2nd Ser. BOTANY.] [VOL. VII. PART 10.

THE

TRANSACTIONS

OF

THE LINNEAN SOCIETY OF LONDON.

MARINE ALGÆ (CHLOROPHYCEÆ AND PHÆOPHYCEÆ) AND MARINE PHANEROGAMS OF THE 'SEALARK' EXPEDITION, COLLECTED BY J. STANLEY GARDINER, M.A., F.R.S., F.Z.S.

BY

A. GEPP, M.A., F.L.S., AND MRS. E. S. GEPP.

LONDON:

PRINTED FOR THE LINNEAN SOCIETY

BY TAYLOR AND FRANCIS, RED LION COURT, FLEET STREET.

SOLD AT THE SOCIETY'S APARTMENTS, BURLINGTON-HOUSE, PICCADILLY, W.,

AND BY LONGMANS, GREEN, AND CO., PATERNOSTER-ROW.

December 1908.

X. *Marine Algæ* (Chlorophyceæ *and* Phæophyceæ) *and Marine Phanerogams of the 'Sealark' Expedition, collected by J. Stanley Gardiner, M.A., F.R.S., F.L.S.*
By A. Gepp, *M.A., F.L.S., and* Mrs. E. S. Gepp.

(Plates 22–24.)

(Read 18th June, 1908.)

The following is a list of the Chlorophyceæ and Phæophyceæ collected by Mr. J. Stanley Gardiner during the 'Sealark' Expedition to the Seychelles, Chagos Archipelago, and the adjacent islands of the Indian Ocean in 1905. The Rhodophyceæ and a few Cyanophyceæ still remain to be worked out.

The present list numbers 36 species of Chlorophyceæ and 13 species of Phæophyceæ, among which 6 are new to science—namely, *Microdictyon pseudohapteron*, *Struvea Gardineri*, *S. orientalis*, *Bryopsis indica*, *Cladocephalus excentricus*, and *Avrainvillea Gardineri*. In addition there are 2 new varieties of *Caulerpa* described by Madame Weber van Bosse and several other species of great interest. Of the novelties, *Microdictyon pseudohapteron* exhibits in its reticulum a new form of tenacular connection which, according to Major Reinbold, whose views on the genus will soon be published, warrants the creation of a special section or subgenus for its reception. *Bryopsis indica* proves to be the same species as Harvey's unnamed specimens from Ceylon, published as no. 99, Alg. exsicc. Ceylon; and it is also represented by other specimens from Ceylon and Mauritius in the British Museum and Kew Herbaria. *Cladocephalus excentricus* is an East-Indian species of Mr. M. A. Howe's new genus, which has hitherto been known only from the West Indies, and indeed from only two localities there.

As regards specially interesting species other than novelties, we would mention *Boodlea van Bossei*, of which we are able to add new records for the Indian Ocean based on specimens found by us in the Kew Herbarium; *Codium difforme*, which, though it has been collected by the 'Siboga' Expedition in the Malay Archipelago, has not yet been actually recorded from the Indian Ocean; *Tydemania expeditionis*, which has only been found once previously, viz., in the Malay Archipelago by Madame Weber van Bosse during the same expedition; *Udotea glaucescens*, now recorded for the first time from the Indian Ocean, its home being in the Pacific; *U. palmetta*, which has never, so far as we know, been collected since the original gathering, and the only specimens of which are preserved in the herbaria of Paris and Caen, but without record of original locality—indeed, till the present specimens were brought home by Mr. Gardiner no region even could be assigned as habitat of the true species, though we had reasons for suspecting it to be an Indian Ocean plant. Mr. Gardiner's notes show that his specimens were dredged up from 45 fathoms; so presumably *Udotea palmetta* is a deep-water species, a fact which would account for its having escaped observation. *U. argentea*, Zanard., is another interesting species, which has remained unknown since Zanardini's time in consequence of the loss of the type. One of the factors which adds much to the interest and importance of Mr. Gardiner's collection is the careful record of the depth from which each specimen was obtained, a detail almost entirely neglected until recently by collectors. Now that deep-water forms are rendered more accessible by the use of the dredge, we are becoming better able to appreciate the range in depth of a given species and its accompanying change of form. A good instance of this is seen in *Avrainvillea amadelpha*, of which Mr. Gardiner procured both reef and deep-water specimens. Though differing greatly in habit, they are identical in structure; and the peculiar dwarfed and mutilated appearance of the reef form is adequately accounted for by the eroding action of strong currents or surf.

The specimens of *Caulerpa* have been determined by Madame Weber van Bosse, the authority and monographer of that genus, who has been so very kind as to examine and name all of them, and her report is incorporated in this list.

The plants of *Turbinaria Murrayana* and *T. ornata* are of special interest, inasmuch as they show a manner of propagation by stolons hitherto unrecorded for *Turbinaria*; though we believe that this mode of reproduction has been known for some time to Madame Weber van Bosse as occurring in the genus.

We would here offer our best thanks to Mr. Gardiner for entrusting to us the examination of this interesting collection, and to Madame Weber for so readily naming the specimens of *Caulerpa*, and also for demonstrating to us the identity of *Zonaria variegata*, a characteristic and widely-distributed species, which is ably treated in one of Monsieur Sauvageau's later papers. To *Z. variegata*, as we now see, must be referred *Ralfsia ceylanica*, Harv. To Major Reinbold we are indebted for the determination of *Boodlea van Bossei* and for valuable information concerning *Microdictyon* derived from his MSS., as yet unpublished. We postpone all remarks on geographical distribution until the rest of the Algæ have been named.

CHLOROPHYCEÆ.

ULVACEÆ.

Ulva (Linn.), Wittr., emend.

1. Ulva fasciata, Del. Flore d'Egypte, 1813, p. 153, tab. 58. fig. 5; De Toni, Syll. Alg. i. (1889) p. 114.

Seychelles: Praslin, on reefs exposed at dead low tide.

Geogr. Distr. Mediterranean. Atlantic. Pacific. Indian Ocean.

Both in form and structure this plant agrees with Harvey's specimen from Ceylon, no. 100.

CLADOPHORACEÆ.

BOODLEA, G. Murr. & De Toni.

2. BOODLEA VAN BOSSEI, Reinb. Neue Chlorophyc. Ind. Ocean, in Nuov. Notar. vol. xvi. (1905) p. 148.

Coetivy, on reefs exposed at dead low tide. Cargados Carajos, 45 fms.

Geogr. Distr. Malay Archipelago, 'Siboga' Expedition! Lucipara Islands, *fide Reinbold.* Mauritius. *Ayres*! in Herb. Kew. Seychelles, *Dupont*! in Herb. Kew. Diego Garcia, German Deep-sea Expedition, 'Valdivia,' 1898–9.

The specimens of this plant collected by Mr. Gardiner vary slightly in the size of the filaments, but they all show the distinguishing character of the long slender unbranched unicellular rhizoids which arise from any part of the thallus, and each bears at the end a well-developed tenaculum. Major Reinbold very kindly examined our plants, and referred them at once to his *Boodlea van Bossei.* We do not figure the plant here, since we understand that Major Reinbold will figure and describe it more fully in his forthcoming account of some of the 'Siboga' algæ. Though we have examined a number of other specimens in the British Museum Herbarium, we do not find a single specimen of *B. van Bossei.* In the Kew Herbarium, however, there was one specimen from the Seychelles and another from Mauritius.

During our search for *B. van Bossei* we found several hitherto unrecognised specimens of *B. coacta*, G. Murr. & De Toni, which we here take the opportunity of recording:—

3. B. COACTA, G. Murr. & De Toni, in Journ. Linn. Soc., Bot. xxv. (1889) p. 245, t. 49.

Friendly Islands, Vavau, *Harvey*, no. 107 (sub "*Cladophora* sp.")! Friendly Islands, Lifuka, *Harvey*, no. 109 (sub "*Cladophora* sp.")! Mauritius Arsenal, no. 78 (collector unknown), July 1868 (in Herb. Mus. Brit.)! Mauritius, Barkly Islands, Jan. 1870, *Colonel Pike*, no. 148!

MICRODICTYON, Decaisne.

4. MICRODICTYON PSEUDOHAPTERON, sp. n. (Plate 22. figs. 1–4.)

M. fronde ramellis radicantibus paucis substrato affixa, foliacea, e filamentis cylindricis primo opposite deinde stellatim ramosis inter sese reticulatim per pseudohaptera conjunctis composita.

Amirante, 20–44 fms. and 30–100 fms. Saya de Malha, 25 and 26 fms. Cargados Carajos, 45 fms.

The principal interest of this species lies in the fact that it diverges from the type of structure hitherto recognised as characteristic of *Microdictyon.* That genus, it will be remembered, consists of a network of short cylindrical cells situated in one plane only. Emerging on each side at the articulations of the main filaments, either singly at right angles to the main axis or in pairs at acute angles, the lateral branches with their branchlets come into contact with their neighbours and become attached to them, thus producing square or polygonal meshes. The main articulated filaments may be seen coursing like veins through this reticulated membrane. No true tenacula have hitherto been described as occurring in *Microdictyon*; and we were therefore much interested to find that the apical attachment-points of the branchlets in our plant have the appearance of tenacula. We submitted our specimens to Major Reinbold, who has lately studied this genus and will shortly publish his conclusions in the reports of the 'Siboga' Expedition; and he kindly pointed out that the attachment-points in our specimens are not true tenacula—that is, specialised cells—but are merely crenellated cell-ends (fig. 3). They are, however, of sufficient importance to warrant his placing our species in a separate section of the genus, a matter which he will deal with in his forthcoming paper.

M. pseudohapteron may also be recognised by the ramification, which in mature parts of the thallus tends to be stellate at the nodes. This appears to arise in the following manner:—The main filaments at each transverse wall put out a pair of opposite branches in the same plane at right angles to the axis of the filament. Each of these branches is seen to be seated in a lateral notch, as shown in fig. 2, *c*. Subsequently these branches may become pulled or pushed forward so as to be situated at an acute angle with the apical part of the main filament. Usually a second branch emerges from the main filament in the axil below the first branch, and as it grows it tilts the first branch forward. Thus a stellate node is obtained (fig. 2, *d*), and this, as mentioned above, is characteristic of our species. Each branch repeats this mode of ramification more or less regularly, and the triangular or polygonal meshes become more and more subdivided, and sometimes almost filled in by the ultimate branchlets. As previously mentioned, the free ends of the branchlets become adherent to the sides of neighbouring cells, and thus the firm flat net of the thallus is formed.

