

REPORTS on the MARINE BIOLOGY of the SUDANESE RED SEA.—VII. The CRINOIDEA. By HERBERT C. CHADWICK, A.L.S., Curator of the Port Erin Biological Station. (Communicated by Prof. W. A. HERDMAN, D.Sc., F.R.S., P.L.S.)

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THE collection of Crinoidea made by Mr. Cyril Crossland on the Sudan coast, and submitted to me for examination, contains six species, only two of which appear to have been previously recorded from the Red Sea. It is worthy of note that the genus *Actinometra* is not represented in the collection. In describing the position of the syzygies in the arms I have adopted, with some hesitation, the view so strongly urged by Bather in his paper entitled "The Term Syzygy in the Description of Crinoids" (*Zoologischer Anzeiger*, No. 495, 1896), to the effect that the epizygal and hypozygal elements which form what is commonly known as a syzygial pair should be regarded as morphologically equivalent to the ordinary brachial ossicles which are united by muscular bands, and not as forming together one such ossicle. I may perhaps be allowed to point out one objection to Bather's view which appears to me to have some weight. On page 117 of Vol. iii. of Lankester's 'Treatise on Zoology' a syzygy is described as "an immovable sutural union between two brachials of a pinnulate arm, accompanied with loss of the pinnule on the hypozygal." Now, if it be true that in the past history of the Crinoidea the hypozygal was once pinnulate, it is remarkable that the pinnules of the epizygals are invariably on that side of the arm from which the pinnule has been lost. Take, for example, the great majority of the family Antedonidæ. The first pinnule is borne by the second brachial on the outer side of the armlet, and the second pinnule by the epizygal of the first syzygial pair (fourth brachial of Bather) on the inner side of the armlet. But if the hypozygal has lost the pinnule which, it must be assumed, was on the inner side of the arm, that of the epizygal (fourth brachial) is on the wrong side, for it also is on the inner side.

## CRINOIDEA.

### ANTEDONIDÆ.

#### ANTEDON SERRIPINNA, *Carpenter*.

Several specimens of this species were dredged from a muddy bottom at a depth of 10 fathoms in Suez Bay. When living they were of a purplish-black colour, the arms of one specimen being regularly striped with yellow.

The cirri consist of twenty-three ossicles, of which all, from the fifth onwards, have a transverse dorsal ridge. As in the specimens of this species collected by Prof. Herdman off the coast of Ceylon, the ridge is near the distal end in the first few ossicles and becomes median in the later ones. In

the last few ossicles it is represented by a pair of parallel spines, and the penultimate one bears a strong opposing spine.

In relative size the proximal pinnules of the armlets resemble those of the specimens from Ceylon, but the number of pinnular ossicles is larger.

The second syzygy occurs at the ninth or tenth joint and the third at the fourteenth.

*Distribution.*—New Guinea, Tonga Islands, Ceylon, Red Sea.

ANTEDON PARVICIRRA, *Carpenter*.

This species, originally discovered by the 'Challenger' in the neighbourhood of the Philippine Islands, is represented in Mr. Crossland's collection by one specimen, and it is, perhaps, the most interesting addition to the Crinoid fauna of the Red Sea made by him, especially as no other record of its occurrence has been made since the publication of Carpenter's Report on the Crinoidea of the 'Challenger' Expedition.

The type specimen has forty cirri, consisting of from ten to twelve ossicles; in the one under notice seventeen are actually present, but the number was originally not less than twenty, and may have been twenty-five. They consist of fourteen ossicles, of which the first and the penultimate are the shortest. The intervening ones are long and cylindrical, with enlarged ends, the fifth and sixth being the longest. The penultimate one bears a minute opposing spine.

The radials are not visible, except at the angles. The first primibrachs are very short and have a transverse furrow, deeper at the sides than in the median line, and are not in contact laterally; the second (axillaries) are pentagonal, wider than long, and have a backward projection into the slightly incised first primibrachs.

The first brachial is wedge-shaped and is just in contact with its fellow on the inner side of the armlet. The second brachial is twice the length of the first and slightly longer on the outer than on the inner side. The third and fourth brachials are together nearly square and are united by syzygy. Then there follow a number of wedge-shaped brachials which, as the tip of the armlet is approached, become obliquely quadrate, but alternately longer on one side than on the other.

In both branches of the left anterior arm the second syzygy occurs at the fifth joint, but in the others it is at the ninth. The third is at the fourteenth, and others follow between every third and fourth brachial with great regularity. The proximal pinnules have fewer ossicles than those of the type.

*Locality.*—Suez Bay, 10 fathoms, mud.

ANTEDON MARGINATA, *Carpenter*.

