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DOLATOCRINUS AND *STEREOCRINUS*, ITS JUNIOR SYNONYM

BY

ROBERT V. KESLING and LEIGH W. MINTZ

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VOLUME XVIII

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6. Key for Classification of Cystoids, by Robert V. Kesling. Pages 101–116.
7. The Middle Devonian Ipperwash Limestone of Southwestern Ontario and Two New Brachiopods Therefrom, by Jean D. Wright and Edward P. Wright. Pages 117–134, with 3 plates.
8. Corals of the Traverse Group of Michigan, Part XI, *Tortophyllum, Bethanyphyllum, Aulacophyllum,* and *Hallia,* by Erwin C. Stumm. Pages 135–155, with 10 plates.
9. Morphology and Relationships of *Cyclocystoides,* by Robert V. Kesling. Pages 137–176.
10. The Crinoid *Opsiocrinus mariae* Kier in the Bell Shale of Michigan, by Robert V. Kesling and David L. Meyer. Pages 177–184, with 1 plate.
11. The Crinoid *Synbathocrinus* in the Middle Devonian Traverse Group of Michigan, by Robert V. Kesling and Raymond N. Smith. Pages 185–196, with 1 plate.

12 *Cyrtina hamiltonensis* (Hall) and a New Species of this Brachiopod Genus from New York, by George M. Ehlers. Pages 197–204, with 1 plate.

13. The Fern Genus *Acrostichum* in the Eocene Clarno Formation of Oregon, by Chester A. Arnold and Lyman H. Daugherty. Pages 205–227, with 6 plates.
14. *Dolatocrinus* and *Stereocrinus,* its Junior Synonym, by Robert V. Kesling and Leigh W. Mintz. Pages 229–237, with 2 plates.

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CONTENTS

INTRODUCTION

BECAUSE the genus *Stereocrinus* Barris, 1878, cannot be clearly separated from *Dolatocrinus* Lyon, 1857, it must be relegated to synonymy. The distinguishing characters attributed to both genera occur within the same specimen.

Just after completing our work on species of *Dolatocrinus* from the Middle Devonian Dock Street Clay exposed in the abandoned Thunder Bay quarry in Alpena, Michigan (Kesling and Mintz, 1963), we turned our attention to specimens of *Dolatocrinus* and *Stereocrinus* from the Thunder Bay Limestone exposed at Partridge Point, only a few miles south of Alpena. Our first interest was comparison of Dock Street and Thunder Bay crinoids. Later, it occurred to us to examine critically the generic distinction between *Dolatocrinus* and *Stereocrinus*.

Stereocrinus was defined as having only one primibrachial (*PBr*) in each ray instead of two, as in *Dolatocrinus*. Thus, the axillary primibrachial in *Stereocrinus* was said to be the first (PBr_1), whereas the axillary in *Dolatocrinus* was the second (PBr_2).

With the great variability of *Dolatocrinus* species fresh in mind, we were not greatly surprised to discover specimens in which one or more rays branched from PBr_1 and the other rays from PBr_2. The combination of *Stereocrinus* and *Dolatocrinus* diagnostic characters in the same crinoid is fatal to the junior genus. Taxonomy does not allow a specimen to be classified as two-fifths *Stereocrinus* and three-fifths *Dolatocrinus*. *Dolatocrinus* has priority by 21 years.

Alerted by this state of development in the specimens from the Thunder Bay Limestone, we restudied older crinoids assigned to *Dolatocrinus*. To

our embarrassment, we found that we had overlooked the occurrence of *Stereocrinus*-type rays in some of the Dock Street Clay specimens. Insofar as indicated by the crinoids in the Museum of Paleontology at The University of Michigan, examples of axillary $PBrBr_1$ are rare in specimens from the Dock Street Clay and fairly common in those from the Thunder Bay Limestone. Accordingly, *"Stereocrinus"* is nothing more than an increasing trend in *Dolatocrinus* toward elimination of the non-axillary *PBr* in one or more rays.

The Systematic Descriptions which follow are devoted to abbreviated descriptions of selected specimens and to taxonomic revisions made necessary by suppression of *Stereocrinus*. All specimens used in this study are catalogued and deposited in the Museum of Paleontology of The University of Michigan.