Though most of the other species have a cruciform ramification, yet some of the species show in the same thallus both cruciform and stellate modes of ramification. Major Reinbold has seen this in Mediterranean specimens of *M. umbilicatum*, and the same may be seen in *M. calodictyon*, Decne., from the Canaries. This is also figured by Montagne in Webb and Berthelot's Hist. Nat. des Iles Canaries, iii. part ii. sect. iv. (1840) p. 180, tab. 8. figs. 1 *b*, 1 *c*. Curiously enough, Montagne describes the primary filaments as dividing into fours ("venis quinis, mediis erectis, binis inferioribus patentibus"). Kützing also figures the branching of *M. calodictyon* in his 'Tabulæ Phycologicæ,' vii. (1857) tab. 25, II.

Though we have not seen in our specimens the original attachment-disc, we have noticed several rhizoids which fasten the thallus to the substratum. They appear to be attenuated prolongations of the apex of a branchlet; sometimes they arise from the side of the cell. They are usually dark and partly opaque, and bear a holdfast at the extremity (fig. 4).

STRUVEA, Sond.

5. STRUVEA GARDINERI, sp. n. (Plate 22. fig. 5.)

S. stipite simplice, rugoso; fronde juniore subelliptico, 5 cm. longo, 3 cm. lato, fronde adultiore late expanso, circa 17 cm. longo, 15 cm. lato; reticulo laxo e rhachi inconspicua pinnatim ramosa et e ramis ad nodos cruciatim egredientibus iterum iterumque in eodem modo cruciatim ramulosis composito; ramulis ultimis vel per tenacula affixis vel conspicue liberis; reticuli interstitiis in fronde juniore polygonis irregularibus 1–4 mm. diam., in fronde adultiore sæpe usque ad 10–20 mm. diam., hinc et illinc per lacerationem majoribus; margine integro. Cellulis rhacheos 7 mm. longis, 0·8 mm. latis; ramulorum 0·75–1·5 mm. longis, 0·3–0·6 mm. latis.

Cargados Carajos, 30, 45, and 47 fms.

Of this species we have four specimens, two consisting of a mature flabellum only without stalk, and the other two complete but small plants, the stalk of one being about 6·5 cm. long and the frond about 5 cm. The meshes of the flabellum are the largest we have seen in *Struvea*, the cells of the costa measuring as much as about 7 mm., the cells of the branches 3 mm., and those of the ultimate ramuli 0·75 mm. The branches and branchlets are opposite and the shape of the meshes is rectangular; the nodes are cruciate and not stellate, whereas in *S. orientalis*, the following species, the branching at the node is stellate.

Struvea Gardineri differs from *S. macrophylla* in the smaller width and greater length of the costa-cells, and in the irregularity and large size of the mesh as compared with the regular and close mesh of *S. macrophylla*. *S. Gardineri* differs from *S. orientalis* in having an unbranched stem, an entire margin, and a looser and rectangular mesh and cruciate nodes, the nodes of *S. orientalis* being stellate. *S. pulcherrima* is the nearest ally in point of size, but is easily distinguished by its stellately branched reticulum of small regular meshes like those of some species of *Microdictyon*.

6. Struvea orientalis, sp. n. (Plate 22. figs. 6–9.)

Planta solitaria vel plures ex eadem basi ortæ; stipite simplice vel diviso, rugoso vel lævi, 2·5–3·75 cm. longo, ramis plerumque oppositis; fronde basi cordato 3–5-costato supra irregulariter expanso et mutilato vel paucilobato, usque ad 4 cm. longo et lato; reticulo denso e rhachi pinnatim ramosa et e ramis ad nodos stellatim egredientibus iterum iterumque in eodem modo stellatim ramulosis composito, ramulis fere omnibus per tenacula affixis; ramulis marginalibus liberis; reticuli interstitiis parvis (0·1–0·3 mm. diam.) triangularibus vel polygonis et sæpe per ramulos ultimos fere omnino impletis. Cellulis racheos infra 3·0–3·5 mm. longis, 0·5 mm. latis, sursum gradatim decrescentibus; ramulorum 0·5 mm. longis, 0·25 mm. latis; cellulis ultimis 0·2–0·4 mm. longis, 0·1–0·15 mm. latis.

Amirante, 20–25 or more fathoms.

This species is represented by a group of four dried plants, all growing from a common base, with rhizoids interwoven, and also by a single plant preserved in formalin. The latter specimen is simple, bears an irregularly lobed frond, with margin not entire but composed of free projecting branchlets (fig. 7, *a*), and has rather dense finely granular cell-contents. Three of the dried plants are two or three times branched; the branching is truly opposite, but occasionally appears to be dichotomous, owing to the removal or loss of one of the branches. The branches themselves are possibly the persistent basal costæ of a denuded frond; but we cannot be certain of this. The fronds of these plants are all so much torn that it is impossible to say what the normal outline of the fron may be. It consists of a close reticulum, the minute meshes of which are often almost completely filled in by cells or branchlets of later growth (figs. 7, *b*, and 8, *a*), somewhat recalling *Anadyomene*. The characteristic tenacula are well developed in this species (fig. 9).

The only branched species of *Struvea* hitherto described are *S. ramosa*, Dickie, and *S. delicatula*, Kütz. From the former of these, which is about equal in size, our plant differs in having a very much smaller mesh with cells half as long as those of *S. ramosa*. From *S. delicatula* it differs in being two to three times as large, and in having the reticulum of the frond composed of cells of approximately equal diameter, forming a much more uniform meshwork.

ANADYOMENE, Lamour.

7. ANADYOMENE WRIGHTII, Harv. apud J. E. Gray in Journ. Bot. iv. (1866) p. 48, tab. 44. fig. 5; De Toni, Syll. Alg. i. (1889) p. 367.

Saya de Malha, 26 fms. Cargados Carajos, 45 and 47 fms.

This species is not represented by authenticated specimens either in the British Museum or in the Kew Herbarium. But the excellent figure and description in J. E. Gray's paper have enabled us to determine our plants and to refer to this species no. 7 of Ferguson's Ceylon algæ.

Geogr. Distr. Loo Choo Islands. Ceylon.

VALONIACEÆ.

DICTYOSPHÆRIA, Decne.

8. DICTYOSPHÆRIA FAVULOSA, Decne. Class. des Algues, p. 32; De Toni, Syll. Alg. i. (1889) p. 371; Weber van Bosse, in Nuov. Notar. xvi. (1905) p. 143.

Coetivy, on reef exposed at dead low tide. Saya de Malha, 25 fms. Cargados Carajos, 45 fms. Chagos Archipelago, Egmont reef, exposed at dead low tide.

Geogr. Distr. West Indies. Pacific Ocean. Indian Ocean.

9. D. VERSLUYSII, Web. v. Bosse, in Nuov. Notar. xvi. (1905) p. 144.

Coetivy reef. Chagos Archipelago: Salomon and Egmont, on reefs exposed at dead low tide.

Geogr. Distr. Malay Archipelago.

As stated by the author (*l. c.*), this species is characterised by being solid throughout its life-history, and by bearing on the internal membrane of the cell cellulose hairs, which grow towards the interior. This species will be more fully described by Madame Weber in her official report upon the algæ of the 'Siboga' Expedition.

VALONIA, Ginn.

10. VALONIA CONFERVOIDES, Harv. Alg. exsicc. Ceylon, no. 73, and Alg. exsicc. Friendly Islands, no. 101; J. Agardh, Till Alg. Syst. viii. (1887) p. 100; De Toni, Syll. Alg. i. (1889) p. 378.

Coetivy reef. Chagos Archipelago: Egmont, on reef exposed at dead low tide.

Geogr. Distr. West Indies. Pacific. Indian Ocean.

11. V. FASTIGIATA, Harv. Alg. exsicc. Ceylon, no. 74, and Alg. exsicc. Friendly Islands, no. 100; J. Agardh, Till Alg. Syst. viii. (1887) p. 101.

Coetivy reef. Seychelles: Praslin reef. Saya de Malha, 25 fms. Cargados Carajos, 47 fms. Chagos Archipelago: Egmont reef.

Geogr. Distr. Indian Ocean. Friendly Islands. Australia.

NEOMERIS, Lamour.

12. NEOMERIS ANNULATA, Dickie, in Journ. Linn. Soc., Bot. xiv. (1873) p. 198; De Toni, Syll. Alg. i. (1889) p. 414; M. A. Howe, in Bull. Torrey Bot. Club, xxxi. (1904) pp. 97–99.

Coetivy. Chagos Archipelago: Egmont. In each case on reefs exposed at dead low tide.

Geogr. Distr. West Indies. Pacific: Tongatabu. Indian Ocean: Mauritius.

The material of this species is somewhat scanty, but ample for identification. The scarcity, however, is explicable in view of the inconspicuousness of the calcified plant to any eye but that of the expectant algologist. The species is synonymous with *N. Kelleri*, Cramer, and has been recorded from the West Indies, Polynesia, and Mauritius. If carefully searched for it will probably be found at other tropical stations. Mr. M. A. Howe (*l. c.*) has published a useful key to the three species of *Neomeris* and has given a bibliography of the literature.

BRYOPSIS, Lamour.

13. BRYOPSIS INDICA, sp. n. (Plate 22. figs. 10, 11.)

B. frondibus erectis, usque ad 30 mm. altus, bifariam plus minusve ramosis vel simplicibus, pluma initiali ambitu oblanceolato-oblonga hinc illinc adparenter disticha circa 12·5 mm. longa, ramentis simplicibus singulis circa 1 mm. longis, in ordines duos ad quodque latus dispositis, raro paucis ordinibus duplicibus interpositis.

Coetivy. Chagos Archipelago: Coin, Peros. In each case on reefs exposed at dead low tide. Also Ceylon, *Harvey*! no. 99 Alg. exsicc. Ceylon. Mauritius, *Pike*! Gabriel Island, May 22/71, sub *B. cæspitosa* in Herb. Mus. Brit. and Kew.

Geogr. Distr. Indian Ocean.

This species is, like the West-Australian *B. australis*, Sond., distinguished by the arrangement of the ramenta along the stem. Through a lens they sometimes appear to be distichous, as if forming single rows on the two opposite sides of the stem or branch (fig. 11), but a more careful examination shows that they form in reality two rows of alternating ramuli, instead of a single one, on each side. The ramenta emerge each singly from the stem, and do not bifurcate at the base as in *Bryopsis gemellipara.* Besides this simple arrangement of two double rows of ramenta, there are occasionally either one or two single or double rows of ramenta arising in the intermediate space between the original rows; and such plants have the appearance of bearing ramenta all round the stem until microscopically examined. This distribution of the ramenta is easily seen by a study of the scars left on the bare stem by the fallen ramenta. This mode of ramification separates our plant from the truly distichous group represented by *B. plumosa* and also from the group including *B. hypnoides*, in which the ramenta arise all round the stem.

