

AUTHOR'S COPIES—REPRINTED FROM PART II.

REPORT
TO THE GOVERNMENT OF CEYLON
ON THE
PEARL OYSTER FISHERIES
OF THE
GULF OF MANAAR,



BY

W. A. HERDMAN, D.Sc., F.R.S., P.L.S.,
Professor of Natural History in the University of Liverpool.

PUBLISHED BY THE ROYAL SOCIETY, 1904.



SUPPLEMENTARY REPORT X.

ON THE ECHINODERMA.

BY

W. A. HERDMAN, D.Sc., F.R.S., AND JANE B. HERDMAN, B.Sc. (LOND.),

WITH NOTES AND ADDITIONS

BY

F. JEFFREY BELL, M.A.,
EMERITUS PROFESSOR AND FELLOW OF KING'S COLLEGE, LONDON.

[WITH TEXT-FIGURES.]

Z. 5.
~~592.9~~ 9p. 1

Z. 5. 9p. 1

REPORT

ON THE

ECHINODERMA

COLLECTED BY

PROFESSOR HERDMAN, AT CEYLON, IN 1902.

BY

W. A. HERDMAN, D.Sc., F.R.S., AND JANE B. HERDMAN, B.Sc. (LOND.),

WITH NOTES AND ADDITIONS

BY

F. JEFFREY BELL, M.A.,

EMERITUS PROFESSOR AND FELLOW OF KING'S COLLEGE, LONDON.

[WITH TEXT-FIGURES.]

[EDITORIAL NOTE.—The HOLOTHURIOIDEA of this collection were described in Mr. PEARSON'S Report published in PART I. (p. 181, 1903), and the CRINOIDEA are reported upon separately by Mr. CHADWICK in this Part (see p. 151, below).

The greater part of the labour in connection with the remaining groups of Echinoderma has been undertaken by my wife, who separated out most of the species and identified the Echinoidea. I should naturally have let her name stand alone in the title of the Report, but as I took some part in the work, exercised a general supervision and identified the commoner starfishes, she prefers that I should be jointly responsible.

Professor JEFFREY BELL, while on a short visit to us in September, kindly went over the greater part of the collection with me and confirmed the identifications. Most of the Ophiuroids and some of the smaller or more doubtful Echinoids and Asteroids were, at his suggestion, sent to him at the British Museum, with the result that he has contributed some additions to our list, and the interesting Notes on some forms and remarks on the more general aspects of the collection, which will be found under his own name at p. 148.—W. A. H.]

T



ECHINODERMA.

In the year 1882, we are told by BELL, only 4 species of Echinoderms were known from Ceylon. HAECKEL'S collection, described by WALTER, added 16 species, but most of our knowledge is due to the successive collections made for the British Museum by Dr. ONDAATJE, which enabled BELL to add about 20 species in 1882 and to raise the number to over 50 in 1887. The collection of P. and F. SARASIN, made at Trincomalee in 1884-86, yielded to DÖDERLEIN 16 species of Asteroids, 10 Ophiuroids, and 18 Echinoids. Adding these, along with 16 Holothurians (LUDWIG) and 5 Crinoids (BELL), to the forms previously known raised the total in 1888 to about 90 species. A few species have since been added by THURSTON and others.

There seem to be about 109 species of Ceylon Echinoderms in all in the present collection. Mr. PEARSON recorded 30 species of Holothurioidea, and Mr. CHADWICK gives 13 species of Crinoidea in the Report that follows this. In the present lists we have 28 species of Echinoidea, 24 species of Asteroidea, and about 14 species of Ophiuroidea. There were no forms unknown to science in the three last-named groups, but some of the species are of interest from the point of view of distribution, habitat and variation.

ECHINOIDEA.

DESMOSTICHA.

CIDARIDÆ.

Cidaris metularia (LAMK.).

Station XL., 10 miles off Galle, 34 fathoms, 2 specimens, about 1 centim. diameter; Station LV., south-west of Periya Paar, 11 to 24 fathoms, 2 specimens, 1 centim. and 1.5 centim. diameter; Station LXIII., west of Periya Paar, 36 fathoms, 1 specimen, about 1 centim. diameter.

