Sciadiocrinus wipsorum, a crinoid from the Minturn Formation (Pennsylvanian) of Colorado

Wayne M. Itano

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Abstract

Sciadiocrinus wipsorum Webster and Houck 1998, a crinoid belonging to the family Pirasocrinidae, was originally described from a cup, the only known specimen, found in the Minturn Formation (Pennsylvanian) at McCoy, Eagle County, Colorado. The locality was searched in an attempt to find specimens of *S. wipsorum* and other pirasocrinids. Incomplete cups of *S. wipsorum* and another pirasocrinid, *Metaffinocrinus perundatus,* were found, as were disarticulated ossicles probably belonging to these two species. In addition, a careful examination of disarticulated primibrachs and tegmen spines indicates that at least one other pirasocrinid remains to be identified at this locality.

Background

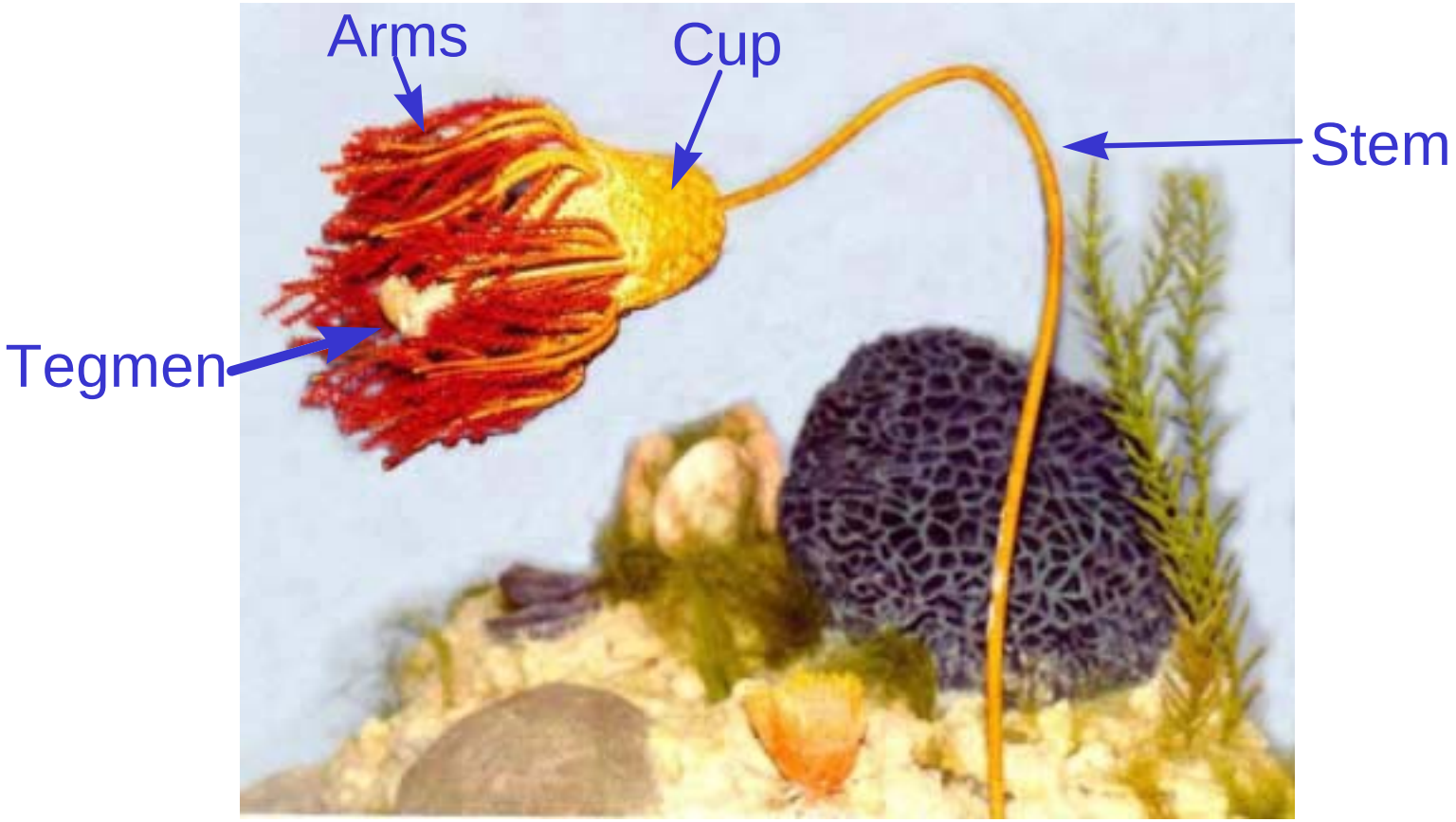
A diverse marine fauna is found in the Minturn Formation, near the town of McCoy in Eagle County, Colorado. The Pennsylvanian age of these deposits ranges from the late Atokan to the Desmoinesian. Crinoid remains are abundant, though articulated specimens are rare. Crinoids from McCoy have been the subject of two publications, one based on a collection made by I. A. Keyte of Colorado College (Strimple and Moore, 1973) and another (Webster and Houck, 1998) based mostly on specimens found by M. Lockley and K. Houck of the University of Colorado at Denver. Members of WIPS (Western Interior Paleontological Society) contributed specimens for the latter study. Most of the species found at McCoy are known only from Colorado.

Sciadiocrinus wipsorum, described from a single cup found by D. Nelson, was named after WIPS, in honor of the members who contributed to the study. Nothing is known for sure of the structure of the rest of *S. wipsorum*, though non-Colorado species of *Sciadiocrinus* have been found in more complete form.

I searched Units 3a and 3b of the Minturn Formation (units of Houck, 1997) in an attempt to find more specimens of *S. wipsorum* and other crinoids of the family Pirasocrinidae.

What is a crinoid?

