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ARMS OF *DECADOCRINUS HUGHWINGI* KESLING

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ARMS OF *DECADOCRINUS HUGHWINGI* KESLING

ROBERT V. KESLING

ABSTRACT—A topotype-hypotype specimen of *Decadocrinus hughwingi* Kesling, a Middle Devonian crinoid from northwestern Ohio, preserves extensive parts of the arms. The secundibrachials comprising each of the ten arms have the same basic pattern that has been recorded for other species of the genus: each brachial bears a stout pinnule of several segments, pinnules alternate left and right on the arm, each arm is a mirror image of the other in the same ray, and the brachials have the general shape of truncated wedges, larger at the side with the pinnule, so that the brachial sutures zigzag. The vermiculate-striate ornamentation present on the cup plates decreases distally on the arms, and most arm plates are nearly smooth. Ambulacral cover plates apparently imbricate somewhat, zipper-like; each plate is L-shaped with the outer ramus attached to muscles for opening and closing the groove.

INTRODUCTION

OFTTIMES, DISCOVERY of an additional specimen of a rare species serves to disclose characters which were not preserved in the holotype. This is such a case. When I first described *Decadocrinus hughwingi* in 1964, it seemed highly unlikely that a more nearly complete specimen would ever be found. The holotype, given to our Museum by the late Hugh Wing of Detroit, Michigan, included the calyx, the proximal section of the column, the contorted anal sac, and arms as far as SBr_2 in two rays. It was superior to most specimens on which species of *Decadocrinus* had been founded.

Early this year, Mr. Lee Nieman presented the Museum of Paleontology with a second specimen of *Decadocrinus hughwingi*. It was from the same stratum in the same quarry as the holotype. This excellent little crinoid is much smaller than the holotype, slightly over half its size. With all arms extended laterally to their limit, the crown of the new specimen probably reached about 50 mm in diameter; the cup itself, however, is only about 5 mm in diameter at the tips of the RR. The specimen lies on and in a slab with the dorsal (stem) end uppermost and the arms spread out on the surface, concealing nearly all of the anal sac.

In contrast to the holotype, the topotype-hypotype preserves much of the arms. No arm is complete from its junction with the R to its tip. Nevertheless, the right arm of the C ray contains 14 SBrBr; the right arm of the E ray is entire as far as SBr_9; and the left arm of the E ray, exposed to SBr_3, lies close to a section with 21 SBrBr which probably was disjointed from this arm. In addition, several shorter pieces of arms are displayed on the little slab, some turned to show the ambulacral cover plates.

Like the holotype, this specimen is composed of plates with only a thin calcareous veneer over pyritic cores, making cleaning difficult. To avoid eradicating the ornamentation, I applied Airdent abrasion with dolomite powder at low feed for brief intervals. The soft matrix was readily blasted away. As a result, the disarticulated pieces of arms could not be exhumed in high relief; other fragments undoubtedly still lie buried in the slab. The delicate nature of the specimen makes further cleaning exceedingly risky. A weak solution of casein glue hardened the specimen and the shale for preservation.

In getting this paper to publication, I enjoyed the excellent assistance of Mr. Karoly Kutasi in photography, Mrs. Helen Mysyk in typing, and Mrs. Gladys Newton in proofreading. Again I thank Mr. Nieman for his generosity which made the investigation possible. The topotype-hypotype specimen is deposited and catalogued in our Museum of Paleontology as number 57886. It comes from unit 9 of the Silica Formation in the North Quarry of the Medusa Portland Cement Company in Lucas County, Ohio.

SYSTEMATIC DESCRIPTION

DECADOCRINUS HUGHWINGI Kesling

Pl. 1, figs. 1–6; pl. 2, figs. 1, 2; pl. 3, figs. 1–4

Dorsal cup.—Bowl-shaped, the RR flared strongly outward (to some degree, probably, the result of compaction). IBB five, forming a thin, inconspicuous ring scarcely exceeding the diameter of the largest columnals and pentalobate like the column (pl. 3, figs. 2–4). Each IB indented laterally in the middle, just below its junction with the two overlying BB, and notched basally immediately opposite the junc-

tion to form two equal lappets projecting out from the columnar facet.

BB five, equal, bulbous, contributing to the bowl-like shape of the cup; each B-B suture set above the middle of an IB, deeply indented (pl. 2, fig. 2; pl. 3, figs. 2, 4). B-IB sutures depressed; B-R sutures forming semisulci, the spherical sides of the B sloping down to the cylindrical surface of the R. BB of BC and CD interrays septagonal, all others hexagonal.

