

DET KGL. DANSKE VIDENSKABERNES SELSKAB  
BIOLOGISKE MEDDELELSER, BIND XIX, NR. 1

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# SOME MARINE ALGAE FROM MAURITIUS

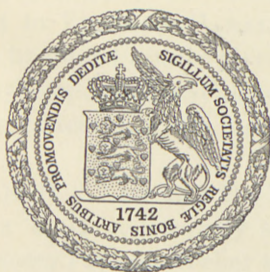
III. RHODOPHYCEAE

PART 2

*GELIDIALES, CRYPTONEMIALES,  
GIGARTINALES*

BY

F. BØRGESEN



KØBENHAVN  
I KOMMISSION HOS EJNAR MUNKSGAARD  
1943

DET KÖN. DANSK. VIDEENSKABSK. SÆLSKAB  
HISTORISKE MEDDELELSER. BÅND XIX. NR. 1.

SOME MARINE ALGAE  
FROM MALDIVES

IN BRITISH MUSEUM  
PART I  
BY  
MRS. J. S. GILBERT



Printed in Denmark.  
Bianco Lunos Bogtrykkeri A/S.

As was the case with the previous parts of this publication the present part is based upon the collections of Dr. TH. MORTENSEN and Dr. R. E. VAUGHAN to which, as has been mentioned in the former part, has been added the rather copious collection of Dr. JADIN sent to me from the Muséum National d'Histoire Naturelle, Paris.

The present part contains the following three orders of the *Rhodophyceae*: *Gelidiales*, *Cryptonemiales* and *Gigartinales*. The systematic arrangement of the families of these orders is in accordance with KYLIN's classification in "Anatomie der Rhodophyceen", 1937.

Dr. G. HAMEL, Laboratoire de Cryptogamie, Paris, has been so kind as to send me, on my request, some material of the typical specimen of *Phyllophora Maillardi* Mont. et Millard. so that I might be able to compare this species with some other related forms.

I am much indebted to Professor HARALD KYLIN, Botaniska Laboratoriet, Lund who has most kindly given me some valuable information concerning type-specimens of algae kept in J. AGARDH's herbarium and likewise concerning the determination of some specimens.

Director, Professor, Dr. H. J. LAM and Dr. I. TH. KOSTER, Rijks Herbarium, Leiden have most courteously sent me a photo of the type-specimen of *Platoma Pikeana* Weber since, because of the war, the specimen itself could not be sent. I take the opportunity here of expressing my sincere thanks to Director LAM and Dr. KOSTER for their kindness.

Further I am much indebted to Dr. O. HAGERUP who with

the greatest readiness made a series of microtomic preparations of some algae for me.

Cand. mag. LOUIS HARMSSEN has produced the two fine microphotographs for me and Miss INGEBORG FREDERIKSEN has kindly helped me with some of the drawings.

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

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## II. Gelidiales.

### Fam. 1. *Gelidiaceae*.

#### *Gelidiella* Feldm. et Hamel.

##### 1. *Gelidiella acerosa* (Forssk.) Feldm. et Hamel.

FELDMANN et HAMEL, *Observ. s. quelq. Gélidiacées*, 1934, p. 533. — *Fucus acerosus* Forssk., *Fl. Ægypt. — Arab.*, 1775, p. 190. *Echinocaulon acerosum* (Forssk.) Børgs., *Revis. Forssk. Alg.*, p. 5.

Some few specimens "growing on coral debris" are found in the collection of Dr. VAUGHAN.

JADIN mentions it in his list. I have seen only a small specimen (no. 514) of his, which is very like the form which KÜTZING called *G. ramelliferum* (Tab. Phycol., vol. 18, pl. 39). On the other hand, a well-developed specimen from Réunion (no. 174) is present in his collection; in his list p. 163 he calls it *Gelidium rigidum* Vahl. About its habitat at the Mascarene Isls. he writes: "Cueilli dans les anfractuosités des rochers exposés aux lames fortes ou aux courants violents".

Mauritius: Savinia, R.E.V. no. 302, Aug. 1939. Mahébourg, Sept. 1890, JADIN no. 514.

Geogr. Distr.: Most warm seas.

#### *Gelidium* Lamour.

##### 1. *Gelidium pusillum* (Stackh.) Le Jolis.

LE JOLIS, *Alg. Cherb.*, p. 139. FELDMANN et HAMEL, *Gelidiales*, 1936, p. 236, where the literature is mentioned.

Several small specimens are found in Dr. JADIN's collection (no. 203); they agree quite well with the figures of KÜTZING in

Tab. Phycol., vol. 18, pl. 37, figs. i, k. They are about 3—4 mm high, a specimen from Réunion is even smaller, the segments reaching a height of 1—2 mm only and in size it is thus like var. *minusculum* Weber-v. Bosse, Siboga Algues, 1921, p. 226. While these specimens had broad oblong erect segments, another specimen (no. 246) had nearly cylindrical erect segments, only a little compressed and broadened above.



Fig. 1. *Gelidium pusillum* (Stackh.)  
Le Jolis var. *pulvinatum* (Ag.) Feldm.  
( $\times 7$ ).

var. *pulvinatum* (Ag.) Feldm.

FELDMANN, Algues de France, no. 36; FELDMANN et HAMEL, *Gelidiales*, p. 237, fig. 19 C. *Acrocarpus pulvinatus* Kütz., Spec. Alg., p. 762; Tab. Phycol., vol. 18, pl. 37, figs. a—h. *Gelidium pulvinatum* Thuret in BORNET, Algues de Schousboe, 1892, p. 268.

In the material of Dr. VAUGHAN (no. 309) a small *Gelidium* forms a low growth upon pieces of shells. This plant (Fig. 1) agrees very well with KÜTZING's above-quoted

figures. The plant has sporangia in roundish or oval groups in the broad lobes of the thallus.

The *Phyllophora reptans* Suhr (Beiträge, 1839, p. 285, tab. III, fig. 10) seems to me, from the description and good figures of SUHR, to be this variety of *Gelidium pusillum* since it quite resembles KÜTZING's figures. KYLIN (Verzeichnis, 1938, p. 6, fig. 2 A—C), on the other hand, who has been able to examine a specimen of *Phyllophora reptans* Suhr found in J. AGARDH's herbarium, Lund, regards it as a separate species = *Gelidium reptans* (Suhr) Kylin, while SCHMITZ (1894, p. 194, Anm. 5) who has also been interested in the *Phyllophora reptans* Suhr expresses as his view, in accordance with AGARDH (Spec. II, p. 480) and GRUNOW (1870, p. 82), that it is "vielleicht nur eine sehr winzige Form von *Suhria pristoides* (Turner) J. Ag."

Mauritius: Mahébourg, July 1890, JADIN no. 246. var. *pulvinatum*. Savinia, R.E.V., no. 309, Aug. 1939, "in rock crevices and on barnacles in exposed situations".

Geogr. Distr.: Extensive in temperate and warm seas.

## 2. *Gelidium micropterum* Kütz.

KÜTZING, Tab. Phycol., vol. 18, p. 21, pl. 59 c-g. Comp. BØRGESEN, Contributions, III, 1938, p. 212.

To this species described upon material from the Cape I have referred some small specimens in Dr. JADIN's collection (no. 203 bis) which in his list, p. 163 are called *G. corneum*. The specimens are about 3 cm high with flat main segments from which in their upper parts some few branches issue which again along both sides are provided with short oblong roundish branchlets. In some of the specimens nearly cylindrical, quite thin filaments are given out. The specimens are sterile. A specimen from Réunion likewise in JADIN's collection (no. 37) agrees perfectly with those from Mauritius.

About its habitat JADIN writes: "Tapissant les rochers dans les parties ombragées, toujours couvert à marée basse".

Mauritius: Flacq, June 1890, JADIN no. 203 bis.

Geogr. Distr.: Cape, Mascarene Islands, India.

## 3. *Gelidium erinale* (Turn.) Lamour.

LAMOUREUX, J. in BORY, Diction. class. d'Hist. nat., vol. 7, 1825, p. 191. FELDMANN et HAMEL, *Gélidiales*, p. 240, fig. 22, where the literature is quoted. — *Fucus erinalis* Turner, Fuci, pl. 198.

A single quite small specimen in Dr. JADIN's collection is most probably this species. In his list, p. 163 JADIN mentions this species from Réunion only.

Mauritius: Without locality, JADIN 1890.

Geogr. Distr.: Atlantic Ocean, Mediterranean Sea, Red Sea, Indian Ocean etc.

## 4. *Gelidium cartilagineum* (L.) Gaill.

GAILLON, B., Résumé méthod. de classification des Thalassiophytes, 1828, p. 15. J. AGARDH, Spec. Alg., vol. II, p. 473; Epicr., p. 550. KÜTZING, Tab. Phycol., vol. 18, pl. 44. BØRGESEN, Mar. Alg. Can. Isl., 1927, p. 90, figs. 48, 49. KYLIN, Floridienstudien, 1928, p. 25. — *Fucus cartilagineus* L.,

Spec. pl., Edit. II, vol. II, p. 1630. TURNER, Fuci, pl. 124. *Gelidium rigidum*, Kütz. Tab. Phyc., vol. 18, pl. 44 (non *Fucus rigidus* Vahl). For more synonyms compare DE-TONI, Syll. Alg., vol. IV, p. 152.

Of this species I have only seen a single specimen belonging to the collection of the Riksmuseum, Stockholm. It has been collected by Colonel PIKE, has no. 45, and has been determined by DICKIE as *Gelidium rigidum* Vahl. The specimen is a little smaller in all respects but otherwise agrees very well with specimens from the Cape.

Mauritius: Grand River, 1867, Colon. PIKE.

Geogr. Distr.: Mauritius, Madagascar, Cape, Canary Islands, Brazil, Philippine Islands etc.

### 5. *Gelidium biserratum* nov. spec.

Frons caespitosa, perennis, subplana, anceps, c. 22 cm alta et ultra? et  $1\frac{1}{2}$ — $2\frac{1}{2}$  mm lata, ad basem filamentis subteretibus, decumbentibus et repentibus instructa. Margines thalli serrati, dentibus acutis, subtriangularibus, aequidistanter praediti.

Superficies thalli glabra, nuda.

Rami hic illic sparsi aut suboppositi, ex marginibus orti.

Substantia in sicco cartilaginea, color rubro-purpureus.

Organa fructificationis ignota.

Mauritius: Tombeau Bay, 10. Febr. 1939, R. E. VAUGHAN legit.

The growth of the plant (Fig. 2) is undoubtedly caespitose; it forms tufts about 22 cm and perhaps more. The base is composed of decumbent thin filaments, the tips of which are very likely able to form new erect shoots. In one of the specimens an ordinary branch has become decumbent and on coming in contact with the substratum has formed a broad flat hapter; above this hapter three young shoots and below it a single one have begun to grow out, thus forming the beginning of a new tuft.

The thallus is flat c.  $1\frac{1}{2}$ — $2\frac{1}{2}$  mm broad; a transverse section (Fig. 3 a) shows it to be lengthened lanceolate, about 300  $\mu$  in the middle, tapering towards both sides.

Along the edges of the thallus densely placed upward directed short teeth are found with a distance of about 1—2 mm between their apices. These toothlike prominences remain undeveloped



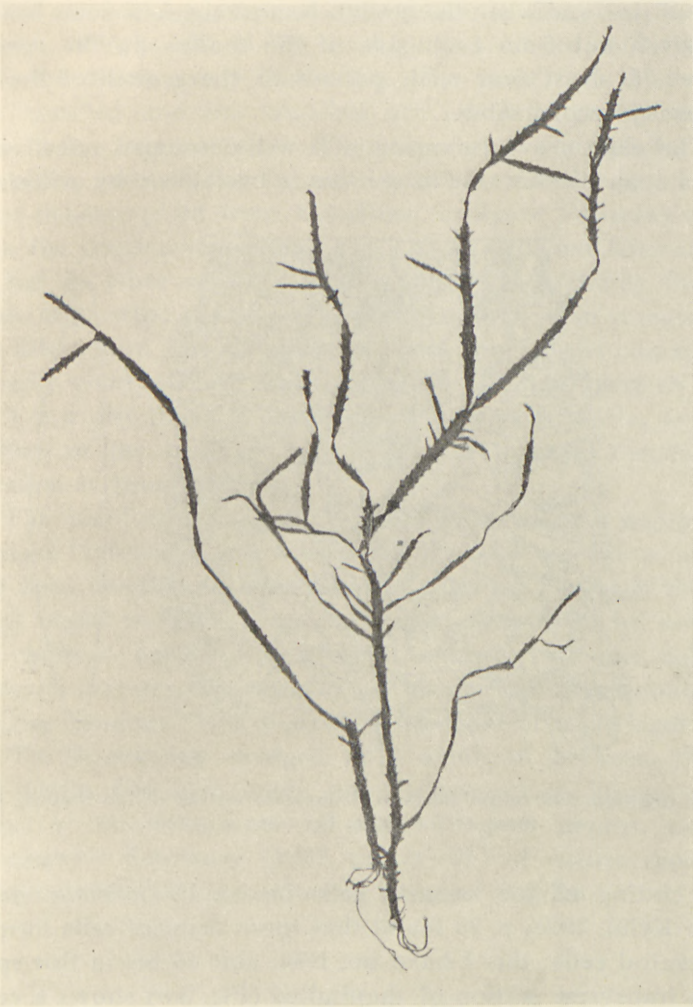


Fig. 2. *Gelidium biserratum* nov. spec. Habit of the plant. ( $\times \frac{3}{4}$ ).

in most cases but now and then they grow out into branches. As a rule the branches grow out near the upper end of the segments in which the plant is divided, this segmentation no doubt originating from the periodic growth of the plant due to the more or less favourable seasons of the year. For I take it for granted that the plant is perennial; when the favourable season sets in the growth commences again, the thallus attains its

normal size, and when the growth is most vigorous some branches are given out from each side of the thallus. In the specimen figured, at least four such periods in the growth of the plant are easily recognizable.

The plant grows by means of a well-developed apical cell; so far as I have been able to see this is two-sided; by a horizontal

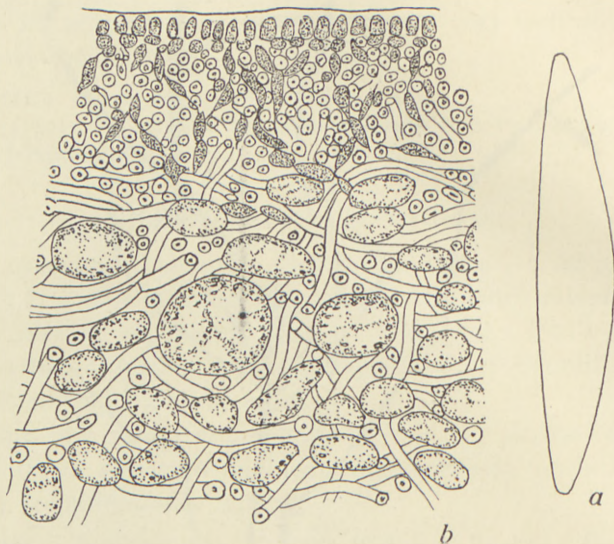


Fig. 3. *Gelidium biserratum* Borgs. a, transverse section of the thallus; b, fragment of the same. (a,  $\times 40$ ; b,  $\times 350$ ).

wall cutting off the segment cells below. In *Gelidium cartilagineum* Kylin, 1928, p. 25 found that these segment cells form four pericentral cells; this I have not been able to see in this species.

A transverse section of the thallus (Fig. 3 b) shows a cortical layer composed of a single or two rows of oblong cells and underneath this a tissue of uncoloured densely placed rhizoids intermixed with assimilating filaments formed by spindle-shaped or more irregularly formed cells. The central large part of the thallus is composed of cells which are roundish or oblong in transverse section, largest near the periphery, between which rhizoids are densely interwoven in all directions.

Apart from its smaller size this species is surely most nearly related to *Gelidium subcostatum* Okamura, Icones Jap. Alg., 1909,

p. 233, pl. XLVI; comp. also OKAMURA in SCHMITZ, Neue jap. Florid., 1894, p. 190, pl. X); a comparison of the habit figures of both the plants easily shows this. The plant from Mauritius is less ramified and the branches are not bi-tri-partite as is the case in the Japanese plant. The very vigorous midrib formed in the older parts of the Japanese plant is not developed in the more delicate plant from Mauritius; compare OKAMURA's Fig. 2 with the transverse section (Fig. 3 a) of *Gelidium biserratum*.

But in other respects both plants have certainly the same mode of growth; the Japanese plant is surely also perennial and has alternating periods of growth according to the climate. This is easily observable on studying OKAMURA's fine figure in Icones.

It is a pity that the plant from Mauritius is sterile; any comparison of the fructiferous organs with those of *Gelidium subcostatum* is thus excluded.

The plant is said to have been dredged at a depth of 80 fathoms (160 metres); if this be right it deserves notice, and if it had been possible to communicate with Dr. VAUGHAN the statement ought to have been confirmed; though, to be sure, it is not without parallel. In a small notice: "Sur une collection d'Algues marines recueillies à une profondeur remarquable près des Iles Canaries" I have given an account of some algae which Dr. TH. MORTENSEN dredged at a depth of between 100 and 200 metres and also made some references to former observations of the occurrence of algae at great depths. Compare FELDMANN's Summary (1937, pp. 71—72) of earlier reports on the occurrence of algae growing at great depths.

## Suhria J. Ag.

### 1. *Suhria vittata* (L.) J. Ag.

AGARDH, J., Alg. medit., p. 68; Spec. Alg., II, p. 480; Epicr., p. 554. — *Fucus vittatus* L., Syst. Nat., II, p. 718. TURNER, Fuci, tab. 64. *Sphaerococcus vittatus* Ag., Spec. Alg., p. 233. For more synonyms comp. DE-TONI, Syll. Alg. IV, p. 164.

Of this species I have seen only a small specimen belonging to the Riksmuseum, Stockholm. It has been collected "prope insulam Mauritiï" by Dr. GRÖNDAL and according to his state-

ment it seems to have been found floating and it is therefore a question if this species really belongs to the flora of Mauritius.

To be sure *Suhria vittata* is mentioned in the list of JADIN (p.163) who writes about it: "Cette plante parait rare, je ne l'ai pas trouvée et n'ai reçu qu'un exemplaire recueilli sur la plage par DARUTY". This specimen I have been able to examine and thus to state that it is not *Suhria vittata* as it has quite another

structure. The specimen of JADIN shows much likeness to *Meristotheca tasmanica* J. Ag., Epicr., p. 583 according to the photo of the original specimen in J. AGARDH's herbarium published by KYLIN in *Gigartinales*, 1932, p. 29, pl. 12, fig. 29. KYLIN points out that its anatomical structure answers to that of *Faucheopsis* Kylin. The specimen of J. AGARDH is sterile

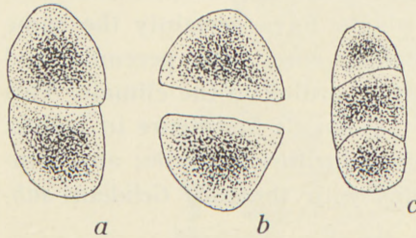


Fig. 4. *Suhria vittata* (L.) J. Ag. Sporangia, a, and b, divided by a transverse wall into two spores; c, a sporangium divided in 3 spores. ( $\times 600$ ).

but that from Mauritius is tetrasporic; the tetrasporangia are cruciately divided and its anatomical structure might very well correspond to that of this genus or a related genus of the *Rhodymeniaceae*.