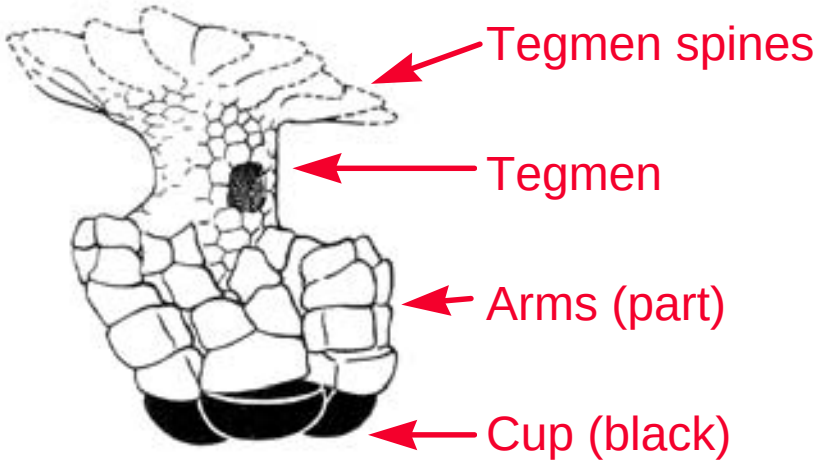
Crinoids, sometimes called “sea lilies” are actually marine animals in the Phylum Echinodermata, which also includes sea urchins and starfish. Most Paleozoic species were attached to the sea floor with a stem. Most living species are non-stemmed.



Reconstruction of a Silurian crinoid, Denver Museum of Natural History.

What is a pirasocrinid?

Pirasocrinids are crinoids of the Family Pirasocrinidae (Class Crinoidea, Order Cladida, Suborder Poteriocrinina, Superfamily Pirasocrinacea). The cup is very low and bowl shaped. The tegmen is mushroom shaped. The flat top of the tegmen is surrounded by spines. Similar spinose tegmens are found in a few other families of crinoids.
Two examples of pirasocrinids are shown below.

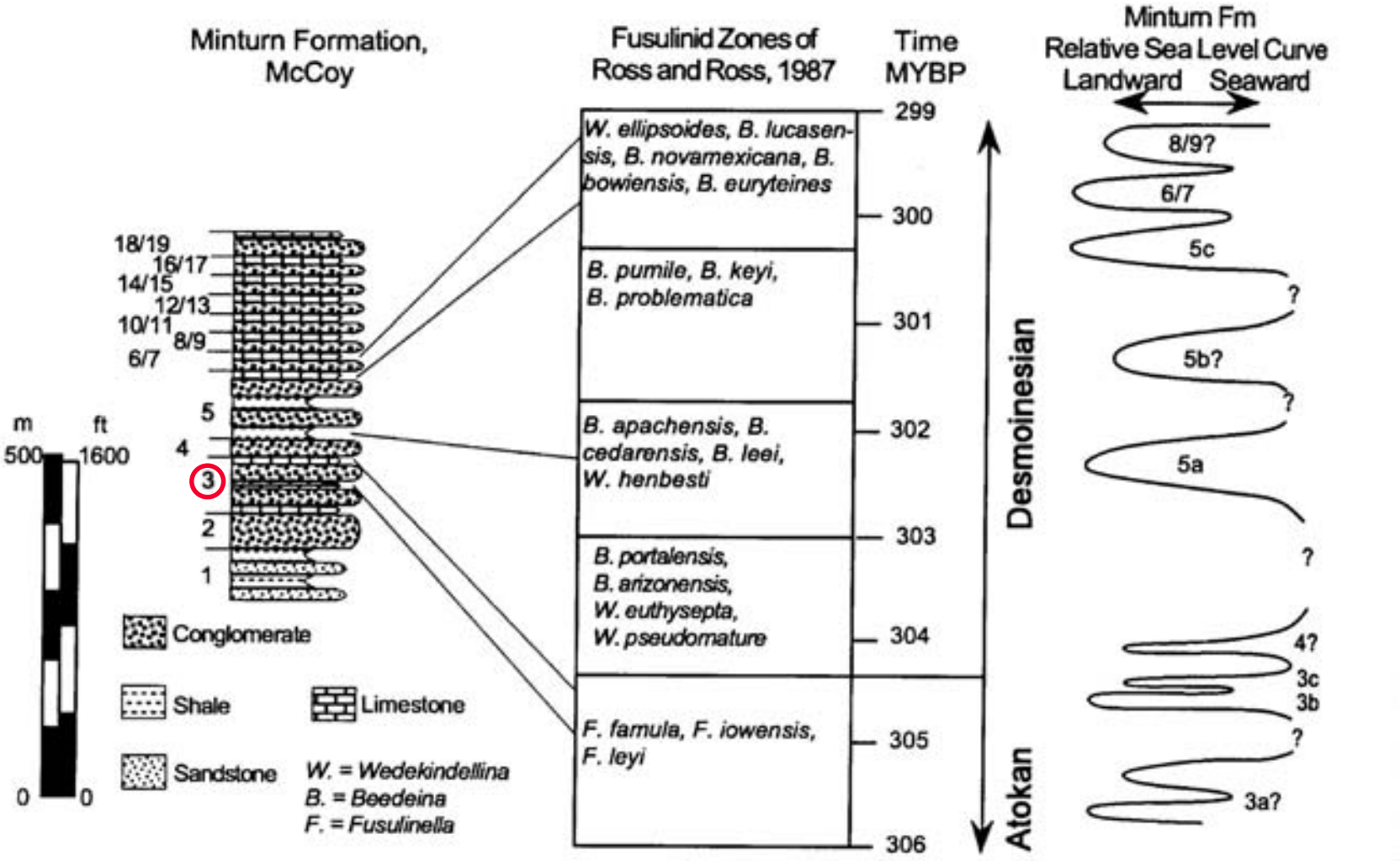


Sciadiocrinus acanthophorus
From Moore & Teichert (1978)

Pirasocrinus scotti
From Strimple & Watkins (1969)

Location of McCoy, Colorado

Minturn Formation at McCoy



Stratigraphic column of the Minturn Formation at McCoy, Colorado, correlated with fusulinid zones and sea-level changes. The crinoids found in this study were in Unit 3, in the latest Atokan, about 305 million years before the present. From Webster and Houck (1998).

