GOVERNMENT CENTRAL MUSEUM, MADRAS.

Science Series No. 1.

PRELIMINARY REPORT

ON THE

MARINE FAUNA OF RÁMÉSWARAM,

AND THE NEIGHBOURING ISLANDS.

BY

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LIST OF PLATES.

PLATE I.

Fig 1

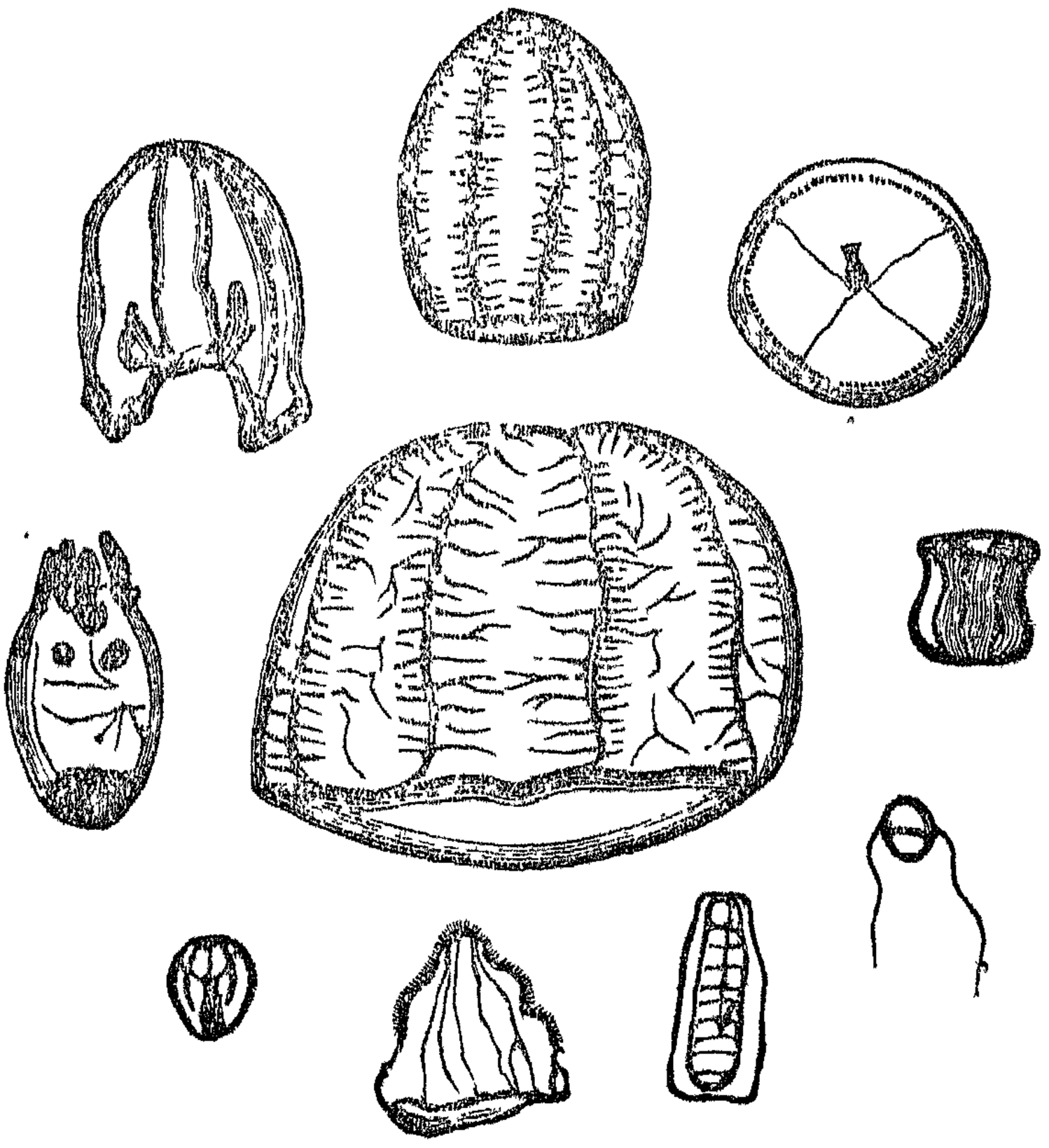

Fig 2

PRELIMINARY REPORT

ON THE

MARINE FAUNA OF RÁMEṢWARAM AND THE NEIGHBOURING ISLANDS.

Introductory.

The Island of Rámeswaram, best known on account of its temple and as being the last place visited by Hindus in their pilgrimage, is connected to the mainland of the Madras Presidency on the one hand and the Island of Manaar on the other by an interrupted ridge of rocks known as Adam's Bridge, concerning which Davy says,[1] writing in 1821: "No one who looks at a map, and sees the little distance between the nearest points of the island (Ceylon) and continent, and how, by the chain of rocks and sand banks commonly called Adam's Bridge, they are still imperfectly connected, can entertain much doubt that the connection was once perfect. This inquiry is rather curious than useful. It would be much more useful to endeavour to complete that which nature has begun and to make the channel, which is now obstructed and dangerous, clear and safe, and fit for the purposes of coast navigation. If, on examination, sandstone and coral rock should be found constituting part of Adam's Bridge, instead of primitive rock, one necessary inference is that the channel, at whatever period formed, was once deeper and more open than it is at present, and another inference is, that in process of time it will be closed up, and Ceylon again joined to the continent."

Coins of the Zamíndárs of Rámnád and Sivaganga are still extant in Southern India, bearing the legend *Sétu* (pl. 1, fig. 1) which indicates the title of Setupati, or Lord of the Bridge, which, "though claiming a high antiquity, appears to have been conferred or restored on the zamíndár by.

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[1] Travels in Ceylon, 1821, pp. 78-9.

Muttu Krishnappa Náyak, the father of Tirumala Náyak of Madura, about A.D. 1605 "[1]

In the present report I purpose making some general remarks on, and giving, so far as is possible, a detailed account of specimens collected during a residence of three weeks on Ráméswaram Island in the months of August and September 1886, which, owing to the general calmness of the water, were very favourable for diving, by which means the majority of the specimens were obtained.

In the absence of "type specimens" for reference a complete report is at present impossible, and can only be made at some future time from comparison of the specimens collected by myself with those which are contained in European or other museums, and from reports which I may receive from specialists, to whom I have sent various groups for investigation.

Surface dredging.

The difficulties which attend the labours of a zoologist beneath a tropical sun are well described by Ernest Haeckel in his "Visit to Ceylon,"[2] wherein he says (pp. 215–16), speaking of surface dredging with a gauze net:—

"The wealth of varieties of marine creatures to be found in the Bay of Belligam was evident even on my first expedition. The glass vessels into which I turned the floating inhabitants of the ocean out of the gauze net were quite full in a few hours. Elegant *Medusæ* and beautiful *Siphonophora* were swimming among thousands of little crabs and *Salpæ*, numbers of larvæ of Mollusca were rushing about, mingled with fluttering *Hyaleadæ* and other Pteropoda, while swarms of the larvæ of worms, crustacea and corals fell a helpless prey to greedy *Sagittæ*. Almost all the creatures are colourless, and as perfectly transparent as the sea-water in which they carry on their hard struggle for existence, which indeed, on the Darwinian principle of selection, has given rise to the transparency of these pelagic creatures. But I soon discovered to my grief that within a very short time after being captured, at most half an hour and often not more than a quarter, most of the fragile creatures died; their hyaline bodies grew opaque, and even before we could reach the land I perceived the characteristic odour exhaled by the soft and rapidly decomposing bodies."

Professor Haeckel's experience is unfortunately not an uncommon one, and while staying at Paumben, I frequently had the mortification of finding on my return to my improvised laboratory at the rajah's bungalow, instead of a host

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[1] Sir W. Elliot. Numismat. Orient. Coins of Southern India, 1885, p. 134.
[2] Transl. by Clara Bell; Kegan Paul, Trench & Co., 1883.

PLATE II.

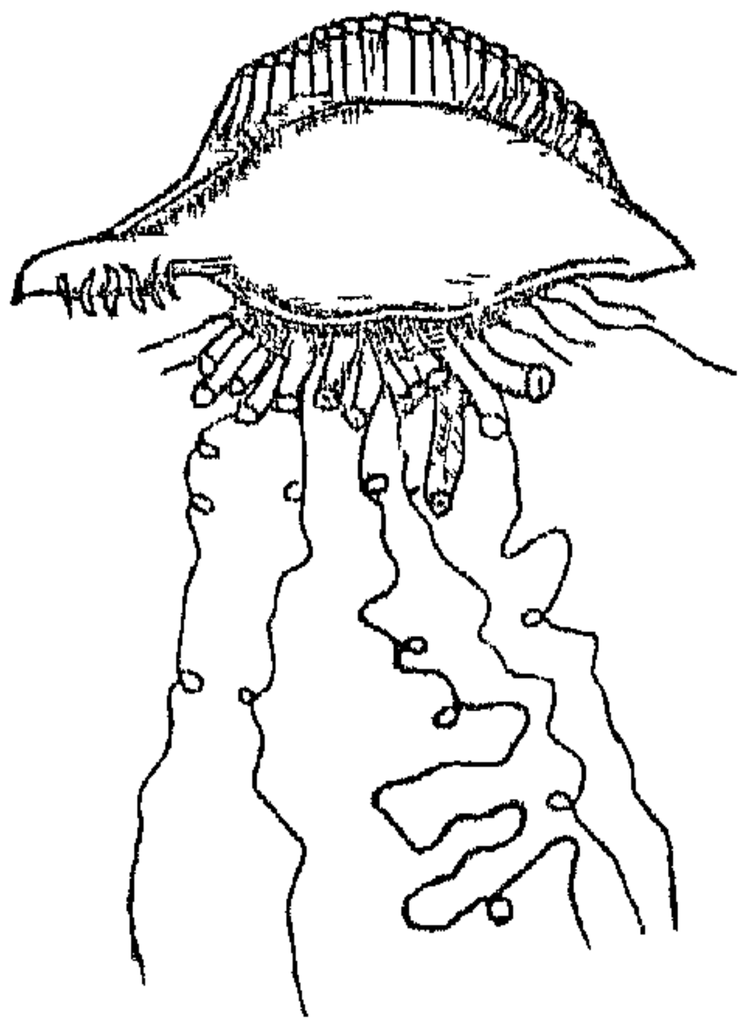


Fig 1

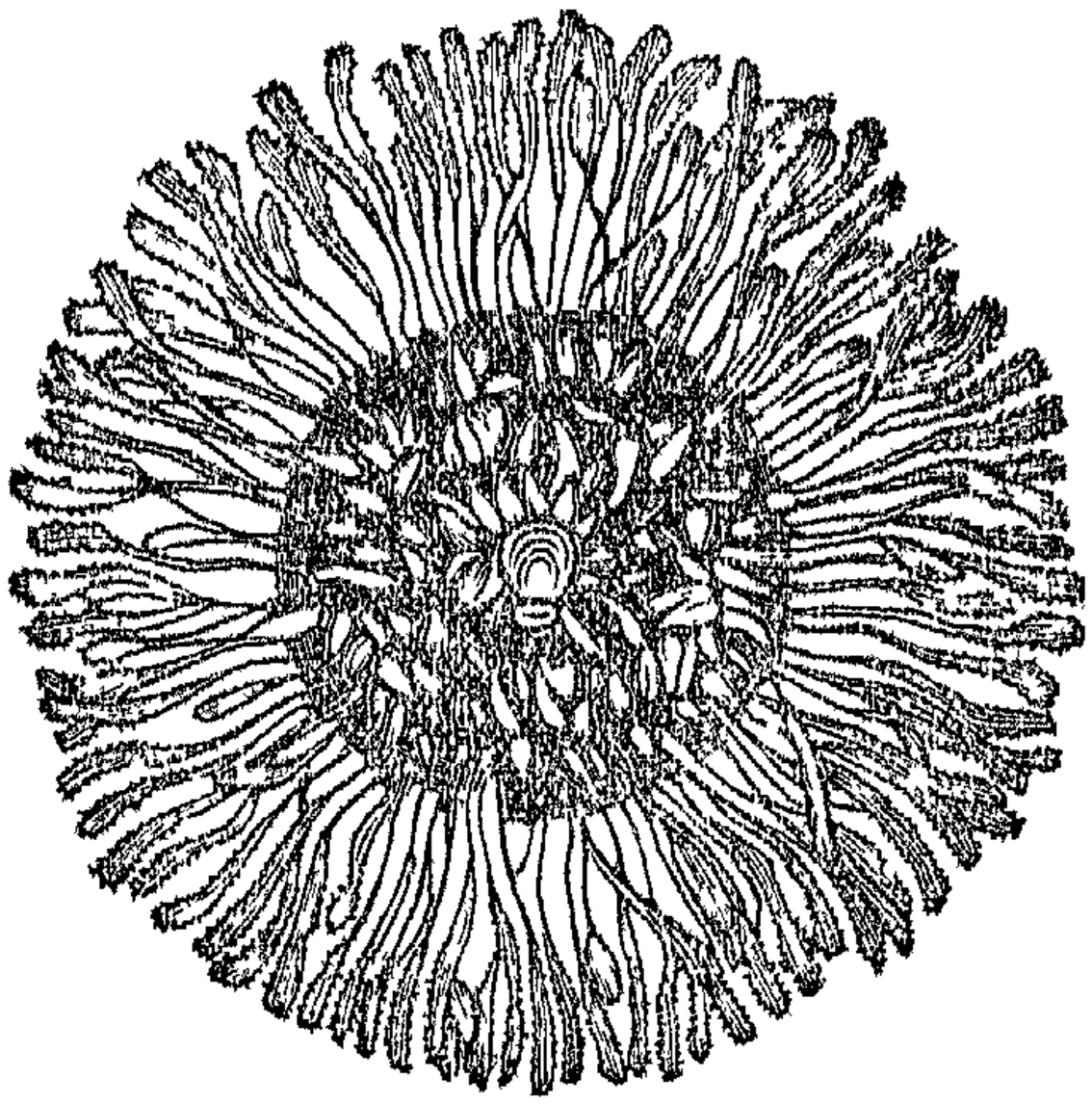


Fig 2.

of living creatures ready for microscopial examination, an amorphous powdery mass, consisting of their decomposing corpses, which had sunk to the bottom of my collecting glasses It is in fact essential for the preservation of many of the delicate gelatinous surface organisms that they should, in this country, in the absence of any apparatus by which they can be supplied with a constant current of cool water, be at once treated with the necessary fixing and preservative reagents, but the management of the requisite processes which have to be carried out is by no means an easy matter in the limited space afforded by a katamaran or "dug-out."