The above-mentioned specimen of Dr. GRÖNDAL has sporangia. These are said to be cruciately divided in *Suhria*; compare for instance SCHMITZ & HAUPTFLEISCH in ENGLER u. PRANTT, Nat. Pflanzenf., 1. Teil, Abt. 3, 1897, p. 348. But all the sporangia I met with in this specimen were divided by a single transverse wall into two spores only (Fig. 4) with the only exception of a single sporangium which was divided into 3 spores by transverse walls. Because of this observation I made an examination of some specimens of *Suhria* found in the Botanical Museum, Copenhagen, and was able to ascertain that in these specimens all the sporangia were divided into two spores, none being cruciately divided.

Mauritius: "Prope insulam Mauritiï", Dr. GRÖNDAL.

Geogr. Distr.: Moluccas, Cape, South America, Brazil.

### III. Cryptonemiales.

#### Fam. 1. *Rhizophyllidaceae*.

#### *Desmia* Lyngb., J. Ag.

##### 1. *Desmia Hornemanni* Lyngb.

LYNGBYE, H. C., Tentamen Hydrophyt. Dan., 1819, p. 35, pl. 7, fig. c. J. AGARDH, Spec. Alg., II, 2, 1852, p. 641; Epicr., p. 357. PAPANFUSS, G., Notes on South African Mar. Alg., I, 1940, p. 216, fig. 12. — *Chondrococcus Hornemanni* (Mert.) Schmitz, Mar. Florideen deutsch Ost-Africa. 1896, p. 170 (in part). BØRGESEN, Some Indian Rhodophyceen, 1933, p. 117. For more synonyms compare PAPANFUSS, l. c.

In the above-quoted paper PAPANFUSS urges the resumption of LYNGBYE'S generic name *Desmia*, re-established by J. AGARDH in 1852. SCHMITZ, 1896, p. 169 rejected the name of LYNGBYE, because it comprehends two Phaeophyceae also besides *Desmia Hornemanni* and substitutes the genus *Chondrococcus* Kütz. published 1847 in Bot. Zeit. p. 23, a genus not much better than that of LYNGBYE, comprising as it does several genera of *Rhodophyceae*. Referring the reader for more detail to the paper of PAPANFUSS I join him in the above-mentioned procedure.

In a note PAPANFUSS furthermore points out that MERTENS' name *Fucus Hornemanni* in Göttinger Gel. Anzeiger, no. 64 (1815), is a nomen nudum, the species being first described by LYNGBYE (1819).

In JADIN'S list, p. 170 this species is mentioned as *Desmia ambigua* Grev. About its habitat JADIN writes: "Les exemplaires cueillis par moi le furent sur les récifs, donc exposés aux lames violentes".

Mauritius: Îlot Brocus, R. E. V., Aug. 1938, no. 194. Flacq, JADIN no. 465, Sept. 1890.

Geogr. Distrib.: Seems to be widely spread in the Indian Ocean and adjacent parts of the Pacific.

## 2. *Desmia tripinnata* (Her.) J. Ag.

AGARDH, J., Spec. Alg., vol. II, 1852, p. 640. PAPENFUSS, Notes etc. p. 218, fig. 13.—*Rhodhymenia tripinnata* Hering in KRAUSS, Pflanzen des Cap.- u. Natal-Landes, 1846, p. 209.

In connection with what I have said about various forms of *D. Hornemanni* in Kew Bulletin 1933, p. 117 I am really most inclined to consider this species as nothing but a thin delicate form of *Desmia Hornemanni*. If nevertheless I mention it as a separate species here it is because Dr. PAPENFUSS during a visit he paid me in Copenhagen saw some few specimens of a delicate form from Mauritius which he considered to be *Desmia tripinnata*. In his paper quoted above, PAPENFUSS, who has collected the plant in South Africa, himself points out that the only differences separating it from *D. Hornemanni* are that it has a "smaller size and more delicate fronds". And further, what is perhaps the most essential fact, that it grows at a level different from that of *D. Hornemanni*.

PAPENFUSS quotes *Chondrococcus Hornemannii*, Kylin, 1938, p. 8 as a synonym of this species, but it seems to me that the figure of *Plocamium cincinnatum* Kütz., Tab. Phyc. vol. 16, pl. 47 cited by KYLIN as the type figure of this species shows a plant which is a good deal more robust than PAPENFUSS's fig. 13.

Mauritius: Cannoniers Point "in shallow water", Th. M., Oct. 18, 1929.

Geogr. Distr.: South Africa.

## Fam. 2. *Squamariaceae*.

### *Peyssonnelia* Decaisne.

#### 1. *Peyssonnelia Gunniana* J. Ag.

Epicrisis, 1876, p. 387. WEBER-van BOSSE, Liste, p. 272, fig. 90.

Some specimens are found in JADIN's collection. They have been determined by FOSLIE.

The specimens are numbered nos. 538 and 543 respectively

but no locality is mentioned. It is not certain therefore whether the specimens are from Mauritius or from Réunion; in JADIN's list p. 170 this species is mentioned from Réunion only.

Geogr. Distr.: Tropical Australia, Tasmania, Malayan Archipelago.

## Hildenbrandia Nardo.

### 1. *Hildenbrandia prototypus* Nardo.

NARDO, S., in OKEN'S *Isis*, 1834, p. 675. HAUCK, F., *Meeresalgen*, p. 38. ROSENINGE, L. *KOLDERUP*, *Mar. Alg. Denm.*, p. 202.

Several specimens of this species are found in JADIN's collection. The filaments of the thallus have a breadth of 4–5  $\mu$ . As is usually the case the sporangia, divided by oblique walls, are of a very variable shape and size.

About its habitat JADIN says p. 172: "Formant des taches lie de vin sur les rochers, les rendant très glissant quand ils sont mouillés d'eau de mer. Cette Algue recouvre beaucoup de roches, grosses ou petits; quand ell croît sur les gros rochers plats, la marche sur ceux-ci devient très difficile". This description shows that it grows here under similar conditions as I found it in the environs of Bombay (Børgesen, 1935, p. 51) where it covered large nearly horizontal rocks and during low-tide was able to endure the burning tropical sun.

Mauritius: Flacq, June 1890, JADIN no. 548. Mahébourg, Aug. 1890, JADIN no. 546. Bay de la Grande Rivière, July 1890. JADIN no. 539.

Geogr. Distr.: Wide-spread in cold and warm seas.

## Fam. 3. *Corallinaceae*.

### Subfam. 1. *Melobesieae*.

The few species mentioned of this group are taken from JADIN's list. The determinations are in most cases, perhaps all, due to FOSLIE.

## Lithothamnion Philippi.

### 1. *Lithothamnion Lenormandii* (Aresch.) Foslie.

FOSLIE, Norwegian forms of *Lithothamnion*, 1895, p. 178. — *Melobesia Lenormandii* Aresch., in J. AGARDH, Spec. Alg., vol. II, V, p. 514.  
Mauritius: Flacq, JADIN no. 562, Aug. 1892.  
Geogr. Distr.: Extensive.

### 2. *Lithothamnion incrustans* (Phil.) Foslie.

FOSLIE, The Norwegian forms of *Lithothamnion*, p. 122. — *Lithophyllum incrustans* Phil. in WIEGM. Arch. 1837, vol. I, p. 388.  
Mauritius: Flacq, JADIN, June 1890, "sur les récifs".  
Geogr. Distr.: Atlantic Ocean, Mediterranean Sea, etc.

## Lithophyllum Phil.

### 1. *Lithophyllum inerassatum* Foslie.

FOSLIE, Algologiske Notiser, VI, 1909, p. 18.  
Mauritius: Mahébourg, JADIN, Sept. 1890. Port-Louis, JADIN, Aug. 1890.  
Geogr. Distr.: South Africa, Madagascar, Mauritius.

## Porolithon Foslie.

### 1. *Porolithon onkodes* (Heydr.) Foslie.

FOSLIE, Algol. Notiser, VI, 1909, p. 57. — *Lithophyllum onkodes* Heydr. in Ber. d. deutsch. Bot. Ges., 1897, p. 410. WEBER and FOSLIE, The Coral-  
linaceæ of the Siboga-Expedition, 1904, p. 57, pl. XI, figs. 5-10.  
Mauritius: Flacq, JADIN, Oct. 1890, "Recueilli sur la plage".  
Geogr.: Distr.: Indian and Pacific Oceans.

## Melobesia Lamour.

### 1. *Melobesia farinosa* Lamour.

LAMOUREUX, J., Polyp. flexib., p. 315, tab. 12, fig. 3. Compare DE-TONI, Syll. Alg., vol. IV, p. 1764, where the literature is mentioned.  
Mauritius: Flacq, JADIN, July 1890.  
Geogr. Distr.: Extensive.



2. *Melobesia mauritiana* (Foslie) Lemoine.

LEMOINE, Sur quelques Mélob. des Comores, 1918, p. 89. — *Heteroderma mauritianum* Foslie, Algol. Notiser, VI, 1909, p. 56.

Mauritius: Flacq, JADIN 1890, "Sur des coquilles".

Geogr. Distr.: Mauritius, Comore Isls.

## Subfam. 2. Corallineae.

*Amphiroa* Lamour.1. *Amphiroa fragilissima* (L.) Lamour.

LAMOUREUX, Hist. Polyp. corallig. flex., 1816, p. 298.

ARESCHOUG, Corallineae, 1852, p. 531. WEBER-VAN BOSSE and M. FOSLIE, The *Corallinaceae*, 1904, p. 89, pl. XVI, figs. 1, 2, 5.

In some specimens of this species found in Dr. VAUGHAN'S collection the swollen padlike end of the joints characteristic of this species were not much developed or not at all, but since the anatomical structure of the thallus was in good accord with that of this species I do not hesitate to refer them to it.

Two forms were present, one with slender joints (no. 289), and one with somewhat more robust joints (no. 288), but the building up of the central strand was quite alike in both forms, having 3—4 to 7—8 rows of long cells interrupted by a row of short cells, thus in good accord with the statement of Mme WEBER. In specimens from Madagascar PILGER, *Corallinaceae*, 1908, p. 47 found 5—7 rows of long cells; compare his fig. 13, pl. 6.

Concerning the habitat etc. of the two forms Dr. VAUGHAN says: "No. 288 forms low cushions pink or grey in colour. Lagoon near shore" and about 289, "very fragile orange red thallus common in shallow water with sea grasses".

Mauritius: Black River Bay, July 1939, R. E. V. nos. 288 and 289.

Geogr. Distr.: Widely distributed in warm seas.

2. *Amphiroa Beauvoisii* Lamour.

LAMOUREUX, J., Hist. Polyp. corallig. flex., 1816, p. 299. BORNET, Algues de Schousboe, 1892, p. 349. — *Amphiroa pustulata* Mertens in Flora 1836,

D. Kgl. Danske Vidensk. Selskab, Biol. Medd. XIX, 1.

p. 487, tab. 1. *Amphiroa exilis* Harv., Nereis Austr., p. 95. *Amphiroa polyzona* Mont., Fl. d'Algerie, 1847-49, p. 136. *Amphiroa algeriensis* Kütz., Tab. Phyc., vol. VIII, p. 21, fig. 44.

Dr. VAUGHAN's collection contains an *Amphiroa* broken to pieces, which seems to be referable to this species of which I have not had any original or well-determined specimen for comparison.

The plant has been described by LAMOUREUX upon a specimen from Portugal but his description is very short. In Algues de Schousboe BORNET points out that the above-mentioned synonyms belong to this species; and about the figure of KÜTZING he says that it gives a good representation of the type-specimen of the plant in LAMOUREUX's herbarium; the plant from Mauritius seems to agree quite well with this figure.

In Algues Siboga, pl. XVI figs. 18 and 19 Mme WEBER gives two figures of joints and nodes of this species, respectively from Naples and Durban; the plant from Mauritius is in good accordance with these figures. In the central strand I have found mostly three rows of long cells followed by one row, sometimes two rows of short cells. The long cells had a length of 70 to 90  $\mu$ , while the length of the short cells varied from 22-35  $\mu$ . Now and then also a row of quite short cells, about 15  $\mu$  long only, was present. As is pointed out by Mme WEBER the node consists of the entire central strand and almost entire cortical layer.

Referring to some figures of *Am. zonata* Yendo and *Am. echi-goensis* Yendo (1902, pp. 10-11, pl. 1, figs. 11-14 and figs. 15-16) Mme WEBER (l. c., p. 101) remarks that these species seem to come near to *Am. Beauvoisii*; these figures show much likeness to the anatomical structure of the plant from Mauritius.

The thallus is terete below, more or less flattened above; its surface is rather uneven, sometimes with a tendency to be annulated, and the ramification is very irregular.

Another specimen, no. 351, was likewise broken to pieces. About its appearance etc. Dr. VAUGHAN writes: "Very fragile, pale pink calcareous segments".

Mauritius: Îlot Brocus, 31. Dec. 1938, R. E. V. no. 219, "in rocky pools". Pte aux Sables, Aug. 1939, R. E. V. no. 351.

Geogr. Distr.: Mediterranean Sea, Portugal, Morocco, Cape, Brazil.

### 3. *Amphiroa crassa* Lamx. forma *minuta* Web.-v. Bosse.

WEBER-VAN BOSSE and FOSLIE, The *Corallinaceae* of the Siboga-Expedition, p. 98.

In Dr. VAUGHAN's collection an *Amphiroa* occurs which forms dense, firm cushions c. 2 cm high, upon rocks. This small plant seems to be the same as the dwarfish form of *Am. crassa* which Mme WEBER, l. c., p. 98, has described as forma *minuta*; compare her figure 3, pl. XV.

As stated above, the plant forms dense low cushions formed by the stiff, much entangled, and very irregularly articulate and ramified filaments. Also the filaments are very irregularly shaped, in some cases terete below and flattened or lingulate above, in others flattened below and gradually subterete and slender upwards. The breadth of the filaments varies from  $\frac{1}{2}$ — $1\frac{1}{2}$  mm.

As regards the anatomical structure, the central strand consisted in one specimen of 3 rows of long cells interrupted by a row of short cells followed by 3 rows of long cells, and so on. The long cells were about 80  $\mu$  long and the short ones about 25  $\mu$  long. In another specimen the central strand contained two rows of long cells and one row of short cells, the long cells reaching a length of 80—110  $\mu$  and the short ones about 30—50  $\mu$ . The node consists of many rows of cells and is quite surrounded by the calcified cortical layer; when the cortical layer does not split, the nodes are not visible.

Mauritius: Souillac, "on reef", R. E. V. no. 340.

Geogr. Distr.: Indian and Pacific Oceans.

## Cheilosporum (Decsne.) Aresch.

### 1. *Cheilosporum acutilobum* Decsne.

DECAISNE, J., Sur les Corallines, 1842, p. 125. MONTAGNE et MILLARDET, Algues, 1862, p. 0—16.

Some specimens in Dr. VAUGHAN's collection seem to be in good accordance with the detailed description of MONTAGNE and MILLARDET; the species was originally described by DESCAISNE upon a specimen from Mauritius but I have not seen an authentic specimen.

The plant (Fig. 5) grows in dense tufts about 3—4 cm high. The basal decumbent and very intricate branches are subterete and composed of joints isodiametric or a little longer than broad, about  $\frac{1}{2}$  mm broad; upwards the joints gradually become flattened out and broader, acquiring the characteristic cordate, bilobate shape with falcate pointed ends. The breadth from point to point is about  $1\frac{1}{2}$  mm. One specimen in Dr. JADIN's col-

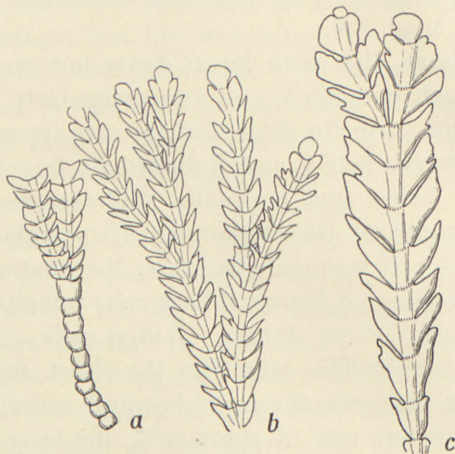


Fig. 5. *Cheilosporum acutilobum* Decsne. *a*, part of the thallus from near the base; *b*, upper part of thallus; *c*, a deviating piece of the thallus. (*a* and *b*  $\times 3$ ; *c*  $\times 6$ ).

lection was larger, nearly 6 cm high, and the breadth of the thallus about 2 mm, thus approaching the size of *Cheilosporum culthratum*; compare ARESCHOUG, 1852, p. 545.

The specimens were sterile.

It seems to me that several of the small forms of *Cheilosporum* are closely related and not easily distinguishable; an examination of their ability of variation is certainly much needed. MONTAGNE et MILLARDET do not conceal that they consider *Amphiroa elegans* Harv., *Nereis Australis*, p. 101, pl. 38, described upon a specimen from Mauritius, to be very closely related to the species of DESCAISNE or perhaps the same species. Nearly allied to *Cheilosporum acutilobum* are surely also forms of the polymorphous species *Cheilosporum culthratum* (Harv.) Aresch., l. c., p. 545.

In the middle of one of the tufts from Mauritius some

branches were found in which the joints instead of the falcate pointed ends at both sides were abruptly cut off, and ended in a nearly entire, or more or less deeply sinuated edge (Fig. 5 c). These branches show much likeness to the plant which in Alg. Bombay, 1935, p. 52, fig. 23, I have referred to *Cheilosporum spectabile* Harv. and in some degree also to *Cheilosporum multifidum* (Kütz.) Yendo = *Amphiroa multifida* Kütz., Tab. Phyc., vol. 8, tab. 56, about which KÜTZING says in a note that it seems only to be one of the many forms of *Cheilosporum culthratum*. In addition MONTAGNE and MILLARDET also mention *Cheilosporum multifidum* in their paper on the algae of Réunion, p. 0—15.

Mauritius: R. E. V. no. 32 (no locality), "in exposed situations constantly washed by waves; dull pink in colour". JADIN 1892, no locality. DICKIE, 1875, p. 193, mentions this species from Mauritius.

Geogr. Distr.: Mascarene Islands.

## Corallina Lamour.

### 1. *Corallina polydactyla* Mont. et Mill.

MONTAGNE, C., and M. MILLARDET, Algues, 1862, p. 0—18, pl. XXV, fig. II.

While referring some specimens in Dr. JADIN's and Dr. VAUGHAN's collection to this species, I must point out that I have not seen any authentic specimen of the plant; but the specimens from Mauritius seem to be in good accordance with the description and figures quoted above.

The plant forms a dense roundish tuft about 3 cm high. Fig. 6 shows two small pieces of the thallus. The articulate main axis is composed of subtriangular joints. These are broadest above, and from their upper margins in the well developed thallus two pinnae are given off on both sides of the main axis (Fig. 6 a); in the less vigorous specimens only a single pinna becomes developed (Fig. 6 b). The more vigorous pinnules are furcated, the rest remain simple and taper gradually upwards to the tips, the joints of which they are composed also at the same time increasing more or less in length. As a characteristic of this species the authors point out that these elongated and often

somewhat curved branchlets may have the appearance of the skeleton of a hand.

The pedicellate conceptacles are obovate in shape, a little narrowed above and provided above with two apposite branchlets composed of a single or often two joints.

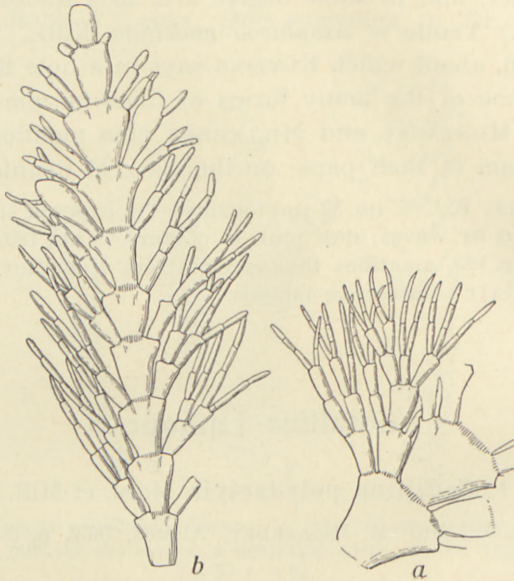


Fig. 6. *Corallina polydactyla* Mont. et Mill. Fragments of the thallus. ( $\times$  c. 10).

