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Bulletin No. 18: Seaweeds of the Connecticut Shore: A Wader's Guide

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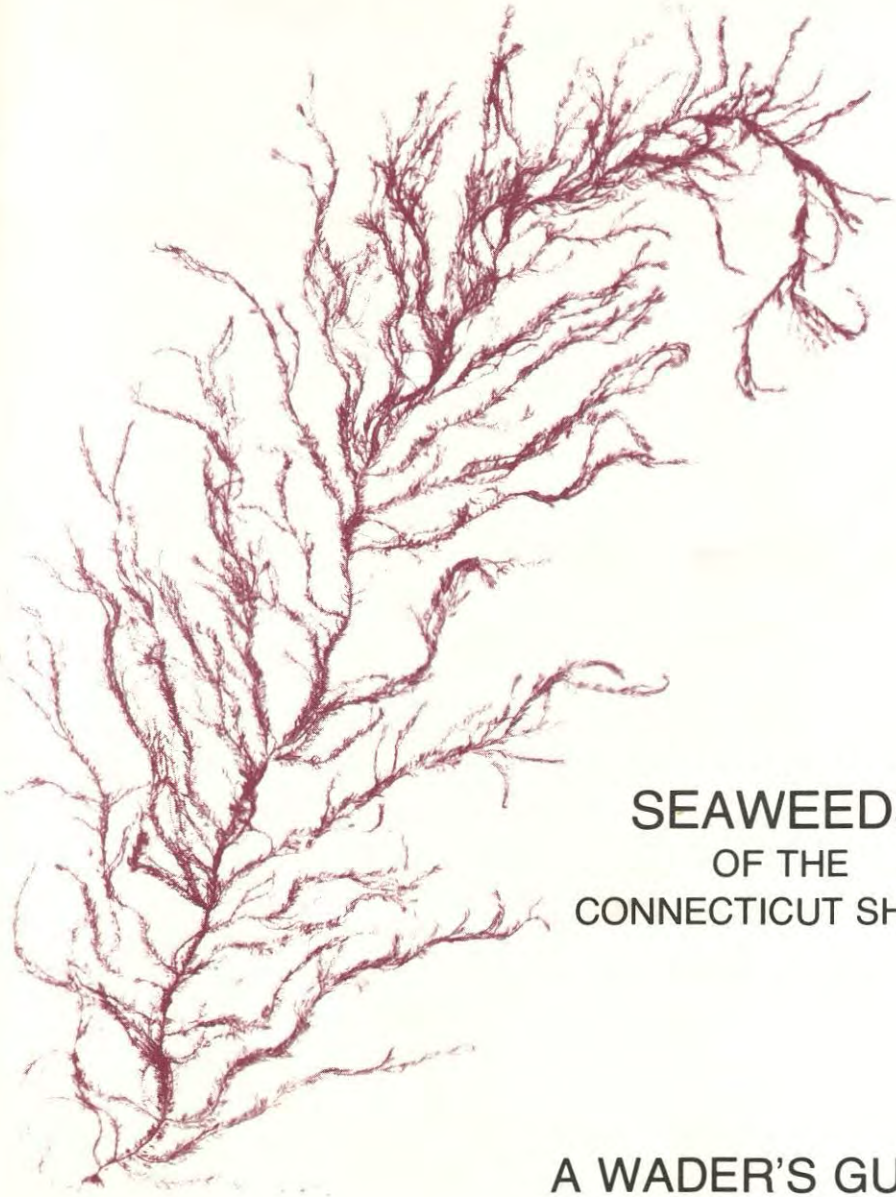
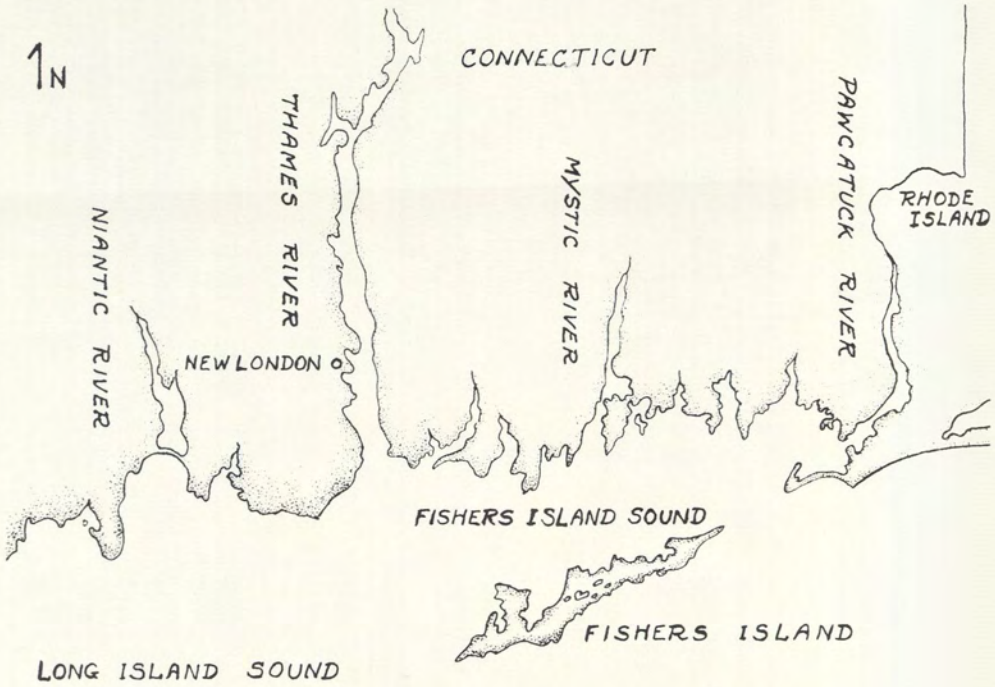


SEAWEEDS
OF THE CONNECTICUT SHORE

A WADER'S GUIDE

CONNECTICUT ARBORETUM
BULLETIN NO. 18



Front cover: *Dasya baillouviana*

THE CONNECTICUT ARBORETUM
New London, Connecticut

BULLETIN NO. 18 SEPTEMBER, 1985

SEAWEEDS OF THE CONNECTICUT SHORE
A WADER'S GUIDE

3rd edition

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Connecticut College

and

Martine Villalard
Roger Williams College, Rhode Island

Photographs by Philip A. Biscuti and Theodore Hendrickson
Drawings by Sibyl A. Hausman, Lucy V. Vokac and Dale Julier

Price 2.50

Foreword

Anyone who has strolled along the shore of southern New England has encountered the tremendous array of seaweeds cast up on the sandy beaches. After storms the quantity of this marine produce can be measured in tons. Even the casual observer will have noted the colors range from green to reddish brown. Green lettuce-like fragments—sea lettuce, brown belt-like straps, several feet long—the kelps, and highly branched delicate reds represent the three major groups of seaweeds. Have you ever wondered whether you could identify this great diversity of forms? Here is your opportunity to be guided by two students of phycology.

The authors have included two keys to identification—one for the student who wishes to pursue the diversity of forms in considerable detail and another for the beginner who is interested in just getting acquainted with the very most common types. For the excellent photographs we are indebted to Mr. Philip Biscuti and Mr. Theodore Hendrickson. The beautiful herbarium specimens from which the photographs were made were prepared by the authors and by Miss Margo Reynolds and Mr. Bradford Peck. The fine drawings of Mrs. Lucy Vokac and the late Miss Sibyl Hausman show the detail needed for distinguishing the various types, especially when a microscope is required.

Since the initial printing in 1972 some species have been renamed. The new nomenclature is incorporated into this third edition. Some of the more diffuse filamentous species, where photographs were not satisfactory, are now represented by drawings.

