

SOME MARINE BROWN ALGAE NEW OR RARE TO THE NETHERLANDS

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SUMMARY

Descriptions and illustrations are given of five brown algal species considered to be new to The Netherlands, viz.: *Laminariocolax tomentosoides*, *Mikrosyphar porphyrae*, *Myrionema aecidioides*, *Pogotrichum filiforme*, and *Protectocarpus speciosus*, and five species which have rarely been recorded previously, viz.: *Feldmannia irregularis*, *Leathesia difformis*, *Punctaria latifolia*, *Sorocarpus micromorus*, and *Ulonema rhizophorum*. Some notes are given on their distribution and ecology, and in some cases results of preliminary culture studies.

1. INTRODUCTION

During the preparation of a new flora of the Dutch marine algae we found it necessary to do a good deal of field work in order to update the information on occurrence and distribution of several algal species. Our chief source of information on Dutch epilithic algae dates back more than 20 years now (DEN HARTOG 1959). An earlier account is that of VAN GOOR (1923), dealing chiefly with the northern part of The Netherlands, whereas the recent study of NIENHUIS (1980) was limited to the southwestern part.

Our inquiries draw the attention to a number of species not known or incompletely known in literature concerning the Dutch coast. Five species of brown algae we consider to be new to The Netherlands. Five other species are reported here because of their relatively rare mention in existing literature and their incompletely known distribution in The Netherlands.

Given descriptions of these species are based upon our own material, part of which has been preserved and is stored at the Herbarium of the Free University at Amsterdam (AVU). In determining whether any find was new to The Netherlands we have relied on presence of material in the Rijksherbarium at Leiden (L), as well as on mention in the literature.

2. OBSERVATIONS AND DISCUSSION

2.1. Species new to The Netherlands

Laminariocolax tomentosoides (Farl.) Kylin (figs. 6–7)

Plants forming tufts up to 1 cm high, consisting of entangled filaments with few indeterminate laterals, but often numerous plurilocular sporangia. Basal part of the plants filamentous, often endophytic. Erect filaments c. 8 μm in diameter, cells 1–2 (3) times as long as broad and containing 1 or

2 parietal chromatophores. Plurilocular sporangia inserted at right angles on the main axes, up to several 100 μm long, hardly broader than the vegetative filaments, usually uniseriate, but sometimes with 2 or 3 loculi per tier. Other reproductive structures not observed, neither in the field, nor in culture.

Found growing on *Laminaria saccharina*, Texel, 2-II-1981. Probably more widespread, but easily overlooked because of its small size.

Mikrosyphar porphyrae Kuck. (fig. 4).

Plants forming brown patches on *Porphyra* spp., up to several mm in diameter, consisting of irregularly branched filaments, both creeping on the surface of *Porphyra* and endophytic between the cells of the latter. In the infected spots the cells of *Porphyra* gradually degenerate. Filament diameter varying between 3 and 8 μm , the cells 1–3 times as long as broad and provided with 1 or 2 parietal chromatophores. Plurilocular sporangia project from the surface of the host and measure c. 15 \times 4 μm ; they are uniseriate, consisting of generally not more than 4–8 loculi. Other reproductive organs not observed.

Found growing in *Porphyra* spp., at Strijenham, 20-II-1980; Yerseke (oyster-ponds), 10-VIII-1980; Sas van Goes, 27-VIII-1980, 31-VIII-1981; Brouwersdam (Grevelingen), 31-V-1981.

The finds indicate that *Mikrosyphar porphyrae* may be quite common in the Delta area. It grows in tidal water of the Oosterschelde as well as in the stagnant Lake Grevelingen. Three of the four species of *Porphyra* occurring in The Netherlands, namely *P. leucosticta*, *P. purpurea* and *P. umbilicalis*, have been found to serve as a substrate. The frequency of the finds and the relative abundance of the plants may indicate a recent introduction into The Netherlands, as it forms conspicuous spots on *Porphyra* and is not easily overlooked.

A related species, *M. polysiphoniae* Kuck., was found in The Netherlands before (Yerseke, 27-VII-1952, present at L). Recently it is not infrequently met with in *Polysiphonia violacea* from Lake Grevelingen. Differences between the two species are not very clear cut. KYLIN (1947) mentioned differences in cell diameter (3–5 μm in *M. porphyrae*, as opposed to 6–9 μm in *M. polysiphoniae*) and presence of multicellular hairs in *M. porphyrae*, which are absent from *M. polysiphoniae*. Our material of *M. porphyrae* shows a considerable variation in cell diameter, and it appears that for the moment the species can only be distinguished by their substrates.