SYSTEMATIC DESCRIPTIONS

Subclass CAMERATA Wachsmuth and Springer

Order MONOBATHRA Moore and Laudon

Family Dolatocrinidae Bather

Genus *Dolatocrinus* Lyon

Cacabocrinites Troost, 1849, p. 419, *nom. nud.* (type species: *C. sculptus* Troost, 1849, p. 419, *nom. nud.* = *Dolatocrinus grandis* Miller and Gurley, 1894, p. 14, Pl. 3, Figs. 1–3).

Dolatocrinus Lyon, 1857, p. 482 (type species: *D. lacus* Lyon, 1857, p. 482, Pl. 4, Figs. 2*a-c*; Jeffersonville Limestone, Jefferson Co., Ky., and Columbus Limestone, Columbus, Ohio).

Cacabocrinus Hall, 1862, p. 137 (type species: *C. speciosus* Hall, 1862, p. 137; Onondaga Limestone, Schoharie Co., N. Y.).

Stereocrinus Barris, 1878, p. 282 (type species: *S. triangulatus* Barris, 1878, p. 283, Pl. 11, Figs. 1–2; *Strobilocystites* zone of "Upper Davenport beds," now called Cedar Valley Limestone, Iowa, and Thunder Bay Limestone, Alpena Co., Mich.).

Our discovery of specimens in which some rays have PBr_1 axillary and some have PBr_2 axillary is ample justification for combining *Dolatocrinus* and *Stereocrinus* under the former name. The strong similarity of the two genera has already been noted by several authors.

Nevertheless, it is difficult to describe the specimens which show the combination of two kinds of rays, primarily because the posterior interray of *Dolatocrinus* is like any other interray. Without positional reference, any discussion of the rays must be predicated on an arbitrary system. We elect to designate the rays with axillary PBr_2 as "D" and those with axillary PBr_1 as "S." In listing the rays for a particular specimen, we give the "D" rays first and progress clockwise in dorsal view; thus, a specimen with two adjacent rays with axillary PBr_1 and the other three with axillary

PBr_2 would be classed as D-D-D-S-S. From this formulation, individual rays can be indicated as first, second, and so on.

Dolatocrinus triangulatus (Barris)
(Pl. I, Figs. 1–9; Pl. II, Figs. 1–6, 9–10)

Stereocrinus triangulatus Barris, 1878, p. 283, Pl. 11, Figs. 1–2.
Stereocrinus triangulatus liratus Barris, 1878, p. 284, Pl. 11, Fig. 3.
Dolatocrinus triadactylus Barris, 1885 (*in* Wachsmuth and Barris), p. 25, Pl. 2, Figs. 5–7; 1886, p. 100, Pl. 2, Figs. 5–7.

Wachsmuth and Springer (1897, p. 325) favorably compared *Stereocrinus triangulatus* with *Dolatocrinus triadactylus* in many respects, but thought one *PBr* was invariably present in each ray in the first and two *PBrBr* were invariably present in each ray in the second species. In comparing specimens with all S-rays against those with all D-rays, we can discern no consistent differences in shape of dorsal cup, ornamentation, or structure of tegmen.

UMMP 45093 (Pl. II, Fig. 6).—Rays D-D-D-D-D. The median ridge of each ray from *R* to PBr_2 is crossed near the middle by a ridge or ridges from PBr_1 to adjacent IBr_1; around this cross, wider than high, is a rhomb made of ridges from each adjacent IBr_1 to *R* and to PBr_2. In this pattern, the ridge or pair of ridges extending laterally from each side of PBr_1 are aligned so that they appear to be a continuous ridge or set of ridges leading from one IBr_1 to the next, narrowing or combining at midpoint where crossing the median ray ridge. Even if plate boundaries are somewhat obscure, the cross-within-a-rhomb pattern identifies a D-ray.

UMMP 6005A (Pl. II, Figs. 1–5).—Rays D-D-D-D-?S. The questioned S-ray (Pl. II, Fig. 4) has a very narrow gap between the sets of ridges leading from the median ray ridge to the adjacent $IBrBr_1$. It appears too narrow to allow room for another *PBr* to be inserted between *R* and the axillary *PBr*. Instead of a rhomb, the ridges more nearly outline a triangle. We can see no suture between the first lateral ridges and the nearby center of the axillary *PBr*, which we suppose is PBr_1.

This specimen shows another feature present in several of the crinoids from the Thunder Bay Limestone. The $PBrBr_1$ are high on one side of the dorsal cup and progressively decrease in height toward the opposite side, in some specimens not discernible or absent opposite the high $PBrBr_1$. In UMMP 6005A, the third ray (Pl. II, Fig. 2) has a higher PBr_1 than that of either the fourth ray (Pl. II, Fig. 5) or the first ray (Pl. II, Fig. 3), the two rays next to the ?S-ray.

