

ON THE OCCURRENCE OF PLATYCRINUS IN PENNSYLVANIAN STRATA OF WESTERN INDIANA*

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The camerate crinoids with the exception of a single degenerate species of the peculiar genus *Acrocrinus* (*A. wortheni* Wachsmuth have long been considered to have become extinct in America at the close of the Mississippian period. It was with no ordinary interest, therefore, that I discovered in the summer of 1926 a locality in Warren County, Indiana, where a limestone, situated only a short distance above the base of the Pennsylvanian, as the system is represented in this region, is literally crowded in places with stem segments of the type which are ordinarily considered to be characteristic of the camerate genus *Platycrinus*. There can be no question as to the Pennsylvanian age of this limestone as it carries an unmistakable fauna including such species as *Chonetes mesolobus*, *Spirifer cameratus*, *Marginifera muricata*, *Hustedia mormoni*, etc.

The great numbers of these stem segments and their large size make them a striking feature of the fauna of this locality. An extended search was made in the hope that a calyx might be discovered but without results. No recognizable portion of any of these crinoids was obtained except the stems. In size the stem segments vary up to those having a greater diameter of nearly an inch, and in this they are unlike anything that is known from the Upper Mississippian. The Chester species of *Platycrinus* are neither large nor abundant, and stems having a larger diameter of more than one quarter of an inch are seldom if ever to be observed. These Pennsylvanian stems resemble in size those which sometimes occur in the Warsaw and Osage divisions of the Lower Mississippian.

The stem segments collected from this Indiana locality exhibit considerable diversity in regard to their various proportions and ornamentation. We know, of course, that the segments of a single crinoid's stem are not necessarily at all uniform. Segments of several types are sometimes intercalated with one another, or

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those at one end of the stem may differ notably from those at the other. From what is known concerning the stems of *Platycrinus*, however, it would appear that stem segments of different types do not occur adjacent to one another. Although the segments at various positions in the stem may be notably unlike, they are probably connected by an intergrading series. A consideration of the various types of segments obtained from this Indiana locality would suggest that more than a single species is represented, but of course this cannot be determined from the material in hand.

Most Paleozoic crinoids were gregarious and often lived in more or less compact colonies. The exposures at this Indiana locality represent the only known *Platycrinus* colony which existed in America during Pennsylvanian time. Of course, there were almost certainly others, but as no other has ever been reported they must have been very rare. In fact, the only locality in the world from which *Platycrinus* or any near relative of it has been reported from beds younger than Mississippian is the island of Timor situated some distance north of Australia. Here a great variety of crinoids have been collected from strata considered to be Permian in age.

The facts that the stem segments occur in such numbers at the Indiana locality and that no recognizable fragment of a calyx has been observed, suggest that these crinoids were long-stemmed forms and probably of considerably smaller size than one would expect from the size of some of the stem segments. Large crinoid stems of the ordinary circular type with a diameter of an inch or even more are quite common at many Pennsylvanian localities, and yet no calyx or even a single plate of a calyx of comparable size has ever been found. It is practically certain, therefore, that these stems were long (I recently collected a piece four feet in length and of a uniform diameter of one inch) and that they tapered very rapidly toward their upper ends, so that at the point of attachment with the calyx they may have been reduced in diameter by as much as seven-eighths or even more. It is not at all improbable that these Pennsylvanian representatives of *Platycrinus* had this characteristic also.

The Carboniferous members of the family Platycrinidae were supported on stems entirely different in nature from those of any other Paleozoic crinoid. The segments of this stem are oval, or at least the surfaces by which they were joined together are oval. Down the center of this surface and marking the long diameter of

