

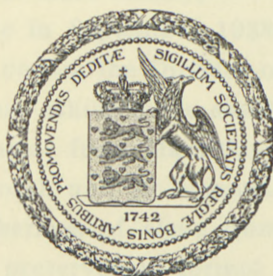
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SOME MARINE ALGAE FROM MAURITIUS

I. CHLOROPHYCEAE

BY

F. BØRGESEN



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The Danish zoologist Dr. TH. MORTENSEN, when he was staying at Mauritius in September—October 1929 for the purpose of studying Echinoderms from that island, at the same time collected and prepared with his usual energy and care a rather large number of algae. Since many of these were dredged in deep water, down to a depth of about 50 fathoms, it is no wonder that his collection contains much interesting material, and all the more so since Dr. MORTENSEN has prepared not only larger forms but also many of the small ones. On his return to Copenhagen Dr. MORTENSEN presented the Botanical Museum of the University with the collection. After having examined it superficially I immediately recognized its value and hoped one day to be able to study it more closely.

When therefore in September 1938 I received a letter from Dr. R. E. VAUGHAN, the Director of the Royal College, Curepipe, Mauritius, asking me to assist him in determining his collection of algae from Mauritius, I was very glad to agree to his proposal, and Dr. VAUGHAN has several times sent me rich gatherings of algae from the island, partly dried and partly preserved in formol and sea-water, and also slides with algae.

The algal flora of Mauritius is by no means unknown. Already from the year 1834 a small list comprising 24 species was published by the well known Irish algologist

W. H. HARVEY in his paper: "Notice of a collection of Algae, communicated to Dr. HOOKER by the late Mrs. CHARLES TELFAIR, from "Cap Malheureux", in the Mauritius. With descriptions of some new and little known species." It is evident from the title that this paper is based upon a collection of algae made by Mrs. TELFAIR.

At the end of the year 1873 G. DICKIE published a paper: "On the Algae from Mauritius." It contains 155 species, some fresh water algae being included in the list. The algae were collected by Colonel NICHOLAS PIKE who during a stay at Mauritius made considerable gatherings there. Like those of Mrs. TELFAIR the specimens of algae which DICKIE determined are included in the Kew Herbarium. DICKIE'S paper is a mere enumeration of the species. Not even the localities where the algae were found are mentioned and the descriptions of the new species are rather poor.

More recently (1934) F. JADIN has published a fuller list of species comprising the algal flora of Mauritius as well as of Réunion, the other large island of the Mascarene Islands. JADIN gathered algae at the islands from February till the end of October 1890. The title of his paper is: "Algues des Iles de la Réunion et de Maurice". Although this list shows a great advance on the lists previously published, nevertheless several of the determinations are not quite modern. According to kind information from Dr. FELDMANN, Algiers, this is no doubt due to the fact that JADIN made the determination of his collection several years ago but postponed the publication until 1934; a list of the *Nostocaceae* of the islands is thus published in Bulletin Soc. bot. France, t. XL, p. CXLVIII—CLXXIII, 1893.

Finally we may mention that MONTAGNE and MILLARDET

in a treatise by L. MEILLARD, "Notes sur l'île de la Réunion (Bourbon)" have given a list of the algae from that island.

It was of course of importance to me to be able to examine these old collections of algae from Mauritius, and upon my application to Sir ARTHUR HILL, Director of the Royal Botanical Gardens, Kew, and to the Keeper of the Herbarium, Dr. A. D. COTTON, they were so kind as to let me have on loan in Copenhagen the *Chlorophyceae* from Mauritius kept in the Kew Herbarium, and after the return of these, the *Phaeophyceae*. While I still had the last-mentioned here the war broke out, and with Sir ARTHUR HILL'S concurrence the algae will remain here until the end of the war.

But it is not only in London that collections of algae from Mauritius are found. In Paris also, in the Muséum d'Histoire naturelle, copious collections from the islands are kept, as I am informed by Dr. FELDMANN, who has taken a great interest in my intended work on the algae from Mauritius.

First of all JADIN'S collection is found there. It is said to be very rich, and also contains a good many duplicates. Doctor FELDMANN has kindly let me know that upon his application Director ALLORGE had given permission for a collection as comprehensive as possible of JADIN'S duplicates to be sent to me, and Dr. FELDMANN had just begun to take out these duplicates when the war broke out and unfortunately made this impossible.

Further another good collection, that of le Vicomte DE ROBILLARD, according to Dr. FELDMANN is likewise found in Paris. This collection has a special value because it has been determined by BORNET. But it is incorporated in the THURET-BORNET Herbarium, and for that reason it is not

permitted to send it away from the Museum. It is therefore very much to be regretted that the war has rendered impossible a visit to Paris and London planned for this spring when I had hoped to be able to study the collections of algae from Mauritius found in the museums there.

Miss INGBORG FREDERIKSEN has most kindly drawn some of the figures.

To the Trustees of the Carlsberg Foundation I am much indebted for a continued grant for algological researches.

CHLOROPHYCEAE

I. Chaetophorales.

Fam. 1. *Chaetophoraceae*.

Endoderma Lagerh.

1. *Endoderma vagans* Børgs.

BØRGESSEN, F., Mar. Alg. D. W. I., vol. II, p. 418, fig. 400.

In the walls of a not yet determined *Griffithsia* an *Endoderma* was found which, as to size and shape of the cells, seems to agree entirely with the West Indian plant.

Mauritius: Pointe aux Roches in rock pools, R. E. V. no. 125.
Geogr. Distr.: West Indies.

Phaeophila Hauck.

1. *Phaeophila dendroides* (Crn.) Batters.

BATTERS, A., Catalogue, p. 13. — *Ochlochaete dendroides* Crn., Florule, 1867, p. 128. *Phaeophila Floridearum* Hauck, Meeresalgen, p. 464. HUBER, J., Contrib. à la conn. des Chaetoph., p. 327, pl. 16, fig. 1—11. SCHUSSNIG, B., Alg. Abhandl., p. 16, pl. IV.

Found in the walls of *Hypnea* and *Griffithsia* from rock-pools.

Mauritius: Pointe aux Roches, R. E. V. (no. 125).
Geogr. Distr.: Widespread.

II. Ulvales.

Fam. 1. *Ulvaceae*.

Monostroma Thuret, Wittr.

1. *Monostroma oxycoccum* (Kütz.) Thur.

THURET, G., Note sur la Synon. des Ulva, 1854, p. 16, emend. HAMEL, Chlorophyc. Côtes Franç., p. 146. — *Ulva oxycocca* Kütz., Phycol. Germ., p. 244. *Monostroma latissimum* (Kütz.) Wittr., Monogr. Monostroma, p. 33, pl. 1, fig. 4. For more synonyms compare HAMEL l. c.

A rather large specimen which has most probably been lying loose is found in Dr. VAUGHAN's collection. The thallus is about 23 μ thick and the cells are roundish polygonal and arranged without order. The specimen is 21 cm broad. Its colour is light olive-green and the surface is shining.

Mauritius: Îlot Brocus, Aug. 1938 in tidal creek, R. E. V. no. 197.

Geogr. Distr.: Atlantic Ocean, Mediterranean Sea, New Zealand, Pacific Ocean etc.

Enteromorpha Link.

1. *Enteromorpha compressa* (L.) Grev.

GREVILLE, R., Alg. Brit. p. 180. HAMEL, Chlorophycées Côtes Franç., p. 156, where the literature is mentioned.

var. *prolifera* (Muell.) HAMEL, l. c. p. 160.

A single specimen in Dr. VAUGHAN's collection may perhaps be referable to this variety. The plant grows gregariously in a dense clump upon a small stem of a sea-grass. In the tubular stem the cells are arranged in rows; they are roundish or square, about 20—25 μ in diameter. Up along the stem are found numerous monosiphonic thin proliferations.

It was found in brackish water in tidal creeks near the sea.

Mauritius: Ilôt Brocus. ¹²/₃ 33, R. E. V. no. 176.

Geogr. Distr.: Widespread.

2. *Enteromorpha flexuosa* (Wulfen) J. Ag.

J. AGARDH, Till Algern. System., III, VI Ulvaceæ, p. 126. BØRGESEN, Mar. Alg. D. W. I., vol. 1, p. 5. FELDMANN, Alg. mar. Côte des Albères, p. 52, where more literature is mentioned.

The thallus is as a rule simple or with a few branchlets or proliferations. It is tubular, somewhat inflated and flexuous above. The cells are arranged regularly in rows and are up to about 20 μ broad.

Dr. VAUGHAN writes about it that it is "very common in Barachois where it is collected for fishing bait".

Mauritius: Ilôt Brocus, Aug. 1938, R. E. V. no. 195.

Geogr. Distr.: Seems to occur in most temperate and warm seas.

3. *Enteromorpha chlathrata* (Roth) J. Ag.

J. AGARDH, Till Algenes Systematik, III, VI Ulvaceæ, p. 153.

var. *Hopkirkii* (M. Calla) HAMEL, l. c., p. 165.

A large much ramified specimen found in the Kew Herbarium seems to be referable to this species.

Mauritius: Flacq, Baie de 4 cows, Jan. 23th, 1870, Colonel PIKE.

var. *crinita* Hauck, Meeresalgen, p. 429. HAMEL l. c., p. 165, where the literature is mentioned.

Some material preserved in formol and about which Dr. VAUGHAN writes "Shallow water, sandy bottom, lagoon in Ilôt Brocus", seems to be referable to this variety.

The plant is very soft, much ramified and provided with numerous often monosiphonic and more or less curved

proliferations. The cells are placed in rows and are square, about 30 μ in diameter, and the chromatophores fill up almost the whole cell.

Mauritius: Ilôt Brocus, Aug. 1938. R. E. V. no. 206.

Geogr. Distr.: Most probably widely spread.

Ulva L.

1. *Ulva Lactuca* L.

LINNÉ, Spec. plant, vol. II, 1753, p. 1163.

Some small specimens growing in a "tidal creek near Sea" are found in Dr. VAUGHAN's collection.

Mauritius: Ilôt Brocus, 12. March 33, R. E. V. no. 180.

Geogr. Distr.: Widespread.

2. *Ulva fasciata* Delile.

DELILE, Flore d'Égypte, p. 153, tab. 58, fig. 5, J. AGARDH, Till Algenes Systematik, VI, p. 173. MONTAGNE, Fl. d'Algérie, p. 151, tab. 14, fig. 1—2. For more literature compare DE-TONI, Syll. Alg., vol. I, p. 114.

A rather badly preserved specimen is found in Dr. VAUGHAN's collection. The cells in the thallus are roundish-polygonal and placed without order; they have a diameter of about 20 μ .

Mauritius: Pt. aux Roches, in pools, 3rd of April 1931, R. E. V. no. 138.

Geogr. Distr.: In most warm seas.

III. Siphonocladales.

Fam. 1. *Valoniaceae*.

Valonia Ginn.

1. *Valonia ventricosa* J. Ag.

AGARDH, J., Till Algernes Systematik, 5te Afd. VIII, Siphoneæ 1886, p. 96. MURRAY, GEORGE, Halicystis and Valonia, p. 50. KUCKUCK, P., Über den Bau und die Fortpflanzung von Halicystis Areschoug und Valonia Ginnani, p. 42. VICKERS, Phycologia Barbado., p. 21, pl. XXIII A. BØRGESEN, Mar. Alg. D. W. I., vol. I, p. 27, fig. 16.

A single specimen of this species is found in Dr. MORTENSEN'S collection, agreeing entirely with my description and figures. It was found near the shore in shallow water at low tide.

Mauritius: Flat Island, ¹⁷/₁₀ 29, leg. TH. M.

Geogr. Distr.: West Indies, Malayan Archipelago, American Samoa.

2. *Valonia utricularis* (Roth) C. Ag.

C. AGARDH, Species Algarum, p. 431. J. AGARDH, Till Algernes Systematik, 5te Afd., VIII, p. 98. KUCKUCK, Über den Bau etc., p. 28.

Some well developed specimens preserved in spirit are found in Dr. MORTENSEN'S collection. In the Kew Herbarium several specimens gathered by Colonel PIKE are also referable to this species.

Mauritius: Between Gunners Quoin and Flat Island at a depth of about 30 fathoms on sandy bottom, ¹⁶/₁₀ 29, TH. M.

Geogr. Distr.: Widespread in warmer seas.

3. *Valonia Ægagropila* C. Ag.

C. AGARDH, Spec. Alg., p. 429. J. AGARDH, Till Alg. System., 5te Afd. VIII. Siphoneæ, p. 99. KUCKUCK, P., Über den Bau und die Fortpflanzung von Halicystis Aresch. und Valonia Ginn. p. 36.

A few thalli are found in one of Dr. VAUGHAN's tubes.

Mauritius: Tamarin Bay, R. E. V. no. 319.

Geogr. Distr.: Mediterranean, Indian and Pacific Oceans, West Indies.

4. *Valonia fastigiata* Harv.

HARVEY, Alg. Ceylon, no. 74. J. AGARDH, Till Algern. System. VIII, p. 101.

Some specimens are found in the Kew Herbarium. Two of them are rather well prepared and agree very well with a specimen from HARVEY's Friendly Island Algae no. 100 found in the Herbarium of the Botanical Museum in Copenhagen. The vigorous hapters are found scattered over the surface of the thallus often also in small groups.

Mauritius: Colonel PIKE.

Geogr. Distr.: Mauritius, Ceylon, Friendly Islands, Australia.

Dictyosphaeria Decsne.

1. *Dictyosphaeria cavernosa* (Forssk.) Børgs.

BØRGESEN, Revision of FORSSKÅL's Algae, p. 2, pl. 1, fig. 1. — *Ulva cavernosa* Forssk., Flora Ægypt.-arabica, p. 187. *Dictyosphaeria favulosa* (Ag.) Decsne, Classific. des Algues, p. 32. BØRGESEN, Mar. Alg. D. W. I., vol. I, pp. 33—39, figs. 20—22.

A well developed specimen is found in Dr. VAUGHAN's collection. He writes about it: "Pale green flattish discs".

Mauritius: Without locality, R. E. V. no. 230. "Common everywhere". Flacq, JADIN no. 299, Juillet 1890.

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

2. *Dictyosphaeria Setchellii* nov. spec.

Frons pulvinata, subplanata et irregulariter difformis, cartilaginea, solida, ad 1—2 cm alta et 2—3 cm et ultra lata, infimo rhizoideis curtis ad substratum adfixa. Spinae ex

parietibus cellularum projectae, erectae aut suberectae, ca. 100—120 μ longae et in parte basali ad 10—12 μ latae, superficie levi et plana numerosae adsunt. Fig. 1.

Mauritius: Flat Island in shallow water, ¹⁷/₁₀ 1929, TH. M. Without locality, Colonel PIKE. R. E. V. no. 230. "Flattish pale green discs, warty surface, very common everywhere".

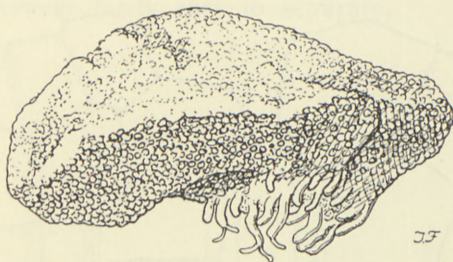


Fig. 1. *Dictyosphaeria Setchellii* nov. spec. Habit of a plant. $\times 1\frac{1}{2}$.

In Dr. MORTENSEN'S collection some fine specimens of a *Dictyosphaeria* preserved in spirit are found. At first I thought I had to do with *Dictyosphaeria Versluysi* Web. v. B. but a comparison with this species and the other related species: *Dictyosphaeria van Bosseae* Børgs. and *Dict. australis* Setch. (the last-mentioned species I know only from the description of it) resulted in my finding that the plant from Mauritius does not exactly agree with any of the above-mentioned species, and therefore I prefer to make it a new species.

