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EUTAXOCRINUS WIDENERI, A NEW FLEXIBLE CRINOID
FROM THE MIDDLE DEVONIAN SILICA FORMATION
OF NORTHWESTERN OHIO

BY

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EUTAXOCRINUS WIDENERI, A NEW FLEXIBLE CRINOID
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ABSTRACT—From the holotype and twenty paratypes, a new species is erected for the *Eutaxocrinus* in the Middle Devonian Silica Formation of Lucas County, Ohio. It is characterized by brachials curved evenly to the edges, an unusually long projection on the left side of the BC-interray basal plate, an elongate anal X, irregular ossicles in the interbrachial spaces between arms, and barrel-shaped columnals with equatorial nodes in the dististele region. The species has exceptionally high morphologic instability. Nearly half of the specimens studied show abnormalities of one kind or another, some in the number of PBrBr and SBrBr and others in the number and disposition of cup plates and even the number of arms.

INTRODUCTION

FLEXIBLE CRINOIDS are not as well known as are the inadunates and camerates in Middle Devonian strata. Part of the explanation lies in the weak construction of these animals, which contributed to their easy disarticulation both before burial and after exposure. Nevertheless, this is only one of the reasons why flexible crinoids are seldom reported in faunas. Another important reason is the general lack of interest by paleontologists in fossils that display many variations, especially variations whose taxonomic significance is a matter of debate.

A species of flexible crinoid from the Silica Formation has now been found in sufficient numbers and in good enough preservation to justify its description.

The first specimens were found by Millard E. Widener of 4217 Lowe Road, Toledo, Ohio 43624, who collects particularly from Unit 18 of the Silica Formation in the quarries of the Medusa Portland Cement Company, Lucas County, Ohio. On September 15, 1966, he wrote to the senior author of this paper, "... I found a complete crinoid head in Unit #18. It is very small—only about $\frac{3}{8}$ " in height—is similar to *Taxocrinus*; has little or no cup, but the arms do not appear too massive." Later that fall he presented our Museum of Paleontology with several crinoids and two brittle-stars (the latter still undescribed) from Unit 18. Included in the lot was the specimen he mentioned (now UMMP 57913) and another, consisting of the

IBB and BB attached to a long stem (now UMMP 57903). Widener found both by splitting large blocks of the shale.

After a storm on July 4, 1969, Mr. Jeff Aubrey discovered a deposit of very nice specimens, which he recovered before the shale was taken to the cement plant. Aubrey gave three specimens to Widener, who passed them on to Mrs. Ruth Berner Chilman with the agreement that one would be given to the U. S. National Museum, one to the Museum of Paleontology (now UMMP 57921), and one for herself. Mrs. Chilman subsequently donated her specimen to our museum, where it is UMMP 57906.

On August 29, 1970, Widener wrote more about the crinoids:

Being familiar with Unit 18 and knowing approximately where Jeff [Aubrey] found his specimens, last fall and until March of this year I excavated in the west wall until it was no longer safe. Late diggings indicated that the supply [of crinoids] was exhausted. All specimens that I mailed or gave to Dr. Strimple or Dr. Kier, and/or Mrs. Chilman were found by myself . . .

The odd columnals were very numerous in the top and immediately above the coral formation [of Unit 18]. Previous washing of matrix from this area did not contain crown parts of this crinoid; however, very small basal cups and plates of *Arthracantha* were found and several semi-microscopic columnals that are still a mystery . . . The occurrence of these crowns indicates a very small pool that was heavily populated by this animal . . .

Of this particular area, immediately above the coral, there was a layer of approximately

one-half to three-quarters inch of columnals. Most other animal life of this unit was represented. Then there appeared to be a definite separation line in the shale in the next layer, about an inch thick, of long columnals and crowns. This was followed by about two inches of apparently barren shale—then a very thin layer of *Sphenophragmus* sp. valve fragments. Above this, for several feet, appeared to be barren shale. Washing of this matrix did not reveal animal life.

Meanwhile, in 1968 and 1969 Mr. and Mrs. Mel Berry of 238 North Avenue, Mt. Clemens, Michigan 48043, also found some excellent specimens of the *Eutaxocrinus* at Silica. One found by Charlene Berry is selected as the holotype. Five others given by the Berrys to the Museum of Paleontology are made paratypes, UMMP 57891–57894 and 57897.

We are grateful indeed to Millard Widener, Jeff Aubrey, Mel and Charlene Berry, and Ruth Chilman for their generous gifts. All have been so nice to us that we could hardly choose a name for the new species. It could have been in honor of any one of these friends, with more than ample justification. We finally resorted to chronology, and named the crinoid *Eutaxocrinus wideneri* after its first discoverer.

