REPORT

ON THE

ZOOLOGICAL COLLECTIONS

MADE IN THE

INDO-PACIFIC OCEAN

DURING THE

VOYAGE OF H.M.S. 'ALERT'

1881-2.

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PREFACE.

The zoological collections made during the Surveying-voyage of H.M.S. 'Alert' in the years 1878–82, under the command of Capt. Sir G. Nares and his successor Capt. J. Maclear, were presented by the Lords Commissioners of the Admiralty to the Trustees of the British Museum.

A narrative of the voyage has been given by Staff-Surgeon R. W. Coppinger, in his work 'Cruise of the 'Alert'' (London, 1883, 8vo).

The principal parts of the Survey, and consequently the Collections, fall into three distinct sections, viz.:—1, that of the Southern extremity of the American continent; 2, that of the coasts of North-eastern Australia and Torres Straits: and 3, that of the groups of Oceanic Islands in the Western Indian Ocean, situated between the Seychelles and Madagascar.

The first of these collections has already been reported upon in Proc. Zool. Soc. 1881; but the two others surpass it so much in extent and importance as to be quite beyond the scope of a periodical publication, and therefore the Trustees considered it best that a full account of them should be prepared in the form of a separate work. With the exception of the 'Challenger' Expedition, none of the recent voyages has contributed so much to our knowledge of the Littoral Invertebrate Fauna of the Indo-Pacific Ocean as that of the 'Alert.' Irrespective of a number of specimens set aside as duplicates, not less than 3700, referable to 1300 species, were incorporated in the National Collection; and

of these more than one third (490) were new additions, if not to science, at any rate to the Museum.

The best thanks of zoologists are due to the Lords of the Admiralty, to the late Hydrographer, Capt. Sir F. Evans, K.C.B., and to the Commanders of the 'Alert,' from whom Dr. Coppinger received every encouragement in the prosecution of his zoological work.

Finally, although the following pages are by themselves a lasting testimony to the great service rendered by Dr. Coppinger to the National Museum and to the cause of science, I must not allow this opportunity to pass without duly acknowledging the energy and skill with which he performed this work. The collections were made with singular judgment, the specimens (many of them most fragile and delicate) preserved, labelled, and packed with the greatest care; and, beside, full lists were prepared by him giving additional, and in many cases most valuable, information. When we bear in mind that all this work was done in the leisure hours which Dr. Coppinger could spare from his strictly official duties, we may be encouraged in the hope that on future occasions similar advantage will be taken of the opportunity which a voyage of Survey offers to a man of science.

The collections were worked out immediately after their arrival; but the completion of this Report was considerably delayed by the removal of the Department from Bloomsbury to South Kensington.

ALBERT GÜNTHER,
Keeper of the Department of Zoology.

British Museum,
June 20, 1884.

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THE

ZOOLOGICAL COLLECTIONS

OF

H.M.S. 'ALERT.'

SUMMARY OF THE VOYAGE.

BY

R. W. COPPINGER, M.D., Staff-Surgeon R.N.

During the summer of 1878 it was resolved by the Admiralty to equip a vessel for the performance of special surveying-work on the western shores of Patagonia, among the South-Pacific Islands, and on the eastern and northern shores of Australia; in addition to which, it was the wish of the Hydrographer of the Navy, Captain (now Sir Frederick) Evans, F.R.S., that no opportunity should be lost of collecting objects of natural history whenever the requirements of the survey brought the vessel into regions whose zoology was hitherto but imperfectly known. It was in accordance with these views that on the 20th August, 1878, H.M.S. 'Alert' was commissioned at Sheerness, with a complement of 120 officers and men, by Captain Sir George Nares, who, by a happy coincidence, had commanded the same vessel in the Polar Expedition of 1875–76. On the 20th of the following month we sailed from Plymouth.

On the outward voyage we touched for a few days at Madeira and St. Vincent respectively; and at both of these places some shallow-water dredging was accomplished, resulting in the acquisition of a small collection of marine invertebrates, in which, as might have been expected, there was little, if any thing, of special interest.

During our further voyage through the South Atlantic a course was held which brought us over the Hotspur and Victoria Banks—submerged coral-reefs which are situated between the parallels of 17½° and 12° S. lat., and are about 180 miles from the east coast of Brazil. In these two places we plied our dredges in depths ranging from 35 to 39 fathoms, obtaining thereby a large number of zoological specimens, among which were several novelties in the classes of Sponges and Polyzoa. The collection made at these stations proved to be of special interest, as it helped to fill up a gap unavoidably left by the 'Challenger' expedition in the marine zoology of the South Atlantic.

On the 27th November we anchored in the estuary of the river Plate, off Monte Video, where we remained until the 14th December. Sailing on the latter date, we shaped a course for the Falkland Islands, and arrived at Stanley Harbour on the 26th inst. A few weeks prior to the time of our visit to the Falklands a peculiar avalanche of semifluid peat had poured down from the summit of one of the low hills, laying waste a portion of the settlement.

We again put to sea on the evening of the 27th December, and steering to the eastward, entered the Strait of Magellan on the first day of the year 1879. After stopping for a few days at the Chilian settlement of Sandy Point, we proceeded to our surveying-ground among the channels on the west coast of Patagonia. Here we spent the greater portion of the two succeeding years, executing surveys of previously uncharted waters, and adding to those which had been partially effected by our predecessors in the same field; but during the more rigorous winter months we each year proceeded north to Coquimbo, on the Chilian coast, where our ship was refitted and fresh supplies of stores were obtained *. As the requirements of the survey necessitated our visiting and anchoring in a great many bays and inlets in this remote region, frequent opportunities occurred for shallow-water dredging, so that we were able to make a large collection of marine invertebrates—a branch of research to which our attention was more especially directed, as we were aware that in other departments of biology the work done by the 'Erebus' and 'Terror,' 'Nassau,' and 'Challenger' of our own navy, as well as by many foreign vessels, left little to be desired.

During the month of March 1880 a visit extending over a few days was made to Skyring Water, a large and almost completely landlocked sheet of water situated to the eastward of the Cordillera, and, so far as we yet know, only accessible by ship through a narrow channel by which it communicates with the main Strait of Magellan. And here I should remark that in the month of July 1879, and during the surplus time allotted for refitting our ship on the Chilian coast, a brief visit was made to the island of St. Ambrose, which lies about 500 miles to the north-west of Coquimbo.

* During the winter of 1879–80 Sir George Nares returned to England, and was succeeded in the command of the 'Alert' by Captain Maclear, formerly of the 'Challenger' Expedition.

On the 14th June, 1880, we bade adieu to the South-American coast and sailed for Tahiti, spending much time on the way in searching for the so-called Minerva Reef, which was reputed to exist some 60 miles to the north-east of Manga Reva, one of the Paumotu group. Arriving at Tahiti on the 6th of August, we made a stay of twelve days at that interesting island, when we again got under way and pursued a circuitous route towards the great Fiji group.

The first place at which we touched on this voyage was Nassau Island, whence we proceeded to the Union group, in 80½° S. lat., passing within sight of Tema Reef and the Danger Islands, which were found to be incorrectly placed on the charts. We made a short stay at Oatáfu, the most westerly island of the Union group, and thence proceeded to Fiji.

We anchored off the settlement of Levuka in the island of Ovalau, Fiji, on the 18th of September, and remained there until the 10th of October. We then steamed over to Tongatabu, in the Friendly Islands, where we made a pleasant stay of ten days, but subsequently spent some very dull weeks, aggravated by unusually boisterous weather, in an uneventful search for the La Rance Bank, the non-existence of which was, however, satisfactorily demonstrated. We returned to Levuka on the 4th of December, and remained in harbour for ten days, when we entered upon the last portion of our Pacific cruise, viz. the voyage from Fiji to Sydney.

We arrived at Sydney on the 23rd of January, 1881, and remained there, refitting, until the 15th of April, when we steamed up the east coast of Australia to our next surveying-ground.

During the ensuing six months we visited Port Curtis, Port Molle, and Port Denison on the east coast of Queensland; Lizard Island, Flinders Island, Clack Island, Bird Island, Percy Islands, Clairemont Islands, and Albany Island, adjoining the coast; and while engaged on the survey of the Prince of Wales Channel, in Torres Straits, we anchored off Wednesday, Thursday, Friday, Horne, West, Prince of Wales, Hammond, Goode, and Booby Islands. In all these localities marine specimens were collected, as well as in the more open parts of the Prince of Wales Channel, where the depth rarely exceeds 30 fathoms. A good many interesting specimens were also obtained through the assistance of the pearl-shell divers, who have an extensive and lucrative industry in these waters.

On leaving this channel we proceeded westwards through the Arafura Sea, sounding and dredging, until we reached Port Darwin, in North-west Australia. Here we remained from the 3rd to the 18th of November, when we again got under way and steamed through the Eastern Archipelago to Singapore. We reached this port on the 18th November, 1881, and remained there for two and a half months, spending most of the time in dock, where our ship underwent an extensive refit. We now received orders to undertake a survey of the Amirantes and neighbouring islands and reefs in the South-Indian Ocean, using Seychelles as our base for

supplies. We accordingly sailed from Singapore on the 5th February, 1882, and steered for the Seychelle Islands, touching on the way at Colombo.

On the 4th of March we reached Bird Island, the most northerly of the Seychelle group; and as we remained at anchor there until the following morning, we had an opportunity, among other things, for exploring the island and accomplishing some dredging-work in the shallow water about the ship. On the next day we steamed over to Mahé, the chief island of the group. After some days spent here in provisioning and coaling the ship, during which time our boats did some useful dredging in the channel between Mahé and St. Anne's Islands, we steamed over to the Amirante group, the most northerly of which is only about a day's run from Mahé. We had orders to make a survey of the Amirantes, and, as far as time would permit, of the other coral islands which extend thence in an irregular chain southward towards Madagascar.

The Amirante group consists altogether of twenty-one low coral islets, resting, with the exception of Ile des Roches (which is separated by a deep channel), on an extensive coral bank, which is 89 miles in length, with an average breadth of 19 miles, and whose long axis lies in a N.N.E. and S.S.W. direction. It is included between the limits of 4° 50½' and 6° 12½' S. lat., and 53° 45' and 52° 50½' E. long., and is thus about 700 miles distant from the nearest part of the East-African coast. Some of the islets and sand-cays of which it is composed, and which are included in the above enumeration, are so arranged in clusters that for all practical purposes the group may be regarded as consisting of nine islets, which have been named African, Eagle, Darros, Des Roches, Poivre, Etoile, Marie Louise, Des Neufs, and Boudeuse Islands.

From the Amirantes we moved over to Alphonse Island, which occupies an isolated position 60 miles S.W. by S. of the southern extremity of the Amirante Bank; and thence proceeded to Providence Island, which is about 240 miles from the Amirantes in a S.W. by S. direction, and about 200 miles from Cape Amber, in Madagascar. After a short stay at each of these islands, we steamed over to the Glorioso group, which consists of three islands, also of coral formation, and situated about 120 miles W. by N. of the northern extremity of Madagascar. Every effort was made to investigate the fauna and flora of these islands as far as time and other circumstances would permit, so that sufficient materials were accumulated to connect their natural history with that of Seychelles to the northward and Madagascar to the southward.

With our departure from the Glorioso Islands the surveying operations of the 'Alert' were brought to a close. On the 12th of May we reached Mozambique, whence, after a stay of a few days, we proceeded on our homeward voyage, stopping *en route* at Algoa Bay, Simon's Bay, Cape of Good Hope, St. Helena, and Fayal (in the Azores), and arrived in Plymouth Sound on the 3rd of September, 1882, after an absence of nearly four years.

PART I.

THE COLLECTIONS FROM MELANESIA.

MAMMALIA.

BY

OLDFIELD THOMAS.

THE Mammalia collected by Dr. Coppinger are too few in number and of too common occurrence to be deserving of special notice; but a very interesting series of Melanesian skulls was obtained by him from various islands in the Pacific, and of these the most important measurements are given in the following notes.

1. **Skull of Torres-Straits Islander.** (PLATES I. & II. fig. A.)

Male. Adult.

"Native chief of Nagheer Island, Torres Straits."—*R. W. C.*

Length[1] 174; gl. occ.[2] 181. Breadth[3] 144. Height[4] 136. Maximum frontal breadth[5] 115; minimum frontal breadth[6] 99. Horizontal circumferences—preauricular[7] 237, total[8] 514. Transverse arcs—frontal[9] 286, bregmatic[10] 303, parietal[11] 323, occipital[12] 273. Longitudinal arcs—frontal[13] 121, parietal[14] 129, occipital[15] 113. Foramen magnum—length[16] 35, width[17] 29. Basinasal length[18] 105. Basialveolar length[19] 112. Bizygomatic breadth[20] 136. Height of—face[21] 98, malar[22] 25, alveolus[23] 22. Auriculo-orbital length[24] 72. Nasal height[25] 50, width[26] 24. Maxilla—length[27] 65, width[28] 67.

Mandible—bicondylar width[29] 126, bigoniac width[30] 99, symphysial height[31] 33, molar height[32] 29, coronoid height[33] 63, gonio-symphysial length (l. side)[34] 81. Ramus—height[35] 71, antero-posterior breadth[36] 35. Bigoniac arc[37] 194.

Indices—latitudinal[38] 82·8, altitudinal[39] 78·2, frontal[40] 68·7, gnathic[41] 106·7, nasal[42] 48·0.

1 9—12 14 19 27 29 33 34 35 taken according to Flower, Journ. Anthrop. Inst. x p. 172 (1881), and Cat. Coll. Surg. i. p. xvii (1879).

2—8 13—17 20—26 29—32 34—37 40—42, Broca, Instruct. Crâniol. (Paris, 1875).

SPONGIIDA.

BY

STUART O. RIDLEY.

The published information relating to the marine Sponges of Australia is very limited, both as compared with that relating to other groups of the Animal Kingdom, and as compared with the attention which has been paid to them by collectors. Large quantities of Sponges have been sent to England from this coast, and the national collection of France possesses a large number evidently of similar origin: but notwithstanding this fact, the number of intelligibly described species is surprisingly small. Dr. Bowerbank, who obtained very large supplies of material, chiefly from S.W. Australia, only described* 14 species which may be said to have probably come from this continent; these are chiefly Silicea. Mr. Carter has described† 8 species from Bass's Straits, and some 25 from other localities (almost entirely southern and south-western); of these 33, about one half are Silicea, and most of the remainder are Ceratosa. Prof. Häckel‡ describes 16 species of Calcarea from the south and east coasts; A. Hyatt§ records 8 Ceratosa from South and East Australia; Prof. Selenka‖ shortly describes and figures 5 Sponges from Melbourne and Bass's Straits; and W. Marshall¶, Gray**, and some other writers add a few species to the list; Poléjaeff†† adds 11 Calcarea to the fauna. Dr. Gray describes a remarkable form, *Xenospongia*, from Torres Straits, the only Siliceous species which I can find hitherto described as definitely obtained from North Australia.

The older writers by no means neglected the Sponges of Australia; and in particular Lamarck‡‡ described 53 species from "Mers Australes," collected by Messrs. Péron and Lesueur, of which, as we shall see below, there is considerable reason to believe that many were obtained off the more northern parts of the continent; a few are certainly from the south (King Island and Francis and Kangaroo Islands). There is, however, the very serious difficulty connected with these descriptions of Lamarck that they are ex-

* Chiefly in Proc. Zool. Soc. 1872–76.
† In Ann. & Mag. Nat. Hist. 1873–84.
‡ Die Kalkschwämme.
§ Mem. Bost. Soc. ii.
‖ Zeitsch. wiss. Zool. xvii.
¶ Zeitsch. wiss. Zool. xxxv.
** Ann. & Mag. Nat. Hist. (4) vi.; Proc. Zool. Soc. 1869.
†† Zoology H.M.S. 'Challenger,' part xxiv.
‡‡ Ann. Mus. Hist. Nat. xx. (besides an uncertain number, as *Alcyonia*, in Mém. Mus. Nat. Hist. i.).

tremely short, and deal almost invariably with the mere external characters of the forms to which they refer, and thus, owing to the well-known variability and comparatively slight diagnostic importance of these characters in the Spongiida, are almost useless, *per se*, even for the identification of species.

Thus we have in all some 90 species (allowing for synonyms), more or less fully described, of Sponges chiefly from the southern, south-eastern, and south-western coasts of Australia, and some 60 species described in the barest manner, probably (but not certainly) in most cases from the northern coasts, and a few from the south.

The present collection comprises upwards of 300 specimens, representing 110 species, besides 7 distinct varieties, of which more than half are well preserved in spirit and the remainder are dry. The districts searched consist of:—1. Port Jackson, N. S. Wales; 2. Several points on the north-east coast of Queensland; 3. Various islands and spots in Torres Straits; 4. The Arafura Sea, between Cape York and Port Darwin; 5. Port Darwin, N.W. Australia. The depths range from between tide-marks to 36 fms. (Arafura Sea), but most dredgings did not exceed 20 fms. in depth.

It is perhaps not surprising, after what has been stated as to the previous work which has been done among the Australian Sponges, to find that a large proportion (42 out of 110, or 38 per cent.) of the species are certainly new to science, and that a considerable number more may possibly prove to be so, having been assigned only doubtfully to described species. However, the distribution of the littoral species (when these are properly defined and limited) of Sponges appears usually to be but moderately wide, and perhaps less so than the shallow-water Alcyonaria; both this and another fact must be adduced to account for this large number of new species, viz. that the sponge-faunas of the neighbouring and moderately distant seas are even less known than that of Australia itself; this will be seen clearly from a statement of what has been done to elucidate the fauna of the Indian Ocean which I have made under the heading Geographical Distribution. I have in this dearth of information taken pains to describe every form which warranted description. I have been careful not to assign a new name where the sponge might possibly have been already described, in order not to run the risk of adding to the overburdened synonymy, but have generally given a full description in such cases, so that no doubt might remain as to the characters of that species, at any rate, with which I have had to deal.

Taxonomy of the Collection.—Of the 110 species obtained, 20 (or more than one sixth) are Ceratosa, a number which is illustrative of the largely tropical character of the localities from which they are drawn; the Dysideidæ include two new species and a most interesting variety of a most important form, *Psammopemma densum*, Marshall, whose nature receives hereby confirmation and elucidation; the number of new Ceratosa (4) is not great, as most of the species seem to have a wide range.

The Silicea, as usual, far outnumber the other groups; the

Chalinidæ are especially abundant (16 species, 5 new). No essentially new types occur; but of two new genera, one (*Toxochalina*) is formed in recognition of a character, hitherto overlooked, connecting this family with the Desmacidinidæ. Seventeen Renieridæ (5 new) occur, which are chiefly remarkable for their close resemblance to European forms, all the genera and three species being already known from Europe. The Desmacidinidæ have 19 species, and include 9 new forms, and a species for which I have established a new genus, *Gelliodes*, which appears to be an extreme development of the well-known European *Gellius* (*Desmacodes*, Schmidt), also two species for which a genus (*Iotrochota*) is formed, in tardy recognition of their great distinctness; it is probably related rather to the deep-sea genera *Chondrocladia* and *Cladorrhiza* than to any littoral genera, except *Monanchora*, Carter, and is remarkable as being a persistent littoral representative of what was probably one of the earliest types of Desmacidines, viz. that in which the anchorate spicule was symmetrical. Such old types usually survive only in the deep sea or fresh water; we have already seen that the deep sea produces examples of it, and probably the Spongillidæ with birotulate spicules are also modern representatives of this type, which (or whose ancestors) have taken refuge in fresh water. Remarkable as are the outward forms assumed by the species of *Rhizochalina* here described, they will not surprise those who have studied the paper in which Mr. Carter recently described (under the name *Phlœodictyon*) a number of species belonging to this genus from various parts of the world; perhaps, however, Torres Straits will prove to be more prolific in this respect than any other locality. The Ectyonidæ are remarkably rich in new forms (10 species out of 17). *Clathria*, which is small in growth and not very rich in species even in the Mediterranean, here assumes a great development in size and number of species. The distribution of the Axinellidæ is as much bathybial as littoral, in accordance with which fact we only have three species here. Of the 8 species of Suberitidæ, 4 are new.

The suborder Tetractinellida is, in conformity with the fondness for greater depths and the relative scarcity of individuals which its members commonly exhibit, represented by only 7 species, of which four are new, and all belong to the Choristidæ (*Sollas*).

The Calcarea are poorly represented (3 species), and afford nothing of great interest from a taxonomic point of view.

I have given further details, where necessary, of the more remarkable systematic points under the different groups themselves, and a classified list of the species is inserted in the account of the Geographical Distribution.

Anatomy and Histology of Soft Parts.—Want of time has prevented me from thoroughly investigating these subjects at present, interesting and important in the extreme as they are, and favourable in many cases for the purpose as is the material contained in the collection. A few notes relating specially to the histology will be found scattered throughout the Report (see especially *Aplysina*,

Dysidea, *Iotrochota*, *Rhaphidophlus*, *Acanthella*). In the systematic descriptions of the genera and species I have employed the old expression "sarcode" for the soft tissues generally, as being intelligible, comprehensive, and as having the advantage of involving no special theory or view with regard to the homologies of the parts referred to; the greater part of the tissues included under the term are, however, the "mesoderm" of F. E. Schulze, together with the ciliated chambers and the walls of the canal-system which it encloses.

Individual Variation.—A few remarks on this subject are suggested by the study of this large collection. First, variation in the *size* of *spicules* is an almost invariable occurrence in different specimens of the same species, as it is in individual spicules in the same specimen; in the one case, however, it rightly falls under the head of variation, in the latter chiefly under that of *growth*. In the descriptions below will be found statements which show the range of this form of variation within the limits of a species to be frequently wide, see especially *Leucophlœus fenestratus*, *Echinodictyum* (the spined spicule), and *Stelletta purpurea*. The Ectyonidæ exhibit, as a rule, surprisingly little variation of this kind, and little use is to be made of characters based on size in distinguishing even *species* in this group. Chalinidæ and Desmacidinidæ are also very fairly constant as a rule. Secondly, variation in the *form* of *spicules* is less common. The Suberitidæ exhibit variation of the head of the skeleton-spicule from sub-acuate to spinulate (*Suberites*). Modifications of the form of the ends of acerate spicules are certainly not often to be noticed: but this collection shows that in *Pellina muricata* the ends of the acerate vary from being gradually sharply pointed to being rounded off almost as thoroughly as in the usual "cylindrical;" and in *Cladochalina nuda* the ends may taper gradually from about four diameters from end of spicule, or else from within about $1\frac{1}{2}$ diameters (var. *abruptispicula*, mihi), producing a very different appearance. Thirdly, as to variation in the *external form* of the Sponge within the limits of the same species, striking examples are afforded by the series of *Iotrochota purpurea* and *Clathria reinwardti* (where a multi-personal origin appears to explain the most remarkable case). The *number of vents* present has been used as a generic character in the Tetractinellida by Prof. Sollas (*Geodia*, *Isops*). In one of the species of *Stelletta* here described this seems to be constant, in the other not: in the species of *Geodia* described below it is doubtful whether absence of vents ("lipostomy," *Häckel*) is constant.

"*Person*"-*theory*.—The individuality of those parts of a Sponge which enclose a single cloacal cavity seems to be regarded as a fact by Marshall, who speaks (Zeitschr. wiss. Zool. xxxv. p. 98 &c.) of species of Dysideidæ as being "monozoisch" or "polyzoisch." It is difficult to see how the different cloacal tubes which are formed during adult life by folding-over of a flat wall, as appears to be the case in the species named below, *Siphonochalina bullata* and *Dysidea semicanalis*, can be said to constitute individuals. It seems possible

that in other species as well the distinct cloacal systems may prove to be formed in the same manner. In his latest work (Spong. Meerbus. Mexico) Schmidt says (p. 16):—"Individuell beginnend übernehmen in vielen Spongien die anfänglich neutralen oder gemeinschaftlichen Gebiete die Rolle der Individuen, aber *der sich nährende und fortpflanzende Körper ist weder Individuum noch ein Stock*, auch der blosse Vergleich mit Individuum und Stock passt nicht auf ihn." (The italics are Prof. Schmidt's.) This view would seem to hold well, at any rate in the cases I have referred to.

Parasitism.—An instance of an Oscillatorian Alga parasitic within the tissues of a Sponge is described under *Stelletta clavosa*; a similar circumstance has been recorded in *Halisarca* and *Spongelia* (Schulze) and in a Suberite (Carter). Two examples are to be noted of the converse case, viz. that of a Sponge constantly employing an Alga for support by mingling with its structures, as already noticed by Semper in *Spongia cartilaginea*, Esper. These cases are—(1) *Gellius cymiformis* (v. infrà), where the Sponge, though probably less in bulk than the Alga, seems to draw the latter into its own form: and (2) a Renierid (probably *Reniera* s. str.) from Port Molle, Queensland, which coats and penetrates between the superficial fibres of two specimens of a species of erect arborescent Alga, giving it the appearance of the British Sponge *Halichondria albescens*.

A few examples of *Spongiophaga* (Carter) were noticed in the basal part of a spirit-specimen of a *Rhaphidophlus* (*R. procera*) from Port Darwin: the heads measured ·005 to ·01 millim., the fibre about ·001 millim. in diameter. This parasite has already been recorded from the Siliceous genera *Axinella*, *Gellius*, *Esperia*, *Tïoa* (Carter. Ann. & Mag. N. H. (5) ii. p. 167). It also occurs in the Ceratosa of the collection; the skeleton of a *Hircinia* from Torres Straits is almost replaced by it.

Geographical Distribution.

1. *Relations of Australia to other Districts.*

In attempting to compare the Australian Sponge-fauna with the faunas of other districts, we are met by a great difficulty, caused by the very imperfect manner in which the Ceratose and Siliceous Sponges of any given marine region, except the Northern and Equatorial Atlantic and Mediterranean, are as yet known. A paper by Prof. Selenka (Zeitsch. wiss. Zool. xxxii. p. 467) and one by myself (Proc. Zool. Soc. 1881. p. 107) give accounts of about 30 species from the South Atlantic: Esper, Carter, and Vosmaer describe species from the Cape. The Sponges of the Pacific are almost wholly unknown*. Thanks almost exclusively to Mr. Carter's and Dr. Bowerbank's exertions, we have a better knowledge of the Indian-Ocean fauna; but even this is extremely imperfect. Our more exact knowledge of this area (excluding Australia, for which see above, p. 366) is based chiefly on:—

* But see Carter's (Ann. & Mag. Nat. Hist.) and Bowerbank's (Proc. Zool. Soc.) writings for sundry species from the "South Seas;" and Döderlein (Zeitsch. wiss. Zool. xl. p. 62) for four new Lithistidæ from Japan.

a. Papers, describing about 70 species from Ceylon, by Carter ('Annals and Magazine of Natural History,' ser. 5, vol. vi. pp. 35, 129, viii. p. 361, xi. p. 353); one by Ehlers (Die Espersehen Spongien &c.), redescribing 4 species from Ceylon and South India; and one by Bowerbank, describing a few from Ceylon (Proceedings of the Zoological Society of London, 1873, p. 25).

b. A paper, describing 4 or 5 species from Mauritius, by Carter (Ann. & Mag. Nat. Hist. ser. 5, vol. iii. pp. 284, 343).

c. Descriptions of 3 species from the Red Sea, by Carter (*tom. cit.* p. 298) and Bowerbank (Proc. Zool. Soc. 1872, p. 630).

d. Papers by Bowerbank, describing 17 species from the Straits of Malacca (Proc. Zool. Soc. 1869, p. 325; 1875, p. 281).

e. A paper by the same author, describing 3 species from the north of New Guinea (*op. cit.* 1877, p. 456).

f. A paper by Carter (Philosoph. Transactions Royal Society, vol. 168. p. 286), describing 8 species from Kerguelen Island.

The Calcarea of this region have received considerable attention from Prof. Häckel in his famous monograph; and a pupil of his (Schuffner) has described (Jenaische Zeitsch. 1878) some species collected at Mauritius. The 'Challenger' collection (*l. c.* p. 366) produced 6 species from the Indian Ocean.

I propose here only to notice some of the most salient facts of the distribution, the known distribution of the species being given below under each.

Of the 110 species described below, only 27 species (25 per cent.) are known with certainty to occur outside the Australian seas. Of these:—

a. One, *Leucetta primigenia*, is almost cosmopolitan.

b. Four, viz. *Reniera indistincta*, *Gellius couchi*, *Suberites carnosus*, *Hymeniacidon caruncula*, occur in the British seas.

c. Five, viz. *Euspongia officinalis*, *Cacospongia mollior*, *Reniera aquaeductus*, *Tedania digitata*, *Gellius fibulatus*, occur in the Mediterranean, the last also on the Portuguese coast.

d. Three, viz. *Cladochalina armigera*, *Acervochalina finitima*, *Tedania digitata*, in the West Indies.

e. One, viz. *Cladochalina pergamentacea*, near the Brazilian coast.

f. One, viz. *Siphonochalina tubulosa*, is known from the Cape of Good Hope.

g. Three, viz. *Tubulodigitus communis*, *Spirastrella vagabunda*, *Geodia globostellifera*, from Ceylon; the first also from Kurrachee.

h. Fourteen (comprising 4 Ceratosa, 1 or 2 each of Calcarea, Tetractinellida, and of each family of the Monactinellida except the Suberitidæ) from the tropical parts of the Western Indian Ocean (see Part II. of this Report).

i. Six, viz. *Toxochalina foliolides*, *Gellius couchi*, *G. varius*, *Rhizochalina singaporensis*, *Iotrochota purpurea*, *Clathria frondifera*, from the Straits of Malacca.

j. One, viz. *Toxochalina foliolides*, from New Guinea.

It should be noticed that the most widely ranging forms belong in most cases to very generalized types, such as might be expected to possess considerable antiquity, and hence a wide distribution. Another

explanation seems, however, to suggest itself as possibly applicable to some cases of extremely generalized and indefinite types (e. g. *Reniera indistincta* and *Hymeniacidon caruncula*, which are common to the British and Australian seas), viz. an independent origin of the same species, or of what to a zoologist's eye is the same species, at two different localities. The number of points by which it is possible to distinguish species of (e. g.) *Reniera*, *Hymeniacidon*, *Amorphina*, and *Suberites* from one another is so small, and these points are so variable and so *relative* in their character, that it is quite possible that the same end (*i. e.* the same specific characters) may be attained by development in the same direction of two distinct species, the result being a *zoological* but not a *natural* species, or, in other words, of species which are distinct from each other but which cannot be shown to be so.

2. *Distribution of 'Alert' Species within Australian Seas.*

List of the Species collected on the Australian coasts, or in the Arafura Sea, by H.M.S. 'Alert,' 1881, with their known distribution in those waters. [The localities for Southern and Western Australia, and in one or two cases for Port Jackson, are given from previous writings; the rest are those due to the 'Alert' investigations.]

Note.—Where the distribution of a *variety* of a species is given, the distribution of the typical form is also given (when Australian) opposite the name of the *species*. The stars opposite the name of the variety refer exclusively to the variety.

	South-eastern Australia (Port Jackson).	North-east Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea.	Western North Australia (Port Darwin).	Western Australia (lat. 20°–35° S.).	Southern Australia (long. 100°–150° E.).
Order **CARNOSA** (not represented).							
Order **CERATOSA.**							
Family SPONGIIDÆ.							
1. Cacospongia mollior, *Schmidt*	.....	.....	*				
2. Euspongia foliacea (*Esper?*)	.....	.....	*				
3. —— officinalis, *Linné*, var. cavernosa, nov.	.....	.....	*				
4. —— septosa (*Lamarck?*)	.....	.....	*				
5. Hippospongia derasa, n. sp.	.....	.....	*				
6. Stelospongus excavatus, n. sp.	.....	*	.....	*			
7. —— implexus, n. sp.	.....	*					
8. —— intertextus (*Hyatt?*)	*	.....	.....	.....	.....	.....	*

	South-eastern Australia (Port Jackson).	North-east Australia (Queensland & E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea.	Western North Australia (Port Darwin).	Western Australia (lat. 20°–35° S.).	Southern Australia (long. 100°–150° E.).
9. Carterispongia otahitica, *Esper*	.....	*	.....	.....	.....	.....	*?
10. —— lamellosa, *Esper*	.....	*	.....	.....	.....	.....	.....
11. —— fissurata, *Lamarck*	.....	.....	*	.....	.....	.....	*
Family HIRCINIIDÆ.							
12. Hircinia horrens, *Selenka*	.....	.....	*	.....	.....	.....	*
13. ——, sp.	*	.....	*	.....	.....	.....	.....
Family DYSIDEIDÆ.							
14. Dysidea favosa, *Marshall*	.....	.....	.....	.....	*	.....	*
15. —— fusca (*Carter?*)	.....	.....	*	.....	.....	.....	.....
16. —— digitifera, n. sp.	.....	.....	*	.....	.....	.....	.....
17. —— semicanalis, n. sp.	.....	*	.....	.....	.....	.....	.....
18. Psammopemma densum, *Marshall*	.....	.....	.....	.....	.....	.....	*†
—— ——, var. subfibrosa, nov.	.....	.....	*	.....	.....	.....	.....
Family APLYSINIDÆ.							
19. Aplysina membranosa, *Pallas*	.....	.....	*	.....	.....	.....	.....
20. Ianthella flabelliformis, *Pallas*	.....	.....	.....	.....	*	.....	.....
Order SILICEA.							
Suborder MONACTINELLIDA.							
Family CHALINIDÆ.							
21. Chalina monilata, n. sp.	*	.....	.....	.....	.....	.....	.....
22. Cladochalina armigera, *Duch. & Mich.*	.....	*	*	.....	.....	.....	.....
23. ——, sp.	.....	.....	*	.....	.....	.....	.....
24. —— nuda, n. sp.	.....	.....	*	.....	.....	.....	.....
—— ——, var. abruptispicula	.....	.....	*	.....	.....	.....	.....
25. —— subarmigera, n. sp.	.....	.....	*	.....	.....	.....	.....
26. —— pergamentacea, *Ridley*	.....	.....	*	.....	.....	.....	.....
27. Acervochalina finitima, *Schmidt*	*	*	*	.....	.....	.....	.....
28. Tuba bullata (*Lamarck?*)	.....	*	.....	.....	.....	.....	.....
29. —— confœderata (*Lamarck?*)	.....	.....	*	.....	.....	.....	.....
30. Siphonochalina tubulosa, *Esper*, var.	.....	*	*	.....	.....	.....	.....
31. Tubulodigitus communis, *Carter*	*	.....	.....	.....	.....	.....	.....
32. Toxochalina folioides, *Bowerbank*	.....	.....	*	.....	*	.....	.....
33. —— robusta, n. sp.	*	.....	.....	.....	.....	.....	.....

† Tasmania.

	South-eastern Australia (Port Jackson).	North-east Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Aratura Sea.	Western North Australia (Port Darwin).	Western Australia (lat. 20°–35° S.).	Southern Australia (long. 100°–150° E.).
Family CHALINIDÆ (*continued*).							
34. Toxochalina murata, n. sp.		*					
35. Pachychalina lobata (*Esper*?)					*		
36. —— macrodactyla, *Lamarck*			*				
Family RENIERIDÆ.							
37. Reniera indistincta, *Bowerbank*, var.			*				
38. —— scyphonoides, *Lamarck*			*				*
39. —— ferula, *Bowerbank*					*		
40. —— aquæductus, *Schmidt*					*		
41. —— testudinaria, *Lamarck*		*					
42. ——, sp., wall-like					*		
43. ——, sp., laminar			*				
44. ——, sp., honeycombed					*		
45. Pellina muricata, n. sp.					*		
46. —— aliformis, n. sp.					*		
47. ——, sp., tubular		*					
48. ——, sp., massive		*			*		
49. —— ensiphonia, n. sp.					*		
50. Protoschmidtia hispidula, n. sp.			*				
51. Schmidtia variabilis, n. sp.					*		
52. Amorphina megalorrhaphis, *Carter*			*				
53. Tedania digitata, *Schmidt*, varr.			*		*		
Family DESMACIDINIDÆ.							
54. Rhizochalina fistulosa, *Bowerbank*						*	
——, var. infradensata, nov.				*			
55. —— singaporensis, *Carter*, var.			*				
56. —— spathulifera, n. sp.				*			
57. —— canalis, n. sp.			*	*	*		
58. Gellius couchi, *Bowerbank*.							
——, var. ceratina, nov.				*			
59. —— varius, *Bowerbank*					*		
60. —— fibulatus, *Schmidt*	*		*				
61. —— cymiformis, *Esper*		*	*				
62. Gelliodes fibulata (*Carter*?)			*				
63. Amphilectus tibiellifer, n. sp.			*				
64. —— hispidulus, n. sp.			*				
65. Myxilla arborescens, n. sp.	*						
66. Crella schmidti, n. sp.	*						
67. Iotrochota purpurea, *Bowerbank*		*	*				
68. —— baculifera, n. sp.					*		
69. Esperia parishi, *Bowerbank*					*		

	South-eastern Australia (Port Jackson).	North-east Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea.	Western North Australia (Port Darwin).	Western Australia (lat. 20°–35° S.).	Southern Australia (long. 100°–150° E.).
70. Esperia pellucida, n. sp.			*				
71. —— obscura (*Carter?*)			*				
72. Phoriospongia fibrosa, n. sp.	*		*				
Family ECTYONIDÆ.							
73. Ophlitispongia australiensis, n. sp.		*					
74. Clathria aculeata, n. sp.			*				
75. —— tuberosa, *Bowerbank*			*				
76. —— coppingeri, n. sp.			*				
77. —— reinwardti, *Vosmaer.*							
—— ——, var. subcylindrica, nov.			*				
—— ——, var. palmata, nov.		*					
78. —— frondifera, *Bowerbank*		*	*				
79. Rhaphidophlus arborescens, n. sp.			*				
80. —— procerus, n. sp.					*		
81. ——, sp.			*				
82. Acarnus ternatus, n. sp.			*				
83. Echinodictyum bilamellatum, *Lmk.*		*				*	
84. —— costiferum (*Lamarck?*)		*					
85. —— glomeratum, n. sp.			*				
—— ——, var. subglobosum			*				
86. —— cancellatum (*Lamarck?*)			*				
87. Raspailia bifurcata, n. sp.			*				
88. —— australiensis, n. sp.					*		
89. —— clathrata, n. sp.			*				
Family AXINELLIDÆ.							
90. Axinella echidnæa (*Lamarck?*)			*				
91. Acanthella, sp. (resembling *carduus*, Lamarck)			*				
92. Leucophlœus fenestratus, n. sp.					*		
—— ——, var.				*			
Family SUBERITIDÆ.							
93. Suberites carnosus, *Johnston*	*						
94. —— epiphytum, *Lamarck*		*					
95. Hymeniacidon caruncula, *Bowerbank*	*						
96. —— agminata, n. sp.	*						
97. ——, sp.			*				
98. Spirastrella vagabunda, n. sp.			*				
99. —— congenera, n. sp.			*				
100. —— decumbens, n. sp.			*				

	South-eastern Australia (Port Jackson).	North-east Australia (Queensland S.E. of Torres Straits).	Eastern North Australia (Torres Straits).	Arafura Sea.	Western North Australia (Port Darwin).	Western Australia (lat. 20° -25° S.).	Southern Australia (long. 100°-150° E.).
Suborder TETRACTINELLIDA.							
Family CHORISTIDÆ.							
101. Stelletta purpurea, n. sp.			*	*	*		
—— ——, var. retroflexa			*				
102. —— clavosa, n. sp.			*	*			
103. ——, sp.			*				
104. Stellettinopsis carteri, n. sp.			*				
105. Tethyopsis dissimilis, n. sp.			*		*		
106. Geodia globostellifera, *Carter*					*		
107. Placospongia carinata, *Bowerbank*			*				
Family LITHISTIDÆ (not represented).							
Suborder HEXACTINELLIDA (not represented).							
Order **CALCAREA.**							
Family ASCONIDÆ (not represented).							
Family LEUCONIDÆ.							
108. Leucetta primigenia, *Häckel*							*†
—— ——, var. microrrhaphis, *Häckel*			*				
109. Leucaltis bathybia, *Häckel*.							
—— ——, var. australiensis nov.	*						
110. Leuconia saccharata, *Häckel*	*						*
Family SYCONIDÆ (not represented).							
Family TICHONIDÆ (not represented).							

It is at once apparent from this Table that by far the largest number of species (64 in all) have been obtained from Torres Straits; that is, no doubt, partly due to the large number of dredgings taken and the number of minor localities investigated here. The Renieridæ are the only family of Silicea or Ceratosa which are not strongly represented. The forms most abundant here are *Iotrochota purpurea*,

† It is uncertain to which *variety* the locality given by Hæckel refers.

Gelliodes fibulata, *Rhizochalina singaporensis*, var., and *Clathria reinwardti*, var. *subcylindrica*. Ectyonidæ and Tetractinellida are relatively the most rich in species in this subequatorial region, 12 out of the 17 species collected of the first and 7 out of the 8 of the latter group being obtained here. It is remarkable that the only Siliceous species hitherto recorded with certainty from the locality, so far as I am aware (*Xenospongia patelliformis*, Gray, P. Z. S. 1858, p. 229, pl. 12), has not appeared on this occasion; it was, however, perhaps obtained from deep water, as its apparent affinity to *Halichœnia*, Bowerbank, of the British seas would suggest, and no specimens were obtained on this occasion from deep water (if such exists) in Torres Straits.

Of the other localities, Port Darwin on the north-west and the eastern Queensland coast on the east have been the most productive. As might have been expected from the wide extent of moderately deep sea which separates Port Darwin from Torres Straits, there are very considerable differences between their Sponge-faunas, although a larger number of dredgings made at the former would probably have reduced these differences. We find, however, the *Iotrochota* (*purpurea*) so common at Torres Straits replaced by another species, *I. baculifera*; *Gelliodes fibulata* and *Rhizochalina singaporensis* do not even appear; the Ectyonidæ, so far from being common, have but a single species here; and the Renieridæ, so poorly represented at Torres Straits, have here 10 species. Only a few species are here shown to extend across the Gulf of Carpentaria (*Toxochalina foliodes*, *Rhizochalina canalis*, *Stelletta purpurea*).

The Arafura Sea represents a somewhat deeper area, but, as might have been expected, shows affinities with Torres Straits on the one hand and Port Darwin on the other; 3 species of *Rhizochalina* and 2 *Stellettæ* are its chief representatives in the collection.

The Queensland coast does not appear to be so rich in Sponges as in Alcyonaria; in particular, the absence of Tetractinellida and almost total absence of Suberitidæ characterizes the collections obtained from this region. The occurrence either here or in Torres Straits of the whole of the 12 species assigned to species described by Lamarck is evidence in favour of the view that it was here that a considerable proportion of the Sponges described by him as collected by MM. Péron and Lesueur in the 'Mers Australes' were obtained.

Port Jackson shows peculiarities connected with its southern latitude, producing two British Suberitidæ besides South-Australian species of *Leuconia* and *Hircinia*; still, it has some species in common with Torres Straits. Six species range from the south to the north of Australia.

Classification.—I have followed no one author in this matter. The subject is in a state of transition, and I have adopted those divisions which seemed most in accordance with the present state of our knowledge. Remarks on the characters of the different groups will be found under their names; in some cases (especially *Chalinidæ*, *Desmacidinidæ*) important modifications in scope or characters seem required by the results of the present collection.

Terms employed.—These are essentially those used by Mr. Carter, as in my Report on the 'Alert' collections from the South-American coast (Proc. Zool. Soc. 1881). The measurements given for spicules are the *average maximum* measurements; the diameter of a spicule is its *greatest* diameter; *spines* are not included in spicule-measurements.

CERATOSA.

Ceraospongiæ, *Schmidt, Spong. Adr. Meer. und Atl. Geb.*

SPONGIIDÆ.

Bibulida, and Hircinida, pars, *Carter, Ann. & Mag. N. H.* (4) xvi. p. 132.

1. Cacospongia mollior.

Schmidt, Adr. Meer. p. 27.

A specimen in spirit, pedicellate, consisting of one prominent lobe and a lower broader portion, and a fragmentary skeleton. The apices of the conuli are about 2 millim. apart; the consistence is firm but compressible and elastic, the dermis black and glabrous, the sarcode rather opaque yellowish brown; the primary fibres long, straight, and with very rare foreign bodies, diameter 1 millim.; the secondaries making very various angles with the primaries, and forming numerous irregular meshes of variable size and angular shape; diameter of fibre ·035 to ·07 millim.; fibre of both kinds coarsely laminated.

The specimen is 68 millim. ($2\frac{3}{4}$ inches) high, 25 millim. in greatest breadth, 12 millim. in greatest thickness, and seems to agree in the main with Schmidt's species, although the network of the fibre is less regular and close.

Hab. Prince of Wales Channel, Torres Straits, 5–7 fms.

Distribution. Adriatic (*Schmidt*).

2. Euspongia foliacea.

? Spongia foliacea, *Esper, Pflanzenthiere, Fortsetz.* i. p. 201, pl. lvi.
? Platychalina foliacea, *Ehlers, Die Espersch. Spong.* p. 21.

It is with much regret that I have to express a doubt whether the sponge for which that careful observer, Prof. Ehlers, established the above genus is, as he asserts, a Chalinid. My reasons are as follows:—From H.M.S. 'Alert' there has been obtained a sponge, in fine preservation although dry, agreeing minutely with Esper's figure and description, except that the "pores" are smaller and more scattered and numerous, and not placed on the back, but on the front. With the exception of a very few fragments of spicules of different thicknesses, found singly and rarely in a few fibres, there are no spicules at all, and the sponge is evidently a Ceratose species, differing from the common species of *Euspongia* only in its flattened form. The fibres of the main skeleton agree in their consistency

and non-rectangular arrangement with those of *Euspongia*, and, as stated already, foreign bodies are the exception even in the surface-tufts; the diameter of the fibres is ·4 to ·7 millim. (Ehlers gives ·5 to ·8), except in the delicate *Ditela*-network of the surface and interstices, where it is ·0085 to ·022 millim. Ehlers says that the fibres contain "in der Axe vereinzelte sehr dünne spitz-spitze Nadeln (0·1 mm. lang, ·006 mm. breit) welche nur in den kegelförmigen Zuspitzungen an der Oberfläche des Schwammes etwas dichter gehäuft sind." Their occurrence singly ("vereinzelte") and not in longitudinal series, if that is what is implied, is not the usual mode of occurrence of spicules in the fibres of Chalinidæ (though it occurs occasionally in some fibres of *Chalochalinæ*), nor is their greater abundance in the surface-tufts, so far as I know, usual in this family. These statements appear to me to point towards the true explanation of the nature of these spicules, viz. that they are foreign, and taken in (as is usually the case in *Euspongia*) as foreign bodies in small quantities into the surface-tufts. A re-examination of the original specimen is desirable. If Esper's species is a Chalinid, then the present species is a *Euspongia*-isomorph of a Chalinid form, like the Chalinopsid representatives of *Siphonochalina* and *Pachychalina* which Schmidt (Spong. Meerbusen Mexico, p. 80) has described as *Siphonochalinopsis* and *Pachychalinopsis*.

I have satisfied myself that another explanation which might be suggested, viz. the dissolution of the spicules from the fibre of the Sponge (as in Carter's *Aplysina chalinoides*, afterwards found to be a true Chalinid), cannot apply to this case. I have studied the fibre very carefully, with and without the aid of potash, and can assert that it never possessed "proper" spicules.

The respective localities (Cape and Torres Straits) perhaps constitute relative objections to the specific identity of the present with Esper's species.

Hab. West Island, Torres Straits.

Distribution. Esper's species is from the Cape of Good Hope.

3. Euspongia officinalis, *Linné*, var. cavernosa. (Plate XLI. fig. *g*.)

From a depth of 10 fathoms in Torres Straits we have a small turnip-like sponge, unfortunately preserved only in the dry state, which to the unaided eye presents the general appearance of a *Rhizochalina fistulosa*, with several tubular processes, 10 to 35 millim. long and 8 to 10 millim. in greatest median diameter, on its upper surface; these processes are, however, ragged in outline at their distal ends, and evidently in life opened through the fringed aperture, now obscured by the falling together of the sides; their sides are in some cases fenestrate. The body of the sponge is rudely globular, and is drawn up above into monticular elevations, which are terminated by the tubes just described; the base is somewhat flattened, and has apparently been attached at three points to rock or gravel at the sea-bottom, portions of which are still left imbedded in the sponge. The chief horizontal diameters of the sponge-body are 45 and 55

millim. respectively: the vertical height, viz. to base of uppermost tube, is 30 millim. The surface is darkish umber-brown in colour, that of the body has a slightly irregularly wrinkled parchment-like appearance, that of the tubes is somewhat wrinkled in the direction of their length, and one of them presents further a somewhat shagreen-like surface, as if beset with very short conuli (scarcely 1 millim. high). On dissection it is found that whereas the tubes are chiefly (in the dry state) composed of a horny skeleton, 1–2 millim. thick, the body is a very cavernous mass whose bulk is largely occupied by large canals or chambers, 7–10 millim. wide, opening directly into the bases of the similarly wide tubes, the skeleton of the body thus consisting of trabeculæ with smooth, rounded surfaces; the subglobular appearance of the body is produced by the bridging over of the spaces between these trabeculæ by a brown paper-like membrane, which is found on microscopic examination to contain no horny elements, but may or may not enclose a certain quantity of minute foreign bodies (sponge-spicules, &c.).

Examining the skeleton of the body with the microscope, I find from vertical sections that it consists of a close reticulation of solid cylindrical horny fibres, distinguishable as:—(1) primary, stouter, approximately straight and parallel to each other, about ·07–·04 millim. apart, more or less vertical to the surface, according to position, thickness about ·03–·04 millim.; and (2) secondary, similar to primary, and more or less vertical to them, but often very obliquely placed, thickness about ·013–·03 millim.: distance apart very variable, from ·14 millim. upwards. Colour of fibre, pale to medium amber-colour. Although single primary fibres do not appear to project in the way strikingly exhibited in the more typical forms of *Euspongia officinalis*, where they project well above the general surface, and where distinct "conuli" are formed by the dermis around their bases, yet the sections show an aggregation and projection of the general skeleton at certain points, apparently representing conuli, but not (in the present state of the sponge) finding expression on the outer surface in the conical eminences which usually occur here in *Euspongia*. On the tubes the dermis (immediately below a membranous substance containing a few foreign bodies) is formed by a very close and regular horny network, composed of primary and secondary fibres, like the main skeleton, but arranged parallel, instead of vertically, to the surface. The proportions of the fibres are about the same, respectively, as those of the main skeleton, but the primaries are only ·03–·1 millim. apart. All the skeleton-fibres are devoid of sand-core, but are coated (in parts strongly) by the minute strongly refractive brown globules which Prof. F. E. Schulze has considered to be probably of Cryptogamous affinities.

In two points is this sponge of especial interest, viz. (1) in the almost complete subordination of the general arrangement of the skeletal framework to the largely developed excretory canals: (2) in the almost total suppression of the "conuli." A further point is the absence of sand-cored fibres. I was at first inclined to separate it generically from *Euspongia*, as having the large mæandrine

excretory chambers, separated by comparatively narrow and sheet-like skeletal trabeculæ, with even surfaces, which distinguish *Hippospongia*; but on looking at the brief description given by Prof. F. E. Schulze (Zeitsch. wiss. Zool. xxxii. p. 620) of the Adriatic form which he has placed under *Euspongia officinalis*, as var. *tubulosa*, I saw that he had had a closely similar form before him. It agrees with our specimen in the long tubes (of much less diameter, however, in the Adriatic *tubulosa* than here) and in the absence of sand-cored fibres: but it appears to want the following striking peculiarities of our form:—(1) subglobular form (incrusting in Schulze's specimens): (2) trabecular structure of main body: (3) absence of conuli (they are stated by Schulze to occur on the general body of the sponge, but in a very well-preserved specimen in absolute alcohol which he has liberally presented to the National Collection, I find them only on some small digitate lobes which spring from the body; those possibly occurring upon one of the tubes in var. *cavernosa* are evidently only exceptional): (4) approximate equality in stoutness of fibres throughout (in var. *tubulosa* those near the surface are said to be thinner than elsewhere).

In a preparation made from Prof. Schulze's specimen I do not notice a special thinness of the fibres at the surface, but they seem to have a slightly greater diameter throughout than in our form.

Considering the dry state of this single specimen and the evident plasticity of form in *E. officinalis*, I think it best to associate this form provisionally with that termed by Prof. Schulze var. *tubulosa*, feeling that it may be only a mere extreme variation of the species in the same direction as that variety, deferring (as I feel bound to do on a question which Prof. Schulze has made so eminently his own) to Prof. Schulze's judgment in specifically uniting aberrant forms like these with those familiarly known as *E. officinalis*: I am, however, induced, from the points of divergence from *tubulosa* noted above, to assign to it a distinct varietal designation.

Hab. Torres Straits, 10 fms.

Distribution (of species). Mediterranean (*Schulze*, &c.).

4. Euspongia septosa.

? Spongia septosa, *Lamarck*, *Ann. Mus. Hist. Nat.* xx. p. 373.

It is possible that Lamarck's species, of which I have access to the description only, is a *Dendrospongia* (Hyatt), as its somewhat honeycomb-like surface renders not impossible: but it seems to resemble a species in this collection, represented by two small specimens in spirit, of a dark grey colour, each attached to two or more stones, over which they form horizontally expanded laminæ which rise into subcylindrical lobes 5 to 7 millim. in diameter. The surface is broken up by a number of sharp prominent ridges and points 1 to 3 millim. high; the intermediate surface is rough. Primary skeleton-fibres set approximately at right angles to surface, thickness about ·06 millim.: secondaries approximately vertical to primaries, about ·035 to ·053 millim. in thickness, forming with some connecting

fibres rounded-angled meshes, ·14 to ·21 millim. in diameter, between the primaries, which are about ·42 millim. apart. Skeleton-fibres amber-yellow in colour, usually homogeneous in appearance throughout. Primaries cored to some little distance from surface by a usually single series of small foreign bodies; secondaries uncored. Sarcode dull pale brown, subtransparent. Texture of sponge in spirit very tough and elastic.

Hab. Alert Island, Torres Straits, 7 fms.

[*Distribution.* "Australian Seas" (*Lamarck*)?]

HIPPOSPONGIA.

Schulze, Zeitsch. wiss. Zool. xxxii. p. 614.

Under this head, owing to the sheet-like aggregation of the skeleton-fibres on the different surfaces, and the large tubular cavities formed by the excretory canals, I am for the present including those Spongiidæ with mæandrine main excretory canals, as *Cacospongia cavernosa*, Esper, and *Spongia intestinalis*, Lamarck, as a subdivision of the genus. Characters may, perhaps, in the future be discovered in their soft parts to justify their separation from that genus. The following is a third species referable to this section of *Hippospongia*.

5. Hippospongia derasa*. (Plate XLI. fig. A.)

Sponge subglobose: surface and interior of skeleton honeycombed by mæandering and branching excretory canals 2 to 3 millim. in diameter at the surface, opening into larger spaces at a short distance within the sponge. Texture of sponge firm, but elastic, in dry state: colour buff, becoming ochreous in parts.

Skeleton at surface between openings of canals smooth and compact, as if pared by a knife; walls of canals smooth. Primary fibres simple, straight, either (1) cored and set at right angles to surface, but not projecting beyond it, diameter, where not distended by foreign bodies, ·05 millim.; or (2) not cored by foreign bodies, set approximately at right angles to cored primaries, diameter about ·035 millim. Secondaries forming either subrectangular or irregular meshes between the primaries; diameter ·018 to ·022 millim. Diameter of the ultimate meshes ·07 to ·14 millim.; distance between primary fibres ·18 millim. Fibre dense, homogeneous, elastic; colour pale amber-yellow.

Hab. West Island, Torres Straits (washed up).

The single dry specimen is subhemispherical, and measures 60 millim. ($2\frac{3}{8}$ inches) in length by 35 millim. ($1\frac{1}{4}$ inch) in height. The species is most nearly allied to *H.* (*Spongia*) *intestinalis*, Lamarck, but has the fibres only about two thirds the stoutness of those of that species, and it is subglobose instead of being elongated and tubular. The texture of *intestinalis* is coarser and harsher than that of this species, partly owing to the thickness of the fibres

* *Derado*, to rub down, in allusion to the smoothness and compact texture of the surface.

and the greater number of cored primaries. *Spongia cavernosa*, Esper, differs from both in having the surface between the canals echinated with tufts.

The peculiarly smooth and unbroken character of the surface of the skeleton between the openings of the excretory canals appears to be due mainly to the remarkable modification of the usual position of the uncored primary fibres, by which, instead of running parallel to the cored primaries, and so meeting the general surface at right angles and (as is usually the case) by a superficial projection, they run approximately at right angles to the very scanty cored fibres, and so *parallel* to the general surface of the sponge; the very close *interstitial* network further adds to its density and evenness of the texture.

STELOSPONGUS.

Stelospongos, *Schmidt, Atl. Geb.* p. 29; *Hyatt, Mem. Bost. Soc.* ii. pt. 3, p. 528.
Polyfibrospongia, *Bowerbank, P. Z. S.* 1877, p. 459.
Stelospongia, *F. E. Schulze, Zeitsch. wiss. Zool.* xxxii. p. 613.
Stellospongia, *Marshall, Zeitsch. wiss. Zool.* xxxv. pp. 90, 118.

I cannot see any sufficient reason for Marshall's mode of writing the name of this genus. The first part of the word appears to be based on στήλη, a column, from the frequency with which Schmidt alludes to the columns ("Säulen") formed by the main fibres of the skeleton.

6. Stelospongus excavatus. (Plate XXXIX. fig. A.)

A small spirit-specimen, obtained at Port Molle, Queensland, has a head which arises from a short pedicel, is broad and semitruncate above, and cup-like, being excavated on its upper surface by four pits, the deepest occupying a great part of the thickness of the sponge; each pit contains a vent: the vents vary in size from about ·25 to 3 millim. The colour in spirit is greyish white (putty colour): the dermis conceals all the skeleton but the ends of the primary fibres, which appear as low points over the whole of the outer surface and just inside the margins of the pits.

The skeleton-lines measure about ·38 millim. in diameter, the individual fibres of primary lines from ·018 to ·028 millim. in diameter, those of the large secondary lines ·07 millim. Both the secondary and primary fibres enclose more or less foreign matter, which also occurs on the outside of the primary fibres and dermis, forming a kind of mosaic. Greatest height and breadth of the single specimen 31 and 25 millim. respectively. Several large nucleated and unsegmented ova are discernible in the tissues, scattered or aggregated in groups of two or three; the diameter of the largest is about ·06 millim.: one was also observed which had apparently divided into four segments.

A fine dry specimen, 300 millim. in gross height by 95 in the maximum diameter of the cup, provided with a slender pedicel 150 millim. long, breaking up below into a number of long stringy rooting

fibres, was also obtained. So far as the vents can be made out, they are numerous, and occur in a zone just inside the margin of the cup. The primary fibres are very stout at the margin of cup, viz. about ·5 to ·7 millim. in diameter, exclusive of their sandy coating.

Hab. Port Molle, Queensland, between tide-marks; Arafura Sea, off north coast of Australia, 32–36 fms. (the larger specimen).

The external position of the sand on the fibres recalls *Mauricea*, Carter (Ann. & Mag. N. H. (4) xx. p. 174), for which see below (*Carterispongia*). In this point, and in the arrangement, proportions, and other characters of the skeleton-fibres, the species strongly resembles Bowerbank's *Polyfibrospongia flabellifera* (Proc. Zool. Soc. 1877, p. 459), from the north of New Guinea: but the shape of that species is entirely different, being fan-shaped and quite thin, and the vents are described as inconspicuous.

7. Stelospongus implexus. (Plate XXXIX. fig. B.)

Stipitate, with short, usually flattened or compound pedicel: subturbinate, the wall usually proliferating inwards, and then anastomosing, forming a chambered cup, with thin walls (2 to 4 millim. thick). Outer and inner surfaces even, the outer marked strongly, in the dry state, by longitudinal projecting skeleton-ridges, the inner slightly so by the subrectangular superficial skeleton-network. Vents? Texture in dry state harsh, but yielding and rather brittle. Colour pale greyish brown.

Main skeleton at some distance below surface consisting of stout fascicles of primary fibres, vertical to the surface, about ·17 millim. in diameter (the individual fibrils about ·025 millim.), densely coated by a mosaic of small sand-grains, connected towards the surface by secondary lines of similar structure, about ·07 millim. in diameter: the primaries, when near the surface, become cored with foreign bodies, and become more condensed, sometimes forming but a single fibre, ·1 millim. thick. Dermal skeleton on exterior of cup consisting of parallel single fibres ·1 to ·17 millim. in diameter, coated, and to some extent cored, by small foreign bodies; intermediate membrane sparsely strewn with similar foreign bodies. Sarcode pale amber-yellow, transparent. Skeleton-fibre very pale yellow in the small, deep amber in the large fibres.

Hab. Port Molle, Queensland, coral-reef.

This species differs in external form from all those described by Hyatt (Mem. Bost. Soc. ii.). In the only cup-shaped form alluded to by Schmidt (Atl. Geb. p. 29) the walls would appear to be relatively much thicker, as is the case in *S. excavatus*, mihi (*suprà*). This form approaches that species closely, the skeleton- and surface-structure being almost identical in the two cases; but the well-marked tendency to proliferation and formation of secondary cavities in the cup and the shortness of the pedicel further distinguish *S. implexus*. This is a small species: all four specimens obtained (which were dry) were in their natural state between 40 and 60 millim. high, and between 40 and 60 millim. in greatest diameter at the top.

8. Stelospongus intertextus.

? *Hyatt, Mem. Bost. Soc.* ii. p. 532.

A fragment of what was probably either a cup-shaped or flabellate specimen is, perhaps, referable to this species: the structure of the skeleton agrees fairly with Hyatt's description; at some little distance below the surface the primary skeleton-lines are very stout, viz. ·14 millim. and upwards in diameter, and mostly *cored*, not *coated*, by foreign material; the skeleton is elastic and very compressible.

Hab. Port Jackson, 0–5 fms.

Distribution. Mauritius? (*Hyatt*)?

CARTERISPONGIA.

Halispongia, *Bowerbank, Mon. Brit. Spong.* i. p. 207 (*nec De Blainville*).

Carteriospongia, *Hyatt, Mem. Bost. Soc.* ii. p. 540.

Mauricea, *Carter, Ann. & Mag. N. H.* (4) xx. p. 174.

