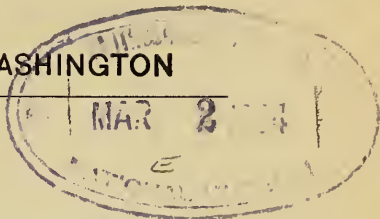


PROCEEDINGS
OF THE
BIOLOGICAL SOCIETY OF WASHINGTONON A COLLECTION OF CRINOIDS FROM THE
RAFFLES MUSEUM, SINGAPORE.BY AUSTIN H. CLARK.¹

The Director of the Raffles Museum at Singapore, Straits Settlements, Mr. F. N. Chasen, has recently been so generous as to send me for study an interesting collection of crinoids from both shallow and deep water, brought together and forwarded by Mr. M. W. F. Tweedie of the Museum.

In all, the collection includes representatives of twelve species. One of these species, *Himerometra magnipinna*, represented by three specimens from Singapore, was previously unknown from that region, though reported from Cochin China. Another species of the same genus, *H. martensi*, has long been known to be common at Singapore.

The stalked crinoids in the collection, all from the China Sea, represent *Metacrinus zonatus*, a species described by the author in 1908 from the Philippines and not since reported. The specimens in the present collection are all much larger than those upon which the original description was based, and show a rather considerable range of variation.

This species (*zonatus*) is a typical representative of the genus *Metacrinus*; but it appears to be very closely related to the aberrant *M. rotundus* of southern Japan, which may prove to be simply its extreme northeastern form.

A number of the most interesting specimens in the collection were brought up from deep water by the cable repair ship *The Cable* of the Eastern Australasia and China Telegraph Company. The officials of this company, and the officers of *The Cable*, are to be commended for their zeal in carrying on work over and above their regular line of duty. This work has resulted in a very material increase in our knowledge of the recent crinoids.

In addition to the material described herein, no less than sixteen species

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of rare deep water crinoids have been in previous years collected by *The Cable*. Of these sixteen species, no less than five—nearly one-third—were new (*Leilametra necopinata*, *Stenometa diplax*, *Iridometra maxima*, *Tonrometra multicirra* and *Nepiometra nicippe*), one of these (the first named) representing a remarkable new genus (see Journ. Linn. Soc. [Zoöl.], vol. 36, No. 249, May, 1929, pp. 635–664, pls. 40–44; and Ann. and Mag. Nat. Hist., ser. 10, vol. 10, No. 58, October, 1932, pp. 378–392, pls. 13–15).

But *The Cable* is not the only cable repair ship to which we owe substantial advances in our knowledge of the recent crinoids. Important contributions have been made by the *Patrol*, the *Lady Denison-Pender*, the *Recorder* and the *Norseman* of the Eastern and Associated Telegraph Company, and especially by various ships of the Great Northern Telegraph Company operating on the coasts of eastern Asia, particularly in the region of the Korean Straits, under the command of Captains Suensson, Schønau and H. Christiansen (see Vidensk. Meddel. fra den naturh. Foren. i København, 1909, pp. 115–194; and Proc. Biol. Soc. Washington, vol. 26, pp. 177–182, August 8, 1913).

The officials of the several submarine telegraph companies, and the officers of the cable repair ships, deserve the hearty thanks of all students of marine biology, and of biology in general, for their invaluable contributions toward a better understanding of the fauna of the sea bottom.

Six of the specimens recorded below were identified in 1899 by the late Mr. F. P. Bedford, who lived for a little more than a year in the neighborhood of Singapore and Malacca, making detailed studies of the echinoderms of the region and later publishing an account of the sea-urchins and starfishes.

Capillaster multiradiata (Linné).

Johore Strait, Singapore; on sand bank; April, 1933. one specimen.

Comatula pectinata (Linné).

Malacca Strait, southwest of Singapore (lat. 1° 25' 03" N., long. 102° 58' E.); 33 meters (18 fathoms); bottom temperature 81° F.; gray mud; cable repair ship *The Cable*, Eastern Australasia and China Telegraph Company; February 11, 1933.

Three specimens; one of these is intermediate between *Comatula pectinata* and *C. purpurea*, having XII cirri arranged in three interradial pairs and two interradial threes. These specimens are all of the slender form.

Java Sea, between Java and Borneo, west of Oosterling Reef (lat. 5° 36' 40" S., long. 112° 05' 30" E.); 66 meters (36 fathoms); bottom temperature 83.5° F.; mud, some sand, and shells; cable repair ship *The Cable*.

One specimen of the slender form.

