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*LOGOCRINUS CONICUS*, A SIMPLE NEW MIDDLE DEVONIAN  
INADUNATE CRINOID FROM MICHIGAN

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BY  
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11. *Ameliacrinus benderi*, a new dicyclic camerate crinoid from the Middle Devonian Silica Formation in northwestern Ohio, by Robert V. Kesling. Pages 155-162, with 3 plates and 2 text-figures.

# LOGOCRINUS CONICUS, A SIMPLE NEW MIDDLE DEVONIAN INADUNATE CRINOID FROM MICHIGAN

ROBERT V. KESLING

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ABSTRACT—Four little crinoids from upper strata of the Middle Devonian Bell Shale in Michigan are dicyclic inadunates. They are here assigned to the family Scytalocrinidae and made the types of a new species of *Logocrinus*. They are characterized by smooth subconical cup, large IBB, rather short RR, high tapering PBrBr<sub>1</sub>, and irregular columnals in a round smooth column that expands proximally to blend inconspicuously with the outline of the cup.

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## INTRODUCTION

FOR MANY YEARS, inadunate crinoids from the Middle Devonian Bell Shale have been assembled at our museum. For some kinds, investigation has been delayed in anticipation of better-preserved specimens. It now seems unlikely that more complete specimens will be discovered of the species described here.

Many years ago, around 1939, Chaplain John Samuel of 824 Third Avenue, Alpena, Michigan, presented a tiny calyx to the Museum of Paleontology of The University of Michigan. It came from the upper strata of the Bell Shale exposed in a drainage ditch in the Rockport Quarry of the Kelley's Island Lime and Transport Company, about  $\frac{1}{4}$  mile west-northwest of the quarry buildings. The quarry, now long abandoned, lies in the NW $\frac{1}{4}$  sec. 6, T 32 N, R 9 E, on the shore of Lake Huron, in the northeastern corner of Alpena County. Since that time, my students and I have collected many samples from the outcrop and searched through washings of the shale for additional specimens. Three have been found, two larger and one smaller than the original discovery; all are rather well preserved, although cup plates have been pushed apart in the small specimen by crushing. The new specimens show the nature of sutures in both cup and column; the original specimen had suffered drastically from someone's inaccurate attempts to "clean" the sutures with a dull needle.

The manuscript was typed by Mrs. Gladys Newton, the photographs were printed by Mr. Karoly Kutasi, and both were critically reviewed by Professors C. A. Arnold and E. C. Stumm. My sincere appreciation is extended to all who assisted. All type specimens are deposited and catalogued in the Museum of Paleontology of The University of Michigan.

## Class CRINOIDEA

### Subclass INADUNATA

Order CLADOIDEA Moore & Laudon

Suborder DENDROCRINOIDEA Bather

Family SCYTALOCRINIDAE Bather

[*nom. correct.* Moore & Laudon, 1943 (*pro* Scytalecrinidae Bather, 1899)]

By its dicyclic cup, firm junctions of plates, and free arms above RR, the new crinoid belongs to the Cladoidea. The conical shape of its cup is a primitive character within the order. The very wide RR facets and the arrangement of RA and XX indicate that it belongs in one of a few families within the Dendrocrinoidea.

As recently as thirty years ago, this crinoid would have been readily assigned to the Poteriocrinitidae. With the restriction of the Poteriocrinitidae to crinoids with relatively narrow RR facets, however, a problem arises in finding a suitable classification for a species with steeply conical cup, RA oblique below the R of the C ray, X<sub>1</sub> and RX<sub>1</sub> incorporated in the cup, and facets nearly filling the wide upper surfaces of RR. Choice can be narrowed to the Blothrocrinidae, Cercidocrinidae, and Scytalocrinidae. The same shape of cup and plate arrangement is present in some crinoids of the Glossocrinidae and Ottawacrinidae; but, although the facets of those crinoids are wide, they do not extend the full width of the RR.

Extensive search through literature shows that Devonian crinoids similar to the new species have been assigned to *Logocrinus*, which was originally assigned to the "Poteriocrinidae" by Goldring (1923, p. 67), retained in the Poteriocrinitidae by Bassler & Moody (1943, p. 540), and transferred to the Scytalocrinidae by Moore & Laudon (1943, p. 59).