A comparison of the four species is given below:

	Diameter of cells	Size of spines:	
		Length	Breadth at the base
<i>D. Setchellii</i> . . .	800—1000—1500 μ	ca. 70—140 μ	ca. 9—15 μ
<i>D. Versluysi</i> . . .	up to 2000 μ	ca. 130—150 μ	ca. 30 μ
<i>D. Van Bosseae</i>	500—700—1000 μ	up to 90 μ	ca. 8—12 μ
<i>D. australis</i> . . .	500—1000 μ	60—88 μ	

It will appear from this survey, (compare also figs. 2—3), that *Dict. Versluysi* has by far the largest cells and spines and by these characters it is easily separable from the other 3 species. These have all cells of about the same size, *Dict. Setchellii* having the larger ones, while those of

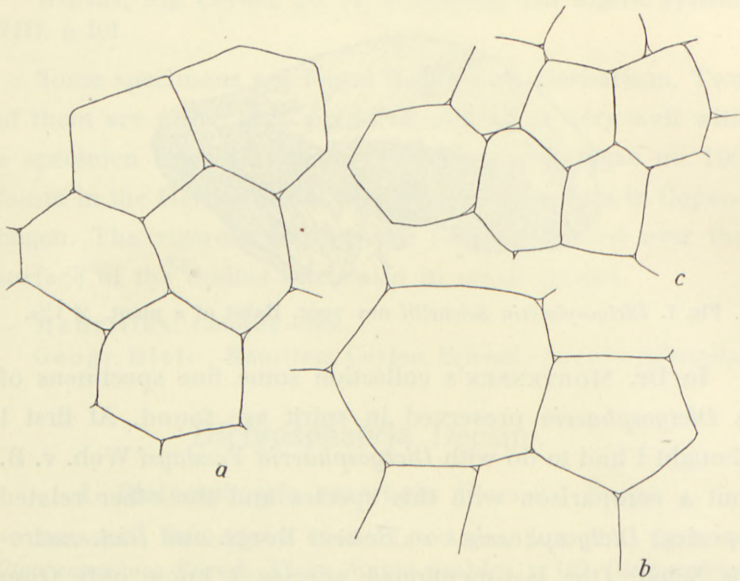


Fig. 2. Cells of: a, *Dictyosphaeria Setchellii* nov. spec.; b, *Dictyosphaeria Versluysi* Web. v. B.; c, *Dictyosphaeria van Bosseae* Børgs. (\times ca. 20).

Dictyosphaeria van Bosseae are somewhat smaller (Fig. 2). And further the shape and size of the spines give some quite good characters. Thus in *Dict. Setchellii* (Fig. 3 a) they are generally found in great numbers having as a rule a length of about 100—120 μ and a breadth of 10—11 μ at their base. They are slender, tapering evenly to the acute summits, and generally quite straight or sometimes bending a little, and they have smooth and even or sometimes a little waved surfaces. In *Dict. van Bosseae* the spines (Fig. 3 c)

are less numerous, only found here and there in some of the cells. They are often rather bent and have more or less uneven, waved surfaces. As to the spines of *Dict. australis* they are said to be 60—88 μ long and further they are "sparsissimis et rarissimis". The 3 species in question are certainly closely related, but by means of the above-mentioned differences fairly easy to separate.

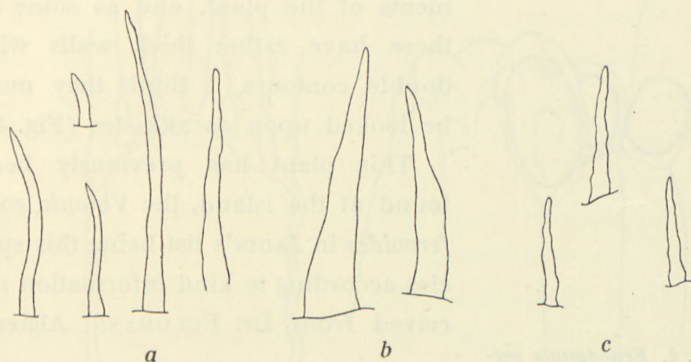


Fig. 3. Spines of: a, *Dictyosphaeria Setchellii* nov. spec; b, *Dictyosphaeria Versluyi* Web. v. Bosse; c, *Dictyosphaeria van Bosseae* Børgs. (\times ca. 250).

In the Kew Herbarium a few dried specimens determined as *Dictyosphaeria sericea* Harv. by DICKIE are referable to this species.

Fam. 2. *Siphonocladaceae*.

Ernodesmis Børgs.

1. *Ernodesmis verticillata* (Kütz.) Børgs.

BØRGESEN, Some Chlorophyceae from the Dan. West Indies, II, 1912, p. 259. Mar. Alg. D. W. I., vol. I, p. 66, figs. 51—54. — *Valonia verticillata* Kütz., Spec. Alg., p. 508; Tab. Phycol. VI, tab. 88.

The discovery of this species in Dr. VAUGHAN'S collection so far from its former known area of distribution is of much

interest. The plant from Mauritius in all respects agrees with the West-Indian one and I can therefore refer the reader to my description of it.

As was the case in the West-Indian plant the cell-content in the plant from Mauritius is often contracted into balls. The balls are found in the upper young segments of the plant, and as some of these have rather thick walls with double contours, I think they must be looked upon as akinetes (Fig. 4).

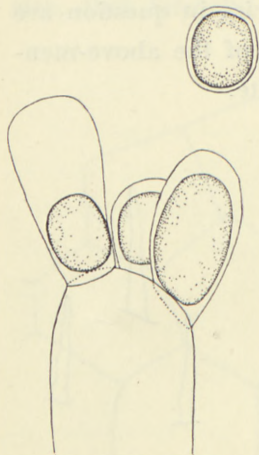


Fig. 4. *Ernodesmis verticillata* (Kütz.) Børgs. Tips of segments with akinete-formation. ($\times 30$).

This plant has previously been found at the island, the *Valonia confervoides* in JADIN'S list being this species according to kind information received from Dr. FELDMANN, Algiers.

Mauritius: In a lagoon at Ilôt Brocus, R. E. V. Aug. 1938.

Geogr. Distr.: The West Indies, Brazil.

Chamaedoris Mont.

1. *Chamaedoris Delphinii* (Hariot) Feldm. et Børgs.

FELDMANN, J., Sur la classification de l'ordre des Siphonocladales, p. 18. — *Siphonocladus Delphinii* Hariot, Quelques Algues de Madagascar, p. 470. *Chamaedoris annulata*. ARESCHOUG, Phyceae Capensis, p. 14. DICKIE, G., Algae of Mauritius, p. 198.

FELDMANN, as mentioned in the above-quoted treatise, made the interesting discovery, when studying the type specimen of HARIOT'S *Siphonocladus Delphinii* in the Museum in Paris, that in reality this plant is a *Chamaedoris*. But due to deficiency of material he does not say anything

about its specific relationship, neither does he mention that it should be specifically different from the West Indian species. The examination of specimens from Mauritius, which I consider the same as those from Madagascar, has proved this to be the case.

In spite of the rather close resemblance of the plant

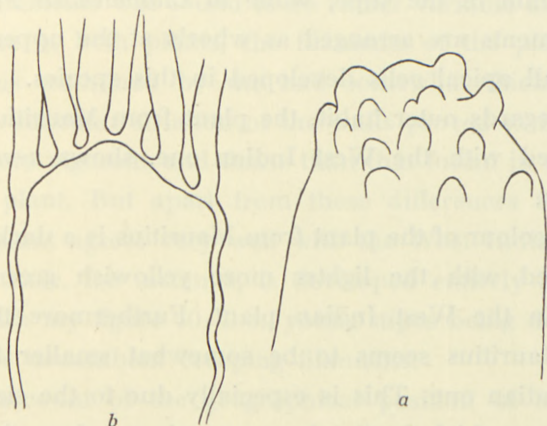


Fig. 5. *Chamaedoris Delphinii* (Hariot) Feldmann. a, apex of young stipe showing development of the filaments of the capitulum. b, longitudinal section through the upper end of a young stipe. ($\times 30$).

from Mauritius (Plate I), of which I have had only some dried material, to the West Indian *Ch. Peniculum* (Sol.) Kuntze (compare my figure 42 in Mar. Alg. D.W. I. p. 59), several features in its outer habit aroused my suspicion as to its real identity. So I commenced to study it more carefully, with the result that I found the plant from Mauritius fundamentally different from the West Indian one.

Above all this species differs from *Ch. Peniculum* by the fact that the small apical cells in the stipe, from which the filaments of the capitulum in *Ch. Peniculum* are developed (compare my figure 41, l. c., p. 58), are missing.

Fig. 5b shows a longitudinal median section of the upper end of the stipe of the plant from Mauritius. No traces of transverse walls are found. The bases of the filaments forming the capitulum are seen to be developed from the upper end of the stipe. And fig. 5a shows the development of the filaments. They are seen to grow without order from the summit of the stipe, while in *Chamaedoris Peniculum* the filaments are arranged as whorls at the upper end of the small apical cells developed in this species.

As regards outer habit, the plant from Mauritius, when compared with the West Indian one, shows several differences.

The colour of the plant from Mauritius is a darker green compared with the lighter more yellowish green colour found in the West Indian plant. Furthermore the plant from Mauritius seems to be somewhat smaller than the West Indian one. This is especially due to the size of the capitulum which in the larger specimens from Mauritius attains only about $1\frac{1}{2}$ cm, whereas the breadth of the capitulum in the West Indian plant from shallow water was about 3 cm, and in plants from deep water even up to 10 cm. Then the shape of the capitulum seems to be ball-like in the plant from Mauritius, that is to say, judging from dried material, whereas in the West Indian one it is more or less cup-shaped, even if ball-shaped ones also occur. The tendency to proliferations from the stem was found in several of the specimens from Mauritius; this is a rather rare feature in the West Indian plant. At first I also had the impression that the annulation of the stipe in the plant from Mauritius was more narrow than that of the West Indian plant, but after having measured the annulations of several plants from both localities I found

that rather large variations occur even in the same stipe, and that a distance of about $470\ \mu$ is the most common in both plants.

Finally the filaments of the capitulum in the plant from Mauritius show some smaller differences when compared with those of the West Indian plant. While the dimension of the filaments was found to be rather variable and about the same in both plants, the filaments of the plant from Mauritius examined by me had somewhat thicker walls and the cuticular striation of the walls proved to be somewhat more vigorous and dense than that found in the West Indian plant. But apart from these differences the habit of the plant agrees very well with the West Indian plant, and its base, for instance, is developed entirely in agreement with my figure 40, l. c., young stipes being developed from the decumbent creeping filaments.

On account of the geographical position of Mauritius and Madagascar, so close to each other, it seems natural to regard the plants from these islands as the same species. It was therefore of great interest to me that by the courtesy of Monsieur le directeur P. ALLORGE, Laboratoire de Cryptogamie du Muséum National d'Histoire Naturelle, Paris, and Monsieur le Docteur J. FELDMANN I had the privilege of borrowing the type-specimen from Madagascar, so that I could study it in Copenhagen. It consists of two capitulums, a larger one about 3 cm broad, thus the same size as that found by me in the West Indian specimens, and a smaller one only about half the size, in which a small piece of the stipe is also preserved. The colour of the filaments in the capitulum of these specimens was the same dark green as that found in the plant from Mauritius, and the shape of the capitulum was likewise the same, and

an examination of the filaments showed that these agreed very well with those of the plant from Mauritius, having thick walls and a well developed striation. For this reason I do not hesitate to regard the two plants as identical. Of course an examination of the building up of the capitulum would have been desirable, but as I feared that an examination of these authentic specimens would have been fruitless, I refrained from spoiling them.

The *Chamaedoris annulata* mentioned by ARESCHOUG in "Phyceae Capensis", p. 14, is also undoubtedly the same as the plant from Mauritius. ARESCHOUG says: "Planta Natalensis et Brasiliensis in omnibus congruunt, quamquam illa plerumque minor haec robustior est", and this agrees with my observations.

The Indian species *Chamaedoris auriculata* Børgs. from Dwarka in the Arabian Sea differs from the plant from Mauritius in having, like the West Indian plant, apical cells in the upper part of the stipe, and by its more or less excentric flat capitulum.

The interesting species *Chamaedoris orientalis* Okam. and Higashi (On the Marine Algae from Kotosho (Botel Tobago), p. 98, pl. 10) differs essentially by its oblong capitulum, the filaments of which it is composed being developed annularly from about 13 articulations in the upper end of the stipe¹.

Mauritius: Off Flat Island, Oct. 1929, TH. MORTENSEN.

Geogr. Distr.: Fort Dauphin, Madagascar; Port Natal.

¹ After this paper had been sent to the press the South-African algologist, Dr. G. PAPERFUSS, Cape Town, paid a visit to the Botanical Museum, Copenhagen, and among some algae which he brought with him was a *Chamaedoris* from Port Natal. This I immediately recognised as the same as that from Mauritius. Dr. PAPERFUSS, who is at present working with his collection of marine algae from the Cape at the Botanical Museum in Lund, has most kindly sent me some young stipes

Fam. 3. *Boodleaceae*.

Cladophoropsis Børgs.

1. *Cladophoropsis Sundanensis* Reinb.

REINBOLD, TH., Chlorophyceen Ind. Ocean in Nuov. Notarisia, 16, 1905, p. 3; Algues Siboga, p. 77, fig. 18.

In the Kew Herbarium some specimens (no. 36) are found that form dark-green roundish *Chladophoropsis*-like clumps. DICKIE has called the plant *Valonia Cladophora*.

After an examination of a slide made of one of the specimens it seems to agree fairly well with *Cladophoropsis Sundanensis* according to REINBOLD's description. The thicker filaments have a diameter of about 80—100 μ , the thinner ones are about 40—50 μ .

From the basal filaments rhizoids are given off which fasten themselves to the substratum.

Undoubtedly related to this species is *Cladophoropsis limicola* Setchell (American Samoa, p. 176, fig. 40), but its thallus is thicker.

Mauritius: Cassis, Aug. 2, 1869, Colonel PIKE.

Geogr. Distr.: Malayan Archipelago.

Boodlea Murray et De-Toni.

1. *Boodlea composita* (Harv.) Brand.

BRAND, F., Ueber die Anheftung der Cladophoraceen etc. p. 187.
REINBOLD in WEBER VAN BOSSE, Algues Siboga, p. 70. — *Cladophora composita* Harv. in Hooker. Journ. of Bot., vol. I, 1834, p. 157.

of this plant preserved in formol and seawater, by means of which I have been able to ascertain that my description given above, which was based upon dried material only, is correct. I wish to thank Dr. PAPENFUSS most heartily for his kindness.

In one of the tubes sent by Dr. VAUGHAN (no. 311) I was fortunate enough to find a well conserved lump of *Boodlea composita*. This species has been described by HARVEY upon a dried specimen from Mauritius, and as such material of this plant is rather unfit for examination a renewed investigation of fresh material was most desirable. To be sure, BRAND has given a fairly detailed description of a closely related form, but his material was not from Mauritius but from the Sandwich Islands. BRAND was of the opinion that the plant had originally come from these Islands but, as pointed out by SETCHELL, *Tahitian Algae*, p. 77, this is incorrect, the plant being first described upon material from Mauritius. KÜTZING's figures in *Tab. Phycologicae* also are drawn from a plant from the Mascarene Islands.

Dr. VAUGHAN's specimen forms a small low cushion, a few cm high as well as broad. It is of a very loose and soft consistency, and this is most probably to some extent due to the fact that the peripheric young branch-systems have no tenacula at all. Only once and in a not quite young filament have I found a rhizoid (Fig. 6 d) in the summit of a branchlet and this was not separated from the mother cell by a transverse wall as is usually the case with *Boodlea*. On the other hand, BRAND, in the plant examined by him, found tenacula to be fairly common but not in all parts of the plant.