Johore Strait, Singapore; on sand bank; April, 1933.

One large specimen with 12 arms, two IIBr 2 (1+2) series being present.

Comatula purpurea (J. Müller).

Malacca Strait, southwest of Singapore (lat. 1° 25' 03" N., long. 102° 58' E.); 33 meters (18 fathoms); bottom temperature 81° F.; gray mud;

cable repair ship *The Cable*, February 11, 1933. One typical specimen, with the cirri X, arranged in five interradial pairs.

Himerometra magnipinna A. H. Clark.

Singapore, 1899. One specimen.

Singapore; no further data. Two specimens.

Heterometra aspera A. H. Clark.

New Harbour, Singapore; 15 meters (8 fathoms); July 31, 1899. One specimen.

Amphimetra discoidea (A. H. Clark).

Singapore, 1899. One specimen.

Stephanometra spicata (P. H. Carpenter).

Blakang Mati, near Singapore; 1899.

One fine specimen with 28 arms 125 mm. long; P_2 is 19 mm. long with 17 segments, and P_3 is 14 mm. long with 15 segments.

Stephanometra protectus (Lütken).

Singapore; no further data. One specimen.

Lamprometra palmata (J. Müller).

Singapore, 1899. One specimen.

Christmas Island, Indian Ocean, south of the western end of Java (lat. $10^{\circ} 25' S.$, long. $105^{\circ} 42' E.$). One specimen.

Pontiometra andersoni (P. H. Carpenter).

New Harbour, Singapore; 15 meters (8 fathoms); July 31, 1899. One specimen.

Singapore, 1899. One specimen.

Neometra alecto A. H. Clark.

China Sea, east of Hainan (lat. $19^{\circ} 18' N.$, long. $112^{\circ} 14' E.$); 208 meters (114 fathoms); cable repair ship *The Cable*.

Two specimens, attached to the cirri of a large specimen of *Metacrinus zonatus*.

Metacrinus zonatus A. H. Clark.

China Sea, west of Ladd Reef (lat. $8^{\circ} 26' N.$, long. $111^{\circ} 16' E.$); 210 meters (115 fathoms); cable repair ship *The Cable*.

One specimen. The stem is 180 mm. long, 5 mm. in diameter but distally tapering and only 4 mm. in diameter at the broken end. There are about 16 nodals. The internodals number 11, 10, 10, 12, 11, 12, 12, 13, 11, beginning at the distal end of the stem. In section the stem is rounded-pentagonal, almost cylindrical. The internodals in their middle third

bear a narrow, abrupt, and conspicuous, though not very high, girdle, which is more or less constricted at frequent, though irregular, intervals, so as to suggest incipient division into a row of tubercles; this girdle may be continuous, passing uninterruptedly around the angles of the stem; but there is often a distinct tubercle, sometimes elongated in the direction of the axis of the stem, at the angles. This tubercle, when it occurs, appears on all the columnals in the internode.

The cirri are 60–62 mm. long with 52–55 segments.

Of the five IBr series, four are 7(1+2, 4+5), and one is 7(1+2, 3+4).

China Sea, east of Hainan (lat. 19° 18' N., long. 112° 14' E.); 208 meters (114 fathoms); cable repair ship *The Cable*. Six crowns with more or less of the stem attached, and three stem fragments.

In one specimen the stem is 150 mm. long and 6 mm. in diameter at the broken end. The internodals number 15, 11, 12, 12, 12, 11, 11.

The cirri have the six basal segments very short, the seventh about twice as broad as long, and the remainder about one-third again as broad as long with a dorsal carination which on the distal half of the cirri becomes prominent, and on the outer segments may be notched in the middle.

Of the four IBr series present, three are 7(1+2, 4+5), and one is 6(1+2, 4+5). The distal ends of the elements of the division series, and especially of the brachials in the proximal portion of the arms, are produced, so that the arms appear very rough.

The lowest pinnules have the ends of the segments much produced and more or less everted, and the sides of the segments with broadly thickened edges, or more or less strongly tubercular, so that the pinnules appear very ornate.

This specimen, like that preceding, resembles the type specimen from off Simonor in the Tawi Tawi group, Philippine Islands, very closely; but it is much larger, with the girdle on the internodals broader and somewhat lower, and with the proximal pinnules somewhat more ornate.

In another specimen the stem is 205 mm. long with about 21 nodals, and is 6 mm. in diameter. The internodals number 10, 9, 9, 10, 11, 9, 10, 8, beginning at the distal end.