This paper was helped immensely by the Museum of Paleontology team—Karl Kutasi in photography, Helen Mysyk in typing, and Gladys Newton in proofreading—with their usual excellence. Mr. George McIntosh kindly drew the text-figures. All type specimens are in the Museum of Paleontology.

Genus EUTAXOCRINUS Springer 1906

EUTAXOCRINUS WIDENERI n. sp.

Text-figs. 1, 2; pls. 1–6

Crown.—Moderately elongate and robust. With arms in contracted position, crown expanding gently for about 80% of its height, thereafter contracting rapidly. Arms with distal parts curved sharply inward, their tips in contact.

Dorsal cup.—Three IBB, two large and one small, the latter in the C ray (text-fig. 1). IBB with exposed sides confluent with column; plates low as viewed laterally, the height varying considerably but generally between 25% and 40% of the height of the BB. Proximal

columnal covering most of IBB; in extreme cases, IB-IB contacts interrupted on sides of cup (pl. 2, fig. 2; pl. 5, fig. 7); normally, short IB-IB sutures exposed (pl. 2, fig. 3; pl. 3, fig. 6).

Five BB of unequal size and outlines. Largest and longest B in CD interray (text-fig. 1), its right shoulder deeply notched to accommodate anal X and its left shoulder projecting alongside X. Other BB subpentagonal with short sides, acuminate upper ends (fitting between RR), and wide bases slightly modified to fit atop IBB circlet. Height/width of BB varying between .48 and .80, averaging .65.

Five RR of unequal size and outline. Each R only slightly larger than adjacent PBr₁, its base acuminate to fit between plates of the BB circlet, its sides straight and very slightly divergent, and its top sinuous with a modified broad U-shaped median embayment and rounded corners (pl. 1, figs. 1–3; pl. 4, fig. 1).

Anal X relatively large, normally elongate (pl. 3, fig. 2; pl. 5, figs. 4, 5), rarely short and quadrate (pl. 1, fig. 7), set atop B of CD interray and bordered on its left side by an extension of that plate (pl. 2, fig. 2).

No plates of cup ornamented. IBB and BB circlets forming rather smooth frustum. RR convex, the circlet lobate except where interrupted posteriorly by largest B and X.

Anal series.—Each plate of XX series round-backed, the outer surface of the tapering series resembling the side of a very narrow cone. More than 8 XX in series, decreasing markedly in height beyond X₂, the distal XX small and nearly square (pl. 5, fig. 3). XX alongside C ray but in no way adjoined to it.

Arms.—Arms broad at base, reduced at each branching to fill available space, forming a pyriform crown when closed. Each arm terminating with a series of small quadrirachials turned in to a common meeting point with those of other arms. Arms of each specimen branching at about the same level, but with many variations. About 40 arm ends per crown.

PBr₁ not much smaller than R below, slightly wider but shorter than R. Axillary PBr in most arms = PBr₂. Top and bottom of PBr₁ sinuous, with a pronounced broad basal lobe

EXPLANATION OF PLATE 1

Figures × 4 except as noted

Eutaxocrinus wideneri n. sp. 1–7, holotype UMMP 57920; 1, 2, lateral views centered on B and A rays; 3, lateral view centered on DE interray; 4, posterior view; 5, 6, top (ventral) and basal (dorsal) views; 7, detail of base of anal series, × 10. 8–10, paratype UMMP 57902, a small specimen with abnormal ray development as shown in text-figure 2; 8, 9, lateral views of crown; 10, impression of crown and part of column. 11, paratype UMMP 57894, two crowns embedded in matrix.