## Genus LOGOCRINUS Goldring

The genus was created by Goldring (1923, p. 437) for crinoids with a calyx like *Scytalocrinus* but with pinnules from every pair of BrBr "alternately on each side" and with quadrangular to wedge-shaped BrBr. Her two species, both new, were *Logocrinus geniculatus* and *L. infundibuliformis*.

*Logocrinus geniculatus* Goldring (1923, p. 438-440; pl. 57, figs. 1-6), the type species, was described as having a bell-shaped dorsal cup; IBB wider at top than base and over half the height of BB; three hexagonal and two heptagonal BB, the posterior larger than the anterior and as large or larger than the RR; RR flared near the top to produce the bell shape, pentagonal, the posterior pair smaller, and "radial facet straight, occupying practically the entire upper face of the radial"; RA pentagonal, fairly large, about the size of IBB, bordered above by  $X_1$ ,  $RX_1$ , and R of the C ray;  $X_1$  hexagonal, smaller than the posterior RR and not much larger than RA, its upper edge at about the level or above RR;  $PBr_1$  wide at the base, about as wide as R, narrowing to about half that width at its upper edge; and  $PBr_2$  narrow, either  $PBr_2$  or  $PBr_3$  being axillary and widening distally at the bifurcation. *L. infundibuliformis* Goldring (1923, p. 440-441; pl. 57, figs. 7-11) was described as similar but with a funnel-shaped cup, bulging in the anal region, and differing from *L. geniculatus* in proportions of certain plates. Measurements of two specimens of *L. infundibuliformis* were: height of cup 4.2 and 4.6 mm, width at base of cup 1.3 and 1.8 mm, and width at RR 4.2 and 4.7 mm. The column was said to taper until at 4 mm from the calyx its diameter was 0.7 mm, "which it maintains, practically, for the rest of its length." Both species of *Logocrinus* had arms preserved.

In the same monograph with her presentation of *Logocrinus*, Goldring re-described "*Poteriocrinus*" *zethus*, a species established by Williams in 1882 (p. 27). According to her description (1923, p. 414-415), *P. zethus* has a very small turbinate calyx; five pentagonal IBB about as wide as high; hexagonal BB; pentagonal RR, "larger than basals, broader but of about the same height," and with facets straight and occupying "practically the entire width of the radial"; and two long  $PBrBr$ , subequal in length and "together giving an hour-glass effect," referring to the broad base of  $PBr_1$ , the narrow  $PBr_1$ - $PBr_2$  junction, and the expanded distal end of  $PBr_2$ . Because of matrix, the anals of species were not known. The exceptional similarities of the wide RR facets,

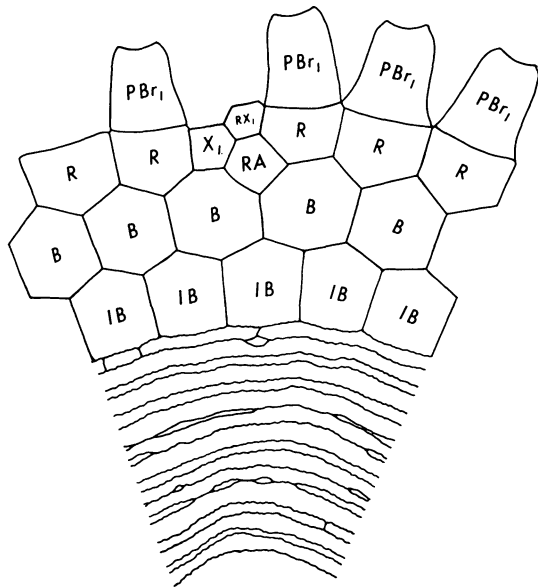
high tapering  $PBrBr_1$ , and high expanding axillary  $PBrBr$ , as well as the small size, subconical to turbinate cup, and arrangement of plates on the anterior side, make one wonder why Goldring did not transfer *P. zethus* from *Poteriocrinites* to her new genus *Logocrinus*.

