

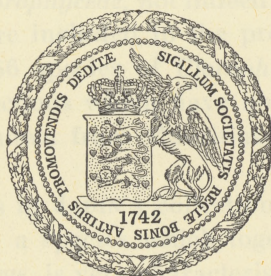
DET KGL. DANSKE VIDENSKABERNES SELSKAB
BIOLOGISKE MEDDELELSER, BIND XX, NR. 6.

SOME MARINE ALGAE FROM MAURITIUS

AN ADDITIONAL LIST OF SPECIES TO
PART I CHLOROPHYCEAE

BY

F. BØRGESEN



KØBENHAVN

I KOMMISSION HOS EJNAR MUNKSGAARD

1946

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In the introduction to section III, 1942, of the *Rhodophyceae* I mentioned that, when the postal communication with Paris was reestablished during the war, I was able, by the aid of the late Director P. ALLORGE and the late Dr. G. HAMEL of the Muséum National d'Histoire naturelle, at the end of the year 1941, to receive a collection of algae from Mauritius collected by the late Dr. F. JADIN. This collection arriving here after the first two parts of this publication dealing with the *Chlorophyceae* and *Phaeophyceae* were published and containing a fairly large number of species not mentioned in these parts, I have now worked out the *Chlorophyceae* and give in the present paper an additional list to the part dealing with this group.

Further I have from the Royal Botanic Gardens, Kew, received a collection of algae gathered in Mauritius by Dr. VAUGHAN which he, when visiting Kew during the war, had left there to be sent to me when it was possible. And finally I have received from Dr. VAUGHAN a collection of algae gathered by Father C. NEYROLES in Mauritius. The *Chlorophyceae*, not indeed very many, contained in these collections are included in the present list.

In the first part 56 species of *Chlorophyceae* are mentioned; by means of the collections which have now been examined the number of species known from Mauritius has been brought up to 79.

Among the species in JADIN's collection is *Siphonocladus tropicus* (Crouan) J. Ag., a species which together with *Ernodesmis verticillata* (Kütz.) Børgs. is very characteristic of the West Indian algal flora. While of *Siphonocladus tropicus* I have seen only a single specimen, *Ernodesmis verticillata* is present in many and large specimens in the collections, indicating that it must be rather common at Mauritius. In his list of species JADIN mentions

Siphonocladus tropicus but the specimens of *Ernodesmis* are referred to *Valonia confervoides*. Both species are also known from the Canary Islands. Their occurrence at Mauritius in the Indian Ocean must be said to be of much plant-geographical interest as a new example of the remarkably discontinuous distribution of many tropical and subtropical algae, which was first pointed out by MURRAY in his well known paper: A comparison of the Marine Floras of the Warm Atlantic, Indian Ocean, and the Cape of Good Hope (1893), by SVEDELIUS in several papers (1906, 1923 and 1924), and by myself in papers from 1920, 1925, 1930 and 1934.

To Dr. A. D. COTTON, Keeper of the Herbarium of the Royal Botanic Gardens, Kew, and to Miss C. I. DICKINSON, the algal Herbarium, Kew, I tender my thanks for their help in sending me some fragments of some few type-specimens in the Kew Herbarium.

To the TRUSTEES OF THE CARLSBERG FOUNDATION I am much indebted for a continued grant for algological researches.

CHLOROPHYCEAE

Chaetophorales.

Fam. 1. Chaetophoraceae.

Endoderma Lagerheim.

Endoderma viride (Reinke) Lagerh.

LAGERHEIM, G., Bidrag till Sveriges Algflora, p. 75. — *Entocladia viridis* REINKE, Zwei parasitische Algen, 1879, p. 473, tab. 6, figs. 6–9.

In the thick wall of *Bornetia Binderiana* (Sond.) Zanard. an *Endoderma* was found which very much resembles some of the forms I have referred to *Endoderma viride* in Mar. Alg. D. W. I., vol. II, pp. 416–8.

Fig. 1 shows some fragments of the plant. The cells in this form are about 7–10 μ broad and $1\frac{1}{4}$ –2 times longer. The shape of the cells is more or less irregular, the walls being often sinuate or provided with roundish outgrowths. The cells contain a large parietal chromatophore and as a rule a single large pyrenoid, sometimes two are present. The apex of the filaments is thin with long, nearly cylindrical cells. In the older parts of the thallus several of the cells are transformed to sporangia containing many zoospores.

Besides this form I have referred to this species several others found in many different *Rhodophyceae*, for instance *Laurencia*, *Griffithsia*, *Gelidium*, *Gracilaria* etc. and also in an old piece of a *Phaeophyceae* most probably *Zonaria*. All these forms show mutually small variations as to shape and size of the cells and of the thallus. In conformity with what I have said about very similar forms found in the West Indies (1920, p. 416) their very

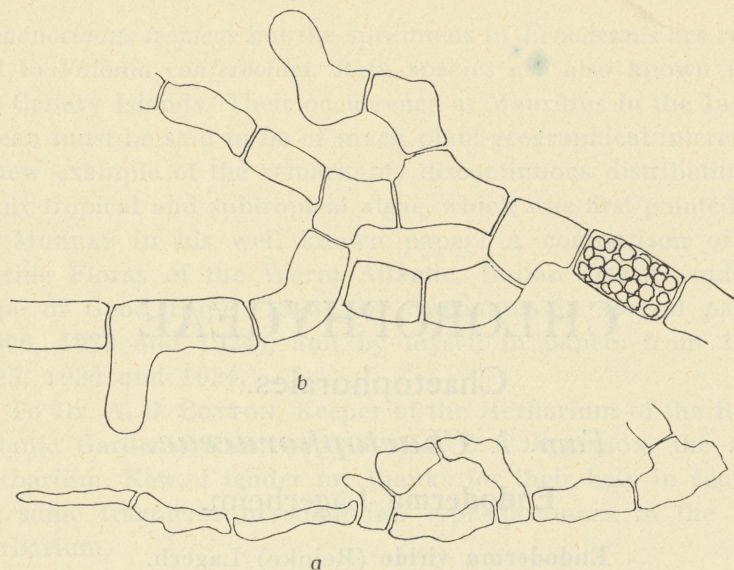


Fig. 1. *Endoderma viride* (Reinke) Lagerh. a, apex of a filament; b, fragment of thallus. ($\times 665$).

variable shape of cells and mode of growth is surely much influenced by the structure of the host plant.

The above mentioned form was found at:

Mauritius: Off Flat Island, 17. Oct. 1929, Th. M.

Geogr. Distr.: Extensive.

Pringsheimiella v. Hoehn.

***Pringsheimiella mauritiana* nov. spec.**

Thallus epiphyticus, disciformis, stratum unicum formans, usque ad 150μ latus, inferiore facie substrato adfixus, e cellulis lateraliter conjunctis compositus.

Cellulae in medio thalli elongato-rotundatae, ca. $15-18 \mu$ longae et $8-10 \mu$ latae, marginem versus longiores, irregulariter di-trifurcatae, ca. $15-20 \mu$ longae et $7-8 \mu$ latae.

Cellulae chromatophorum parietalem, pyrenoide unico instructum continent.

In fragmento *Laurenciae* epiphytica.

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

Upon a fragment of a *Laurencia* dredged at a depth of 60 metres a small discshaped epiphyte was found which I think is a representative of a new species of the genus *Pringsheimiella* (Fig. 2).

When compared with *Pringsheimiella scutata* (Reinke) Schmidt et Petrack it is a smaller plant the diameter of the disc attaining

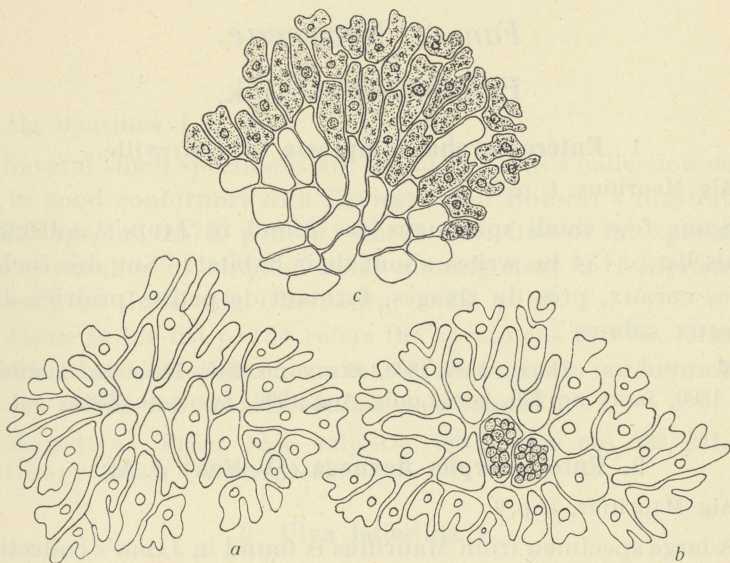


Fig. 2. *Pringsheimiella mauritiana* nov. spec. *a* and *b*, young plants, *b* with sporangia; *c*, part of an older plant with emptied sporangia in the middle of the thallus. The pyrenoids are drawn in the cells. (*a*, *b*, \times about 500, *c*, \times about 400).

only a length of up to 150 μ , but in spite of this the cells of the plant are of about the same size or even larger. And the cells are furthermore, when compared with those of *Pr. scutata*, much more irregular of shape, often di-trifurcated and this applies not only to the marginal ones but also to those in the interior of the disc at any rate in the young specimens. When the figure of a young plant of *Pr. scutata* as illustrated by HAMEL, 1930, p. 48, fig. 18 C, and that of an older plant given by FELDMANN, 1937, p. 47, fig. 9 A, are compared with those of *Pr. mauritiana* the differences are easily observable.

Concerning the cells in the middle of the disc it is not until these approach the fertile stage that their shape becomes somewhat more roundish-polygonal.

The growth is marginal and gradually as the outgrowth of the cells reach a suitable length they are cut off by transverse walls from the mother cell. The cells contain a large pyrenoid, in cells going to be divided in two.

Fam. 2. Ulvaceae.

Enteromorpha Link.

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

Alg. Mauritius, I, p. 8.

Some few small specimens are found in JADIN's collection. In his list p. 154 he writes about their habitat: "Sur des rochers et des coraux, près du rivages, formant de petites prairies dans les eaux calmes".

Mauritius: Flacq, July 1890, JADIN no. 240. Baie du Tombeau, July 1890, JADIN no. 320. Port-Louis, Aug. 1890, JADIN no. 358.

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

Alg. Mauritius, I, p. 9.

A large specimen from Mauritius is found in JADIN's collection. It has been gathered by DARUTY but is without locality and number.

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

Alg. Mauritius, I, p. 9.

Several small specimens and a large one collected by DARUTY are found in JADIN's collection. About its habitat JADIN writes in his list p. 154: "Dans des eaux claires, soumis au ressac des vagues".

Mauritius: Flacq, June—July 1890, JADIN nos. 200 and 315. Mahébourg: Sept. 1890, JADIN no. 420.

Enteromorpha ramulosa (Engl. Bot.) Hooker.

HOOKEER, British Flora, 1833, vol. II, p. 315. HAMEL G., Chlorophycées des Côtes françaises, 1930, p. 166 where more literature is mentioned.

A single specimen composed of numerous fragments of this species is found in JADIN's collection. The thallus is irregularly

bent and curved and provided with numerous shorter or longer more or less thornlike proliferations on all sides.

This species is not mentioned in JADIN's list.

Mauritius: Without locality and date, 1890, leg. DARUTY.
Geogr. Distr.: Widespread.

Ulva L.

1. *Ulva Lactuca* L.

Alg. Mauritius, I, p. 10.

Several small specimens are found in JADIN's collection which are in good conformity with THURET's and BORNET's illustrations of this species, 1878, p. 5—9, tab. II—III. One of the specimens had a number of circular holes coming near to *f. myriotrema* (Desm.) Le Jolis, Alg. Cherbourg, 1863, p. 39.

JADIN in his list p. 154 refers the specimens to *Ulva latissima* Lamrx. About its habitat he writes: "Très commun sur les rochers; sur les pilotis des wharfs sounis aux vagues".

Mauritius: Flacq, June—July—Oct. 1890, JADIN nos. 223, 241, 499.
Geogr. Distr.: Widespread.

2. *Ulva latissima* L.

LINNÉ, Spec. Plant., vol. 2, 1753, p. 1103. SETCHELL, Mar. Alg. Pacific Coast, 1920, p. 266 where literature is mentioned.

A single large specimen is found in Dr. VAUGHAN's collection.

A transverse section of the thallus is about 38 μ thick, and the cells are nearly square.

Mauritius: Without locality, collected by C. NEYROLES.
Geogr. Distr.: Widespread.

3. *Ulva fasciata* Delile.

Alg. Mauritius, I, p. 10.

A well-developed specimen is found in JADIN's collection. A transverse section of the thallus is about 125 μ thick; according to BORNET, Alg. SCHOUSBOE, p. 196, the thickness varies from 45—150 μ . The narrow palissade-like cells in transverse section of the thallus have a length of about 40 μ .

JADIN in his paper, p. 154, refers it to *Ulva latissima*.

Mauritius: Port-Louis, Aug. 1890, JADIN no. 366.

Fam. 3. *Prasiolaceae*.

Prasiola C. Agardh.

1. *Prasiola mauritiana* (Jadin) Børgs.

Monostroma Mauritiana Jadin, Algues des Iles de la Réunion et de Maurice, 1934, p. 154 (nomen nudum).

Prasiola minima, 2—3 mm alta, caespitosa, disco ad substratum adfixa; discus e filamentis brevibus plus minus ramosis compositus.

Filamenta erecta in parte basali filamentosa, ca. 8—10 μ lata, superne sensim dilatata, elongata-lanceolata, ad 70—80 μ lata, apicibus lata rotundis e margine interdum proliferis.

Cellulae in parte filamentosa seriatae, in parte superiore foliosa aut sparsae, aut in series transversales et interdum etiam longitudinales, sed non areolatae ordinatae.

Akinetes ex cellulis sparsis in parte foliosa ortae.

Mauritius: Mahébourg, Sept. 1890, JADIN no. 520. "Sur la carapace d'un crabe desséché, soumis aux embruns des grosses vagues frappant l'île de la Passe".

JADIN in his list p. 154 mentions a *Monostroma Mauritiana* nov. spec. but any description of the plant is not given. It was found upon a dried up shield of a crab cast ashore and exposed to the moist air from the surf.

An examination of the specimen has shown that it is not a *Monostroma* but referable to the genus *Prasiola*.

The plant (Fig. 3), which forms a dense light-green cover, 2—3 mm high upon the substratum, is fixed to this by means of discs of various sizes and fusing gradually during the growth. The discs (Fig. 4 *a*) are composed of short filaments more or less ramified, reminding one of IMHÄUSERS Fig. 95 (1889, p. 279) of those found in *Prasiola mexicana* J. Ag.