Myrionema aecidioides (Rosenv.) Sauv. (fig. 5).

Plants microscopic, primarily forming a basal cell layer between epidermis and cortex of *Laminaria* spp. Basal layer on the lower side giving rise to endophytic filaments, on the upper side with many plurilocular sporangia. The sporangia ultimately break through the epidermis of the host and thus a structure is formed not unlike the fruiting bodies of rusts (Basidiomycetidae). Plurilocular sporangia uniseriate, c. 8 μm in diameter, 60 μm in length. Other reproductive structures not observed.

Found growing in *Laminaria saccharina*, Texel, 5-VI-1980.

Because of its endophytic habit this species is easily distinguished from the other representatives of *Myrionema* growing on the Dutch coast, namely *M. coronnae*, *M. magnusii* and *M. strangulans*. Like *M. aecidioides*, *M. coronnae* occurs exclusively on Laminariales.

Pogotrichum filiforme Reinke (figs. 8–11).

Plants unbranched filamentous, up to 1 cm high, first uniseriate, later on multiseriate; several erect filaments arise from a basal cell layer. Secondary attachment of the filaments by means of rhizoids

from the lowermost cells, vegetative cells square or rectangular, 15–30 μm in largest diameter, containing 4–10 disc-shaped chromatophores in parietal position. Plurilocular sporangia formed from scarcely modified vegetative cells, often occupying the larger (distal) part of the plants; no vegetative core remains after spore release. Other reproductive structures not observed.

Found growing on *Laminaria saccharina*, on the island of Texel, 2-II-1981 and Gorishoek, 7-IV-1981.

Preliminary culture studies indicated a type of life history identical to that found by PEDERSEN (1978): from the zoids a creeping phase (microthallus) develops, with irregularly shaped plurilocular sporangia as sole reproductive organs. This phase may probably be identified as *Endodictyon infestans* Gran (cf. KYLIN 1947).

Protectocarpus speciosus (Børg.) Kuck. (figs. 12–13).

Thallus consisting of a monostromatic basal plate, at the margin loosely filamentous, bearing numerous erect filaments, the latter up to 1 mm high. Prostrate filaments c. 6 μm in diameter, cells as long as broad, at the margins longer. Erect filaments 8–11 (12) μm in diameter, cells 1–2 times as long as broad, containing 1 or 2 parietal chromatophores with one or two pyrenoids each. Plurilocular sporangia either sessile on the basal plate or terminal or lateral on vegetative filaments, in the latter case often in second series. Plurilocular sporangia measure c. 10 μm in diameter, their length varying between 20 and 100 μm . Other reproductive structures not observed. Multicellular hairs may be present, arising from the basal plate.

Found growing on *Petalonia fascia*, Lake Grevelingen near Bruinisse, 25-VI-1980, and washed ashore, Huisduinen, 29-VIII-1980.

The latter specimens showed part of the basal system to grow endophytic in *Chorda filum*.

2.2. Species rarely recorded previously in The Netherlands

Feldmannia irregularis (Kütz.) Hamel (figs. 1–2).

Plants filamentous, forming small tufts up to 5 mm high. An irregularly branched system of filaments creeping between the utriculi of *Codium* serves as an endophytic base. The erect filaments branch a few times near their bases and bear several plurilocular sporangia. Above this sporangia bearing region a small meristematic zone is found, which on the distal side gives rise to strictly unbranched assimilatory filaments. Erect filaments c. 20 μm in diameter, the cells up to thrice as long as broad, containing several parietal chromatophores. Plurilocular sporangia measure up to 120 \times 30 μm . Other reproductive structures not observed.

Found at the harbour mole at Ouddorp, Lake Grevelingen, growing on *Codium fragile*, 25-VI-1980.