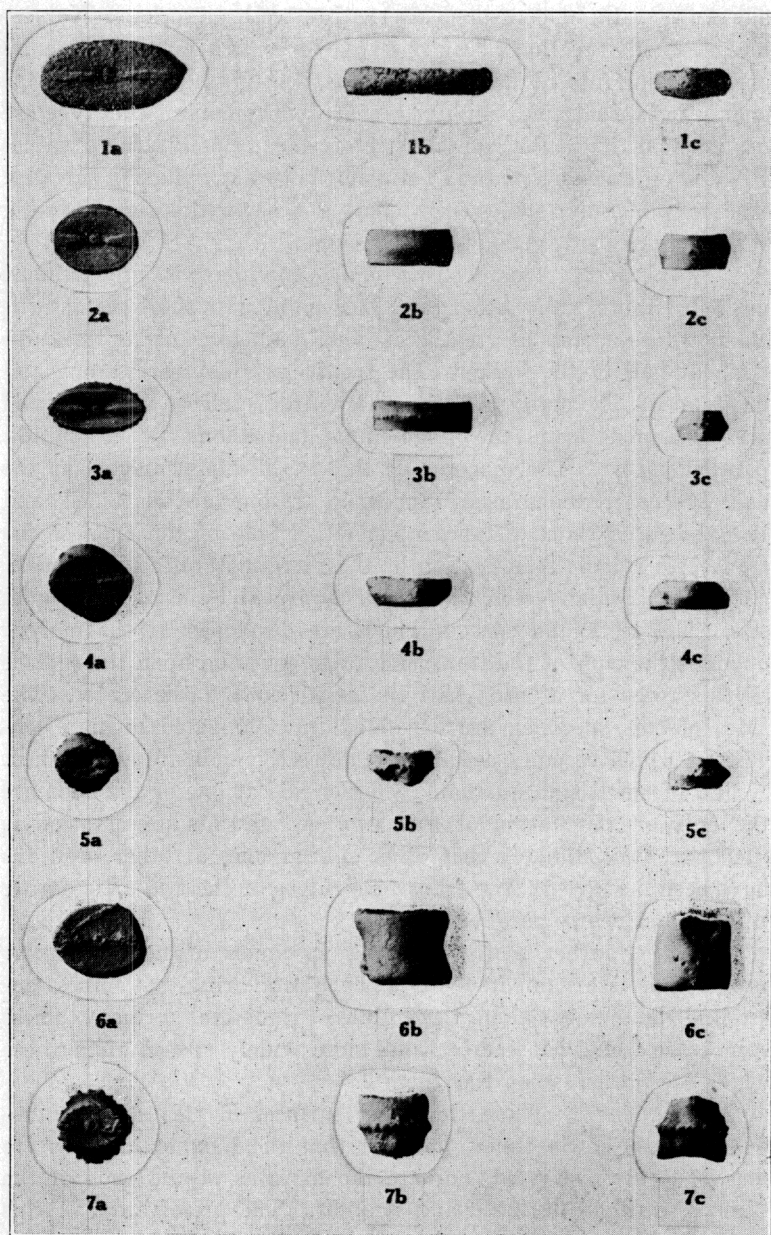
the oval extends an articulating ridge which is raised slightly above the lateral margins of the plate. Upon either side of this ridge lies a depression which is bounded upon the outside by the lateral margin of the segment and which was probably occupied by ligamental material during the life of the crinoid. Such an arrangement allowed a certain amount of free movement between each pair of stem segments with the articulating ridges acting as fulcra.

The articulating ridges upon the opposite surfaces of each segment are seldom if ever exactly parallel, and one may deviate from the direction of the other by any angle up to nearly 90° , although in most cases this angle is rather small. Each successive segment, therefore, is rotated through a certain angle when compared to its predecessor, and as such rotation is progressive a twisted stem results which is flexible and capable of movement in any direction.

The stem segments illustrated upon the accompanying plate and described in the following paragraphs possess in typical fashion the characters described above. They were all collected in a silicified condition from a dark lower Pennsylvanian limestone near the center of the north half of section 35, T. 21 N., R. 9 W., Warren County, Indiana.

Specimen 1. This specimen is of a type which is rather abundant. Its long diameter is almost exactly twice its short diameter, and its thickness is about one third of the latter. The articulating ridges of the opposite sides are almost parallel to one another. Many of the segments of this type are nodals and bear, at one end only, a circular facet for the attachment of a cirrus. These are of various sizes and may be quite small (as in the figured specimen) or so large that the segment becomes wedge shaped due to the thickening of the cirrus bearing end. No specimens of this type of segment have been obtained in a sufficiently perfect state of preservation to exhibit the details of their structure or ornamentation. The sides and ends, however, while convex, were probably smooth and unornamented.

Specimen 2. This specimen is of a type also commonly present. Its shape resembles that of the former except that this segment is considerably thicker in proportion. The articulating surfaces are also more deeply excavated between the transverse ridges and the lateral margins. Like the former, the articulating ridges are almost parallel. The margins of the articulating surfaces opposite the ends of the transverse ridges are raised into



Pennsylvanian *Platycrinus* Stems.