## LOGOCRINUS CONICUS n. sp.

Text-fig. 1; pl. 1, figs. 1-8

*Description*.—Small dicyclic inadunate with primitive conical cup. Cup forming inverted frustrum of steep cone, its diameter at top of RR less than its height, tapering to slightly over half this diameter at the base of IBB (pl. 1, figs. 1-8). Three anal plates incorporated in cup (RA,  $X_1$ , and  $RX_1$ ), not protruding (pl. 1, figs. 1, 4, 6, 7). Sutures of small (presumably young) specimen slightly depressed (pl. 1, fig. 8); those of large (probably adult) specimens scarcely depressed if at all, emphasizing the smooth conical shape of cup (pl. 1, figs. 1-4). No ornamentation. Cup dorsally confluent with tapering column (pl. 1, figs. 1, 2).

IBB pentagonal, relatively large, the circlet of plates having a circular junction with the column. Each IB with slightly diverging sides and a very broad apex inserted between adjacent BB. In the two larger specimens, IBB of B and C rays widest, that of E ray narrowest (table 1). Smaller specimens with IBB wider than high, larger specimens with IBB higher



TEXT-FIG. 1—*Logocrinus conicus* n. sp. Diagram of cup, arm bases, and columnals. Based on holotype. Note irregularity of sutures in column.

TABLE 1—MEASUREMENTS OF CUP PLATES IN *LOGOCRINUS CONICUS* (in mm).

Plate		IBB								
Meas.		Width					Height			
Spec.	A	B	Ray C	D	E	A	B	Ray C	D	E
57221	1.67	1.80	1.80	1.56	1.54	1.62	1.97	1.98	1.88	1.80
57222	1.63	1.73	1.74	1.68	1.60	1.85	1.88	1.83	1.81	1.82
57223	1.30	1.25	1.52	1.29	1.36	1.22	1.10	1.30	1.10	1.20
57224	1.09	1.00	0.92	1.05	1.09	0.64	0.66	0.80	0.64	0.68

Plate		BB								
Meas.		Width					Height			
Spec.	AB	BC	Interray CD	DE	AE	AB	BC	Interray CD	DE	AE
57221	2.00	2.05	2.00	1.75	1.80	2.22	2.14	2.03	2.02	2.10
57222	1.84	2.10	1.96	1.69	1.66	2.41	2.34	2.25	2.21	2.31
57223	1.48	1.53	1.77	1.47	1.50	1.71	1.68	1.73	1.72	1.63
57224	1.15	1.22	1.27	1.18	1.11	1.28	1.32	1.31	1.36	1.34

Plate		RR								
Meas.		Width					Height			
Spec.	A	B	Ray C	D	E	A	B	Ray C	D	E
57221	1.88	1.94	1.80	1.68	1.90	1.64	1.58	1.38	1.50	1.66
57222	1.84	1.76	1.74	1.72	1.93	1.74	1.78	1.42	1.61	1.71
57223	1.86	1.70	1.64	1.51	1.77	1.32	1.25	1.23	1.31	1.46
57224	1.21	1.11	1.14	1.14	1.19	1.18	1.08	1.05	1.15	1.17

Plate		Anal Plates					
Meas.		Width			Height		
Spec.	RA	X <sub>1</sub>	RX <sub>1</sub>	RA	X <sub>1</sub>	RX <sub>1</sub>	
57221	1.42	1.00	0.90	1.24	0.97	0.78	
57222	1.50	1.12	1.00	1.55	1.07	0.92	
57223	1.17	0.86	0.73	1.17	0.90	0.80	
57224	1.02	0.79	0.62	0.89	0.95	0.76	

than wide; height/width ratios from smallest to largest specimen: 0.66, 0.88, 1.10, 1.11.

BB of BC and CD interrays heptagonal (pl. 1, figs. 1, 4, 6, 7), the others hexagonal (pl. 1, figs. 2, 3, 5, 8). BB averaging 11 per cent wider and 13 per cent higher than IBB. Each B higher than wide (table 1); the heptagonal BB considerably wider and the B of the AE interray narrower than the average; BB of CD and DE interrays shorter and B of AB interray higher than the average. All B-B junctions nearly vertical on cup, diverging slightly in lateral view.