This is not the first report of *F. irregularis* from the Dutch coast (cf. DEN HARTOG 1959), but the specimens cited by VAN GOOR (1923) and LUCAS (1950) (both as *Ectocarpus irregularis*) are morphologically different from our material and in our view belong to *Giffordia*. Also other specimens present at L belong to different taxa, among which *Elachista* sp. These reidentifications presume the presence of meristematic zones only in the basal part of the plants to be of crucial importance for the genus *Feldmannia*; this interpretation is in agreement with that of CARDINAL (1964, see also KÜTZING 1855 on *Ectocarpus irregularis*), but other authors (cf. HAMEL 1931–1939) have stated that plants may be more diffusely branched and possess several meristematic regions at different levels. Last-mentioned form agrees rather well with *Giffordia intermedia* (Rosenv.)

Lund and may represent an intermediate between the genera *Feldmannia* and *Giffordia* (see CARDINAL 1964).

A related species, *F. simplex* (Crouan frat.) Hamel, also growing on *Codium*, was reported by DEN HARTOG (1959). It differs from *F. irregularis* by its larger filament diameter (c. 30 μm) and more blunt plurilocular sporangia. Another species reported to grow on *Codium* (but not known from The Netherlands) is *F. globifera* (Kütz.) Hamel; it has larger cell diameters than our material (CARDINAL 1964).

Leathesia difformis (L.) Aresch. (fig. 3).

Plants forming globose masses, up to 5 cm in diameter. Young plants solid and regularly globose, older plants becoming hollow and irregularly furrowed. Color olive-brown. Internally the plant is composed of radiating dichotomously branched filaments, terminating into short (up to 5-cells) simple assimilatory filaments. Cells of the latter contain several disc-shaped parietal chromatophores, the inner cells are much larger and contain only a few chromatophores or none at all. Multicellular hairs are formed from below the surface. Both unilocular and plurilocular sporangia are borne terminally or laterally on the non-assimilating filaments.

Found in tidal pools at Kats (4-IV-1977, 2-V-1977, 28-V-1977), in Lake Grevelingen near Bruinisse (25-VII-1979, 7-V-1980, 25-VI-1980, 31-V-1981) and in the Mokbaai (Texel) (5-VI-1980).

The history of the occurrence of *Leathesia* in The Netherlands consists of infrequent records. Earlier reports, based on material from Den Helder and Vlissingen, are summarized by DRESSCHER (1976), while at L there are specimens from a few localities along the Waddenzee. We found this species in some quantity in tidal pools at Kats (1977) and in large numbers in Lake Grevelingen near Bruinisse (1979). During the years 1980 and 1981 only a few specimens were found on last-mentioned locality, whereas it was rather frequent in the Mokbaai (Texel), 1980. This illustrates the irregular occurrence of *Leathesia* in The Netherlands; we do not know one single locality where this species does occur with some regularity. Our collections (also including fertile specimens) were made in the months April, May, June and July. Plants grew often epiphytic, e.g. on *Gigartina stellata* and *Chaetomorpha linum*.

Punctaria latifolia Grev. (figs. 14–19).

Plants consisting of undivided light brown blades, up to c. 10 cm long and 4 cm wide, provided with a stalk of a few mm at the most. At cross section the blades are 2–6 layered, when more than 2 layers are present a differentiation in medulla and epidermis becomes apparent. Epidermal cells contain several parietal chromatophores. Superficial cells square or rectangular, 15–30 μm in largest diameter. Blades on the margins and on the surface provided with numerous multicellular hairs. Plurilocular sporangia usually formed in rectangular patterns, developing from the epidermal cells and more or less protruding from the thallus surface. Other reproductive structures not observed.

Found in Lake Grevelingen (Bruinisse), 30-V-1980, 1-IV-1981, 31-V-1981; Brouwersdam, 1-IV-1981; Den Osse, 29-X-1980; Ouddorp, 7-V-1980.

In recent years this species is found rather frequently in Lake Grevelingen, in spring sometimes abundant, mostly epiphytic on other algae (*Codium fragile*; *Scytosiphon lomentaria*; *Sargassum muticum*; *Chondrus crispus*; *Gigartina stellata*).

Although *P. latifolia* has been mentioned only once from a drift specimen

(VAN GOOR 1923), it was reported under the name of *Desmotrichum undulatum* (J. Ag.) Reinke from the island of Terschelling (DEN HARTOG 1959). Arguments for the synonymy of these species were given by RIETEMA & VAN DEN HOEK (1981). *Desmotrichum* in its original description differs from *Punctaria* by the lanceolate to linear shape of the blades. If we accept the two as one and the same species, there is no explanation why at Terschelling only a narrow-leaved form should be found, whereas in Lake Grevelingen broad-leaved forms are more abundant.

