontology Museums, University of Michigan, Ann Arbor, Michigan.

Occurrence—Madera Formation, Desmoinesian, Middle Pennsylvanian; Heurfano Park, Colorado.

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