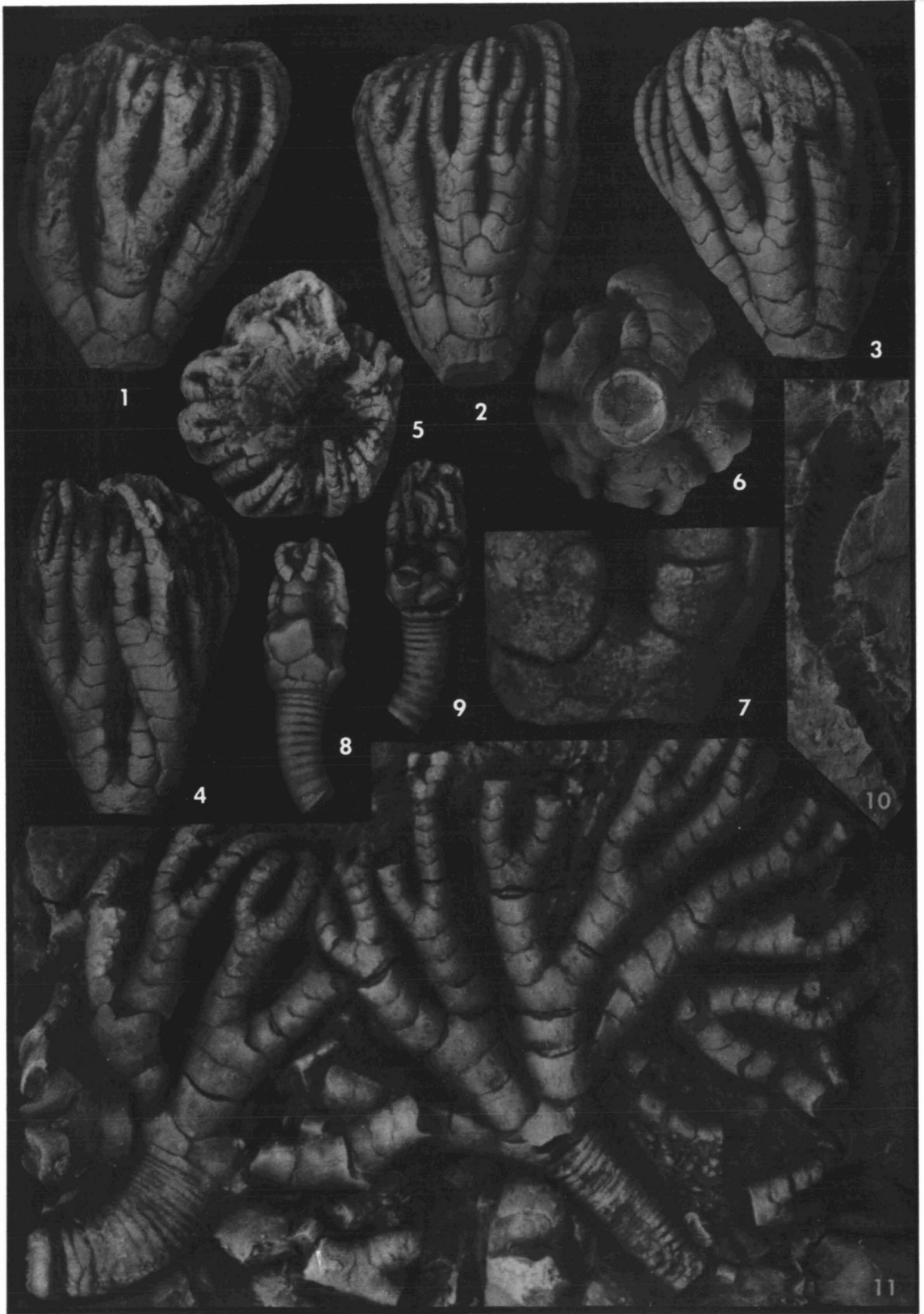
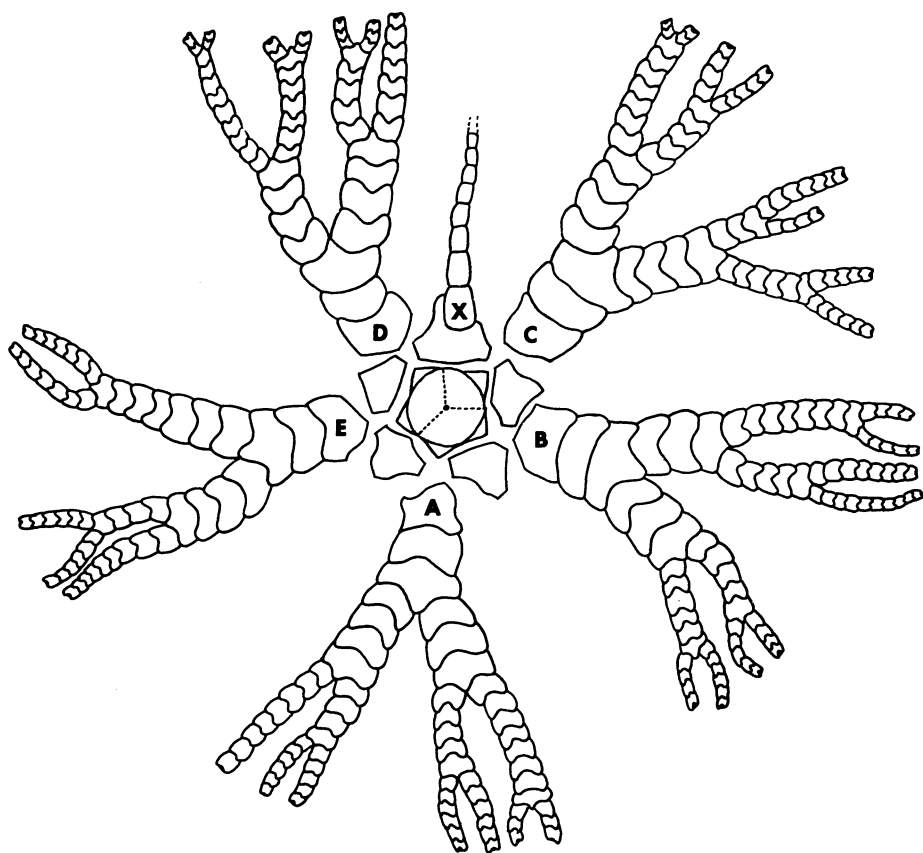