From these discs the erect parts of the thallus are given out. The lower parts of these are threadlike, being composed of a single row of cells, lowest down smaller, roundish or quadrangular (Fig. 4 *a*), higher up broader and discshaped (Fig. 4 *d*); as one advances upwards in the filaments some of the cells become divided into two (Fig. 4 *d, e*). This thin threadlike part of the

erect thallus is of varying length, often short, often up to 1 mm long; below it is about 8–10 μ thick, gradually increasing in size to about 15–20 μ . The peripheric wall is proportionally

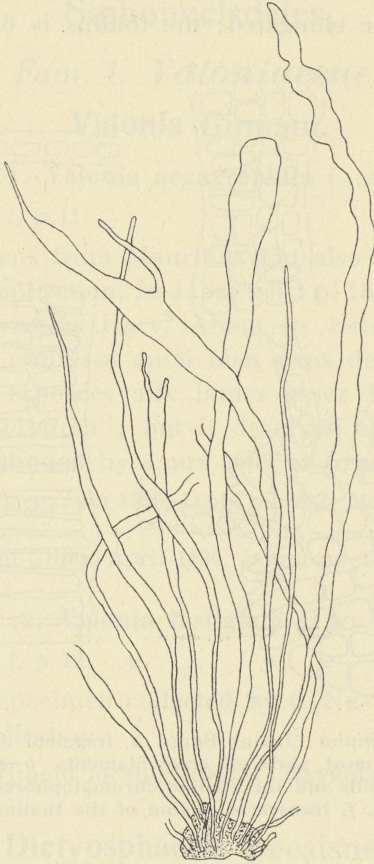


Fig. 3. *Prasiola mauritiana* (Jadin) Børgs. A sketch of a piece of the plant. ($\times 65$).

thick, 2–3 μ . Then the narrow, elongated-cuneate to ribbonlike part of the thallus becomes developed; compare Fig. 3. In breadth the leaf-like parts are up to 70–80 μ broad, rarely more. The cells of which it is composed are roundish-quadrangular, about 5–8 μ broad, and often without order, but also arranged nicely in horizontal rows and sometimes also in vertical ones (Fig. 4 b); but no arrangement in groups is found.

Proliferations are sometimes given out from the edge of the leaf-like part of the thalli, most often from the upper ends of these.

In transverse section the cells in the leaflike part of the thallus are often more elongated; the thallus is 6–8 μ thick.

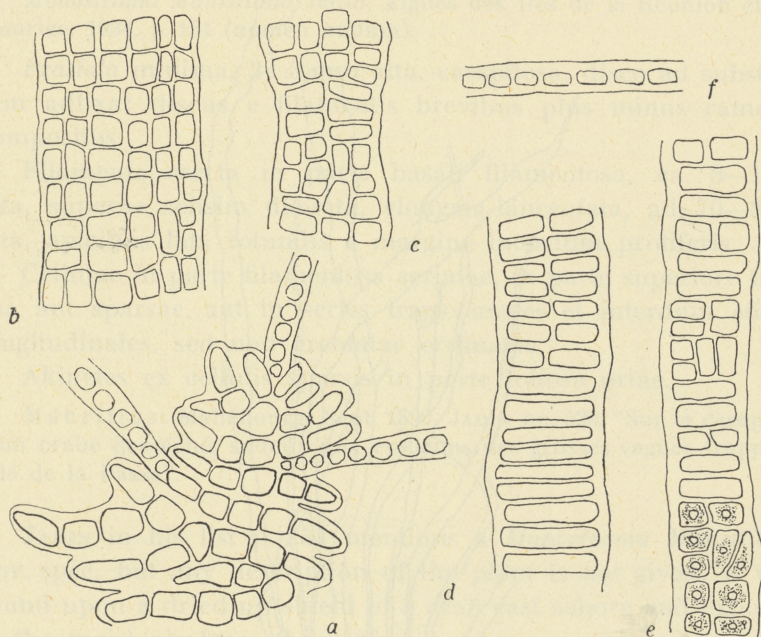


Fig. 4. *Prasiola mauritiana* (Jadin) Børgs. *a*, fragment of the base seen from below with the lowermost parts of erect filaments. *b–e*, some parts of the thallus, in *e* the pyrenoids and the stellate chromatophores are drawn in some of the cells. *f*, transverse section of the thallus. ($\times 660$).

All cells in the plant contain a stellate chromatophore with a large pyrenoid in their middle (Fig. 4 *e*).

In the leaf-like part of the thallus the cells become gradually transformed into akinetes and when most of the cells have passed through this process the leaf dies away.

This little *Prasiola* is probably most nearly related to *Prasiola calophylla* Menegh.; compare the figure of this species in C. JESSEN, *Prasiolae Generis Algarum Monographia, Kiliae 1848*, p. 14, tab. 1, figs. 1–3; but it is a larger plant, the threadlike parts of the thallus composed of a single row of cells is quite short, and

the cells in the leaf-like parts are often arranged in groups, to mention only some of the most essential deviating characters.

Siphonocladales.

Fam. 1. *Valoniaceae*.

Valonia Ginnani.

1. *Valonia aegagrophila* C. Ag.

Alg. Mauritius, I, p. 11.

Some specimens from Mauritius but also from Réunion are found in JADIN's collection. In JADIN's list p. 157 they are referred to *Valonia confervoides* HARV. About its habitat JADIN writes: "Assez commun; croissant aussi bien dans des eaux calmes que dans des zones exposées aux lames assez fortes; souvent en touffes sur des *Corallina*"; but it deserves notice that some of the numbers mentioned by JADIN refer to *Ernodesmis verticillata*.

Mauritius: Flacq, Juin 1890, JADIN no. 202; Mahébourg, Sept. 1890, JADIN no. 433.

Réunion: Saint-Gilles, April 1890, JADIN, no. 140.

2. *Valonia fastigiata* HARV.

Alg. Mauritius, I, p. 12.

A single fine specimen collected by C. NEYROLES is found in Dr. VAUGHAN's collection.

Mauritius: Without locality, 1943, C. NEYROLES.

Dictyosphaeria Decaisne.

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

Alg. Mauritius, I, p. 12.

In JADIN's collection a quite small specimen of *Dictyosphaeria* (no. 299) is found which is most probably this species, but the material is too poor to make an exact determination possible. The cells in the specimen are rather large, about 1000 μ in diameter, and no needles have been found, but it has not been possible to decide with certainty if the thallus is hollow or not.

Besides this specimen a still smaller one (no. 368) is also

present in JADIN's collection, likewise referred to this species by JADIN. The cells in this specimen are about $450\ \mu$ broad only and needles are wanting, and furthermore it seems to have a solid thallus. According to these characters it might be *Dictyosph. intermedia* Weber, *Algues Siboga*, p. 64.

JADIN in his list p. 157 mentions *Dictyosphaeria favulosa* Ag.; about its habitat he writes: "Croît à l'abri des lames, dans des bassins lagunaires, appliqué sur les débris de coraux".

Mauritius: Flacq, July 1890, JADIN no. 299.

Geogr. Distr.: Widespread in tropical seas.

Fam. 2. *Siphonocladaceae*.

Ernodesmis Børgs.

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

Alg. Mauritius, I, p. 15.

This characteristic West Indian species, mentioned already in part I as found by Dr. VAUGHAN, must, according to the many large specimens found not only in Dr. JADIN's collections but also in several others, be presumed to be a widely distributed species at the Mascarene Islands.

In his list p. 157 JADIN refers this species to *Valonia confervoides*. About its habitat he writes: "Assez commun; croissant aussi bien dans les eaux calmes que dans des zones exposées aux lames assez fortes; souvent en touffes sur des *Corallina*".

Mauritius: Flacq, Oct. 1890, JADIN no. 479. Tamarin Bay, Aug. 1939, R. E. V. no. 312. CASSE's, 15. Dec. 1940, G. MORIN no. 425. Without locality, C. NEYROLES, 1943, no. 484.

Réunion: Saint-Gilles, April 1890, JADIN no. 78.

Siphonocladus (Schmitz) Børgs.

1. *Siphonocladus tropicus* (Crouan) J. Ag.

AGARDH, J., Till. Alg. System., 5 afd. p. 105. BØRGESEN, F., *Contributions*, 1905, p. 259; Mar. Alg. D. W. I., 1913, p. 61, figs. 44–50.

A fine specimen of this plant is found in JADIN's collection and is also named in his list, p. 157.

The occurrence of this characteristic West Indian species at Mauritius is of great plant-geographical interest.

About its habitat JADIN writes: "Croît sur les rochers exposés aux lames très violentes".

Mauritius: Flacq, Oct. 1890, JADIN no. 48.

Geogr. Distr.: West Indies, Florida, Canary Islands.

Fam. 3. *Boodleaceae*.

Cladophoropsis Børgs.

1. *Cladophoropsis Sundanensis* Reinbold.

Alg. Mauritius, part I, p. 21.

In JADIN's collection some few specimens of this species are found. The diameter of the filaments in the different specimens varies from about 60 μ to 140 μ .

A single specimen (no. 298) in JADIN's list p. 155 is referred to *Cladophora repens* Ag. var. *Columbensis* Grunow.

Mauritius: Flacq, July-Oct. 1890, JADIN 298. Réunion: St. Gilles, April 1890, JADIN no. 131.

2. *Cladophoropsis Zollingeri* (Kütz.) Børgs.

BØRGESEN, F., Contributions, 1905, p. 288; Some Indian green and brown Alg. III, 1933, p. 1, fig. 1. — *Cladophora Aegagropila Zollingeri* Kütz., Spec. alg., p. 415; Tab. phyc., vol. IV, tab. 64, fig. II.

Of this species some few specimens are found in JADIN's collection. The filaments of the specimens have a diameter of about 200—260 μ .

This species is mentioned in JADIN's list p. 155. About its habitat it is said here: "Dans les bassins intérieurs des récifs, dans les fentes des rochers, toujours en filaments très enchevêtrés".

Mauritius: Mahébourg, Sept. 1890, JADIN no. 429. Flacq, June 1890, JADIN no. 522.

Geogr. Distr.: Malayan Archipelago, Arabian Sea etc.

Boodlea Murray et De-Toni.

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

Alg. Mauritius, part I, p. 21.

Several specimens of this species are found in JADIN's collection, some of which have been gathered by DARUTY at Mauritius.

In some material preserved in formalin and sea-water recently received from Dr. VAUGHAN a much more robust form than that described and illustrated in part I was found. This form (Fig. 5) has shorter cells with thick walls and numerous hapters, the result being a dense and firm clump. Most of the main filaments are about 250—350 μ thick, but some filaments with a diameter

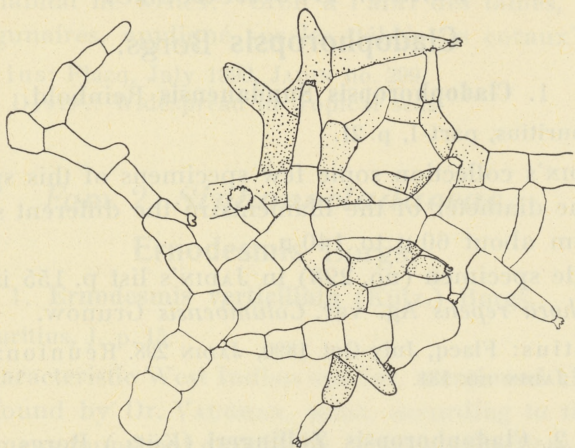


Fig. 5. *Boodlea composita* (Harv.) Brand, forma *contracta* Brand. ($\times 45$).

of up to 450 μ are sometimes found. The thinner peripheric branchlets have a breadth of about 100—200 μ .

BRAND (1904, p. 190) mentions two forms of this species, f. *elongata* being the form described in part I, and f. *contracta* which is the present form described above.

About the appearance and habit of this form Dr. VAUGHAN writes: "Stiff wiry filaments usually forming loose irregular mats or cushions".

Having been able to examine several gatherings of this species and thus becoming acquainted with the variability of this plant I have come to the conviction that *Boodlea siamensis* Reinbold after a comparison with authentic material kept in the Botanical Museum, Copenhagen, is to be referred to this species. And in consequence of this the plant from the West Indies I (1913, p. 49, fig. 34) referred to *B. siamensis* is also to be referred to *B. composita*, the West Indian plant being a somewhat slender form of this variable species. And further the plant I have collected at

Dwarka and Okha Port in the Arabian Sea and have referred to *Boodlea siamensis* (1930, p. 153, fig. 2) I now, too, consider to be *Boodlea composita*.

In his list, p. 155 JADIN calls it *Cladophora composita* Harv.; about its habitat he writes: "Formant des touffes vertes, à aspect rigide, sur les récifs coralligènes ou sur d'autres Algues".

Mauritius: Mahébourg, Sept. 1890, JADIN no. 471. Pte aux Sables, Aug. 9, 1940, R. E. V. no. 409.

Réunion: Saint-Gilles, April 1890, JADIN no. 118.

Geogr. Distr.: Seems to be widely spread in warm seas; according to TAYLOR, 1945, p. 50 it has recently been found at the shores of Mexico and Equador.

Spongocladia Areschoug.

1. *Spongocladia vaucheriaeformis* Aresch.

Alg. Mauritius, I, p. 37.

A small specimen is found in JADIN's collection; in his list it is mentioned p. 155. It agrees perfectly with ARESCHOUG's figures drawn from a specimen from Mauritius collected by Colonel PIKE. In addition a single specimen collected by Father C. NEYROLES (no. 481) is found in Dr. VAUGHAN's collection.

According to Mme WEBER's observations (1890, p. 85) the alga growing here in symbiosis with a sponge should most probably be *Struwea delicatula*; compare her additional remarks concerning the question in "Algues Siboga", pp. 86—87.

MURRAY & BOODLE according to their observations (1888, p. 265) made shortly before the examination of Mme Weber, arrived at the result that the alga in question was most probably a *Cladophora*. According to my observation of the alga it seems to me very like *Cladophoropsis*, for instance *Cl. Zollingeri*, a species which is found at Mauritius.

About its habitat JADIN (p. 155) writes: "Dans la rade, près du Fort-Georges, à 0 m. 75 au-dessous des eaux à marée basse. Eaux calmes".

Mauritius: Port-Louis, April 1890, JADIN no. 471 bis. Without locality. C. NEYROLES, no. 481.

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

Microdictyon Decaisne.

Microdictyon Agardhianum Decsne.

Alg. Mauritius, I, p. 25.

An undetermined small specimen of this species is present in JADIN'S collection.

Mauritius: 1890, but without locality, JADIN no. 481.