The 60 different algae illustrated in this guide represent a mere sample of one of the major units of primary production in the coastal estuarine waters. These, along with the microscopic forms, represent the base of the food chain for all other marine life. There is no environment in greater jeopardy today than the coastal zone. Sixty percent of the nation's population lives in a band of 250 miles wide along our shoreline. Here too are concentrated the major industries producing by-products of our technology. The State of Connecticut lies within this coastal megalopolis. It is worth recognizing that the beauty and diversity illustrated in the pages of this Bulletin represent millions of years of evolution. Yet in a few decades much of what we see here could be lost. The Mamacoke Island Natural Area, one of two natural areas within the Connecticut Arboretum, exhibits and will, hopefully, preserve for future generations a small sample of the species of algae shown here. However, much of the State's coastline is at present unprotected. There is no doubt that one of man's greatest future challenges will be the preservation of the tremendous floristic and faunistic diversity that has evolved in the coastal zone. The algae you are about to study in this guide represent a unique sample of this ecological diversity.

William A. Niering

Director

THE CONNECTICUT ARBORETUM

BULLETIN NO. 18 SEPTEMBER, 1985

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THE CONNECTICUT ARBORETUM ASSOCIATION

Membership is open to organizations and individuals interested in supporting the Arboretum and its program. Members receive Arboretum publications and enjoy other privileges, including notices of special field trips and lectures, and the use of the Arboretum facilities.

Individual memberships: annual $10; sustaining, $25; life, $500

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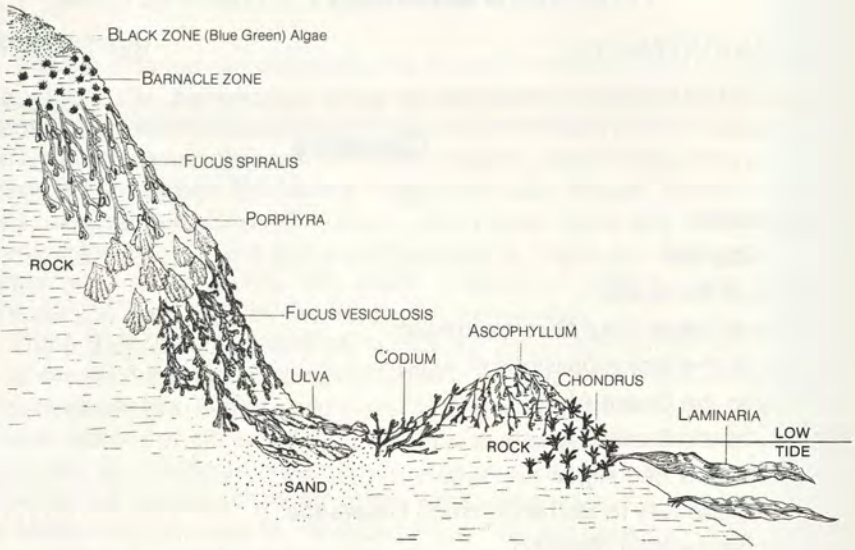
Checks should be made payable to the Connecticut Arboretum and sent to the Director, Dr. William A. Niering, Connecticut College, New London, Conn. 06320.



Introduction

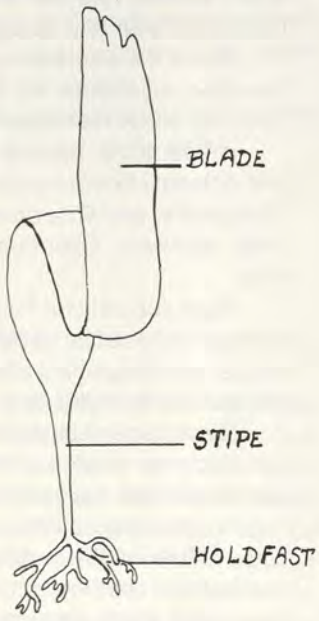
It has become apparent while teaching a summer course in Marine Botany at Connecticut College that a collection of photographs of the commonest algal forms, accompanied by a simple key, would be an invaluable aid to the amateur naturalist and the beginning student.

The shoreline localities sampled lie within the area shown on the map inside the front cover. They include: Weekapaug in Rhode Island; Harkness State Park, Avery Point, Mason's Island, Bluff Point, Waterford Beach, Oswegatchie, Pleasure Beach in Connecticut; Hay Harbor and Race Point Beach on Fisher's Island in New York.

This guide includes 60 of the most frequently encountered macroscopic species of green, brown and red algae along this section of the coast. Since most of these species have a wide distribution, the guide should prove useful for a considerable distance up and down the Atlantic Coast. Microscopic forms have been omitted. One group of these is the blue-green algae (Cyanophyta) represented along the shoreline as a paint-like black zone on the rocks above the high tide line. Their presence makes the rocks extremely slippery. Another microscopic group not dealt with is the yellow brown diatoms (Chrysophyta). There are vast numbers of these tiny plants, with beautifully patterned silica cases, attached or encrusted on eelgrass, rocks, other algae, or covering the exposed mud flats at low tide.

Long Island Sound, formed at the retreat of the ice sheet, exhibits a fascinating diversity of algal species. The shoreline is bouldery, with scattered sandy beaches. Rocky headlands, reefs, and a stony bottom provide attachment for multitudes of seaweeds and associated animals. A few algae are found attached to small pebbles in the sandy bottom, especially where tidal action is not strong; others grow attached to eel grass or to each other in a very characteristic fashion.

The seaweeds have a simple body structure which consists of a thallus (a form of plant which has no true roots, stems or leaves). The thallus may be a simple or a branched filament, a hollow tube or bladder, a spongy or solid mass, a simple or compound blade. A holdfast generally attaches the thallus to the substrate. Between the holdfast and the blade a stalk-like *stipe* may be present, as in *Laminaria,* one of the most common brown algae.



Those algae which grow upon another plant, usually an alga, are called epiphytes. Most forms begin their life cycle and growth attached to a substrate, but in certain species pieces may break off to form new free-floating plants which continue to grow in masses. Others, mainly the red algae, are found floating after a storm since they become wrenched loose from their deep-water substrate by wave action. All the specimens pictured here have been found either attached or floating freely along the exposed shoreline at low tide.

In the intertidal zone, the rocks exposed to the air are often covered with heavy growths of two conspicuous brown seaweeds, *Fucus* and *Ascophyllum,* both of which have floats or bladders. These plants support a large population of grazing snails and smaller epiphytic plants such as *Ectocarpus* (a brown alga) and *Polysiphonia* (a red alga), which grow attached only to these particular plants. In this zone, one also finds attached to the rocks the red alga *Porphyra,* recognized by its thin, sheetlike thallus. Other reds found here are *Chondrus* (Irish moss), *Gigartina,* and the brown, thin-bladed *Petalonia.* Irish moss is especially common in the backwash. Its highly branched, shrub-like form is especially distinctive.

In water several feet deep at low tide, the red alga *Palmaria* occurs, intermixed with two browns, *Laminaria* and *Chorda.* The distinctive, strap-like *Laminaria,* with its tangled root-like holdfasts, is often found on the beach. Specimens 1-2 meters in length are not uncommon. *Chorda* is a single long, round strand which looks like a swollen string, and often reaches a length of

40-45 cm. Green algae, such as the soft, much branched *Cladophora,* the narrow, strap-like tubes of *Enteromorpha* and the broad blades of *Ulva* (sea lettuce) are found near the high-tide line. Submerged at high tide and exposed at low tide, these plants occur as attached or floating masses along the margins of quieter estuaries and salt marshes. In recent years, another green alga, *Codium,* has become abundant locally. It is easily recognized by its branching habit and sponge-like texture.