The nearest ally to our plant is *B. australis*, which bears two double or triple rows of alternating ramenta. The difference between *B. australis* and our plant is found in the habit—*B. australis* having long bare branched stems, with short plumes at the top, 3–5 mm. long; while in *B. indica* the stems are much shorter and the plumes extend twice as far downwards from the apex (about 10 mm.) as in *B. australis*. In the latter species the ramenta, in fact, appear to be much more deciduous.

B. australis was discovered by Preiss in West Australia, and, so far as we know, has never been recorded since. Authentic specimens are preserved in the Herbaria of the British Museum and Kew, which witness to the truthfulness of Kützing's plate (Tab. Phyc. vi. tab. 81, i.) so far as concerns the general habit of the plant. The Kew specimen, for instance, consists of some half-dozen long bare stems, arising from a fragment of main stem and having at their base the clasping rhizoids so often present in *Bryopsis*. At the summit of each branch is a short lanceolate plume of unbranched ramenta, which were described by Sonder in Lehmann's 'Plantæ Preissianæ,' ii. (1846–7) p. 152, as arising in a subhexastichous order. It is strange that J. G. Agardh, in his 'Till Alg. Syst.' viii. (1887) p. 27, states that he has not observed this mode of arrangement, and describes the ramenta as "quoquoversum egredientibus," without further detail. Kützing (*loc. cit.*) is unsuccessful in portraying the terminal plume and the arrangement of the ramenta. These latter are far too few in the figure, and are represented as emerging all round the stem, as indicated by the scars below.

While examining other species of *Bryopsis* in the Herbaria of the British Museum and Kew, we have been able to identify several as *B. indica*, and thus add to the area of its distribution. Among these is Harvey's unnamed specimen issued in his 'Exsiccatæ' as *Bryopsis* sp., Ceylon, no. 99. Col. N. Pike also collected this species in Mauritius.

CAULERPACEÆ.

(By Madame WEBER VAN BOSSE.)

CAULERPA, Lam.

14. CAULERPA CRASSIFOLIA, J. Ag.

f. TYPICA, Web. v. Bosse.

C. pinnata f. typica, Web. v. Bosse, Monogr. des Caulerpes, in Ann. Jard. Bot. Buitenzorg, xv. (1898) p. 290.

Cargados Carajos, 30 fms.

Geogr. Distr. Ceylon.

15. C. TAXIFOLIA, J. Ag.

f. INTERRUPTA, Sved. in Rep. Ceylon Marine Biol. Lab. part ii. (1906) p. 32.

Cargados Carajos, 30 fms.

Geogr. Distr. Ceylon.

f. ASPLENIOIDES, Web. v. Bosse, *l. c.* p. 292.

Amirante, 30 fms.

Geogr. Distr. Ceylon. Malay Archipelago. Sandwich Islands.

16. C. FREYCINETII, Ag.

Var. TYPICA, Web. v. Bosse, *l. c.* p. 312.

Chagos Archipelago: Salomon, on reef exposed at dead low tide.

Geogr. Distr. West Indies. Red Sea. Indian Ocean. Pacific.

Var. TYPICA f. LATA, Web. v. Bosse, *l. c.* p. 313.

Seychelles: Praslin, on reef exposed at dead low tide. Chagos Archipelago: Diego Garcia, Barachois, on reefs exposed at dead low tide.

Geogr. Distr. West Indies. Red Sea. Ceylon. Malay Archipelago. Marianne Islands. Caroline Islands. Friendly Islands.

Var. TYPICA f. SPIRALIS, Web. v. Bosse, *l. c.* p. 314.

Chagos Archipelago: Salomon, Egmont and Diego Garcia, on reefs exposed at dead low tide. Amirante, 20–44 fms.

Geogr. Distr. New Caledonia.

The Amirante specimen shows less torsion and has bigger teeth than is usually the case in f. *spiralis*. The difference is probably due to the great depth from which the plant was collected.

17. C. CUPRESSOIDES, Web. v. Bosse, *l. c.* p. 323.

Coetivy, on reef exposed at dead low tide.

Geogr. Distr. West Indies. Indian Ocean. Pacific.

This is an intermediate specimen, standing nearer to var. *typica* than to var. *mamillosa* f. *nuda*.

Var. TYPICA f. DENUDATA, Web. v. Bosse, f. n.; rhachi passim pinnulis orbata, pinnulis parvis.

Cargados Carajos [depth unknown; probably about 30 fms.]. Farquhar Lagoon.

The main axis is in many parts bare of pinnules, and the pinnules where present are small. In the dried specimens the axis is a little constricted above a whorl of pinnules. This is, however, not always the case, and may be due to the drying process.

Var. TYPICA f. GARDINERI, Web. v. Bosse, f. n. (Plates 22, 23. figs. 12, 13); frondibus a surculo repente erectis elongatis dichotome ramosis fastigiatis, vel planis pro specie latis (1·5–2 mm.) pinnulas distichas gerentibus, vel triangularibus pinnulas regulares tristichas breves subnaviculares gerentibus.

Saya de Malha, 25 fms. Cargados Carajos, 28 and 45 fms.

The form *Gardineri* is another instance of the difficulty of distinguishing definitely the members of *Caulerpa cupressoides*. Some months ago I received from my friends Mr. and Mrs. Gepp a small collection of Mr. Stanley Gardiner's *Caulerpæ*, and among these I found the above-named form, but only with branches bearing distichous pinnules (fig. 12). These plants were dried specimens, and bore no indication of the depth at which they had been collected. The rather broad axis and the distichous pinnules pointed towards *C. Lessonii*, Bory, but the entire absence of cylindrical pinnules, the great length (20 cm. and more) of the branches, or "assimilators" as Svedelius calls them, made me think that this plant was a deep-water form of *C. cupressoides*.

A short time ago I received from Mr. and Mrs. Gepp some more *Caulerpæ* from the same collection for determination. This time the material was preserved in alcohol, and amongst it was this same form *Gardineri*. On the accompanying label was mentioned the depth from which the alga had been hauled up; it was 28 fathoms. Amongst these specimens there was one large plant with triangular regularly tristichous pinnules, all subnavicular (fig. 13). We know, and Svedelius in his beautiful paper on the *Caulerpæ* of Ceylon has described the fact at full length, that some species of *Caulerpæ* increase in length when they grow in places where the water is deep, and that other species do not. *C. cupressoides* seems to belong to the first category; but with the lengthening of the main axis we observe a reduction of the pinnules in size and often in number. The pinnules of the form *Gardineri* are smaller than the pinnules of *C. cupressoides* var. *typica*, and they are often distichous instead of tristichous, but specimens with tristichous pinnules do occur. The present form is new to science, and I have given it the name of *Gardineri*, in honour of Mr. Stanley Gardiner who collected it for the first time. Its characteristics are the great length of the assimilators and the regular, rather small, subnavicular pinnules, placed either distichously (fig. 12) along a rather broad, or tristichously (fig. 13) along a triangular, axis.

Var. MAMILLOSA f. NUDA, Web. v. Bosse, *l. c.* p. 332.

Chagos Archipelago: Diego Garcia and Coin, Peros. Coetivy. In each case on reefs exposed at dead low tide.

Geogr. Distr. West Indies.

CODIACEÆ.

CODIUM, Stackh.

18. CODIUM DIFFORME, Kütz. Tab. Phyc. vi. (1856) p. 35, tab. 99; Askenasy, in Forschungsreise 'Gazelle,' Theil iv. Bot. (1889) p. 10; Bornet, Algues de Schousboe (1892), p. 55.

Chagos Archipelago: Peros, on reefs exposed at dead low tide.

Geogr. Distr. Mediterranean. Kerguelen.

This species resembles in habit *C. adhærens*, Ag., but is quite distinct in the size of its utricles (peripheral cells), which measure about 1 mm. in length and 150–200 μ in diameter, while those of *C. adhærens* do not exceed 60 μ in diameter. These distinctions are pointed out by Askenasy and Bornet (*ll. cc.*).

19. C. OVALE, Zanard. Phyc. Papuanæ, in Nuov. Giorn. Bot. Ital. x. (1878) p. 37; De Toni, Syll. Alg. i. (1889) p. 491.

Seychelles, 31 fms.

Geogr. Distr. New Guinea.

20. C. TOMENTOSUM, Stackh. Ner. Brit. (1801) p. 21, tab. 7; De Toni, Syll. Alg. i. (1889) p. 491.

Amirante, 20–25 fms. and below 25 fms.

Geogr. Distr. Mediterranean. Atlantic. Cape of Good Hope. Indian Ocean. Pacific.

This species has a wide distribution in temperate and tropical waters. But since many specimens of similar habit have in the past been wrongly referred to it, caution should be observed in accepting all the specimens so determined in large Herbaria without re-examination of the utricles of the plants. The shape and average size of the utricles, the apex of the utricle whether thin-walled or thickened, whether mucronate or not—these, together with habit, are the distinguishing characters of the species.

21. C. ELONGATUM, Ag. Spec. Alg. (1849) p. 454; Kützing, Tab. Phyc. vi. (1856) tab. 96; De Toni, Syll. Alg. i. (1889) p. 496; Bornet, Algues de Schousboe (1892), p. 56.

Amirante, 20–25 fms. and below 20 fms.; Seychelles, 31 fms.

Geogr. Distr. Mediterranean. Indian Ocean. Australia.

In an interesting note upon this species Bornet (*loc. cit.*) points out that in distinguishing the forms of this and of the preceding species the most trustworthy character is found in the respective size of the utricles rather than in the external habit of the plants, and that the specific limits thus assigned accord well with the geographical distribution on the west coast of Europe. The true *Codium tomentosum* has small utricles up to 500 μ in length and ranges as far north as Great Britain, whereas *C. elongatum* has large utricles, often twice as long as those of *C. tomentosum*, and does not seem to occur north of Cadiz. We find the same distinction to hold good for extra-European species.

TYDEMANIA, Weber van Bosse.

22. TYDEMANIA EXPEDITIONIS, Weber van Bosse, in Ann. Jard. Bot. Buitenzorg, xvii. (ser. 2, vol. ii.) 1901, p. 139. (Plate 23. figs. 18, 19.)