Fam. 4. *Cladophoraceae*.

Cladophora Kütz.

1. *Cladophora Hauckii* nov. combin.

Cladophora fracta Kütz., f. *marina* Hauck, Meeresalgen, 1885, p. 461. HAMEL, G., Quelques *Cladophora* des Côtes Françaises, 1930, p. 14. — *Cladophora heteronema* Brand, Anheftung der Cladophoraceen, 1904, p. 177.

In JADIN'S collection a small specimen of a *Cladophora* occurs which seems to agree quite well with the description which HAUCK, l. c. has given of a plant which he calls *Cladophora fracta, marina*. But as was later pointed out by BRAND (l. c.), LYNGBYE in Tentamen 1819, p. 152 described a forma *marina* of *Cladophora fracta*, and as HAUCK'S name for the plant therefore cannot be used, BRAND alters the name to *Cladophora heteronema*, taking as the specific name for the species the first of the many synonyms mentioned by HAUCK. Meanwhile HAMEL (1930, p. 14) having been able to examine two authentic specimens of *Conferva heteronema* C. Ag. points out that AGARDH'S specimens, as supposed by BRAND, have nothing to do with *Cladophora fracta*, being, according to HAMEL, referable to *Cl. ramulosa*. Because of this the plant of which HAUCK l. c. has given a description, and to which he, to be sure besides several other synonyms, also referred *Conferva heteronema*, cannot, as done by BRAND, be named *Cladophora heteronema*. HAMEL therefore retains the name HAUCK gave the plant, pointing out at the same time that it is better to wait with any alteration of the name until the study of the *Cladophoras* has become more advanced.

Even if in a way I agree with HAMEL'S point of view I nevertheless think it would be more suitable instead of using HAUCK'S name, which must be rejected, to give this *Cladophora* a new

name; and I propose it should be called *Cladophora Hauckii*, based as it is upon HAUCK's description.

As mentioned above, the small specimen in JADIN's collection answers very well to HAUCK's description and likewise to several of the figures of KÜTZING in "Tabulae Phycologicae" of species referred by HAUCK as synonyms to this species.

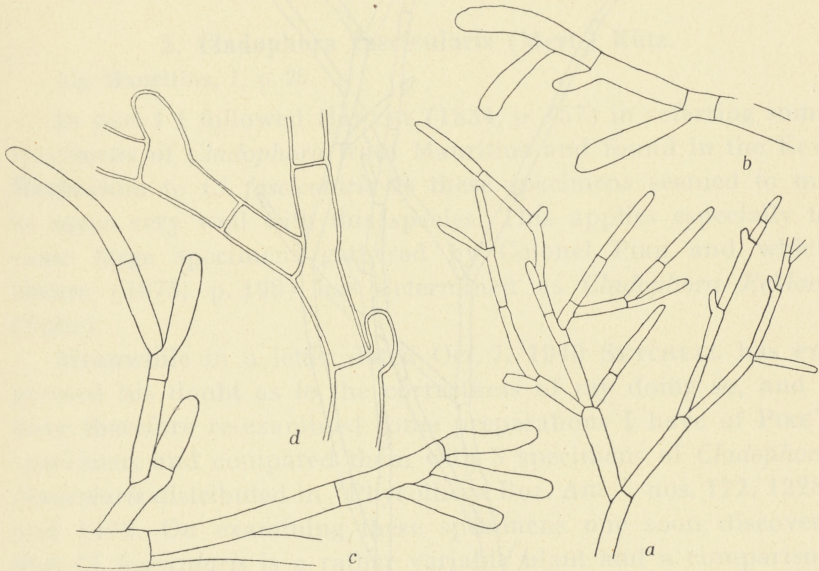


Fig. 6. *Cladophora Hauckii* nov. combin. Fragments of the thallus. (*a* $\times 15$; *b, c* $\times 30$; *d* $\times 70$).

The specimen has a yellowish-green colour and, as stated above, is small, about 2 cm high. Fig. 6 shows some parts of the thallus. The ramification is irregular, branches and branchlets being given out in all directions with a longer or shorter distance between them. And what adds to the irregularity is that the side-branches often push the main axis aside, growing out in the direction of this; compare Fig. 6 *d*.

The cells give out one or two sometimes also more branches from their upper ends (Fig. 6 *c*); in the upper parts of the thallus the filaments are often unbranched. The cells are of rather variable length, from short ones not much longer than the breadth, up to about 250 μ or even longer. Near the base the cells are up to about 150 μ thick, decreasing slowly upwards to 20 μ or a little more.

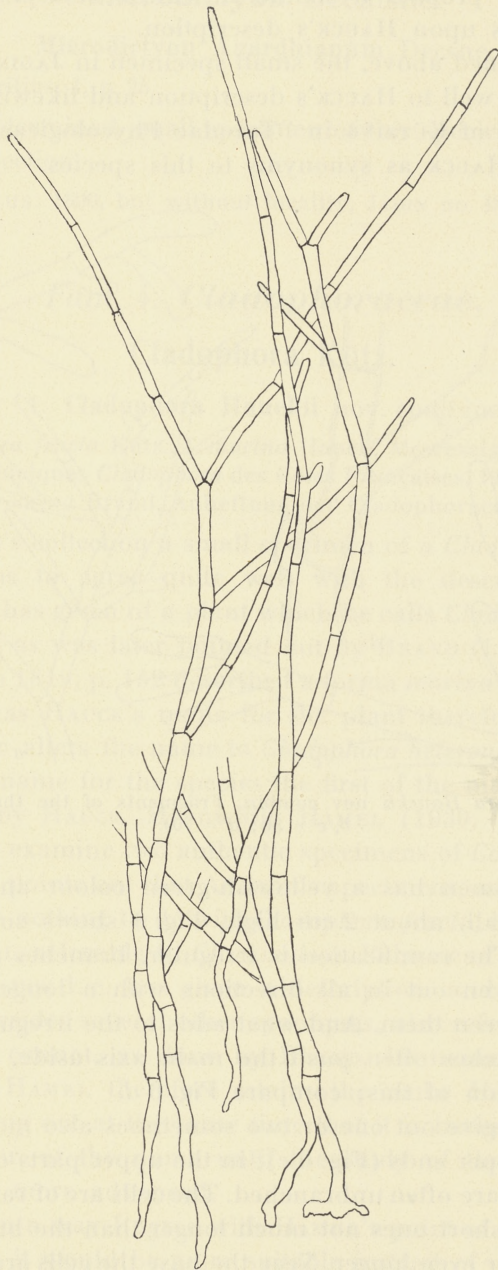


Fig. 7. *Cladophora Hauckii* nov. combin. Base of the specimen. (\times about 15)

The base consists of a plexus of rhizoids growing out from the lowermost cells in thallus (Fig. 7).

In his list, p. 156, JADIN calls the plant *Cladophora luteola* Crouan. About its habitat he writes: "Dans des bassins creusés dans les rochers où les eaux croupissent".

Mauritius: Flacq, July 1890, JADIN 306.

Geogr. Distr.: Most probably widespread.

2. *Cladophora fascicularis* (Mert.) Kütz.

Alg. Mauritius, I, p. 25.

In part I I followed HARVEY (1834, p. 157) in referring some specimens of *Cladophora* from Mauritius and found in the Kew Herbarium to *Cl. fascicularis* as these specimens seemed to me to agree very well with this species. This applies especially to some large specimens gathered by Colonel PIKE and which DICKIE (1875, p. 199) has determined as *Cladophora Eckloni* (Suhr).

Meanwhile in a letter dated Oct. 7, 1940 SETCHELL has expressed his doubt as to the correctness of my doing so, and I have therefore re-examined some preparations I have of PIKE's specimens and compared them with 3 specimens of *Cladophora fascicularis* distributed in "Phycotheca Bor. Am.", nos. 122, 1228, and 1472. On examining these specimens one soon discovers that *Cl. fascicularis* is a rather variable plant and a comparison of PIKE's specimens from Mauritius with the West Indian plants makes it clear, at any rate in my opinion, that the Mauritian specimens are very like those from the West Indies, so I think it justifiable, at any rate for the present, to refer them to this species until more material is available for examination. The accompanying figures Fig. 8 *a* and *b* show some branchlets of PIKE's specimens, and for comparison two branchlets of *Cl. fascicularis* of the abovementioned specimens nos. 122 (Fig. 8 *c*) and 1228 (Fig. 8 *d*) of Phycotheca are added; the likeness is unmistakable.

In his letter SETCHELL also hints that *Cladophora mauritiana* Kütz. should be taken into consideration in this connection, a species which KÜTZING has based upon a specimen received from HARVEY, collected by Mrs. TELFAIR in Mauritius and determined as *Cladophora fascicularis* by HARVEY. About this species of

KÜTZING SETCHELL points out in "Tahitian Algae", 1926, p. 75 that it is characterized by the "ultimate ramelli, suddenly reduced

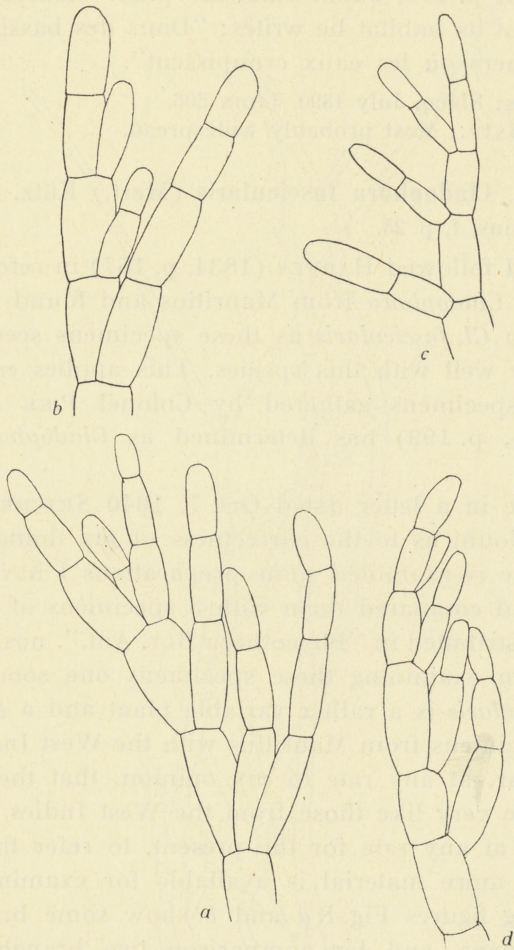


Fig. 8. *Cladophora fascicularis* (Mert.) Kütz. *a, b*, branchlets of a specimen from Mauritius; *c, d*, branchlets of specimens from the West Indies. (*a, b* $\times 55$; *c, d* $\times 45$).

and about 35μ in diameter". In opposition to this BRAND (1904, p. 180), when describing the var. *ungulata* of *Cladophora mauritiana* Kütz. says about this variety: "Differt a specie ramellis terminalibus subito ad 40 (raro 30) μ attenuatis", while according to BRAND the main species does not taper essentially upwards

and in this respect BRAND refers to KÜTZING's figure in Tab. Phyc., vol. IV, pl. 12 and to a specimen in MARTENS's Herbarium in the Botanical Museum, Berlin. It was therefore of great interest to me, by the kindness of Dr. COTTON, to be able to examine a fragment of a cotype-specimen of *Cl. mauritiana* of Mrs. TELFAIR's collection preserved in the herbarium of Kew. From this

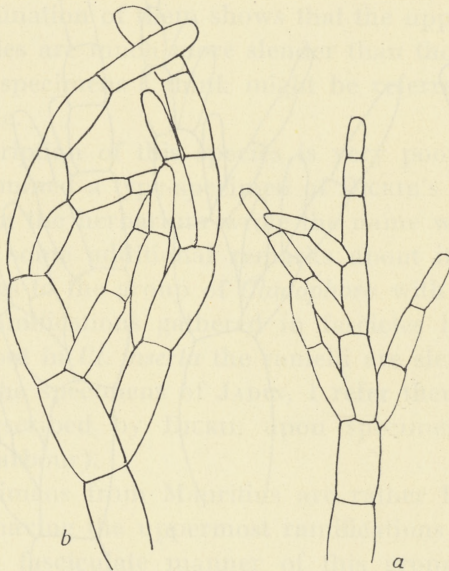


Fig. 9. Branchlets of a cotype specimen of *Cladophora mauritiana* Kütz. preserved in the Herbarium of Kew. ($\times 60$).

examination it became obvious that the pinnules in this specimen do not taper in a striking manner upwards. Figs. 9 *a* and *b* show two branchlets from this specimen; the pinnules in Fig. 9 *a* are rather slender, about 40μ broad, reminding one of those in *Cladophora inserta*; those in Fig. 7 *b* are broader, about 60μ , resembling those of *Clad. fascicularis*.

About *Clad. mauritiana* Kütz. I wrote in part I. that the specimen upon which KÜTZING based his description must be presumed to be a small and badly developed plant and this is shown not only by his description in "Species Algarum", where the plant is said to be "humilis" and his figure in "Tabulae", but the examination of the fragment from the Kew Herbarium makes

it evident also that the specimen is much shrivelled and unfit for examination.

In JADIN'S collection a single small specimen (no. 231) is found in which most of the branchlets by far are like that reproduced in Fig. 10 *a*, being thus referable to *Cl. fascicularis*

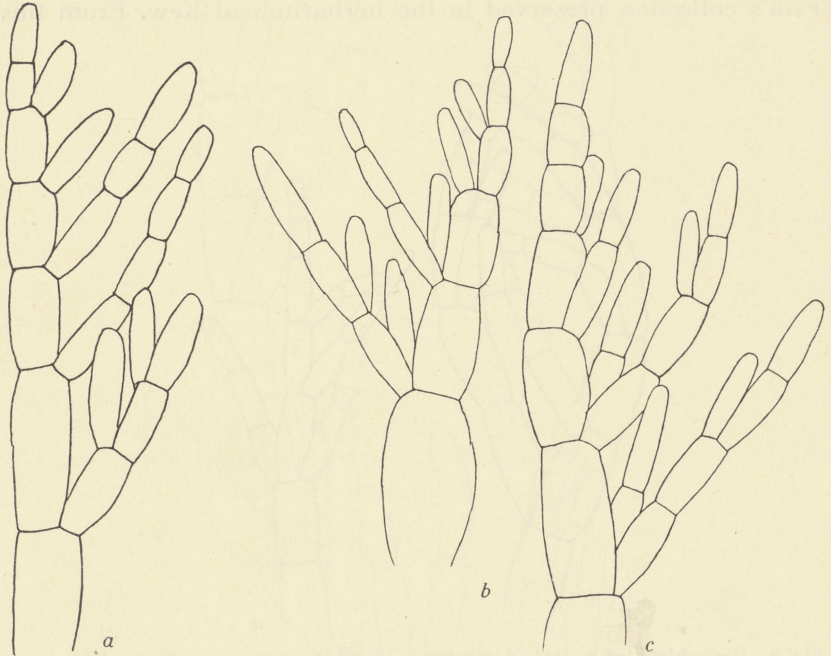


Fig. 10. *Cladophora fascicularis* (Mert.) Kütz. Branchlets from a specimen collected by JADIN. Compare the text. (*a* \times 110; *b*, *c* \times 90).

according to my view. But in rare cases, I have seen only the two represented in Figs. 10 *b*, *c*, the pinnules in the branchlets tapered a good deal towards their summits thus coming near to SETCHELL'S description of those of *Cl. mauritiana*.