About its habitat Dr. VAUGHAN writes: "growing in rock crevices usually in exposed situations constantly washed by waves". This species is also mentioned in JADIN's list, p. 170 but the specimens of his I have seen are the following species.

Mauritius: R. E. V. no. 31 (no locality).

Geogr. Distr.: Mascarene Islands.

## 2. *Corallina mauritiana* nov. spec.

Frondes caespitosae, c. 6 cm altae, articulatae, compressae, distichae, ad basem subsimplices, ex articulis subteretibus nudis compositae, ad apicem versus plus minus abunde et irregulariter ramosae, ex articulis compressis, triangularibus, pinnulatis, c. 600  $\mu$  altis et 600—900  $\mu$  latis compositae.

Rami bipinnati. Pinnae circumscriptione fere lineares, c. 3 mm

longae et 2—3 articulos oblongo-triangules continentes, sub-erectae, angulis acutis ortae, pinnulatae.

Pinnulae erectae, fere cylindricae, simplices aut interdum furcatae, aequicrassae, apicibus late rotundatae, ex articulis 2—6 compositae.

Conceptacula ex transmutatione pinnularum orta, urceolata vel pyriformia, corniculata.

Cornua simplicia aut interdum furcata, 2—3 articulos continentia.

Mauritius: Without locality, JADIN nos. 210, 121, 453, 262. Flat Island, 17. Oct. 1929, TH. M.

The characteristic feature of *Corallina mauritiana* (Figs. 7 and 8) is its very regularly featherlike ramification. The thallus has a well marked articulate midrib, composed of nearly triangular joints. From the upper corners of these at both sides straight, obliquely upward directed pinnae are given out. The angle between the pinnae and the joints of the midrib is very narrow (Fig. 8).

The pinnae consist of 2, most often of 3, more rarely of more joints and from the uppermost of these, but sometimes



Fig. 7. *Corallina mauritiana* nov. spec. Habit of the plant. ( $\times 2$ ).

also from the lower ones, pinnules issue. The pinnules are articulate, nearly terete and upward directed. The pinnae and pinnules all lie on the same plane as the main axis.

The base of the plant forms a plexus of intermingled irregularly ramified and more or less decumbent filaments composed of nearly terete joints; from this base the erect part of the thallus arises.

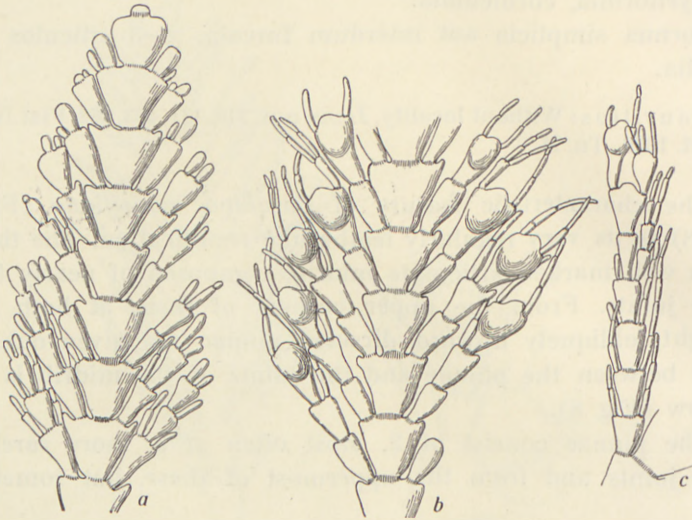


Fig. 8. *Corallina mauritiana* nov. spec. Pieces of the thallus, *b* and *c* with conceptacles. ( $\times$  c. 8).

*Corallina mauritiana* may show some likeness to *Corallina rosea* Lamarck, compare HARVEY, *Nereis austr.*, 1847, p. 105, tab. 40. I have seen no material of this species but a comparison with HARVEY's description and figure shows that rather essential differences are present. Thus the ramuli in *Corallina rosea* are broader, carrying pinnules on both sides of the axis, while in *Cor. mauritiana* these are less developed, often quite wanting on the lowermost joints; furthermore the pinnules are straight upward directed in the latter species, while those in *Cor. rosea* are spreading.

The herbarium of the Botanical Museum, Copenhagen, contains a small specimen from Port Natal determined as *Cor. rosea* but with no information about the collector or who has determined it. Most probably this plant is the same as the one ARESCHOU, G.



*Corallineae*, p. 524, mentions in a special note, pointing out that the specimen in question is perhaps *Jania Cuvierii natalensis* mentioned by HARVEY, l. c., p. 105, but at the same time declaring that he dare neither refer it to *Jania rosea* nor consider it as a separate species. On a superficial inspection, the plant from Natal may show some likeness to *C. mauritiana*, but its thallus is in all respects smaller and the ramuli are more developed and have more spreading pinnules.

From *Corallina polydactyla* *Corallina mauritiana* differs by less branching of the main filaments. In *Corallina mauritiana* the pinnae together with the pinnules have nearly the same length, are straight and upward directed, the result being that the thallus keeps nearly the same breadth and has nearly straight parallel flanks, while in *Corallina polydactyla* the pinnules are of unequal length, are not directed so straight upwards and the pinnules are more crooked; because of this the breadth of the thallus is variable. And in *Corallina polydactyla* the pinnules (horns) terminating the conceptacles are composed of a single or now and then two joints and their tips are more acute, while in *Corallina mauritiana* the horns consist of 2—3 joints and are obtuse above (Fig. 8 b).

Finally the colour of *Corallina mauritiana* in the dried condition is a dull greyish red, while in *Corallina polydactyla* the colour of the thallus is a fine rosy red with shining surface.

The specimens of *Corallina mauritiana* in JADIN's collection which I have seen have numbers, and according to these JADIN in his list refers them to *Corallina polydactyla* Mont. JADIN also mentions *Corallina plumifera* Kütz., a species which is also included by DICKIE in his list of algae from Mauritius, p. 173; but no explanatory remarks as to why it is referred to KÜTZING's species (Spec. Alg., p. 705 and Tab. Phycol., vol. VIII, pl. 71, II c, d) are given. It cannot be denied that *Corallina mauritiana* shows some likeness to KÜTZING's figure II d, though with the exception that the conceptacles in KÜTZING's figure are without pinnules, while such are present in the plant from Mauritius. But as to the other figure of KÜTZING, fig. II c, the likeness is not a good one; this figure suggests that *Corallina plumifera* Kütz. is most probably a form of the very polymorphous species *Corallina Cuvierii*, a possibility already alluded to by DE-TONI in Sylloge Alg., vol. IV, p. 1854.

## Jania Lamour.

### 1. *Jania rubens* (L.) Lamour.

LAMOUREUX, Hist. Corall. flexib., 1816, p. 272. ARESCHOUG, *Corallineae*, 1852, 557. — *Corallina rubens* L., Systema Nat., ed. 12, vol. 1, p. 1304.

Two small specimens are found in Dr. VAUGHAN'S collection; one of these being an epiphyte upon *Digenea*.

I have also seen some specimens from Dr. JADIN'S collection; it is mentioned in his list as a very common species.

SUNESON (1937, p. 38) classes *Jania* to *Corallina*, referring to the view of ROSENVINGE (1927, p. 275) who considers *Jania* as a subgenus of *Corallina*, because, according to him, *Jania* differs only from *Corallina* by its dichotomous ramification. Meanwhile, as Mme WEBER (1904, p. 85) points out, an anatomical character by which *Jania* differs from *Corallina* is also present, seeing that the cells in the central strand of *Jania* are proportionally longer as compared with the shorter ones in *Corallina*, and further the cells in the nodes of *Jania* are shorter when compared with the long cells of the node in *Corallina*. Mme WEBER refers to KÜTZING'S figures in Phycologia generalis, pl. 79, figs. I and II of *Corallina officinalis* and *Jania rubens* respectively, which show the differences pointed out by her very clearly. I therefore prefer to keep up the genus *Jania*, and in this I am, indeed, in agreement with by far the greater number of algologists.

Mauritius: Pte aux Roches, 7. Febr. 1939, R.E.V. no. 263. Flacq and Mahébourg, July—Sept. 1890, JADIN nos. 431, 449.

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

### 2. *Jania tenella* Kütz.

KÜTZING, Tab. Phycol., vol. VIII, p. 41, pl. 85, fig. II.

On a piece of *Galaxaura* a quite small *Jania* was found, the thallus of which had only a breadth of about 60  $\mu$ .

Mauritius: Pte aux Sables, R. E. V. no. 354, Aug. 1939.

Geogr. Distr.: Mexico, Mediterranean Sea, Malayan Archipelago etc.

## Fam. 4. *Grateloupiaceae*.

### *Grateloupia* C. Ag.

#### 1. *Grateloupia filicina* (Wulf.) Ag.

AGARDH, C., Spec. Alg., p. 223. J. AGARDH, Spec. Alg., vol. II, p. 180. — *Fucus filicinus* Wulf. in JACQUIN, Collectanea, vol. III, 1789, p. 157, tab. 5, fig. 2 (not seen).

Of this species I have seen some few specimens in Dr. JADIN's collection; some of these are undetermined, some are determined as *Hypnea nigrescens*. JADIN mentions *Grateloupia filicina* in his list p. 170. About its habitat he writes: "Sur des débris de coraux, à une faible profondeur".

Mauritius: Port Louis, Fort-Georges, Aug. 1890, JADIN.  
Geogr. Distr.: Most warm seas.

### *Halymenia* J. Ag.

#### 1. *Halymenia maculata* J. Ag.

AGARDH, J., Till Alpernes Systematik, VII, *Florideæ*, 1884, p. 12.

This species has been described by J. AGARDH upon a specimen from Mauritius gathered by MELVILL. I have not seen any specimen of it. It is not mentioned in JADIN's list.

Geogr. Distr.: Endemic.

### *Carpopeltis* Schmitz.

#### 1. *Carpopeltis rigida* (Harv.) Schmitz.

SCHMITZ, FR., Florideen von Deutsch-Ostafrika, 1896, p. 167. OKAMURA, Icones Jap. Alg., vol. II, 1912, p. 63, pl. LXVI. — *Cryptonemia rigida* Harv., Alg. Ceylon Exsicc. no. 51 (nomen nudum). J. AGARDH, Epicrisis, 1876, p. 163. *Phyllophora Maillardi* Mont. et Millard., Algues Réunion, 1862, p. 8, pl. 24. *Suhria*(?) *Zollingeri* (Sonder) Grun., Alg. Novara, 1870, p. 82, tab. X, fig. 3.

As will appear from the above-mentioned synonyms, this plant has been described as a distinct species several times.

HARVEY was the first to name the plant, in Alg. Ceylon Exsiccatae no. 51, but as a nomen nudum only; afterwards J. AGARDH published a description of it, keeping HARVEY's name.

Then MONTAGNE et MILLARDET in their paper on the algae of Réunion described the plant as a new species: *Phyllophora Maillardii*; their description is accompanied by some good figures. And finally GRUNOW in 1870 mentions the plant as *Suhria*(?) *Zollingeri*, basing his description upon material from the Nicobar Islands.

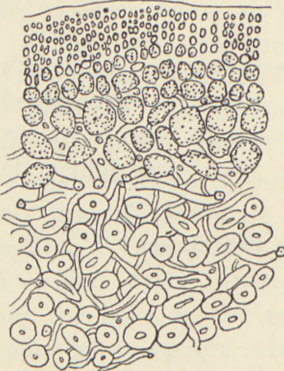


Fig. 9. *Carpopeltis rigida* (Harv.) Schmitz. Fragment of a transverse section of the thallus. ( $\times c. 400$ ).

When mentioning the synonymy of this species SCHMITZ in the paper quoted above (1896, p. 167) arrives at the result: "dass *Phyllophora Maillardii* mit *Suhria Zollingeri* entschieden zusammengehört und wie diese vermutlich mit *Cryptoneimia rigida* zu vereinigen ist".

So as to arrive at a definite result concerning this question which was thus not quite settled, I asked Dr. HAMEL, Muséum National d'Histoire Naturelle, Paris to let me see, if possible, a small piece of *Phyllophora Maillardii* M. et M. Upon my request Dr. HAMEL most kindly sent me a small piece of the original material by means of which I have been able to establish the identity of the plant from Réunion with those which I have for determination from Mauritius. A comparison of the plant from Réunion with HARVEY's plant and some specimens I have collected at Galle showed further evidence that the plant from Ceylon was the same as that from Réunion.

If finally we turn to *Suhria Zollingeri* Grunow, the determination of which GRUNOW based upon material from the Nicobar Islands, we have here in the Botanical Museum, Copenhagen, some excellent material collected during the Galathea-Expedition in the years 1845—47.

These specimens not only agree perfectly with GRUNOW's figures but also with HARVEY's and other specimens from Ceylon, and with those from the Mascarene Islands. Hence there can be no possible doubt that they are all one and the

same species, and referable to the genus *Carpopeltis* established by SCHMITZ in Flora, 1889, p. 453.

Of this species several specimens are found in the collections. As the anatomy of this plant seems to be known only from the short description of SCHMITZ in ENGLER und PRANTL, Natürl. Pflanzenfam., I Teil, 2. Abt., 1897, p. 514, I give here a part of a transverse section of the thallus (Fig. 9). The cortical layer consists of short densely placed anticlinal more or less furcated filaments, composed of oblong cells, smallest near the periphery, becoming gradually larger inwards, forming an even transition to the somewhat larger, at first roundish, soon more irregularly shaped cells of the peripheric medulla; the innermost part of this tissue is composed of thick-walled, densely interwoven filaments, among which rhizoids are intermingled. The thallus is very tough and cartilaginous, which is in good accord with the very exposed habitats of this plant.

Concerning the habitat of this species JADIN, p. 170 writes: "Croissant sur des rochers exposés aux lames violentes".

Mauritius: Flacq, June 1890, JADIN no. 217. Pointe aux Roches, R. E. V. no. 237.

Geogr. Distrib.: Seems to be wide-spread in the Indian and adjacent parts of the Pacific Ocean.

## Fam. 5. *Kallymeniaceae*.

### *Kallymenia* J. Ag.

#### 1. *Kallymenia perforata* J. Ag.

AGARDH, J., Bidrag till Florideernes Systematik, p. 9; Epicr., p. 219.  
BØRGESEN, Mar. Alg. D. W. I., p. 358, fig. 353.

Two small specimens are found in Dr. MORTENSEN's collection. I have compared them with some preparations of a plant from Ceylon (FERGUSON, Alg. Ceylon exsicc., no. 16) and spe-

cimens from the West Indies, with which the plant from Mauritius seems to agree perfectly.

The specimens were dredged at a depth of about 25 fathoms.

Mauritius: Between Gunners Quoin and Flat Island, TH. M., 15. Oct. 1929.

Geogr. Distr.: Ceylon, West Indies, Malayan Archipelago.

## IV. Gigartinales.

### *Fam. 1. Nemastomaceae.*

#### *Nemastoma* J. Ag.

##### 1. *Nemastoma coliformis* J. Ag.

AGARDH, J., Till Algernes Systematik, IV., 1884, p. 11, KYLIN, H., Gigartinales, p. 7, tab. 1, fig. 2.

This species is described by J. AGARDH upon material from Mauritius. KYLIN's above-quoted figure shows the original specimens.

I have not seen any specimen of it.

Geogr. Distr.: Endemic.

#### *Titanophora* nov. gen.

Thallus 10—20 cm altus et ultra(?), disco ad substratum adfixus, calce incrustatus, exsiccatione fragilis, subcompressus, irregulariter lobatus, interdum ex marginibus proliferus.

Lobi in parte basali latiores, sinu rotundato sejuncti, ad apicem versus tenuiores, iterum furcati, apicibus obtusis vel subacutis.

Superficies frondis inaequale-subverrucosa, colore in sicco albidu-rubescente.

Stratum corticale ex filamentis brevibus subdichotomis, cellulas breves continentibus et glandulis sparsis intermixtis formatum.

Medulla ex filamentis crassioribus, irregulariter inter se confluentibus, sparsim furcatis composita.

Gonimoblasti per totam superficiem frondis sparsi, in superiore parte medullae immersi.

Carposporae, ex cellulis omnibus filorum gonimoblastorum ortae, per porum rotundatum superne in strato corticali formatum, liberatae.

Species typica: *Titanophora Pikeana* (Dickie) Børgs.

### 1. *Titanophora Pikeana* (Dickie) Børgs., nov. comb.

*Galaxaura Pikeana* Dickie, Alg. Mauritius, 1873, no. 195. *Halymenia Pikeana* J. Agardh, Till Alg. System. VII, Florideae, 1884, p. 15. *Platoma Pikeana* Weber, Alg. Siboga, p. 253, pro parte.

Some undetermined material collected by Dr. JADIN contained an alga (Fig. 10) incrustated with chalk which upon examination turned out to be identical with *Galaxaura Pikeana* Dickie (1873, p. 195), an alga which, when superficially observed, may bear some likeness to *Galaxaura*.

This alga J. AGARDH (1884, p. 15) refers to the genus *Halymenia*, placing it with a plant from the West Indies (*Halymenia incrustans*) in a separate section named *Titanophora*, because of the chalk-incrustated thallus of the plants in question.

Later the late, much regretted Mme WEBER (1921, p. 253) collected an alga on a reef at New Guinea which she presumed to be the same species as that from Mauritius. She placed it in the genus *Platoma* as it is also rather closely related to this genus, but nevertheless it comes nearer to another genus of the *Nemastomaceae*, namely *Schizymenia*, as will be demonstrated in more detail later. Meanwhile it seems better to place these plants in a separate genus for which I propose the name *Titanophora*, giving the section of J. AGARDH generic rank.

Yet I should like also to point out here that I do not think that the plant of Mme WEBER is the same as that of DICKIE, but another species of *Titanophora*.

In the sequel I shall first give a description of the plant from Mauritius. This can be based only upon dried material, just as I have had no occasion to compare with authentic material, since the collection of *Rhodophyceae* from Mauritius of the Kew

Herbarium in which DICKIE's specimens are incorporated could not be sent because of the war.

It cannot be denied that the description of DICKIE is rather poor; nevertheless some of the few characters mentioned in his diagnosis give some idea of the plant. Meanwhile so as to make

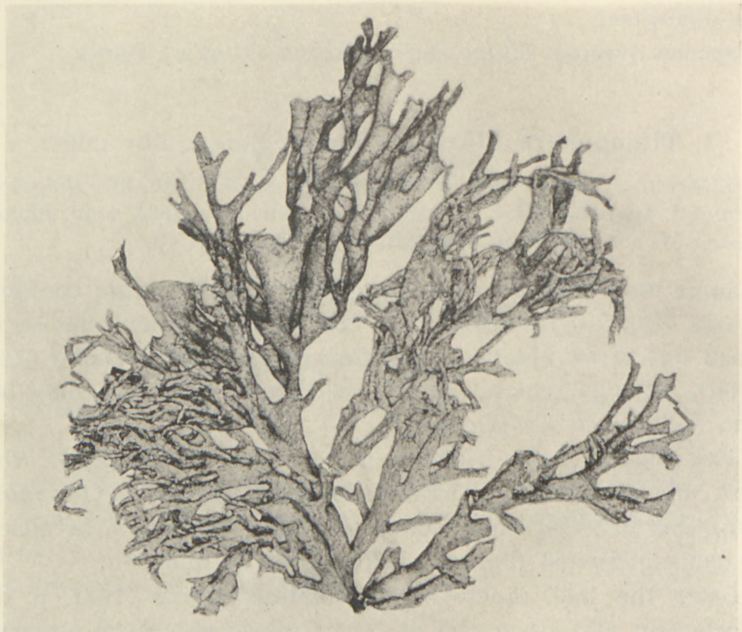


Fig. 10. *Titanophora Pikeana* (Dickie) Børgs. Habit of the plant. ( $\times \frac{4}{5}$ ).

sure as far as possible of the identity of JADIN's plant with that of DICKIE, Professor KYLIN, Lund, has most kindly on my request made a comparison of JADIN's specimen with those found in J. AGARDH's herbarium and informed me that they agree perfectly. Two specimens are found in AGARDH's herbarium; one of these, which was most probably collected by Colonel PIKE himself, FARLOW sent to AGARDH, the other one was collected by MELVILL. Professor KYLIN has also most kindly sent me some fragments of both specimens by which I have been able to establish the identity of their anatomical structure with that of JADIN's plant.