The peripheric branch-systems are generally branched rather regularly, in a featherlike way (Fig. 6 a, b), as also shown by KÜTZING's figures, and in agreement with forma *elongata* mentioned by BRAND. The branches are as a rule opposite, but sometimes 3 or, in rare cases, 4 branches issue from the nodes. The formation of the branches (Fig. 6 a, b, c) reminds one very much of *Struvea* and most

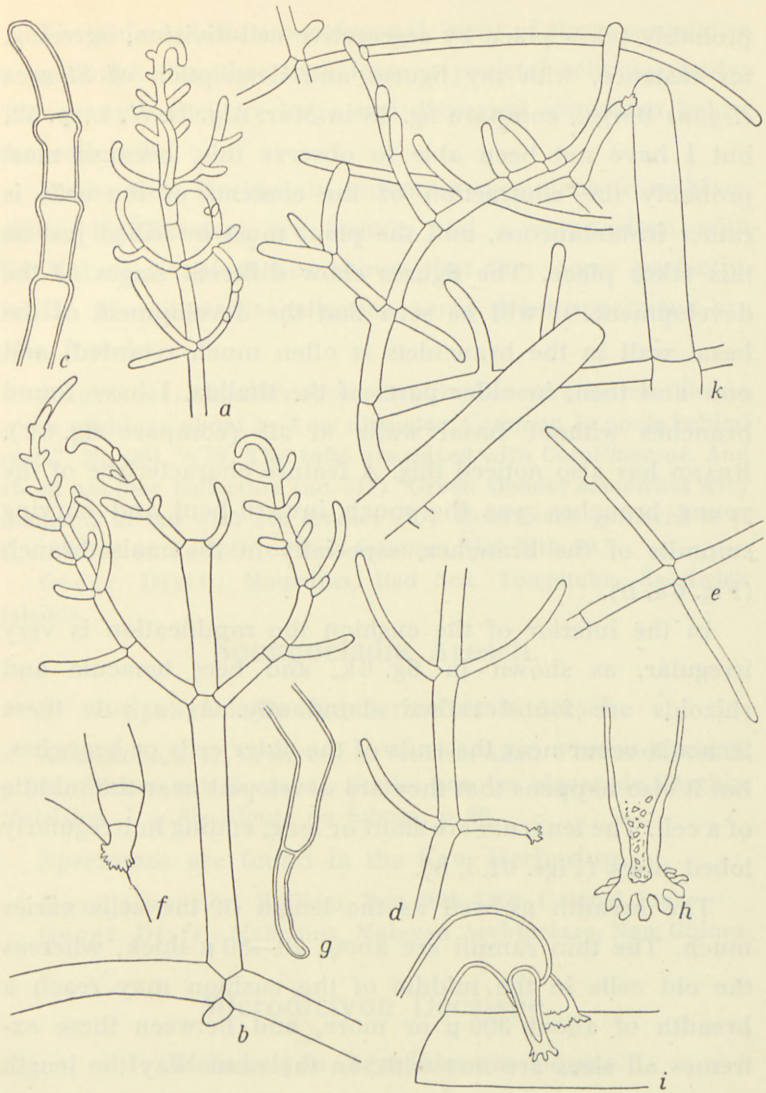


Fig. 6. *Boodlea composita* (Harv.) Brand. a, b, summits of the peripheric branches; c, tip of a filament showing the growing out of the side branches; e, a rhizoid begins to grow from the side of a branch; d, f, h, i, tenacula in summits of the branches; g, a rhizoid growing out from the tip of a branch; k, part of the thallus from the interior of the thallus. (a, b, d, e, k = \times ca. 20; c, f, g, h, i = \times ca. 50).

probably takes place by segregative cell-division, agreeing, for instance, with my figures and description of *Struvea elegans* Børgs., compare fig. 38 in Mar. Alg. D.W. I., p. 52, but I have not been able to observe this, because most probably the contraction of the contents of the cells is rather instantaneous, and the plant must be killed just as this takes place. The figures show different stages of the development. It will be seen that the development of the basal wall in the branchlets is often much retarded, and now and then, in older parts of the thallus, I have found branches without basal walls at all (compare fig. 6k). BRAND has also noticed this. A feature characteristic of the young branches was the much inward-bent and curving summits of the branches, especially in the main branch (Fig. 6a, b).

In the interior of the cushion the ramification is very irregular, as shown in fig. 6k, and here tenacula and rhizoids are found rather abundantly. As a rule these tenacula occur near the ends of the older cells or branches, but it also happens that they are developed near the middle of a cell. The tenacula are short or long, ending in irregularly lobed discs (Figs. 6f, i, h).

The breadth as well as the length of the cells varies much. The thin ramuli are about 70—80 μ thick, whereas the old cells in the middle of the cushion may reach a breadth of about 300 μ or more, and between these extremes all sizes are met with. In the same way the length varies. One of the longest cells I have seen is that found uppermost in fig. 6k. It was 3 mm long, and as the breadth was 80 μ , it was thus 37 times as long as broad. KÜTZING in his somewhat schematic figures has also drawn some long cells.

The chloroplasts are polygonal, most of them containing a pyrenoid. Together they form a parietal reticular body. The many nuclei are large and dispersed somewhat below the cell walls.

In the Kew Herbarium authentic specimens from Mauritius, leg. TELFAIR are found; and a comparison with Dr. VAUGHAN'S plant has shown that they agree perfectly. In Dr. MORTENSEN'S collection some dried specimens are also found.

Mauritius: About its occurrence Dr. VAUGHAN writes: "Bright green cushions about 3—6 cm diameter. Common in pools behind reefs". No. 264, $\frac{1}{2}$ 39. The tufts are mixed with *Corallinaceae*. And about another collection (no. 311) "Green slender somewhat wiry filaments mixed with sea grasses". Dr. MORTENSEN gathered it at Grand Bay at a depth of 2—3 fathoms, Oct. 24th 29.

Geogr. Distr.: Mauritius, Red Sea, Tongatabu, Sandwich Islands.

Spongocladia Aresch.

Spongocladia vaucheriaeformis Aresch.

ARESCHOUG, J. E., in Öfvers. k. Vetensk. Akad. Forhandl., vol. X, p. 201. WEBER VAN BOSSE, A., Etudes sur les algues de l'Archip. Malaisien, I, p. 85; Algues du Siboga, p. 86.

Specimens are found in the Kew Herbarium.

Mauritius: Fort William, Dec. 26th 1869, Colonel PIKE.

Geogr. Distr.: Mauritius, Malayan Archipelago, New Guinea.

Microdictyon Decaisne.

1. *Microdictyon Agardhianum* Decsne.

DECAISNE, J., Plantes de l'Arabie Heureuse, p. 115. SETCHELL, W. A., The genus *Microdictyon*, p. 479. — *Microdictyon tenue* Gray, On Anadyomene and *Microdictyon*, p. 291.

In Dr. MORTENSEN'S collection two well prepared specimens of a *Microdictyon* are found, the colour of which in

the dried condition is greyish-greenish. The plant adheres more or less strongly to paper. The specimens are fastened to the substratum by means of a broad not coherent base, small pieces of coral etc. being found attached round about the middle of the plant over a rather large area. The plant belongs to the group *Annuliferae*, and to Section *Eumi-*

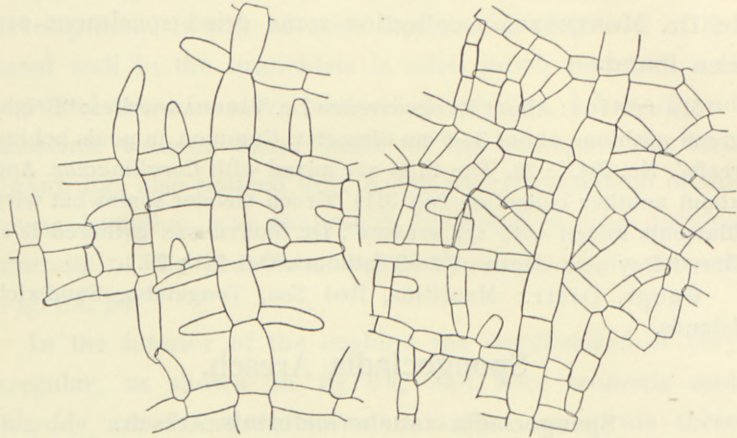


Fig. 7. *Microdictyon Agardhianum* Decsne. Parts of the thallus. (\times ca. 18).

crodictyon, according to the division in SETCHELL's monograph. As mentioned here the geographical distribution of this group is from the Red Sea westward through the Mediterranean Sea and the eastern part of the Atlantic Ocean to the Caribbean Sea. The occurrence of this plant at Mauritius is therefore most interesting and still more so because it agrees as well with *M. Agardhianum* from the Red Sea that I do not hesitate to refer it to that species.

Plate II, fig. 1 shows a photograph of one of the plants. It is seen to be roundish with an irregularly waved outline, about 5—6 cm broad, and, as mentioned above, it is fixed to the substratum by means of a broad base. Fig. 7 shows

a drawing of some parts of the plant. The primary filaments are composed of cells which are about $1\frac{1}{2}$ times longer than broad, their breadth being about 130—50 μ . They form a marked venation and are branched as a rule at right angles. The secondary branches are about 90—100 μ thick and consist of cells about twice as long as broad. These give off other branchlets which are about 60 μ thick, having segments about $1\frac{1}{2}$ times longer than broad. The branchlets also generally issue at right angles; they are either straight, giving rise to rectangular meshes, or curved, forming triangular meshes. If this description is compared with SETCHELL'S, the resemblance of the two plants will be obvious.

Professor SETCHELL once in a letter informed me that Dr. A. H. NASR, Biological Station Ghardaqa, Red Sea, had succeeded in finding DECAISNE'S old species. I therefore wrote to Mr. NASR and asked him to send me, if possible, a little material of the plant so that I could compare it with the plant from Mauritius, and Mr. NASR was so kind as to do so; I received some well preserved material. After having made drawings of both plants and compared these, it was obvious that the mode of ramification etc. was quite the same in both plants, the only observable difference being that the plant from the Red Sea was in all respects a little smaller than the plant from Mauritius, but this may be due to accidental circumstances. Further, the plant from the Red Sea has a somewhat lighter green colour than the plant from Mauritius, but as the two plants otherwise entirely agree I do not hesitate to refer the plant from Mauritius to DECAISNE'S species.

From the western part of the Indian Ocean two species are previously recorded: *Microdictyon pseudohapteron* Gepp

and Gepp and *Microdictyon Krausii* Gray; the latter is known also from Mauritius. But both these species are entirely different from *M. Agardhianum* and belong to quite other groups of *Microdictyon*.

It must further be pointed out that DICKIE in his "Algae of Mauritius", p. 198, mentions *Microdictyon Agardhianum*, but this observation has not been stated by SETCHELL in his treatise on *Microdictyon*. In the Kew Herbarium I have examined a specimen (no. 148) from Barkly Isl., Jan. 9, 70, leg. PIKE, determined by DICKIE as *Microdictyon Agardhianum*. According to my notes it is like a large clump and I have also determined it as a *Boodlea*.

Mauritius: Flat Island, 17/10 1929. TH. M.
Geogr. Distr.: Red Sea.

2. *Microdictyon Kraussii* Gray.

GRAY, J. E., On Anadyomene and *Microdictyon* in Journ. of Bot. IV, 1866, p. 69. SETCHELL, W. A., The genus *Microdictyon*, p. 519, figs. 39—43.

Some specimens preserved in formol are found in Dr. VAUGHAN'S collection. They agree very well with SETCHELL'S description and figures.

From the base, which is composed of a plexus of rhizoids, the primary filaments are given off, spreading flabellately in all directions. The lowermost cells in these filaments are elongated clavate, up to about 165 μ thick and 5—7 times as long, the cells becoming gradually shorter upwards. From the lowermost ends of the clavate cells, especially in the basal part of the thallus but higher up as well, though to a less degree, rhizoids are given off. The rhizoids grow downwards along the walls of the cells, thus strengthening the basal part.

The ramification is flabellate throughout, reminding one very much of that of *Anadyomene*. Besides the cells continuing the veins, up to 3 cells issue in descending order from the apical ends of the cells in the veins. In the upper part of the thallus the cells in the veins become nearly cylindrical and about as long as broad. While the thallus in the lower part is rather open, with long interstices between the long cells found there, the meshes higher up in the thallus become quite small, and in parts the thallus is here almost compact. The wall is yellow and keeps its colour well in formol. I found it was up to 10 μ thick, thus much thicker than the size given by SETCHELL, but most probably the formol influences the thickness of the wall.

The basal part of this and related species reminds one very much of *Rhipidiphylon*; compare my figures of this plant in Mar. Alg. Easter Island p. 252, figs. 3 and 4b with SETCHELL's figures 41, 46 and 51. *Rhipidiphylon* may in a way be said to represent an everlasting infantile stage of development of this and related species of *Microdictyon*; on p. 526 SETCHELL discusses this fact.

Microdictyon Kraussii has hitherto been recorded from the coast of Natal only.

Mauritius: Ilôt Brocus, in lagoon, R. E. V. no. 211.

Geogr. Distr.: Coast of Natal.

Microdictyon(?) spec.

Dr. MORTENSEN's collection contains some quite small dried lumps of a green alga which I first thought was a *Boodlea*, but after examining it more thoroughly I have found that it cannot be referred to that genus owing to its ramification and to its want of tenacula etc.

The specimens form small irregularly shaped lumps, the larger ones about 1 cm broad. Their colour is a dirty olive-green. The filaments of which the thallus is composed

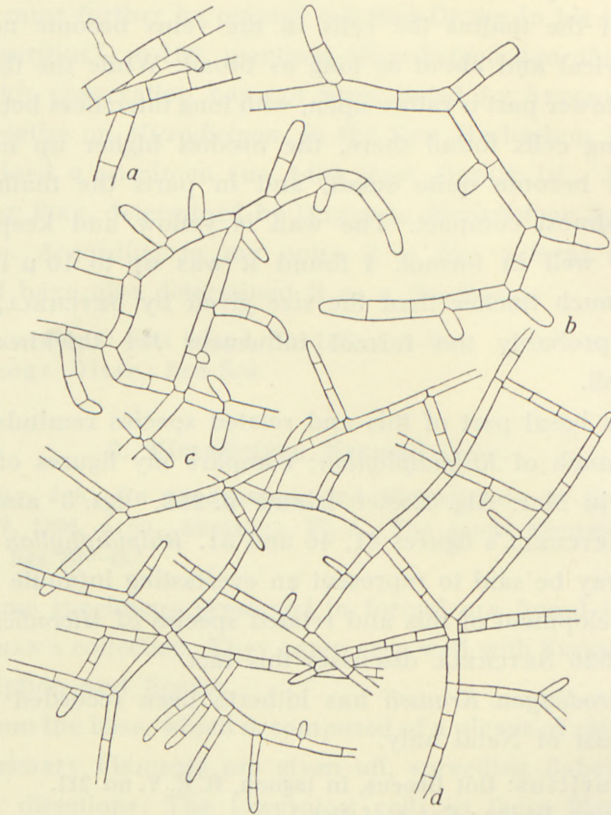


Fig. 8. *Microdictyon*(?) spec. a, part of the thallus with a rhizoid. b, c, parts of the young thallus. d, older thallus. a, \times ca. 50; b, c, \times ca. 40; d, \times 25).

vary as to size, the thicker ones being about $75\ \mu$ broad, while the thinner ones and the ramuli are from $30\text{--}50\ \mu$ thick. The length of the cells varies from $1\frac{1}{2}\text{--}2$ up to 3 times or sometimes, though rarely, 4 times that of the breadth (Fig. 8). Marked main branches are not present,

and the ramification is very irregular in all directions. The branches are generally given off rectangularly, or nearly so, from the mother branch. As a rule only a single branch issues from each joint, sometimes two and then they are opposite or almost so. When a third one is given off, it is often vertically placed in proportion to the other ones. The branches are often short with obtuse apices. When in touch with other branches, the summits of the branches adhere to them, in this way forming a cushion-like network. At the same time the branches stop growing in length. Some small pieces of coral etc. are found in the cushion, and once I found a short rhizoid (Fig. 8a).

The chromatophores are roundish-polygonal discs and form together a more or less perforated parietal plate. In most of the chromatophores a pyrenoid is present. I have already mentioned that this plant shows much likeness to *Boodlea*. It also shows some likeness to *Cladophora boodleoides* Børgs., Mar. Alg. Canary Islands, I Chlorophyceae, p. 56, compare for instance figures 21 and 22c.

But the genus with which the specimens from Mauritius seem to agree most is *Microdictyon*; it is reminiscent of it not only by its rectangular ramification, but also by the way the tips of the branchlets adhere to neighbouring filaments. I have not, however, found annular thickenings. In this connection attention must especially be directed towards the plant which BERTHOLD has described as *Microdictyon Spongiola*. The description BERTHOLD gives of this plant is: "Bildet lockere, kuglige, schwammähnliche Räschen auf *Peyssonnelia squamaria* und *P. rubra*. Die Zweige stehen allseitig von den Achsen ab und sind nicht so regelmässig mit einander verwachsen wie bei *M. umbilicatum*". BERTHOLD found the plant in November on the north side of

Capri near the surface of the sea. This description must be said to correspond in an astonishing way to the plant from Mauritius as well. And it is especially interesting that GEORG BITTER (in his paper: Zur Morphologie und Physiologie von *Microdictyon umbilicatum*), during a stay at the Zoological Station, Naples, points out that he has succeeded in developing experimentally similar cushion-like specimens of normal *Microdictyon* specimens. According to BITTER strong light in connection with the movement of the waves should develop a tendency to ramification in all directions.

Whether the plant from Mauritius is the result of such a development it is of course impossible to ascertain. It is more likely that it is to be regarded as the representative of a new genus. But in order to decide this, better and especially better conserved material in alcohol is needed.