De Blainville founded the genus *Halispongia* (Man. Actinol. p. 532) to contain a number of sponges, of which the first is *Spongia papillaris*, Grant (=*Halichondria panicea*, Johnston), and which are stated in the generic diagnosis to contain siliceous spicules; therefore Bowerbank is clearly wrong when he describes and figures (Mon. Brit. Spong. i. pp. 207, 278) an obviously horny sponge as typical of the genus. The sponges which he has referred by name to this genus (*H. choanoides*, *mantelli*, *ventriculoides*, *stellifera*) appear to be all in accordance with his, but not with De Blainville's idea of the genus. Hyatt formed the genus *Carteriospongia* nominally for a species called by him *otahitica*, Esper, which is, however, apparently *lamellosa*, Esper, to the plate of which he refers. This species differs in outward form from the cup-shaped or palmate *Halispongiæ* of Bowerbank, but agrees with them in the skeleton-structure, while some *Halispongiæ* agree in possessing the cabbage-like growth which characterizes Hyatt's typical *Carteriospongiæ*. So many species (*Halispongia ventriculoides*, *Spongia fissurata*, Lamk., &c.), which appear to agree in all other points with Hyatt's conception of the genus, have, nevertheless, the secondary fibres sand-cored, that I venture to omit the character "absence of foreign matter from the secondary or connecting fibres," which he attributes not only to the genus, but to the entire family Phyllospongiadæ in which he places it. Schulze (Z. wiss. Zool. xxxii. p. 613) upholds this genus as a true member of the family Spongiidæ as revised by himself. In the second part of this work I shall explain the reasons why I cannot admit *Mauricea* as a distinct genus.

9. Carterispongia otahitica.

Spongia otahitica, *Esper, Pflanzenth. Fortsetz.* i. p. 209, pl. lxi. figs. 7, 8.

Halispongia ventriculoides, *Bowerbank, P. Z. S.* 1874, p. 301, pl. xlvii. figs. 1, 2.

? Cacospongia poculum, *Selenka*, *Z. wiss. Zool.* xvii. p. 567, pl. xxxv. fig. 7.

The specimens agree well with Esper's figure 7 and Bowerbank's specimens.

Hab. Bird Island, N.E. Australia (from coral-reef).

Distribution. N.E. Australia (*B.M. coll.*); [Melbourne (*Selenka*)?]; Otaheite (*Ellis*).

10. Carterispongia lamellosa.

Spongia lamellosa, *Esper*, *Pflanzenth.* ii. p. 270, pl. xliv.
Cacospongia lamellosa, *Ehlers*, *Espersch. Spong.* p. 15.
? Carteriospongia otahitica, *Hyatt*, *Mem. Bost. Soc.* ii. p. 541.

Fine dry examples showing the cabbage-like growth characteristic of Hyatt's genus. Also specimens with single stem (showing, however, traces of being composed of two or more united axes) and simply flabellar, with more or less prominent longitudinal ridges on one side, sometimes forming secondary flabellate expansions. The specimens, being still invested with dried sarcode, have an umber-brown colour and a stiffness, which contrasts strongly with the very pale colour and the flexibility of washed-out specimens.

I cannot agree with Prof. Ehlers in placing this sponge, with its close network, under *Cacospongia*, which is distinguished by the loose wide meshes formed by the fibres.

Hab. Port Molle, Queensland, and "North-east coast of Australia."

Distribution. Uncertain.

11. Carterispongia fissurata.

Spongia fissurata, *Lamarck*, *Ann. Mus. Hist. Nat.* xx. p. 382.
Carteriospongia vermifera, *Hyatt*, *Mem. Bost. Soc.* p. 543.

Cabbage-like heads formed of flabelliform expansions, which fold round at their lateral extremities, which then may, or may not, unite with similar fronds which arise parallel to each other from the multiple-stalked base or from the surfaces of other fronds. The surface of the skeleton is even, without projecting ridges, but honeycombed with small longitudinal, connected by short horizontal, demi-canals, between which intervene small, usually longitudinally elongate ridges, which all lie on one level. The fibres show very distinct lamination of the ceratinous material: both primary and secondary fibres are sand-cored, but the sand is often wanting over certain areas of the skeleton. Represented by dry specimens.

Hab. Thursday Island and Channel Rock, Torres Straits.

Distribution. "Australian seas" (*Lamarck*); Phillip's Island, probably near Melbourne (*Hyatt*).

HIRCINIIDÆ.

Schulze, Zeitsch. wiss. Zool. xxxii. p. 594.

12. Hircinia horrens.

? Spongelia horrens, *Selenka, Zeitsch. wiss. Zool.* xvii. p. 560.

Differs from Selenka's description in the pale colour (dull yellow or putty-colour) of the sponge as a whole and the pale brownish colour of the sarcode; the former is perhaps due to the absence from the dermis of the dark bodies described as nuclei. The fibres are closely reticulate in the conuli and in parts of the dermis; in other parts the latter is homogeneous, but of a ceratinous appearance; the diameter of the fibres is ·042 to ·088 millim. (Selenka gives ·07 to ·15). The conuli are, as in Selenka's specimen, about 5 to 10 millim. apart, but not so prominent as most of those in that specimen. The specimen is an irregular lobate mass growing over some bottom material, and is itself much overgrown by a sponge (*Iotrochota*), a Didemnid Ascidian, and a creeping Alcyonarian (*Callipodium*). This latter fact may account for the pale colour, which is perhaps owing to a sickly condition produced by the growth of other animals obscuring the pores; and indeed an orange colour in one part of the sponge itself seems likely to be due to local death. It is possible that Selenka's species may prove to be an *Aplysina*. The specimen is preserved in spirit.

Hab. Prince of Wales Channel, Torres Straits, 7 fms.

Distribution. Bass's Strait (*Selenka*)?

13. Hircinia, sp.

Three specimens in spirit, incrusting in growth; colour flesh-tint. The primary fibres are almost full of foreign bodies in the Torres-Straits specimen, less often so in the Port-Jackson one, and are about ·18 millim. in diameter; the secondaries at acute angles to the primaries, generally free from foreign bodies, and about ·06 millim. in diameter.

I had referred this to a species of Selenka's which I now see has been referred to *Aplysilla* by Prof. F. E. Schulze. I hope to describe it more fully at a future time.

Hab. West Island, Torres Straits, 7 fms.; Port Jackson, 0–5 fms.

DYSIDEIDÆ.

Gray, P. Z. S. 1867, p. 511.

Gray appears to have been the first to give a distinctive name to this family, although Bowerbank (Mon. Brit. Spong. i. p. 211), in 1864, makes *Dysidea* the type of a distinct suborder, to which he gives no name. Marshall ("Ueber Dysideiden und Phoriospongien," Zeitsch. wiss. Zool. xxxv. p. 92) employs the same name; and as his arguments for the retention of the *generic* term *Dysidea* instead of *Spongelia* appear to me to be valid, it seems desirable to retain the old family name, which is derived from it, in preference to Spon-

gelidæ, which Vosmaer has recently (Mitth. Zool. Stat. Neapel, iv. pp. 444, 445) employed. On the geographical distribution of the members of the Family see the subsequent Report on the Collections made in the Western Indian Ocean.

14. Dysidea favosa.

Marshall, Zeitsch. wiss. Zool. xxxv. p. 98, pl. vi. figs. 6–11.

Fragments; exhibiting, however, the secondary pouches in the wall of the tube, into which the excretory canals open, as described by Marshall. Here also, as in Marshall's specimens, the foreign contents of the fibres are chiefly sponge-spicules, but linear siliceous forms seem to prevail.

Hab. Port Darwin, between tide-marks.

Distribution. Bass's Strait (*Marshall*).

15. Dysidea fusca.

? Hircinia fusca, *Carter, Ann. & Mag. N. H.* (5) vi. p. 36.

One specimen is composed of two anastomosing lobes, somewhat compressed, 9–17 millim. in diameter, one being pointed and 45 millim. high, the other shorter and blunt. Vents few, scattered between conuli; tubercular, about 1 millim. across. Conuli 2–3 millim. apart, about 1 millim. high, apex often ridge-like; intermediate surfaces concave, depressed, glabrous. Texture in spirit fairly tough; colour dark reddish brown. Mr. Carter speaks of the fibre being "covered" with foreign material. In this specimen it is very coarse, viz. ·07 to ·25 millim. thick, and has the structure of that of *Dysidea* (*i.e.* is filled with coarse foreign bodies). Sarcode dense, reddish brown, granular. Main skeleton somewhat irregular, primary fibres plainly distinguishable only near surface; secondary fibres stout, irregular in direction. Dermal skeleton chiefly composed of coarse fibres, ·25 millim. broad, radiating from conuli. The fibres of the main skeleton contain a distinct yellow horny substance, and are occasionally devoid of foreign bodies for a short distance.

It seems possible that this may be Mr. Carter's species, but his description is too short to decide the matter. In a second specimen, which covers the upper surfaces of the body and limbs of a crab, throwing up short lobose projections at intervals, the conuli are smaller, pointed, and only 1 millim. apart, and the colour is a dull reddish brown.

Hab. Prince of Wales Channel, Thursday Island, Torres Straits, 3–4 and 7 or 9 fms.

Distribution. Ceylon (*Carter*)?

Histology. The cortex and subjacent tissues contain large quantities of granular reddish-brown cells, with circular outline, apparently those of the ectoderm (*Schulze*) lining the excretory cavities, which give the sponge its peculiar colour. In some parts of the paler-coloured sponge they are still distinguishable, but in others they are scarcely demarcated from the general transparent sur-

rounding tissues. The paler colour, to the natural eye, of the latter sponge appears to be due to the greater concentration of the pigment within the cells: a similar effect is produced by a similar cause in some Cephalopoda (*Loligo*).

16. Dysidea digitifera. (Plate XLI. fig. C.)

Curved and anastomosing cylindrical digitations, about 3 millim. in diameter, arising from the upper aspect of an erect, compressed, irregular basal mass, and tapering gradually to pointed ends. Surface even, minutely roughened by the presence in the dermis of a coarse, reticulate, horizontal skeleton. Vents few, scattered on main mass of sponge, subcircular, leading deeply into sponge. Texture (in spirit) very friable; colour pale greyish brown. Main skeleton composed of large foreign bodies, united by a thin, almost colourless membrane (not visible unless the fibre is broken); primary * fibres running approximately at right angles to surface; secondaries (*tertiary* of Marshall) approximately parallel to surface, very short; meshes narrow, about ·07 to ·09 millim. broad, rounded; fibres ·019 to ·05 millim. thick. Dermal skeleton formed of fibre similar to that of the main skeleton, about ·025 to ·055 millim. thick, forming circular or oval meshes, ·032 to ·09 millim. broad. Sarcode pale greyish brown, rather granular.

Hab. Albany Island, Torres Straits, 8 fms.

This is a delicate species, distinguished from all other described species by its closed digitate processes (those of *D. callosa*, Marshall, bear vents); in being devoid of conuli it differs from most species, but seems to agree with *Dysidea kirkii*, Carter (Ann. & Mag. N. H. (5) vii. p. 374), ? Bowerbank.

Height of sponge 40 millim. ($1\frac{3}{5}$ inch); greatest lateral extension 25 millim. (1 inch); longest individual digitation, 20 millim. ($\frac{4}{5}$ inch). The sponge has grown up amongst and over some specimens of *Eudendrium*.

17. Dysidea semicanalis. (Plate XLI. fig. B.)

A hollow flattened vertical common stem, giving rise to several vertical cloacal tubes, some of which are open on one side (evidently formed in some cases by the folding over of surface-ridges), united more or less by their projecting knife-like adjacent edges. Tubes about 60 millim. ($2\frac{3}{4}$ inches) in greatest length; mean internal diameter about 6 millim.; contracted at mouth, their walls 3 to 4 millim. in greatest thickness; inner surface provided with a few shallow pits. Outer surface bearing a few long, but not prominent, ridges running from near base to near the upper end; surface between ridges even, minutely honeycombed in dry state by small, longitudinally elongated spaces, separated by fibres of dermal skeleton, and about ·5 millim. in their smaller diameter. Texture, in dry state, rather harsh to the touch, firm but elastic, compressible and somewhat tough. Colour pale yellowish brown.

* *Secondary* of Marshall, *primary* of Hyatt, *vertical* of Carter.

Main skeleton forming rectangular meshes; primary fibres strong, running at right angles to surface, exhibiting horny margins (which may form as much as one third of total thickness of fibre), about ·28 to ·35 millim. apart, ·1 to ·18 millim. thick. Secondary fibres vertical to primaries, at about the same intervals, either without foreign bodies or with only about half to two thirds of the thickness occupied by them; in the former case ·035 to ·043 millim. thick, in the latter ·053 to ·1 millim. thick. Longitudinal fibres (*primary* of Marshall) of same structure as primaries, but less horny, ·18 to ·28 millim. apart, ·14 to ·21 millim. thick, running upwards and spreading out somewhat from each other. Dermal skeleton composed of long compound fibres, the primaries running parallel to each other and to the long axis of the sponge, ·35 to ·43 millim. apart; the secondaries extended between them at considerable intervals; primaries ·14 to ·28 millim. broad, secondaries ·1 to ·14 millim., the horny matter of the former usually, of the latter often, obscured by the foreign bodies, which often project much from the fibre. Horny substance amber-yellow. Sarcode amber-yellow, transparent. Foreign bodies of fibres small, chiefly sand.

Hab. North-east coast of Australia.

The single specimen is 105 millim. (4⅛ inches) high by 65 millim. greatest width. In its even compact surface it differs from all other *Dysideæ* except *D. favosa*, Marshall, with which it also agrees in the large development of the tubular form which it exhibits. The strongly horny character of the secondary fibre, however, distinguishes it from this (as from most, if not all other) species, and allies it to *Hircinia*. These striking characters, and the good preservation of the specimen, seem to warrant its description.

18. Psammopemma densum, *Marshall*, var. subfibrosa.

(Plate XLI. fig. *h*.)

Psammopemma densum, *Marshall, Zeitsch. wiss. Zool.* xxxv. p. 113.

Agreeing closely in size and external characters with Marshall's account of this strange form is a specimen in spirit in the present collection. It has the size and almost the shape of a horse-bean, and is of a grey colour. The dermal membrane contains numerous foreign bodies, but is in parts transparent, though fibrillated. Owing to an inferior amount of contained sand, a distinct network of wholly sandy fibres is to be made out, which Marshall did not find in his specimens; the meshes are round, about ·3 millim. in diameter, in the natural state almost filled up with sarcode containing foreign bodies. Sarcode very pale brown, subtransparent. The radiating tubes indicated in Marshall's figure (6) appear to me possibly to represent spaces between primary fibres; but those fibres in the present specimen are not straight, but bend right and left to meet the short secondary lines; thus a vertical section of the sponge exhibits a somewhat honeycomb-like appearance. No trace of horny matter was observed.

Hab. Thursday Island, Torres Straits, 3–4 fms.

Distribution. Tasmania (*Marshall*).

APLYSINIDÆ.

Aplysinida, *Carter, Ann. & Mag. N. H.* (5) xvi. p. 132.

This name is used in a wider sense than that to which Vosmaer (Mitth. Zool. Neapel, iv. p. 444) limits it.

19. Aplysina membranosa.

Spongia membranosa, *Pallas, Elench. Zooph.* p. 398.
Spongia membranacea, *Esper, Pflanzenth.* ii. p. 256, pl. xxxiv.
? Ianthella concentrica, *Hyatt, Mem. Bost. Soc.* ii. p. 407.
? Aplysina purpurea, *Carter, Ann. & Mag. N. H.* (5) vi. p. 36.

A very fine species, fortunately preserved in spirit as well as in the dry state. It forms a cylindrical mass, which has the same general form as that given in Esper's figure (*l. c.*): the base of the wet specimen is about 40 millim. ($1\frac{3}{5}$ inch) in diameter. The dry specimen, which is much the largest of the two, is 580 millim. ($22\frac{1}{2}$ inches) high, and the maximum diameter, which is at about 5 inches above the base, is about 40 millim. ($1\frac{3}{5}$ inch). At 77 millim. (3 inches) above the base a branch is given off, 22 millim. ($\frac{7}{8}$ inch) in maximum diameter and 145 millim. ($9\frac{1}{2}$ inches) in length, and on the same side, about 30 millim. higher up, a smaller branch, 12 millim. ($\frac{1}{2}$ inch) in maximum diameter and 75 millim. (3 inches) in height. The skeleton consists of a very open and irregular network of fibres, 1·5 to 2 millim. in thickness, which arise at the base of the sponge, and take a longitudinal but somewhat sinuous course along the interior of the cylindrical column of which the sponge consists. They throw out branches somewhat freely from their sides, and subdivide terminally into ramifying branches; the resulting twigs anastomose freely, the superficial ones end in outwardly and upwardly directed points, usually bi- or tri-furcate, which are just covered by the tough dermis; the apices are ·18 to ·28 millim. in diameter. The dermis and the internal membranes consist of a tough membrane of a puce or dull purple colour in spirit, almost black in the dry state. The membrane is seen with the naked eye to be marked with numerous raised thickened lines, which radiate from the projecting apices of the dermal conuli (formed by the tension of the dermis over the points of the skeleton, as mentioned above), and branch and anastomose on the membranes. Under the microscope they are seen not to be special fibre-structures, but to consist simply of thickened membrane. The membrane is coloured by purplish cells, which are about ·03 millim. in diameter, and are crowded with semiopaque granules, to which they owe their colour. The fibres of the skeleton have a wide central cavity, occupying about half their diameter, and filled, or almost so, with a transparent substance coloured diffusely of a purplish-red colour. The walls of the fibre are composed of laminæ which separate readily, and may then be seen to consist of a dark substance, rather readily torn, thickly set with fine dark purple-red

granules, lying in a diffusely stained subtransparent matrix of the same colour, but paler. A transparent membrane, consisting of an almost colourless matrix, containing few purple granules, appears to invest the fibre.

Hab. Thursday Island, Torres Straits, 4–5 fms.; bottom sand, or sand and rock.

Distribution. "Indian Ocean" (*Pallas*).

Obs. In many particulars this species recalls *Aplysina purpurea* of Carter, but appears to differ fundamentally in the distinctness, large size, and non-multiplicity of the fibres: whereas in that species the axes of the conuli and the skeleton generally consist of aggregated masses of fine fibrils. If Hyatt's species is really like *Ianthella homei*, with which he compares it, it cannot be this sponge, as it would be of flattened growth; but he appears to be uncertain on the point.

If one of the dermal cones, with the surrounding membranes, is treated with a strong solution of caustic potash, a dark brownish-yellow colouring-matter is dissolved out, thereby differing from that of *Ianthella*, which is said to be violet under similar circumstances (Gray, Proc. Zool. Soc. 1869, p. 50); nothing of the tissues is left but a branched fibre or two and some flocculent matter; therefore the only truly fibrous structures here are the terminal twigs of the skeleton.

The wall of the main skeleton-fibre of this species is much thicker than in most *Aplysinæ*, and its axial substance is not granular.

20. Ianthella flabelliformis.

Spongia flabelliformis, *Pallas, Elench. Zooph.* p. 380.
Ianthella flabelliformis, *Gray, P. Z. S.* 1869, p. 50.

A specimen in spirit, somewhat imperfect, and not showing any of those exfoliations of the lateral surfaces which specimens commonly exhibit.

Hab. Port Darwin, 7–12 fms.; bottom sand.

Distribution. Indian Ocean (*Pallas*); "Australia" (*Gray*).

CHALINIDÆ.

In this family must now be included some forms with minute flesh-spicules. *Homœodictya*, Ehlers, is the earliest discovered case of this combination; and I am able to add another, in a new genus, *Toxochalina*, which possesses fine tricurvates scattered in the sarcode. I have relegated *Rhizochalina* to the Desmacidinidæ for reasons given below (family Desmacidinidæ). I have also given reasons for a belief that *Platychalina*, Ehlers, is a Ceratose sponge (see *Euspongia*, suprà).

The fact cannot be ignored that the genus *Toxochalina*, characterized below, runs counter to the plan of classification hitherto

usually adopted in the family Chalinidæ, viz. that by the external form, in which both Carter and Schmidt agree. So long as, in the remaining features of their organization, the different members of the family did not present any sufficiently distinctive characters, it was impossible to do otherwise than arrange them by this character, which, indeed, appears to possess, from its approximate constancy in the species, more importance than in some other families of Monactinellida. Now, however, that two markedly distinct types of flesh-spicules have been found to occur (*cf.* the anchorate in *Homorodictya* (*Chalina*, Carter) *palmata*, Johnston), in addition to the normal acerate or fine subcylindrical, it seems necessary to apply the same rule as in other families, and allow the spicular characters, where they are well marked, precedence over those derived from the general form. Thus I have thought it right to unite here species which would, *cæteris paribus*, be classed in groups *Reptata* and *Aculeata* of two distinct families (Chalinida and Cavochalinida) of Mr. Carter's classification. This single spicular character is supported in this case by the coexistence of a firm texture and a rectangular arrangement of the skeleton-fibre.

On the comparatively slight value of aculeation of the surface and of erect or decumbent growth, see below under *Cladochalina subarmigera*.

In the present collection the family is represented by no less than 7 genera (8, if *Siphonochalina* is to be regarded as distinct from *Tuba*) and 15 species, of which 1 genus and 5 species are described as new. The latter are probably not forms of any great rarity, but owe their novelty to the very slight attention which has hitherto been paid to the Chalinidæ of the Indo-Pacific region; the chief contributors to the fauna hitherto being Mr. Carter, who has described or re-identified some 8 or 9 forms from this region, and Dr. Bowerbank, with 3 or 4 species. The identification of two of the species is unfortunately somewhat uncertain, from the very scanty descriptions given by Lamarck, their original describer.

With the exception of *Toxochalina*, the species have a strong resemblance to Atlantic forms, and in three cases (*Cladochalina armigera*, *C. pergamentacea* and *Acervochalina finitima*) have been satisfactorily determined as identical with species found near the eastern coast of America (West Indies and Brazil).

CHALINA, *Bowerbank*.

This genus was merely mentioned by name in Grant's 'Tabular View of the Animal Kingdom' (1861). In 1864 Dr. Bowerbank* (first) defined correctly the genus, assigning to it *Spongia oculata*, Pallas, as its type species. Schmidt therefore appears to me to be in the wrong when he (Atl. Geb. p. 32) removes this species to his genus *Chalinula*, of 1868, and restricts *Chalina* to species which have the habitus of *Euspongia* and *Cacospongia*.

* Mon. Brit. Spong. i. p. 208.

21. Chalina monilata*. (Plate XLI. fig. *k*.)

Erect, dichotomously branched; branches circular in transverse section, round at the ends, solid, 4 to 6 millim. in diameter, swelling out gently, necklace-like, about every 8 or 10 millim. of their length; terminal ones 35 to 85 millim. long, generally broad and compressed at point of bifurcation. Stem short, no stouter than most of the branches. Surface smooth, glabrous. Vents circular, edges flush with the surface, diameter about 2 millim., few, scattered irregularly on surface. Texture in spirit compressible, elastic, moderately tough; dermis tough, parchment-like; colour opaque yellowish brown.

Main skeleton irregularly rectangular, fibres very flexible, pale amber-yellow: primaries about ·042 millim. in diameter, spicules 3- to 4-serial; secondaries about ·035 millim. in diameter, spicules 1- to 3-serial: primaries ·35 to ·53 millim. apart at surface, secondaries ·14 to ·35 millim. Dermal skeleton—a wide-meshed, irregular polygonal network of strong fibre, ·035 to ·07 millim. thick; spicules numerous, 3- to 8-serial; within its meshes a dense and regular, usually rectangular, network of very pale horny fibre, ·006 to ·042 millim. in diameter; meshes ·05 to ·1 millim. in diameter; spicules of fibre usually 1-serial: fibres of characters transitional between these two kinds also occur. Sarcode very pale brown, slightly granular. Spicules smooth, acerate, usually tapering gradually to fine points, size ·1 by ·0017 millim.: more rarely tapering slightly from centre to about two diameters from ends, and then suddenly to sharp points; size ·085 by ·0021 millim.

Hab. Port Jackson, 0–5 fms.

Several specimens in spirit, the largest 175 millim. (7 inches) in height. This species has the general habit of *Chalina oculata*, Pallas: but the vents are less numerous and regular, the dermis is tough, instead of being soft and velvet-like, and the branches are moniliform, not strictly cylindrical, and the slender acerate spicules are very different from the stout fusiform ones of *C. oculata*. I am unable to assign this species to any of the numerous probable Chalinidæ which Lamarck has described under his section "Masses rameuses," &c.† The tough outer layer, the spiculation, or the habit distinguish it alike from these and all other *Chalinæ* with which I am acquainted.

22. Cladochalina armigera.

Tuba armigera, *Duch. de Fonbressin & Michelotti.*

Two dry specimens and one in spirit. Agree well in external characters with the original figure (Spong. Mer Caraïb. pl. viii. fig. 3) and in the characters of the fibre, except that the spicules are far more abundant (6 to 8 series in the primary and proportionally

* From Lat. *monile* a necklace.
† Ann. Mus. Hist. Nat. xx. p. 446.

more in the secondary fibres) than is the case with the mounting which the Museum possesses from Prof. Schmidt. The spicules are chiefly acerate, tapering gradually to sharp points, characters which I have already described in those of Schmidt's specimen (P. Z. S. 1881, p. 114); but here I find also a considerable number of cylindricals, in some places with well-rounded extremities: the size of both kinds is ·08 by ·0025 millim., which is almost exactly the size I gave for those of Schmidt's slide (*l. c.* p. 114). On re-examination of the latter, I find a few of the cylindricals present there also, and the position of the spicules in the fibre is normally axial on the whole, and not superficial only, as I stated in the paper referred to: I was misled as to these points by the scantiness and badly preserved condition of the small mounting which represents the species. Thus, with the exception of the more strongly spicular character of the fibre, the present specimens do not differ essentially from West Indian specimens of the species. The diameter of the stem varies from 5 to 9 millim. (exclusive of the spines), and the spines are strong, viz. 2 to 3 millim. high. Vents at intervals of 6 to 12 millim. along the stem.

Hab. Thursday and Alert Islands, Torres Straits, 3–7 fms.; Port Denison, Queensland, 4 fms.

Distribution. Caribbean Sea (*Duch. & Mich.*); Florida, 9 fms. (*Schmidt*).

It is interesting to have such a well authenticated case of identity of a West-Indian and an Australian sponge.

23. Cladochalina, sp.

A spirit-specimen, of sub-erect habit, with stout amber-yellow horny fibre and fusiform acerates, uni- or biserial, measuring ·28 by ·016 millim. Stem subcylindrical, about 12 millim. thick, without surface aculeations. I prefer to await more perfect specimens rather than risk an incorrect determination and description.

Hab. Prince of Wales Channel, Torres Straits, 5–7 fms.; bottom sand and shells.

24. Cladochalina nuda. (Plate XLI. fig. *i*.)

Decumbent. Stems solid, slender, tortuous (branches?; none occur in the specimens), irregularly cylindrical, more or less compressed from above in places, especially at points at which large vents occur; generally bullately swollen out laterally at the same points; diameter irregular, 2 to 7, or 5 to 9 millim. in different specimens. Surface even, minutely rough to the touch, with occasional low pointed projections. Vents uniserial, approximately confined to upper surface, 6 to 12 millim. apart, circular, opening level with the surface, or occasionally with edges drawn up, 1 to 3 millim. in diameter, 1 to 3 millim. deep; walls cavernous, perforated by numerous excretory canal-openings. Texture in spirit compressible, but resistent, very elastic; outer wall parchment-like, tough; colour pale umber-brown.

Main skeleton strictly rectangular; primary fibres ·28 to ·35 millim. apart at surface, secondaries ·24 to ·28 millim.; primaries ·053 to ·07 millim. in diameter, spicules 2- or 3-serial; secondaries ·035 to ·07 millim. in diameter, spicules uniserial; horny matter strong, pale amber-yellow, composing two thirds of the fibre in the primary, and five sixths in the secondary fibres. Dermal skeleton a strong, usually quadrangular network, tending to be rectangular, of similar composition to the main skeleton; between its meshes is intercalated a close angular network of finer and paler uniserially spiculate fibre, ·018 to ·024 millim. in diameter, the meshes ·053 to ·14 millim. in diameter. Sarcode pale umber-brown, granular. Spicule slightly bent, smooth acerate, tapering gradually to sharp points from three or four diameters from ends; size ·115 by ·007 millim.

Hab. Alert and West Islands, Torres Straits, 7 fms.; bottom sand.

Three good and some more or less fragmentary specimens in spirit. The two largest are 120 and 115 millim. (4¾ and 4⅝ inches) in length. The largest is composed of two stems, apparently of independent origin, but one of them attached to and united with the other at two points by broad masses of common substance. The species is nearly allied to *C. subarmigera*, and hardly differs at all exteriorly from the smooth form of that species except in its apparently slight tendency to form branches, but has the spicules of about twice the diameter, and much fewer in number in proportion to the horny matter, and the network of the main skeleton closer.

It resembles *Chalina montagui*, Bowerbank (? Fleming) (Great Britain), in the general form and the size and shape of the spicules; but the fibre in that species is less horny and stout, and has but one or two series of spicules.

It is a curious fact that at one of the points of union between the two stems, as above described, a vent, originally belonging to one of the stems, seems to have come into communication with the canal-system of the other stem.

Cladochalina nuda, var. **abruptispicula**. (Plate XLI. fig. *j*.)

Repent?, with single series of vents on one surface about 2 millim. in diameter, from 15 millim. and upwards apart, margins level with surface. Stem 8 to 12 millim. in diameter, slightly compressed, unbranched; surface even. Colour, in dry state, brown. Texture tough, elastic. Main skeleton rectangular. Fibre strong, pale amber-yellow; primary fibres about ·088 millim. thick, spicules axial, about 3-serial, ·35 to ·5 millim. apart, with a margin of horny matter; secondary fibres, as primaries, but ·044 to ·088 millim. thick, spicules somewhat loosely aggregated, 1- to 3-serial. Dermal skeleton as in the typical form, but with stouter main fibres. Sarcode pale yellow-brown, transparent. Spicules smooth acerate, straight or almost so, coming abruptly to sharp points within 1½ diameter from ends; size ·107 by ·0063 millim.

Hab. Thursday Island, Torres Straits.

The abrupt termination of the spicules and the stouter fibre distinguish this form of *C. nuda*. A single dry specimen, 105 millim. (4¼ inches) long.

25. Cladochalina subarmigera.

(Plate XXXIX. fig. H: Plate XLI. figs. *l*, *l'*.)

Repent, tortuous, solid, subcylindrical: stems 4 to 8 millim. in diameter (2 to 4 in a dwarf form), branching dichotomously at rather long intervals, somewhat flattened above. Branches of same general character as stems, often increasing somewhat in diameter towards apices, maximum length about 45 millim., attached at various points of lower surface. A few sharp points 1 to 2 millim. long project from sides of stem and branches here and there, especially in the neighbourhood of the larger vents; absent in some specimens; surface otherwise even. Vents numerous, in a single series, 2 to 6 millim. apart, along upper surfaces of stem and branches, circular, 1 to 2 millim. deep, 1 to 2·5 millim. in diameter; lumen cylindrical; margins level with the flattened upper surface of the sponge. Texture in spirit compressible, elastic, tough; surface somewhat harsh to the touch; colour umber-brown.

Main skeleton strictly rectangular in arrangement, rather variable in size of meshes and diameter of fibres in different specimens; thus the distance between primaries is ·28 to ·77 millim., between secondaries ·042 to ·28 millim.; diameter of primaries ·053 to ·09 millim., of secondaries ·035 to ·053 millim. (in dwarf form, primaries ·035 to ·053, secondaries ·023 to ·035 millim.); fibre almost entirely spicular, a very narrow horny margin alone being usually discernible (rarely in the dwarf specimen); spicules 6- to polyserial in primaries, 3- to 5-serial in secondaries (in the dwarf form, 4- to 8-serial in the former, 2- to 4- in the latter). Dermal skeleton of irregular wide meshes, composed of fibres of the same structure as those of the main skeleton; between these a close angular network of fine unispicular fibre, meshes ·053 to ·08 millim. in diameter. Horny matter of fibres amber-yellow. Sarcode rich yellowish brown, finely granular. Spicules smooth acerate, slender, almost cylindrical to within three diameters of ends, whence they taper to sharp points; size ·08 by ·0032 millim., ·09 by ·0032, ·095 by ·002, to ·12 by ·002 (in different specimens).

Hab. Warrior Reef, Alert Island, Thursday Island, Prince of Wales Channel, Torres Straits, 4–7 fms., &c.; bottom pearl-shells or sand, &c. Albany Island, N. coast of Australia, 3–4 fms.; bottom mud (dwarf form).

A few spirit-specimens represent the larger form of the species, one of them is 105 millim. (4¼ inches) in maximum extent. A small specimen, 25 millim. long, is the dwarf form above mentioned.

The species is perhaps most closely allied to *Cladochalina armigera*, Duch. & Mich., of described species; the surface-spines, however, which are the most striking external feature of *C. armigera*, are

here few in number and reduced in dimensions: the primary fibres are more slender and much more strongly spicular, and I have not observed here the cylindrical form of spicule which accompanies the acerate in *C. armigera*; the vents are more abundant and the growth is repent, instead of suberect. Still I believe the species to be not remotely allied; and this near relation between two species, one of which has an aculeated surface and an erect growth, while the other is decumbent and scarcely at all aculeated, shows how little value for the group-distinction of the Chalinidæ such characters may possess. The variation shown by different specimens (see description) is somewhat wide.

26. Cladochalina pergamentacea.

Cladochalina armigera, var. pergamentacea *, *Ridley*, *P. Z. S.* 1881, p. 112, pl. x. fig. 4.

A young specimen of compressed form, smooth surface, and with a row of vents along each margin, with the fibre as in *C. armigera*, and spicules measuring ·09 by ·0016 millim. and shaped like those of *C. armigera*, seems to belong to the above form.

Hab. Thursday Island, Torres Straits, 3–4 fms. (on *Retepora*).

Distribution. Hotspur Bank, off S.E. Brazil (*Ridley*).

ACERVOCHALINA, g. n.

Chalina, *Schmidt*, *Suppl.* ii. *Adr. Meer.* p. 10 (*nec Bowerbank*).

Massive, sessile Chalinidæ. Fibre strongly ceratinous, containing axially or diffusely arranged slender acerate spicules, which do not exceed in bulk the horny material of the fibre which contains them. Vents distinct, ranged along upper surface.

Type *Chalina limbata*, Bowerbank (Mon. Brit. Spong. ii. p. 373; ? Montagu).

This genus appears to be most closely allied to *Cladochalina*, by its strong relative development of keratose, its fine acerate spicules, and its serial vents. Mr. Carter indicated the distinctness of such forms as long ago as 1875, when (Ann. & Mag. N. H. (4) xvi. pp. 142, 162) he established the family Acervochalinida, making his first group of the family *Solida*, in which *Acervochalina* would come. He himself suggested the name which I have adopted, and has sent me a specimen illustrating his view of the species which should be assigned to the genus. The constancy in form of both this and the following species, and their agreement in other points, show them to be no mere dwarfed forms of erect Chalinidæ.

Schmidt has on reconsideration (Atl. Geb. p. 38) referred *Chalina limbata* to *Chalinula*; but that genus is equivalent to *Chalina*,

* This so-called variety seems, by the constancy of the peculiarities of its external form, viz. knife-like shape, two marginal rows of vents, and smooth surface, to differ specifically from *C. armigera*, and may therefore stand as *Cladochalina pergamentacea*.

and besides being primarily based on an *erect* species, requires the spicules to form the greater part of the skeleton-fibre, which he reconciles with the structure of *C. limbata* by stating that the horny matter in this species shrivels when dried.

27. Acervochalina finitima.

Chalina finitima, *Schmidt, Atl. Geb.* p. 33.

Several specimens agreeing with this Atlantic species. They have the general habit of *Cluthria oroides*, Schmidt, which from a low massive body throws out blunt spurs. On the spurs are placed numerous small vents, 1–4 millim. in diameter, biserially or irregularly arranged. Texture in spirit very soft and elastic; colour pale yellowish brown. Skeleton network close, rectangular; fibres stout, pale yellow or colourless; spicules multiserial in primary, biserial or uniserial in secondary fibres. Spicules smooth, gradually and sharply pointed; size about ·1 by ·0018 millim. (*i. e.* a little thinner than in West-Indian specimens).

Hab. Port Jackson, 0–5 fms., Percy Island, Queensland, 0–5 fms.: Alert Island, Torres Straits, 7 fms.

Distribution. Florida, Antilles (*Schmidt*).

A. finitima differs from the British species *limbata* in its general shape, that of *limbata* being globular to lobate.

The specimens measure about 50 millim. (2 inches) in greatest diameter, and 25 millim. in height.

28. Tuba bullata.

? Spongia bullata, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 43 (*nec* var. β): *nec* Siphonochalina bullata, *Schmidt.*
Spongia aculeata, *Linné*, pars, *Syst. Nat. ed.* 12, p. 1297.

Wide-mouthed tubes, 50 to 200 millim. high (2 to 8 inches), rising from a common horizontal lamina, from which they appear to be formed by the reversion and curling of its edges. Tubes irregular in lumen, 35 to 125 millim. (1½ to 5 inches) in maximum diameter. Surface asperated by a network of low sharp ridges, beset with numerous sharp points, 1 to 3 millim. high. Mouth of tubes somewhat constricted, inner surface smooth. The surface-tufts are seen on examination generally to proceed from narrow superficial ridges which run over the surface in different directions. The prolongation of the margin spoken of by Lamarck is not to be made out distinctly.

Skeleton of narrow rectangular meshes. Primary fibres about ·1 to ·14 millim., secondary ·42 to ·7 millim. in diameter, both full (in most places) of the acerate spicules, though these are somewhat closely aggregated. Spicules (i.) fusiform, tapering to sharp points from within about two diametersof the apices, ·18 by ·0095 millim.; also (ii.), probably a variety of (i.), acuate, about ·14 by ·0063 millim.

This species appears to be widely distributed between Japan and

Australia. I have, at any rate, seen pieces of a sponge closely allied to, if not identical with, this substituted for the original sponge of *Hyalonema sieboldi*, probably belonging to the species alluded to as occurring in this connexion in Japan by L. Döderlein (Arch. für Naturg. xlix. p. 104), under the name of *Siphonochalina papyracea*; it is in any case not referable to that species, but possibly to *Tuba megastoma*, Duch. & Mich., or *T.* (*Spongia*) *bursaria*, Lamarck. Linné seems to have confounded two or more species under the name *aculeata*.

Hab. Port Molle and Port Curtis, Queensland (from coral-reef, &c.).

Distribution. Australian seas (*Lamarck*).

29. Tuba confœderata.

? Spongia confœderata, *Lamarck*, *Ann. Mus. Hist. Nat.* xx. p. 438.

Groups of erect, straight, laterally united tubes, each about 25 millim. (1 inch) in greatest internal diameter in the present (dry and somewhat compressed) state, the surface covered with numerous sharp but low aculeations, about 2 to 3 millim. high and 3 to 5 millim. apart, seem to me to possibly represent this species. I am, however, doubtful whether Seba's figure to which Lamarck refers (viz. Thesaurus, iii. pl. xcvii. fig. 2) professes to represent the surface aculeations which I have described; in that figure the tubes are shorter in proportion to their diameter than here. In this specimen the surface between the aculeations is smooth, and the tubes decrease but slightly in diameter towards the mouth, which is fringed with a row of small, flexible, tag-like aculeations 2 to 3 millim. long. The tubes are 95 to 120 millim. long, and have evidently been torn from a common hollow horizontal base (as is shown by another, very battered specimen, which also shows the real length of the tubes to be approximately as stated above for the detached tubes); they are united up to their summits or to within a very short distance of them. The walls are 1 to 3 millim. thick. Vents numerous, small, ·5 to 1 millim. in diameter, on the inner (otherwise smooth) surface of the tubes. The colour is pale brown.

The main skeleton-fibre is tough, flexible, amber-yellow: the spicules of the primary fibres form about 3 or 4 series in axis of fibre, of which they occupy about one fourth of the total breadth, which is ·07 to ·1 millim.: the spicules of the secondary fibres are in two or three axial series, diameter of fibre about ·07 millim. Secondary fibres generally long, not far apart, approximately vertical to the primaries. Dermal skeleton consisting of stout main fibres about ·14 millim. in diameter, intermediate fibres ·035 to ·1 millim. broad; fibres usually spicular, with little or no visible horny matter. Sarcode wanting. Spicules smooth acerate, tapering to sharp points from about three diameters from ends: size ·1 by ·0063 to ·0075 millim.

Represented by three more or less washed dry specimens.

Hab. West Island, Torres Straits (from beach).

This species has a great resemblance to the West-Indian *Tuba sororia* of Duchassaing de Fonbressin and Michelotti, but differs from the West-Indian species included by Schmidt in his *Siphonochalina papyracea*, of which *T. sororia* is one, in having the spicules ·0063 millim. and upwards thick, instead of only ·002 to ·0042, as stated by Schmidt for those species.

SIPHONOCHALINA, *Schmidt.*

Although apparently published (Spong. Küst. Alg. p. 7) as distinct from *Tuba* of Duch. de Fonbr. and Michelotti, it seems to be coextensive with that (older) genus. I have, however, provisionally retained the name for convenience, for a few forms with narrow, thick-walled tubes, like those of the type species *S. coriacea* (*l. c.*).

30. Siphonochalina tubulosa, var.

Spongia tubulosa, *Esper, Pflanzenth. Fortsetz.* i. p. 196, pl. liv.
Siphonochalina tubulosa, *Ehlers, Die Espersch. Spong.* p. 19.
? Spongia bullata var. β, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 437.

Small colonies, some agreeing well with Esper's figure, some with the tubes scarcely rising above the general surface. The skeleton-spicules are rather longer and more slender than is indicated by Ehlers's measurements, viz. ·17 by ·009 millim. (Ehlers gives ·11 to ·13 by ·012 millim.); the smaller ones mentioned by him are obviously young.

Several specimens, dry and in spirit.

Hab. Thursday Island, Channel Rock, Torres Straits, depth ?; Port Molle, Queensland, "beach."

Distribution. Cape of Good Hope (*Esper*).

31. Tubulodigitus communis.

Carter, Ann. & Mag. N. H. (5) ix. p. 367.

The present specimens, preserved in spirit, agree sufficiently with Mr. Carter's description as regards external characters. The colour (in spirit) is chiefly a dark earthy brown, which may very probably have been altered from the purple described by Mr. Carter. The fibre is strongly horny, slender, and very flexible, ·035 to ·042 millim. in diameter in the case of the primaries, ·028 to ·035 in the secondaries; spicules 1- to 3- (rarely 4-) serial in the primaries, 1- or 2-serial in the secondaries. In Mr. Carter's specimens the spicules appear to be relatively somewhat more abundant. Colour pale amber-yellow. Although I have not observed in these specimens a constant difference in size between the axial and peripheral spicules of the fibre, such as that which Mr. Carter notices (*l. c.*), there is, nevertheless, a very marked dimorphism in the spicules. Between those of the commoner, slender acerate form, gradually sharp-pointed, size ·1 by ·005 millim., are intercalated in various places stouter ones of similar shape, but in size ·14 by ·0063 millim., and they sometimes occur by the side of the slenderer form. From the

resemblance in external characters and in this remarkable structural point between Mr. Carter's species and the present specimens, I assign the latter with little doubt to that species, although Mr. Carter has not given the measurements of the spicules.

Hab. Port Jackson. 0–5 fms.

Distribution. Ceylon (*Carter*); Kurrachee (*coll. Mus. Brit.*).

The absence of this species from the hauls made in the tropical waters of Northern Australia perhaps indicates that its natural habitat is in subtropical seas, like those of Northern India and Port Jackson.

TOXOCHALINA*, g. n.

Chalinidæ with well-developed horny fibre arranged rectangularly. Spicules, a skeleton acerate and a tricurvate acerate ("Bogen," German) flesh-spicule.

Obs. The tricurvate flesh-spicule distinguishes this genus from all other Chalinidæ; the only parallels for the occurrence of a flesh-spicule in this group with which I am acquainted are found in the species *Halichondria palmata* of Johnston, lately (Ann. & Mag. Nat. Hist. (5) x. p. 109) redescribed and assigned by Mr. Carter to the genus *Chalina*, and *Spongia* (*Desmacidon*, Ehlers) *compressa*, Esper, also referred (*l. c.* p. 112) by Mr. Carter to *Chalina*, and in a species described by O. Schmidt ('Meerbus. Mexico,' p. 76) as *Rhizochalina? fibulata*, which has bihamates. The fact of an intimate connexion, which seems to have been thus already discovered, between the Chalinidæ and Desmacidinidæ, appears to receive confirmation from the present cases of the occurrence of a *tricurvate* flesh-spicule in members of the former family.

32. Toxochalina folioides. (Plate XLI. figs. *m–m''*.)

Desmacidon folioides, *Bowerbank, P. Z. S.* 1875, p. 295.

In one Bowerbankian specimen from New Guinea and one 'Alert' specimen from Australia the form is vallate, produced by the lateral union of a series of tubes; the other 'Alert' specimens agree with the type (see Bowerbank, *l. c.*) in its external form, and the former specimens may be termed var. *vallata*. This is a true Chalinid, although the amount of horny material in the fibre is no more than enough to unite the spicules into a tough and elastic mass, and is not visible outside the spicules. I have detected in the type specimen of this species small, smooth, finely-pointed, tricurvate acerates, about ·04 by ·001 millim. in size, in the dermal membrane; I have not yet detected them in the subjacent tissues, though this has been done for another specimen of the species in the Bowerbankian collection (from New Guinea). The skeleton-spicules vary from rather tapering cylindrical, with rounded ends, to tapering acerate, with sharp ends, size about ·11 by ·0042 millim. in the typical, and ·16 by ·0085 millim. in the Port Darwin specimens. The New-Guinea

* From Gr. τόξον, a bow; and χαλινός, a thong.

and Australian specimens have rather thicker branches than those from the Straits of Malacca, viz. 12 to 25 millim. as against about 10 millim.

Hab. Prince of Wales Channel and Thursday Island, Torres Straits, beach and 7–9 fms.; Port Darwin, 7–12 fms.

Distribution. Straits of Malacca (*Bowerbank*); New Guinea (*Bowerbank coll.*).

33. **Toxochalina robusta.** (Plate XXXIX. fig. G; Plate XLI. figs. *a*, *a'*.)

Repent, branching, attached usually by the lower surface of the main stem or branches. Stem and branches subcylindrical, uneven in places, subnodular, varying in diameter within short distances; solid, not tubular. Branches given off at intervals of 1 to 2 inches, at angles of from about 30° to 80°, sometimes anastomosing. Stem and main branches usually 10 to 18 millim. in greatest diameter, some small branches descend to 4 and 5 millim. Vents few, approximately one to the space between each two branches, the margins usually sharp and projecting somewhat; diameter 3 to 6 millim.; excretory canals penetrating straight and deeply into the substance of the sponge. Sponge, in spirit, tough, but yielding and pliable (almost as much so as *Chalina oculata*, Pallas). Internal fibres soft and elastic, forming a close network. Dermal membrane firmer, parchment-like, even, glabrous, slightly marked by the apices of the primary skeleton-fibres and the dermal skeleton-network. Colour of sponge in spirit pale brown, inclined to yellow.

Main skeleton consisting of straight, stout, bright amber-yellow, horny primary fibres, ·05 to ·075 millim. thick, and about ·5 to ·7 millim. apart at surface, meeting the surface at right angles, and sometimes projecting slightly: their apices are, however, connected by a system of fine horizontal fibre-network; spicules closely aggregated, confined to the axis of fibre, forming a band there of about 6 to 8 spicules broad, and occupying, near the surface of the sponge, only about one third of the total thickness of the fibre. Secondary fibres at right angles to primaries, of paler yellow horny fibre, about ·035 to ·05 millim. in diameter and ·28 to ·35 millim. apart; spicules of axis in a unispicular series (occasionally two spicules broad), often interrupted altogether or wholly wanting. Dermal skeleton formed by a few very stout, dark yellow fibres, ·05 to ·1 millim. thick and 1 to 1·4 millim. apart, enclosing angular spaces filled by a close subrectangular network of paler, mostly non-spiculate fibres from ·009 to ·045 millim. in diameter. Sarcode very pale yellow, transparent, with numerous small dark granules.

Skeleton-spicule acerate, tapering abruptly from within about 1½ diameters of ends to very sharp points; size ·1 by ·0032 to ·0042 millim. Flesh-spicule tricurvate acerate, curves moderately bold, tapering gradually to sharp points from centre; size ·05 to ·063 by ·0017 to ·0021 millim.; found in superficial and deeper parts of the sponge, fairly abundant.

Hab. Port Jackson, 0–5 fms.

The maximum lateral extent of the largest of the specimens appears to have been about 270 millim. (10¾ inches), another measures 250 millim. (10 inches) across the branches, while individual branches may attain a length of 90 millim. (3½ inches). In *habitus* the species differs from *T. folioides* mainly in having the general surface approximately *even*, and not asperated by projecting points; in the structure of the fibre, the horny element shows a far greater development, and the tricurvate is much stouter than in that species.

34. Toxochalina murata*.

Low, broad, wall-like masses, enclosing a series of vertical tubes, 5 to 8 millim. in diameter, which rise straight from near the base of the mass, and are separated by 8 to 10 millim. of sponge-substance; the mouths of the tubes may project slightly, but are rather contracted. General surface of sponge asperated with low, sharp, monticular elevations 3 to 7 millim. apart, 1 to 2 millim. high, often connected by low ridges; surface between ridges and elevations smooth in dry state. Texture in dry state elastic but firm; colour pale yellowish brown. Fibre very tough.

Main skeleton—meshes chiefly very wide, rectangular, formed by primary and secondary fibres of approximately equal diameter; at intervals a less regular network of smaller secondary fibres combined with the straight primaries; larger fibres ·022 millim. broad, smaller ·0095 to ·016 millim.; primaries cored by 1 to 4 series of axially placed acerate spicules, sometimes wanting; secondaries by 1 to 2 series, often wanting altogether. Colour of fibre pale yellow-brown.

Spicules—(1) skeleton acerate, straight, smooth, tapering to very sharp points from about two diameters from ends, size ·1 by ·005 millim.; (2) tricurvate acerate of sarcode, smooth, curves gentle, tapering gradually to fine points, size ·063 by ·0016 millim.

Hab. Port Molle, Queensland, 12–20 fms.

The average greatest height of the single (dry) specimen is 30 millim. (1¼ inch), the total length (from side to side) 140 millim. (5½ inches).

This species has very much the external habit of *T. folioides*, var. *vallata*, but the points on the surface are less prominent than in that species; the very strongly horny character of the fibre separates it more decidedly, so that it is impossible to confound the two species under the microscope. In the case of *T. robusta*, mihi, the repent habit, the solid and smooth branches, and the slighter and more strongly spiculate fibre constitute ample means of differentiation.

35. Pachychalina lobata, var.

? Spongia lobata, *Esper, Pflanzenth.* ii. p. 273, pl. xlvi.

I have thought it best to assign, with doubt, to the above species (as a variety) a form with strong, rudely cylindrical main axis and branches, which was apparently semidecumbent in life, and which

* From Lat. *muratus*, walled.

has a slightly but regularly uneven surface, the tissue covering it being, however, almost smooth. Vents with thin everted margins about ·5 millim. high, abundant, irregularly uniserial, 1 to 3 millim. in diameter on one (presumably the upper) side of the stem and branches, less abundant and generally smaller on the opposite side. Branching dichotomous, at angles of 50° to 60°; the branches rather flexuous; branches and stem 8 to 18 millim. in diameter. Texture in spirit firm, but flexible, tough; colour dark dull grey. Main skeleton composed of tough, flexible primary fibres of closely packed spicules, about 6- to 12-serial, running approximately at right angles to surface (no horny uniting-matter visible), the fibres nearly approximated to each other; and of irregular and often loose crossing secondary tracts of spicules 2 to 4 spicules broad, not strictly at right angles to primaries. Dermal skeleton a closely-set coat of subparallel spicule-fibres about 8 spicules broad. Sarcode dark brownish, granular. Spicules acerate, slightly but sharply bent, tapering slightly from middle, and rather suddenly from within about two diameters of ends, to moderately sharp points; size ·2 by ·0128 millim.

Hab. Port Darwin, 7–12 fms.; bottom mud and sand.

Distribution. East-Indian seas (*Esper*)?

The only specimen measures 150 millim. (6 inches) in extreme length. The species is at any rate distinct from *Spongia arborescens* of Lamarck, who gives *S. lobata*, Esper, as a synonym of his species. It stands on the borderland between *Pachychalina* and the branched and large-vented Renieridæ. I assign it to the former, as its fibres are evidently formed in part by a flexible horny material. It differs from the described specimens of *S. lobata* in having approximately cylindrical branches and bearing some vents on both sides.

36. Pachychalina macrodactyla. (Plate XL. figs. B, B'; Plate XLI. fig. *o*.)

Spongia macrodactyla, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 457.

Guided only by the short and superficial description given by Lamarck, and by the locality ("probably Indian Ocean") assigned by him, I refer to his species some dry fragments of an exquisite *Pachychalina*, possibly originally belonging to one specimen. It has some external resemblance to *Spongia asparagus*, Lamarck, of which I have seen a specimen; but the branches in the latter are cylindrical, the vents open on the level of the general surface, and the fibre-structure is that of *Chalina* rather than *Pachychalina*. I will proceed to supplement the original incomplete description by a fuller one.

The stem and branches are flattened out, somewhat knife-like, in most places, the edges being sometimes quite sharp; the lateral diameter is here about twice the antero-posterior one (viz. about 13 millim. at largest part of stem, 9 millim. just below apex of branches); the stem near the base appears to be normally cylindrical, about 6 millim. in diameter. Branches (in present specimens) given off pin-

nately from one side of the main stem at very acute angles, soon becoming almost parallel with the stem itself; their length varies from 60 to 120 millim. (2½ to 4¾ inches). The vents are numerous, ·5 to 1 millim. in diameter, circular, with sharp, prominent margins, about ·5 to 1 millim. above the general surface: ranged in a single row down each margin of the stem and branches, and also scattered (more sparsely) on their anterior and posterior faces; they are 2 to 5 millim. apart on the margins. General surface of sponge level, only rendered a little uneven by the slight elevations which carry the vents, composed of a close meshwork; meshes ·25 wide, ·25 to ·5 millim. apart. Texture firm, incompressible in stem, elastic, somewhat compressible towards ends of branches, brittle; the surface and internal fibre soft, like leather. Colour in dry state—surface pale grey; interior brownish yellow in present specimens, owing to a parasitic microphyte of some kind. Sarcode apparently transparent, almost colourless.

Main skeleton—meshes strictly rectangular, very close; primary fibres about ·11 millim., secondaries about ·14 millim. apart near surface; horny material uniting fibres only visible distinctly at some depth in the sponge; primary fibres 3 or 4 spicules broad, secondaries 2 or 3 spicules broad. Dermal skeleton composed of meshes of various sizes and a varying number of angles, formed by the projecting ends of the primary main-skeleton fibres and the uppermost secondary fibres. Horny matter almost colourless. Spicules—(1) skeleton acerate, smooth, slightly curved, tapering to sharp points from near middle: size ·16 by ·0063 millim.

Hab. Friday Island, Torres Straits.

Distribution. "Probably Indian Ocean" (*Lamarck*).

Parasite. The horny matter of the fibres is covered with immense numbers of a small, strongly refractive globular body about ·0015 millim. in diameter, similar to that which gives a rust-brown colour to the fibres of many *Euspongiæ*, recently stated by Prof. F. E. Schulze ("Der Badeschwamm," Westermann's Illustr. Deutsch. Monatshefte, 1882, pp. 188–210) to be probably of parasitic nature. Certainly, judging by the friable character of these and other similarly affected specimens, these bodies would appear to have exercised some distinctly deteriorating influence.

RENIERIDÆ.

Renierida, *Carter, Ann. & Mag. N. H.* (4) xvi. p. 133.

Under this heading I include only those Monactinellida which have merely acerate spicules not enclosed in a distinct horny fibre. The genus *Reniera* very commonly has strong indications of a horny material uniting the ends of the spicules, and thus approaches *Chalina* and *Pachychalina*, where, however, the horny element is distinct enough to bear the name of a fibre; but there is no sharp line between the Renieridæ and Chalinidæ. In several cases, where the specimens have been imperfect, I have preferred to give no specific

name, for want of characters by which to identify species with others which I know merely by descriptions; I have, however, given descriptions in these cases, in order that the species may be identified (if possible) by future comparisons with *specimens* of species to which I have not access at present.

RENIERA, *Nardo*.

This genus is distinguished by the regularity of its main skeleton, the small size of its spicules, and the want of an evident distinct dermal skeleton. The latter point, however, is not very satisfactorily indicated in all the species which seem otherwise referable to the genus.

37. Reniera indistincta, var.

Isodictya indistincta, *Bowerbank, Mon. Brit. Spong.* ii. p. 290, iii. pl. li. figs. 1–4, iv. p. 119.

A small specimen in spirit, incrusting stones. The surface is smooth, formed of a thin but strong membrane, of grey colour (in spirit), penetrated by moderately numerous round perforations, ·5 millim. across. Vents few, occasionally slightly elevated, 2 to 3 millim. in diameter. Main skeleton agreeing fairly with the typical specimen of the species; a dermal network, uni- to bispicular (in the type specimen it appears to exist, although Bowerbank denies it, but it is somewhat irregular there). Sarcode yellowish brown, slightly granular (it is more yellow in the type). Spicules: shape as in type; size ·16 by ·0063 millim., the same as in the type. The vents are rather smaller in the type, and the colour in the dry state is reddish brown; but the agreement in the characters on the whole is so close that I have little hesitation in making this identification.

Hab. Prince of Wales Channel, Torres Straits, 7–9 fms.

Distribution. British Islands and Guernsey (*Bowerbank*).

A specimen without distinct vents, but with a curious system of branching grooves on the surface, and of a dark greenish colour, appears to be also referable to this form.

Hab. Alert Island, Torres Straits, 7 fms.

38. Reniera scyphonoides.

Spongia scyphonoides, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 437.

An elegant, slightly tortuous, tubular *Reniera*, 45 millim. high, tapering from its subcylindrical basal portion, which is 3–4 millim. thick, to an elliptical, slightly bullate summit, preceded immediately by a more decidedly flattened portion, the two diameters of which are respectively 4 and 8 millim. Long and short diameters of mouth of tube $2\frac{1}{2}$ and 4 millim. respectively. Two small vents, 1 millim. in diameter, open on one margin of the compressed part of the sponge, and one of about ·4 millim. diameter on the opposite margin.

Surface even, very slightly roughened by the projecting primary skeleton-lines, which form a fine velvet-like pile. Texture in spirit soft, compressible, elastic; colour pale brown, with a slight (possibly accidental) tinge of purple. Main skeleton—network rectangular; fibre to the eye wholly composed of spicules loosely aggregated, especially in the secondary fibres; primary fibres running at right angles to surface. spicules 3- to 5-serial; secondary fibres, spicules 1- to 3-serial; intervals between primaries about ·17 millim., and the same between secondaries. No special dermal skeleton. Sarcode dark umber-brown. Spicules smooth acerate, slightly and gradually curved, tapering gradually to sharp points from near centre; size ·21 by ·011 millim.

Hab. West Island, Torres Straits, 7 fms.; bottom mud and coral.

Distribution. St. Peter and St. Francis Islands, Australia (*Lamarck*).

The "leviter incrustæ fibræ" and the "2- seu 3-fidi tubuli" of Lamarck's description are the only points not quite in agreement with our specimen; but it is evidently young, and might have branched when older; and the "incrustæ" apparently alludes to the sarcode, which here, as in Lamarck's var. *filis subnudis*, has not all been retained; his specimens were 18–25 centimetres (7–10 inches) in length. Schmidt's *Reniera alba* (Adr. Meer. p. 73), from the Adriatic, seems to resemble the species, but a *uni*serial network is figured for its skeleton.

39. Reniera ferula.

Isodictya ferula, *Bowerbank, Mon. Brit. Spong.* iv. p. 116, pl. viii. figs. 1–3.

A small specimen of the size and shape of a hazel-nut, with few vents about ·8 millim. in diameter; colour (in spirit) dull brown. It does not bear the interesting handle-like process on which Dr. Bowerbank lays so much weight as a "caudal appendage," which is (as the type specimens appear to have been young) perhaps a form of a *stolon*, like that described by Mereschkowsky in an *Esperia* from the White Sea (Mém. Acad. Pétersb. xxvi. no. 7, p. 22, pls. i. & iii. figs.), but which, as being apparently sessile by its whole length, as a stolon would normally be, Dr. Bowerbank cannot be right in comparing (*l. c.* p. 117) with the *erect* digitate processes which distinguish the genus *Polymastia*. The absence of this lobe does not appear to be of sufficient importance to separate this species from Bowerbank's. The spicules measure ·21 by ·0079 millim., whereas those of Bowerbank's type specimen are ·19 by ·01 millim., and are thus decidedly stouter; the arrangement of the skeleton is essentially the same in both species. The specimen is attached to what seems to be a Hydroid stem.

Hab. Port Darwin, 7–12 fms.; bottom sand and mud.

Distribution. Ireland (*Bowerbank*).

40. Reniera aquæductus.

Reniera aquæductus, *Schmidt, Spong. Adr. Meer.* p. 73, pl. vii. figs. 6, 6*a*, 6*b*.

Two specimens, 65 and 70 millim. ($2\frac{2}{3}$ and $2\frac{3}{4}$ inches) long, branched, forming very thick-walled tubes which open at the extremities of the branches, appear to represent this species. The branches and stem are somewhat irregular in outline, and decidedly compressed antero-posteriorly; their surface is rendered uneven by very low, almost obsolete ridges or eminences, though it is smooth between these; maximum diameter of stem and branches 7 to 12 millim., that of lumen of tube 3 to 4 millim. Texture in spirit firm, slightly compressible, moderately tough; normal colour apparently a pale brownish grey. Main skeleton—a rather irregular network of primary and secondary spiculo-fibres, about 4 to 6 spicules broad, with much interstitial 1- or 2-serial spicular network; dermal skeleton composed of long compact spiculo-fibres, 6 to 12 spicules broad. Sarcode pale yellowish, slightly granular. Spicules chiefly smooth acerate, curved, tapering gradually to sharp points from about four diameters from ends, or subacuate, tapering somewhat to the rounded end, or strictly acuate with well-rounded head; size ·17 to ·19 by ·011 millim.

Hab. Port Darwin, between tide-marks.

Distribution. Adriatic (*Schmidt*); Black Sea (*Czerniavsky*).

