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DOLATOCRINUS KUTASII, A NEW CRINOID FROM THE
MIDDLE DEVONIAN BELL SHALE OF MICHIGAN

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DOLATOCRINUS KUTASII, A NEW CRINOID FROM THE MIDDLE DEVONIAN BELL SHALE OF MICHIGAN

ROBERT V. KESLING

ABSTRACT—A new crinoid from the Bell Shale is the oldest *Dolatocrinus* found in the Middle Devonian Traverse Group of Michigan. It is characterized by a broad funnel-shaped basal pit, a lobate tegmen bearing high spines, and a relatively low cup. Ornamentation is dominated by high crested ridges from centers of RR to centers of the axillary PBr₂, spines at centers of iBr₁, where numerous low ridges converge, and a straight-sided pentagonal basal rim linking centers of RR; other ridges are relatively low. The species shows several similarities to immature specimens of *D. michiganensis* and to adults of *D. bulbaceus*. The holotype has 18 arms.

INTRODUCTION

COLLECTING FOSSILS can be exasperating or exhilarating, barren or fruitful, disappointing or rewarding. When a particularly rare species is sought, the alternatives approach agony or bliss. Even the most enthusiastic collector drags a bit at the end of an unsuccessful day in the field. And even the most blasé veteran can get an instant thrill from an unexpected find. Collecting is a game of chance, fascinating and compelling. Fortune is fickle.

Without the vicissitudes of fossil hunting, this paper would not have been possible. It began on a raw, overcast spring day in 1968. In the abandoned Kelley's Island Lime & Transport Quarry at the northeast corner of Alpena County, Michigan, a light but steady rain had started early. By mid-morning the old dump piles of Bell Shale were thoroughly wet, turning the soft shale from pearl gray to slate color, the iron-stained limy strata from warm brown to chocolate, and the purely calcareous fossils from light gray to white. Searching over this familiar ground, I suddenly spotted a crinoid head. Its white plates were so conspicuous that I wondered how it had escaped the notice of collectors through the years. As it lay in the brownish, muddy dump pile, about half the calyx was exposed. The highly ornamented plates of one side and over half the tegmen showed clearly. Obviously, this was a *Dolatocrinus* from the Bell. I was delighted, of course, because no species of that genus had ever been found so low in the Traverse Group. Picking it up carefully, however, I found to my dismay that the exposed half of the calyx was *all* the specimen—the other half had completely broken away. A concerted hunt in the area did not turn up the missing half nor any other crinoids of the genus.

The specimen that promised so much in-

formation on early *Dolatocrinus* in Michigan had failed miserably; no trace of the RR plates was preserved, and the whole base was missing. The best ray began at PBr₁, although three interrays still held the large iBr₁. This was hardly sufficient material on which to base a species, even though the ornamentation of spines on the tegmen indicated that the crinoid was new. Other visits to the quarry that year and in the spring of 1969 were likewise fruitless as far as *Dolatocrinus* was concerned.

Then in the fall of 1969 detailed plans were underway for the field trip of the North-Central Section of the Geological Society of America, to take place the following May. Professor Emeritus George M. Ehlers, Mr. Karoly Kutasi, and I were again at the abandoned Kelley's Island Quarry. Ehlers went to look for suitable sites to show the lower beds of the quarry. I planned to search out a roadway leading across the quarry floor, through the labyrinth of piled-up ridges of Rockport Quarry Limestone, to the sinkholes at the western wall. Before I left, I took Kutasi to an outcrop of the upper unit of Bell Shale, sketched quickly a restoration of the *Dolatocrinus* species, and said, "Now, Karl, find one with arms and you will be forever famous."

Upon my return an hour or so later, you may imagine my amazement. Calmly, in a matter-of-fact way, Karl said, "Here, sir,"—and held out a slab with a nearly perfect cup and arms of the new *Dolatocrinus*! It was embedded in a very hard layer with the tegmen concealed and the arms spread out from the cup onto the surface of the brownish limestone. Its only flaws were a small chip missing from one ray, three arms incomplete, and the ends of the other arms concealed in the matrix. Now the species could be described. Only the column remains unknown.

Relatively little preparation of this crinoid

was necessary. Large scattered spines increased the risk of fracturing the brachials and breaking off segments of the arms; therefore, the tips of the arms were left embedded in rock. Light application of dolomite powder by compressed air removed a few foreign particles from the cup. Otherwise, the holotype was left in about the same state in which it was found.

The two specimens were photographed by Kutasi, the plate diagram was prepared by Mr. George McIntosh, the manuscript was typed by Mrs. Helen Mysyk, and the proof was read by Mrs. Gladys Newton. All deserve my special thanks for jobs well done.

Both types are deposited and catalogued in the Museum of Paleontology, the holotype (Kutasi's prize) as UMMP 57887 and the paratype (found first) as UMMP 57432.