The suggestion made by Professor Haeckel, that the death and decomposition of the delicate organisms might be prevented by placing them in vessels cooled by ice, is undoubtedly an excellent one, but unfortunately ice cannot as a rule be procured when one most requires it.

Among the "pelagic" organisms (pl. I, fig. 2) which I collected off the coast of Rámeswaram Island may be mentioned various *Medusæ*, *Cydippe*, *Beroe*, *Bolina*, of which the latter was present one morning for a few hours in such enormous numbers that the net, when dragged along the surface of the water, became instantly filled with a thick jelly; *Pluteus* larvæ, various *Copepoda*, crab *Zoœæ*, *Styliola aciculа*, a pteropod mollusc plying its ciliated wings on the surface of the water in the early morning and towards sunset, young *Cephalopoda* (of which the adults, as well as a burrowing *Annelid*, are extensively used by the local fishermen as bait), *Sagitta*, *Salpæ*, fish larvæ, &c.

Siphonophora.

Floating on the surface of the water and conspicuous by their rich colouring were various *Siphonophora*: *Physalia*, the Portuguese man-of-war (pl. II, fig. 1) which, in common with various Medusæ, coral polyps, &c.,[1] produces a stinging sensation as bad as

[1] Darwin says (Journal of Researches) that, while staying on Keeling Island, he was "a good deal surprised by finding two species of coral of the genus Millepora (*M Complanata* and *M Alcicornis*) possessed of the power of stinging Many marine animals seem to have this power of stinging, besides the Portuguese man-of-war, many jelly-fish, and the aplysia or sea slug of the Cape de Verd Islands, it is stated in the voyage of the *Astrolabe* that an actinia or sea-anemone, as well as a flexible coralline allied to Sertularia, both possess this means of offence or defence In the East Indian seas a stinging sea-weed is said to be found"

While staying recently at Tuticorin I was told that the sting of a species of Medusa which is met with there has been known to kill native fishermen who have been stung by it, and a case in which death occurred was cited as an authentic one The subject is one which is worthy of investigation.

that from a stinging nettle, *Velella* with its vertical crest raised above the surface and *Porpita* (pl. II, fig. 2), with its exquisitely marked cartilaginous disc, of which the latter occasionally visits the Madras harbour in vast numbers.

Paumben beach. Coral. Pumice.

Eastward of the lighthouse the beach was strewn, over a length of several miles, with great masses and broken fragments of coral lying free or blended with sand so as to form blocks of coral sandstone, and affording an index to the still submerged and living corals which fringe the shore. Scattered here and there were blocks of pumice, encrusted with *Chamæ*, *Serpulæ*, various *Polyzoa*, &c., dislodged in the first instance, in all probability, from the volcano of Krakatoa Island in the Straits of Sunda, by the great eruption of 1883, and drifted across the Indian Ocean.

Melobesian Nodules.

Washed on shore by the tide and brought up from the sea-bottom by the divers, whom I employed, were calcareous nodules, of which the largest was 6 inches in its long diameter, and which from detailed microscopical examination I find to be identical with those which were dredged up from the Gulf of Manaar in 65 fathoms and less, off the town of Negombo in Ceylon, and Tuticorin, respectively, by Captain W. H. Cawne Warren, and reported on by H. J. Carter, Esq., F.R.S.[1] "The specimens" says that authority, whose description I cannot do better than copy "consist of calcareous nodules of different sizes, which may be said to originate, in the first place, in the agglutination of a little sea-bottom by some organism into a transportable mass, which, increasing after the same manner as it is currented about, may finally attain almost unlimited dimensions. They are therefore compounded of all sorts of invertebrate animals, whose embryos, swimming about in every direction, find them, although still free and detached, of sufficient weight and solidity to offer a convenient position for development, and hence the number of species in and about them.

They vary in form and weight in proportion to the amount of loose or solid material in them, some being round, hollow, clathrous, others more solid, but much creviced, and some almost entirely solid; while they may be more or less rugged on the surface from the nature of the organisms of

[1] Ann. and Mag. Nat. Hist., No. 30, June 1880.

PLATE III.

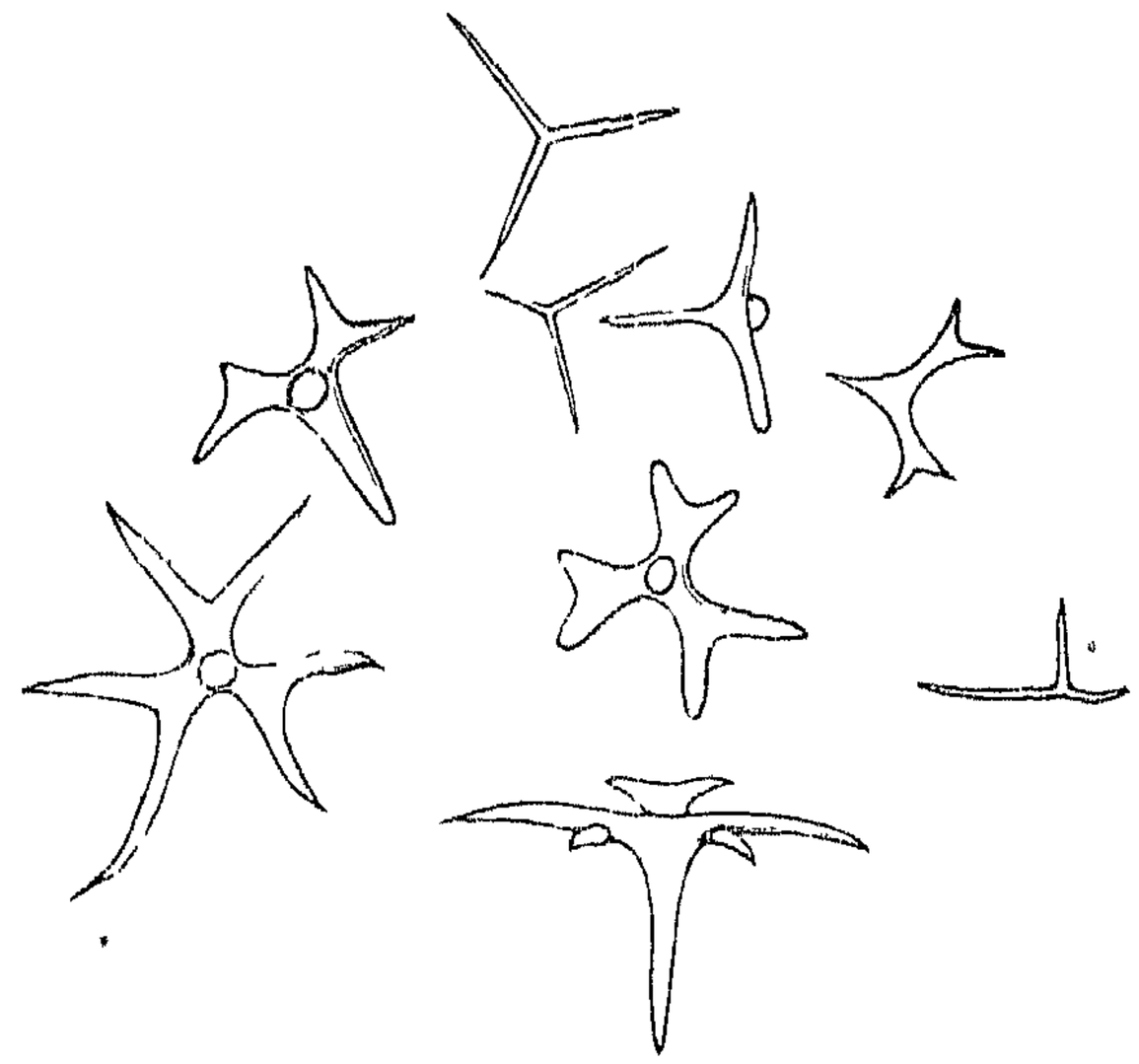
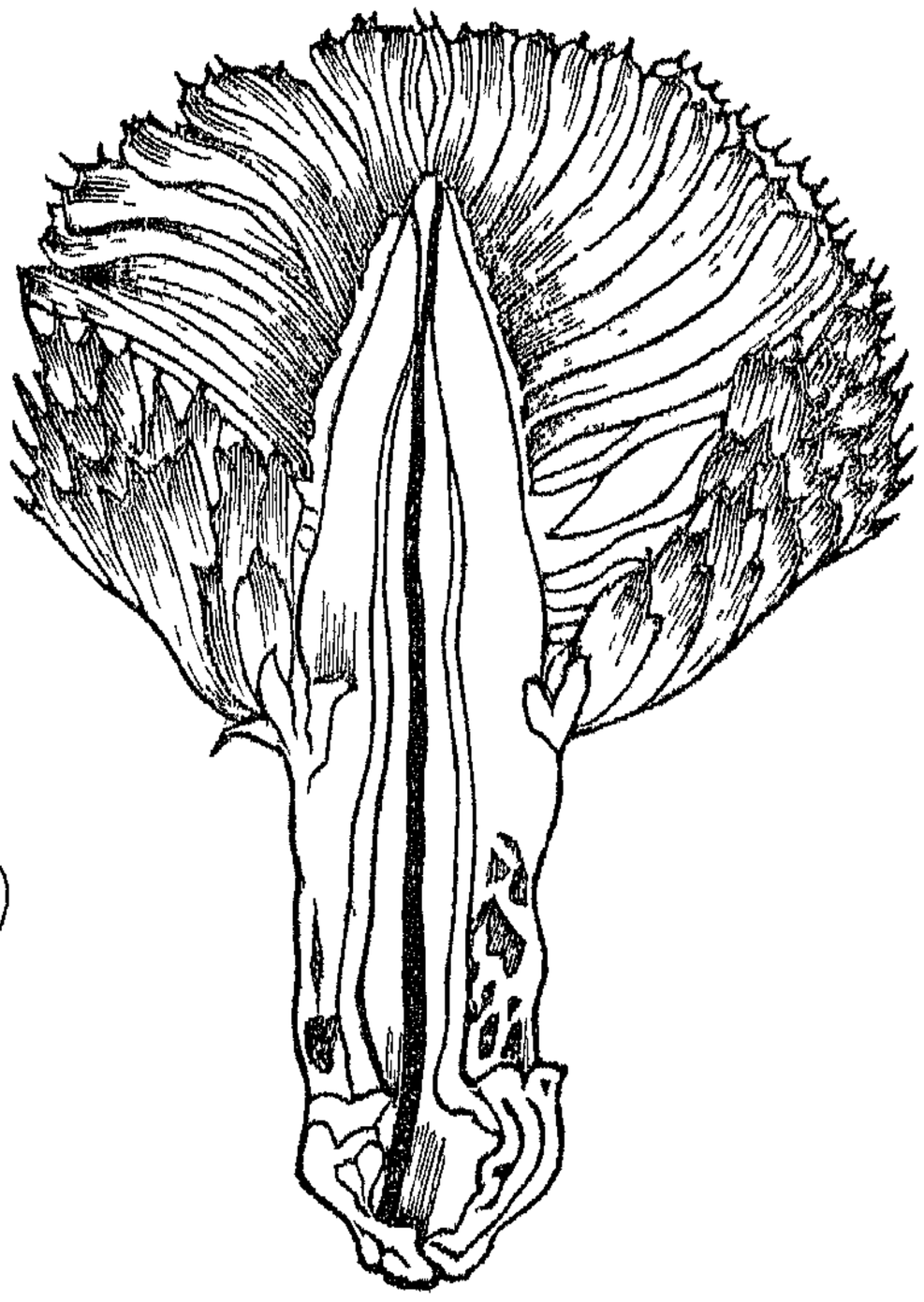


Fig 1.