SETCHELL, l. c. pp. 576—79, has discussed the similar problem concerning the more or less spongiöse thallus of *Microdictyon Montagnei* Harv.

Mauritius: Flat Island, 17. Oct. 1929, leg. TH. M.

Fam. 4. *Anadyomenaceae*.

Anadyomene Lamour.

1. *Anadyomene Wrightii* Gray.

GRAY, J. E., On Anadyome and Microdictyon, p. 48, tab. 44, fig. 5. J. AGARDH, Till Algernes Systematik, VIII, Siphoneæ, p. 124. OKAMURA, K., Icones Jap. Alg., Vol. I, p. 198, tab. 40, figs. 1—6. WEBER, A., Alg. Siboga, p. 73, figs. 14—15.

In Dr. MORTENSEN's collection a few small specimens are found which agree very well with J. AGARDH's description. The most characteristic feature of this species (Fig. 9)

is the strong development of one or two of the up to 7 daughter veins radiating from the summit of the mother vein, while the rest of the veins remain short. Furthermore these vigorously developed veins are nearly cylindrical, about $150\ \mu$ thick, and often reach a length of 2 mm or more before they become branched again, and these long parts of the veins become divided by transverse walls into 2—3 cells according to their length. The small cells filling up the interstices between the veins vary as to size

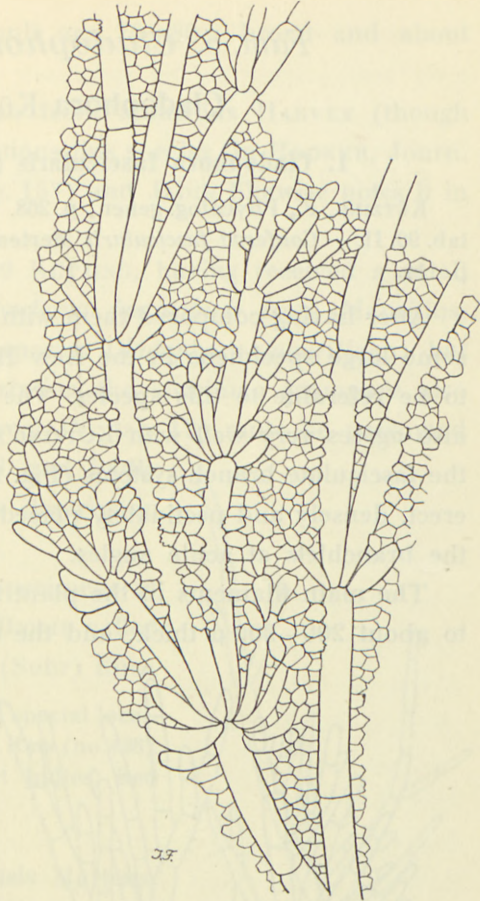


Fig. 9. *Anadyomene Wrightii* Gray. Part of the thallus. ($\times 30$).

and are roundish polygonal or elongated of shape. Transverse sections show that these parts of the thallus are more or less composed of two layers of cells, compare OKAMURA's figures 5—6.

Mauritius: Between Gunners Quoin and Flat Island at a depth of 25 fathoms, TH. M. ^{15/10} 1929.

Geogr. Distr.: West Indies, Loochoo Islands, Malayan Archipelago, Japan, etc.

*Fam. 5. Cladophoraceae.***Cladophora** Kütz.**1. Cladophora fascicularis** (Mert.) Kütz.

KÜTZING, F., Phycolog. gener., p. 268. Tabulæ Phycol., vol. III. tab. 90, II. — *Conferva fascicularis* Mertens in C. AGARDH, Systema, p. 114.

After having compared them with West Indian material, some large specimens in the Kew Herbarium seem to me to be referable to this species. The plant from Mauritius also agrees very well with KÜTZING's figure quoted above, the fasciculate branch-systems (Fig. 10) being composed of erect, densely and pectinately placed ramuli given off from the branchlets at acute angles.

The main filaments in the plant from Mauritius are up to about 200—300 μ thick, and the cells about 3 times as

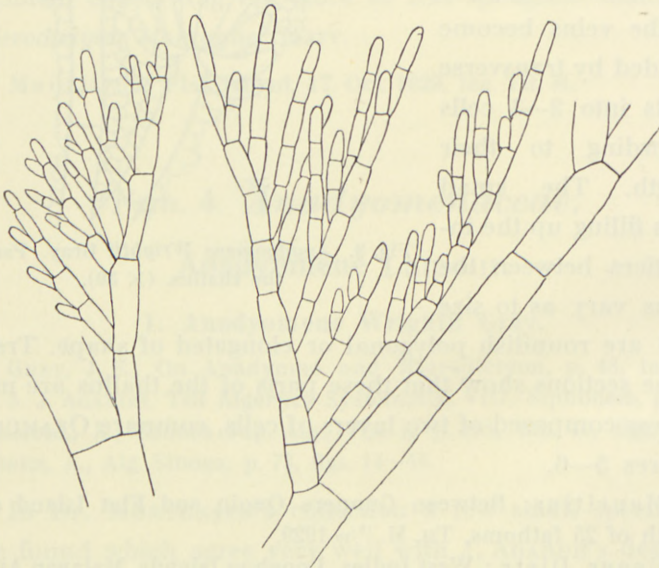


Fig. 10. *Cladophora fascicularis* (Mert.) Kütz. Two branch-systems. ($\times 30$).

long. The upper ramuli are 70—80 μ broad and about 2—4 times as long.

In his list of Algae from Mauritius HARVEY (though with a ?) already mentions this species (in HOOKER, Journ. of Bot., vol. I, 1834, p. 157) and JADIN likewise notes it in his list, p. 156.

In Spec. Alg. p. 399 KÜTZING, having received a small piece of HARVEY'S *Conferva fascicularis* from Mauritius, refers it to his new species *Cladophora mauritiana*; but according to his description the specimen (compare also his figure in Tab. Phycol. IV, tab. 12) must be presumed to have been a small and badly developed one, as his description and figure also shows.

According to the specimens in the Kew Herbarium, DICKIE called it *Cladophora Eckloni* (Suhr) Kütz.

Mauritius: Without special locality, leg. Colon. PIKE, Herb. Kew (no. 188).

Geogr. Distr.: West Indies, Red Sea, Mauritius.

2. *Cladophora timorensis* Martens.

MARTENS, G., Preuss. Expedition nach Ostasien, Die Tange, p. 22, tab. 2, fig. 6.

A dried specimen together with a slide in Dr. VAUGHAN'S collection seem to agree rather well with MARTENS' description and figure.

The thicker filaments were about 125—150 μ , the ramuli were about 40—50 μ thick and the apical cells

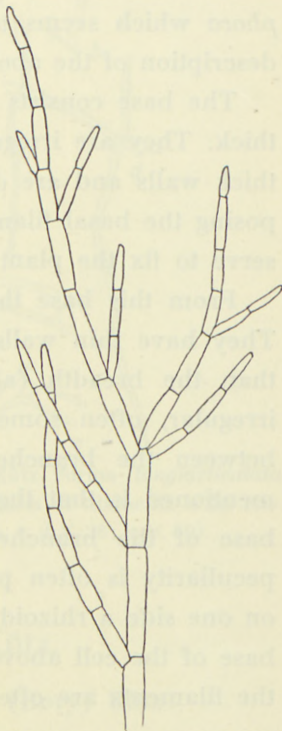


Fig. 11. *Cladophora timorensis* Martens. Part of the thallus ($\times 30$).

decreased upwards more or less to about 25—30 μ . No base was present in the specimen (Fig. 11).

Mauritius: Ilôt Brocus, 12. March 1933, R. E. V. no. 178 in a "tidal creek near sea".

Geogr. Distr.: Timor, New Guinea, Samoa.

3. *Cladophora patentiramea* (Mont.) Kütz.

KÜTZING, F., Spec. Alg., p. 416; Tab. Phycol., vol. IV, pl. 69. — *Conferva patentiramea* Mont., Prodr. Phyc. antarct., p. 15 (not seen).

forma *longiarticulata* Reinbold in WEBER, Alg. Siboga, p. 84.

Two tubes of Dr. VAUGHAN'S collections contain a *Cladophora* which seems to agree fairly well with REINBOLD'S description of the above mentioned form (Fig. 12).

The base consists of decumbent filaments about 100 μ thick. They are irregularly bent and ramified. They have thick walls and are dark green of colour. The cells composing the basal filaments are short or long, and rhizoids serve to fix the plant to the substratum (Fig. 12 e).

From this base the erect filaments issue (Fig. 12 a, b). They have thin walls and long cells, many times longer than the breadth (about 60—70 μ). The ramification is irregular, often somewhat unilateral with long distances between the branches. Another feature which must be mentioned is that the formation of the cross walls at the base of the branches is often much retarded. Another peculiarity is often present: When a branch is given off on one side a rhizoid issues on the opposite side from the base of the cell above (Fig. 12 d). The uppermost ends of the filaments are often a little swelled.

Mauritius: Ilôt Brocus. "One of the commonest species in the lagoon". R. E. V. no. 207. Bel Air. "Rock pools near reef". Aug. 1939. R. E. V. no. 323.

Geogr. Distr.: Malayan Archipelago.

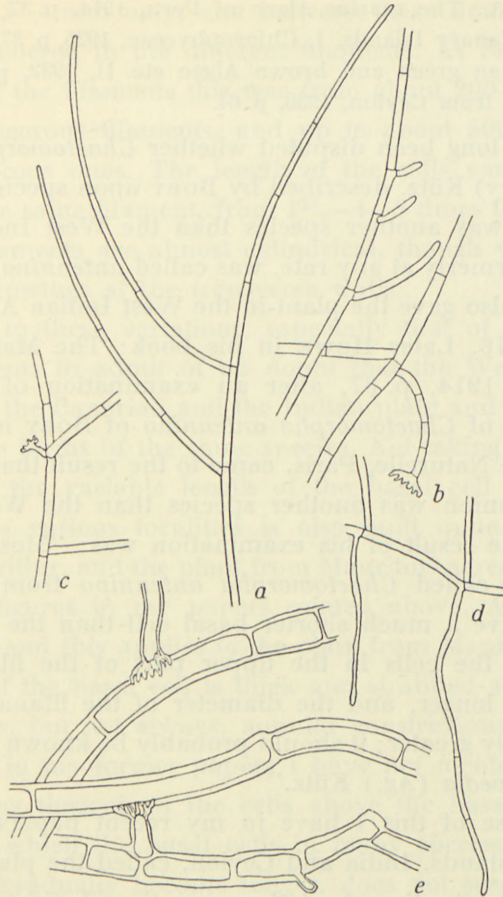


Fig. 12. *Cladophora patentiramea* (Mont.) Kütz. forma *longiarticulata* Reinb. a, upper ends of branches; b, c, d, parts of filaments with rhizoids; e, parts of basal filaments. (a, b, c, d $\times 25$; e $\times 50$).

Chaetomorpha Kütz.

1. *Chaetomorpha antennina* (Bory) Kütz.

KÜTZING, F., *Spec. alg.*, 1849, p. 379. VICKERS, A., *Phycologia Barbadosensis*, 1908, p. 19, pl. VIII; BØRGESEN, F., *Mar. Alg. D. W. I.*, vol. I, 1913, p. 16, figs. 4—5. — *Conferva antennina* Bory, *Voyage*, t. II, 1804, p. 161. *Chaetomorpha media* (Ag.) Kütz., l. c., p. 380.

HOWE, M. A., The marine Algae of Peru, 1914, p. 37. BØRGESEN, Mar. Alg. Canary Islands, I, Chlorophyceae, 1925, p. 37, figs. 9—10; Some Indian green and brown Algae etc. II, 1932, p. 51; Some Mar. Algae from Ceylon, 1936, p. 64.

It has long been disputed whether *Chaetomorpha antennina* (Bory) Kütz. described by BORY upon specimens from Réunion was another species than the West Indian plant which, formerly at any rate, was called *antennina*, the name which I also gave the plant in the West Indian Algal Flora, 1913, p. 16. Later HOWE in his book: The Marine Algae of Peru, 1914, p. 37, after an examination of the type-specimen of *Chaetomorpha antennina* of BORY in Muséum d'Histoire Naturelle, Paris, came to the result that the plant from Réunion was another species than the West Indian plant. The result of his examination was: "Most, at least, of the so-called *Chaetomorpha antennina* from the West Indies have a much shorter basal cell than the type from Réunion, the cells in the upper part of the filament are relatively longer, and the diameter of the filaments above is generally greater; it should probably be known as *Chaetomorpha media* (Ag.) Kütz."

Because of this I have in my recent papers from the Canary Islands, India and Ceylon, called the plant *Chaetomorpha media*, though at the same time I did not conceal my doubts as to whether it really, owing to great variation of the basal cell, was specifically different from the plant from Réunion.

It was therefore most interesting to find, in a tube in Dr. VAUGHAN'S collection, several well conserved tufts of a *Chaetomorpha* in which many filaments occurred which had basal cells up to a length of 15—16 mm, thus quite the same as found in the plant from Réunion. But this length was not found in all the filaments, in some the length of the

cells was 3—4 mm only, and between these limits various lengths occurred in the different filaments. As regards the breadth of the filaments this was from about 200—400 μ in the less vigorous filaments, and up to about 500 μ in the more vigorous ones. The length of the cells varies much even in the same filament, from $1\frac{1}{2}$ —4—5 times the length.

The filaments are almost cylindrical, though with quite small narrowings at the transverse walls.

Owing to these variations, especially that of the basal cell, it seems to admit of no doubt that the West Indian as well as the Canarian and the Indian plant and that from Ceylon are forms of the same species. Not taking into consideration the variable length of the basal cell the plant from these various localities is also built quite like that from Mauritius, and the plant from Mauritius agrees entirely with the figures in my papers quoted above. As pointed out there, and this applies to the plant from Mauritius, too, the wall of the basal cell is thick and stratified and has in most cases, but not always, annular constrictions near the base. But in my former papers I have not mentioned that the growing through of the cells above the basal one, by means of which the basal cells in many species of *Chaetomorpha* gradually become longer, does not seem to take place in this species; at least I have not found this to be the case in the specimens examined by me.

The Kew Herbarium contains a specimen collected at Mauritius by Colonel PIKE.

In agreement with the occurrence of this species in other places the plant at Mauritius was found in exposed localities.

Mauritius: *Salvinia*, R. E. V. no. 254. Cane Point, May 1870, Colonel PIKE.

Geogr. Distr.: Réunion, West Indies, Brazil, Canary Islands, India, Ceylon, Pacific coast of Mexico etc.

2. *Chaetomorpha aerea* (Dillwyn) Kütz.

KÜTZING, F., Spec. Alg., p. 379. HAUCK, F., Meeresalgen, p. 438. HAMEL, G., Chlorophyc. des côtes franç., p. 123, figs. 38 A, B, C, D. — *Conferva aerea* Dillwyn, Brit. Conf., tab. 80.

In Dr. VAUGHAN'S collection some specimens (no. 204) are found, the filaments of which have a breadth of about 300 μ .

In Dr. MORTENSEN'S collection some thinner specimens are found which I think are also referable to this species. The specimens have filaments 120—160 μ broad, with thick and stratified walls and cells from $\frac{1}{2}$ —2 times as long, which are not constricted at the transverse walls. The filaments taper below to about 88 μ and are fixed to the substratum by means of a disc which is broadened. As is commonly the case in *Chaetomorpha* the basal cells become lengthened and strengthened by the growing through of the cells above the basal one. The plant very much resembles KÜTZING'S figures in Tab. Phycol., tab. 55, figs. II and III, which he calls *Ch. variabilis* and *Ch. Linum* respectively. The former is by HAUCK in "Meeresalgen", p. 438, referred to *Ch. aerea* as a synonym, the latter is not mentioned in HAUCK'S list of synonyms, neither as synonym of *Ch. aerea* nor of *Ch. Linum*.

Mauritius: Barachois, Ilôt Brocus, R. E. V. (no. 204). Cannonier's Point, Oct. 29. TH. M.

Geogr. Distr.: Widely spread in temperate and warm seas.

3. *Chaetomorpha linoides* (Ag.) Kütz.

KÜTZING in Bot. Zeit. 1847, p. 167; Spec. Alg., p. 377. — *Conferva linoides* Ag., Syst. p. 98.

The Kew Herbarium contains a specimen of a plant determined by DICKIE as *Chaetomorpha javanica* Kütz. After

having examined this plant, it appears to me that it does not agree very well with KÜTZING'S description and figures of this species.

