

AN ABSTRACT OF THE THESIS OF

Mary Louise O'Flaherty for the M. S. in Botany  
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Title TAXONOMY OF SOME ENDOPHYTIC AND EPIPHYTIC  
GENERA OF PHAEOPHYTA ON THE OREGON COAST

Abstract Approved Redacted for Privacy

A taxonomic study was made of one endophytic genus and several epiphytic genera of Phaeophyta on the Oregon coast. Thirteen species are described, four of which are new species and seven have not been previously reported from this area.

Two new Streblonema species are described, S. oregonum and S. variable. S. aecidioides var. pacificum Setch. and Gard., S. myrionematoides Setch. and Gard., and S. vorax Setch. and Gard. are reported for the first time from the Oregon coast.

Two new species of Myrionema are also described, M. egregiophilum and M. difformans. Those Myrionemas in which all the erect filaments become fertile have been placed in the collective species, M. foecundum (Stroemfelt) Foslie.

Several members of the Myrionemataceae are reported for the first time from Oregon, including; M. phyllophilum Setch. and Gard., M. coronnae var. sterile Setch. and Gard., Compsonema sessile

Setch. and Gard., and Hecatonema variabile Setch. and Gard.

TAXONOMY OF SOME ENDOPHYTIC AND  
EPIPHYTIC GENERA OF PHAEOPHYTA  
ON THE OREGON COAST

by

MARY LOUISE O'FLAHERTY

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APPROVED:

Redacted for Privacy  
Professor of Botany  
In Charge of Major

Redacted for Privacy  
Head of the Department of Botany and  
Plant Pathology

Redacted for Privacy  
Dean of Graduate School

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TAXONOMY OF SOME ENDOPHYTIC AND  
EPIPHYTIC GENERA OF PHAEOPHYTA  
ON THE OREGON COAST

INTRODUCTION

A critical study of small endophytic and epiphytic Phaeophyta by Setchell and Gardner (23) brought to light a number of little known or wholly new species and varieties on the Pacific Coast of North America. Since their investigations, little has been published concerning the distribution, structure or life cycles of these plants. This thesis reports a taxonomic study of some of the endophytic and epiphytic Phaeophyta on the Oregon coast, including the genera Streblonema Derbès and Solier, Myrionema Greville, Compsonema Kuckuck and Hecatonema Sauvageau.

The Endophytic Genus Streblonema  
Derbès and Solier, 1851 (2, p. 100)

Setchell and Gardner (23, p. 440) characterized the genus in the following manner. Thalli wholly or partly endophytic and composed of irregularly branched, usually monosiphonous but sometimes polysiphonous filaments. Prostrate filaments entirely endophytic, creeping among the cells of the host. Erect secondary filaments wholly or largely endophytic, simple or branched, with or without hairs. The thallus with unilocular sporangia, or plurilocular

organs, or both. Reproductive organs terminal, borne singly or in clusters, sessile or pedicellate. Plurilocular organs uniseriate or pluriseriate. The type species is S. sphaericum Derbès and Solier.

The earliest record of Streblonema on the Pacific Coast was by Saunders (14, p. 148). He listed S. fasciculatum (Thuret) Le Jolier in the family Ectocarpaceae C. A. Agardh and described the plant as growing in Nemalion andersonii at San Pedro, California.

In a report of the Harriman Alaska Expedition, Saunders (15, p. 416-417) described three new species of Streblonema. "Streblonema pacifica" (S. pacificum Saund.) was collected at Yakutat Bay, where it was penetrating sporophylls of Alaria. "S. minutissima" (S. minutissimum Saund.) was found at Sitka, growing in branches of Liebmannia sp. "S. irregularis" (S. irregulare Saund.) was characterized as forming small brown patches on bulbs of Nereocystis, also at Sitka.

Setchell and Gardner described thirteen new species of Streblonema from the Pacific Coast in 1922 (22, p. 387-402). In 1925, in a monograph of the marine algae of the Pacific Coast, these species were included together with Saunders' earlier records (23, p. 440-453). In the monograph, the authors separated Streblonema into two series of species, one causing noticeable deformation of the host tissues and the other not doing so (23, p. 400-401).

In 1940, Gardner (6, p. 267-286) reported a new species,

Streblonema desmarestiae, described as being endophytic within fronds of Desmarestia munda at Kanaka Bay, San Juan Island, Washington.

Smith (25, p. 90-92) listed five species of Streblonema from the Monterey Peninsula of California, all previously cited by Setchell and Gardner (23).

No other reports in the literature have added to the list of species on the Pacific Coast. Streblonema is presumed to have an alternation of identical generations, but life cycles of members of this genus have not been studied in culture (25, p. 90).

#### The Epiphytic Genera

Myrionema Greville, 1827 (7, pl. 300)

Setchell and Gardner (23, p. 454) redescribed the genus essentially as follows. Thalli minute cushions, circular to ellipsoidal, or even quite irregular, in outline. Thallus composed of a monostromatic basal stratum and numerous pigment bearing erect filaments, with or without interspersed hairs. The erect filaments in part or wholly transformed into gametangia, except at the margins of the thallus. The basal stratum comprised of closely crowded filaments radiating from a common center, with dichotomous branching by splitting of terminal cells; rarely with a few subulate branches penetrating the host. Reproduction by unilocular zoosporangia and by

plurilocular gametangia with mostly uniseriate loculi.

Setchell and Gardner (23, p. 455) redescribed the genus to include forms possessing the characters mentioned in the generic description. They placed Myrionema in the family Myrionemataceae Foslie of the order Ectocarpales, along with the three closely related genera; Compsonema, Hecatonema and Microspongium. They also included under Myrionema the species formerly assigned to Ascocyclus Magnus and Phycocelis Stroemfelt.

Myrionema strangulans Greville is the type species, and the type locality is Appin, Scotland, where it was found growing on a small species of Enteromorpha (23, p. 454).

The earliest record of the collection of Myrionema on the Pacific Coast was at the turn of the century. Saunders (14, p. 147-148), in a publication on some Pacific Coast Ectocarpaceae, reported collecting Phycocelis (Myrionema) foecunda Stroemfelt, at Pacific Grove, California. It was growing on Macrocystis pyrifera, Desmarestia ligulata, and Pterygophora californica.

From material collected on the Harriman Alaska Expedition at Sitka, Saunders (15, p. 416) reported Phycocelis (Myrionema) baltica (Reinke) De Toni. He described the plants as forming minute tufts on Ralfsia deusta. Saunders (15, p. 423) listed Myrionema strangulans Grev. as occurring on Ulva lactuca at Sitka. He stated that it was also abundant along the California coast.

Other reports appeared concerning the distribution of Myrionema strangulans Grev. Collins (1, p. 108), and Muenscher (11, p. 272) collected M. strangulans at Victoria, Vancouver Island, British Columbia.

Setchell and Gardner (23, p. 455-472) separated, on a provisional basis, over twenty species or varieties of the genus Myrionema. They separated the species into two lines, one containing those species in which only zoosporangial forms were known, and the other containing species in which only forms with gametangia and "ascocysts" were known. The authors stated that possibly some of the structures they called "ascocysts" may have been zoosporangia, but probably most or all such structures were hypertrophied gametangia (23, p. 455). They emphasized that the possible generic connection between the two series could not be demonstrated except by cultures.

Compsonema Kuckuck, 1899 (9, p. 90-92)

Setchell and Gardner (23, p. 473) described the genus in the following way. The thalli small cushions, more or less circular in outline. The thallus comprised of a prostrate creeping portion, giving rise to numerous erect branched or unbranched filaments, with or without hairs. The prostrate monostromatic portion consisting of closely crowded filaments quite regularly radiating from a common center, and usually with subterminal branching. Reproduction by

unilocular zoosporangia and plurilocular gametangia with mostly pluriseriate loculi.

The type species of this genus is Compsonema gracile Kuckuck. The type locality is Rovigno, on the east coast of the Adriatic Sea, where it was found growing on stones in water one to two meters deep (23, p. 473).

Setchell and Gardner (20, p. 353) considered that the genus included forms like Myrionema in all characters, except that they produce, on erect filaments, numerous gametangia that develop pluriseriate loculi. They reported eighteen new species of Compsonema, the first records on the Pacific Coast (20, p. 353-376). The authors separated these species into two series (23, p. 473-474). One contained only species in which the sterile erect filaments were simple, and the other those in which the sterile erect filaments were branched. They believed the genus Compsonema to be very closely related to Myrionema on the one side, and to Hecatonema on the other.

Hecatonema Sauvageau, 1897 (16, p. 248)

Setchell and Gardner (23, p. 488) characterized the thallus as starting from a single cell, but soon developing a series of closely crowded filaments, radiating in all directions to form a compact disc. Branching of radiating filaments often subterminal. Cells of these filaments dividing horizontally to create a distromatic layer.

The lower layer of cells sometimes producing short, penetrating, subulate rhizoids. The upper layer of cells producing erect assimilating filaments. These erect filaments wholly or in part producing gametangia, and hyaline hairs; gametangia pluriseriate.

The type species is Hecatonema maculans Sauv. It was collected at Cherbourg, France, where it was growing on Rhodymenia palmata (23, p. 488).