With some little doubt I have referred to this species two small and imperfect specimens from the same locality as the foregoing. As in the type

specimen, which was obtained by the 'Challenger' off Manila, the centro-dorsal is a saucer-shaped disc, marked with cirrus-sockets almost to the centre of the dorsal surface, and bears seventeen cirri in an irregular row around its margin. These have fifteen to seventeen or even nineteen ossicles, which gradually increase in length from the first to the seventh, beyond which they are scarcely longer than broad and increasingly compressed, and have slightly carinate dorsal edges or even a minute dorsal spine.

In the specimens under notice the radials are distinctly visible, and are not in contact except at their proximal ends. In the type they are only just visible, but this point of difference is possibly due to the immature condition of the Suez specimens. The two primibrachs agree with those of the type.

The arms of one of these specimens branch once only; the other has two secundibrachs in one branch of each arm and, in the case of one arm, two tertiibrachs\*. The third, eighth, and fourteenth joints are syzygies; others follow at intervals of four to five joints.

The proximal pinnules have fewer ossicles than those of the type. That of the second brachial has fourteen, and that of the fourth fourteen or fifteen. The next pinnule (fifth brachial) is little larger than that of the second, but has fifteen or sixteen ossicles; while that of the seventh brachial has eleven to twelve and is much smaller than that of the second.

*Locality*.—Suez Bay, 10 fathoms, mud.

*ANTEDON IMPARIPINNA*, Carpenter.

One specimen of this species was collected in Suez Bay and four in Suakim Harbour. In the former the dorsal surface of the centro-dorsal is simply flattened, but in the latter, especially the larger ones, it is concave, thus resembling the type.

In the Suez specimen the total number of armlets is twenty-seven; while those from Suakim have twenty-one, twenty-one, twenty-six, and thirty-three, respectively.

In the Suez specimen the second syzygy occurs at the seventeenth to the nineteenth joint, and others follow at intervals of eight to nine joints. In several of the arms of the specimens from Suakim, syzygies occur at the eighth and twelfth joints, and in several of the arms of the larger specimens the second syzygy is at the twentieth.

Colour in life, as noted by Mr. Crossland,—Suakim specimens: (a) purple and yellowish white; (b) brown and white; (c) light brown and white; (d) a uniform deep brown; Suez specimen, predominantly yellow. This last specimen had a brown commensal Polynoid living upon it. When taken from the water the tegmen and viscera were detached spontaneously.

*Distribution*.—Bay of Amboina, Tonga Islands, Batjan, Hongkong, New Guinea (*Hartlaub*), Red Sea.

\* A more precise description of these specimens is not possible owing to their imperfect condition.

*ANTEDON PALMATA (Müller).*

This species has been long known from the Red Sea, Müller's original description being based upon specimens from that locality and from Ceylon. The specimens in Mr. Crossland's collection were obtained from the coral-reef of Misharif Island, Khor Dongola, and from between tide-marks at Suez, the collector at the latter place being C. Gordon Logan, Esq.

In the specimens from Misharif Island the ossicles of the calyx and the proximal brachials are of a dirty-white colour in spirit, and the armlets are alternately and broadly banded with the same colour and dark brownish grey. The dorsal and ventral faces of the cirri show the same contrast of colour. The single specimen from Suez is of a uniform purplish black.

*Distribution.*—Red Sea, Ceylon.

*ANTEDON SAVIGNYI (Müller).*

In two examples of this species obtained from a depth of 4 fathoms in Suez Bay the number of armlets is thirteen.

In both specimens the third and eighth brachial joints are syzygies, and others follow at irregular intervals of four to thirteen joints.

Colour in spirit: purple, with purplish-white cirri and almost white pinnules.

A single specimen obtained from a muddy bottom at a depth of 9 fathoms at Ul Shubuk was, when living, "whitish, with a violet tinge, and with patches of darker colour and of yellow." From it were taken "fifteen Ophiurids which lived with their arms twisted round those of the Antedon. The colour of these on the whole resembled that of their host."

This specimen has twenty armlets, each facet of the five primibrachial axillaries bearing a series of four secundibrachs, the fourth of which forms the axillary. The position of the second syzygy varies between the sixteenth and twentieth joints, and others follow at intervals of ten to twelve joints.

Of two specimens obtained from a depth of 10 to 12 fathoms at Khor Shinab, one when living was brown and white, the other purple and white. One has fourteen armlets and the other eighteen, some of the arms dividing once only. The second syzygy is in some cases at the fourteenth joint, but usually varies in position between the seventeenth to the nineteenth, and others follow at intervals of seven to nine joints.

A single specimen with twenty armlets was found living amongst coral at the anchorage at Salaka. Like one of those from Khor Shinab, its colour was brown and white.

*Distribution.*—Red Sea, Ceylon.