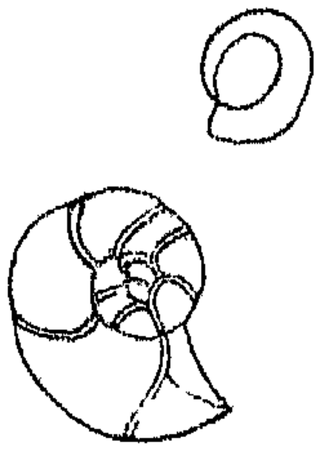


Fig 2

Fig. 3.

which they are chiefly composed, whether through development *in situ*, or subsequent agglutination. Perhaps no family of organisms has entered into their composition or increased their solidity more than the calcareous algæ (*melobesiæ*) which, in successfully laminated or mulliporoid growths, have rendered these nodules almost solid throughout or covered with short, thick, mulliporiform processes. I am not sufficiently acquainted with the calcareous algæ to say what the species are, but the common incrusting one hardly differs from our *melobesia polymorpha*, and this seems also to have produced the mulliporoid growths to which I have alluded. There is also another laminar species with larger cells which are quadrangular; but this does not appear to be so common, while the loose, deciduous, flat, reniform, articulations of *flabellaria opuntia* are agglomerated with everything, showing that this calcareous alga or coralline, which is very common in the tropics generally, is not less so in the Gulf of Manaar.

As it is upon these agglutinated compounds, as well as in their crevices and the excavated cavities formed by lithodomous sponges [1] in them, that the organisms have been developed, I shall henceforth allude to the former under the term of "Melobesian nodules."

Next to the part which the *Melobesiæ* have taken in their formation may be mentioned the sessile foraminifera; and these have, in turn, been overgrown in many instances by Polyzoa.

Some of the varieties of sponge spicules, isolated from the Melobesian nodules obtained off Paumben by boiling with solution of caustic potash, are represented in pl. III, fig. 1, and examples of *Foraminifera*, isolated by similar treatment, on pl. III, fig 2. A detailed description by H. J. Carter, Esq., of the Sponges and *Foraminifera* contained in the nodules will be found in the Annals and Magazine of Natural History, June 1880, pp. 437–457, July 1880, pp. 35–61, and August 1880, pp. 129–156.

Teredo and Filigrana.

Among other shore specimens which were picked up I may mention, in addition to the shells of numerous Mollusca, a large block of drift wood bored by *Teredo cornuformis* and skeletons of the Chætopod, *Filigrana*.

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[1] Boring sponges, e g , *Cliona*, shells perforated by which may be frequently picked up on the Madras coast

Porifera.

In addition to differently coloured encrusting sponges, growing on stones and corals, more than thirty species of sponges were found by me either between tide-marks or in deeper water. These have been sent to the British Museum, Natural History, for identification, and will be reported on hereafter, but I may refer here, in passing, to a beautiful species, which was brought up by the divers in considerable quantities from the vicinity of Ráméswaram, and to which the name of *Isodictya donnani* was given by Dr. I. S. Bowerbank [1] who examined the specimens collected on the Ceylon Pearl Banks by Mr. Holdsworth, who describes this species as follows:— "The dark, thick, cup-shaped sponge with undulated margin is not uncommon on the large pearl banks in from $6\frac{1}{2}$ to 9 fathoms; and I have met with it once or twice on rough ground on other parts of the coast; it is usually attached to some bit of rock, and is always, when alive, of a uniform bright orange colour. It turns black an hour or two after being taken out of the water."

Several specimens were also obtained of the species *Haliphysema tubulatum* collected by Mr. Holdsworth on the Ceylon Pearl Banks, and described by Dr. Bowerbank.[2]

Anthozoa.

The majority of the ANTHOZOA (ALCYONARIA and ZOANTHARIA) were obtained by me from the reefs which fringe the shores of Ráméswaram, and the neighbouring islands between it and the mainland, by native divers, who displayed considerable skill in uprooting, with the assistance of crowbars, huge masses of the brittle and delicate structures, and transferring them to the boats in an unbroken condition. On perfectly calm days it was possible to direct the movements of the divers from the boat, and point out individual specimens, which could be distinctly seen on the sea bottom; but even a slight ripple on the surface rendered this impossible, and much time and labour were, of necessity, wasted in bringing up many specimens which proved to be useless, in order that I might not miss the opportunity of obtaining as many species as possible.

Many of the specimens still remain unnamed, and must so remain in the absence of type specimens for reference;

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[1] Proc. Zool. Soc., 1873, p. 28, pl. VI, figs. 2–6.
[2] Loc. cit., p. 29, pl. VII.

and the following list must be regarded as only a very incomplete initial index to the coral fauna.

ORDER ALCYONARIA (OCTACTINIA).

FAMILY ALCYONIIDÆ.

Genus Alcyonium.

Alcyonium polydactylum.—Dana U. S. Expl. Exp., p. 617.—Variet *mammillifera.* Klunzinger-Korallthiere Roth. Meer, p. 26, Taf. I, fig. 6 b.

Lobularia polydactyla.—Ehrenberg Kor. Roth. Meer., p. 58.

Ammocella polydactyla.—Gray Ann. Mag., Nat. Hist., 1869, p. 125.

Remarks.—Described by Ridley (Ann. Mag. Nat. Hist., 1883, p. 251) from Ceylon.

Several specimens obtained off Rámęswaram in shallow water.

Genus Sarcophytum.

Sarcophytum pauciflorum.—Klunz. Kor. Roth. Meer., p. 29, Taf. II, fig. 2.

Lobularia pauciflora.—Ehr. Kor. Roth. Meer., p. 58.

Alcyonium pauciflorum.—Dana. U. S. Expl. Exp., p. 616.

Remarks.—Described by Ridley from Ceylon (loc. cit., p. 252). Several specimens obtained off Rámęswaram.

FAMILY PRIMNOIDÆ.

Echinogorgia pseudosappo.—Kölliker, Icones Histiologicæ, p. 136, Pl. XVIII, fig. 10.

Gorgonia sasappo: var-*reticulata.*—Esper Pflanzenthiere, Part II, p. 48, Gorg. Taf, IX-A.

Remarks.—Recorded by Ridley (loc. cit., p. 253) from Ceylon and by Esper from "East Indian Seas;" very abundant off Rámęswaram, and specimens have been brought up by divers from the Madras harbour. This and other species of Gorgonia were studded, as indicated in Esper's drawing, with living specimens of *Avicula, Comatula* and *Ophiothrix*, of which the last was present on the surface and in the canal system of many of the sponges which I collected, in extraordinary numbers.

Several specimens of the species named by Esper (loc. cit.) *Gorgonia sasappo*, and figured by him (Gorg. Taf., IX), of which he calls the preceding a variety, were also obtained off Rámęswaram.

FAMILY EUNICEIDÆ.

Plexaura flabellum.—Ridley, loc. cit., p. 253.

Remarks.—Recorded by Espor (loc. cit., Part II, p. 139) from the East Indian Ocean and Molluccas, and the horny axis figured (antipathos Taf. I). Very common off Ráméswaram.

FAMILY GORGONELLIDÆ.

Suberogorgia suberosa.—Ridley, loc. cit., p. 253.

Gorgonia suberosa.—Pallas, Elenchus Zoophytorum, p. 191.

Remarks.—This species, the corky Gorgonia, is described by Boerhaave (Ind. Alt. Plant, Hort., Lugduno Batav., 1720, p. 8, No. 24) as "arbor marina, ramosa, suber perfecte referens, cinerea; ubique eleganter et ordinata serie pertusa"; recorded by Pallas (loc. cit.) from the African and Indian Oceans, and by Ridley (loc. cit., p. 253) from Ceylon. A great number of specimens obtained from Ráméswaram.

FAMILY CORALLIIDÆ.

Corallium nobile.—Ridley, loc. cit., p. 253.

Isis nobilis.—Pallas, loc. cit., p. 223.

Remarks.—A single small fragment was picked up on the Paumben beach, but the divers told me that they sometimes come across much larger pieces. Concerning this species Ridley says (loc. cit., pp. 253-4): "Dr. Lankester (Uses of Animals to Man), besides the Persian Gulf, gives Ceylon as a locality for this, the precious red coral of the Mediterranean and Cape Verd Islands, and Dr. Ondaatje has shown me decorticated specimens from Ceylon which make the identity of the species probable. It is noteworthy that a fossil form is recorded from Indian deposits (Duncan) which (as I have given reasons for thinking, see Proc. Zool. Soc., 1882, p. 234) seems probably identified with this species, Seguenza having found it fossil in Italy, still bearing a slight red tint."

"An Officer" in a work entitled "Ceylon" (London, 8vo., 1876, 2 Vols., II, p. 274) mentions small fragments of red coral similar to that of the Mediterranean as having been found at the water's edge between Galle and Colombo, and states it to have been referred to by the Portuguese.

FAMILY PENNATULIDÆ.

This family was represented by a single species of *Pennatula*, sea-Pen (sp ?) of which several specimens were bought up by the divers, and which is figured on pl. III, fig. 3, where it is represented with its stem laid open so as to expose the central horny axis.

PLATE IV.

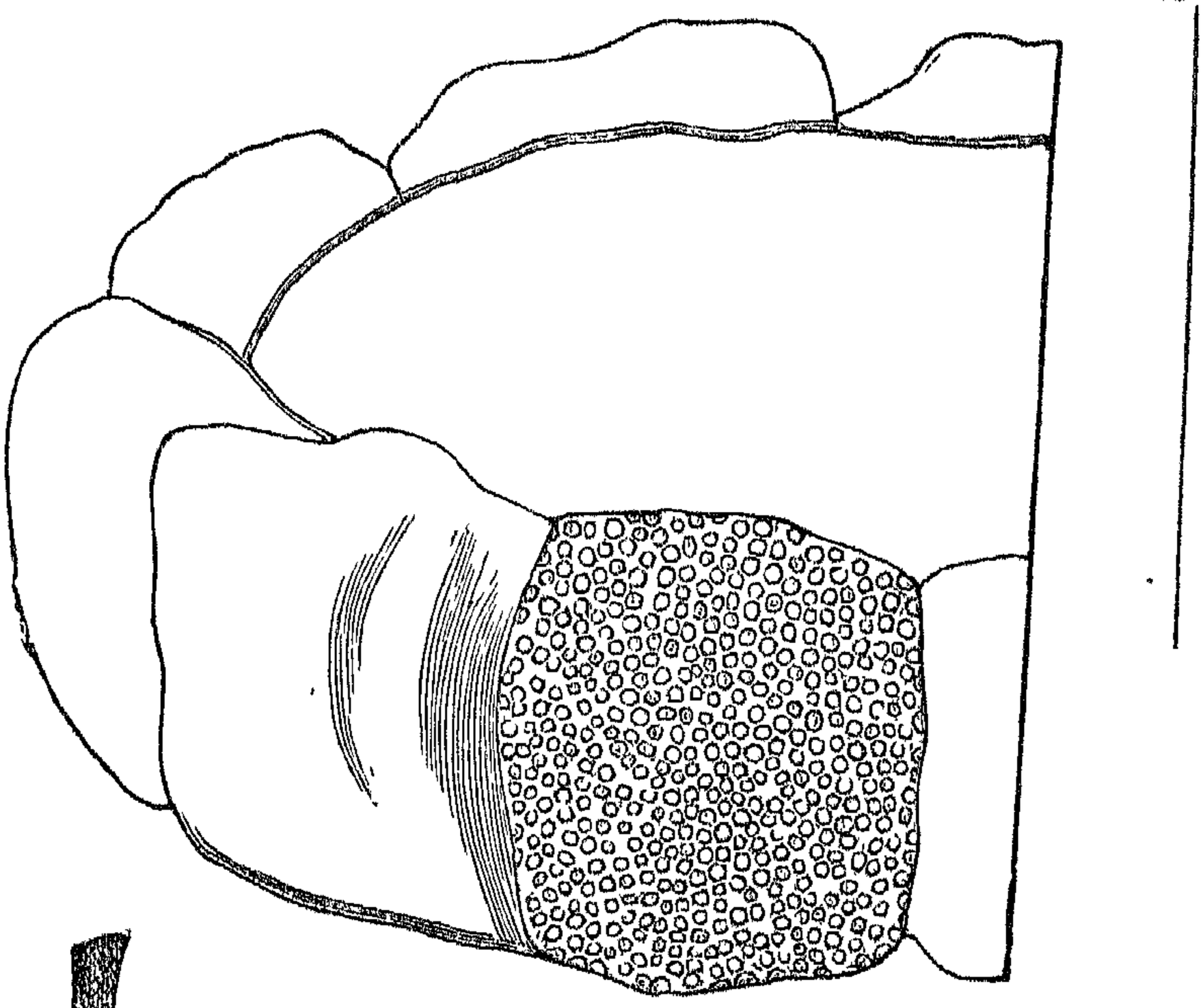

FIG. 1.