The first report of Hecatonema on the Pacific Coast was by Setchell and Gardner (21, p. 377-384). They described three new species of Hecatonema. The authors interpreted the genus as being quite similar to Compsonema and Myrionema, but differing from these in having a distromatic basal layer (21, p. 377). Of the two, they stated, Hecatonema seemed more closely akin to Compsonema, in that Hecatonema characteristically produces gametangia with pluriseriate loculi.

Setchell and Gardner (23, p. 488) separated the species into two lines. One contained a single species that had all the erect filaments transformed into gametangia. The other contained those species in which only a portion of the filaments transformed into gametangia.

#### Other Publications on the Myrionemataceae

Smith (25, p. 103-113) listed a number of species of Myrionema,

Compsonema and Hecatonema for the Monterey Peninsula of California, which had previously been cited by Setchell and Gardner (23).

No new members of the Myrionemataceae were reported by Smith.

There have been very few recent reports of the collection of Myrionema and Compsonema species on the Oregon coast. Sanborn and Doty (13, p. 28), stated that Myrionema primarium Setch. and Gard., and Compsonema secundum Setch. and Gard. had been collected in the Coos Bay-Cape Arago region. In another publication, Doty (3, p. 34) reported M. primarium as occurring on Costaria costata and other Laminariales along Cape Arago. There have been no reports of Hecatonema species on the coast of Oregon.

#### The Life History of Myrionema Grev.

The family Myrionemataceae remained in the order Ectocarpales until the early 1930's. In 1934, Kylin (10, p. 5-9) cultured Myrionema strangulans, and found that it showed an alternation of heteromorphic generations. On this basis, the entire family was placed in the order Chordariales (12, p. 89). This is the only species of the Myrionemataceae that has been studied in culture.

## MATERIALS AND METHODS

### Materials

Material for this study was collected at a number of coastal locations in Oregon, including Boiler Bay, Marine Gardens, Beverly Beach, Yaquina Head, Yaquina Bay and Cape Perpetua in Lincoln County, and Cape Arago in Coos County.

Type collections and other material were obtained on loan from the University of California at Berkeley. They were of three kinds: (1) liquid preserved type collections; (2) herbarium specimens designated as holotype, or parts of type collections preserved on microscope slides; and other, non-type specimens.

### Methods

#### Procedure for Handling Fresh Material

Fresh material was wrapped in saltwater-soaked newspaper, and temporarily stored in plastic bags at the collection site. Specimens were kept in a cold storage room at 3°C until mounted or prepared for microscopic examination.

Scrapings from the surface of the host thalli and sections of fresh material were made with a single-edge razor blade, and placed on a microscope slide in seawater.

## Preservation of Fresh Material

Early in this study, material was killed and fixed by mounting scrapings or sections on a slide in several drops of a mountant containing 20 mls each of Karo, Certo and acetic acid, and 40 mls distilled water. After the mounts hardened, the coverslip was sealed with clear lacquer to prevent softening of the mounting medium.

In addition to the preparation of slides, recently collected material was also preserved by drying. Initially, specimens were mounted on herbarium paper and placed in a plant press to dry. Later, to conserve storage space, specimens were allowed to air-dry without mounting, and stored in envelopes.

Restoration of dried material was accomplished by soaking in a wetting agent consisting of a detergent in seawater. Specimens were thoroughly rinsed in seawater, and scrapings and sections mounted in either seawater or the mountant previously described.

On collecting trips at a distance from laboratory and cold storage facilities, the specimens were killed and fixed immediately in vials containing an 8% formalin-seawater solution (8, p. 264). Slides were prepared by thoroughly rinsing the material in seawater and mounting in the Karo mountant.

## Restoration of Type Specimens

Microscope slides received from the University of California were glycerin mounts that had dried. Dr. P. C. Silva<sup>1</sup> suggested that an attempt be made to restore them by first soaking the material in a wetting agent consisting of detergent and seawater, and then adding a 25% glycerin solution and allowing the material to stand until saturated before replacing the coverslip. Material adhering to the coverslip and not soaking satisfactorily was scraped onto the slide, care being taken to avoid contamination from other slides.

Experience with a few slides proved this method unsatisfactory and the glycerin restoration technique was abandoned. Other dry slides were restored using a procedure in which the wetting agent was placed under the coverslip with a pipette. After soaking, the coverslip was removed and the material mounted in seawater.

Sections made from type specimens preserved in liquid were rinsed and mounted in seawater.

## Photomicrographs

Illustrations of material from Oregon were made using a camera lucida to trace the main features of the object image. Detail was filled in free hand. Drawings were photographed with a Pentax 35.

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<sup>1</sup>Letter received March 31, 1965.

mm camera on Kodak Tri-X film. Photomicrographs of type specimens were taken with a Leitz Makam using Kodak Panatomic-X film.

## SYSTEMATIC ACCOUNT

## Class Isogeneratae

## Order Ectocarpales

## Family Ectocarpaceae

Plants filamentous, freely to sparingly branched, and branches not laterally compacted. Thalli monosiphonous, but sometimes biseriate in older parts. Growth trichothallic with intercalary cell divisions. The sporophyte and gametophyte vegetatively identical. Sporophytes with unilocular and plurilocular sporangia, and gametophytes with plurilocular gametangia. Gametophytes usually pluri-seriate, but sometimes uniseriate (25, p. 79).

Genus Streblonema

Plants wholly or partly endophytic, and composed of irregularly branched filaments. Thalli not differentiated into prostrate and erect portions. Thalli may produce simple, colorless, multicellular hairs with basal growth, projecting beyond the surface of the host (25, p. 89). Plastids lenticular or band-shaped, several per cell. Plants with unilocular sporangia, with plurilocular structures, or both. Reproductive organs terminal, borne singly or in clusters,

sessile or pedicellate. Plurilocular structures uniseriate or pluriseriate.

Key to the Species of the Genus Streblonema

1. Endophytic within Zostera or Phyllospadix.... S. vorax (p. 14)
1. Endophytic within larger algae..... 2
2. Creeping portion penetrating the host deeply..... 3
2. Attaching portion poorly developed, not penetrating the host deeply..... 4
3. Crowded in circumscribed eruptive sori or "aecidia" at the surface of the host ..... S. aecidioides var. pacificum (p. 16)
3. Not producing "aecidia"..... S. oregonum (p. 16)
4. Plurilocular structures uniseriate; erect filaments to 75 $\mu$  high..... S. myrionematoides (p. 15)
4. Plurilocular structures both uniseriate and pluriseriate; erect filaments to 400 $\mu$  high..... S. variabile (p. 17)

Streblonema vorax Setch. and Gard., 1922 (22, p. 389)

Plants microscopic, composed of profusely branched, tortuous, vegetative filaments which penetrate the interior of the host. Creeping filaments destroy the walls and contents of the parenchyma cells of the host. Although creeping filaments have plastids, the plants seem to be in a large degree parasitic (23, p. 445). Cells of the creeping filaments 5-10 $\mu$  long by 5-7 $\mu$  broad. Erect filaments to

400 $\mu$  long, fasciculately branched at or near the surface of the host, and forming a compact mass of cells. Certain of the erect filaments attenuated into hairs. Plurilocular structures numerous, cylindrical, sessile or lateral on short pedicels, to 90 $\mu$  long by 7-10 $\mu$  wide; loculi mostly uniseriate.

Setchell and Gardner (23, p. 445) described these plants as having broadly clavate zoosporangia. No unilocular structures were found on the Oregon material.

Endophytic within blades of Zostera and Phyllospadix, in company with epiphytic Rhodophyta, Chlorophyta and Phaeophyta. Collected at Marine Gardens and Cape Perpetua, Oregon.

Streblonema myrionematoides Setch. and Gard., 1922 (22, p. 387)

Thalli minute, with a poorly developed attaching portion; most of the plant outside the host. Creeping filaments penetrate only slightly among the outer cell layers of the host. Erect filaments more or less fasciculately branched at the surface of the host, mostly fertile, to 75 $\mu$  long. Plurilocular structures numerous, cylindrical, 50-65 $\mu$  long by 4-7 $\mu$  broad; loculi uniseriate.

On blades of Laminaria, Hedophyllum and Pterygophora. Collected at Yaquina Bay, Yaquina Head and Boiler Bay, Oregon.

Streblonema aecidioides var. pacificum Setch. and Gard., 1922  
(22, p. 395-396)

Plants minute, appearing as small elevations on the surface of the host, to 200 $\mu$  in diameter. Thallus composed of a compact horizontal layer of cells just beneath the surface, which produce erect filaments above, and irregularly branched filaments below that penetrate deeper into the host. The erect filaments lift the surface of the host, forming a small blister or "aecidium" which finally ruptures (23, p. 451). All of the erect filaments fertile, except a few short hair filaments. Plurilocular and unilocular structures in separate sori, crowded together with the hairs. Unilocular sporangia narrowly clavate, sessile, 20-30 $\mu$  long by 8-12 $\mu$  broad at the apex. Plurilocular structures numerous, closely crowded, cylindrical, sessile, to 65 $\mu$  high and 5-7 $\mu$  broad; loculi uniseriate.