PLATE 1



PLATE 2

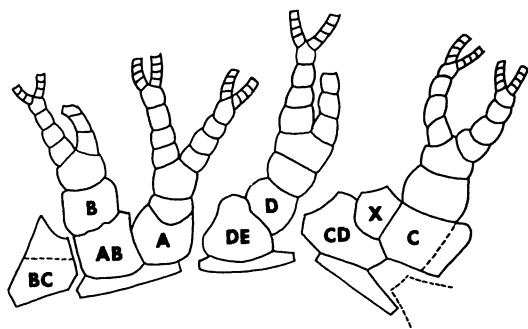


TEXT-FIG. 1—*Eutaxocrinus wideneri* n. sp. Composite plate diagram with RR labeled with the letter of the ray. Drawing by George McIntosh.

and a parallel upper embayment along its axis; lower corners angular and upper corners distinctly rounded.

Axillary PBr wider than PBr₁; its sides continuing the flare beginning at R; its upper border with two embayments to fit median basal lobes of the two SBrBr₁ and with median projection having convex sides; its upper corners rounded (pl. 1, figs. 2, 3, 11; pl. 2, figs. 1, 3). Median height of axillary PBr nearly equal to that of R.

Each pair of SBrBr₁ adjoining for nearly two-thirds of their height; their combined width greater than that of axillary PBr, the two outer sides continuing the flare of R and PBrBr. Each half-ray containing three or four



TEXT-FIG. 2—*Eutaxocrinus wideneri* n. sp. An abnormal young specimen (paratype 57902), apparently with only four IBB and four rays. Camera lucida drawing by George McIntosh.

EXPLANATION OF PLATE 2

Figures $\times 4$ except as noted

Eutaxocrinus wideneri n. sp. 1, 2, paratype UMMP 57892; 1, posterior view; 2, detail of posterior region showing displaced anal series and the characteristic socket to which it is attached low on the right side of the underlying B, $\times 10$. 3, paratype UMMP 57901, embedded in matrix. 4, 5, paratype UMMP 57896, lateral views centered on AB interray and on D ray.

TABLE 1—NUMBER OF PBrBr AND SBrBr OBSERVED IN TYPE SPECIMENS OF *Eutaxocrinus wideneri* n. sp.

Specimen	Illustrations Pl., figs.	Ray														
		E			D			C			B			A		
		SBr	PBr	SBr	SBr	PBr	SBr	SBr	PBr	SBr	SBr	PBr	SBr	SBr	PBr	SBr
57890		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57891	3, 1-4	-	2	-	-	2	-	3	2	3	3	2	-	-	2	-
57892	2, 1-2	-	2	4	3	2	3	4	2	3	4	-	4	-	-	-
57893	3, 5-6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57894	1, 11	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57895 ¹	5, 3	3	2	3	3	2	-	4	1*	-	2*	2	3	4	2	3
57896	2, 4-5	-	2	-	-	2	4	3	2	3	4	2	4	-	2	-
57897	4, 1-2	5*	2	5*	4	2	3	4	2	2*	4	2	4	4	2	4
57898	5, 4, 7	-	2	3	3	2	3	3	2	3	3	2	3	3	2	3
57899	4, 3-4; 5, 8	3	2	4	4	2	7*	4	2	4	4	2	-	3	2	3
57900	5, 6; 6, 2	-	-	-	-	-	3	3	-	3	5*	-	5*	-	-	-
57901	2, 3	-	2	3	3	2	3	3	2	3	-	-	-	-	2	3
57902 ²	1, 8-10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57903	6, 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
57906	5, 1-2	5*	2	5*	4	2	4	-	3*	-	-	2	-	4	2	5*
57907	4, 5-6; 5, 5	-	2	-	-	-	-	3	2	3	5+*	2	-	-	2	-
57913 ³	3, 7-8	-	-	-	-	2	-	-	2	-	3	1*	-	-	-	-
57914		-	2	4	4	2	4	3	2	4	-	-	-	-	-	-
57920 ⁴	1, 1-7	4	2	4	3	2	3	3	2	3	4	2	4	3	2	3
57921		4	2	4	2*	2	-	3	3*	3	4	2	-	-	2	4
57922		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Average		4.0	3.9	3.3	3.7	3.3	3.1	3.6	3.9	3.5	3.5	3.5	3.5	3.5	3.5	3.5