The Adriatic form has a decided tough uniting material between the ends of the spicules, and the tube is relatively wider in the specimen figured by Schmidt, otherwise the two forms appear to agree. I find the spicules in a slide obtained from Prof. Schmidt to measure ·19 by ·0095 millim. in average maximum dimensions; he himself gives (Atl. Geb. p. 40) ·16852 millim. for the length.

"*Reniera*, yellow" of Carter (Ann. N. H. (5) vi. p. 48, pl. v. fig. 17), from Ceylon, is probably not far from this species, but the spicule appears to be about half as stout again as here.

41. Reniera testudinaria. (Plate XXXIX. fig. D; Plate XLI. figs. *u*, *u'*.)

Alcyonium testudinarium, *Lamarck, Mém. Mus. Hist. Nat.* i. p. 167.

One of the present specimens originally formed part of a much larger one, probably as much as 6 inches long by 6 broad by $2\frac{1}{2}$ thick, covered with prominent jagged ridges; the other is a fine cup-shaped form, with wide mouth, thin edges, the ridges only appearing near the base. The skeleton-fibre is stout, strong, polyspicular, and of the Renierid type: it is composed of stout, smooth, cylindrical spicules, rounded at each end, sometimes tapering somewhat to the ends, and of a small number of smaller acerate forms, tapering suddenly to their points; average maximum size about ·32 by ·016 millim.

The species belongs to that group of Renieridæ which Mr. Carter, in his "Notes Introductory to the Study and Classification of the

Spongida" (Ann. & Mag. N. H. (4) xvi. p. 178) calls *Crassa*; in its cup-shaped form and cylindrical spicules it is evidently nearly allied to *R. cratera*, Schmidt (Adr. Meer. p. 73). It was described by Lamarck in 1815, and has not been since identified as a sponge or redescribed. The present specimen agrees well with the description, and with the specimen which represents the species in the Museum, in both the larger and the minuter characters. It is certainly not, as Lamarck suggests (*l. c.*), the *Spongia cristata* of Ellis and Solander.

Hab. Port Denison, Queensland, 4 fms.

Distribution. Lamarck's *conjecture* as to the locality, viz. "Seas of Europe," can hardly be correct.

42. Reniera, sp.

Wall-like. A small specimen attached to a filamentous Alga. It is erect, broad, laterally compressed; maximum thickness 6 millim., length 25 millim., height 19 millim. On the sloping and narrow upper margin is placed one blind rounded eminence and the suborbicular opening, 4–5 millim. wide, of a deep cloacal cavity, which rises from near the base of the sponge. The skeleton-fibres have 1- or 2-serially arranged spicules: the latter are short, smooth, curved acerates, tapering to sharp points from within about three diameters of ends, size ·11 by ·006 millim. Texture of sponge in spirit soft, brittle; colour dull pinkish grey. Surface even, glabrous.

Hab. Port Darwin, between tide-marks; bottom mud and rock.

43. Reniera, sp.

Laminar. Some fragments of a laminar *Reniera* (s. str.) of erect habit occur in the collection. The lamina is 1 to 2 millim. thick, and exhibits curves in some pieces, perhaps indicating that the original form was cup-shaped; its free edge is quite thin; both surfaces are quite even and of a texture resembling fine cloth, exhibiting very minute apertures, closely set, all over. Texture of sponge in spirit very soft and compressible, subelastic, but very readily torn; colour dull pale yellowish brown. Main skeleton very regular; primary lines biserial, running parallel or obliquely to lateral surfaces in centre of lamina, but curving out towards the surface of the sponge, which they meet at right angles; these lines scarcely one spicule's length apart; secondary lines uniserial, the single spicules usually crossing obliquely the spaces between the primaries. Sarcode dull brown, rather granular. Spicules smooth acerate, very slightly curved, tapering gradually to sharp points from about five diameters from ends; size ·175 by ·0079 millim.

The specimen when entire must have been two or three inches high and as many wide. It strongly resembles *Isodictya infundibuliformis*, Bowerbank, in growth, texture, and surface-characters, but its spicules are less stout and do not include acuate forms. It is a striking species, and should be recognized from the above description when met with in a perfect state; until that

time I forbear to assign a specific name; it appears not to have been described before. It also resembles *Spongia plancella*, Lamarck (a Chalinid with strong fibre and smaller spicules), externally. Future researches will, no doubt, prove this to be a distinct species, to which the name *Reniera infundibularis* may be given.

Hab. Thursday Island, Torres Straits, 4–6 fms.; bottom sand and rock.

44. Reniera, sp.

Honeycombed. An imperfect specimen. From an incrusting base arise narrow trabeculæ, which meet above and enclose meandering channels, 3 to 5 millim. in diameter. The aspect of the mass is that of a piece of wood almost reduced to fragments by some boring animal, or of a much folded piece of chamois-leather. Texture of sponge in spirit compact, brittle; colour very pale buff. Surface (apart from the large ridges and canals) even, smooth. Main skeleton—general arrangement rectangular near surface, irregular near base; spicules of fibre very loosely aggregated; both primary and secondary fibres bi- to multispicular, primary fibres ·14 to ·18 millim. apart. Lines of growth very apparent. Dermal skeleton a 1- to 2-serial network of spicules, with triangular polygonal meshes. Sarcode very pale buff, opaque. Spicules smooth acerate, slightly curved, tapering to sharp points from about three diameters from ends; size ·2 by ·0085 millim.

I can find no such species described from Australia, and I know of no European form like it.

Hab. Port Darwin, 8–12 fms.

PELLINA.

Schmidt, Spong. Atl. Geb. p. 41.

The want of regularity and definiteness in the structure and arrangement of the fibres, and the large size of the spicules, appear to me to be more distinctive attributes of *Pellina* than Schmidt's character, viz. the possession of a distinct dermis; but it is to species combining a reticular dermis with these two characters that I here apply the name.

45. Pellina muricata. (Plate XXXIX. fig. J; Plate XLI. fig. *v'*.)

Aggregations of irregularly united short parallel tubes, 6 to 10 millim. in diameter, lumen 3 to 7 millim. across; tubes cylindrical, summit usually widely open. Surface asperated with sharp monticular points, 1 to 2 millim. high; glabrous between and over bases of points. Texture in spirit firm, slightly compressible, but somewhat brittle. Surface harsh to touch; normal colour apparently pale brown. Main skeleton composed of compact spiculo-fibre, the spicules united by a colourless transparent substance: the primary fibres

wide apart, vertical to surface, 3 to 8 spicules broad; secondaries at less intervals, 3 to 6 spicules broad; the interstices occupied by much irregular 1- or 2-serial network. Dermal skeleton of stout spiculo-fibre, similar to that of main skeleton; the spicules 3- to 8-serial, forming a network of subrectangular meshes, ·4 to ·7 millim. wide, enclosing detached or loosely aggregated spicules. Sarcode very pale yellowish brown, slightly granular. Spicules smooth acerate, slightly and gradually curved, tapering to sharp points from about three diameters from ends (varieties occur having one end tapering more or less to a blunt rounded extremity, or with one end rounded and as stout as the middle of the spicule, thus becoming truly acuate); size ·2 by ·0127 millim.

Hab. Port Darwin, 7 fms.; bottom sand.

This species is perhaps allied to *Reniera aquaeductus*. It differs from that species in the anastomosing and externally spinous tubes and in the superior diameter of the spicule, which does not exceed ·0095 millim. in that species. The specimen forms a low hedge-like series of anastomosing tubes, which are almost horizontal at their lower ends; maximum height of colony 55 millim. ($2\frac{1}{5}$ inches), maximum lateral extent 100 millim. (4 inches). It has a remarkable external resemblance to a form of the Chalinid, *Tuba acapulcensis*, Carter.

46. Pellina aliformis. (Plate XXXIX. fig. 0; Plate XLI. fig. *w*.)

Erect, with slender pedicle; expanding into one or more wing-like lobes, 4 to 6 millim. thick, 14 to 20 millim. in greatest width; the free edges looking upwards and downwards respectively and the apex directed horizontally. Surface more or less roughened (especially on the flat surface of the lobes) by the conuli, about ·6 millim. apart, which enclose the ends of the primary skeleton-fibres; the margins of the lobes, and sometimes their sides, are covered by a glabrous semitransparent membrane. Vents few, suboval, 2 millim. in greatest diameter, with thin membranous margins, generally placed on the edges of the lobes; their cavity oblique, entered by numerous excretory canals. Texture in spirit brittle, slightly elastic; colour very pale brown.

Main skeleton—spiculo-fibres loose, no perceptible horny uniting substance; primary fibres approximately vertical to surface, ·6 to ·85 millim. apart, 8 to 10 spicules broad; secondary fibres at various angles to primaries, at some distance apart, about 5 spicules broad. Dermal skeleton thick, formed of very loose spicular tracts of various sizes, crossing each other at various angles, leaving small spaces between them. Sarcode rather granular, pale brown. Spicules smooth acerate, slightly curved, tapering to sharp points from near centre; size ·5 by ·025 millim.

Hab. Port Darwin, 8–12 fms.; bottom sand and mud.

Represented by one whole specimen and one fragment, in spirit. The former 33 millim. high by about the same wide, and formed

by a short narrow pedicle, which rises broadening and flattening, and producing two broad expansions, about 25 millim. long, which bend to one side, where they meet and unite by their apices. The fragment consists of a similar wing-like expansion; so that this character is probably more or less constant in the species. The large size of the spicules and the coarse, though vague, dermal skeleton seem to justify the generic position I have assigned to the sponge. *Pellina bibula*, Schmidt (Baltic), resembles it in form, but has no apparent vents, and the spicules measure only ·13 to ·24 millim. in length.

47. Pellina, sp.

Tubular. Part of a specimen, consisting of a detached subcylindrical tube, 30 millim. long, 10 millim. in extreme diameter, wall 2·5 millim. in greatest thickness; tube contracted towards mouth, which is 4 millim. across and has a thin margin. Consistence firm, brittle; colour dull brown. Skeleton irregular; tracts loose. Spicules smooth acerate, slightly curved, tapering very gradually to sharp points; size ·6 by ·02 millim.

The spicules are larger than in the European species of the genus; but I do not assign a specific name, as the specimen is imperfect.

Hab. Port Curtis, Queensland, 11 fms.

Some very small, massive, rounded specimens from Port Darwin, between tide-marks, with spicules measuring ·8 by ·02 millim., are perhaps young forms of a variety of this species.

48. Pellina, sp.

Massive. Nearly allied to "*Reniera*, yellow" of Carter (Ann. & Mag. N. H. (5) vi. p. 48), from the Gulf of Manaar, and possibly identical with it, although that form seems to be paler in colour, and its spicule as described would be about ·24 by ·02 millim. in size. It seems to consist normally of a massive base, which sends up digitate processes, suboval in transverse section and about 15 millim. in greatest basal and 5 millim. in greatest apical diameter respectively. Consistence in spirit firm, brittle; colour dull brown. Surface even, covered by thin glabrous dermal membrane. Vents few, scattered usually on the narrow margin of the sponge, receiving the larger excretory canals at a slight distance below surface, oblong, maximum greater and less diameters usually 3 and 1·5 to 2 millim. respectively. Main skeleton composed of loose spiculo-fibre 1 to 2 spicules broad; the primaries only approximately vertical to surface; the secondaries irregular in direction. Dermal skeleton reticulate; fibre usually 2–3-serial, very loose. Sarcode reddish brown, somewhat granular. Spicules smooth acerate, tapering to sharp points from about four diameters from ends; size ·38 by ·0127 millim. Specimens fragmentary.

Another compressed specimen, terminating in an angle above, and with a single orbicular vent about 3 millim. wide, leading deeply

into the sponge, agrees fairly with this species. Sponge 30 millim. long, 20 millim. high, 10 millim. in greatest thickness. The main-skeleton lines are somewhat more abundantly spicular.

Hab. The first specimen, Port Curtis, Queensland, 11 fms.; the latter specimen, Port Darwin.

49. Pellina eusiphonia. (Plate XLI. fig. *x*.)

Massive, sessile, horizontal in growth. Surface even, smooth. Vents formed by prominent thin-walled tubes, 3 to 4 millim. in diameter, ranging in length up to 12 millim., numerous, aggregated on upper surface of sponge, anastomosing with each other; thickness of wall about ·2 millim. Texture in spirit—basal portion firm, rather brittle; of vents soft, very yielding; colour in spirit dull pinkish brown. Main skeleton—no visible horny matter, spicules loosely aggregated in fibres; primary fibres vertical to surface, ·28 to ·42 millim. apart, 3 to 5 spicules broad; secondary fibres approximately vertical to primaries, about ·28 to ·42 millim. apart, 2 to 5 spicules broad. Dermal skeleton composed of long subparallel spiculo-fibres, rather compact, without visible horny material, 3 to 10 spicules broad, ·53 to ·7 millim. apart; the intermediate spaces are occupied by an irregular 1–2-spicular network. Subjacent sarcode transparent, pale brown; that of dermis almost colourless, pinkish. Spicules smooth acerate, tapering to moderately sharp points from within about two diameters of ends; size ·33 by ·0125 to ·019 millim.

Hab. Port Darwin, between tide-marks; bottom rock and sand.

The specimen is an irregularly flattened mass, 75 millim. (3 inches) long, 35 millim. broad, 20 millim. in greatest thickness, and involves several stones in its substance. The peculiar arrangement of the excretory tubes distinguishes it from any species which I can find described. In the allied form *Pellina semitubulosa*, Lieberkühn (Schmidt, Adr. Meer. p. 75; Atl. Geb. p. 41), perhaps the most nearly related described species, the spicules taper very gradually to sharp points, as in *Amorphina panicea*, Johnston, and measure ·38 to ·44 by ·01 millim., and no true vent-tubes seem to be formed either in this or in the other species referred to *Pellina* by Schmidt.

50. Protoschmidtia hispidula. (Plate XLI. figs. *p*, *p'*.)

Erect, lobose, nodular, the subcylindrical lobes have a slight tendency to branch sideways and a strong tendency to anastomose; lobes about 4 to 6 millim. in diameter. Growth bushy (*i. e.* in more than one plane). Surface beset with a velvet-like pile of fine hair-like points, ·5 to 1 millim. apart and about ·25 to ·75 millim. high; between points, leathery and glabrous. Vents? Texture in spirit elastic and fairly compressible, tough; colour dark reddish brown. Main skeleton consisting of spiculo-fibre 4 to 6 spicules broad, closely but not firmly united; numerous short parallel

primary fibres run vertically to surface, mostly into the surface-points; these are connected below by long secondary fibres, approximately at right angles to them; internal skeleton consisting chiefly of long more or less curved spiculo-fibres and membranous expansions, containing non-aggregated spicules, surrounding rounded spaces. Dermal skeleton formed by the projection of the ends of the primary main-skeleton lines; the spaces between these are occupied by numerous spicules irregularly scattered over the membrane which covers the surface, occasionally aggregated into irregular loose pauci-spicular tracts. Sarcode of interior reddish brown (darkest around the fibres), rather granular, of conuli very dark opaque red-brown Spicules smooth acerate, very slightly curved, tapering to sharp points from about three diameters from ends; size ·14 by ·0063 millim.

Hab. Albany Island, Northern Australia, 3–4 fms.; bottom mud.

A specimen and a fragment, both in spirit, the former 45 millim. ($1\frac{4}{5}$ inch) high by 40 millim. across; a *Serpula* is imbedded in the lower part, which forms (from anastomosis) almost one continuous mass, and small specimens of *Serialaria* are growing on it. The tenacity of the internal fibres and membranes shows the presence of a stronger element than ordinary sarcode; but horny outlines are not to be distinguished on the fibres, although the sarcode is darker here.

It is nearly allied to *Hymeniacidon bretti* and *thomasi*, Bowerbank (British seas); but the spicules of these species are far longer than those here, and the surface-roughness does not extend to the production of the characteristic hair-like points found here, which resemble those of *Euspongia*. Dr. Gray (P. Z. S. 1867, p. 518) retains these species in *Reniera*, with most of the acerate-spiculed species of *Hymeniacidon* described by Bowerbank: Schmidt (Atl. Geb. p. 76) assigns them to *Amorphina*. *Protoschmidtia foraminosa*, Czerniavsky (Bull. Soc. Mosc. 1879, p. 98), Black Sea, agrees in the proportions and forms of its spicules, in colour, &c., differing mainly in its much less rough surface and distinct vents: so I place this species in the same genus in preference to *Amorphina*, which, if *Halichondria panicea* is to be regarded as typical of its structure, should include forms with a distinctly reticulate dermal skeleton and absence of tough and deeply coloured sarcode from the fibres.

51. Schmidtia variabilis. (Plate XXXIX. fig. N; Plate XLI. fig. *t*.)

Decumbent; consisting of elongated horizontal (sometimes vertically flattened-out) lobes of very irregular, more or less angular outline, sometimes branching and anastomosing: the upper margin rises at intervals into low elevations, which consist of thick-walled, wide, rounded tubes, 3 to 7 millim. in diameter at the mouth, within which the true vents unite at about 6 millim. below mouth;

or the tubes are almost level with the edge of a wall-like ridge which terminates the sponge above; margin of tubes simple. Surface of sponge between the coarse inequalities smooth, imperforate to naked eye. Texture in spirit firm but brittle; colour dull and pale umber-brown.

Main skeleton—very loose primary lines of spicules, about three spicules broad, running irregularly towards surface, crossed by secondary tracts of similar character, 2 or 3 spicules broad, at right angles to the primaries and about ·4 millim. apart. Dermal skeleton—extremely loose tracts of irregularly parallel spicules, 3 or 4 spicules broad, surrounding roundish or polygonal areas from ·18 to ·28 millim. in diameter. Sarcode dense, granular, yellowish brown, containing much foreign material. Spicules smooth acerate, slighly curved, tapering to fairly sharp points from centre, more rapidly towards the ends than near the centre; size ·4 by ·019 millim.

Hab. Port Darwin, N. coast of Australia, 7–12 fms.; bottom sand and mud.

The vertical and horizontal dimensions of the irregular lobes both vary from about 12 to 22 millim. The specimens are all broken; the greatest length represented among the pieces is 60 millim. ($2\frac{1}{3}$ inches). By the very slight extent to which the tubes which chiefly characterize the genus are developed, the species is distinguished from *S. dura*, Schmidt; by the large size of the skeleton-spicules, from *S. aulopora*. It has somewhat the general habit of the specimen figured by Schmidt (Atl. Geb. pl. v. fig. 8) for the latter species, and of *Thalysias subtriangularis*, Duch. de Fonbressin and Michelotti; but has a more contort character than the latter, and the spicules are far larger than those of the former. It is also quite distinct in habit and spiculation from the form termed *Thalysias triangularis* by Carter (Phil. Trans. clxviii. p. 287), from Kerguelen Island, the spicules in this being (as I have ascertained from the original specimens, now in the Museum) only ·19 to ·2 by ·014 to ·016 millim. in dimensions. In *Schmidtia* (*Isodictya*, Bowerbank) *mirabilis*, Bowerbank, another Indo-Pacific species, the spicules are only about half the size of the present species, although the habit is similar. It is perhaps nearly allied to *S. clavata* (Balsamo-Crivelli), Esper, by its general habit and large strong spicules; but those of that species, as figured by Balsamo-Crivelli (Atti Soc. Ital. v. pl. iv. fig. 12), are considerably stouter than those of *S. variabilis*.

52. Amorphina megalorrhaphis.

Carter, Ann. & Mag. N. H. (5) vii. p. 368.

A remarkable small specimen, which at first sight appears to be pedicillate, with a fusiform head, but is in reality horizontal in growth. It is a subfusiform mass, which tapers rapidly to a blunt point at one end, runs out as a long narrow cylindrical lobe at the other, and is attached by one side of its thickest part, so that the two ends mentioned project horizontally outwards to right and left of the

point of attachment: the length (horizontal) is 39 millim. (1½ inch), greatest (vertical) thickness 8 millim., average thickness of narrow lobe 2 millim. Colour (in spirit) white; texture rather firm, harsh (Carter says "tender"). A small aperture, about 3 millim. in diameter, at the end of the shorter lobe is the only perceptible vent. Surface obscurely wrinkled. Spicules as in *A. panicea*, measuring ·8 to 1 millim. by ·012 to ·018 millim.

This specimen agrees well in size and in its general and spicular characters with those described by Mr. Carter from Ceylon.

Hab. Prince of Wales Channel, Torres Straits, 5–7 fms.

Distribution. Basse Rocks, Ceylon, Kerguelen Island (*Carter*), (Atlantic?, *Carter*, *l. c.*).

53. Tedania digitata, varr.

Reniera digitata, *Schmidt*, *Adr. Meer.* p. 75, pl. vii. fig. 11.
Reniera ambigua, *id. Adr. Meer. Suppl.* p. 39, pl. iv. fig. 8.
Reniera muggiana, *id. Spong. Alg.* p. 28.
Tedania digitata et muggiana, *Gray*, *P. Z. S.* 1867, p. 520.

Tedania nigrescens, Schmidt, Adr. Meer. p. 74, is probably not distinct from the above species: but, as it was not intelligibly described until after *T. digitata*, the latter name in any case takes precedence.

From a comparison of the specimens and slides of these different species in the Museum *inter se* and with Schmidt's descriptions, I come to very much the same conclusion as Schmidt (Atl. Geb. p. 43), viz. that they are all mere varieties. Schmidt's expression is that it is merely a matter of taste whether they are called species or varieties. The differences in outward form have caused him his greatest doubts as to their identity; and it is true that, while some specimens bear large lobate elevations, others are massive, and that whereas some have large vents, in others they are all small and scattered. But I find that all agree in a more or less massive habit, cavernous structure, and strongly ridged or papillose surface; whereas the Atlantic form, *T. suctoria*, Schmidt, and the Chilian *T. tenuicapitata*, mihi, have an almost even surface.

The forms of the spicules are practically the same in all cases, and the micro-spination of the heads of the cylindrical "tibiella" is undoubted throughout, whereas in the two specified species the heads are quite smooth.

The Port-Darwin specimens differ decidedly in the proportions of the acuate spicule, as will be seen below, from the rest. None of the varieties pointed out seem to stand out with sufficient distinctness from the rest to receive distinct varietal names. A specimen lately received from Kurrachee agrees essentially with all the above specimens, the spicules being only rather small: the surface is broken up into a dense mass of slender, almost filiform processes and lamellar ridges, from 1 to 5 or 6 millim. high.

I append a Table showing the chief variations in the proportions of the spicules:—

Proportions of Spicules (in millim.).

	Smooth Acuate.	Tibiella (including heads and their diameter).	Fine Acerate.
Mediterranean specimens of *T. digitata, nigrescens, ambigua, muggiana*	·29 by ·011 to ·012	·23 to ·25 by ·0063	·18 to ·2 by ·0016 to ·0017
T. digitata, var., Kurrachee specimen	·21 by ·007	·16 by ·0042	·14 by ·002
Do., Thursday and Alert Islands, Torres Straits, specimens (2)	·19 by ·0063	about ·228 by ·006	about ·18 by ·0015
Do., Prince of Wales Channel, Torres Straits, specimen ...	·25 by ·0063	·22 by ·0042	·22 by ·002
Do., Port Darwin (Australia) specimens (2)	·3 by ·0095	·2 to ·25 by ·006 to ·0063	·18 to ·19 by ·0021 to ·0032

In the present collection are some more or less fragmentary specimens, and two which incrust crabs, all well preserved in spirit; they are either broad, massive, about 25 millim. (1 inch) thick, or incrusting, 1 to about 6 millim. thick. The surface is covered with more or less closely-set ridges or monticular elevations, from 1 to 3 millim. high. The colour is pale grey of different shades (a purple colour in one case being apparently derived from a purple sponge which arrived in the same bottle of spirit). The spicules agree closely in form with those of Mediterranean specimens; and the only notable difference in proportion is that the diameter of the acuate is from $\frac{1}{2}$ to $\frac{1}{4}$ less than that of those specimens. The colour is paler than in the Mediterranean forms; but these exhibit a wider range of variation in this respect than is shown by a comparison of the darkest Australian and palest Mediterranean specimen. Therefore I feel fully justified in uniting the two groups of forms as one species, remarkable for its wide geographical distribution, polymorphic external habit, and great range of spicular variation.

Hab. Alert and Thursday Islands, and Prince of Wales Channel, Torres Straits, 3–9 fms.: Port Darwin, between tide-marks.

Distribution. Mediterranean (*Schmidt*); Atlantic (*Schmidt*): Antigua (*Carter*); Kurrachee (*coll. Brit. Mus.*).

T. increscens, Schmidt, JB. Comm. Unters. deutsch. Meer. ii.-iii. p. 115 (off S.W. Norway), differs from these and all described species in having a spinulate head to most of the smooth acuates.

DESMACIDINIDÆ (*Schmidt*, 1870).

If all those sponges which contain hooked or bow-like flesh-spicules were, in accordance with Vosmaer's views, as expressed in his very useful Revision (Notes Roy. Mus. Netherl. ii. p. 99), included in this family, it would not only be the largest, in all probability, of the families of Siliceous Sponges, but it would leave some of the remaining ones mere skeletons. Judged by the facts now known, the boundary region between the Desmacidinidæ and Chalinidæ is now narrow, but not in reality so narrow as it would be if the above definition is insisted on. Whatever may be the affinities of *Homaodictya*, with its anchorate flesh-spicules (referred by Mr. Carter to the Chalinidæ), those of *Toxochalina*, mihi (see Chalinidæ, *suprà*), are undoubtedly with that group; yet it has a bow-like flesh-spicule in conjunction with a Chalinid acerate skeleton-spicule, horny fibre, and digitate habit. Until the homologies of the flesh-spicules are better understood than they are at present, I believe that cases such as those just mentioned will have to be considered separately on their individual merits as they arise, having special regard to the direction in which the greater assemblage of affinities point. It seems probable that this family will only prove a fresh illustration of the maxim "Natura non facit saltum." Besides *Toxochalina* I here exclude from the family those genera (e. g. *Clathria*, *Acarnus*, *Echinonema*) in which any of the spicules project laterally from the fibre; such forms as these seem to pass by gradations (*Echinodictyum*, *Raspailia*) almost into *Axinella* and *Phacellia*, by losing, in the first case, the flesh-spicules, and in the second (*Axinella* &c.) the spined echinating cylindricals. *Rhizochalina*, on the other hand, seems linked to the family by its occasionally horny fibres, and by its ally *Oceanapia* with its bihamate flesh-spicule; and I have ranged it (although only provisionally) here as a degraded Desmacidine. It probably owes its peculiar form to its mud-loving habits. Two new generic types, *Gelliodes* and *Ectrochota*, are described below.

RHIZOCHALINA.

Schmidt, *Atl. Geb.* p. 35.
Phlœodictyon, *Carter*, *Ann. & Mag. Nat. Hist.* 1882, x. p. 122.

This form is so aberrant in its coarser anatomy that I think there can be little doubt that Carter has done right (*l. c.*) in making it the type of a distinct group, although we have as yet no satisfactory information about the arrangement and structure of the soft parts. Although I can see no sufficient reason why the name *Oceanapia*, Norman, should give way to the above names for such species as *Desmacidon jeffreysi*, Bowerbank, whose spiculation includes a bihamate, yet it seems not undesirable to retain the older of the two for those which have simply an acerate spicule. With regard to the question of syste-

matic position, which Carter (*l. c.*) is inclined to regard as among the Renieridæ, I notice that *Rhizochalina oleracea*, at any rate, has a true Chalinid fibre: but Bowerbank's and Carter's species never approach this condition more closely than by producing a few scattered compact fibres, wholly composed of spicules, like those of some *Pachychalinæ*: but the greater part of the organization is Renierid, and it appears to approach *Schmidtia*, Balsamo-Crevelli. On the other hand, *Oceanapia*, which seems to be nearly allied, has the bihamate spicule. Taking this fact in conjunction with the horny fibre of *Rh. oleracea*, it seems to me best to place the two genera in the Desmacidinidæ.

54. **Rhizochalina fistulosa**, *Bowerbank*, var. **infradensata**, nov.

? Alcyonium putridosum, *Lamarck, Mém. Mus. Hist. Nat.* i. p. 168.
Desmacidon fistulosa, *Bowerbank, P. Z. S.* 1873, p. 19, pl. iv. figs. 7, 8.

Two more or less imperfect specimens in spirit, the largest about 25 millim. (1 inch) across the body, and some detached dry tubes. An arrangement here found, which I have not seen described in this species, is that of a dense layer of the skeleton-spicules, packed side by side, at right angles to and about ·25 to ·8 millim. below the surface of the sponge—below, that is to say, the superficial Isodictyal, or rather Halichondrioid (in Bowerbank's sense) network containing the subcortical crypts and other cavities. This layer recalls the vertical layer of small subspinulates of *Rinalda uberrima*, Schmidt, only that it is not, as there, placed at the surface. It is represented in the type specimen of the species by a layer in which the spicules are set obliquely to the surface at various angles. As both the present specimens present this peculiarity, I think it well to establish for them a distinct variety.

One of the specimens exhibits the small crateriform eminences figured on the outside of Bowerbank's specimen, but the other does not: hence they probably have no systematic, and but little physiological importance. The spicules agree closely in proportions with those of the type.

	Type specimen.	Arafura Sea, Spec. no. 1.	Arafura Sea, Spec. no. 2.
Acerate spicule .	·27 by ·011 to ·0127	·25 by ·011	·25 by ·012 mm.

Hab. Arafura Sea, N.W. coast of Australia, 32–36 fms.; bottom mud, sand, and shells.

Distribution. Fremantle, W. Australia (*Bowerbank*) (the typical form).

The dermal membrane of one of the specimens contains a large number of smooth acerate spicules of about half the length and breadth of the proper spicules: they do not occur below the membrane, nor, apparently, in the other specimen. A similar circumstance occurs in *R. singaporensis* described below: in that case a number of short blunt cylindrical spicules occur of the normal, or almost the normal thickness, but only one half to two thirds the length of the adult form.

55. **Rhizochalina singaporensis**, *Carter*, var. (Plate XLI. fig. *s*.)

Phlœodictyon singaporense, *Carter, Ann. & Mag. N. H.* (1883) xii. p. 326, pl. xiii. fig. 17.

With this species I identify a series of specimens which usually have the outward habit of *R. fistulosa*, but in which a large proportion of the (usually acerate) spicules have both ends more or less rounded. In the most perfect specimen the cortex is glabrous, chestnut to purplish-brown in colour, thin; the fistulæ are wanting on one, presumably the lower, surface. A smaller specimen consists of a barrel-shaped mass adherent by its lower surface to two other sponges, and giving off from one lateral extremity one, from the other two fistulæ and no others. A detached fistula exhibits furcation, dividing into two unequal branches at an angle of about 30° to each other. In one remarkable specimen the central part of the body is elongate, slightly compressed, and measures 110 millim. ($4\frac{3}{8}$ inches) in its present length, while its diameter does not exceed 12 millim. anywhere; in its other characters it agrees well with the above specimens. A fragment of the bulbous part of a large specimen shows that part of this specimen, when perfect, to have possessed a diameter of about 75 millim. (3 inches).

The ends of the spicules show almost every stage between a merely blunted point and a rounded end like that of the base of an ordinary acuate spicule: some thin, completely acerate forms, which occur mixed with the blunt forms in the subcortical tissues, are perhaps the young of the latter, indicating the typical shape from which the adult spicules have diverged. The largest adult spicules have nearly the same size as the acerates of the typical form of *R. fistulosa*, viz. ·3 by ·0127 millim., but they vary immensely in *length*; the thin acerates measure ·28 by ·004 millim. In Carter's specimen the acerates measure ·3 by ·017, the blunt forms ·04–·08 by ·004 millim.

Three fistulæ retain their ends, and these are finger-like and closed.

Hab. Prince of Wales Channel, West and Alert Islands, Torres Straits, 7 fms.

Distribution. Singapore (*Carter*).

I may explain that I had at first distinguished this form as a variety of *R. fistulosa*; but as Mr. Carter has, since then, published a description of it as a distinct species, and as I had already felt that it should perhaps be so described, I assign the name proposed by him to the Australian specimens.

56. **Rhizochalina spathulifera.**

(Plate XXXIX. fig. E; Plate XLI. fig. *q*.)

Main body elongated, flexuous, cylindrical or somewhat compressed, 12–17 millim. in greatest diameter. External portion (cortex) in dry state even, hard and dense on the stem, where it is about ·7 millim. thick; rather uneven, porous and compressible on the branches;

rather brittle, white, marked (at any rate on the stem) on its inner surface by closely-set elongate or reticulate ridges; covered by a thin, wrinkled, paper-like, pale yellow-brown membrane. Branches given off towards end of stem, in succession, in one plane; 7–8 millim. in diameter at bases, slightly less towards apices, 25 to 60 millim. (1 to 2½ inches) long; cylindrical at base, becoming compressed at apex into flattened subcircular or knife-like expansions, about 10 to 12 millim. in width and 1·5 millim. in thickness; the free ends often (if not always) imperforate. Skeleton of cortex a rather close Halichondrioid network, with meshes ·07–·14 millim. wide, fibre 3 to 6 or 7 spicules broad. Main skeleton below cortex coarsely reticulate with immense aggregations of spicules into coarse spiculo-fibre. Sarcode in axial tissues brown, transparent, in cortex almost colourless. Spicules smooth acerate, tapering gradually to sharp points from about seven diameters from ends; size ·22 by ·0098 millim.

Hab. Thursday Island, Torres Straits, 4–5 fms.; bottom mud.

A single specimen, 175 millim. (7 inches) long, composed of two laterally fused specimens. One end is broken across, and shows the interior to be filled with flocculent spiculo-tissue; it is thus doubtful whether this end bore any tubes. This species differs, in its very drawn-out form, from all the described species except, perhaps, *Phloeodictyon hondurasense*, which is known only from a tubular fragment; but the spicules of that species are considerably smaller than those of this form, viz. only ·16 by ·008 millim.

No Chalinoid or even *Esperia*-like fibre appears to occur in any part of the sponge.

57. Rhizochalina canalis.

(Plate XXXIX. fig. F; Plate XLI. fig. *r*.)

Simple, unbranched, cylindrical tubes, straight or slightly bent near middle. Diameter at middle about 10 millim. (in large specimens), gradually (sometimes very slightly) decreasing towards ends; ends finger-like, closed, 3 to 4 millim. broad. Surface somewhat uneven. Vents apparently represented by circular perforations of cortex, ·5 to ·8 millim. wide, few, scattered. Cortex in dry state hard, rather brittle, slightly compressible towards ends, dense; colour greyish; thickness about ·7 millim.; outer layer hard, about ·2 millim. thick; inner layer bast-like, closely reticulate, about ·3 millim. thick. Axial substance? Skeleton of cortex composed of very strong vertical spiculo-fibres 5–12 spicules broad, interlacing closely at the surface to form the hard outer layer; they are about ·14 to ·18 millim. apart and about ·7 millim. long at the thickest part of the cortex, being met at their inner extremities by a strong secondary fibre (parallel to the surface) about 10 spicules broad. Sarcode pale brown, transparent. Spicules smooth acerate, becoming rounded off (rather than tapering) to sharp points from about four diameters from ends; size ·27 by ·014 millim.

Hab. Port Darwin, 8–12 fms., bottom sand, mud, &c.; Arafura Sea, 32–36 fms., bottom sand, mud, and shells; Torres Straits.

Several dry, more or less imperfect specimens, all somewhat overgrown by Polyzoa, Hydroids, or other Sponges; and one in spirit, showing the only at all complete extremity. The largest measures 155 millim. (6¼ inches) in present length, and was probably quite 250 millim. (12 inches) long when perfect. The species is an extreme form of the same elongate type as *R. spathulifera*, but does not branch, and there is no indication in the present specimens of flattened extremities like those of that species; the spicule is stouter, longer, and more approaching a cylindrical form than in that species.

GELLIUS.

Gray, P. Z. S. 1867, p. 538.
Asychis, *id. l. c.* p. 539.
Desmacodes, *Schmidt, Spong. Atl. Geb.* p. 54; *Vosmaer, Notes Roy. Mus. Netherl.* ii. p. 104.
Fibularia, *Carter, Ann. & Mag. N. H.* 1882, ix. p. 282.

The identity of Schmidt's genus with Gray's might appear to be questionable, as Schmidt, besides the acerate and bihamate spicules on which Gray bases his definition, describes also a spinulate and cylindrical one ("Stift"); but I fail to find these forms on the slide of the type species which the Museum possesses from Prof. Schmidt. The genus, which may be defined as "consisting of massive or erect forms, with loose brittle texture, and a skeleton smooth acerate, and a flesh bihamate spicule," is widely distributed; the proportions of the spicules vary little, and the external form has chiefly to be relied upon in distinguishing the species. It is unfortunate that Dr. Gray's genus, which, like many others made by him, is sufficiently characterized, and is prior to names assigned to the genus by other authors, has not come into general use, since many synonyms have been thereby created. Sollas (Ann. & Mag. N. H. 1882, ix. p. 427) upholds Gray's genus *Thenea* against all comers in a similar way, and is supported by Norman (*apud* Bowerbank, Monograph Brit. Sponges, iv. p. 29).

Horny matter is not usually to be detected in the skeleton.

58. Gellius couchi, *Bowerbank*, var. ceratina, nov.

Halichondria couchi, *Bowerbank, Mon. Brit. Spong.* iii. p. 203, pl. lxxxi. figs. 12–15.
Halichondria elegantia, *id. P. Z. S.* 1875, p. 286.

As Vosmaer (*l. c.*) has suspected, the above two species are both congeneric with *Desmacodes fibulatus* (Schmidt, sp.) and agree with it in having a spiculation composed of an acerate and bihamate.

Bowerbank's type specimen of *H. couchi*, which I have examined, contains plenty of the latter spicule; and his own statement to the contrary (P. Z. S. 1875, p. 286) is obviously an error, as he himself describes and figures these spicules from this species (Mon.

Brit. Spong. iii. p. 204, pl. lxxiii. fig. 15); Vosmaer notes this discrepancy.

The British form of *Gellius couchi* has external characters similar to those of *Halichondria elegantia*, and differs from it but slightly in the spiculation. In the present collection occurs a specimen with very similar spiculation, but the acerate is thinner and the fibre is very distinct, the spicules being united by a yellow substance which appears beyond the spicules on each side of the fibre. It has grown over a Sertularian Hydroid, to which circumstance it probably owes its elongate cylindrical form (that of *G. couchi* is usually massive, compact, and the spiculo-fibre is loose). The vents are scattered on the surface, and measure only about 2 millim. in diameter. It may be distinguished as var. *ceratina*. The following table gives the proportions of the spicules in the type specimens of each of the three forms here united:—

	Acerate. millim.	Bihamate. millim.
Hal. couchi, Bowerbank ..	·24 by ·011	·02 by ·0016
Hal. elegantia, id.....	·2 by ·01	·025 by ·016
G. couchi, var. *ceratina*....	·23 by ·0063–·0079	·025 by ·0016

Hab. Arafura Sea, 32–36 fms.

Distribution. Straits of Malacca (*Bowerbank*): Cornwall (*Bowerbank*).

59. Gellius varius.

Halichondria varia, *Bowerbank, P. Z. S.* 1875, p. 292.
Isodictya virgata, *id. l. c.* p. 294.

The above two species must be united. The erect cylindrical form of well-grown specimens forms a good external distinctive specific character, while the superior diameter (see below) of the skeleton-spicule readily distinguishes it under the microscope. Two fragments, exhibiting a cylindrical erect habit, occur; the skeleton-fibre is rigid and brittle, even in spirit-specimens, and agrees sufficiently with that of the typical specimens; the proportions of the spicules are as follows:—

	Acerate. millim.	Bihamate. millim.
Hal. varia (type).....	·22 by ·016	·025 to ·032 by ·0016
Isodictya virgata (type) ..	·22 by ·014	·025 by ·0021
G. varia (from Pt. Darwin)	·25 by ·015	·019 by 0015

Hab. Port Darwin, 8–12 fms.
Distribution. Straits of Malacca (*Bowerbank*).

60. Gellius fibulatus.

Reniera fibulata, *Schmidt, Adr. Meer.* (1862), p. 73; *Atl. Geb.* (1870), p. 40.
? Isodictya jugosa, *Bowerbank, Mon. Brit. Spong.* ii. p. 296, iii. pl. 2. figs. 11–14.

Schmidt's Portuguese specimen differs from the specimen which was originally described by him (and which was from Triest) in its more massive habit and in the much larger size of its bihamate, which (as I find in the slide in the British Museum) measures ·04 to ·07 millim. in length, or ·0337 (·337 millim. seems to be a misprint), as he himself states at p. 40 of the 'Spong. Atl. Geb.' *Isodictya jugosa* agrees closely with this form in the proportions of its spicules, but was based on a very young specimen, so that its external characters can hardly be appealed to; it differs from the specimens described below in its rough surface.

Several specimens have lately been added to the National collection from the neighbourhood of Kurrachee (Hindostan), which consist usually of stout, horizontally spreading and anastomosing lobes, with a row of vents of various sizes, about 10 millim. or less in diameter, ranged along their upper margins. The surface of the sponge is quite smooth in most places, and the texture soft and brittle. The spiculation closely resembles that of *Reniera fibulata*.

Lastly, in the present collection occur:—(i.) a small but massive soft specimen from Torres Straits, with a few oscula on its summit: it has a somewhat pyriform shape, apparently owing to its having grown upon the stem of what seems to be a filamentous Hydroid: (ii.) a fragmentary specimen, which apparently had when perfect the same general habit as the Kurrachee specimens just referred to; the spiculation is similar. I propose to unite all these forms except *I. jugosa* under the name *fibulata*; I give the spiculations of all for comparison:—

	R. fibulata.		*I. jugosa.*	Kurrachee specimens.	Torres-Straits specimen.	Port-Jackson specimen.
	Triest.	Portugal.				
	millim.	millim.	millim.	millim.	millim.	millim.
Acerate ...	?	·22 by ·0095	·27 by ·0095	·16–·19 by ·0079–·0084	·19 by ·0079	·19 by ·0063
Bihamate (length).	·023	·038–·07	·025–·038	·019–·025	·019–·038	·036–·042

The slender proportions of the acerate and the soft texture of the sponge distinguish the species from *G. varia*, Bowk., and its distinct vents from *G. couchi*, Bowk.

Hab. Torres Straits, 10 fms.: Port Jackson, 0–5 fms.

Distribution. Adriatic, coast of Portugal (*Schmidt*); coast near Kurrachee (*coll. Mus. Brit.*).

61. Gellius cymiformis. (Plate XLI. fig. z.)

Spongia cymæformis, *Esper, Pflanzenth. Fortsetz.* i. p. 43, *Spong.* pl. lxix.

Isodictya cymæformis, *Ehlers, Espersch. Spong.* p. 24.

The external characters agree well with those of Esper's species,

and the fibre appears to agree with Ehlers's account of the species, but I do not find the acuate spicules mentioned by him as occurring less abundantly than the acerates; the size of the latter in the present specimens is ·15 to ·16 by ·0055 to ·007 millim. (Ehlers gives ·17 millim. for the length); and I find (what Ehlers does not mention) fine bihamates measuring ·02 by ·001 to ·0016 millim. But a more extraordinary fact connected with the species is that the sponge-tissue is almost entirely replaced (this seems to be the true explanation of the facts) by a ramifying and anastomosing algal fibre, ·1 to ·18 millim in diameter, of a semitransparent appearance and tough elastic texture in the dry state, like that of dry isinglass: the component cells are about ·007 millim. in their smallest diameter. It appears to be the same species as that which forms the substratum of the mass described by Bowerbank (P. Z. S. 1876, p. 771, pl. lxxx.) as *Ophlitaspongia fucoides*, which is nothing more than a coating Suberitid Sponge running over the fibrous filaments of this same alga, which Bowerbank has taken, though not without hesitation (see p. 772, *l. c.*) for the horny fibre of an *Ophlitispongia*, although he has identified isolated portions as alga. In this case also it is not until examined with the microscope that the algal nature of most of the structure is identified with certainty. This form of *symbiosis* has been lately noticed by Prof. K. Semper in 'Die natürlichen Existenz-Bedingungen' ('Animal Life,' International Scientific Series), where *Spongia cartilaginea*, Esper, is used in illustration; it is probably of not uncommon occurrence in the Spongida. A Formosa specimen agrees closely in the characters both of the sponge and alga with those from Australia. Mr. Carter (Ann. & Mag. Nat. Hist. 1878, ii. p. 163) describes exactly the same circumstance in an allied species from Hong Kong, and adds other similar instances. Several specimens, dry and in spirit.

Hab. Thursday Island, Prince of Wales Channel, Torres Straits, 7–9 fms.: Port Molle, Queensland, coral-reef.

Distribution. Ceylon (*Esper*): Formosa (*coll. Brit. Mus.*).

This species has a similar habit to *G. varius*, if the form may be regarded as that of the sponge and not of the alga; but its acerate spicules are not so long and scarcely half as thick as those of that species.

GELLIODES, g. n.

Desmacidinidæ of erect habit and well-defined form, fibre distinct and compact; outer surface of sponge beset with pointed eminences. Spicules smooth skeleton acerate and bihamate.

This genus unites the habit of Echinonemata with the fibre of Desmacidinidæ and the spiculation of *Gellius* (*Desmacodes*). Mr. Carter (Ann. & Mag. N. H. 1882, ix. p. 288) has referred his species *Leos fibulata* to the genus *Phorbas*, Duch. and Mich., together with his *Leos anchorata*, which can hardly be generically identical with it, as its spiculation is an acerate and an anchorate, while *Phorbas amaranthus*, the second species of the genus, has only an

acerate. Judging by the present specimens, *A. fibulata* wants also the purple colour of *Phorbas*, on which Mr. Carter lays so much weight; so that I see nothing but the general external form by which to connect this species with *Phorbas*, and this cannot suffice for a point of affinity in the Spongiida.

62. Gelliodes fibulata.

(Plate XXXIX. fig. 1; Plate XLI. figs. *bb*–*bb*''.)

? Spongia rubispina, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 450.
? Axos fibulata, *Carter, Ann. & Mag. N. H.* 1881, vii. p. 383, pl. xviii. fig. 4.

Long cylindrical stems, given off from a common base, but not in a plane, irregularly curved, anastomosing at points of contact, aculeated at intervals of about 2 to 5 millim. by strong but slender sharp spines 2 to 3 millim. long; intermediate surface more or less cavernous, the spaces more or less tympanized by membrane which is semitransparent in spirit, transparent in the dried state. Skeleton-fibre very compact, but exhibiting no horny material; main fibres going direct to surface, ·18 to ·28 millim. thick; secondaries given off at various angles from primaries and at intervals of ·43 millim. and upwards, ·088 to ·18 millim. thick. Sarcode transparent, with only the faintest tint of yellow. Spicules:—(1) Acerate, smooth, tapering gradually to sharp points from near middle, slightly and gradually curved: size ·25 by ·0063 millim.; forming the fibres. (2) Bihamate, smooth, slender, with fine points, well curved; size ·016 by ·001 millim. Texture of sponge in dry state firm, very harsh to touch, slightly flexible: colour pale or darkish brown.

Hab. Prince of Wales Channel and Thursday Island, Torres Straits, 3–10 fms. Abundant.

Distribution. Bass's Straits (*Carter*)?

Single branches attain a length of about 100 millim. (4 inches), and the largest colony is 160 millim. (6⅜ inches) high. The species differs from Lamarck's description of *S. rubispina* in wanting the white incrustation, and in not being branched in a fan-like manner: it is doubtful what he means by an "encroûtement coriacé." A specimen in the Lamarckian collection named *Spongia licheniformis* having apparently formed part of a turbinate or flattened mass, even on one side and beset with low but sharp distant monticular eminences on the other, has an almost identical spiculation, but the fibres are less stout and are decidedly loose in their structure. It seems to me that we have here a small natural assemblage of forms representing a more primitive type of Desmacidinidæ than the forms with anchorate spicules.

AMPHILECTUS.

Vosmaer, Family Desmacidinidæ, Notes Roy. Mus. Netherl. ii. p. 109.

Although this genus as defined by Vosmaer appears to have

somewhat too wide a scope, it is at the same time true that a resting place or places must be found for those numerous and varied species which are intermediate between the more plainly marked genera *Desmacidon*, *Esperia*, and *Myxilla*. For some of these forms older genera may be employed, e.g. *Dirrhopalum* (*Plocamia*) for *A. coriaceus* and *microcionides* (as I have endeavoured to show in a paper "On the Genus *Plocamia* &c.," Journ. Linn. Soc., Zool. xv. pp. 481, 482). For some such species (*abyssi*, *phlyctenoides*) Mr. Carter employs the old term *Halichondria*; but the type of Fleming's genus *Halichondria* is *Spongia papillaris*, Pallas, which appears to be a synonym of *Halichondria* (*Amorphina*, Schmidt) *panicea*, viz. a Renierid and not a Desmacidine, and so the genus *Halichondria*, if maintained, should be restricted to Renieridæ.

Amphilectus, it seems to me, may be kept with advantage for forms with dentate or navicular equianchorate flesh-spicules, with smooth skeleton-spicules and absence of any echinating spicules: the type of the genus is *Isodictya gracilis* of Bowerbank. It may be perhaps necessary to admit forms in which the tibiella (when present) is slightly spined, as in *Desmacidon anceps*, Schmidt. Vosmaer's limitation of *Desmacidon* to species with horny fibre is not justified by the species he has assigned to it.

63. Amphilectus tibiellifer. (Plate XLII. figs. *t*–*t*″.)

Erect, massive, sessile by broad base; sponge broader than high and higher than it is thick, decreasing in thickness towards upper margin, which presents a narrow edge. Sponge-mass honeycombed by a system of tortuous, anastomosing spaces, 3 millim. and upwards in diameter, separated in most cases merely by trabeculæ of substance. Surface perforated by the closely-set openings of the above-mentioned spaces; surface of sponge and of the trabeculæ between openings even, slightly villous in spirit. Texture of sponge in spirit firm, subelastic, tough; colour dark reddish umber-brown. Sarcode pale reddish brown, rather soft. Main skeleton consisting of compact spiculo-fibre formed of spicule no. 1, showing no horny uniting substance, about 3 to 6 spicules broad, irregular; some only of the primary fibres go straight to surface, the secondary fibres usually meet the primaries at acute angles; primaries about ·5 millim. apart. Dermal skeleton consisting of a network of spiculo-fibre 2 to 4 spicules broad, the spicules mostly loosely aggregated; meshes of network about ·35 millim. apart.

Spicules:—(1) Skeleton acuate, strong, smooth, straight or slightly curved; base rather squarely rounded, shaft cylindrical, tapering to point from about three diameters from end; size ·38 by ·014 millim. (2) Tibiella, slender, almost straight; shaft smooth, of same diameter throughout, passing gradually into an oval smooth head about half as thick again as shaft; size ·25 by ·0042 millim. (thickness of head); abundant in dermal membrane and interior. (3) Equianchorate, navicular or shuttle-shaped, with palms rather

longer than broad, inner margins truncate, as seen from front, tubercle distinct; shaft slightly and gradually curved; size ·016 millim. long: abundant, especially in dermal membrane. (4) Tricurvate, smooth, strong, the curves bold, the points sharp: size ·15 by ·006 millim.

Hab. Prince of Wales Channel, Torres Straits, 7 fms.; bottom sand.

A specimen and a fragment in spirit, the former 80 millim. broad by 75 high by 40 thick at present base; it is almost semicircular in outline, the round margin uppermost; it appears to have been torn from a rather larger specimen.

The presence of a tibiella with smooth ends distinguishes it from all allied species of *Desmacidon* (Schmidt) but *D. emphysema*, Schmidt (JB. Comm. Unters. deutsch. Meer. ii.–iii. p. 118), and *D. physa* (id. *l. c.*), the latter of which, however, has the surface of the sponge even and the sponge itself flask-shaped: in the former the sponge is covered with bubble-like elevations. *Desmacidon arciferum*, Schmidt, which has a similar tibiella, appears to be an *Ophlitispongia*, from the strong horny fibre and the echinating arrangement of some of its acuates. *D. dianæ*, id., has, besides, the tridentate anchorates of *Myxilla* and a strongly horny fibre; and both it and *D. anceps*, id., possess the forcipiform spicules which occur in *Halichondria forcipis*, Bk.

64. Amphilectus hispidulus.

(Plate XL. fig. C: Plate XLI. figs. *y*–*y*″.)

Erect, clathrous; formed of a number of irregularly branching and anastomosing masses, their surface more or less covered with low cylindrical or ridge-like elevations. Vents? Surface hispid with closely set, hair-like terminations of the primary skeleton-fibres. Texture of sponge in dry state firm, elastic, but readily torn, in spirit soft, elastic; colour dull pale brown in dry state, in spirit pale pinkish brown.

Main skeleton of the type known as "isodictyal," viz. consisting of primary lines running straight to the surface, at right angles to it, connected by numerous transverse secondary lines set at right angles to the primaries; distance between primaries at surface about ·25 millim., between secondaries ·17 millim., length of the surface processes of primaries about ·3 millim. Fibres formed of pale yellow horny material, cored by the axial spicules (no. 1) to the extent of about one third of their total thickness in the case of the secondary fibres, about three quarters in the primaries; margins of horny material clearly seen outside the spicules, except in the surface-tufts of the primaries, which are opaque and dark-coloured; spicules in series of 3 or 4 in the primary, of 2 in the secondary fibres, of about 6 in the dermal tufts of the primaries. Dermal skeleton consisting of an irregular reticulation with polygonal meshes made up of fibres, some of which resemble the primaries,

others the secondaries of the main skeleton. Sarcode very pale brownish yellow, thin and transparent.

Spicules:—(1) Skeleton acuate, smooth, straight or slightly curved, with rounded base slightly smaller than the middle of the shaft, which tapers gradually to a fine point from near the middle of the spicule; size of spicule ·18 to ·2 by ·046 to ·0063 millim.: in middle of fibre. (2) Flesh-spicule, equianchorate, navicular, shaft gradually curved, slender; length of spicule ·013 to ·016 millim.

Hab. Thursday Island, Torres Straits, 3-6 fms. (on bivalve shell and Hydroid).

Represented by a dry specimen and by one in spirit: the larger one is 50 millim. high by 55 in extreme diameter. The species is distinguished by its regularly rectangular main skeleton and well-developed horny fibre.

65. Myxilla arborescens.

(Plate XL. fig. G; Plate XLII. figs. *a*–*a*''.)

? Halichondria plumosa, *Carter, Phil. Trans.* vol. 168, p. 287 (*nec* Spongia plumosa, *Montagu, Wern. Mem.* ii. p. 116).

Erect, pedicellate, branched, branching not confined to one plane, forming "heads" by the aggregation and partial anastomosis of many different pedicellate branched growths arising from one or more common stems; mode of branching dicho- to pollacitomous*. Stems, both primary and secondary, slender, of angulated outline, owing to the lateral projection from them of a number of prominent, jagged, longitudinal ridges. Branches palmate, the edges sharp, the flat surfaces covered with longitudinal, very prominent ridges and upwardly projecting points, the tips of the branches subtruncate. Thickness of secondary stems, exclusive of surface-projections, about 1·5 millim., of palmate parts of branches ·25 to ·5 millim. Minute appearance of surface in spirit granulated (*i. e.* covered with minute rounded elevations, which are smooth and glabrous in spirit). Texture in spirit tough, very pliable, of very imperfect elasticity. Vents apparently represented by round or oblong apertures, ·25 to 1 millim. in maximum diameter, numerous, placed between prominences of surface of branches. Colour in spirit dull pale brown. Sarcode rather granular, pale yellow-brown, soft. Skeleton consisting of longitudinal lines of loosely aggregated spicules (nos. 1 and 2), about 8 to 10 spicules broad, surrounded by some loose spicules of the same kind and echinated by spicule no. 1; the lines run approximately parallel with each other, occasionally branching and anastomosing at acute angles; at the surface these primary lines either become loose and form loose tracts of skeleton-spicules running along the surface, or they remain compact and project as surface-tufts.

Skeleton-spicules:—(1) Spined acuate, tapering gradually from rounded head to sharp point, generally somewhat curved; spines

* *i. e.* dividing many times at one point; from πολλάκις.

straight, sharp, slender, about ·002 millim. long at head, where they are closely aggregated, gradually decreasing in size and numbers towards point, where they cease entirely; size of spicule ·1 to ·17 by ·0063 to ·0079 millim. (2) Hastate cylindrical or subacerate, smooth, of almost uniform diameter from centre to within two diameters of ends, whence it tapers to a sharp point; size ·2 by ·0042 millim. Flesh-spicule, (3) Equianchorate; tridentate, with stout, strongly backwardly curved shaft ·0026 millim. in diameter; lateral arms of heads subtriangular, about ·0063 millim. long, the middle of the margin of the arm conspicuously folded inwards; the middle arm narrow, oblong, about ·0032 millim. long; length of spicule ·025 millim.

Hab. Port Jackson, 0 to 5 fms.

The entire "stock" or head, of which the single well-preserved spirit-specimen consists, is 42 millim. (1½ inch) in height by 40 in greatest diameter; the individual branches may be as much as 9 millim. in diameter at their broadest palmate part. I am under the impression that this is the species alluded to by Mr. Carter (*l. c.*) as *Halichondria plumosa*, from Kerguelen Island. It differs, however, in spiculation from the typical form of that British species in having the shaft of the anchorate about twice as thick and in the longer and slenderer hastate spicule: the difference between the anchorates is perceptible even under a low magnifying-power. It is, however, nearly allied to both it and *Myxilla fictitia* of Bowerbank, and to some Mediterranean *Myxillæ* of Schmidt.

I add the measurements of the spicules of what is probably the type specimen of *Halichondria* (*Microciona*, Bk.) *plumosa*, Mont., for comparison:—

1. Spined acuate, ·16 by ·0063 millim.

2. Hastate acerate (hastate only at *one* end), ·17 by ·0063 millim.

3. Equianchorate, ·016 millim. long, shaft ·0013 millim. in diameter.

Mr. Carter places species of this nature in a new Group, called *Plumohalichondrina* (Ann. & Mag. Nat. Hist. 1875, xvi. p. 144, and 1880, vi. p. 39), as being distinguished by their habit and their angulated, not "naviculiform" anchorate; but his genus *Plumohalichondria* (*op. cit.* 1876, xviii. p. 236) must be carefully distinguished from this similarly named Group, for it is described as possessing a naviculiform anchorate.

CRELLA.

Crella, *Gray, P. Z. S.* 1867, p. 521.
Cribrella, *Schmidt, Adr. Meer.* p. 69.

Schmidt's generic name was already in use for a genus of Asteridean Echinodermata (L. Agassiz, 1835, Mém. Soc. Sci. Neufchâtel, i. p. 191). Dr. Gray therefore very properly altered it.

The present species, although the first assigned to the genus from

the Indo-Pacific region, agrees well with the typical form of the genus, only presenting its peculiarities, both external and internal, under a decidedly more striking form than in the Atlantic and Mediterranean species. *Halichondria infrequens*, Carter, differs from it in having the spined acerate skeleton-spicule which occurs in some of the Atlantic species, but agrees with it in having a bihamate; its external characters are unknown, but it will almost certainly prove to be a *Crella*.

66. Crella schmidti. (Plate XLI. fig. *a a*.)

Massive, sending up moderately thick lobes pierced by passages 1 to 4 millim. in diameter, lined by smooth surfaces bearing the pores. General surface covered with narrow longitudinal ridges about 1 millim. broad, .5 millim. high, and 1 millim. apart, rough; dermal membrane between ridges smooth, transparent. Vents few, in depressions 1 to 3 millim. deep. Texture in spirit like crumb of bread; colour dirty yellowish white. Main skeleton somewhat irregular, spiculo-fibre devoid of horny matter; in deep parts spicules 1- or 2-serial, fibres very irregular in direction; towards the periphery primary fibres, with spicules 2- to 4-serial, run towards the surface, generally at an obtuse angle to it; they terminate between the intermarginal chambers in tufts of the tibiella spicule, 12 to 15 spicules broad, the distal ends of the tibiellæ spreading out upon the dermal membrane and forming its only skeleton. Sarcode pale brown, rather granular. Spicules:—(1) Skeleton acerate, smooth, straight or slightly curved, tapering to sharp points from near centre; size ·22 by ·0063 millim. (2) Tibiella of dermal tufts, straight, smooth, heads of same thickness as centre of shaft; shaft tapering to necks below heads, necks tapering gradually to the oval heads; size ·22 by ·0063 millim. (3) Equianchorate of flesh, tridentate, the shaft stout, strongly curved; the teeth strong, well curved inwards, sharp, the two lateral ones united to shaft by falcate expansions; length of spicule ·037 millim., that of each head ·013 millim., thickness of shaft ·0044 millim. [(4) Bihamate of flesh, contort, curve moderate, ends bent sharply inwards; size ·037 by ·0021 millim. Possibly foreign to the sponge, but not uncommon in both the deeper and superficial parts of the sarcode.]

Hab. Port Jackson, 0–5 fms.

The only specimen is in spirit and well preserved, but small; the external characters peculiar to the genus are, however, well marked. Whereas the head of the tibiella is scarcely defined as such in any of Schmidt's species (of which two are from the Adriatic and two from the West-Indian seas), here it is quite a striking feature of the dermal membrane when seen in section; in *Halichondria infrequens*, Carter, above referred to, the head of the tibiella is similarly well defined. The spicules are generally stouter than those of Schmidt's species, and none of the skeleton forms are spined, as appears to be the case in *C. elegans* and *papillosa*, if not in *hospitalis*. I associate this species with the name of the distinguished

spongologist to whose keen eye for generic characters we owe this very distinct and constant genus.

IOTROCHOTA *, g. n.

Halichondria, pars, *Higgin*, *Bowerbank*, *Carter*.

Desmacidinidæ with smooth linear skeleton-spicules and minute birotulate flesh-spicules with straight shafts, both the heads being of the same size, circular, and symmetrical; sarcode purple.