RR circlet interrupted by RA, X<sub>1</sub>, and RX<sub>1</sub> (pl. 1, figs. 1, 4, 6). RR pentagonal, averaging about the same width as BB and slightly higher than IBB. Those of A and E rays wider, that of D ray narrower than the average; those of A and E rays higher, that of C ray shorter than the average. R of C ray bordered by R of B ray, B of BC interray, RA, RX<sub>1</sub>, and PBr,

(text-fig. 1; pl. 1, fig. 7). RR facets extending practically the full width of plates, of the dendrocrinoid type, with a clearly defined straight ridge across the joint face from corner to corner of the plate, separating a narrow outer ligament fossa from a larger inner muscle and ligament field.

RA pentagonal, small, narrower and shorter than IBB, bordered by R of C ray, BB of BC and CD interrays, X<sub>1</sub>, and RX<sub>1</sub>. X<sub>1</sub> smaller than RA, pentagonal, with horizontal base and top, perpendicular left edge (abutting R of D ray), and bluntly acuminate right side inserted between RA and RX<sub>1</sub>. Top of X<sub>1</sub> about level with top of R of D ray (pl. 1, figs. 1, 4, 6). RX<sub>1</sub> slightly smaller than X<sub>1</sub>, pentagonal to hexagonal, its upper edge about even (pl. 1, fig. 6) or slightly higher than top of R of C ray (pl. 1, fig. 4).

PBrBr<sub>1</sub> tall, subtrapezoidal, each with wide base set atop corresponding R and narrow facet

for junction with  $PBr_2$ .  $PBrBr_1$  averaging about same height as BB in the cup. Outer surface of each  $PBr_1$  subcylindrical, curved to fit against R at the base, more strongly curved distally so that sides of adjacent  $PBrBr_1$  converge sharply inward (pl. 1, fig. 3).

Proximal part of column tapering evenly with sides of cup (pl. 1, figs. 1, 2), with more or less alternating thick and thin columnals but with peculiar structures. Columnal sutures somewhat irregular, separated in places around lunate "islands" of columnal material. Some columnals apparently divided by vertical sutures into irregular and unequal sectors. At a distance equal to the height of the cup, column only slightly more than half the diameter at the proximal facet.

*Remarks.*—Unfortunately, no part of the arms beyond  $PBrBr_1$  is known. From *Logocrinus geniculatus* Goldring the new species differs in the shape of the cup, having no flare at the top. From *L. infundibuliformis* Goldring it differs in the relatively much shorter RR and slightly higher cup; nevertheless, it shows some strong similarities to *L. infundibuliformis* in the general form of the cup, large IBB, size and shape of anal plates, and taper of the column.

A peculiar feature of *Logocrinus conicus* is the irregularity of the column. The holotype shows no signs of wear or abrasion in its col-

umn, yet some columnals seem to be composed of irregular sectors and some appear to be reduced to thin abnormal structures only parts of which extend outward far enough to form sutures. Not enough specimens are known to permit speculation on whether this is a normal condition in the species. In this specimen, the thin little lunate edges exposed as "islands" between sutures seem to be distributed throughout the preserved section of column; they are probably parts of plates which did not develop to normal thickness, either because secretion did not function evenly across the facet or because resorption affected the amount and distribution of calcareous substance.

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#### EXPLANATION OF PLATE 1

All figures  $\times 10$ ; specimens lightly coated with ammonium chloride

FIGS. 1-8—*Logocrinus conicus* n. sp. 1, 2, holotype UMMP 57221, lateral views centered on CD (posterior) and AE interrays. 3, 4, paratype UMMP 57222, lateral views centered on AE and CD (posterior) interrays. 5, 6, paratype UMMP 57223, the original discovery by Chaplain Samuel; sutures abnormally incised by cleaning attempts; views centered on A (anterior) ray and CD (posterior) interray. 7, 8, paratype UMMP 57224, the smallest specimen; plates slightly dislodged by crushing during fossilization; views centered on RA and on E ray. Sutures slightly retouched.



PLATE 1