LOCALITY

Abandoned quarry of the Kelley's Island Lime & Transport Company, Rockport, northeastern corner of Alpena County, Michigan, in the NW $\frac{1}{4}$ sec. 6, T 32 N, R 9 E; west bank of a drainage ditch about $\frac{1}{4}$ mile west-northwest of the quarry buildings. Upper part of Bell Shale, at most a few feet below the Rockport Quarry Limestone. Holotype found on side of steep bank of ditch just opposite the northern end of the outcrop area yielding *Genaeocrinus variabilis*; paratype found on dump piles (possibly from same stratum) about 50 yards north.

SYSTEMATIC DESCRIPTION

Subclass CAMERATA Wachsmuth & Springer 1897

Order MONOBATHRA Moore & Laudon 1943

Family DOLATOCRINIDAE Bather 1899

Genus DOLATOCRINUS Lyon 1857

Middle Devonian species from Michigan particularly those from the Four Mile Dam Formation (Dock Street Clay Member) and the Thunder Bay Limestone, have been discussed by Kesling & Mintz (1963a, 1963b).

DOLATOCRINUS KUTASII n. sp.

Text-fig. 1; pl. 1; pl. 2, figs. 1-4; pl. 3, figs. 1-4; pl. 4, figs. 1-3; pl. 5, figs. 1-3

Cup.—Medium size, rather shallow for the genus. Sides curved up evenly from the base. Basal pit broad, funnel-shaped, surrounded by a pentagonal frame of ridges. General shape dominated by high ray ridges and a spine in each interray marking the convergence of numerous low ridges (pl. 1; pl. 2, figs. 1, 2, 4).

RR equal, large; each R with its proximal half forming part of the basal pit (text-fig. 1). Each R hexagonal, with three long sides bounded by two adjacent RR and the PBr₁ and three short sides bordered by the BB circling and two large iBrBr₁. Each R linked to its adjoining RR by straight, conspicuous, narrow ridges, the ridges together forming a pentagon around the basal pit; sides of this pentagon crossing each R-R suture at about two-thirds the distance from the small BB circling to iBrBr₁. Ray ridges high and thick (pl. 3, fig. 3; pl. 5, fig. 1), their bases indenting the corners of the pentagonal rim around the basal pit; ridges extending to centers of axillary PBrBr₂, there dividing into equal branches. Main ray ridge bearing a thick, wedgelike, vertically elongate crest or spine on each of the three plates it crosses (R, PBr₁, and PBr₂), giving it a grossly serrate outline in lateral view (pl. 2, fig. 4).

PBrBr₁ small, rectangular, each about two-thirds as wide as the R below, its height only about one-third its width. Shape dominated by thick ray ridge bearing spinelike crest along its midline. PBrBr₂ axillary, pentagonal, about as wide as RR but appreciably shorter (text-fig. 1); each PBr₂ with very short sides adjoining iBrBr₁ and relatively long sides adjoining the paired SBrBr₁. Ornamentation predominantly a high, conspicuous Y (pl. 3, fig. 3; pl. 5, fig. 1), the stem formed by the thick main ray ridge and its spinelike crest and the branches formed by high, narrower ridges to the SBrBr. At the central junction of the three ridges, the high spinelike crest with an upper concave surface; viewed from above, junction resembling the projecting tip of a thick pointed spoon.

SBrBr₁ axillary, large but appreciably smaller than PBrBr₂. In each pair of SBrBr₁, one commonly pentagonal and the other hex-

EXPLANATION OF PLATE 1

Dolatocrinus kutasii n. sp. Holotype UMMP 57887, lightly coated with sublimated ammonium chloride, dorsal (basal) view; $\times 4$.