1 One PBr in cup; six arms present.

2 Very aberrant; see text-figure 2.

3 Four IBB present.

4 Holotype.

* Exceptional number of plates.

EXPLANATION OF PLATE 3

Figures × 4 except as noted

Eutaxocrinus wideneri n. sp. 1-4, paratype UMMP 57891; 1, lateral view centered on AB interray; 2, posterior view showing exceptionally large anal series; 3, lateral view centered on E ray; 4, basal (dorsal) view. 5, 6, paratype UMMP 57893, basal (dorsal) and posterior views. 7, 8, paratype UMMP 57913, × 10; 7, column, showing equatorial nodes on barrel-shaped columnals; 8, posterior view of crown, showing four IBB.



PLATE 3

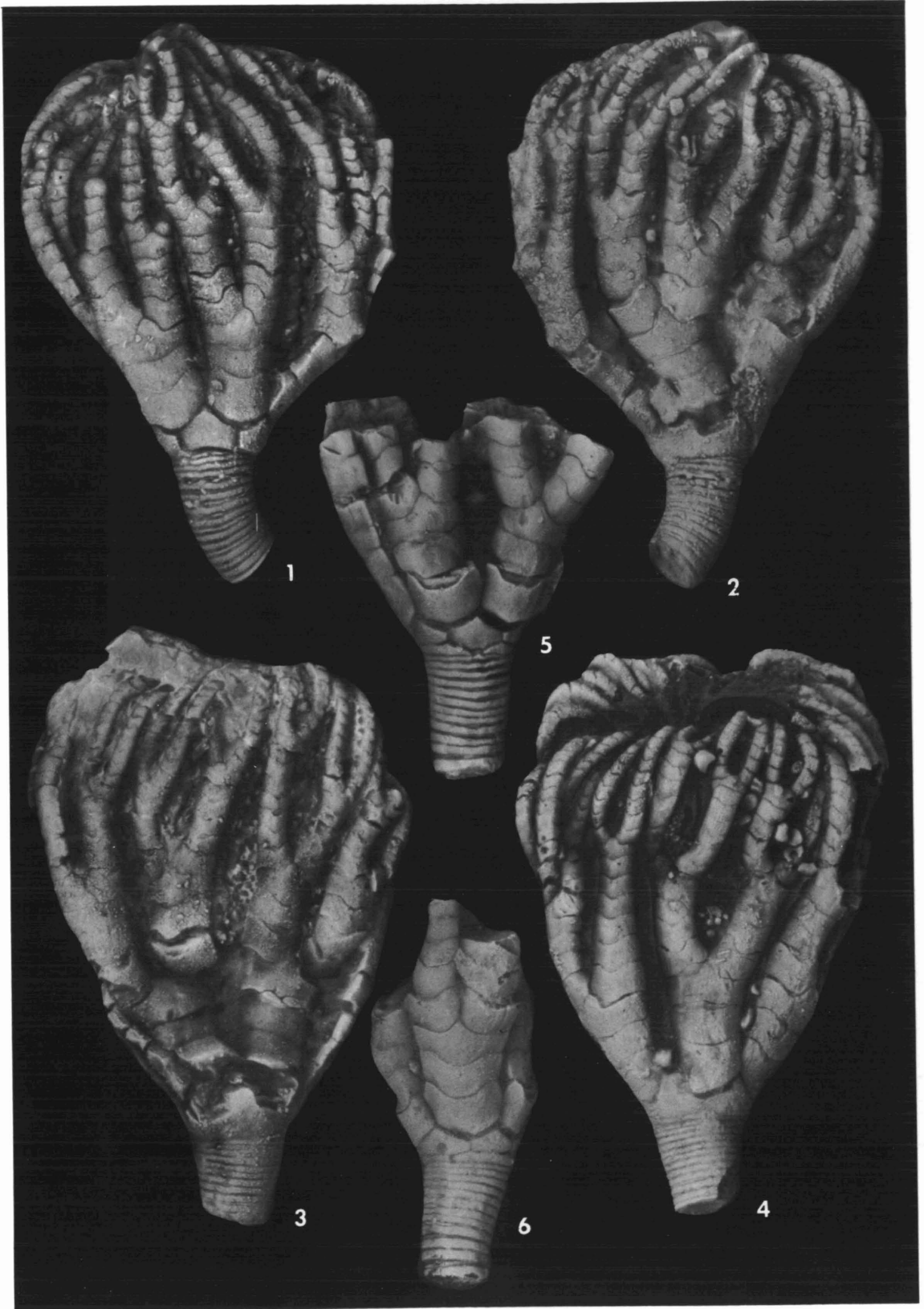


PLATE 4

TABLE 2.—SUMMARY OF NUMBER OF SPECIMENS OF *Eutaxocrinus wideneri* SHOWING PARTICULAR NUMBERS OF SBrBr IN SPECIFIED HALF-RAYS. See table 1.

Number of SBrBr	Number of specimens									
	E		D		C	B		A		
	Left	Right	Left	Right	Left	Right	Left	Right		
2			1			1	1			
3	2	3	5	6	9	9	3	2	3	5
4	2	5	4	3	4	2	6	4	3	2
5	2	2					1	1		1
6										
7			1							

SBrBr in most specimens, but variations observed from two to seven (table 1). Both non-axillary and axillary SBrBr resembling corresponding PBrBr in shape, differing only in their smaller size.

TBrBr resembling SBrBr except for smaller size; TBrBr₁ in each half-ray adjoining for over half their height. Number of TBrBr in each series commonly four or five, varying from three to over 12; some quarter-rays apparently containing a long tapering series of TBrBr to the tip of the ray (pl. 1, figs. 2, 5); the two TBrBr series in each half-ray seldom having the same number of plates, no ray observed with all four series having the same number. TBrBr in each ray seldom overlapping, but those of adjacent rays overlapping in some cases (pl. 1, figs. 1-4; pl. 4, figs. 1-4).

QBrBr commonly forming very gradually tapering series to end of ray, the number difficult to determine except in excellently preserved specimens but apparently averaging ten or more. Quinquebrachials present in at least one specimen (pl. 2, fig. 3), with branching at QBr₇ in a well-exposed eighth-ray. Distal brachials subquadrate but with sinuous upper and lower borders. In all, each ray containing over 100 BrBr plates.