Stephanocidaris bispinosa (LAMK.).

Pearl banks, Gulf of Manaar; 4 specimens. Also another "very young *Cidaris*."

Phyllacanthus baculosa (LAMK.).

Many specimens were dredged from 10 to 12 miles off Galle, at Stations XL. and XLI., depths 34 to 100 fathoms. Also further on up the west coast of Ceylon, towards Colombo, and off Kaltura and Mount Lavinia, at Station XLVI., depth 25 to 30 fathoms. Also in the Gulf of Manaar, at Station LIV., south of Adam's Bridge, 4 to 40 fathoms; at Station LV., south-west of Periya Paar, 11 to 24 fathoms; at

Station LX., outside Donnan's Paar, 20 to 30 fathoms, and from Cheval Paar, 7 fathoms, obtained by the divers. The diameters of the specimens, without the spines, ranged from 1 centim. to 4.5 centims.

Phyllacanthus imperialis (LAMK.).

One specimen from the Gulf of Manaar, at Station LVII., outside Dutch Modragam Paar, 12 to 36 fathoms; it measures about 2 inches in diameter, without the spines, and about 6 inches including them.

DIADEMATIDÆ.

Diadema saxatile (LINN.).

One small specimen was obtained at Station XL., 10 miles off Galle, depth 34 fathoms. This specimen has long spines on the upper surface, banded straw-coloured and red.

Echinothrix diadema (LINN.).

Obtained at Station XL., 10 miles off Galle, depth 34 fathoms.

ECHINOMETRIDÆ.

Stomopneustes variolaris (LAMK.).

Many specimens were found at the south-eastern corner of Welligam Bay, south end of Ceylon, in hollows in rock pools and also under the sea, in cavities and crevices of the rock. They were of a very deep purple colour when alive, but are now, both the dried and the spirit specimens, of a greenish-black colour. This species was also observed in the lagoon inside the reef at Galle.

Pseudoboletia maculata, TROSCH.

One specimen, diameter about 6.5 centims., was obtained from the Cheval Paar, 7 fathoms, by native diver.

Echinostrephus molare (DE BL.).

This little species was obtained in coral blocks in the Gulf of Manaar, at Station XV., on Periya Paar, 9 fathoms, 2 specimens; at Station LXII., between Periya Paar Kerrai and Periya Paar, depth 7 fathoms to 13 fathoms, 2 specimens, 1.5 centims. and 2 centims. in diameter; and on the Jokkenpiddai Paar, obtained by native divers, many specimens, 1 centim. to 1.5 centims. in diameter.

All the specimens of this little purple Echinid were dug out of deep holes in massive blocks of dead coral; and the top-shaped or obovate form of the test, with all the long spines on the abactinal surface, seems well adapted to the burrowing habit. It was noticed on the living specimen that the shorter spines on the actinal surface around the mouth are arranged so as to show a spiral twist such as would be produced by a rotation of the animal within its burrow.

TEMNOPLEURIDÆ.

Temnopleurus toreumaticus (LESKE).

A number of small Temnopleurids, which probably belong to this species, were obtained (1) south of Galle, in deep water, and (2) at Station LXIII., west of Periya Paar, 36 fathoms, 9 specimens, of 1.5 centims. to 2 centims. diameter.

Temnopleurus, sp. ?

Some small cream-coloured Temnopleurids were obtained from Station XV., on Periya Paar, 9 fathoms; 10 miles off Galle, in deep water; on the Cheval Paar (off Aripu), 7 fathoms; and at Station L., west of Negombo, 12 fathoms to 20 fathoms.

Salmacis bicolor, AGASS.

This species was obtained (1) off Galle, Station XXXIX., depth 16 fathoms to 30 fathoms; (2) south-west of Periya Paar, Station LV., depth 11 fathoms to 24 fathoms; (3) at various localities on Cheval Paar and other pearl banks off Aripu, depth 6 fathoms to 7 fathoms; and (4) at Station XVIII., in Palk Bay, 7 fathoms.

The specimens range from 1 centim. to 6.5 centims in diameter.