On Hedophyllum, Laminaria and Alaria, at Cape Perpetua, Yaquina Bay and Boiler Bay, Oregon.

Streblonema oregonum species nova

Plants forming circular masses, 5-8 mm in diameter, composed of irregularly branched filaments penetrating deeply into the host, and numerous erect filaments exerted beyond the host. The erect filaments fasciculately branched near the surface of the host,

tapering slightly at apex and base, to 130 $\mu$  long; cells 4-15 $\mu$  long, 4-8 $\mu$  wide. Thalli with both unilocular and plurilocular structures. Plurilocular structures numerous, cylindrical, sessile or on short pedicels, 30-65 $\mu$  long by 4-8 $\mu$  wide, wholly uniseriate or with a few median biseriate loculi. Unilocular structures borne laterally on erect filaments, sessile or on one-celled pedicels, 25-40 $\mu$  long by 9-18 $\mu$  broad. The shape of the unilocular sporangia quite variable, from saccate to broadly clavate.

On pneumatocysts of Nereocystis luetkeana, at Cape Arago, Oregon.

S. oregonum resembles the description of S. penetrale Setch. and Gard., except that S. oregonum produces unilocular sporangia (22, p. 388-389). S. penetrale was collected at San Pedro, California, where it was growing on stipes of Hesperophycus Harveyanus. Type material was unavailable for examination.

Streblonema variabile species nova

Plants produce externally evident discolored areas on sori of the host. The creeping filaments give rise at right angles to erect sterile and fertile filaments, and to short peg-like rhizoids. Cells of the creeping filaments irregularly shaped, 7-12 $\mu$  long by 6-9 $\mu$  broad. The attaching portion poorly developed, and the 1-3 celled rhizoids penetrate only slightly between the sporangia of the host.

Erect filaments variable in size and shape, narrower at base than apex, and to 400 $\mu$  high. Sterile erect filaments simple or dichotomously branched; cells cylindrical to dolioform, 6-8 $\mu$  wide by 1-4 times as long. The plurilocular structures also variable in shape and size, with both uniseriate and pluriseriate loculi. Uniseriate, plurilocular structures on 1-4 celled pedicels, or terminal on long erect filaments, to 100 $\mu$  high, and cylindrical to narrowly clavate. Pluriseriate, plurilocular structures numerous, borne on 1-4 celled pedicels or terminally on long erect filaments; 30-150 $\mu$  long by 10-25 $\mu$  wide, narrowly to broadly clavate. Thalli without unilocular structures.

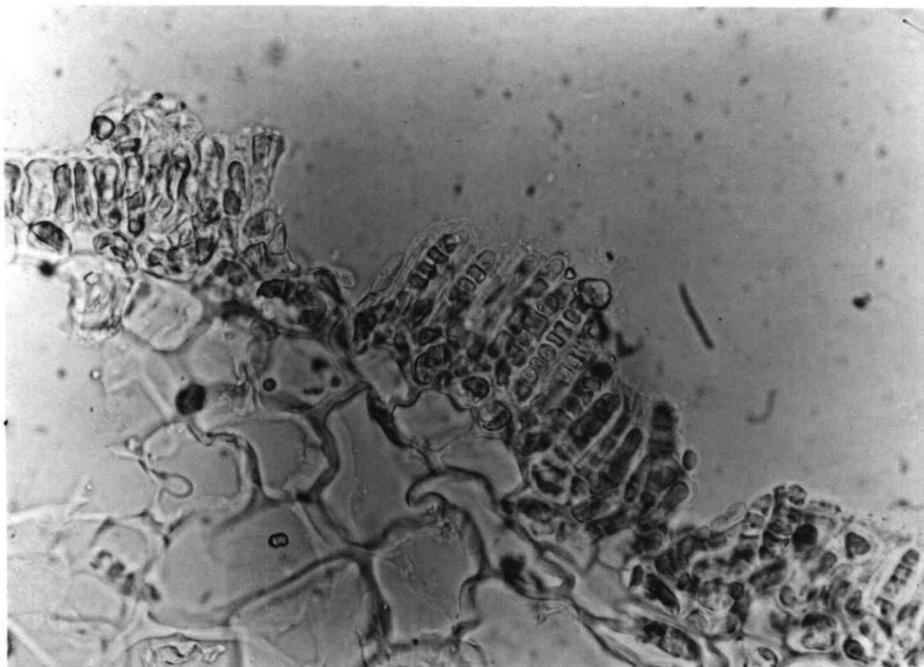
In sori of Hedophyllum sessile, at Yaquina Bay, Oregon.

Plate 1

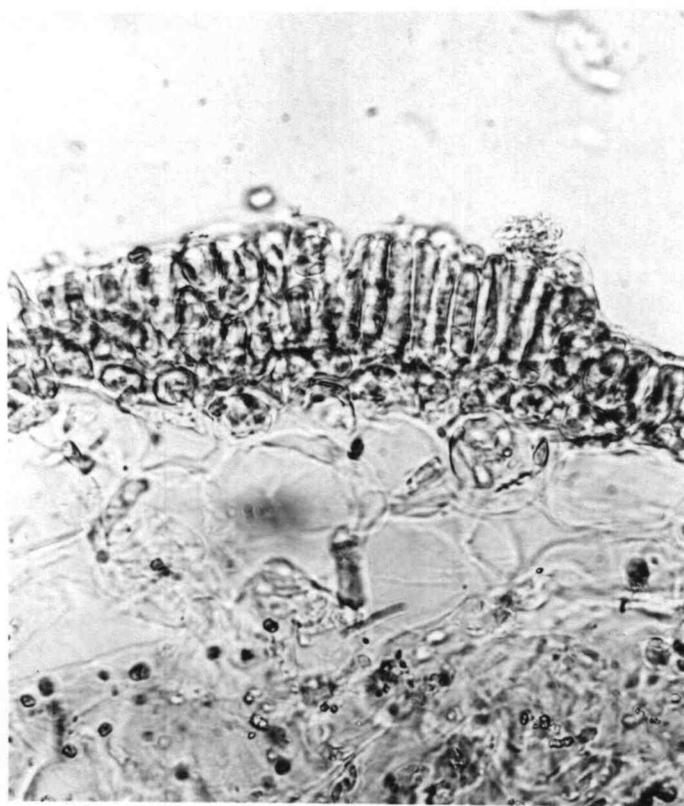
Type of Streblonema aecidioides var. pacificum  
Setch. and Gard.

Fig. 1. A section through an "aecidium" with unilocular sporangia.  
(645x)

Fig. 2. Same as fig. 1, but with plurilocular reproductive structures.  
(526x)



2



1

Plate 2

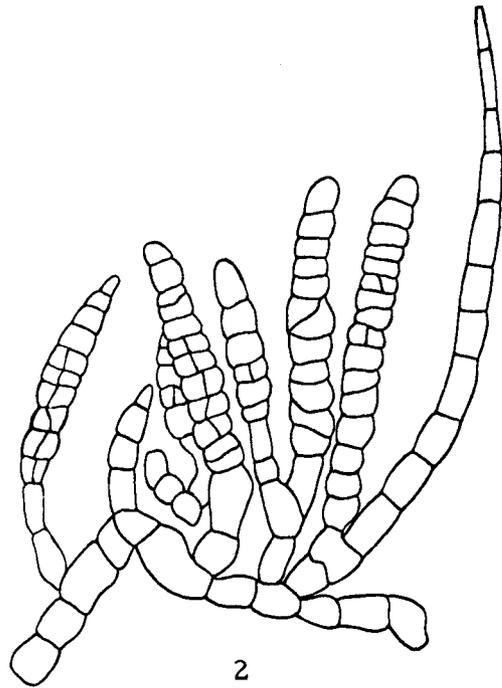
Streblonema vorax Setch. and Gard.

Fig. 1. A diagrammatic section of the host showing the relation of this destructive Streblonema to its host.

Fig. 2. A portion of a creeping filament freed from its host, with mostly uniseriate, plurilocular structures and a hair. (400x)



1



2

Plate 3

Streblonema myrionematoides Setch. and Gard.

These partly endophytic plants are in various stages of development. (385x)

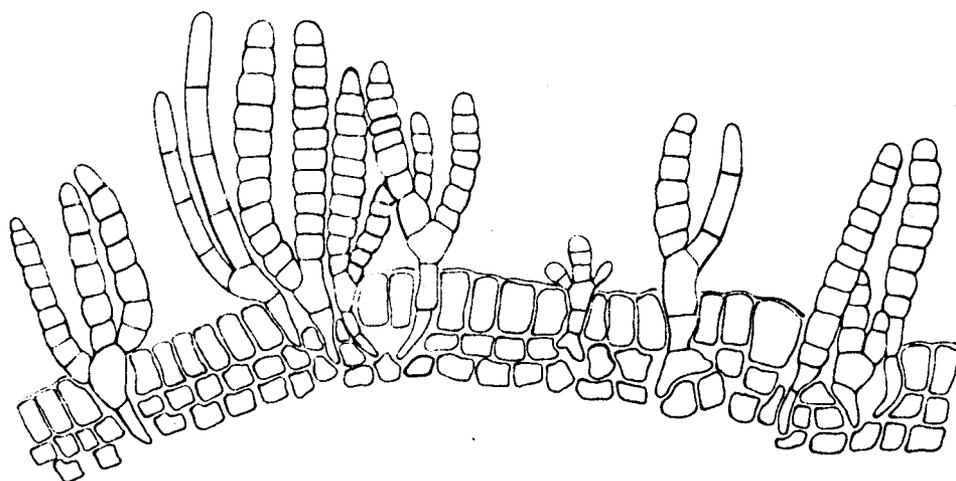


Plate 4

Streblonema aecidioides var. pacificum Setch. and Gard.