The McCoy Locality

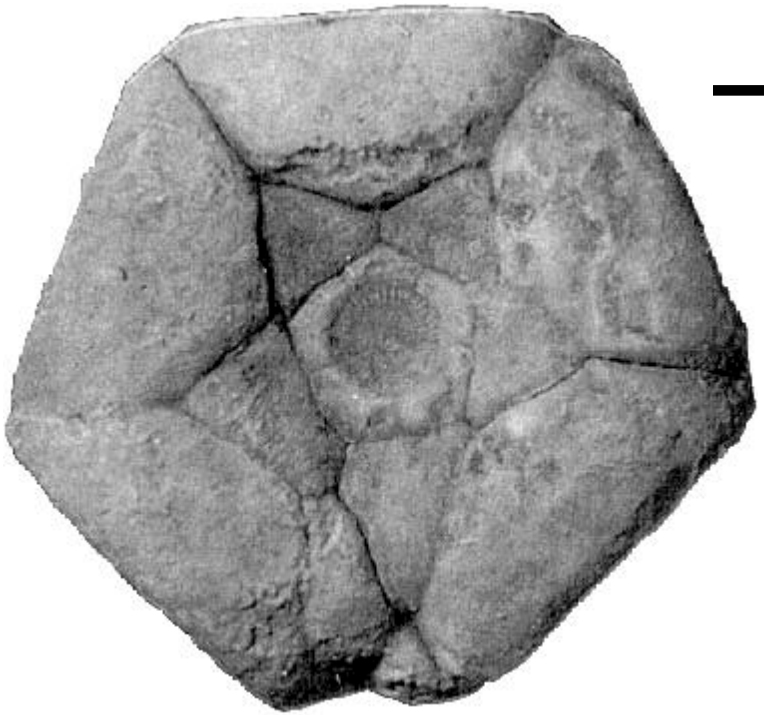
The Minturn Formation, which consists of a complex system of marine and nonmarine sediments, is exposed near McCoy in Eagle County, Colorado, about 100 miles (160 km) west of Denver. The crinoids are found mostly in limestone beds, like the one shown on the right, in Unit 3b.

The crinoid remains are mostly stems or disarticulated plates and spines, but articulated cups, like the one on the right, are sometimes found.

Crinoid cup, as found

Aglaocrinus magnus

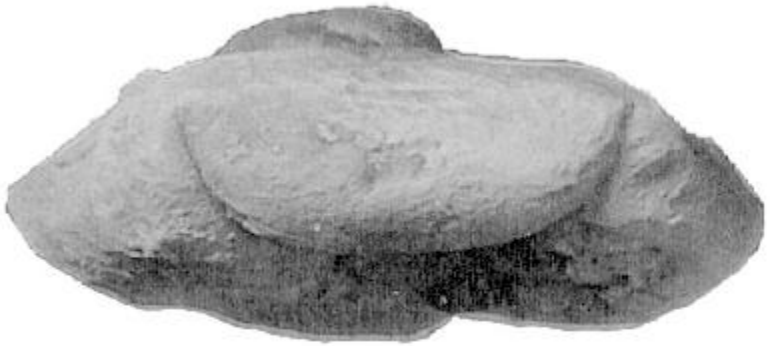
Holotype of *Sciadiocrinus wipsorum*



1 cm

Basal (bottom) view

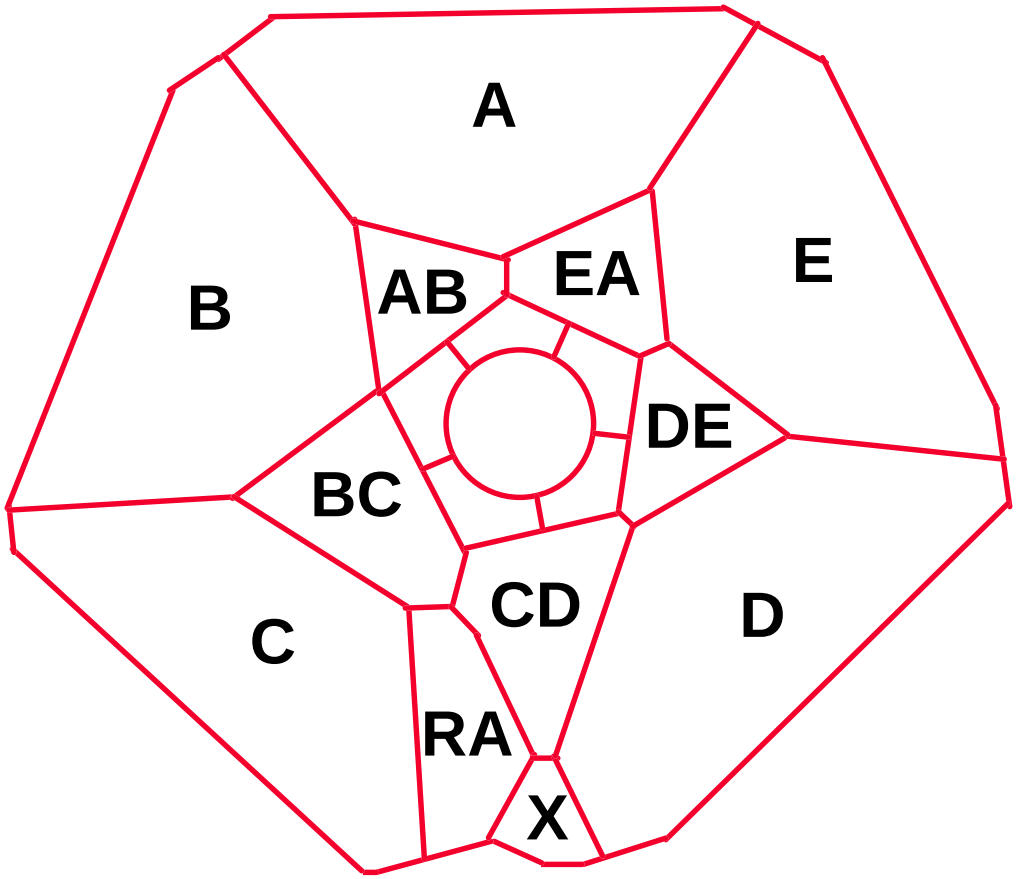
Oral (top) view



Side view

This is the holotype and only known complete cup of *S. wipsorum.* From Webster and Houck (1998).