Salmacis dussumieri, AGASS.

This species was obtained (1) at Station II., north-west of Negombo, 8 fathoms, 12 specimens, from 2 centims. to 4 centims. in diameter; (2) at Station XLVIII., between East and West Cheval Paars, depth 7 fathoms, many specimens, ranging from 0.5 centim. to 2.5 centims. in diameter; (3) at Station LXIII., west of Periya Paar, 36 fathoms; and at several other places on the pearl banks.

Salmacis sulcata, AGASS.

Specimens were obtained (1) at Station L., off Negombo, 12 fathoms to 20 fathoms, 3 specimens, 1.5 centims. to 2.5 centims. in diameter; (2) at Station XLVIII., on the Cheval Paar; and at other localities amongst the pearl banks off Aripu, depths 6 fathoms to 8 fathoms, many specimens, ranging from 1 centim. to 4 centims. in diameter.

TRIPLECHINIDÆ.

Toxopneustes pileolus (LAMK.).

Three specimens were dredged in the Gulf of Manaar, from Station LV., south-west of Periya Paar, 11 fathoms to 24 fathoms; on North-west Cheval Paar, 8 fathoms; and again on Cheval Paar, 7 fathoms. They range in diameter from 7.5 centims. to 10 centims.

Most of the pedicellariæ of this species are very remarkable and striking, both in size and colour, when seen alive. They show the three valves connected by a large discoid membranous extension, which is of a beautiful deep-red colour edged by a

band of snowy white. In the preserved specimens the membrane is now contracted to a triangular peltate form, but the white band is still visible.

CLYPEASTRIDA.

EUCLYPEASTRIDÆ.

Fibularia australis, DESML. (?).

Many specimens, ranging from 6 millims. to 10 millims. in length, were dredged outside Dutch Modragam Paar, at Station LVII., 11 to 36 fathoms; and two specimens, 8 millims. and 12 millims. in length, were obtained in deep water outside Galle. These specimens have many more than 4 pairs of pores on the petals—generally 12 to 15 pairs are present.

ECHINANTHIDÆ.

Clypeaster humilis (LESKE) = *C. rosaceus*, LINN., *vide* LOVÉN.

Dredged all round the coast of Ceylon, at Stations I., II., IV., IX., XI., XII., XIV., XXXVIII., XLIV., XLVI., XLVIII., XLIX., LI., LIII., LVII., LXIX. The specimens ranged from 1 centim. to 15 centims. in length.

This species seems commonest in depths of 8 to 10 fathoms on the pearl banks in the Gulf of Manaar.

Clypeaster scutiformis (GMEL.).

Two specimens, about 50 millims. and 40 millims. in length, were dredged to the west of the Periya Paar, at Station LXIII., 17 to 55 fathoms.

Two specimens, about 30 millims. long, were dredged in deep water 10 miles off Galle, at Station XL., 34 fathoms, and 6 miles west of Kaltura, depth 22 fathoms, at Station XLIII.

Echinanthus testudinarius (GRAY).

At Station III., off Chilaw, 9 to 14 fathoms; at Station XII., 12 miles south of Galle, about 100 fathoms; at Station XLIX., south of Cheval and Periya paars, about 12 fathoms.

Echinanthus, sp. ?

A young specimen which we cannot identify with certainty was dredged at Station LXVI., off Mutwal Island, 10 to 35 fathoms.

LAGANIDÆ.

Laganum depressum, LESS.

Many specimens, ranging in length from 1.8 centims. to 4 centims., were dredged all round the coast of Ceylon, at Stations II., XII., XXI., XLIII., XLVI., XLVIII., LIII., LVI., and LVII.

They were particularly abundant at Back Bay, Trincomalee, in 8 to 12 fathoms.

SCUTELLIDÆ.

Echinodiscus auritus, LESKE.

Dredged at many points on the west and south coasts of Ceylon, including Stations I., II., XI., XII., XIV., XXXIV., XXXVIII., XXXIX., XLIX., LI., LVI., LXII., and LXIX.

The specimens ranged from 1 centim. to 11 centims. in length.

PETALOSTICHA.

CASSIDULIDÆ.