A section through an "aecidium" with plurilocular reproductive structures and short hair filaments. (395x)

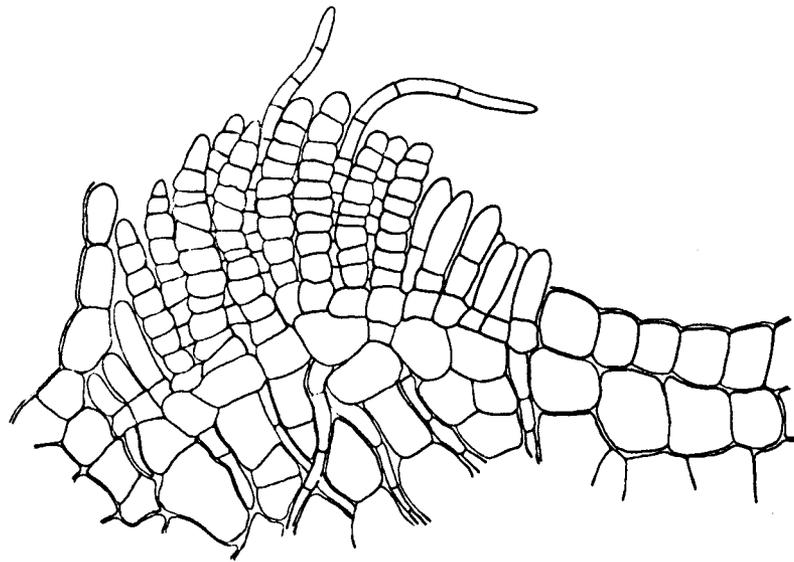
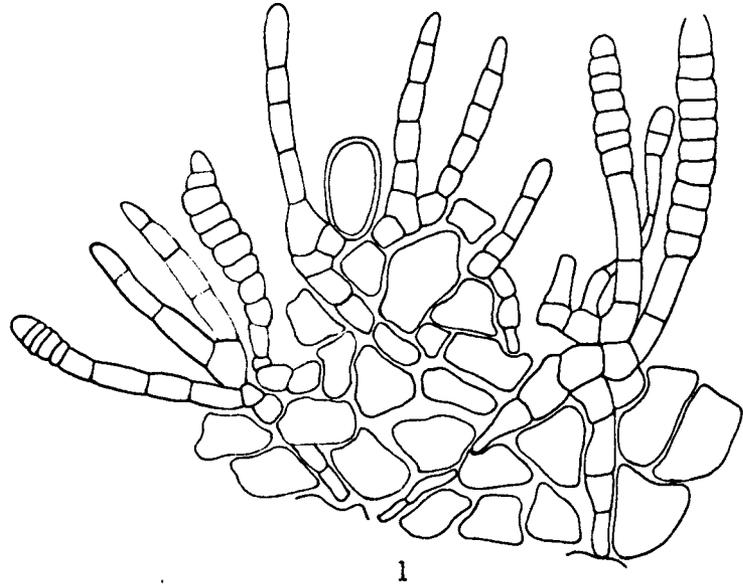


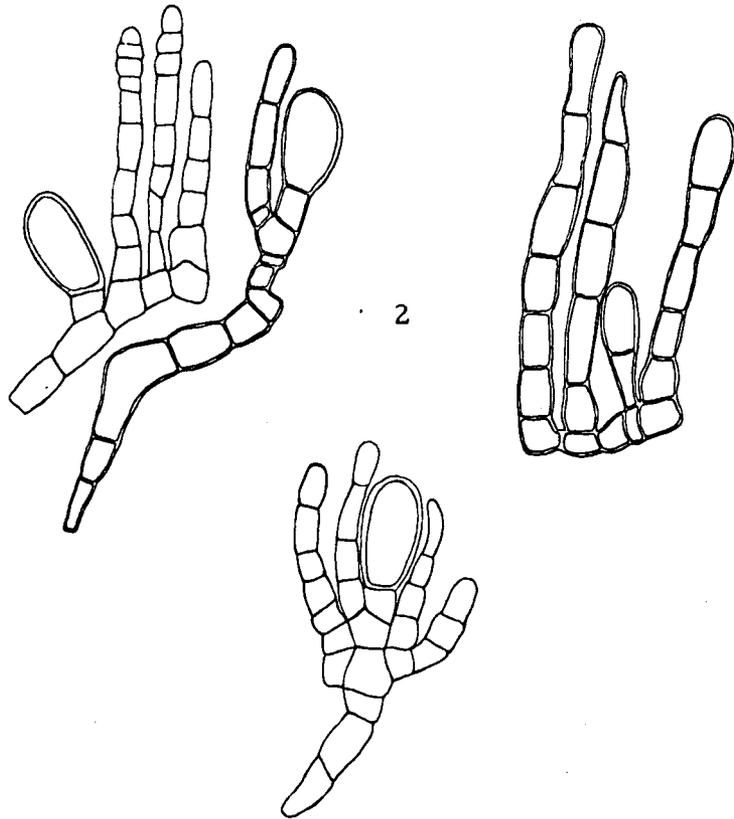
Plate 5

Streblonema oregonum species nova

- Fig. 1. A section through the host showing the relation of this Streblonema to its host. (315x)
- Fig. 2. Fragments of plants freed from their host, with both unilocular and plurilocular reproductive structures. (315x)



1



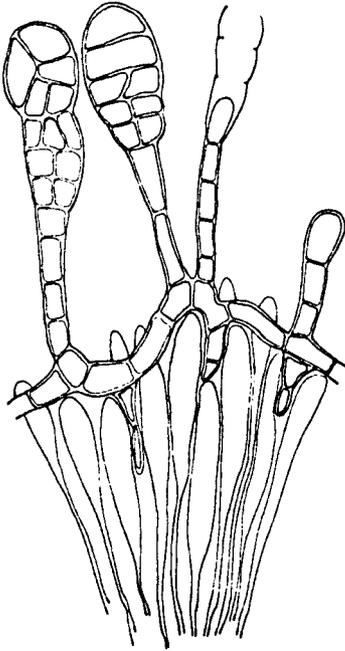
2



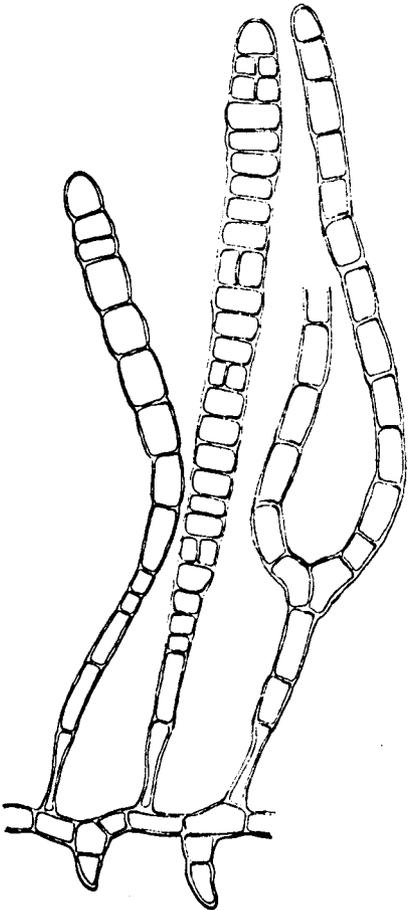
Plate 6

Streblonema variabile species nova

- Fig. 1. A portion of a plant penetrating among the sporangia of the host, with pluriseriate, plurilocular reproductive structures. (350x)
- Fig. 2. A fragment of a plant freed from its host, showing dichotomous branching of an erect filament, and mostly uniseriate, plurilocular reproductive structures. (350x)



1



2

## Class Heterogeneratae

### Subclass Haplostichineae

#### Order Chordariales

##### Family Myrionemataceae

Sporophytes minute, cushion-like plants with a monostromatic or distromatic basal stratum, and numerous erect filaments. The basal layer composed of laterally adherent, radiating, branched filaments. All except marginal cells of the prostrate portion producing a simple or branched erect filament, laterally adherent or with interstices. Reproductive organs arising from the prostrate layer, or by transformation of parts of erect filaments. Sporophytes with both unilocular and plurilocular sporangia. Unilocular structures terminal or lateral. Plurilocular structures wholly or in part uniseriate or pluriseriate, terminal or lateral, and produced by division of cells of the erect filaments.

Gametophytes, so far as known, microscopic and filamentous. Gametic union has not been demonstrated, but is presumably isogamous (25, p. 103).