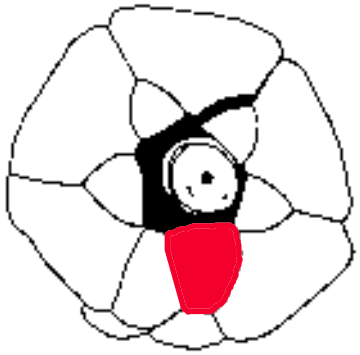
Terminology of cup plates of *Sciadiocrinus* visible from basal view



In the center of the base is the circular area where the stem attaches. Surrounding this are the 5 small plates making up the infrabasal circlet. Surrounding these are the 5 basal plates, labeled AB, BC, CD, DE, and EA. Surrounding these are the 5 radial plates, A, B, C, D, and E, to which the arms are attached. In *Sciadiocrinus,* there are 3 anal plates, 2 of which, the radianal (RA) and anal X plate, are visible here.

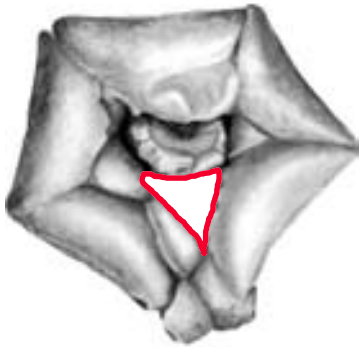
Comparison of 6 species of *Sciadiocrinus*

S. wipsorum
from Webster & Houck (1998)



S. acanthophorus
(type species) from Lewis & Strimple (1990)

S. plautus
from Strimple (1975)



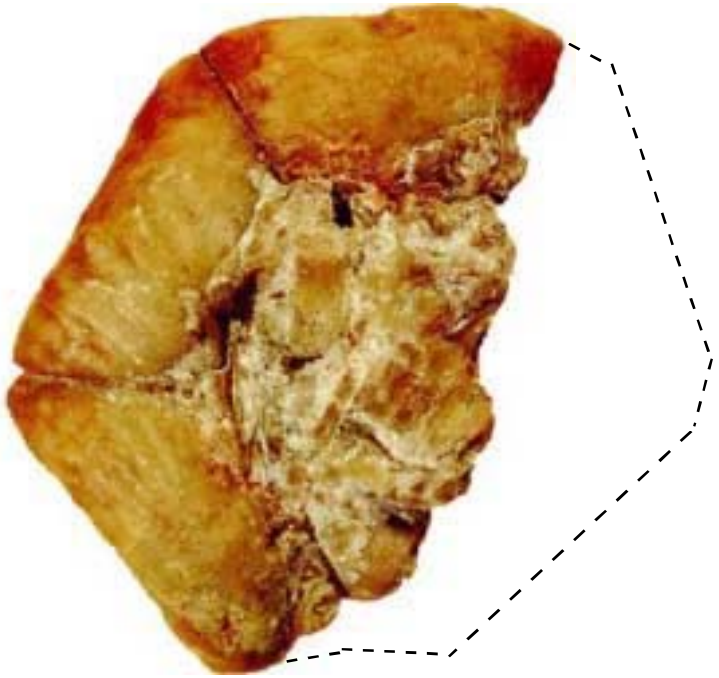
S. cascus
from Moore & Strimple (1973)

S. llanoensis
from Strimple & Watkins (1969)

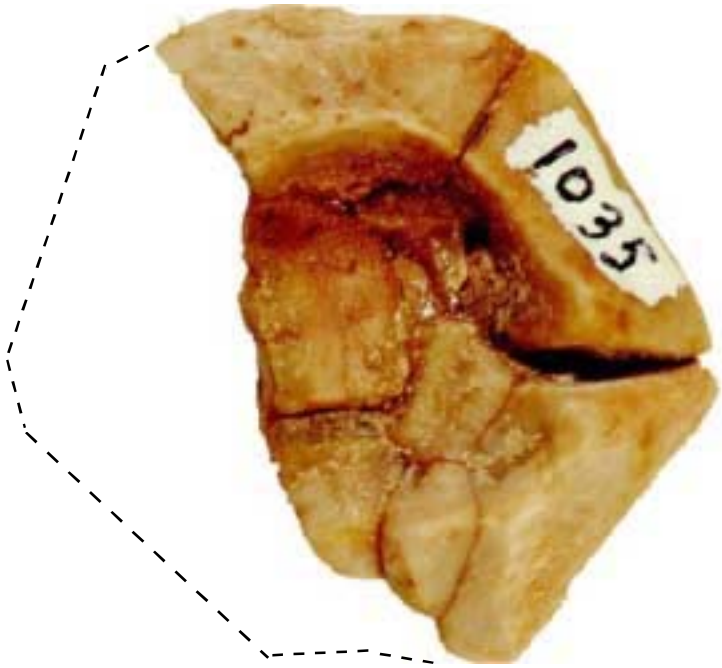
S. humilis
from Pabian & Strimple (1974)

Sciadiocrinus has about 20 assigned species, all from the Pennsylvanian of North America. One of the distinctive characteristics of *S. wipsorum* is the long, pointed CD basal plate. The CD basal plate is marked on each figure above.