The plant is about 10 cm high. The thallus (see Fig. 10) is



subterete to complanate, repeatedly irregular, subdichotomously divided into longer or shorter lobes of variable breadth; below the divisions the segments are broadened out subcuneately, reaching a breadth of up to 1 cm, the upper lobes having only a breadth of 1—2 mm. The angles between the lobes are more or less broadly rounded. The whole thallus is incrustated with chalk and rather brittle; the surface is unevenly warted. A transverse section of a decalcified piece of a lobe shows it to be oval, and nearly terete in the uppermost tips. The apices of the segments are obtuse, which is best observable when the thallus is decalcified. The colour of the specimen upon which the examination was based is reddish, the same as that of the specimens in J. AGARDH's herbarium; another specimen of Dr. JADIN's collection, most probably cast ashore, has a greenish colour and a more smooth surface.

The incrustation of chalk consists of a porous rather soft mass filling up the whole interior of the thallus; in this mass the filaments of the medullary tissue are imbedded. However, the cavities of the cystocarps are free from incrustation; this has also been observed by Mme WEBER (p. 254).

Concerning the anatomical structure of the plant I must point out that I have only had the opportunity of examining a full-grown dried specimen in which young apices were wanting, for which reason I have not been able to observe the development of the thallus.

Before entering upon a description of the anatomical structure of the plant I should like to express my acknowledgements to Dr. O. HAGERUP who most kindly made a series of microtomic preparations of the plant for me.

A transverse section of the thallus shows that the cortical tissue forming the assimilating part of the frond consists of oblong or more irregularly shaped cells, largest innermost, smaller towards the periphery (Fig. 11 a). From the uppermost of these cells papilliform subcylindrical cells, broadly rounded above, protrude freely. For lack of young well-preserved material I have not been able to follow the development of the cortical layer, but I suppose it to be homologous to that of the following species in which according to Mme WEBER's description

and figures the cortical layer consists of filaments several times furcated. The freely projecting papilliform cells in *Titanophora Pikeana* (Fig. 11 a, Pl. I, fig. 1) would thus be the apices of the short filaments.

The cells from which the papilliform cells issue, forming the closely connected peripheric layer, are short and broad in trans-

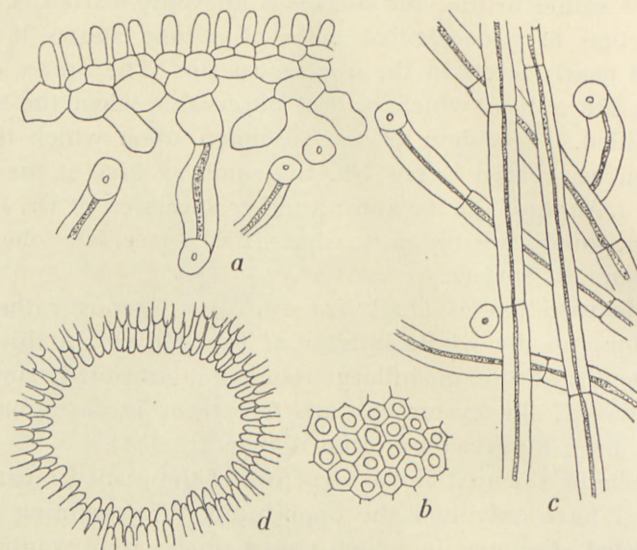


Fig. 11. *Titanophora Pikeana* (Dickie) Børgs. a, transverse section of the cortical tissue; b, the peripheric layer seen from above; c, fragments of the medullary filaments; d, a porus seen from above, surrounded by the papilliform cells. ( $\times 500$ ).

verse section; when viewed from above, the cells of this layer are subhexagonal in shape, about  $7-10\ \mu$  broad (Fig. 11 b). But the freely projecting upper ends of the filaments are not always developed, and the surface of the thallus is then formed by the hexagonal cells only. An even transition is found from the places where the papilliform cells are developed to the bare places; for the papilliform cells gradually become shorter and at last are quite wanting, while at the same time the peripheral cells become more or less vaulted above. The lowermost cells of the peripheric layer are connected with the filaments of the medullary tissue.

In various places in the cortical layer more or less numerous glandular cells are found immersed in it (Pl. I, fig. 1). The glands

are flattened-subglobular with thick walls, about  $30\ \mu$  broad and  $23\ \mu$  high; they have a yellowish, clear, refractive content.

The medullary filaments (Fig. 11 c) are of variable breadth, about  $8\text{--}12\ \mu$  thick, have thick walls and are composed of nearly cylindrical cells about  $60\text{--}70\ \mu$  long; the filaments are furcated

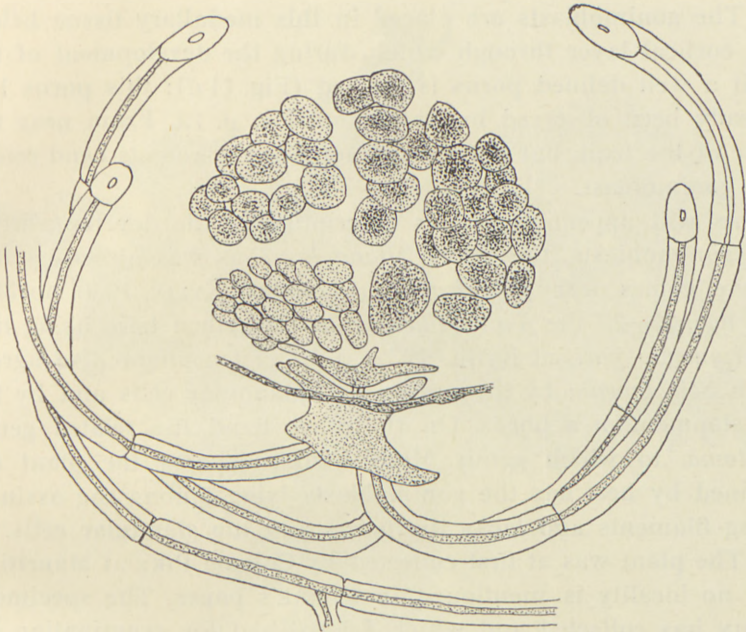


Fig. 12. *Titanophora Pikeana* (Dickie) Borgs. Transverse section of a gonimoblast. The fertilizing filament is seen in connection with the auxiliary cell. The figure is somewhat schematic. ( $\times 700$ ).

now and then. They traverse the interior of the thallus, running in all directions and intercrossing, but having plenty of space between them.

The specimen is a female one, having ripe or nearly ripe fruits also near the apices of the thallus. Consequently it has been impossible to follow the development of the female organs nor that of the auxiliary cells, but in several cases I have been able to observe the fertilizing filaments (Verbindungsfäden Berthold, 1884) in fusion with the auxiliary cells (compare Fig. 12 and Pl. I, fig. 2). The auxiliary cell is large and irregularly polygonal, its corner having often long prolongations. Towards the

periphery the first gonimoblast cell is formed. This cell is large and flattened. Several gonimoblast filaments are developed from it, the cells of which become carpospores. Each of these gonimoblast filaments forms a group of carpospores, and as these groups are of different ages the groups of carpospores are in different stages of development.

The gonimoblasts are placed in this medullary tissue below the cortical layer through which during the development of the fruit a well defined porus is formed (Fig. 11 *d*); this porus has already been observed by J. AGARDH, l. c. p. 13. From near the base of the fruit, but not always, some few filaments bend round the gonimoblast.

As will appear from this description of the development of the gonimoblasts, the genus *Titanophora*, as was already stated above, comes near to *Schizymania*; compare KYLIN, 1930, pp. 38—40, figs. 25—27 the *Turnerella pacifica* described here being like *Schizymania pacifica* Kylin, 1932, p. 10. *Titanophora* also agrees with *Schizymania* by the presence of glandular cells and by the development of a porus. On the other hand the related genus *Platoma*, to which genus MME WEBER referred the plant examined by her, has the gonimoblasts lying among the assimilating filaments and lacks the porus and the glandular cells.

The plant was at first collected by Colonel PIKE at Mauritius, but no locality is mentioned in DICKIE's paper. The specimens JADIN has collected and which I have had for examination are undetermined and without locality. In his list JADIN does not mention it.

To his section *Titanophora* of the genus *Halymenia* J. AGARDH further referred *Halymenia incrustans* J. Ag. from the West Indies; not having been able to examine any specimen of this species I am unable to express any opinion about it. On the other hand, I feel sure that the plant from New Guinea which the late MME WEBER in her Liste, p. 253, calls *Platoma Pikeana*, considering it to be the same as the plant from Mauritius, cannot be DICKIE's species but another species of *Titanophora*.

Soon after I had begun the examination of the plant from Mauritius I felt some doubts about their connection, since it seemed to me that the habit figure of the plant as well as the anatomical figures of MME WEBER showed essential differences

from that of the species from Mauritius. I therefore enquired of the Rijks Herbarium, Leiden, where, as is well known, the herbarium of Mme WEBER is kept, if it were possible for me to see for a short time a specimen of the plant in question. On account of the war the specimen could not be lent, but Director

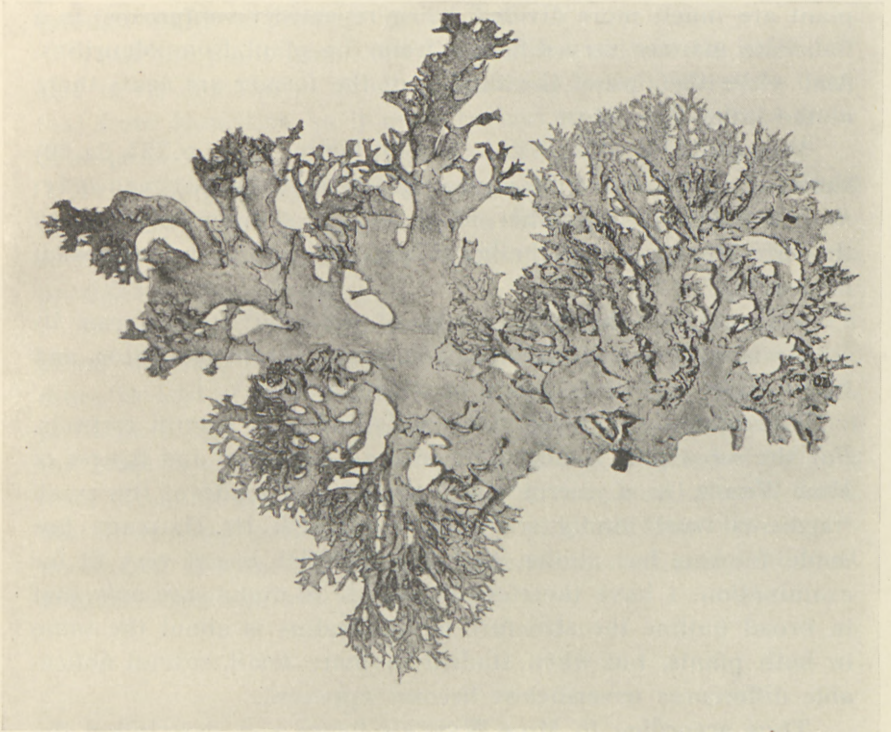


Fig. 13. *Titanophora Weberae* Borgs. A photo of the type-specimen in the Rijks Herbarium, Leiden. (About  $\frac{4}{5}$  natural size).

LAM and Dr. J. TH. KOSTER had the great kindness to send me a photo of one of the two specimens of the plant found in the herbarium and further some fragments of it.

Fig. 13 gives an illustration of the plant. When compared with that from Mauritius the differences are disclosed. *Platoma Pikeana* Weber is much bigger and more robust and much more irregularly divided. Especially is the difference between the very broad main segments and the much divided upper parts of the thallus conspicuous. As is also observable in the photo of the plant,

small proliferations are present along the margins of the thallus which I have not seen in the plant from Mauritius.

The broad portions in the middle of the thallus of *Platoma Pikeana* Weber reach a breadth of up to 2 cm, thus they are much broader than those in the plant from Mauritius; on the other hand, the uppermost parts of the thallus in Mme WEBER's plant are much more divided, being repeatedly subfurcated in a flabellate manner very different from the plant from Mauritius. And while the tips of the thallus of the former are acute those of the latter are obtuse.

Most probably Mme WEBER's habit figure (Liste, p. 253, fig. 80) shows a small part of the upper right side of the specimen only; as her figure, on the other hand, does not show anything of the broad parts of the thallus it must be said to be somewhat misleading.

According to the small pieces of the plant I have seen, its colour is whitish red like that of the plant from Mauritius, and like this its surface is warty in a similar way.

The anatomy of both plants differs also in several respects. For the most part I must refer to the description and figures of Mme WEBER, as a microtomical preparation made of the small fragments most kindly sent me, and which Dr. HAGERUP has made for me, has shown that the material is not very fit for examination. I have therefore been able to make sure only that in broad outline the structure of the thallus is about the same in both plants, but when studied in more detail, several noticeable differences nevertheless become apparent.

Thus according to Mme WEBER's figure and description the peripheric tissue is much more developed, consisting of well marked short filaments several times divided.

And the papilliform free ends of the assimilating filaments found in *Titanophora Pikeana* are not mentioned by Mme WEBER; neither have I found them, but the epidermal cells are often much elongated, attaining a length twice that of their breadth.

Glandular cells very like those in the plant from Mauritius as to size and shape are also found in the cortical layer of the plant from New Guinea; their occurrence is not mentioned in the description of Mme WEBER.

According to Mme WEBER, the auxiliary cells originate from one of the lowermost cells in the assimilating filaments; compare her figure 82. The auxiliary cells are roundish and differ by this from the very irregularly shaped auxiliary cell of the plant from Mauritius. Fig. 83 of Mme WEBER shows that the gonimoblast lies in the medullary layer below the cortical one, through which a porus is developed.

Thus the plant from New Guinea, not only in its habit but also in its anatomical structure shows essential differences from that from Mauritius, so it must be said to be well-defined from this species.

In memory of Mme WEBER who first collected and described this stately plant I propose to call it *Titanophora Weberae* nov. spec., Syn. *Platoma Pikeana* Weber p. p., Liste Alg. Siboga, pp. 253—55, figs. 80—83.

In connection with the description of this species Mme WEBER points out that most probably the *Halarachnion calcareum* Okamura in List of Mar. Alg. collect. in Carol. and Marian Isl., 1916, p. 13, pl. I, figs. 19—21 is the same as her *Platoma Pikeana*. That the plant is a *Titanophora* seems very likely to me, but judging from the habit figure and description of the plant I should think that it is most probably specifically different from the above-mentioned species; but to make sure of this an examination of authentic material will be necessary.

## Fam. 2. *Solieriaceae*.

### *Sarconema* Zanard.

#### 1. *Sarconema filiforme* (Sonder) Kylin.

KYLIN, *Gigartinales*, 1932, p. 22. BØRGESEN, Indian Rhodophyceæ, 1934, p. 11, fig. 7. — *Dicranema filiforme* Sonder in Bot. Zeitung, 1845, p. 56.

In the collection of Dr. JADIN there is a small specimen of a *Sarconema* from Réunion which agrees quite well with Indian specimens. The only difference I have found is that a transverse

section of the plant shows that the cells of the medullary layer are a little smaller than those in the Indian plant; compare my figure 7 l. c.

Réunion: Without locality, F. JADIN no. 176.

Geogr. Distr.: West Australia, India.

## Solieria J. Ag.

### *Solieria natalensis* (Reinb.) Børgs. nov. comb.

*Rhabdonia natalensis* Reinhold in TYSON, New South African Marine Algæ, 1912, p. 199.

Several undetermined specimens in JADIN's collection are, I think, referable to this species; but I have not been able to confirm the determination by means of authentic material.

The figure (Fig. 14) gives the habit of one of the specimens. The frond is terete, perhaps with the exception of the basal parts of the main branches which in the dried condition may reach a breadth of about 8 mm; higher up the main filaments are about 1 mm thick, tapering very little upwards.

As the figure shows, the plant has a rich but irregular pseudodichotomous ramification, forming a dense tuft. The branches are upward directed, the axes in the lower parts rounded, higher up more acute. The tips of the branches are obtuse, often also acute. Short spinelike adventitious branchlets are often given out; this was especially the case in the tetrasporic specimen.

The consistency of the dried plant is very firm and cartilaginous; its colour is dark red-brownish.

An examination of the tips shows that the development of the thallus takes place in accordance with the fountain type, characteristic of the Fam. *Solieriaceae*, compare KYLIN, 1932, p. 13. The structure of the thallus is upon the whole that known from other species of *Solieria*.

The large specimen (Fig. 14) is sterile, but one of the smaller ones is a female plant; the cystocarps occur scattered about the surface of the thallus. They are very protruding with an uneven wartlike surface; a transverse section shows that they are built



up in conformity with KYLIN's figure of that from *Solieria chordalis* (1932, p. 19, fig. 3 B).

Another specimen is tetrasporic; the zonately divided sporangia are formed in the cortical layer and are spread over the thallus.



Fig. 14. *Solieria natalensis* (Reinb.) Børgs. Some filaments from a large specimen prepared separately. ( $\times 1$ ).

REINBOLD points out that the habit of the plant comes near to KÜTZING's figure of *Gigartina flagelliformis* (Tab. Phycol., vol. 18, pl. 5, fig. c) and to *Trematocarpus elongatus* (vol. 18, pl. 4, fig. d). The plant from Mauritius, too, shows a very great resemblance to these figures.

JADIN in his list, p. 164, mentions a *Rhabdonia* spec. from Mauritius (no. 442); a small specimen of his has this number and is this species; on the other hand all the other specimens are unnumbered.

Mauritius: Mahébourg, Sept. 1890, JADIN no. 442.  
Geogr. Distr.: South Africa.

## *Eucheuma* J. Ag.

The late Mme WEBER, in her monograph on the Malayan Algæ, submitted the species of this very polymorphic genus to a thorough examination and found that as regards their anatomy the presence or absence of a central axis in the thallus is of much systematic value. As stated by Mme WEBER, J. AGARDH (Spec. Alg., vol. II, p. 624) had already observed this central axis in *Eucheuma muricatum* Gmel. (= *Euch. spinosum* J. Ag.).