Echinoneus cyclostomus, LESKE.

One specimen, about 1·8 centims. in length, was dredged to the west of Periya Paar, at Station LXIII.; depth, 17 to 55 fathoms.

Echinolampas oviformis (GMEL.).

Dredged on the pearl banks, Gulf of Manaar, at Stations IV., XI., XLVIII., XLIX., LV., and LXIII.

The specimens ranged in diameter from 2 centims. to 10 centims.

SPATANGIDÆ.

Maretia planulata (LAMK.).

A few specimens, from 2 centims. to 3·5 centims. in length, were dredged in the Gulf of Manaar, at Station IV., opposite Karkopani, 6 to 9 fathoms; Station XLIX., south of Cheval Paar, 12 fathoms; Station LV. and LXIII., west of Periya Paar, 11 to 36 fathoms.

Maretia alta, A. AGASS.

At Station XXXIII., south of Arugam Bay, east of Ceylon, 18 fathoms; off Galle; and south of Modragam.

Lovenia elongata (GRAY).

Several specimens were dredged between Colombo and Palk Strait, and also off Welligam and Galle, at Stations I., IV., XI., XXXIV., XXXIX., XL., XLIII., XLVIII., XLIX., LV., and LXIII., at depths of 2 to 40 fathoms. They range in length from 2 centims. to 6 centims.

LESKIIDÆ.

Schizaster gibberulus, AGASS.

One specimen (2·5 centims. in length) from Station LV., south-west of Periya Paar, 11 to 24 fathoms.

ASTEROIDEA.

ASTROPECTINIDÆ.

On the characters of the species of *Astropecten* see Professor BELL'S Notes (p. 148, below).

***Astropecten hemprichi*, M. and T.**

Stations I, IV., X., XIV., XX., XXVIII., XXXII., XXXIX., XLII., XLVII. and LIV., practically all round the island, at depths of 4 to 40 fathoms. It is especially abundant on some parts of the pearl banks.

***Astropecten euryacanthus*, LÜTKEN.**

Station XX., Back Bay, Trincomalee, 11 to 13 fathoms.

***Astropecten polyacanthus*, M. and T.**

Station XXVIII., Trincomalee, 7 to 14 fathoms; Station XXXVIII., off Galle, 9 to 22 fathoms; Station LX., outside Muttuvaratu Paar, 20 to 30 fathoms; Station XLIII., west of Kaltura, 22 fathoms; and Station LXIII., west of Periya Paar, 36 fathoms.

***Astropecten indicus*, DÖDERLEIN.**

Off Galle. Also Station XXXIV., off Welligam, at south end of Ceylon, 7 fathoms.

***Astropecten zebra*, SLADEN.**

Trincomalee. (See Professor BELL'S Notes, p. 149, below.)

***Luidia maculata*, M. and T.**

Abundant all round Ceylon, and especially in the shallow water of the pearl banks in the Gulf of Manaar, where we obtained specimens of all sizes from a couple of centimetres up to well over a foot across.

***Luidia hardwickii* (GRAY).**

Pearl banks, Gulf of Manaar. Professor BELL reports that "from the same locality there is a very interesting young specimen which belongs either to some undescribed species, or is, as is quite likely, the armed young of an unarmed adult, for it is provided with spines on the surface of its rays."

PENTAGONASTERIDÆ.

***Stellaster incei* (GRAY).**

Stations XX. and XXI., Trincomalee, many; between Colombo and Palk Strait;

off Galle, 16 to 20 fathoms; 12 miles south of Galle, 100 fathoms; Station XLIV., off Kaltura, 30 fathoms; Station LIV., south of Adam's Bridge, 4 to 40 fathoms.

Young Stellasters from Station XLIII., west of Kaltura, 22 fathoms; from Back Bay, Trincomalee, and from other localities, are in the collection.

ANTHENEIDÆ.

Anthenea sp?

In the lagoon of the reef at Galle.

Goniodiscus, sp. (?)

Professor BELL adds "? young *Goniodiscus*," from locality (?) in Gulf of Manaar.

FAMILY: PENTACEROTIDÆ.

Pentaceros lincki, DE BL.