Below the intertidal zone in still deeper water grow the delicate, finely branched reds, such as *Spermothamnion, Antithamnion,* or *Callithamnion.* They are easily dislodged by wave action and are found freely floating.

In tidal pools, rocks and mollusc shells are often encrusted by the red or pink colored *Hildenbrandia* or *Phymatolithon.* Green algae such as *Ulothrix, Cladophora,* and *Enteromorpha* also thrive in the same pools, attached to the rocky substrate. Their thread-like thalli float in the quiet water between high tides.

Algal populations fluctuate with the seasons. Some reproduce in early spring and die out by late summer. For example, the pink *Grinnellia* appears in August and disappears after four to six weeks. Certain species of *Monostroma* are found only in the spring and disappear by July.

Distribution of algae along the shoreline, both horizontally and vertically, can easily be related at first glance to specific sites which are alternately submerged and exposed by the tides. However, a complex set of ecological factors including salinity, water temperature, pigmentation, length of exposure, nature of the substrate and the severity of wave action affect this distributional pattern. In general, the splash zone is darkened by the blue-green algae. Greens or browns are characteristic of the intertidal zone, while the reds are more typical of the deeper water.

Algal pigments have evolved over millions of years so that they are able to absorb specific wave lengths of the visible spectrum. All algae contain chlorophyll, a green pigment. The brown algae contain in addition the brown pigment fucoxanthin, which gives them their characteristic brown or brownish green color. The reds contain the phycobilins, which are either red or blue in color and mask the green of chlorophyll. These pigments are called accessory pigments, and they help the plant absorb a greater range of the wave lengths of light available to it. Thus the red algae, with phycobilins as well as chlorophyll, can survive in the dimness of deep water by more effectively using the blue, green and yellow wave lengths for photosynthesis.

Marine algae play a vital part in the energy flow pattern of coastal waters. The myriad microscopic plants (phytoplankton), along with the larger marine forms pictured here, form the base of the food chain. These plants, large and small, serve as food for huge populations of crustaceans, mulluscs, and small fish, upon which the larger fish and man depend. They also produce oxygen as a by-product of their metabolism during the process of photosynthesis, which uses light energy to convert carbon dioxide and water into sugar. Oxygen, which supports our life processes, is released into the atmosphere from the marine algae in all the oceans of the world.

Marine algae such as *Laminaria* and *Fucus* are used as a source of iodine, and *Gelidium* as a source of agar. Agar, a chemically inert colloidal substance which can form a gelled solid when it is dissolved in water, is invaluable as a binder in foods and as a base for the culture of bacteria. Irish moss *(Chondrus crispus)* and dulse *(Palmaria palmata)* are part of the human diet in fishing communities along the North Atlantic Islands. Irish moss is harvested commercially in the Atlantic Provinces of Canada and the extract is used in the dairy, baking, brewing, pharmaceutical, cosmetic and textile industries. In Japan, *Porphyra* is cultivated as a diet staple.

Further information about the life cycles and distribution of marine algae can be found by consulting the books listed at the end of the guide.

Use of the Guide

Most seaweeds can be fully identified by following the numbered key (pages 9 to 33) for the appropriate group, making a series of choices which best describe the plant, and then comparing the specimen with the accompanying pictures. Most scientific terms used in the key are illustrated by small sketches. Some specimens which closely resemble each other can be identified only by using a microscope to examine the arrangement of cells. For instance, the green, sheet-like *Monostroma,* which closely resembles the more common sea lettuce, *Ulva,* is readily distinguished by a cross section showing it to be one cell layer thick, as opposed to *Ulva's* two cell layers. More technical descriptions are found in the books by Kingsbury and Taylor listed under Recommended Reading.

Sometimes the color of different groups of algae is very similar, and it may be difficult to decide whether a specimen belongs to the green, red or brown group. Green algae are the only group which contain true starch and will show a blue-black color when an iodine solution is applied to them. If a red and a brown alga are dipped in boiling water, the watersoluble red pigment will fade from the red alga, becoming dissolved in the water, while the pigment of the brown alga will not.

The collector should note that not all the species occurring along the Connecticut shoreline are included, only the most common. Over one hundred species have been recorded for the area. Plants of the same species can vary greatly in form in response to differences in the physical conditions of their habitat. If identification is in doubt, don't be discouraged. Mount the specimen with complete data as shown on page 8, and save the final decision for an expert judgment at another time. Where possible, pictures have been placed near the species listed in the key; sometimes two illustrations are included to indicate their variation.

How to Make Your Own Herbarium

In the process of creating a personal herbarium, you will discover the pleasant pastime of the wading collector. An occasional slip of the foot and a dunking is inevitable, and rubber soled shoes should be worn at all times to protect your feet from the barnacle-encrusted rocks.

The plants collected should be in good condition, and the *holdfast* (see illustration p. 5) included wherever possible. If the plant is securely cemented to the substrate, use a knife to pry it loose carefully. The plants can be isolated in plastic bags filled with sea water and kept in a cool spot until they can be mounted. If the plants are mounted the same day they are collected, preservatives are not necessary to maintain the colors. The red algae tend to lose color first as their pigment deteriorates rather quickly.

Mount the plants by spreading them while wet upon 100% rag herbarium paper laid in a shallow sink or pan. Use a bulb syringe filled with sea water to arrange the plant in its natural configuration by squirting the water on it. As the water drains away, the plant will adhere to the paper as you have arranged it. The mounted specimen is covered with a thin cloth (old sheeting is good) in order to prevent sticking to the next layer; the paper and cloth are then placed between herbarium blotters. Blotters and specimens are separated by layers of corrugated paper in sandwich fashion, which allows air to circulate and speed the drying. The stack is then pressed between boards weighted with bricks or strapped firmly. Blotters must be changed daily so the plants will dry rapidly. The finished mounts will keep for years stored flat in protective folders, and will remain true in color as long as they are not constantly exposed to light. Specimens collected in 1870 are still in excellent condition in the herbarium at Connecticut College.

Each finished sheet should be labelled with the collection number, the date collected, the collector's name, the height of the plant in relation to mean low tide (datum), and the precise location. The name of the plant may be added upon identification, which can be at the convenience of the collector. It is most important, however, that an immediate record of habitat information be made, since this is most difficult to reconstruct later.

collection n° 264

FUCUS SPIRALIS L.

1 foot above datum on granite boulder
100 feet north of jetty, McCook Point
Beach, Niantic, New London Co., Conn. U.S.A.

Coll. M. Villalard — June 2, 1985
Det. M. Villalard — June 3, 1985

Parts of the dried plant specimen can be reconstituted in water for microscopic study of cell detail at any later time.

Specimens may also be preserved in airtight jars with 4% formalin, to which a trace of borax has been added to keep the solution alkaline. Labels are then inserted inside the jars with the same kind of information written in pencil or India ink.

Key to the Major Divisions of Algae

1. Plant green, staining black with iodine † ..... GREEN ALGAE *(Chlorophyta)*

1. Plant not green, not staining black with iodine 2

   2. Plant light to dark brown or dark green, pigment not diffusing out in boiling water ..... BROWN ALGAE *(Phaeophyta)*

   2. Plant usually light to dark red, red color diffusing out in boiling water ..... RED ALGAE *(Rhodophyta)*

†Solution can be made by dissolving 2 grams of potassium iodide in 100 milliliters of water; then dissolve 1 gram of iodine crystals in this solution. Water with tincture of iodine added to give a color like medium strong tea can also be used for this test.