UMMP 45092 (Pl. II, Figs. 9–10).—Rays D-D-D-D-S. In this specimen four of the rays are distinctly D-rays (Pl. II, Fig. 9), having ridge

patterns of crosses-within-rhombs. The fifth ray (Pl. II, Fig. 10), however, has the ridges forming a wide triangle with a bisector; the axillary primibrachial is PBr_1.

UMMP 45096 (Pl. I, Figs. 1–5).—Rays D-D-D-S-S. No trace of another *PBr* can be found between *R* and the axillary *PBr* in the fourth (Pl. I, Fig. 3) or fifth (Pl. I, Fig. 4) rays. Yet adjacent to this pair of S-rays, the first (Pl. I, Fig. 5) and the third (Pl. I, Fig. 2) rays are definite D-rays, each having a well-developed PBr_1 between *R* and the axillary PBr_2. That the difference in kinds of rays does not greatly affect the symmetry of the dorsal cup is well shown in the basal view of the cup (Pl. I, Fig. 1), in which the pentagram of ridges connecting *RR* and $IBrBr_1$ has equal sides.

UMMP 45094 (Pl. I, Figs. 6–9).—Rays D-D-S-D-S. This is exceptional for the alternation of D-rays and S-rays; in most crinoids having the two types, the D-rays are together. In the third (Pl. I, Fig. 7) and fifth (Pl. I, Fig. 9) rays, the *R* is succeeded by a large pentagonal PBr_1; but in the fourth ray (Pl. I, Fig. 8), the *R* is separated from the pentagonal PBr_2 by a rectangular PBr_1, just as in the first and second rays.

Occurrence.—Thunder Bay Limestone, Partridge Point, Alpena Co., Michigan.

Dolatocrinus barrisi (Wachsmuth and Springer)

(Pl. II, Figs. 7–8, 11–15)

Stereocrinus barrisi Wachsmuth and Springer, 1897, p. 326, Pl. 26, Figs. 9*a, b*.

We have some doubts about this species. Of the characteristics ascribed to it by Wachsmuth and Springer and used by them to differentiate it from *D. triangulatus,* the only one which does not fall within the realm of individual variation is the circular rim around the basal pit. From sectioning some specimens having such a circular rim, we find that it is really part of the plates, despite the suggestion in some specimens that it is either part of the column or a fused structure of cup and columnals. Yet young specimens with a circular rim have the centers of their *RR* spaced about the same as those specimens without such a rim. The column fits tightly against the sides of the rim; we have not investigated enough specimens to determine to our satisfaction whether or not such close contact may have induced secretion of the rim. For the present, we accept *D. barrisi* as a species distinct from *D. triangulatus.*

All but one of the 15 specimens we examined have all S-rays. The exception, however, has all D-rays. It also has the ornamentation somewhat simpler in pattern and more accentuated than the typical specimens.

Nevertheless, such variations have been noted in other *Dolatocrinus* species, and we believe the exception should be included in *D. barrisi.*

UMMP 6005B (Pl. II, Figs. 7–8).—Rays D-D-D-D-D. The $PBrBr_1$ are all large, so that the ridges connecting *R* and PBr_2 with adjacent $IBrBr_1$ outline a large rhomb in each ray. These elements of ornamentation are especially conspicuous, and coupled with the high sides of the cup, accentuate the difference created by D-rays as compared with S-rays.

UMMP 45097 (Pl. II, Figs. 11–12).—Rays S-S-S-S-S. This is typical of medium-size specimens. In larger specimens, the ornamentation is not as clearly defined and additional concentric triangles are added to make a more complex pattern. The specimen is slightly compressed, so that the rays appear more nearly in plan view as seen dorsally (Pl. II, Fig. 11).

UMMP 6018A (Pl. II, Figs. 13–15).—Rays S-S-S-S-S. The dorsal cup is not compressed or distorted. The median ray ridges are higher than other ornamentation. The circular rim has a sharp fissure around its periphery.

Occurrence.—Thunder Bay Limestone, Partridge Point, Alpena County, Michigan.

Dolatocrinus stellifer Miller and Gurley

(Pl. I, Figs. 10–12)

The long synonymy is given by Kesling and Mintz, 1963.

Of over fifty specimens studied, only one contained an S-ray. It is from the Dock Street Clay member of the Four Mile Dam Formation.