This genus is formed to include *Halichondria birotulata*, Higgin (Ann. & Mag. Nat. Hist. 1877, xix. p. 296) and *Halichondria purpurea*, Bowerbank (P. Z. S. 1875, p. 293). *Halichondria* s. str. is based on a Renierid. The peculiar flesh-spicule of this genus is one form of the flesh-spicule which usually appears in the Desmacidinidæ under the form of an "anchorate," equi- or inequi-anchorate. The latter forms apparently originate by excentric flexion of the shaft of a birotulate form like the present, and suppression of the rays which lie on that side towards which the shaft is bent; the thin expansions uniting the arms in the birotulate apparently become the "falces" which unite the arms of the anchorate (see Carter, Ann. & Mag. Nat. Hist. 1874, xiv. p. 207). An intermediate stage is seen in *Chondrocladia*—viz. *C. virgata*, Wyville Thomson, and *C. (Halichondria) abyssi*, Carter (Vosmaer),—the shaft of the birotulate being *bent* and the arm of that side almost aborted as in a normal anchorate (see Carter, *tom. cit.* p. 218). *Chondrocladia* differs further from *Iotrochota* in being accompanied by a bihamate or tricurvate flesh-spicule. *Cladorrhiza*, Sars (*C. abyssicola*, id. Some Remark. Forms &c. i. p. 65. pl. vi. figs. 16–34), is an allied form, but not only has the shaft of the birotulate bent, and the symmetry of the head impaired by the almost total reduction of that arm of the head which thus comes into contact with the curve of the shaft, but it is *inequi-birotulate*, and corresponds in the birotulate series to the inequianchorate form of the anchorates of the common types of Desmacidinidæ; it differs from *Iotrochota* in the possession of a bihamate flesh-spicule in addition to the birotulate.

It is noteworthy that those species of this genus hitherto known are from shallow water (littoral, see below), while all other known allied forms except *Axos anchorata*, Carter, for which the depth is not given, are from the deep sea.

From an unusually well-preserved specimen of the green variety of *I. purpurea* from the Amirante Islands (see Pt. II. of this Report), I am able to make out that the ciliated chambers are oval, the ends being well rounded, and measure ·032 by ·025 millim. They are crowded along the sides and in the parenchyma, lying between what appear to be secondary and tertiary canals of the excretory system, and also (though this may perhaps be merely apparent) upon the

* From ἴον, a violet, and τροχός, a wheel, in allusion to the purple colour and the birotulate flesh-spicules.

primary skeleton-fibres: the canals I have mentioned range in diameter from about ·07 to ·14 millim. This opening of a considerable proportion of the ciliated chambers directly into moderately wide canals agrees with what Vosmaer finds to be the arrangement in many forms of the other Monactinellid families Renieridæ and Suberitidæ, as well as in a few other forms, viz. his third type ('Antee-keningen over *Leucandra aspera*, H.,' Leyden, 1880, and Tijdschrift Nederl. Dierk. Vereen. v. p. 144 *et seq.*).

67. Iotrochota purpurea.

(Plate XXXIX. fig. I.; Plate XLII. figs. *e*–*e*''''.)

Halichondria purpurea, *Bowerbank*, *P. Z. S.* 1875, p. 293.

Dr. Bowerbank's specimen (from the Straits of Malacca) is evidently quite young; the present fine series of specimens, both dry and in spirit (numbering upwards of twenty), gives a better idea of the characters of the species.

The external form is usually that of a cylindrical column, narrow, diminishing gradually in thickness towards apex, viz. from about 15 millim. at base to 4 millim. at apex in adult specimens, dividing towards the apex into two or three subequal branches; it is sometimes flattened irregularly near the base: it occasionally forms a broad palmate frond or irregular erect expansion, or an irregularly honeycombed horizontal mass which may attain a diameter of 65 millim. (2½ inches). The surface is broken up into a forest of pointed or ridge-like monticular elevations, 1–3 millim. apart, 1–3 millim. high. In the typical specimen (dry) the surface aculeations are only ·5 to 1 millim. apart and the same in height. Texture in spirit rather firm, but soft on surface, tough and flexible; in dry state harsh on surface, rather brittle: colour in spirit very deep purple, in dry state dark green or pale purple. Skeleton rectangular, consisting of stout compact primary spiculo-fibres devoid of visible horny material, 10 to 20 spicules broad, and of similar secondary fibres 1 to 3 spicules broad. Skeleton-spicules smooth, acuate, rather squarely rounded at base, tapering to a sharp point from about five diameters from end; size chiefly ·26 by ·0063 millim., a few in the interior of the primary fibres ·18 by ·005 to ·0095 millim. (in the type the prevailing size is ·16 by ·0127 millim. and the spicule frequently increases in diameter from the base towards the centre). Flesh-spicule birotulate (not *equianchorate*, as stated by Bowerbank), shaft very slender; rotulæ small, umbrella-shaped, with four equal curved teeth; length of spicule ·016 to ·019 millim. Sarcode in spirit dark purple, granular; in dry state either dark purple or dark greenish. Large specimens attain a height of about 150 millim. (6 inches).

Hab. Torres Straits, various localities down to 10 fms.; Albany Island, 3–4 fms.; Port Molle, coral-reef.

Distribution. Straits of Malacca (*Bowerbank*).

The specimens referred to as being greenish in colour are all dry.

and four of the five agree further in being the only ones of the series which present an irregular erect expansion or horizontal mass; a specimen of the erect slender type also shows this colour; neither do I find any thing peculiar in the spiculation of greenish specimens. Two of them are the only specimens received from Port Molle, the rest are from Torres Straits. But as two flattened specimens from the Amirante Islands, in spirit, also possess a decided olivaceous green coloration, I conclude it to represent a variety, uniting green colour with expanded habit of growth. Possibly the colours may depend on sexual characters, or reproductive condition, as noted by Keller in *Chalinula fertilis*.

The general form and surface characters resemble strongly those of the species named by Mr. Carter *Axos anchorata*, from Bass's Straits, except that this is not branched; in this the colour is given as brown; the equianchorate appears to be a modified birotulate, but the skeleton-spicule is acerate. It is perhaps referable to *Chondrocladia*, Wyville Thomson, although, unlike the hitherto described species of that genus, it has no second form of flesh-spicule.

68. Iotrochota baculifera.

(Plate XXXIX. fig. M; Plate XLII. fig. *f*.)

Erect, formed of subcylindrical lobes, terminating bluntly; diameter of lobes about 12 millim. Surface chiefly rough, owing to the projection from it, at intervals of ·5 to 1 millim., of blunt meandering ridges or conical blunt processes, ·5 to 1 millim. high; dermis between eminences smooth, glabrous (in parts smooth patches of some extent). Texture in spirit soft to touch, but very slightly compressible and elastic; colour very dark crimson (almost black).

Main skeleton forming somewhat irregular and wide meshes (·4 to ·6 millim. across): consisting of stout compact primary spicular fibres running approximately at right angles to the surface, about 12 to 15 spicules broad, and of similar secondary fibres, vertical to the former in general direction, often meeting them in curves, about 10 spicules broad. Sarcode purple, stained diffusely and also coloured by the presence of very abundant dark purple cells. Dermal skeleton formed by summits of primary and by uppermost secondary fibres, and by long compact tracts of cylindrical spicules which traverse the intervening spaces.

Spicules:—(1) Smooth acuate, rather suddenly curved, base well rounded, tapering to a sharp point from about four diameters from apex, or to blunt point from about 1½ diameters from the apex; size ·2 by ·0095 to ·0127 millim.: forms the main skeleton-fibre. (2) Smooth, cylindrical, straight, ends well rounded; size ·22 to ·28 by ·0063 millim.: lies loose in dermis. (3) Birotulate, shaft slender, heads about ·003 millim. across; teeth four in number, bent inwards, umbrella-like; length ·016 millim.

Hab. Port Darwin, between tide-marks: bottom mud and rock.

The specimen consists of an irregular horizontal mass about 40 by

15 millim. in greatest and least thicknesses respectively, spreading over and uniting three detached stones, from which arise two chief and a few incipient lobes, the largest respectively 12 and 25 millim. in height. The species differs from the Torres-Straits and Malacca species (*I. purpurea*) in the presence of the cylindrical dermal spicule, in the stouter stem, and the much more finely roughened surface; it is more nearly allied to *D.* (*Halichondria*) *birotulifera*, Higgin (from the West Indies), which it resembles in stoutness of habit; but the cylindrical and acuate spicules are both twice the diameter of the corresponding spicules of that form.

69. Esperia parishi.

Raphiodesma parishii, *Bowerbank*, *P. Z. S.* 1875, p. 283.
Amphilectus parishii, *Vosmaer*, *Notes Roy. Mus. Netherl.* ii. p. 119.

An indubitable *Esperia*. Dr. Bowerbank's description of the spiculation of this species is defective and misleading; he omits to notice the sheaves of "trichites" which I find in his preparations; they are, as usual, local in their occurrence, and, from their delicate proportions, not easy to find; the slender bihamates described may be traced by intermediate stages up to the large bihamates, which are perhaps the most striking feature of the spiculation; they are thus merely the young of these latter forms: the alleged spined acuates and tricurvates obviously belong to a *Myxilla* over which the *Esperia* has grown, as they occur in abundance together, but not all over the "basal membrane." (Some navicular *equianchorates* which occur seem to be also foreign, being found only detached and in small numbers, and but local in their distribution.) I am inclined to consider the small "palmato-inequianchorates" as young forms of the normal large one.

The following are the proportions of the different spicules proper to the sponge; they agree fairly in both the Malacca and Australian specimens:—

1. Smooth, subspinulate acuate, with slight elongate head; basal end slenderer than middle of shaft: ·33 by ·013 millim.

2. Large inequianchorate; large end comparatively short, its tubercle long and narrow: ·057 millim. long.

3. Navicular equianchorate: ·013 millim. long.

4. Bihamate, smooth, contort: ·095 by ·008 millim.

5. Trichite spicules in bunches of two to four or five: ·032 to ·16 by ·0018 millim.

Some thin fragments agreeing well in all respects with the typical specimen occur in the present collection.

Hab. Port Darwin, between tide-marks.

Distribution. Straits of Malacca (*Bowerbank*).

This species appears to be absent from Torres Straits, judging from the results of the numerous dredgings taken there; its presence at Port Darwin is therefore probably to be accounted for by direct transit across the western end of the Arafura Sea by way of Timor and the neighbouring islands.

70. Esperia pellucida.

(Plate XL. fig. K; Plate XLII. fig. *h*.)

Growth horizontal, spreading over and between stones &c., rising at certain points into slender lobes. Surface even, glabrous. Consistence rather firm and brittle. Vents? Colour in spirit pale pink or dirty white, subtransparent. Dermal membrane gelatinous, transparent, subelastic, firm; internal structures soft. Main skeleton formed of delicate, widely inosculating fibres 4 to 6 spicules broad, soft, branching at obtuse angles. Dermal skeleton consisting of angular meshes formed by distinct straight tracts of spicules, 2 to 4 spicules broad.

Spicules:—(1) Skeleton subspinulate; straight or slightly curved; head marked by a slight and gradual enlargement a little below base; head round and blunt, diameter less than maximum diameter of shaft; shaft tapering gradually to sharp point from within about 2 to 6 diameters of apex; size ·42 by ·0095 millim. (2) Large inequianchorate; shaft strong, slightly bent, of same diameter throughout except near the two ends. Large end forming about one third of total length of spicule, diameter about the same as its length. Lateral palms, as seen from front, broad, truncate below, inferior angle projecting slightly; outer margin slightly reverted throughout; median palm oval, small; tubercle distinct, small, pear-shaped; small end almost truncate above as seen from front, but with the supero-lateral angles sharp, slightly produced upwards, outer margins reverted throughout; tubercle relatively large, anvil-shaped; the small end of the spicule is truncate below and about half the diameter of the large end; length of spicule ·1 millim. (3) Small inequianchorate; shaft slender, gradually curved; large end forming about two fifths of total length of spicule; lateral palms with sharp inferior angles, being excavated on inner side, outer margin reverted throughout; tubercle narrow, elongate; smaller end about half the length of upper (larger) end; outer margin reverted throughout; tubercle subterminal, squarish; end truncate below; length of spicule ·032 millim. (4) Bihamate, contort, slender, with wide curve; size ·057 by ·0032 millim. (5) Trichites, in bundles of from 20 to 30, with fine points; size of individual spicules ·06 by ·0015 millim.

Hab. Alert Island, Torres Straits, 7 fms.; bottom sand.

The anchorate of this spicule belongs to the more common of the types occurring in Atlantic and Mediterranean *Esperiæ*; it is, however, larger than most, if not all, and the presence of a second form of inequianchorate is another unusual point. The single specimen is in spirit and runs over and between a number of loose and attached calcareous fragments, *i. e.* shells &c. The upright lobes are about 16 millim. long and somewhat flattened.

71. Esperia obscura.

? *Carter, Ann. & Mag. Nat. Hist.* 1882, ix. p. 299, pl. xi. fig. 18.
? Mycale grandis, *Gray, P. Z. S.* 1867, p. 533="Eine indische Esperie," *Schmidt, Suppl. Spong. Adr. Meer.* p. 34, pl. iii. fig. 11.

Mr. Carter assigned the above name to a massive specimen from Freemantle, S.W. Australia, of which he says (*l. c.*) it has "all the characters of *Esperia*, viz. lace-like dermal layer, rigid interior fibre, and acuate (sub-pinlike) form of skeletal spicule, but with an inequianchorate about 5-6000ths" (of an inch) "long so transparent in its detail that all I can give of it are the representations (pl. xi. fig. 18), in the hope that it might be thus recognized and finally illustrated." In the present collection made by H.M.S. 'Alert' occur two small imperfect specimens of an *Esperia* which has (besides a larger one) a small inequianchorate spicule which strongly resembles Mr. Carter's figures above referred to, and does not contradict in any point the other parts of the short description which was all that Mr. Carter was able to give of his species. I therefore propose to refer the present specimens to that species provisionally until other specimens are obtained from Freemantle or its neighbourhood which may clear up the question of identity. The following is a description of the 'Alert' species; it may be taken as characteristic, so far as the more minute characters go, the tissues being in a good state of preservation :—

Sponge massive, enclosing detached (and perhaps fixed) foreign bodies. Texture firm, rather brittle. Surface gently undulating, glabrous. Vents numerous, oval, 1 to 2·5 millim. in greatest diameter, scattered on general surface; margins thin, sometimes projecting somewhat; main excretory canals rising from a distance below the surface. Dermal membrane thin, glabrous, semitransparent, firm. Colour in spirit pale dull brown.

Main skeleton—spiculo-fibre moderately well defined, delicate, branching at various angles, from 5 to 10 spicules broad. Dermal skeleton diffuse, the spicules scarcely ever arranged into definite tracts, but loosely matted. Sarcode thin, very pale yellow-brown, slightly granular.

Spicules:—(1) Skeleton subspinulate, straight or slightly curved, head elongate, subterminal, slight, gradually passing into a bluntly-rounded narrower extremity on the one hand, and into the shaft on the other; diameter of head decidedly less than that of shaft; shaft tapering gradually to within about three diameters of apex and then rapidly to a sharp point; size ·8 by ·014 millim. (2) Large inequianchorate; shaft slightly curved, stout; larger end of spicule of same longitudinal and horizontal diameter, viz. one third as much as total length of spicule; lateral palms finely curved, ending below in sharp inwardly-curved points and reduced to narrow falciform processes with a narrow reverted rim as seen from front; anterior palm oblong, with rounded angles as seen from front; tubercle distinct, oval; smaller end of spicule with abrupt square upper margin;

lateral margins reverted at upper end; tubercle strong, oval; breadth and length of small end about half those of larger end; length of spicule ·12 millim. (3) Small inequianchorate; shaft slender, sharply bent at about middle; larger end about three fourths of total length of spicule in length and about half that amount in breadth; the lateral arms as seen from front finely curved and forming long wing-like processes, pointed below and excavated on their inferior and inner aspects, reaching almost to the upper edge of the smaller end of the spicule; their curve coincides with that of the lower end; smaller end like that of the large inequianchorate, but truncate at its distal extremity; length of spicule ·032 millim. (4) Bihamate, contort, slender, curve wide, points sharp; size ·057 by ·0032 millim. (5) Trichites, in sheaves of 10 to 20 or 30; finely pointed, apparently straight, each about ·032 long by ·0016 millim. thick; very abundant in some parts of dermal membrane.

Hab. Thursday Island, Torres Straits, 4–6 fms.; bottom rock and sand.

Distribution. Freemantle, S.W. Australia (*Carter*)?; Indian Ocean (*Schmidt*)?

The larger piece is 43 millim. ($1\frac{3}{4}$ inch) long, by 20 millim. ($\frac{3}{4}$ inch) broad, by 10 millim. thick; it is uncertain whether it ever had an independent stem or whether it depended for attachment on the fragments of shells &c. which it involves in its substance, or on fixed foreign bodies; the smaller piece is similar in its relations, and perhaps both originally formed part of one specimen.

The large anchorate strongly resembles that figured by Schmidt (*l. c. supra*) as belonging to "eine indische Esperie," named *Mycale grandis* by Gray (*l. c.*), in the form of its larger end, although the anterior palm is relatively larger than in that form, while the middle palm of the lower end is far smaller relatively to the spicule and to the lateral palms than in Schmidt's anchorate; but it seems likely from its appearance that the lower end of the spicule was imperfectly developed in the example figured by Schmidt. The spicule was even larger than that of our species, viz. ·145 millim. long, according to Schmidt's measurement. Gray's species is based simply on that author's description of the spicule.

PHORIOSPONGIA.

Marshall, Zeitschr. wiss. Zool. xxxv. p. 122.

The striking structural character on which this genus was founded receives confirmation and illustration from the following species: I have referred to it as occurring in *Clathria* (*Microciona*) *tuberosa*, Bowerbank (see p. 444). *Fibularia anchorata*, Carter, from Antigua (Ann. & Mag. N.H. 1882, ix. p. 283), is perhaps a *Phoriospongia*.

72. Phoriospongia fibrosa. (Plate XLII. fig. *g*.)

Massive, sessile, irregularly shaped; surface uneven, with irregular

shallow depressions, covered by a glabrous semitransparent membrane, rendered rough by the projection of the low ends of the primary fibres, ·25 to ·5 millim. apart (many smooth patches occur); texture in spirit brittle, compressible (specimen No. 1), rather tough, elastic (specimen No. 2); colour pale greyish (specimen No. 1) or reddish brown (specimen No. 2). Internal structure cavernous, loose. Vents numerous, scattered, circular or oval, leading deeply into sponge: diameter 1·5 to 3 millim.

Main skeleton regular, rectangular in arrangement: primary fibres set at right angles to surface, ·18 to ·35 millim. apart, ·013 to ·03 millim. thick: secondary fibres at right angles to primaries, ·18 to ·35 millim. or upwards apart, similar to primaries in proportions; fibres wholly composed of foreign bodies united by an almost colourless, not dense, substance. Dermal skeleton formed by small foreign bodies scattered abundantly over the dermis, tending to aggregate into slightly denser anastomosing tracts about ·14 millim. broad, enclosing rounded meshes about ·18 to ·53 millim. in diameter, and by the cylindrical spicules of the sponge, which by loose aggregation form tracts, about 4 to 6 spicules broad, below the skeleton of foreign bodies, the tracts branching and anastomosing not unfrequently, and ending freely on the surface in slightly expanding tufts; sarcode subtransparent, granular, colour a warm brown (slightly in specimen No. 1, strongly in specimen No. 2, in which it is more dense. Spicules:—(1) Slender acerate, smooth, with very slightly enlarged subpyriform basal end, the other end rather bluntly pointed: size about ·16 to ·19 by ·0021 by ·0032 millim.: forming part of dermal skeleton and scattered over main skeleton-fibres. (2) Contort bihamate, smooth, curve moderately strong, points sharp, suddenly and sharply bent inwards; size ·032 by ·002 millim.: abundant in subjacent tissues. (3) Tridentate equianchorate, shaft well curved, about ·0016 millim. thick; teeth slender, sharp, curved inwards, about ·008 millim. long; spicule ·022 millim. long. Foreign bodies small in specimen No. 1; large, for the most part, in specimen No. 2.

Hab. Specimen No. 1: Prince of Wales Channel, Torres Straits, 7–9 fms.: bottom sand. Specimen No. 2: Port Jackson, 0–5 fms.

Two specimens in spirit. No. 1 has apparently been torn from a larger mass; it is much penetrated by some thin Algæ, on which it seems to have grown much as *Amorphina panicea* grows over weed; it measures 60 millim. by 22 millim. in its two chief dimensions. No. 2 is somewhat compressed on one side, and measures 36 by 19 by 12 millim. The anchorate spicule is scarce in one of the specimens (that from Port Jackson), while it is abundant in the other.

The variability in colour and texture, and perhaps in the secondary fibres, is considerable, but not surprising, considering the distance between the stations at which the specimens were obtained; in other points the agreement is close. The species is a very distinct one, differing from both Marshall's species in the presence of a well-defined reticulate skeleton and of an anchorate flesh-spicule.

in the slenderness of the bihamate spicules, and the almost absolute absence of a head to the very slender linear spicule; the resemblance in spiculation seems conclusive as to the generic identity of the three forms, in spite of the remarkable differences in the skeleton. The mulberry-like bodies described by Marshall in *P. solida* I cannot see in the present species; when treated with hydrochloric acid the superficial layer of the dermis parts with all hard elements except the spicules and some amorphous transparent fragments. Marshall himself does not mention these bodies in *P. reticulum*, so that they cannot be of more than specific or individual importance.

The spiculation of *Phoriospongia* is perhaps nearer to that of *Amphilectus* than of any other genus. Thus, besides *Clathria* (see *C. tuberosa*, p. 444), we have a second genus of Siliceous Sponges which may normally exhibit the phenomenon of intussusception of sand into the fibre. It seems to me that intussusception is the most probable hypothesis on which to account for the presence of the sand in this genus, although Marshall, whom I understand to describe *Phoriospongia* as penetrating and spinning up masses of sand ("durchziehen und umspinnen Sandmassen, sie zu Klumpen vereinigend"), *may* be right in this interpretation of the origin of the sand in the genus *Phoriospongia*; however, in *P. fibrosa* we find a real system of fibres which does not appear to occur in *P. solida* and *reticulum*; and although I have not been able to detect a horny material, like that of *Dysidea*, uniting the sand grains, which might, as held by Bowerbank and Marshall, pick them up, it seems to me that, remembering the readiness with which Siliceous Sponges, whether possessing a horny fibre or not, take up foreign bodies, there is no reason why the sand of *Phoriospongia* should not be taken up, and not be due to the penetration of masses of sand by the sponge. This view is supported by the spiculation, which is not Suberitid like that of *Vioa*, but, as above remarked, Desmacidine; the presence of the spinulate spicule is common to it and many Desmacidines; while the absence of the remarkable eversible funnel which distinguishes the termination of the excretory canal-system in *Vioa* seems to indicate a different affinity. *Reniera fibulata*, Schmidt, to which Marshall refers in support of his view that bihamates occur in sponges other than Desmacidinidæ, has been placed by Vosmaer in that group under the genus *Desmacodes*, Schmidt, apparently not without reason; and Schmidt (Spong. Atl. Geb. p. 40) himself inclines to the view of its Desmacidine affinities; but the presence of bihamates in Suberitidæ is hitherto unknown.

ECTYONIDÆ.

Ectyonida, *Carter, Ann. & Mag. N. H.* 1875, xvi. p. 133.

Schmidt (Spong. Atl. Geb. 1870, p. 133) grouped *Chalinopsis* (=*Ectyon*) and its allies, with *Acanella*, *Phacellia*, &c., under the heading Chalinopsidinæ (=Echinonemata, Carter, *l. c.*). Mr. Carter

has, however, done good service in pointing out an essential difference between the two groups into which he divides the Chalinopsidinæ, viz. in the way in which their echinating spicules are attached. It must, however, be remarked that *Echinodictyum*, mihi, as now understood, approaches *Axinella* decidedly in this point.

The presence of spined echinating spicules is not (see *Raspailia*, infrà) distinctive of the family as here constituted.

The absence or slightly pronounced tendency to difference in size and form between the corresponding spicules of allied species, when the outward form of the sponge differs unmistakably, is a most characteristic feature of this family, and is especially well exhibited in the genera *Echinonema*, *Clathria*, *Echinodictyum*, and *Raspailia* (s. str.), whereas in Axinellidæ the relative thickness of the spicules usually gives good characters (see *Acanthella*, sp., p. 463, where the external form differs little from *A. obtusum*).

OPHLITISPONGIA.

Ophlitaspongia, *Bowerbank*, *Mon. Brit. Spong.* ii. p. 14.

Vosmaer (Family Desmacid. p. 107) places *O. seriata*, Bowerbank, the typical species of this genus, under *Desmacodes*, and says (*l. c.* p. 155) of *O. papilla*, id., which seems to me not to be specifically distinct from it, that it is probably a *Clathria*, but that no anchorate spicules have been described in it; I have examined the original slides (Bowerbankian) without finding anchors. The sponge which I am about to describe from the present collection agrees with these British *Ophlitispongiæ* (but not with the foreign ones) of Bowerbank in their fibre and spiculation, except that the fibre is cored by a cylindrical spicule which is wanting in *O. seriata* and *papilla*. I am inclined to believe that we have here a natural genus, differing from *Clathria* mainly in the absence of anchorate spicules. I do not see how these species can be placed under *Desmacodes*, when they have echinating spicules, but no skeleton acerates (except tricurvates) and no bihamates.

73. Ophlitispongia australiensis. (Plate XLII. figs. *c*, *c'*.)

Habit of *Clathria frondifera*; spiculation of *C. coralloïdes* and allied species. Massive; structure cellular, *i. e.* interior and surface broken up into angular cells by walls of tough denser sponge-substance, projecting at surface in low ridges and slight points: between them are extended thin membranous expansions. Texture in dry state firm, tough, subelastic; colour pale dirty brown.

Main skeleton—meshes rounded, narrow: primary fibres stout, amber-yellow, cored with about one third their thickness of spicules, proceeding straight to surface, diameter about ·1 to ·14 millim.: secondary fibres abundant, irregular in direction, amber-yellow,

diameter about ·07 millim.; one or two axial series of spicules; both sets of fibres echinated sparsely with the echinating spicule. Dermal skeleton formed by undulating, very pale yellow horny fibres containing two or three series of spicules, about ·053 millim. broad, and of loose tracts of spicules. Sarcode pale amber-yellow, transparent.

Spicules:—(1) Skeleton cylindrical, smooth, straight, tapering slightly from middle towards well-rounded ends; size about ·2 by ·0042 millim. (2) Echinating acerate, smooth, straight, tapering decidedly from middle towards the base, which is thus thinner than the middle of the shaft, but is well rounded, and tapering from middle to sharp point at apex; size about ·13 by ·0095. (3) Tricurvate acerate, smooth, curves slight, ends finely pointed; size about ·042 by ·0021; in sarcode.

Hab. Port Molle, Queensland, 12 fms.; bottom rock and coral.

In general appearance this sponge resembles *Clathria frondifera*, but has the intervals between the trabeculæ of the clathrous structure more or less filled with membranous expansions. The spiculation is not quite so simple as that of the British species, but has, in addition to their echinating acerate and tricurvate, a cylindrical skeleton form. I know of no other near allies. A small but well-preserved dry specimen represents this species.

74. Clathria aculeata.

(Plate XL. fig. 1; Plate XLII. fig. *k*.)

Erect, with single, slender stem, dividing into branches at some distance from base; branches given off in various planes and at acute angles, occasionally connected by bars of sponge-substance; secondary branches occur, formed in the same manner as the primary branches. Stem cylindrical, 4–5 millim. in diameter in present specimens; surface even, with the exception of a few prominent but blunt aculeations shortly below the commencement of the branches; branches well covered by long, more or less pointed aculeations, 2 to 5 millim. high. Texture of stem, both in spirit and in the dry state, woody, incompressible; that of the branches elastic, but more or less incompressible until near the apices, which are firm but compressible. Colour, in spirit, dark amber-brown; in dry state pale brown, the branches having a whitish incrusted appearance. Surface of branches, in spirit, minutely uneven, that of stem glabrous.

Main skeleton composed of very strong amber-yellow horny fibre, tortuous and anastomosing, not showing distinct separation into primary and secondary fibres, but forming oval meshes; diameter of fibre at base of branches varying from ·05 to ·2 millim., the short diameter of the meshes formed by it at the same spot from ·18 to ·8 millim.; fibre cored by a tract of slender spinulate spicules, 3 or 4 spicules broad, and echinated everywhere abundantly by the spined acerate spicule. Dermal skeleton similar to main skeleton,

but fibre more constantly stout: thickness from ·07 to 2 millim.; meshes narrower, viz. ·09 to ·7 millim. in smaller diameter, and bearing short blunt processes at intervals, echinated by thick tufts of the smooth subspinulate spicule on its upper surface. Sarcode very dark yellowish brown, granular and opaque.

Spicules:—(1) Stouter, smooth, subspinulate acuate, straight, with very slight constriction marking off a short head, which is less in diameter than the middle of the shaft; shaft tapering gradually to sharp point from about centre: size ·23 by ·0127 millim.: in tufts on dermal skeleton. (2) Slender, smooth, spinulate, with slight oval head, nearly straight; tapering to sharp point from near centre; size ·35 by ·0085 millim.: forming axis of skeleton-fibres. (3) Subspinulate spined acuate, with small globular head, and tapering to a fine point from about centre; spines numerous, sharp, projecting at right angles to long axis of spicule, prominent on middle of spicule and sometimes on head, becoming obsolescent in the other parts; size ·09 by ·0079 millim.: echinating the skeleton-fibres. (4) Tricurvate acerate of sarcode, smooth, sharp-pointed; curves gentle; size about ·063 by ·0015 millim. (5) Navicular equianchorate; shaft slender, slightly curved; length about ·0127 millim.

Hab. Thursday Island, Torres Straits, 3–4 fms., bottom sand; also same locality, probably from beach.

Two specimens, agreeing closely in their characters, represent the species; heights 70 and 85 millim. ($2\frac{4}{5}$ and $3\frac{2}{5}$ inches) respectively; expanse of branches 30 and 20 millim. respectively. It agrees closely in character of spiculation with *C. ulmus*, Vosmaer (Notes Roy. Mus. Netherl. ii. p. 151), of which the locality is not stated; but the stem is single and not ramified as stated by Vosmaer, who does not mention the most striking external characteristic of this species, viz. its strong aculeation by long pointed processes. I know of no other species which approaches it at all closely.

75. Clathria tuberosa. (Plate XLII. fig. *d*.)

Microciona tuberosa, *Bowerbank*, *P. Z. S.* 1875, p. 281.

The specimens are finer than those in the Bowerbankian collection: the largest measures 70 millim. ($2\frac{3}{4}$ inches) in greatest diameter, and 50 millim. (2 inches) in greatest height; the individual lobes may measure as much as 14 millim. in greatest diameter. The "skeleton columns" (*Bowerbank*) are even more strongly arenated than in the type specimen, and resemble those of a *Dysidea*, the projecting ends of the spined and fine smooth acuate being the only point of difference which appears at first sight. The proportions of the spicules differ slightly from those of the Malacca specimens as given by me (*P. Z. S.* 1881, p. 121)*, viz.:—

* The length of the equianchorate should have been stated there as ·016 millim., and the base of the slender smooth acuate described as slightly inflated.

	Torres Straits specimen.
1. Slender acuate (slightly inflated basally)	·25 to ·31 by ·0042 to ·005 millim.
2. Stout long acuate (very scarce)	About ·19 by ·0095.
3. Spined echinating acuate	·085 by ·0044.
4. Equianchorate	·014 to ·016 long.

Hab. Prince of Wales Channel, Thursday Island, &c., Torres Straits, 4–10 fms.; bottom sand &c.; common.

From study of the present series of specimens, with the light afforded by W. Marshall's important paper, "Untersuchungen über Dysideiden und Phoriospongien" (Zeitsch. wiss. Zool. xxxv. p. 122), I am now convinced that Bowerbank was right in describing the arenaceous material which is so plentifully present in this sponge as the normal substratum of the skeleton-lines, and that it does not, as I formerly considered (P.Z.S. 1881, p. 122), consist of the tubes of an arenaceous Foraminifer. That being so, the character assumes a fresh importance when it is seen not to stand alone among the Siliceous Sponges. *Phoriospongia*, Marshall (*l. c.*), is described as having a spiculation consisting of acerate and (or) spinulate and bihamate spicules in combination with a large quantity of sand, the latter, however, not aggregated into definite fibres. With regard to *Clathria tuberosa*, though it differs from other *Clathriæ* in this remarkable point, its spiculation is distinctly that of the genus to which I propose to refer it.

76. Clathria coppingeri.

(Plate XL. figs. F, F'; Plate XLII. figs. *i*, *i'*.)

Erect, palmate, clathrous, growing in only one plane. A few main branches are given off from the common base or rudimentary stem, each dividing furcately once or twice at acute angles: the terminal branches are traceable to within about two thirds of the distance from the base to the periphery of the sponge. All the branches intimately united by a close reticulation, consisting of bars of sponge-substance, suboblong in transverse section, the longest diameter being the antero-posterior one, the anterior and posterior surface of the bars either flat or coming to an angle in front or behind or on both aspects; the surface of the sponge thus presents a series of subquadrangular, polygonal, or suboval cells, having a maximum diameter of 3 to 10 millim. Main branches suboblong in transverse section, the antero-posterior diameter being longer than the lateral one: slightly marked by longitudinal furrows, the anterior and posterior faces flat or angular; the branches (especially the larger ones) project above the level of the intermediate reticulation, owing to their superior antero-posterior thickness, which attains a maximum of 20 millim., the lateral diameter a maximum of 10 millim. Surface of intermediate reticulation, sides of main

branches, and the entire surface of smaller branches uneven and covered with small deep vents, about ·5 millim. in diameter and ·5 to 1 millim. apart. Texture of sponge in dry state and in spirit firm, the peripheral portions and the reticulation generally elastic, somewhat compressible and flexible, like cork; the main stems in dry state hard, woody; reticulation and lesser branches rather brittle. Surface between pits composed of an incrustation, which is whitish when dry, dull umber to pinkish in spirit; colour of subjacent tissue pale brown in dry state, pinkish and subtransparent in spirit.

Main skeleton irregular, consisting of a close reticulation of primary and secondary fibres, which are curved, and form rounded meshes from ·18 to ·25 millim. wide; primaries ·044 to ·07 millim., secondaries about ·035 millim. in diameter. Dermal skeleton formed of similar, rather narrower meshes; fibres ·053 to ·07 millim. in diameter.

Spicules:—(1) Smooth acuate, tapering gradually to sharp points and also to base, which is slightly narrower than middle of shaft: size ·2 by ·015 millim.: in axis of fibres and projecting from ends of primaries. (2) Subspinulate acuate, slightly curved, tapering gradually to sharp point; head formed by a slight constriction just above base, which is microspined: size ·34 by ·015 millim.: in axis of and projecting from ends of primary fibres. (3) Smooth, straight, slender spinulate, with oval head slightly stouter than shaft, tapering gradually to sharp point; size ·25 by ·005 millim. to ·15 by ·0063 millim.: in the sarcode, especially at the surface (probably young forms of No. 2). (4) Spined acuate, with slight constriction just above base, spined all over with small, sharp, straight spines; size ·011 by ·0063: scattered, echinating the different fibres at right or acute angles. (5) Equianchorate, navicular, with slender shaft and slightly elongate palms with truncate proximal margins, as seen from in front: ·017 millim. long: abundant in sarcode.

Hab. Albany Island, north coast of Australia, 3 to 8 fms.; bottom sand and mud.

A very fine dry specimen, 455 millim. (18¼ inches) by 450 millim. (18 inches) in extreme height and diameter respectively, together with a portion in spirit of what must have been also a large specimen, represent this species. The remarkable external characters are not accompanied by any thing striking in the spiculation: indeed this is remarkable, if for any thing, for its simplicity, the equianchorate being the only flesh-spicule present. I have great pleasure in associating with what is perhaps the finest new sponge of this collection, and the finest known species of its genus, the name of the indefatigable and successful collector who obtained it.

77. Clathria reinwardti, var. subcylindrica.

Clathria reinwardti, *Vosm., Notes Roy. Mus. Netherl.* ii. p. 152.

I have little doubt of the identity with Vosmaer's species of this sponge which occurs abundantly in Torres Straits. The general external resemblance to *Axinella cannabina* is very striking and the

specimens recall strongly, from their habit and size, the figure of this species given by Esper (Pflanzenth. ii. pl. xlv.), with which Vosmaer's specimen was at first erroneously identified.

The following are the leading points in the external characters:—The specimens are abundantly branched, the stems and branches are either roughly cylindrical below (usually flattened at the ends), greatest diameter about 9 millim. in the cylindrical, 12 to 14 millim. in the compressed parts. Anastomosis frequent, produced by lateral adhesion of branches, sometimes forming broad expansions of sponge-substance. Surface entirely broken up by a system of anastomosing, more or less sharp, usually jagged ridges, 2 to 3 millim. high, often drawn up into prominent detached points. Texture in dry state subelastic, firm, harsh to touch. Maximum extent of largest specimen 180 millim. (7¼ inches). Skeleton: indications of horny matter in fibres slight and infrequent; fibres usually wholly composed of the smooth skeleton-spicule, about 8 spicules broad, and sparingly echinated by the spined cylindrical form. Spicules: I cannot find any spinulates, those which Vosmaer describes are perhaps young forms of the smooth acuate; nor do I find the smooth cylindrical which he places within brackets.

(1) The skeleton smooth acuate, has a well-rounded head and tapers gradually to a sharp point; size ·25 by ·0127 to ·28 by ·0095 millim.

(2) Smooth acuate, occasionally echinating, measures ·22 by ·0127 millim.

(3) The spined echinating cylindrical tapers to the smaller blunt end: the spines project directly outwards from the shaft and are about equally distributed over the whole spicules; size ·076 by ·0063 millim.

(4) Equianchorate, ·019 millim. long.

Colour, in dry state, grey or very pale brown.

Vosmaer's description being short and merely preliminary, I have thought it well to give the chief details (although I hope he will himself figure or further describe his species) to obviate any future uncertainty as to the identity of the present form.

Hab. Thursday Island, Prince of Wales Channel, Torres Straits, 3–7 fms.; common.

Distribution. Moluccas (*Vosmaer*).

Vosmaer states that his specimen is unbranched.

Clathria reinwardti, *Vosmaer*, var. palmata.

It is not surprising to find *Clathria* exhibiting individual variation in its external form of a character similar to that which occurs in the nearly allied genus *Echinonema*. As in that genus the same species may be either cylindrical or semipalmate, so here. In this collection occur two specimens from one locality, which, though differing greatly in form from each other, have the same colour, a surface of similar character, and agree closely in spiculation.

The one arises from a stout, laterally compressed, short pedicle, and expands rapidly into a fan-shaped but rather thick expansion,

apparently partly formed by upgrowths from short stems placed beside it, which, though now single, appears to have been originally compound also: one surface of this expansion is almost level, but honeycombed densely with openings with rounded edges, varying from 1 to 4 millim. in diameter; the other surface is broken up into seven more or less pronounced vertical ridges, irregular and frequently interrupted, 3 to 10 millim. in height: this surface and its ridges are also strongly honeycombed, and between the openings usually project points and ridges of sponge-tissue. It measures 130 millim. (5¼ inches) in breath, 120 millim. (4¾ inches) in height. The second specimen is strap-shaped, 24 to 30 millim. across, somewhat abruptly bent at one point, and terminated by two small lobes; like the other specimen, one surface is comparatively level and is honeycombed rather minutely (openings ·3 to ·5 millim. in diameter), while the other is rugose, from the presence of several demi-canals, about 2 to 4 millim. across, which run from the middle to the margin of the frond: the surface between them is minutely honeycombed and drawn up into a few sharp points and ridges. The colour is darkish grey, varying to greenish in both specimens. The spiculation is essentially that of the above-mentioned form of *C. reinwardti*, but the skeleton smooth acuate is only ·0063 to ·0079 millim. in diameter, and the short, stouter, smooth acuate is wanting: this slight difference in spiculation appears to justify the separation of this form under a distinct varietal name. It is perhaps as nearly related to the original form as the first-mentioned specimens. The remarkable fan-shaped specimen appears (having regard to the multiple character of its base) to be made up of several "persons" which have united to form a single symmetrical frond.

Hab. Bird Island, N.E. Australia, coral-reef.

78. Clathria frondifera.

(Plate XLII. fig. *i*; and Part II. of this Report, Plate LIII. fig. J.)

Halichondria frondifera, *Bowerbank*, *Proc. Zool. Soc.* 1875, p. 288.
Amphilectus frondifer, *Vosmaer*, *Notes Roy. Mus. Netherl.* ii. p. 115.

A very common species, especially in Torres Straits. At first I was inclined to separate the specimens from Bowerbank's species on account of the greater development of ceratinous substance investing the lines of skeleton-spicules. In the Australian specimens this occupies from half to two thirds of the diameter of the fibres, while in the type specimen from the Straits of Malacca its place is often almost entirely taken by spicules, and extends to half the diameter of the fibre only in some cases. The consistency of the sponge is hence much tougher and more elastic in the Australian specimens. The main skeleton-spicules are much stouter in the Malacca specimens.

Dr. Bowerbank has omitted to describe a very fine tricurvate flesh-spicule which occurs both in his specimens and in the present ones. His description is also misleading in not stating, what his own type specimen satisfactorily exhibits, and what the Australian examples

show to greater advantage, that the stag's-horn-like branches anastomose and inosculate very freely with each other, forming a number of deep angular cells, open above and below, and more or less at the sides also, owing to the fenestræ left between the branches. The Australian specimens mostly exceed Bowerbank's type in their dimensions: the largest measures 110 millim. (4⅜ inches) by 115 millim. (4½ inches) in extreme height and breadth respectively; it is formed of three main lobes which arise from a common base and unite towards the summit of the sponge.

The measurements of the spicules are given, as Bowerbank has not figured them:—

	Smooth skeleton Acuate.	Smooth surface Acuate.	Spined echinating Acuate.	Equi-anchorate.	Tricurvate.
	millim.	millim.	millim.	millim.	millim.
Gaspar-Strait spec. (Bowerbank Coll.)	·22 by ·0127	·28 by ·0063	·08 by ·0095	·019 long	·042 by ·001
Typical specimen, thickness..	·0127–·0158				
Queensland spec. ('Alert' Coll.), A	·2 by ·0112	·28 by ·0063 to ·0078	·07 by ·0095	·019 long	·042 by ·001
Ditto, B....	·21 by ·008	·28 by ·004	·09 by ·016	about ·017	about the same.

Hab. Thursday Island, 4–5 fms.; Prince of Wales Channel, 5–7 fms.; Percy Island and Fitzroy Island, Queensland, 7–11 fms.; bottom—combinations of sand, mud, or shells.

Distribution. Straits of Malacca, Gaspar Strait (*Bowerbank*).

The presence of spined echinating spicules removes the species from *Amphilectus*, where it had been placed by Vosmaer, who had only an imperfect description to guide him. It must be referred to *Clathria* as emended by him; and it is interesting to find here a variability in the development of the horny fibre in different specimens which is similar to what he has described (*l. c.* p. 150) in *C. coralloides*.

The second Queensland specimen ("B"), from Percy Island, differs decidedly from the rest in the greater slenderness of its skeleton-spicules; it is, however, a young specimen, and the differences may be due to this circumstance.

RHAPHIDOPHLUS.

Ehlers, Die Espersch. Spong. pp. 19, 31.

This genus differs from *Clathria* only by its spicular crust, and from *Echinonema*, Carter, only by the absence of tricurvate spicules.

79. Rhaphidophlus arborescens. (Plate XL. fig. L; Plate XLII. figs. *n*, *n'*.)

Sponge stipitate, much branched, bush-like; branches angular rather than cylindrical; surface nodular, connected by frequent horizontal trabeculæ at right angles to the erect branches. The average diameter of the stem and its branches is 4–5 millim. The cortical incrustation of spicules consists of a layer about ·5 millim. thick, the outer part of which consists of loose fascicles of the smooth spinulate spicule, with the pointed ends placed outermost; the spicules are closely approximated to each other below the surface, between the intermarginal canals, but their distal ends diverge and spread out somewhat at the surface, and between them appear to be placed the pores; the intermarginal canals, as stated, lie between the bases of these fascicles. The deeper part of this layer consists of Halichondrioid spiculo-fibre, about 6–8 spicules broad, with small roundish or polygonal meshes, which seem to have enclosed small canals (probably the afferent canals leading from the intermarginal cavities to the ciliated chambers). No horny matter is to be seen in this part of the skeleton, the extreme fragility of which forbids the idea that any such occurs here [on the contrary, the compressibility and readiness with which the spicules and fibres must be able to move upon each other in life, owing to the manner of their aggregation, point to a probable great power of contractility and expansion in the dermal membrane, with important consequences to the pores, intermarginal cavities, and inhalent canals which it contains; and I should anticipate that good spirit-specimens would show the strong development here of muscle-cells, such as has been shown by Prof. Sollas in *Tetilla* (Ann. & Mag. N. H. 1882, ix. p. 155)]. The fibres of the skeleton are irregular; their course is winding, and the distinction between primary and secondary fibres not clear, except at the surface; here the ends of the primary fibres, which stand out for some distance beyond the general reticulum and support the dermal crust, are absolutely concealed by the enormous abundance of points of the spined spicules which project from them.

Spicules:—(1) Slightly spinulate, smooth acuate, ·34 by ·0063; (2) Spined acuate, slightly constricted basally, ·08 by ·0044; (3) Delicate equianchorate, palms proximally square, ·012 millim. long.

Hab. Friday Island, Torres Straits.

The specimen, which is dry, measures 125 millim. (5 inches) in height and 60 millim. (2⅜ inches) in maximum diameter.

Vosmaer's *Clathria ulmus* (Notes Roy. Mus. Netherl. ii. p. 151) resembles this species, but is stated to have a bihamate flesh-spicule, and no dermal crust is described. The species differs from *R. cratitius*, Esper, in the well-branched habit and in minor points in

the proportions of the spicule. Ehlers (Espersch. Spong.) assigns a bihamate to that species *.

80. Rhaphidophlus procerus. (Plate XXXIX. fig. K; Plate XLII. figs. *o*–*o*″.)

Erect, cylindrical, or very slightly compressed. Stem tapering to a point above, commencing with a cylindrical approximately smooth basal portion, about 6 millim. in diameter; it gradually increases in diameter towards the middle, where the antero-posterior diameter is 7, the lateral diameter 8 millim.; the lateral surfaces show a tendency to develop a succession of low upwardly-projecting eminences; the anterior and posterior surfaces of this (middle) division of the sponge are covered with closely-set rounded papillæ, 1–2 millim. apart, 1 millim. broad by ·5 to 1 millim. high; the upper fourth tapers gradually to the apex and is approximately smooth, the papillæ of the median part becoming gradually obsolete here. No true branches (only two small cylindrical processes on one side close together, near the middle). Base formed by several branched roots, 3 to 5 millim. in diameter. Surface smooth between and over eminences, compact, soft and velvet-like to the touch; no vents visible to the naked eye. Texture in spirit firm, very slightly compressible, flexible, very tough; colour pale grey.

Main skeleton consisting of a close network of amber-coloured horny or dull subopaque yellow horny sarcodic fibre, the primary lines of which are about ·2 millim. apart and are placed vertically to the surface, the secondaries also about ·2 millim apart, crossing the intervals between the primaries at approximately right angles; to the fibres are attached by their bases large numbers of the larger smooth spinulate spicule, whose points project outwards and upwards at acute angles to the fibre. Dermal skeleton formed of a single thickness of distinct, but overlapping, dense tufts of the smaller smooth spinulate spicule, one or more of the spined acuate spicules occupying the centre of each tuft; the spicules are attached by their blunt ends, and the points radiate outwards over the dermis. Sarcode pale yellowish brown, somewhat granular.

Spicules:—(1) Smooth spinulate; head distinct, suboval, rather narrower than middle of shaft; shaft tapering gradually to sharp point from about middle; size ·36 by ·0127 millim: in fibre of main skeleton. (2) As (1), but measuring ·28 by ·0079 millim.; forming tufts in dermis. (3) Spined acuate, with well-rounded, undilated base, tapering to sharp point from base; spines usually absent from the apex and just above base, stout, sharp, those of median portion of spicule more or less recurvate towards base; size ·11 by ·0127: in centre of dermal tufts and sparingly in main-skeleton

* *Spongia cactiformis*, Lamarck (Ann. Mus. Hist. Nat. xx. p. 440), is also a *Rhaphidophlus*, differing from *R. arborescens*, so far as the material at my disposal shows, mainly in the non-spinulation of the smooth acuate.

fibre. (4) Equianchorate; navicular, shaft almost straight, pointed at each end; length ·016–·018 millim.

Hab. Port Darwin, 7–12 fms.; bottom sand, mud, and shells.

The above diagnosis is based on a large specimen. A small specimen (which is perhaps the apex of a larger one), 36 millim. high, also occurs from the same place and same depth, differing from it in having no perceptible horny fibre, in being, in consequence, soft and flaccid, and in having the spined acuate confined to a central axis which contains a large quantity of sand; it is probably identical with the large specimen, its differences being partly individual, partly due to youth; it contains the parasite *Spongiophagus*, Carter. This very fine species appears to be referable to *Rhaphidophlus* by possessing a distinct dermal crust composed mainly of smooth spinulate spicules with their points projected outwards, but adds to this the presence in this crust of the spined echinating spicules, a feature in which it resembles *Dirrhopalum*. The crust is thin, but appears to represent the correspondingly situated structure in *R. cratitius*, Esper (Ehlers). Its root-like base recalls the horizontal meshwork figured by Esper, and here, as there, the erect portion appears to have no real tendency to form branches; but, besides the differences in the dermis, the skeleton and echinating spicules are both much longer than in the type and hitherto only recognized species of the genus. The height of the perfect and well-preserved spirit-specimen is 470 millim. (18¾ inches). The arborescent form, the strongly horny fibre, the slenderness of the skeletal and echinating spicules, the replacement of the spinulate for the most part by the spined acuate in the main-skeleton fibre, and the thickness of the dermal crust, distinguish *R. arborescens* from *R. procerus*.

81. **Rhaphidophlus**, sp.

The following appears to be distinct from all known species of the genus, but more material is necessary for full description :—

A small dry specimen of subramose cylindrical growth, 45 millim. long by 12 millim. in greatest diameter, the surface proliferating into ridges and processes 2–3 millim. high, giving it a flocculent appearance. Colour pale dusky brown. Skeleton irregularly rectangular in arrangement; spicules united in the fibre by a small amount of very pale horny substance, which is only occasionally seen outside the spicules; primary fibres about 8 to 10, secondary 6 to 8 spicules broad. Dermal skeleton a single layer of smooth subspinulates in tufts radiating outwards.

Spicules :—(1) Smooth acuate, tapering gradually to sharp point; size ·23 by ·0095 to ·0127 millim.: in fibre. (2) Smooth subspinulate, forming dermal layer; head very slight, larger than shaft; tapering gradually to sharp point; size ·25 by ·0095 to ·0127 millim. (3) Spined cylindrical, tapering gradually from well-rounded, very slightly dilated base to rounded apex, which is about one third the diameter of the base; spines prominent, sharp, distal ones

strongly recurvate; size of spicule ·07 by ·0095 millim.: very abundant on the fibre. (4) Navicular equianchorate of sarcode, shaft slender, almost straight; length of spicule ·018 millim.

Hab. Prince of Wales Channel, Torres Straits, 5–7 fms.

ACARNUS.

Gray, P. Z. S. 1867, p. 544.

Acarnia is used as a generic name in an earlier part (*tom. cit.* p. 515) of the same paper as that in which Dr. Gray described *Acarnus*; but it has not come into general use, otherwise the essential agreement in form between the two words would necessitate the suppression, on that ground, of the later one. A careful comparison of the grapnel-spicule, which characterizes the genus, with the spined cylindricals of *Clathria* and *Echinodictyum* shows that the affinity of the sponge is with these genera rather than with the "Tethyadæ" of Dr. Gray, as held by him, or with the "Esperiadæ," as supposed by Mr. Carter (Ann. & Mag. Nat. Hist. 1871, vii. p. 274).

A. innominatus, Gray* (*l. c.*), besides the remarkable 4-hooked grapnel-like spicule and the acuate (not cylindrical, as stated by Gray, *l.c.*) form which characterize the main skeleton, possesses—as I have been able to ascertain by an examination of a mounting made by Dr. Bowerbank, who was the first to figure and describe these spicules (Mon. Brit. Spong. i. figs. 73–76, 292), which Dr. Gray afterwards embodied in his description of the species—also a tricurvate (figured by Bowerbank) and an equianchorate flesh-spicule; the former about ·13 by ·0042 millim. in dimensions, the latter ·016 to ·024 millim. long; also a tibiella, measuring about ·28 by ·0045 (shaft) or ·0063 (head) millim.

82. Acarnus ternatus. (Plate XLII. figs. *b*, *b'*.)

From a mounting which the Museum owes to the liberality of Dr. John Millar, and from the spirit-specimen in the present collection, we learn that in this new species the acuate spicules are imbedded in a reticulate horny skeleton of a pale salmon-red colour, and not, as usual, yellow. The grapnel has but *three* hooks, and the tibiella has the shaft only ·003 millim. thick. The other spicules agree with those of *A. innominatus*. The largest of the present specimens is about 65 by 25 millim. (2½ inches by 1 inch), and forms a clathrous structure of round soft anastomosing trabeculæ which are about 3 millim. in diameter. Colour in spirit reddish brown. Several specimens occur in the present collection.

Hab. West Island and Prince of Wales Channel, Torres Straits, 7 fms.; bottom sand and coral.

Distribution. Bombay? (*coll. Brit. Mus.*).

* Mr. Carter gives reasons (*l. c.*) for his supposition that the West Indies are the home of this species; the specimen, however, to which he appeals in support of this view, viz. that attached to the base of a specimen of the West-

ECHINODICTYUM.

Echinodictyum, *Ridley, Journ. Linn. Soc., Zool.* xv. p. 493.
Dictyocylindrus, *Carter*, pars, *nec Bowerbank.*

There can be no doubt that Schmidt is right in identifying his (Nardo's) genus *Raspailia* with *Dictyocylindrus* of Bowerbank, and in superseding the latter name on grounds of priority (the dates are, Nardo, 1833, Schmidt, 1862, Bowerbank, 1864). The spiculation, outward form, and skeleton-arrangement of the type species of the two genera (*R. viminalis*, Schmidt, and *D. hispidus*, Montagu) agree essentially. Bowerbank has placed in his genus, besides typical *Raspailiæ*, species of *Axos* (*D. dentatus*) and *Axinella* (*D. setosus*). Carter has placed in the genus species (*D. laciniatus* and *pykei*) of an erect branching habit, somewhat like some *Raspailiæ*, but with a spined *cylindrical* instead of a spined acuate echinating spicule, as in *Echinodictyum*, which is thus further approximated to *Raspailia*. A slight enlargement of this genus, by admitting species which have the setaceous acuate, will, I believe, meet the requirements: it will then be distinguished from *Raspailia* only by a more robust habit and by having the fibre exclusively composed of acerate spicules:—

Echinodictyum, *diagn. emend.* Sponges erect, cup-shaped or ramose. Skeleton formed of spicules united into distinct fibres. From the fibres project at right angles short, strongly spined, cylindrical spicules, tapering from their attached ends; long, slender, smooth acuate (single-pointed) spicules may also be inserted upon the fibre, projecting from it at acute angles. Spicules composing fibre exclusively smooth, acerate (doubly pointed). No special flesh-spicules.

Distribution. Indo-Pacific region.

Echinonema vasiplicatum, Carter, Ann. & Mag. Nat. Hist. 1882, ix. p. 114, S.W. Australia, and *Dictyocylindrus laciniatus* and *pykei*, id., must be referred to this genus.

83. Echinodictyum bilamellatum.

Spongia bilamellata, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 434.
Echinodictyum bilamellatum, *Ridley, Journ. Linn. Soc., Zool.* xv. p. 493, pl. xxviii. figs. 1–6.

A dry specimen, very closely resembling in its external characters the one which I described (*l. c.*) from N.W. Australia, but not so well preserved. It differs somewhat from previously known specimens in the proportions, though not in the form, of its spicules, viz.:—Larger acerate, about ·35 by ·018 millim.; smaller acerate, about ·17 to ·24 by ·0095 millim.; spined echinating cylindrical, ·099 to

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Indian species *Ectyon sparsus*, appears to me to be specifically distinct both from Dr. Gray's and the present species for two reasons, viz. (1) the presence in it of a smaller grapnel-spicule with *spined* shaft; and (2) the apparent absence of the tibiella. I propose the name *Acarnus carteri* for the West-Indian form.

·11 by ·0095 millim.; and thus gives a wider range to the possible variation in the sizes of spicules within the limits of a species.

The only locality hitherto known with certainty was N.W. Australia.

Hab. Port Curtis, Queensland (apparently from beach).

Distribution. N.W. Australia (*Ridley*).

Obs. This specimen most forcibly illustrates some remarks which I published in the 'Journal of the Linnean Society' (Zool. xv. p. 149), on the possible intrusion of extraneous spicules into sponges. The dermis contains, in fascicles and scattered, large numbers of a slender acuate form, which is wholly alien to the sponge, but whose appearance and position are so natural that I found it difficult to establish this fact. Re-examination of the slide referred to by me (*l.c. suprà*, p. 495) as representing a specimen of this species, probably from Freemantle, S.W. Australia, has satisfied me that it is not referable to the species, but to one of those *Echinodictya* which possess fine acuate spicules in addition to the skeleton acerate (see above); the fine acuates were at first regarded by me as adventitious.

84. Echinodictyum costiferum. (Plate XLII. fig. *r*.)

? Spongia costifera, *Lamarck*, *Ann. Mus. Hist. Nat.* xx. p. 432.

Normally probably turbinate, forming an open cup; wall about 3 to 8 millim. thick, undulating. Inner surface uneven, beset at intervals of about 5 millim. with pointed monticular eminences, about 3 millim. high; outer surface proliferating into subdivided ridge-like or monticular eminences, each beset with several sharp points; these eminences are about 5 to 8 millim. high. Surface between eminences on both sides cancellated and more or less cavernous in dry state. Texture in dry state very harsh to touch, hard, brittle; colour pale buff-yellow. Main skeleton:—spiculo-fibre compact, no horny matter apparent, but surrounded by yellow sarcode; all fibres echinated by the spined spicules; consists of (i.) a longitudinal series of stout branching fibres, ·032 to ·095 millim. thick, running towards the free edge of the sponge, and outwards into its surface-eminences, where they form the sharp points referred to above, and (ii.) an intermediate network composed of meshes varying in shape from subrectangular (square or oblong) to oval and round, the angles always more or less rounded off, greatest diameter from ·06 to ·15 millim.; the deeper fibres bear the slender acuate spicule (No. 2) laid along the surface or projecting at very acute angles from it, sparingly. Dermal skeleton as main skeleton, but spiculo No. 2 apparently absent.

Spicules:—(1) Smooth acerate, slightly bent, tapering to more or less sharp points from about 3 to 5 diameters from ends; size ·22 to ·28 by ·0079 to ·0095 millim.: forms the skeleton-fibre. (2) Smooth acuate, with well-rounded base, tapering gradually to fine point; size ·44 by ·005 millim.: on surface of deeper skeleton-fibres. (3) Spined cylindrical, tapering gradually from rounded base to the rather coarsely spined free end; spines distributed all over spicule,

numerous, low, sharp, those of distal half recurvate towards base; size of spicule ·1 to ·14 by ·0079 millim.

Hab. Port Molle, Queensland, from coral-reef.

Both in its external form and in the structure of its fibre this species much resembles *E. bilamellatum*; the form, however, is less definite here, and the presence of the fine acuate effectually distinguishes this species. Its turbinate form separates it from *E. pykei* and *laciniatum*, and its rough outer and inner surface from *E. vasiplicatum*, although it agrees with these three in possessing the fine acuate spicule.

The dry specimen which represents it is not completely turbinate, but forms about three fifths of an open cup, not stipitate, at any rate in its present condition. There is little doubt that when fully grown it would be turbinate, as *E. bilamellatum* shows traces of an originally non-cup-shaped condition (and *cf.* varieties of *Phacellia ventilabrum*). The height is 50 millim. (2 inches), the extreme breadth of the cup 70 millim. (2¾ inches).

85. Echinodictyum glomeratum. (Plate XL. fig. A; Plate XLII. fig. *p*.)

Erect, stipitate; base spreading; stem short, branching frequently at acute angles and in an arborescent manner. Branches angular, more or less flattened, showing strong tendency to unite by their edges, forming a dense head, from which the rounded ends of the branches project to a short distance; maximum diameter of primary branches 7 to 10 millim., of terminal twigs 3 to 6 millim. Surface (in present dry state) even, but honeycombed by the spaces between the superficial skeleton-fibres: these bear small inconspicuous sharp points, ·25 to 1·0 millim. high, at intervals of about 1·5 millim. Vents? Texture in dry state harsh to touch, hard, incompressible, and almost inflexible; colour probably dull purple in natural state.

Main skeleton composed of compact spiculo-fibre; no horny matter apparent outside the spicules: spicules about 10-to 12-serial: arrangement non-rectangular, the meshes rounded, and the primary and secondary fibres not traceable as distinct fibres beyond one or two consecutive junction-nodes; meshes ·28 to ·5 millim. in greatest width; both primary and secondary fibres echinated at right angles by an abundance of the echinating spicule. Dermal skeleton composed of fibre similar in structure to that of skeleton, but ranging from 5 to about 20 spicules broad; meshes rounded, from ·25 to about ·7 millim. in width, echinated in same way as the primaries; the fibre composing the projecting vertical lines is similar in constitution to that of the main skeleton. Sarcode pale yellow, transparent or purplish brown, subopaque.

Spicules:—(1) Long setaceous acerate, sparse, echinating; smooth, tapering to sharp points: size about 2·0 by ·0127 millim. (2) Skeleton acerate smooth, slightly but rather suddenly bent in the middle, tapering to sharp points from about two diameters from

each end; size ·19 by ·0079 to ·25 by ·0095 millim. (3) Echinating spined cylindrical; base with slight globular inflation; tapering gradually to blunt distal end; spines short (the longest about ·0016 millim. long), thorn-like, sharp, shortest at apex, those of distal half more or less recurvate towards base, distributed equally over whole of spicule; size of spicule ·095 to ·106 by ·01 millim. (apex of spicule about ·005 millim. thick).

Hab. Thursday Island, Torres Straits, 4–5 fms.; bottom sand.

A single dry specimen, 70 millim. (2¾ inches) high by 60 millim. (2⅜ inches) in greatest width. The arborescent growth distinguishes it at once from the turbinate *E. bilamellatum*, *vasiplicatum*, and *costiferum*, and the palmate, branched *E. nervosum*, mihi (Lamarck), the only species hitherto recognized: in fibre-structure it closely resembles *E. bilamellatum*, although the spicules are somewhat smaller. The much smaller smooth acuate and acerate distinguishes it from *E. laciniatum* and *pykei*.

Echinodictyum glomeratum, var. subglobosum.