S. wipsorum partial cup



1 cm



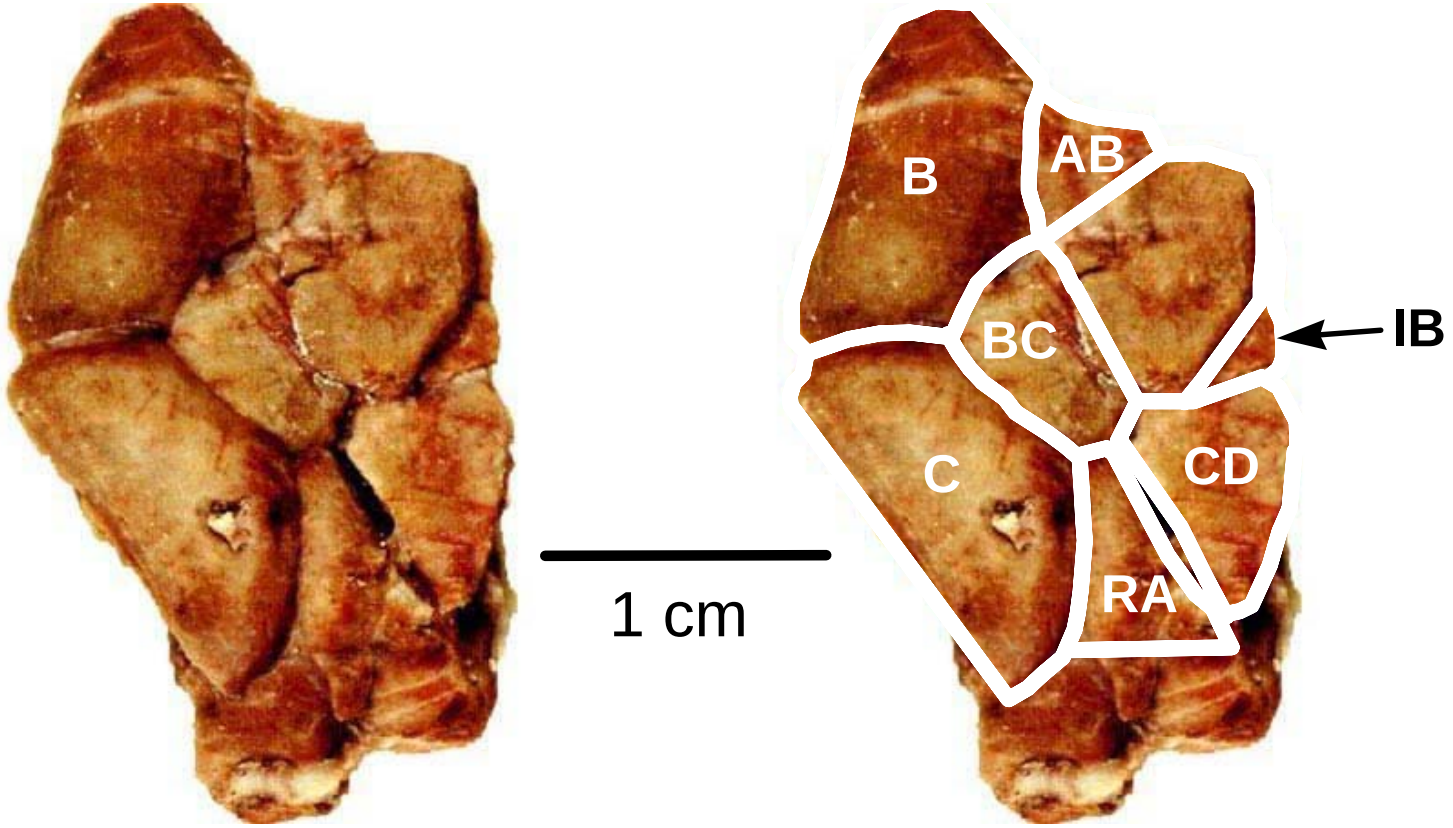
Basal view

Oral view

Prior to cleaning

This partial cup of *Sciadiocrinus wipsorum* was found in Unit 3b of the Minturn Formation at McCoy. Originally, a brachipod shell was attached to the base (see left). After cleaning, the A, B, and C radial plates are visible. The oral side shows some details of the CD and BC basals and the radianal which are not visible on the holotype in the oral view.

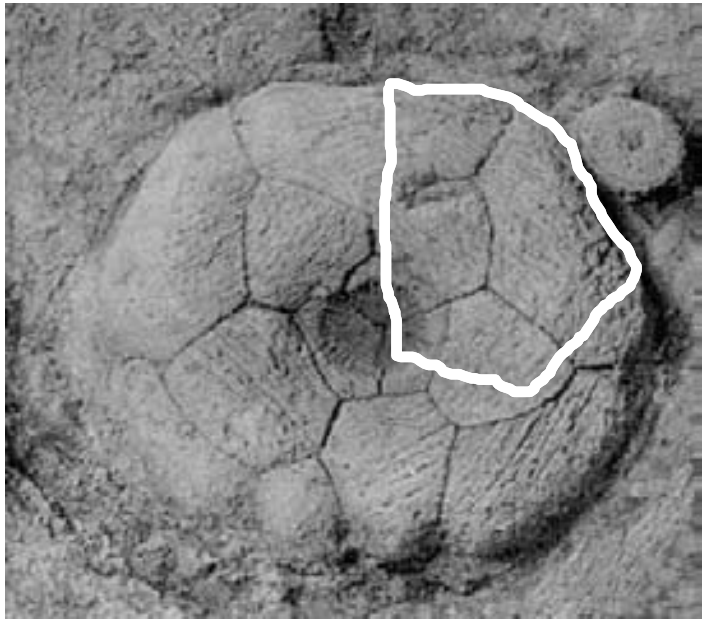
Another *S. wipsorum* partial cup



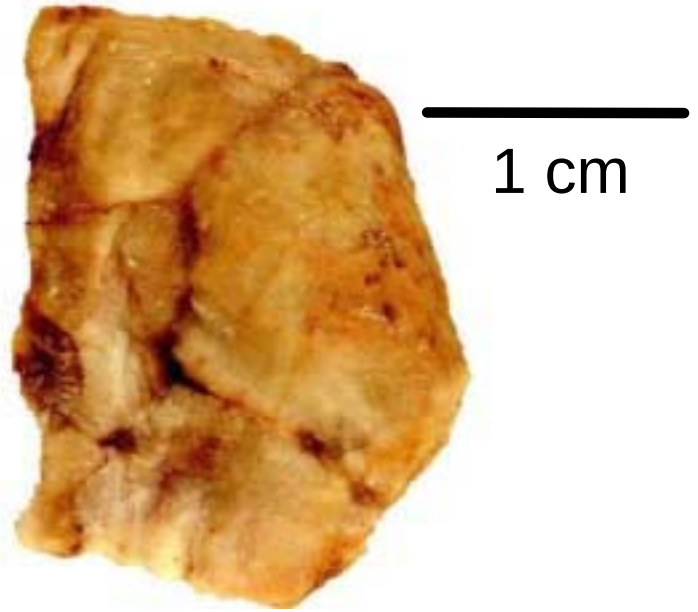
Basal view

This partial cup of *Sciadiocrinus wipsorum* was found in Unit 3a of the Minturn Formation at McCoy. The recognizable plates are the B and C radials, the AB, BC, and CD basals, and the radianal (RA). A loose plate of some kind obscures most of the infrabasal circlet (IB) and some of BC.