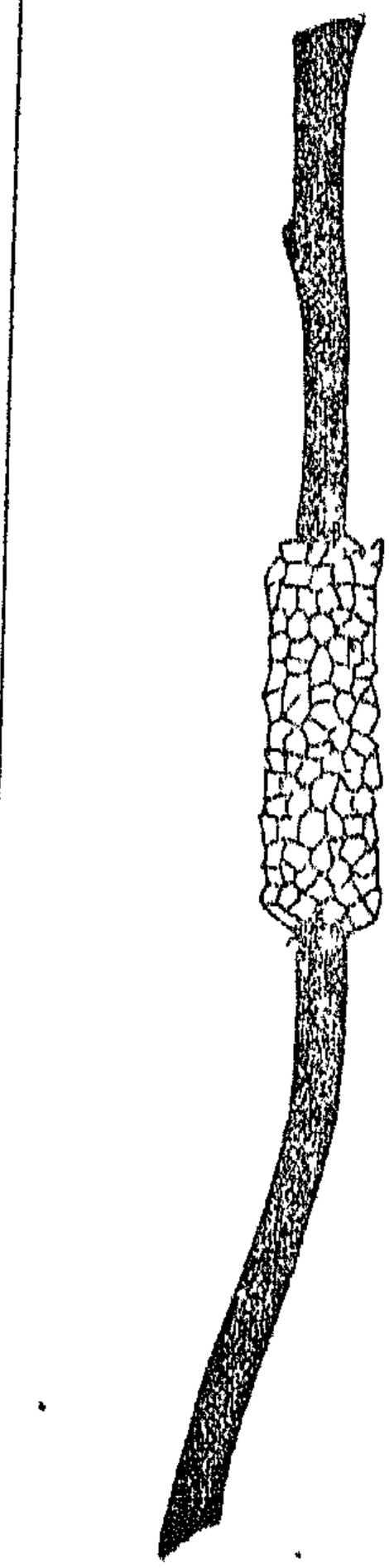

FIG. 2

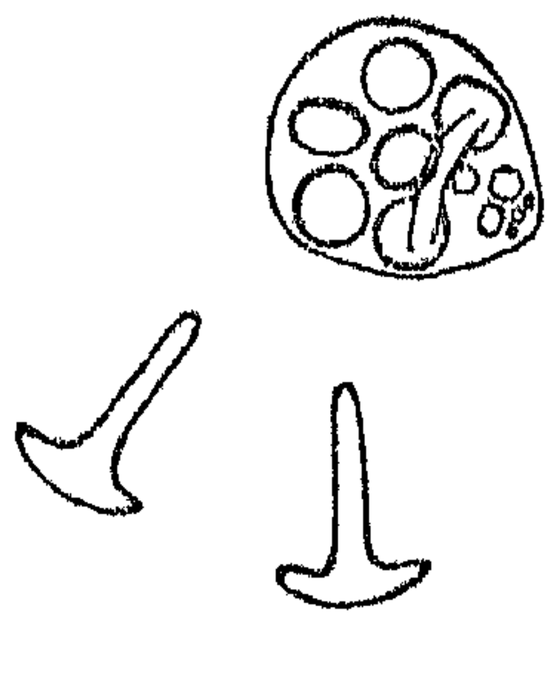

FIG. 4.

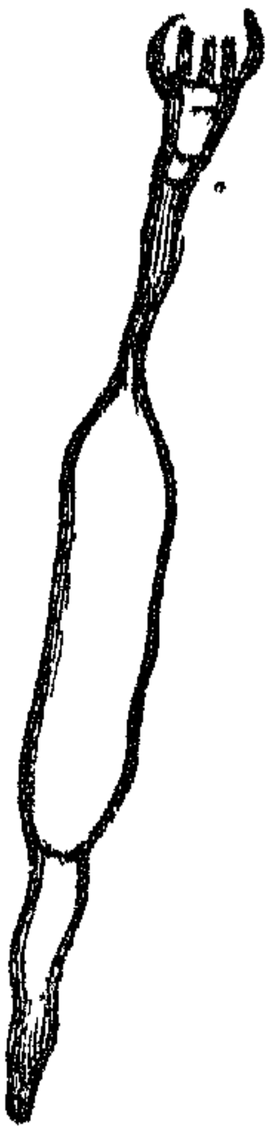

FIG. 3.

ORDER ZOANTHARIA (HEXACTINIA).

FAMILY PORITIDÆ.

Porites solida.—Klunz. Kor. Roth. Meer, pl. II, p. 29. Taf. V, fig. 21 ; Taf. VI, fig 14.

Madrepora solida var a.—Forskal descr. anim., p. 131.

Madrepora conglomerata var.—Esper tab. 59-A.

Porites conglomerata.—Lamarck Ed. II, p. 432 ; Ehrnbg. Kor., p. 117 ; M. Edw. and Haime, Cor. III, p. 179.

Remarks.—Many specimens obtained from Ráméswaram forming knobbed solid masses.

Porites limosa.—(pl. IV, fig. 1) Dana U. S. Expl. Exp., p 563, pl. LV, fig. 2.

Remarks.—Recorded by Dana from Fiji Islands ; many large blocks found on the upraised beach off Paumben, and in shallow water near the shore. Measurements of the largest specimen obtained, height 9 inches, longest diameter 15 inches.

Goniopora sarignyi (Sav.) Dana. U. S. Expl. Exp., p 570 ; Klunz. Kor. Roth. Meer., vol. II, p. 45 ; Taf. VIII, fig. 24 ; Taf. V, fig. 23 ; M. Edw. and Haime, Cor. III, p. 191.

Remarks.—A single specimen, 9 inches in height, with clavate lobes, and incrusted below with nulliporoid growths, *Polyzoa*, &c., obtained off Ráméswaram.

FAMILY STYLOPHORIDÆ.

Stylophora digitata.—M. Edw. and Haime, Cor. II, p. 135 ; Klunz. Ker. Roth. Meer., pl. II, p. 61 ; Taf. VII, fig. 5 ; Taf. VIII, fig. 1.

? *Madrepora digitata.*—Ehrbg. Kor., p. 116.

Sideropora digitata.—Dana. U. S. Expl. Exp., p. 515.

Remarks.—Several specimens obtained off Ráméswaram. This species is very plentiful on the Tangachori reef near Quilon, on the west coast of Southern India.

FAMILY MADREPORIDÆ.

Montipora tuberosa.—Klunz. Kor. Roth. Meer., pl. II, p. 32 ; Taf. VI, fig. 6 ; Taf. V, fig. 11 ; Taf. X, fig. 3.

Porites foliosa.—Ehrbg. Cor., p. 117.

? *Manopora hispida.*—Dana. U. S. Expl. Exp., p. 496 ; Taf. 44, fig. 5.

? *Montipora foliosa.*—(M. Edw. and Haime) recorded by Ridley (loc. cit., p. 259), and with doubt by Verrill (Proc. Essex Institute, VI, p. 51) from Ceylon.

Remarks.—A single specimen obtained off Ráméswaram. Breadth 18 inches.

GROUP TABULATA

Pocillopora favosa.—Ehrbg. Kor., p. 127; M. Edw. and Haime, Cor. III, p. 305; Haeckel Arab. Kor., Tab. 2, fig. 8.

Remarks.—Recorded by Klunzinger (op. cit., p. 68, Taf. VII, fig. 2; Taf. VIII, fig. 10), from the Red Sea. Ehrenberg makes of this species two varieties—leptoclados and sphæroclados; several specimens obtained off Rámêswaram.

SUB ORDER ANTIPATHARIA.

Antipathes anguina.—Dana. U. S. Expl. Exp., p. 576, pl. LVI, fig. 1.

Cirrhipathes anguina.—Ridley, Ann. Mag. Nat. Hist., 1883, p. 260.

Remarks.—Greatest length of specimen obtained from Rámêswaram 6 feet 3 inches; a portion represented on pl. IV, fig. 2, which shows the central horny axis partly exposed by removal of the crust. This species, says Ridley (loc. cit., p. 260), is quite distinct from the above (*Cirrihipathes spiralis*), differing in the only slightly twisted condition of the axis and in the arrangement of the spines of the surface.

In addition to the above species many species of *Madrepora*, *Turbinaria*, *Montipora*, *Goniastræa*, &c., were collected.

Echinodermata.

The phylum of the Echinodermata was very largely represented and in every class, as indicated in the following list:—

CLASS I CRINOIDEA.[1]

FAMILY COMATULIDÆ.

Living *Comatulæ* found in abundance attached to the stems of Gorgoniæ.

CLASS II ASTEROIDEA.

SUB-CLASS I STELLERIDEA.

(Astoridia star-fishes.)

Many specimens sent to Europe for identification.

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[1] No example of the family *Pentacrinidæ* was found during my stay on Rámêswaram Island, but, on a recent visit to Tuticorin, I saw a specimen of *Pentacrinus* sp. in the possession of Captain Phipps, obtained from the pearl banks.

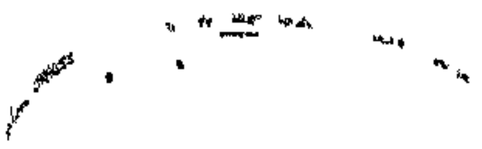

PLATE V.

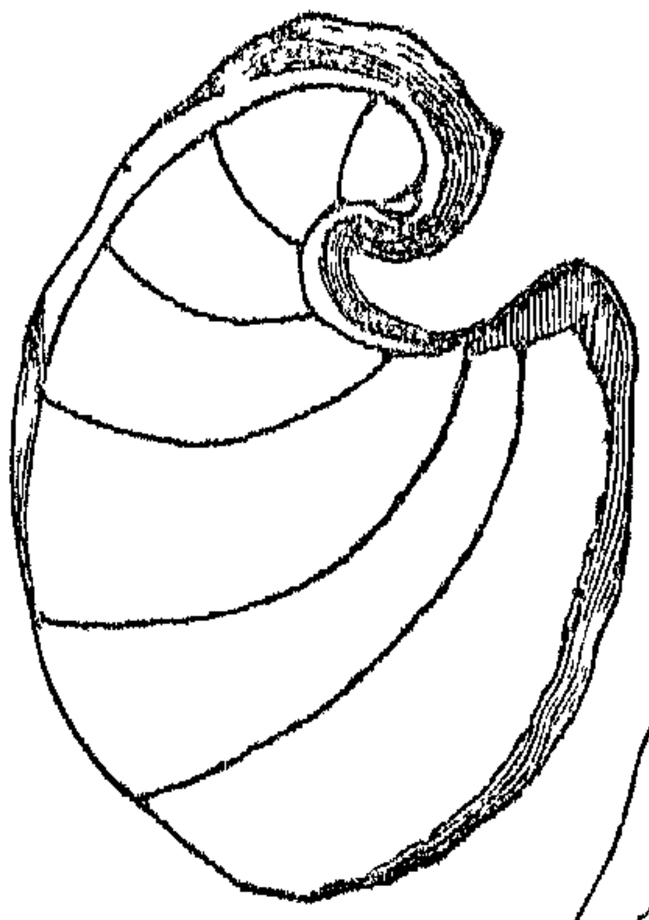

Fig 4

Fig 3.

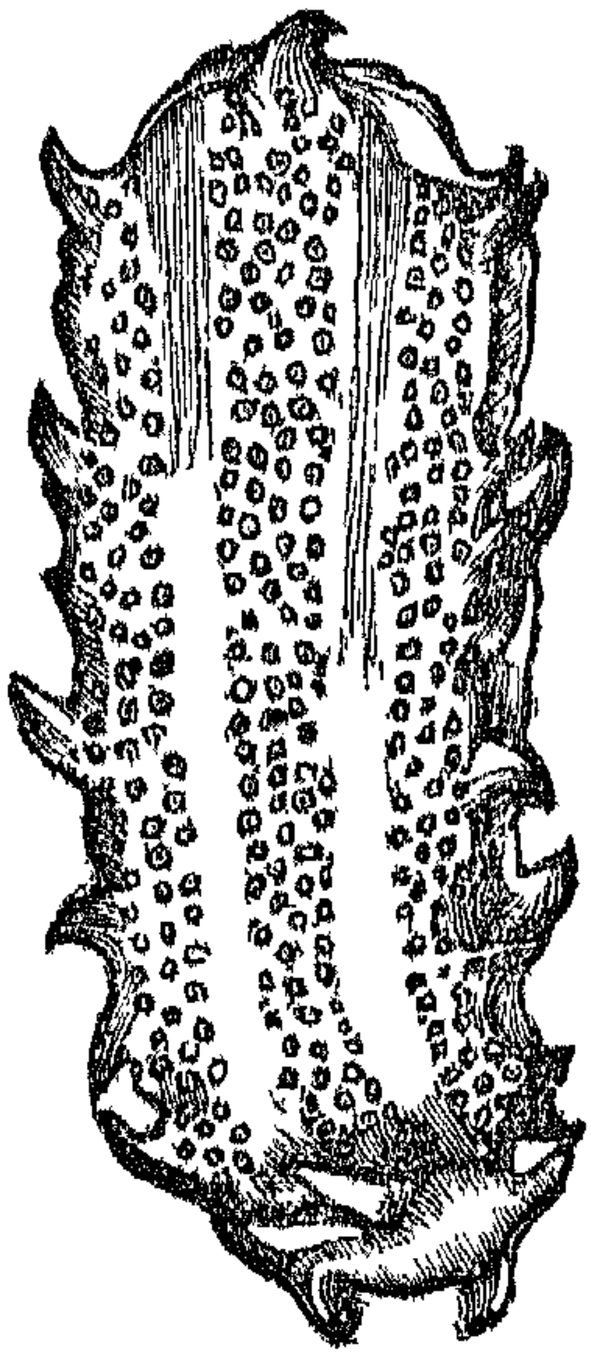

Fig 1

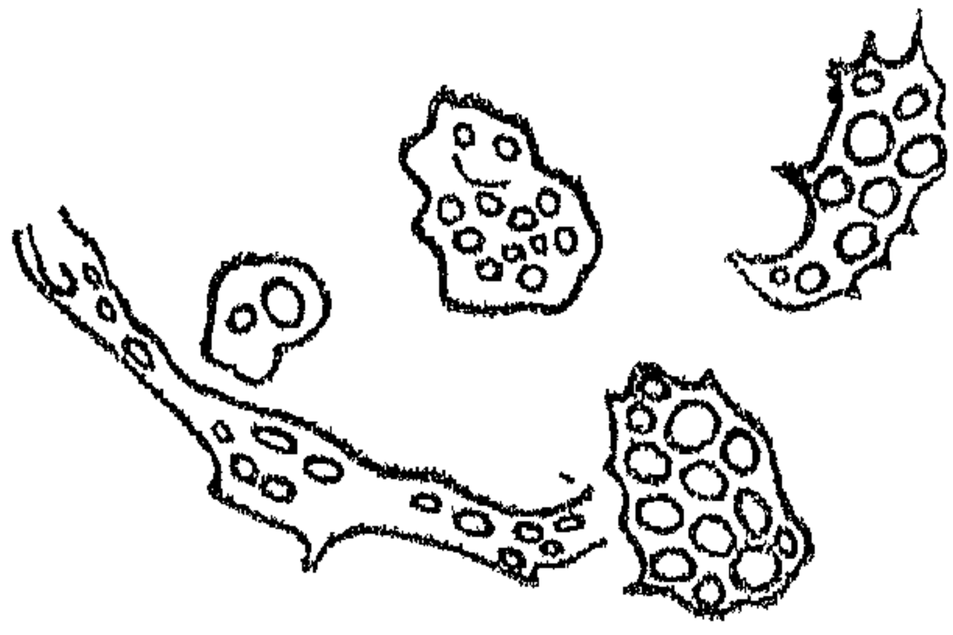

Fig 2

SUB-CLASS II OPHIURIDEA.