Two dry specimens, consisting of an obsolescent stem, rising at once into a globular clathrous or honeycombed head, formed by rapid branching at subacute angles and free anastomosis; the branches appear to end bluntly on the surface in rough points, at about the same level (this, however, is perhaps partly due to abrasion on the shore). Texture rigid, harsh; colour pale brown in macerated, dark purplish in non-macerated specimen. Spicules:—(1) Long setaceous acuate, with well-rounded head, tapering to sharp point; size about 2·0 by ·00127 millim.: apparently echinating the bases of the primary fibres. (2) Smooth acerate of fibre, slightly curved, tapering gradually to sharp points; size ·25 by ·0085 millim. to ·33 by ·0127 millim. (3) Spined echinating cylindrical, with slightly indicated head and apex almost coming to a point; spines numerous, fine, sharp, straight at middle, recurvate at distal end of spicule; size ·106 to ·16 by ·0085 to ·0095 millim. Skeleton-fibres stout, compact, almost straight, sometimes with yellow transparent margins; secondary fibres given off at right, or more usually acute, angles from primaries.

Hab. Torres Straits, 5–10 fms.; bottom sand and coral.

A well-marked variety. The outward form and the almost pointed spined spicule distinguish this from the typical form. One specimen measures 40 millim., the other 75 millim. (3 inches) in both greatest height and diameter.

86. Echinodictyum cancellatum. (Plate XL. fig. D; Plate XLII. fig. *q*.)

? Spongia cancellata, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 456.

The short description of Lamarck agrees so closely, so far as it goes, with the external character of this sponge, that in default of information as to the minute characters of the old species, I assign

the present form provisionally to that species, with which it agrees much better than the form which I named *E. necrosum* (Journ. Linn. Soc., Zool. xv. p. 496). As to the locality at which *S. cancellata* was obtained, we have no more particular knowledge than that it was obtained by MM. Peron and Lesueur. As these travellers seem to have collected, among other places, on the north coast of Australia, this fact supports, if any thing, the above view as to its identity with the present species. In any case it will be best to describe the latter fully:—Erect, flabellate, clathrous. A short main stem gives rise to a clathrous reticulation lying in one plane, in which the original branches are only distinguishable near the base. Reticulation close, regular: meshes oval, the longest diameter lying in direction of long axis of sponge, about 10 by 5 millim. in average dimensions: the meshes form deep cells, occasionally closed by a septum of sponge-substance. The stem, branches, and the bars which complete the reticulation are oblong in transverse section, with rounded margins: hence the lateral surfaces are flat and the antero-posterior ones are rounded. Antero-posterior diameter of stem 32 millim., lateral diameter 18 millim.: antero-posterior diameter of the bars which form the ultimate reticulation about 10 millim., lateral diameter about 6 millim. A slight tendency to proliferation so as to form expansions parallel to the main plane of the sponge is shown by formation of a few meshes on the surfaces of the frond. Terminations of branches either united by connecting bars or projecting slightly as rounded loose ends. Surface in dry (macerated) state quite even, appearing minutely reticulate. Texture firm, that of stem woody: substance of branches and reticulation rather brittle, slightly compressible: colour, in macerated condition, very pale yellow-brown.

Main skeleton rectangular in arrangement: primary fibres only projecting from surface by the tuft of echinating spicules which terminates them, compact, about 8 to 10 spicules broad: distance between them at surface about 4 millim.: echinated sparsely in interior, abundantly near surface of sponge, with the echinating spicule: secondary fibres compact, about 3 to 6 spicules broad, about ·3 millim. apart, echinated abundantly with the echinating spicule. Dermal skeleton consisting of an irregular network with rectangular meshes, the meshes generally not exceeding ·35 millim. in diameter; fibre compact, about 10 spicules broad, well echinated with the echinating spicule. Horny uniting material occasionally distinguishable outside fibre as a pale yellow transparent substance. Sarcode absent. Spicules:—(1) Skeleton scerate, smooth, slightly curved, tapering to sharp points from within about four diameters of the ends: size ·22 by ·0127 millim. (2) Echinating cylindrical, spined: both ends well rounded: spicule tapering slightly from base to apex: the apex about half the diameter of the base: spines distributed all over the spicule, rather more abundantly at base and near apex than elsewhere: those of the proximal half or one third of the spicule rather small, straight, sharp, the remainder longer, curved towards base: size of spicule ·15 by ·01 millim.: scar-

tered over surface of fibres, and aggregated into tufts at the ends of the primary fibres.

Hab. Warrior Reef, Torres Straits (apparently from beach).

A single dry specimen: extreme height 410 millim. (16⅛ inches), extreme diameter 420 millim. (16½ inches). This species resembles *E. bilamellatum* in the regularity of its skeleton and the compactness of its fibre. In outward appearance in the macerated condition, however, it has more the aspect of the Arabian form *necessarium*: but in this species the frond is only incipiently reticulate and the branches are much stouter. It differs markedly from both in the great length of the echinating spicule, almost half as long again as in those species.

57. Raspailia bifurcata. (Plate XL. fig. J; Plate XLII. figs. *i*, *l*.)

Erect, arborescent: stem short, 3–4 millim. thick, branching dichotomously and frequently, in planes usually at right angles to each other and at angles of 30° to 40°; terminal branches pointed, tapering to points from a thickness at origin of 1 to 1·25 millim. Stem and branches approximately cylindrical. Surface minutely hispid with sharp filiform points, about ·3 millim. high and the same distance apart. Texture (in spirit) of stem and branches hard, woody, that of the tips of terminal branches soft and flexible: colour of stem and lower branches purple, of terminal branches white. Main skeleton composed of longitudinally arranged, subparallel loose bundles of the long acuates, accompanied by about the same amount of the acerate, covered and united by a considerable amount of pale purple tenacious material: the bundles anastomose freely by convergence at small angles: diameter ranging from about ·25 millim. in stem to ·05 millim. in tips of branches; surface sparsely covered by the spined acuate scattered over it. No distinct dermis: the surface is echinated at right angles by tufts, each composed of one or more long acuates; spicules projecting from a conical mass of purple tenacious substance. Sarcode very pale purplish, transparent. Spicules:—(1) Skeleton acuate, smooth, base well rounded, tapering gradually to sharp points (more rapidly near end): size about 1·2 by ·0127 millim. (2) Skeleton acerate, smooth, slightly curved, tapering to sharp points from about six diameters from ends; size about ·5 to ·7 by ·0095 millim. (3) Echinating acuate of dermal tufts, as (1), but measuring ·022 millim. in thickness. (4) Spined cylindrical, tapering gradually from well-rounded base to blunt distal end, thickly and equably spined; spines fine, sharp, those of distal part of spicule recurvate: size ·19 by ·0079.

Hab. Prince of Wales Channel, Torres Straits, 5–7 fms.: bottom, shells and sand.

The specimen on which the species is based is 53 millim. (2 inches) high and 24 millim. across. The species much resembles *Dictyocylindrus pilosi*, Carter, from Mauritius, in form, but, as we have seen, that species is referable to *Echinodictyum*.

The general form, the large development of acuate spicules, and the echination by the long acuate spicules ally the species more closely to *Raspailia* (*Dictyocylindrus*) than to *Echinodictyum*; the cylindrical form of the spined spicule agrees with the latter genus; but the share taken by the acuate spicule in the formation of the fibre is conclusive as to its belonging to *Raspailia*.

Subgenus Syringella, *Schmidt*.

In the description, in the Spong. Küste Algier., at p. 10, of a species from Algiers, named by him *Raspailia syringella*, Prof. Schmidt says that it diverges remarkably from the type of *Raspailia*, having but one form of spicule (spinulate) and (in the case of one specimen) a well-marked vent; he does not definitely form a new genus to contain it, but suggests that if the two characters referred to should, with further material, prove constant, a genus should be formed for the species, and named *Syringella*. Fresh material has now appeared, from which I describe the two following species. Although the spicular character of Schmidt's species is (essentially) reproduced in them, that of the presence of a vent is not; therefore, although I consider the group for which Prof. Schmidt provisionally proposed the name *Syringella* to be of *subgeneric* value, I do not feel justified in separating it generically from *Raspailia*. The group may be defined as differing from *Raspailia* in the absence of the spined acuate spicule. In the following species the skeleton-spicule has usually lost the *head*, which *R. syringella* retains well developed. It is interesting to find this subgeneric type so widely distributed.

88. Raspailia (Syringella) australiensis.

(Plate XLII. figs. *m*, *m'*.)

Erect, unbranched, consisting of a single, slender, cylindrical column, tapering very gradually from about two thirds of the height to the base on the one hand and to the rounded free extremity on the other; diameter at base and summit about half that of the thickest portion of the stem. Surface in spirit semi-gelatinous in appearance under lens, and minutely pilose and velvet-like; it is corrugated by closely set, irregularly interrupted, longitudinal ridges. The sponge is, as a whole, tough and elastic: the corrugated superficial layer loose and fragile, its greatest thickness about 1 millim. Colour in spirit dirty white. The stem is formed by a dense flexible rod of a dull yellow colour and smooth surface. Vents not perceptible to naked eye or lens. Skeleton of axis consisting of a close network of tracts of skeleton-spicules, the tracts mostly arranged longitudinally, and connected by smaller tracts set at oblique angles to them (as in *Axinella*, Schmidt, but much closer together); tracts often confluent, at most only ·15 millim. apart; no soft substance is apparent uniting the spicules. Skeleton of cortical soft layer consisting of fascicles of skeleton-spicules, radiating

horizontally from the axis, about ·4 millim. apart, each about 10 to 20 spicules broad; the spicules appear to be simply imbedded in the dense, dull yellow sarcode which forms the chief part of the cortex, and they project about ·4 millim., diverging somewhat, from its surface. Sarcode dull yellow, subtransparent, no distinct granules visible. Spicules:—(1) Skeleton acuate, long and slender, tapering gradually to basal rounded end from about ten diameters from base, and very gradually to the sharp point (the basal portion is thus little more than half the maximum diameter of the spicule); size about ·7 by ·013 millim. (2) Smaller acuate; as (1), but size about ·5 by ·004 millim.

Hab. Port Darwin, 7–12 fms.; bottom sand and mud.

This fine species is represented by two good specimens in spirit, of which the largest measures 160 millim. ($6\frac{2}{5}$ inches) in height by 4 millim. in greatest thickness. Near the base the axis is very tough, and consists almost entirely of continuous colourless or pale amber horny matter and of the imbedded spicules. As the skeleton-spicules are simply acuate, not spinulate, the distinction between this species and *R. syringella* is seen to be well marked.

89. Raspailia (Syringella) clathrata.

(Plate XLI. fig. F.)

Erect, branched approximately in one plane; mode of branching essentially dichotomous, at angles of about 45°, anastomosis frequent. Stem rudely cylindrical, 5 millim. in greatest diameter; branches flattened out laterally, lateral margins sharp; lateral diameter of largest branches 5 millim., of terminal branches 1 to 1·5 millim. No vents observed. Surface, in spirit, covered with low obsolescent ridges, running into each other. Texture of branches in spirit tough, elastic; the terminal branches compressible, the larger ones hard, the stem almost rigid; colour pale dirty grey.

Skeleton consisting of the skeleton-spicule traversing longitudinally the branches and stem, about equally distributed throughout their thickness, and of horizontal bundles of the same radiating towards the surface, about 3 or 4 bundles in the circumference, about 10–12 spicules broad. No distinct dermis. Sarcode pale yellow, subtransparent. In the base the reticulum of spiculo-fibre is backed by some horizontal (circular) horny fibres, amber-yellow, ·9 millim. and upwards in thickness; the bases of the radiating tufts and the general reticulum of spicules is more or less sheathed in horny fibre (which is quite pale in this place). Spicules smooth acuate, with well-rounded heads, tapering gradually to fine points; size about ·6 by ·011 millim. in the horizontal bundles, from ·6 by ·0032 to ·6 by ·0095 millim. in the longitudinal series.

Hab. Thursday Island, Torres Straits, 7–12 fms.; bottom sand.

The specimen which furnishes the above description is 105 millim. ($4\frac{1}{5}$ inches) high and 80 millim. ($3\frac{1}{5}$ inches) across the broadest part. It is remarkable for having several small stones and shells attached to some of the outer branches, which perhaps indicates that the

frond, though only curved somewhat to one side in the plane of expansion, was in life decumbent, so that the terminal branches were then in contact with the sea-bottom. The species differs from *R. australiensis* in the branching and anastomosing habit and the flattened knife-edged branches, and in having the longitudinally arranged spicules not confined to the axis, but extending to the cortex. From *R. syringella*, Schmidt, it also differs in its growth (though Schmidt mentions that the branches of *R. syringella* sometimes unite) and in the absence of heads to the acuate spicules.

AXINELLIDÆ.

Axinellida, *Carter*, *Ann. & Mag. N. H.* 1875, xvi. p. 133.

This family differs from the Ectyonidæ in the much greater importance of *size* of spicule as a factor of specific distinction. The relations of the two families, however, require readjustment on more satisfactory bases than at present.

90. **Axinella echidnæa.** (Plate XLIII. fig. *a*.)

? Spongia echidnæa, *Lamarck*, *Ann. Mus. Hist. Nat.* xx. p. 448.

It seems likely that this will prove to be Lamarck's species. That author refers (*l. c.*) to Seba (Thesaurus, iii. pl. xcix. fig. 7) in illustration of his sponge. This figure has a strong resemblance to the present species, but does not show the same tendency to lateral junction between the branches, and has most of the latter somewhat enlarged at the tips, whereas in these specimens they usually, though not invariably, are either of about the same diameter throughout or else taper to points. The dark reddish-brown colour of these specimens and the peculiar echination of their surface by angular wedge- or knife-shape processes about 2 to 4 millim. high, projecting outwards and somewhat upwards, are decidedly indicated in the figure. In texture the specimens are tough, elastic, harsh to the touch in the dry state; the surface-processes are flexible, almost soft, in spirit. In structure it is a true *Axinella*, and thus does not support Lamarck's surmise that it might be identical with *Spongia muricata* of Esper (Pallas, sp.), which is *Tricentrium muricatum* of Ehlers. The main skeleton exhibits the usual longitudinally elongated meshes of loose spiculo-fibre, which in the stem is composed in part of a transparent and almost colourless horny uniting material, which seems to be wanting in the surface-tufts; distance between longitudinal lines of axis ·07 to ·1 millim. Surface covered with a fuscous-brown subopaque pigment, which penetrates to a slight distance below. Sarcode transparent, almost colourless, very pale reddish brown. Spicules:—(1) Smooth, slightly curved acerate, tapering gradually to sharp points, or more or less blunted at one or both ends; size ·3 by ·0095 to ·44 by ·0127 millim.: these

forms compose the main bulk of the skeleton. (2) Long smooth acuate, generally slightly curved, tapering gradually to a fine point; size about 1·1 by ·0127 millim.: forming part of longitudinal skeleton-lines of surface-tufts.

Hab. Thursday Island and Prince of Wales Channel, Torres Straits, 4–7 fms.

Distribution. "African coasts?" (*Lamarck*).

As pointed out in speaking of the characters of the ends of the branches, this form shows considerable variability: as a rule the specimens are chiefly branched in one plane (fan-like), but in two specimens branches project from both faces, but they then tend to form fan-shaped fronds parallel to the main frond. The largest specimen measures 160 millim. (6½ inches) high by 160 millim. wide; the average maximum diameter of the distinct branches (which are cylindrical or somewhat compressed), not that of the broadest but obviously compound branches (which occur commonly), is about 10–12 millim. Five specimens occurred.

91. Acanthella, sp.

Externally resembling *Spongia carduus*, Lamarck (Ann. Mus. Hist. Nat. xx. p. 381). When guided by the description alone, I had referred the present specimen to this species with more confidence than usual; but on mounting sections of the probable type specimen at Paris, I saw that it was a different species. The points in which the description does not quite suit this form are "pédicule cylindracé, très-dur," the stem having apparently been flattish, and, though stiff, not inflexible; and "couleur d'un blanc grisâtre," whereas this (in spirit) is flesh-colour. The ridges run longitudinally up and down the sponge, and are 1 to 3 millim. high, and their free edge is beset with sharp (in spirit flexible) points at intervals of one or two millimetres. Texture tough and flexible, substance compact, surface between inequalities glabrous. It is a true *Acanthella*. The spiculation is as follows:—(1) Smooth acuate, slightly curved, tapering gradually to sharp point, about ·4 to ·6 millim. by ·0095 millim. (2) Smooth undulating cylindrical with rounded ends, length about ·7 millim., diameter just ·0063 millim.

The species differs from the Adriatic forms *A. acuta* and *obtusa*, Schmidt, in the broad explanate form and in the smaller size of the spicules, the cylindrical being much shorter and thinner, the acuate much shorter than in those species. The skeleton forms a loose-fibred *Axinella*-like network of spicules, imbedded in a dense, transparent, almost colourless mass of caoutchouc-like consistency, containing nucleoid bodies about ·007 to ·008 millim. in diameter.

Hab. Prince of Wales Channel, Torres Straits, 7 fms.

A single specimen in spirit, 35 millim. (1⅜ inch) high by 29 millim. across.

LEUCOPHLŒUS.

Carter, Ann. & Mag. N. H. 1883, xii. p. 323.

92. Leucophlœus fenestratus. (Plate XLII. fig. *s*.)

Massive, suberect, terminating above in thin edges, on each side of which open wide pouch-like vent-cavities, which also open to the surface laterally by rounded apertures. Surface minutely undulating, but glabrous. Texture in spirit rather tough, compressible, soft; colour dull greyish brown. Main skeleton composed of irregular, very loose tracts of spicules, 3 to 10 spicules broad, extending in various directions and lying at various angles; the dermis is supported by some closely set subvertical tracts of similar character lying between the subcortical crypts. Dermal skeleton composed of very loose and irregular tracts or aggregated masses of spicules intercrossing so as to form an almost continuous sheet, in the intervals of which are placed the pores. Sarcode pale brown, subtransparent. Spicule smooth straight, or almost straight acuate, tapering gradually from centre to moderately sharp point, and from centre gradually to well-rounded undilated base, which has, however, only about half the diameter of the centre of the shaft; size of spicule ·5 to ·8 by ·019 to ·022 millim.

Hab. Port Darwin, 8–12 fms.; bottom sand and mud.

The height of the single specimen is 38 millim., greatest diameter (at base) 20 millim.; it forms an irregular, elongated pyramid, with the apex flattened out and somewhat twisted. In size and shape of the spicules the species resembles *Hymeniacidon crustula*, Bowerbank (Mon. Brit. Spong. ii. p. 185), from the British Seas, which is, however, massive or mammillated and, owing to the inferior diameter (·012 millim.) of the spicule, shows the slenderness of the basal end much less distinctly. It is nearly related to *L. massalis*, Carter (*l. c.*), from W. Australia, but is darker in colour, is less distinctly penicillate, and has the spicule rather larger.

Leucophlœus fenestratus, var. (Plate XLIII. fig. *g*.)

A dry, upright, flattened specimen, which has grown around a Hydroid bush, appears closely allied to the above species. It appears to have formed part of a long wall-like mass, 70 millim. ($2\frac{4}{5}$ inches) high and 15–20 millim. thick. Like it, it is surmounted by pyramidal processes, and is traversed from the upper surface downwards by large cloacal spaces. Colour white, with a tinge of green. The spicules differ from those of the typical form in measuring ·9 by ·032 millim.: as, however, a small series of specimens of this species from the western part of the Indian Ocean (see Part II. of this work) includes within itself as great a variation in this respect as is shown by these two Australian specimens, I do not assign distinct varietal names to these two, at first sight, very distinct Australian specimens.

Hab. Arafura Sea, 32–36 fms.; bottom sand, mud, and shells.

SUBERITIDÆ.

Suberitida, *Carter, Ann. & Mag. N. H.* 1875, xvi. p. 133.

No strikingly new form occurs in this group. It is remarkable that from so large an Australian collection *Tethya* is altogether absent, though Dr. Bowerbank long since showed that it is well established in these seas.

93. Suberites carnosus.

Halichondria carnosa, *Johnston, Brit. Spong.* p. 146, pl. xiii. figs. 7 & 8.

Two specimens undistinguishable from British specimens of this common species. Mr. Carter has recorded its occurrence at Kerguelen Island (Phil. Trans. clxviii. p. 287). The present specimens are greenish white in spirit and irregularly lobate in shape; one appears to have been attached by the base, the others to have been quite unattached. The spicules have a suboval head, the free end projecting slightly beyond the actual enlargement of the head, and measure ·28 to ·57 by ·0063 millim. (the spicules of the Johnstonian type measure ·45 by ·0063 millim., and have a similarly formed head). The arrangement of the skeleton-fascicles is also closely similar, the greater distance between them in the present specimens being probably due to the more natural conditions retained by preservation in spirit.

Hab. Port Jackson, 0–5 fms.

Distribution. British Islands (*Bowerbank*).

94. Suberites epiphytum.

Alcyonium epiphytum, *Lamarck, Mém. Mus. Hist. Nat.* i. p. 163.

Lamarck's species, as I have ascertained from the original specimen in the Museum at the Jardin des Plantes, is a *Suberites* coating a fucus with a thin lamina of sponge (in which are imbedded a number of spinulate spicules whose heads rest for the most part almost directly on the supporting fucus, while their points project freely to the exterior). There is no flesh-spicule. The spinulate skeleton-spicule is generally curved, and gradually tapers to a sharp point; the head is transversely elongated, the side at which it is attached to the shaft being flat, and the free end curved, but more gradually than the lateral parts (in fact the shape is nearly that of the head of the spicule of *Caulospongia*, Kent, which Mr. Carter has graphically compared to a door-handle); the head is not unfrequently surmounted by a slight prominence (marking the aborted second ray, if the spinulate spicule is to be regarded as a uniaxial, biradiate spicule, with one ray aborted). In the type specimen there is some dark granular matter between the spicules. The

spirit-specimen in the present collection is in reality entirely incrusting, though apparently in part erect and cylindrical, owing to its growing along the stem of a Tubularian Hydroid, which is planted on the back of the crab on which the sponge-growth commenced. In the thicker parts of the sponge the spicules form long tracts, about 6 spicules in breadth, connected by interdigitation, or by loose, irregularly crossing spicular tracts. The sarcode is subtransparent, somewhat granular, diffusely stained of a reddish-brown colour. The spicules in both the type and the present specimen measure about ·25 millim. in length by ·0063 millim. in the diameter of the shaft.

Hab. Port Curtis, Queensland, 7 fms.

Distribution. "Probably the seas of America" (*Lamarck*).

HYMENIACIDON.

Bowerbank, Mon. Brit. Spong. i. p. 191.

It appears to me that Bowerbank's genus should be retained for those sponges with spiculo-fibrous skeleton without horny matter, but in which primary lines are distinguishable, breaking up at the surface and more or less within the sponge into tufts (thus forming tracts which represent the secondary fibres of Renieridæ), and in which there is but one form of spicule, a slender skeleton acuate with or without indications of incipient spinulation. Such are the characters derived from *H. caruncula*, Bowerbank, the species which that author (*l. c.*) has named as the type of his genus. It differs from *Suberites* in the absence of distinct spinulation of the skeleton-spicule. Schmidt refers this sponge to *Amorphina* (Spong. Atl. Geb. p. 76), although he assigns in his diagnosis (*op. cit.* p. 40) *acerate* spicules to that genus, which belongs to the family Renieridæ, whereas *Hymeniacidon* s. str. is decidedly a Suberitid, closely allied to *Suberites*.

95. Hymeniacidon caruncula, *Bowerbank*.

A broad, horizontally extended specimen from a crab's back; it presents a few short mamillæ on its free surface. The form of the spicules and arrangement of the skeleton are fully in accordance with the type specimens of this British species. The spicules measure ·23 to ·29 by ·0063 to ·008 millim.; those of the type specimen from Tenby, ·19 to ·32 by ·0063 to ·008 millim.

Hab. Port Jackson, 5–7 fms.

Distribution. British seas (*Bowerbank*).

96. Hymeniacidon agminata.

(Plate XLI. fig. E; Plate XLIII. figs. *f*, *f'*.)

Aggregations of erect, flexuous, more or less compressed stems, 8 to 10 millim. in longest diameter, anastomosing; subdividing in a

cymose manner into branches. Branches in part subcylindrical, in part compressed like the stems, of same diameters as stems; they divide and subdivide and anastomose irregularly, and frequently terminate in short vermiform tips about 10 millim. long by 2 millim. thick. Surface of sponge even, smooth. Texture in spirit rather tough, but dough-like, somewhat elastic. Internal structure subcompact, excretory canals small. Vents small, few, oval, 1 millim. in greatest diameter, with thin collapsing margins; near ends of branches. Colour in spirit pale greenish white.

Main skeleton consisting, beneath surface, of very loose spicular tracts confusedly arranged; at the surface they are set regularly at right angles to it, and are about 8 to 10 spicules broad, with intervals of ·07 to ·14 millim. between the tracts. Dermal skeleton formed by the points of the vertical tracts just mentioned, which do not project from the surface, and by a single thin layer of spicules scattered horizontally on the surface. Sarcode very pale, transparent. Spicules smooth, subspinulate, straight or slightly curved; head merely a slight enlargement of shaft, only slightly larger than adjacent part; shaft tapering to sharp point from near base; size ·28 by ·0063 millim.

Hab. Port Jackson, 0–5 fms.

A single spirit-specimen, 90 millim. (3½ inches) high, 55 millim. (2¼ inches) in diameter. This species recalls in colour and consistency *Suberites carnosus*, which, however, differs in its compact form and in the basal protuberance on the head of its spicule. The habit of growth is more that of *Suberites antarcticus*, Carter (Ann. & Mag. N. H. 1882, ix. p. 350); but in that species the colour is dark brown, and the spicule much larger and provided with a large spherical head. It is near *H. caruncula*, only the spicules are of a rather smaller average size, and the head is slightly more pronounced; but the chief differences are the erect branched growth as opposed to the horizontal, merely mammillated habit of *H. caruncula*, and the pale whitish, not brown or yellow, colour.

97. Hymeniacidon, sp.

A small incrusting specimen of a dull dark crimson colour, in spirit; the margins glabrous, the centre of the surface roughened by small conuli about ·5 millim. high and ·5 to 1 millim. apart. Primary skeleton-lines compact, about 10 spicules broad. Spicules smooth acuate, tapering gradually to fine points; size ·16 to ·22 by ·0042 millim.

Hab. West Island, Torres Straits, 7 fms.

SPIRASTRELLA, *Schmidt.*

In accordance with the rules of zoological nomenclature, the generic designation *Suberites* (Nardo) should be retained for those species only which are generically identical with the type of Nardo's

genus. The first species, *Suberites typus*, Nardo, does not appear to have been recognized by authors; the next is *Alcyonium domuncula* of Olivi, the *Hymeniacidon suberea* of Bowerbank, the spiculation of which consists of a simple spinulate. Even if we include in the genus the third species, *Suberites ficus*, Nardo (probably the *Hymeniacidon ficus* of Bowerbank), which possesses, in addition to the spinulate, a cylindrical flesh-spicule with a central inflation, those free compact Suberitidæ, with skeleton spinulate, whose flesh-spicule is a modified stellate ("spinispirula," Carter), cannot be admitted to the same fellowship, and Schmidt's genus *Spirastrella* must receive all such. Besides *Spirastrella cunctatrix* and *vidua*, Schmidt, *Hymeniacidon angulata*, Bowerbank, *Alcyonium purpureum*, Lamarck, and several other species enumerated by Mr. Carter in his valuable "List of Suberites" lately published (Ann. & Mag. N. H. 1882, ix. p. 349 and following pages) must be included in the genus. To any one who has noticed the practical identity in spiculation between typical *Spirastrellæ* and numerous species of *Vioa* (e. g. *johnstoni*, Schmidt, and several described by Hancock as *Cliona*), it must be a matter for serious consideration whether the boring habit and that general arrangement of their tissues which is expressed by Mr. Carter by the term *Laxa*, which he has applied to the group in which he places *Cliona* and *Vioa*, are of sufficient importance to justify their being kept distinct from their non-boring allies, the *Spirastrellæ*. To me it seems very possible that they may some day be demonstrated to possess a free state, corresponding to *Papillina suberea*, Schmidt (=*Rhaphyrus griffithsii*, Bowerbank), which Mr. Carter has found to be merely the free condition of *Vioa* (*Cliona*) *celata*; such a free state should be carefully watched for.

98. Spirastrella vagabunda. (Plate XLIII. figs. *c*, *c'*.)

"Suberites, ? sp. undescribed. Trincomalee."* *Carter, Ann. & Mag. N. H.* 1882, ix. p. 352.

Massive, attached by broad base, tending to grow up into large nodular elevations, which may bear one or more vents. General surface slightly verrucose (in spirit), more so in large dry specimens, smooth over and between inequalities of surface. Colour (in dry state) pale to dark yellowish brown, in spirit olive greenish brown. Vents of two kinds:—(1) At summit of the large elevations of surface, one or more (sometimes 5 to 8) on each; opening level with surface; suboval in uncontracted state, 2 to 10 millim. in greatest diameter, leading into wide and deep excretory canals. (2) On general surface of sponge, usually between the lesser inequalities of the surface, subcircular, with thickened margins, about ·8 millim. in average diameter.

* In the Trincomalee specimen described by Mr. Carter the vents are not placed at the apices of the lobes of the sponge, the adult spicule is scarcely spinulate at all, and measures only ·0127 millim. in diameter, and the spinispirulæ appear to be scarce. For these reasons it appears desirable to distinguish it under the name *S. vagabunda*, var. *trincomaliensis*.

Internal structure rendered cavernous by the wide canals of the excretory system; texture of internal structures moderately tough. Internal skeleton formed of trabeculæ and sheet-like expansions some larger trabeculæ formed of crossed skeleton-spicules strengthened by dense sarcode proceed from the interior and support the cortex; they are from ·4 to ·8 millim. in diameter. A strong cortex, about ·8 millim. thick, tough, formed chiefly by the skeleton-spicules much intercrossed, and united by a somewhat dense, brownish, subtransparent sarcode (becoming less visible when the specimen is dried). Spicules:—(1) Skeleton spinulate, strong, slightly curved; head oblong, almost oval: shaft gradually diminishing to about two thirds of its full diameter towards head, and tapering gradually to sharp distal point; average maximum size ·6 by ·02 millim. (2) Spinispirular, delicate, composed of about three rather sharp bends, with about 4 to 8 rather blunt spines, ·0021 millim. long, to each bend; shaft of equal diameter in all parts; average maximum size ·032 by ·0016 millim. (exclusive of spines).

Hab. Thursday and West Islands, Torres Straits, 4–7 fms.; bottom sand or coral.

Distribution. Trincomalee (*Carter*); Galle coast, Ceylon (*coll. Mus. Brit., ex coll. Dr. Ondaatje*).

The external appearance of this fine species is more characteristic and constant than is usual in the Suberitidæ. Mr. Carter has shortly described it, but without name. The largest specimen known to me is one brought by Dr. Ondaatje, Colonial Surgeon, from Ceylon, which measures 225 millim. by 130 millim. (9 by 5 inches), by 60 millim. (2½ inches) in greatest thickness; it was obtained at or near low-water mark.

The species is nearly allied to *Hymeniacidon angulata* of Bowerbank (Madeira), but has a skeleton-spicule of twice the diameter of the spinulate found in that species.

The spicules show no striking variation in size; the length of the spinulate varies from ·55 to ·63 millim. in different specimens; its breadth and the size of the flesh-spicule are almost constant.

Colour. This is produced by a number of globular or suboval cells of olive-green colour throughout, provided with a large nucleus of a darker colour: they measure about ·0095 millim. in diameter, and have a well-defined outline; they appear to be confined to the mesoderm.

99. Spirastrella congenera. (Plate XLIII. figs. *d*, *d'*.)

Massive, attached by broad base, tending to rise into pyramidal or cylindrical lobes, each terminated by the vent. General surface even, smooth (in dry state). Colour (in dry state) pale fawn. Vent (in the single dry specimen) oval, 8 millim. in greatest diameter, leading deeply into the body of the sponge, the margin level with the general surface (in the single specimen a tongue-like process, 8 millim. high, stands at one side of it). Internal structure cavernous, with wide spaces; texture of internal structures moderately tough.

Internal skeleton formed by a coarse network of loose spiculo-fibre, the subcortical ends of the fibres rising up so as to support the cortex. A strong cortex composed of a zone of chiefly subhorizontal skeleton-spicules united by sarcodic substance, and about ·45 millim. in thickness.

Spicules:—(1) Skeleton spinulate, very large, decidedly curved, tapering gradually to a sharp point: head oval, shaft tapering slightly towards it, forming a decided but slight neck; size ·8 by ·035 millim. (2) Spinispirular, either delicate, long, composed of about three bends, which are gradual, so that no part of the whole spicule lies much out of the straight line; size ·05 to ·056 by ·0016 millim.; or, rather stouter and shorter, with only two bends, size ·032 by ·0022 millim.; in either case about 10 spines to a bend; spines slender, sharp-pointed, ·0022 to ·0032 millim. long.

Hab. Thursday Island, Torres Straits, 4–5 fms.

The, unfortunately, single and dry specimen measures 35 millim. (1¼ inch) high by 25 millim. (1 inch) in extreme breadth.

The species has in the dry state the colour and much of the appearance of *S. vagabunda*; both forms of spicule, however, are considerably larger than in that form and the angulation of the flesh-spicule is less abrupt. It is, however, undoubtedly nearly related to it.

100. Spirastrella decumbens. (Plate XLIII. fig. c.)

Incrusting, thin (·5 to 10 millim. thick). General surface level (except where affected by the inequalities of the substance to which it is attached), glabrous. Colour in spirit grey, slightly tinged with pink. Vents not made out with certainty. Texture tough and leathery. Internal structure very compact; no large spaces seen, as a rule, in vertical sections. Sarcode dull greenish, subtransparent, coloured diffusely. Skeleton consisting of loose spicular tracts, about 6 to 10 spicules broad, running obliquely or at right angles to the surface, and occasionally forming slight prominences, protected by the cortex, and of loose skeleton-spicules lying in all directions between them. Cortex consisting of a layer, two or three spicules deep, of the flesh-spicule, lying in almost colourless sarcode.

Spicules:—(1) Skeleton spinulate, slender, tapering very gradually to a sharp point, and very gradually also to the head, below which the shaft forms a decided and well-defined neck; head oval, rather pointed at free end, of about the same diameter as the middle of the shaft, viz. ·0095 millim.; length of spicule ·35 millim. (2) Spinispirular, moderately stout to stout, consisting of two bends, about 12 spines to a bend; spines strong, tapering from broad bases to sharp points, length about ·0045 millim.; length of spicule ·025 millim., thickness (excluding spines) ·0032 to ·0063 millim.

Hab. Alert Island, Torres Straits, 7 fms. (growing over a tubular *Retepora*).

This species appears to be more nearly allied in its spiculation to *S.* (*Alcyonium*) *purpurea*, Lamarck, than to any other Indo-Pacific species, but it differs from it in wanting the magnificent crimson colour

of that form, in its incrusting habit (*purpurea* being massive), in the inferior diameter of the shaft of the spinulate and the superior length of the spinispirular spicule (in *purpurea* these dimensions are respectively ·013 and ·016 millim.), the latter usually consisting in *purpurea* of only one to one and a half bends.

The single spirit-specimen measures 32 millim. (1¼ inch) in height by 30 millim. in longest diameter, by 10 millim. (⅜ inch) in greatest thickness.

TETRACTINELLIDA.

The family *Lithistidæ* is not represented. This is not surprising if it is remembered that the depths investigated did not exceed 40 fms. Mr. Carter's better fortune with collections from Ceylon is in part due to the greater depth at which the specimens were obtained.

CHORISTIDÆ.

Sollas, Ann. & Mag. N. H. 1882, ix. p. 164.

Prof. Sollas has since proposed a different arrangement of the Tetractinellida, but the division into Choristidæ and Lithistidæ appears a natural and convenient one. The species obtained, though few in number, are of remarkable interest, and all new to the Australian seas.

STELLETTA, *Schmidt.*

This genus, as at present constituted, is decidedly heterogeneous. Some of Schmidt's and Carter's species appear referable either to *Geodia*, or some genus intermediate between *Geodia* and *Stelletta* (by virtue of the transitional character of their ball-stellate spicule), while *S. euastrum* appears distinct by virtue of its *disks*. The more typical forms appear to be divisible into subgroups which coincide roughly with their geographical distribution. Thus the Atlantic species mostly have medium-sized stellates, with numerous rather coarse, pointed rays; the Indo-Pacific ones have few-rayed stellates, usually minute; of the latter, the Fijian and two of the Ceylon forms agree in having a small surface bacillate or acerate spicule, while one Ceylon form (*S. tethyopsis*) and all the Australian ones known at present agree in having only minute delicate rayed stellates.

The Indo-Pacific species of *Stelletta*, s. str., may be divided into two groups:—

Group 1. With bacillar or acerate flesh-spicule.

1. *S.* (*Ecionemia*) *acervus*, Bowerbank, P. Z. S. 1873, p. 322, pl. xxx. figs. 1–6. Fiji Islands.

2. *S.* (*Ecionemia*) *densa*, id. *l. c.* p. 322, pl. xxx. figs. 7–14. Fiji Islands.

3. *S.* (*Tisiphonia*) *nana*, Carter, Ann. & Mag. N. H. 1880, v. p. 138, pl. vii. fig. 43. Gulf of Manaar, Ceylon.

4. *S. crassicula*, id. ibid. p. 371. Basse Rocks, Ceylon.

5. *S. australiensis*, id. op. cit. 1883, xi. p. 350, pl. xiv. fig. 2. W. Australia.

6. *S. bacillifera*, var. *robusta*, id. loc. cit. p. 351, pl. xiv. fig. 3. S. Australia.

Group 2. Without bacillar or acerate flesh-spicule.

7. *S. tethyopsis*, Carter, Ann. & Mag. N. H. 1880, v. p. 137, pl. vi. figs. 39, 40. Gulf of Manaar, Ceylon.

8. *S. globostellata*, id. op. cit. 1883, xi. p. 353, pl. xiv. fig. 5. Galle, Ceylon.

9. *S. bacca*, Selenka, Zeitsch. wiss. Zool. xvii. p. 569, pl. xxxv. figs. 14, 15. Samoa Islands.

10. *S. purpurea*, sp. n. N. coast of Australia.

11. *S. clavosa*, sp. n. N. coast of Australia*.

In no Atlantic *Stelletta* which I have seen do the minute or any stellates possess *capitate* rays, except in a MS. species of Schmidt's from Florida, which has minute drawn-out stellates (*i. e.* incipient spinispirular spicules) with very slight heads to the slender rays: a larger stellate is, however, present in addition to these, and has not heads to its rays; the large stellate of *S. intermedia*, Schmidt, from Algiers, has the ends of the rays roughly tuberculated by prominent groups of tubercles, but the spicule itself seems to be homologous with the "balls" of *Geodia*, and not with the small stars of *Stelletta*, which are present as well. The Indo-Pacific species more often have the head. In *Stelletta* (*Ecionemia*) *densa*, Bowk., from the Fiji Islands, the tuberculation of the rays is sometimes rather coarser at their apices than on the remaining part, and in *Ecionemia acervus* the rays of the delicate stellate are very fine and slightly capitate. Carter does not describe or figure any heads on the rays of the stellates of his species from this region except *S. globostellata*. Selenka's species has no heads.

The two species from Australia to be first described agree with each other and with *Ecionemia acervus* in having small heads to the stellates, although they differ from it, and agree with *Stelletta tethyopsis*, in the probably more important character of the absence of a flesh acerate or bacillar spicule; the character of the apex of the ray of the stellate in the latter species has not been described. The Samoa-Islands species has no surface linear spicule assigned to it by its describer, but it differs fundamentally from our species in its large, noncapitate-rayed stellate.

* *S. ewastrum* of Carter (? Schmidt) described (Ann. & Mag. Nat. Hist. 1882, v. pp. 135, 136, pl. vii. figs. 41, 42) from the Gulf of Manaar and Australia, includes two distinct species, of which the first at any rate is distinct from Schmidt's species; they belong to a remarkable group of forms which connect *Stelletta* with *Geodia*: the surface-disk forms a character of sufficient importance to distinguish the species which possess it from *Stelletta* s. str. *S. nux* of Selenka (Zeitsch. wiss. Zool. xvii. p. 569, pl. xxxv. figs. 11–13), from the Samoa Islands, is probably a *Tethya* s. str., as its stellate agrees with the large stellate of that genus, and its "forks" are rare and probably foreign to the sponge.

101. Stelletta purpurea.

(Plate XL. fig. E; Plate XLIII. figs. *j*, *j'*.)

Free, subspherical or suboval. A single circular vent (about 2 millim. in diameter in moderate-sized specimens) often present; it leads deeply into the sponge. Surface subpapillose, *i. e.* embossed with small semiglobular elevations, visible most readily under a lateral light. Colour purple in spirit, when well preserved. A distinct cortical layer with sarcode of the same consistency as that of the central part of the sponge, about ·7 millim. broad, containing the subcortical crypts, and formed (in adult specimens) by the space intervening between the heads of the superficial zone-spicules; a subcortical zone of anchors and smaller zone-spicules. Deep sarcode transparent, brownish yellow; that of surface purplish red, rather granular.

Spicules:—(1) Zone-spicule; shaft stout, tapering gradually to sharp point, 1·4 to 1·6 by ·045 to ·06 millim.; arms strong, tapering gradually to sharp points, projecting somewhat forward at the commencement, and then curving backwards slightly, ·27 by ·043 to ·06 millim. in length and breadth respectively. (2) Anchor, long, tapering to sharp point; head almost flat above; arms turning rather abruptly back to form an angle of about 45° with shaft, tapering to sharp points: expanse of arms at their points ·1 millim.; diameter of shaft about ·035 millim.; length of shaft about 2 millim., of arms about ·07 millim. Head usually lying below the zone of "chones." (3) Body acerate, long, slender, tapering very gradually from centre to sharp points; size about 1·5 to 2 by ·037 millim. (4) Minute stellate of flesh; about 7 to 10 arms; no perceptible body; arms straight, very slender, viz. about ·0008 millim. in diameter, apparently smooth, terminated by minute head; diameter of spicule across arms ·02 to ·025 millim.: distributed throughout all parts of the sarcode.

Hab. Prince of Wales Channel, Thursday Island, and West Island, Torres Straits, 4–9 fms.; bottom sand or sand and coral. Port Darwin, 7–12 fms.; bottom sand and mud. Arafura Sea off N.W. coast of Australia, 32–36 fms.; sand, mud, and shells.

Specimens not abundant at any of the stations. The single specimen from West Island is remarkable for being half covered by specimens of *Iotrochota purpurea*, *Rhizochalina singaporensis*, *Cladochalina nuda*, and a coralline.

Stelletta purpurea, var. retroflexa. (Plate XLIII. fig. *k*.)

This name may be applied to a specimen which has the expanse of the arms of the zone-spicule somewhat greater than in the typical form, while their diameter is less, and one or more of the arms generally has the point bent backwards abruptly, so as to form an angle of about 135° with the rest of the arm. The specimen is globular, and has a vent about 1·5 millim. in diameter. The bend

in the arm is not quite constant in its position. The rest of the characters agree with those of the typical form.

Hab. West Island, Torres Straits, 7 fms.: bottom sand.

Variations. This sponge varies, as has been seen, in shape (oval or subspherical) and in the presence or absence of a vent. A third variation may be noted, viz. in the length, stoutness, and amount of curve in the arms, and in stoutness of the shaft of the zone-spicule; thus in a specimen from the Arafura Sea the diameter of the shaft falls to ·045 millim., that of the arms to ·043 millim., the length of the arm remaining ·25 millim., while the backward bend of the arm, though gradual, is very decided.

The variations in this spicule, which is the only one which seems to differ much in *different specimens*, are as follows:—

	Diam. of shaft.	Diam. of arm.	Length of arm.	Curve of arm
	millim.	millim.	millim.	
1. Port-Darwin specimen	·06	·06	·25	slight, gradual.
2. Thursday Island specimen	·05	·05	·27	„ „
3. Arafura-Sea specimen	·045	·043	·26	decided, gradual.
4. Var. *retroflexa* (West Island, Torres Straits)	·04	·04	·33	sharp near end.

The stellate is only ·013 to ·017 millim. in diameter in specimen No. 3.

The species differs from *S. bacca*, Selenka, in the small size of the stellate spicule, viz. ·02–·025 millim. instead of ·2 to ·4 millim. in diameter; from *S. tethyopsis*, Carter, in having no "forks," and simple, not trifid, arms to the "zone-spicule;" and from *S. globostellata*, id., in the absence of a globostellate spicule; for distinctions from other species see table of species above. The largest specimens measure about 25 millim. (1 inch) in greatest diameter; all the specimens are preserved in spirit.

102. **Stelletta clavosa** *. (Plate XLIII. figs. *i*, *i''*.)

Free, subglobular (very occasionally suboval). A single circular vent is almost (if not quite) invariably present; it is situate either on a flattened or depressed area; its margin apparently forms a sphincter: diameter 2 millim. in the largest specimens received. The excretory canals unite at 1–2 millim. below surface. Colour, in well-preserved spirit-specimens, pale purplish grey to puce, in others

* From *clavus*, a nail, in allusion to the fine nail-like zone-spicule.

simply grey. A distinct cortical layer, containing the subcortical crypts, and formed in adult specimens by the space between the heads of the zone-spicules and those of the anchors, diameter about ·7 millim.; sarcode here of same consistency as in rest of sponge. Sponge-sarcode below surface rather dark yellow-brown, rather granular: that of surface (in well-preserved specimens) reddish brown, granular.

Spicules:—(1) Zone-spicule, with long shaft tapering gradually from head to sharp point; head composed of three bifid arms; the proximal third of each arm projects forward at an angle of about 120° to the shaft, and then bifurcates in a plane parallel to that of the surface of the sponge, so that the ultimate divisions are parallel with this surface; the ultimate divisions taper gradually to sharp points from the point of bifurcation; shaft about 3 millim. long by ·035 millim. in diameter; total length of single arm ·32 millim., of proximal (simple) part ·1 millim.; diameter of proximal part throughout ·028–·032 millim., of base of ultimate divisions about the same. (2) Anchor, with long shaft tapering gradually from head to sharp point, and head composed of three arms tapering gradually to sharp points, curved backwards to form angles of about 45° with shaft (the angles vary slightly in different specimens); shaft about 2·1 millim. by ·022 to ·024 millim.; expanse of arms ·11 to ·12 millim., diameter of arm at base about ·02 millim. (3) Body acerate, long and slender, smooth, tapering gradually to sharp points from the centre; size about 3 by ·025 millim. (4) Flesh-spicule, composed of about 7 to 12 straight arms, radiating from a centre which does not show any perceptible inflation; arms very slender (about ·0008 millim. in diameter), terminated by heads of about twice their own diameter; spicule ·01 to ·013 millim. in diameter across the arms: distributed generally in sarcode.

Hab. Prince of Wales Channel and West Island, Torres Straits, 7–9 fms.; bottom sand and coral. Arafura Sea, off N.W. coast of Australia, 32–36 fms.; bottom sand, mud, and shells.

This appears to be a small species, none of the specimens exceeding 13 millim. in their longest diameter. It exhibits, as compared with *S. purpurea*, a remarkable constancy in its form and in the occurrence of a vent, and the spicules vary but slightly in form and dimensions (the only variations observed are incorporated with the description above). In Torres Straits very few specimens were obtained; but in the Arafura Sea a considerable number of small specimens occurred. *Stelletta clavosa* differs from all nearly allied forms except *S. tethyopsis*, Carter, in the bifurcation of the arms of the zone-spicule, and from the latter species by the absence of "anchors" and of an *external* as distinguished from an *internal* form of stellate. The arms of the zone-spicule are much longer in proportion to their thickness than in Carter's species.

Parasite. In the superficial sarcode (probably just beneath the ectoderm) of one specimen occur a large number of a chain-like Alga, resembling *Nostoc*, usually coiled, with very distinct cells.

103. **Stelletta**, sp.

Some fragments of a large specimen which has grown over some coils of *Vermetus*, not sufficiently complete to be safely described in full. The stellates are minute, and resemble those of *S. purpurea* and *clavosa*, but the arms are somewhat stouter and are not provided with heads.

Hab. Torres Straits, 5–7 fms.

STELLETTINOPSIS.

Carter, Ann. & Mag. N. H. 1879, iii. p. 348.

This genus resembles *Tethyopsis*, Stewart, in that the two typical species have a minute bacillar flesh-spicule just such as that of the new species of *Tethyopsis* described below; and if it be, as seems probable, a tetractinellid which has undergone abortion of two arms (as in *Placina monolopha*, Schulze) of the main spicule, it resembles *Tethyopsis* further in this tendency to lose the arms of its skeleton-spicule (see description of *Tethyopsis dissimilis*, suprà). Reduction of the triradiate of the latter species by loss of a single arm would make the spiculation (apart from the skeleton-arrangement) essentially that of *Stellettinopsis*, if the bacillar spicule is regarded as an elongate stellate. The new species is assigned here to *Stellettinopsis* because it differs only from the typical species in the absence of the bacillar,—not a point of great importance, if the variation in *Geodia* as to presence and absence of one or other of the minute spicules is considered.

I dedicate this new species to Mr. H. J. Carter, to whom is due the credit of establishing this genus, and to whom I owe a great debt in his constant and ready help.

104. **Stellettinopsis carteri.** (Plate XLIII. figs. *n*, *n'*.)

Pedicellate, on a short cylindrical stalk, passing gradually into a massive, somewhat flattened upper portion, which shows semi-detached lobes. Surface of upper portion dimpled and corrugated (somewhat like the Mammalian cerebrum). No visible vents. Texture in spirit soft, but elastic; colour in spirit dirty white. Surface between the undulations even, but minutely rough. Sarcode continuous, without many cavities; soft, very pale yellow in colour. Main and dermal skeletons consisting of a confused interlacement of the skeleton acerate spicules, not aggregated into fibres or tracts.

Spicules:—(1) Skeleton acerate, tapering to sharp points from near the middle; size 1·0 by ·02 millim. (2) Stellate, with very slight body, and five to ten straight blunt arms of uniform diameter (about ·0017 millim.) throughout; microspined with fine sharp points, which are most prominent at the tips; size ·05 millim. across arms.

Hab. Prince of Wales Channel, Torres Straits, 5–7 fms.; bottom sand and shells.

Of the two species assigned by Mr. Carter (*l. c.*) to the genus, *S. simplex*, recorded from Freemantle, Australia, and Hayti, is the most closely allied to the present, but differs from it in the possession of the bacillar tuberculate flesh-spicule. Mr. Carter, however, described in the same paper as that in which he founded *Stellettinopsis* (*tom. cit.* p. 344), a species which even more nearly approaches the present: this is *Amorphina stellifera* from South Australia, which differs from the present form only in its amorphous, non-pedicellate growth and the proportions of its spicules, which I now give, reduced to metric measurements:—

1. Acerate, ·7 by ·017 millim.

2. Stellate (stated to have no central inflation: that in *S. carteri* is hardly worth the name), ·017 millim. in diameter.

Thus the acerate is one fourth and the stellate two thirds smaller than in our species, and hence the two species are, in my view, sufficiently distinct. *Amorphina stellifera* should, however, stand as *Stellettinopsis stellifera*.

TETHYOPSIS.

Stewart, Quart. Journ. Micr. Sci. n. s. x. (1870) p. 281 (*nec Zittel, Abh. bayer. Ak.* xiii., ii. (1879) p. 9).

To this remarkable genus I propose to assign a species which has, as described recent allies, the species *T. columnifera*, from the Philippine Islands, on which the genus was based, and *Tribrachion* (*um*) *schmidti*, from the Gulf of Mexico. Like the latter, the present form exhibits a singular divergence from the more normal Tetractinellid types, in that its chief spicule has lost one of its arms, and is only triactinellid. The genus appears to be allied to *Stelletta*, the peculiar development of its large tetractinellid spicule being apparently caused by the erect growth and non-corticate character of the sponge.

105. Tethyopsis dissimilis.

(Plate XL. fig. II; Plate XLIII. figs. *l*–*l*''''''.)

Sponge elongated, slender, cylindrical or suboblong, tapering to the free extremity, which is pointed; attached by a narrow base which throws out a thin horizontal expansion outside the sponge itself. Flexible: surface formed by a thin and delicate dermal membrane of a dark grey colour in spirit. Vent? Pores ·04–·08 in diameter, crowded in the interfascicular spaces of the dermis. Skeleton formed by a number of narrow bands of aggregated spicule-shafts (spicule No. 1) running longitudinally down the interior of the sponge; the bands are united laterally (see fig. *l*''') by means of the arms of the triradiate spicule, are clothed with the soft tissues, and serve to break up the space within the sponge into 8 or 9 elongated cavities running from the base towards the apex of the sponge, viz. (1) anterior, (2) posterior, (3 and 4) lateral, (5 and 6) antero-lateral, (7 and 8) postero-lateral, and in one case (9) axial (see figs. *l* and *l*'). Subdermal skeleton formed by similar longitudinal

fascicles of spicule-shafts, a ray proceeding from the head of each of the latter, extending along the membrane and supporting it (see fig. *l''*); in some parts stout acerate spicules (No. 2) take part in the formation of the dermal skeleton. Sarcode transparent, of very pale brown colour; rendered subopaque, when seen in the mass, by immense numbers of small elongate stellate spicules.

Spicules:—(1) Triradiate of axis and dermal skeleton, consisting of a straight shaft and two arms, one tapering to a sharp point and boldly recurvate, the other ending abortively in a rounded extremity shortly after its origin; the arms are set at right angles to the shaft and at angles of about 160° to each other, but lie in different planes. Length of shaft and long arm probably variable, and depending on the position of the spicule; the former attains a length of 5·5 millim., the latter of 2 millim.: diameter about ·05 millim. It is the shaft of this spicule which forms the longitudinal skeleton-bands. (2) Large acerate of dermal skeleton, slightly curved, tapering from centre to sharp points: size about 1·8 by ·05–·075 millim. (3) Minute elongate stellate flesh-spicule, consisting of a straight or occasionally curved or sinuous cylindrical shaft, beset with numerous irregular blunt processes, about 20 to the spicule, varying in length from ·001 to ·002 millim., thickness about ·001 millim.; length of spicule about ·0095 millim., thickness of shaft alone ·001 millim. Crowded over all parts of the soft tissues.

Hab. Port Darwin, 7–12 fms., bottom sand and mud; Torres Straits, 10 fms., bottom sand.

Of the two specimens from Port Darwin the larger is 74 millim. (3 inches) long in its present state, viz. without its original base and with the apex somewhat abraded: it probably did not much exceed this length when perfect; its longest diameter (it is suboblong in transverse section) is 8 millim., its shortest 5 millim., at the present base. The smaller specimen has the base attached, but has lost the apex: it is almost cylindrical, and has a diameter of about 3·5 millim. throughout. In the dermis of the larger specimen no acerates have been found, but in the smaller one they appear to replace the triradiates in this place; it is in this specimen that an axial canal traverses the sponge. The specimen from Torres Straits is a fragment, forming the base of a specimen almost certainly belonging to the same species, but very imperfect. Its acerate differs from that of the typical form by having a diameter of ·075 instead of ·05 millim.; the flesh-spicule shows no divergence.

The species differs very markedly from Stewart's—(1) outwardly, in having the surface level instead of bearing sharp points; (2) inwardly, in the presence of an *axial* cavity, in having tri- instead of quadriradiate body-spicules, and in having a dermal acerate; the stellates of *T. columnifera*, further, are normal globostellates and not elongate, as here; in the general arrangement of the skeleton this species differs by possessing a number of longitudinal lines, instead of the condensed central mass of that species.

The species is obviously nearly related to a form named *Tribrachion Schmidtii*, well described and illustrated as the type of

a new genus by W. Weltner ('Beitr. zur Kenntniss d. Spongien,' Inaugural Dissertation, Freiburg-in-Breisgau, 8vo, 1882, p. 30, pl. iii. figs. 29–41, 43), from Prof. Agassiz's dredgings in 1879 off the Morro Light, Gulf of Mexico, in 250–500 fathoms. In point of fact Weltner's species, which differs from *T. dissimilis* principally in the possession of a fully developed triradiate "anchor," occupies a position almost exactly intermediate between *T. dissimilis* and Stewart's species. I gather from Weltner's paper that he has not seen Stewart's description: had he done so he would, I feel sure, have at any rate mentioned the close affinity of his species to that of Stewart, from which it differs chiefly by the elongate form of the flesh-stellate and by the suppression of the third lateral arm of the skeleton-spicule, a suppression already foreshadowed in Stewart's species by the great reduction of two out of the three lateral arms in some of these spicules (see fig. 75, *l. c.*). I do not think that *Tribrachium* can be upheld as distinct from *Tethyopsis*; the gradation of forms between *T. columnifera* and *T. dissimilis*, by which (1) the quadriradiate spicule of *T. columnifera* is reduced to a triradiate in *Tribrachium*, and to (*a*) a biradiate with aborted third ray and (*b*) an acerate in *T. dissimilis*, together with the general agreement between the minute spicules, the skeletal structure, and the general form of the sponge, appear to mark these three species out as belonging to a natural though highly plastic circle of forms comparable to the Tetractinellid genus *Placina*, Schulze, of which the species (*P. monolopha*, *dilopha*, and *trilopha*, Schulze) each include bi-, tri-, and quadriradiate forms of the fundamental quadriradiate type; they are comparable also to many genera of the Calcarea, where the fundamental (probably triradiate) type exhibits great modifications, even within the limits of a single species.

Besides possessing three complete arms and the large skeleton-spicule, *Tribrachium schmidti* is distinguished from *Tethyopsis dissimilis* by:—(2) the exterior being unmarked by *horizontal* ridges; (3) the inferior length of the lateral arm of the triradiate spicule; (4) the apparent absence of the long acerate spicule; (5) the more generally elongate form of the flesh-spicule and the superior number of its lateral whorls of tubercles.

Weltner's comparison of the form of the minute flesh-spicules with the similarly dendritic skeleton-spicules of the Rhizomorine Lithistids is invalidated by the fact that the two classes of spicules are not homologous with each other, the flesh-spicules of *Tribrachium* being represented in the Lithistid series only by the minute bihamates and other flesh-spicules of *Corallistes* &c.

A striking analogy with the arrangement of the skeleton of the Lyssakine Hexactinellida is afforded by the manner in which the arms and shafts of the large skeleton-spicules are employed in *Tethyopsis* (inel. *Tribrachium*) to form coherent rectangular meshes.

Weltner's discovery is of great interest, apart from the peculiarities of the type described, in the fact that his species, though living in the West Indies, is clearly intermediate between two types found near the confines of the Indo-Australian region.

106. Geodia globostellifera. (Plate XLIII. fig. *b*.)

Carter, Ann. & Mag. N. H. 1880, vi. p. 134, pl. vi. fig. 38.

I have been able conclusively to determine the true relations of the globostellate spicule to the sponge, which Mr. Carter appears not to have felt quite safe in regarding as really belonging to it. As, however, I find it to occur not only in the cortex of different parts of the same sponge and in different specimens, but sometimes also in the sarcode beneath the crust of balls, it must be regarded as truly a production of, and thus proper to, the sponge itself. I find, what Mr. Carter does not describe, a small acerate spicule which forms small tufts on the surface, generally accompanied by the globostellate, and probably related specially to the orifices of the canal-system. Like Mr. Carter, I have been unable to find any "anchors."

My measurements of the spicules do not quite correspond with those given by Mr. Carter: but as these do not quite agree with his figures, I do not attach much importance to the discrepancy. In his description the globostellate has the same diameter (viz. $\frac{1}{1800}$ inch) assigned to it as to the shafts of the zone-spicule and body acerate, whereas in the plate, where it is figured (at fig. *f*) as on the same scale ("scale D," magnified 32 diameters) as those spicules, it appears as only about one third of their diameter.

The following are the chief spicular measurements from the present specimens:—

1. Zone-spicule (the arms of which are *simple*, as in Mr. Carter's figure, not trifid): diameter of shaft ·07 millim., of arm at base about ·048 millim.: expanse of any two arms together about ·58 millim.

2. Body acerate, 3·0 millim. long by ·038 thick.

3. Fork (the only one seen): diameter of arms and shaft ·016 millim.: length of arm 1 millim.

4. Geodia-ball, long diameter ·09 millim.

5. Globostellate, diameter ·028 millim.

6. "External" stellate (forming, with the globostellate, the outer pellicle, but, like it, also occurring sparingly in the subcortical sarcode), ·0063 millim. in diameter. Its arms are numerous and appear to end bluntly.

7. "Internal" stellate (the arms are few in number and are usually curved), ·038 millim. in diameter.

8. Surface acerate; about ·16 millim. long by ·005 millim. in diameter.

The largest specimen is about 80 millim. ($3\frac{1}{4}$ inches) in its greatest diameter; and the two specimens (which are preserved in spirit) are tinged with crimson in places, as if this was their colour during life.

Hab. Port Darwin, north coast of Australia, near tide-marks; bottom sand and rock.

Distribution. Gulf of Manaar, Ceylon (*Carter*).

The great interest of this species has induced me to devote some

space to its description. The complexity of its spiculation and the curious occurrence of the globostellate and of the surface acerate all combine to render it remarkable. Possibly it may have in the future to be separated from *Geodia* s. str. It is noteworthy that, while one of the specimens (the larger) exhibits nothing like a vent, the other has a circular opening leading obliquely and deeply into the sponge, lined with a soft wall, and about 4 millim. in diameter; its margin is slightly raised at one point. It is possible that it is merely an opening formed by growth over some cylindrical foreign body which has since disappeared: if a vent, its absence in the other specimen is remarkable. Mr. Carter does not mention any vents in his specimens.

107. Placospongia carinata.

Geodia carinata, *Bowerbank*, *P. Z. S.* 1874, p. 298, pl. xlvi. figs. 1–5.

This species differs from *P. melobesioides*, Gray, the typical species of the genus, in having a spinispirular and a globostellate flesh-spicule, the latter with furcate rays. Taking this difference into consideration, it is impossible any longer to regard the two species as identical. Some fine specimens were most fortunately obtained in spirit.

Hab. Prince of Wales Channel, Torres Straits, 7 fms.; bottom sand.

Distribution. Dr. Bowerbank's specimen is said to have been obtained in the "South Sea."

CALCAREA.

As with the collections made by the 'Alert' on the Patagonian coasts, so with those from the north and north-east of Australia, a very small number of Calcisponges have to be recorded, and no species new to science. Perhaps this is in part to be connected with the fact that but few Algæ (which so commonly afford a resting-place to these Sponges) occurred among the collections sent to the British Museum. But Häckel says ('Kalkschwämme,' i. p. 426) of Calcarea, "Auf sandigem oder schlammigem Grunde wachsen nur sehr wenige Arten;" hence, as the abundant details given by Dr. Coppinger of the nature of the bottom on the coasts more particularly investigated by the 'Alert' show that it is chiefly composed of sand or mud or loose shells, this group of Sponges was likely to be found to be but poorly represented on the actual coast-line of this district; the coral-reef might be expected to produce more.