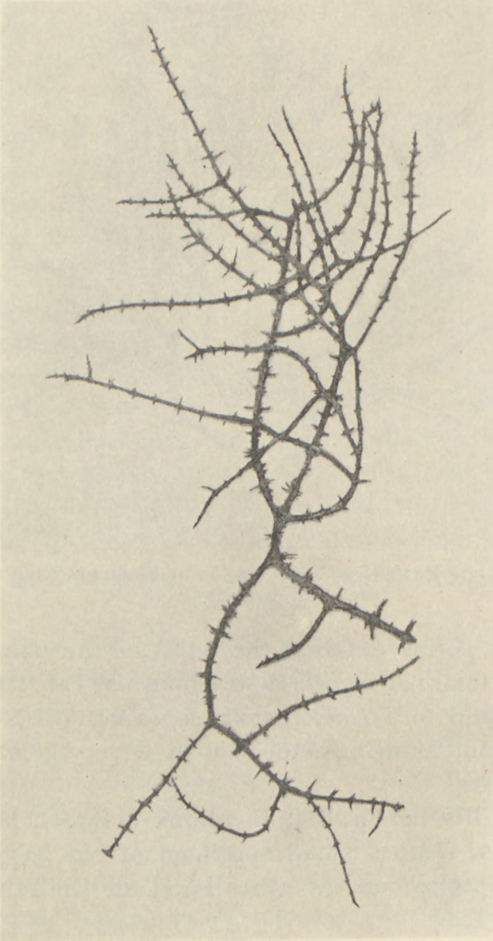


Fig. 15. *Eucheuma serra* J. Ag. Habit of a specimen (no. 854) near the typical form ( $\times \frac{2}{3}$ ).

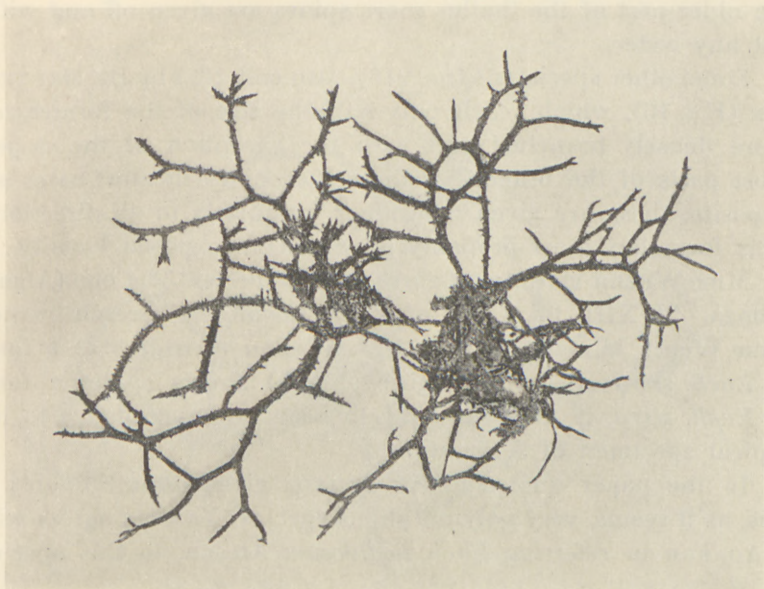


Fig. 16. *Eucheuma serra* J. Ag. A more densely branched and more densely spined form (no. 916) most probably from an exposed place. ( $\times \frac{2}{3}$ ).

The species of *Eucheuma* from Mauritius which I have examined have all had a central axis with the exception of the specimens which I have with much doubt referred to *Eucheuma chondriforme* J. Ag.

### *Sectio I. Anaxifera.*

#### 1. *Eucheuma serra* J. Ag.

AGARDH, J., Spec. Alg., II, p. 626; Epicr., p. 601. WEBER-VAN BOSSE, Algues Siboga, p. 411, pl. XIII, figs. 4–5. KYLIN, *Gigartinales* p. 24, pl. 10, fig. 21. YAMADA, Y., The species of *Eucheuma* from Ryûkyû and Formosa, 1936, p. 120, figs. 1–2, pl. 21–22.

In DR. MORTENSEN'S collection some specimens reaching a height of about 16 cm are found; they agree quite well with the original specimen of J. AGARDH according to a photo published by KYLIN, *Gigartinales*, 1932, pl. 10, fig. 21. In the specimens (nos. 853–54) (Fig. 15) the spines are nearly all opposite or, when more than two are present, subverticillate<sup>1</sup>, lower down in

<sup>1</sup> Compare J. AGARDH, Till Algeries Systematik, VII, Florideæ, p. 87.

the older part of the thallus more spines are given off and without any order.

Some other specimens (no. 916), also collected by Dr. MORTENSEN (Fig. 16), which reach only half the size of the former, are more densely branched and with the exception of the uppermost parts of the branches, where the spines in most cases are opposite, these are given out rather irregularly in all directions. This form has most probably grown in an exposed locality.

Mme WEBER gives two figures of this species. The one (Algues Siboga, Pl. XIII, fig. 4) is of *Euch. nodulosum* Aresch. which Mme Weber in agreement with J. AGARDH considers as a form of *Euch. serra*; the other figure (Fig. 5) shows a sterile form of *Euch. serra*, it must be said to bear no resemblance to the typical specimen of J. AGARDH.

In the paper quoted above YAMADA gives several figures of this, as it seems, very polymorphous species; YAMADA agrees with J. AGARDH in referring *Euch. nodulosum* Aresch. to this species.

Mauritius: Cannoniers Point, 25. Oct. 1929, TH. M.

Geogr. Distr.: Malayan Archipelago, Mauritius.

## 2. *Eucheuma nodulosum* Aresch.

ARESCHOUG, J. E., *Phyceae novae*, 1854, p. 22 (348). KYLIN, H., *Gigartinales*, p. 24, tab. 10, fig. 22. — *Eucheuma serra* forma *nodulosum* Weber, *Liste Algues Siboga*, p. 411, pl. XIII, fig. 4.

Of this species a fine cystocarpic specimen is found in the collection belonging to the Riksmuseum, Stockholm. J. AGARDH in *Epicrisis*, p. 601 considers this plant as the fertile form of *Euch. serra*, but here I follow KYLIN in regarding it as a separate species.

The material was not fit for examination of the anatomical structure.

Mauritius: LJUNGGREN, no locality or date.

Geogr. Distr.: Endemic.

## 3. *Eucheuma horridum* (Harv.) J. Ag.

AGARDH, J., *Spec. Alg.*, p. 625; *Analecta Algologica*, p. 121. WEBER-VAN BOSSE, *Algues Siboga*, p. 412, tab. 16, fig. 3. KYLIN, *Gigartinales*, p. 23, tab. 9, fig. 19. — *Gigartina horrida* Harv., *Alg. TELFAIR*, no. 12, 1834, p. 152 (non *Sphaerococcus horridus* Ag.).

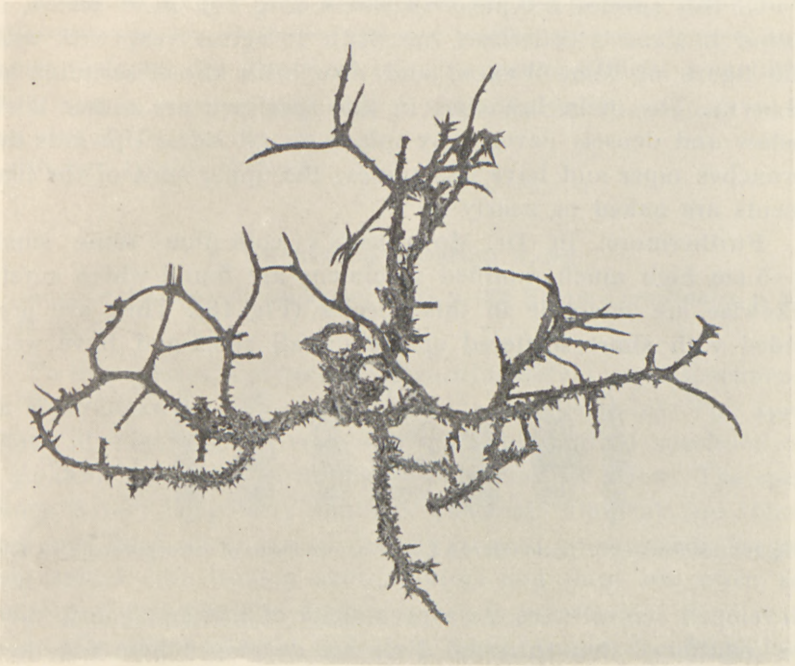


Fig. 17. *Eucheuma horridum* (Harv.) J. Ag. Habit of a most probably typical specimen, JADIN no. 316. ( $\times 1$ ).

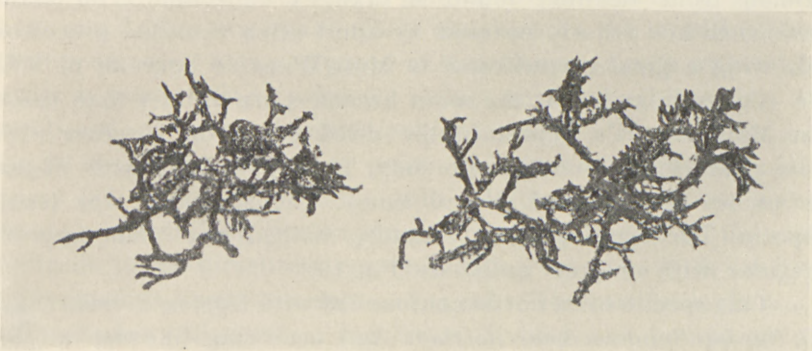


Fig. 18. *Eucheuma horridum* (Harv.) forma *radicans* nov. form. J. Ag. ( $\times 1$ ).

Of this species a typical specimen (Fig. 17), as it seems, is found in JADIN's collection (no. 316). It agrees very well with the figure of Mme WEBER, and also with the description of HARVEY. The main branches in this specimen are rather thick below and densely covered by spines on all sides. Upwards the branches taper and have less spines; the upper ends of the filaments are naked or nearly so.

Furthermore, in Dr. MORTENSEN's collection some small 4–5 cm high much ramified specimens are found which surely likewise are referable to this species (Fig. 18). They are provided with short scattered spines on all sides and have well-



Fig. 19. *Eucheuma horridum* (Harv.) J. Ag. Various forms of tetrasporangia. ( $\times 350$ ).

developed central axes. As a peculiarity of this small form must be mentioned that rhizoidal discs are developed here and there upon the thallus. Most probably this plant has formed a low dense covering upon the rocks, to which it becomes fixed by the discs; because of this peculiarity it may be called *forma radicans*.

Finally, but not without doubt, I refer to this species a specimen from Réunion found in JADIN's collection. The main branches are densely covered by short often ramified processes showing a great resemblance to Mme WEBER's figure 3, pl. XVI in *Algues Siboga*. But the main branches are thinner than those in Mme WEBER's figure; in the dried condition, together with the processes, about  $2\frac{1}{2}$  mm only. The upper bare parts of the branches are furcated several times. The specimen was tetrasporic. The sporangia are zonately divided but often very irregular with oblique walls, see Fig. 19.

This species must not be confounded with *Hypnea horrida* (Ag.) J. Ag. (= *Sphaerococcus horridus* Ag.) occurring likewise at the island. HARVEY did so; he writes (l. c. p. 153): "In referring the specimens to AGARDH's "*Sph. horridus*", I have been perhaps a little guided by his reference, "ad insulam Franciae"."

About its habitat JADIN writes in his list p. 164: "Abondant, croissant sur les récifs en grosses touffes rosées, exposée aux lames violentes. La plante est très cassante et difficile à cueillir".

Mauritius: Flacq, July 1890, F. JADIN, no. 316. Cannoniers Point, Oct. 1929, TH. M. (forma *radicans*).

Geogr. Distr.: Endemic.

#### 4. *Eucheuma jugatum* J. Ag.

AGARDH, J., *Analecta algologica*, 1892, p. 122. KYLIN, *Gigartinales*, p. 23, pl. 9, fig. 20.

To this species, known from Mauritius only, several specimens in MORTENSEN's and JADIN's collection are referable. The specimen of JADIN agrees very well with the original specimen of J. AGARDH according to the figure published by KYLIN. The specimen is very irregularly ramified. The main filaments are about 2—3 mm thick; they are all densely covered by shorter or longer thin spines (the longest about 3 mm) and these are often so densely placed that the thallus is nearly setose.

In Dr. MORTENSEN's collection some specimens from Isle Marianne are, I think, also referable to this species, the filaments in the older parts of the thallus being densely covered by long, thin, often curved spines. In the young parts of the thallus the spines are placed more scattered, often also opposite, and thus show some resemblance to *Eucheuma horridum*.

This species together with the above-mentioned 3 species have nearly the same anatomical structure. In the middle of the thallus a central axis composed of thin elongated cells with thick walls is found. The medullary tissue surrounding this axis is composed of large roundish-polygonal cells. These cells are largest innermost, becoming gradually smaller towards the periphery and at the same time getting thicker and thicker walls through which long prolongations from the lumen of the cell protrude in all directions, communicating by pores with similar prolongations from the neighbouring cells. The cortical layer consists of short filaments a few times divided and composed of ellipsoidal cells.

Whether the above-mentioned 4 species are actually anything but forms of a very polymorphous species is an open question

to me. I have had very little material and these species are no doubt in most cases described upon very scarce material, difficult to prepare as they are, and furthermore the variations of the plants under different external conditions have not been sufficiently taken into consideration.

Mauritius: Herb. F. JADIN (without locality). Isle Marianne, Oct. 29. TH. M. no. 788.

Geogr. Distr.: Endemic.

### 5. *Eucheuma odontophorum* nov. spec.

Thallus ca. 5 cm altus et ultra (?), perennis, ancipite-compresus, hic illic constrictus et subfurcatus, in marginibus dentosis.

Thallus in sicco sine dentibus ca. 3 mm latus, dentes triangulares acuti, ca. 1 mm longi.

Substantia in sicco corneo-cartilaginea.

Organa fructificationis desunt.

Mauritius: Off Flat Island, ca. 25 fathoms, Oct. 1929, TH. MORTENSEN.

In Dr. MORTENSEN'S collection a small but characteristic species of this very polymorphous genus is found (Fig. 20). Most regrettably the material is sterile, but the structure is that of *Eucheuma*.

The plant is surely perennial with periodical growth which stops during the unfavourable season; when the growth begins a single or mostly two shoots are given off from the tips of the thallus from last year.

The thallus is markedly compressed, a transverse section of it being rhomboidal-lanceolate. Along the margins on both sides a row of acute teeth are present; the teeth, triangular of shape and, when dry, sharp and prickly, are nearly 1 mm long and the intervals between them about  $1-1\frac{1}{2}$  mm. In the dried condition the thallus without the teeth is about 3 mm broad; when saturated with water the breadth is about 6 mm and the thickness of the thallus about  $2\frac{1}{2}$  mm.

When dry, the colour of the plant is dark-red, and the consistence is corneous-cartilaginous, the surface being much shrivelled. And, as is mostly the case with dried *Eucheuma*, the thallus is more or less covered with salt incrustations.



A transverse section of the thallus shows the cortical layer to be composed of densely placed filaments several times furcated and consisting of oblong cells, the uppermost peripheral ones being longest and clavate of shape. Inwards the cells become gradually larger, polygonal, often with a tendency to be

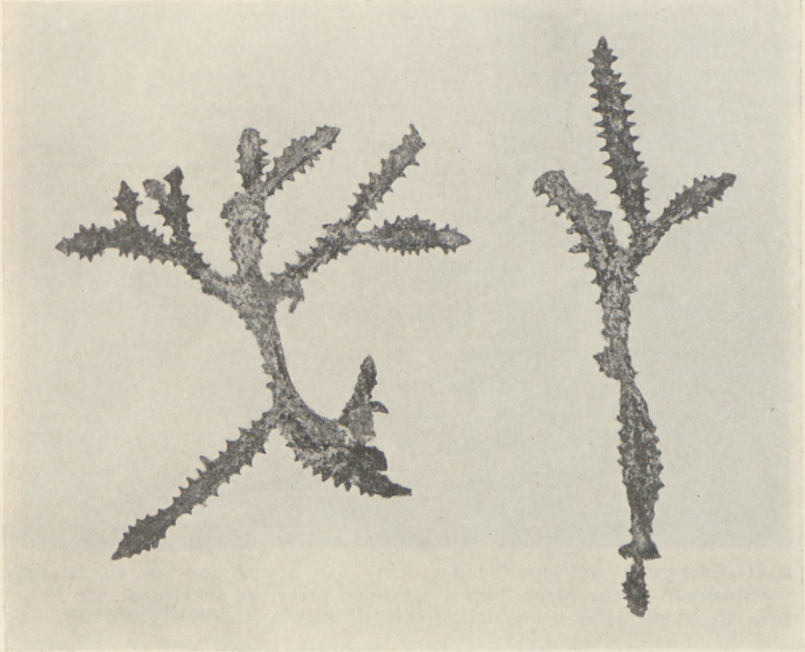


Fig. 20. *Eucheuma odontophorum* nov. spec. Two specimens. ( $\times 1\frac{1}{8}$ ).

stellate. These larger cells make an even transition to the medullary layer which is composed of roundish thick-walled cells, smallest towards the periphery, larger innermost; having a diameter of up to  $200\ \mu$ . In the middle of the thallus a much compressed central axis is present, composed of densely crowded, small thick-walled cells, elongated in longitudinal section.

#### 6. *Eucheuma speciosum* (Sonder) J. Ag.

AGARDH, J., Spec. Alg., II, p. 628; Epicr., p. 603. HARVEY, Phyc. Austr., tab. LXIV. — *Gigartina speciosa* Sonder, in Bot. Zeit., 1845, p. 55. *Gigartina ornata* Kütz., Tab. Phycol., vol. 18, pl. 6.

D. Kgl. Danske Vidensk. Selskab, Biol. Medd. XIX, 1.

var. *mauritiana* n. var.

A var. *typica* præcipue differt thallo tuberculis robustis conicis plus minus dense oblecto.

Dredged near Gunner's Quoin and Flat Island at a depth of about 25 fathoms, Th. M. (Station 44), 1929.

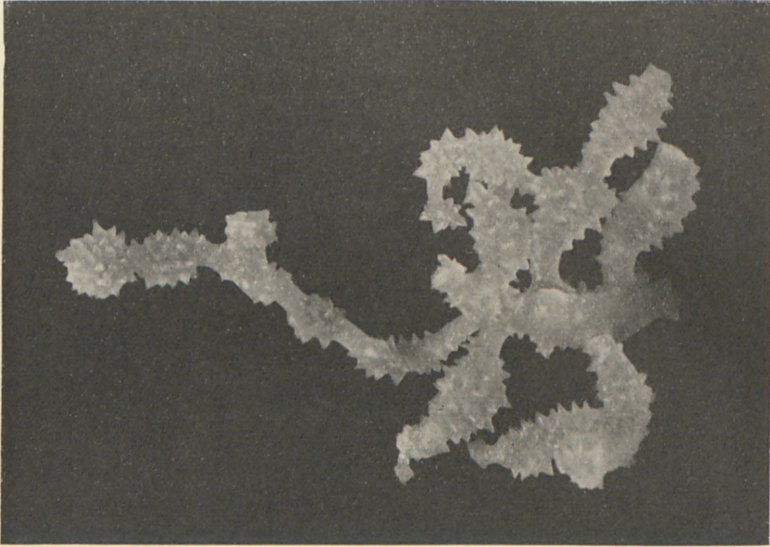


Fig. 21. *Eucheuma speciosum* (Sonder) J. Ag. var. *mauritiana* nov. var. Habit of a fragment of the plant from a specimen preserved in alcohol. ( $\times \frac{5}{6}$ ).

A fine specimen (Fig. 21) preserved in alcohol is found in Doctor MORTENSEN'S collection. In most respects it agrees fairly well with HARVEY'S above-cited figure having a rather regularly constricted nodulose and somewhat compressed thallus, but when according to HARVEY'S figure and description the thallus is said to be "beset on all sides with slender, setaceous, simple or branched processes", this description cannot be said to be in accordance with the plant from Mauritius. In this the thallus is densely covered by vigorous conical spines about  $1\frac{1}{2}$ —2 mm long together with the spines attaining a breadth of nearly 1 cm. Now and then short pieces of the thallus are left bare without spines. Slender, simple or branched processes do not occur.