(Brittle stars.)

A single perfect specimen of *Ophiocoma* sp obtained. *Ophiothrix* present in great numbers on the stems of Gorgoniæ, and on the surface of, and in the canal system of spongos.

CLASS III ECHINOIDEA.

(Sea urchins.)

Representatives of each of the orders, *Cidaridea*, *Clypeastridæ*,[1] and *Spatangidæ* exist off the shores of Rámóswaram. Many *Scutellidæ* were obtained from the mud at the sea-bottom by dredging. No example of the *Spatangidæ* was obtained by myself, but I have, during a recent tour round the coast of the Madras Presidency, seen two specimens of *Schizaster* sp. collected by Captain James, Port Officer at Paumben.

CLASS IV HOLOTHUROIDEA.

(Sea cucumbers, &c.)

Both orders, Pedata, and Apoda, were represented, the latter by *Synapta* sp, which was found burrowing in the sand and mud, and is represented on pl. IV, fig. 3, as it appears, with its tentacles partially extended, and shrunken by immersion in alcohol. Its calcareous anchors and anchor plates are represented on pl. IV, fig. 4, after isolation from the transparent integument, in which they are imbedded, by boiling it with solution of caustic potash.

The former (Pedata) were represented by—(1) *Colochirus quadrangularis* (Lesson) (pl V, figs. 1 & 2), a species which receives its name from its quadrangular shape, and has been described in the report of the Challenger Expedition (Vol. XIV, p. 120) from Hong Kong; (2) several species of *Holothuria*, including the edible Trepang, which lives in the mud off the south shore of Paumben, where it is preserved ready for exportation to Penang and Singapore. The process of preparation, which is not a pleasant one to watch, is as follows.—The Trepangs are

Trepang fishery.

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[1] In a note on Clypeaster suffarcinatus Duncan and Sladen say (Palæont. Ind., 1866, Ser. XIV, Vol I, 3, pp 376-8, pl LVIII) "The present (fossil) form is very nearly allied to C. placunarius—Agass (C. humilo Klein-pars), the living representative of which occurs in the Indian Ocean."

collected by natives, as they lie on the mud, at low water, and placed in a chaldron which is heated by a charcoal fire. As the temperature rises in the chaldron, the still living animals commit suicide by ejecting their digestive apparatus, &c., and become reduced to empty membranous sacs, which, by loss of water consequent on the temperature to which they are exposed, shrivel up considerably. At the end of twenty minutes or half an hour the boiling process is stopped, and the shrivelled sacs are buried in the sand until the following day, when the same process is repeated for a similar time. Finally they are arranged in order according to their size, and are then ready for shipment to China.

Crustacea.[1]

The Crustacean Fauna of Ráméswaram was very rich, but in the absence of type specimens the identification of many species of *Thalamites*, *Xantho*, *Pilumnus*, *Petrolisthes*, &c., (some of which are doubtless new to science) is at present out of the question. The following list contains only a list of those specimens which have been so far identified :—

STOMATOPODA.

Genus Gonodactylus.

Gonodactylus chiragra (Fabricius). Latreille. Encycl. Meth. Hist. Nat. X, p. 473, pl. 325, fig. 2.

Squilla chiragra. Fabricius Supplem. Ent. syst.

Many specimens of this common oriental Stomatopod were collected, the average length of which was 2·8 inches. Concerning this species Mr. W. K. Brooks says[2]: "There seems to be no doubting that the specimens from various parts of the ocean which have been described as *Gonodactylus chiragra* really belong to one species, and that it is very widely distributed throughout the Atlantic, the Pacific and the Indian Oceans. E. V. Marten says[3] that, although he has formerly published as his opinion that this species is confined to the Indian Ocean, and the Pacific from the Red Sea to Chili, the absence of any decided difference between the specimen obtained in Cuba by Gundlach and those which he has himself collected at Amboina compels him to reserve this opinion and to recognise the occurrence of the

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[1] For the identification of and notes on *Philyra scabriuscula*, *Gonodactylus chiragra*, and *Matuta victor* var, I am indebted to Mr. J. R. Henderson.

[2] Challenger Report, Vol. XVI; Report on the Stomatopoda, pp. 56-7.

[3] Ueber Cubanische Crustaceen, nach den Sammlungen D. J. Gundlach's archiv f. Naturgesch, 1872, Jahrg XXIII, Bd. II, p. 147.

species in the tropical Atlantic. .....which are smaller on the average than those from the Indian Ocean."

Genus Squilla.

Squilla nepa. Latreille, Encyc. Meth. Hist. Nat X, p. 471. M. Edwards. Hist. Nat. Crust, II, p. 522. Miers. Ann. Mag. Nat. Hist., 5th Series, Vol. V, p. 25.

A very common species throughout the coast of the Madras Presidency. Described by M. Edwards (loc. cit) as an "*espèce extrement voisine de la Squille Mante*," and Miers says of it (loc. cit.): "This species may be considered to represent *S. Mantis* in the Indo-Pacific Region." Recorded by Heller from Ceylon, Madras, &c.

Squilla scorpio.[1] Latreille Encyc Meth. Hist. Nat. X, p. 472. M. Edwards. Hist. Nat. Crust., II, p 522. Miers. Ann. Mag. Nat. Hist., 5th Series, Vol. V, p. 18.

A single specimen obtained off Rámêswaram. Recorded by Latreille from Pondicherry.

In connection with the Genus *Squilla* I may mention that, while recently examining the meshes of the nets, and the contents of the fish baskets at Gopalpore, on the north-east coast of the Madras Presidency, I collected a large number of *Alima* larvæ of a species of Squilla, and I may with advantage quote from Mr. W. K Brook's account of this interesting larval type. "The fully-grown *Alima*," he says,[2] "is usually much larger than any of the *Erichthi*, and among the largest known pelagic larvæ. It leads an active swimming life, pursuing and capturing with the greatest rapacity the copepods and other small crustacea which form the chief part of its food. Its metamorphosis is slow, and the wide distribution of most of the species of Squilla is undoubtedly due to the fact that the larva is carried to distant localities by the winds and currents, but notwithstanding the great size, often 2 inches or more, which is attained by the fully-grown larva, the young *Alima*, even of the largest species, is very minute, and it is probable that all *Alimæ* hatch from the egg in the *Alima* form and that the *Erichthoidina* stage has been entirely dropped from their metamorphosis.

"The *Alima* larva is one of the most sharply-defined larval types, and we have every reason to believe that all the larvæ in this group pertain to closely-related adults As one of them has been kept by Faxon in an aquarium until it changed into a young *Squilla*, and as all the species of the genus *Squilla* agree with each other in several features which are not united in any

[1] Frequently obtained from the fishing-nets along the Madras coast together with *S nepa*

[2] Loc. cit., pp. 21 and 81.

other adult *Stomatopod*; ..... and as all the *Alimæ* larvæ, including *Alimerichthus*, agree with each other, and differ from all other *Erichthydæ* except the anomalous *Erichthalima*, in similar features, we can state with confidence that all *Alima* larvæ are young *Squillæ*, and that all *Squillæ* larvæ are *Alimæ*."

DECAPODA.

1 BRACHYURA.

Genus Philyra.

Philyra scabriuscula. M Edwards. Hist. Nat. Crust., II, p. 132.
Leucosia scabriuscula. Fabricius Suppl. Ent. Syst., p. 349.
Two specimens—male and female obtained.

Philyra globulosa—M. Edwards. Hist Nat. Crust, II, p. 132.
Leucosia globulosa—Fabricius Suppl Ent Syst, p. 349.
Several specimens obtained.

Genus Grapsus.

Grapsus strigosus. Latreille. Hist. Crust VI, p. 70; M. Edwards. Hist Nat Crust., II, p. 87.
Many specimens of this common species obtained.

Genus Neptunus.

Neptunus sanguinolentus. Herbst.
Neptunus pelagicus. Linnæus.
Many specimens of those two species obtained.

An interesting fact in connection with a specimen of the latter species, *N. pelagicus*, is that, during the removal of its soft parts in the course of preparation as a dry specimen, the gills and respiratory appendages were found to be studded with a parasitic cirriped [1] which corresponds in its details, and is, doubtless, identical with *Paradolepas neptuni*, described by J. D. Macdonald, F.R.S.,[2] as living parasitically in *N. pelagicus* at Moreton Bay, Sydney, and among the islands of the South-western Pacific. "I found them" (the gills and respiratory appendages), says Macdonald, "beset with beautiful little pink-tinted barnacles, having a vitreous-looking capitulum, about one-

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[1] There is in the Central Museum a specimen of a sea snake from the Madras coast, of which the skin is studded throughout with a parasitic pedunculated cirriped

[2] Proc., Zool Soc., 1869, pp. 440-444, pl. XXXIII, XXXIV.

eighth of an inch in length, with shelly depositions bearing an important relation to the rudimentary valves of *Dichelaspis* and *Conchoderma*. In general form, however, and even in many details of their anatomy, these little parasites are perfect miniatures of *Lepas anatifera*, their most striking character being that the valves, which are semi-transparent in the greater part of their extent, are distinctly in articulation with each other, or closely approximate."

Genus Ocypoda.

Ocypoda platytarsis M. Edwards.

Several specimens obtained In reference to this species Milne Edwards says [1] "*L'Ocypoda platytarsis*, Lamarck, Collection du Museum, me parait se rapporter a cette espéce (*Ocypoda ceratophthalma*." The differences between the two species are pointed out by Miers in his article [2] on the species of Ocypoda in the collection of the British Museum.

Genus Gelasimus.

Gelasimus sp. Very common, burrowing on the muddy shores of the lagoon of Coorsoody Island.

Genus Calappa.

Calappa tuberculata. Fabricius Supplem, p. 345; Latreille Hist. Nat. Crust., t. V, p. 393.

Several specimens obtained.

Genus Matuta.

Matuta victrix. (victor. Latreille Encyc., pl. 273, figs 3-1; Fabricius, Suppl., p. 369.

Specimens of this common species were abundant, and a single specimen was found, which shows an arrangement of the spots on the carapace in the form of circles arranged in transverse series.

Concerning the latter, Mr. Henderson writes to me: "It must be united with, or simply regarded as, a variety of *M. victrix*."

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[1] Hist Nat Crust , II, p 18.
[2] Ann. Mag. Nat. Hist , 5th Ser , Vol. X, p. 383.

2 ANOMURA.

Genus Porcellanella.

Porcellanella triloba. White. Voyage of H. M. S. Rattlesnake, app. Vol. II., pl. V, fig 2. Stimpson. Proc Acad. Nat. Sc., Philadelphia, p. 67 ; Haswell. Cat. Austr. Crust., p. 149.

A single specimen obtained.

Dr. Henderson writes to me: "The discovery of this species at Rámóswaram greatly increases its known area of distribution. It has only been previously recorded from the Australian Coasts (Macgillivray and Haswell), though specimens were taken by H. M. S. Challenger at two stations in the Eastern Archipelago." White writes (loc cit, p. 395): "This curious species was dredged by Mr. Macgillivray off Cape Capricorn, in lat. 23° 25′ S., long 151° 12′ E. in 15 fathoms, the bottom being muddy sand and shells. It is allied to the species of the second section of genus Porcellana, as detailed by Professor Milne Edwards in the second volume of the '*Histoire Naturelle des Crustacés,*' but has characters sufficient to constitute a new sub-genus, to which may be applied the name Porcellanella."

Genus Pagurus.[1]

Pagurus punctulatus. Olivier, M. Edwards. Hist. Nat. Crust., II, p. 222-3.

Several specimens of this common hermit crab, which is of an orange red colour with white ocellated spots, were found living in the empty shells of the *Chank.*

Genus Hippa.

Hippa asiatica. M. Edwards. Hist. Nat. Crust., II, p. 522.

Very commonly found off the shores of Ráméswaram, burrowing in the mud. Length of largest specimen 2·8 inches.