Judging from the collections in the British Museum, from Häckel's Tables of Distribution (*op. cit.* i. pp. 430–432), and from Dr. Poléjaeff's Report, the south coast of Australia appears to be considerably more productive, fifteen or sixteen species being known from this region. I know of only two species from the western coast of the continent: but that district has been but imperfectly investigated hitherto. From the east coast Häckel records but six species, Poléjaeff adds eight, and the present collection two. None of the species now to

be mentioned appear to have occurred in the Australian collections of the 'Challenger,' the Report on which unfortunately only appeared while this Report was passing through the press.

108. **Leucetta primigenia**, *Häckel*, var. **microrrhaphis**, *id.*

Kalkschwämme, ii. p. 118, pl. xxi.

A small bean-shaped specimen, of the *Lipostomella* form.

Hab. Alert Island, Torres Straits, 7 fms.

Distribution (the species). Mediterranean, Atlantic, Cape of Good Hope, Red Sea, Indian Ocean, South Australia, Fiji Islands, Chili (*Häckel*); Kerguelen and Heard Islands (*Polejaeff*).

109. **Leucaltis bathybia**, *Häckel*, var. **australiensis**, nov. (PLATE XLIII. fig. *m*.)

Leucaltis bathybia, *Häckel, Kalkschwämme*, ii. p. 156, pl. xxviii. fig. 2.

A small, low, massive specimen, with a small lateral unarmed vent and very reduced cloacal cavity. The quadriradiates are sagittal, those of the outer surface very large: diameter of rays about ·04 millim., the facial angle nearly 180°, the apical ray in the same plane as the laterals: the deep quadriradiates have a somewhat smaller facial angle and more slender rays, and the apical ray often projects well forward; rays almost straight. The triradiates form a thin layer on the inner wall, where their rays measure only about ·01 millim. in diameter; they have a facial angle of about 160°; in the deep parts they are subregular, sparsely scattered amongst the quadriradiates, and the rays measure about ·02 (sometimes ·025) millim. in diameter; rays approximately straight. Colour (in spirit) white.

This form differs from vars. *perimina* and *arabica* of Häckel (*l. c.*) in the massive shape of the sponge, and in the larger size, as compared with the quadriradiates, of the deep triradiates. In the comparative straightness of the rays it agrees with var. *arabica* and var. *mascarenica*, mihi (see this Report, Western Indian Ocean district); but differs from the latter in the smaller diameter of the rays of the large quadriradiates, in the apparent smoothness of the cloacal surface, and the massive form.

Hab. Port Jackson.

Distribution of species Red Sea (*Häckel*).

110. **Leuconia saccharata**, *Häckel.*

Leucandra saccharata, *Häckel, Kalkschwämme*, ii. p. 228, pl. xxxiii. fig. 3, pl. xxxviii. figs. 7–14.

A fine specimen, 60 millim. across, of the *Amphoriscus* type, and fragments. One cloacal fistula measures upwards of 30 millim. in length.

Hab. Port Jackson, 0–5 fms.

Distribution. Bass Straits (*Häckel*).

PART II.

COLLECTIONS FROM THE WESTERN INDIAN OCEAN.

BIRDS.

BY

R. BOWDLER SHARPE.

From the Amirante Group.

1. **Foudia madagascariensis** (*L.*).

Hartl. Vög. Madag. p. 212.

a. ♂ ad. Ile des Roches, Amirante group, March 1882. Iris dark; bill horn-colour; legs and feet reddish brown.

Identical with Madagascar specimens.

2. **Crithagra chrysopyga**, *Swains.*

Hartl. t. c. p. 418.

a. ♂. Ile des Roches, Amirante group, March 1882. Iris dark; bill horn-colour; legs and feet brown.

Doubtless introduced. It is a common African species.

3. **Francolinus ponticerianus** (*Gm.*).

Hartl. t. c. p. 282.

a. ♀. Eagle Island, Amirante group, March 17, 1882. Iris dark; bill horn-colour, black at tip; legs and feet red.

Also introduced.

SPONGIIDA.

BY

STUART O. RIDLEY.

The collections of Sponges made during the latter part of the 'Alert's' voyage, although not so important from the number of species or the interest attaching to the new forms as those made in Australian waters, constitute nevertheless, considering the extent to which these waters have been the subject of previous investigations (see Introduction to Melanesian Report, p. 371) and the somewhat less favourable circumstances under which Dr. Coppinger carried on his collecting, an invaluable contribution to our knowledge of the Spongiida of the Indian Ocean. On the latter point Dr. Coppinger, in a letter dated Sheerness, Sept. 11, 1882, says:—"The latter part of the 'Alert's' commission has been devoted to a hurried survey of the Amirante Islands and of two other small groups. . . . . The time at our disposal has been so short that we have had comparatively few opportunities of doing anything in the way of dredging. What little has been done in the localities has been accomplished from the ship itself, by laying out a dredge from the stern at every anchorage and giving it the benefit of the swing of the ship. At Seychelles, where we stopped to take in coals &c., we dredged several times from the boats: but at all the other stations our dredging-operations have been limited to the swing of the ship about her anchor. I mention this to account for the scantiness of the collection of dredged specimens from a region whose fauna is undoubtedly so rich. I have, however, had plenty of occupation for my spare time in exploring the beaches and reefs at times of low water, and have therefore been able to accumulate a good number of marine specimens from between tide-marks." In spite of difficulties, Dr. Coppinger sent 56 species belonging to this group, including 21 species not previously distinguished by naturalists. Many of the species are represented by fine series from various localities: and fortunately the genus *Carterispongia*, hitherto so imperfectly known, comes under this category, furnishing a most important contribution to the material available for the distinction of its species, and for the study of the interesting question of polymorphism of Sponges, so well illustrated by this genus.

Distribution.—This is perhaps the most important aspect under which this Collection is to be regarded. I have arranged the localities for convenience under five heads, viz.:—1. Mozambique Island (as

representing the African coast); 2. Glorioso Islands (as the most southern investigated member of the outlying groups of islands; 3. Providence Island and Reef, still further north; 4. Amirante Islands, a further northward step in the direction of (5) the Seychelles.

The physical relations of these different localities and their coasts are ably described in Dr. Coppinger's 'Cruise of the Alert'; I have added to my descriptions of the species notes as to localities and nature of bottom, taken from his own notes accompanying the specimens.

Depth.—It will be seen that the depths investigated did not exceed 24 fms.

Locality.—About half the gatherings are from a bottom composed either of sand, sand and coral, or broken coral; in but two cases (in the Amirante Islands) is mud recorded; the remaining localities are given either "beach," reef, or "between tide-marks." I know of no previous descriptions of Sponges from Mozambique or any part of the Eastern coast of Africa nearer than Zanzibar, whence A. Hyatt* derived many of the Ceratose species referred to in his paper "Revision of the North-American Poriferæ" &c. Prof. E. P. Wright has introduced us to the Sponges of the Seychelle Islands in a paper† on *Alemo seychellensis*, collected with many other species by himself many years since. The Glorioso and Amirante Islands and Providence Reef and Island are entirely new ground in this respect. Practically the only acquaintance we have hitherto had with the Sponge-fauna of this Western part of the Indian Ocean is derived from papers by Mr. Carter describing a few Silicea from Mauritius (especially in Ann. & Mag. Nat. Hist. 1879, iii. p. 284, five species), and one by Schuffner ('Jenaische Zeitschrift,' xi. p. 403, pls. xxiv.–xxvi.) describing 6 new Calcarea from Möbius's collections at Mauritius. Thus it may justly be claimed that in magnitude and interest the present collection far excels any collection hitherto described from these waters.

Looking generally at the distribution of the fifty-six species here described (see Table of Distribution, p. 586), and comparing it with that of the species obtained at or near the eastern confines of the same Ocean (this Report, Part I. p. 372), we find a similar resemblance to the Atlantic fauna (including the Mediterranean) in both areas: excluding doubtful cases we have here 7 out of 55 species as against 12 out of 106 species decidedly identical with Atlantic forms. We have the same number (3) of species recorded also from Ceylon. Some species (*Iotrochota purpurea*, *Clathria frondifera*) range to the Straits of Malacca, and hence, as we have seen above (p. 371), to Australia; two extend across into mid-Pacific (*Carterispongia otahitica*, *Stelletta acervus*). The almost cosmopolitan Australian species *Leucetta primigenia* and *Tedania digitata* are found here also.

Passing to the more direct relations of the Australian and Western

* Mem. Bost. Soc. ii. pt. 4, nos. ii. & v.

† Proc. R. Irish Academy, xxviii. p. 13, pl. i.

Indian Ocean shallow-water faunas, we find 16 out of the 56 species obtained in the latter region to be identical with Australian species, a proportion to the whole of 2 : 7, or 28 per. cent. It is still more remarkable to find that of these, three (viz. *Carterispongia otahitica*, *Iotrochota purpurea*, *Clathria frondifera*) occur abundantly in both places. Had Dr. Coppinger's researches enabled me to add more species to the list, I have little doubt that still greater proofs would have been forthcoming of a former communication between these two widely remote districts. As might almost have been expected, 14 of these identical species occur in *tropical* waters in Australia also (chiefly from Torres Straits or N. Queensland, but one third of the number from Port Darwin).

Of the mutual relations of the different localities in the district at present under notice I have little to say, as the investigation of them must be admitted not to be sufficient for a satisfactory comparison. In spite of its much more westerly longitude and of its separation from the other localities by much open sea and in part by that great body of land, the island of Madagascar, we find no decided differences between the fauna of Mozambique and that of the rest of the district; perhaps the Mozambique current partly accounts for this. On the other hand, we find that 7 out of the 13 species recorded from the Seychelles were not found in the other localities: probably this is partly due to the fact that here alone was dredging regularly carried out. The Amirante Islands have the greatest number of species (26).

Taxonomy.—Of the strictly taxonomical aspects of this part of the collection little has to be said which has not been already said in the Melanesian portion of this Report. I therefore refer those interested in the subject to that part of the Report for most questions relating to the general zoology of the Group and to the bearing of these collections on classification and morphology. The full descriptions of new species and genera which are represented also in the Melanesian collection will be found in the Report on that collection; they are not noticed at length in this place. This collection from the Western Indian Ocean is remarkable for the large proportion (31 per cent. of the whole) which the Ceratose sponges bear to the remaining groups: this is no doubt largely due to the number of "beach specimens" included in the collection, representing, as such specimens naturally would, most chiefly this less perishable order. This proportion probably more closely resembles that which would be obtained in the South-west of Australia than that found by the 'Alert' in the Eastern and Northern parts of that continent (which was about 18 per cent.); but the species are smaller than the generality of those which contribute so largely to the shore gatherings at Freemantle, West Australia.

No species of the order *Ceratosa* call for special notice here.

Of the *Monactinellid Silicea* none of the Families are strongly represented, the Renieridæ, with 7 species, being the most abundant, and yet maintaining only about the same proportion (15 per cent.) to the remainder of the Sponges as in the Melanesian collection.

Among Ectyonidæ, *Echinonema*, abundant in South and South-west Australia, but apparently wanting in the North and East, appears here. Of the *Tetractinellida* we have a fine new Geodine form (*Erylus cylindrigerus*), belonging, however, to a type found already in Australian and in European seas. *Calcarea* are relatively rather abundant, at any rate in individuals, and the new species *Leucortis anguinea* is of somewhat unusually large growth.

What strikes us in a survey of the species, both of this and the Melanesian collection, is, notwithstanding the large proportion of new specific types, the comparative scarcity of forms showing marked distinctive characters of generic importance which are not also found in the more familiar Atlantic fauna. It is true that *Carteriospongia*, *Phyllospongia*, *Ianthella*, *Toxochalina*, *Psammopemma*, *Echinodictyum*, and *Rhaphidophlus* have not yet been recorded from elsewhere than the Indo-Pacific area, and are probably most of them peculiar to it, but several of these are not distantly related to Atlantic forms; and within this wide Indo-Pacific region (of which, it must be admitted, the Eastern part is very imperfectly known) the number of districts exhibiting at all peculiar shallow-water sponge-faunas is small. Certainly the Western part of the Indian Ocean is not one of these, and may be considered in this respect, as well as geographically, as transitional between Australia, South-west Asia, and the Mediterranean.

	Western Indian Ocean.					Australia.							Other Localities.
	Mozambique.	Glorioso Islands.	Providence Island and Reef.	Amirante Islands.	Seychelles Islands.	Port Jackson.	North-eastern.	Torres Straits.	Arafura Sea.	Port Darwin.	Western.	Southern.	
Order CERATOSA.													
Family SPONGIIDÆ.													
1. Caeospongia cavernosa, *Schmidt*	.....	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	Adriatic; Algiers.
2. Hippospongia intestinalis, *Lamarck*, var.	.....	.....	*	*	.....	.....	.....	.....	.....	.....	.....	.....	Mediterranean.
3. —— simosa, *Pallas*.													
—— ——, var. mauritiana, *Hyatt*	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	Mauritius; Cuba.
—— ——, var. decidua, *Hyatt*	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	
4. Phyllospongia papyracea, *Esper*	*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Tranquebar.
5. —— madagascarensis, *Hyatt*	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	Madagascar.
—— ——, var. supraoculata, nov.	.....	.....	*	*									
6. Carterispongia otahitica, *Esper*	.....	*	....	*	*	.....	*	.....	.....	.....	.....	*?	Tahiti.
7. —— mantelli, *Bowerbank*	*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	South Seas.
8. —— pennatula, *Lamarck*	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	Mauritius, Zanzibar.
Family HIRCINIIDÆ.													
9. Hircinia fusca, *Carter*	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	Ceylon.
10. —— byssoides, *Lamarck*	.....	*	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	Southern Seas, or Australia.
11. ——, sp.	.....	.....	.....	.....	*	*	.....	*					

12. Dysidea conica, *Bowerbank*	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
13. —— gumminea, n. sp.	*	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	.....	Ceylon.
14. Oligoceras conulosum, n. sp.	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	
Family APLYSINIDÆ.													
15. Aplysina fusca, *Carter*	.....	.....	.....	.....	*	.....	.....	.....	.....	.....	*?	.....	Ceylon.
16. —— pallasi, n. sp.	.....	.....	*	*	.....	.....	.....	.....	.....	.....	.....	.....	
17. Ianthella flabelliformis, *Pallas*	.....	.....	*	.....	.....	.....	.....	.....	.....	*	.....	.....	
Order SILICEA.													
Suborder MONACTINELLIDA.													
Family GUMMINIDÆ.													
18. Chondrilla mixta (*Schulze?*)	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	Red Sea?
Family CHALINIDÆ.													
19. Chalina elongata (*Lamarck*, sp.)?	.....	.....	.....	*									
20. ——, sp.	.....	.....	.....	*									
21. Acervochalina finitima, *Schmidt*	.....	.....	.....	.....	.....	*	*	*	.....	.....	.....	.....	West Indies.
—— ——, var.	.....	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	
Family RENIERIDÆ.													
22. Reniera indistincta, *Bowerbank*	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	British Isles and Channel Islands.
—— ——, var.	.....	.....	.....	*	.....	.....	.....	*	.....	.....	.....	.....	
23. —— rosea, *Bowerbank*	.....	.....	.....	*	.....	.....	.....	.....	.....	.....	.....	.....	Ditto; Kerguelen.
24. —— camerata, n. sp.	.....	.....	.....	*	*								
25. —— cribriformis, n. sp.	.....	.....	.....	.....	*								
26. ——, sp. near crateriformis, *Carter*	.....	.....	*										
27. Pellina, sp.	.....	.....	.....	*	.....	.....	*	.....	.....	.....	.....	.....	Kurrachee; Mediterranean; Atlantic.
28. Tedania digitata, *Schmidt*	*	.....	.....	*	.....	.....	.....	*	.....	*	.....	.....	

Table (*continued*).

	Western Indian Ocean.					Australia.							Other Localities.
	Mozambique.	Glorioso Islands.	Providence Island and Reef.	Amirante Islands.	Seychelles Islands.	Port Jackson.	North-eastern.	Torres Straits.	Arafura Sea.	Port Darwin.	Western.	Southern.	
Family DESMACIDINIDÆ.													
29. Rhizochalina pellucida, n. sp.			*										
30. Desmacidon rimosa, n. sp.	*												
31. Iotrochota purpurea, *Bowerbank*				*			*	*					Straits of Malacca.
32. —— baculifera, n. sp.			*							*			
33. Esperia gelatinosa, n. sp.			*										
Family ECTYONIDÆ.													
34. Clathria frondifera, *Bowerbank*			*	*	*		*	*					Straits of Malacca; Gaspar Straits.
35. —— decumbens, n. sp.				*									
36. —— mæandrina, n. sp.				*									
37. Acarnus ternatus, n. sp.				*				*					Bombay?
38. Echinonema, sp.				*									
39. —— gracilis, n. sp.			*										
Family AXINELLIDÆ.													
40. Axinella spiculifera, *Lamarck*				*								*	
41. —— proliferans, n. sp.			*										
42. Leucophlœus proteus, n. sp.			*										
43. —— fenestratus, n. sp.									*	*			
—— ——, var.			*										

Family SUBERITIDÆ.														
44. Suberites, sp.					*									
45. Vioa schmidti, *Ridley*				*										Adriatic.
46. Spirastrella transitoria, n. sp.				*										
47. —— punctulata, n. sp.	*													Mauritius.
48. Tethya cliftoni, *Bowerbank*					*							*		
Suborder TETRACTINELLIDA.														
Family CHORISTIDÆ.														
49. Tetilla dactyloidea, *Carter*		*												S.E. Arabia.
50. Erylus cylindrigerus, n. sp.			*											
51. Stelletta acervus, *Bowerbank*				*										Fiji Islands.
52. —— purpurea, n. sp.									*	*	*			
—— ——, var. parvistella, nov.			*											
Order **CALCAREA.**														
Family LEUCONIDÆ.														
53. Leucetta primigenia, *Häckel*														Almost cosmopolitan.
—— ——, var. megalirrhaphis, *id.*					*									
54. Leucaltis bathybia, *Häckel*						*								Red Sea.
—— ——, var. mascarenica, nov.				*	*									
55. Leucortis anguinea, n. sp.			*											
56. Leuconia echinata, *Schuffner*				*										Mauritius.

CERATOSA.

This Order is well represented, viz. by 17 species (or 31 per cent.), as the tropical position of the localities would lead one to expect. *Carterispongia* is the dominant type, and probably more abundant here in species, and not less so in individuals, than in any other part of the world: the two aberrant *Hippospongiæ* described are also wonderfully abundant. A Mediterranean type, *Oligoceras*, is for the first time recorded from the Indo-Pacific area.

SPONGIIDÆ.

1. Cacospongia cavernosa.

Schmidt, Spong. Adr. Meer. p. 28; *F. E. Schulze, Zeitsch. wiss. Zool.* xxxii. p. 653, pls. xxxiv. fig. 11, pl. xxxv. fig. 17, pl. xxxvii. figs. 7, 13.

In spite of the remarkable geographical distribution which is involved by identifying the present specimens with a Mediterranean species, the identity seems to me fairly certain. The characters agree well with those given by Schmidt and with Schulze's figures. The conuli are 2–4 millim. high and about 5 millim. apart, in spirit: the colour in spirit is dark grey; the primary fibres measure ·18–·24 millim. in diameter. Vents numerous, 2–3 millim. in diameter, grouped at summits of the lobes formed by the sponge. Represented here by semi-repent masses growing between and over stones or rocks, and sending up cylindrical lobes 18–25 millim. in diameter, which tend to divide above and to attach foreign bodies to themselves. The skeleton shows an irregularly rectangular arrangement of the fibres similar to that figured by Schulze.

Hab. Seychelles Islands, 4–12 fms.

Distribution. Adriatic (*Schmidt* and *Schulze*); Algiers (*Schmidt*).

2. Hippospongia intestinalis, var. (Plate LIII. fig. D.)

Spongia intestinalis, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 434.
Spongelia velata, *Hyatt, Mem. Bost. Soc.* ii. p. 534, pl. xvii. fig. 8.

The tortuous perforated tubes are sometimes single, but sometimes form confused reticulate masses (see fig. D, Plate LIII.), which, when the soft tissues are dried on them, have a very different appearance, and as such have been described under the above separate name by Hyatt, whose figure well represents this state: their diameter varies from about 5 to 20 millim. The surface is covered in fresh specimens by a delicate diteliform network, as stated by Hyatt, and as found in our specimens; the sarcode in spirit is opaque pale brownish yellow. The species must be nearly related to *Hircinia clathrata*, Carter; but that species would seem to assume a decidedly vertical growth, whereas this has the appearance of being subrepent. Mr. Carter's description of that form speaks of sand-cored fibre as only occurring here and there, especially near the surface, whereas in *H. intestinalis* long straight primary fibres cored with foreign

bodies are constantly present, traversing the main mass of the skeleton; these fibres are, however, much less abundant than in the original specimen of Lamarck, and the wall of the sponge is thinner. Abundant.

Hab. Providence and Cerf Islands, Mascarenes, and Amirante group; beach to 24 fms.

Distribution. "Mediterranean" (*Lamarck*); Zanzibar (*Hyatt*).

3. Hippospongia sinuosa.

Spongia sinuosa, *Pallas, Elench. Zooph.* p. 394; *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 371.

?Spongia fenestrata, *Lamarck, tom. cit.* p. 374.

Spongia lapidescens, subspecies mauritiana, *Hyatt, Mem. Bost. Soc.* ii. p. 528.

Lamarck's and Pallas's *S. sinuosa* seem, by their descriptions, to be referable to a *Hippospongia* of which I describe two forms below. *S. fenestrata*, Lamarck, is probably a more sessile and incrusting form of the same species. The question of identity is beset with great difficulties, owing to the want of authentic specimens of the different species for reference. A specimen long contained in the National collection, and labelled *S. mæandriformis* or *mæandriniformis*, differs from the form described below as var. *mauritiana* mainly in its somewhat more slender fibre (·016–·045 millim. in thickness); but its history is unknown.

With regard to Pallas's description, I would remark (1) that the dry skeleton of our specimens is not tender ("tenera"), but hard and almost incompressible; (2) it attains a vertical thickness of 35 millim.; (3) the cavities meander and anastomose, and are not merely "oblongæ vel cotyloideæ"; (4) the colour is a fine amber-yellow; (5) in var. *mauritiana* the fibres are only approximately parallel and perpendicular, except at the very surface.

The term "surface nivellée" used by Lamarck in his description of *S. fenestrata* well expresses the appearance which the sponge has of having been *pared* smooth, as in the species *H. derasa* (see Part I., p. 382, of this Report).

It is easy to distinguish among the specimens two varieties, of which one apparently corresponds to the more typical form of Hyatt's subspecies, and may therefore stand under that name, viz.

Hippospongia sinuosa, var. mauritiana.

The general form of the sponge is that of a low, horizontally extended mass, apparently originally attached by one or more small points; it is about 35 millim. high, and throws out short subcylindrical, terminally-rounded lobes 25–35 millim. in diameter. Colour in macerated state bright amber-yellow. Diameter of the meandering canals of the skeleton 2·5 to 5 millim.

The skeleton consists of a strong horizontal system of long secondary fibres lying parallel to the surface, and of short stout, primary

fibres, meeting the surface at various angles, and projecting slightly above it, and of a system of crossing fibres connecting the two and forming approximately rectangular meshes, their direction being roughly vertical to one or other of the above systems. The mesh is very variable in diameter, viz. from ·07 to ·24 millim., the former chiefly at the surface. The diameter of the main fibre is ·028–·07 millim., not including the ditelous network of fibres of small diameter which often surrounds the bases of the large primary fibres. Colour of fibre pale amber-yellow; no foreign bodies imbedded in any part of the skeleton; the fibre is homogeneous in appearance, with the occasional exception of a faint granular axial line. Size of sponge, 80–95 millim. (3–3¾ inches) in greatest diameter.

Hab. African Island, Amirante group (gathered on beach).

Distribution. "Indian Ocean?" (*Pallas*); Indian Ocean (*Lamarck*); Mauritius (*Hyatt*).

Hippospongia sinuosa, *Pallas*, var. decidua, *Hyatt*.

The other variety of the species is very distinct in its external appearance, but on examination this is found to be due merely to modifications of the same structural arrangements as those of var. *mauritiana*. The surface is entirely broken up into small isolated tufts, or short meandrine ridges, flattened externally, about 1–2 millim. in diameter (the ridges of *mauritiana* being 3 or 4 millim. across), rising from a considerable depth, viz. 7–15 millim., and commencing below by very narrow bases, and not expanding until close to the surface. By the juxtaposition of these tall walls and tufts, a number of freely intercommunicating, very narrow (2 to 2·5 millim. wide) and deep channels are formed, very different in appearance from the subcylindrical and semi-tubular canals which represent them in var. *mauritiana*. The outward form of the sponge is essentially similar to that of the other variety, but the specimens are much larger; the largest, an example of incrusting growth about 30 millim. in average vertical thickness, measures 275 millim. (11 inches) in greatest diameter; some smaller specimens attain about twice the thickness. As in var. *mauritiana*, the tubular character of the channels of the skeleton is much more strongly marked on the lower surface, where (as observed by Hyatt) connecting laminæ of horny fibre frequently bridge over the spaces between the summits of the tufts and ridges. The colour of well-preserved skeletons is a rather pale amber-yellow; those which have suffered much washing on the beach are almost white.

The general arrangement of the skeleton is similar to that of the other variety; but the following important differences are to be noted:—(1) It is the primary and not the secondary fibres which are the most distinct elements of the deep skeleton; they form continuous, almost straight lines, ·4–·5 millim. apart, and are placed vertically to the surface. The primary fibres of the outer surface form a decided *pile* of short projecting points, being much more numerous than in var. *mauritiana*. (2) Owing to the

regularity and straightness of the primaries, the secondaries more constantly form right angles with them, and the meshes are more commonly rectangular. (3) The primary fibres are more or less constantly sand-cored; the core occupies about half the thickness of the fibre.

In the characters of the purely horny fibre and the size of the meshes *decidua* agrees with *mauritiana*; the diameter of the fibre varies from ·025 to ·063 millim. in the specimen examined (*i. e.* about the same range as in *mauritiana*).

Hab. African Island, Amirante group, from beach.

Distribution. Mauritius, Havana (*Hyatt*).

It is possible that the forms which I have called varieties should rank as distinct species; but until the arrangement of the soft parts is known I prefer to keep them under one specific heading. Younger specimens of var. *decidua* have shallower channels, and one has broader tufts and ridges than the rest, thus approaching var. *mauritiana*. The distinctness of the two forms, found at precisely the same spot, shows that the differences between them cannot be due to locality.

4. Phyllospongia papyracea.

Spongia papyracea, *Esper*, *Pflanzenth. Fortsetz.* ii. p. 38, pl. lxv., pl. lxv. A. figs. 1 & 2.

Phyllospongia papyracea, *Ehlers*, *Espersch. Spong.* p. 22 (? *Hyatt*, *Mem. Bost. Soc.* ii. p. 543, pl. xvii. fig. 31).

A dry specimen, 195 millim. (7¾ inches) high by 155 millim. (6½ in.) in greatest lateral extent. It is proliferous, a single base giving rise to the main frond, which is irregularly flabelliform, and to a few smaller strip-like fronds, some of which unite with each other by their edges at a short distance above the base; main frond also proliferating by giving off at or near its margin, and in one instance from the face, a few small secondary fronds similar in character to the smaller fronds which arise from the base. Vents few, near margin on both front and back of large fronds, diameter 1 millim. Primary fibres ·035–·053 millim. in diameter; secondary fibres about ·035 millim. thick; both devoid of foreign bodies. Some minute intermediate fibres or dense strands of sarcode are also present. Meshes of main skeleton about ·15 millim. wide, of dermal skeleton ·18–·28 millim. A few scattered foreign bodies in the dermal fibres. In other respects it agrees with Esper's figure, and his and Ehlers's descriptions. The latter writer says of the fibres of the Esperian specimens that they are "homogeneous," which may fairly be taken to imply that, as in this specimen, they contain no extraneous matter. Hyatt, however, assigns to this species specimens (from the Cape of Good Hope) which, from his description, I understand to contain a large amount of foreign material in the primary fibres.

Hab. Mozambique.

Distribution. Tranquebar (*Esper*).

5. Phyllospongia madagascarensis.

Carteriospongia madagascarensis, *Hyatt*, *Mem. Bost. Soc.* ii. p. 542.

Extremely variable in external form, viz. from single flexible cylindrical stems about 2 millim. in diameter to palmate fronds arising from similar stems, forming large compound growths; the cylindrical form also occurs compound; the same colony may show transitions from the cylindrical to the palmate type. A spirit-specimen of the cylindrical form has a pale brownish-yellow colour, and its surface is seen under the lens to be very minutely hispid with the projecting ends of the primary fibres. The primary fibres are mostly somewhat, though slightly, sand-cored near the surface (much less than in *C. pennatula*); they measure about ·04 millim. in diameter, the secondaries somewhat less; fibres very pale yellow in spirit-specimens, colourless in dry skeletons. Surface-texture much finer than in *C. pennatula*; surface never broken up into the ridges and grooves which distinguish macerated specimens of that species. Vents slightly projecting, and sparsely distributed up and down the cylindrical axes; abundant, not projecting, on one side of the palmate fronds, diameter about ·7 millim. Consistence in all cases very soft and flexible in the macerated state. Owing to the unbroken character of the surface, this species is best placed under *Phyllospongia*. I am indebted to Dr. Poléjaeff for pointing out the importance of this character in *Phyllospongia*.

Hab. Amirante Islands, beach and 17 fms.

Distribution. Madagascar (*Hyatt*).

Phyllospongia madagascarensis, var. supraoculata, nov.

(Plate LIII. figs. M, M'.)

Some specimens of firm texture, not readily compressible, with very smooth dense surface; form simple palmate, much and deeply divided or multicaulate; sometimes partly cylindrical. Vents very small, viz. about ·4 millim. in diameter, on one side of the frond and also on its free margin. Meshes of skeleton very close (*i. e.* primaries only ·1 millim. apart at surface); sand-cores of primary fibres extending a very short distance below the surface. Colour, in dry state (well preserved specimens), cream to pure white.

Several small specimens, the greatest height and lateral expansion being about 70 millim. (2¾ inches).

Hab. Providence Island, Mascarene group: African Island, Amirante group, beach.

CARTERISPONGIA.

Carteriospongia, *Hyatt*, *Mem. Bost. Soc.* ii. p. 540.
Mauricea, *Carter*, *Ann. & Mag. N. H.* 1877, xx. p. 174.

Curiously enough, these two generic terms were published within four months of each other (*Carteriospongia*, May, *Mauricea*, September, 1877). As, however, the former, besides having this slight

priority, is accompanied by a diagnosis, while the characters of the latter are merely hinted at, I believe the right course is to adopt the former.

6. Carterispongia otahitica.

Spongia otahitica, *Esper, Pflanzenth. Fortsetz.* i. p. 209, pl. lxi. figs. 7, 8.

A flabelliform and two cup-shaped, internally proliferating specimens. The former exhibits signs of incipient formation of a cup, and thus shows Esper to have been right in uniting the two outwardly different forms under one head. Two simple cup-shaped specimens and an irregularly grown proliferating flabelliform one also occur.

Hab. Glorioso Islands, beach and between tide-marks; Amirante Islands, beach; Seychelle Islands, 7 fms.

Distribution. See Part I. of this Report, p. 386.

7. Carterispongia mantelli.

Halispongia mantelli, *Bowerbank, P. Z. S.* 1874, p. 303, pl. xlvii. figs. 3, 4.

A small but deep regularly cup-shaped specimen, gross height 45 millim., that of cup 35 millim., diameter of cup at margin 32 millim. The outside is marked by faint longitudinal ridges; on the inner surface the vents, about ·5 millim. in diameter, are arranged in approximately concentric series round the cup, at intervals of 3–4 millim. Bowerbank's description of the vents is unsatisfactory.

The skeleton contains much less sand than Bowerbank's specimen, but agrees with it in the general characters of the skeleton, the differences being to some extent due to age. As stated in the Report on the Australian collections, this species agrees essentially with the characters of *Carterispongia*. The colour (in spirit) is greyish brown outside, dirty white inside.

Hab. Mozambique, between tide-marks.

Distribution. "South Seas" (*Bowerbank*).

8. Carterispongia pennatula.

Spongia pennatula, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 440.

Carteriospongia radiata, *Hyatt* (typical form and var. *complexa*), *Mem. Bost. Soc.* ii. pp. 541, 542.

Mauricea lacinulosa, *Carter, Ann. & Mag. N. H.* 1877, xx. p. 174.

This species varies in outward form from contort flabellate, with single thick stem, to compound, multicaulate, anastomosing, with thin stems, the terminal fronds narrower or broader flabelliform. In much-washed specimens the surface has an eroded appearance, from the exposure of the ramifications of the canal-system, and such specimens are usually of a pale brownish-yellow colour; when the sarcode is preserved, the surface of dry specimens is white, and

appears as if covered by a dense fine incrustation: the vents are small, ·5 to 1 millim. across, placed on both sides of the fronds. The primary fibres are strongly sand-cored for some distance below the surface, but little or no sand occurs in the centre of the frond. Var. *complexa* of Hyatt seems to be founded on fresh specimens, whereas his typical form seems to have suffered from abrasion.

Hab. Glorioso Islands, beach.

Distribution. Australian seas (*Lamarck*); Mauritius (*Carter*); Zanzibar (*Hyatt*).

Obs. I have had the advantage of being able to examine original specimens of Carter and Lamarck while making my identification.

HIRCINIIDÆ.

9. Hircinia fusca.

Carter, Ann. & Mag. N. H. 1880, vi. p. 36.

Branched cylindrical solid stems, 8 millim. in mean diameter, becoming somewhat dilated at the ends; conuli of skeleton only about 1 millim. high. Central core of foreign bodies in primary and secondary fibres not large, and sometimes absent here and there; fibres also coated in places with foreign bodies; diameter of primaries about ·18 millim., of secondaries ·1 millim. Mr. Carter's description is extremely short, but seems to be sufficient for the purpose of the present identification. A skeleton occurs in the present collection.

Hab. Boudeuse Island, Amirante group, 10 fms.

Distribution. Ceylon (*Carter*).

10. Hircinia byssoides.

Spongia byssoides, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 375.

Some small horizontally-spreading sessile specimens, about 4 millim. in thickness and 30–40 millim. in greatest diameter. Texture in spirit, with sarcode attached, harsh, firm. Primary fibres cored at intervals with small core of foreign bodies, about ·07 to ·1 millim. wide: all fibres strongly laminate, of light to dark amber-yellow colour. Diameter of primary fibres ·1 to ·24 millim., of secondaries ·1 to ·14 millim. There is also an intermediate system of narrow uncored fibres, ·035 to ·05 millim. wide. Colour (in spirit) black. Conuli about 1 millim. high, 2 millim. apart.

This species agrees fairly well with Lamarck's species, of which I have examined a specimen, but the fibre is decidedly stouter. The form is rather that of his var. *β*, which is described in the words "massis planulatis"; the original specimen of this in the Paris Museum is firm and harsh to the touch, like the present specimen.

Hab. Glorioso Islands, Seychelle Islands, 7–12 fms.

Distribution. Southern Seas or Australia (*Lamarck*).

11. Hircinia, sp.

The same species as the unnamed *Hircinia* mentioned in Part I. of this Report, p. 387.

A flattened specimen. The secondary fibres are somewhat stouter and darker in colour than in the Australian specimen, and the primaries contain less sand.

Hab. Seychelle Islands, 4–12 fms.

Distribution. See Part I. of this Report, p. 387.

DYSIDEIDÆ.

Dysidea has a remarkably wide range in latitude, its localities including (among others) Iceland and England in the North Atlantic, the West Indies in the tropical Atlantic, the Cape and South Australia in the Southern Ocean, the Western Indian Ocean and the North of Australia in the tropical parts of the Indo-Pacific area. While, on the other hand, it is abundant in *individuals* in temperate waters (as is the case on the British coasts), it appears to be more prolific in *species* in subtropical and tropical waters (Mediterranean and Indian Ocean). Two species occur in the district at present under notice, and four others were obtained by the 'Alert' off the Australian coast. The other genera appear to be much more limited in range: *Psammopemma*, Marshall, was but once obtained by the 'Alert' (viz. in Torres Straits). *Psammoclema* and *Psammascus*, id., have not been recognized in any of the 'Alert' collections.

12. Dysidea conica.

Bowerbank, P. Z. S. 1873, p. 26, pl. vi. fig. 1.

To this species, so fully described by Bowerbank, I assign a fragmentary Dysideid closely resembling the top of the specimen figured by him, also some skeletons. Although the mesoderm contains abundant foreign bodies, the species does not fall into either of the genera *Psammascus* and *Psammoclema*, which Marshall has formed for Dysideidæ exhibiting this character, as it has neither the tubular form of the one nor the smooth surface of the other, but agrees with *Dysidea* in its well-developed conuli. The dermis is dark to the naked eye, but is transparent under the microscope. It is infested by a *Spongiophaga* (Carter), of large size, the head measuring about ·012 and the filament about ·009 millim. in diameter.

Hab. Glorioso Islands, 7–10 fms.

Distribution. N.W. Ceylon, 8 fms. (*Bowerbank*).

13. Dysidea gumminea. (Plate LIII. fig. C.)

? Dysidea kirki, pars, *Carter, Ann. & Mag. N. H.* 1881, vii. p. 374, nec *Bowerbank*.

A species bearing a close external resemblance to *D. conica*,

Bowerbank, but differing in its very dense and opaque dermis, and the strictly Dysidean distribution of its foreign bodies, viz. only in the skeleton-fibres. The primary fibres are either single or multiple in the same conulus, and range from about ·07 to ·36 millim. in diameter. The sponge forms low, longitudinally-extended masses, about 50 millim. (2 inches) in greatest length, 12 millim. in greatest vertical thickness, throwing out rounded lobes which are 15 millim. in greatest diameter. Vents round, few, placed near ends of lobes, 1 to 2·5 millim. in diameter. Texture in spirit rather elastic, compressible. Conuli sharp-pointed, usually connected by radiating ridges with each other; height ·75 to 1 millim., distance apart 1–2 millim. Dermal membrane very dark grey, glabrous. Primary fibres, as such, apparently existing only in the conuli, and not extending beneath them into the mass of the sponge; secondary fibres also very slightly developed, except in the ridges connecting the conuli, where they form a dense network of horizontal fibres, extending to a depth of about 1 millim. below the surface. Skeleton-fibres ·05 to ·18 millim. thick; generally compact in structure, exhibiting no horny substance to view.

Hab. Mozambique, between tide-marks (on back of crab); Providence Island, Mascarene group, 19 fms. (on rock).

Carter's species *D. kirki*, from Mauritius, South Australia, and the Cape of Good Hope, above cited, may possibly include this; but as from his description and specimens it is evident that he groups more than one species together, and as the present form is decidedly distinct from Bowerbank's *D. kirki* (from the far smaller diameter of the largest skeleton-fibres), it is not necessary to pursue the question further. The very tough and opaque dermal layer and the remarkable development of the secondary or horizontal fibre-system, which assists in producing it, distinguish this *Dysidea* from all intelligibly described species. *Spongelia elegans*, Nardo, as described by F. E. Schulze, appears to approach it in the fasciculated arrangement of the primary fibres, the proportions of the conuli, and the general shape, but differs in its pale colour and in having the secondary fibres more or less free from sand.

OLIGOCERAS.

Schulze, Zeitsch. wiss. Zool. xxxiii. p. 34.

This genus, introduced (and rightly, as it seems to me) by Marshall into this family, is based on a species from the Adriatic, remarkable for a habit of attaching to itself foreign bodies of some size. Prof. Schulze has expressed to me verbally a doubt as to whether the genus will prove to have been rightly established. If, however, this is due to the supposition that *Oligoceras* is a young stage of a horny sponge, I think it may be set aside* by a consi-

* Since writing the above, I have been assured by Dr. Polejaeff, whose Report on the 'Challenger' Ceratosa is in the press, that he has found the skeleton of

deration of the large size of a specimen from Mauritius (probably from deep water) in the National collection: this measures 170 by 100 millim. in greatest length and breadth; the primary fibres project strongly from the paper-like dermis, and the conuli are 5–10 millim. apart; the fibre shows just the branching arrangement described in *O. collectrix*. The species now to be described agrees remarkably in general characters with the same species, and is also sufficiently large to be called adult.

14. Oligoceras conulosum.

Incrusting, strongly flattened from above downwards, forming a leathery crust, but occasionally throwing out flattened, pointed, free lobes from lateral margin; strongly hirsute above with the very prominent, slender, and pointed conuli, 1–2 millim. high, 2–4 millim. apart at tips; terminated by the single or (more rarely) multiple ends of primary fibres, which stand out about 1 millim. beyond the dermis. Surface between ends of conuli forming a series of slightly concave spaces (in spirit), smooth, glabrous, of leathery appearance. Colour in spirit dull putty-colour to pale grey; consistence (when occupied by *Spongiophaga*) flexible, tough. Main skeleton—primary fibre occasionally branched at apex, about ·17 to ·27 millim. in diameter; axis composed of closely packed foreign bodies, occupying from $\frac{3}{5}$ to $\frac{8}{10}$ of the entire diameter: secondary fibres apparently absent. Dermal skeleton composed of irregularly arranged fibres, chiefly straight and parallel to each other, varying in composition from an almost entirely horny to an almost entirely sandy state; diameter about ·14 to ·35 millim., meshes about ·35 millim. wide; a small quantity of free foreign bodies is to be found interspersed in the intervals between the fibres. Tissues between fibres of main skeleton also containing a considerable proportion (about one fourth) of free, small, foreign bodies. Horny matter of fibre normally pale amber-yellow, transparent. Parenchyma very pale brown, transparent.

Hab. Glorioso Islands, 7–10 fms.; bottom, sand and coral.

A single specimen in spirit, 60 millim. in extreme diameter at base, 8 millim. in greatest thickness of the same; the lateral lobe (which seems to have been decumbent) is 30 millim. high, 14 by 4 millim. in basal diameter. Tissues infested by a *Spongiophaga* (Carter)—head oval or subpyriform, long diameter ·095 to ·013 millim., short diameter ·006 to ·0095 millim.; filament, diameter ·004 to ·005 millim.—which has partly destroyed the horny matter of the fibre, and forms sheets in the mesoderm.

The apparent total absence of secondary fibres is perhaps due to youth or the ravages of the parasite: the arrangement of the skeleton is that ascribed by F. E. Schulze to *Oligoceras collectrix*, Schulze, from

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Oligoceras to possess in parts the ordinary reticulate arrangement found in *Cacospongia*, &c. This observation seriously militates against its generic distinctness.

the Adriatic. The conuli are more prominent and distant than in that species, and the proportion of horny matter in the fibre is considerably greater.

APLYSINIDÆ.

Although Pallas and Lamarck cite *Ianthella flabelliformis* as from the Indian Ocean, I am not aware that the genus has been hitherto shown to occur on the western side of that ocean.

15. Aplysina fusca.

Carter, Ann. & Mag. N. H. 1880, vi. p. 36.

A spirit-specimen, agreeing in its more slender fibre (maximum diameter about ·7 millim.), especially near the surface, and in its smaller interconular spaces with the Ceylon specimen rather than with that from S.W. Australia, subsequently assigned to the same species by Carter (Ann. & Mag. N. H. 1881, viii. p. 107), which I have seen. In this spirit-specimen the cells which are so numerously congregated in the surface-membrane are not colourless, as in the dry specimen from Australia, but are very granular and of brownish colour: they measure ·008 millim. in average diameter, whereas those of the Australian specimen measure about ·013 millim. Having regard to these differences, it seems to me not unlikely that the latter specimen is specifically distinct. If the expression "hollow" of Mr. Carter's original description denotes fistulose, the present specimen differs from the Ceylon form in being solid (with the exception of the usual spaces between the fibres).

Hab. Seychelle Islands, 12 fms.

Distribution. Ceylon, S.W. Australia? (*Carter*).

16. Aplysina pallasi.

? Spongia membranosa, pars, *Pallas, Elench. Zooph.* p. 398.

Columnar masses, generally less than an inch in diameter at their broadest part, and tending to bifurcate early and at acute angles into secondary lobes of a diameter inferior to that of the main body of the sponge: the ends of the conuli are only about 5 millim. apart, except near the ends of the lobes, where they approach each other more closely; a single or bifurcate purple-black fibre projects about 1 millim. from the end of almost every conulus, replacing the blunt compound fibrillated mass which is characteristic of this part in *A. membranosa* (see Carter, also Part I. of this Report). Vents oval, 2–4 millim. in diameter, few, at sides of terminal lobes. Consistence elastic, very compressible.

The skeleton-fibre is much branched and anastomoses frequently, and ranges in diameter from about ·9 millim. in main fibres to as little as ·1 millim. in some subdermal twigs; those which terminate the conuli are about ·3 millim. in average diameter; the main direction is upwards and outwards; the fibre is firm, compact, tough;

its wall about ·05 millim. thick, of a fine transparent purple colour, and is composed of a transparent matrix containing closely packed subglobular transparent cells ·008 to ·013 millim. in diameter, provided with small opaque refringent nuclei: the laminæ composing the wall of the fibre are readily separated. The dermal membrane is not, as in *A. membranosa*, traversed by raised thickenings which radiate from the tips of the conuli, but is externally homogeneous and subtransparent: it is pale purple in colour and quite thin: under the microscope it is subtransparent, granular and speckled in parts with the less transparent and darker purple nuclei or condensed pigment-masses, about ·005 millim. in diameter, which occupy the centres of large cells.

Hab. Marie Louise Island, Amirante group, 16 and 17 fms.: Providence Island, Mascarene group, 19 fms.

The species appears to be most nearly related to *A. carnosa*, Schmidt (Spong. Adr. Meer. p. 26, pl. iii. fig. 3), from the Adriatic, and *A. cauliformis*, Carter (Ann. & Mag. N. H. 1882, ix. p. 270), from the West Indies; but differs from the former in its far more loosely reticulate skeleton, and from the latter in not having the surface nearly even. It is perhaps identical with the *elongated* specimens described by Pallas (*l. c.*) under *Spongia membranosa*. It differs superficially from the typical form of that species in the closer approximation of the conuli, the more slender habit of the sponge, the smoothness of the dermal membrane, in its minute structure, and in the simple, not compound, character of the skeleton-fibre.

The larger specimens are slightly compressed laterally, and both measure about 60 millim. ($2\frac{1}{3}$ inches) in height; four spirit-specimens form the series.

17. Ianthella flabelliformis.

Spongia flabelliformis, *Pallas, Elench. Zooph.* p. 380.

A macerated fragment agreeing in outward form, so far as it goes, and in the proportions and character of its fibre with the above species. The places in the fibres originally occupied by the purple cells are chiefly represented by vacant spaces, giving a honeycombed appearance to the skeleton-fibre in some parts.

Hab. Providence Reef, Mascarene Islands, 24 fms.

Distribution. See Part I., p. 392, of this Report.

SILICEA.

MONACTINELLIDA.

The great abundance of Ceratosa has for its complement a corresponding comparative scarcity of Monactinellid Silicea: this deficiency is largely accounted for by the few Ectyonidæ collected here as compared with the Northern Australian waters.

GUMMINIDÆ.

Gummineæ, *Schmidt, Spong. Küst. Alg.* p. 1.
Gumminida, *Carter, Ann. & Mag. N. H.* 1881, viii. p. 248.

I retain this group provisionally at the commencement of the Silicea, but believe it will ultimately have to be placed near the Tetractinellida.

18. Chondrilla mixta.

? Chondrilla mixta, *Schulze, Zeitsch. wiss. Zool.* xxix. p. 116.

Prof. Schulze's description of his species is scarcely sufficient for me to determine its relations to the present specimen, as he does not mention the size and exact form of the spicules. It agrees with the present form in having two kinds of spicules, stellates and globostellates, in having a fibrous outer layer about 1 millim. thick, and in the distribution of the spicules in the substance. On the other hand the sections of this (very young) specimen exhibit but scanty traces of the system of subcortical canals which appears to be so well developed in the Red-Sea species, and the colour (in spirit) is pale brown or buff rather than "pale grey, speckled with brown." The stellate spicules have rather coarse rays which often bifurcate, as in *C. australiensis*, Carter; they measure ·025 millim. in diameter, the globostellates ·032 millim. Having regard to the nearness of the two localities, and to the points of positive agreement between the present specimen and Schulze's species, I am disposed to consider them to be identical. The present specimen differs from *C. australiensis* in the relatively longer and more slender arms of the stellate (*radiostellate* of Carter), the greater abundance of the spicules in the subcortical tissues, and the larger size of both spicules (in *C. australiensis* the globostellate measures ·025, the stellate about ·02 millim.).

A very small specimen, about 5 millim. across, on a Nullipore which has been partly overgrown by a repent *Chalina*.

Hab. Marie Louise Island, Amiranto group, 16–17 fms.

Distribution. Red Sea (*Schulze*)?

CHALINIDÆ.

The percentage of species of Chalinidæ in this collection is small for the Tropics, viz. less than 8 per cent., that of the Chalinidæ in the Australian collections being 15 per cent. This inferiority in numbers is due in part to the absence of the tubular forms, which are represented by *Tuba*, *Siphonochalina*, and *Tubulodigitus* near Australia, and chiefly by *Tuba* in the West Indies. As, however, *Siphonochalina* occurs both at the Cape (*Ehlers*) and the Red Sea (*British-Museum collection*), it probably will be ultimately found also in the intervening district. If the wide-mouthed genus *Tuba* is really absent here, the circumstance is of considerable importance, as it seems to be represented abundantly in the tropical parts of both sides of the American continent and in the Malay archi-

pelago, but it has not yet, so far as I am aware, been recognized on either coast of Africa.

19. Chalina elongata.

? Spongia elongata, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 451.
? Spongia lanuginosa, *Esper, Pflanzenth.* ii. p. 243, pl. xxiv.

An erect *Chalina*, with short common stem and somewhat tortuous branches, few, tapering to sharp points, uneven in diameter and shape, ranging from 2 (at the tips) to 8 millim. in thickness, cylindrical or compressed, simple, or bearing a short incipient or stunted branchlet here and there. Length of branches 20–55 millim. Common stem 25 millim. long, compressed, greatest diameter 11 millim. Vents? (perhaps ·6 to 1 millim. in diameter, few). Mode of branching dichotomous, branches given off at angles of about 50°. Surface rendered minutely pilose by the projecting ends of the primary fibres. Consistence in spirit very soft, compressible, elastic (like that of the finest Turkey sponge); colour very pale brown (almost white). Main skeleton rectangular in arrangement; primary fibres ·35–·7 millim. apart, ·035–·043 millim. in diameter, containing 3–5 series of spicules, with a narrow horny margin visible; secondaries ·024 millim. thick, with 1 (rarely 2) series of spicules, the fibres at intervals of ·18 to ·35 millim. Dermal skeleton as main skeleton, but primary fibres only about ·14 to ·28 millim. apart. Skeleton-fibre pale yellow. Sarcode transparent, almost colourless. Spicule smooth, acerate, straight, tapering from one or two diameters from ends to moderately sharp points: size ·13 by ·0057 millim.

Hab. Darros Island, Amirante group, 22 fms.; bottom, broken coral.

Two specimens, one 80 millim. (3⅛ inches) high, the other quite low, their bases growing among some branching Polyzoa. The species agrees with Lamarck's description of his *S. elongata* so far as it goes, but it is too short to be decisive; he gives "Mers Australes" as its locality. Esper's figure (*l. c.*) strongly resembles it in colour and in the shape of the branches, but his specimen was from Brittany. Possibly some of the specimens from other localities, which he mentions as belonging to his species, may be identical with the present.

20. Chalina, sp.

A small specimen of a tender repent species, the horny matter of the fibres being small in quantity and very pale and transparent. Colour in spirit a fine nut-brown: consistency soft and very yielding. Surface even, rendered minutely pilose by the ends of the primary fibres. Branches rather tortuous, subcylindrical, compressed here and there; greatest diameter (where not affected by accidents of growth) 2–6 millim.; stem similar, diameter about 2·5 millim. Vents orbicular, ·5 to 1·5 millim. in diameter, arranged in a series on one side of sponge, at intervals of about 5 millim. Main

skeleton—primary fibres vertical to surface, about a spicule's length apart, containing 3 to 5 series of spicules; secondaries at various angles to primaries, spicules 1- or 2-serial. Sarcode rich brown, subtransparent. Spicules acerate, slightly curved, tapering to sharp points from about 3 diameters from ends; size ·17 by ·0085 millim. It branches once at an angle of about 35°, its total length is 50 millim. (2 inches), and it has involved a mass of *Polytrema*, Nullipore, &c., in its course; the Nullipore bears the specimen which I have provisionally assigned to *Chondrilla mixta*, Schulze.

In the character of the skeleton and the size of the spicules this species resembles the British species *Isodictya simulans*, Bowerbank, and *Chalina montagui*, Johnston; but it has not the firm texture of the former, nor the tubular form of the latter, and I have not found any more nearly allied species. In spite of its repent growth I have assigned it to *Chalina* rather than to *Cladochalina*, the proportions of the spicules and the character of the fibre agreeing with those of typical *Chalinæ* (*Chalinula* of Schmidt), and being in my view far superior as diagnostic characters to those taken only from the external habit.

Hab. Marie Louise Island, Amirante group, 16–17 fms.

ACERVOCHALINA, gen. n.

See Part I., p. 398, of this Report.

21. Acervochalina finitima, var.

Chalina finitima, *Schmidt, Spong. Atl. Geb.* p. 33.

As on the North-Australian margin of the Indian Ocean, so also in its North-western angle this otherwise West-Indian* species seems at home. Two specimens (the one 25 millim., the other 40 millim. in extreme diameter) show the essential characters of the species; the vents, however, unlike those of the Australian specimens, are placed on the margins rather than the upper surface of the sponge, and the spicules are slightly thicker than in both the Australian and W.-Indian forms, viz. ·003 millim. as against ·0018 in the one and ·0025 in the other.

Hab. Seychelle Islands, 4–12 fms.

Distribution. See Part I., p. 399, of this Report.

RENIERIDÆ.

Besides the probably almost cosmopolitan species *Tedania digitata*, I find that several of the representatives of this generalized Family type have quite a European *facies*, and I have identified two of them (*Reniera indistincta* and *rosea*) with British species; but two members of the same genus, now described for the first time, possess external characters of a definiteness and singularity unusual

* Also British, if *Chalina limbata*, Bowerbank, is identified with it.

in their genus and family. A fifth species, assigned also to *Reniera*, has affinities which find expression elsewhere, so far as my knowledge extends, only in Indo-Pacific waters.

22. Reniera indistincta, var.

Isodictya indistincta, *Bowerbank, Mon. Brit. Spong.* ii. p. 290, &c.

A specimen almost identical in form and size with that described above from the Australian collections (from Torres Straits) under this title: it has, however, a superficial rich umber-brown coloration, produced by a sarcode darker than that of the same parts in the Australian specimen, the external colour of which is grey. The dermal skeleton-fibres are also constantly, and not merely occasionally, biserially spiculate, and the spicules measure ·19 by ·008 millim., instead of ·16 by ·0063 millim. The occurrence of this form on the western side of the Indian Ocean, together with the dark coloration (resembling that of the British specimen), are confirmatory of its identity with a British species.

Hab. Darros Island, Amirante group, 22 fms.

Distribution. See Part I., p. 407, of this Report.

23. Reniera rosea.

Isodictya rosea, *Bowerbank, Mon. Brit. Spong.* ii. p. 282, iii. pl. xlix. figs. 12–14.

Some small, sublobate, apparently subsessile, soft pale brown specimens. Skeleton-fibre formed of uniserially (rarely biserially) arranged spicules; the rectangular arrangement is rather obscure. Spicules curved, acerate, tapering to fine points from about 4 diameters from ends; size ·16 by ·006 millim. Vents about 1·5 millim. in diameter, placed at extremities of lobes. The agreement with the British specimens is comparatively close: the spicule in the type specimen, which I have examined, is slightly shorter; as depicted by Bowerbank, the spicule is made too stout.

Hab. Marie Louise Island, Amirante group, 16 and 17 fms.

Distribution. Tenby, Sark (*Bowerbank*); Kerguelen Island (*Carter*).

24. Reniera camerata*. (Plate LIII. figs. H, H'; Plate LIV. fig. *a*.)

Sponge generally subcylindrical or subconical, perforated above by large irregular openings; formed of thin compact lamellæ 1–2 millim. thick, thinning off into knife-like edges, and much folded and anastomosing with each other within the sponge, so as to form a labyrinthine system of passages, 3–5 millim. in diameter, chiefly more or less vertical in their direction. Outer surface of sponge smooth, gently undulating; inner surface of passages very minutely pitted by the openings of the excretory canals.

Consistency of sponge-wall, in spirit, very flexible and compres-

* From *camera*, a chamber, in allusion to the *chambered* interior.

sible, readily torn. Colour pale brown; general appearance that of soft leather. Main skeleton composed of multispicular secondary tracts of loosely aggregated spicules, 8- to 15-serial, placed parallel to the surface at intervals of ·2 to ·3 millim., and of primary lines represented by groups of 4 to 10 spicules crossing the intervals of the secondaries, ladder-like, at intervals of about ·3 millim., the spicules composing these groups being so loosely associated as often hardly to be in contact: they turn to one side at the points at which they come into contact with the secondaries, thus rounding off the angles of the otherwise rectangular spaces of the meshwork. Dermal skeleton formed by the outward projection of slender primary tufts of spicules, 2 to 4 spicules broad. Sarcode pale brownish yellow, subtransparent. Spicules smooth acerate, slightly curved, tapering to sharp points from 2 or 3 diameters from ends; size ·18 by ·007 millim.

Hab. Seychelle Islands, 2 fms.; Marie Louise Island, Amirante group, 16–17 fms.; bottom coral.

This species, by its polyspicular fibre and compact structure, differs from most species of *Reniera*. Indeed the former character would appear to ally it to *Schmidtia*; but it is remarkable that, probably in connexion with the thinness of the wall and consequent need of resistance to lateral pressure, it is the secondary, and not the primary, fibres which are the stoutest; possibly it is to the exigencies entailed by the peculiar external form that the whole of the internal peculiarities are due. The largest of the specimens, which are somewhat fragmentary, measures 30 millim. high by 18 millim. in extreme breadth.

25. **Reniera cribriformis.** (Plate LIII. fig. G; Plate LIV. fig. *o*.)

Some fragments in spirit of a hollow cushion-shaped sponge seem worthy of a description, as it has characters by which it may be recognized. The wall is ·5 to 3 millim. thick, compact, folded back at the margin so as to enclose a space below the surface. Surface very even and glabrous, perforated at intervals of 1–5 millim. by circular vents, ·5 to 2·5 millim. in diameter. Consistence elastic, rather firm; colour pale dull brown. Primary fibres of main skeleton about ·18 millim. apart, vertical to surface, spicules 2–3-serial; secondary fibre represented by separate spicules, traversing at various angles the spaces between the primaries. Dermal skeleton a close meshwork of irregularly disposed single spicules, not united to form fibres. Sarcode transparent, almost colourless. Spicule smooth, subcylindrical acerate, very slightly curved, tapering from near centre to points of various degrees of bluntness; size ·2 by ·007 millim.

Hab. Seychelle Islands, 12 fms.; bottom coral.

This species seems to approach *R. testudinaria*, Lamarck (see Australian Report), in the tendency of its spicules to assume the cylindrical form.

Carter's "*Reniera*, dark brown" from the Gulf of Manaar (Ann. & Mag. N. H. 1880, vi. p. 48), differs decidedly from this in its

colour, and its cylindrical spicule is curved and apparently stouter than that of this species.

26. Reniera, sens. lat., allied to crateriformis, *Carter*.
(Plate LIV. fig. *i*.)

Some small dark-brown fragments of a species belonging to the group Crassa (Renieridæ), Carter, to which the preceding species is related, and which is probably connected with *Schmidtia*. The spicules are smooth, slightly curved, subcylindrical, tapering somewhat to the well-rounded ends; size ·48 by ·028 millim. Arrangement of skeleton as in *Schmidtia*, viz. massive fibre forming rounded meshes (except near the surface). Species of this character are especially abundant in the Malay Archipelago, whence *R. crateriformis* is obtained. Not knowing the external form of the sponge, I content myself with indicating the occurrence of this well-marked group in this region.

Hab. Providence Island, Mascarene group, 19 fms.

27. Pellina, sp.

I have little doubt of the identity with the species from Australia, described at p. 413 (No. 48) of Part I. of this Report, of an erect, laterally compressed, suboblong specimen in spirit in this collection, 45 millim. high, 30 millim. in greatest diameter, 14 millim. in greatest thickness. It is squarely truncate above and diminishes slightly in diameter towards the broken lower end; the surface is rather uneven, but the dermal membrane is smooth, thin, and transparent. Vents chiefly at the margin; round or suborbicular, deep, diameter 1–5 millim. Spicules ·33 to ·35 by ·019 millim. Other characters essentially as in Australian specimen, from which it differs chiefly in wanting the short lobes.

Hab. Darros Island, Amirante group, 22 fms.

28. Tedania digitata, *Schmidt*.

For synonyms and distribution see this Report, Part I. p. 417.

A fine specimen from Mozambique, very different in external characters from those described by me from Australia and Hindostan. In this case the vents are strongly developed, and the mass consists of four superiorly distinct, more or less bullate tubes, with thin, smooth margins, 3–9 millim. in diameter at their mouths, arising out of a very irregularly shaped, massive, suberect base, the surface of most of which is broken up into closely-set pits and grooves, about 1·5 millim. in diameter, which are the external openings of the excretory canals of this solid part of the sponge. The colour is pale, rather reddish, brown. The acuate measures ·19 by ·0095 millim., the tibiella ·19 by ·005 millim. While the outward form is rather that of Mediterranean specimens, the proportions of the spicules agree more closely with examples from Kurrachee and Queensland than with Mediterranean or Port-Darwin specimens.

The spicules of a small incrusting fragment from the Amirante

Islands give the following measurements: acuate ·2 to ·25 by ·007 millim.; tibiella ·2 to ·25 by ·004 millim.

Hab. Mozambique; Marie Louise Island, Amirante group; tide-marks to 17 fms.

DESMACIDINIDÆ.