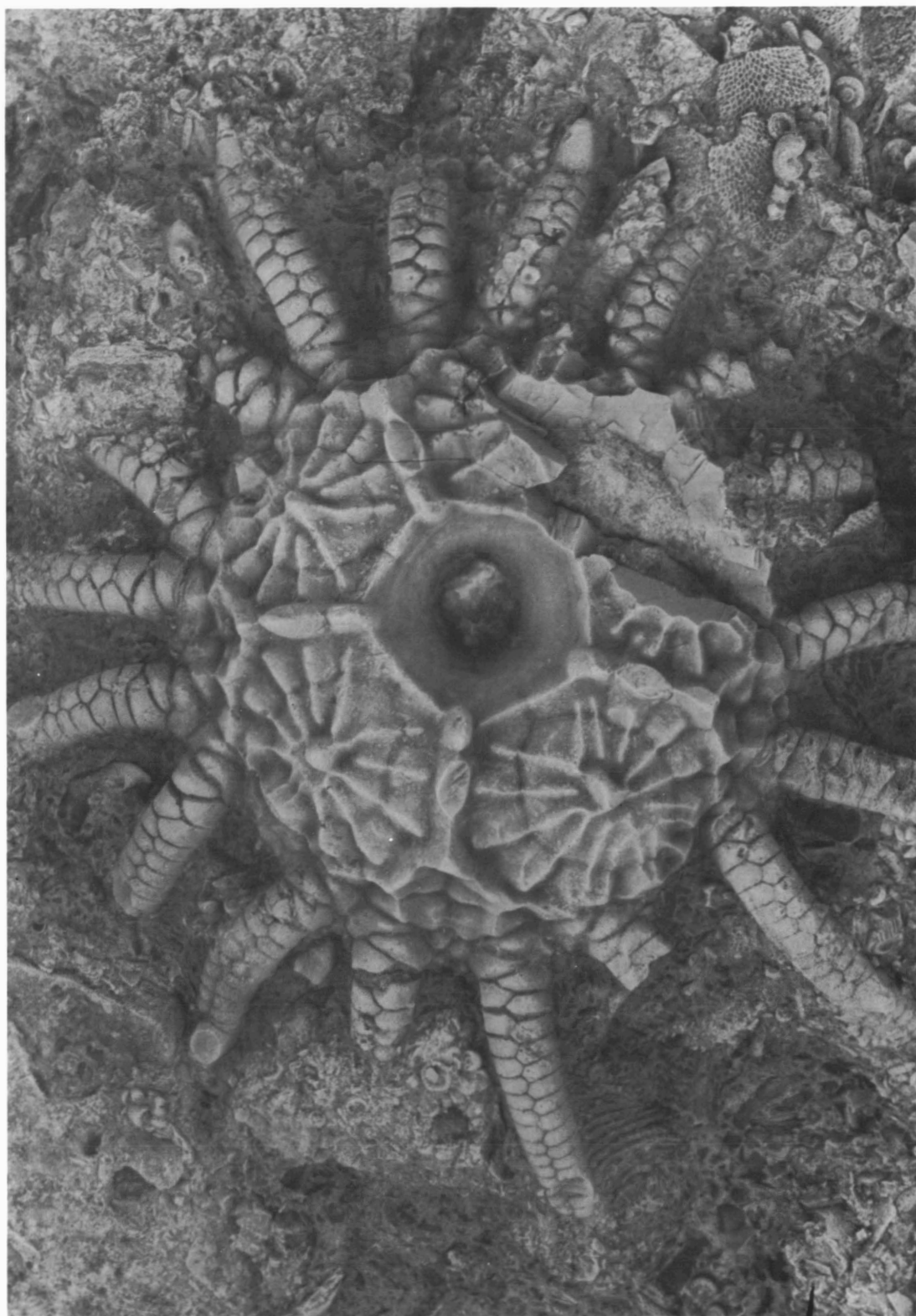


PLATE 1

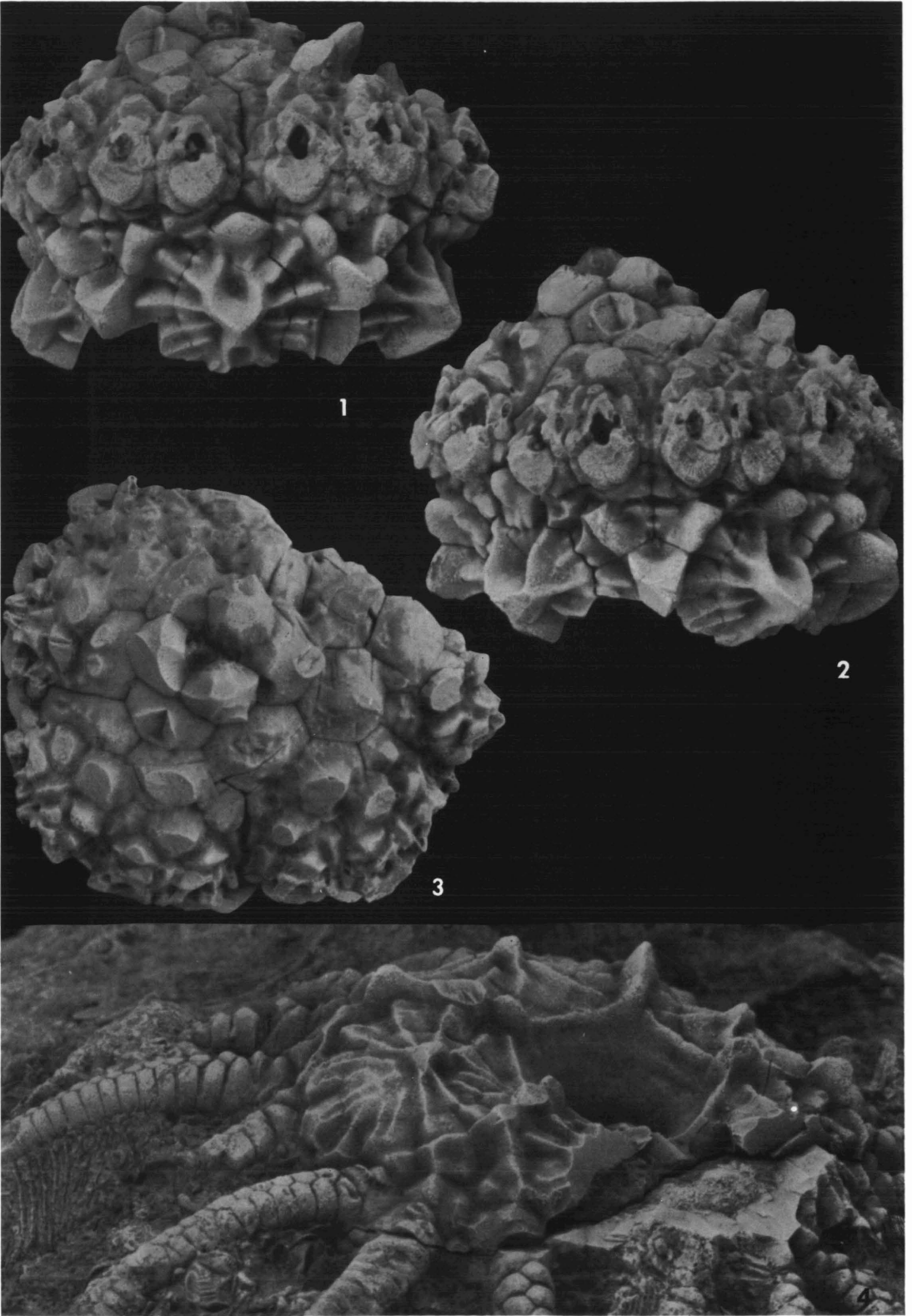


PLATE 2

agonal, the extra side in contact with a TBr_1 of the opposite half-ray. Center of each SBr_1 bearing a Y of three ridges leading to PBr_2 and the pair of $TBrBr_1$.

$TBrBr_1$ relatively large, most irregularly six-sided, each with a long concave side adjoining TBr_2 , nearly straight sides adjoining SBr_1 and the other TBr_1 , and short sides adjoining $iBrBr$ or $iTBrBr$. TBr_2 a semilunate plate extending nearly or completely across the arm, having a convex suture with TBr_1 and a concave suture with TBr_3 , variously slightly modified by $iBrBr$ and/or $iTBrBr$. Arms becoming free at about TBr_3 or TBr_4 (pl. 3, fig. 2).

Most of interradial region of cup filled by large $iBrBr_1$; each commonly 11-sided, bounded by two RR , two $PBrBr_1$, two $PBrBr_2$, two $SBrBr_1$, two $TBrBr_1$, and one iBr_2 (text-fig. 1). Each iBr_1 about the same size as an R or slightly larger, acuminate basally. The iBr_2 commonly pentagonal, bounded by iBr_1 , two $TBrBr_1$, and two $iBrBr_3$, about the same size as the bordering $TBrBr_1$. Normally two $iBrBr_3$ per interray, each plate subpentagonal, modified to fit against convex edges of adjacent $TBrBr$. Small irregular $iSBrBr$ between arm bases, serving the same structural function as $iBrBr_3$.

Pinnule apertures present between arms, both in radial (pl. 5, figs. 2, 3) and interradial (pl. 4, fig. 1) regions; elongate slits with an ellipsoidal surrounding area, apparently an articular surface.