This is all that I have been able to observe as to the questionable species of KÜTZING, new well preserved material to be compared with the typical material being necessary to solve the question whether or not this species is to be maintained.

In JADIN'S list *Cladophora fascicularis* (no. 231) is mentioned p. 156. About its habitat he writes: "Sur les rochers et des coraux ensablés dans les eaux calmes affleurant a marée basse".

Mauritius: Flacq, July 1890, JADIN no. 231.

3. *Cladophora inserta* Dickie.

DICKIE in Journal Linnean Soc. Bot., Vol. 15, London 1877, p. 454.
SETCHELL, V. A., Tahitian Algae, 1926, p. 75.

f. *typica* Setchell, l. c.

In JADIN'S collection several specimens occur which as to their habit have a great likeness to *Cladophora fascicularis* (Fig. 11). But an examination of them shows that the uppermost filaments in the fascicles are much more slender than those of *Cl. fascicularis*. These specimens I think might be referred to *Cladophora inserta* Dickie.

The description of this species is very poor but SETCHELL, who has examined a type-specimen of DICKIE'S plant and found that DICKIE in the herbarium wrote the name with a "c", offers (l. c., p. 75) some additional remarks about it. He points out that it belongs to the group of *Cladophora* with zigzag axes and the upper ramifications gathered in fascicles like those of *Cl. fascicularis*, but in *Cl. inserta* the ramelli are slender. This being the case in the specimens of JADIN, I refer them to this species originally described by DICKIE upon specimens from Samoa (Honolulu harbour).

The specimens from Mauritius are rather large up to 16—17 cm high having the uppermost ramifications arranged in the characteristic fasciculate manner of this group of *Cladophora* (Fig. 11). The accompanying figures (Fig. 12) show the ramuli of the specimens. It is seen that the branchlets and ramuli in the fascicles are obliquely upward-directed, all the branchlets and ramuli issuing at acute angles and being unilaterally placed especially in the uppermost parts. And the cells of the ramuli are 6—8 times longer than the breadth, which is about 20—30 μ rarely up to 35 μ . A comparison with *Cl. fascicularis* gives as the essential differences that the ramuli and pinnae in this species are thicker, composed of proportionally shorter cells, and furthermore that the ramification in the West Indian plant is somewhat more irregular.

In a small specimen of JADIN (no. 314) the base was retained (Fig. 12 c). It consists of an irregularly shaped disc. Several specimens were densely aggregated. The basal cells were about 230 μ thick and the cells very long, up to 2 mm.

Some years ago SETCHELL sent me some material of a *Clado-*



Fig. 11. *Cladophora inserta* Dickie. Habit of a specimen of JADIN'S collection.
Natural size.

phora from Tahiti referred by him to *Cl. inserta*. Even if the habit of this plant is rather different from that of the specimens from Mauritius, the shape of the pinnae is very much alike in both plants.

Cl. Savoena Reinb. (1905, p. 146 and 1913, p. 81) seems to

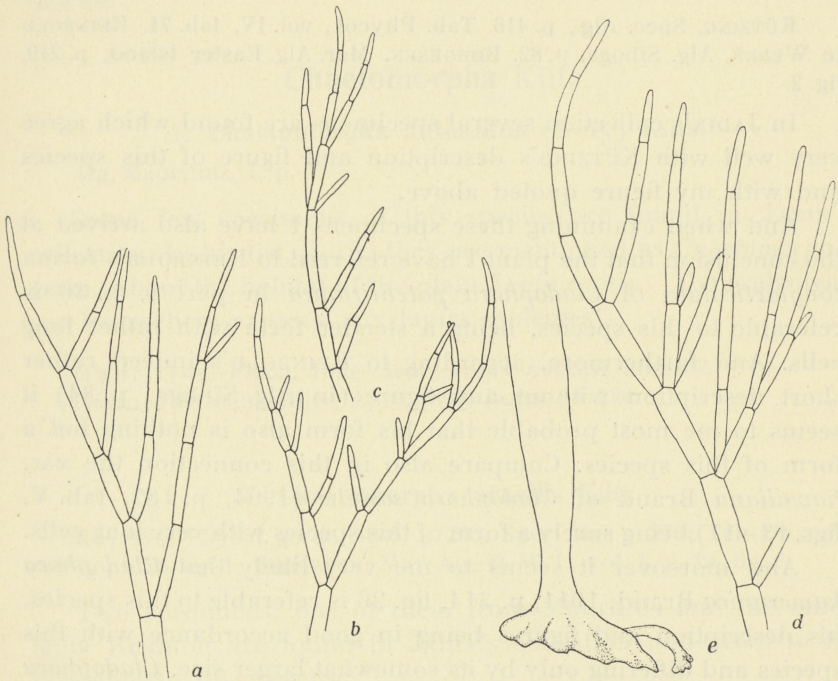


Fig. 12. *Cladophora inserta* Dickie. a, b, c, d, branchlets from different specimens. e, base of a small plant. (a, b, c, d $\times 35$; e \times about 75).

be related to this species. The description of the species is poor and without figures but REINBOLD refers to *Cl. cristata* Kütz., Tab. Phycol., vol. IV, pl. 25 as having a similar habit and to *Cl. fascicularis* (Mert.) Kütz., pointing out that this is much more robust. The ramuli of *Cl. Savoena* having a breadth of only 12—20 μ are, however, thinner than those of *Cl. inserta*.

JADIN in his list p. 156 refers his specimens (I have seen only no. 307) to *Cladophora fascicularis* Kütz. About their habitat he writes: "Sur des rochers et des coraux ensablés dans les eaux calmes affleurant à marée basse".

Mauritius: Baie du Tombeau, July 1890, JADIN no. 307. Besides there is found in JADIN's collection a specimen, no. 256, not mentioned in his list and some few specimens cast ashore and without number. Geogr. Distr.: Honolulu, Tahiti.

4. *Cladophora (Aegagropila) socialis* Kütz.

KÜTZING, Spec. Alg., p. 416. Tab. Phycol., vol. IV, tab. 71. REINBOLD in WEBER, Alg. Siboga, p. 82. BØRGESEN, Mar. Alg. Easter Island, p. 249, fig. 2.

In JADIN's collection several specimens are found which agree very well with KÜTZING's description and figure of this species and with my figure quoted above.

And when examining these specimens I have also arrived at the conclusion that the plant I have referred to REINBOLD's forma *longiarticulata* of *Cladophora patentiramea* in part I, p. 36 is referable to this species, being a slender form with rather long cells. And furthermore, according to REINBOLD's indeed rather short description without any figure (in Alg. Siboga, p. 84) it seems to me most probable that his form also is nothing but a form of this species. Compare also in this connection the var. *hawaiiiana* Brand of *Cladophora socialis* (1904, p. 182, tab. V, figs. 13—17) being surely a form of this species with very long cells.

And moreover it seems to me very likely that *Cladophora kamerunica* Brand, 1911, p. 314, fig. 26 is referable to this species, his description and figures being in good accordance with this species and differing only by its somewhat larger size. *Cladophora socialis* is surely a very variable plant, very changeable according to the external conditions.

As to the specimens in JADIN's collection these, as stated above, are good in accordance with KÜTZING's and my figures. The cells in the thallus have a rather variable size, being from 60 μ up to about 130 μ thick in rare cases. The cells are mostly 5—7 times longer than the breadth but longer ones are often met with, and in the form I formerly referred to REINBOLD's plant they were even 16 times the breadth. And as to his var. *hawaiiiana* BRAND says that the cells have a length from 8 to 20 times the breadth.

According to two of the specimens in JADIN's collection this species is called in his list p. 155 *Cladophora repens* Ag. var.

Columbensis Grunow. About its habitat JADIN writes: "Très abondant, formant de grosses touffes vertes sur les rochers et sur les blocs de coraux dans les lagunes".

Mauritius: Flacq, July to Oct. 1890, JADIN nos. 219 and 497.

Geogr. Distr.: Tahiti, Malayan Archipelago, Easter Island, Mauritius etc.

Chaetomorpha Kütz.

1. *Chaetomorpha antennina* (Bory) Kütz.

Alg. Mauritius, I, p. 37.

Some few specimens of this species are found in JADIN's collection. In his list, p. 155 they are mentioned as *Chaetomorpha aerea*. About the habitat of the plant JADIN writes: "Généralement sur les rochers exposés aux lames violentes".

Mauritius: Flacq, June—Sept., JADIN nos. 211 and 452.

Réunion: Saint-Gilles, April 1890, JADIN no. 124.

2. *Chaetomorpha gracilis* Kütz.

KÜTZING, Phycol. germ., 1845, p. 203; Spec. Alg., p. 276; Tab. Phycol., vol. 3, pl. 52, fig. 1. BØRGESSEN, Mar. Alg. D. W. I., vol. I, p. 19, fig. 6.

Two specimens, one of them from Mauritius and the other from Réunion are found in JADIN's collection and seem to be referable to this species.

The much entangled filaments form a spongy mass and have a light-green colour. In no. 116 filaments of *Rhizoclonium Kockianum* are intermingled.

The filaments of the mauritian specimens have a breadth of from 38 to 70 μ or little more, and the length of the cells is from $1\frac{1}{2}$ —3 times the breadth.

The specimen from Réunion, no. 116, is referred in JADIN's list p. 156 to *Rhizoclonium tortuosum* Kütz. About its habitat JADIN writes: "Sur d'autres Algues ensablées formant une sorte de réseau vert à leur sommet".

Mauritius: Without locality, April 1890, JADIN no. 130.

Réunion: Without locality, 1890, JADIN no. 116.

Geogr. Distr.: Mediterranean Sea. West Indies.

3. *Chaetomorpha Linum* (Mueller) Kütz.

KÜTZING, *Phycol. germanica*, 1845, p. 204; *Spec. alg.*, p. 378; *Tab. Phycol.*, III, tab. 55, fig. 3. For more synonyms compare DE-TONI, *Sylog. Alg.*, Vol. I, p. 269.

Two specimens referable to this species are found in JADIN's collection. The specimens form a very intricate mass of entangled and curved filaments. These have a diameter from about 280—400 μ , and the length of the cells is from $1\frac{1}{2}$ —3 times the breadth, rarely more. The colour is dead-green.

JADIN in his list p. 155 refers it to *Chaetomorpha intestinalis* Kütz. About its habitat he writes: "Sur les rochers—ou rejeté sur la plage".

Mauritius: Flacq, July 1890, JADIN no. 243.

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

4. *Chaetomorpha natalensis* (Hering) De-Toni.

Alg. Mauritius, I, p. 42.

In JADIN's collection there is a large specimen, most probably taken from a floating mass, which I think referable to this species.

The filaments are from 60—80 μ broad, nearly cylindrical and only very little or not at all narrowed at the cross-walls, thus in this way differing from the few filaments upon which the description and figure was based in part I. The colour of the filaments was dark brownish-green.

This specimen agrees quite well with LEVRING's figures (1938, p. 7, fig. 3 *F—I*), but while LEVRING's plant was light green this, as said above, had a brownish dark-green colour.

Mauritius: Without locality, DARUTY 1892 in herb. JADIN.

Geogr. Distr.: Port Natal, Mauritius.

Rhizoclonium Kütz.

Rhizoclonium Kockianum Kütz.

KÜTZING, *Phycologia germ.*, 1845, p. 206. STOCKMAYER, *Rhizoclonium* 1890, p. 582.

Entangled among *Chaetomorpha gracilis*, filaments of this species occurred in a specimen in JADIN's collection. The filaments had a breadth of about 12 μ and the length of the cells was about $1\frac{1}{2}$ —2 times the breadth.

Réunion: Without locality, 1890, JADIN no. 116.
Geogr. Distr.: Mediterranean Sea, West Indies etc.

2. *Rhizoclonium grande* Børgs.

BØRGESSEN, F., Alg. Bombay, 1935, p. 14, figs. 5–6.

In JADIN's collection there occurs a big *Rhizoclonium* from Réunion which as to the shape of the filaments etc. agrees very well with the plant from Bombay. Only the breadth of the filaments is even greater, ranging between 450–550 μ . The walls in the specimen from Réunion are from 30–40 μ thick and stratified, even if the stratification is not so marked as in the plant from Bombay. As was the case in the latter plant, the filaments in the plant from Réunion are in most cases short, composed of few cells only, but by means of the numerous vigorous rhizoid-like branchlets they are firmly fixed to each other.

Réunion: Without locality, 1890, JADIN no. 75.
Geogr. Distr.: Bombay.

Dasycladales.

Fam. 1. *Dasycladaceae*.

Neomeris Lamouroux.

1. *Neomeris van Bosseae* Howe.

HOWE, M. A., Phycological Studies IV. 1909, p. 80, pl. I, figs. 4, 7; pl. V, figs. 17–19, where synonyms and more literature is mentioned. GILBERT, W. J., The Dasycladaceæ, 1943, p. 17.

JADIN's collection contains 2–3 small specimens of a *Neomeris* from Réunion which I of course at first presumed to be *N. annulata* Dickie, Mauritius being the type-locality of this species, which is the only hitherto known species from the Mascarene Islands, but after examination of the sparse material they turned out to be *Neomeris van Bosseae* Howe.

The largest specimen of the three small plants is about 16 mm long and 2.6 mm broad, thus a little more than the minimum size of this species according to HOWE. *N. van Bosseae* is closely related to *N. dumetosa* both species having the mutually free gametangia

incrusted in a thick coat of chalk. According to HOWE the main difference between the two species is that the primary branchlets, in both species more or less incrusted with chalk, in *N. dumetosa* are solidly connected with the neighbouring filaments and thus form shorter or longer very characteristic collar-like rings¹, whereas in *N. van Bosseae* they are either mutually free or if somewhat connected are easily separable. This being the case with the specimens from Réunion I have referred them to this species.

According to SVEDELIUS's study (1924, p. 25) on the geographical distribution of the 6 known species of *Neomeris*, *N. van Bosseae* is widely distributed in the Malayan Archipelago and furthermore found at the Friendly Islands. By its occurrence at the Mascarene Islands the area of distribution of this species has now become much enlarged in a westerly direction.