A transverse section of the thallus is oval. The plant has a central axis; round this there is a medullary layer composed

of large thick-walled cells. As was the case in the above-mentioned species, the cells of the medullary layer decrease in size towards the periphery, at the same time getting very thick walls through which prolongations from the lumen of the cells communicate with those issuing from the neighbouring cells (Fig. 22).

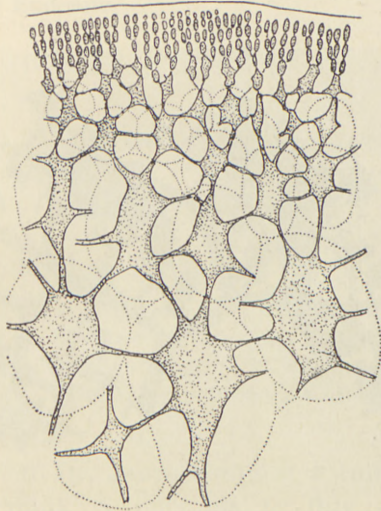


Fig. 22. *Eucheuma speciosum* (Sonder) J. Ag. var. *mauritianum* nov. var. Transverse section of the thallus. ( $\times 225$ ).

The cortical layer is proportionally thin and composed of short filaments, a few times divided, and formed of small oval cells.

JADIN, in his list (p. 164) mentions *Eucheuma speciosum* from Mauritius and gives as localities: Flacq and Mahébourg.

About its habitat he says: "Sur les récifs en grosses touffes rosées, mais cette espèce est assez moins abondante que la précédente" (*Eucheuma horridum*).

Geogr. Distr.: *Eucheuma speciosum* is known from Mauritius, Australia, Tasmania.

## Sectio II. *Anaxifera*.

### 7. *Eucheuma condriforme* J. Ag.

AGARDH, J., Till Algernes System., VII, Florideae, p. 86; *Analecta algol.*, 1892, p. 125. KYLIN, *Gigartinales*, p. 24, pl. 11, fig. 26.

This species has been described upon specimens from Mauritius by J. AGARDH. I have not seen any authentic material of the plant.

In JADIN's collection two small undetermined specimens (compare Fig. 23) are found which might show some likeness to the photo of the original specimens published by KYLIN; but essential



Fig. 23. *Eucheuma chondriforme* J. Ag. One of the specimens in JADIN's collection. ( $\times 1$ ).

differences are present; for instance the main sections of the thallus are much narrower than those found in the original specimens. In some respects the specimens show a fair resemblance, too, to the West Indian species *Eucheuma Gelidium* J. Ag., according to KYLIN's figure of this species, l. c., pl. 11, fig. 24.

A transverse section of the thallus shows a medullary tissue of roundish thick-walled cells reminding one very much of that of *Gracilaria*. In one specimen, that pictured in Fig. 23, the main axis is flattened, in the other subterete. No central axis is present. Whether any central axis is present in the authentic specimen is not mentioned by KYLIN. On the other hand, KYLIN points out that the construction of the cystocarps of this species seems to agree better with that of *Sarcodia*. The specimens I have seen are sterile, and as they were most probably cast ashore, they are not very fit for anatomical examination. But

as said above, the reference of the two small specimens I have seen to this species is not to be relied upon; meanwhile, since this species was originally based upon specimens from Mauritius I have mentioned it in the list. The specimens of JADIN have no locality.

Geogr. Distr.: Endemic.

### Fam. 3. *Rhodophyllidaceae*.

#### *Gelidiopsis* Schmitz.

##### 1. *Gelidiopsis intricata* (Ag.) Vickers.

VICKERS, A., *Algues Mar. Barbade*, 1905, p. 61. FELDMANN, J., *Remarques etc.*, 1931, p. 157. — *Sphaerococcus intricatus* C. Ag., *Spec. Alg.*, p. 333. *Gelidium intricatum* Kütz., *Spec. Alg.*, p. 767. SETCHELL, W. A., *American Samoa*, 1924, p. 163, fig. 31. *Acrocarpus intricatus* Kütz., *Tab. Phyc.*, vol. 18, p. 12, pl. 35.

The collection of Dr. JADIN contains a tuft of a small *Gelidiopsis* which I think is referable to this species originally described upon a specimen from Mauritius.

However, the description of the species is rather defective

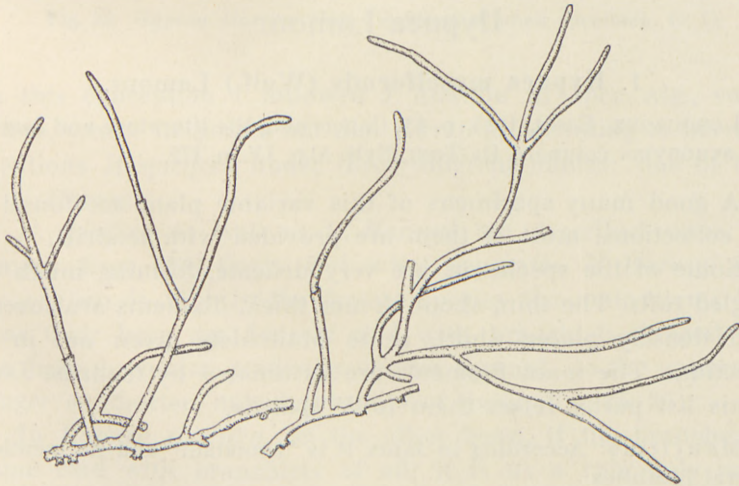


Fig. 24. *Gelidiopsis intricata* (Ag.) Vickers. Parts of the thallus. (About  $\times 5$ ).

and as KÜTZING's figure also is somewhat schematic I give here a figure of the plant (Fig. 24). This forms a low, about  $\frac{1}{2}$ — $\frac{3}{4}$  cm high, tuft formed by the densely crowded and very intricate thin filaments. The plant has creeping, decumbent filaments from which the erect ones arise. The filaments are nearly terete; their diameter is as a rule from 150—200  $\mu$  long, but may in rare cases attain up to 280  $\mu$ . The filaments are much curved and bent and the ramification is scattered and irregular.

The surface cells are rather large, about 8—12  $\mu$  long and 4—6  $\mu$  broad. This agrees with the size of the surface cells SETCHELL (l. c. p. 163) found in specimens from Tutuila Island. I have not seen any kind of fructification but SETCHELL has found tetrasporangia born on short conical branchlets; compare his figure 31.

Mauritius: Without locality in Herb. JADIN.

Geogr. Distr.: Seems to be widely distributed in the Indian and Pacific Ocean, West Indies.

## Fam. 4. *Hypnaceae*.

### *Hypnea* Lamour.

#### 1. *Hypnea musciformis* (Wulf.) Lamour.

LAMOUREUX, Essai, 1813, p. 43. Concerning the literature and numerous synonyms compare DE-TONI, Syll. Alg., IV. p. 472.

A good many specimens of this variable plant are found in the collections, most of them are provided with tendrils.

Some of the specimens are very delicate, forming much entangled tufts. The thin, about  $\frac{1}{2}$  mm thick, filaments are covered with densely placed short, acute branchlets given out in all directions. The main filaments are terminated by tendrils. JADIN in his list partly refers them to *H. spinella*.

Mauritius: According to JADIN it is "abondant" and he mentions several localities.

Geogr. Distr.: Widely distributed in warm seas.

## 2. *Hypnea Harveyi* Kütz.

KÜTZING, F., Spec. Alg., p. 760; Tab. Phycolog., vol. 18, pl. 28, figs. a, b, c

Some small specimens (Fig. 25) in JADIN's collection agree very well with KÜTZING's figure of this species in Tab. Phycologicae. In my paper on North Indian Algae, 1934, p. 18, I referred this species as a synonym to *H. spicifera* (Suhr.) Harv.



Fig. 25. *Hypnea Harveyi* Kütz. Habit of a small specimen. ( $\times 1$ ).

In this conception I followed J. AGARDH in Spec. Alg., vol. II, p. 445, where he points out that KÜTZING, according to his view, mentions *H. spicifera* under three different names; one of these is *H. Harveyi*.

*H. spicifera* as well as *H. Harveyi* are described upon specimens from the Cape. But what separates *H. Harveyi* from *H. spicifera* is that in the former species the main stems from near their base are densely clad with branchlets, longest near the base, becoming gradually shorter upwards to the uppermost, longer or shorter, naked summits of these (Fig. 25, 26).

In *Hypnea spicifera*, on the other hand, if the branches become clad with branchlets at all, it is as a rule only in the upper parts of the main branches that longer or shorter parts

become covered by branchlets. These branchlets are all of nearly the same length, often unilaterally placed and often interrupted by naked interstices.

Thus these species are in reality easily separated.

JADIN in his list p. 166 calls it *H. spicigera* Harv. and writes about its habitat: "Croissant sur les rochers là où la vague est très forte".

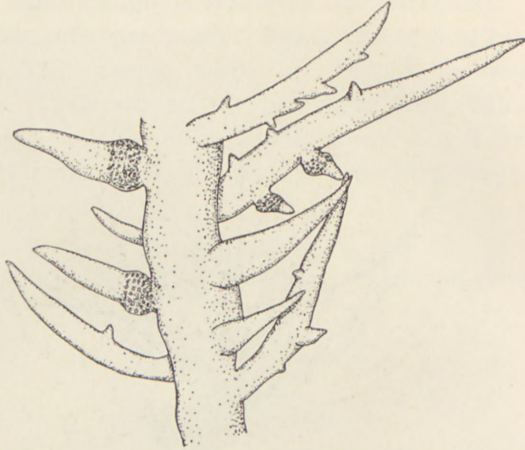


Fig. 26. *Hypnea Harveyi* Kütz. A fragment of the thallus of the plant figured in Fig. 25. (About  $\times 12$ ).

Mauritius: Mahébourg, Sept. 1890, JADIN no. 466. Flacq, Sept. 1890, JADIN no. 485.

Geogr. Distr.: Cape.

### 3. *Hypnea charoides* Lamx.

LAMOUREUX, J., Essai, 1813, p. 44, pl. 10, figs. 1—3. WEBER-VAN BOSSE, Alg. Siboga, p. 449, figs. 188, 189. TANAKA, *Hypnea* from Japan, 1941, p. 243, fig. 16. — *Halymenia seticulosa* J. Ag., Spec. Alg. II, p. 446.

I have referred to this species several specimens in JADIN's collection, basing the determination upon LAMOUREUX's above-quoted figure only; it has not been possible for me to compare the specimens with any authentic material. The specimens also show much likeness to Mme WEBER's figure 188—89, p. 450 of a form which she calls var. *indica*, but they are often still more densely ramified. This for instance was the case in one of the



specimens (Fig. 27), the branches and branchlets forming nearly compact roundish bundles up along the main filaments. In Fig. 28 a small piece of a branch from such a bundle is pic-

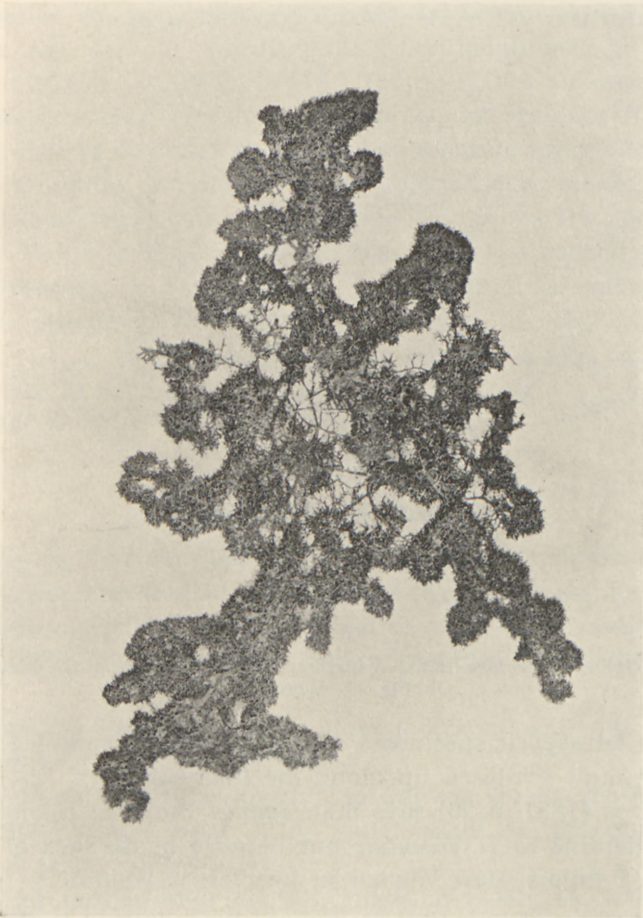


Fig. 27. *Hypnea charoides* Lamx. Habit of a specimen. ( $\times 1$ ).

tured; it shows the irregularly alternating ramification and the more or less divaricate branchlets.

This much ramified form is surely the same as that which HARVEY refers to in Alg. TELFAIR, p. 153 as *Hypnea musciformis* Lamour.,  $\beta$  *ramulosa*. Compare also J. AGARDH, Spec. Alg., vol. II, p. 448. I base this statement upon a specimen from Mauritius

collected by Colonel PIKE and found in the collection belonging to the Riksmuseum, Stockholm. This specimen was determined by DICKIE as *Hypnea divaricata*.

The most densely ramified specimens are female. The cystocarps are nearly globular, about 500–600  $\mu$  broad.

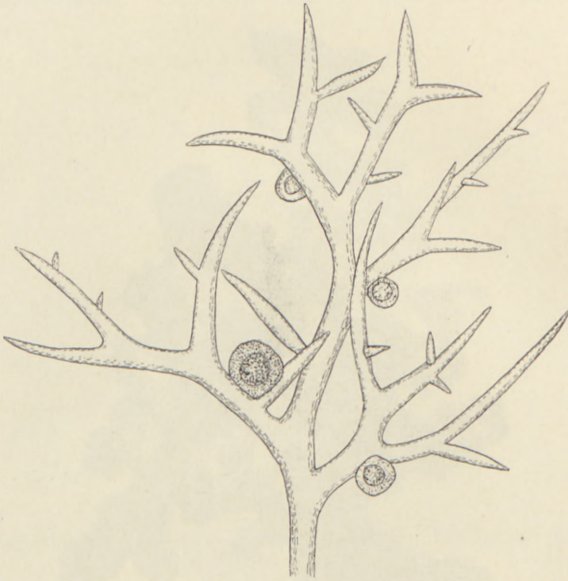


Fig. 28. *Hypnea charoides* Lamx. A fragment with cystocarps of the plant figured in Fig. 27. (About  $\times 10$ ).

The tetrasporic specimens are not so densely ramified, having short ramuli scattered up along the filaments.

HAUCK (1887, p. 20) says that *Hypnea charoides* is most probably referable to *H. Valentiae* but because of the lack of stellate bulbils I follow MME WEBER in keeping it separate.

Mauritius: Cassis, Dec. 21., Colonel PIKE. Without locality, Herb. JADIN.

Geogr. Distr.: Indian Ocean, Australia, Japan etc.

#### 4. *Hypnea Valentiae* (Turn.) Mont.

MONTAGNE, C., Plantes cellulaires. 1840, d. 161. AGARDH, J., Spec. Alg., vol. 2, p. 450. HAUCK, Ueber einige von J. M. HILDEBRANDT etc., 1886, p. 20. BØRGESEN, Contributions, I, 1937, p. 47. — *Fucus Valentiae* Turner, Fuci, pl. 78. *Hypnea musciformis*  $\gamma$  *Valentiae* Harvey, Alg. TELFAIR, p. 153.

Of this variable species Dr. MORTENSEN has collected several large specimens. They form much ramified bushes up to 30 cm high, with numerous branches and branchlets, all with acute tips. All over the thallus stellate small bulbils characteristic of this species are present in great numbers; compare my fig. 387 in Mar. Alg. D.V.I., vol. II, p. 382. As mentioned in former papers (1934, p. 17; 1937, p. 47) I follow HAUCK in referring to this species several closely related forms, for instance *H. hamulosa*, *H. cornuta* etc. often considered as separate species but most probably nothing but forms due to different external conditions.

The specimens are sterile or tetrasporic. Some few specimens are also found in Dr. JADIN's and Dr. VAUGHAN's collections, and it is mentioned in JADIN's list p. 165, where it is said to be a common species at the island.

Mauritius: Cannoniers Point, Oct. 1929, TH. M. Flic en Flacq, 31. Dec. 1938, R. E. V., no. 258.

Geogr. Distr.: Most warm seas.

### 5. *Hypnea bryoides* nov. spec.

Frons ca. 2—3 cm alta, ex filamentis decumbentibus, repentibus, hapteris brevibus ad substratum adfixis et filamentis erectis, simplicibus, teretibus, ramuliferis aut in parte basali nudis, prope basem 1 mm latis, ad apicem versus gradatim tenuioribus composita.

Ramuli sparsi, irregulariter quoqueversum orti, aut steriles aut fertiles.

Ramuli steriles subcylindrici ad apicem versus sensim attenuati, 600—1800  $\mu$  longi et in parte basali ca. 250—300  $\mu$ , in superiori parte ca. 150  $\mu$  lati.

Ramuli fertiles inter steriles mixti, urceolati, ca. 400—500  $\mu$  lati, tetrasporangia per totam superficiem plus minus abundanter praesentia.

Cystocarpia et antheridia non visa.

Mauritius: Flat Island, 17. Oct. 29, TH. MORTENSEN legit.

This handsome, delicate *Hypnea* (Fig. 29), of which I have seen only a single specimen, forms a low tuft about 2 $\frac{1}{2}$  cm high. It is fixed to the substratum by means of decumbent creep-



Fig. 29. *Hypnea bryoides* Borgs. Habit of the plant. ( $\times 2$ ).

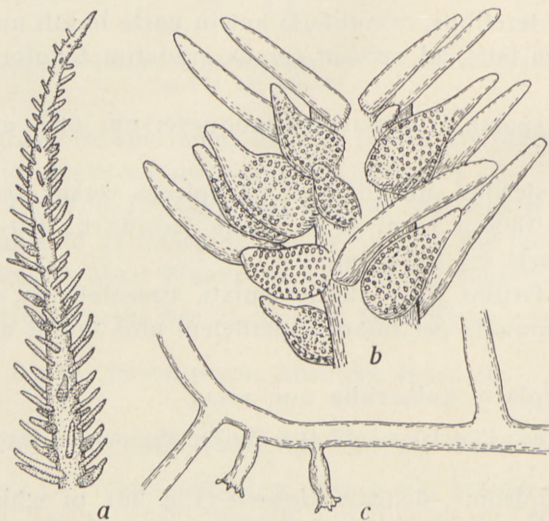


Fig. 30. *Hypnea bryoides* Borgs. *a*, upper part of a filament. *b*, fragment of the thallus with stichidia. *c*, part of a creeping filament. (*a* and *c*  $\times 6$ , *b*  $\times 30$ ).

ing filaments from which short hapters are given out downwards and erect shoots upwards (Fig. 30 c). The erect shoots are terete, unbranched, stemlike and rather straight. Near the base their diameter is up to about 1 mm long; upwards they taper slowly to the summits.

The erect filaments are densely clad all round with short sterile branchlets intermingled with sporangiferous ones (Fig. 30 a, b). The sterile branchlets are subcylindrical, about 600 to 1800  $\mu$  long; near the base their breadth is about 250–300  $\mu$ , tapering gradually upwards to about 150  $\mu$ . Near the base they are a little narrowed and their tips are obtuse. They are in most cases unbranched, only a very few times have I seen a branchlet provided with a short side-branch.

The sporangiferous bodies (Fig. 30 b) are short, bottle-like, and more or less oblique; from the base their breadth increases very quickly to about 400–500  $\mu$ , whereupon they taper gradually, ending in a slender neck about 150  $\mu$  broad.