### Key to the Genera of the Family Myrionemataceae

1. Thallus with a monostromatic basal layer ..... 2
1. Thallus with a predominately distromatic basal layer .....  
..... Hecatonema (p. 54)
2. Plurilocular structures wholly or in part uniseriate .....  
..... Myrionema (p. 32)
2. Plurilocular structures pluriseriate ..... Compsonema (p. 45)

### Genus Myrionema

Thallus a minute cushion, circular to irregular in outline, with a monostromatic basal layer. The prostrate base composed of radiating, branched filaments. The basal portion without rhizoids. Except at the margins, each cell of the basal layer produces a simple or branched filament. The erect filaments usually closely crowded and laterally appressed. Certain of the erect filaments may be replaced by multicellular, uniseriate hairs with a basal meristem. Cells with 1-3 plate-like plastids. Both unilocular and plurilocular structures either erect on the prostrate filaments, or terminal or lateral on the erect filaments. The plurilocular sporangia wholly or partly uniseriate.

The gametophyte an irregularly branched filament in which the branches are free from one another. None has been grown to a

mature fruiting condition (24, p. 248).

Key to the Species of the Genus Myrionema

1. All erect filaments fertile (except hairs and marginal cells)  
..... M. foecundum (p. 33)
1. Some erect filaments sterile ..... 2
2. Sterile erect filaments simple ..... 3
2. Sterile erect filaments both simple and branched .....  
..... M. egregiophilum (in part, p. 37)
3. Epiphytic on Zostera or Phyllospadix .....  
..... M. phyllophilum (p. 36)
3. Epiphytic on other algae ..... 4
4. Plurilocular sporangia terminal ..... 5
4. Plurilocular sporangia both terminal and lateral .....  
..... M. difformans (p. 37)
5. Sterile erect filaments longer than the fertile filaments .....  
..... M. egregiophilum (in part, p. 37)
5. Sterile erect filaments the same length as the fertile  
filaments ..... M. coronnae var. sterile (p. 35)

M. foecundum (Stroemfelt) Foslie, 1894 (4, p. 161)

M. primarium Setch. and Gard., 1922 (19, p. 334-335)

M. primarium var. acuminatum Setch. and Gard., 1922 (19,  
p. 335)

M. foecundum var. simplissimum Setch. and Gard., 1922  
(19, p. 336-337)

M. foecundum var. divergens Setch. and Gard., 1922

(19, p. 338)

M. foecundum var. majus Setch. and Gard., 1922 (19, p. 338-339)

Thalli minute, circular, 0.5 - 3 mm in diameter, and occasionally confluent with one another. Cells of the prostrate filaments quite regularly radiating from a common center. Erect filaments simple, and some may be replaced by multicellular hairs with a basal meristematic region. All the erect filaments (except hairs and marginal cells) fertile; to 65 $\mu$  high, 5-9 $\mu$  broad. Thalli with plurilocular sporangia only, or with both unilocular and plurilocular sporangia. Unilocular structures cylindrical, sessile or on one-celled pedicels. Plurilocular sporangia cylindrical to fusiform, sessile or on one-celled pedicels, and uniseriate or with a few median biseriate loculi.

On members of the Laminariales. Collected at Cape Arago, Yaquina Bay, Marine Gardens, Boiler Bay and Cape Perpetua.

Setchell and Gardner (19, 23) described several species and varieties of Myrionema in which all the erect filaments, except hairs and marginal cells, become fertile. These species were distinguished from one another primarily on the basis of the shape and dimensions of the plurilocular structures. Smith (25, p. 105) placed these species and varieties in one collective species, M. primarium Setch. and Gard., because they intergraded so gradually

with one another.

Examination of a large number of specimens from the Oregon coast has led to a similar conclusion; thus, all forms in which the erect filaments are fertile (except hairs and marginal cells) have been placed in one collective species, Myrionema foecundum (Stroemf.) Foslie. These forms were included in M. foecundum because of nomenclatural priority.

Myrionema corunnae var. sterile Setch. and Gard., 1922 (19, p. 339)

Plants minute, forming small cushions 1-3 mm in diameter on the surface of the host. Thalli without multicellular hairs. Erect filaments longest at the center of the thallus, and becoming progressively smaller toward the margins. Certain of the erect filaments remaining sterile, and interspersed among the fertile filaments. Sterile and fertile filaments of the same height, blunt, cylindrical, on 1-4 celled pedicels, rarely sessile; to 65 $\mu$  long by 4-6 $\mu$  wide. Thalli without unilocular sporangia.

On pneumatocysts of Nereocystis and Egregia, and blades of Alaria and Laminaria. Collected at Cape Perpetua, Yaquina Bay, Marine Gardens, and Boiler Bay, Oregon.

Myrionema phyllophilum Setch. and Gard. , 1922 (19, p. 344-345)

Thalli minute, forming more or less circular cushions, 200-800 $\mu$  in diameter. The monostromatic basal layer composed of closely crowded filaments radiating from a common center. Cells of the prostrate filaments 3-5 $\mu$  wide and to twice as long. Due to the long basal cells, the erect filaments distinct and readily separable. Sterile filaments unbranched, cylindrical, tapering towards the base and attenuated, frequently piliferous, near the apex; they extend beyond the fertile filaments. Long multicellular hairs (with a basal meristem) interspersed among the erect filaments. The sterile filaments up to 140 $\mu$  long, cells 4-7 $\mu$  broad by 2-3 times as long. Unilocular structures broadly clavate, sessile on prostrate filaments or on 1-4 celled pedicels, and to 40 $\mu$  long by 12-18 $\mu$  broad at the outer end. Plurilocular structures cylindrical, borne sessile on prostrate filaments, or on 1-3 celled pedicels, and 35-100 $\mu$  long by 6-10 $\mu$  broad; loculi uniseriate with mostly horizontal cross walls.

On blades of Zostera and Phyllospadix, at Cape Perpetua and Marine Gardens, Oregon.

Setchell and Gardner (23, p. 469) characterized M. phyllophilum as having about one third of the erect filaments remaining sterile. Specimens collected in this survey showed much greater variation. In some plants, most of the erect filaments remained sterile.

Other thalli had approximately equal numbers of sterile and fertile filaments, or more fertile than sterile filaments.

Myrionema difformans species nova

Plants minute, forming circular cushions 0.5-1.5 mm in diameter, and frequently confluent with one another. The monostromatic basal layer composed of closely crowded, radiating filaments. Cells of the prostrate filaments 3-5 $\mu$  broad by 1-2 times as long. The erect portion consisting of both sterile and fertile filaments up to 200 $\mu$  high; one plate-like plastid per cell. Erect filaments with interspaces. Thalli without multicellular hairs. Sterile filaments cylindrical, narrow toward the base and attenuated at the apex; cells slightly dolioform, 3-6 $\mu$  broad by 1-3 times as long. Plurilocular sporangia sessile or on one-celled pedicels on prostrate filaments, and terminal and lateral on erect filaments. Plurilocular structures cylindrical, acuminate, and lateral sporangia curve toward the main axis; 30-130 $\mu$  high, 3-10 $\mu$  broad, loculi uniseriate. Without unilocular sporangia.

Epiphytic on blades of Hedophyllum sessile, at Yaquina Bay, Oregon.

Myrionema egregiophilum species nova

Thalli minute, circular in outline, 0.4-1 mm in diameter.

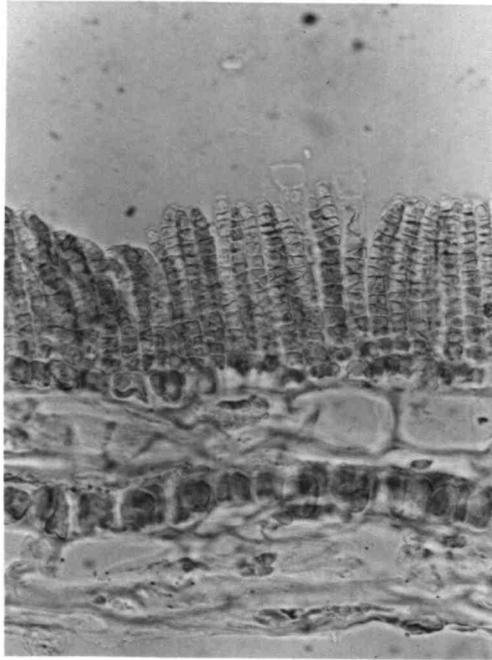
The monostromatic basal layer composed of laterally appressed, radiating, branched filaments; cells 4-8 $\mu$  long, 3-4 $\mu$  wide. The erect portion consisting of closely crowded sterile and fertile filaments, with the sterile filaments longer than the fertile ones. Sterile filaments simple or branched, cylindrical, attenuate, to 160 $\mu$  high; cells 7-12 $\mu$  long by 3-5 $\mu$  broad, cylindrical to slightly dolioform. Branched filaments, located near the center of the frond, may be absent in young plants. Branches primarily unilateral. Plurilocular sporangia cylindrical, acuminate, on 1-4 celled pedicels, and to 60 $\mu$  long by 4-6 $\mu$  wide. Thalli without unilocular sporangia.

On pneumatocysts of Egregia menziesii, at Yaquina Bay, Oregon.