It seems to agree better with *Chaetomorpha linoides* (Ag.) Kütz.

The plant from Mauritius forms an erect, dense and broad tuft about 8 cm high. The filaments (Fig. 13) are about 70—110 μ broad and the cells from $\frac{3}{4}$ —2 times as long as the breadth. The filaments are cylindrical, not constricted at the transverse walls, and the walls are rather thick 3—4 μ . The filaments are fastened to the substratum by small discs which gradually grow together, and since new filaments are most probably also developed from them during the growth the result is a dense tuft of filaments. The cells above the discs become successively longer and strengthened, the walls becoming thick and stratified because the lowermost cells in the filaments above the basal one gradually grow downwards into the latter (Fig. 13b).

When the plant from Mauritius is compared with KÜTZING'S short description and his figure of *Chaetomorpha javanica* (I have not seen any authentic specimen) this latter shows much thinner filaments and much shorter cells.

Another species having almost the same size is *Chaetomorpha indica* Kütz., Spec. Alg., p. 376 and Tab. Phyc., vol. III, pl. 52, fig. III, which I likewise only know from the short description and figure of it; it

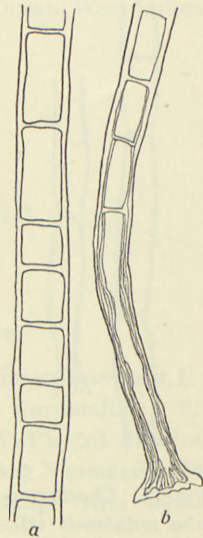


Fig. 13. *Chaetomorpha linoides* (Ag.) Kütz. a, part of a filament; b, basal part of a filament. ($\times 55$).

differs essentially by thinner and shorter cells. In my paper "A List of Marine Algae from Bombay", p. 12, I have referred a *Chaetomorpha* to *Ch. indica*. The Indian plant likewise has shorter cells and the filaments are a little narrowed at the transverse walls.

Mauritius: Grand River, May 1879, Colonel PIKE in Herb. Kew.

Geogr. Distr.: Pacific and Atlantic Oceans.

4. *Chaetomorpha natalensis* (Hering)

De-Toni.

DE-TONI, J. B., Sylloge Algarum, Vol. I, p. 275. LEVRING, T., Verzeichnis, p. 7, fig. 3 F, G, H, I. — *Conferva natalensis* Hering in Flora, 1846, p. 215. *Teresias natalensis* (Her.) Aresch., Phyceae capensis, p. 7.

Mingled with *Cladophora patentiramea* there occurred a few filaments of a slender *Chaetomorpha* which seem to agree very well with the description of this species, but I have had no authentic material with which to compare it. The filaments (Fig. 14a) are composed of cells from about 2 up to 4—5 times as long as broad. The cells are cylindrical-subelliptical and narrowed at the transverse walls, where they are $55\ \mu$ broad, whereas in the middle of the cells their diameter is about $66\ \mu$. The basal cell is fastened to the substratum by means of an irregularly shaped disc (Fig. 14b).

Mauritius: Bel Air in rock pools near reef. Aug. 1939, R. E. V. no. 323.

Geogr. Distr.: Port Natal.

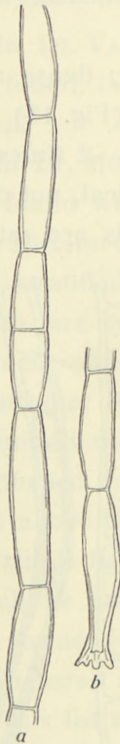


Fig. 14. *Chaetomorpha natalensis* (Hering) De-Toni. a, part of a filament; b, base of a filament. ($\times 55$).

Rhizoclonium Kütz.

1. *Rhizoclonium Kernerii* Stockm.

STOCKMAYER, S., Algengattung *Rhizoclonium*, p. 852. BØRGESSEN, F., Mar. Alg. D. W. I., p. 20, fig. 8. FELDMANN, J., Algues Côte des Albères, p. 73, fig. 20 A, B, C, D, E.

The specimens had a breadth of about $15\ \mu$ and the length of the cells was about 3—4 times the breadth.

It was found intertwined with *Cladophora*.

Mauritius: In the lagoon at Ilôt Brocus, R. E. V. no. 207.

Geogr. Distr.: Mediterranean Sea, Atlantic Ocean, West Indies.

IV. Dasycladales.

Fam. 1. *Dasycladaceae*.

Neomeris Lamouroux.

1. *Neomeris annulata* Dickie.

DICKIE, G., On the Algae of Mauritius, p. 198. SOLMS-LAUBACH, H., Über die Algengen. Cymopolia, Neomeris und Bornetella, p. 61. BØRGESSEN, F., Mar. Alg. D. W. I., p. 71. HOWE, M. A., Phycol. Studies, IV, p. 87. SVEDELIUS, N., Zur Kenntnis der Gattung Neomeris 1923, 449. BØRGESSEN, Marine Algae in Ostfeld, Plants from Beata Island, St. Domingo, p. 17.

The few specimens from Mauritius upon which DICKIE based the species are found in the Kew Herbarium.

Mauritius: Colonel PIKE.

Geogr. Distr.: Fairly widespread in the Indian and Pacific Ocean, West Indies etc. Compare SVEDELIUS' map with its distribution, l. c. p. 467.

Acetabularia Lamouroux.

1. *Acetabularia Moebii* Solms.

SOLMS-LAUBACH, H., Monograph of the Acetabularieae p. 30, pl. IV, fig. 1.

In the Kew Herbarium only the discs of several specimens are present, but nevertheless they are easily recognisable. The disc examined by me had 15 rays laterally strongly calcified and with broadly rounded ends. The coronal knobs are roundish and have as a rule 5 hair-scars, sometimes 4 and in one case only 3.

This small species is described from specimens from Mauritius, and as far as I know it has not been found anywhere else. But in a collection of algae from Ghardaqa, the Red Sea, sent to me for identification a few years ago by Dr. A. A. NAYAL, the Egyptian University, Kairo, some specimens of this plant are found mounted together with a specimen of *Udotea javensis* Gepp, for which species too the Red Sea is a new locality.

According to the specimens in Herb. Kew *Acetabularia Caliculus* in DICKIE'S list is this species.

Mauritius: Colonel PIKE.

Geogr. Distr.: Mauritius, Ghardaqa (Red Sea).

V. Siphonales.

Fam. 1. *Bryopsidaceae*.

Bryopsis Lamour.

1. *Bryopsis indica* A. & E. S. Gepp.

A. and E. S. GEPP., Mar. Alg. "Sealark" Expedition, p. 379, pl. 47, figs. 10, 11.

Some small specimens in Dr. MORTENSEN'S collection are referable to this species. The Kew Herbarium contains

several specimens gathered at Mauritius by Colonel PIKE; they have been referred to this species by Mrs. & Mr. GEPP; compare their remarks, l. c. pp. 380. In DICKIE's list the plant is called *Bryopsis caespitosa* Suhr.

Mauritius: Flat Island, 16. Oct. 1929, TH. M. Gabriel Is. Colonel PIKE ²²/₆ 1871.

Geogr. Distr.: Indian Ocean.

Fam. 2. *Caulerpaceae*.

Caulerpa Lamouroux.

1. *Caulerpa Webbiana* Mont.

MONTAGNE in Ann. sc. nat., 2. sér., t. 9. bot. 1838. WEBER v. BOSSE, A., Monographie, p. 269.

Dr. MORTENSEN's collection contains a single specimen of the typical form. It had been dredged at a depth of 60 meters.

Mauritius: Flat Island, ¹⁰/₁₀ 1929. TH. M.

Geogr. Dist.: Seems to occur in most warm seas.

2. *Caulerpa Mauritiana* nov. spec.

Caulerpa mediocris, a surculo terete, ca. $1\frac{1}{2}$ —2 mm lato, in arena repente et rhizoideis robustis adfixo et a frondibus erectis composita. Frondes planae, glabrae, lineari-spathulatae, apice basique late obtuso, ad 7 cm longae et 7 mm latae, marginibus integerrimis, rectis, parallelibus, pedicellatae sunt. Stipites cylindrici teretiusculi, longitudine variabile, ad 1 cm 2 mm longi et $1\frac{1}{2}$ mm lati. Frondes simplices aut interdum proliferationibus paucis ex margine aut pagina plana emergentibus instructae (Plate III).

Mauritius: Grand Bay at a depth of 2—3 fathoms of water in a rather sheltered locality, growing on sandy bottom with *Halophila*, ²⁴/₁₀ 1929. Dr. TH. MORTENSEN legit.

It is not without hesitation that I proceed to describe a new species of *Caulerpa* knowing by experience that these plants show a great power of accommodation and therefore often a very deviating appearance according to their different external conditions of life. But with the specific interpretation of *Caulerpa* now prevalent, it seems to me most correct to consider it a new species.

Two larger specimens and a smaller one are found in Dr. MORTENSEN'S collection. In the two larger specimens (Plate III) the prostrate horizontal creeping rhizome is about 31 cm long, provided below with vigorous rhizoids and upward erect assimilating shoots. The vigorous rhizoids issue at a mutual distance of about 2—3 cm, whereas the distance between the assimilators varies from one to seven cm. The assimilators have below a short cylindrical stem of variable length, from a few mm up to about 1 cm and 2 mm. They are leaflike structures, spatulate and linear of shape with entire, straight, parallele margins, without anything like teeth or serratures, and with broadly rounded upper ends and bases. Most of the leaflike shoots are simple but a few are provided with a single or a few proliferations issuing from the upper ends of the shoots. In one case a proliferation is given off from the edge of the thallus near its middle; in another case one issues from the flat side of it. The larger simple assimilators are $6\frac{1}{2}$ cm long and 7 mm broad and the most proliferous assimilator reaches a height of 9 cm. It is only one of the specimens that has proliferous assimilators, in the other two these are quite simple. While the two larger specimens are quite alike as to size and appearance the third specimen is in all respects smaller. The largest erect assimilator in this specimen is only $3\frac{3}{4}$ cm long and at its broadest $4\frac{1}{2}$ mm broad. Most of the erect

assimilators in the specimen taper a little upwards from the broadest part somewhat above the base. Furthermore all the pedicels are short and of almost the same length, about 2 mm.

The Mauritius plant seems to hold an intermediate position between *Caulerpa ligulata* (Harv.) J. Ag. (= *Caulerpa flagelliformis* f. *ligulata* Web. v. Bosse) on the one side, and *Caulerpa brachypus* Harv. on the other side. Of the first-mentioned species I have had for comparison with the Mauritius plant some fine specimens from False Bay, collected 19th October 1929 by Dr. TH. MORTENSEN, besides specimens from the herbarium of the Botanical Museum, Copenhagen, and from my own collection. At a cursory glance they seem to be much alike, but a more thorough examination soon shows considerable differences. Thus the annulation of the stipes, of the basal ones as well as those of the proliferations, and the marked tendency to dichotomy of the assimilators found in *Caulerpa ligulata* is not present in the Mauritius plant. Further the gradual narrowing towards the base of the assimilators in *Caulerpa ligulata* is not found in the Mauritius plant, in which the assimilators above the stipe quickly reach their normal breadth and keep this up to the broadly rounded apex. In addition *Caulerpa ligulata* is much more proliferous and a taller plant. Owing to these differences the Mauritius plant must be said to be well separated from *Caulerpa ligulata*.

In a paper: "On *Caulerpa anceps* Harv." YENDO¹ has

¹ When the specific name *brachypus* is used and not *anceps* it is because YENDO in this paper has made an exhaustive comparison of *Caulerpa anceps* and the related species *Caulerpa brachypus* and *Caulerpa Stahlii* and arrives at the result that they are scarcely specifically different, basing his examinations upon material which he collected on a reef somewhat below the surface of the sea at low tide near the

given an exhaustive description of this plant (as stated in the note below = *Caulerpa brachypus*) and I refer the reader to this treatise. As the most essential characters by which *Caulerpa brachypus* and related forms differ from *Caulerpa Mauritiana* must be mentioned that the assimilators are much more irregularly shaped and often richly provided with proliferations, that the margins of the assimilators are serrated and provided with teeth, that the short pedicels, when present, are ball- or clubshaped and finally that the plant, of which the late Professor YENDO as well as Professor YAMADA most kindly sent me specimens, as a rule is only half as large as the plant from Mauritius. YENDO, however, points out that the winter-form may reach a height of about 6—7 cm, thus about the same size as the plant from Mauritius.

A comparison between the plant from Mauritius and *Caulerpa prolifera* shows that the latter plant has a much larger obovate-lanceolate leaf tapering evenly upwards and downwards with even transitions in the stipe, and although narrowleafed forms, for instance one gathered by me near Las Palmas at the Canary Islands, may show some resemblance to the plant from Mauritius, the assimilators always taper upwards and downwards from their middle. And when we add to this the geographical distribution, *Caulerpa*

biological station at Misaki. After having collected material at different seasons of the year he found that the summer forms resembled *Caulerpa anceps*, whereas the more robust *Caulerpa brachypus* was the winter form. It is evident from his description that this species is to a great extent polymorphic. In this respect compare also OKAMURA's fine figures in "Icones", pl. 125 and M^{me} WEBER's remarks in "Algues Îles Kei", p. 89. In this paper M^{me} WEBER also pointed out that the consequence of YENDO's discovery must be that the specific name of this species must be *Caulerpa brachypus* as the oldest name (1859), whereas *Caulerpa anceps* dates from 1872.

prolifera never having been found outside the Atlantic Ocean and the Mediterranean Sea, it seems to me most appropriate to consider the plant from Mauritius as specifically different from *Caulerpa prolifera*.

In this comparison I have taken into consideration only the two large specimens. The small specimen I presume to be a young and less developed plant, but this cannot be decided with so little material.

3. *Caulerpa scalpelliformis* (Rr. Br.) Web. v. Bosse.

WEBER VAN BOSSE, A., Monographie des Caulerpes, p. 286.

f. *denticulata* (Decsne) Web. v. Bosse.

A single specimen is found in Dr. MORTENSEN'S collection. The assimilators are short and broad and the upper ends of the lobes are broadly rounded and denticulate.

The Kew Herbarium contains one specimen closely resembling the one mentioned above and another very much ramified specimen with quite short ($1\frac{1}{2}$ —2—3 cm) assimilators only. Furthermore a specimen with long narrow assimilators resembling the forma *Dwarkensis* from the northern part of the Arabian Sea is found there; compare BØRGESEN, Some Indian green and brown Algae etc. II, p. 56—57, pl. I.

Two specimens are present in Dr. VAUGHAN'S collection.

Mauritius: Cannonier's Point, Oct. 1929, TH. M. Grand River, Dec. 67, Colonel PIKE. Black River Bay, R. E. V. no. 130.

Geogr. Distr.: Indian Ocean, Red Sea, Brazil etc.

4. *Caulerpa sertularioides* (Gmel.) Howe.

HOWE, M. A., Phycological Studies. II, p. 576. — *Fucus sertularioides* Gmelin, Historia Fucorum 1768, p. 151.

Several specimens are found in Dr. VAUGHAN'S collection.

A single specimen was collected by Dr. MORTENSEN at a depth of about 2—3 fathoms.

forma *Farlowi* Web. v. Bosse, l. c. p. 295.

Dr. MORTENSEN'S collection contains some quite small specimens, 1—1½ cm high, in which the pinnules are placed round the axis in all directions.

Mauritius: Grand Bay, ²⁵/₁₀ 1929, TH. M. Cannoniers Point, ⁶/₈ 71, Colonel PIKE. Port Louis harbour, R. E. VAUGHAN no. 129.

forma *Farlowi*: Flat Island, 16. Oct. 1929, TH. M.

Geogr. Distr.: Most warm seas.

5. *Caulerpa serrulata* (Forssk.) J. Ag., emd. Børgs.

BØRGESEN, F., Revision, p. 5. — *Caulerpa Freycinetii* Ag., Spec. Alg., p. 446. WEBER VAN BOSSE, A., Monographie, p. 310, where the literature is quoted.

Dr. VAUGHAN'S collection contains a large specimen no. 246 but without any indication of locality.

A fine specimen is found in the Kew Herbarium. It is mentioned in DICKIE'S list as *Caulerpa najadiformis* Bory.

Mauritius: On the reefs, Barkley Isl., Aug. 70, Colonel PIKE.

Geogr. Distr.: Most warm seas.

6. *Caulerpa cupressoides* (Vahl) Ag.

C. AGARDH, Spec. Alg., p. 441. WEBER VAN BOSSE, A., Monographie, p. 323. — *Fucus cupressoides* Vahl, En deel kryptogamiske Planter fra St. Croix, p. 29.