From lagoon inside reef, Galle. Common on the pearl banks in the Gulf of Manaar, and of importance as an enemy of the pearl oyster (see figure on p. 147).

Pentaceros mammillatus (M. and T.).

West of Periya Paar; at Station LXIV., south-east of Modragam Paar, 5 fathoms.

Pentaceros nodosus (GRAY).

Station III., off Chilaw, 12 fathoms; Station XLII., off Barberyn, 40 fathoms; Station LIV., south of Adam's Bridge, 4 to 40 fathoms; Station LXIV., south-east of Modragam Paar, 5 fathoms.

Pentaceros, sp. (young).

Station XLIII., west of Kaltura, 22 fathoms.

Culcita schmideliana (RETZ.).

Station LIX., Muttuvaratu Paar, 8 fathoms; and Station LX., outside Muttuvaratu Paar, 20 to 30 fathoms.

This cushion-like starfish is almost circular in outline when alive, but shows on the oral surface a bright orange-coloured pentagon closely papillated and with the ambulacral grooves running as narrow red lines out to the angles. On the aboral surface there are short red spines on the well-marked lobed areas, while the surface between has a fine fluffy or velvet-like appearance. The larger specimen measures 19 centims. in diameter and 10 centims. in height, and is much less spiny on the aboral surface than the smaller specimen, which is about 14 centims. in diameter and 8 centims. in height. The animal when alive has a much more globular form than have preserved specimens.

ASTERINIDÆ.

Asterina cepheus (M. & T.).

Station LXVI., off Mutwal Island, 10 to 35 fathoms; off Galle, in deep water; on Navakaddu Paar, April 2nd, 1902; Station IV., off Karkopani, 6 to 9 fathoms; Station XLI., 12 miles south of Galle, 100 fathoms.

LINCKIIDÆ.

Ophidiaster cylindricus (LAMK.).

Station XXXVIII., outside Watering Point, Galle, 9 to 22 fathoms.

Ophidiaster helicostichus (SLADEN).

What may be the young of this little-known species was taken south of Galle, in deep water.

Linckia multiforis (LAMK.).

Specimens (including "comet forms") were obtained from Back Bay, Trincomalee; also at Station XXIII., 6 fathoms.

Linckia lævigata (GMEL.).

On the pearl banks in the Gulf of Manaar; and at Station XIV., west of Cheval Paar, 8 fathoms.

Linckia pacifica, var. *diplax* (teste SLADEN).

Muttuvaratu Paar, Gulf of Manaar.

Nardoa tuberculata, GRAY.

From lagoon inside the reef, Galle; and at Station LX., outside Muttuvaratu Paar, 20 to 30 fathoms.

Metrodira subulata (GRAY).

Station XLIII., west of Kaltura, 22 fathoms.

PTERASTERIDÆ.

Retaster cribrosus, v. MART.

At Station XLII., between Galle and Barbeyrn, 40 fathoms, one specimen (see Professor BELL's Notes, below).

ECHINASTERIDÆ.

Echinaster purpureus (GRAY).

Station LXIV., south-east of Modragam Paar, 5 fathoms; Station VI., Muttuvaratu Paar, 6 to 9 fathoms; Station XIV., west of Cheval Paar, 8 fathoms; and other localities on the pearl banks, Gulf of Manaar.

OPHIUROIDEA.

Pectinura gorgonia (M. and T.).

Gulf of Manaar, pearl banks; Station LXIII., west of Periya Paar, 36 fathoms; Station X., off East Cheval Paar, 6 fathoms.

Both adult and young stages were found in abundance on the pearl banks.

Pectinura intermedia, BELL.

Gulf of Manaar, pearl banks; Station I., off Negombo, 12 to 20 fathoms.

Ophiura, sp.

From the Cheval Paar. This is not *O. kinbergi*, which is known from this neighbourhood.

Amphiura, sp.

At Station LIII., 10 miles north of Cheval Paar, 9 fathoms; Station XLVII., south of Cheval Paar, 9 fathoms; also off the south-east coast of Ceylon (see Professor BELL's Notes below, p. 149).

Ophionereis, ? sp.