UMMP 44995 (Pl. I, Figs. 10–12).—Rays D-D-D-D-S. The axillary nature of PBr_1 in the fifth ray (Pl. I, Fig. 12) is indicated by the bisected-triangle form of associated ridges. In contrast, the non-axillary nature of PBr_1 in the fourth ray (Pl. I, Fig. 11) is indicated by the cross-within-a-rhomb form of the associated ridges. When submersed in xylol, the sutures of this specimen are distinct; they confirm the presence of two *PBrBr* in each of the D-rays and only one *PBr* in the S-ray.

Occurrence.—Dock Street Clay member of Four Mile Dam Formation, Thunder Bay Quarry, Alpena, Michigan.

Dolatocrinus liratus (Hall)

(Pl. I, Figs. 13–15; Pl. II, Fig. 16–17)

The very lengthy synonymy is given by Kesling and Mintz, 1963.

Of about fifty specimens we have examined, only two have any S-rays. Both are from the Dock Street Clay member of the Four Mile Dam Formation.

UMMP 44978 (Pl. I, Figs. 13–15).—Rays D-D-D-D-S. In this adult, the axillary *PBr* in the S-ray (Pl. I, Fig. 15) is much larger than that in the adjacent fourth D-ray (Pl. I, Fig. 14), and the $SBrBr_1$ are also larger. However, the combined height of the two *PBrBr* in the D-ray greatly exceeds that of the single *PBr* in the S-ray.

UMMP 44980 (Pl. II, Figs. 16–17).—Rays D-D-D-D-S. The contrast between the two kinds of rays in this young specimen is the same as in the adult described above. The second (Pl. II, Fig. 16) and fifth (Pl. II, Fig. 17) rays are illustrated.

Occurrence.—Dock Street Clay member of Four Mile Dam Formation, Thunder Bay Quarry, Alpena, Michigan.

Dolatocrinus sp.

(Pl. II, Figs. 18–19)

A specimen in the Museum of Paleontology was labeled "Sink hole about 20 miles W. of Alpena. A. W. Grabau." This locality cannot be correct. No Middle Devonian strata crop out 20 miles west of Alpena. Sink holes occur in the Alpena Limestone a few miles west of Alpena; possibly, the crinoid is from the Alpena Limestone, although it does not bear close resemblance to specimens known to be from that formation. If it does come from the Alpena Limestone, it is the oldest specimen with an S-ray that we have studied.

UMMP 45095 (Pl. II, Figs. 18–19).—Rays D-D-D-D-S. Although the fourth ray (Pl. II, Fig. 18) is an excellent example of a D-ray, the fifth ray (Pl. II, Fig. 19) is definitely an S-ray. The PBr_1 of the S-ray is only slightly larger than the PBr_2 of the fourth ray.

Occurrence.—?Alpena Limestone, ?western Alpena Co., Michigan.

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PLATES

EXPLANATION OF PLATE I

(All figures natural size; sutures retouched)

PAGE

Dolatocrinus triangulatus (Barris) 231

FIGS. 1–5. Basal and inclined lateral views of UMMP 45096, with rays D-D-D-S-S. Third ray uppermost in Figure 2, fourth ray in Figure 3, fifth ray in Figure 4, and first ray in Figure 5.

FIGS. 6–9. Basal and inclined lateral views of UMMP 45094, with rays D-D-S-D-S. Third ray uppermost in Figure 7, fourth ray in Figure 8, and fifth ray in Figure 9.

Dolatocrinus stellifer Miller and Gurley 233

FIGS. 10–12. Basal and inclined lateral views of UMMP 44995, with rays D-D-D-D-S. Fourth ray uppermost in Figure 11 and fifth ray in Figure 12.

Dolatocrinus liratus (Hall) 233

FIGS. 13–15. Basal and inclined lateral views of UMMP 44978, with rays D-D-D-D-S. Fourth ray uppermost in Figure 14 and fifth ray in Figure 15.