Culture observations on our material indicate a life history similar to the one found by RIETEMA & VAN DEN HOEK (1981): no other reproductive structures than plurilocular sporangia were found, both on the macrothallus and microthallus. No name has so far been attached to the microthallus, which in the field might well be taken for a different species. We think it fits the description of a *Hecatonema* species fairly well.

Two other species of *Punctaria* have been reported from the Dutch coast, namely *P. hiemalis* Kylin and *P. plantaginea* (Roth) Grev. The former (see VAN GOOR 1923) is probably a small form of *P. latifolia*, growing on *Zostera* leaves (cf. RUENESS 1977). *P. plantaginea* is only known from drift material (LUCAS 1950). In the literature there is no general agreement concerning the differences between *P. latifolia* and *P. plantaginea*. Their anatomical structures appear to be identical. Differences have been mentioned with regard to the following characters:

1. transition of stipe into blade: abrupt in *P. latifolia*, gradual in *P. plantaginea* (e.g. HAMEL 1931–1939; NEWTON 1931). In view of the alleged conspecificity of *P. latifolia* and *Desmotrichum undulatum* this seems not a valuable character, as in the latter "species" there is a very gradual transition.
2. sporangia: only plurilocular sporangia are said to occur in *P. latifolia*, only unilocular sporangia in *P. plantaginea* (e.g. HAMEL 1931–1939; KYLIN 1947). This is contradicted by the descriptions of NEWTON (1931), while SOUTH (1980) confirms that *P. latifolia* may bear both types of sporangia.
3. colour change when pressed for the herbarium: *P. plantaginea* is said to remain (dark) brown, whereas *P. latifolia* turns a greenish brown (SOUTH 1980).

Sorocarpus micromorus (Bory) Silva (fig. 20).

Plants filamentous, branched, up to several cm high. Main filaments up to 45 μm in diameter, cells about as long as broad, containing many disc-shaped chromatophores in parietal position. Plurilocular sporangia in clusters of several together on branches of limited growth, these branches often terminated by multicellular hairs. Plurilocular sporangia irregularly conical, c. 30 \times 20 μm . Other reproductive structures not observed.

Found on Texel, growing on a wooden raft (2-II-1981).

This appears to be the first find of *S. micromorus* since VAN GOOR's (1923) record (as *S. uvaeformis*). Van Goor's specimens were found near the same area (Den Helder, Nieuwe Diep) as our specimens.

Preliminary observations on cultured material indicated that zooids from plurilocular sporangia produce the same generation; this confirms the observations of PEDERSEN (1974) on this species.

Ulonema rhizophorum Fosl. (fig. 21).

Plants epi/endophytic on *Dumontia contorta*, forming patches c. 1–3 mm in diameter. Basal layer composed of densely crowded procumbent filaments. Numerous rhizoids penetrate into the host tissue. Erect filaments of limited height, once or twice branched, c. 8 μ m in diameter, the cells 1–1.5 times as long as broad. Multicellular hairs arise from the creeping filaments. Unilocular sporangia situated on the procumbent filaments or on the basal cells of the erect filaments, measuring c. 50 \times 25 μ m. Other reproductive structures not observed.

Found exclusively on *Dumontia contorta*, in the brackish canal near Sas van Goes, 7-V-1980.

Earlier records of this species include those of DEN HARTOG (1954) and DE BEER (1961) from the Oosterschelde; DEN HARTOG (1959) mentioned it from the Waddenzee. In all cases it was found as an obligate epi/endophyte of *Dumontia contorta*.