RR nearly equal, larger than BB; each R pentagonal and trough-shaped in section (hemicylindrical), its height fully equal to its width or even greater. Anal series prominent, the plates bulbous (pl. 3, fig. 1). RA pentagonal, smaller than adjacent R of the C ray; X_1, X_2, and X_3 (all exposed) gradually decreasing in size, their corners deeply indented.

Ornamentation distinct on cup plates, consisting of prominent rounded irregular crests. BB, RA, and XX vermiculate to reticulate. RR vermiculate in middle zone, the crests along the sides tending to align in subparallel striae directed abradially and dorsally (toward the edge and down; pl. 2, fig. 2; pl. 3, figs. 1–4).

Arms.—$PBrBr_1$ and $PBrBr_2$ fully as wide and long as RR, strongly curved (hemicylindrical), the former rectangular and the latter pentagonal in lateral view. No iRR or iSBrBr, the arms becoming free at the level of the RR. Each SBr_1 about two-thirds the width of PBr_1.

Ten arms, large, equal, all composed of SBrBr. About 25 SBrBr per arm, gradually decreasing in size. The proximal four or five SBrBr of each arm nearly rectangular, their sutures subparallel. Distally, SBrBr becoming more and more trapezoidal or wedge-shaped, their sutures zigzag; near the end of the arm (pl. 2, fig. 1), SBrBr becoming nearly pentagonal, alternately offset from the midline of the arm. SBr_1 without pinnules. Each succeeding SBr bearing a stout pinnule; the pinnules alternating left and right, that of SBr_2 on the abradial side of the ray (outside edge of the ray) and that of SBr_3 on the adradial (inside edge, facing the other arm of the ray), thereafter alternating in similar fashion. Each arm, therefore, a mirror image of the other arm in the ray; in the two arms of a ray at equal distances from PBr_2, the pinnules either directed toward each other (odd-numbered SBrBr) or away from each other (even-numbered SBrBr). Trapezoidal SBrBr with the larger side bearing the pinnule, the edges of the arms in this section only slightly sinuous; near the end of the arm, pentagonal SBrBr with one of the two proximal sides of each bearing the pinnule, one of the distal sides adjoining the next SBr and the other free, the edges of the arm in this section strongly zigzag (pl. 2, fig. 1).

Ornamentation on PBrBr essentially the same as that of RR. Crests on proximal 6 or 7 SBrBr gradually decreasing in relief, and remainder of arm essentially smooth. Edges of PBrBr and proximal SBrBr with subtriangular lappets, rather sharply acuminate (pl. 3, fig. 3).

Pinnules graduated, those near proximal end of arm with over 15 pinnulars, those near distal end with 5 or less (pl. 2, fig. 1). Each pinnule thick, forming a deep modified V-shaped trough with convex sides, its margins thinning to the edges. Pinnule base about one-third the width of adjoining brachial.

Ambulacral cover plates relatively narrow, about five pairs on each pinnular (pl. 1, figs. 2, 4). Each plate L-shaped, with a nearly straight exposed piece covering the ambulacral groove and a tapering ramus extending down inside

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EXPLANATION OF PLATE 1

Specimen lightly coated with ammonium chloride; topotype-hypotype UMMP 57886

FIGS. *1-6*—*Decadocrinus hughwingi* Kesling. *1*, specimen on small shale slab, a calyx with its ventral end still embedded, the broken-off major part of one arm, and disarticulated short sections of arms and pinnules; × 2. *2–4*, three sections of pinnules, showing ambulacral cover plates, some displaced from the pinnulars; × 20; *5, 6*, slightly inclined views of AB and BC interrays; × 8.