PLATE I

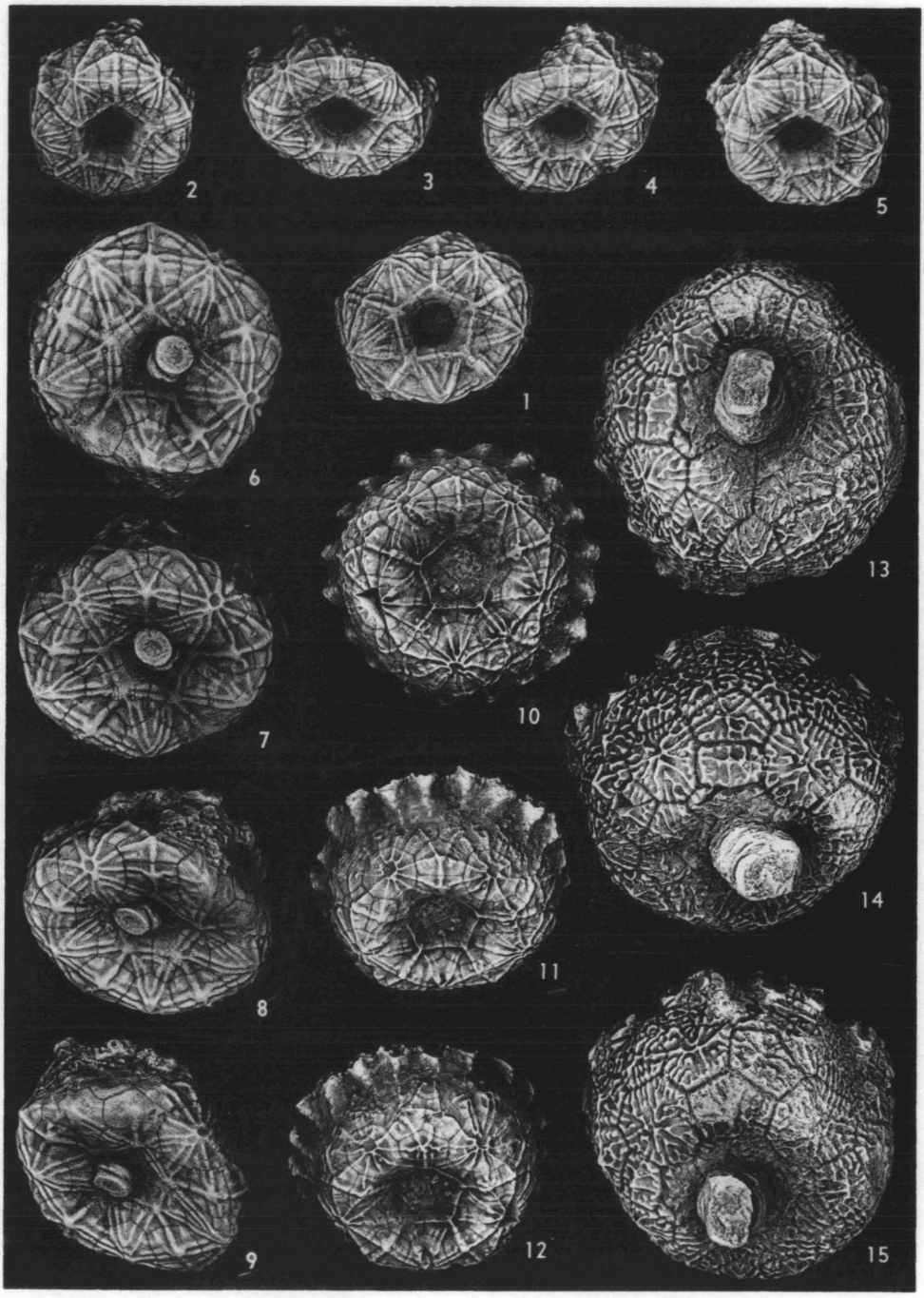
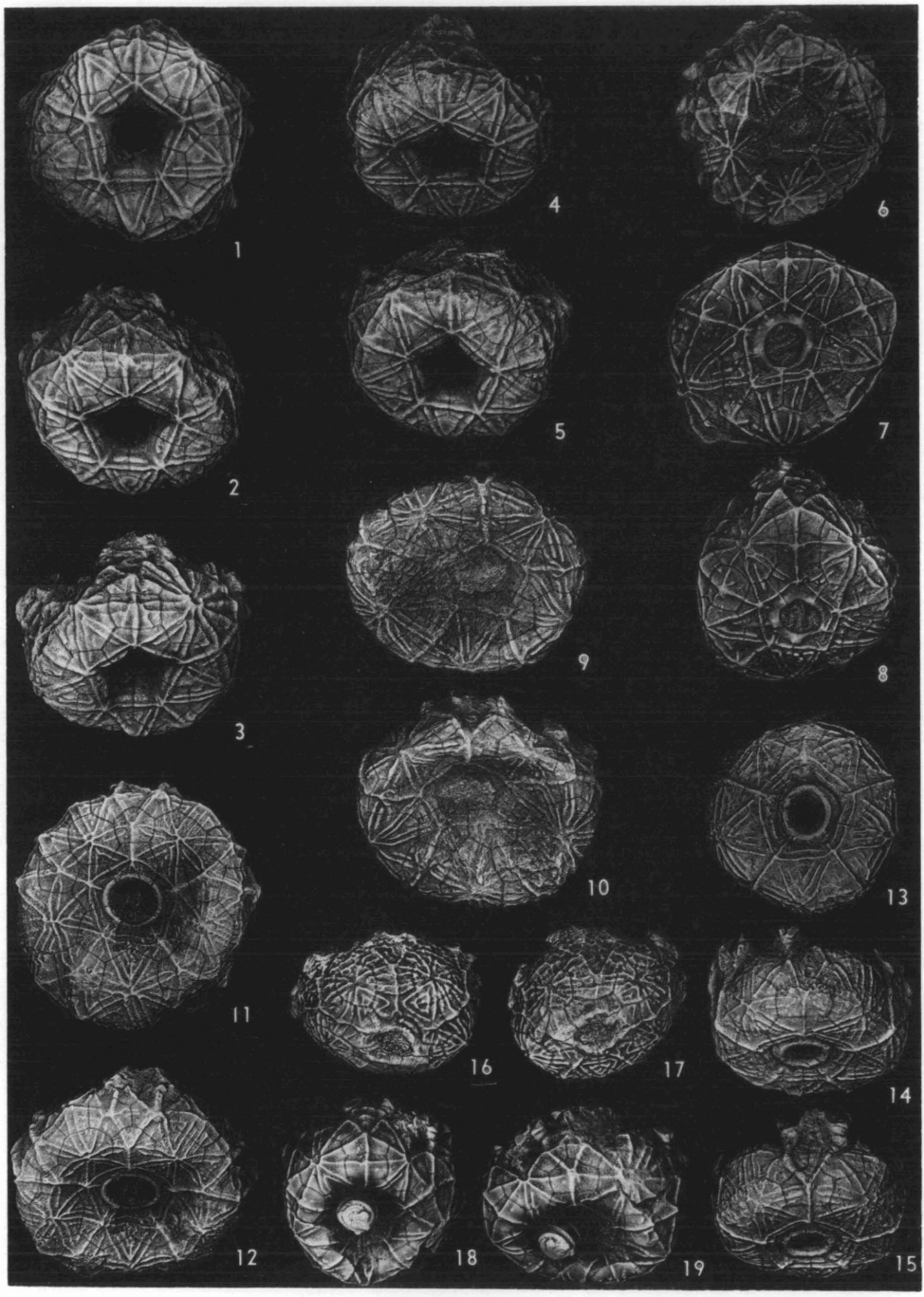