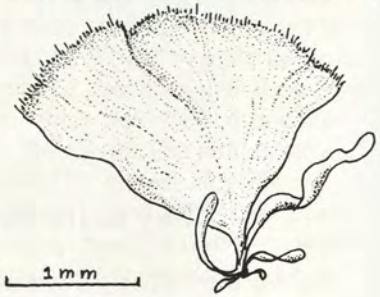
Key to the Green Algae

(Chlorophyta)

1. Plant a flat sheet or minute blade ..... 2.

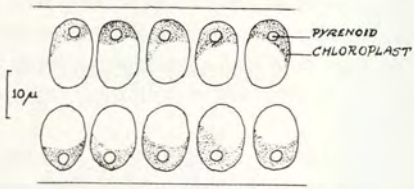
1. Plant a filamentous, tubular, feathery or spongy mass or narrow blade ..... 3.

2. Plant a minute blade, not exceeding 1 cm. high, growing in dark green tufts at or above high tide line. Found often near bird droppings on rock ..... *Prasiola stipitata*



2. Plant very thin, light green sheet up to 20 cm. long. One cell layer thick in cross section; fragile. Found in spring and early summer. ..... *Monostroma* Fig. 1

2. Plant firm, bright green sheet, Sturdier than Monostroma; two cell layers thick. To 60 cm. long. Found in all seasons ..... *Ulva lactuca* Fig. 2



3. Plant unbranched or sparingly branched; entangled masses of hairlike or threadlike filaments ..... 4.

3. Plant branched, tubular, spongy or filamentous ..... 6.

4. Filaments coarse and wiry, yellow green. Often floating in large masses. Does not adhere well to paper ..... *Chaetomorpha linum* Fig. 3

4. Filaments softer than above. Adheres well to paper ..... 5.

5. Filaments long, with occasional rootlike branches. Dark green. Found in floating masses ..... *Rhizoclonium tortuosum* Fig. 4

5. Filaments short, dark green, very thin, slippery. Often mixed with other algae in mats along the edge of tidal marsh ..... *Ulothrix flacca* Fig. 5