A transverse section of the thallus shows in the middle some few cells with a narrow lumen surrounded by larger cells which gradually decrease in size towards the periphery. The cells of the medullary layer are rather thick-walled.

I do not know any species of *Hypnea* resembling this little plant.

## 6. *Hypnea pannosa* J. Ag.

AGARDH, J., Alg. LIEBMANN, p. 14; Spec. Alg., II, p. 453. KÜTZING, Tab. Phycol., vol. 18, pl. 27. WEBER-VAN BOSSE, Algues Siboga, p. 455. — *Hypnea musciformis*  $\lambda$  *cornuta* HARV., Alg. TELFAIR, 1834, p. 154.

Some specimens collected by Dr. MORTENSEN quite agree with the type-specimen of this species in the Botanical Museum, Copenhagen. Besides these specimens I have seen a well-prepared tuft in Dr. VAUGHAN'S collection, and a small one from Réunion (no. 63) in Dr. JADIN'S collection.

It is mentioned in JADIN'S list of Algae p. 165, and about its

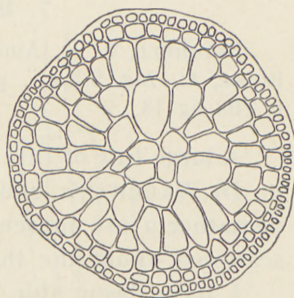


Fig. 31. *Hypnea bryoides* Børgs. Transverse section of erect filament. ( $\times 60$ ).

occurrence he writes: "Forme un gazon de coloration rose-irisé sur les rochers et sur les fonds sablonneux, dans les rigoles creusées dans les coraux".

Mauritius: Cannoniers Point, Oct. 1929, TH. M. Barkly Island, Aug. 1939, R. E. V. no. 335.

Geogr. Distr.: Pacific and Indian Oceans.

### 7. *Hypnea nidulans* Setch.

SETCHELL, W. A., American Samoa, 1924, p. 161, fig. 30. WEBER-VAN BOSSE, A., Alg. Siboga, p. 455, fig. 192. TANAKA, *Hypnea* from Japan, p. 246, fig. 18.

A large tuft of this alga intermingled with *Ceramium* is found in Dr. VAUGHAN'S collection. The specimen is tetrasporic. The nemathecia are present in great number as saddlelike cushions scattered about the thallus.

I have been able to compare the specimen with a cotype specimen from Tutuila (no. 1084) which Professor SETCHELL has most kindly sent me and found that the plant from Mauritius agrees perfectly with the Samoan plant.

SETCHELL has pointed out that HARVEY'S Friendly Island Alga no. 44 distributed as *Hypnea pannosa* is in reality this species. An examination of a specimen of HARVEY'S plant found here in the Botanical Museum shows that this plant has some more short spines scattered upon the thallus than is the case in the specimens from Mauritius and Tutuila Island.

Mauritius: Pointe aux Sables, Aug. 1939, R. E. V. no. 342.

Geogr. Distr.: Samoa, Friendly Islands, Japan, Malayan Archipelago etc.

### 8. *Hypnea* (?) *horrida* (Ag.) J. Ag.

AGARDH, J., Nya Alger fr. Mexico, 1847, p. 14; Spec. Alg., vol. II, p. 454; Epicrisis, p. 565. — *Sphaerococcus horridus* Ag., Spec. Alg., 1821, p. 322; Systema Alg., 1824, p. 237. *Gigartina horrida* Grev., Alg. Brit., 1830, p. LIX.

Of this plant some specimens, most probably cast ashore, are found in JADIN'S collection. As usual the specimens are sterile, this species has not yet been found fruiting, and its systematic position is therefore uncertain.

So as to be able to examine the anatomical structure of the plant I saturated some pieces of the thallus in water and I then noticed that the thallus appeared to have distinct transverse stratifications. A longitudinal section (Fig. 32 *b*) of the thallus showed that this peculiarity was due to the fact that the nearly cylindrical cells of the medulla are all of the same length and arranged in layers above each other. A transverse section of the

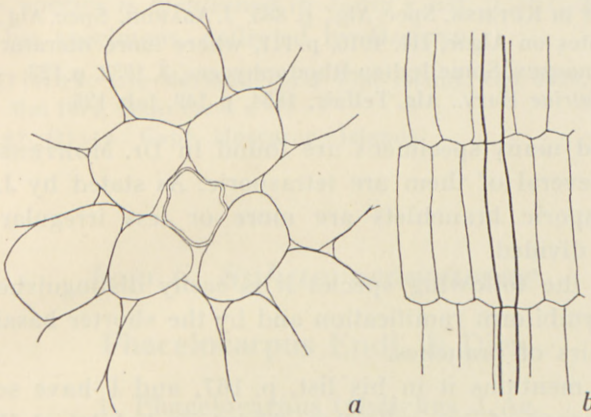


Fig. 32. *Hypnea horrida* (Ag.) J. Ag. *a*, transverse section of the thallus. *b*, longitudinal section of the same. (*a*  $\times$  60, *b*  $\times$  25).

thallus (Fig. 32 *a*) shows that the cells are roundish, and decrease in size from the middle towards the periphery of the thallus. In the middle of the thallus a slender central axis is found, composed of a single filament, the cells of which have the same length as those of the medullary layer. The walls of the central axis are somewhat undulated and rather thick.

In the two specimens I have been able to examine the length of the cells was different, in one specimen about 1300  $\mu$ , in the other about 1000  $\mu$ ; their diameter was about 200–300  $\mu$ . The central cell had a diameter of about 100  $\mu$ .

*Hypnea horrida* is mentioned in JADIN's list p. 166. About its habitat at the island he writes: "Croît en grosses touffes très cassantes sur les récifs. Souvent au voisinage des *Eucheuma*".

Mauritius: Flacq, Sept. 1890, JADIN no. 438, 462 bis.  
Geogr. Distr.: Endemic.

## Fam. 5. *Plocamiaceae*.

### Plocamium (Lamour.) Lyngb.

#### 1. *Plocamium Telfairiae* Harv.

HARVEY in KÜTZING, Spec. Alg., p. 885. J. AGARDH, Spec. Alg., II, p. 400. YENDO, Notes on Algae, III, 1915, p. 111, where more literature is mentioned. BØRGESEN, Some Indian Rhodophyceae, 3, 1933, p. 123. — *Thamnophora Telfairiae* Harv., Alg. Telfair, 1834, p. 149, tab. 125.

A good many specimens are found in Dr. MORTENSEN'S collection. Several of them are tetrasporic. As stated by J. AGARDH the tetrasporic branchlets are more or less irregularly, often stellately divided.

From the following species it is easily distinguished by its more corymbiform ramification and by the shorter basal pinnule in the pairs of branches.

JADIN mentions it in his list, p. 167, and I have seen some few specimens of his collection. About its habitat at the island he writes: "Croissant soit sur des récifs soit sur des rochers avançant en pointe au niveau des récifs; toujours exposé aux vagues très violentes".

As is well known, Mauritius is the type-locality of this species, which is widely distributed in the Indian Ocean.

This species is no doubt common at the island. In JADIN'S and MORTENSEN'S collections I have seen specimens from Flat Island, Isle Marianne, Flacq and Mahébourg.

Geogr. Distr.: Mauritius, New Zealand, Tasmania, New Holland, Japan, India (Karachi).

#### 2. *Plocamium cornutum* (Turn.) Harv.

HARVEY, Nereis Australis, 1847, p. 123. J. AGARDH, Spec. Alg., II, p. 404. — *Fucus cornutus* Turner, Fuci, pl. 258. *Thamnocarpus cornutus* Kütz., Phycol. Gener., p. 450, tab. 59, fig. 3; Tab. Phycol., vol. 16, tab. 55.

Several specimens are found in Dr. MORTENSEN'S collection. From the above-mentioned species, with which it agrees in having two pairs of branchlets alternating up along the main



stems on both sides, it differs by its more robust habit, its more erect main branches, which keep nearly the same breadth upwards due to the fact that the uppermost ramified branchlet have all nearly the same length, and finally because the lowermost undivided branchlets have a length nearly double that in *Ploc. Telfairiae*. KÜTZING'S above-quoted figure in *Tabulae* gives a good illustration of the plant.

This species is mentioned in JADIN'S list, p. 167; I have seen two of his specimens, collected by DARUTY.

Mauritius: Isle Marianne and Flat Island, Oct. 1929, TH. M. Ilôt Gabriel, Mai 1874, DARUTY.

Geogr. Distr.: Cape, Mascarene Islands.

## Fam. 6. *Sphaerococcaceae*.

### *Phacelocarpus* Endl. & Dies.

#### 1. *Phacelocarpus tristichus* J. Ag.

AGARDH, J., Till Algeries System., VII. *Florideae*, p. 57.

Some small specimens are found in the collections. This is the smallest and most graceful of all known *Phacelocarpus* (Fig. 33).



Fig. 33. *Phacelocarpus tristichus* J. Ag. Habit of the plant. ( $\times 1$ ).

The conical and somewhat incurved pinnae are tristichously arranged and are longer than the breadth of the stem-like part of the thallus.

The specimens are sterile.

Mauritius: Îlot Brocus, "washed into the lagoon", Aug. 1938, R. E. V. Mahébourg, Sept. 1890, JADIN no. 463.

Geogr. Distr.: Endemic.

## Fam. 7. *Sarcodiaceae*.

### *Sarcodia* J. Ag.

#### 1. *Sarcodia ceylanica* Harv.

HARVEY, W. H., Alg. Ceylon Exsicc., no. 27. J. AGARDH, Spec. Alg., vol. III, p. 431. KÜTZING, Tab. Phycol., vol. 19, p. 12, pl. 33 a, b. KYLIN, Gigartinales, 1932, p. 56. BØRGESSEN, Alg. Ceylon, 1936, p. 85.

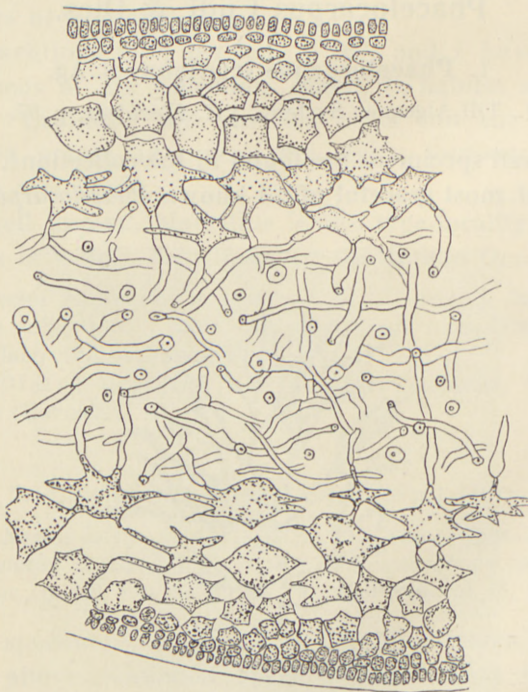


Fig. 34. *Sarcodia ceylanica* Harv. Transverse section of the thallus. (About  $\times 200$ ).

The collections contain several specimens. A transverse section of the thallus shows that in the peripheric part of the medullary layer the cells found there are stellate (Fig. 34), a peculiarity which, as pointed out by KYLIN, is found also in *S. Montagneana* and *S. Gattyaë*.

The elongated transversely divided sporangia are developed in the cortical layer.

In the gonimoblasts their base and interior is composed of a parenchymatic tissue of rather large stellate cells in direct connection with the stellate cells in the medullary layer; from this tissue the gonimoblastic filaments radiate in all directions. The much protruding fruits have a thick wall with a well-developed porus above. In *Icones of Japanese Algae*, vol. IV, no. VI, 1921 OKAMURA in Plate 178, fig. 10 gives a figure of a longitudinal section of a cystocarp of *Sarcodia Montagneana* which agrees quite well with that of the plant I have examined.

About its habitat JADIN, p. 164 writes: "Assez abondante; cette plante croît sur les rochers volcaniques recevant de grosses lames ou soumis à des courants violents. La plante est toujours recouverte, même aux marées basses".

Mauritius: Pointe aux Roches, Febr. 7, 1939, R. E. V. no. 262. Flacq, 1890, JADIN no. 204, 207.

Geogr. Distr.: Ceylon, Japan etc.

## Fam. 8. *Gracilariaceae*.

### *Corallopsis* Grev.

#### 1. *Corallopsis Opuntia* J. Ag.

AGARDH, J., *Epicr.*, p. 409. — *Corallopsis Cacalia* Harv., *Alg. Ceylon*, exsicc. no. 30.

In JADIN's collection some few typical specimens are found and further a single one which has only very scarce annular constrictions and therefore reminds one of *Gracilaria crassa* (Harv.) J. Ag. As I have pointed out in my paper on algæ from Ceylon

(1936, p. 86) I do not think it very improbable that *Corallopsis Opuntia* and *Gracilaria crassa* are forms of the same species influenced by different external conditions.

In this connection I may mention that when visiting the Kew Herbarium shortly before the war I examined the 3 specimens of *Corallopsis Cacalia* Harvey, Alg. Ceyl. exsicc. no. 30 found in the algal collection. In my opinion the two specimens of these are more poorly developed specimens of *Gracilaria crassa*, most probably plants which have grown out of the optimum of the occurrence of this species; the third one, on the other hand, is a bleached, most probably washed-up specimen, quite unlike the two above-mentioned specimens. This latter one answers very well to J. AGARDH's description of *Corallopsis Cacalia*.

Among the material of *Gracilaria crassa* in the Kew Herbarium, on the other hand, some specimens of HARVEY (Alg. Ceylon exsicc. no. 29) are quite typical. But some other specimens from Ceylon (FERGUSSON, Alg. Ceyl. no. 121) referred to this species are more poorly developed and more like the two specimens of HARVEY mentioned above, which I think are intermediate forms between the two species in question. But to be able to decide the above mentioned supposition finally an examination of living material in situ is necessary.

In his list p. 164 JADIN mentions this species; about its habitat he writes: "Recueilli sur la plage après un gros temps; doit être assez rare".

Mauritius: Flacq, July 1890, JADIN no. 245. The specimens I have seen were collected by DARUTY in 1894.

Geogr. Distr.: Ceylon, Malay Archipelago, Mauritius etc.

## Gracilaria Grev.

### 1. *Gracilaria lichenoides* (L.) J. Ag.

AGARDH, J., Spec. Alg., p. 588; Epicr., p. 412. — *Fucus lichenoides* L., TURNER, Hist. Fucorum, tab. 118 a.

Dr. VAUGHAN's collection contains a single but typical specimen; it is a female specimen with cystocarps scattered about the thallus. A transverse section of the thallus shows a rather

thick cortical layer of small cells becoming gradually larger innermost, and surrounding a medulla of large cells.

Some undetermined specimens in JADIN's collection are, I think, also referable to this species.

Mauritius: Flic en Flacq, R. E. V., no. 249, Dec. 31., 1938, "attached to coral debris in lagoon". Without locality, JADIN.

Geogr. Distr.: Red Sea, Indian Ocean.

## 2. *Gracilaria arcuata* Zan.

ZANARDINI, J., *Plant. Mar. Rubr.*, 1858, p. 57, tab. III, fig. 2. FELDMANN, J., *Note sur quelq. Alg. mar. de Tunisie*, 1931, p. 14, figs. 4-6.

var. *Snackeyi* Weber, *Liste Alg. Siboga*, 1928, p. 430, fig. 173.

A small much bleached and most probably washed-up specimen in Dr. JADIN's collection is, I presume, referable to the above-mentioned variety of this species.

It forms a dense much ramified and intricate roundish tuft. The filaments are arcuate and the branches issue more or less secundly; towards the summits of the filaments the ramification becomes irregularly furcated and divaricate; the apices of the branchlets are acute. Mme WEBER's figure gives a good illustration of the plant.

The specimen is a female plant with some few cystocarps. ZANARDINI has not found fruiting specimens; but in the Mediterranean Sea FELDMANN (1931, p. 14, figs. 4, 6) has collected cystocarpic specimens of a plant which he refers to ZANARDINI's species, and points out as a character of this species that the cystocarps are large and ballshaped; in the plant from Mauritius the few and surely rather young cystocarps are also rather large.

As to the anatomical structure of the plant from Mauritius, a transverse section of the thallus shows much likeness to that of FELDMANN. The peripheric cells of the cortical layer are radially elongated like those of the plant from the Mediterranean Sea, but about  $18\ \mu$  long only, thus somewhat smaller than those of FELDMANN's plant; on the other hand, the cells of the interior of the medullary layer had a diameter of about  $500-600\ \mu$ , the same size that FELDMANN gives for his plant. For the rest, when the transverse section of the plant from the Red Sea (comp. ZANARDINI's figure 2 a) is considered, the cells of the

medullary layer seem to be smaller than those of the plant from Mauritius and the Mediterranean Sea. MME WEBER does not mention the anatomy of the Malayan plant.

In his list p. 165 JADIN mentions *Gracilaria radicans* Hauck as occurring at the island. In his collection I have seen two small specimens (nos. 218 and 424) referred to this species. As

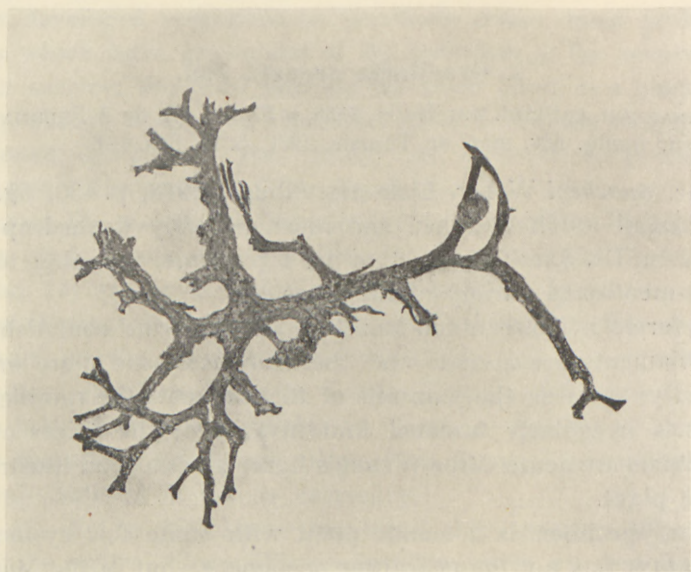


Fig. 35. *Gracilaria arcuata* Zan. var. *Snackeyi* Weber forma *rhizophora* Borgs. ( $\times 1$ ).

some material of HAUCK's species, collected at Madagascar by HILDEBRANDT (no. 94), and determined by HAUCK (1886, p. 165) is found in my herbarium I have been able to compare the specimens of JADIN with authentic material and found that JADIN's specimen cannot be referred to HAUCK's species. On the other hand, as the material of JADIN's plant I have seen, though rather poor, seems to bear a great resemblance to the above-mentioned variety of *Gr. arcuata* I do not hesitate to refer the specimens to it, as also the anatomical structure is rather alike. The reason why JADIN has referred this plant to HAUCK's species is no doubt that from the lower part of the filaments rhizoids are given out, by means of which the filaments become rooted to the substratum.

Because of this peculiarity I propose to call this special form forma *rhizophora* (Fig. 35).

In this connection I should further like to point out that the plant which in Contributions, III, 1938, p. 221 I referred, though with much doubt, to *Gracilaria debilis* (Forssk.) Boergs. is this form; the only specimen I have agrees with this form not only as to its ramification but is also provided with rhizoids.

Mauritius: Herb. JADIN, without locality, DARUTY legit 1892; forma *rhizophora*: Flacq, June 1890, JADIN no. 218; Mahébourg, September 1890, JADIN no. 424.

Geogr. Distr.: Red Sea, India, Malayan Archipelago etc., Mediterranean Sea.