JADIN in his list, p. 158, refers the specimens to *N. dumetosa* Lamour. About its habitat he writes: "Sur fond de sable, toujours recouvert par l'eau à marée basse".

Réunion: Saint-Gilles, April 1890, JADIN no. 197.

Geogr. Distr.: Malayan Archipelago, Friendly Islands, Tahiti, Hawaii.

Bornetella Munier-Chalmas.

1. **Bornetella nitida** (Harv.) Munier-Chalmas.

MUNIER-CHALMAS, Observations, 1877, p. 814. CRAMER, C., *Neomeris* und *Bornetella*, 1890, p. 22. SOLMS LAUBACH, *Cymopolia*, *Neomeris* und *Bornetella*, 1893, p. 81.

In JADIN's collection some few small specimens of this species are found. The specimens have a length of about $1\frac{1}{2}$ cm and a breadth of $4-5\frac{1}{2}$ mm, they are bleached, yellow-whitish with a smooth and shining surface. Their size is thus somewhat smaller than is usually the case, but an examination of the specimens have shown that they agree well with CRAMER's detailed description and figures and likewise with that of SOLMS. One or two gametangia are borne laterally upon each of the primary branchlets, the essential character distinguishing *Bornetella* from *Neomeris*. The gametangia contain a large number of cysts, about 50, ac-

¹ Compare HOWE's figures, pl. 6, figs. 1-2 in his paper quoted above.

ording to CRAMER from 24—67. They are ball-shaped with a thick and ornamented wall (compare CRAMER's fig. 16) and with a diameter about $65\ \mu$ long.

As this species has been found at Mauritius its area of distribution has been much enlarged in a westerly direction.

Mauritius: Collected at the island in 1890 by JADIN but without locality.

Geogr. Distr.: Friendly Islands, Australia, Malayan Archipelago.

Acetabularia Lamouroux.

1. *Acetabularia Caliculus* Quoi et Gaimard.

QUOI et GAIMARD, Voyage autour du Monde etc., Paris 1924, p. 621, pl. 90, figs. 6—7. HARVEY, Phycol. Austr., vol. V, pl. 249. SOLMS-LAUBACH, Acetabulariæ, 1895, p. 26. BØRGESEN, Mar. Alg. D. W. I., vol. I, p. 75, figs. 61—65.

A specimen of the plant referred by JARDIN in his list p. 158 to *Acetabularia Caliculus* is found in his collection. An examination of this specimen shows, mentioning only the most essential characters, that the rays, of which about 35 are found in the disc, are rather firmly connected before decalcification and that the apices of the rays are broadly rounded or faintly emarginate. As to the shape of the corona superior it is broadly rounded with two, rarely three hair-scars and the corona inferior has about the same shape with broadly rounded outer ends. This short description of the plant shows that it agrees quite well with the form I have mentioned in my paper quoted above p. 79, fig. 65, a form coming near *Acetabularia Farlowii* Solms, which according to my view belongs to *Acet. Calyculus*.

Concerning the delimitation of this species which I consider to be very variable, including not only *Acet. Farlowii* Solms but also *Acet. Suhrii* Solms, I refer the reader to what is said in my above-quoted paper.

Regarding its habitat JADIN writes: "Cueilli sur des morceaux de coraux enfoncés dans du sable vaseux, en eaux calmes", thus in a locality very similar to that in which it was found in the West Indies.

Mauritius: Rochebois, Aug. 1890, JADIN no. 380.

Geogr. Distr.: Australia, West Indies etc.

Fam. 2. *Bryopsidaceae*.

Bryopsis Lamouroux.

1. *Bryopsis hypnoides* Lamouroux.

LAMOUREUX, J. V. F., Mémoire, 1809, p. 135. AGARDH, J., Till Algern. System. VIII, 1886, p. 27. VICKERS, Phycol. Barbado., 1908, p. 30, pl. 53.

JADIN's collection contains a single rather young specimen. Its base consists of a plexus of decumbent, ramified filaments from which the erect filaments are given out. In their lower part these are divided, issuing side-branches which again in their lower part give out smaller branchlets. These as well as the upper parts of the branches give out ramuli without order in all directions. Lower down the ramuli are often again provided with some few ramuli, higher up they are simple. The plant has a light green colour. The specimen is undetermined and therefore not mentioned in JADIN's list.

Mauritius: Without locality, 1890, JADIN no. 389.

Geogr. Distr.: Mediterranean Sea, West Indies, Pacific coast of America, etc.

2. *Bryopsis Harveyana* J. Ag.

AGARDH, J., Till Algern. System., 5 afd., 1886, p. 22. VICKERS A., Phycol. Barbado., 1908, p. 30, pl. 51. — *Br. plumosa* γ *secunda* Harv., Ner. Bor.-Am., 1857, III, p. 31, pl. 45 A, figs. 1-3.

Of this species a single small specimen from Réunion is found in JADIN's collection. The ramuli in this specimen are given out unilaterally from the rachis, but not as is figured in Mll. VICKER's figures in a single row above each other but in an irregular way in a rather broad belt on one side of the rachis (Fig. 13). An examination of the specimen, no. 60 in VICKER's "Algues de la Barbade" shows that the ramuli are placed in a similar way in this specimen, and the same is the case in the specimen of HARVEY's Friendly Island Algae no. 98, found in the Botanical Museum, Copenhagen.

The plant forms low tufts 2-3 cm high. The erect filaments issue from a plexus of basal decumbent filaments. From the erect filaments ramuli are given out in some cases from near their bases, in some from about the middle. The erect filaments

are about 200—300 μ thick. The ramuli are up to about 3 mm long and 80 μ thick, much narrowed at their base and with a broadly rounded apex.

JADIN in his list, p. 156 calls it *Bryopsis caespitosa* Suhr. About

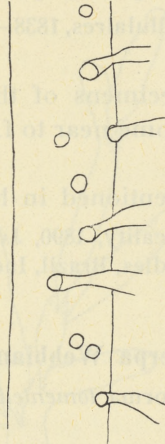


Fig. 13. *Bryopsis Harveyana* J. Ag. A piece of the rachis with the basal parts of the ramuli or scars after these. ($\times 45$).

its habitat he writes: "Dans la lagune, sur fond de sable, en touffe, formant des houppes d'un vert très foncé".

Réunion: Saint-Gilles, April 1890, JADIN no. 117.

Geogr. Distr.: West Indies, Friendly Islands.

Bryopsis spec.

In JADIN's collection a large not very well prepared specimen collected by DARUTY is found. To judge from the specimen the plant seems to have formed a very soft, above nearly slimy, tuft about 10—11 cm high. The rhachis is about 250—350 μ thick; it is naked below and from about the middle clad with ramuli issuing in all directions. The ramuli are about 110—140 μ thick where they are broadest, tapering gradually upwards and ending in an obtuse apex. Most of the ramuli are simple, some of them give out some few ramelli. Because of the soft, slimy consistency the plant adheres closely to the paper and is therefore unfit for examination.

Mauritius: DARUTY 1892 in Herb. JADIN.

Fam. 3. *Caulerpaceae*.

Caulerpa Lamouroux.

1. *Caulerpa fastigiata* Mont.

MONTAGNE, C., *Plantes Cellulaires*, 1838-42, p. 19, pl. 2, fig. 3. WEBER, A., *Monographie*, 1898, p. 262.

Some quite small specimens of this species are present in JADIN's collection. They come near to f. *minor* Weber l. c., p. 263, pl. XX, figs. 1, 2.

This species is not mentioned in his list.

Mauritius: Without locality, 1890, JADIN no. 280.

Geogr. Distr.: West Indies, Brazil, India; seems to be widespread in tropical seas.

2. *Caulerpa Webbiana* Mont.

Alg. Mauritius, I, p. 45, forma *tomentella* (Harv.) Weber, 1898, p. 270, pl. XXI, fig. 4.

Of this species a small specimen of forma *tomentella* Harv. is found in JADIN's collection. In his list p. 157 it is mentioned as *Caulerpa tomentella* Harv.

About its habitat JADIN writes: "Sur les récifs, en touffes vertes, exposées aux lames violentes".

Mauritius: Flacq, Sept. 1890, JADIN no 459.

3. *Caulerpa brachypus* Harv.

HARVEY, W. H., *Characters of new Algae*, 1859, p. 332.

A small collection of algae received from Dr. VAUGHAN in February 1946 contained a fragment of a *Caulerpa* (no. 418) which I take to be a form of this very variable species (Fig. 14).

Only a small piece of the rhizome with a single rhizoid is preserved. From this an about 5 cm high assimilating shoot arises, from the upper part of which a number of proliferations, like or a little narrower than the mother shoot, are given out. These proliferations issue partly from the edges and partly from the plane side of the mother shoot. The leaf-like assimilating shoots are linear-spathulate of shape with cuneate base and broadly rounded tips and the proliferations repeat the shape of the mother

shoot. The last mentioned is about 5 cm long and its breadth is 6—7 mm, the proliferations a little narrower about 3—4 mm. The edge of the assimilating shoots is faintly sinuated and waved and in parts clearly dentated when a little magnified. The teeth

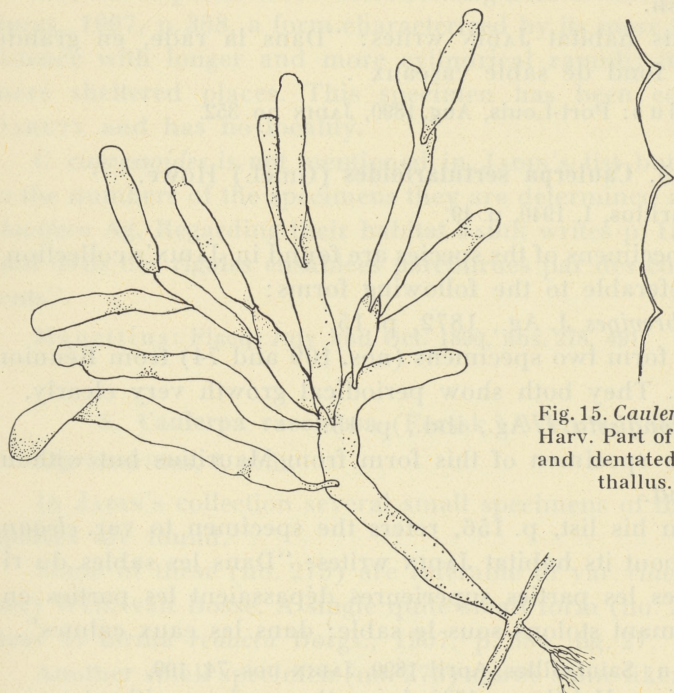


Fig. 15. *Caulerpa brachypus* Harv. Part of the sinuated and dentated edge of the thallus. ($\times 50$).

Fig. 14. *Caulerpa brachypus* Harv. Part of a specimen. About $\frac{2}{3}$ natural size.

(Fig. 15) are sharply pointed and placed at a distance of about 1—2 mm.

As a characteristic feature of the Japanese plant, YENDO 1903, p. 155, 6 points out "the bullation of the short pedicels" and similar swellings are also present in the stipes of the proliferations. Such swellings are not found in the plant from Mauritius, and YENDO, having been able to examine the original specimen of *C. Stahlia* Weber van Bosse, which is a form of this species, did not find it in this specimen either.

Mauritius: Without precise locality and date, Fr. C. NEYROLES.
Geogr. Distr.: Japan, Malayan Archipelago, Java.

4. *Caulerpa scalpelliformis* (R. Br.) Weber.

Alg. Mauritius, I, p. 49.

A fine specimen of this species (forma *denticulata*) is found in JADIN's collection. In his list p. 156 it is named *Caulerpa denticulata* Decsn.

About its habitat JADIN writes: "Dans la rade, en grande prairie sur fond de sable vaseaux".

Mauritius: Port-Louis, Aug. 1890, JADIN no. 352.

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

Alg. Mauritius, I, 1940, p. 49.

Some specimens of this species are found in JADIN's collection; they are referable to the following forms:

forma *brevipes* J. Ag., 1872, p. 15.

Of this form two specimens (nos. 109 and 74) from Réunion are present. They both show periodical growth very clearly.

forma *longiseta* J. Ag., *ibid.*, p. 15.

A single specimen of this form from Mauritius but without no. is found.

JADIN in his list, p. 156, refers the specimen to var. *elegans* Crouan. About its habitat JADIN writes: "Dans les sables du rivages, seules les parties supérieures dépassaient les parties ensablées formant stolons sous le sable; dans les eaux calmes".

Réunion: Saint-Gilles, April 1890, JADIN nos. 74, 109.

Mauritius: Mahébourg 1890, JADIN, the specimen without no.

6. *Caulerpa serrulata* (Forssk.) J. Ag. emd. Borgs.

Alg. Mauritius, I, p. 50.

A fine specimen of this species from Réunion is found in JADIN's collection. In his list p. 156 JADIN uses C. AGARDH's name *C. Freycinetii*.

About its habitat JADIN writes: "Sur fond de sable, toujours couvert par 50 centimètres d'eau à marée basse; dans des eaux calmes à faibles courants".

Réunion: Saint-Gilles, April 1890, JADIN no. 195.

7. *Caulerpa eupressoides* (Vahl.) Ag. Weber emend.

Alg. Mauritius, I, p. 50.

Three small specimens are found in JADIN's collection. Two of them (nos. 278 and 491) are referable to var. *typica*, a form characteristic of exposed localities where they have also been found by JADIN.

The third specimen is a form coming near to var. *plumarioides* Børgs., 1907, p. 368, a form characterized by its more flabby consistence with longer and more cylindrical ramuli; it occurs in more sheltered places. This specimen has been collected by DARUTY and has no locality.

C. cupressoides is not mentioned in JADIN's list but according to the numbers of the specimens they are determined as *Caulerpa clavifera* Ag. Regarding their habitat JADIN writes p. 156: "Croissant dans des rigoles ensablées parcourues par des courants violents".

Mauritius: Flacq, July and Oct. 1890, nos. 278, 491.

8. *Caulerpa racemosa* (Forssk.) Web. v. Bosse.

Alg. Mauritius, I, p. 51.

In JADIN's collection several small specimens of this variable species are found.

Some of these (no. 275) are referable to var. *clavifera* (Turner) Web. van Bosse. A single quite small form (no. 277) comes near to forma *reducta* Børgs., 1907, p. 384, fig. 27.

Another small specimen (no. 273) shows some likeness to var. *occidentalis* (J. Ag.) Børgs., l. c. 1907, p. 379, figs. 28, 29.

And finally a specimen (no. 474) might be a small form of *laetevirens* Mont.

In JADIN's list p. 156 some of the specimens according to the numbers are referred to *Caulerpa clavifera*, some to *Caulerpa peltata*. About the habitat of the first-mentioned species JADIN writes: "Croissant dans les rigoles ensablées parcourues par des courants violents".