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[1] I have recently obtained from the Tuticorin Pearl Banks a single female specimen of *Aniculus typicus,* Dana (U. S., Expl. Exped. Crust., pt. 1, p. 461, pl. XXIX. fig. 1), who records it from Raraka, Waterland, and Carlshoff Islands, Paumotu Archipelago; also Wakes Island, Pacific Ocean. The same species is recorded by M. Edwards (Hist. Nat. Crust., vol. II., p. 230) under the name of *Pagurus aniculus,* and the abdomen of the female is thus described by him: "Abdomen de la femelle garni en dessus de grandes plaques cornées, transversales, lobés sur leur bord postérieur, trois premiéres fausses pates ovifères, grandes, terminées par deux articles ciliés, et portant prés de leur base une énorme lame foliacée, qui, en se réunissant avec un grand repli tégumentaire et lamelleux placé obliquement sur la face inférieure du ventre, forment une poche ovifére trés vaste; la quatriéme fausse pate presque rudimentaire."

Mollusca.

Besides many species of the *phylum* Mollusca obtained out of mud from the sea bottom, by R. Bruce Foote, Esq., who accompanied me to Rámés-waram in an unofficial capacity, by dredging, the following species were collected :—

Strombus canarium. Lamarck.
Pterocera aurantia. Lamarck.
Pterocera lambis. Linnæus.
Pterocera scorpius. Linnæus.
Murex tenuispina. Lamarck.
Murex haustellum. Linnæus.
Ranella foliata. Broderip.
Turbinella pyrum. Lamarck.
Ficula lævigata. Linnæus.
Ficula reticulata. Lamarck.
Fusus colus. Lamarck.
Buccinum erythrostoma. Reeve.
Eburna spirata. Lamarck.
Eburna zeylanica. Lamarck.
Nassa callospira.[1] Lamarck.
Cassis canaliculata. Lamarck.
Cassis areola. Lamarck.
Dolium olearium. Lamarck.
Dolium fasciatum. Lamarck.
Harpa ventricosa. Lamarck.
Oliva gibbosa. Born.
Oliva ispidula. Linnæus.
Conus marmoreus. Linnæus.
Conus punctatus. Chemnitz.
Cymbium indicum. Gmelin.
Cypræa arabica. Linnæus.
Cypræa lynx. Linnæus.
Cypræa tigris. Linnæus.
do. young. Linnæus.
Cypræa moneta. Linnæus.
Cypræa caput serpentis. Linnæus.
Ovulum volva. Linnæus
Natica lineata. Lamarck.
Sigaretus neritoideus. Linnæus.
Cerithium microptera. Kiener.
Cerithium morus. Lamarck.
Turritella attenuata. Reeve.

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[1] Corresponds with N. callospira (? Juv. ? n. sp.) described and figured by Messrs. G. and H. Nevill (Journ As. Soc., Beng., 1874, p 25 ; pl. I, figs. 5-5*a*), who say : "We have long hesitated whether to regard the shell figured as a new species, or merely as a not fully developed form of N. callospira, in which the characteristic callosity does not extend to the apex."

Turritella duplicata. Lamarck.
Solarium perspectivum. Lamarck.
Nerita rumphii. Recluz.
Phasianella lineolata. Wood.
Trochus vividus. Reeve.
Rotella vestiaria. Sowerby.
Delphinula distorta. Lamarck.
Haliotis semistriata. Reeve.
Ianthina globosa. Swainson.
Crucibulum extinctorium. Lamarck.
Dentalium octogonum. Lamarck.
Bulla ampulla. Linnæus.
Bulla fasciata. Bruguiere.
Aplysia leporina. See foot-note.[1]
Dolabella rumphii. Cuvier.
Hyalea tridentata. See foot-note.[2]
Styliola acicula. See foot-note.[2]
Pecten senatorius. Gmelin.
Avicula fucata.[3] Gould.
Circe scripta. Linnæus.
Venus scabra. Hanley.
Venus reticulata. Linnæus.
Meroe truncata. Deshayes.
Meroe picta. Lamarck.
Tapes rotundata. Linnæus.
Donax scortum. Linnæus.
Pholas dactylus. Linnæus.
Teredo corniformis. Lamarck.

Pisces.

Leaving now the Invertebrate sub-kingdom I pass on to the fish fauna of Ráméswaram, which is mainly characterised by the prevalence and gorgeous colouring of members of the genera *Apogon, Chætodon Heniochus, &c.*, which have been well named "coral fishes"

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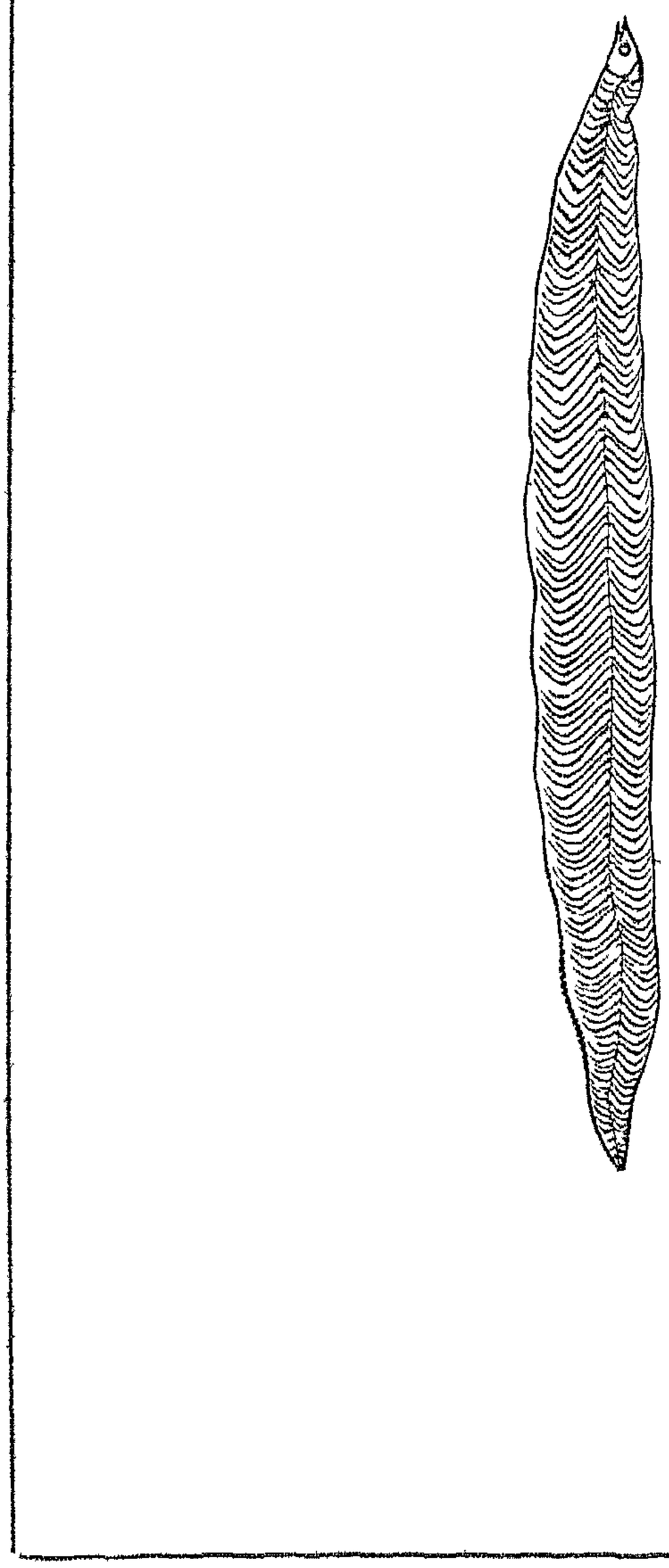
[1] One of "the sea-hares" found also in large numbers on the shores of Pulicat lake at Pulicat, and represented on pl. V, fig. 3, where also is depicted (fig. 4), the shell removed from the mantle in which it is enclosed during life. This species pours out a purple fluid, which is secreted by small cutaneous glands. It is classed among Mollusca, in branch Euthyneura order. Opisthobranchia, section *Palliata*, sub-order *Ctenidiobranchia.* To the other sub-order *Phyllidiobranchia* of the same section belongs the species *Pleurophyllidia lineata* (Otto), of which several specimens are contained in the collection of the Central Museum, but no record exists of the locality from which they were obtained.

[2] "Pelagic" mollusca obtained by surface dredging.

[3] The pearl oyster. A beautiful specimen, obtained from the pearl banks, of young pearl oysters attached to the branches of a *Gorgonia*, has been recently presented to the Central Museum by Captain Phipps, Port Officer of Tuticorin.

PLATE VI.



from their habit of frequenting coral banks, on which they find their food, which consists mainly of small marine animals. Conspicuous, too, by their abundance were various species of *Balistes* (file fishes), *Tetrodon* and *Diodon* (globe fishes), including the beautifully-coloured *Tetrodon margaritatus*, and the bristling *Diodon hystrix*, all of which have sharp teeth or beaks well adapted for crushing the hard coral branches and shells of mollusca, which form their principal articles of diet. With reference to the genus *Balistes* Gunther says (Study of Fishes, 1880, p. 685) "both jaws are armed with eight strong incisor-like and obliquely-truncated teeth, by which these fishes are enabled to break off pieces of corals on which they feed, or to chisel a hole into the hard shell of mollusca, in order to extract the soft parts. They destroy an immense number of mollusks, thus becoming injurious to the pearl fisheries." [1]

I obtained from the fishing nets several specimens of a species of *Leptocephalus* (pl. VI), large numbers of which were more recently seen by me, while examining the contents of the fish baskets at Gopalpore, where it is called a "sea-leech." Concerning this interesting genus, of which three species have been described by Francis Day, Esq.,[2] I cannot do better than quote from Gunther's description. "The *Leptocephali* are," he says,[3] "small, narrow, elongate, more or less banded-shaped fishes, pellucid in a fresh state, but assuming a white colour when preserved in spirits, resembling a tape-worm, being quite as soft and flexible. The skeleton is entirely cartilaginous, or slight ossifications are only now and then visible, especially towards the end of the vetebral column. The latter is replaced by a chorda dorsalis, which, in many specimens, is found to be divided into numerous segments..... ..... Taking into account all the various facts mentioned, we must come to the conclusion that these Leptocephalids are the offsprings of various kinds of marine fishes, representing, not a normal stage of development (larvæ), but an arrest of development at a very early period of their life; they continue to grow to a certain size without corresponding development of their internal organs, and

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[1] Captain Phipps has recently presented to the Central Museum a fine specimen of a large slab of coral from the Tuticorin Pearl banks covered with masses of a small Mollusc of the genus *Modiolus*, called *Suram* locally, which grows in large beds at the sea-bottom, and is said to be very destructive to the young oysters.

[2] The Fishes of Malabar, 1865, p 251 pl XIX, fig 1

[3] Introduction to Study of Fishes, 1880, pp. 179-182.

perish without having obtained the characters of the perfect animal. The cause by which this abnormal condition is brought about is not known; but it is quite within the limits of probability that fishes usually spawning in the vicinity of land sometimes spawn in the open ocean, or that floating spawn is carried by currents to a great distance from land; and that such embryos, which for their normal growth require the conditions afforded by the vicinity of the shore, if hatched in mid-ocean, grow into undeveloped hydropic creatures, such as the *Leptocephalids* seem to be."

The following list comprises those fishes, collected during my stay on Rámeswaram Island, of which the genus or species have been up to the present date identified by me :—

FIRST SUB-CLASS PALÆICHTHYES.

FAMILY TORPEDINIDÆ (Electric rays).

Narcine timlei.

SECOND SUB-CLASS TELEOSTEI.

FAMILY PERCIDÆ (Perches).

Lates calcarifer. The "cock up" or "Nair fish" of Europeans.
Lutianus fulviflamma.
Diagramma crassispinum.
Scolopsis vosmeri.

Apogon kalosoma, one of the fishes which are found in greatest abundance in the neighbourhood of coral reefs, and termed "coral fishes."

Cheilodipterus quinquelineatus.

FAMILY SQUAMIPINNES.

Chætodon auriga.
,, sp.
,, sp.
Heniochus macrolepidotus.

All very numerous in the neighbourhood of coral reefs.

FAMILY MULLIDÆ (Red mullets).

Upeneoides tragula.
Upeneus indicus.

FAMILY SPARIDÆ (Sea breams).

Pimelepterus cinerascens.

FAMILY SCORPŒNIDÆ.

Pterois miles (*Kurrun toombi*, Tam.)
("Flying dragon.")

FAMILY TEUTHIDIDÆ.

Teuthis oramin.

FAMILY BERYCIDÆ.

Holocentrum rubrum.

FAMILY ACRONURIDÆ.[1]

Acanthurus mata.
,, sp.

Fishes of this genus, which are sometimes termed Surgeons, are readily recognized by the sharp lancet-shaped spine with which each side of the tail is armed, and occur in all tropical seas, with the exception of the eastern part of the Pacific, where they disappear with the corals (Günther.)

FAMILY CARANGIDÆ.

Caranx gallus, one of the "Horse Mackerels."
Platax teira (vel, *P. vespertilio*, one of the species of "sea bats," so named from the length and appearance of their fins.
Lactarius delicatulus.

FAMILY SCOMBRIDÆ (Mackerels).

Echeneis naucrates, one of the "sucking fishes," of which it and *E. remora* are the most common.

FAMILY GOBIIDÆ (Gobies).

Periophthalmus koelkreuteri, a common species of the so-called "amphibious" fishes, which may often be seen walking along the banks of canals, or on mud flats at low water, hop-

[1] Vel. Acanthuridæ.

ping over the ground, or leaping into the water on the approach of a man, or birds of prey, &c "The peculiar construction of their eyes" says Gunther [1] "which are very moveable and can be thrust far out of their sockets, enables them to see in the air as well as in water."