All natural size except two lower rows, which are enlarged 4 diameters.

about five pairs of elongated alternating teeth or sockets. No segments of this type have been observed to be cirriferous. The sides are expanded into rounded angulations, becoming obsolete near the ends whose profiles are slightly concave. Segments of this type are ornamented by a horizontal ring of short, closely spaced spines situated on the sides midway between the two articulating surfaces. One or two similar spines occur above and below this ring, forming vertical rows at the ends of the segments.

Specimen 3. This well-preserved specimen is proportioned quite differently from either of the foregoing. Its short diameter is about three-quarters as great as its long diameter, and its thickness is about half of the former. The transverse ridges are strong and flat-topped. The margins of the articulating surfaces are sharp and are separated from the ligamental depressions by a shallow parallel groove. The margins of the articulating surfaces at the ends are not rounded as in Specimen 2, but are flattened and straight for a short distance upon either side of the ends of the transverse ridge. This portion of the margin is raised into small, closely set, radially elongated teeth separated by sockets of equal size. The teeth and sockets which are developed at the margin opposite the ends of the transverse ridge continue upon the surface of this ridge for at least half its length toward the center. The sides of this specimen are expanded into elongated median convexities which becomes nearly obsolete as the ends are approached. A pair of small spines situated side by side at one of the ends are the only ornamentation of this segment, and its preservation is such that it is unlikely that other similar ones at other positions have been destroyed. The transverse ridges of the two articulating surfaces are nearly parallel.

Another rather poorly preserved specimen of nearly similar proportions is ornamented by a horizontal ring of spines encircling the segment along the middle of its lateral surfaces. These spines are somewhat coarser and more widely spaced than those which are present upon Specimen 2.

Specimen 4. The articulating surfaces of this specimen resemble those of Specimen 3 except that the ligamental areas are not so deeply excavated, nor are the margins at the ends of the transverse ridges flattened and straight. The preservation of this specimen is not good enough to show whether or not a groove was present just within and parallel to the margin, but there is no trace of it remaining. Remnants of the fine radial teeth and

sockets are preserved upon the flat surfaces of the transverse ridges to a position nearly half-way to the center. This specimen differs from all of the foregoing by virtue of the strong rotation of one articulating surface with respect to the other, so that the transverse ridges intersect at an angle of about 68° . This segment is thin, compared to either Specimen 2 or Specimen 3. The sides are smooth and are unornamented save for two irregular pustules. These do not resemble the spines mentioned in connection with the foregoing specimens, and they may have supported small cirri although this is far from certain.

Specimen 5. This specimen resembles the last in a general way, as the proportions of the long and short diameters of the articulating surfaces and the amount of rotation of one with respect to the other are about the same. This segment, however, is proportionally thicker, and the ligamental depressions are deeper, but the details of the articulating surfaces have been largely destroyed. The most conspicuous difference, however, between this segment and Specimen 4 consists in the presence of a spinose, angular ridge which extends around the segment at the middle of the sides and gives it a nearly circular outline. The spines which stand upon the crest of this ridge are small, rounded, and unevenly spaced. Additional spines of a similar nature occur in small triangular areas, the apices of which meet the margins of the articulating surfaces at the ends of the transverse ridges.

Specimen 6. This specimen, the illustrations of which are magnified four diameters, possess articulating surfaces whose proportions are about equal to those of Specimen 3. This small segment, however, is very much thicker in proportion than any of the foregoing. The articulating surfaces are nearly flat. The margins are only very slightly raised above the ligamental areas, and the transverse ridges are low and divided down the center by a rather prominent groove or socket, which transforms this ridge into two equal tooth-like processes. The lateral surfaces are smooth and extend straight from one articulating surface to the other. The ends, however, possess a concave profile, thus giving the segment a constricted appearance when viewed from the side. One articulating surface is rotated with respect to the other through an angle of about 14° .

Specimen 7. This small segment, the illustrations of which are also enlarged four diameters, greatly resembles Specimen 5. It differs principally in its greater relative thickness, in the

relatively coarser nature of its spines, and in the rotation of one articulating surface with respect to the other through a somewhat greater angle, being in this case about 73° . The margins of the articulating surface of this specimen are raised very slightly if at all. The ends, however, are higher than any other portion of these surfaces, thus giving them a concave profile when viewed from the side. The articulating ridges are rather weak and are cut by a prominent notch at their outer extremities, thus producing two small tooth-like processes. Only one faint spine is present between the encircling ring of lateral spines and the ends of the transverse ridges. The other three areas, which are occupied by triangular groups of spines in Specimen 5, are smooth in this segment. Stem segments of this type are strongly reminiscent of the Ste. Genevieve species, *Platycrinus penicillus* Meek and Worthen.