Amirante, 20–44 fms. Chagos Archipelago: Salomon, on reefs exposed at dead low tide.

Geogr. Distr. Malay Archipelago.

For the sake of convenience we quote here the original diagnosis of this rare alga :—

"Thalle incrusté de calcaire, composé d'un axe cylindrique simple ou ramifié, portant des branches réunies en glomérules superposés ou rarement disposés en éventail. Branches se divisant par dichotomie répétée en directions alternantes en ramules très étalés, enchevêtrés, formant un glomérule dense, ou branches se divisant par dichotomie répétée en une seule direction en ramules érigés, conglutinés, en forme d'éventail. Fructification inconnue."

This plant seems to have eluded the observation of collectors until discovered and recorded by Madame Weber van Bosse when on the 'Siboga' Expedition to the Dutch East Indies, and it was briefly described by her in the diagnosis quoted above. The specimens which she has been so kind as to lend us show the remarkable dimorphic habit of the plant, and they will be figured among the 'Siboga' reports. But while her specimens chiefly represent the glomerulous form, those of Mr. Stanley Gardiner are of the flabellate form only, without a single example of the glomerulous form, and consist of tufts and masses of small flabellate calcified fronds connected together by a continuous branched filament. At first sight these flabella might easily be mistaken for *Udotea javensis*, Gepp (Journ. of Botany, xlii. 1904, pp. 363–4, pl. 467), formerly known as *Rhipidosiphon javensis*, Mont., since they consist, like that species, of calcified dichotomously branched filaments, adhering laterally in one plane. The stipes also, upon which the flabellum in each species is borne, is monosiphonous. But a comparison of the two species side by side shows at once unmistakable differences. In *T. expeditionis* the single siphon, which bears the flabellate fronds, is beaded from its point of junction with the main filament up to the point at which it divides to form the flabellum, while in *U. javensis* the monosiphonous stipes is entirely unbeaded and often emits rhizoids, as may be seen in our figures of the plant (*loc. cit.* figs. 2, 3 *a*). In the size of the filaments, both of stem and frond, there is considerable difference between the two species. The diameter of the stipes in *T. expeditionis* is about 250–280 μ and of the frond filaments 40–70 μ, while that of the stipes of *U. javensis* is 60–100 μ and of the frond filaments 30–40 μ.

UDOTEA, Lamour.

23. UDOTEA GLAUCESCENS, Harv. Algæ exsicc. Friendly Islands, no. 82; J. G. Agardh, Till Alg. Syst. viii. (1887) p. 70.

Cargados Carajos, 30 fms.

Geogr. Distr. Friendly Islands. Fiji. Cape York.

This species has not hitherto been recorded from the Indian Ocean, though its near ally *U. javensis*, Gepp (*Rhipidosiphon javensis*, Mont.), occurs in the Malay Archipelago and Ceylon.

24. U. CONGLUTINATA, Lamour. Polyp. flex. (1816) p. 312; De Toni, Syll. Alg. i. (1889) p. 507.

Amirante, 30 fms. Coetivy reef. Cargados Carajos, 30 and 47 fms.

Geogr. Distr. Atlantic. Indian Ocean. Pacific.

25. U. PALMETTA, Decne. Mém. sur les Corallines etc. in Ann. Sci. Nat. 2e sér. xviii. (1842) p. 105; De Toni, Syll. Alg. i. (1889) p. 506.

Cargados Carajos, 45 fms.

Geogr. Distr. Indian Ocean.

This species has, so far as we know, never been collected since the original plant was described by Decaisne (*l. c.*). The original locality whence this species came has never been recorded. It is indicated neither by Decaisne in his description nor on the label of the type specimen preserved in the Paris Herbarium. Decaisne merely says "in Herb. Petit Thouars, nunc Mus. Par." Through the kindness of Messrs. Hariot and Lignier we have been accorded the privilege of examining Decaisne's type now in Paris, as well as the specimen preserved in Herb. Chauvin at Caen, which together have hitherto constituted the only known material of the species. The home of *U. palmetta* remained therefore a mystery until the present collection of Mr. Stanley Gardiner yielded fresh examples, which point to the conclusion that the original locality was situated in the Indian Ocean. As stated above, Mr. Stanley Gardiner's specimens were obtained from a depth of 45 fathoms and in a living state. It would be extremely interesting if light could be thrown upon the following questions concerning Decaisne's type and the specimen in Herb. Chauvin. Did they both come from the same locality? Were they collected by Du Petit Thouars? From what island or coast did they come? And from what depth were they obtained? If the species is of restricted distribution, and occurs only at so great a depth as 45 fathoms, the explanation of its being so scantily represented—namely, in only two herbaria—is obvious.

The thallus of *Udotea* consists, as is well known, of unicellular, dichotomously branched filaments, which in some species are simple, as in *U. conglutinata*, and in others bear numerous short lateral branchlets varying in form according to the species. *U. palmetta* is one of the group characterised by bearing these lateral branchlets, and they are of the simpler type, being short, undivided, or more or less forked, and borne now along one side, now along the other side, of the same main filament, but never on both sides at once. They are not sufficiently large to form a cortex like that which conceals the main filaments in *Udotea argentea*, Zan., and other species, but they can be detected by a lens as standing out along the main filaments even before the plant, whether dry or moist, has been decalcified. In Decaisne's type the branchlets are more short and simple than in Chauvin's specimen, where each lateral branchlet frequently divides into two or three points. The plants from Cargados Carajos resemble the type in this character, and have mostly simple, short, pointed branchlets.

26. Udotea argentea, Zanard. Plant. Mar. Rub. in Mem. R. Ist. Ven. vol. vii. (1858) p. 290, tab. 10. figs. 1 *a*, 1 *b*.

f. typica, form. nov.; ramulis lateralibus capitatis; capitibus varie angulatis aut lobatis.

Coetivy, on reefs exposed at dead low tide. Cargados Carajos, 22, 30, and 47 fms.

Geogr. Distr. Red Sea.

This species is not a well-known one, but it is so well marked that, when once recognised, it is quite unmistakable. The figures given by Zanardini (*l. c.*) of the original plant, collected by Portier at Suez, are quite sufficiently good to identify this characteristic species, even despite the loss of Zanardini's type, which has been searched for in foreign herbaria in vain. In habit *U. argentea* is often repeatedly proliferous, the proliferations overlapping each other so thickly at times that a single plant forms a sort of fan-shaped colony. The structure is, generally speaking, like that of other corticated species of *Udotea*, but it is distinguished from all of them by the character of the lateral branchlets. In *U. argentea* these arise at short intervals in two or three rows along the main filaments and bear each a head which is variously angulate or lobed. These capitate lateral branchlets soldered together by a deposited cement of calcium carbonate form a strong cortex, and thus unite into a firm frond the parallel main filaments, which form the framework of the thallus. The variations in the form of the head of the lateral branchlets are sufficiently marked to allow of the species being divided up into several forms, which appear to have also a more or less definite geographical distribution. The form represented in the present collection is the one which we regard as a typical representative of the original plant from the Red Sea, and we call it therefore f. *typica*. Other forms will be described and figured by us in our account of the *Udoteæ* collected by Madame Weber van Bosse during the 'Siboga' Expedition.

Since the above remarks were written, we have recently had the great satisfaction of examining what we had long desired to see, namely, specimens of *U. argentea* from the Red Sea, and actually from the type-locality. These were included among some unnamed specimens submitted to us by Prof. R. J. Harvey Gibson and had been collected by Mr. C. Crossland at Suez Bay. They have since been embodied in Prof. Gibson's paper read before the Linnean Society on December 5th, 1907. Mr. Crossland's specimens supply just the geographical link which we desired for the completion of the chain of proof that we had rightly referred the Indian Ocean specimens to the *U. argentea*, which had previously been recorded only from the Red Sea. The Suez Bay specimens exactly resemble those of Mr. J. Stanley Gardiner, while further to the east, as shown by specimens from the Malay Archipelago ('Siboga'

Expedition, *Madame Weber*) and from Queensland (*Bailey*), the species exhibits slight modifications of internal structure; and, further, a slightly modified form occurs in the West Indies. These forms we hope to describe in a paper soon to be published.

CLADOCEPHALUS, Howe.

27. CLADOCEPHALUS EXCENTRICUS, sp. n. (Plate 23. figs. 14–17.)

Planta læte viridis, solitaria, usque ad 10 cm. alta, adspectu primo *Udoteam conglutinatam* simulans, stipite e substrato calcareo orto, simplici, olivaceo, usque ad 3 cm. alta, tereti, solido, 1–2 mm. crasso; fronde inæqualiter cyathiformi, peltata, late expansa, primo rotundata, demum irregulariter elliptica vel lobata, usque ad 10 cm. lata, membranacea, viridi, zonata; filamentis frondis primariis e stipite radiantibus, pallide viridibus, 25 μ crassis, superne in ramulos dense intertextos et corticem frondis formantes dichotome divisis, ramulis ultimis hyalinis 10 μ crassis.

Cargados Carajos, 30, 45, and 47 fms.

The genus *Cladocephalus* was founded by Mr. M. A. Howe (Bull. Torrey Bot Club, xxxii. 1905, p. 569) on a new plant, *C. scoparius*, collected by him in the Bahamas. The characters by which the author distinguishes this genus from *Udotea*, its nearest ally, are the external habit and the intricate labyrinthiform nature of the pseudo-cortex (figs. 15, 16), which is composed of repeatedly divaricato-dichotomous filaments closely interwoven. The author describes it thus:—"The cortex is formed by branches originating subdichotomously from the more peripheral members of the medullary strand, and becoming afterwards apparently lateral. These branches then undergo repeated divaricate forkings, with a gradual diminution of diameter, until finally they may have only one-fifth or even one-twelfth the diameter of the filaments of the central strand." We find the same peculiar cortical structure in *Flabellaria luteo-fusca*, Crouan, from Guadeloupe; indeed a microscopical preparation of that species is quite indistinguishable from one of *Cladocephalus scoparius*, Howe. The only difference between the two species is in the habit and colour. *C. scoparius* is of a yellowish-brown, substramineous, or olivaceous colour on drying and has a scopiform or thamnioid capitulum, "varying in outline from elongate-fusiform or elongate-ellipsoid to obovoid or subspherical," while *F. luteo-fusca* has a cuneate-flabellate or spathulate frond, with a subentire to eroso-lacerate margin. The stem of *F. luteo-fusca* is sometimes branched, as is that of *C. scoparius*. *Cladocephalus* being now established as an independent genus, *F. luteo-fusca*, Crouan, must be transferred to it under the name of *Cladocephalus luteo-fuscus* *.