Interbrachials.—Discrete but closely spaced irregular ossicles visible between arms in some specimens (pl. 2, figs. 1, 3; pl. 4, figs. 3, 4; pl. 5, fig. 8; pl. 6, fig. 2). Distribution of these ossicles suggesting a large tegmental sac protected within the folded arms.

Column.—Column xenomorphic (terminology of Moore, Jeffords, & Miller, 1968). In proxistele region, columnals relatively thin,

slightly flared to junction with cup (pl. 6, fig. 1). In mesistele region, alternating columnals becoming long and thick, comparable to nodals of heteromorphic stems, with latus (extra-facet surface) developed but not greatly protuberant; intervening columnals thin, their sides straight. In dististele region, internodals progressively more elongate, developing uniform configuration indistinguishable from nodals; each columnal barrel-shaped with equatorial nodes. Articulation of columnals distinctly crenulate. Lumen small, pentastellate. Detached stems in close proximity to crowns having similar distinctive shape and equatorial nodes (pl. 3, fig. 7), and presumably of the same species.

Mutants.—Mutations or abnormalities common both in cup and arm plates. Of 16 specimens having arms exposed as far as SBrBr, three with abnormal cups, two with abnormal numbers of rays, five with abnormal numbers of PBrBr, and seven with abnormal numbers of SBrBr. Several specimens with more than one abnormal character (text-fig. 2; tables 1, 2).

Paratype 57902 (pl. 1, figs. 8-10) the smallest specimen found. Its four arms apparently arising from four RR in the highly irregular cup (text-fig. 2). Four BB in our interpretation; however, plate designated as AB-interray B possibly including the B-ray R by fusion, giving two PBrBr for that ray. In C ray, R exceptionally large, PBr₂ axillary, and both SBrBr₄ axillary. D-ray R supporting normal ray. A-ray R inserted in circlet of BB. No E ray.