Mauritius: Flacq, July 1890, JADIN nos. 273, 275.

9. *Caulerpa peltata* Lamour.

Alg. Mauritius, I, p. 51.

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

Several specimens referable to this variety are found in JADIN's collection.

var. *nummularia* (Harv.) Weber, l. c. p. 376.

Of this variety some specimens are present in JADIN's collection. It is characterized by the fact that no erect assimilators carrying the discformed ramuli are found, all the assimilators taking root and becoming rhizomes from which the discformed ramuli issue directly.

This being so REINKE in "Ueber *Caulerpa*", p. 39 considers this form as a species and SVEDELIUS (1906, p. 132) follows REINKE. But since even a detached assimilator of a *Caulerpa* under suitable conditions may be able to take root and give rise to new rhizomes this form according to my view cannot be maintained as a species; compare my figure of such a case in a detached assimilator of *Caulerpa racemosa* var. *Corynephora*; 1932, p. 61, fig. 4.

In JADIN's list this species is mentioned on p. 156. About its habitat he writes: "Assez commun. Croit dans les rigoles ensablées, soumises à des courants assez violents".

Mauritius: Flacq, July-Aug. 1890, JADIN nos. 258, 279. Mabébourg, Sept. 1890, JADIN no. 449. Pte aux Sables, 26, Febr. 1940, R. E. V. no. 388 (var. *nummularia*).

Fam. 4. *Codiaceae*.

Avrainvillea Decsne.

1. *Avrainvillea* spec.

A single small specimen of an *Avrainvillea* is present in JADIN's collection. According to its number, 410, it is the one of the specimens referred in JADIN's list p. 157 to *Udotea flabellata*, the other one being *Udotea argentea*.

The specimen (Fig. 16) is two cm high, its stipe reaching a length of a little more than one cm. The fan-shaped thin flabellum is nearly 1½ cm broad, oblong reniform, not zonate, the margin above broadly rounded. The stipe is 1½—2 mm broad, above broadly cuneate, making an even transition in the flabellum.

The filaments in the flabellum are from 12 μ—20 μ thick, toro-

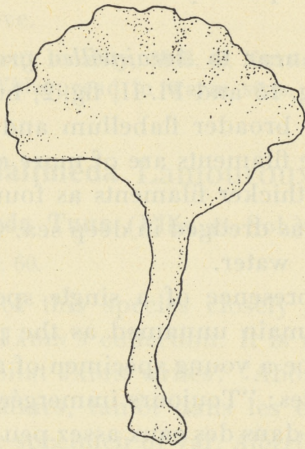


Fig. 16. *Avrainvillea* spec. Habit of the specimen. ($\times 3$).

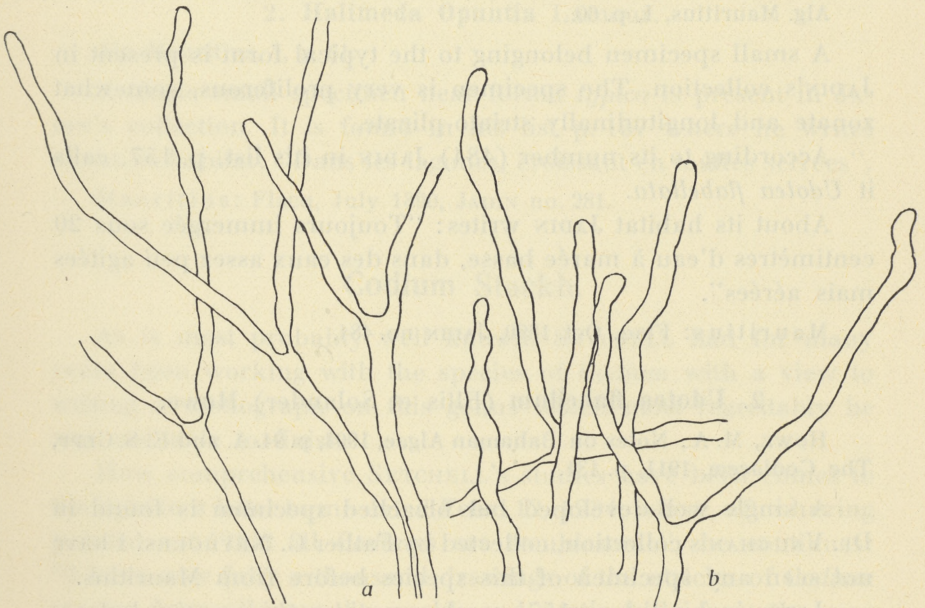


Fig. 17. *Avrainvillea* spec. Filaments of the thallus; *a*, from the interior, *b*, from the surface. ($\times 150$).

lose to moniliform, especially near the surface and margin of the thallus (Fig. 17).

In size it comes near to *Avrainvillea gracillima* Børgs., Alg. Mauritius I, p. 52, fig. 15 and Pl. II, fig. 2, but it differs, in brief, by its proportionally broader flabellum and much broader and stouter stipe. And the filaments are of more even size, not having mixture of thin and thicker filaments as found in *Av. gracillima*. Finally this species was dredged in deep sea, while JADIN collected his plant in shallow water.

Because of the presence of a single specimen only I have preferred to let it remain unnamed as the possibility is not excluded that it might be a young specimen of a larger plant. About its habitat JADIN writes: "Toujours immergée sous 20 centimètres d'eau à marée basse, dans des eaux assez peu agitées mais aérées".

Mauritius: Baie de la Grande Rivière, Sept. 1890, JADIN no. 410.

Udotea Lamouroux.

1. *Udotea argentea* Zan.

Alg. Mauritius, I, p. 60.

A small specimen belonging to the typical form is present in JADIN's collection. The specimen is very proliferous, somewhat zonate and longitudinally striato-plicate.

According to its number (484) JADIN in his list, p. 157, calls it *Udotea flabellata*.

About its habitat JADIN writes: "Toujours immergée sous 20 centimètres d'eau à marée basse, dans des eaux assez peu agitées mais aérées".

Mauritius: Flaq, Oct. 1890, JADIN no. 484.

2. *Udotea flabellum* (Ellis et Solander) Howe.

HOWE, M. A., Notes on Bahaman Algae, 1904, p. 94. A. and E. S. GEPP, The Codiaceæ, 1911, p. 131.

A single well-developed but bleached specimen is found in Dr. VAUGHAN's collection, collected by Father C. NEYROLES. I have not seen any specimen of this species before from Mauritius.

JADIN in his list, p. 157, surely mentions this species but according to his specimens the one no. 484 is, as said above, *Udotea*

argentea and the other one no. 410 is the *Avrainvella* spec. likewise mentioned above.

Mauritius: Without locality, 1843, C. NEYROLES no. 480.

Geogr. Distr.: Widespread in warm seas.

Halimeda Lamouroux.

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

Alg. Mauritius, I, p. 60.

Two specimens of this species closely resembling the var. *typica* are found in JADIN's collection. It is mentioned in his list p. 157. About its habitat JADIN writes: "Abondant, croissant tantôt dans les eaux calmes, tantôt dans les eaux agitées".

In addition a fine specimen of var. *Albertisii* Piccone collected by C. NEYROLES is found in a collection of algae belonging to the Mauritius Institute and Public Museum.

Mauritius: Flacq, July 1890, JADIN no. 206.

Réunion: Saint-Gilles, April 1896, JADIN no. 66.

2. *Halimeda Opuntia* Lamour.

Alg. Mauritius, I, p. 61.

A single small specimen near forma *typica* is present in JADIN's collection. It is found in his list p. 157 where he writes about its habitat: "Dans les lagunes, croissant en touffes serrées".

Mauritius: Flacq, July 1890, JADIN no. 281.

Codium Stackh.

As is most probably well known, SETCHELL had for many years been working with the species of *Codium* with a view to writing a monograph on this genus which most regrettably he was not able to finish.

How comprehensive SETCHELL's studies have been comes to the light in a letter to me dated Febr. 12, 1934, where, after having pointed out "that all *Codiums* are troublesome", he continues: "I have now fully a thousand drawings of the utricles of *Codium* species from all over the world, and particularly from the very extensive collection at Kew. These drawings have been made to

scale, and very carefully, and have been dissected out, at least as far as the compound utricles are concerned, and represent a very valuable aid to the study of *Codium* utricles and *Codium* species".

The difficulty about the limitation of the species of *Codium* is that there are so few stable characters to rely on. The characters are derived from the shape and structure of the thallus and from the shape and size of the vesicles and the gametangia; but the gametangia are very much alike in all the species, and as far as the vesicles are concerned, these are often very variable even in the same specimen, both as to shape and size.

To begin with when comparatively few species were known only, it was not so troublesome, but gradually as the number of species has increased it has been more and more difficult to keep the species separated. This SETCHELL also points out time after time in his letters to me.

Together with the shape of the thallus as to specific characters SETCHELL laid very much stress upon the shape of the vesicles. But in a newly edited work by E. Y. DAWSON, *The marine Algae of the Gulf of California*, this author points out that he "considers utricule shape-characters of secondary importance in distinguishing the species at hand, for considerable variation due to age and habitat may occur in the same plant". To be able to determine the species of this genus a rich material of each species of various ages and dried specimens as well as some preserved in alcohol or other suitable fluids is necessary. By means of such material DAWSON in his above-mentioned paper has been able to reduce the 11 species of *Codium* mentioned by SETCHELL & GARDNER in their paper on the algae of the Californian Gulf to 6 species.

During his stay at Kew some years ago SETCHELL, as said above, went through the whole large collection of *Codium* kept in the herbarium and, according to kind information from Miss DICKINSON at the algal herbarium, has left there profuse annotations in which together with the hitherto known species more than 90 species of *Codium* are enumerated.

The following more or less revised account of the species of *Codium* from Mauritius is primarily based upon various new material received after the first part was published but also takes account of observations in letters from SETCHELL.

1. *Codium arabicum* Kütz.

Alg. Mauritius, I, p. 61.

A single dried specimen (no. 378) of this species is found in JADIN's collection. The habit of the thallus is in good accordance with KÜTZING's figures *a* and *b* and the structure of the thallus also seems to accord quite well with SCHMIDT's description (1923, p. 30) of specimens from Madagascar.

Thus the vesicles are most often cylindrical, now and then subclavate. Below the rounded or nearly flat apex the vesicles are often narrowed, forming a capitalum above. The wall in the summits of the vesicles is thin, rarely up to $4\ \mu$ thick. The vesicles are closely connected, being ramified below. Scars of hairs are not very prominent. As to the size of the vesicles the breadth was from $60\text{--}230\ \mu$ and the length from $350\text{--}660\ \mu$, thus a little shorter than stated by SCHMIDT.

Mauritius: Mahébourg, 1890, JADIN no. 378.

2. *Codium coronatum* Setch.

Alg. Mauritius, I, p. 63.

JADIN's collection contains a small specimen (no. 104) from Réunion which I think is referable to *Codium coronatum* Setch. as it has a lobed thallus like SETCHELL's figures (1926, p. 82, pl. 10, figs. 3—4).

The shape of the vesicles in this specimen is likewise very similar, those of this species being cylindrical to clavate; as to the size of the vesicles it differed somewhat, several of them being somewhat shorter than those of the typical form, reaching only a length of $400\text{--}500\ \mu$, but longer ones were also found, up to $600\ \mu$. Hairs or scars after these are found upon many of the vesicles and often in great numbers. The apical ends of the vesicles are thin in some of them, in some thickened to about $7\ \mu$, and in some of the latter these are dotted.

As is pointed out by SETCHELL, when he describes this species, it is surely closely related to *Codium arabicum*. A character upon which SETCHELL when describing this species laid special stress was the presence of the numerous hairs encircling the vesicles above, and to which the name of the species alludes. But as SETCHELL has later written to me (in a letter dated March 26,

1935): "At that time I was unaware of how frequent this character has been found to be", it is of lesser value as a specific character.

JADIN in his list, p. 157, refers it to *Codium adhaerens* Ag. About its habitat he writes: "Très commun, appliqué contre les rochers, les coraux, sur des moules, etc."

Réunion: Saint-Gilles, April 1890, JADIN no. 104.

Geogr. Distr.: Tahiti, Pilippines to India.

3. *Codium mauritianum* nov. spec.

Codium spongiosum var. *mauritiana* Børgs., Alg. Mauritius, I, p. 68, fig. 23.

Thallus mollis, gelatinosus, supra substratum discum applatum, superficiem sinuatam formans.

Vesiculae plus minus e basi ramosae, anguste cylindricae aut subclavatae, ca. 150—350 μ latae, raro ultra, et ca. 2 mm longae, apicibus plus minus fornicatis, membrana in apice vesicularum tenui aut raro usque ad 19 μ crassa.

Pili adsunt. Filamenta interna ca. 40—80 μ crassa.

Gametangia ignota.

In part I I referred a fragment of a specimen in Dr. VAUGHAN's collection as a variety to *Codium spongiosum* Harv., pointing out that its habit and consistency seemed to be very like that of *C. spongiosum*; on the other hand the shape of the vesicles differed a good deal, for which reason I described it as a variety of this species. Meanwhile SETCHELL in a letter of Oct. 7, 1940 writes to me: "I do not think that I would, myself, refer your Mauritian specimen, even as a variety, to *Codium spongiosum*". When I referred the plant from Mauritius to *C. spongiosum* I also relied on the fact that SCHMIDT in his monograph of the genus *Codium* as to the distribution of this species beyond Australia mentions "Kap", but in LUCAS (1935, p. 202) in which SETCHELL has the main responsibility for the part of the paper dealing with *Codium*, it is said about the distribution of *Codium spongiosum*: "He (SCHMIDT) in his monograph (p. 32) adds a mysterious "Kap" which may mean Cape York"; according to this the distribution of *C. spongiosum* should be restricted to Australia.

Because of the above-mentioned I have now re-examined the

material and find it better to consider the Mauritian plant as a distinct species.