Crouan's species was published by Mazé and Schramm (Algues de la Guadeloupe, ed. ii. 1870–77, p. 88) without description. They say:—"Croît dans un fond de sable vaseux, entre des fragments de rochers et de madrépores brisés. . . . . Coloration brune noirâtre persistante. Saint Martin (Lac Simpson, près l'embarcadère de l'habitation Durat, Anse du Marigot). Presque toute l'année. Coll. nos. 1403, 1904." Consequently the species could not be recognised save by comparison with an authentic specimen.

* Since the present paper was read before the Society, Dr. F. Börgesen, having come to a similar conclusion about *F. luteo-fusca*, has transferred it to the genus *Cladocephalus* (Vidensk. Meddel. naturh. Foren. Kjöbenhavn, 1908, p. 44).

Authentic specimens of it are preserved in the British Museum, and we have figures and a diagnosis of them awaiting publication.

Since this note was written, an excellent diagnosis of *Flabellaria luteo-fusca*, Crouan, has been published by Mr. Howe (in Bull. Torrey Bot. Club, xxxiv. 1907, p. 513), who, presumably on the ground of external habit, follows Murray and Boodle (Journ. of Bot. xxvii. 1889, p. 239) and places it in *Udotea*.

Hitherto the only plants of either species of *Cladocephalus* have been recorded from the West Indies alone, but we now propose to describe a third species which was collected by Mr. Gardiner in the Indian Ocean. Among Mr. Gardiner's plants are several specimens which have all the appearance of a peltate *Udotea* (fig. 14), being green, zoned, and borne on a delicate stalk. An examination of their structure reveals, however, a labyrinthiform pseudo-cortex (figs. 15, 16) similar to that of *C. scoparius* and *C. luteo-fusca*. But while in these two latter species the lateral branchlets arise from a comparatively coarse main filament, 50 μ broad, in our Indian Ocean plant the main filaments are only 25 μ wide, and the contrast in size between them and the final dichotomies of the branchlets (fig. 16) is not nearly so marked as in the two other species. One of the most characteristic features of our plant is its peltate habit, resembling that of *Udotea conglutinata* f. *infundibuliformis* (*U. infundibulum*, J. Ag., and *U. cyathiformis*, Decne.); but in addition to having a very different structure, it is at once distinguished from that species in being uncalcified. The form of the cup is irregular, being lop-sided, much raised on one side and depressed on the other. The new species has a very slender stalk and a large frond, much in the proportion of *U. conglutinata*, whereas the two West Indian species have long thick stalks.

We would point out that in the generic description of *Cladocephalus* (*l. c.* p. 569) the author describes the capitulum as thamnioid or scopiform and non-zonate. These characters are, however, of specific rather than of generic value; and we propose that the generic diagnosis should be amended in such a way as to admit the inclusion of other species which possess the structural character of *Cladocephalus*, viz., the intricate labyrinthiform pseudo-cortex.

AVRAINVILLEA, Decaisne.

28. AVRAINVILLEA AMADELPHA, Gepp. (Plate 23. fig. 20; Plate 24. figs. 21, 22.)

Syn. *Udotea amadelpha*, Mont. in Ann. Sci. Nat. 4 sér. t. vii. (1857) p. 136; De Toni, Syll. Alg. i. (1889) p. 509.

Amirante, 30 fms. Coetivy, on reefs exposed at dead low tide. Saya de Malha, 25 and 29 fms. Cargados Carajos, 47 fms. Chagos Archipelago: Salomon, on reefs exposed at dead low tide.

Geogr. Distr. Western Indian Ocean.

This species was considered by its author to belong to *Udotea*, in which genus it has till now always been placed, but as a more or less unknown member. The original plant was collected by Le Duc at the Island of Galega in the Indian Ocean and was at some time divided, the larger part being preserved in the Decaisne Herbarium in Paris, while the smaller part found its way into Kützing's Herbarium, now in the possession of Madame Weber van Bosse. By the kindness of M. Hariot and of Madame Weber we have seen and examined these two portions of the type, and we find that both in habit and structure it possesses the generic characters of *Avrainvillea* and not of *Udotea*. The filaments are uncalcified, branch dichotomously, bear no side branchlets, and are not parallel but are more or less intricated to form a feltwork as in all species of *Avrainvillea*. In almost all the species of *Udotea* the whole plant is generally more or less calcified, the main filaments run out almost parallel from the stipes to the periphery of the frond, bearing in many species lateral branchlets of peculiar form. We have therefore transferred *U. amadelpha*, Mont., to the genus *Avrainvillea*. In the original specimen many short thickish stalks spring from a thickened crowded base and generally branch dichotomously, each bearing a small rather thin frond, the whole plant being of a brownish colour and about 6 cm. high. The basal part has a more or less felt-like hairy appearance, caused by the projection beyond the surface of the ends of filaments composing the stem.

A. amadelpha has never been recorded since the original description was published, and we were therefore greatly interested to find specimens of it in the collections of Mr. Stanley Gardiner, who gathered it from reefs and deep water in five different localities more or less in the neighbourhood of Galega. Some of these plants are less congested in their habit of growth and attain larger dimensions, up to 17 or 18 cm. (the stalks themselves being about 6 cm., the height of the entire plant described by Montagne). These large plants all come from deep water, 25–47 fms., whereas the congested forms, which exactly resemble the type, were collected on reefs exposed at dead low water.

A. amadelpha is distinguished from other species of the genus by the peculiar form of the apices of the frond-filaments, which are torulose (fig. 19), sometimes irregularly swollen on one side, often twisted and curved and often so interwoven as to form a thin pseudo-cortex of the frond (fig. 20). The filaments do not, as a rule, diminish so markedly in width towards their apices as is the case in *A. lacerata*, to which species *A. amadelpha* is in structure closely allied.

29. Avrainvillea Gardineri, sp. n. (Plate 24. figs. 23, 24.)

Planta elata usque ad 30 cm. alta, solitaria; rhizomate crasso luride fusco, 9–12 cm. longo, 1·5 cm. crasso, e basi bulbosa suboblique adscendente, et in stipitem brevem compressum (1·5–2·5 cm. longum, 6–9 mm. latum) viridem apice subito mutato; fronde e olivaceo viridescente (nunquam brunneo) amplissima (usque ad 18 cm. alta et 20 cm. lata) rotundata, basi plerumque cordata vel auriculato-cordata, membranacea, zonata, margine primo integra, demum senectute plus minusve grosse lacerata; frondis filamentis laxe intertextis et facile separabilibus, 20–30 μ crassis, apices versus haud attenuatis, plerumque regulariter torulosis, ad apices interdum leviter tortuosis sed inter sese vix intertextis.

Cargados Carajos, 22, 30, and 47 fms.

This species is a deep-water form and one of the largest members of the genus so far as we know it, rivalling *A. nigricans*, Decne., the biggest species of the West Indies, and is indeed a very handsome plant. The rhizome is cylindrical, is of considerable size, and is often encrusted with epiphytic animals; it arises obliquely or subvertically from the bulbous base by which the plant is attached. It rather suggests that the plant grew on a firm matrix covered with three or four inches of mud; and at its apex it is abruptly transformed into a short flattened green stalk, which bears the large round subauriculate membranaceous frond. The frond being thin shows clearly, when held up to the light, the zonate marking. When young and small the frond is quite entire; but in the old plants it is sometimes split here and there along the radii, so that it appears deeply and irregularly lacerate. The colour varies from a deep olive to a light green, while the rhizome is pale brown. In young fronds the base is rather cuneate, while in older plants it is often auriculate-cordate.

The filaments of the frond are markedly torulose for some distance behind the apex (fig. 22), and do not taper towards their apices; the apices are often curled, but not markedly interwoven.

A near ally to this species is *Avrainvillea nigricans*, Decne., from which it differs in having a short flattened stipes on a long unbranched rhizome and also a very thin green frond; its frond-filaments are of fairly uniform thickness (20–30 μ diam.) and are much smaller than those of *A. nigricans*, which measure 60 μ or more inside the frond, but diminish to 30 μ at their apices. Further, *A. Gardineri* is confined to the western Indian Ocean, being known only from Cargados Carajos, whereas *A. nigricans* is a West Indian species.

A. Gardineri resembles *A. amadelpha* in being composed of filaments which for a certain distance behind the apex are torulose, but in *A. Gardineri* the torulose beading is more regular, extends further back from the apices of the filaments, and the filaments are wider than those of *A. amadelpha*. The pseudo-cortex, composed of twisted knotted apices, usually characteristic of *A. amadelpha* is not found in *A. Gardineri*, though in the latter species the torulose apices are often curled and loosely intertwined. In habit *A. Gardineri* and *A. amadelpha* are quite distinct.

CHLORODESMIS, Bail. et Harv.

30. CHLORODESMIS COMOSA, Bail. et Harv. in Harvey, Nereis Bor.-Amer. iii. p. 29 (1858).

Avrainvillea comosa, G. Murr. & Boodle, in Journ. of Bot. xxvii. 1889, p. 71, tab. 282. fig. 12; De Toni, Syll. Alg. i. 1889, p. 515.

Hab. Seychelles: Praslin, on reef.

Geogr. Distr. Fiji, Friendly Islands, New Caledonia, New Guinea, Celebes.

HALIMEDA, Lamour.

31. HALIMEDA TUNA, Lamour. Classif. Polyp. corall. (1812) p. 186; E. S. Barton, Siboga-Expeditie, Monographe lx. *Halimeda*, 1901, p. 11, t. 1.

f. TYPICA, E. S. Bart., Coetivy reef. Saya de Malha, 26 and 55 fms. Cargados Carajos, 30, 45, and 47 fms. Chagos Archipelago: Egmont, lagoon shoal and reef.

f. TYPICA, E. S. Bart., varying to f. PLATYDISCA, E. S. Bart., Cargados Carajos, 47 fms.

f. PLATYDISCA, E. S. Bart., Amirante, below 20 and 25 fms. Seychelles, below 34 and 44 fms. Saya de Malha, 26 fms. Cargados Carajos, 30, 45, and 47 fms.

Geogr. Distr. Mediterranean. Atlantic. Indian Ocean. Pacific.

32. HALIMEDA CUNEATA, Hering, in Flora, xxix. (1846) p. 214; E. S. Bart. Siboga-Expeditie, Mon. lx. *Halimeda*, p. 15, t. 1.

f. UNDULATA, E. S. Bart., Chagos Archipelago: Coin, Peros, and Salomon, on reefs exposed at dead low tides.