Paratype 57895 with an axillary plate (? PBr) inserted in cup, producing six apparent rays (pl. 5, fig. 3). Only one PBr in C ray.

Paratype 57913 with four nearly equal IBB (pl. 3, fig. 8).

Two specimens with three PBrBr in the C ray: 57906 (pl. 5, figs. 1, 2) and 57921. Three specimens with only one PBr in a ray: 57902 (text-fig. 2; pl. 1, figs. 8-10) and 57913 (pl. 3, figs. 7, 8) with odd PBr in B ray, and 57895 with odd PBr in C ray.

If three or four SBrBr regarded as normal, several specimens with subnumerary or supernumerary SBrBr (table 1). Three paratypes with only two SBrBr: 57895 (B ray), 57897 (C ray), and 57921 (D ray). Three paratypes with five SBrBr: 57897 (both halves of E ray; pl. 4, fig. 1), 57900 (both halves of B ray; pl. 5, fig.

EXPLANATION OF PLATE 4

All figures × 4

Eutaxocrinus wideneri n. sp. 1, 2, paratype UMMP 57897, lateral views on AE interrayer and on C ray. 3, 4, paratype UMMP 57899, lateral views centered on AE interrayer and on C ray; enlargement in plate 5, figure 8. 5, 6, paratype UMMP 57907, lateral views centered on AE interrayer and on B ray; another view in plate 5, figure 5.

TABLE 3—COMPARISON OF TWO SPECIES OF *Eutaxocrinus*.

Character	<i>E. whiteavesi</i>	<i>E. wideneri</i>
Edges of BrBr	"Lateral margins of brachials . . . bent sharply outward in wing-like projections fringing the arms"	Lateral margins curved evenly to edge of brachials, not bent outward
Anal X	Small, relatively short	Large, elongate
Anal series	Closely associated with edge of C ray, its margin irregularly serrate to fit against the C-ray margin	Free of association with C ray, its margin independently straight
B of BC interray	Projection short, not bordering anal X	Projection well developed, lying alongside anal X
IBB	"Slightly exposed beyond column or entirely covered"	Never entirely covered
Interbrachials	"No iBr, but spaces at primary and secondary axils evidently filled by perisome"	Irregular ossicles visible between arms
Height/width of RR	Twice as wide as high (.50)	Ranging from .55 to .80, average .67
Average crown	15 x 23 mm, base 4 mm	12 x 16 mm, base 3.3 mm

6), and 57906 (both halves of E ray; pl. 5, fig. 1; also right half of A ray). Paratype 57907 with more than five SBrBr in left branch of B ray (pl. 4, fig. 6), not preserved to axillary SBr. Paratype 57899 with seven SBrBr in right branch of D ray (pl. 4, fig. 4).

Average number of SBrBr greatest in E ray and least in C ray (table 1). A larger sample of population undoubtedly showing other exceptional features.

Comparison with other species.—In size and general conformation, our species resembles *Eutaxocrinus whiteavesi* Springer, the types of which came from the Widder Formation of the Thedford region of Ontario and were described by Springer in his *Crinoidea Flexibilia* (1920). A crinoid identified as *Eutaxocrinus* cf. *E. whiteavesi* was described from the Wanakah Formation of western New York by Goldring (1936). Seven years later, in their *Bibliographic and Faunal Index*, Bassler & Moodey (1943) listed *Eutaxocrinus whiteavesi* from the

New York locality without comment. Major differences between *Eutaxocrinus whiteavesi* and *E. wideneri* are summarized in table 3. The two can be readily distinguished by the flange-like edges of the lower brachials in the former.

Types.—Holotype UMMP 57920. Paratypes UMMP 57890–57903, 57906, 57907, 57913, 57914, 57921, and 57922 (table 1 lists illustrations).

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EXPLANATION OF PLATE 5
Figures × 4 except as noted

Eutaxocrinus wideneri n. sp. 1, 2, paratype UMMP 57906, lateral views centered on DE interray and on B ray. 3, paratype UMMP 57895, lateral view centered on E ray. 4, 7, paratype UMMP 57898; 4, lateral view centered on D ray; 7, detail of AB interray showing small IBB, × 10. 5, paratype UMMP 57907, posterior view; other views shown in plate 4, figures 5, 6. 6, paratype UMMP 57900, lateral view centered on C ray; enlargement in plate 6, figure 2. 8, paratype UMMP 57899, detail of AE interray showing interbrachial ossicles, × 10; other views of this specimen in plate 4, figures 3, 4.