### 3. *Gracilaria corticata* J. Ag.

AGARDH, J., Spec. Alg., II, p. 602; Epicr., p. 423.

A small specimen in JADIN's collection is referable to this species.

It is already known from Mauritius as the *Chondrus multipartitus*,  $\beta$  *foliifer*, Grev. which HARVEY mentions in Alg. TELFAIR, p. 147, according to J. AGARDH, l. c., is this species; J. AGARDH refers to it as a separate variety: var. *linearis*.

The specimen of JADIN has no number and is undetermined but in his list p. 165 the species is mentioned. About its habitat at the island JADIN writes: "Croissant en assez grande abondance; en buissons d'un joli rose; recouvert à marée basse de cinquante centimètres d'eau environ".

Mauritius: Fort Georges à Port-Louis, Aug. 1890, JADIN no. 349.

Geogr. Distr.: Red Sea, Indian Ocean.

### 4. *Gracilaria foliifera* (Forssk.) Børgs.

BØRGESSEN, F., Revision FORSSK. Alg., 1932, p. 7, fig. 1, where the chief literature of the species is mentioned. — *Fucus foliifer* Forssk., Flora Ægyptiaco-arabica; 1775, p. 191.

A specimen of this highly variable plant has been collected by Dr. VAUGHAN. The plant is more subdichotomously divided and fastigiate than is usually the case in this species and in some respects recalls *Gracilaria corticata*. Two small specimens

in JADIN's collection with rather narrow and proliferous thallus also seem referable to this species.

Mauritius: Barkly Island, R. E. V. no. 336, Aug. 1939. Without locality, JADIN.

Geogr. Distr.: Warmer parts of Atlantic Ocean, Mediterranean Sea, Red Sea, Indian Ocean.

### 5. *Gracilaria Millardetii* (Mont.) J. Ag.

AGARDH, J., Till Alg. Syst., IV, VII, 1884, p. 64. — *Rhodymenia Millardetii* Mont., in MONTAGNE et MILLARDET, Algues, 1862, p. 9, pl. XXV, fig. 3.

Of this elegant and characteristic small species, originally described upon specimens from the Mascarene Islands and hitherto known from these alone, I have seen three small specimens only, two of which are from Mauritius and one from Réunion. Two of these specimens are antheridial and one is tetrasporic.

AGARDH describes 3 forms of this species: the typical form, forma *Millardetii* with a thallus divided into broad segments



Fig. 36. *Gracilaria Millardetii* (Mont.) J. Ag. forma *Millardetii* J. Ag. Habit of a male plant. ( $\times 2$ ).



(MONTAGNE l. c. fig. 3) and two with narrow lobes: forma *crenulata* and forma *linearifolia*.

The small antheridial plant of which Fig. 36 shows a picture

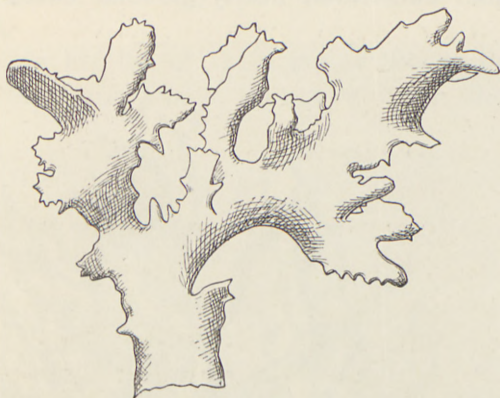


Fig. 37. *Gracilaria Millardetii* (Mont.) J. Ag. forma *Millardetii* J. Ag. A small piece of the plant shown in Fig. 36 drawn on an enlarged scale. ( $\times 5$ ).

is, I think, referable to forma *Millardetii*. Fig. 37 shows a small piece of this plant on an enlarged scale. When compared with MONTAGNE's figure of a cystocarpic specimen the antheridial plant has much narrower lobes, about 2–3 mm broad. The thallus is

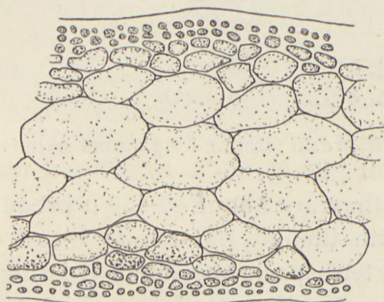


Fig. 38. *Gracilaria Millardetii* (Mont.) J. Ag. Transverse section of the thallus (About  $\times 300$ ).

flat and the segments are several times irregularly flabellately divided; the margins are provided with short processes in some places, in others not.

A transverse section (Fig. 38) of the thallus shows a cortical layer composed of small roundish cells. The medullary layer

consists of roundish or oblong cells, smallest nearest the periphery, larger towards the middle where they have a breadth of up to 100  $\mu$ . The whole thallus is about 300  $\mu$  thick.

The small antheridial nearly globular caves are formed in



Fig. 39. *Gracilaria Millardetii* (Mont.) J. Ag. forma *crenulata* J. Ag. ( $\times 1\frac{1}{3}$ ).

the cortical layer; they are about 40–50  $\mu$  broad and the surface is closely beset with them.

Fig. 39 shows a tetrasporic specimen. It is higher, about 6 cm, and the thallus consists of narrow lobes which towards the apices become more irregularly divided and crenulated; this plant, I think, is referable to forma *crenulata* J. Ag.

The specimen from Réunion, like the one from Mauritius, is antheridial. It has a very narrow, linear thallus and is most probably referable to forma *linearifolia* J. Ag. (Fig. 40).

Having now become acquainted with this small *Gracilaria*, it strikes me that the small *Gracilaria* I described in Contributions,

II, 1937, p. 327, fig. 3 as a new species: *Gracilaria pygmaea* most probably, like the above-mentioned, is forma *linearifolia* of this species. The only specimen I had for examination was female. To decide the question definitely more material than I have seen will be required.

Mme WEBER, in her list of the algae of Siboga p. 432, has figured a small *Gracilaria* which, though with a ?, she refers to

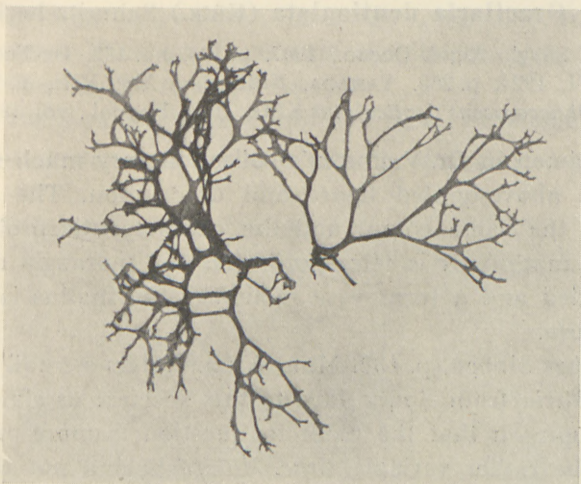


Fig. 40. *Gracilaria Millardetii* (Mont.) J. Ag. forma *linearifolia* J. Ag. ( $\times 1\frac{1}{8}$ ).

*Gracilaria denticulata* (Kütz.) Schmitz, syn. *Sphaerococcus denticulatus* Kütz., Tab. Phyc., vol. XIX, 1869, p. 19, tab. 51. The plant of Mme WEBER was collected at Java and from her description, and especially from her figure, I am much inclined to suppose that the plant in question is a form of *Gracilaria Millardetii*.

In addition to this I would further point out that the well-known Chinese algologist, Professor C. K. TSENG, in a letter received from him from America just before the postal connection became interrupted, has written to me that near Hong Kong he has collected a small *Gracilaria* which he presumes to be like *Gracilaria pygmaea*. Most probably the plant in question is a form of *Grac. Millardetii*.

It seems rather likely therefore that this small species is actually widely distributed in the Indian Ocean.

As to the habitat of *Grac. Millardetii* JADIN, l. c. p. 165, writes:

“Abondant. La plupart des exemplaires ont été recueillis rejetés sur la plage sauf le numéro 369 qui croissait sur des débris de grosses coquilles a l'îlot Barclay dans une eau calme”.

Mauritius: Îlot Barclay à Port-Louis, Aug. 1890, JADIN no. 369.

Geogr. Distr.: Mascarene Islands; most probably also distributed throughout the Indian Ocean.

### 6. *Gracilaria denticulata* (Kütz.) Schmitz herb.

MAZZA, Saggio Algol. Ocean., 1907, p. 138, no. 172. DE-TONI, Sylloge Alg., vol. VI, 1924, p. 265. YAMADA, Notes Jap. Alg., VIII, p. 125, pl. 25, fig. 2. — *Sphaerococcus denticulatus* Kütz., Tab. Phycol., vol. 19, tab. 51.

A specimen in Dr. VAUGHAN's collection very much resembles KÜTZING's above-quoted figure and description. The specimen has quite the same colour and the characteristic proliferations along the margin. It is tetrasporic and the sporangia are cruciately divided and a transverse section of the thallus is like that of *Gracilaria*.

In Algues Siboga, p. 432, Mme WEBER refers a small specimen of a *Gracilaria* from South Java to this species; as stated above, I am of opinion that the plant in question is more probably a form of the rather variable *Grac. Millardetii* and not this much bigger species of KÜTZING.

Most probably the plant from Mauritius is the same as that which A. MAZZA, l. c. p. 172 (compare also what is said by DE-TONI in Sylloge Algarum, vol. VI, p. 265), found in SCHMITZ's herbarium under the above-mentioned name. This specimen originates from The Kowie in South Africa and this species might therefore very well occur at Mauritius also.

Mauritius: Barkly Island, “cast up by waves”, R. E. V. no. 355.

Geogr. Distr.: New Caledonia, Timor, South Africa, Japan.

*Fam. 9. Mychodeaceae.***Mychodea** Harvey.**Mychodea chamaedoridis** nov. spec.

Frons epiphytica, teretiuscula, in *Chamaedoride Delphinii*, caespitosa, intricata, ca. 3—4 cm alta et  $\frac{1}{4}$ — $\frac{1}{2}$  mm lata, irregulariter sparse ramosa. Rami quoqueversum egredientes, plus minus curvati, apicibus acutis et saepe hamatis.

Color thalli exsiccatione purpureo-fuscus. Fructificatio ignota.

Mauritius: Flat Island, 17. Oct. 1929, TH. MORTENSEN legit.

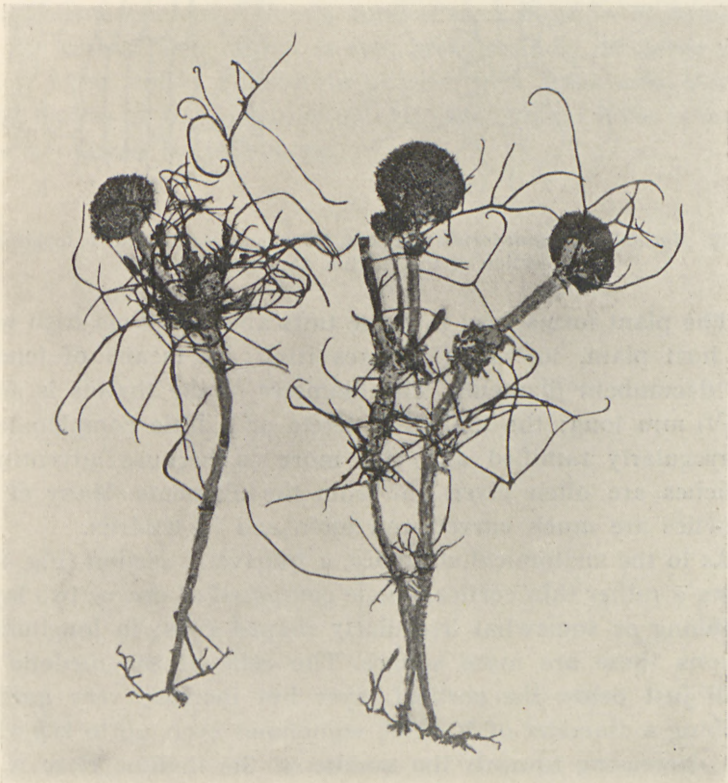


Fig. 41. *Mychodea chamaedoridis* Børgs. Filaments of the plant epiphytic upon *Chamaedoris Delphinii* (Hariot) Feldm. et Børgs. ( $\times 1$ ).

As an epiphyte upon *Chamaedoris Delphinii* (Har.) Feldm. and Børgs. a small *Mychodea* is found in MORTENSEN'S collection (Fig. 41). It is very regrettable that all the specimens are sterile but even so, I think it justifiable to regard the plant as a new species since it cannot be referred to any of the species of this genus hitherto described. In appearance it shows much likeness to forms of *M. hamata* J. Ag. but it scarcely attains half the size of this species and is also very different in its anatomical structure.

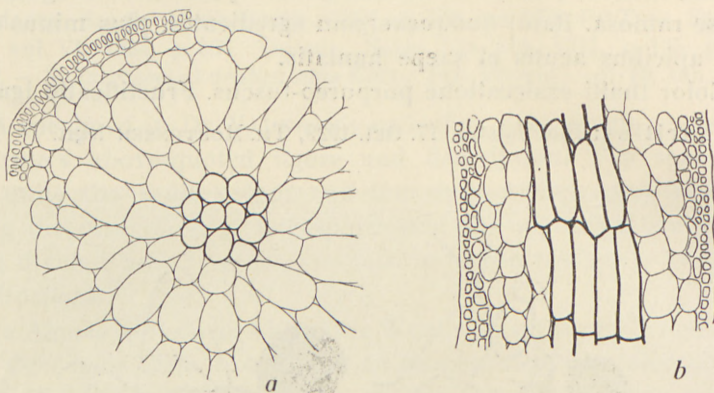


Fig. 42. *Mychodea Chamaedoridis* Børgs. *a*, transverse section and *b*, longitudinal section of the thallus. (About  $\times 60$ ).

The plant forms very intricate tufts about 3–4 cm high upon the host plant, to which it fixes itself by means of tendrils and decumbent filaments. The diameter of the thallus is about  $\frac{1}{2}$ – $\frac{1}{4}$  mm long; the thallus is terete or a little complanate. It is irregularly ramified and still more so because adventitious branches are often given out from the filaments. Many of the branches are much curved and often end in tendrils.

As to the anatomical structure, a transverse section (Fig. 42 *a*) shows a rather thin cortical tissue composed of one or two layers of oblong or somewhat irregularly shaped cells; in longitudinal sections these are more square. The cells of the medulla are small just below the cortical layer but increase very quickly, reaching a diameter of 50–100, sometimes even up to 200  $\mu$  and then decreasing towards the middle of the thallus. Here a not very marked axis is found, formed of up to about ten cells; in transverse section these cells are roundish or a little edged; they

have rather thick walls and a diameter of about 20—30  $\mu$ . In longitudinal sections (Fig. 42 b) they are found to be sub-cylindrical, about 180  $\mu$  long with more or less oblique transverse walls.

As is mentioned by KYLIN, 1932, p. 62, the *Mychodea* species grow by means of an apical cell; in some species this is easily observable, in others difficult to see because of the crowded cells at the tips of the thallus. In the *Mychodea* species from Mauritius a good many cells surround densely the apical cell; but being a little larger than those nearest to it, it is in most cases discernible without difficulty.

As was said above, the plant from Mauritius bears some likeness to *M. hamata*, but it is much smaller and poorer developed in all respects. The same applies to the cells of the medullary tissue, which are about  $\frac{1}{2}$ — $\frac{1}{3}$  smaller than those in *M. hamata*; and the central axis, which is very prominent in the latter species, is often rather difficult to observe in a transverse section of the thallus of *M. Chamaedoridis*. Also the cortical layer is much more developed in *M. hamata*.

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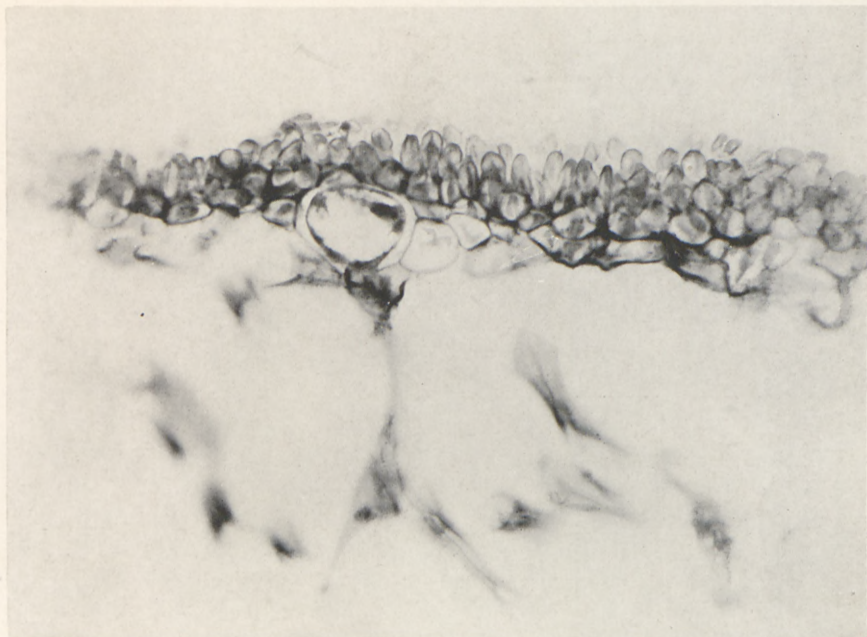


Fig. 1. *Titanophora Pikeana* (Dickie) Børgs. Transverse section of the thallus showing the cortical layer with the papilliform, subcylindrical cells; in the middle a gland-cell and below fragments of the filaments traversing the interior of the thallus. ( $\times 530$ ).

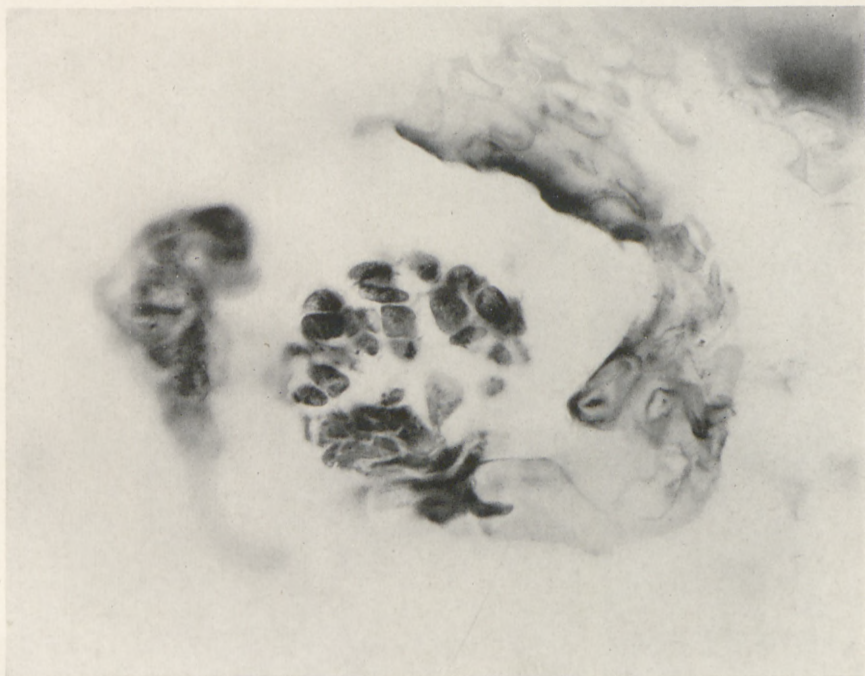


Fig. 2. *Titanophora Pikeana* (Dickie) Børgs. A gonimoblast. The fertilizing filament is visible crossing over the auxiliary cell. ( $\times 530$ ).