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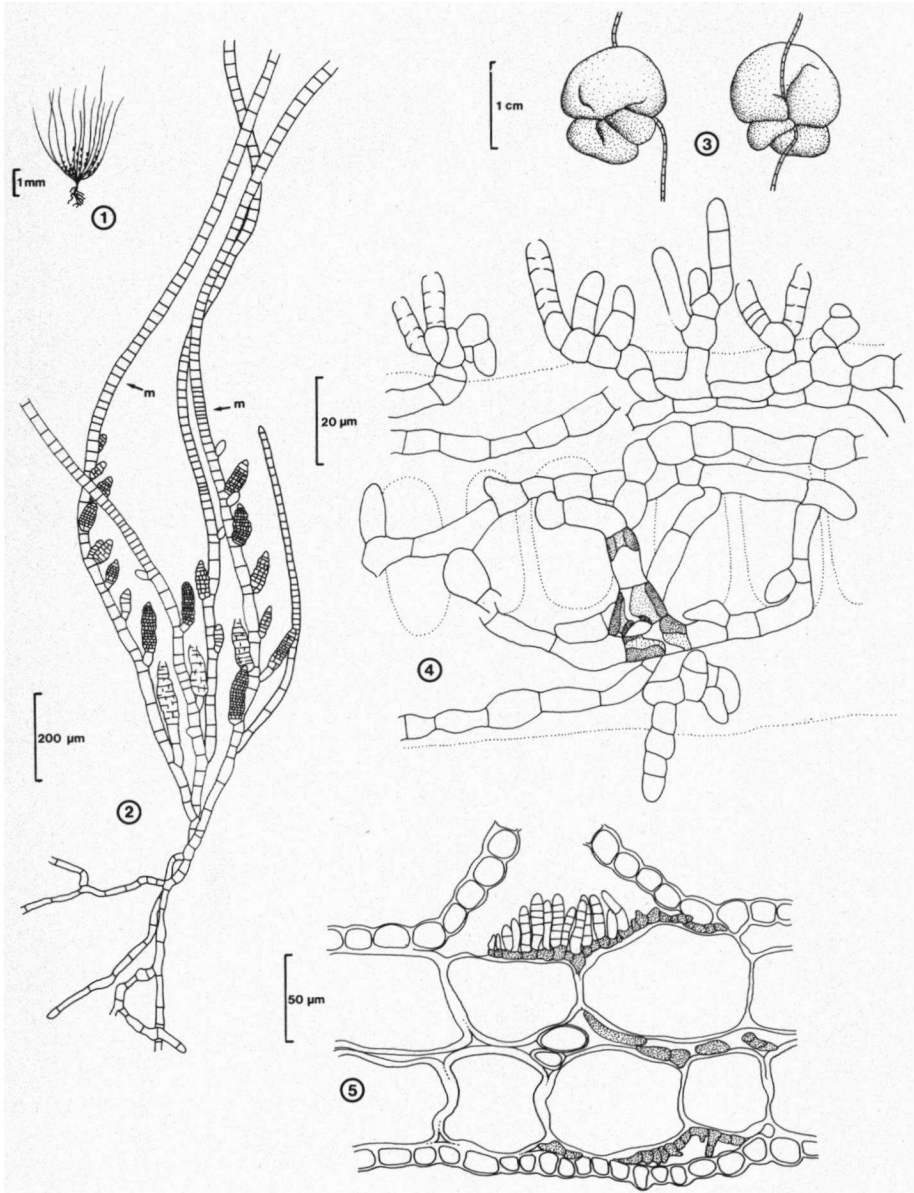


PLATE I. Fig. 1-2, *Feldmannia irregularis*. Fig. 1, habit. Fig. 2, detail with plurilocular sporangia (m = meristematic region). Fig. 3, *Leathesia difformis* habit on *Chaetomorpha linum*. Fig. 4, *Mikrosyphar porphyrae*, microscopic habit in cross section of *Porphyra* sp. (dotted line). Fig. 5, *Myrionema aecidioides*, microscopic habit in cross section of *Laminaria saccharina* (prostrate system dotted).

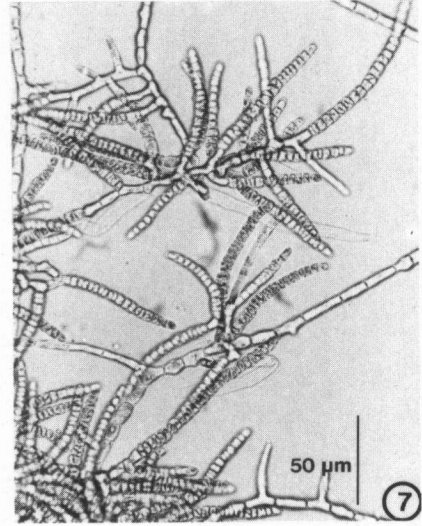
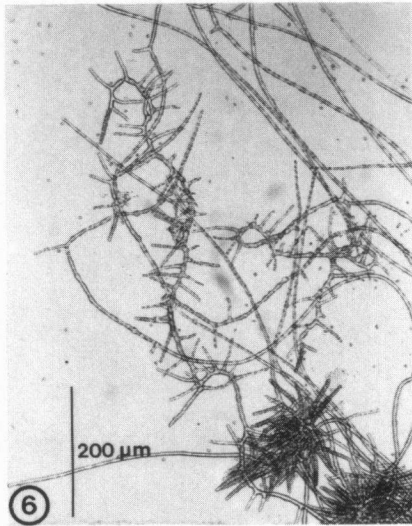


PLATE II. Fig. 6-7, *Laminariocolax tomentosoides*, plants in culture, bearing plurilocular sporangia.