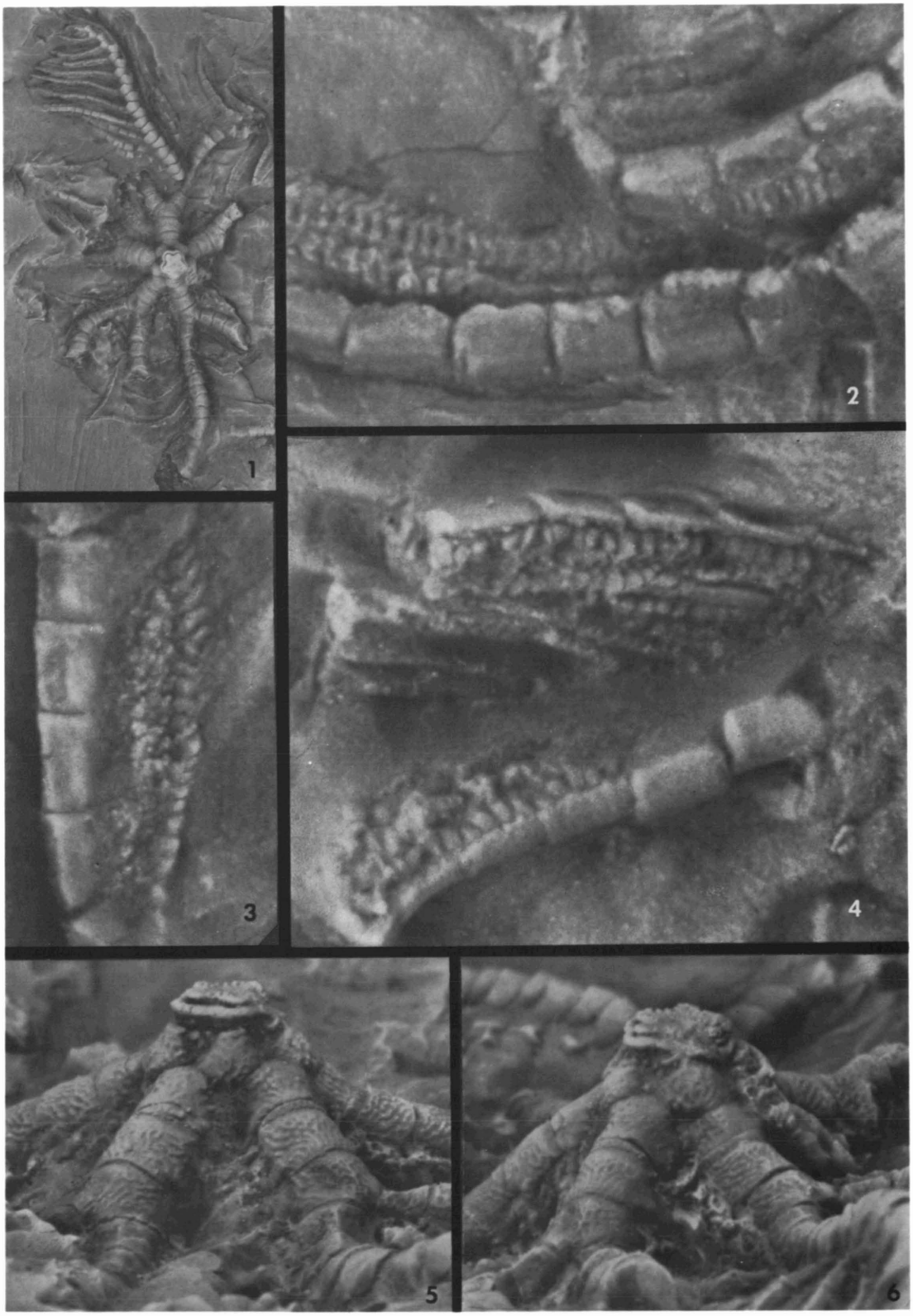

PLATE 1

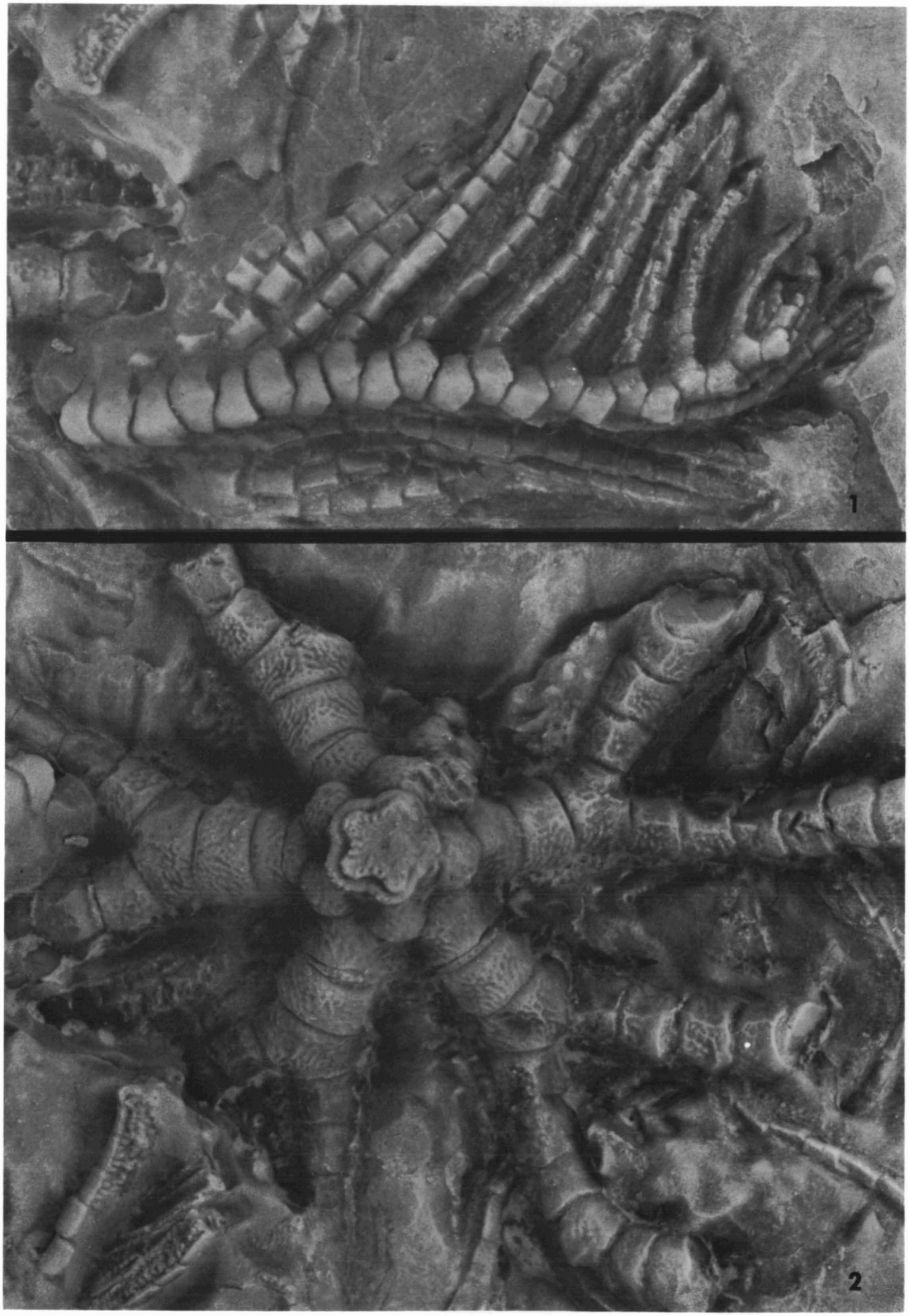

PLATE 2

the marginal part of the pinnular (pl. 1, figs. 2, 3). Ramus undoubtedly for attachment of muscles operating the cover plate, lifting and lowering it, but no muscle scars discernible on the tiny part. Exposed piece thickened at its adradial end (at midline of arm and intercalated with ends of opposite pieces) and at its junction with the ramus, suggesting a firm, zipper-like fit of the closed cover plates.

Anal sac.—Only a small patch visible, between A and E rays (pl. 2, fig. 2), insofar as can be seen, composed of wide, low plates with reinforcing ridges.

Column.—Heteromorphic. Both large thick and small thin columnals pentalobate (pl. 2, fig. 2). Articulating facet also pentalobate, extending nearly to edge of the small columnal, its rather wide crenularium surrounding a pentastellate areola; lumen very small, pentastellate.

Ontogeny.—Although only two specimens are known, some general trends of development may be suggested. The striking differences between them are the relatively large size of the PBrBr in the juvenile, distinctly larger than the RR, and the relatively large size of the RR in turn, definitely larger than the BB. It would seem, even on this meager sample, that the crown grew mostly in the BB, and that growth gradients increased downward from the PBrBr into the cup. The RR also seem to have decreased in