Ornamentation strongly developed on RR , $PBrBr$, and $iBrBr_1$; as seen on broken edge of paratype, thickness of plate through spine on each of these plates fully as great as width of plate! Ornament of $iBrBr_1$ much more strongly developed on paratype (pl. 4, fig. 2) than holotype (pl. 3, fig. 4), consisting of a sharp central apex with two gradually divergent ridges extending down to the RR and two short, thick ridges directed laterally and up, together forming a broad U and bordering a scooplike depression on the upper side of the main apex. Viewed from above, central apex of iBr_1 strongly resembling the junction of Y-shaped ridges

on PBr_2 , like the projecting tip of a thick pointed spoon. From central region of iBr_1 low ridges descending and extending onto adjacent plates but not completely linking centers of cup plates in a network. Small nodes on proximal 3 or 4 $TBrBr$.

Tegmen.—Lobate, domed with considerable relief; plates with convex surfaces, imparting a rugosity (pl. 2, figs. 1–3). Centers of many tegminal plates bearing high, thick, acuminate spines (pl. 4, fig. 3). Anal prominence surrounded by thick rugose plates distinctly elevated above rest of tegmen.

Arms.—Eighteen arms in holotype; two adjacent rays giving rise to three arms each, the other rays to four arms each. Arms free from about level of TBr_3 or TBr_4 (text-fig. 1; pl. 3, fig. 2). Each arm at free base about two-thirds as wide as the PBr_1 of the ray, tapering very gradually. Arm from junction with cup distinctly biserial, formed of pentagonal $TBrBr$; those on left side forming narrow zigzag suture with those of right side. Outer surface of arm evenly rounded, hemicylindrical, except for scattered spines; spines strong, large, subconical, some involving more than one TBr .