Fig. 1 Monostroma pulchrum

Fig. 2 Ulva lactuca

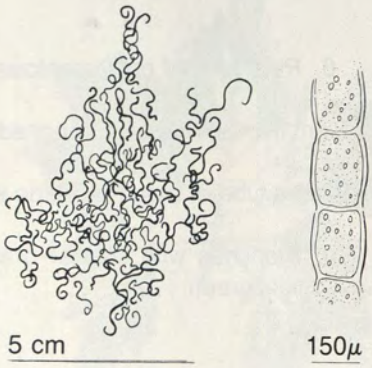


Fig. 3 Chaetomorpha linum

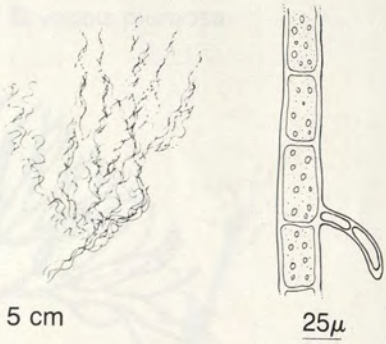


Fig. 4 Rhizoclonium tortuosum

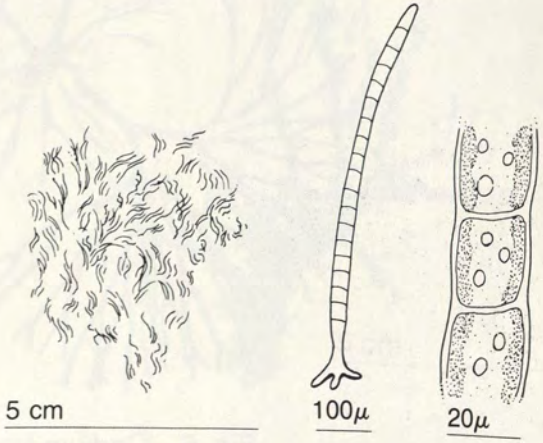


Fig. 5 Ulothrix flacca

6. Plant a dark green, spongy mass of thick branches ..... *Codium fragile* Fig. 6

6. Plant tubular or filamentous ..... 7.

7. Plant filamentous and branched ..... 8.

7. Plant a tube or a narrow blade with occasional branching ..... 9.

8. Branches with smaller branchlets from a main axis. Feather-like, light green ..... *Bryopsis plumosa* Fig. 7

8. Branches irregular ..... *Cladophora* Fig. 8

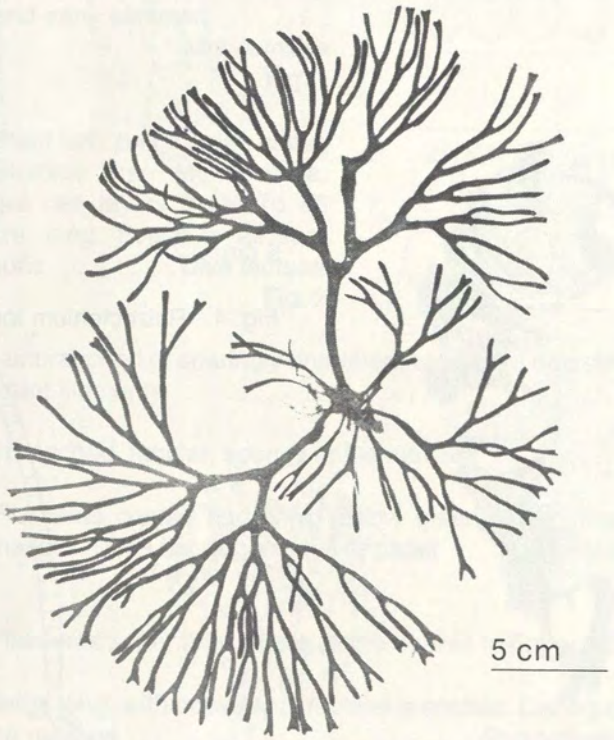


Fig. 6 Codium fragile

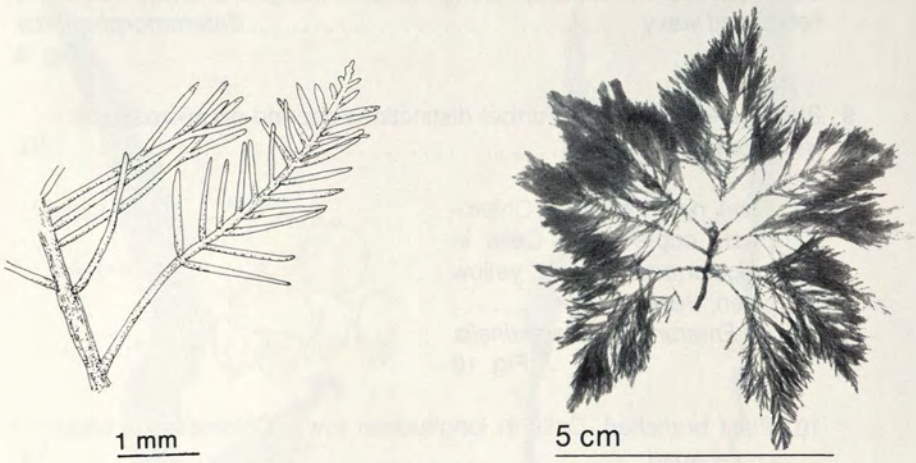


Fig. 7 Bryopsis plumosa

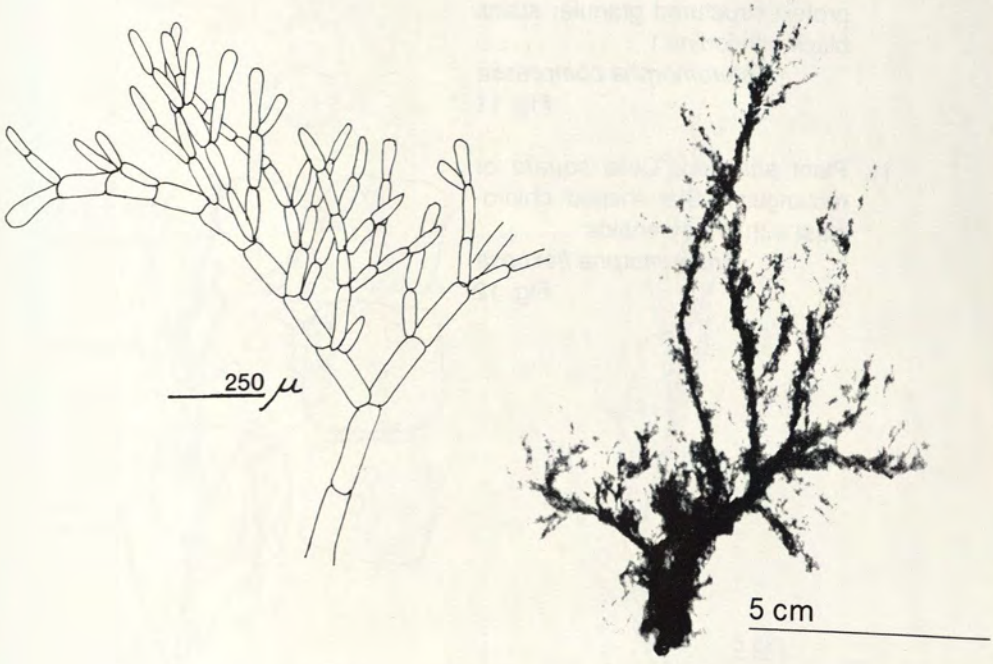
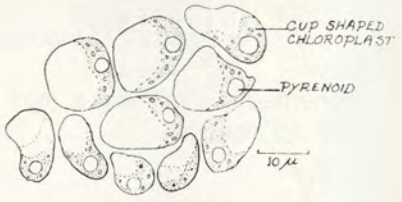


Fig. 8 Cladophora sp.

9. Solid flattened blade, except along margins. Margins of blade frequently hollow and wavy ..... *Enteromorpha linza* Fig. 9

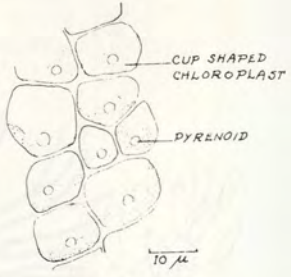
9. Blade generally hollow. Further distinctions depend on microscopic characteristics ..... 10.

10. Plant not branched. Chloroplasts cup-shaped. Cells in irregular arrangement, yellow green. Very common ..... *Enteromorpha intestinalis* Fig. 10



10. Plant branched. Cells in longitudinal rows. Chloroplast stellate or cup shaped ..... 11.

11. Plant attached, bright green. Cells rounded or polygon shaped, with a cup-shaped chloroplast and 1 pyrenoid (starch-accumulating protein-structured granule; stains black with iodine.) ..... *Enteromorpha compressa* Fig. 11



11. Plant attached. Cells square or rectangular. Star-shaped chloroplast with 2-3 pyrenoids ..... *Enteromorpha flexuosa* Fig. 12

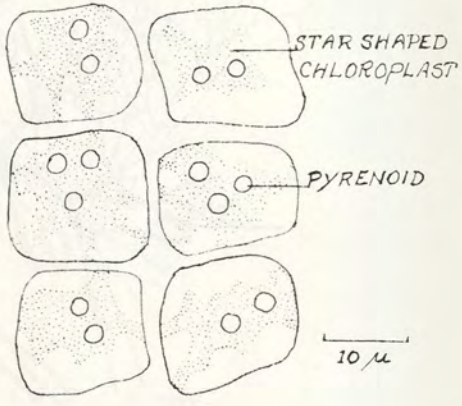


Fig. 9 Enteromorpha linza

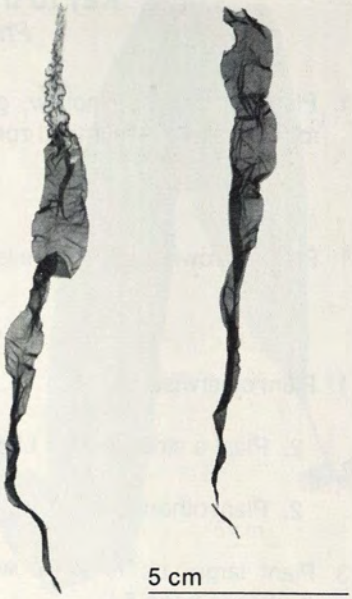


Fig. 10 Enteromorpha intestinalis

Fig. 11 Enteromorpha compressa

Fig. 12 Enteromorpha flexuosa

Key to the Brown Algae

Phaeophyta

1. Plant an irregular, hollow, globular mass, yellow brown, attached to rocks or algae in intertidal zone. Small to large crabapple size ..... *Leathesia difformis* (sea potato) Fig. 1

1. Plant a brown crust on shells or rocks in intertidal zone ..... *Ralfsia verrucosa* (not illustrated)

1. Plant otherwise ..... 2.

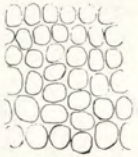
2. Plant a strap-like flat blade ..... 3.

2. Plant otherwise ..... 5.

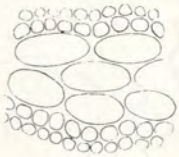
3. Plant large, up to 3 m. with conspicuous stipe and holdfast (see illustration page 5.) ..... *Laminaria saccharina* (kelp) Fig. 2

3. Plant remaining small, up to 50 cm. long. Without a conspicuous stipe or holdfast ..... 4.

4. Plant thin, cells in cross section few and of equal size .. *Punctaria latifolia* Fig. 3



4. Plant thicker, cells of different sizes in cross section ..... *Petalonia fascia* Fig. 4



5. Plants generally epiphytic, thread-like, uniseriate (filament consists of single cells attached in a chain-like fashion) ..... 6.

5. Plants not epiphytic, often attached to rocky substrate. Thallus leathery ..... 7.

6. Plant less than two cm. long, dark brown, minute tufts of short, erect filaments. Usually attached to *Fucus* as in illustration ..... *Elachista fucicola* Fig. 5

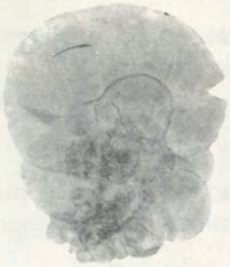


Fig. 1 Leathesia difformis

Fig. 2 Laminaria saccharina

Fig. 3 Punctaria latifolia

Fig. 4 Petalonia fascia

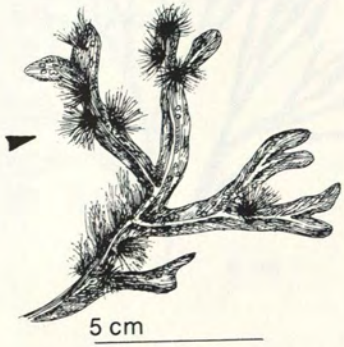


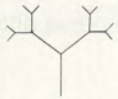
Fig. 5 Elachista fucicola

6. Plant generally more than 2 cm. long, yellow brown. Attached to rocks, pilings, other algae or eel grass as in illustration ..... *Ectocarpus* Fig. 6

7. Plant large, leathery, thick, branching. Float bladders frequently present. With swollen bladder-like sex structures (receptacles) terminating branches ..... 8.

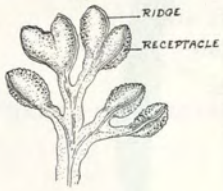
7. Plant otherwise ..... 10.