relative height, as did the $PBrBr_1$. Briefly stated, the young specimen is mostly arm bases, the adult mostly cup base. Lappets on the PBrBr in the young are subtriangular and pointed, whereas those in the adult are broad and rounded. On the other hand, the bulbous shape of the BB and the peculiar pattern of ornamental crests changed very little.

LITERATURE CITED

KESLING, R. V., 1964, *Decadocrinus hughwingi,* a new Middle Devonian crinoid from the Silica Formation in northwestern Ohio: Contrib. Mus. Paleontology, Univ. Mich., v. 19, no. 10, p. 135–142, 1 pl., 1 text-fig.

EXPLANATION OF PLATE 2

Specimen lightly coated with ammonium chloride; topotype-hypotype UMMP 57886; both figures × 8

FIGS. *1, 2—Decadocrinus hughwingi* Kesling. *1,* arm, apparently from E ray, showing zigzag junctions of Brr, which alternately bear pinnules on one side and the other; between the stout pinnules, some series of cover plates can be seen shoved out of position. *2,* dorsal view of cup and arm bases; a few proximal columnals retained on the cup base; anal series slightly offset to right above center of cup.

EXPLANATION OF PLATE 3

Specimen lightly coated with ammonium chloride; topotype-hypotype UMMP 57886; both figures × 8

FIGS. *1–4—Decadocrinus hughwingi* Kesling. Slightly inclined side views of cup. *1,* posterior view (centered on CD interray). *2,* anterior view (centered on A ray). *3, 4,* views centered on DE and AE interrays.

PLATE 3