Pinnules relatively thin, tapering gradually, the base of each occupying about half the length of the attached brachial. Pinnulars considerably longer than wide, slightly expanded at the ends, the pinnule showing strong similarity to a bamboo cane.

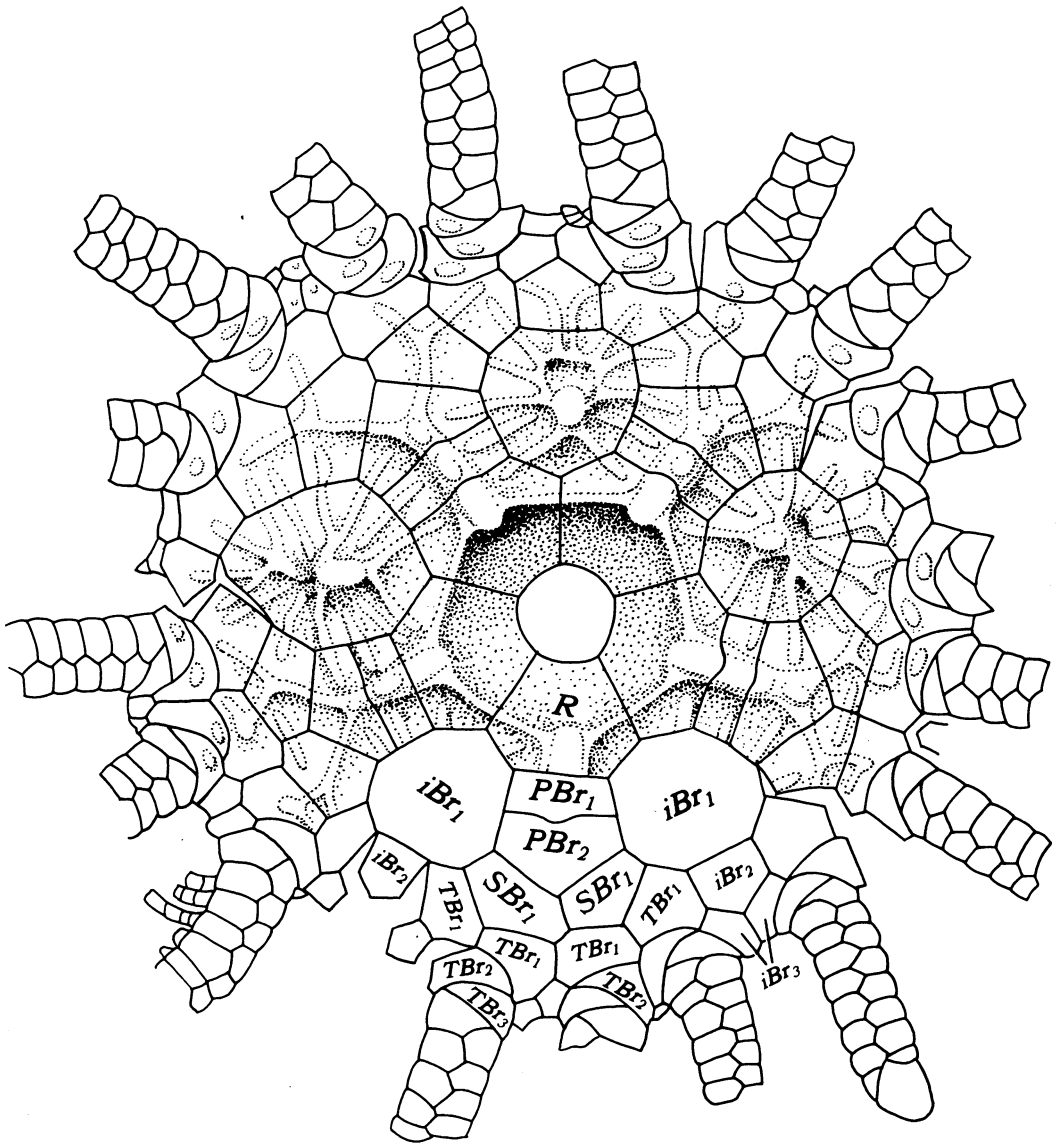
Remarks.—This species is the oldest in the Traverse Group of Michigan, but it is far from the oldest *Dolatocrinus*. It shows stronger similarities to species from the Dock Street Clay Member of the Four Mile Dam Formation than to species from the Alpena Limestone. With only minor variations, the arrangement of plates is the same in all *Dolatocrinus* species; the proportions of plates does change. The $PBrBr_1$ of *D. kutasii* are particularly short, and its $iBrBr_2$ are smaller than those of many other species.

One of the distinctive features of the new species is the great thickness of the cup plates through the positions of the central spines or

EXPLANATION OF PLATE 2

Specimens coated with ammonium chloride; all figures $\times 4$

FIGS. 1–4—*Dolatocrinus kutasii* n. sp. 1–3, two lateral and ventral (tegminal) views of paratype UMMP 57432. 4, inclined view of holotype UMMP 57887, showing shape of cup and some pinnules attached to arms.