The occurrence of a true *Desmacidon* in the Indian Ocean is perhaps for the first time indicated by the new species described below. The two species assigned to the genus by Ehlers ('Die Espersehen Spongien') appear to belong respectively to *Amphilectus* and *Clathria*. The wide range possessed by species of the new genus *Iotrochota* is shown also by the occurrence of our two new Australian species, one of them being abundant in both localities.

RHIZOCHALINA.

The scarcity of this genus, so common in the tropical waters of Australia, and well represented also in the south of that continent, is probably due to the absence of mud from the localities investigated; slightly deeper dredging, clear of the reefs, might be expected to reveal more of this interesting genus, which had not hitherto been noted from any localities nearer than Ceylon (Carter, Ann. & Mag. N. H. 1880, vi. p. 37, under the name of *Desmacidon jeffreysi*).

29. **Rhizochalina pellucida.** (Plate LIV. fig. *j*.)

Elongate, tapering gradually from base of sponge to summit of fistula. Fistula single, straight. Surface even, glabrous. Consistence in spirit soft, brittle; colour very pale brown; appearance semitransparent. Body of sponge oval, compressed; includes foreign bodies.

Main skeleton a somewhat confused mass of moderately closely felted and irregularly crossing spicules, traversed at intervals by tracts of compact spiculo-fibre, 4–8 spicules broad, running parallel to the surface. Dermal skeleton consisting of long, straight, compact spiculo-fibres, 4–20 spicules broad, branching at acute angles, and thus spreading over the surface; the intervals occupied by a loose open reticulation of single spicules or of fascicles two or three spicules broad, crossing at various angles. Sarcode pale yellowish brown, subtransparent. Spicule acerate, slightly curved, tapering gradually to sharp points from about middle of spicule; size ·26 by ·01 millim.

Hab. Providence Island, Mascarene group, 19 fms.; bottom coral.

A single specimen, 87 millim. (3½ inches) long, 12 millim. in greatest basal diameter; greatest diameter of present end of fistula 3 millim.

In its subtransparency, and in the great thinness of the dermal layer of the skeleton, as well as in its having been apparently sessile by a bulbous base, this differs from all described species of the genus.

30. Desmacidon rimosa *. (Plate LIII. fig. F; Plate LIV. figs. *m*–*m*″.)

Erect, stipitate; stem and branches solid, more or less antero-posteriorly compressed, except the extreme apices of the latter, which are cylindrical and terminally rounded, finger-like. Branching very irregular, not confined to one plane, the first division approximately dichotomous; the resulting (secondary) axes are either flattened strongly (2–4 times as broad as they are long), with but short subcylindrical marginal branchlets, or subcylindrical, giving off several subcylindrical (tertiary) branches; the largest of these branches may attain a length of 35 millim.; diameter of tips of branches, just before termination, 4–5 millim. Surface of stem and, to a less extent, of branches scored by winding furrows, 1–3 millim. deep, 1–3 millim. wide, generally directed transversely when on the flat surface of the branch, more longitudinally when they have reached its margin; they either vanish by becoming gradually shallower distally, or end abruptly in an oscular opening. Vents ·5 to 1·5 millim. in diameter, circular, deep, numerous, scattered along the above-mentioned grooves. Surface pilose, like coarse velvet, owing to projection of primary skeleton-fibres to a height of ·25 to 1 millim., at distances of ·25 to 1 millim. apart. Texture in spirit firm, tough, subelastic, the surface slightly harsh to the touch; colour in spirit normally brown, inclining to grey, and to rufous where skrinkage or abrasion of sarcode has more or less exposed the skeleton.

Main skeleton—primary fibres vertical to surface, about ·07 millim. thick, ·28–·35 millim. apart; the secondaries vertical to the primaries, about ·05 millim. thick, ·28–·35 millim. apart: fibres cored by spicule no. 2, with a few of no. 1 near the centre of the sponge; the horny fibre is almost wholly obscured by spicules; near the surface a distinct clear pale brown transparent margin of about a quarter the thickness of the fibre is usually left. Dermal skeleton made up of triangular to polygonal meshes (·28–·8 millim. wide) of spiculo-fibre, ·035–·09 millim. thick, strengthened by much pale brown transparent horny substance, which is seen outside the spicules in the narrower fibres; the contained spicules are chiefly no. 1; the stouter fibres contain also, superficially, no. 2. Sarcode transparent, pale yellowish brown.

Spicules of skeleton:—(1) Acuate, smooth, slightly curved, tapering gradually, more rapidly towards apex, to moderately sharp point, and diminishing slightly in diameter towards the rounded base; length about ·35 millim.; diameter, base ·019, middle of shaft ·022 millim. (most abundant in the fibre near surface, occasionally free in sarcode). (2) Acuate, approximately straight, tapering gradually from near head to sharp point; the base occasionally provided with a small number of minute spines; size ·23–·33 by ·005–·01 millim. (sometimes loose in sarcode, especially in dermis).

* *Rimosus*, full of furrows, referring to the appearance of the surface.

Sarcode-spicules :—(3) Tricurvate acerate, smooth, tapering gradually to fine points; median curve rather sharp, forming angle of about 150°; from this point arms almost straight, until just before tips, which turn up slightly: size ·19–·22 by ·006 millim. (4) Equianchorate, navicular, shaft slender, smooth, curve gradual and slight; palms narrow, viz. about ·08 long by ·0055 millim. broad, tapering to sharp points at apex, square below; tubercle slight, rather elongate, length ·022 millim.

Hab. Mozambique, between tide-marks.

Two specimens and a fragment are in the collection. The largest measures 110 millim. (4½ inches) in greatest height, 85 millim. (3½ inches) in greatest lateral expansion: common stem 55 millim. long, 20 by 10 millim. in diameter at middle of its course, rather tortuous, deeply scored on one side by a main median longitudinal depression. The second specimen has its branches more cylindrical than those of the larger specimen: but it has grown abnormally, some of the branches being twisted back, and anastomosis occurs near the base of the specimen. The description of *Spongia palmata*, Lamarck (Ann. Mus. Hist. Nat. xx. p. 453), var. β, recalls this sponge. The typical form of the species, which I have seen at Paris, resembles it more closely than does the specimen on which this var. β was probably founded; however, microscopic examination shows *S. palmata* to be a *Chalina*. While the present species resembles *Desmacidon fruticosa*, Mont., in texture and in the structure of the skeleton, it is yet quite distinct on account of its solid branches, its acerate skeleton- and its tricurvate (not bihamate) flesh-spicules. *D. arciferum*, Schmidt (Algiers), appears to approach it the most nearly of described species, but an acerate spicule is mentioned in addition to the tricurvate. *D. frondosum* (Ehlers), Esper, from "East Indies," resembles this sponge in general appearance, but has echinating spicules, some of which are strongly spined, and no tricurvate is mentioned; hence it seems to be a *Clathria*.

31. Iotrochota purpurea.

Halichondria purpurea, *Bowerbank*, *P. Z. S.* 1875, p. 203.

See Part I., p. 434, of this Report.

Fine specimens, chiefly of the usual cylindrical form, and with the same coarsely roughened surface as in the Australian specimens. Like those specimens, too, they show a tendency to become flattened, and to vary in colour from dark purple to dark green. The spiculation is essentially the same as in the Australian specimens. The maximum height is also just the same, viz. 150 millim. (6 inches).

Hab. Etoile Island, Amirante group, 13 fms.

Distribution. See Part I. p. 434.

32. Iotrochota baculifera.

See Part I., p. 435, of this Report.

Some small specimens, in spirit and in the dry state. In the

finely hispid surface and the low irregularly lobate form, together with the spicular characters, they agree closely with the Australian specimen, but the average diameter of the lobes is somewhat less (about 10 millim.).

Hab. Providence Reef, Mascarene Islands, 24 fms.

Distribution. Port Darwin.

33. **Esperia gelatinosa.** (Plate LIV. figs. *f–f''''*.)

Low incrusting masses, frequently involving foreign bodies, occasionally rising into slender lobes. Surface in spirit undulating, glabrous. Consistence tough, elastic, firm. Colour pale greenish grey or pinkish brown; general appearance gelatinous, semi-transparent.

Main skeleton rather confused in the incrusting specimens; the vertical lines near the surface being short, broad, loose, and closely approximated; in thicker specimens the ordinary Esperian distinct spiculo-fibres appear at some distance below the surface; primaries crossed by more or less numerous detached skeleton-spicules. Dermal skeleton composed of confusedly intercrossing spicules not arranged into spiculo-fibrous reticulation. Sarcode very pale yellow, transparent.

Spicules:—(1) Skeleton subspinulate; head oval, slightly but distinctly demarcated from shaft, about two thirds the maximum diameter of the latter; shaft tapering rather abruptly to sharp point; size of spicule ·5 by ·016 millim. (2) Large inequianchorate; large end moderately broad, about half the total length of the spicule, tubercle long, lower angles of outer palms slightly rounded; small end subtriangular, rather small, pointed below, tubercle small, tongue-shaped, a small reverted margin extending as far as the tubercle in the middle; size of spicule ·06 by ·0032 millim. (3) Small inequianchorate, large end about three fifths the total length of the spicule; shaft and arms well but gradually curved, tubercle short; lesser end very small, not prolonged below into a point; length of spicule ·019 millim. (4) Bihamate, contort, slender, well curved, sharp-pointed; size ·057 by ·002 millim. (5) Trichites in oblong compact bundles about ·02 millim. long and ·0063 to ·0075 millim. in diameter; spicules approximately straight. Extremely abundant.

Hab. Providence Reef and Providence Island, Mascarene group, 19–24 fms.; bottom, sand or dead coral.

The longest lobes are 20–30 millim. long and 3–6 millim. in diameter. In habit, spiculation, and arrangement of skeleton it much resembles *E. lævis*, Carter (Ann. & Mag. N. H. 1882, ix. p. 291, pl. xi. fig. 16), from Venezuela, and *E. pellucida*, mihi (Part I., p. 437, of this Report); but the small inequianchorate here has not the terminal point described by Carter, and the trichites are much smaller (·02 millim. instead of ·067 millim. long); from *E. pellucida* it differs in the small, short, quadrangular trichite-bundles, in the smaller size of the anchorates, &c. The species is quite abundant, though no large specimens were found.

ECTYONIDÆ.

Two of the six species obtained, viz. *Clathria frondifera* and *Acarnus ternatus*, must now be regarded as characteristic of the equatorial parts of the Indian Ocean. As this ocean appears to be the main focus of *Clathria*, it is not surprising to find this most prolific genus further represented here by two new species.

CLATHRIA.

The three species found in this district contrast, by their decumbent or incrusting habit, with the fine arborescent species which prevail in Australia.

34. Clathria frondifera, *Bowerbank*. (Plate LIII. fig. J.)

See Part I., p. 448, of this Report.

This species seems to be almost as abundant in this region as in the North-Australian seas. The specimens agree well, both as to outward form and size and in their fibre-characters, with those described by me (Part I. p. 448) from those seas. The only divergent points which they present are found in the spiculation, viz. the slightly greater diameter attained by the smooth deep-skeleton acuate in some of the specimens, and the wide range of dimensions exhibited by this spicule: it ranges from ·16 to ·25 millim. in length and from ·008 to ·0127 millim. in thickness; the latter thickness is not reached by the Australian specimens, but is exhibited by one from Gaspar Strait, and exceeded (·0158 millim.) by the type specimen, from the Straits of Malacca.

Hab. Providence Reef and Island, Mascarene group: Amirante Islands; Seychelle Islands; 12–24 fms.

35. Clathria decumbens. (Plate LIII. fig. K; Plate LIV. figs. *g*, *g'*.)

Sponge massive, sessile; forming low, spreading masses, either (*a*) of submonticular form, *i. e.* highest in the middle and terminating laterally in a few short angular ends, or (*b*) commencing as a horizontal flattened cylinder, sessile by its lower side, terminated at each end by rounded (sometimes free) extremities, and sometimes sending off lateral lobes of similar character. Surface (in unmaccerated condition) slightly undulating, either (in *b*) glabrous, formed by a parchment-like brown membrane which conceals the honeycombed main mass of the sponge, or (in *a*) much grooved, having a worm-eaten appearance, the surface between the grooves slightly and minutely pilose with the ends of the skeleton-fibres, the bottom of the grooves themselves smooth, membranous. Vents moderately abundant (7 or 8 in small specimen), scattered on all parts, round, suborbicular, or oval; opening level with surface; provided with thin membranous margins; diameter 1–4 millim.

Main mass of sponge composed of subcylindrical trabeculæ, 5 to

2 millim. thick, which form the boundaries of cavities 1–2 millim. wide, extending parallel to the surface: the intervals between the trabeculæ are more or less tympanized by thin transparent membranous expansions. Consistency in spirit—(*a*) of monticular specimen soft and elastic, like Turkey sponge; (*b*) of subcylindrical specimens tough, parchment-like. Colour—(*a*) almost white, (*b*) dull putty- to reddish brown.

Main skeleton—primary fibres approximately vertical to surface, ·05 to ·07 millim. thick, ·18 to ·35 millim. apart; secondaries approximately vertical to surface, but often curved; size, as primaries; about ·18 to ·25 millim. apart. Dermal membrane in (*a*) based on fibre ·035 to ·1 millim. thick, forming oval meshes ·1 to ·18 millim. in diameter; in (*b*) fibre ·035 to ·088 millim. thick, meshes ·14 to ·3 millim. wide, oval or oblong. Fibre brown of various shades, axially cored by one to four series of spicule no. 1, echinated abundantly by the spined acuate spicules.

Spicules:—(1) Skeleton acuate, straight, tapering gradually from near centre to sharp point on the one hand and to rounded base on the other; base about two thirds the diameter of centre, and carrying a few very small spines; size of spicule, ·15 to ·175 by ·0055 millim. (2) Spined acuate, straight, tapering gradually from base to sharp point, base rather rugose; spines sharp, small to moderate-sized, those of proximal two thirds vertical to shaft, rather scanty, those of apical third numerous, recurvate; size of spicule ·075 by ·0063 to ·09 by ·008 millim. (3) Equianchorate, navicular, shaft almost straight, slender; palms as seen from front truncate below, subpyramidal, elongate (each more than one third the total length of the spicule); tubercle rather elongate: size of spicule, ·021 to ·032 millim. (4) Same as (3), but shaft more curved, and size of spicule only ·011 millim.

Hab. Boudeuse and Etoile Islands, Amirante group, 10–13 fms.; bottom, sand or coral.

The two externally very different forms which I have indicated in the description by (*a*) and (*b*) agree so closely in their microscopic characters that I do not feel justified in separating them, even varietally; the absence of a tough cortex from (*a*) is perhaps due to some local circumstance.

The greatest vertical thickness of the largest specimen is 23 millim., the length 60 millim., the diameter of the lateral lobes 17 millim. The brown specimens have a strong external resemblance to small specimens of the *Hippospongiæ* with meandrine canals, and especially to *H. derasa*, mihi (see Part I., p. 382, of this Report); also to fresh specimens of *Chalinopsis clathrodes*, Schmidt; and to a specimen, now in the National collection, of an apparently MS. species allied to *Clathria*, named "*Spongia multifora*, Dufr.," but which is quite distinct from *C. decumbens*, owing to the strongly spined skeleton-spicules. The very slender skeleton acuate with its slightly spined head is an unusual feature in a *Clathria*, and few Clathrias are without either a bihamate or tricurvate flesh-spicule. The sessile massive habit distinguishes it from all other true

Clathrias, except perhaps *C. elegans*, Vosmaer (habit unknown), and *C.* (*Dictyocylindrus*) *anchorata*, Carter. The latter is only known from small shapeless masses, and has the skeleton-spicule stout, smooth, and strongly curved; otherwise the spicular complement is essentially the same. In the present species the two kinds of anchorates appear to be distinct, the smaller form being very abundant, the larger, though evidently normally present, much less common; the occurrence of a larger and smaller anchorate in some *Esperiæ*, as pointed out by Carter (Ann. & Mag. N. H. 1882, ix. pp. 298, 299), is an analogous circumstance.

36. **Clathria mæandrina.** (Plate LIII. fig. 1; Plate LIV. figs. *h*–*h*''.)

Sponge only known as an incrusting, widely-spreading mass, consisting of a thin basal lamina not exceeding 1 millim. in thickness, from which arise vertically, at intervals of 1 to 3 millim., parallel-walled ridges, or triangular masses, about ·5 to 1·5 millim. in diameter and 2–4 millim. in height, usually united laterally to form a series of meandrine ridges, generally 2–3 millim. apart, at the surface of the sponge. Surface of basal lamina very uneven under lens, honeycombed with round openings ·25 to ·75 millim. in diameter; the trabecula between the openings is hirsute with projecting spicules: surface of vertical ridges uneven, densely hirsute with projecting spicules and skeleton-fibres, towards the base it has a honeycombed appearance similar to that of the basal lamina. Consistence in spirit slightly resistent, but soft, compressible, elastic. Colour in spirit buff-yellow.

Main skeleton—arrangement subrectangular: fibre dense, pale amber-yellow, echinated sparsely below surface of sponge by spicule no. 2, set at right angles to fibre. Primary fibres approximately vertical to surface, terminating on it in short horny points densely clothed with spicule no. 1, which are directed outwards, parallel to the axis of the fibre: diameter of fibre about ·05 to ·1 millim.; cored with proper spicules, usually biserially arranged, to a variable distance, not exceeding ·7 millim., below surface; distance of fibres apart about ·17 to ·35 millim. Secondary fibres uncored, ·035–·07 millim. thick, placed at intervals of about ·17 millim., approximately vertical to primaries. Dermal skeleton composed of a rather close rectangularly-meshed reticulation; fibres about ·04–·07 millim. thick, apparently covered in parts by a thick incrustation of foreign bodies. Sarcode transparent, very pale yellow-brown.

Spicules:—(1) Acuate, or with slightly constricted base, either smooth or with the base minutely spined, moderately curved, tapering gradually from base to sharp point; size ·023 by ·011 to ·013 millim. (echinating the apices of primary fibres). (2) Spined acuate, straight: a head slightly indicated by a subterminal neck, spines minute to moderate-sized, placed at right angles to long axis: size of spicule ·075 by ·0063 millim. (echinating fibres of main skeleton). (3) Subspinulate or acuate, smooth, almost straight, tapering gradually from

near centre to sharp points; size ·32 by ·0063 millim. (in axis of outer extremities of primary fibres, and loose in the meshes of the skeleton). (4) Tricurvate acerate, smooth; the curves bold; tapering to sharp points; size ·076 to ·12 by ·0032 millim. (in sarcode). (5) Equianchorate, shuttle-shaped, shaft slender, slightly and gradually curved, palms each about one third the total length of the spicule; length ·025 millim.

Hab. Marie Louise Island, Amirante group, 17 fms.; bottom coral.

The specimen on which this species is based coats continuously for a distance of 100 millim. (4 inches) most of the circumference of a stem (probably algal) 3 millim. in thickness. The surface of *Spongia vulpina*, Lamarck, in the Museum at the Jardin des Plantes, Paris, decidedly recalls this sponge; but that species is tall, stipitate, and arborescent, with a superficial spicular incrustation, and hence is rather referable to *Rhaphidophlus* than *Clathria*: it seems to want the tricurvate acerate spicule of the present species.

One remarkable point about the species is the unusually great proportion of horny matter to spicules in the fibres. This is also shown in *Tenacia clathrata*, Schmidt, of the W. Indies, which, besides its clathrous habit, differs from this species mainly in the very coarse horny fibre, the considerably superior dimensions of the smooth acuates, and the rather clumsy form of the spined echinating spicules.

37. Acarnus ternatus.

See Part I., p. 453, of this Report.

A young specimen. The tricurvates are somewhat shorter, thicker, and more strongly curved than in the Australian specimens.

Hab. Ile des Neufs, Amirante Islands, 15 fms.

ECHINONEMA, *Carter*.

This genus was nominally established in 1875 (Ann. & Mag. N. H. 1875, xvi. p. 185), in Mr. Carter's "Notes Introductory to the Study and Classification of the Spongida," by the insertion of the words "*Echinonema typicum*, C., MS.," under the Group Pluriformia, Family Ectyonida, of the Order Echinonemata; but its characters were not made known until 1881 (*op. cit.* 1881, vii. pp. 378–380), when Mr. Carter somewhat briefly described two species under this name, viz. *E. typicum* and *E. anchoratum*, without, however, giving any definition of the genus. I have been able to examine a considerable number of the specimens thus identified by Mr. Carter, and find them to be nearly allied to *Rhaphidophlus* of Ehlers (Espersch. Spong. pp. 19, 31) and to *Clathria*, Schmidt, having the same general character of spiculation and arrangement of the skeleton as these genera, but differing from *Clathria* in having a non-fibrous and purely spicular cortical layer, composed of acuates or spinulates with their points directed outwards, and while agreeing with *Rhaphidophlus* in this point, differing from it in the possession (not

mentioned by Carter, *ll. cc.*) of a fine tricurvate acerate flesh-spicule in addition to an equianchorate. A third species, *E. vasiplicata*, assigned by Carter (*op. cit.* 1882, x. p. 114) to the genus belongs, as I have stated in my report on the Australian collections (Part I. p. 454), not to this genus, but to *Echinodictyum*, mihi. The genus was not met with by the 'Alert' on the north and east of Australia, although it is common on the south and south-west (Carter); it is a little strange therefore to find the following two species in the western part of the Indian Ocean.

38. Echinonema, sp.

A small, irregularly-grown specimen in spirit, consisting of an extended coating base and three low lobes, more or less flattened, two of them uniting with each other. Surface corrugated by low meandering ridges, giving an irregularly dimpled aspect to the surface; dermal membrane upon the ridges glabrous. Vents small, scattered, oval or circular, ·6 to 1·0 millim. in diameter, generally placed on margins or in depressions rather than in the middle of surfaces. Consistence in spirit firm, very tough, elastic; colour dull umber-brown.

Main skeleton approximately rectangular in arrangement, the primary fibres being set vertically to the surface, and the secondaries parallel to it, but with their ends curved round to meet the primaries; fibre very strong, pale to dark amber-yellow in colour: the primary fibres about ·14 millim. thick, and cored for one to two thirds of their thickness by subspinulate spicules; secondary fibre ·07 to ·14 millim. thick, either devoid of spicules or cored by at most two series. Dermal skeleton formed by a set of radiating tufts of subspinulate spicules, the bases of the tufts being placed about ·25 millim. apart, and the ends of the spicules of the different tufts intercrossing. Sarcode pale yellowish brown, subtransparent. Spicules:—(1) Skeletal and dermal subspinulate; head slight, oval, provided with a few very fine terminal spines; head of about the same diameter as middle of shaft; tapering gradually to sharp point; size ·26 by ·008 millim. (2) Echinating spined subspinulate; the head and distal two thirds well spined; spines strong, sharp, projecting at right angles to surface; size of spicule ·1 by ·0085 millim. (3) Tricurvate acerate of sarcode, median curve rather sharp; size ·04 by ·001 millim. (4) Equianchorate, navicular, shaft slightly curved; length of spicule ·012 millim.

Hab. Etoile Island, Amirante group, 13 fms.; attached to dead coral.

This species is evidently nearly related to *E. typicum* and *E. anchoratum* of Carter, from its resemblance in external form and in spiculation. The structure of the dermal "crust" is essentially the same as that described by me in the nearly allied genus *Rhaphidophlus* (see *R. arborescens* and *R. procerus*, Part I. pp. 450–1, of this Report).

39. **Echinonema gracilis.** (Plate LIV. figs. *l*, *l'*.)

Erect, very slender, branching dichotomously and seldom; branches given off at angles of from about 60° to 90°, cylindrical or irregular, sometimes somewhat flattened, diameter 2 to 5 millim. Surface smooth. Vents not apparent. Consistence in spirit soft, elastic, very compressible, rather tough; colour very dark purplish brown.

Main skeleton subrectangular in arrangement; primary fibres ·05 to ·07 millim. in diameter, pale yellow, almost filled with the skeleton-spicule; secondaries ·035 to ·05 millim. in diameter, containing one or two series of spicules. Dermal skeleton consisting of radiating tufts of subspinulate spicules, the bases of the tufts about ·25 millim. apart, the points of adjacent tufts crossing each other. Sarcode of interior dark yellow, granular; that of dermis transparent, very pale purple. Spicules:—(1) Subspinulate of skeleton and dermis, straight, shaft smooth, head provided with a few terminal very fine spines; head oval, of about same diameter as middle of shaft, neck slight; spicule tapering gradually to sharp point; size ·34 by ·012 millim. (2) Acuate, minutely spined on base, straight, tapering gradually to sharp point; size ·25 by ·014 millim. (in centre of primary fibre). (3) Echinating spined subspinulate, tapering to sharp point from two or three diameters from end, well spined over head and distal two thirds; the spines sharp and strong, those on shaft recurvate towards head; size of spicule ·082 by ·013 millim. (4) Tricurvate acerate of sarcode, smooth, middle curve bold; size ·057 by ·001 millim. (5) Equianchorate, navicular, shaft slightly curved; length of spicule ·02 millim.

Hab. Providence Reef, Mascarene Islands, 24 fms.; bottom, sand and dead coral.

Several small and more or less imperfect specimens in spirit; the largest measures 75 millim. (3 inches) in length. In the slender proportions of the sponge (which gives it the appearance of a *Raspailia*) and in the weak development of the horny fibre this species stands quite apart from the Australian species as well as from the foregoing form.

AXINELLIDÆ.

Of the four species to be enumerated, one is found also on the southern and one on the west northern coasts of Australia. The very variable character of the surface of *Leucophlœus proteus* is a somewhat unusual manifestation of the polymorphism of Sponges.

40. **Axinella spiculifera.** (Plate LIV. fig. *b*.)

Spongia spiculifera, *Lamarck, Ann. Mus. Hist. Nat.* xx. p. 449.

A specimen in spirit, agreeing well with the fragment in the Museum which represents Lamarck's species. It consists of two

approximately cylindrical stems, 50 by 13 and 80 by 20 millim. respectively in greatest height and thickness, arising close together from a common rocky base. The lower end of the larger one is almost smooth for a distance of about 8 millim.; the remainder, as well as the whole of the smaller stem, is beset with small, slender, wedge-shaped or pyramidal eminences, sometimes forked, 2–3 millim. high, about 2 millim. in diameter at their bases and 2–4 millim. apart at their summits; the general surface between these processes is honeycombed with circular openings, ·5 to 1·0 millim. in diameter and ·25 to 1·0 millim. apart. Consistence rigid, slightly compressible, tough. Colour very pale buff.

Skeleton typically *Axinella*-like; fibre 3 or 4 spicules broad; spicules united by dense, very pale yellow horny fibre; axial meshes close, ·18 to ·3 millim. across, the reticulation extending to exterior of sponge. Sarcode pale yellow, subtransparent. Spicules smooth acuate, curved more or less boldly at from one third to one half of the distance from the base; base well rounded; spicules tapering to sharp points from about their middle; size ·35 by ·019 millim. In Lamarck's specimen the surface-tufts are smaller and only 1–2 millim. apart, the sponge is more flattened than here, and the spicules are slightly smaller, viz. ·31 by ·018 millim.

Hab. Darros Island, Amirante group, 22 fms.

Distribution. King Island, Australia (*Lamarck*).

41. Axinella proliferans. (Plate LIII. figs. E, E'; Plate LIV. fig. c.)

Erect, with short flattened stem, expanding into flabellate fronds, which towards their ends proliferate into secondary flabellate frondlets, which assume a course parallel to that of the main frond; as the latter is frequently plicate at its free margin, the aspect on looking down at a large specimen from above is that of a number of irregular funnel-shaped cells, bounded by lamellar walls, roughened by very numerous slashed ascending ridges. Surface of frond beset, at intervals of about 4 millim., with sharp ridges 3–4 millim. high (5 or 6 millim. near upper margin); the ridges notched at intervals of about 3 millim. by ascending teeth, 1–3 millim. high, or altogether replaced by longitudinal series of flattened, notched teeth.

Vents in spirit-specimen formed by circular openings, 1–2 millim. wide, leading obliquely downwards, scattered between the bases of the laciniate surface-tufts and ridges of the sponges, chiefly near the free margins of the latter. Texture in dry state tough, subelastic: of stem and midribs firm, woody, of margins of fronds and ridges flexible; in spirit, all parts relatively more pliable. Colour in dry state pale yellow-brown to rufous-brown, in spirit pale salmon-colour.

Cortical skeleton appearing on margins of surface-tufts and in some places on face of frond as tufts composed of a few of spicule no. 1, connected by their bases; in main stem consisting of confused linear

spicular columns radiating horizontally from the axial skeleton, but much disguised by crossing spicules, sometimes united into secondary fibres. Axial skeleton—the longitudinal lines strong, but in basal parts of sponge confused by close aggregation; the axis of the flabellate parts is composed, on the contrary, of a dense mass of horizontally arranged spicules, from which the short dermal tufts project so as to appear on the surface of the sponge. Bases of spicules of radiating lines and much of the entire axial spicular columns enveloped in a tough transparent substance, amber-yellow in dry, salmon-colour in spirit-specimens.

Spicules:—(1) Acuate, smooth, curved slightly but rather abruptly at from one third to one half the distance from the base; tapering gradually from about middle, more rapidly from about three fourths of length, to sharp points, and sometimes slightly towards base; base rather squarely rounded; size ·55 by ·032 to ·045 millim. (forms chief part of the axial and radial columns and the secondary fibres). (2) Acuate, smooth, straight or slightly curved, tapering gradually to fine points from about one fourth of the length from the apex; base well rounded; size ·5 to 1·8 by ·015 to ·02 millim. (sparingly, in company with no. 1, in most parts; especially, attached to bases of radiating columns, and projecting outwards in a direction parallel to them).

Hab. Providence Island, Mascarene group, 18 and 19 fms.; bottom coral.

Two small specimens in spirit, one large dried dredged specimen, and two medium-sized beach-worn specimens represent the species; the largest measures 120 millim. (5 inches) in both greatest height and lateral extent: the stem is 20 millim. in greatest lateral by 8 millim. in greatest antero-posterior diameter. The species has much of the external appearance of *Spongia cardinus*, Lamarck, of the Paris Museum, the spiculation of which, however, refers it to another genus. It differs from all the species described by Schmidt from European and W.-Indian seas in the absence of an acerate spicule; in the great stoutness of the main acerate it approaches *A. mastophora* of that author, from Florida. In general habit it resembles *Acanthella* rather than *Axinella*, but wants the long undulating cylindrical spicule hitherto found in species of that genus; it appears doubtful whether the existence of such species as this should not induce us to unite the two genera. I have been unable to identify it with any described species; the large stout acerate appears to be the most distinctive characteristic.

LEUCOPHLŒUS.

Carter, Ann. & Mag. N. H. 1883, xii. p. 323.

In its affinities this genus appears to be Axinellid; it is distinguished from *Axinella*, s. str., by its loose yielding texture, the skeleton-fibres being loosely united, but containing a dense keratose

or sarcodic material, and a single form of spicule, viz. smooth acuate of considerable length, and by the presence of a regular dermal skeleton composed of spicules laid horizontally. I do not know any other species except the original one, *L. massalis*, Carter, and the two described below.

42. **Leucophlœus proteus.** (Plate LIII. fig. B; Plate LIV. fig. *k*.)

Massive, suberect; irregularly columnar near base, showing a tendency to terminate above in several short and thin membranous or prismatic lobes, which by anastomosis *inter se* enclose cellular spaces, within which the chief excretory canals open. Surface very variable in character in different specimens; either rough or even and glabrous near the base, towards apex longitudinally ridged and grooved, leading up into the membranous expansions just described, and hispid with closely set, upwardly-directed sharp points, 1–2 millim. high, tending to coalesce into ridges, and terminated by single projecting spicules. Vents opening either upwards at the bottom of the spaces enclosed between the terminal lobes, or laterally between the larger lateral ridges, 1–3 millim. in diameter. Consistence in spirit—that of solid basal part firm, rather elastic, that of upper laciniate parts compressible, elastic; colour, surface reddish purple, interior dull pale brown. Main skeleton formed of very loose spicular tracts, 5–10 spicules broad, passing outwards from the centre of the sponge, at distances of about ·28 to ·6 millim. from each other, branching at acute angles, but maintaining a direction subparallel to each other, and not crossing. No visible horny uniting substance; spicules connected by a yellowish sarcode, rather darker than the interstitial sarcode. The terminal spicules of the fibres either penetrate or support the dermal membrane. Dermal skeleton consisting of irregular tracts of spicules laid obliquely or vertically along the ends of the main-skeleton fibres. Sarcode subtransparent, yellowish brown in centre, bright reddish purple at surface. Spicules smooth acuate, bluntly rounded at base and tapering gradually to sharp points from about the middle; size about 2·5 by ·032 millim.

Hab. Providence Reef, Mascarene group, 24 fms.; bottom, sand and dead coral.

Of the two spirit-specimens from which this description is drawn up, the largest has the variable surface characters above described, and must have been 50 millim. (2 inches) high by 25 millim. broad when perfect: its basal portion is very irregularly formed, being curved to one side and ending in a cup-shaped depression, by which it was perhaps attached to a shell or other foreign body: the smaller specimen has lost its base. The specific name, *proteus*, is intended to commemorate the variability of the outward form.

The general habit is that of *L. massalis* and *fenestratus*; but the spicules differ from those of the former in being about five times as

long, from those of the latter in the greater relative stoutness of the basal end and in their superior length (about twice that of *fenestratus*).

43. Leucophlœus fenestratus, var. (Plate LIII. fig. A.)

See Part I., p. 464, of this Report.

A spirit-specimen and some fragments, combining the external characters (viz. erect, laminate, with the upper portion echinated by fine upwardly directed processes, and with smooth, thick basal portion) of *Leucophlœus proteus*, mihi, with a spiculation of the character of *L. fenestratus*. The outward form of these two species is, however, essentially the same, and the differences observed in this point are mainly individual. The present specimen, linking the Australian to the more western form, has decided a doubt which I had as to the rightful position of the former species in the genus. The specimen is young, measuring 50 millim. (2 inches) in height by (including a fragment which appears to belong to it) 35 millim. in greatest diameter (that of the base). It consists of a massive basal portion, enclosing a large quantity of calcareous matter (Nullipore, &c.), and of a slender flattened expansion, 20 millim. high, 10 millim. broad, 4 millim. thick, arising from it: the base is glabrous, the surface being formed by a thin, transparent membrane, loosely attached. Main skeleton consisting of compact spiculo-fibres about 10 spicules broad, and of broad expansions containing a large number of spicules loosely aggregated. There is no sign of horny uniting substance. Spicules tapering gradually from near the centre, or about midway between the centre and base, to a smaller rounded basal extremity, which is about one half the maximum diameter of the spicule; spicule tapering rapidly to moderately sharp point from two or three diameters from apex; size of spicule ·8 to 1·1 millim. by ·02 to ·032 millim. (a considerable range for only two or three specimens). The spicule has thus practically the same form as in both the Australian varieties, and in its range of dimensions connects the two. The colour, which is purple, as in *L. proteus*, but pale, is possibly derived from some purple sponges which had been kept in the same vessel.

Hab. Providence Reef, Mascarene group, 24 fms.

SUBERITIDÆ.

The few species received illustrate well the wide affinities of Sponges from this district. *Tethya*, s. str., which was not found on the northern and eastern coasts of Australia, but which is recorded by Bowerbank from the west coast, appears here also, in the shape of a species described by Bowerbank from Freemantle. Of the two new species of *Spirastrella*, *S. transitoria* appears to throw fresh light on the homologies of the spinispirular spicule. The *Vioa* is identical with a Mediterranean species.

44. Suberites, sp.

A dull red-brown, smooth, incrusting film, about ·5 millim. thick; the closely-set spinulate spicules measure about ·8 by ·02 millim.; the head is distinct, suboval, approaching a globular form, and of about the same diameter as the shaft. No other spicule. The species is perhaps nearly allied to *S. antarcticus*, Carter.

Hab. Seychelle Islands, 12 fms.

45. Vioa schmidti.

Vioa johnstoni, var., *Schmidt, Spong. Atl. Geb.* p. 5.
Vioa schmidti, *Ridley, P. Z. S.* 1881, p. 130.
Vioa Schmidtii, *Carter, Ann. & Mag. N. H.* 1882, ix. p. 354.

The specimen agrees with Schmidt's species from the Bocche di Cattaro (Adriatic), which Mr. Carter and myself have agreed in considering distinct from the original *V. johnstoni* from Sebenico. As the species has never been fully described, I give a description of the present specimen.

Main cavities formed by sponge botryoidal, wide. Colour of sponge bright pink to crimson. Vent- and pore-areas ·5 to 1·5 millim. in diameter. Sarcode pale pink, for the most part very diffusely coloured, transparent. Spicules:—(1) Spinulate, smooth, straight or slightly curved, tapering gradually to sharp point; head large, oval, longitudinally elongate, distinguished from shaft by distinct neck, the diameter of which is ·006 millim.; length of spicule ·28 millim., diameter of shaft ·008 millim., of head (transverse) ·0095 millim. (2) Spinispirular, stout, with 4–6 sharp bends; spines sharp, arranged in regular uniserial spirals, 5 or 6 to a bend, length the same as thickness of the shaft; size of spicule ·05 by ·006 millim. (excluding spines). (3) Spinispirular, slender, with about 8–10 gradual bends, 5 or 6 to a bend: size of spicule ·075 by ·002 to ·0042 millim. (excluding spines). Spicule no. 1 is generally loosely scattered; no. 3 sometimes aggregated in dense masses.

Hab. Eagle Island, Amirante group, 10 fms. (in base of lobate *Madrepora*).

Distribution. Adriatic (*Schmidt*).

The stout spinispirular appears to be normally confined to that side of the sponge which is in contact with the matrix, the slender one to occupy the internal sarcode; but they also occur mixed. Although the two kinds of spinispirular spicule approach each other somewhat nearly in the diameters of their adult forms, yet the longer spines and the constantly inferior length and inferior number of bends, and the superior sharpness of the bends, in the stouter form sufficiently distinguish it from the slender form. A further argument against the possibility of the two forms being merely stages of growth of one spicule is derived from the fact that the more slender form (which, from the analogy of siliceous sponge-spicules generally, would on this hypothesis be the young form of the other) is actually

longer and has more bends than the stout form, which could thus only have been derived from it by fission or retrogressive absorption, methods unknown, so far as I am aware, in the normal development of siliceous sponge-spicules.

46. Spirastrella transitoria. (Plate LIV. figs. q, q'.)

Sessile, incrusting. Surface broken up by slight intercrossing ridges into very shallow angular areas 1 to 2 millim. wide; surface between and over ridges subglabrous. Consistence in spirit tough, elastic; colour pale pinkish brown.

Main skeleton chiefly composed of dense fascicles of the skeleton-spicule, with the points radiating outwards, set at various angles to the surface, viz. from right angles to a horizontal position; the points of the bundles frequently project slightly beyond the surface. Sarcode dense; that of surface subtransparent, dark greenish yellow; of subjacent tissues very pale yellow, transparent.

Spicules:—(1) Skeleton spinulate, straight or nearly so; head spherical, neck distinct; head and centre of shaft of about the same diameter, viz. ·016 millim.; shaft tapering to sharp point from about 7 diameters from apex: length of spicule about ·9 millim. (2) Spinispirular, extremely concentrated, composed of only one entire bend; spines numerous, closely aggregated, strong and sharp; shaft about ·004 millim. thick; spines ·004 millim. long; length of spicule, including spines, ·016 millim.

Hab. Darros Island, Amirante group, 22 fms.; bottom broken coral.

This species is represented by a specimen of about 1 square inch in superficial extent, covering and following the inequalities of a small mass of shells and Polyzoa; the thickness varies from about ·5 to 2 millim. It appears to be most nearly related to the form, termed by Mr. Carter (Ann. & Mag. N. H. 1882, ix. p. 352) "*Spirastrella cunctatrix*, variety," from Mauritius; but this form is stated to be white, to have a spinispirular with *two* bends, of a length of about ·036 millim. It differs from *S. cunctatrix*, Schmidt, in the shorter spinispirular, and the globular, not oval, head of the spinulate. In *S. transitoria* we have the spinispirular almost in the form of the stellate, with which Schmidt (Spong. Atl. Geb. p. 5) and Carter (*op. cit.* 1879, iii. p. 355) consider it to be homologous.

47. Spirastrella punctulata. (Plate LIV. figs. p, p'.)

"Suberites? sp. undescribed, Mauritius," *Carter, Ann. & Mag. N. H.* 1882, ix. p. 352.

Elongated, subconical. Vents single or few, terminal, oval, about 2 millim. in greatest diameter. Surface obscurely nodose, and covered besides on the upper parts of the sponge with a minute, but close and regular pitting, giving the appearance of shagreen; pits and intermediate elevations low, each about ·3 millim. in diameter:

lower part of sponge glabrous. Consistence in spirit very tough, elastic; colour dull olivaceous brown.

Main skeleton rather loose, formed of broad tracts of loosely aggregated spicules, horizontally or obliquely arranged with regard to the surface, and of intercrossing spicules loosely scattered between them; that of the cortex, which forms a denser layer, consists of more compact bundles, 10 to 15 spicules broad, placed vertically with regard to the surface, from which their points project; the bundles are from ·1 to ·14 millim. apart. Sarcode subtransparent, bright greenish brown, crowded with globular cells about ·011 millim. broad, with large nucleus and one or more opaque granules.

Spicules:—(1) Skeleton spinulate, smooth, straight or slightly curved; head oval, longitudinally elongate, slightly flattened at free end, of about same diameter as middle of shaft, tapering gradually from centre of shaft to sharp apex; size of spicule ·4 by ·013 millim. (2) Spinispirular, short, slender, consisting of about four bends, about 6 spines to a bend; spines sharp, about ·002 millim. long; size of spicule ·02 by ·002 millim. (exclusive of spines).

Hab. Mozambique, between tide-marks.

Distribution. Mauritius (*Carter*).

The greatest height of the single spirit-specimen representing this species is 65 millim. (2½ inches), the greatest diameter 25 millim.; its form is that of a much drawn-out, truncate cone, compressed so that the long diameter is about twice that of the small one; there is a nodular process, 5 millim. high, on one side near the extremity; the base includes a large amount of coarse foreign bodies. The characters agree well with those given by Mr. Carter (*l. c.*) for a fragment from Mauritius. It is nearly related to *Hymeniacidon angulata* of Bowerbank (Madeira), and *vagabunda* and *decumbens*, mihi (Australia, this Report, Part I. pp. 468, 470); but it is distinguished readily from all by its very short spinispirular spicule.

48. Tethya cliftoni.

Tethea cliftoni, *Bowerbank*, *P. Z. S.* 1873, p. 16, pl. iii. figs. 14–18.

A single specimen, cream-white, covered with low papillæ about 1·5 millim. in diameter. The species, unless the separation of the large stellates into two distinct dermal zones proves to be constant and distinctive, can hardly be kept distinct from *T. ingalli* (Freemantle, Australia) and *T. robusta* (Australia), both of Bowerbank, the chief difference being in the diameter of the acuate, which in *T. cliftoni* is about ·025 millim., in *T. ingalli* ·035 millim., and in *T. robusta* ·045 millim. Again, all three species are scarcely more than varietally distinct from *T. lyncurium* of Europe, differing from it mainly in the greater distinctness of the heads of the small stellates.

Hab. Seychelle Islands, 12 fms.

Distribution. S.W. Australia (*Bowerbank*).

TETRACTINELLIDA.

As usual with shallow dredgings like those of the 'Alert,' the family Choristidæ is alone represented. The proportion of species to the rest of the collection is about the same as in the Australian collection; but we miss the genera *Geodia* and *Placospongia*, which might have been expected to occur here. The remarkable group with discoid dermal plates which stands between *Geodia* and *Stelletta* is represented by a new species.

CHORISTIDÆ.

49. Tetilla dactyloidea.

Tethya dactyloidea, *Carter, Ann. & Mag. N. H.* 1869, iii. p. 15, figs. 1-5; 1872, ix. p. 82, pl. 10. figs. 1-5.

A somewhat imperfect specimen, having, however, probably had somewhat the form of *Theuea wallichi*, Wright, when perfect—*i. e.* not produced upwards into the long cylinder figured by Mr. Carter, but depressed and agariciform. Its diameter is much greater than that of Carter's specimen, viz. 40 millim. (1½ inch); its present height is 25 millim. (1 inch). The spicules agree closely with Mr. Carter's descriptions and figures, with the exception that the forked anchor does not exhibit a constant inequality in the length of the arms.

Hab. Glorioso Islands, low water.

Distribution. S.E. coast of Arabia (*Carter*).

ERYLUS, *Gray*.

Stelletta, pars, *Schmidt, Spong. Adr. Meer., Spong. Küst. Alg., Spong. Atl. Geb.*; *Carter, Ann. & Mag. N. H.* 1880, v. p. 135.
Erylus and Triate, *Gray, P. Z. S.* 1867, p. 549.
Discifera, of subsection Pycnodermata of group Stellettina, *Carter, Ann. & Mag. N. H.* 1883, xi. p. 348.

I have already indicated (Part I. pp. 471, 472) that the species called by Schmidt *Stelletta*, but provided with disks composed of modified trichites, should be definitely separated from that genus. I adopt for this distinct group the generic term which Dr. Gray assigned to *S. mamillaris*, Schmidt. It may be characterized as:—Comprising Choristid Tetractinellida with the surface covered by a layer of detached discoid trichite globates, and having besides a zone-spicule and small stellates with slender and few rays. Form lobate. Vents single or multiple.

It differs from *Geodia* in the discoid form of the trichite masses and their independence of each other (in *Geodia* they are united by ligaments). It includes the described species *Stelletta euastrum*, *S. mamillaris*, and *S. discophora*, Schmidt, and *S. euastrum*, Carter. *Stelletta geodina* and *S. intermedia*, Schmidt, should be referred to *Geodia*.

50. Erylus cylindrigerus *.

(Plate LIII. fig. M; Plate LIV. figs. *e*–*e*''''''.)

Massive, suberect; terminating above in a lobate prolongation. Surface smooth, slightly uneven. Vents one (or more?) near apex of sponge, about 2 millim. in diameter, opening flush with surface, leading obliquely and deeply downwards into sponge. Texture in spirit tough, firm, but somewhat flexible; colour in spirit dark brown, almost black. Skeleton composed of bundles of spicule no. 1, 6–8 spicules broad, radiating from centre to just below surface, ·17 to ·3 millim. apart near surface. Surface covered with a layer about ·1 millim. thick of the discoid spicule no. 2, arranged horizontally. Sarcode subtransparent, very pale brown, almost colourless.

Spicules:—(1) Zone-spicules subcylindrical, smooth, straight or very slightly and gradually curved, tapering from within about six diameters of ends to rounded terminations of about one third the diameter of the middle of the shaft; size about ·7 by ·032 millim. (2) Discoid, of subdiamond-shaped outline, viz. that of a rhombus with the angles rounded off; length ·21 to ·28 millim., breadth ·1 to ·14 millim., thickness about ·04 millim.; covered with minute low punctiform spines, about ·012 millim. apart (spines, as seen under a high power from above, stellate in outline; they are multifid terminally). (3) Acerate, smooth, slightly and gradually curved, tapering to sharp points from centre; size ·06 by ·0032 millim. (scattered abundantly throughout sarcode). (4) Stellate, with about 10–12 straight rays ·003 millim. thick at base, tapering to sharp points, springing from a slight central body ·01 to ·013 millim. in diameter; expanse of spicule about ·05 millim. (5) Stellate like the preceding, but arms about 16 in number and expanse about ·02 millim.

Hab. Providence Reef, Mascarene group, 24 fms.; bottom, sand and dead coral.

A single specimen with a somewhat spreading base, which encloses calcareous fragments, rising into a subcylindrical, terminally rounded, finger-like column, 30 millim. high and 12 millim. in mean diameter, slightly overgrown by a delicate Sertularian Hydroid; extreme diameter of base 40 millim.

The species is most closely allied to *Stelletta cuastrum*, Schmidt, from Algiers, and to forms so named by Carter (Ann. & Mag. N. H. 1880, v. pp. 135, 136) from Ceylon and Australia, which perhaps represent another species. Instead of the trifid zone-spicule with bifurcate arms found in Schmidt's species, it has simply a subcylindrical spicule, usually blunt at both ends, and wants the long slender acerate; the few-armed stellate has its arms more numerous (10–12 instead of 2–4, which is the range represented by Schmidt's

* From the cylindrical zone-spicule.

preparation, although he says that the range is great); and I do not find in Schmidt's species the small multiradiate stellate which occurs here; the granulations on the surface of the disk are much coarser in this species. In having lost the trifid head of the zone-spicule it exhibits the same tendency as that which seems to have led in *Ancorina aaptus*, Schmidt, to the loss of all tetraradiate characters.

Early stages of the acerate spicule (no. 3) exhibit the central inflation found in the young acerates of some *Reniera* and *Spongillidæ*.

51. Stelletta acervus.

Ecionemia acervus, *Bowerbank*, *P. Z. S.* 1873, p. 322.

There appears to be only one form of minute stellate; those stellates in which the arms are small, relatively to the body, seem to be the young form of the longer-armed adult: the arms are very slightly capitate, as shown by Dr. Bowerbank's preparations and still more plainly in the present specimen, and vary in number from about 5 to about 12. The small acerates are scantily present in the cortex. Dr. Bowerbank considered his specimen to have been originally fixed, but the actual base was absent; the present specimen is decidedly free, and has an oval shape.

Hab. Etoile Island, Amirante group, 13 fms.

Distribution. Fiji Islands (*Bowerbank*).

52. Stelletta purpurea, var. parvistella, nov.

See Part I., p. 473, of this Report.

A small oval specimen 7½ millim. long, destitute of a vent, and of a purple colour, undoubtedly represents this species in a somewhat modified form. Thus the stellates do not exceed ·0095 millim. across the arms, and usually measure about ·007 millim., and the arms are generally more numerous than in the Australian specimens. The skeleton-spicules are also somewhat smaller, viz.:—diameter of shaft of zone-spicule ·032 millim., of anchor about ·023 millim., of acerate about ·025 millim.; the arm of the zone-spicule curves boldly backwards, but does not make an angle in its course like that of var. *retroflexa*, mihi. The small size of the skeleton-spicules is perhaps partly due to the youth of the specimen. The variety approaches the form obtained in the Arafura Sea the most closely.

Hab. Providence Reef, Mascarene group, 24 fms.

CALCAREA.

No Calcarea from this district are recorded in Häckel's 'Kalkschwämme' (1872); but Schuffner (Jenaisch. Zeitsch. xi.) in 1878 described several species from Mauritius, where they were collected by Prof. Möbius.

LEUCONIDÆ.

Two very widely distributed known species, a second species added to a hitherto monotypic genus (*Leucortis*), and a known Mascarene species, all belonging to the Leuconidæ, represent in this collection the Calcarea of the Western part of the Indian Ocean.

53. Leucetta primigenia, var. megalirrhaphis.

Leucetta primigenia, var. megaraphis, *Häckel, Kalkschwämme*, ii. p. 118.

Two subglobular specimens 9 and 18 millim. in diameter, respectively, of the *Dyssycus*-form. Colour in spirit pale brown. Häckel states that this variety is rare, but does not give localities. In the specimen which I examined, the small triradiates are chiefly confined to a thin cortical layer.

Hab. Seychelle Islands, 12 fms.

Distribution of species. Almost cosmopolitan.

54. Leucaltis bathybia, *Häckel*, var. mascarenica, nov.

(Plate LIV. figs. *a*, *a'*.)

Kalkschwämme, ii. p. 156, pl. xxviii. fig. 2.

Some specimens of the *Amphoriscus*-form, composed of branching and anastomosing tubes, cylindrical or somewhat compressed, 2·5 to 3·5 millim. in diameter; lumen 1·5 to 2·5 millim. wide, wall about ·5 millim. thick. Colour dull umber-brown to cream-colour. The large quadriradiates are very large, viz. rays about ·07 millim. thick, and rather short, with a long apical ray projecting into the cloacal cavity, and frequently a basal in the same plane but opposite to the apical; the small triradiates and quadriradiates are very small, viz. rays about ·007 millim. thick, and most commonly have the forms figured in figs. 2 *c*, 2 *d* of Häckel's plate (*l. c.*), viz. with very large facial angle. The larger triradiates are usually regular, and their rays are about ·04 millim. in diameter. The slight thickness of the body-wall, the proportions of the spicules, and the general form of the specimens (which is simply cylindrical in Häckel's specimens) distinguish this form from varr. *perimina* and *arabica*, Häckel: but in the straight or but slightly curved spicular rays it approaches most closely the latter variety.

Hab. Darros Island, Amirante group; Seychelle Islands, 4–12 fms.

Distribution of species. Red Sea (*Häckel*); Port Jackson (Part I., p. 482, of this Report).

55. Leucortis anguinea *.

(Plate LIII. fig. 1.; Plate LIV. figs. *d*, *d'*.)

Erect, branched; stem and branches cylindrical, tubular. (Vent opening probably at end of tube and nearly as wide as tube.) Branches given off at angle of about 140° with each other. Wall ·25 to ·35 millim. thick; lumen of tube ·8 to 1·2 millim. in diameter. Outer and inner surfaces even, smooth. Consistence in spirit elastic, compressible (colour probably white or grey naturally, at present pale purple, probably derived from other sponges). Skeleton mainly composed of triradiate spicules: those (1) of outer surface sagittal, with large facial angle, viz. 150° to 170°, the distal three fourths of the lateral rays being, in the latter case, bent back so as to be nearly in a line with each other; basal ray about ·28 millim. long, laterals ·16 to ·22, diameter of rays at base ·013 to ·019 millim. Surface triradiates occasionally provided with a short stout apical ray. (2) Triradiates of inner and central part of wall either sagittal, with facial angle of about 140°, the rays as in the surface-spicules, or subregular, the angles being about 120° each and the lateral rays slightly unequal: in both cases the lengths and diameters of the rays as in the surface-spicules. Rays of triradiates, except in the case above mentioned, almost straight, tapering from base to point. (3) Linear spicules of general body-wall, stout, fusiform, acerate, slightly curved, tapering equally to similarly sharp points at both ends; size ·65 by ·032 millim.; scattered singly at right angles to surface, points not projecting except at peristome slightly. (4) Fine acerate? of peristome, length probably about ·22 millim., thickness ·0032 millim.; closely aggregated at outer surface, at right angles to surface (the inner end is sharp, the outer end has not been observed). Canals leading from cloacal cavity small; chambers of canal-system small, inconspicuous. Spicules of centre of wall densely aggregated.

Hab. Providence Reef, Mascarene group, 24 fms.; bottom, sand and dead coral.

A single specimen, imperfect at both extremities, represents the species. It is 25 millim. in height, and consists of a short common stem and of two branches, little inferior to the stem in diameter, one of them even increasing in diameter towards its termination.

From the occurrence of the fine linear spicules in some of the first sections which were made it is inferred that they were from a peristome, which was probably almost as wide as the tube and had a slight fringe. The occurrence of a few quadriradiates has been observed also in the only species assigned by Häckel to the genus, viz. *L. pulvinar*, Häckel; and thus, if Häckel's terms were employed, this specimen would be distinguishable as a "connecting variety" under the name *Leucandra anguinea*. This species is markedly distinct from *L. pulvinar* in its slender form, in the relatively small size of the acerate spicules of the body-wall, and in

* *Anguineus*, snake-like, from the elongate pliable character of the specimens.

the presence in the peristome of fine accrates; the triradiates have their arms straighter than those figured by Häckel for his species, but their forms and dimensions are about the same in the two species.

56. Leuconia echinata.

Leucandra echinata, *Schuffner, Jenaisch. Zeitschr.* xi. p. 411, pl. xxiv. fig. 4.

A compressed purse-shaped specimen, with the mouth-opening lost. The outer termination of the accrate is slightly enlarged just before the point, forming a hastate apex, not noticed by Schuffner, who only says that the spicule is "unequally pointed at the two ends." The specimen measures 20 millim. in greatest diameter, whereas Schuffner's did not exceed 10 millim.

Hab. Darros Island, Amirante group, 22 fms.

Distribution. Mauritius (*Schuffner*).

ALPHABETICAL INDEX.

EXPLANATION OF THE PLATES.

MELANESIAN COLLECTIONS.

HUMAN CRANIA.

PLATE I.

Skulls of Torres-Straits Islanders.

Figs. A and B. Side views, one half natural size.

PLATE II.

Skulls of Torres-Straits Islanders.

Figs. A and B. Front views.

FISHES.

PLATE III.

Fig. A. *Trachynotus coppingeri.* B. *Doryichthys serialis.*

MOLLUSCA.

PLATE IV.

Fig. A. *Octopus polyzenia*, dorsal view; A^1, ventral view; A^2, end of hectocotylized arm, lower side; A^3, lateral view of same.

[D' shows the naked calcareous axis of one of its branches.] D''. Portion of D', ×6. From Port Molle.

Fig. E. *Acabaria serrata*. Portion of larger specimen in spirit, nat. size. E'. Portion of second joint above first bifurcation, of same specimen, from Port Darwin, 7–12 fms., ×6.

F. *Iciligorgia orientalis*. Type specimen, in spirit, reduced to one half nat. size. F'. Portion of left-hand branch, the margin as seen from the side, showing the depressions for the zooids and the common groove which contains them, ×2. F''. Portion of main stem just below bifurcation, from front, showing four exsert zooids. From Torres Straits, 10 fms.

Plate XXXVIII.

Fig. *a*. *Mopsella clavigera*, cortical clavate, *a'*, cortical bifurcate, and *a''* & *a'''*, Blattkeule spicules. ×100.

b. *Melitodes albitincta*, fusiform, and *b'*, small nodular cortical spicules, ×100.

c. *Acabaria serrata*, long, and *c'*, short verruca-spicules; *c''*, short, and *c'''*, long cortical fusiform spicules. All ×150.

d. *Echinomuricea indo-malaccensis*. *d* & *d'*, chief forms of the toothed spicule of the verruca, *d''* & *d'''*, cortical spicules. All ×70.

e. *Iciligorgia orientalis*. Chief forms of spicules, ×70.

f. *Psilacabaria gracillima*, cortical, *f* & *f'*, verruca-spicules, ×70. [The ridged cortical spicule has been omitted.]

g. *Plexaura prælonga*, var. *typica*, radiate, and *g'*, Blattkeule cortical spicules, ×70.

h. *Plexaura prælonga*, var. *cinerea*, Blattkeule cortical spicule, ×70.

SPONGES.

Plate XXXIX.

Fig. A. *Stelispongus excavatus*. Type specimen (dry) from Arafura Sea. Reduced to one half nat. size.

Fig. B. *Stelispongus implexus.* The most symmetrical of three specimens from coral-reef, Port Molle ; dry. Nat. size.

C. *Siphonochalina bullata.* Left-hand half of largest dry specimen from Port Curtis, showing two completed tubes, and behind them (*c*) the margin of an incomplete one. Reduced two thirds nat. size.

D. *Reniera testudinaria.* Small part of large dry specimen from 4 fms., Port Denison, showing the lobes and ridges which characterize the surface of the species. Reduced to two thirds nat. size.

E. *Rhizochalina spathulifera.* The type (dry) specimen from Thursday Island, 4–5 fms. Reduced to two thirds nat. size. [The lower part overrun by the filiform stolons of a Hydroid Zoophyte.]

F. *R. canalis.* Dry specimen, one of the types, from Port Darwin, 8–12 fms. [The lower end of the figure shows that one end of the canaliform Sponge has been broken off and the centre of the specimen coated by a calcareous Polyzoon (*Cellepora*).] Reduced to two thirds nat. size.

G. *Toxochalina robusta.* Terminal branches of a spirit-specimen from Port Jackson ; upper surface, showing vents. Reduced to two thirds nat. size.

H. *Cladochalina subarmigera.* Part of a specimen in spirit from Warrior Reef, Torres Straits, seen from above, showing vents and short and scanty spines. Nat. size.

I. *Gelliodes fibulata.* One of the larger and more ramose specimens, exhibiting several anastomoses of the branches. Dry ; from Thursday Island, 3–5 fms. Reduced to two thirds nat. size.

J. *Pellina muricata.* Part of the type specimen, in spirit, from Port Darwin, between tide-marks, showing serial arrangement of the hispid cloacal tubes to form a wall-like ridge. Nat. size.

K. *Rhaphidophlus procerus.* The largest spirit-specimen from Port Darwin, 7–12 fms. [The basal portion includes a

Serpulid or *Vermetus*-shell, and forms several roots.] Reduced to one third nat. size.

Fig. L. *Iotrochota purpurea*. A small but symmetrically developed dry specimen from Torres Straits or its neighbourhood. Nat. size.

M. *I. baculifera*. Portion of type (spirit) specimen on stone, from Port Darwin, between tide-marks. Nat. size. [The small pointed conuli are not quite so well marked on this as on the reverse side of the specimen.]

N. *Schmidtia variabilis*. The greater part of the type specimen (spirit), from Port Darwin, 7–12 fms. [Seen from the side, the true base is towards the right-hand margin of the plate.] Reduced to two thirds nat. size.

O. *Pellina aliformis*. The type specimen (in spirit), from Port Darwin, 7–12 fms. Seen from one side, one wing almost concealing the other. Nat. size.

Plate XL.

Fig. A. *Echinodictyum glomeratum*. Type specimen (dry), from Thursday Island, Torres Straits, 4–5 fms. Nat. size.

B. *Pachychalina macrodactyla*, portion, including the second and third bifurcations above base, seen from the front. B'. Apex of branch from front, slightly inclined to one side to show lateral series of vents. From dry, somewhat macerated, specimen from Friday Island, Torres Straits. Nat. size.

C. *Amphilectus hispidulus*. The greater part of the type (dry) specimen; the real base is on a shell (omitted) to the left. From Thursday Island, Torres Straits, 3–5 fms. Nat. size.

D. *Echinodictyum cancellatum*. The lower part (about half of the whole) of the type (dry and macerated) specimen from Warrior Reef, Torres Straits. One third nat. size.

Fig. E. *Stelletta purpurea.* One of the larger specimens from above, showing (*e*) vent. In spirit. West Island, Torres Straits, 7 fms. Nat. size.

F. *Clathria coppingeri.* The type specimen (dry), from Albany Island, Torres Straits, 3 fms. One third nat. size. [The margins are slightly reduced by fracture.] F'. The same; two meshes, from front, from specimen in spirit; West Island, Torres Straits, 3–4 fms. Nat. size.

G. *Myxilla arborescens.* About one half of type specimen (in spirit), from Port Jackson, 0–5 fms. Nat. size.

H. *Tethyopsis dissimilis.* Larger of the two specimens from Port Darwin, 7–12 fms. In spirit. Nat. size. [Imperfect above and below.]