Young forms from the Cheval Paar, 6 to 8 fathoms.

Ophiocnemis marmorata (LAMK.).

Trincomalee, various localities, February, 1902; Gulf of Manaar, March, 1902; Station VI., Muttuvaratu Paar, 6 to 9 fathoms; Station XVII., west of Periya Paar, 11 fathoms; Station XX., Back Bay, Trincomalee, 11 to 13 fathoms.

Ophiocoma scolopendrina, AGASS.

Station LX., outside Muttuvaratu Paar, 20 to 30 fathoms.

Ophiarachna incrassata, M. and T.

Very young specimens, probably of this species, were dredged in deep water off Galle.

Ophiothrix, spp. (? *O. aspidota*, *O. nereidina*, and others).

Station XLVI., off Mount Lavinia, 25 to 30 fathoms; Station LXIII., west of Periya Paar, 36 fathoms; off Galle, deep water, up to 100 fathoms; Station XLV., off Pantura, 25 fathoms; on Jokkenpiddai Paar, April 3rd, 1902; on Aripu Reef, shallow water.

Three "species" from Cheval Paar, from Trincomalee, and from Gulf of Manaar (see Professor BELL's Notes below, p. 150).

Ophiomaza cacaotica, LYM.

Gulf of Manaar, pearl banks; Station XV., on Periya Paar, 9 fathoms.

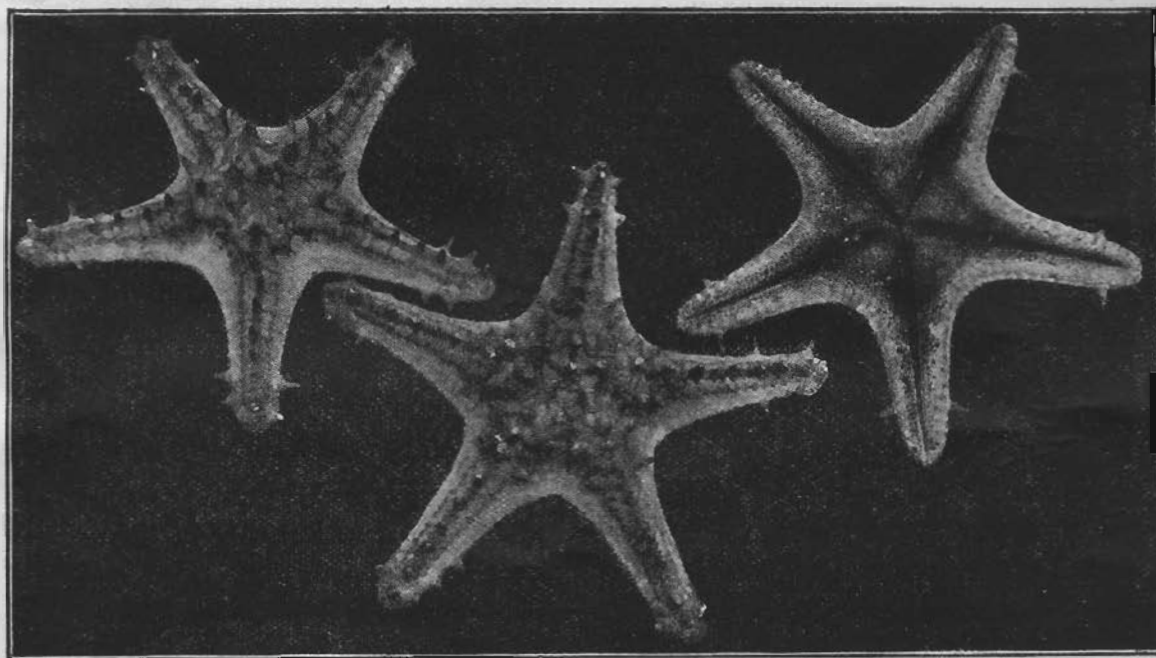
Ophiopteron elegans, LUDWIG.

Station LXIII., west of Periya Paar, 17 to 55 fathoms.

Ophiomyxa, ? sp.

Young specimens from deep water off Galle and from Trincomalee.