FAMILY CENTRISCIDÆ.

Amphisile scutata.

FAMILY POMACENTRIDÆ.

Glyphidodon cœlestinus.
" *notatus*

"Fishes of this family live chiefly in the neighbourhood of coral formations. They feed chiefly on small marine animals, and such as have compressed teeth appear to feed on the small zoophytes covering the banks round which these 'coral fishes' abound." (Gunther)

FAMILY LABRIDÆ (Wrasses).

Platyglossus dussumieri.
" sp.
" sp.

Included under the heading of "coral fishes."

Pseudoscarus chrysopoma.
" *rivulatus.*

Some species of this genus acquire poisonous properties from their food, which consists either of corals or of fucus (Gunther).

FAMILY PLEURONECTIDÆ (Flat fishes).

Plagusia marmorata.
" sp

FAMILY SCOPELIDÆ.

Saurida tumbil

FAMILY CLUPEIDÆ (Herrings).

Pellona leschenhaultii

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[1] Loc. Cit., p. 488.

FAMILY MURÆNIDÆ (Eels).

Muræna tessellata.
,, sp.

FAMILY SYNGNATHIDÆ (Pipe fishes).

Syngnathus serratus.

FAMILY SCLERODERMI.

Triacanthus strigilifer.
Balistes mitis.
Ostracion cornutus.
,, *nasus.*
,, *turritus.*

The Ostracions are commonly known as "coffer fishes," from the coffer-like case in which their soft parts are enclosed.

FAMILY GYMNODONTES.

Tetrodon margaritatus.
Diodon hystrix.

Reptilia.

No special attention was paid to Reptilia while I was on Ráméswaram Island, and I have only two species to record, viz. :—

(*a*) *Pelamis bicolor*, one of the most common sea snakes.

(*b*) *Chelone viridis* (Schneid). The green turtle, a skeleton of one of which was prepared for the Museum Several carapaces of this species picked up on shore by fishermen were brought to me studded with the shells of *Chelonobia testudinaria*,[1] a Cirriped Crustacean, which frequently makes its home on the back of this species of turtle.

Conclusion.

At the commencement of this report I mentioned that it must be regarded in the light of a preliminary one, but sufficient species have been described or indicated to show what a wealth of marine life abounds among the coral-reefs of Ráméswaram and the neighbouring small islands.

Speaking in general terms of the coast of the Madras Presidency, which I had the opportunity of seeing through-

[1] See Darwin monograph of the Cirripedia. Balanidæ, pp. 392-4.

out during a recent official cruise, and forming an opinion upon the zoological capacity of the different parts, I should say that the main field of work for the zoologist lies within an area bounded on the north by Rámeswaram and on the south by Cape Comorin, the whole of which area it is my intention to study in detail.

EDGAR THURSTON,
Supt., Govt. Central Museum.

GOVT. CENTRAL MUSEUM,
EGMORE,
MADRAS, 1*st July* 1887.

SUPPLEMENT.

PORIFERA, p 10.

A report by Mr. Arthur Dendy, Assistant in the Zoological Department of the British Museum, on some of the sponges which I obtained off the shores of Ráméswaram Island, has been published in the Annals and Magazine of Natural History for September 1887. In his introductory remarks, Mr. Dendy writes as follows :—

"The collection is of exceptional interest, owing to the fact that it is the first which has been obtained from this particular locality. Indeed, our knowledge of the sponge-fauna of the entire Indian Ocean is extremely deficient. This deficiency is almost entirely due to want of investigation rather than to any actual scarcity of sponges. Mr. Ridley and I have already pointed out, in our Report on the Monaxinoda collected by H.M.S. *Challenger*, that 'this little known field will probably yield a rich harvest to whoever has the good luck to thoroughly investigate it;' and this statement is amply borne out by Mr. Thurston's researches.

"The best known locality for sponges in the Indian Ocean is undoubtedly Ceylon; Bowerbank, Gray, and Carter have all written upon the sponge-fauna of this particular district, and the sponge-fauna of Madras, in so far as is evidenced by the material at my disposal, bears a striking resemblance to it. Thus, out of the ten determinable species from Madras, four, viz., *Halichondria panicea* (a cosmopolitan species), *Axinella Donnani*, *Hircinia clathrata*, and *Hircinia vallata*, have already been recorded from the neighbourhood of Ceylon.

"There can be no doubt that the present collection was obtained in shallow water, although there is no record of the depth. Species with a strong development of spongin in the skeleton-fibre predominate, as might have been safely predicted from the climatic conditions of the locality.

It is remarkable that all the species, with a single exception, belong to the sub-order Halichondrina or else to the Keratosa, which are undoubtedly direct descendants of the former group. The single exception is a new species of the cosmopolitan genus *Suberites*, which I have called *S. inconstans*, owing to its extraordinary variability in external appearance.

"In addition to the species recorded below there are in the collection a number of Ectyonine and Homorrhaphid forms, which I have thought desirable to leave undetermined until a better supply of material is forthcoming."

The following are the species identified and described by Mr. Dendy, from whose remarks thereon I copy extracts.

Suberites inconstans, n. sp.

"There are six specimens of this species in the collection. They present us with an extraordinary range of external form, and yet all agree so closely in the arrangement and in the shape and size of the spicules that it is impossible to distinguish more than one species. I have, therefore, decided to group all the specimens under three varieties :—(1) *Suberites inconstans*, var. *globosa*, (2) *Suberites inconstans*, var. *mœandrina* ; (3) *Suberites inconstans*, var. *digitata*."

Of the second variety I only obtained a single specimen ; but the two other varieties were very abundant, and I picked up a large number of specimens while wading in shallow water at the foot of the Paumben light-house.

Halichondria panicea, Johnston, var.

1842. *Halichondria panicea*, Johnston, British sponges, p. 114.

Mr. Carter [1] has already recorded a sponge, which he calls "*Amorphina megaloraphis*, n. sp." from Ceylon, and he also remarks in the same place: "This seems to be a variety of the common British species, *Halichondria panicea*, chiefly differentiated by the size of its largest spicules, which is double that of the English one."

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[1] Ann. and Mag. Nat. Hist. Ser. 5, vol. VII, p. 368.

Tedania digitata, Schmidt, sp.

1862. *Reniera digitata*, Schmidt, Spong. Adriat. Meeres, p. 75.

"This species has already been recorded from the Mediterranean, Atlantic, Antigua, Kurrachee, Australia, Mozambique, and the Amirante Islands."

Iotrochota baculifera, Ridley. var. *flabellata*.

1884. *Iotrochota baculifera*, Ridley, Zool. Coll. H.M.S. *Alert*. Brit. Mus. p. 435.

"There are in the collection two specimens which have given me a great deal of trouble in determining, and which I have finally decided to regard as belonging to a variety of Ridley's species *Iotrochota baculifera*, the types of which were obtained from Port Darwin, Australia."

Axinella Donnani, Bowerbank, sp.

1873. *Isodictya Donnani*, Bowerbank, Proc. Zool. Soc., 1873, p. 28, pl. VI, figs. 2–6.

"One specimen is almost a *fac simile* of that figured by Bowerbank, and is, moreover, labelled 'colour orange,' which is a very satisfactory confirmation of Mr. Holdsworth's statement. A second specimen is also cup-shaped, but the wall of the cup, instead of simply undulating, is proliferated outwards into large, branching and anastomosing, vertical lamellæ.

"The most remarkable variation in external form is, however, exhibited by a specimen which is not cup-shaped at all, but consists of a number of vertical lamellæ inclined at various angles to one another and attached to a stout peduncle."

Both the cup-shaped and lamelliform variety were very abundant in the vicinity of Rámêswaram.

Phakellia Ridleyi, n. sp.

Raspailia fruticosa, n. sp.

Raspailia Thurstoni, n. sp.

"It is interesting to find two species so nearly resembling one another in all essential charactors, yet so

totally distinct from one another, as *Raspailia fruticosa* and *Raspailia Thurstoni*, both coming from the same locality. They may be distinguished from one another immediately both by their external appearance and by their spiculation, and although there are in the collection three specimens of the one species and two of the other, none of them show any transitional condition between the two species. It is also very interesting to observe how different spicules are utilised in the two species for the same function, viz., the protection of the surface."

Hircinia clathrata, Carter.

1881. *Hircinia clathrata*, Carter, Ann. and Mag. Nat. Hist. Ser. 5, vol. VII, p. 366.

"The species has hitherto been recorded by Carter from the Gulf of Manaar and from the Red Sea."

Hircinia vallata, n. sp.

Hircinia vallata, R. v. Lendenfeld, MS.

"There is in the collection of the British Museum a specimen from Ceylon . . . . . , which belongs to the same species as the Madras specimen. It was collected by Mr. E. W. H. Holdsworth, and is labelled in Dr. Bowerbank's handwriting '*Stematumenia*.' It is obviously one of the two specimens referred to by him in his "Report on a Collection of Sponges found at Ceylon, by E.W.H. Holdsworth, Esq.,[1] under that name; but he appears to have considered these two specimens unworthy of description.

"Dr. vonLendenfeld, in working over the British Museum collection of horny sponges for his forthcoming monograph of the group, has given the manuscript name '*Hircinia vallata*' to the species in question—a name to which I of course adhere."

Genus Hippospongia, Schulze.

"There are in the collection two fair-sized specimens, evidently both belonging to the same species . . . . . In the almost hopeless state of confusion at present existing

[1] Proc. Zool. Soc., 1873, p. 25.

with regard to the classification and nomenclature of the horny sponges, I shall not attempt to attach a definite specific name to these two specimens. Suffice it to say that they closely resemble vonLendenfeld's *Euspongia canaliculata* . . . . . ."

SUBEROGORGIA SUBEROSA, p. 12.

A specimen of this species, obtained at Mauritius in 90 fathoms, is described by Ridley [1] as "an immense dry specimen, 3 feet 5 inches high and 18 inches in maximum lateral diameter. The colour is pale wainscot to pale rufous brown; the branches are given off mostly at angles of 30°. The colour, very different from the deep brick-red usual in this species, may perhaps be due to the manner of drying." The largest specimen, which I obtained off Ráméswaram Island, was 21 inches in height, whereas the maximum height of specimens acquired recently at Tuticorin, where the pale and brick-red varieties were living side by side, was 4 feet 8 inches and the maximum lateral diameter 2 feet 2 inches.

ECHINODERMATA, pp. 14–16.

The following Echinodermata from the neighbourhood of Ráméswaram Island have been identified for me by Professor Jeffrey Bell, to whom I have recently sent a rich collection of Echinodermata from Tuticorin for examination :—

Laganum decagonale.[2]

Echinodiscus auritus.

Goniodiscus granuliferus.

Echinolampas oviformis.

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[1] Ann. Mag. Nat. Hist. Ser. 5, vol. X, 1882, p. 132.

[2] See *Observations on the Generic and Specific Characters of the Laganidæ.* By F. Jeffrey Bell, Ann. Mag. Nat. Hist. Ser. 5, vol. XI, 1883, pp. 130–136.

Oreaster Lincki, Bell.
Asterias Lincki, De Bl. Dict. Sci. Nat. LX, p. 219.
Pentaceros muricatus, Perrier, Rev. Stell., p. 239.

This species is recorded by Bell[1] from the Indian Ocean (Mauritius, Timor). Only dead shore specimens obtained at Rámęswaram, but many living specimens collected in the neighbourhood of the Tuticorin pearl banks. Colour of living specimens—lower surface uniformly deep crimson lake; a pattern of the same colour on the disc and arms, except over the grey poriferous areas; surface of spines deep crimson lake, interior light red.

CRUSTACEA, pp. 16–20.

Portunus (*Charybdis*) *granulatus*, De. Haan.

Recorded and figured as a new species by De Haan,[2] who thus accurately describes it:— "Thorace lineis transversis granulatis; dentibus lateralibus æqualibus, supremis truncatis; fronte 8 dentata, dentibus obtusis, quatuor mediis ab lateralibus incisione separatis; chelis spinosis; manibus latere exteriore et interiore tuberculatis, tuberculis sparsis rotundatis.

"Thorax longus 3," latus 2," dense villosus, ruber. Dentes laterales supremi truncati (obtusiores quam in figurâ laudata). Chelæ subinæquales; dextra paulo crassior, digitis brevioribus crassioribus magis incurvatis, tuberculis magis rotundalis armatis. Brachia et carpi transversim seriatim granulata; illa carina superiore interna inæqualiter dentata; manus parte inferiore lineis transversis margine antefiore crenulatis, lateribus tuberculatæ, tuberculis rotundis in seriebus longitudinalibus vel inordinatim dispositis; digiti immaculati, apice nigri; pollices costati, costis infra medium crenulatis."

A single specimen of this species, corresponding in all respects with De Haan's description, was obtained off

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[1] Proc. Zool. Soc., 1884, p. 72.
[2] Crust. Japon., ed. 1850, p. 42, T. 1, f. 1.

Ráméswaram, and there is in the Government Central Museum an old dried specimen, labelled "Madras."

Porcellanella triloba, p. 20.

A second specimen, an adult female with eggs, has been lately collected by me near the Tuticorin pearl banks, attached to a *Pennatula*, which was brought up by one of the native divers in about 9 fathoms.

Note on the Squillidæ of the Madras Presidency.