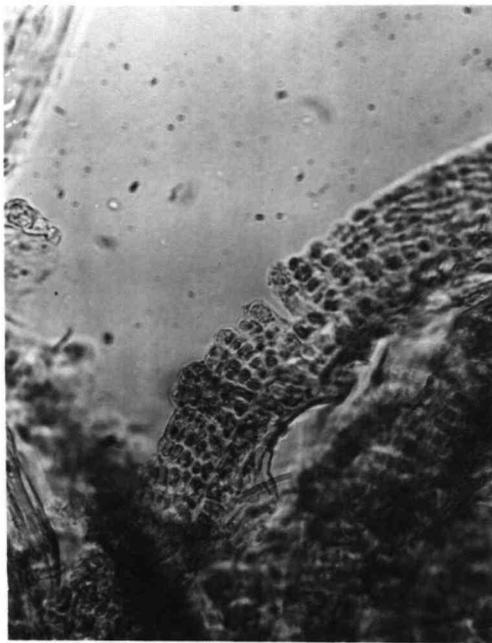
Plate 7

Myrionema foecundum (Stroemfelt) Foslie

- Fig. 1. Type of M. primarium Setch. and Gard. A section through the center of a typical plant. (430x)
- Fig. 2. Type of M. foecundum var. simplissimum Setch. and Gard. A section through a frond with sessile plurilocular sporangia. (430x)



1



2

Plate 8

Myrionema foecundum (Stroemf.) Foslie

- Fig. 1. A section near the margin of a frond with sessile plurilocular sporangia. (210x)
- Fig. 2. A section through a mature plant illustrating both plurilocular sporangia and hairs. (200x)
- Fig. 3. A fragment of a typical plant. (100x)
- Fig. 4. A fragment of a plant with a group of unilocular sporangia. (100x)

Myrionema corunnae var. sterile Setch. and Gard.

- Fig. 5. A diagrammatic section to illustrate how the erect filaments become progressively smaller toward the margin of the thallus.
- Fig. 6. A section at the margin of a frond. (200x)
- Fig. 7. A section through the center of the thallus and its host, with plurilocular sporangia and interspersed sterile filaments. (200x)
- Fig. 8. A fragment of a mature plant. (225x)

Myrionema phyllophilum Setch. and Gard.

- Fig. 9. A single creeping filament with young and mature sterile erect filaments, and both unilocular and plurilocular sporangia. (110x)
- Fig. 10. Same as fig. 9, but illustrating the structure of the sterile erect filaments and plurilocular sporangia. (230x)

Myrionema difformans species nova

- Fig. 11. A fragment of a plant with sterile erect filaments, plurilocular sporangia sessile or on short pedicels from a prostrate filament, and terminal and lateral on an erect filament. (210x)
- Figs. 12 and 13. Fragments of mature plants with both terminal and lateral sporangia. (210x)

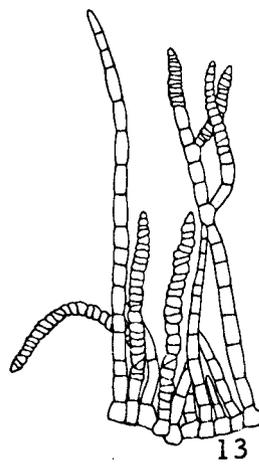
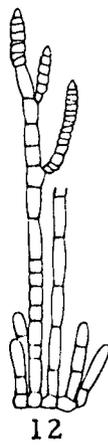
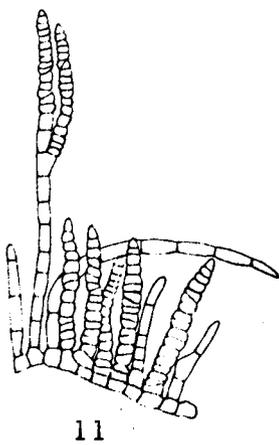
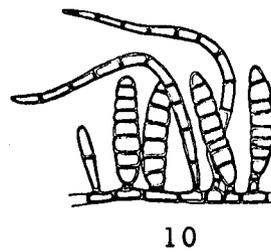
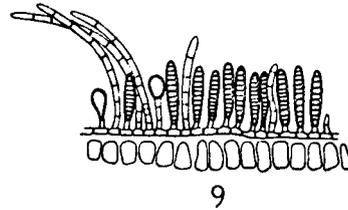
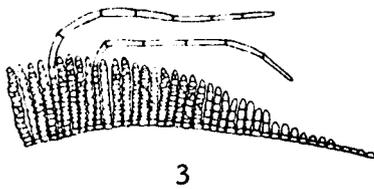
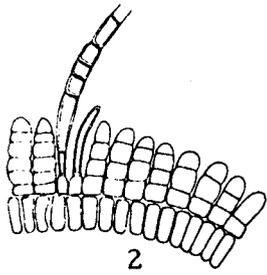
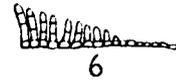
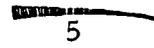
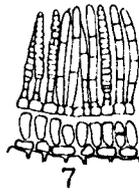
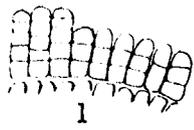
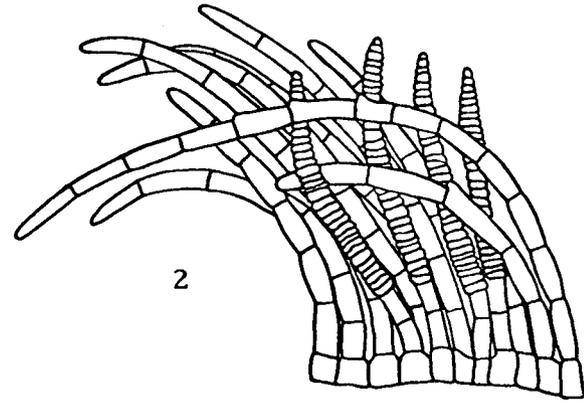
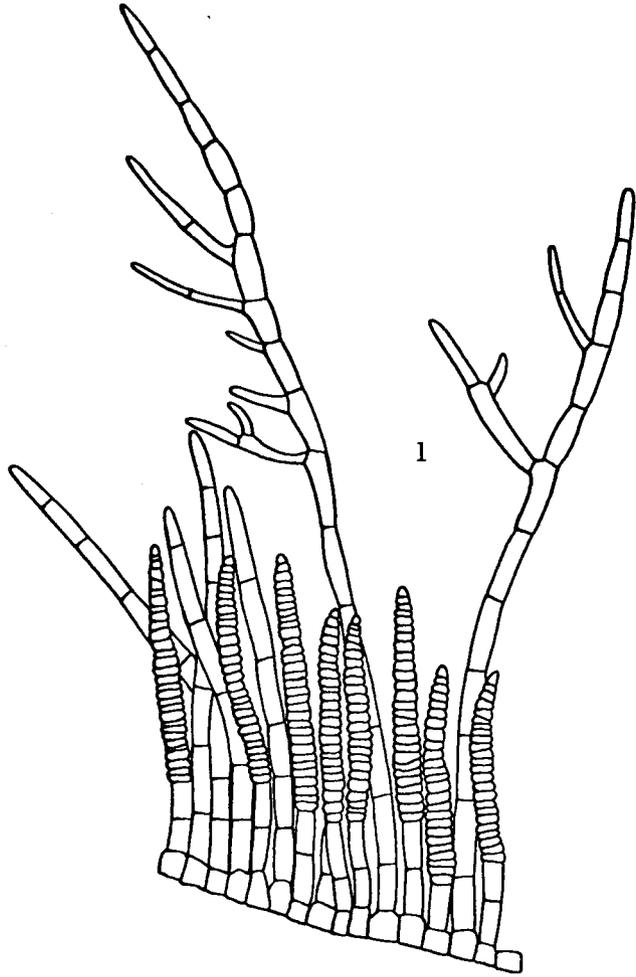


Plate 9

Myrionema egregiophilum species nova

- Fig. 1. A fragment of a plant with plurilocular sporangia on short pedicels from a prostrate filament, and both simple and branched sterile erect filaments. (400x)
- Fig. 2. Same as fig. 1, but illustrating several sterile erect filaments which have begun to produce lateral proliferations. (400x)



Genus Compsonema

Plants minute, circular in outline, with a monostromatic basal stratum. The basal portion consisting of radiately branched horizontal filaments, more or less laterally appressed to one another.

Most cells of the prostrate monostromatic portion giving rise to erect simple or branched filaments. Cells of the erect filaments containing one or more band-shaped plastids. Unilocular sporangia usually terminal on erect filaments, but at times lateral. Plurilocular sporangia sessile on prostrate filaments, or terminal or lateral on the erect filaments. Plurilocular structures pluriseriate.

Gametophytes unknown (25, p. 108).

Key to the Species of the Genus Compsonema

1. Plurilocular sporangia sessile on prostrate filaments; erect filaments to 25 $\mu$  long ..... C. sessile (p. 45 )
1. Plurilocular sporangia both terminal and lateral; erect filaments to 1.3 mm long ..... C. secundum (p. 46 )

Compsonema sessile Setch. and Gard., 1922 (20, p. 358-359)

Thalli inconspicuous, circular to irregular in outline, 0.5-1.5 mm in diameter. Cells of the basal stratum irregular in shape and size, 5-12 $\mu$  in diameter, and without rhizoids. Plastids band-shaped, one per cell. Erect sterile filaments, sparse, 15-25 $\mu$  high.