There are probably other species of Ophiuroids in the collection. A number of the smaller—possibly immature and in some cases imperfect—specimens remain unnamed. Professor BELL's remarks below refer to some of these.



Specimens of *Pentaceros lincki*, DE BL., from the Gulf of Manaar.

SOME NOTES ON THE ABOVE-NAMED COLLECTION OF ECHINODERMS.

BY

F. JEFFREY BELL, M.A.,

EMERITUS PROFESSOR AND FELLOW OF KING'S COLLEGE, LONDON.

I had the advantage of going through the eleutherozoic actinogonidiate Echinoderms with Professor HERDMAN himself, and he has included my determinations in the above list. The more difficult specimens I brought to London for determination in the National Collection, and on these, and on some general aspects of the subject, I take leave to say a few words.

(1.) The collection contains a large number of specimens of common Indo-Pacific Echinoderms and a goodly store of young forms; these it is most necessary to keep with their generic allies; the determination of their *species* is quite a trivial matter as compared with the importance of obtaining a rich and extensive series of stages, showing the variations due to increase in size, and also the numerous individual variations which wide-spread species of Echinoderms always exhibit.

(2.) The absence of some of the species which at present we are inclined to associate with Ceylon, such as *Asthenosoma urens*, *Fromia tumida*, *Ophiothela holdsworthi*, is to be deplored, but the general character of the collection leads us to suppose that these species are local even in Ceylon; the presence of *Ophiopteron elegans*, which Mr. STANLEY GARDINER obtained in his expedition to the Laccadives, confirms me in my view that this species is widely distributed in the tropical waters of the Indian Ocean.

(3.) On one important matter I have at last some hope that we are on the way to a solution. In 1887 the late P. M. DUNCAN* observed "One of the commonest species of the Ophiurida is a form which is usually found without a top to the disk," but the fact, apart from the difficulty it produced as to naming the genus, did not appear to him to be of any interest.

In 1888† I somewhat pointedly drew attention to the same phenomenon, and I ventured to remark, "Naturalists who have the opportunity of observing this long-armed form in life should direct particular attention to this loss of the disk, with a view to answering such questions as to whether the loss is in any way associated with the act of reproduction, whether the disk becomes restored, and, if so, whether the restoration is effected rapidly."

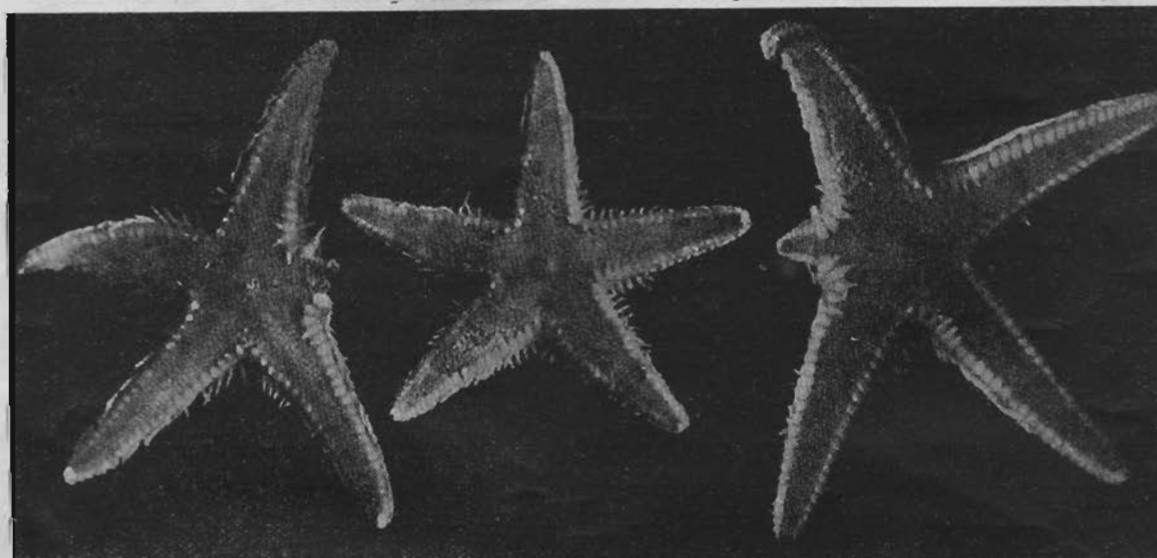
* 'Journ. Linn. Soc. Zool.,' vol. XXI., p. 90.