PLATE 5

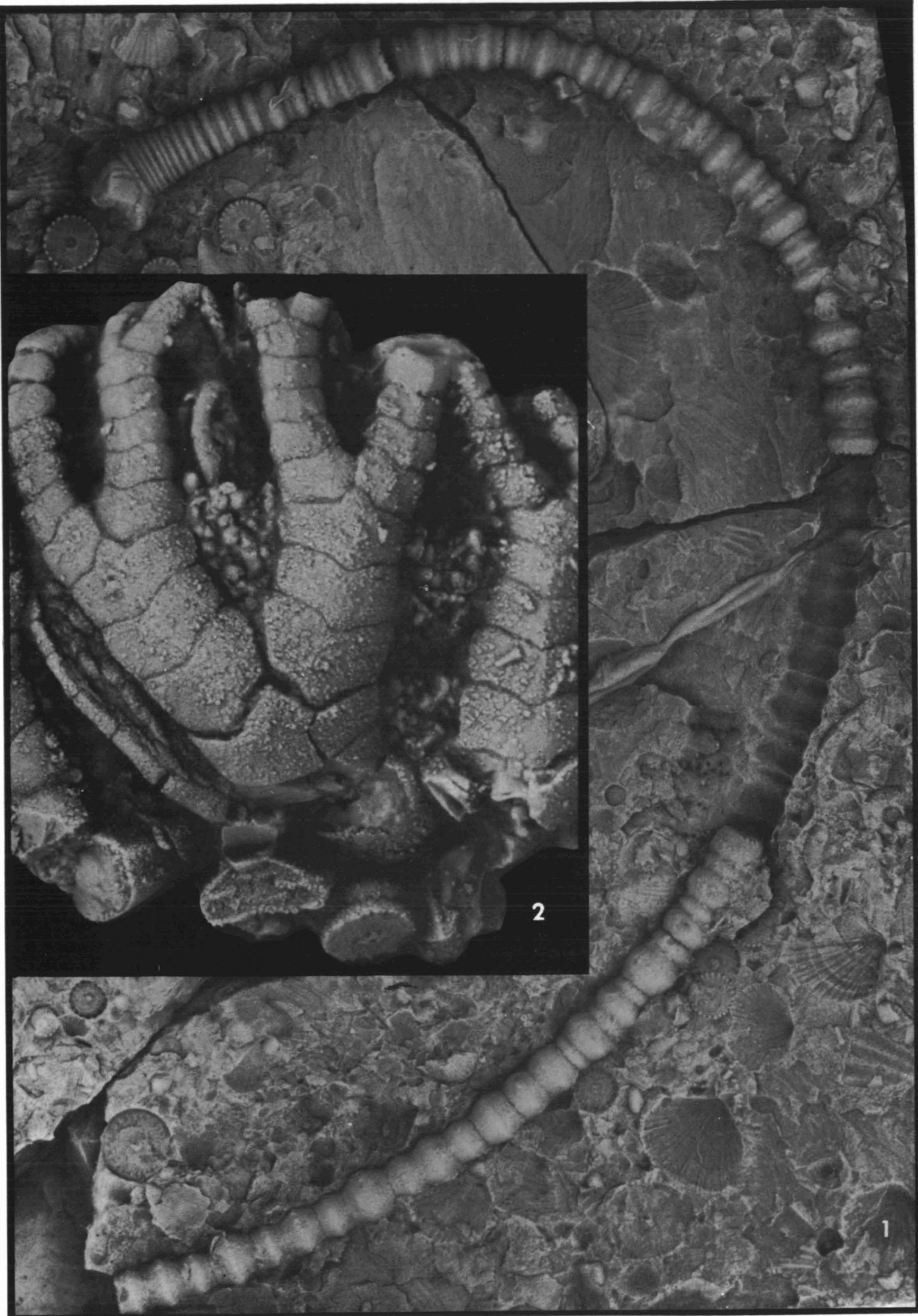


PLATE 6

EXPLANATION OF PLATE 6

Both figures $\times 10$

Eutaxocrinus wideneri n. sp. 1, paratype UMMP 57903, column and circlets of IBB and BB in matrix, showing heteromorphic columnals. 2, paratype UMMP 57900, details centered on C ray showing interbrachial ossicles associated with arms and anal series; another view of this specimen in plate 5, figure 6.