8. Branching highly dichotomous ..... 9.



8. Branching not generally dichotomous; main axis flattened. Large single float bladders noticeable along main axes ..... *Ascophyllum nodosum* Fig. 7

9. Receptacles with a ridge or wing; male and female structures in the same plant (seen only with a microscope). No float bladders ..... *Fucus spiralis* (rockweed) Fig. 8



9. Receptacles without ridge; paired float bladders along midrib. Male and female structures on different plants. Very common, found attached to rocks in intertidal zone ..... *Fucus vesiculosus* (rockweed) Fig. 9

9. Receptacles long, flattened; male and female structures on the same plant ..... *Fucus distichus* (rockweed) Fig. 10

Fig. 6 Ectocarpus siliculosus

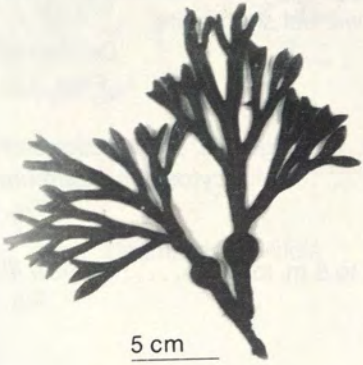


Fig. 9 Fucus vesiculosus

Fig. 7 Ascophyllum nodosum

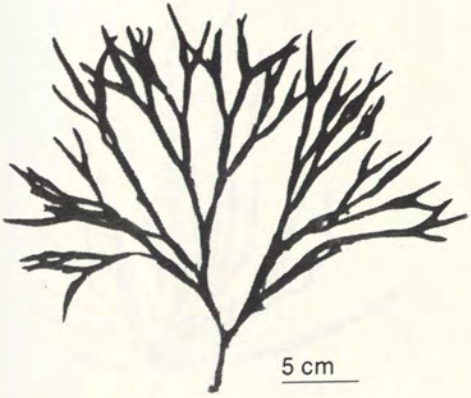


Fig. 10 Fucus distichus

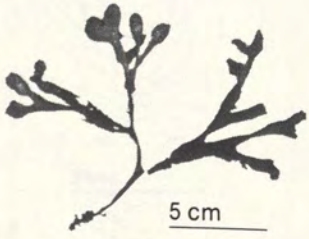


Fig. 8 Fucus spiralis

10. Plant branched ..... 11.

10. Plant not branched ..... 12.

11. Plant with long side branches from short main axis, rarely rebranched. Color blackish brown ..... *Chordaria flagelliformis*
Fig. 11

11. Plant with short side branches from a long main axis. Often epiphytic on *Chordaria*. Color light brown ..... *Dictyosiphon foeniculaceus*
Fig. 12

11. Plant with opposite or alternate branching, much rebranched. Grows below low tide line, attached. With or without short hairs .....
Desmarestia
Figs. 13a, b

12. Plant tubular, up to 50 cm. long. Sausage-like constructions often apparent ..... *Scytosiphon lomentaria*
Fig. 14

12. Plant tubular, generally solid. Up to 5 m. long ..... *Chorda filum*
Fig. 15

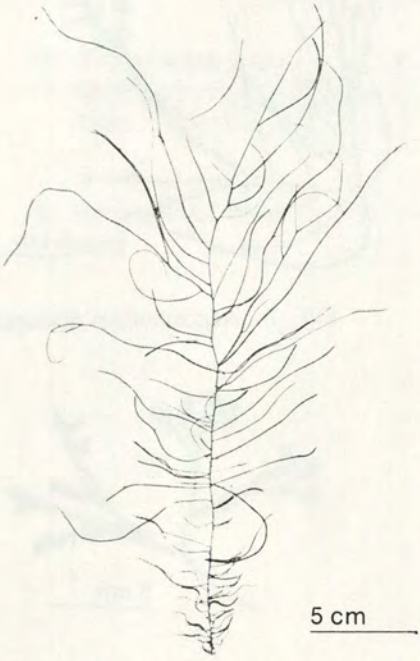


Fig. 11 Chordaria flagelliformis

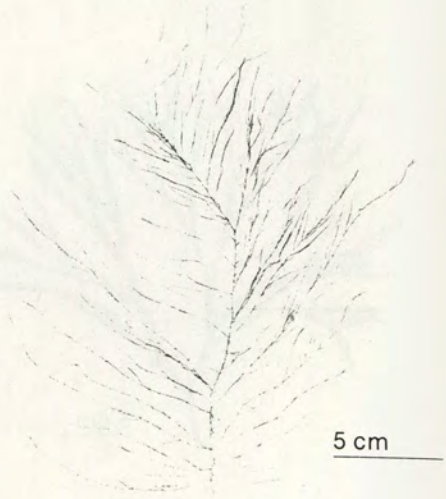


Fig. 12 Dictyosiphon foeniculaceus

Fig. 13a Desmarestia viridis

Fig. 13b Desmarestia aculeata

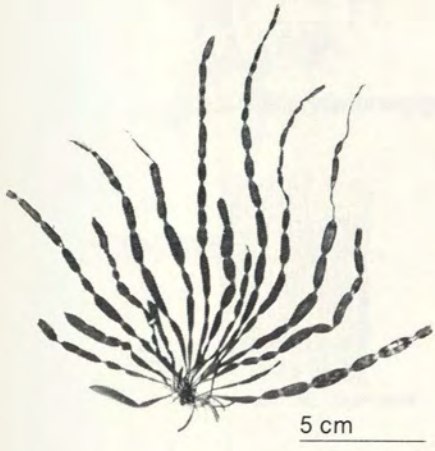


Fig. 14 Scytosiphon lomentaria

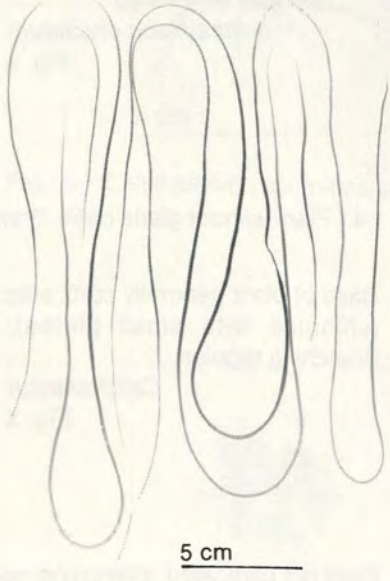


Fig. 15 Chorda filum

Key to the Red Algae
Rhodophyta

1. Plant erect, branched, encrusted with lime. Generally pink, but white when bleached. 3 to 5 cm. tall ..... *Corallina officinalis*
Fig. 1

1. Plant forming a crust ..... 2.

1. Plant otherwise ..... 3.

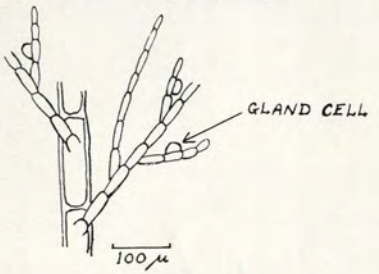
2. Plant a red crust ..... *Hildenbrandia rubra*
(not illustrated)

2. Plant a pink crust ..... *Phymatolithon laevigatum*
Fig. 2

3. Plant very fine, small, plume-like. Uniseriate filaments ..... 4.

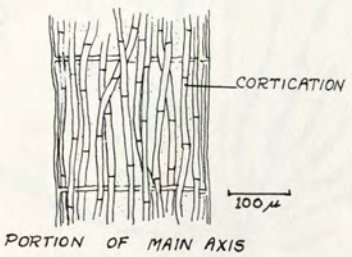
3. Plant more than one cell broad, coarse ..... 6.