A single dried specimen without locality or other data is found in Dr. VAUGHAN'S collection (no. 244). The branches in the assimilators are slender and covered with ramuli from near their bases. The short naviculoid ramuli are

placed in 3 rows. It seems to have an intermediate position between *f. typica* and *f. mamillosa*.

Mauritius: FR. NEYROLLES (the specimen without locality).
Geogr. Distr.: West Indies, Indian and Pacific Oceans.

7. *Caulerpa racemosa* (Forssk.) Web. van Bosse.

WEBER VAN BOSSE, A., Monographie, p. 357. — *Fucus racemosus* Forssk., Flora Ægypt. — Arab., p. 191.

A specimen with small vesicles and rather short assimilators coming near to var. *wifera* is found in Dr. VAUGHAN'S collection (no. 36).

Mauritius: Point aux Roches, in sandy pools, R. E. V. no. 36.
Geogr. Distr.: Tropical seas.

8. *Caulerpa peltata* Lamour.

LAMOUREUX in Journ. de Bot. II, 1809, tab. 3, fig. 2. AGARDH, J., Till Algernes System. I, p. 37. SVEDELIUS, N., Ceylon species of *Caulerpa*, p. 131. BØRGESSEN, F., Some Indian green and brown Algae, II, p. 62, fig. 5.

var. *typica* Web. v. Bosse, Monographie, p. 373.

Some small specimens have been gathered by Dr. TH. MORTENSEN. Each of the stems carried mostly only one or two discs. A similar form is found in the Kew Herbarium gathered by Colonel PIKE.

Mauritius: Flat Island, ¹⁶/₁₀ 1929, TH. M.

Geogr. Distr.: Indian and Pacific Oceans, Red Sea, Canary Islands, West Indies.

*Fam. 3. Codiaceae.**Avrainvillea* Decaisne.1. *Avrainvillea gracillima* nov. spec.

Frons sordide brunneo-viridis, solitaria, pusilla, ca. 2 cm alta, flabelliformis, e stipite et flabello composita.

Stipes cylindricus, ca. 7—8 mm longus et $\frac{3}{4}$ mm latus, superne cuneatim applanatus in flabellum transiens.

Flabellum tenue, membranaceum, oblonge-reniforme aut subcordatum, margine superiore late rotundato, subintegro vel parum lacerato, inconspicue zonatum.

Filamenta frondis subcylindrica, torulosa aut submoniliformia, brunneo-flava, 6—30 μ crassa (Plate II, fig. 2).

Mauritius: Between Gunner's Quoin and Flat Island, at a depth of 25 fathoms, $\frac{15}{10}$ 29, TH. M.

This elegant small species differs from all known species of *Avrainvillea* because of its small size, the whole plant attaining a height of 2 cm only.

The slender cylindrical terete stipe has a length of 7—8 mm and is about $\frac{3}{4}$ mm thick. Below the stipe broadens out into a small disc attached to pieces of calcareous algae. The stipe is of firm consistency and passes evenly into the cuneate base of the flabellum, which is oblong, reniform, or subcordate, with broadly subentire or fibrillose upper margin, about $1\frac{1}{2}$ cm broad and $1-\frac{1}{4}$ cm high. The flabellum is thin and membranaceous, rather firm below, of a more loose consistency above. A not very distinct zonation is found near the upper margin of the frond. The colour is brownish to olive-green and dull. The surface is a little gritty.

The filaments of the flabellum (Fig. 15) are more or

less firmly interwoven and vary as to size, being from about $6\ \mu$ to $27\ \mu$ thick, rarely up to $30\ \mu$ below the dichotomies. The thin and the thick filaments are mixed together. The filaments are subcylindrical, often tortuous, moniliform and torulose. The colour is yellowish-brownish to

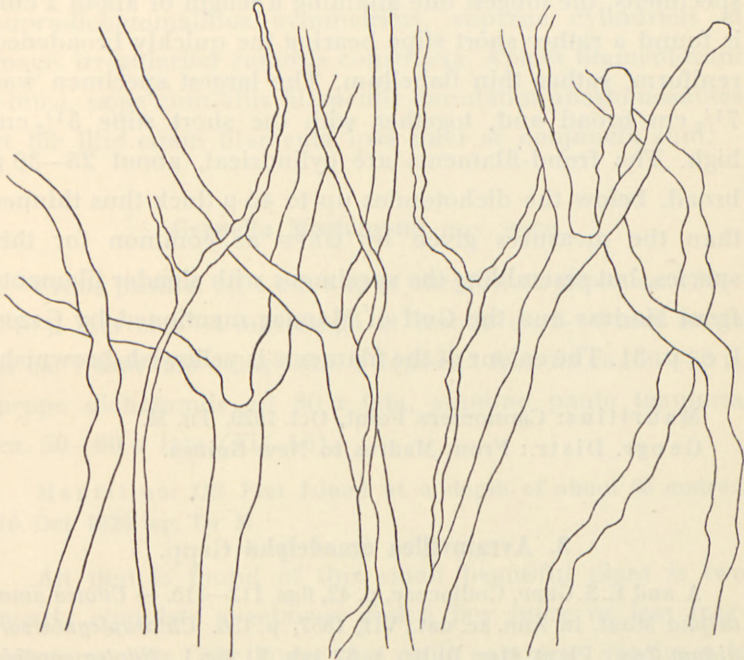


Fig. 15. *Avrainvillea gracillima* nov. spec. Filaments of the flabellum. ($\times 150$).

dark brown. The occurrence of the plant is most certainly solitary. Only two specimens, both figured on Plate II, fig. 2, are found in the collection.

2. *Avrainvillea erecta* (Berkel.) Gepp.

A. and E. S. GEPP, The Codiaceae of the Siboga Expedition, p. 29, figs. 84—89. — *Dichonema erectum* Berkeley in HOOKER'S London Journal of Botany, I, p. 157, tab. VII, fig. 11. *Avrainvillea papuana*

Murray and Boodle in Journ. of Botany, XXVII, 1889, p. 71, tab. 289. For more synonyms compare A. and E. S. GEPP's monograph.

The specimens in Dr. MORTENSEN's collection seem to agree very well with A. and E. S. GEPP's description. Above the root-mass which is not very much developed in these specimens, the longest one attaining a length of about 2 cm, is found a rather short stipe bearing the quickly broadened reniform, rather thin flabellum. The largest specimen was $7\frac{1}{2}$ cm broad and, together with the short stipe $5\frac{1}{2}$ cm high. The frond-filaments are cylindrical, about 25—30 μ broad, below the dichotomies up to 45 μ thick thus thinner than the measures given by GEPP as common for this species, but resembling the specimens with slender filaments from Madras and the Gulf of Manaar mentioned by GEPP, l. c., p. 31. The colour of the filaments is yellowish-brownish.

Mauritius: Cannoniers Point, Oct. 1929, TH. M.
Geogr. Distr.: From Madras to New Guinea.

3. *Avrainvillea amadelpha* Gepp.

A. and E. S. GEPP, Codiaceae, p. 42, figs. 112—115. — *Udotea amadelpha* Mont. in Ann. sc. nat., VII, 1857, p. 136. *Chloroplegma sordidum* Zan., Plant. Mar. Rubr., p. 82, tab. XI, fig. 1. *Udotea sordida* Mont., Dickie, Alg. Mauritius, p. 198.

The Kew Herbarium contains fine specimens gathered by Colonel PIKE and, as mentioned above, determined by DICKIE. The habit of the specimens agrees very well with GEPP's figure 112 of forma *Montagneana*. As has been pointed out by GEPP, l. c. p. 43 the pseudo-cortex in the plant from Mauritius is not so well developed.

Mauritius: Colonel PIKE, May 1870.
Geogr. Distr.: Indian Ocean, Red Sea.

Geppella nov. gen.¹

Thallus viridis, non incrustatus, verisimiliter cyathiformis, stipitatus. Stipes monosiphonius, tenuis, superne in frondem leniter transiens. Frons submonostromatica et reticulata ex filamentis dichotome divisis, constrictionibus supradichotomalibus symmetricis, superne cylindricis et magis irregulariter ramosis constructa. Apices filamentorum obtusi, sæpe cum aliis filamentis annulatim anastomosantes et hic illic etiam filamenta ipsa inter se conjuncta sunt.

Geppella Mortensenii nov. spec.

Frons pusilla, ad 1 cm alta et ultra(?), ex stipite ca. 130—140 μ lata et 3—4 mm longa et fronde ca. 5—6 mm longa et ca. 7 mm lata composita. Filamenta frondis ca. 60—70 μ , prope dichotomiis ad 80 μ lata, superne paulo tenuioria ca. 50—60 μ lata (Fig. 16).

Mauritius: Off Flat Island at a depth of about 60 metres, 16. Oct. 1929 leg. TH. M.

All that is found of this small beautiful plant is two nearly complete specimens and a few more or less fragmentary parts. The larger, not quite complete, specimen is about 1 cm high and its upper part is about 7 mm broad. The stipe in this specimen is 3 mm long and 130—140 μ broad. Below, the stipe is divided into a few rhizoidlike branchlets by means of which it is fastened to the substratum. Above, as Fig. 17a shows, the monosiphonous stipe becomes furcated into two branches which quickly by repeated furcations (Fig. 17b) are divided into a number

¹ Named in honour of Dr. A. GEPP and the late, much regretted Mrs. ETHEL S. GEPP, authors of the excellent monograph of the *Codiaceae*.

of filaments gradually increasing upwards and forming the most certainly cyathiform part of the thallus. The material being so scarce, and all dried on a small piece of paper together with pieces of *Microdictyon*, I dare not deny the possibility that the frond may be flabellate, but I do not

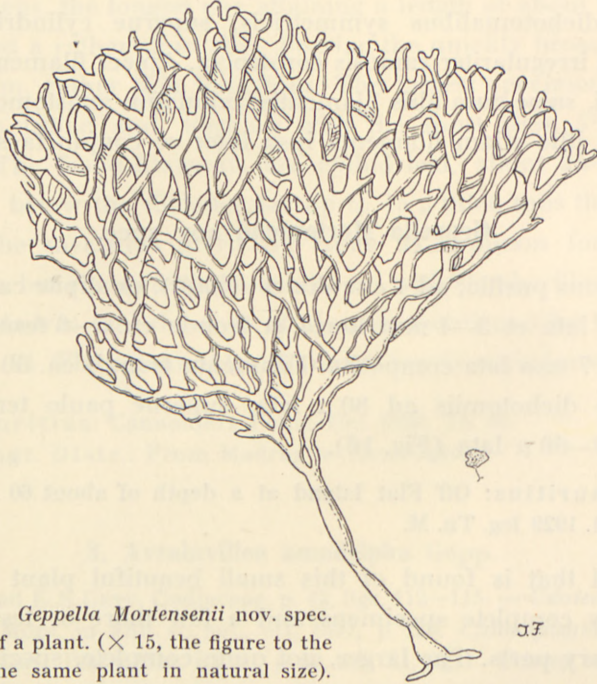


Fig. 16. *Geppella Mortensenii* nov. spec.
Habit of a plant. ($\times 15$, the figure to the
right the same plant in natural size).

think so. The frond has a cuneate base which is quickly broadened. The frond is composed of a reticular tissue with numerous open interstices between the filaments. It consists of a single layer of filaments with the exception that now and then one filament may cross another. The filaments in the lower part of the flabellum are rather regularly dichotomously divided and above the dichotomies they are not a little narrowed (Fig. 17b). Higher up the filaments become nearly cylindrical, and the ramification

is more irregular, in the upper parts of the frond antler-like, with lateral branchlets sometimes ramified several times (Fig. 18). In the lower part of the frond the filaments are about 60–70 μ , and below the dichotomies up to 80 μ thick, tapering a little upwards to about 50–60 μ . The upper ends of the filaments are obtuse and broadly rounded.

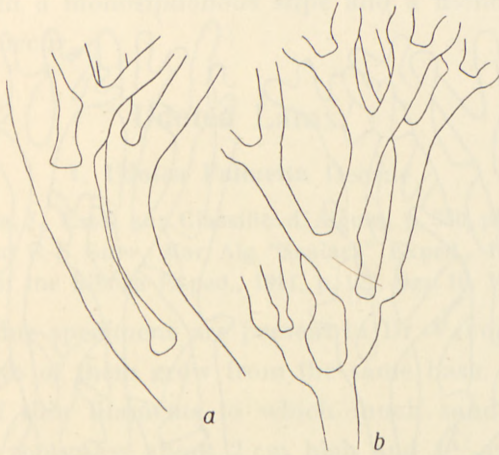


Fig. 17. *Geppella Mortensenii* nov. spec. a, upper end of the stipe with the first divisions; b, filaments showing divisions in the basal part of the frond. (\times ca. 50).

It is especially characteristic of this plant that all the summits of the filaments as well as the filaments themselves when they come in contact with neighbouring filaments anastomose with these in a way very similar to that found in the group *Annuliferae* of *Microdictyon*, that is to say, by annular swellings on the tips of the filaments (Fig. 18b). And not only the tips of the filaments attach themselves to other filaments, but neighbouring filaments sometimes too become attached to each other by means of kneelike swellings; compare Fig. 18b in the middle to the right.

The colour of the plant is green. Chalk incrustations are not present. The discoid chromatophores are roundish-

polygonal without pyrenoids. Large oblong to reniform grains of starch are present in great numbers. No transverse walls are found in the thallus.

In a family composed of so many closely related forms all consisting of dichotomously divided filaments it is of course necessary to take into consideration even rather

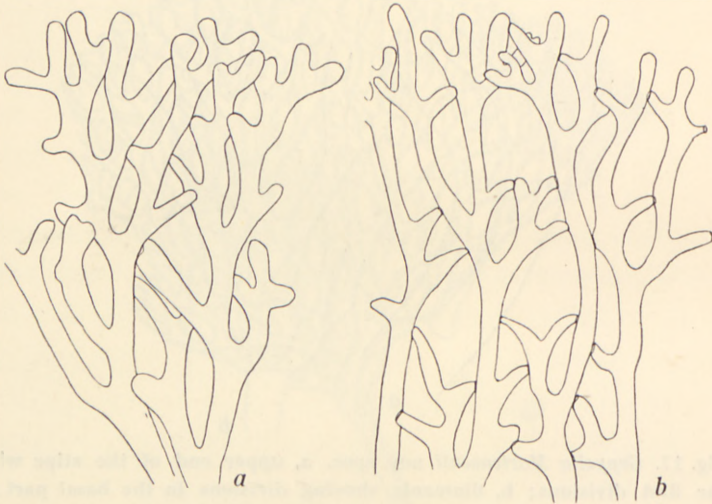


Fig. 18. *Geppella Mortensenii* nov. spec. a, part of young thallus near the edge; b, more developed thallus, nearly all the apices of the filaments have become attached to neighbour-filaments (\times ca. 50).

insignificant features to get sufficient characters to separate the forms. Besides the outer habit it is especially the various shapes and ways of ramification of the filaments which afford the essential characters on which to rely. It is of course also upon such characters that A. and E. S. GEPP have based the various genera in their most useful monograph, and upon which I too base this new genus. The antlerlike ramification and notably the fastening of the tips of the lateral branchlets to neighbouring filaments by means

of annular thickenings are not known in other forms of the *Codiaceae*. The kneelike anastomosing of the filaments found now and then reminds one of that found in *Rhipiliopsis*. As regards the general habit of *Geppella* its division into a stipe and a cyathiform upper part agrees with some of the genera, for instance *Udotea*, in which genus also species with a monosiphonous stipe and a monostromatic flabellum occur.

Udotea Lamx.

1. *Udotea Palmetta* Decsne.

DECAISNE, J., Essai sur Classific. d. Algues, p. 380, pl. 17, fig. 15.
GEPPE, A. and E. S. GEPPE, Mar. Alg. "Sealark" Exped., 1909, p. 385;
Codiaceae of the Siboga Exped., 1911, p. 122, figs. 10, 11, 54.

Three fine specimens are present in Dr. VAUGHAN'S collection. Two of them grow from the same base. The base consists of thin filaments to which much sand adheres, forming a root-mass about 2 cm high and 1½ cm broad. The stipes are 1½—2 cm long, and about 2 mm broad. The flabellum in the largest specimen is 2½ cm high and 4 cm broad. The zonation is not very highly developed and the margin is lacerate. The specimens are rather bleached as most probably they have been cast ashore.