TEXT-FIG. 1.—*Dolatocrinus kutasii* n. sp. Generalized plate diagram of holotype. Camera lucida plate drawings by George McIntosh.

EXPLANATION OF PLATE 3

Specimen coated with ammonium chloride; all stereograms $\times 6$

FIGS. 1-4—*Dolatocrinus kutasii* n. sp. Holotype UMMP 57887. 1, pinnules. 2, arm bases. 3, ray ridge. 4, iBr₁.

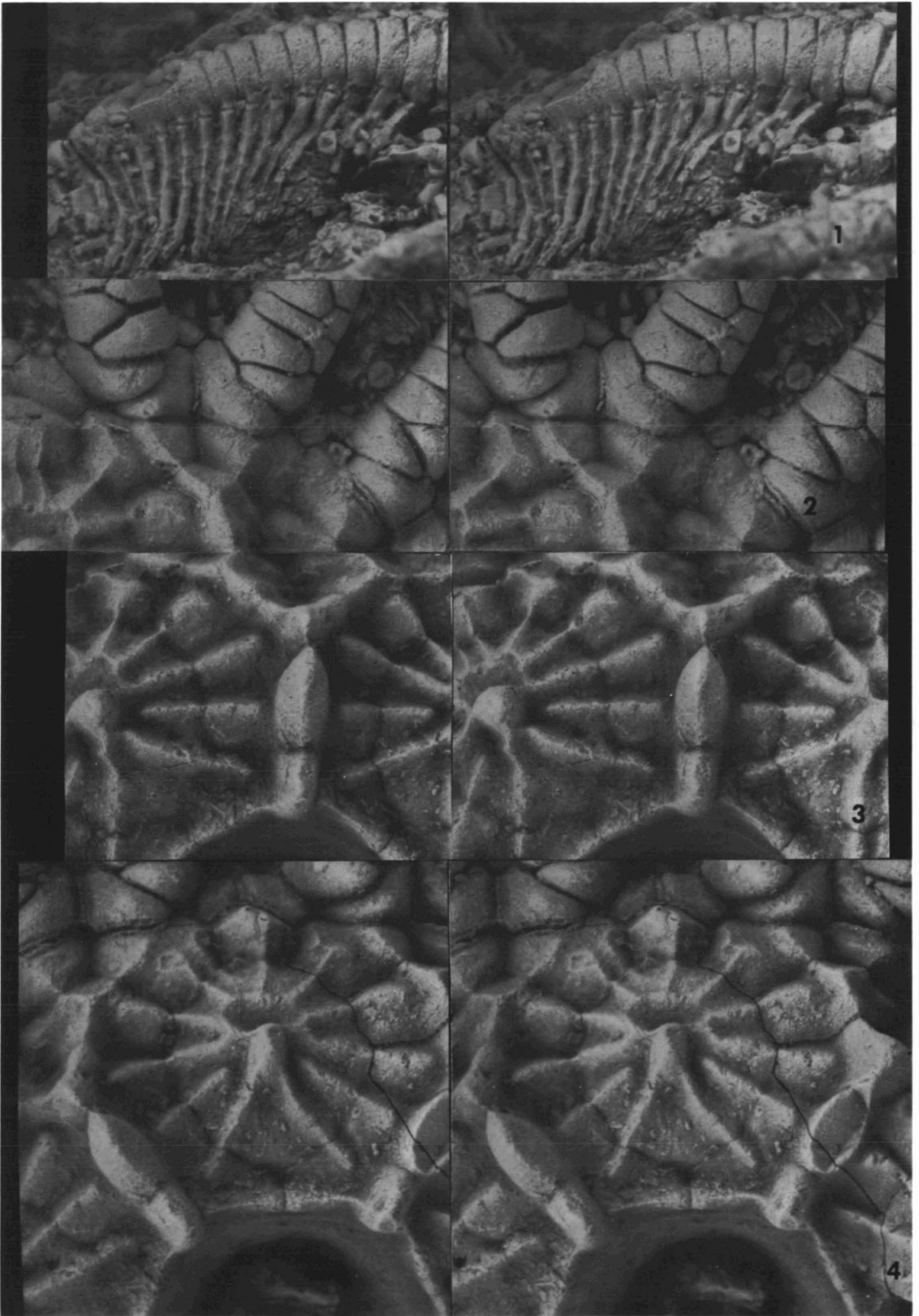


PLATE 3

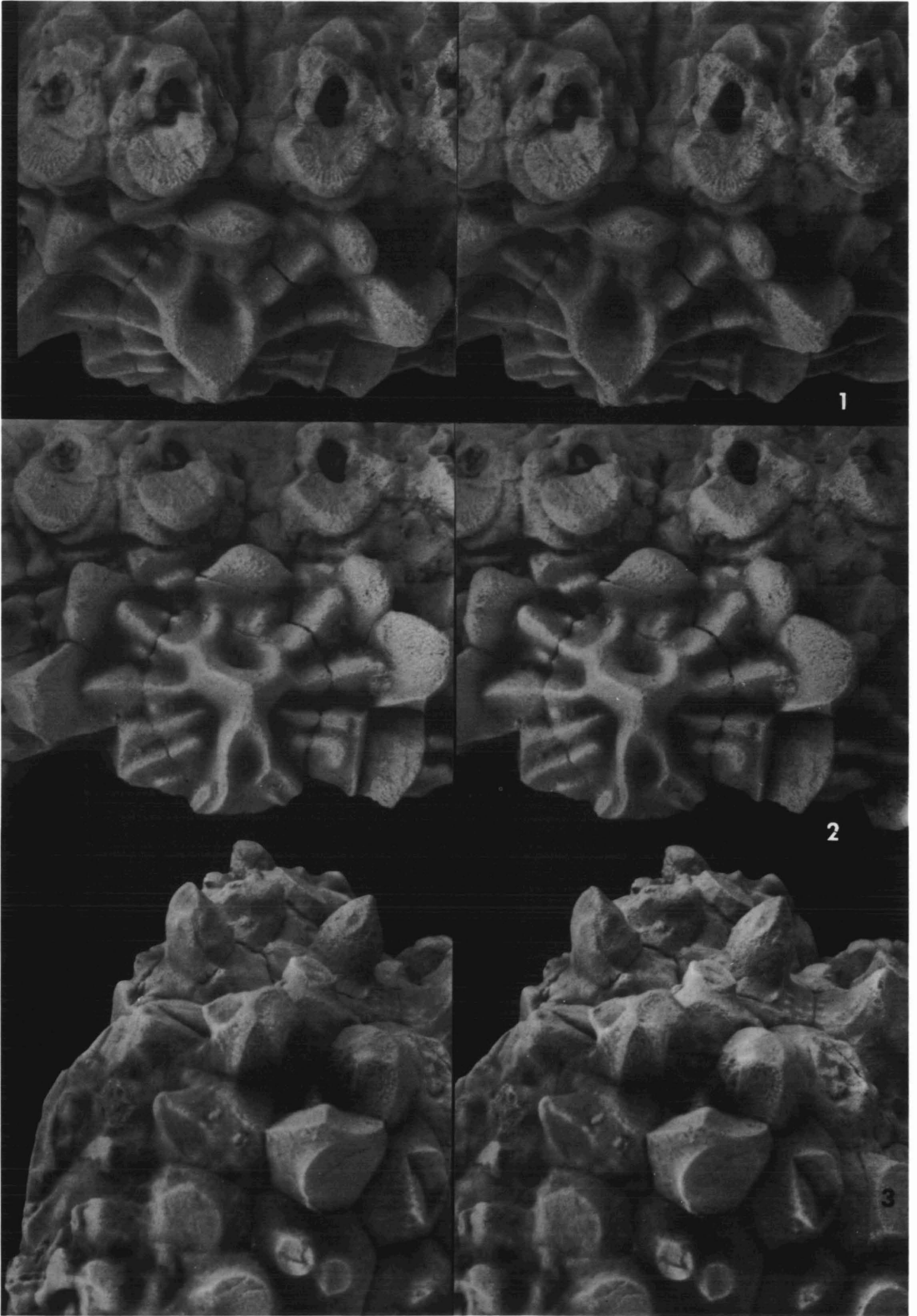


PLATE 4

ridges, giving great relief to the surface of the cup. In general, *Dolatocrinus kutasii* resembles *D. bulbaceous* Miller & Gurley in the strong ray ridges and the central spine or protuberance on iBr_1 ; but the calyx is much larger, its cup shallower, its base more convex instead of square, its sides more flared, its tegmen is strongly spinose instead of pustulose, and the ridges radiating from iBr_1 are much stronger.

D. kutasii also resembles *D. michiganensis* Kesling & Mintz in the general pattern and strength of ornamentation, particularly a young individual of that species (UMMP 44994, see Kesling & Mintz, 1963a, pl. 4, fig. 10), but it can be differentiated by the tegmen, which is spinose instead of rugose, and by the ridges radiating from iBr_1 , which fail to extend to centers of bordering plates. Nevertheless, both species have broad basal pits, strongly lobate tegmens, and pentagonal rims around the bases linking the RR, as well as great relief on the cup.

D. kutasii has a broad basal pit and lobate tegmen like those of *D. triadactylus* Barris; but its ridges have much greater relief, they fail to link plate centers, and they are never double; further, its tegmen has much stronger ornamentation.

The slab containing the holotype is brownish, probably from iron stains. There can be

little question that it came from strata above that which has yielded *Gennaeocrinus variabilis* Kesling & Smith and *Logocrinus conicus* Kesling. Perhaps it came from unit 8 of Ehlers & Kesling (1970, p. 43), 3.2 feet of soft, gray-blue clay shale at the top of the formation. This unit has been thought to be the source of various thin hard limy layers that have been found in the dump piles, but the slab bearing the crinoid is exceptionally thick and may be part of a local lens. The paratype came from an area of the dump piles where brown limestone fragments were common, probably derived from the same rock unit.