Metaffinocrinus perundatus, the other pirasocrinid known from the Minturn



Metaffinocrinus perundatus, from Webster & Houck (1998). 2 cm across.

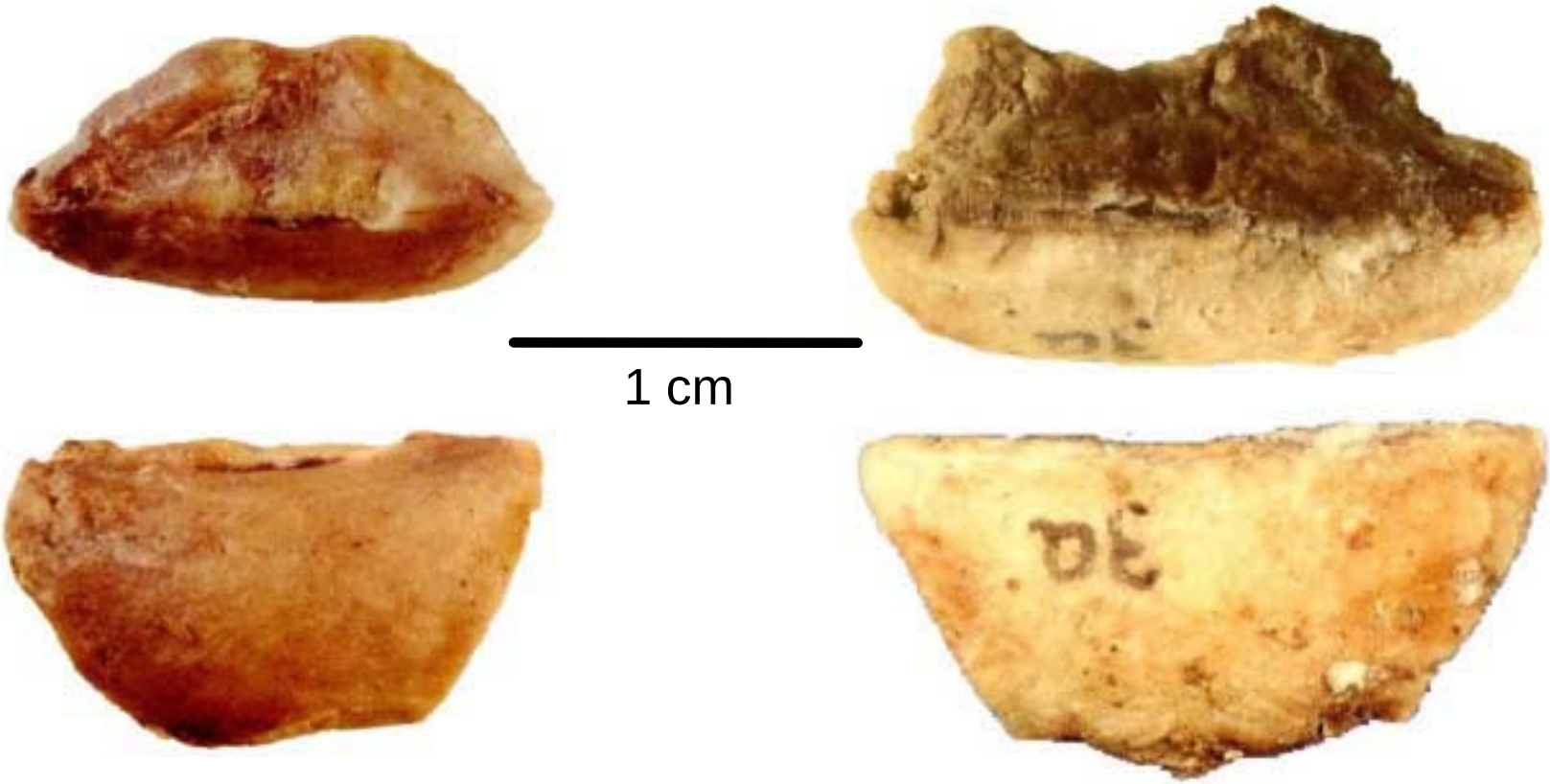


Crinoid cup fragment found in this study. Possibly *Metaffinocrinus perundatus.*

The only pirasocrinid other than *Sciadiocrinus wipsorum* which has been identified in the Minturn Formation is *Metaffinocrinus perundatus,* previously found in Unit 7. The cup fragment on the right, from Unit 3a, may correspond to the part outlined on the left, though it shows some variation in the basal-basal sutures and basal development. *Metaffinocrinus perundatus* is also known from Texas and Oklahoma.

Disarticulated radials

Disarticulated radial cup plates were found, some of which appear to belong to *Sciadiocrinus wipsorum* and some to *Metaffinocrinus perundatus.* An example of each is shown below.