Plurilocular sporangia numerous, sessile on prostrate filaments, broadly clavate to fusiform, 15-25 $\mu$  high by 8-15 $\mu$  broad; loculi pluri-seriate. Thalli without unilocular sporangia.

The plurilocular structures described by Setchell and Gardner (23, p. 474-475), and shown in a photomicrograph of the type specimen (Plate 10, p. 48) are conical to fusiform in shape. Specimens collected in this study showed much greater variation in shape, with a tendency to be narrowly to broadly clavate.

On blades of Hedophyllum sessile, at Yaquina Bay, Oregon. Found growing in company with Streblonema aecidioides var. pacificum which gave the host a roughened appearance, otherwise it would not have been detected without microscopic examination.

Compsonea secundum Setch. and Gard., 1922 (20, p. 361-362)

Thalli minute, and more or less confluent with one another. The monostromatic basal portion composed of much crisped, branched filaments, without rhizoids. Cells of the basal layer 6-8 $\mu$  in diameter, and of variable length. Erect filaments to 1.3 mm long, simple or occasionally with lateral fertile branches, and narrower toward the base. Cells cylindrical, 5-7 $\mu$  in diameter at the base, 9-11 $\mu$  in diameter at the widest point, and 3-6 times longer than broad; terminal cells to 9 times longer than broad. Unilocular sporangia broadly clavate, sessile or on short pedicels from prostrate

filaments, 60-90 $\mu$  long by 22-28 $\mu$  broad. Plurilocular sporangia quite variable, borne terminally on long or short pedicels from prostrate filaments, as lateral second branches of erect filaments, and terminally on erect filaments; to 400 $\mu$  long by 10-15 $\mu$  broad, loculi biseriate to pluriseriate.

Growing on pneumatocysts of Nereocystis luetkeana, at Cape Arago, Oregon.

Plate 10

Type of Componema sessile Setch. and Gard.

A marginal section of a mature plant. (860x)

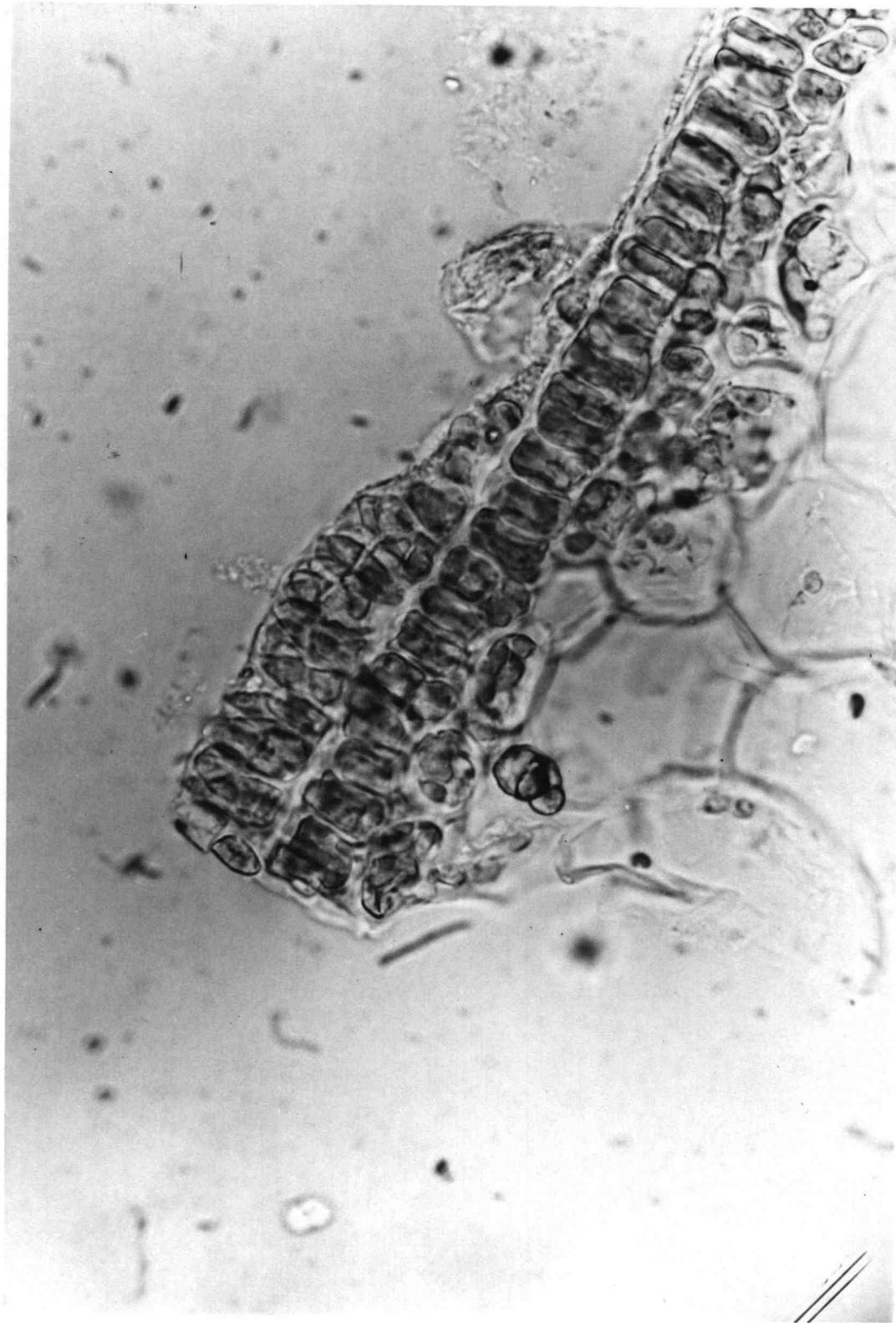
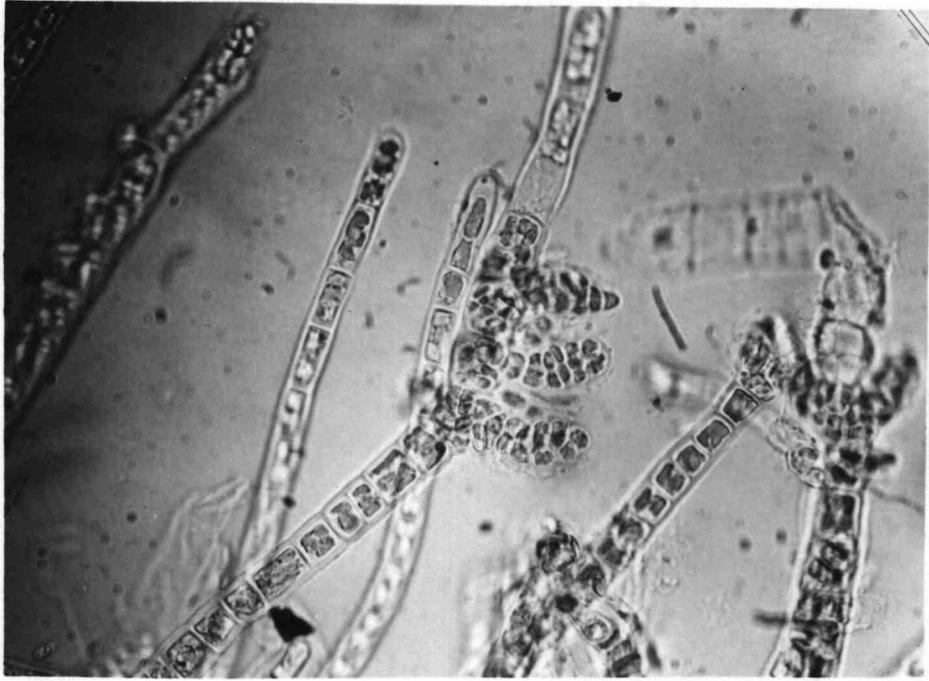


Plate 11

Type of Compsonema secundum Setch. and Gard.