Geogr. Distr. Indian Ocean. Pacific.

These specimens have the habit of f. *undulata*, with the undulate and thickened margin, and have also the thickened junction of filaments at the apex of each joint, but the lateral walls of the peripheral cells are not connected for more than a quarter of their length, and in some cases hardly so much.

33. H. OPUNTIA, Lamour. *l. c.* p. 186; E. S. Bart. *l. c.* p. 18, t. 2.

f. TYPICA, E. S. Bart., Amirante, below 20 fms., below 25 fms., 30–100 fms. Seychelles, 34 fms. Saya de Malha, 25, 26, 29, and 55 fms. Cargados Carajos, 30 fms. Chagos Archipelago: Salomon reef, Coin, Peros reef, Chagos 30 fms., Diego Garcia reef.

f. TYPICA, E. S. Bart., varying to CORDATA, E. S. Bart., Amirante, 25 fms. Cargados Carajos, 30 fms. Chagos Archipelago: Salomon reef.

f. TYPICA, E. S. Bart., verging to TRILOBA, E. S. Bart., Salomon reef.

f. TYPICA, verging to CORDATA and TRILOBA, Diego Garcia reef.

f. CORDATA, E. S. Bart., Amirante, 20 and 30 fms. Coetivy reef. Seychelles, 34 fms. Saya de Malha, 26 and 29 fms. Salomon reef.

Geogr. Distr. Atlantic. Indian Ocean. Pacific.

34. H. GRACILIS, Harvey, ex J. Ag. Till Alg. Syst. viii. (1887) p. 82; E. S. Bart. *l. c.* p. 22, t. 3.

f. TYPICA, E. S. Bart., Amirante, below 20 fms. and below 25 fms. Saya de Malha, 25 and 29 fms.

Geogr. Distr. Atlantic. Indian Ocean. Pacific.

35. H. INCRASSATA, Lamour. *l. c.* p. 186; E. S. Bart. *l. c.* p. 25, t. 4.

f. TYPICA, E. S. Bart. (with rather small joints). Chagos Archipelago: Coin, Peros, reef. Egmont.

f. MONILIS, E. S. Bart., Amirante, 25 fms. Coetivy reef. Saya de Malha, 25 fms. (between *typica* and *monilis*). Cargados Carajos, 47 fms.

f. OVATA, J. Ag., Seychelles: Praslin reef. Amirante, 44–20 fms. Saya de Malha, 26 fms. Cargados Carajos, 30 fms. Chagos Archipelago: Salomon reef; Egmont reef and lagoon shoal.

Geogr. Distr. Atlantic. Indian Ocean. Pacific.

36. Halimeda macroloba, Decne. in Arch. Mus. Hist. Nat. Paris, t. ii. (1841) p. 118; E. S. Bart. Siboga-Expeditie, Mon. lx. *Halimeda*, p. 24, t. 3.

Seychelles: Praslin reef.

Geogr. Distr. Indian Ocean. Pacific.

PHÆOPHYCEÆ.

FUCACEÆ.

Sargassum, Ag.

37. Sargassum duplicatum, J. Ag. Sp. Sarg. Austral. (1889) p. 90; De Toni, Syll. Alg. iii. (1895) p. 50.

Seychelles: Praslin, on reefs exposed at dead low tide.

Geogr. Distr. Indian Ocean. South Pacific.

38. S. subrepandum, Ag. Sp. Alg. i. (1823) p. 8; J. Ag. Sp. Sarg. Austral. (1889) p. 95; De Toni, Syll. Alg. iii. (1895) p. 62.

Seychelles: Praslin, on reefs exposed at dead low tide.

Geogr. Distr. Indian Ocean. Red Sea.

This species is represented by several specimens showing slight variation in the form of the leaves.

39. S. persicum, Kütz. Spec. Alg. (1849) p. 610 and Tab. Phyc. xi. (1861) tab. 13; De Toni, Syll. Alg. iii. (1895) p. 114.

Seychelles: Praslin, on reefs exposed at dead low tide.

Geogr. Distr. Persian Gulf.

This species is represented in the collection by one plant only, which is clearly the same as that figured in Kützing's Tab. Phyc. xi. t. 13. It seems to be closely allied to *S. vulgare*. Our plant is also exactly like a specimen in Herb. Kew, placed under the name *Sargassum vulgare* and labelled "Th. Kotschy, Pl. Pers. austr. Ed. R. F. Hohenacker, 1845. No. 30[5]. *Sargassum vulgare* var. *latifolium*, Endl. et Dies.—Dies. Ad oram Karek, insulæ sinus Persici. M. Jan. 1841."

Turbinaria, Lamour.

40. Turbinaria conoides, Kütz. Tab. Phyc. x. (1860) p. 24, tab. 66; E. S. Bart. in Trans. Linn. Soc., 2nd ser. Bot. vol. iii. (1891) p. 217; De Toni, Syll. Alg. iii. (1895) p. 126.

Seychelles: Praslin, on reefs exposed at dead low tide.

Geogr. Distr. Kamschatka. Indian Ocean. Red Sea. Shores of North Australia.

Var. evesiculosa, E. S. Bart. *l. c.* p. 217.

Coetivy, on reefs exposed at dead low tide.

Geogr. Distr. Malay Archipelago.

41. TURBINARIA DECURRENS, Bory, Voy. Coquille, Bot. i. (1826–8) p. 119; E. S. Bart. Siboga-Expeditie, Mon. lx. *Halimeda*, p. 217.

Seychelles: Praslin, on reefs exposed at dead low tide.

Geogr. Distr. Red Sea. Indian Ocean. China Sea.

42. T. MURRAYANA, E. S. Bart. in Trans. Linn. Soc., 2nd ser. Bot. vol. iii. (1891) p. 218, tab. 54. fig. 2; De Toni, Syll. Alg. iii. (1895) p. 127. (Plate 24. figs. 25, 26.)

Seychelles; Praslin, on reefs exposed at dead low tide.

Geogr. Distr. Macassar. New Guinea.

The only specimens of this alga hitherto seen by the authors have consisted solely of the cone of so-called "leaves" and receptacles characteristic of an ordinary *Turbinaria* plant. In the present collection of Mr. Gardiner there is, however, material of *T. Murrayana* which adds considerably to our knowledge of its manner of development and growth. The material in question consists of colonies of plants in various stages. The mature "leaves" of the typical *T. Murrayana* are solid (not hollow), winged and slightly toothed both along the wings and the margin of the leaf; and being short-stalked and closely-set they make a cone-like head, short and compact. At the base of the main stem, close above the point of attachment to the substratum, there arise in the place of leaves for about 1 cm. up the stem a number of cylindrical, much and irregularly branched, filiform outgrowths often arranged in alternating verticils of three, spreading in all directions and varying in length (fig. 23). These are the "Langtriebe" of Engler and Prantl and are figured by Kützing for some of the species in his Tab. Phyc. vol. x. tabb. 66–68. If these branched outgrowths are examined it will be seen that they are really stolons, which run out in all directions horizontally and that some of them sprout at their apices into small plantlets, after becoming attached to a shell or other convenient substatum. From the new base arises an upright shoot which puts out near the base a few filamentous branches (potential stolons) and above them produces 3–5 simplified leaves (fig. 24) quite different from the well-known trigonous "leaves" of the coma of the mature plant. They are shortly stalked, flat, cuneate at base, lanceolate, longly acuminate, and about 1–2 cm. long, sinuato-denticulate at the margin and slightly carinately thickened beneath, and bear cryptostomata; but each new leaf is shorter and broader than the last and approximates more and more to the typical generic form, till in the centre of a sort of basal rosette of 4–5 of these flat lower leaves of gradually decreasing length there is seen a small peltate trigonous leaf of the usual type (fig. 24, *a*, *b*). The shoot continues to grow, the early acuminate leaves fall off, and the ordinary mature plant of *T. Murrayana* remains as figured (*l. c.* tab. 54. fig. 2).

43. T. ORNATA, J. Ag. Sp. i. (1823) p. 266; E. S. Bart. *l. c.* p. 219. (Plate 24. fig. 27.)

Seychelles: Coetivy. Chagos Archipelago: Diego Garcia. On reefs exposed at dead low tide.

Geogr. Distr. N. & S. Pacific. Indian Ocean. Australia.

The manner of propagation described above for *T. Murrayana* occurs also in some of the specimens of *T. ornata* brought by Mr. Gardiner from both the Seychelles and the

Chagos Archipelago. Stolons emerge from the base of the stem, but in *Turbinaria ornata* they are somewhat flattened or sometimes bluntly triquetrous, not cylindrical as in *T. Murrayana*. From these stolons arise young plantlets less regular in habit than those of *T. Murrayana*, and consisting of only one or two straggling linear-lanceolate grossly serrate first leaves (fig. 27), which are abruptly succeeded without any transitional stages by the normal trigonous leaves of the genus, though leaves with the specific character of a double row of teeth do not appear till later. Another noteworthy feature of *T. ornata* is that the stolons are apparently not confined to the base of the mature plant; for similar outgrowths often arise from the receptacular branches, either together with or in the place of the fertile branches.

We would here insert a note about *Turbinaria dentata*, Bart., and its identity with *T. condensata*, Sond.

In 1891 one of us published a new species of *Turbinaria*, *T. dentata* (Trans. Linn. Soc. ser. 2, Bot. iii. (1891) p. 219, pl. 54. fig. 5), founded on a specimen collected at Macassar by Madame Weber van Bosse. The distinguishing feature of this species was the small leaf crowned by sharp teeth, which extend down the angles of the vesicle. In the same paper, *T. condensata*, Sond., was mentioned (*l. c.* p. 220), and as the species was unknown to the author, she contented herself with transcribing the original diagnosis (Kütz. Tab. Phyc. x. 1860, p. 25). Figures of *T. condensata*, natural size, and of an enlarged vesicle crowned with teeth are given (*l. c.* tab. 69. figs. 2, 3); but in the absence of an authentic specimen of *T. condensata* the author did not regard that species as identical with her *T. dentata*, as there seemed to be some slight differences between her plant and the Kützing figure. Some time ago, however, Major Reinbold was so kind as to send to the author part of Sonder's original specimen of *T. condensata*, and at once it became evident that that species and *T. dentata*, E. S. Bart., are identical. The only difference between them is that in the Macassar plant the teeth are found regularly marking the angles of the vesicles, whereas in *T. condensata* the teeth are often confined to the crown at the top. This difference, however, amounts to nothing, and we therefore annul *T. dentata*, E. S. Bart., which must now be ranked as a mere synonym of *T. condensata*, Sond.