The stem is pentagonal with broadly rounded angles, and the sides scarcely convex. The internodals alternate high and low, the high being about twice as long as the low. The girdle on the internodals is low, arising from the whole lateral surface, and is more or less tubercular, especially in the middle of the sides.

The cirri are 60 mm. long, and are composed of 60–63 segments.

The arms divide three or four times. The outer branch from each IIIBr axillary divides again, but the inner does not, so that there are 2, 1, 1, 2 : 2, 1, 1, 2 = 12 arms on each post-radial series, or 60 arms in all.

Of the five IBr series, four are 7(1+2, 4+5), and one is 6(1+2, 4+5).

Of the ten IIBr series, four are 9(3+4), one is 8(4+5), one is 7(2+3), one is 7(3+4), one is 7(4+5), one is 7(6+7), and one is 6.

Of six external IIIBr series, four are 13(3+4), one is 14(3+4), and one is 15(3+4). Of six internal IIIBr series, four are 17(3+4), one is 17(3+4, 7+8), and one is 15(2+3).

Seven IVBr series are 17(2+3), 17(3+4), 20(2+3), 21(6+7), 22(2+3), 22(3+4), and 23(3+4).

Usually after an axillary the third and fourth ossicles are united by syzygy.

The arms are 200 mm. long, measured from the radials.

In a third specimen the stem is 260 mm. long with about 20 internodes. The fully developed internodes are 20–22 mm. in length. The internodals number 11, 13, 13, 12, 15, 12, 14, 11, 12, 12, beginning at the broken end of the stem.

The stem is pentagonal with rounded angles. The girdle is low and inconspicuous, and is confined to the middle third of the internodals. On the distal portion of the stem the girdle is uninterrupted, passing unmodified around the angles, but on the proximal portion it becomes tubercular, and there is a slightly enlarged and more or less isolated tubercle at each of the five angles.

The cirri are up to 60 mm. long, equalling from two and one-half to three internodes in length. They are composed of 49–53 segments.

The arms are between 40 and 45 in number, IVBr axillaries being rare.

Of the five IBr series, three are 7(1+2, 4+5), one is 7(1+2, 5+6), and one is 6(1+2, 4+5).

The four IIBr series counted are all 11(3+4).

The three external IIIBr series counted are all 15(3+4). Of the three internal IIIBr series counted, two are 20(3+4, 17+18), and one is 20(3+4, 16+17).

The single IVBr series counted is 44(3+4, 15+16, 24+25, 39+40).

The arms are about 155 mm. long, measured from the radials.

In a fourth specimen the stem is 75 mm. long with 10 nodals. The internodals number 11, 11, 11. The diameter of the stem is 6 mm.

The cirri are up to 54 mm. in length, with 51 segments.

Of the five IBr series, three are 6(1+2, 4+5), one is 6(1+2), and one is 7(1+2, 4+5). One of the 6(1+2, 4+5) series has a small supplementary ossicle interpolated between the two elements of the first syzygial pair, which is apparently united to both elements by syzygy.

The three IIBr series counted are all 11(3+4).

The single external IIIBr series counted is 13(3+4). The two internal IIIBr series counted are 21(3+4) and 13(3+4).

This last specimen agrees with the others except for the slightly fewer ossicles in the IBr series and the smooth stem which in section is pentagonal with rounded angles. There is not the slightest trace of the girdle about the internodals that occurs, in varying degrees of development, on all the other specimens.

It very closely resembles *M. rotundus*, differing only in the regularity of the IBr series, and the longer cirri with more numerous segments.

In *M. rotundus* the stem often has swollen sides, so as to be in cross section pentagonal with the sides of the pentagon more or less convex, and furthermore the external sides of the internodals are commonly more or less swollen, or they may be encircled by a continuous low and inconspicuous narrow girdle which arises from little more than the middle third.

In connection with Indo-Malayan crinoids Dr. F. A. Bather, F. R. S., has recently been so kind as to call my attention to the fact that the generic name *Oreometra* A. H. Clark (Crinoids of the Indian Ocean, 1912, p. 179) applied to a type of comatulid included in the family Calometridæ is preoccupied by *Oreometra* Aurivillius (Wiss. Ergebn. d. Schwed. zool. Exped. nach dem Kilimandjaro, dem Meru u. den umgebenden Massaisteppen Deutsch-Ost-Afrikas 1905-1906, part 9, 1910, p. 38) applied to a group of moths included in the family Geometridæ and subfamily Boarmiinæ. The generic name *Oreometra* A. H. Clark may be replaced by *Reometra*, nom. nov.