4. Plant with or without gland cells. Branching generally opposite or whorled ..... *Antithamnion cruciatum*
Fig. 3



4. Plant without gland cells. Branching generally alternate ..... 5.

5. Base of plant generally corticated (shingled with small plates). Branching regular ..... *Callithamnion*
Fig. 4



5. Plant not corticated. Branching not regular .. *Spermothamnion repens*
Fig. 5

Fig. 1 Corallina officinalis

Fig. 2 Phymatolithon laevigatum

Fig. 3 Antithamnion cruciatum

Fig. 4 Callithamnion corymbosum

Fig. 5 Spermothamnion repens

6. Plant a flat, round or lobed blade, with or without branches .... 7.

6. Plant wiry, at least near base ..... 10.

6. Plant otherwise ..... 13.

7. Plant without a midrib, not branched. Generally a rounded, flat, thin reddish or yellowish sheet ..... *Porphyra*
Figs. 6a, b

7. Plant with a midrib ..... 8.

7. Plant branched or lobed ..... 9.

8. Plant lobed. Bright purple-red ..... *Phycodrys rubens*
Fig. 7

8. Plant a simple pink blade, with punctate dots often present .....
Grinnellia americana
Fig. 8

9. Plant up to 10 cm. Bushy, dichotomous branching. Dense crisp mats
..... *Chondrus crispus*
Fig. 9

9. Plant larger, broad bladed with irregular divisions. Holdfast obvious
..... *Palmaria palmata*
Fig. 10

Fig. 6a Porphyra miniata

Fig. 6b Porphyra umbilicalis

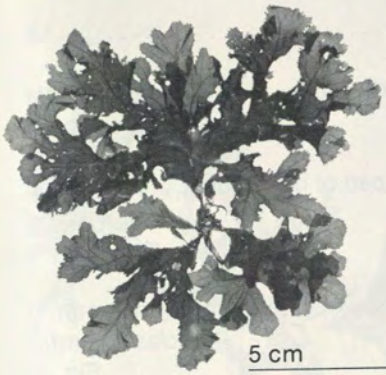


Fig. 7 Phycodrys rubens

Fig. 8 Grinnellia americana

Fig. 9 Chondrus crispus

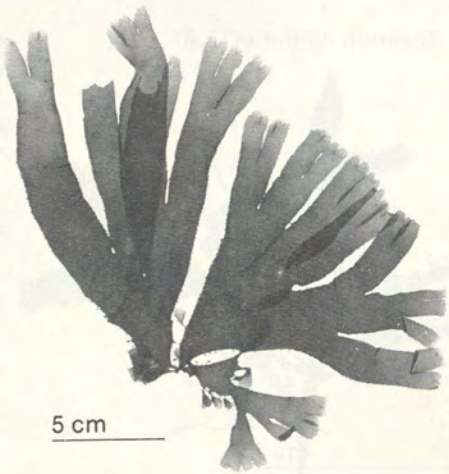


Fig. 10 Palmaria palmata

10. Plant flattening in the upper parts ..... 11.

10. Plant otherwise ..... 12.

11. Plant with small outgrowths on surface of blade ..... *Gigartina stellata*
Fig. 11

11. Plant without any outgrowths; flattened part of blade thin .....
Phyllophora
Figs. 12a, b

12. Plant regularly branched (dichotomous). Branches up to 2 mm. in diameter ..... *Polyides rotundus*
Fig. 13

12. Plant more irregularly branched. Branches up to 1 mm. in diameter, intertwined. Forming bushy, wiry tufts ..... *Ahnfeltia plicata*
Fig. 14

13. Plant soft, with few branches, often with a worm-like appearance .....
14.

13. Plant otherwise ..... 15.

14. Plant generally hollow. A spring species .... *Dumontia contorta*
Fig. 15

14. Plant not hollow. Very slippery. Wider at branching point.
Summer species ..... *Nemalion helminthoides*
Fig. 16

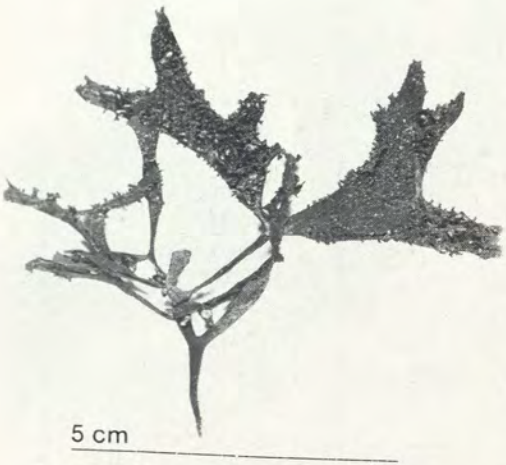


Fig. 11 Gigartina stellata

Fig. 12a Phyllophora pseudoceranoides

Fig. 12b Phyllophora truncata

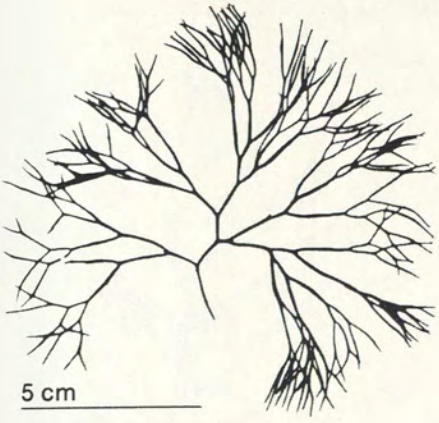


Fig. 13 Polyides rotundus

Fig. 14 Ahnfeltia plicata

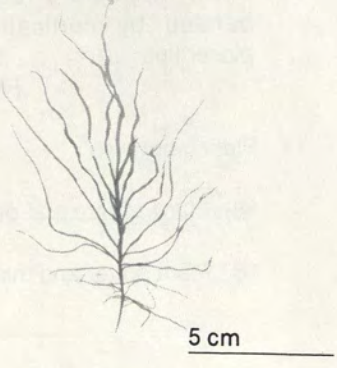


Fig. 15 Dumontia contorta

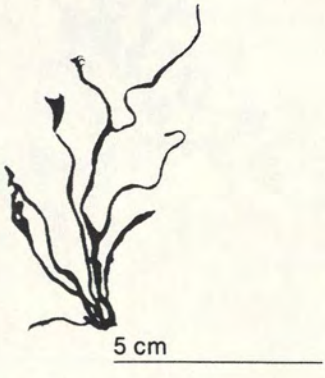


Fig. 16 Nemalion helminthoides

15. Plant with visible appendages (hairs, hooks or tendrils) ..... 16.

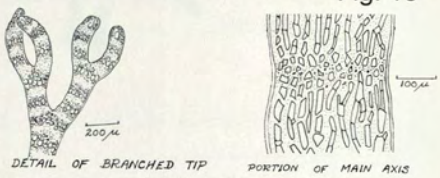
15. Plant without visible appendages ..... 17.