ZONARIA, J. Ag.

44. ZONARIA VARIEGATA, Mart. in Mart. Icon. Crypt. tab. 2. fig. 2; Sauvageau, in Soc. Sc. d'Arcachon Stat. Biol. Trav. Lab. viii. (1904–5) Paris, 1905, pp. 66–81.

Syn. *Gymnosorus variegatus*, J. Ag. Anal. Alg. cont. i. (1894) p. 11; De Toni, Syll. Alg. iii. p. 227 (1895).

Ralfsia ceylanica, Harv. ex Gepp, in Journ. Linn. Soc., Bot. xxxv. (1903) p. 477, tab. 13. figs. 1–4.

Zonaria Isselii, Piccone & Grunow, in Nuov. Giorn. Bot. Ital. xvi. (1884) p. 297, tab. 7. figs. 1–4, tab. 9. fig. 1.

Coetivy, on reef, and at 32 feet obtained by diver. Saya de Malha, 26 fms. Chagos Archipelago: Salomon reef; Egmont reef; Diego Garcia lagoon.

Geogr. Distr. N. & S. Atlantic. Pacific. Indian Ocean.

An interesting account of this species is given by Sauvageau (Biol. Trav. Lab. viii. pp. 66–81), to which our attention was drawn by Madame Weber van Bosse. The author there points out sundry errors made by J. G. Agardh in his 'Analecta Algologica,' continuatio i. (1894) p. 11, in describing his new genus *Gymnosorus*, which is founded on the present species. J. G. Agardh separates *Gymnosorus* from *Zonaria* in the belief that the former possesses neither indusium nor paraphyses. Sauvageau, however, and, before him, H. M. Richards have seen the indusium, which Sauvageau describes in detail; and as regards the paraphyses he observed peculiar bodies which, though not typical paraphyses, are at least comparable with them. It is therefore obvious that the type of *Gymnosorus* must be excluded from that genus; that is, *Zonaria variegata* resumes its old position. Sauvageau has closely studied the plant in the Canaries, and describes the manner in which the erect thallus grows out from the horizontal or creeping thallus, and points out its preference for shallow rock-pools, where it can creep over submerged surfaces near the brink of the pool. The normal form of the plant is the creeping rooting thallus; and the erect form is only found when some marginal part or parts of the growing thallus fail to find a suitable substratum to which they may attach themselves, and accordingly remain free, finally, after the death of the older creeping parts, assuming the appearance of an erect plant with a comparatively small base.

The creeping vegetative thallus is figured in the account of the Marine Algæ collected at the Maldive and Laccadive Islands by Mr. Stanley Gardiner, in Journ. Linn. Soc., Bot. xxxv. (1903) tab. 13. figs. 1–4, under the name *Ralfsia ceylanica*, Harv. This plant, previously undescribed, is, as we now see, nothing but a typical form of *Zonaria variegata*.

PADINA, Adans.

45. PADINA COMMERSONII, Bory, Voy. 'Coquille,' Bot. i. (1826–8) p. 144, tab. 21. fig. 2; De Toni, Syll. Alg. iii. (1895) p. 244.

Seychelles: Praslin, on reefs exposed at dead low tide.

Geogr. Distr. West Indies. Indian and Pacific Oceans.

46. P. DISTROMATICA, Hauck, in Hedwigia, xxvi. (1887) p. 43; De Toni, Syll. Alg. iii. (1895) p. 244.

Seychelles, on reefs exposed at dead low tide.

Geogr. Distr. Somali coast.

HALISERIS, Targ.-Tozz.

47. HALISERIS WOODWARDIA, J. Ag. Spec. i. (1848) p. 116; De Toni, Syll. Alg. iii. (1895) p. 254.

Seychelles, 44 fms.; Praslin reef. Amirante, below 20 fms.

Geogr. Distr. Australia. Sarawak. China Sea.

DICTYOTA, Lamour.

48. DICTYOTA DICHOTOMA, Lamour. in Desv. Journ. de Bot. ii. (1809) p. 42.

Amirante, below 25 fms., and 20–25 fms. Seychelles, 44 fms.; Praslin, on reefs exposed at dead low tide.

Geogr. Distr. Mediterranean. Atlantic. Pacific. Indian Ocean.

ECTOCARPUS, Lyngb.

49. ECTOCARPUS SPONGIOSUS, Dickie, in Journ. Linn. Soc., Bot. vol. xiv. (1875) p. 191; Gepp, in Journ. Linn. Soc., Bot. vol. xxxv. (1903) pp. 479–80, pl. 13. figs. 9–13.

Praslin, on reefs exposed at dead low tide.

Geogr. Distr. Indian Ocean: Mauritius, Laccadive Islands, Admiralty Islands, Cheduba Straits (Burmah).

APPENDIX.

With the Algæ were a few marine phanerogamic plants, the names and distribution of which are as follows. We have to thank Dr. A. B. Rendle for assisting us in the determination of them.

POTAMOGETONACEÆ.

ZOSTERA, Linn.

50. ZOSTERA NANA, Roth, Enum. Pl. Germ. i. (1827) p. 8.

Imperfect specimen, doubtfully referred here.

Seychelles: Praslin. On reefs exposed at dead low tide.

Gen. Distr. N. & S. Atlantic (eastern shores). Mediterranean. Indian Ocean (western shores).

CYMODOCEA, Koenig.

51. CYMODOCEA SERRULATA, Aschers. & Magn. in Sitzber. Ges. naturf. Freunde Berlin, 1870, p. 84.

Seychelles: Praslin. On reefs exposed at dead low tide.

Gen. Distr. Red Sea. Indian and West Pacific Oceans. Mostly tropical.

52. C. ISOETIFOLIA, Aschers. in *op. cit.* 1867, p. 3.

Seychelles: Praslin. On reefs exposed at dead low tide.

Gen. Distr. Red Sea. Indian and Pacific Oceans. Mostly tropical.

53. C. CILIATA, Ehrb. ex Aschers. in *loc. cit.*

Amirante, 25 fms. Coetivy, on reef. Cargados Carajos.

Gen. Distr. Red Sea. Indian and West Pacific Oceans. Mostly tropical.

HYDROCHARIDACEÆ.

HALOPHILA, Du Petit Thouars.

54. HALOPHILA OVALIS, Hook. f. Fl. Tasman. ii. (1860) p. 45.
Amirante, 20–25 fms. Seychelles, below 34 fms. Cargados Carajos, 30 fms.
Gen. Distr. Red Sea. Indian and Pacific Oceans.

55. ENHALUS ACOROIDES, Steud. Nomencl. Bot. ed. ii. (1840) p. 554.
Seychelles: Praslin. On reefs exposed at dead low tide.
Gen. Distr. Red Sea. Indian and West Pacific Oceans. Tropical.

EXPLANATION OF THE PLATES.

PLATES 22–24.

Microdictyon pseudohapteron, sp. n.

Fig. 1. Plant, somewhat torn. (Nat. size.)

Fig. 2. Portion of thallus, showing (*a*) the stellate mode of branching of the filaments in one plane, and (*b*) the gradual tendency of the branchlets to fill in the meshes of the reticulum (× 8); *c* and *d*, enlarged diagrams of a cruciate and of a stellate node (× 20).

Fig. 3. Tenacula which hold the reticulum together. They are expanded crenellated end-walls of the branchlet, and are not special cells cut off by a transverse wall, as in *Struvea*. One (*a*) is detached, the other (*b*) is applied to the side of another cell. (× 75.)

Fig. 4. Rhizoids which attach the thallus to the substratum. They are thin unsegmented tubes arising from any point of the thallus cells and terminating in a nodulose expansion. *a*. A group of cells with rhizoids in various stages of development (× 40). *b*. Single rhizoid (× 110).

Struvea Gardineri, sp. n.

Fig. 5. Young plant showing main filament branched above by usually cruciate ramification in one plane into a reticulate frond with margin entire. (Nat. size.)

Struvea orientalis, sp. n.

Fig. 6. Plants showing habit, size, branching of main filament. *a*. Dried specimen. *b*. Specimen preserved in formalin. (Nat. size.) The stipes in figs. 5 and 6 is non-septate.

Fig. 7. Portion of frond showing (*a*) free edge composed of projecting branchlets, and (*b*) inner part of reticulum in which the primary meshes are much filled in by subsequently formed branchlets. (× 8.)

Fig. 8. Cells of frond enlarged. *a*. A primary mesh of the reticulum completely filled in by a subsequent growth of branchlet-cells. *b*. A few branching cells with a tenaculum. (× 25.)

Fig. 9. Tenacula or specialised terminal cells which fasten the filaments of the reticulum together. (× 110.)

Bryopsis indica, sp. n.

Fig. 10. Habit of plant, simple and branched. (Nat. size.)

Fig. 11. Portion of plume showing arrangement of the ramuli alternately disposed in two double rows on opposite sides of the main filament. (× 75.)

Caulerpa cupressoides var. *typica* forma *Gardineri*, f. n.

Fig. 12. Habit of plant (dried specimen), showing minute distichous pinnules. (Nat. size.)

Fig. 13. Habit of plant (specimen preserved in formalin), showing minute tristichous pinnules. (Nat. size.) Figs. 12 and 13 are from drawings supplied by Madame Weber von Bosse.

Cladocephalus excentricus, sp. n.

Fig. 14. Habit of plant: *a*, in surface view, seen from above; *b*, in side view. (Nat. size.) By an error the stipes in fig. 14*a* is erroneously shown as if visible through the frond.

Fig. 15. External view of frond showing the labyrinthiform pseudo-cortex, composed of repeatedly divaricato-dichotomous filaments closely interwoven. (× 280.)

Fig. 16. Single lateral mature branch arising from a main filament, constricted near the base and showing the divaricato-dichotomous system of branches which interlocking with their fellows form the labyrinthiform pseudo-cortex. (× 230.)

Fig. 17. Main filaments of frond near apex, showing young lateral branches in various early stages of the division shown in the preceding figure. (× 230.)

Tydemania expeditionis, Weber van Bosse.

Fig. 18. Creeping flabellate form of the plant; portion of the ramified non-septate axis, cylindric below, torulose above, and bearing about a dozen flabella. (× 3.)

Fig. 19. A torulose branch of the axis bearing a mature flabellum, the upper half of which has been cut away. At the apex of the continuation of the branch is a young flabellum in the first stages of development. (× 16.)

Avrainvillea amadelpha, A. & E. S. Gepp.

Fig. 20. Habit of mature plant, deep-water form, Saya de Malha, 29 fms. (Nat. size.)