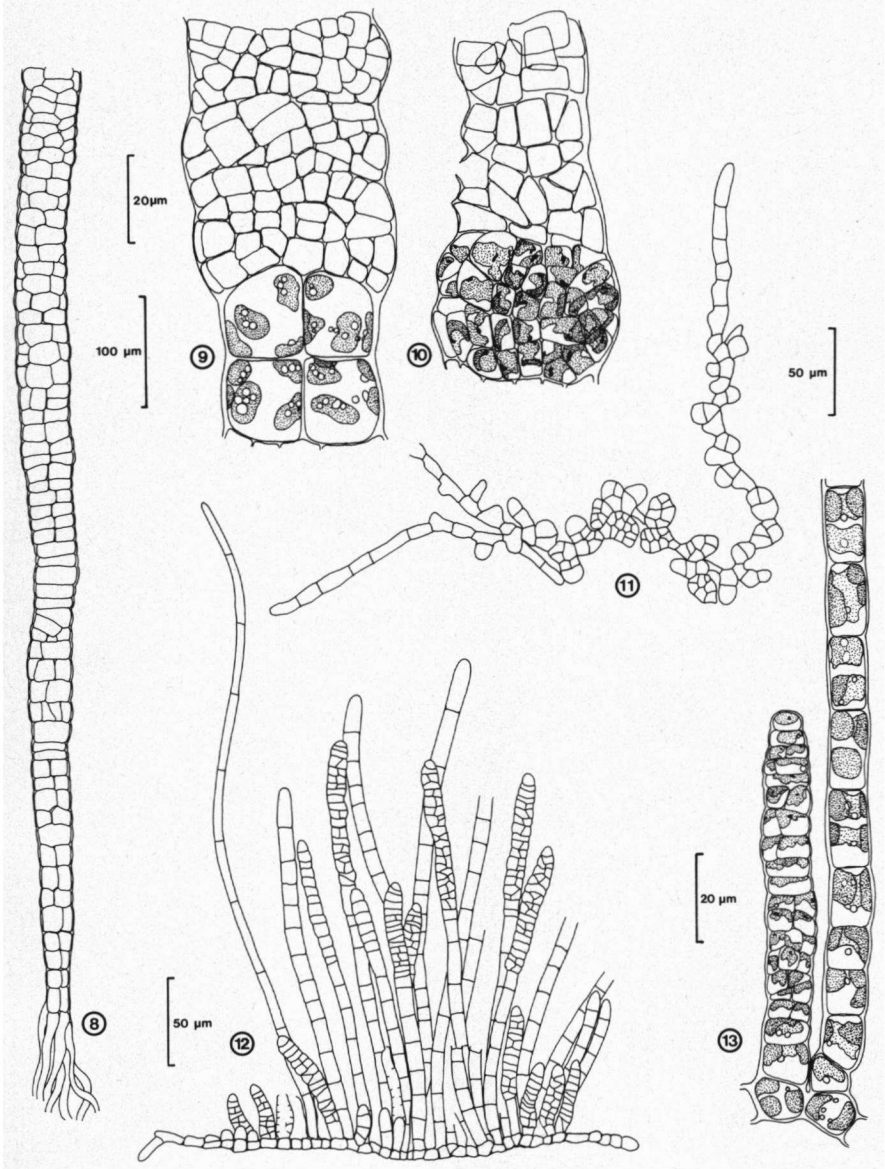


PLATE III. Fig. 8–11, *Pogotrichum filiforme*. Fig. 8, macrothallus. Fig. 9–10, developmental stages of plurilocular sporangia. Fig. 11, microthallus with plurilocular sporangia (from culture). Fig. 12–13, *Protectocarpus speciosus*. Fig. 12, habit of sectioned specimen. Fig. 13, detail of erect filament and plurilocular sporangium.