In JADIN's collection a dried specimen of this species is found. It forms a roundish, dark green, very thin, but rather stiff and tough, amorphous crust with a shining surface. This seems to

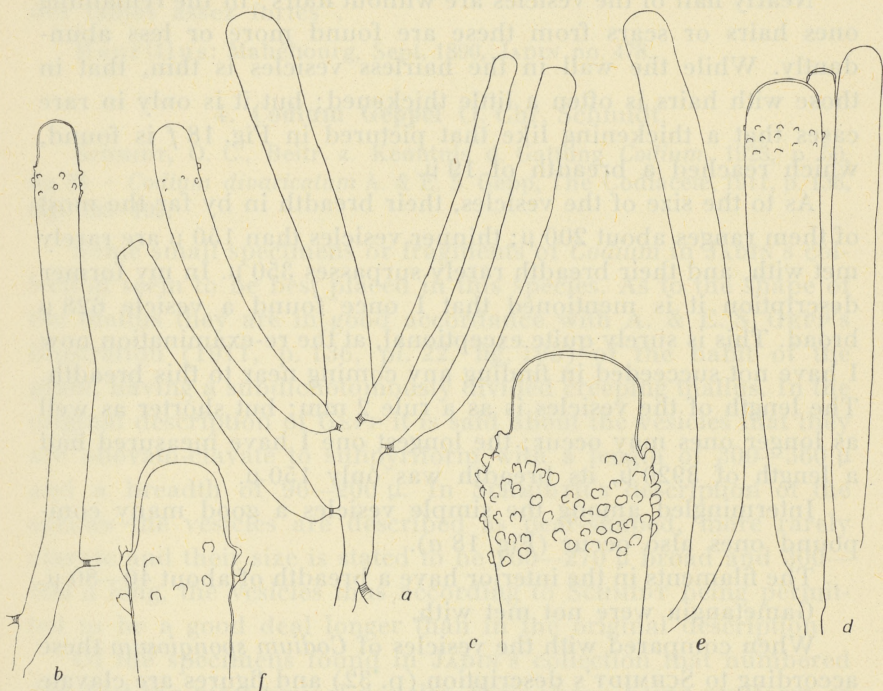


Fig. 18. *Codium mauritianum* nov. spec. a, b, d, e vesicles of different shape, a a compound one. c apical end of a vesicle with numerous scars after hairs; f a vesicle with thick apical wall. (a, b, d, e $\times 35$; c, f $\times 75$).

show that the plant when living has contained much water and slime, in conformity with what is said about it in part I that this species has a very soft and mucilaginous flattened thallus and, as was observable upon Dr. VAUGHAN's material in formol, with roundish foldings.

The habit and the consistency of the thallus is thus very like that of *Codium spongiosum* according to HARVEY's description.

Regarding the vesicles (Fig. 18), on the other hand, these differ a good deal from those of *Codium spongiosum*. The vesicles are nearly cylindrical or taper only very little towards the base.

The apex of the vesicles is vaulted in by far the most of the vesicles, being often nearly semiglobular with thin walls above. The greatest breadth of the vesicles is found just below or at any rate near the apex. Below this a faint narrowing is sometimes present, but any more marked capitulum is rarely found.

Nearly half of the vesicles are without hairs; in the remaining ones hairs or scars from these are found more or less abundantly. While the wall in the hairless vesicles is thin, that in those with hairs is often a little thickened; but it is only in rare cases that a thickening like that pictured in Fig. 18 *f* is found, which reached a breadth of 19 μ .

As to the size of the vesicles, their breadth in by far the most of them ranges about 200 μ ; thinner vesicles than 150 μ are rarely met with, and their breadth rarely surpasses 350 μ . In my former description it is mentioned that I once found a vesicle 628 μ broad. This is surely quite exceptional, at the re-examination now I have not succeeded in finding any coming near to this breadth. The length of the vesicles is as a rule 2 mm; but shorter as well as longer ones may occur; the longest one I have measured had a length of 3920 μ , its breadth was only 150 μ .

Intermingled among the simple vesicles a good many compound ones also occur (Fig. 18 *a*).

The filaments in the interior have a breadth of about 40–80 μ . Gametangia were not met with.

When compared with the vesicles of *Codium spongiosum* these according to SCHMIDT's description (p. 32) and figures are clavate to pearshaped or cylindrical, being in most cases markedly narrowed towards the base. The tips of the vesicles according to SCHMIDT are rather variable, being now much vaulted, now nearly flat, often also with a capitulum above. Regarding the size SCHMIDT says their breadth is 200 to 800 rarely up to about 1000 μ , and their length from 1.5–6 mm long. But according to LUCAS the typical vesicles are 1500 μ long and 160–280 μ broad only, thus much smaller than the size given by SCHMIDT and more like that of *Codium mauritianum*.

The shape of the thallus and size of the vesicles of this species may also show some likeness to *Codium difforme* Kütz. but the tips of the vesicles in this species are often flattened with a thick wall and the size of the vesicles is proportionally smaller; and

to this must be added that the consistency of the thallus in *C. difforme* is not so loose and slimy as is the case in *Codium mauritanum*.

JADIN in his list p. 157 refers his specimen to *Codium difforme*. About its habitat he writes: "Observé à l'île de la Passe, recevant des lames assez fortes".

Mauritius: Mahébourg, Sept. 1890, JADIN no. 478.

4. *Codium Geppii* O. Chr. Schmidt.

SCHMIDT, O. C., Beitr. z. Kenntniss d. Gattung *Codium*, 1923, p. 50, fig. 33. — *Codium divaricatum* A. & E. S. Gepp, The Codiaceæ, 1911, p. 136, figs. 195–199.

Some small specimens or fragments of *Codium* in JADIN's collection seem to be best placed in this species. As to the shape of the thallus they are in good accordance with A. & E. S. GEPP's illustration (1911, p. 136, pl. 22, fig. 195) of the habit of the plant, having a subdichotomously divided creeping thallus. In the original description of GEPP it is said about the vesicles that they are obovato-clavate to subpyriform with a length of 300–360 μ and a breadth of 96–200 μ . In SCHMIDT's description of the species the vesicles are described as pear-shaped, more rarely clavate and their size is stated to be 100–270 μ broad and 300–500 μ long, the vesicles thus according to SCHMIDT being permitted to be a good deal longer than in the original description.

Of the specimens found in JADIN's collection that numbered 495 had the most typical vesicles, their shape being pyriform or broadly clavate with a breadth from 80 to 210 μ and a length from 400 to 500 μ , rarely more; compare Fig. 19. The other specimens in JADIN's collection had proportionally more elongated vesicles. Thus for instance no. 478 b (Fig. 20) had mostly narrow vesicles about 90 to 120 μ broad and about the same length, but shorter and proportionally thicker ones were found also. The apical walls in the vesicles in these specimens were thin, up to 4 μ only. This specimen approaches *Codium taitense* SETCH. (1926, p. 83, pl. 12, figs. 3–4).

And this applies still more to some specimens (no. 413) Dr. VAUGHAN has recently sent me. Fig. 21 shows a sketch of one of the specimens and Fig. 22 some vesicles from this. The vesicles are subcylindrical to subclavate; their length is about 550–650 μ

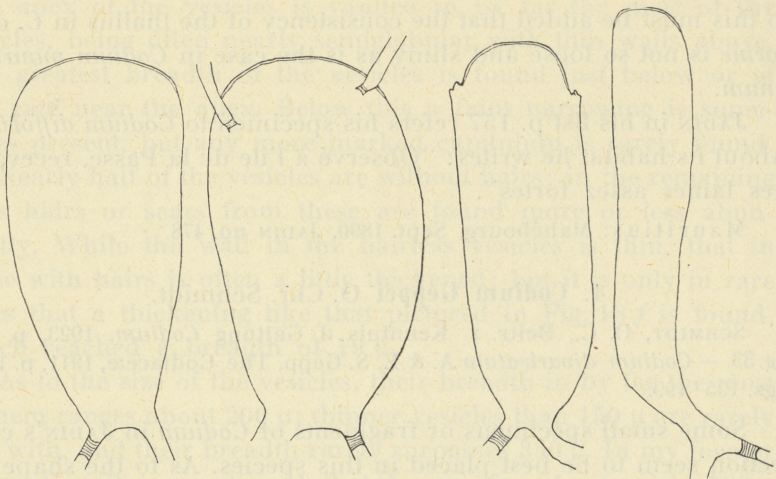


Fig. 19. *Codium Geppii* Schmidt. Different vesicles from JADIN's specimen no. 495.
($\times 115$).

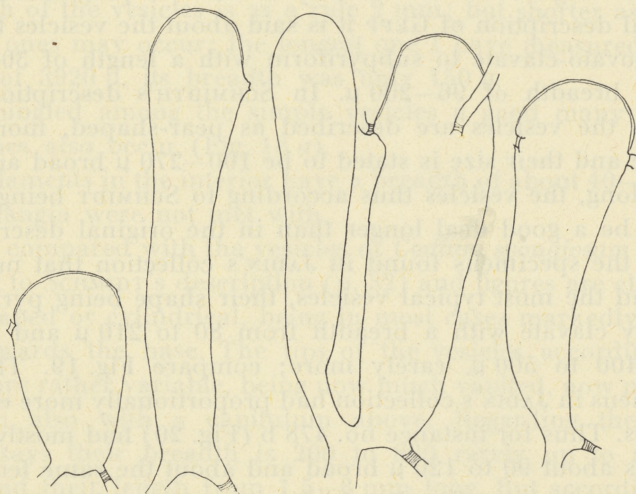


Fig. 20. *Codium Geppii* Schmidt. Some vesicles from JADIN's specimen no. 478 b.
($\times 115$).

and their breadth from 90—200 μ . The apical ends of the vesicles are often much vaulted and umbonate and the membrane up to 11 μ thick. In size and breadth these specimens agree very well with *Codium taitense* Setchell.

But besides the two small species of *Codium* already named,

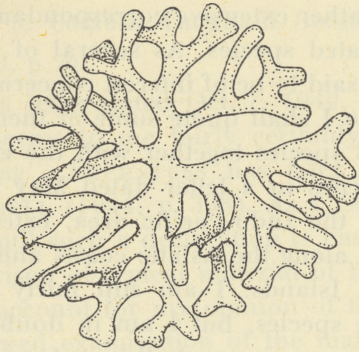


Fig. 21. *Codium Geppii* Schmidt. A form near *C. taitense* Setch. About natural size.

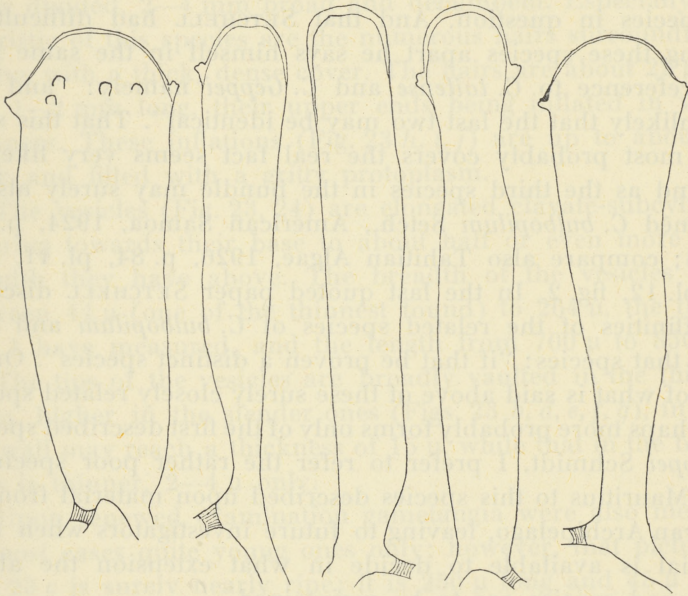


Fig. 22. *Codium Geppii* Schmidt. Vesicles from a specimen coming near to *C. taitense* Setch. ($\times 115$).

with a creeping thallus, namely *Codium Geppii* Schmidt and *C. taitense* Setchell, we might also mention *C. bulbopilum* Setchell (1924, p. 173, fig. 38), to which the specimens from Mauritius might possibly be referred.

In respect of the determination of a *Codium* from Ceylon (no. 6056) referred in my paper (1936, p. 68) to *Codium Geppii*

Schmidt, I had a rather extensive correspondance with SETCHELL about this and related species. As several of the utterances of SETCHELL must be said to be of interest concerning the specimens from Mauritius also I shall quote some of them here. About the above-mentioned 3 species together with the erect *Codium tenue* Kütz. SETCHELL writes in a letter dated May 11, 1937: "These four species cover the Indo-Pacific area, extending from Natal in South Africa up along the Asiatic coasts and across to at least the central Pacific Islands. I am still fairly certain as to the characters of these species, but I am in doubt frequently as to whether a particular specimen shall be referred to one or to the other". This is just the case with the specimens from Mauritius, the shape of the vesicles showing likeness to one or another of the species in question. And that SETCHELL had difficulty in keeping these species apart he says himself in the same letter with reference to *C. taitense* and *C. Geppei* namely: "and it is not unlikely that the last two may be identical". That this statement most probably covers the real fact seems very likely to me, and as the third species in the bundle may surely also be reckoned *C. bulbopilum* Setch., American Samoa, 1924, p. 173, fig. 38; compare also Tahitian Algae, 1926, p. 84, pl. 11, fig. 1 and pl. 12, fig. 2. In the last quoted paper SETCHELL discusses the affinities of the related species of *C. bulbopilum* and adds about that species: "if that be proven a distinct species". On the basis of what is said above of these surely closely related species, or perhaps more probably forms only of the first described species: *C. Geppei* Schmidt, I prefer to refer the rather poor specimens from Mauritius to this species described upon material from the Malayan Archipelago, leaving to future investigators when more material is available to decide in what extension the above-mentioned species are to be maintained.

In JADIN's list, p. 157, his specimens mentioned here, are referred to *Codium tomentosum* Ag. About the habitat of these specimens JADIN writes: "Abondant, croissant aussi bien dans les eaux tranquilles que sur les recifs".

Mauritius: Flacq, Aug. and Oct. 1890, JADIN, nos. 251, 478, 495. Port-Louis, Aug. 1890, JADIN no. 376. Ilôt Barkly near Port-Louis, G. MORIN, Aug. 26, 1943. Herb. R. E. V. no. 413.

Geogr. Distr.: Pacific and Indian Oceans.

5. *Codium Vaughani* Borgs.

Alg. Mauritius, I, p. 70.

SETCHELL in a letter dated Oct. 7, 1940, remarks as to this species "that it seems to me fairly certainly to be the *Codium prostratum* Levring". PAPENFUSS has later accepted this supposition of SETCHELL (1944, p. 338). As I cannot agree in this, at any rate not until such a declaration is based upon real facts, namely a comparison of typical material of both species, I shall in the following account for my opinion of the question, basing this upon a renewed examination of the material of the typical specimen, accompanying the description with some more figures.

As stated in the former description, the thallus is subdichotomously divided, 2—4 mm broad and decumbent. Especially characteristic of this species are the numerous hairs surrounding the thallus with a thick, dense cover. The hairs are about 22 μ thick and 1—2 mm long, their upper ends being inflated in various manners. These inflations (Fig. 23 *h, i, j*) are up to about 60 μ thick and filled with a gritty protoplasm.

The vesicles (Fig. 23, 24) are elongated clavate-subcylindrical, tapering towards their base to about half or even more of the breadth they have above. The breadth of the vesicles ranges between 44 μ (one of the thinnest found) to 264 μ , the thickest one I have measured, and the length from 700 μ to 850 μ .