Fig. 21. Filament of frond, cylindrical below, torulose and tortuous at apices. (× 110.)

Fig. 22. External view of frond showing the pseudo-cortex, composed of the interwoven torulose apices of the frond filaments. (× 280.)

Avrainvillea Gardineri, sp. n.

Fig. 23. Habit of mature plant, showing long unbranched rhizome, short stipes, and large thin zonate lacerate frond. (½ nat. size.)

Fig. 24. Filament of frond, more or less torulose for a considerable distance behind the apex, and not attenuated towards apex. (× 110.)

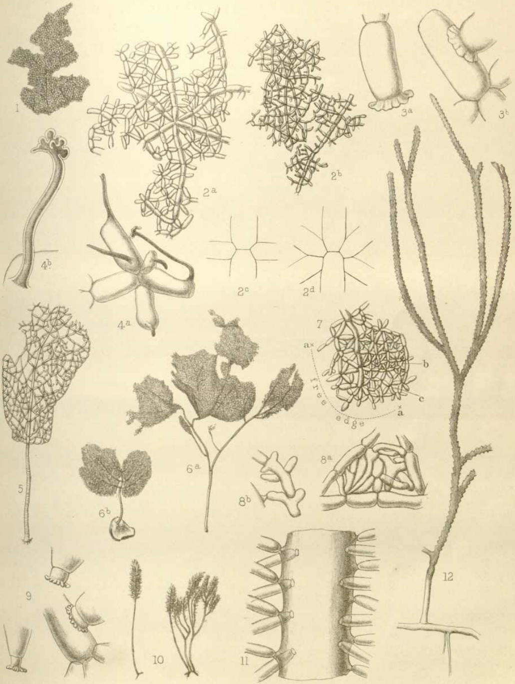
Turbinaria Murrayana, Bart.

Fig. 25. Mature plant, showing typical cone of solid trigonous leaves above, and numerous stolons below, one of which has already produced a bud (*a*). (Nat. size.)

Fig. 26. Young plants arising from stolons. *a*. Seen from above, showing rosette of primitive leaves, shortly stalked, flat, cuneate at base, the oldest being lanceolate and longly acuminate, each subsequent leaf approximating gradually to the typical trigonous normal leaves, of which two small ones are seen in the middle. *b*. A similar young plant, in side view. (Nat. size.)

Turbinaria ornata, J. Ag.

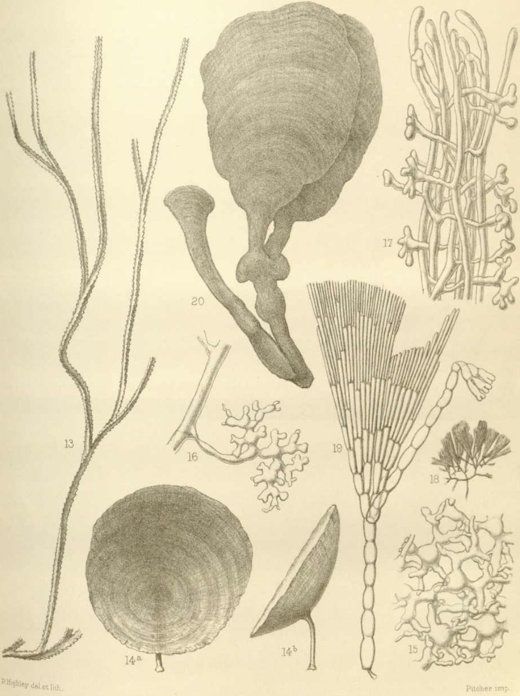
Fig. 27. Young plants which have arisen from stolons, showing one or two primitive lanceolate leaves which are more serrate than the primitive leaves of *T. Murrayana*, Bart. (Nat. size.)



P Highley del et lith.

Pitcher imp.

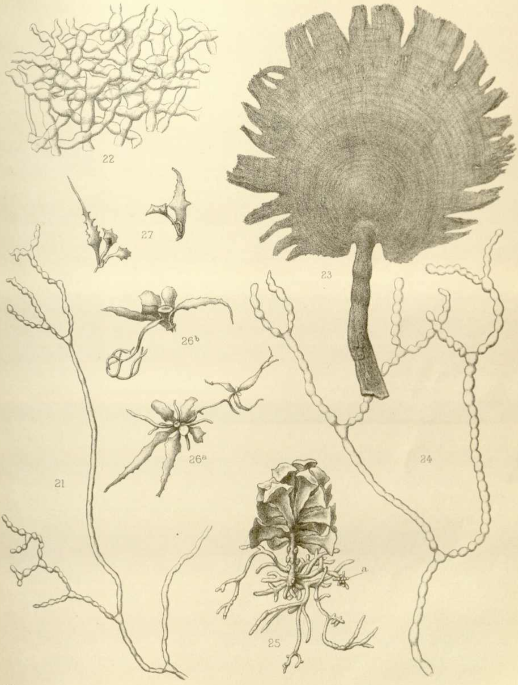
MARINE ALGAE FROM THE INDIAN OCEAN.



R. Highley del. et lith.

Pitcher imp.

MARINE ALGAE FROM THE INDIAN OCEAN.



P. Highley del. et lith.

Pitcher imp.

MARINE ALGAE FROM THE INDIAN OCEAN.

LINNEAN SOCIETY OF LONDON.

MEMORANDA CONCERNING TRANSACTIONS.

The First Series of the Transactions, containing both Botanical and Zoological contributions, has been completed in 30 Vols., and a few entire sets are still for sale. Only certain single volumes, or parts to complete sets, may be obtained at the original prices. The price of the Index to Vols. 1–25 is 8s. to the public, and 6s. to Fellows; to Vols. 26–30, 4s. to the public, and 3s. to Fellows.

The Second Series of the Transactions is divided into Zoological and Botanical sections. The prices of the Botanical parts of these which have been published are as undermentioned. (For the Zoological parts see Zoological wrapper.)

SECOND SERIES.—BOTANY.

Volume.		When Published.	Price to the Public.			Price to Fellows.		
			£	s.	d.	£	s.	d.
I.	Part I.	1875.	0	8	0	0	6	0
	Part II.	1875.	0	16	0	0	12	0
	Part III.	1876.	0	12	0	0	9	0
	Part IV.	1876.	0	10	0	0	7	6
	Part V.	1878.	1	4	0	0	18	0
	Part VI.	1879.	1	6	0	0	19	6
	Part VII.	1880.	1	4	0	0	18	0
	Part VIII.	1880.	1	1	0	0	16	0
	Part IX.	1880.	1	0	0	0	15	0
II.	Part I.	1881.	0	12	0	0	9	0
	Part II.	1882.	0	5	0	0	3	9
	Part III.	1883.	0	10	0	0	7	6
	Part IV.	1883.	0	3	0	0	2	3
	Part V.	1883.	0	3	0	0	2	3
	Part VI.	1884.	0	13	6	0	10	0
	Part VII.	1884.	0	9	6	0	7	0
	Part VIII.	1884.	0	10	0	0	7	6
	Part IX.	1886.	0	7	0	0	5	0
	Part X.	1887.	0	3	4	0	2	6
	Part XI.	1886.	0	6	0	0	4	6
	Part XII.	1886.	0	8	0	0	6	0
	Part XIII.	1887.	1	7	0	1	0	0
	Part XIV.	1887.	0	7	0	0	5	0
	Part XV.	1887.	0	10	0	0	7	6
	Part XVI.	1888.	0	2	6	0	2	0
III.	Part I.	1888.	3	12	0	2	14	0
	Part II.	1891.	0	5	0	0	3	9
	Part III.	1891.	0	7	0	0	5	0
	Part IV.	1891.	0	6	0	0	4	6
	Part V.	1891.	0	6	0	0	4	6
	Part VI.	1891.	0	3	6	0	2	8
	Part VII.	1892.	0	6	0	0	4	6
	Part VIII.	1893.	0	6	0	0	4	6
	Part IX.	1893.	1	8	0	1	1	0
	Part X.	1894.	0	10	0	0	7	6
	Part XI.	1894.	0	3	4	0	2	6
IV.	Part I.	1894.	1	0	0	0	15	0
	Part II.	1894.	2	0	0	1	10	0

SECOND SERIES.—BOTANY (*continued*).

Volume.		When Published.	Price to the Public.			Price to Fellows.		
			£	s.	d.	£	s.	d.
IV.	Part III.	1895.	2	10	0	1	17	6
	Part IV.	1895.	0	3	4	0	2	6
V.	Part I.	1895.	0	9	0	0	6	9
	Part II.	1895.	0	12	0	0	9	0
	Part III.	1896.	0	6	0	0	4	6
	Part IV.	1896.	1	0	0	0	15	0
	Part V.	1896.	0	14	0	0	10	6
	Part VI.	1896.	0	4	0	0	3	0
	Part VII.	1897.	0	4	0	0	3	0
	Part VIII.	1897.	0	6	0	0	4	6
	Part IX.	1899.	0	12	0	0	9	0
	Part X.	1899.	0	6	0	0	4	6
	Part XI.	1899.	0	7	0	0	5	0
	Part XII.	1899.	0	12	0	0	9	0
	Part XIII.	1900.	0	1	6	0	1	2
	Part XIV.	1900.	0	3	0	0	2	3
	Part XV.	1901.	0	6	0	0	4	6
VI.	Part I.	1901.	1	10	0	1	2	6
	Part II.	1901.	0	6	0	0	4	6
	Part III.	1902.	0	18	0	0	13	6
	Part IV.	1903.	0	8	0	0	6	0
	Part V.	1903.	0	8	0	0	6	0
	Part VI.	1903.	0	12	0	0	9	0
	Part VII.	1904.	0	12	0	0	9	0
	Part VIII.	1904.	0	12	0	0	9	0
	Part IX.	1904.	0	7	0	0	5	3
	Part X.	1904.	0	14	0	0	10	6
	Part XI.	1905.	0	4	0	0	3	0
VII.	Part I.	1904.	0	5	0	0	3	9
	Part II.	1905.	0	6	0	0	4	6
	Part III.	1906.	0	3	0	0	2	3
	Part IV.	1906.	0	7	0	0	5	3
	Part V.	1907.	0	10	0	0	7	6
	Part VI.	1907.	0	4	0	0	3	0
	Part VII.	1907.	0	6	0	0	4	6
	Part VIII.	1908.	0	5	0	0	3	9
	Part IX.	1908.	0	2	6	0	2	0
	Part X.	1908.	0	7	0	0	5	3