- Fig. 1. A portion of an erect filament with secund plurilocular sporangia. (500x)
- Fig. 2. An apical portion of an erect filament with a terminal plurilocular sporangium. (516x)



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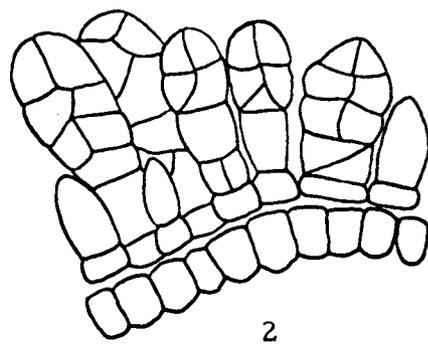
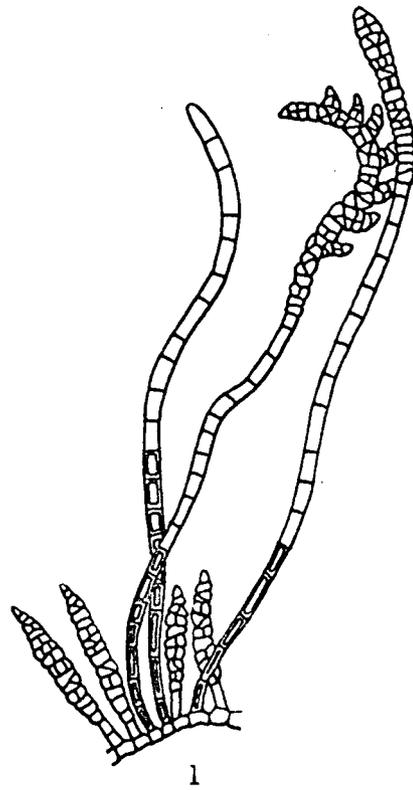


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Plate 12

Fig. 1. Componema secundum Setch. and Gard. A fragment of a plant with plurilocular sporangia on short pedicels from a prostrate filament, and both terminal and secund on erect filaments. (215x)

Fig. 2. Componema sessile Setch. and Gard. A section from the center of a typical plant. (515x)



Genus Hecatonema

Sporophytes minute, crustose, mostly circular in outline, and with a wholly or partly distromatic basal layer. The prostrate base composed of radiating filaments, laterally appressed to one another. Cells of the prostrate filaments divide horizontally, creating a distromatic basal layer (25, p. 488). Basal layer may produce rhizoids below. Most of the cells of the upper layer of the basal stratum producing an erect, simple or branched filament. The unilocular sporangia sessile or pedicellate on the prostrate filaments, or terminal or lateral on the erect filaments. Pluriseriate, plurilocular structures borne erect on prostrate filaments, and terminal and lateral on erect filaments.

Gametophytes unknown (25, p. 488).

Hecatonema variabile Setch. and Gard., 1922 (21, p. 377-378)

Thalli crustose, forming more or less circular cushions, 2-8 mm in diameter. The basal layer partly or wholly distromatic, and composed of laterally appressed filaments with or without short peg-like rhizoids. Sterile erect filaments to 500 $\mu$  high, simple, cylindrical and narrow toward the base. Unilocular sporangia broadly clavate to cylindrical, sessile or pedicellate on prostrate filaments, and lateral or terminal on erect filaments; 14-51 $\mu$  long by 15-40 $\mu$

broad. Plurilocular sporangia cylindrical to fusiform, sessile or pedicellate on prostrate filaments, and terminal on the erect filaments; to 120 $\mu$  long, 9-12 $\mu$  wide, loculi uniseriate to pluriseriate.

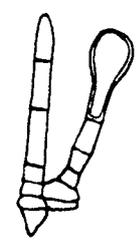
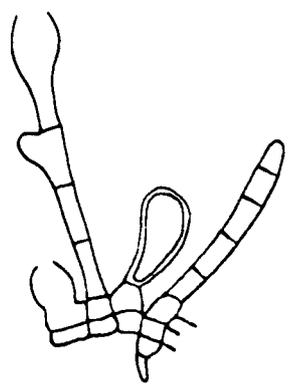
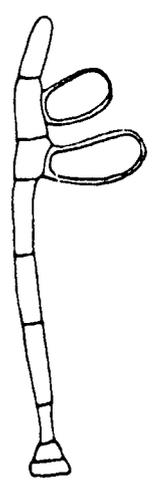
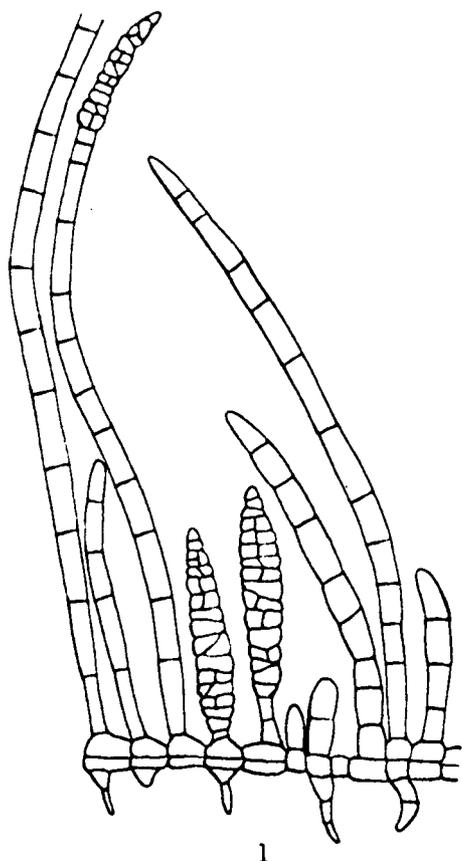
The unilocular sporangia on Oregon specimens were considerably shorter than those described by Setchell and Gardner (23, p. 490). They characterized these structures as broadly clavate, and listed measurements as 50-65 $\mu$  long by 20-24 $\mu$  broad. The dimensions for Oregon material were 14-40 $\mu$  long by 15-40 $\mu$  broad, broadly clavate to orbicular.

On pneumatocysts and stipes of Nereocystis, and lamina of Hedophyllum, Pterygophora, and Laminaria. Collected at Cape Arago, Cape Perpetua, Yaquina Bay, Beverly Beach and Boiler Bay, Oregon.

Plate 13

Hecatonema variabile Setch. and Gard.

- Fig. 1. A fragment of a mature plant with plurilocular sporangia on short pedicels from a creeping filament, and terminal on a long erect filament. (675x)
- Fig. 2. Fragments of plants with both terminal and lateral unilocular sporangia. (675x)



## GLOSSARY

- Acuminate:** tapering to a slender point.
- Adherent:** adnate.
- Aecidium:** a small blister.
- Aecidioid:** forming blisters, or eruptive sori at the surface of the host.
- Appressed:** pressed closely against or fitting closely to something.
- Attenuate:** narrow and gradually tapering.
- Clavate:** club-shaped.
- Confluent:** fusing together, touching one another.
- Crisped:** in tight waves or folds.
- Crustose:** crust-like, adnate to the substrate, growing in a thin layer flattened against the substrate.
- Dichotomous:** divided or dividing into two parts.
- Distromatic:** consisting of two layers.
- Dolioform:** cask or barrel-shaped.
- Endophyte:** a plant that grows within the tissues of another plant.
- Endophytic:** growing within the tissues of another plant.
- Epiphyte:** a plant growing superficially on the surface of another plant.
- Exserted:** protruding above associated structures.
- Fasciculate:** in a small cluster or tuft.
- Fronde:** the expanded thallus or lamina.
- Fusiform:** spindle-shaped, tapering at the extremities.

**Hair:** a filament growing free from the surface of the confluent thallus.

**Intercalary:** occurring anywhere throughout a filament, not at apex or at base.

**Lateral:** situated at the side.

**Locus (pl. loculi):** a chamber.

**Monostromatic:** consisting of a single layer of cells.

**Orbicular:** circular, round.

**Pedice:** a stalk of a reproductive structure.

**Pedicellate:** stalked, born on a pedicel.

**Phaeophyceean hairs:** hairs in which the meristematic region is near the base (characteristic of the Phaeophyta).

**Piliferous:** having hair.

**Plurilocular:** containing more than one chamber.

**Pluriseriate:** more than one cell broad.

**Pneumatocyst:** an air-bladder or float.

**Prostrate:** lying along the substratum.

**Rhizoid:** a filamentous attaching organ.

**Saccate:** sac-like.

**Secund:** unilateral, turned toward one side only.

**Sessile:** having no stalk.

**Simple:** unbranched.

**Sorus (pl. sori):** a group or cluster of reproductive structures.

**Thallus:** the plant body.

**Unilateral:** occurring on one side only.

**Unilocular:** containing a single chamber.

**Uniseriate:** occurring in one row or series.

## SUMMARY

A taxonomic study was made of one endophytic genus and several epiphytic genera of Phaeophyta on the Oregon coast. Thirteen species have been described, four of which are new species, and seven have not been previously reported from this area.

Two new Streblonema species have been described. S. oregonum was collected at Cape Arago, where it was endophytic in pneumatocysts of Nereocystis luetkeana. S. variabile was penetrating sori of Hedophyllum sessile, at Yaquina Bay.

S. aecidioides var. pacificum Setch. and Gard., S. myrionematoides Setch. and Gard., and S. vorax Setch. and Gard. were reported for the first time on the Oregon coast.

Two new species of Myrionema were also described. M. egregiophilum was growing on air-bladders of Egregia menziesii, at Yaquina Bay. M. difformans was epiphytic on blades of Hedophyllum sessile, also at Yaquina Bay.

Those Myrionemas in which all the erect filaments, except hairs and marginal cells, become fertile have been placed in the collective species, M. foecundum (Stroemf.) Foslie.

Several members of the Myrionemataceae have been reported for the first time from Oregon, including; M. phyllophilum Setch. and Gard., M. coronnae var. sterile Setch. and Gard., C. sessile

Setch. and Gard. , and H. variabile Setch. and Gard. C. secundum  
Setch. and Gard. , previously reported on N. luetkeana, at Cape  
Arago, was also collected in this study.

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