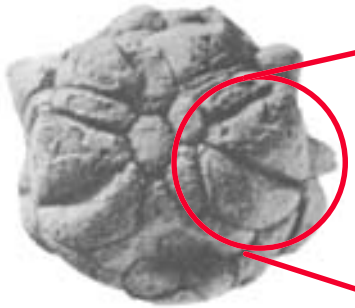
Probably C radial of *S. wipsorum*

Probably A, B, or E radial of *M. perundatus*

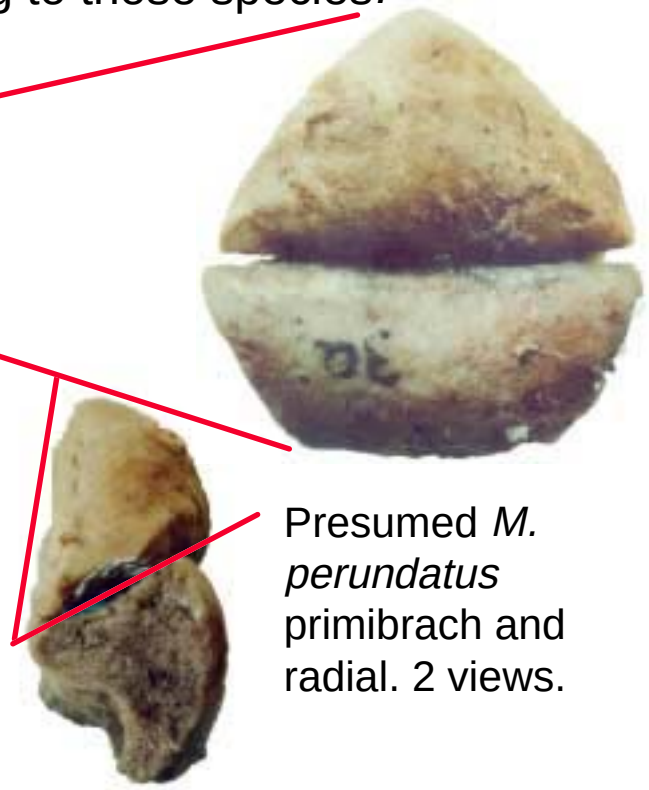
Radials of *S. wipsorum* are more bulbous than those of *M. perundatus.*

Disarticulated primibrachs

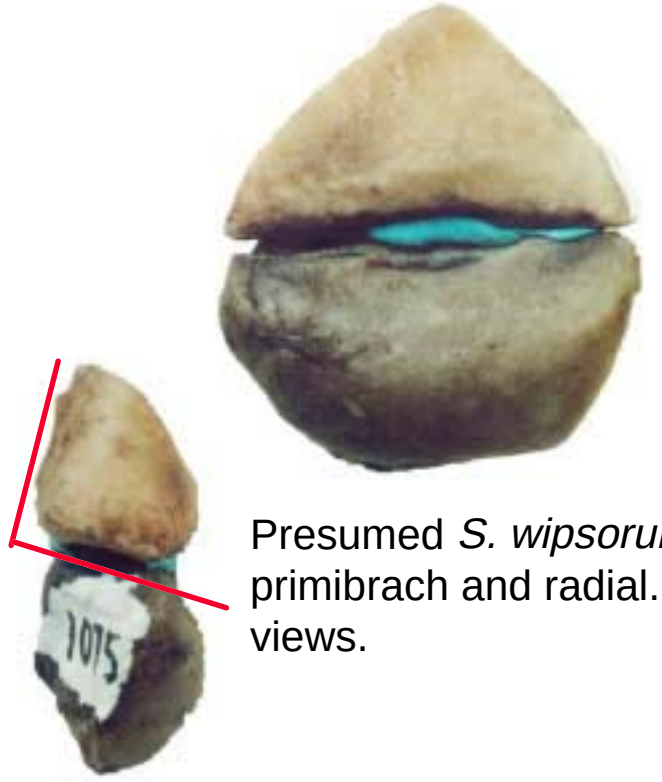
Disarticulated primibrachs (lowest arm parts) with broad, triangular outlines are common at McCoy. *Metaffinocrinus perundatus* is known to have such a primibrach (see below). The primibrach of *Sciadiocrinus wipsorum* is not known, but some other species of *Sciadiocrinus* have primibrachs with this shape. Some primibrachs articulate (fit) with radials believed to belong to *M. perundatus* and *S. wipsorum* and thus may belong to those species.



Metaffinocrinus perundatus cup for comparison. From Moore & Teichert (1978)



Presumed *M. perundatus* primibrach and radial. 2 views.



Presumed *S. wipsorum* primibrach and radial. 2 views.

The articulating surfaces in the presumed *M. perundatus* primibrachs form an acute angle, while those of the presumed *S. wipsorum* primibrachs form a nearly right angle. These angles are marked in red in the side-views above.

Unidentified spinose primibrachs

Several isolated primibrachs, each with a single sharp spine, have been found. Two examples are shown below. They resemble spines found in *Plaxocrinus, Metaperimestocrinus,* and some other pirasocrinid genera, though they may belong to another family entirely. In any case, they probably belong to at least one genus present at McCoy which is not yet known from a cup.

Basal view of *Plaxocrinus mooresi,* a crinoid from Ohio with spinose primibrachs. From Strimple (1969).

3 views of spine #1

1 cm

3 views of spine #2

Tegmen spines

While all pirasocrinids are presumed to have a tegmen roof made up of an umbrella-like array of spines, most species are described only from the cup or the cup and arms. The form of the tegmen roof is not known for *Sciadiocrinus wipsorum* or for *Metaffinocrinus perundatus.* I have found isolated tegmen spines, which seem to be of at least 3 distinct types. It is not possible to identify these, even to family, but this does indicate that there are at least 3 different species, each with a spine-bearing tegmen. Thus, there must be at least one other unrecognized species in the McCoy fauna.

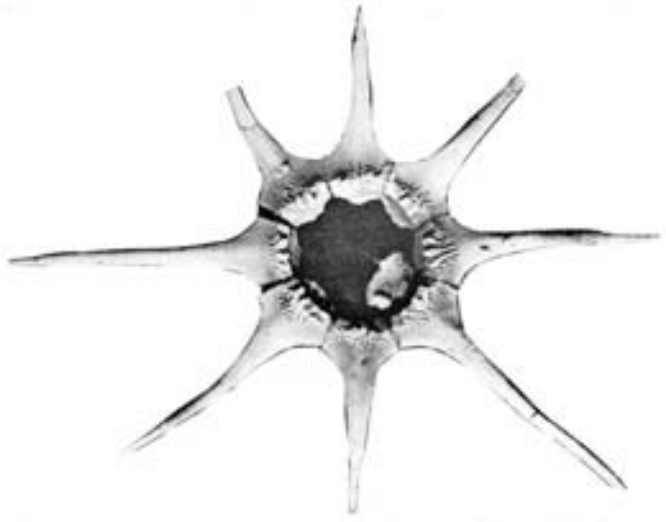
1 cm

Top Bottom

Type 1 spines

Broad base, rough ornament on lower side of base.

Plaxocrinus macrospiniferus (right) is similar.



From Pabian & Strimple (1974a)

Tegmen spines - cont.