I. *Clathria aculeata.* The type specimen, from Thursday Island, Torres Straits, 3–4 fms. In spirit. Nat. size.

J. *Raspailia bifurcata.* The type specimen (in spirit, but macerated), from Prince of Wales Channel, Torres Straits, 5–7 fms. Nat. size.

K. *Esperia pellucida.* One lobe of type specimen, with part of incrustation involving stones &c.; in spirit; from Alert Island, Torres Straits, 7 fms. Nat. size.

L. *Rhaphidophlus arborescens.* The type specimen (dry), from Friday Island, Torres Straits. Two thirds nat. size.

Plate XLI.*

Fig. A. *Hippospongia derasa.* The type specimen, from West Island, Torres Straits; dry, macerated. Seen from the longest side. Reduced to two thirds nat. size.

B. *Dysidea semicanalis.* The type specimen, from North-east coast of Australia; dry and macerated. Reduced to one half nat. size.

* The microscopic details in this and the following Sponge-plates have been in almost all cases prepared with the aid of sketches made to scale by Mr. Ridley himself.

Fig. C. *Dysidea digitifera.* The type specimen, from Albany Island, 8 fms.; in spirit; growing over Hydroid zoophyte. Nat. size.

D. *Cladochalina diffusa.* One of the type specimens, from Singapore, between tide-marks; in spirit. Reduced to two thirds nat. size. *d.* Portions of primary and secondary fibre of vertical section, × 95. *d'.* Detached spicule, × 190.

E. *Hymeniacidon agminata.* The type specimen, from Port Jackson, 0–5 fms.; in spirit. Reduced to two thirds nat. size.

F. *Raspailia clathrata.* Basal portion of type specimen, from Thursday Island, 3–4 fms. Nat. size.

g. Euspongia officinalis, var. *cavernosa.* Vertical section of type (dry) specimen, from Torres Straits. × 38.

h. Psammopemma densum, var. *subfibrosa.* Vertical section of type (spirit) specimen, from Torres Straits. × 38. [The surface faces to the right.]

i. Cladochalina nuda. Portion of vertical section of type specimen, from Alert Island, showing the contained spicules. × 190.

j. C. nuda, var. *abruptispicula.* Spicules of type specimen from Thursday Island. × 190.

k. Chalina monilata, portion of primary fibre of vertical section of type, from Port Jackson, showing the contained spicules, × 370. *k'.* An isolated spicule, × 370.

l. Cladochalina subarmigera, portion of primary and secondary fibres of vertical section, *l'*, spicules, of type specimen, from Warrior Reef. × 190.

m. Toxochalina folioides, fibre of main skeleton as seen in vertical section. *m'.* Skeleton-spicule, × 68. *m''.* Tricurvate flesh-spicule, × 370. From specimen from Port Darwin.

Fig. *n*. *Toxochalina robusta*, portion of skeleton, showing primary and secondary fibre. *n'*. Skeleton acerate and tricurvate acerate spicules. × 370. From type specimen from Port Jackson.

o. *Pachychalina macrodactyla*. Skeleton-spicule, × 190. From specimen figured Plate XL. fig. B.

p. *Protoschmidtia hispidula*, portion of vertical section, × 68. *p'*. Skeleton-spicule, × 190. From type specimen from Albany Island. [*Note*.—Some loose spicules in the interspaces of the skeleton have been omitted for the sake of clearness.]

q. *Rhizochalina spathulifera*. Skeleton-spicules, × 68. From type specimen from Thursday Island.

r. *R. canalis*. Skeleton-spicule, × 68. From type specimen from Port Darwin.

s. *R. singaporensis*, var. Spicules, × 190. From specimen from West Island, Torres Straits.

t. *Schmidtia variabilis*. Spicules, × 68. From type specimen from Port Darwin. [The median curve of the diagonally-placed spicule is represented as too sudden, and the two lateral curves introduced do not exist.]

u. *Reniera testudinaria*, part of vertical section, × 38. *u'*. Spicules, × 68. From dry specimen from Port Denison.

v'. *Pellina muricata*. Skeleton-spicule, with ends of two others, exhibiting the wide range of variation, × 190. From type specimen from Port Darwin.

w. *P. aliformis*. Skeleton-spicule, × 68. From type specimen from Port Darwin.

x. *P. eusiphonia*. Skeleton-spicules, × 68. From type specimen from Port Darwin.

y. *Amphilectus hispidulus*, vertical section, × 68. *y'*. Skeleton acuate spicule, × 190. *y''*. Anchorate spicule from front and side, × 370. From type (dry) specimen from Thursday Island.

Fig. *z*. *Gellius cymiformis*. Spicules, × 370. From specimen from Thursday Island.

aa. *Crella schmidti*. Spicules (anchorate from front and side), × 370. From type specimen from Port Jackson.

bb. *Gelliodes fibulata*, fibre of part of vertical section, showing the very stout and straight primary and the secondary fibres; *bb'*, portion of secondary fibre, showing arrangement of spicules and isolated skeleton-spicule: × 68. *bb''*. Bihamate spicules, × 370. From dry specimen from Prince of Wales Channel.

cc. *Amphilectus tibiellifer*, skeleton acuate and tibiella-spicules, × 190 (head of latter enlarged). *cc'*. Tricurvate acerate, × 190. *cc''*. Anchorate seen from front and side, × 370. From one of the types from Prince of Wales Channel.

Plate XLII.

Fig. *a*. *Myxilla arborescens*, portion of vertical section, × 190. *a'*. Skeleton acerate spicules, × 190. *a''*. Equianchorate spicule from front and side, × 370. From type specimen (in spirit) from Port Jackson.

b. *Acarnus ternatus*, acuate, grapnel, and tricurvate spicules, and head of grapnel as seen from above, × 190. *b'*. Tibiella and equianchorate (from front and side) spicules, × 370. From specimen from West Island, Torres Straits.

c. *Ophlitispongia australiensis*, fibre of vertical section, × 190. *c'*. Skeleton cylindrical and echinating acuate spicules, × 190. From type specimen from Port Molle.

d. *Clathria tuberosa*, vertical section, × 38. From specimen in spirit from Prince of Wales Channel.

e. *Iotrochota purpurea*, vertical section, and *e'*, dermis, × 20. *e''*. Two sizes of skeleton-spicule, × 190. *e'''*. Birotulate spicules, × 370. From dry specimen from Prince of Wales Channel. *e''''*. Two ciliated chambers, from specimen of green var. from Amirante Island, × 370.

f. *I. baculifera*, tibiella-spicule of dermis, × 370. From type specimen from Port Darwin.

Fig. *g*. *Phoriospongia fibrosa*, cylindrical, bihamate, equianchorate (from front and side) spicules, × 370. From type specimen from Prince of Wales Channel.

h. *Esperia pellucida*, skeleton acuate spicule. *h'*, large (from front), *h''*, small inequianchorate (from front and side); *h'''*, bihamate spicule: and *h''''*, trichite-bundle, × 370. From type specimen from Alert Island, Torres Straits.

i. *Clathria coppingeri*, small and large spined acerate, and smooth variety of end of latter, and smooth subspinulate spicules, × 190. *i'*, equianchorate spicule (from front and side), × 370. From specimen from Albany Island.

j.* *C. frondifera*, smooth acerate spicule, three sizes, × 190. *j'*, spined acuate, two forms, × 190; *j''*, tricurvate spicule, and *j'''*, equianchorate (from front and side), × 370. From specimen from Fitzroy Island, Queensland.

k. *C. aculeata*, smooth acuate and subspinulate, and spined acuate spicules, × 190. *k'*, tricurvate, and *k''*, equianchorate (from front and side), × 370. From type specimen from Thursday Island.

l. *Raspailia bifurcata*, portion of fibre from near base, showing spined acuate spicule *in situ*, × 190. *l'*, smooth acuate and acerate spicules, × 38. From type specimen (in spirit) from Prince of Wales Channel.

m. *R. australiensis*, part of vertical section from near middle of Sponge, × 38. *m'*, larger and smaller acuate spicules, × 68. From type specimen (in spirit) from Port Darwin.

n. *Rhaphidophlus arborescens*, smooth and spined acuate spicules, and head of spinulate variety of the former, × 190. *n'*. Equianchorate seen from the front, × 370. From type specimen from Friday Island.

o. *R. procerus*, part of vertical section, × 68. *o'*, skeleton-spicules, × 68; *o''*, flesh-spicules, × 370. From type specimen (in spirit) from Port Darwin.

* This figure has been erroneously referred to as fig. *i* in the text on p. 448.

Fig. *p*. *Echinodictyum glomeratum*, spicules, ×190. From type specimen from Thursday Island.

q. *E. cancellatum*, spicules, ×190. From specimen figured Pl. XL. fig. D.

r. *E. costiferum*, spicules, ×190. From specimen from Port Molle.

s. *Leucophlœus fenestratus*, part of vertical section from type specimen, ×38.

t. *Amphilectus tibiellifer*, skeleton acuate and tibella and tricurvate acerate spicules, ×190. *t'*, head of tibiella, and *t''*, equianchorate as seen from front and side, ×370. From type specimen from Torres Straits.

Plate XLIII.

Fig. *a*. *Axinella echidnœa*. Spicules, ×68. From dry specimen from Thursday Island.

b. *Geodia globostellifera*, globostellate, external and internal stellate spicules, in tissue below dermal crust, ×370. *b'*. Portion of cortex, showing crust of balls covered by membrane containing smaller stellates, and tuft of surface acerate spicules projecting from it, ×68.

c. *Spirastrella decumbens*. Spicules, ×190. From type specimen from Alert Island.

d. *S. congenera*, skeletal spinulate spicules, showing two forms of head, ×190. *d'*. Flesh-spicules, ×370. From type specimen from Thursday Island.

e. *S. vagabunda*, skeletal spinulate spicule, ×190. *e'*. Flesh-spicules, ×370. From specimen from Torres Straits.

f. *Hymeniacidon agminata*, spicules, ×190. *f'* Head of spinulate spicules, ×370. From type specimen from Port Jackson.

g. *Leucophlœus fenestratus*, var. Spicule, ×68.

h. *Suberites epiphytum*, vertical section, ×68. *h'*, spicule ×68: *h''*, head of spicule, chief forms, ×370. From spirit-specimen from Port Curtis.

Fig. *i*. *Stelletta clavosa*, acerate, anchoring quadriradiate, and zone spicules, ×68. *i'*, head of zone-spicule, as seen from above, ×68; *i''*, stellate flesh-spicules, ×370. From type specimen from Prince of Wales Channel.

j. *S. purpurea*, acerate, anchoring quadriradiate, and zone-spicules, ×68. *j'*, stellate flesh-spicules, ×370. From type specimen from Torres Straits.

k. *S. purpurea*, var. *retroflexa*, the zone-spicule, ×68. From specimen from Torres Straits.

l. *Tethyopsis dissimilis*, diagrammatic vertical section* across upper end of larger† specimen from Port Darwin, × about 2. *l'*. The same* of smaller specimen from Port Darwin, × about 3 [the dark parts represent canals, the dotted portions those occupied by the skeleton and tissues in the Sponge itself]. *l''*. Portion of dermis‡ from between two longitudinal skeletal lines, from larger specimen from Port Darwin, as seen from *inside*, × about 25. *l'''*. Part of septum between two large canals, from same specimen, × about 25. *l''''*. Skeleton triradiate spicules, one normal, the other with abnormally elongated third ray, × 34. *l'''''*. Acerate spicule from small Port-Darwin specimen, and *l''''''*, from Torres-Straits specimen, ×34. *l'''''''*. Flesh-spicules from larger specimen from Port Darwin, ×850.

m. *Leucaltis bathybia*, var. *australiensis*, tri- and quadriradiate spicules of outer surface; *m'*, triradiate from centre of wall; *m''*, quadriradiates of subjacent parts. All ×68. From type specimen from Port Jackson.

n. *Stellettinopsis carteri*, the skeleton-spicule, ×68. *n'*, the larger, and *n''*, the smaller stellates, ×370. From type specimen from Torres Straits.

* *Canals.*—1, anterior; 2, posterior; 3 and 4, lateral; 5 and 6, antero-lateral; 7 and 8, postero-lateral; 9 (in *l*), axial.

† *Note.*—Since writing the account of the canals (given at p. 478 of Part I. of the Report), I have discovered that the apparently single pair of *lateral* spaces in the larger specimen is in reality double.

‡ Showing that the long arm of the skeleton-spicule commonly extends over *two* interfascicular spaces, and is not confined to one as stated in the description at p. 477.

COLLECTIONS FROM THE WESTERN INDIAN OCEAN.

MOLLUSCA.

Plate XLIV.

Fig. A. *Conus martensi.*

B. —— *articulatus.*

C. *Pleurotoma* (*Defrancia* ?) *grisea.*

D. *Murex* (*Ocinebra*) *pumilus.*

E. —— (——) *infans.*

F. —— (——) *darrosensis.*

G. *Columbella seychellensis.*

H. —— *cincinnata.*

I. —— *rufopiperata.*

K. —— *amirantium.*

L. —— *albocaudata.*

M. *Coralliophila amirantensis.*

N. *Mitra tenuis.*

O. *Turricula* (*Callithea*) *bipartita.*

P. *Marginella picturata.*

Q. *Cerithium albovaricosum.*

R. —— *amirantium.*

S. —— (*Rhinoclavis*) *acutinodulosum.*

T, T^1. *Triphoris mirificus.*

U, U^1, U^2. *Turbo tursicus.*

V, V^1. *Trochus* (*Gibbula* ?) *amirantium.*

W. *Chemnitzia coppingeri.*

Fig. C. Frontal region of *Gonodactylus* (*G. elegans*, ♂?), showing the form of the rostrum. ×3.

D. Part of right gnathopod of *Meera diversimanus*. *d*, part of left gnathopod.

SPONGES.

Plate LIII.

Fig. A. *Leucophlœus fenestratus*. Specimen which has incorporated many calcareous fragments with its base, and gives off a remarkable smooth flat lobate process (*a*) from the base. In spirit. From Providence Reef, 24 fms. × 1½.

B. *L. proteus*. Variety distinguished by its almost entirely massive and smooth habit, a small part only (*b*) of the surface exhibiting the usual ridged and pilose character. *b'*, apparently accidental pit. In spirit. From Providence Reef, 24 fms. Nat. size.

C. *Dysidea gummiuea*. Small specimen, based on a stone, showing lateral extension into lobes. In spirit. From Providence Island, 19 fms. Nat. size.

D. *Hippospongia intestinalis*, var. Part of a large contorted mass, showing great irregularity of growth and variation in the stoutness of the twisted lobes [the dermal sheet of fibres has been abraded from the lobes towards the top of the figure (*d*)]. Dry. From Providence Island. Nat. size.

E. *Axinella proliferans*. Left-hand half of small specimen from Providence Island, 19 fms. In spirit. ×¾. E'. Profile view of upper part of same specimen, slightly shaded. Nat. size.

F. *Desmacidon rimosa*. The type specimen, showing the large vents and well-marked grooves (*f*, *f*) of the excretory canal-system. In spirit. From Mozambique. Nat. size.

Fig. G. *Reniera cribriformis.* The most complete of the fragments, representing the type specimen, from the exterior. In spirit. From Seychelle Islands, 12 fms. × ⅔.

H & H'. *R. camerata.* Two fragments, probably belonging to one (the typical) specimen. H shows the compact, even character which distinguishes the *outer* surface: H' the chambered or plicate condition of the *interior*. In spirit. From Marie Louise Island, 16–17 fms. Nat. size.

I. *Clathria meandrina.* Part of the type specimen, incrusting a stem. In spirit. From Marie Louise Island, Amirantes, 17 fms. Nat. size.

J. *C. frondifera.* The largest specimen obtained; attached to rock. It shows a transition from a flattened expanded (*j*) to a rounded trabecular (*j'*) form of the constituent lobes of sponge-substance, and exhibits more definiteness of form as a whole than is usual in the species. Dry. From Providence Reef, 24 fms. Nat. size.

K. *C. decumbens.* The type specimen, showing considerable variation in the proportionate amount of fenestration to the surface (*e.g.* at *k* the surface is entire, at *k'* it is regularly fenestrate); at *k''* the surface is abraded. In spirit. From Etoile Island, 13 fms. Nat. size.

L. *Leucortis anguinea.* The type specimen, in spirit. From Providence Reef, 24 fms. × 2. *l*, stem.

M. *Erylus cylindrigerus.* The type specimen, in spirit. From Providence Reef. Nat. size.

N*. *Phyllospongia madagascarensis*, var. *supraoculata.* From African Island. Dry. N'. The same, upper margin of median lobe, from above, to show thickness of frond and characters of vents. Nat. size.

* By an inadvertence these figures have been referred to in the text (p. 594) as M and M'.

PLATE LIV.*

Fig. *a*. *Leucaltis bathybia*, var. *mascarenica*, the two forms of stout quadriradiate and the triradiate spicules of the main skeleton. ×38. *a'*. The minute tri- and quadriradiates of the cloacal surface, ×370. From type specimen from Seychelle Islands.

b. *Axinella spiculifera*, two sizes of the skeleton-spicule, ×68. From specimen from Darros Island.

c. *A. proliferans*, the skeleton-spicule, ×68. From type specimen from Providence Island.

d. *Leucortis anguinea*, the stout acerate, and different forms of the tri- and quadriradiate spicules of the main skeleton, ×68. *d'*, the slender acerate (?) of the peristome (the outer end imperfect), ×370. From type specimen from Providence Reef.

e. *Erylus cylindriyerus*, part of the disk-spicule, in profile, ×190. *e'*, the disk-spicule, from the front (tubercles omitted, except at apex), ×190: *e''*, the same, the tubercles, ×300; *e'''*, the cylindrical spicule, two forms, ×68: *e''''*, the minute acerate spicule, young and adult, ×190: *e'''''*, larger stellate spicule, two forms, showing variation in the number and spination of the rays, ×190: *e''''''*, the small stellate, ×370. From specimen from Providence Reef.

f. *Esperia gelatinosa*, the subspinulate, *f'*, large, and *f''*, small anchorate (the latter from the front and side), *f'''*, bihamate spicules; *f''''*, trichite-bundle. ×370. From specimen from Providence Island.

g. *Clathria decumbens*, the skeleton and echinating acuate spicules, ×190. *g'*, the equianchorate flesh-spicule, from the front and side, ×370. From type specimen from Etoile Island.

* *Note*.—The figures in this Plate have been prepared with the aid of sketches, to scale, made by Mr. Ridley.

Fig. *h*. *Clathria meandrina*, the stout and slender smooth acerate, and the spined acuate spicules, × 190. *h'*, the tricurvate acerate, and *h''*, the equianchorate spicules (the latter from the front and side), × 370. From type specimen from Marie Louise Island.

i. *Reniera*, sp. allied to *R. crateriformis*, average form of skeleton-spicule, × 68. From specimen from Providence Island.

j. *Rhizochalina pellucida*, the skeleton-spicule, × 190. From type specimen from Providence Island.

k. *Leucophlœus proteus*, the skeleton-spicule, × 68. From specimen from Providence Reef.

l. *Echinonema gracile*, the skeleton- and echinating spicules, × 190. *l'*, the tricurvate acerate, and *l''*, equianchorate spicules, × 370. From type specimen from Providence Reef.

m. *Desmacidon rimosa*, the skeleton-, and *m'*, tricurvate acerate spicules, × 190; *m''*, the equianchorate, from the front and side, × 370. From type specimen from Mozambique.

n. *Reniera camerata*, the skeleton-spicule, × 190. From type specimen from Marie Louise Island, Amirantes.

o. *R. cribriformis*, the skeleton-spicule, × 190. From type specimen from Seychelle Islands.

p. *Spirastrella punctulata*, the skeleton-spicule, × 190. *p'*, the spinispirular flesh-spicules, × 370. From type specimen from Mozambique.

q. *S. transitoria*, the skeleton-spicule, × 190. *q'*, the spinispirular flesh-spicules and curiously attenuated variety of apex, × 370. From type specimen from Darros Island.

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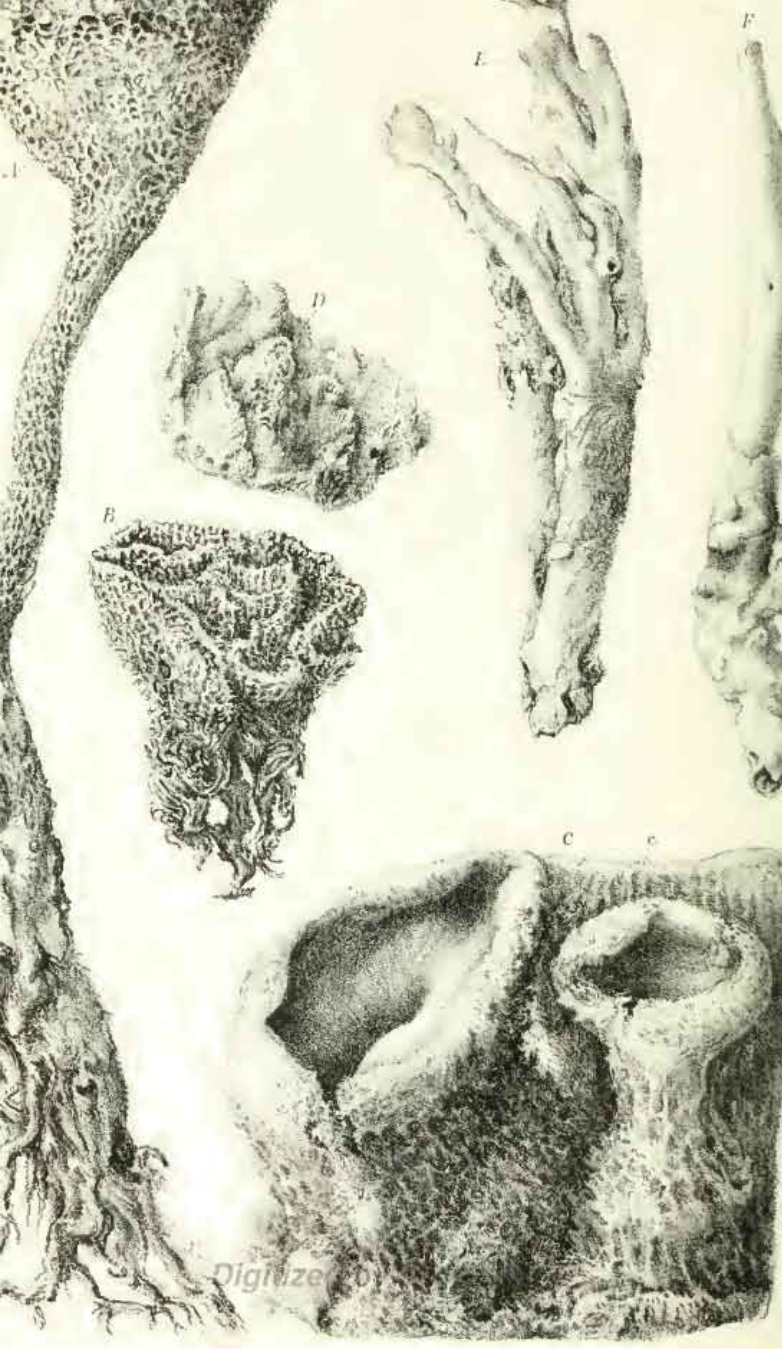
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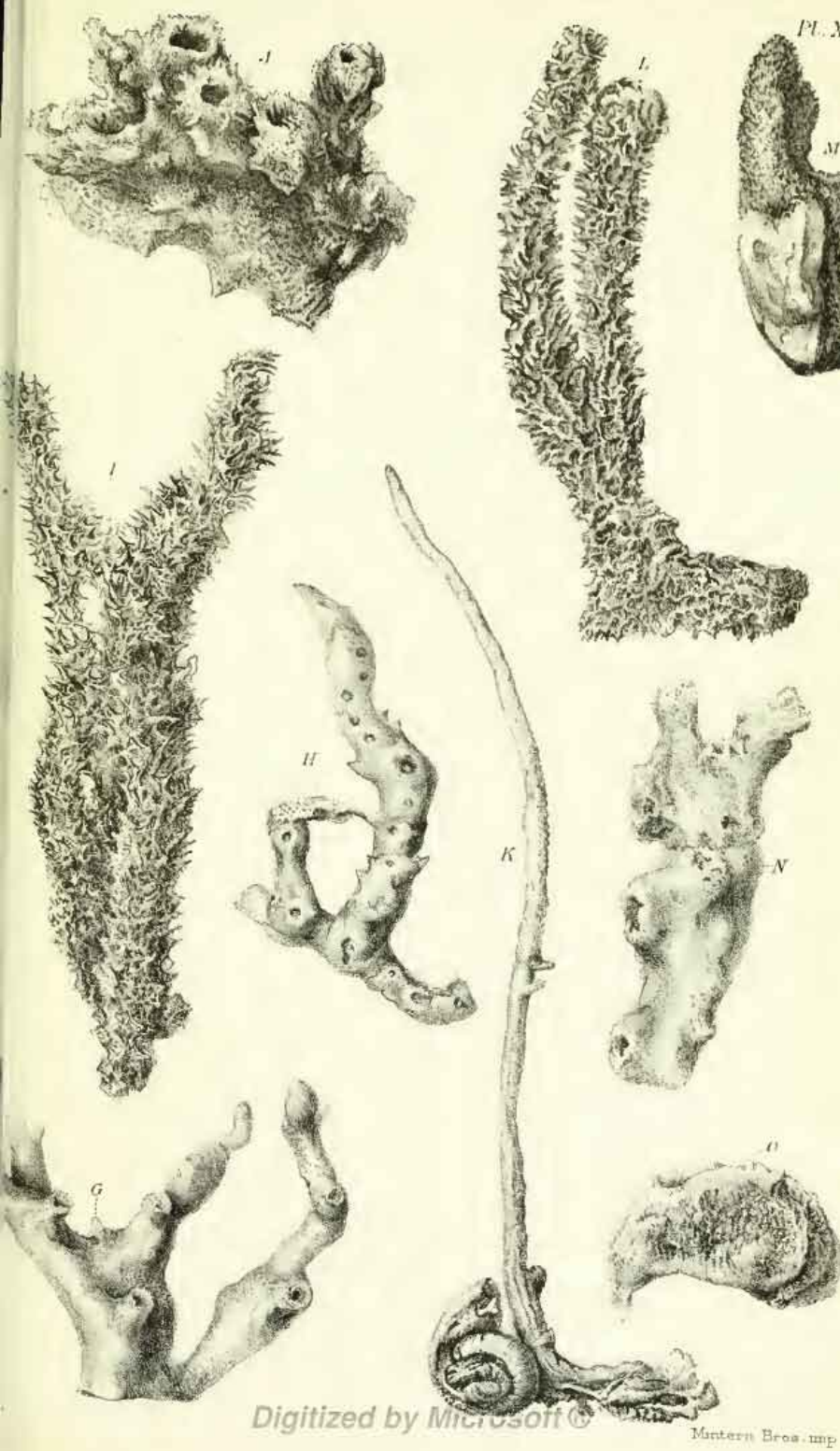

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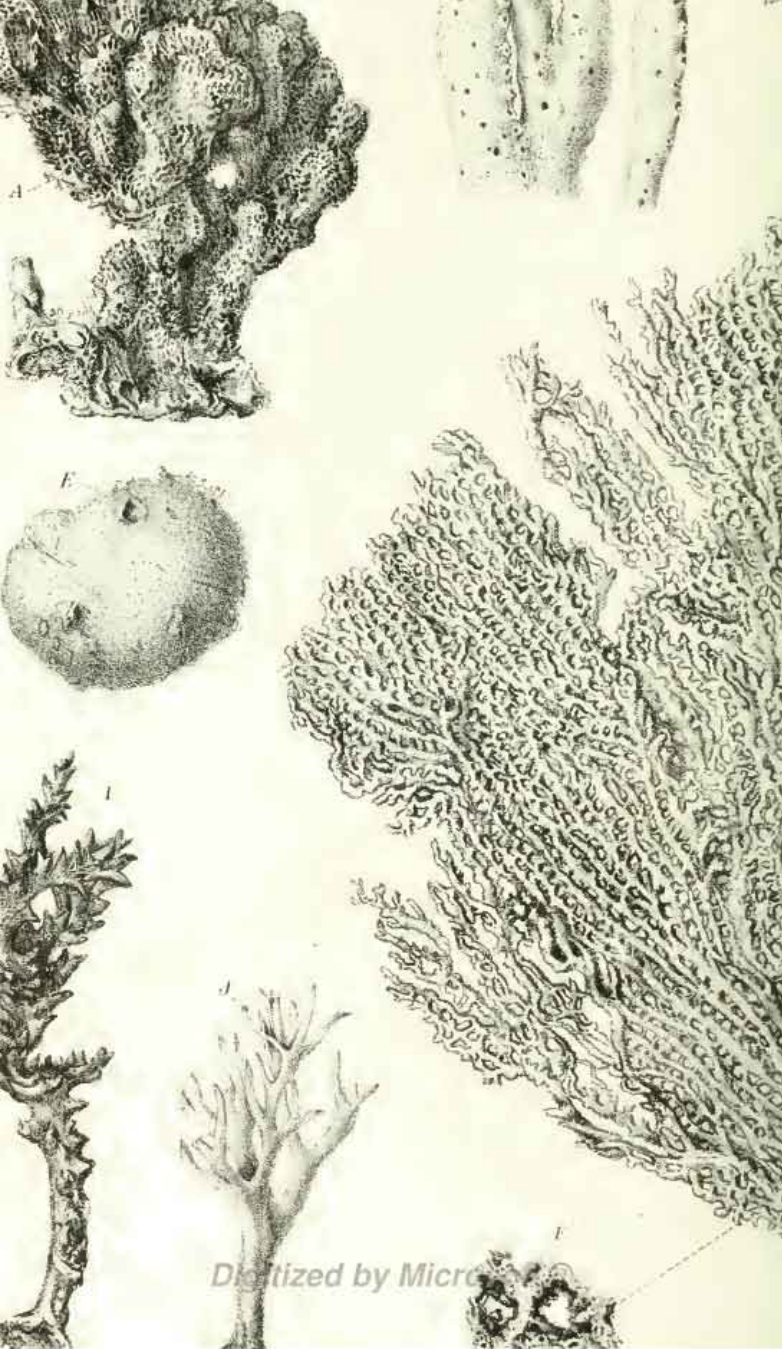

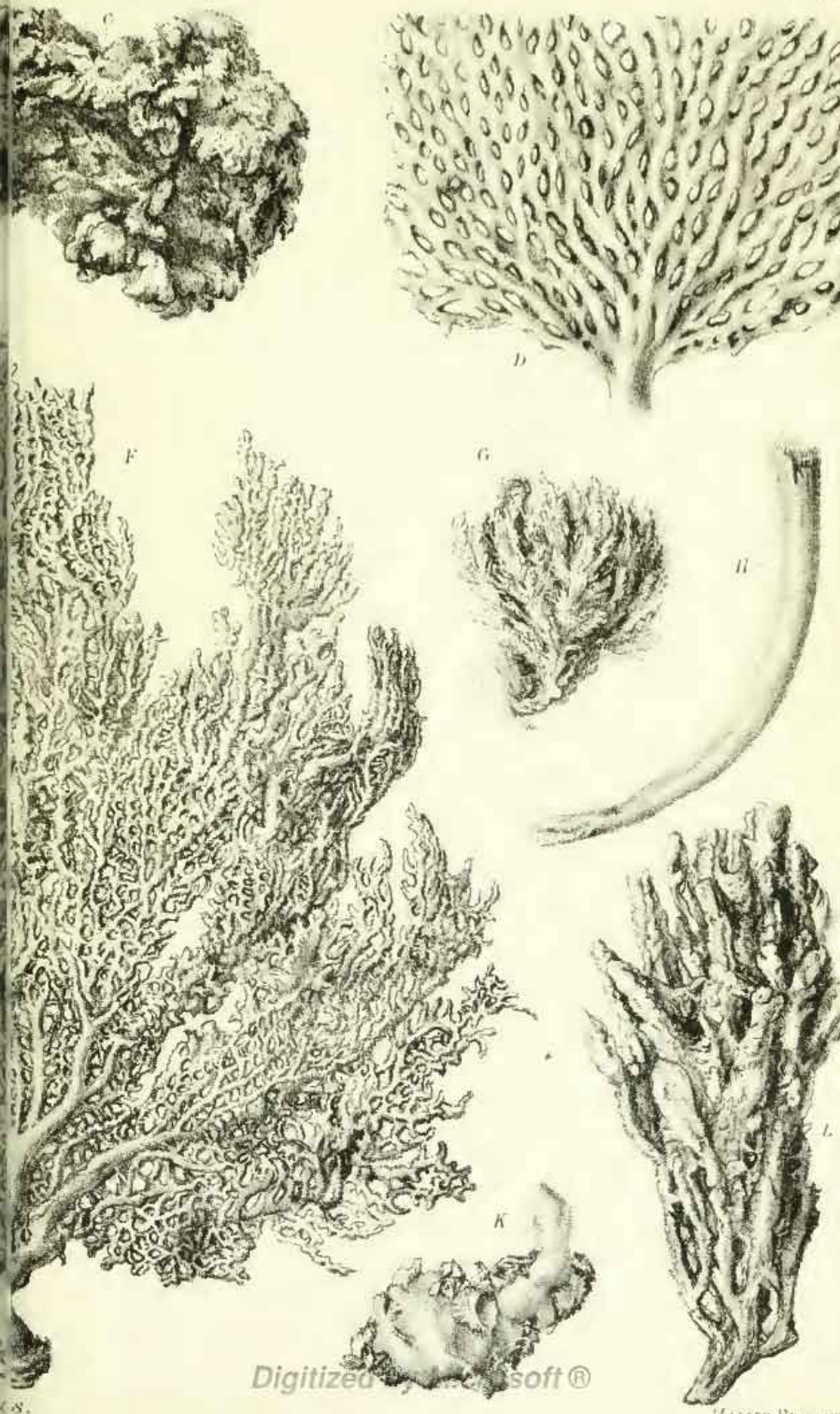

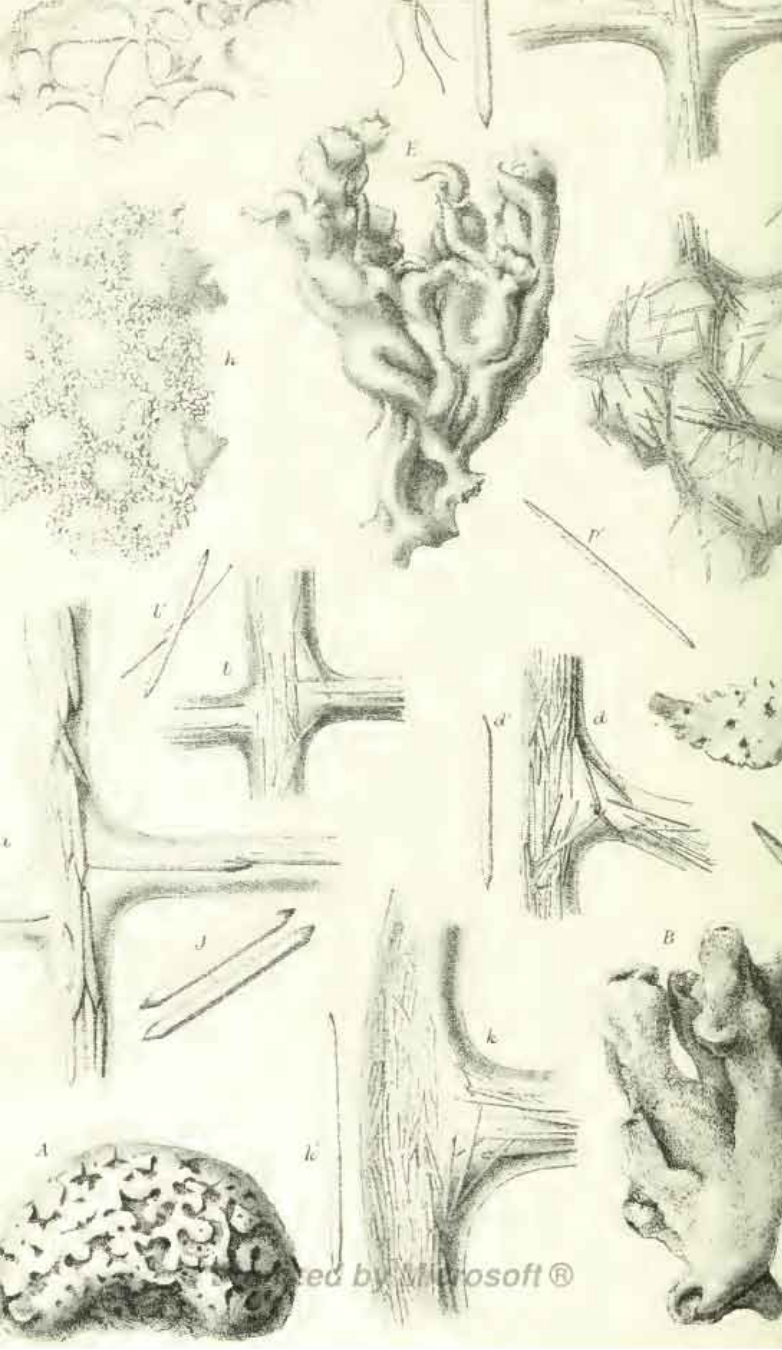

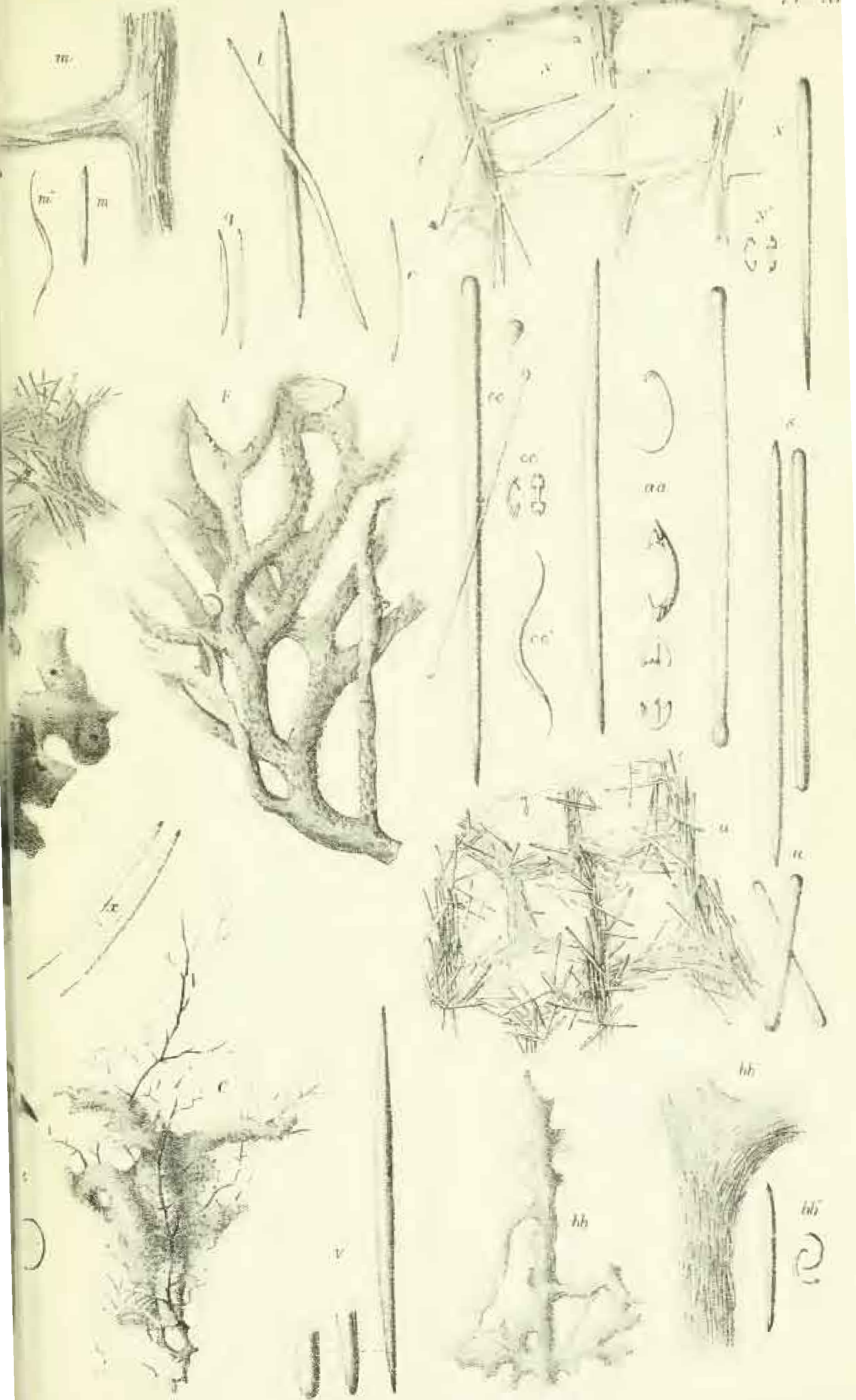

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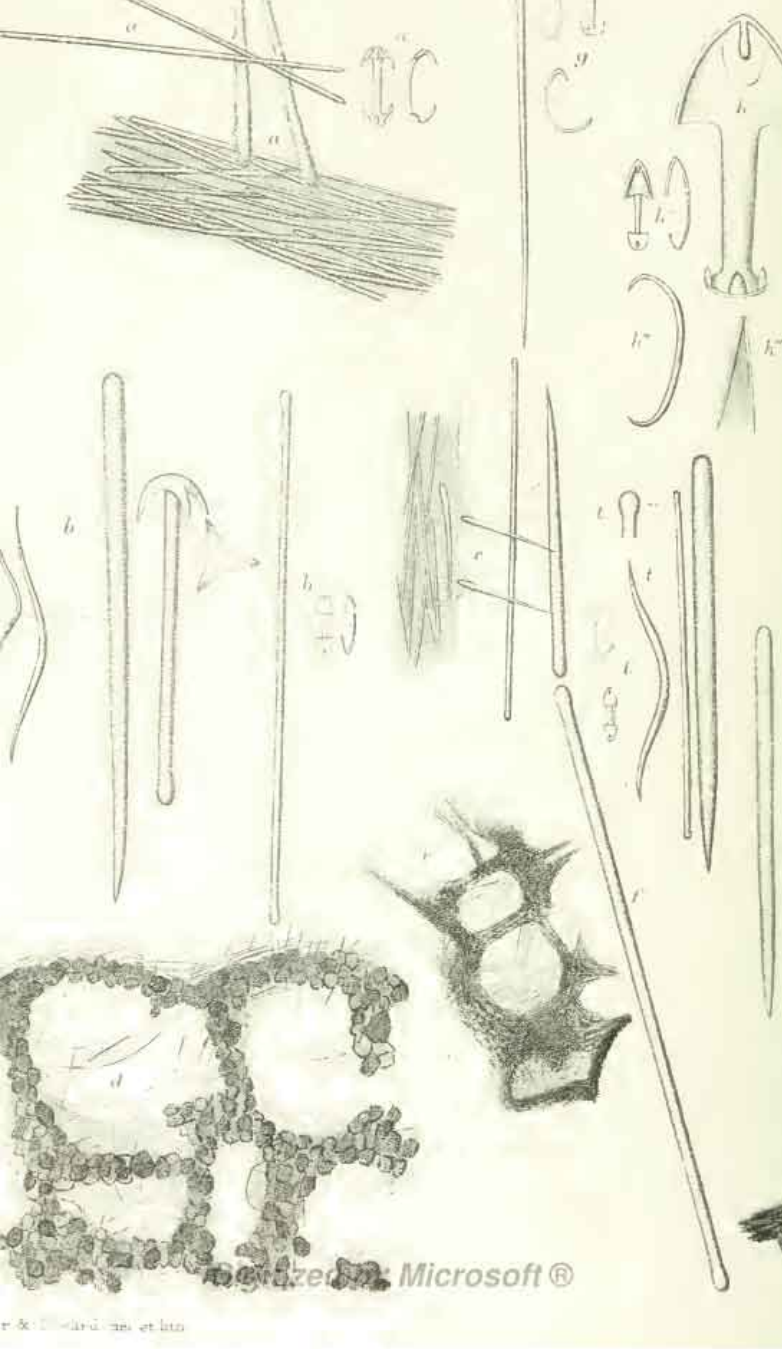

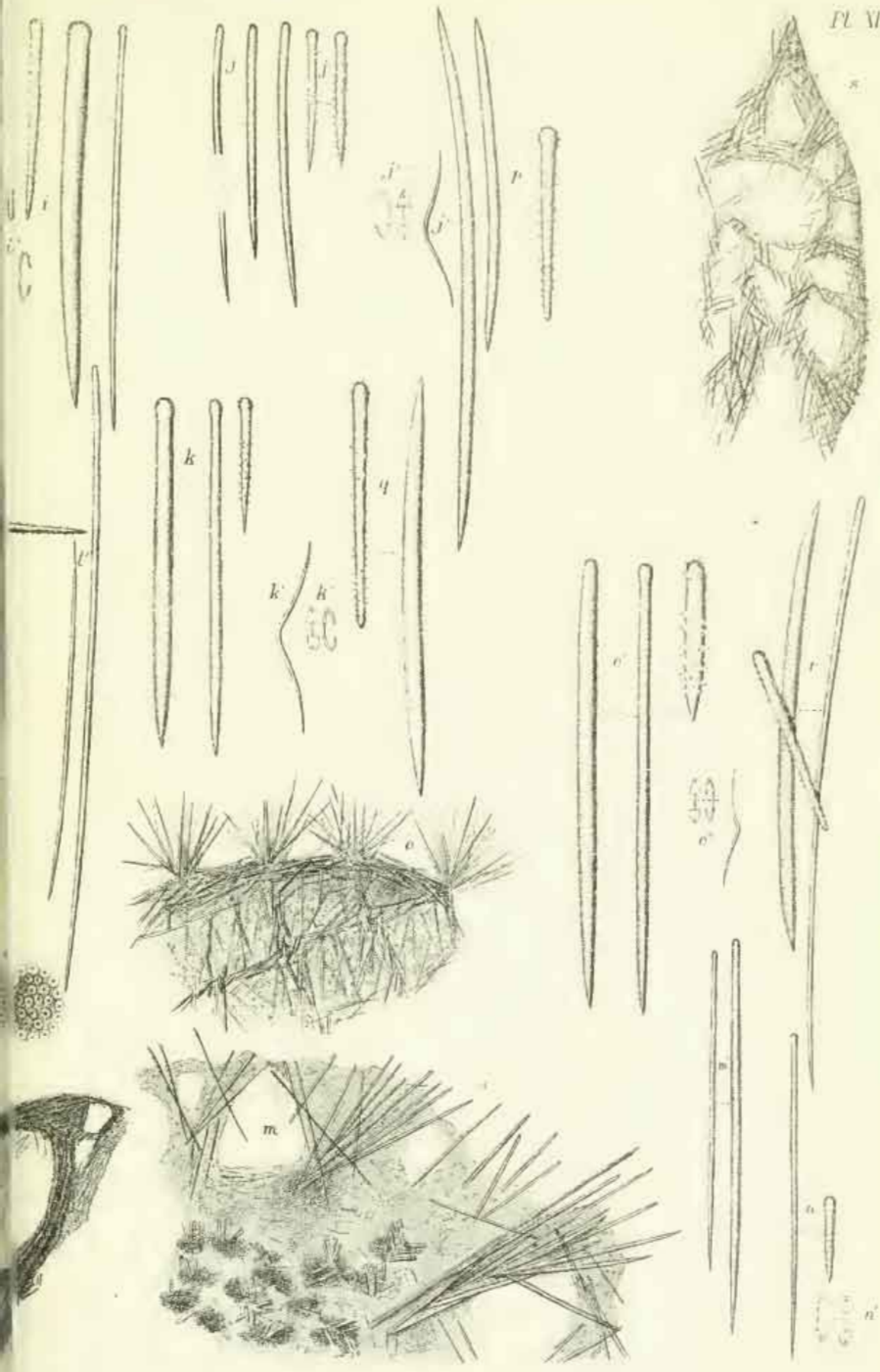

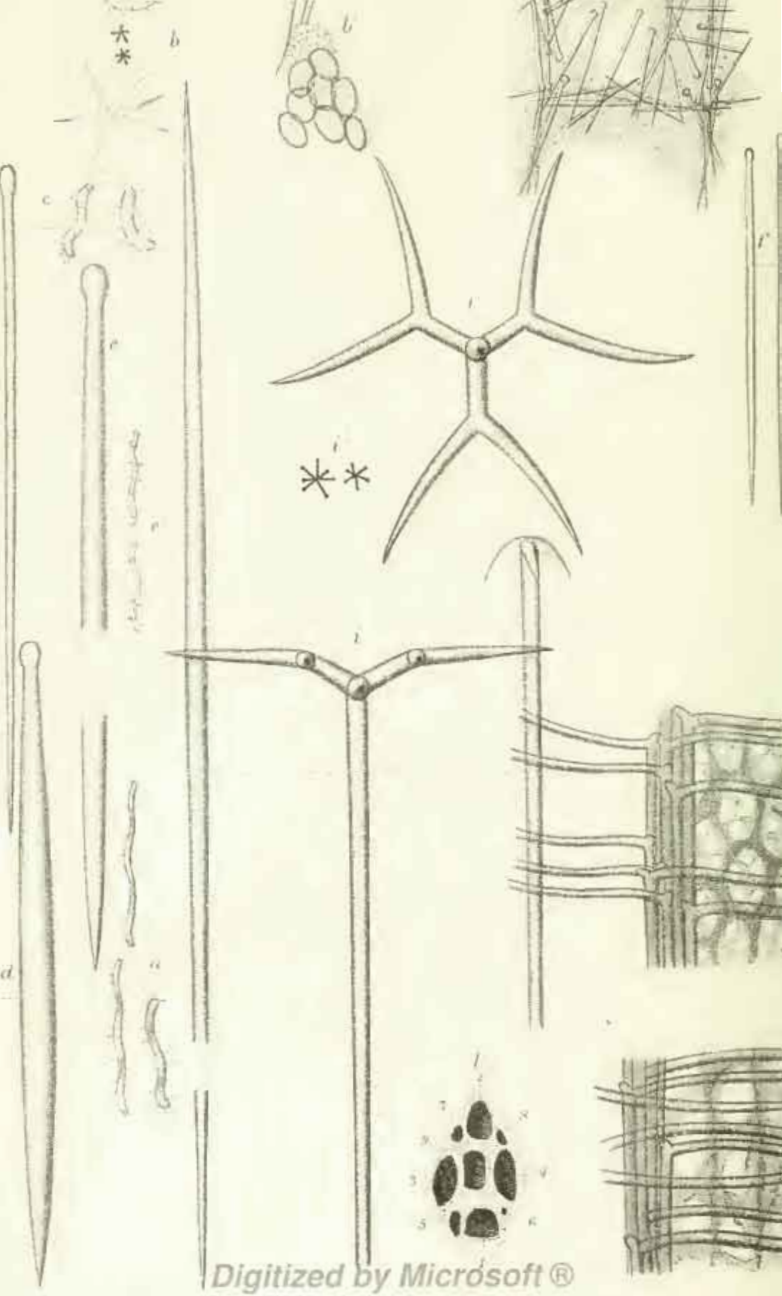

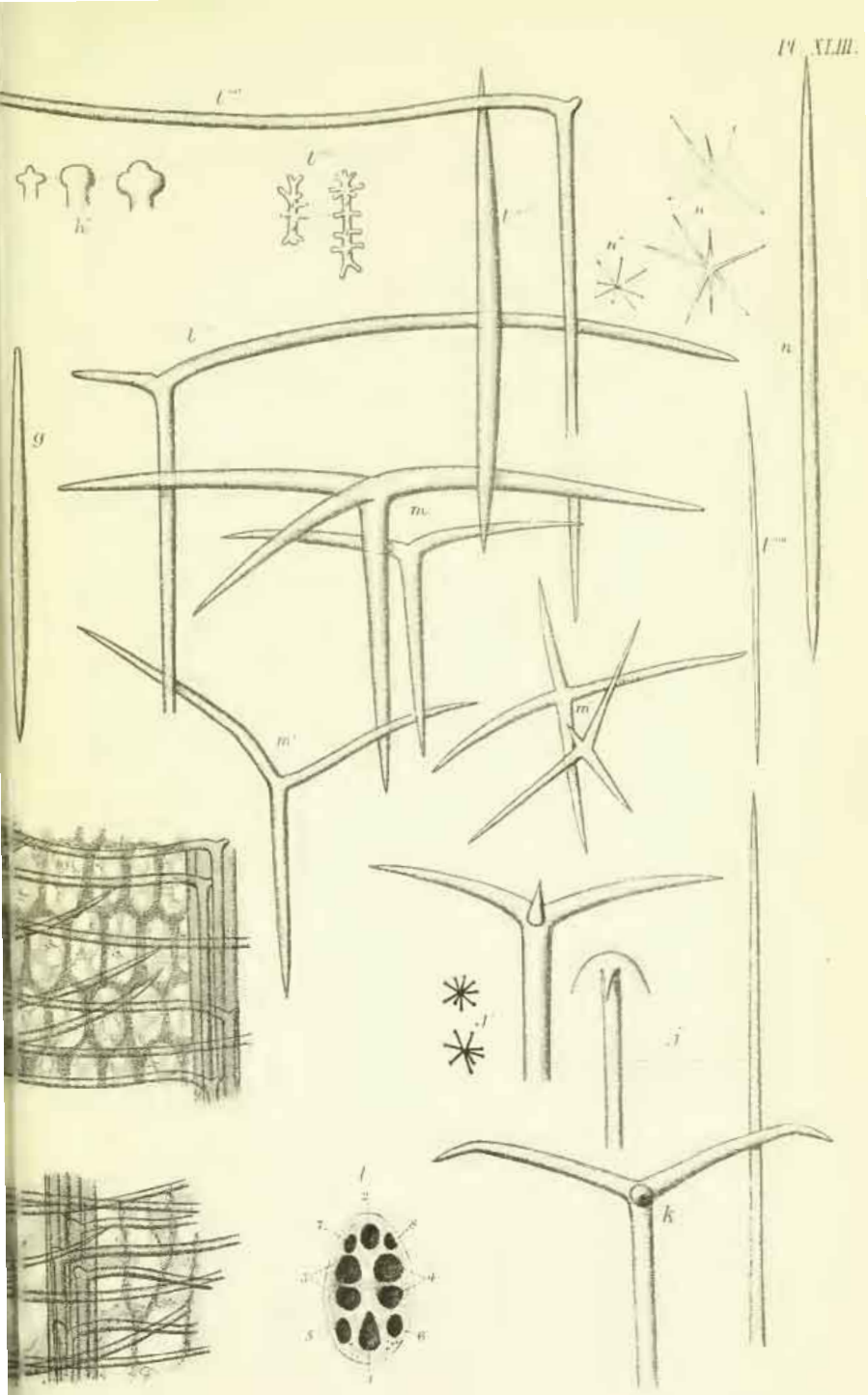

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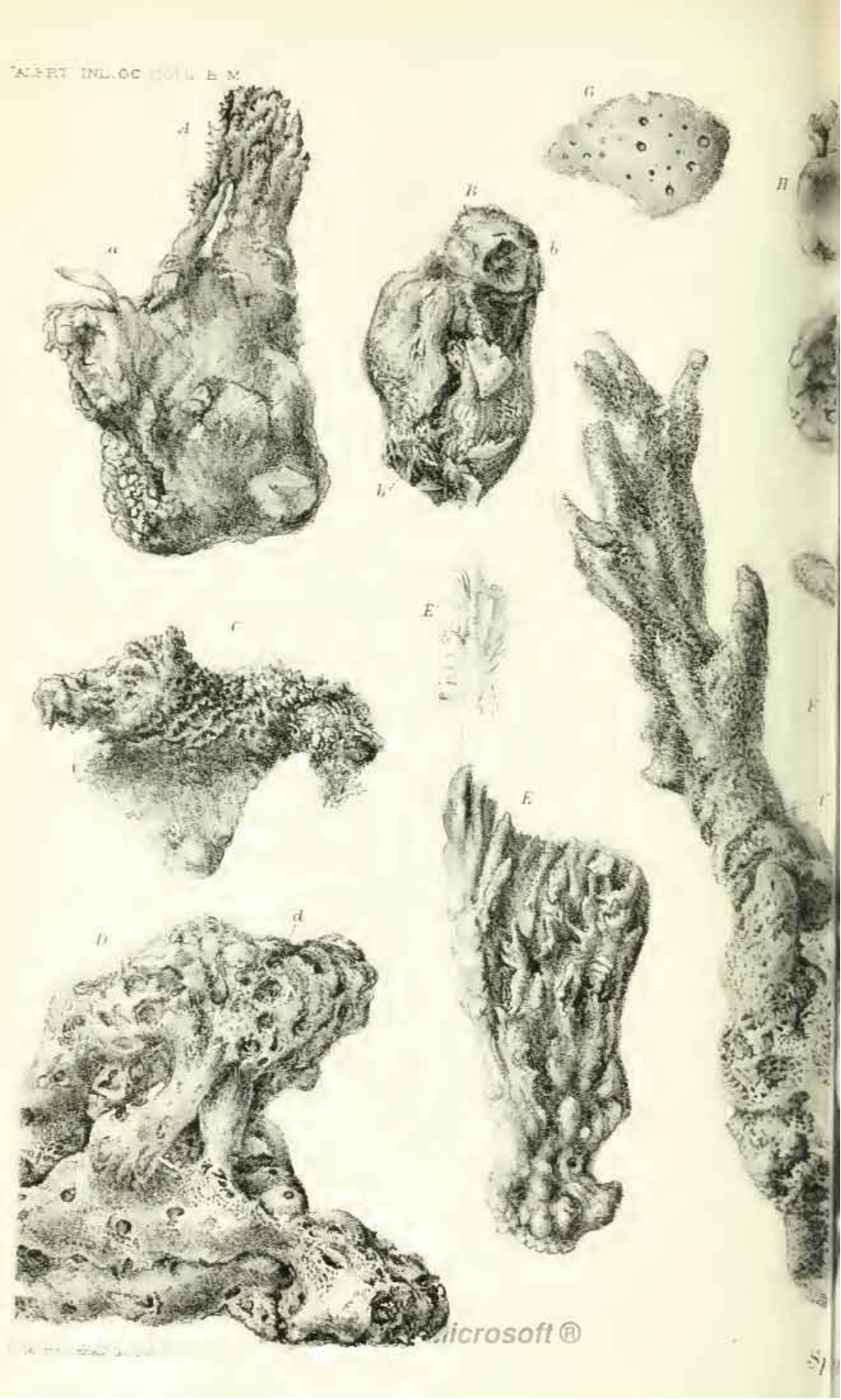
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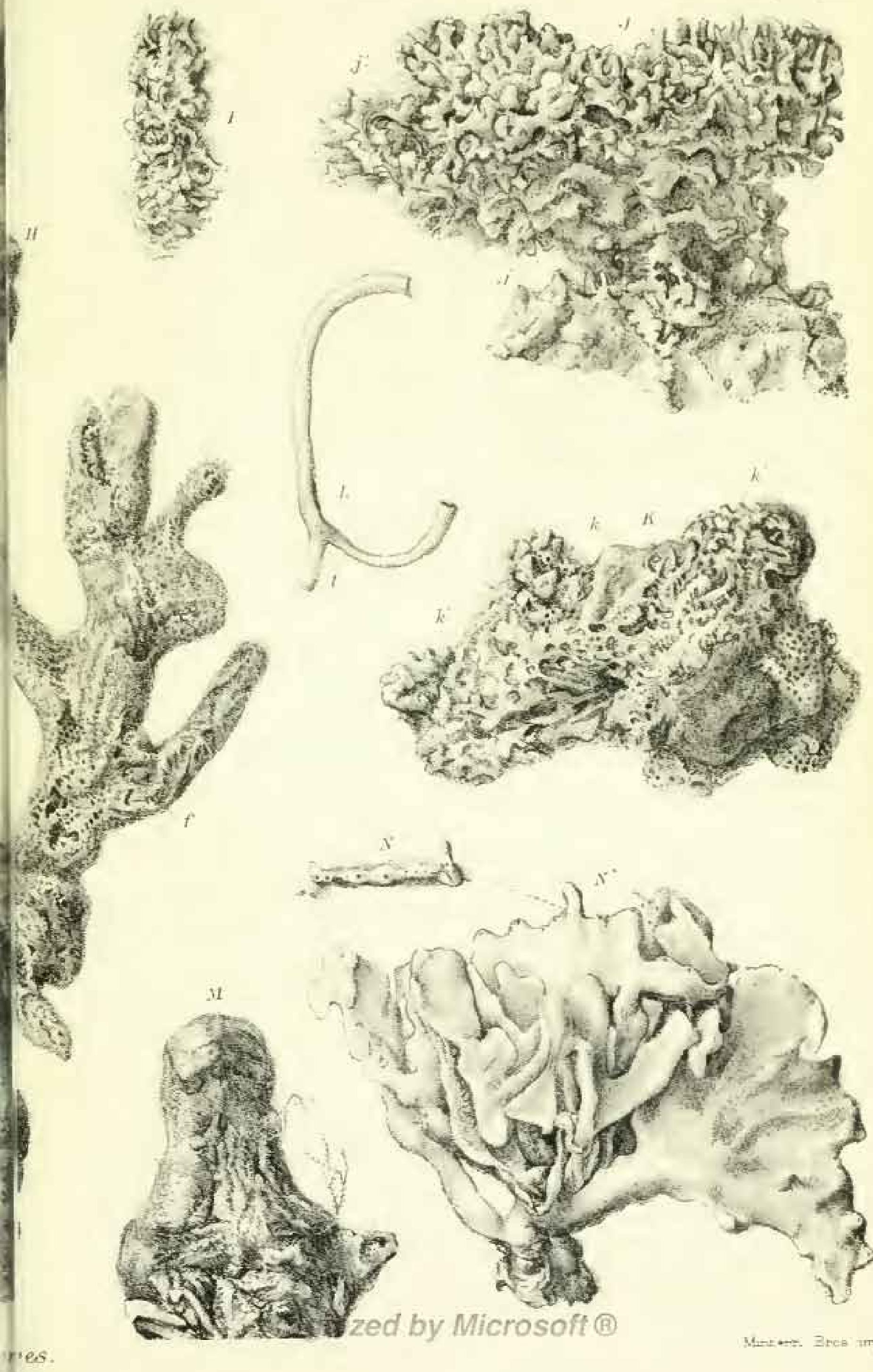

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