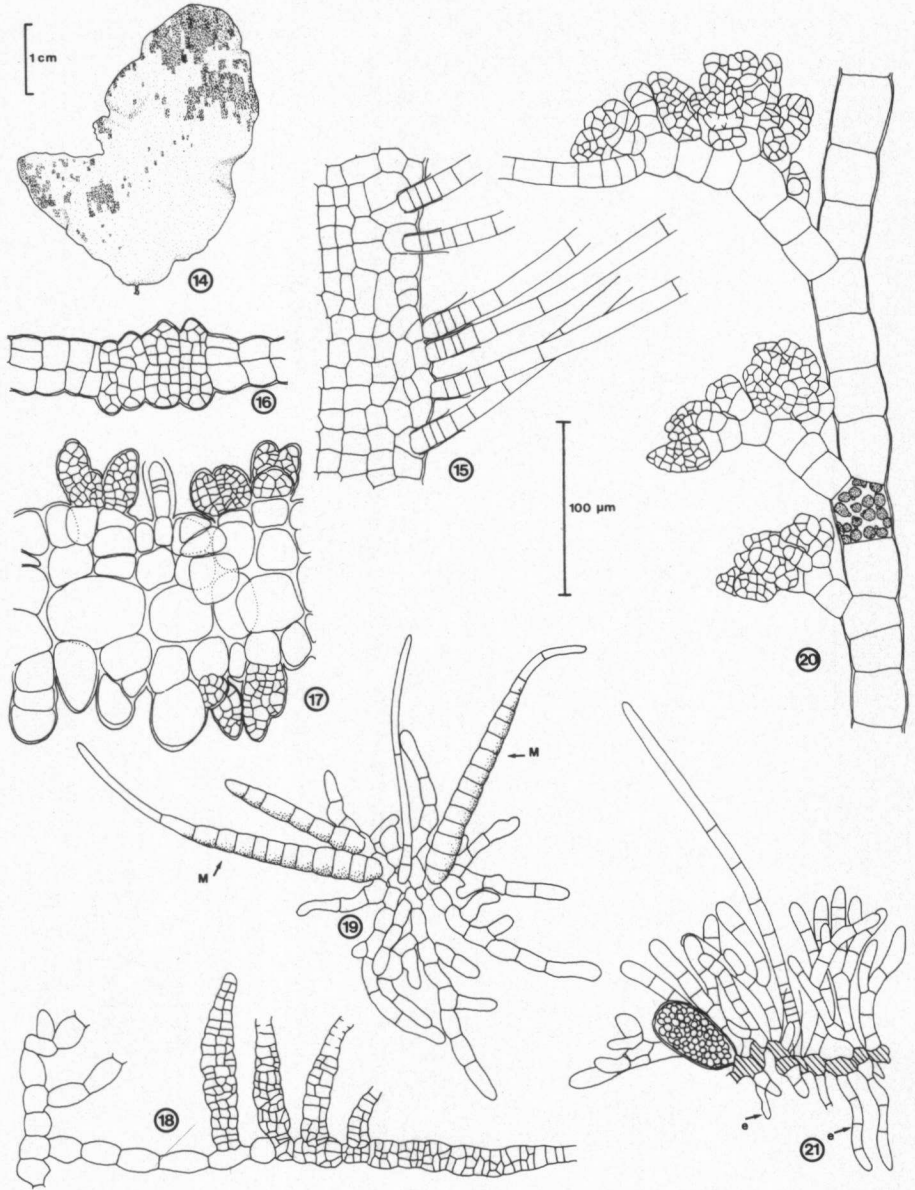


PLATE IV. Fig. 14-19, *Punctaria latifolia*. Fig. 14, habit of fertile specimen. Fig. 15, detail of leaf margin with numerous hairs. Fig. 16-17, cross section of fertile leaf, in fig. 16 2-layered thallus, in fig. 17 4-(6)-layered thallus. Fig. 18, microthallus with plurilocular sporangia (from culture). Fig. 19, microthallus with developing macrothalli (M) in culture. Fig. 20, *Sorocarpus micromorus*, detail of thallus with plurilocular sporangia. Fig. 21, *Ulonema rhizophorum*, detail of thallus with unilocular sporangium (e = endophytic filaments; prostrate part hatched).