Type 2 spines

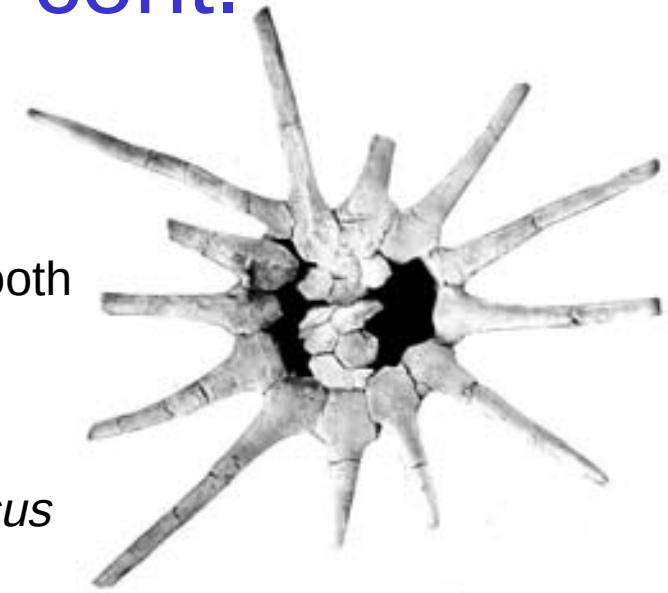
Top

1 cm

Bottom

Narrow base, smooth surface, tapers gradually.

Eirmocrinus grossus (right) is similar.



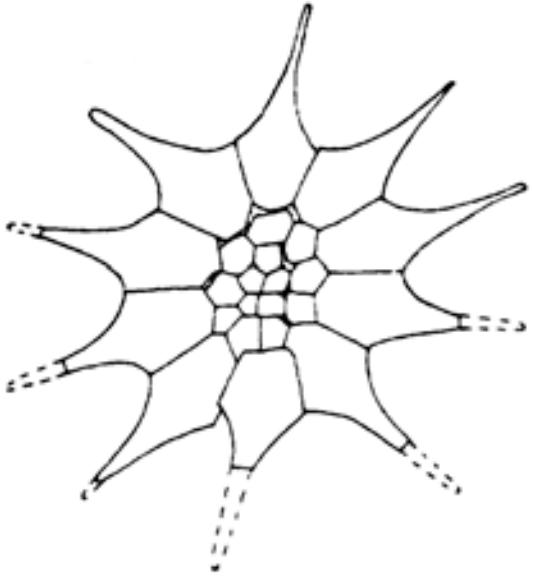
From Strimple & Watkins (1969)

1 cm

Type 3 spines

Narrow base, tapers rapidly to a sharp point. Lower side of base has a median ridge.

Plaxocrinus mooresi (right) is similar.



From Burke (1967)

Discussion

As a result of this study, the number of known specimens of *Sciadiocrinus wipsorum* has increased from 1 to 3. Disarticulated radials and primibrachs probably belonging to *S. wipsorum* and *Metaffinocrinus perundatus,* the other pirasocrinid known from the Minturn Formation, have been identified. A spinose primibrach, resembling that of *Plaxocrinus,* has been found. At least 3 types of tegmen spines have been found. The spinose primibrach and at least one of the tegmen spines probably belong to species not yet recognized at McCoy (possibly the same one). Until more complete remains are found, it will probably not be possible to assign these isolated plates more specifically.

Acknowledgments

I especially thank Gary Webster for giving me a preliminary version of the paper on the McCoy crinoids nearly 2 years prior to its publication, for reviewing this work, and for other advice over the last few years. Without that help I could not have carried out this study. I thank Karen Houck for leading the 1995 WIPS field trip on which I learned much about the stratigraphy of the Minturn Formation at McCoy. Finally, I thank Jordan Sawdo for introducing me to the paleontology of McCoy back in 1984.

References

- Burke, J. J. 1967. The tegmen roof of *Plaxocrinus mooresi* (Whitfield). The Ohio Journal of Science, 67:298-300.
- Houck, K. J. 1997. Effects of sedimentation, tectonics, and glacio-eustasy on depositional sequences, Pennsylvanian Minturn Formation, North-Central Colorado. AAPG Bulletin, 81:1510-1533.
- Lewis, R. D., and H. L. Strimple. 1990. *Sciadiocrinus,* convergence on the family Pirasocrinidae (Crinoidea: Echinodermata). Journal of Paleontology, 64:293-300.
- Moore, R. C., and H. L. Strimple. 1973. Lower Pennsylvanian (Morrowan) crinoids from Arkansas, Oklahoma, and Texas. The University of Kansas Paleontological Contributions Article 60:1-84.
- Moore, R. C., and C. Teichert (eds.). 1978. Treatise on Invertebrate Paleontology (T) Echinodermata 2, Crinoidea. Geological Society of America and University of Kansas, vol. 2.
- Pabian, R. K., and H. L. Strimple. 1974. Crinoid Studies, Part I. Some Pennsylvanian crinoids from Nebraska, Part II. Some Permian crinoids from Nebraska, Kansas, and Oklahoma. Bulletins of American Paleontology, 64(281):249-337.
- Pabian, R. K., and H. L. Strimple. 1974a. Miscellaneous Pennsylvanian crinoids from Kansas, Oklahoma, and Nebraska. The University of Kansas Paleontological Contributions Paper 73(1):2-19.
- Strimple, H. L. 1969. Pennsylvanian crinoids from Ohio and Oklahoma. The University of Kansas Paleontological Contributions Paper 42(3):11-17.
- Strimple, H. L. 1975. Middle Pennsylvanian (Atokan) crinoids from Oklahoma and Missouri. The University of Kansas Paleontological Contributions Paper 76:1-30.
- Strimple, H. L., and R. C. Moore. 1973. Middle Pennsylvanian crinoids from central Colorado. The University of Kansas Paleontological Contributions Paper 56(9):35-40.
- Strimple, H. L., and W. T. Watkins. 1969. Carboniferous crinoids of Texas with stratigraphic implications. Palaeontographica Americana, 6:141-275.
- Webster, G. D., and K. Houck. 1998, Middle Pennsylvanian, late Atokan-early Desmoinesian echinoderms from an intermontane basin, the Central Colorado Trough. Journal of Paleontology, 72:1054-1072.