† 'Ann. and Mag. Nat. Hist.,' p. 368.

Dr. SLUITER* has since put on record his regret that he did not become acquainted with my note, when he still had under his eyes Ophiuroids that were living in his aquaria without the dorsal covering to their disks. The phenomenon seems to be pretty common, and there are a number of interesting biological problems associated with it which should attract naturalists in tropical and subtropical seas.

After some search I lit on a long-armed Ophiuroid with the upper surface of the disk intact; it was soon easy to see that this was not the *Ophiocnida imbricata* in which Dr. SLUITER had noticed the phenomenon, and I was inclined to ascribe it to *Amphiura divaricata*, but the arms of that species, as described by LJUNGMAN, are much shorter. It appears to be a true, but unnamed, Amphiuran.

(4.) I beg once more to offer an example of the variability of Echinoderms, and to call attention to the mode of distribution of the spicules on the superomarginal plates of *Astropecten hemprichi*; the three figures here shown are taken from the three



specimens found in the bottle to which the late Mr. SLADEN affixed the name of *Astropecten zebra*. In the "Challenger" Report *A. zebra* occupies the following position in the author's "key":—

- (A.) With small spinelet, on the first four or five plates.
 - (a.) With four or five spinelets. A well-developed series of pseudo-pedicellariæ *zebra*.
 - (b.) With one spine only on the first plate. No pedicellariæ . . . *velitaris*.

Inspection of my photographs will show how little constant is the number of spinelets, and the uselessness of the character as an aid to specific distinction.

* 'Tijds Nederl. Dierk. Ver.,' v. (1898), p. 306.

A. zebra should, I think, be united with *A. hemprichi*.* Perhaps, also, SLADEN'S *A. notograptus* is another synonym.†

(5.) The evidence in favour of the great variability of Echinoderms is now overwhelming, and new species should only be made on the most solid grounds. The condition into which the genus *Ophiothrix* has been allowed to fall by the uncritical establishment of a multitude of species is such that I had to tell Professor HERDMAN that I could not undertake the determination of the numerous forms in his collection that appear to the cabinet naturalist to be very different, but which, if we may argue from what we know of the genus in our own seas, would be all brought up by one haul of the dredge. A critical revision of the described species of *Ophiothrix* by a naturalist of unlimited leisure would be a boon to the systematist; the uncritical addition to our list of forms "which appear to be distinct" is of no service whatever to science.

(6.) As in all carefully prepared collections, there are a number of small Ophiuroids, many more or less broken; I have referred all I can to their genus, and have sometimes made suggestions as to their species.

(7.) A small specimen of *Retaster*, from deep water off Galle, is not unlike a young example which BEDFORD has placed in the same bottle as an adult *R. cribrosus*; this species is already recorded from Ceylon. With *R. cribrosus*, BEDFORD associates *R. insignis* of SLADEN. The chorology of this species is given by its author as including "Port Jackson (*vide* BELL)." The punctuation of the sentence is faulty, but I do not delay over that, as I have to point out that I think the locality, "Port Jackson," is an error. The statement is made in a paper of mine in vol. 9 of the 'Proceedings of the Linnean Society of New South Wales,' the proofs of which were never seen by me, and which teems with misprints; *Retaster* itself is misprinted. In the British Museum there is no specimen of the species from so far south as Port Jackson, and in the report of the "Alert" collections, written while the collections of the Australian Museum were in my hands, I record specimens from Port Molle and Thursday Island (p. 134), while on p. 173 I cite the species as one limited to "inter-tropical Australia."

* I have taken the opportunity of examining the "types" of *A. velularis*; they are all immature, and are, perhaps, not members of the same species.

† Describers of young Star-fishes should have their memoirs placed in some scientific Index Expurgatorius; they take no trouble, and give much.