The discovery of this species at Mauritius is of interest, for according to GEPPE'S monograph the species is known only from a single locality, namely Cargados Carajos, where it was gathered at a depth of about 45 fathoms. The type-specimen in Herb. Paris, upon which DECAISNE based the species, is without any information as to locality.

Mauritius: Black River Bay, G. ANTELME in Herb. R. E. VAUGHAN no. 223.

Geogr. Distr.: Cargados Carajos.

2. *Udotea argentea* Zan.

ZANARDINI, J., *Plant. Mar. Rubr.*, p. 82, pl. X, fig. 1. GEPP, A. and E. S., *The Codiaceae*, p. 125, figs. 15, 21, 22 c, 22 d, 25 a, 57—62.

The specimens from Mauritius belong to the forma *typica*, the filaments of the frond bearing lateral appendages with lobately divided heads. As to habit two of the specimens agreed with GEPP's fig. 57 of a plant from Cargados Carajos. Another specimen, R. E. V. no. 276, was very prolific, resembling var. *spumosa* Gepp, but the appendages of the filaments had heads which were lobately divided.

Mauritius: Point aux Roches in sandy pools, R. E. V. no. 139, $\frac{3}{4}$ 31.

forma ad var. *spumosum* vertens: Flic en Flacq lagoon. Growing in sand behind reef. R. E. V. no. 276, $\frac{17}{1}$ 39.

Geogr. Distr.: Red Sea, Seychelles, Malayan Archipelago, Queensland.

Halimeda Lamx.

1. *Halimeda Tuna* (Ellis et Sol.) Lamx.

LAMOUREUX, J. V., *Sur la Classif. d. Polypiers corall. etc.* p. 186. BARTON, *The genus Halimeda*, p. 11, where the literature is mentioned.

Several specimens are found in Dr. VAUGHAN'S collection, most of them belonging to forma *typica* and forma *platydisca*. A single specimen with elongate-cuneate joints resembled var. *Albertisii* Picc.

According to Dr. VAUGHAN this species is very common in sandy shallow pools. Dr. MORTENSEN has dredged a specimen at a depth of about 50 meters.

Mauritius: Cannoniers Point, Point aux Roches etc.

forma *platydisca* (Decsne) Barton, *The genus Halimeda*, p. 11, where literature is mentioned.

A small piece of this form is found in Dr. MORTENSEN'S collection. It was gathered at a depth of about 50 meters.

Mauritius: Between Gunner's Quoin and Flat Island, ^{15/10} 29, TH. M.

Geogr. Distr.: Widely distributed in temperate and warm seas.

2. *Halimeda Opuntia* Lamx.

LAMOUREUX, J. V., l. c. p. 186. BARTON, l. c. p. 18, where the literature is mentioned.

forma *typica* Barton, l. c., p. 20, pl. II, fig. 19.

Mauritius: Off Flat Island, Oct. 29, TH. M. According to Dr. VAUGHAN the plant is common in lagoons and pools.

Geogr. Distr.: Widely distributed in temperate and warm seas.

3. *Halimeda incrassata* (Ell. et Sol.) Lamx.

LAMOUREUX, J. V., l. c., p. 186. BARTON, l. c., p. 25 where the literature is cited.

Only a single specimen is found in Dr. VAUGHAN'S collection. It is a strongly calcified plant showing much likeness to forma *robusta* Børgs., Mar. Alg. D.W. I., p. 112, fig. 90.

Mauritius: Without locality, Father NEYROLLES. Herb. R. E. V. no. 245.

Geogr. Distr.: Warm seas.

Codium Stakh.

1. *Codium arabicum* Kütz.

KÜTZING, F., Tabulae Phycologicae, vol. VI, pl. 100, fig. II. SCHMIDT, O. CHR., Beiträge, p. 30, fig. 11.

Some specimens in the Kew Herbarium collected by Colonel PIKE at Rochetois, Aug. 29th 1869 and at Port Louis Harbour, Dec. 28th 1869 seem, especially as regards the last mentioned plant from Port Louis Harbour, to agree

fairly well with SCHMIDT's description of this species. I wish, however, to point out that I have not been able to examine any type-specimen of KÜTZING's.

The accompanying figures (Fig. 19) show some utricles drawn from a slide of the plant from Port Louis Harbour.

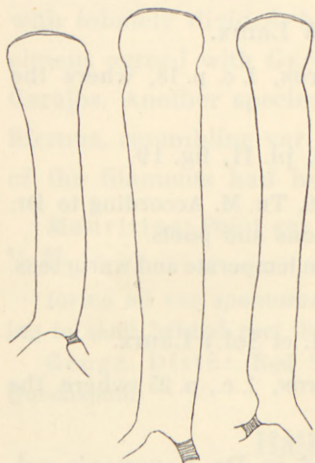


Fig. 19. *Codium arabicum* Kütz.
Utricles from the thallus.
(\times ca. 150).

The utricles are as a rule slender, cylindrical or, more rarely, somewhat clavate, about 53—77 μ broad or now and then a little more, and about 300—400 μ long. They generally have a roundish or somewhat flattened summit and are often narrowed near their upper ends, thus forming a "Blaskopf". The apical wall is not thickened, or only slightly so, up to about 4 μ . In the specimen from Rochetois the vesicles are often more clavate and somewhat broader, up to about 132 μ .

The specimen from December has gametangia (Fig. 20).

SCHMIDT gives a description of a plant from Madagascar, with which especially the plant from Port Louis Harbour agrees very well. According to the dimensions of the utricles mentioned by SCHMIDT in his description of *C. arabicum* the plant from Mauritius is within the limits given in this diagnosis, but the dimensions of the utricles of the plant from Mauritius, in the small preparations examined by me neither reach the breadth nor the length which they are said to attain in SCHMIDT's diagnosis.

Professor SETCHELL who has likewise taken proofs of these specimens in the Kew Herbarium, and with whom

I have discussed the problem, writes about the specimens from Port Louis Harbour that they are somewhat nearer to *C. arabicum* but do not exactly correspond with KÜTZING's type specimen. Professor SETCHELL points out that he is more inclined to refer them to the West indian species *C. intertextum* Collins & Herv. After an examination of typical material of this species (Phycotheca Bor. Am. no. 2018) and according to COLLIN's and HERVEY's somewhat defective description (The Algae of Bermuda p. 58) and the good description and figures given by TAYLOR, The Mar. Algae of Florida, p. 79, pl. 6, figs. 11—12, pl. 7, fig. 5, whose figures show, besides cylindrical utricles, very broadly clavate ones, up to 195 μ or rarely even 294 μ , I prefer to do as SCHMIDT did with the plant from Madagascar, and refer them to *Codium arabicum*.

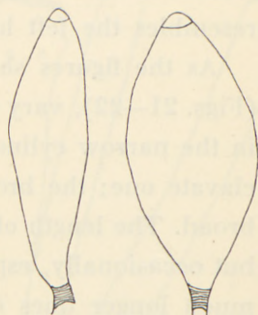


Fig. 20. *Codium arabicum*
Kütz. Two gametangia.
(\times ca. 150).

Mauritius: Rochetois, Aug. 29th and Port Louis Harbour, Dec. 28th 1869, Colonel PIKE.

Geogr. Distr.: Indian and Pacific Oceans.

2. *Codium coronatum* Setch.

SETCHELL, W. A., Tahitian Algae, p. 82, pl. 10, figs. 2—5; pl. 11, figs. 2—3; pl. 12, figs. 1, 5.

var. *aggregata* nov. var.

a forma *typica* præcipue differt utriculis angustioribus et latioribus in aggregatis minoribus separatis, apicibus utriculorum sæpe depressis et parietibus internis superne foveolatis.

Mauritius: Tamarin Bay. R. E. V. no. 317.

Some material preserved in formol and seawater in Dr. VAUGHAN'S collection seems to show so much likeness to *Codium coronatum* Setch. that I think it can be considered a variety of this species.

The material consists of a small lump with a somewhat waved surface and a narrower prolongation; it very much resembles the left half part of SETCHELL'S fig. 2, pl. 10.

As the figures show, the shape and size of the utricles (Figs. 21—22), vary much, their breadth ranging from 55 μ in the narrow cylindrical form up to 300 μ or more in the clavate one; the broadest one examined by me was 407 μ broad. The length of the utricles was as a rule about 700 μ , but occasionally, especially amongst the clavate ones, some much longer ones occurred which were about 1200 μ or even more. However, such anomalous utricles often occur in specimens of *Codium* and are most probably due to abnormal growth, caused for instance by the danger of overlapping from adjacent utricles. VOUK in "Studien über adriatischen Codiaceen", p. 10 proposes to call them sacculi in order to distinguish them from the normal utricles.

As regards the plant from Mauritius it is worth noting that it is easy to divide the utricles into three groups: the thin cylindrical ones, those of medium size, cylindrical-clavate of shape, and the broad clavate ones. Furthermore, the first and last mentioned as a rule occurred in small groups, either of the one or of the other kind, while those of medium size were found mingled with thin ones. The thin cylindrical utricles (Figs. 21 a, b, c) are from about 55—100 μ broad. Their summits vary as to shape, being roundish-cupola-like to almost flat or often depressed in the middle. Many are capitate, being narrowed somewhat below the apex. The wall of the apical end is thickened

and has a distinctly dotted inner wall. The thin utricles carry no hairs.

The utricles of medium size (Figs. 21 a, b, d, e, f) are from about 80 to 170 μ broad and carry a whorl or sometimes irregularly arranged hairs or scars of these. Their

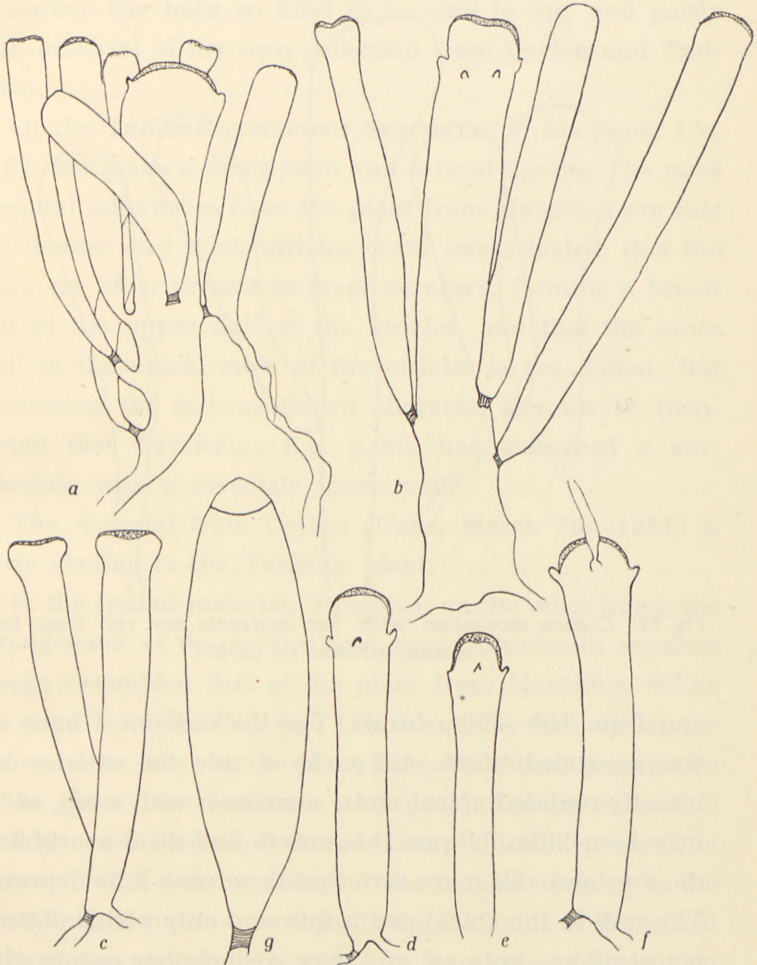


Fig. 21. *Codium coronatum* Setch. var. *aggregata* nov. var. a, b, two utricles of medium size surrounded by thin utricles; c, two thin utricles; d, e, f, utricles of medium size; g, a gametangium (a—f \times ca. 75; g \times ca. 200).

apical ends are roundish cupola-like and have as a rule thick walls with a dotted inner wall. Sometimes thickenings are found up to 15—16 μ . They generally occur scattered between the thin ones, but also now and then several together.

The third kind of utricles (Figs. 22) are clavate of shape

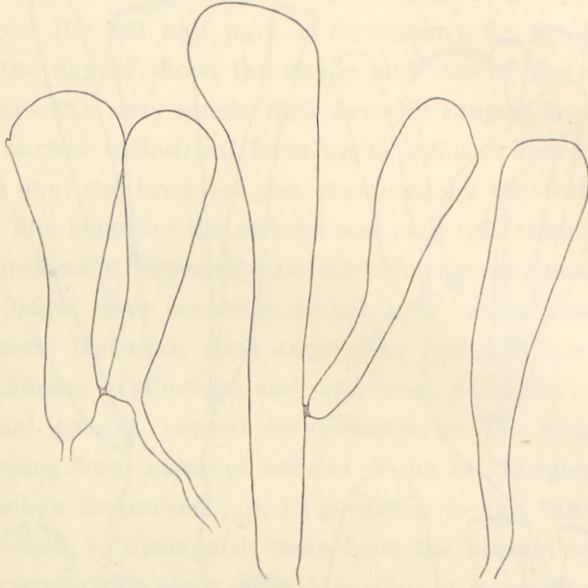


Fig. 22. *Codium coronatum* Setch. var. *aggregata* nov. var. Some broad, clavate utricles. (\times ca. 55).

and from 180—300 μ broad. The thickest one I have seen was as stated above 407 μ . As a rule the utricles have broadly rounded apical ends, sometimes with a top, or they may be a little oblique. It is rare to find them nearly flat at the top, and still more rare that they are a little depressed. The wall in the apical end is thin and only a little dotted or not at all so, but now and then a single one occurs with a little thickening. Hairs are found in some of them but more than half of them have none. Generally they form lumps.

Only once have I come across a gametangium (Fig. 21 g). It was spindle-shaped, 260 μ long and 83 μ broad.

I have compared the plant from Mauritius partly with a typical specimen of *Codium coronatum* Setch. from Tahiti: Reef at Tahara Mountain, July 9, no. 5240, which Professor SETCHELL has been so kind as to send to me, and partly with material of my own collection from Ceylon and Tuticorin.

Of the Tahitian specimens SETCHELL, in his paper l. c. p. 82, has given a description and several figures. The most essential differences from the plant from Mauritius are that the slender and thick utricles occur intermingled, that the hairs are often present in great numbers, forming a broad belt in the upper half of the utricles, and that the inner wall in the apical ends of the utricles is not dotted. But concerning the last-mentioned character it must be mentioned that SETCHELL, l. c. p. 83, has described a var. *insculpta* with a foveolate inner wall.

The material from Ceylon (Galle, March 7th, 1927) is fairly similar to the Tahitian plant.

In the Indian material, Tuticorin, on the other hand, the arrangement of the narrow and broad utricles in separate groups resembled that of the plant from Mauritius. While the narrow utricles in the Tahitian plant had about the same size as those in the plant from Mauritius, the utricles in the plant from Tuticorin were proportionally somewhat broader and their apical ends were often depressed, a feature found, too, in many of the narrow utricles in the plant from Mauritius. As regards the thickness of the apical ends of the utricles, this seems to be almost the same in the specimens examined, but the plant from Mauritius differs from the other ones by its dotted inner wall.

It remains to be mentioned that the only gametangium I have succeeded in finding in the plant from Mauritius is a good deal larger, and especially longer, than the measures given by SETCHELL for the gametangia of the plant from Tahiti.

As will be seen from this comparison, the plant from Mauritius, though in many respects showing much likeness to *Codium coronatum* differs from it also in several respects, but as I have only had a single small specimen to examine, I prefer to consider it a variety of this species which, by the way, seems also to be a rather variable plant.

3. *Codium spongiosum* Harv.

HARVEY, W. H., in Transact. Royal Irish Acad. 33 (1854) p. 565; Phycologia austral., tab. 55. SCHMIDT, Beitr. z. Kenntn. d. Gattung *Codium*, p. 32, figs. 14—15.

var. *Mauritiana* nov. var.

A forma *typica* praecipue differt utriculis tenuioribus et brevioribus.