The tips of the vesicles are broadly vaulted in the thick vesicles, higher in the slender ones (Figs. 23 *b, d, e, f, g*), in which the wall may reach a thickness of 15 μ , while that in the broader ones is thinner, 2—4 μ only.

Upon renewed examination gametangia were also met with, in most cases quite young ones only; however, that pictured in Fig. 23 *c* is surely nearly ripe; it is 250 μ long and 45 μ broad. Several gametangia are often present upon the same vesicle (Fig. 23 *a*); they are developed near the middle of these.

The filaments in the interior of the thallus are about 25—50 μ thick.

Compared with the description and figures of *C. prostratum* Levring rather striking differences must be said to prevail. Thus the vesicles of this species are described as cylindrical and when the figures of LEVRING are considered, this also appears, as of

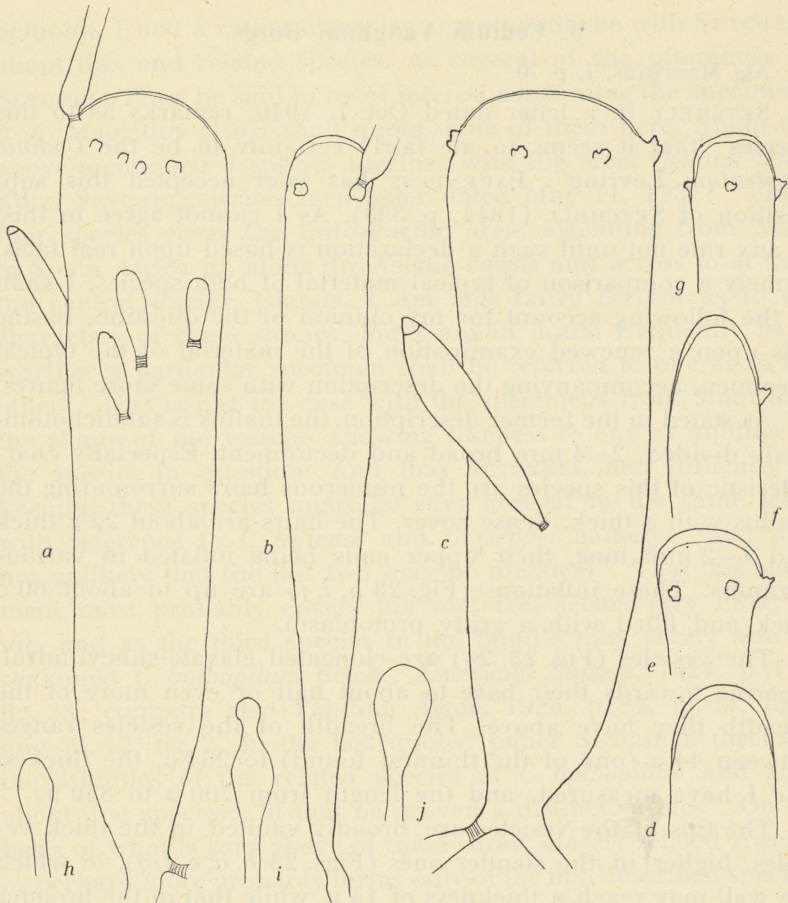


Fig. 23. *Codium Vaughani* Borgs. Some vesicles etc. from the type specimen. *a, b, c* vesicles two of which with gametangia; *d, e, f, g* apical ends of vesicles; *h, i, j* inflated tips of hairs. ($\times 115$).

the 6 vesicles pictured only two taper faintly towards their base, the others being cylindrical. As to the breadth of the vesicles this is said to lie between $75-150 \mu$, thus reaching only half the breadth, as is found in *Codium Vaughani*. And the wall in the tips of the vesicles is said to be thin, as also the more magnified figure *B* of LEVRING shows, while in *C. Vaughani* it is about $2-4 \mu$ thick in the broader vesicles and up to 15μ in the slender ones.

Hairs are said to be present but surely not so abundantly as in *C. Vaughani*, which is also seen from the figures of *C. prostra-*

tum where of 6 vesicles only two have hairs. Essential differences between the two species are thus present.

In JADIN's collection a single small specimen (no. 251) is found, the structure of which agrees very well with the above

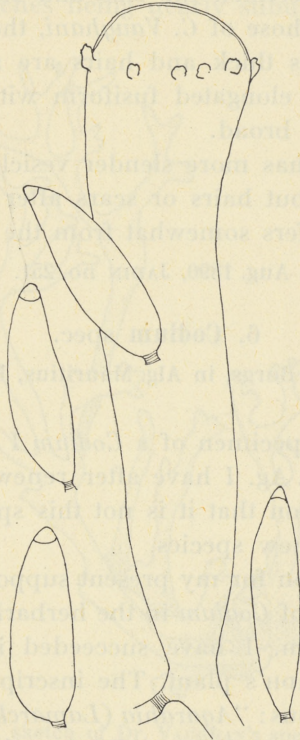


Fig. 24. *Codium Vaughani* Borgs. A vesicle with a single gametangium and some unfasten ones from JADIN's specimen no. 251. ($\times 115$).

given description of this species. Fig. 24 shows a vesicle of this specimen. They all taper much towards the base, have breadths from 77—200 μ , rarely more (once I have found one 300 μ broad), and lengths from 600—770 μ . Hairs are abundantly present and the tips of the slender vesicles are thick like those in the typical specimen. In this specimen ripe gametangia were present. These (Fig. 24) are slender fusiform, about 250 μ long and 45—60 μ broad; the thickest met with was 77 μ broad.

JADIN in his list p. 157 refers this specimen to *Codium tomentosum* Ag.

In my paper I have furthermore referred to *C. Vaughani* two specimens of *Codium* found in the Kew Herbarium; one of these was collected by Dr. AYRES in 1858 and the other one by Colonel PIKE, no. 84, in 1869.

In Dr. AYRES' specimen the size and shape of the vesicles quite correspond to those of *C. Vaughani*, the wall of the tips of the slender vesicles is thick and hairs are abundantly present. The gametangia are elongated fusiform with acute tips, about 275 μ long and 55 μ broad.

PIKE's specimen has more slender vesicles, the tips of these have thinner walls, but hairs or scars after these are common. PIKE's plant thus differs somewhat from the typical specimen.

Mauritius: Flacq, Aug. 1890, JADIN no. 251.

6. *Codium* spec.

Codium elongatum Børgs. in Alg. Mauritius, I, Chlorophyceae, 1940, p. 72, fig. 26.

As to the single specimen of a *Codium* I referred in part I to *Codium elongatum* C. Ag. I have after renewed examination arrived at the conclusion that it is not this species but rather the representative of a new species.

An essential reason for my present supposition is that among some old specimens of *Codium* in the herbarium of the Botanical Museum, Copenhagen, I have succeeded in finding a cotype specimen of C. AGARDH's plant. The inscription on the label of this specimen runs thus: "*Agardhia (Lamarckia) areolata*, e Gadiibus, misit Rev. CABRERA", *Agardhia areolata* being the name CABRERA gave the plant when sending it to AGARDH; compare C. AGARDH, Spec. alg., 1823, p. 454. This specimen agrees perfectly with the original specimen of *C. elongatum* C. Ag. found in J. AGARDH's herbarium in Lund, a photo of which is reproduced in SETCHELL's paper Some early algal Confusions, II. 1933, pl. 26, fig. 2.

A comparison of the specimen from Mauritius (Fig. 25) with AGARDH's plant shows that not only in the habit of the thallus but also in the structure considerable differences are present.

In the following I shall give a more detailed description of the plant from Mauritius accompanied by a description with some figures of *C. elongatum* C. Ag.

As Fig. 25 shows, its thallus is rather regularly di-trichotomously divided, terete but with flattened dilatations below the divisions. The angles between the divisions are broadly rounded. In the upper part of the thallus the ramification becomes more irregular, the branches being nearly subunilateral with broadly



Fig. 25. *Codium* spec. A sketch of Dr. VAUGHAN's specimen (no. 334). About $\frac{2}{3}$ nat. size.

rounded angles between them, and the upper branchlets are more or less curved, the result being that the upper parts of the thallus has a more or less antler-like appearance. In *Codium elongatum* on the other hand the thallus is very different, being more regularly ramified with a longer distance between the divisions, just as the flattened parts of the thallus below the divisions are more regularly elongated cuneate and pass evenly over into the terete parts of the thallus.

As far as the structure of the thallus of the plant from Mauritius is concerned, the vesicles (Fig. 26) are of rather variable shape, mostly broadly clavate to pyriform or even barrelshaped, but

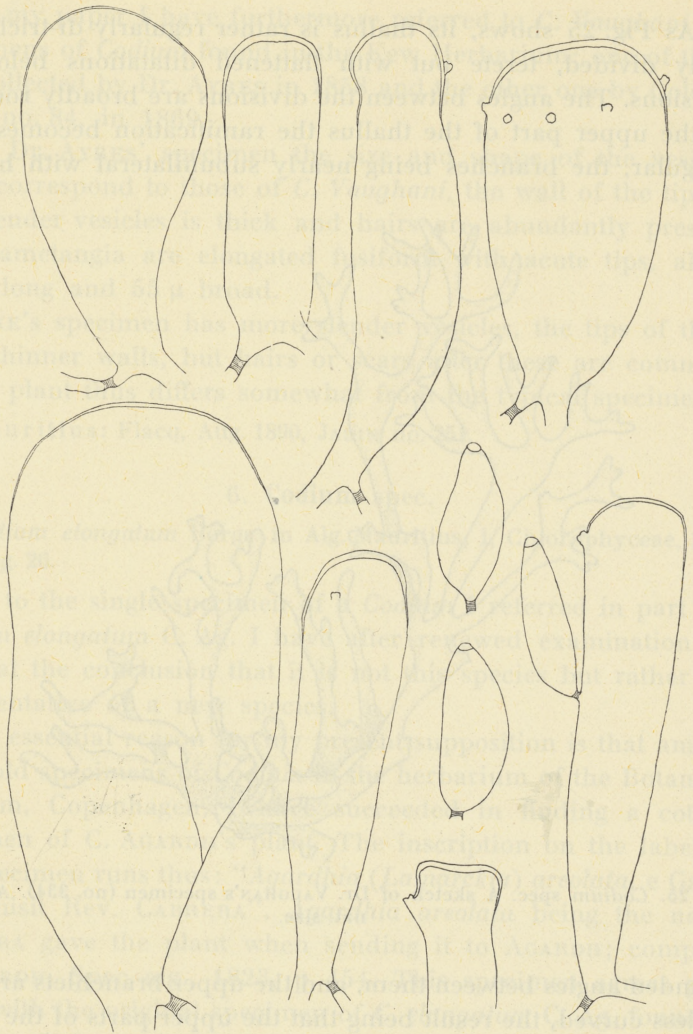


Fig. 26. *Codium* spec. Some vesicles and gametangia from Dr. VAUGHAN's specimen no. 334. ($\times 75$).

slender subcylindrical ones are also found. The top of the vesicles is mostly broadly vaulted, in rarer cases flattened or even a little depressed in the middle. The apical wall is as a rule thin or moderately thick only, but in rare cases it may reach a thickness of up to $15\ \mu$ or more. Depressions below the apical ends may occur but are rare. As to the size of the vesicles the breadth varies

from 150—400 μ or rarely more, the broadest I have measured was 550 μ thick, and their length from 550 μ —800 μ , some even up to 1100 μ . The pyriform or barrelshaped vesicles are as a rule proportionally short, while the slender ones are longest.

Hairs are not very abundant, many of the vesicles are with-

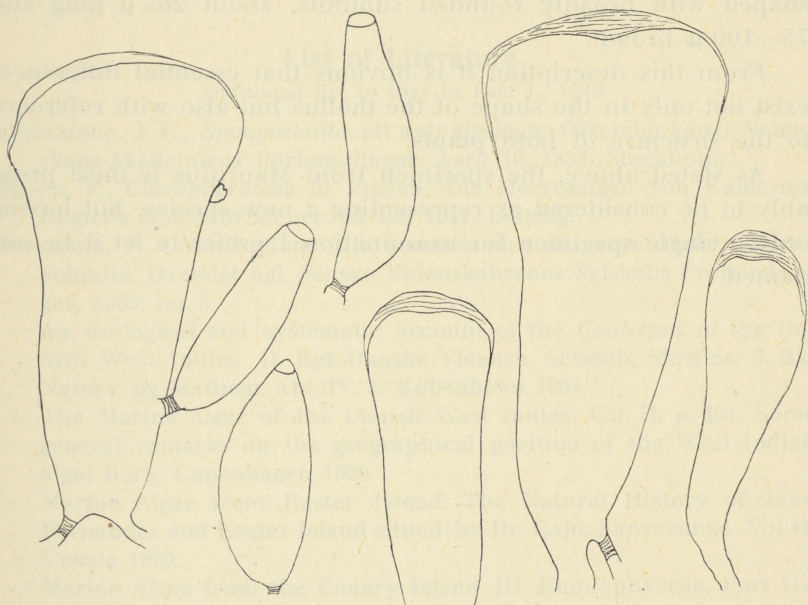


Fig. 27. *Codium elongatum* C. Ag. Some vesicles and gametangia from the co-type specimen in the Botanical Museum in Copenhagen. ($\times 115$).

out them and when present a single hair or scars after hairs is in most cases found only; vesicles with several scars are rare.

The filaments in the interior are about 40—50 μ thick.

The gametangia are broadly spindleshaped or more irregularly formed. They are about 250—280 μ long and 90—100 μ broad.

For comparison I give here a short description and some figures of the vesicles of *Codium elongatum* C. Ag. (Fig. 27); compare also SETCHELL's figure of the type-specimen in J. AGARDH's herbarium in Lund and of a single vesicle, 1933, pl. 26, fig. 2 and pl. 29, fig. 2. The vesicles are nearly always pyriform to clavate, 120—275 μ broad and 264—350—600 μ long, but some few almost cylindrical ones may occur, such a vesicle had for instance a breadth of 160 μ and a length of 890 μ . The apical

ends of the vesicles are now much vaulted, now also flattened, and the apical wall is often very thick, up to $30\ \mu$ or even more, and very clearly stratified. Hairs are not numerous, most of the vesicles have none, nor scars after them.

The gametangia are broadly spindle-shaped or more irregularly shaped with broadly rounded summits, about $265\ \mu$ long and $75\text{--}100\ \mu$ broad.

From this description it is obvious that essential differences exist not only in the shape of the thallus but also with reference to the structure of both plants.

As stated above, the specimen from Mauritius is most probably to be considered as representing a new species, but having only a single specimen for examination I prefer to let it be unnamed.

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