I have already (pp. 16–18) recorded two genera and three species of these interesting Stomatopoda from the neighbourhood of Ráméswaram Island, and it will not be out of place to supplement my remarks by a reference to the other members of this group, which I have collected myself, or of which there are specimens in the Government Central Museum from different parts of the Madras coast. I may, however, first quote from an exceedingly interesting communication on the habits of the Squillidæ by Mr. George Clark, of Mahéburg, Mauritius, who writes:[1] "The squills are mostly nocturnal animals, living in holes; hence it is not surprising that they are little known. It is evident at a glance that the position of their branchial apparatus renders it impossible for them to carry their eggs as lobsters and shrimps do; such an arrangement would stop their breathing. Cuvier states that he never saw one bearing eggs; and it was with no small satisfaction that, while making researches on the history and habits of these creatures, I learnt from Dr. Power he had seen this; and a few days after I had the satisfaction of witnessing it myself. The roe of the squill is very curious, and occupies the whole length of the body. The eggs when first extended form a compact mass, which the female holds between the three pairs of jaw-feet. As this mass expands it forms a loose kind of tissue, somewhat similar to a fleece of wool. Little by little, as the eggs enlarge, the texture of the mass becomes looser, until the larvæ are hatched and swim off to shift for themselves. . . . . The young squills inhabit holes in the sand near low water-mark. The old ones are never found here, but reside in the patches

[1] Proc. Zool. Soc. 1869, pp. 3-4.

of coral which are scattered over the shallows. Both old and young have invariably two entrances to their holes; and the adults always stop these with a plug of fine sea-weed. They do not swim swiftly; and in places where the water is not deep enough for them to swim their principal organs of progression are their large jaw-feet, which they thrust forward as a man would do striving to get along on the points of his elbows. I believe these limbs also serve them to make their holes, as they are often considerably worn on the joints. The motions of the squill are very different from those of a shrimp or a lobster, being much more like those of a caterpillar; hence the little Creoles call the young ones 'Chenilles de mer.' The extensor muscles seem to act much more powerfully than the flexors; and it is by the former that the vigorous motion is produced which inflicts such terrible wounds with the tail. I have seen one literally split the end of a person's finger, and another wound the hand through a thick leather glove. I believe the squills to be, as Cuvier supposed, carnivorous. I have carefully examined the stomachs of some, and have always found them to contain the remains of small crustaceans, but no vegetable matter."

List of the genera and species found in the Madras Presidency.

Lysiosquilla.

L. maculata, Fabr. Madras and Tuticorin.

Squilla.

S. scorpio, Latr. Madras, Pondicherry and Rámésworam.
S. nepa, Latr. Madras, Rámésworam and Tuticorin.
S. raphidea, Fabr. Madras.

Pseudosquilla.

P. ciliata, Fabr. Tuticorin.

Gonodactylus.

G. chiragra, Fabr. Rámésworam.

G. graphurus, White (ined), Miers. Rámésworam and Tuticorin.

G. trispinosus, White. Ráméswaram.

Of these seven species, three, viz., *S. scorpio*, *S. nepa*, and *G. chiragra*, have been already referred to in the present report (pp. 16, 17), but some reference is necessary to the remaining species, all of which have been previously recorded by Mr. E. J. Miers [1] from other regions.

Lysiosquilla maculata.

Squilla arenaria, Rumph., Amboin. Rarit. p. 6, pl. III, fig. E (1705).

Squilla maculata, Fabr., Ent. Syst. II, p. 511 (1793); Suppl. p. 415 (1798); Lamarck; Hist. Anim. sans. Vert. V, p. 188 (1818); Desm. Consid. Crust. p. 250 (1825); Latr. Encyc. Méth. Hist. Nat. X, p. 470 (1825); M. Edwards, Hist. Nat. Crust. II, p. 518, pl. XXVI, fig. 11 (1837); De Haan, Faun. Japon. Cr. p. 221 (1849); White, List. Crust. Brit. Mus. p. 83 (1847).

Cancer (*Mantis*) *arenarius*. Herbst. Nat. Krabben. u. Krebse. II, p. 96, pl. XXXIII, fig. 2 (1796).

Lysiosquilla maculata, Miers., P.Z.S., p. 138 (1877); Philosoph. Trans. Roy. Soc. CLXVIII, p. 494 (1879); Ann. Mag. Nat. Hist. Ser. 5, vol. V, 1880, p. 5, pl. I, figs. 1, 2; Brooks, Challenger Report. vol. XVI, 1886: Report on the Stomatopoda, p. 45, pl. X, figs. 1–7.

The length of the largest male examined by Miers was upwards of 12 inches. A dried specimen (male) in the Government Central Museum, labelled "Madras," measures $10\frac{1}{2}$ inches in length.

A single female, $2\frac{3}{4}$ inches in length, was found by me at Tuticorin. Carapace mottled along the margin and towards the centre in front; a broad transverse whitish band near the posterior margin, giving off two narrower bands which run forwards in the sulci, but end abruptly before reaching the anterior margin. All the free thoracic as well as the abdominal segments have a broad, mottled, brownish band near the anterior margin, and a narrower band along the posterior margin. The sixth abdominal segment is uniformly mottled with brownish black. The telson has a broad semi-lunar band, with its convexity directed forwards, including the three dentations on the postero-lateral margins.

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[1] Ann. Mag. Nat. Hist. Ser. 5, vol. V, 1880.

The appendages of the sixth abdominal segment have a broad dark mottling towards the base of the protopodite. The anterior half of the exopodite and posterior two-thirds of the endopodite have a similar dark mottling; a few slight mottlings on the free thoracic and abdominal appendages. The remainder of the specimen uniformly whitish yellow.

Squilla raphidea.

Squilla arenaria marina, Seba, Thesaurus. III, p. 50, pl. XX, fig. 2 (1758).

Squilla raphidea, Fabr., Ent. Syst. Suppl. p. 416 (1798); Latreille, Encyc. X, p. 471 (1825); Atlas (as *S. mantis*), pl. CXXIV; M. Edwards, Hist. Nat. Crust. II, p. 524 (1837); White, List. Crust. Brit. Mus. p. 84 (1847); Miers, Ann. Mag. Nat. Hist. Ser. 5, vol. V, 1880, p. 27.

Squilla mantis var. *B. major,* Lamarck, Hist. Anim. sans. Vert. V, p. 187 (1818).

Squilla harpax, De Haan, Faun. Japon. Crust. p. 222, pl. LI, fig. 1 (1849).

There is a single dried specimen (male) in the Government Central Museum, labelled "Madras," the length of which is $11\frac{1}{2}$ inches. The length of the largest individual (a dried female from Borneo) examined by Miers was somewhat over $10\frac{1}{2}$ inches.

Pseudosquilla ciliata.

? *Squilla ciliata,* Fabr., Ent. Syst. II, p. 512 (1793), Suppl. p. 417 (1798); Owen Zool. Voy. Blossom. p. 90, pl. XXVII, fig. 5 (1839); White, List. Crust. Brit. Mus. p. 84 (1847).

Squilla stylifera, Lam., Hist. An sans. Vert. V, p. 189 (1818); Latreille, Encyc. Méth X, p. 472 (1825); Guérin, Icon. Crust. R. A., pl. XXIV, fig. 1; M. Edwards, Hist. Nat. Crust. II, p. 526 (1837); Gibbes, Proc. Amer. Assoc. p. 200 (1850); Hoffmann, Recherches Faune Madagascar. Cr. p. 43 (1874).

Pseudosquilla stylifera, Dana, U.S. Expl. Exp. XIII, Cr. 1, p. 622, pl. XLI, fig. 4 (1852).

? *Pseudosquilla stylifera*, v. Martens, Archiv. f Naturg. XXXVIII, p. 146 (1872).

Pseudosquilla ciliata, Miers, Ann. Mag. Nat. Hist. Ser. 5, vol. V, 1880, p. 108, pl. III, figs. 7, 8; Brooks, Challenger Report, vol. XVI, 1886; Report on the Stomatopoda, p. 53.

A single male specimen collected by me at Tuticorin. Length nearly 3 inches; colour uniform orange brown during life and remaining unchanged for some months in alcohol. The colour of the male of this species is, according to Mr. G. Clark,[1] "of a beautiful bluish-green, with the jaw-feet, the swimmerets, and the branchiæ, as well as the antennæ and the fimbriæ, which border the different organs, of a cherry-red. The female is clouded with brown and grey, presenting much the appearance of tortoise shell, and the red about her is much less than in the male."

Mr. W. K. Brooks says (l.c) of this species: "The raptorial claws, the spines of the telson, and the paddles and spines of the uropods retain, in the alcohol specimen, the bright cherry-red colour, which, according to G. Clark, is exhibited by the living animal. The alcoholic specimens also have eye-like spots of black pigment near the lateral edges of the third thoracic and first abdominal somites, and another on the dorsal surface of the base of the telson on the middle line."

Gonodactylus trispinosus.

Gonodactylus trispinosus, White, List. Crust. Brit. Mus. p. 85 (1847); Dana, U.S. Explor. Expod. XIII, Cr. I, p. 623 (1852); Heller, Reise der Novara. Crust. p. 126 (1865); Miers, Cat. New Zeal. Crust. p. 90 (1876); and Ann. Mag. Nat. Hist. Ser. 5, vol. V, 1880, p. 121, pl. III, fig. 10.

A single specimen (male) collected at Tuticorin; length 1½ inches. This specimen is interesting, inasmuch as it agrees with Miers' description of *G. trispinosus* from Swan River, Australia, and not with that of his *G. trispinosus*, var. *pulchellus*, nov., by which name he designates a small male from Ceylon, concerning which he says:[2] "It differs from the typical *G. trispinosus* in the absence of corrugations on the median portion of the fifth post abdominal segment.

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[1] Squilla stylifera, Proc. Zool. Soc., 1869, p 3.
[2] Ann. Mag. Nat. Hist. Ser. 5, vol. V, 1880, p 122.

The median spine of the rostral plate is absent, but may have been broken off close to the base. Length about $1\frac{1}{4}$ inches."

Gonodactylus graphurus.

Gonodactylus graphurus, White, List. Crust. Brit. Mus. p. 85 (1847); Miers, Ann. Mag. Nat. Hist. Ser. 4, vol. XVI, 1875; Ser. 5, vol. V, 1880, p. 120, pl. III, fig. 9 and p. 459; Brooks, Challenger Report, 1886, Report on the Stomatopoda, p. 58, pl. XIV, figs. 1, 4, 6; pl. XV, figs. 3, 8.

A common species off the shores of both Ramésvaram Island and Tuticorin, where many specimens, male and female, were obtained. Concerning this species Brooks says: "This species is very closely allied to *Gonodactylus chiragra*. . . . . Notwithstanding the fact that this is a widely distributed species, no minute description of it has been published, as Miers' description gives little except the points of difference from *Gonodactylus chiragra*, and the only figure, the telson shown in Miers' fig. 9, is misleading, as will be seen by comparison with our fig. 4, pl. XIV. In his figures, as well as in his descriptions, he represents the central area of the dorsal surface of the telson as made up of three pairs of curved carinæ on the sides of the median one, whereas more careful examination will show that the third or outermost pair do not belong to the central elevated convex system so characteristic of this and related species, but to a distinct eminence on the anterior edge of the telson."

The correctness of the latter statement is borne out by my specimens. Unfortunately my notes on the colour differences between the males and females have been mislaid, but the alcohol specimens show the dull olive green colour and pink branchial appendages noticed by Miers.

Note on the Ocypoda of the Madras Presidency, p. 19.

In his article "on the Species of Ocypoda in the collection of the British Museum,"[1] Mr. E. J. Miers records the two following species from the Madras Presidency :—

Ocypoda platytarsis, M. Edwards.
A single male specimen from Pondicherry.

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[1] Ann. Mag. Nat. Hist. Ser. 5, vol. X, 1882, p. 376, pl. XVII.

Ocypoda macrocera, M. Edwards.
An adult male specimen from Madras.

A specimen of *O. rotundata*, sp. n., is also mentioned as being labelled "Dukhun, Col. Sykes" (*Coll., India Museum*), and probably obtained at some locality on the western coast of India.

Of the two definitely recorded species, *O. platytarsis* and *O. macrocera*, the former is a common Madras species, and the latter is to be found in large numbers on the sandy shores of the islands in the vicinity of Tuticorin, where also *O. ceratophthalma*, Pallas., is very abundant. I am informed by Mr. J. R. Henderson that he has collected specimens of *O. cordimana*, Desmarest, at Madras, at least a quarter of a mile inland

All the Ocypoda of our Presidency make for themselves burrows in the sand at some distance above tide mark, and the habits of *O. ceratophthalma*, a species which is common to the Madras Presidency and Ceylon, are well described by Sir J. Emerson Tennent, who says:[1] "The *Ocypode* burrows in the dry soil, making deep excavations, bringing up literally armfulls of sand; which with a spring in the air, and employing its other limbs, it jerks far from its burrows, distributing it in a circle to the distance of several feet. So inconvenient are the operations of these industrious pests that men are kept regularly employed at Colombo in filling up the holes formed by them on the surface of the Galle face. This, the only equestrian promenade of the capital, is so infested by these active little creatures that accidents often occur through horses stumbling in their troublesome excavations."

EDGAR THURSTON,
Supt., Govt. Central Museum.
MADRAS,
10*th November* 1887.

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[1] Sketches of the Natural History of Ceylon, 1861.