Dr. VAUGHAN'S collection contains a specimen preserved in formalin which I have referred as a variety to this species. It has a very soft mucilaginous flattened thallus with roundish foldings, the utricles being imbedded in mucilage and very loosely connected. When compared with HARVEY'S and SCHMIDT'S descriptions (I have not seen any original material) the plant from Mauritius seems to agree quite well with these as to habit and consistency. On the other hand, the shapes and sizes of the utricles (Fig. 23) differ somewhat, the utricles in the plant from Mauritius being somewhat more slender than those in the typical form. The breadth given by SCHMIDT is 200—800 μ (rarely \pm 1000 μ) whereas in the plant from Mauritius the breadth

was 200—400 μ , in rare cases more; once I have found a vesicle 628 μ broad. As to the length of the utricles it is as a rule about 2 mm but a length of 3 mm is often met with

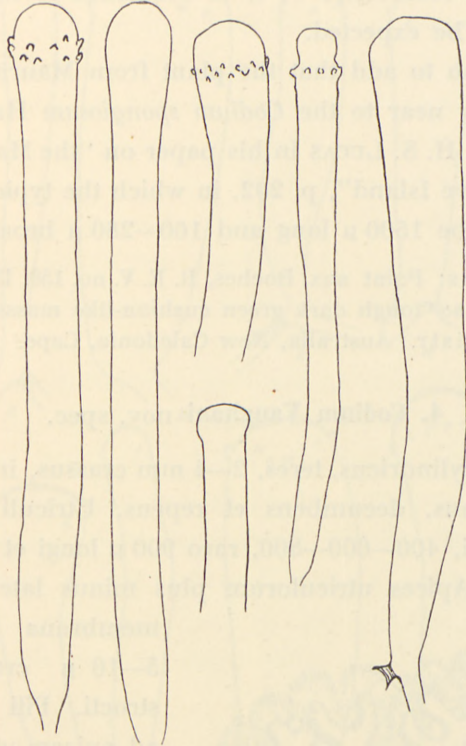


Fig. 23. *Codium spongiosum* Harv. var. *Mauriliana* nov. var. Utricles and uppermost parts of some. (\times ca. 30).

and some attain almost 4 mm. But otherwise the shape of the sporangia agreed well with SCHMIDT's figures and description. The wall at the summit of the utricles was thin, about 2—3 μ thick. Curiously enough, I have not seen any hairs, but near the apices of the utricles an often broad ring of scars from hairs is frequently found, though this is not always the case; in some utricles no scars whatever are present.

Because of these differences I consider the plant from Mauritius a variety of *C. spongiosum*. As SCHMIDT has stated that a specimen from Cape in Herb. Hamburg is this species, the occurrence of it at Mauritius is nothing but what might be expected.

Yet I wish to add that the plant from Mauritius seems to come very near to the *Codium spongiosum* Harv., mentioned by A. H. S. LUCAS in his paper on "the Marine Algae of Lord Howe Island", p. 202, in which the typical utricles are said to be 1500 μ long and 160—280 μ broad.

Mauritius: Point aux Roches, R. E. V. no. 159. Dr. VAUGHAN describes it as: "tough dark green cushion-like masses".

Geogr. Distr.: Australia, New Caledonia, Cape.

4. *Codium Vaughani* nov. spec.

Thallus cylindricus, teres, 2—4 mm crassus, irregulariter subdichotomus, decumbens et repens. Utriculi subcylindrici-obovati, 400—600—800, raro 900 μ longi et 44—100—250 μ lati. Apices utriculorum plus minus late fornicati,

membrana incrassata, 5—10 μ crassa constructi. Pili numerosi ad apicem utriculorum adsunt (Fig. 24).

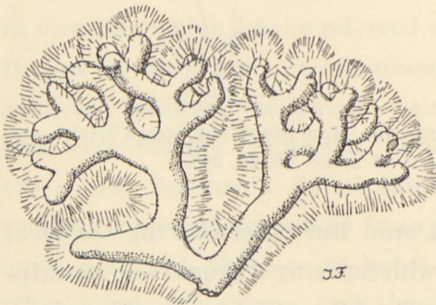


Fig. 24. *Codium Vaughani* nov. spec. Part of the thallus with hairs. ($\times 1\frac{1}{2}$).

Mauritius: Îlot Brocus, R. E. VAUGHAN no. 163, without locality or date but with the remark: "Common everywhere, deep olive green slimy dichotomous thallus".

This plant (Fig. 24) is, I am sure, closely related to *Codium repens* (Crouan) Vickers, having utricles of nearly

the same shape and size, and were it not that *C. repens* is only known from the West Indies I think I should have

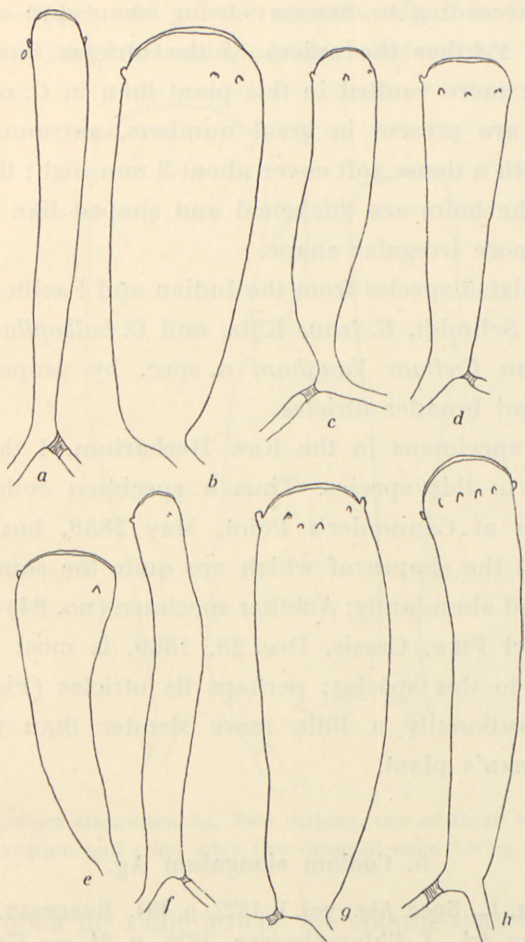


Fig. 25. *Codium Vaughani* nov. spec. a, b, c, d, utricles of R. E. V. no. 163; e, f, utricles of Pike's plant, Dec. 29, 1869; g, h, utricles of Ayre's plant, May 1858. (\times ca. 80).

referred the plant from Mauritius to it as a variety. But as differences due to size and shape of the utricles (Fig. 25) were found as well, I prefer to give it specific rank. The

length of the utricles is almost the same in both plants but they are not so broad in the plant from Mauritius, the breadth according to SCHMIDT being about 110—450 μ in *C. repens*. Further the apices of the utricles seem to be somewhat more vaulted in this plant than in *C. repens*.

Hairs are present in great numbers, surrounding the thallus with a dense soft cover about 3 mm high; the upper ends of the hairs are thickened and shaped like sausages or of a more irregular shape.

The related species from the Indian and Pacific Oceans: *C. Gepei* Schmidt, *C. tenue* Kütz. and *C. bulbopilum* Setch. differ from *Codium Vaughani* n. spec. by proportionally shorter and broader utricles.

Some specimens in the Kew Herbarium, I think, are referable to this species. Thus a specimen collected by Dr. AYRES at Cannonier's Point, May 1858, has utricles (Fig. 25h) the shapes of which are quite the same. Hairs were found abundantly. Another specimen (no. 84) gathered by Colonel PIKE, Cassis, Dec. 28, 1869, is most certainly referable to this species; perhaps its utricles (Fig. 25e, f) are proportionally a little more slender than those in Dr. VAUGHAN's plant.

5. *Codium elongatum* Ag.

AGARDH, C., Spec. Alg., vol. I, 1822, p. 454. BØRGESEN, F., Mar. Alg. Canary Isl., I. Chlorophyceae, 1925, p. 94. — *Codium decorticatum* (Woodw.) Howe, Phycological Studies, V, 1911, p. 494. O. C. SCHMIDT, Beiträge, p. 52? *Ulva decorticata* Woodw., Observations upon the generic Character of Ulva, p. 55.

Dr. VAUGHAN's collection contains a single fruiting specimen of this species. The utricles (Fig. 26) have a breadth of about 300 μ , in rare cases up to about 500 μ , and a

length of about 1100 μ . The wall of the apical ends of the utricles is thin, and hairs or scars from these are found near the upper end of the utricles, often in fairly great numbers. The gametangia, of which several are frequently

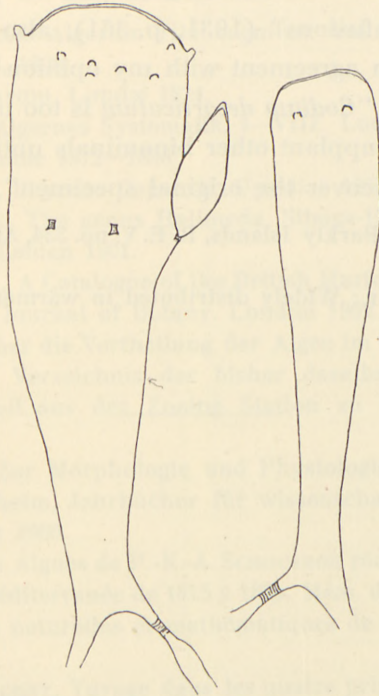


Fig. 26. *Codium elongatum* Ag. Two utricles, one of these with a gametangium and scars after two dropped ones. (\times ca. 70).

present upon the same utricle, are spindle-shaped or ovate and about 100—140 μ broad and up to about 400 μ long.

This species, for which formerly AGARDH's name was used, has more recently been termed *Codium decorticatum* (Woodw.) Howe. This author, in the paper quoted above, pointed out that *Ulva decorticata* Woodw. was this species, and that WOODWARD's name as the oldest one ought to be

used. Against this I (1925, p. 95) have raised objections as, in my opinion, the description of WOODWARD cannot be said to correspond so very well to *Codium elongatum* Ag., and any reference to WOODWARD's plant is excluded as the material seems to be lost. SETCHELL, in his paper: "Some early algal Confusions" (1931, p. 361), also discusses the question and in agreement with my opinion arrives at the conclusion that "*Codium decorticatum* is too uncertain in its application to supplant other binominals until some happy chance may uncover the original specimen".

Mauritius: Barkly Islands, R. E. V. no. 334, August 1939, "cast up by waves".

Geogr. Distr.: Widely distributed in warmer seas.

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Indleveret til Selskabet den 19. Februar 1940.
Færdig fra Trykkeriet den 27. Maj 1940.



Chamaedoris Delphinii (Hariot) Feldm. et Børgs. (× 1).

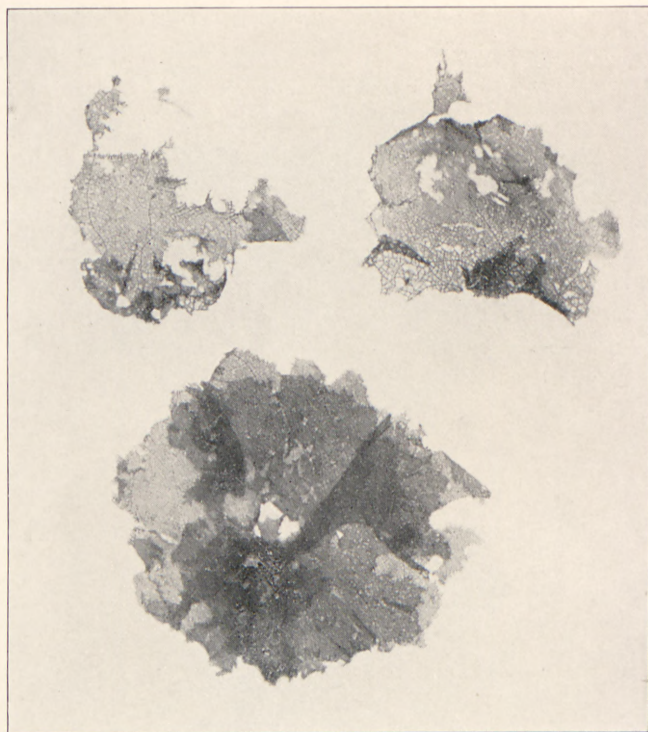


Fig. 1. *Microdictyon Agardhianum* Decsne. ($\times 1$).

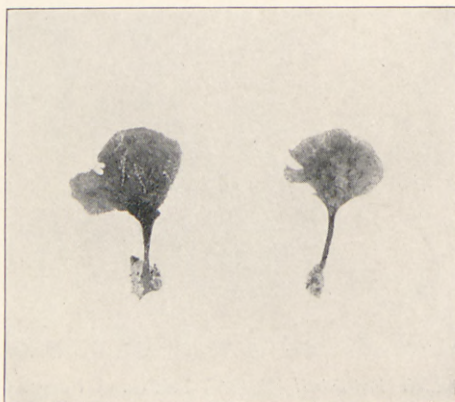
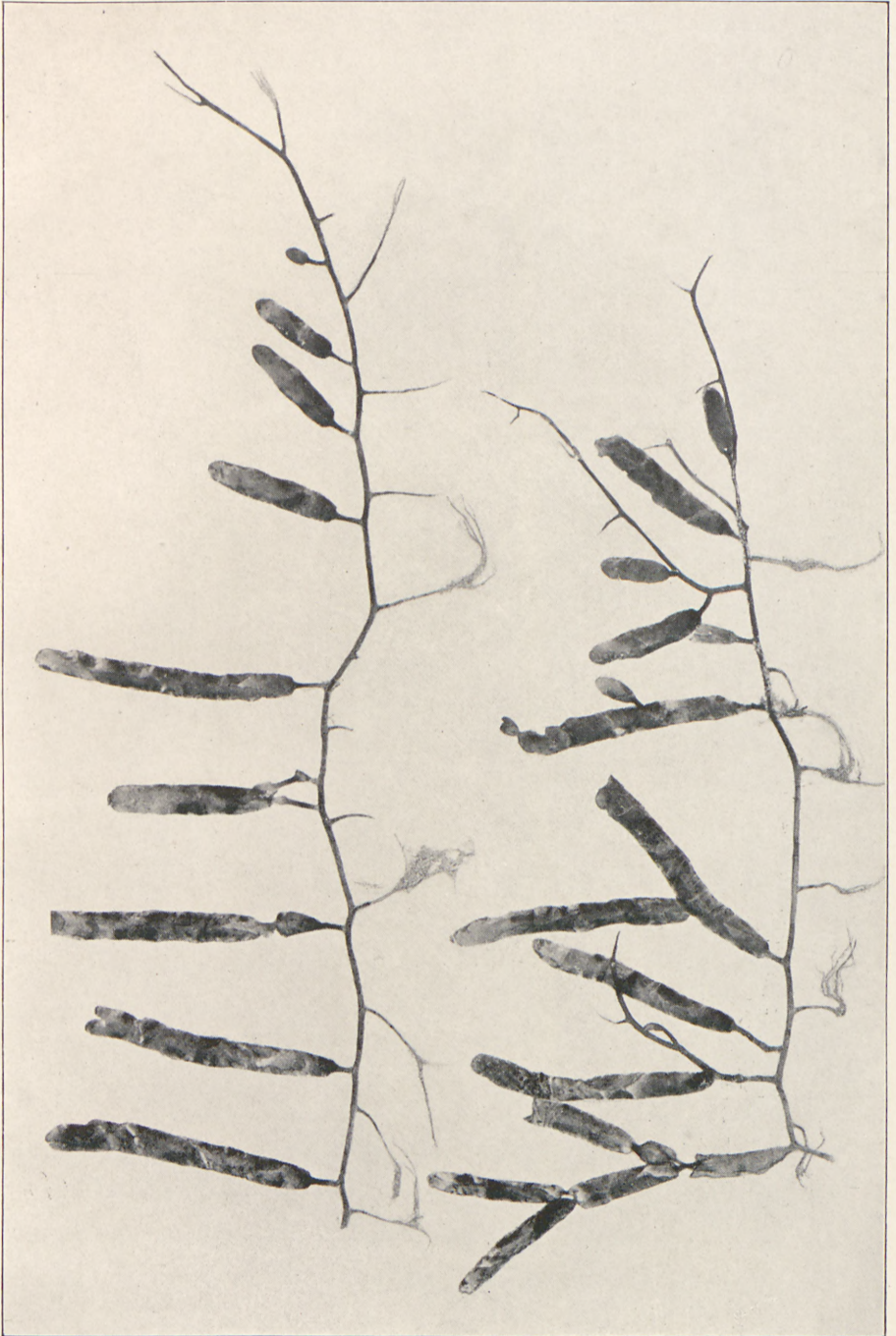


Fig. 2. *Avrainvillea gracillima* Børgs. ($\times 1$).



Caulerpa Mauritiana Borgs. (ca. $\frac{1}{2}$ size).