PLATE II



EXPLANATION OF PLATE II

(All figures natural size; sutures retouched)

PAGE

Dolatocrinus triangulatus (Barris) 231

FIGS. 1–5. Basal and inclined lateral views of UMMP 6005A, with rays D-D-D-D-?S. Third ray uppermost in Figure 2, first ray in Figure 3, fifth ray in Figure 4, and fourth ray in Figure 5.

FIG. 6. Basal view of UMMP 45093, with rays D-D-D-D-D.

FIGS. 9–10. Basal and inclined lateral views of UMMP 45092, with rays D-D-D-D-S. Third ray uppermost in Figure 9 and fifth ray in Figure 10.

Dolatocrinus barrisi (Wachsmuth and Springer) 232

FIGS. 7–8. Basal and inclined lateral views of UMMP 6005B, with rays D-D-D-D-D.

FIGS. 11–12. Basal and inclined lateral views of UMMP 45097, with rays S-S-S-S-S.

FIGS. 13–15. Basal and inclined lateral views of UMMP 6018A, with rays S-S-S-S-S.

Dolatocrinus liratus (Hall) 233

FIGS. 16–17. Inclined lateral views of UMMP 44980, with rays D-D-D-D-S. Second ray uppermost in Figure 16 and fifth ray in Figure 17.

Dolatocrinus sp. 234

FIGS. 18–19. Inclined lateral views of UMMP 45095, with rays D-D-D-D-S. Fourth ray uppermost in Figure 18 and fifth ray in Figure 19.