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- & ———, 1963b, *Dolatocrinus* and *Stereocrinus*, its junior synonym: *Ibid.*, no. 14, p. 229-237, 2 pls.
- MANUSCRIPT SUBMITTED AUGUST 3, 1970.

EXPLANATION OF PLATE 4

Specimen coated with ammonium chloride; all stereograms $\times 6$

FIGS. 1-3—*Dolatocrinus kutasii* n. sp. Paratype UMMP 57432. 1, pinnule apertures in interray. 2, iBi_1 . 3, tegminal spines and anal opening.

EXPLANATION OF PLATE 5

Specimen coated with ammonium chloride; all stereograms $\times 6$

FIGS. 1-3—*Dolatocrinus kutasii* n. sp. Paratype UMMP 57432. 1, ray ridge on PBr_2 . 2, 3, pinnule apertures within ray.

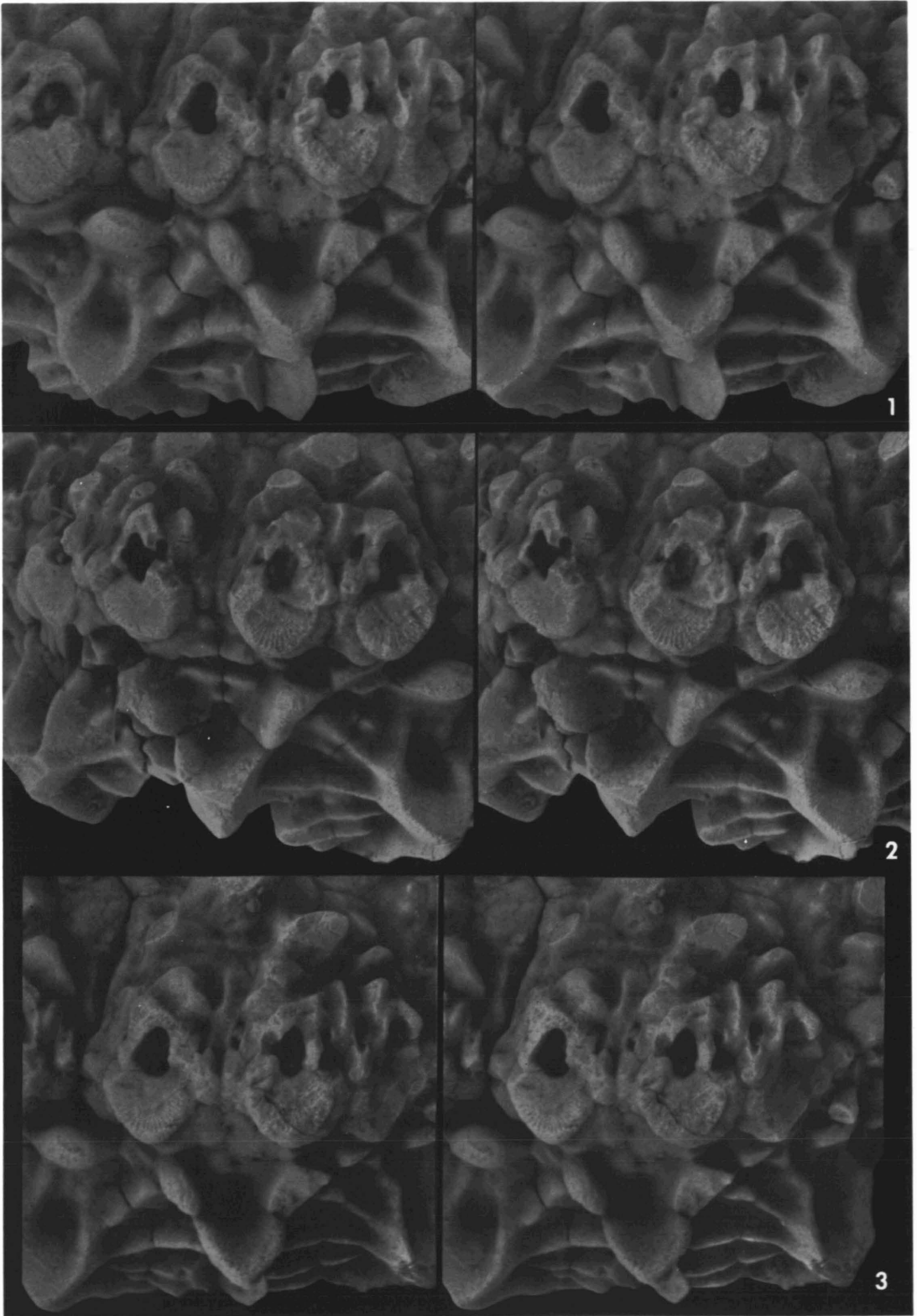


PLATE 5