16. Delicate hairs up to 5 mm. long covering the surface of branches ..... *Dasya baillouviana*
Fig. 17

16. Hook-like lateral structures arising from branches ..... *Bonnemaisonia hamifera*
Fig. 18

16. Branches with coiled tendrils like those of a grapevine ..... *Cystoclonium purpureum*
Fig. 19

17. Plant appearing beaded or banded by cortication. With pincer tips .....*Ceramium*
Figs. 20a, b



17. Plant otherwise ..... 18.

18. Plant coarse and generally thick, up to 5 mm. in diameter .... 19.

18. Plant softer and thinner ..... 20.

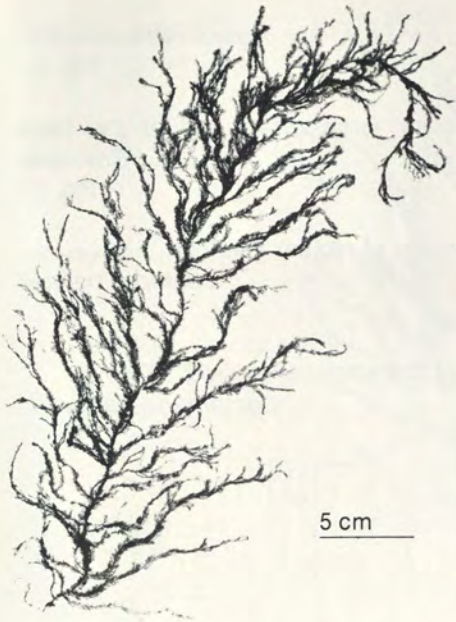


Fig. 17 Dasya baillouviana

Fig. 18 Bonnemaisonia hamifera

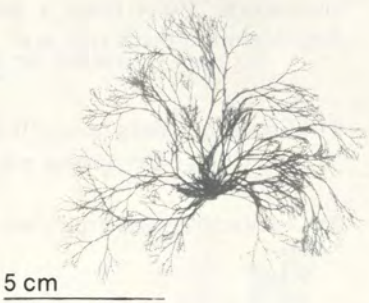


Fig. 20a Ceramium rubrum

Fig. 19 Cystoclonium purpureum

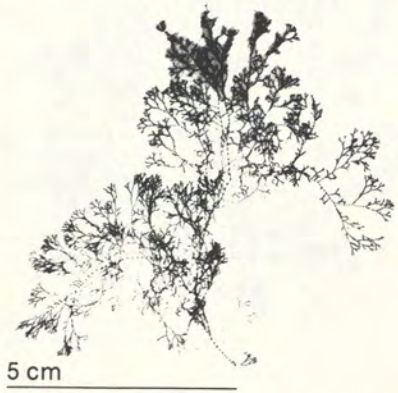


Fig. 20b Ceramium diaphanum

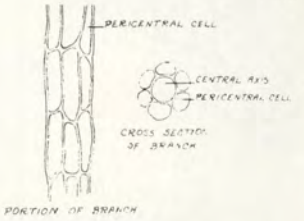
19. Plant a deep red color ..... *Agardhiella subulata*
Fig. 21

19. Plant a purplish to green color, occasionally red at the base
..... *Gracilaria*
Fig. 22

20. Branches generally hollow, constricted at regular intervals .....
Champia parvula
Fig. 23

20. Outermost branches short, base of branches constricted .....
Lomentaria baileyana
Fig. 24

20. Plants with pericentral cells (cells arranged around a single central or axial cell). Sometimes corticated; this can be seen only with a microscope. Color often a deep purplish red to black with age. . . 21.



21. Pericentral cells (4 to 20) regularly arranged around an axial cell. Branches often appear cross banded ..... 22.

21. Pericentral cells irregularly arranged, often obscured .....
Rhodomela confervoides
Fig. 25

Fig. 21 Agardhiella subulata

Fig. 22 Gracilaria tikvahiae

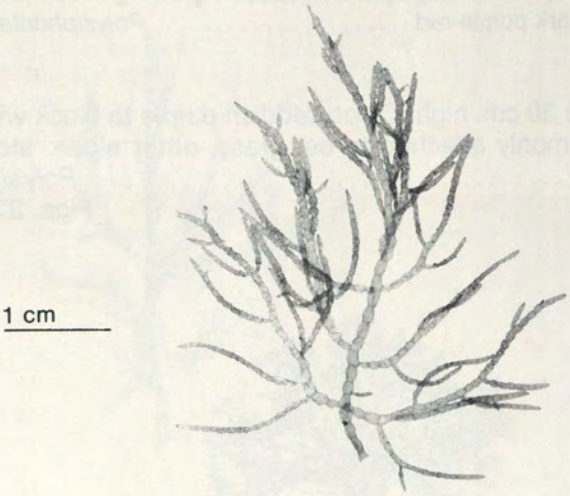


Fig. 23 Champia parvula

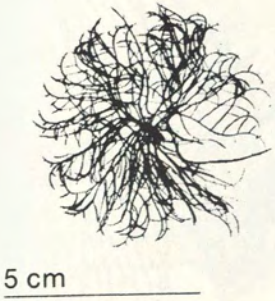


Fig. 24 Lomentaria baileyana

Fig. 25 Rhodomela confervoides

22. Plant an epiphyte on *Ascophyllum nodosum,* growing in stiff tufts 3 cm. high. Color dark purple-red ..... *Polysiphonia lanosa*
Fig. 26

22. Plants up to 30 cm. high. Color, reddish purple to black with age. Found commonly attached to eel grass, other algae, stones or shells ..... *Polysiphonia*
Figs. 27a, b, c

Fig. 26 Polysiphonia lanosa

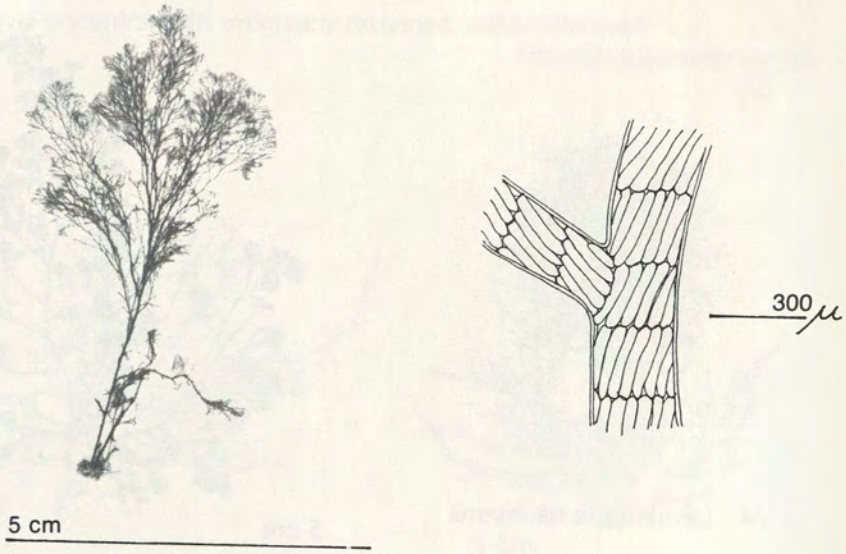


Fig. 27a Polysiphonia nigra

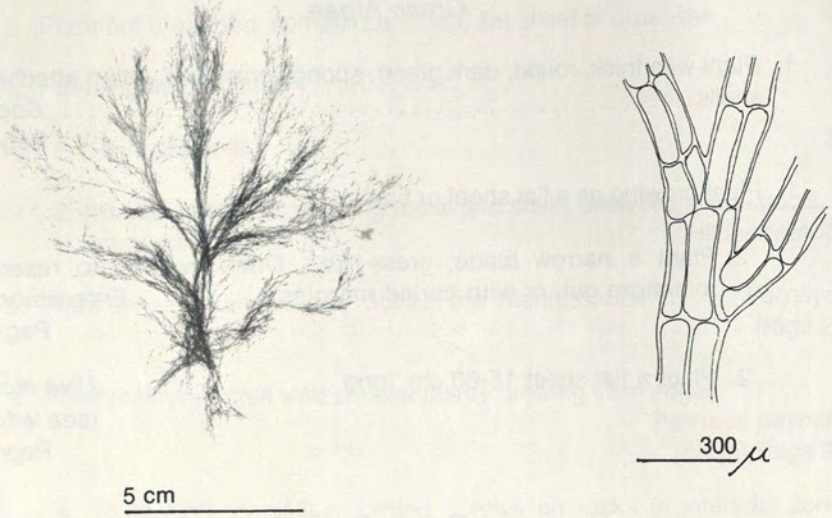
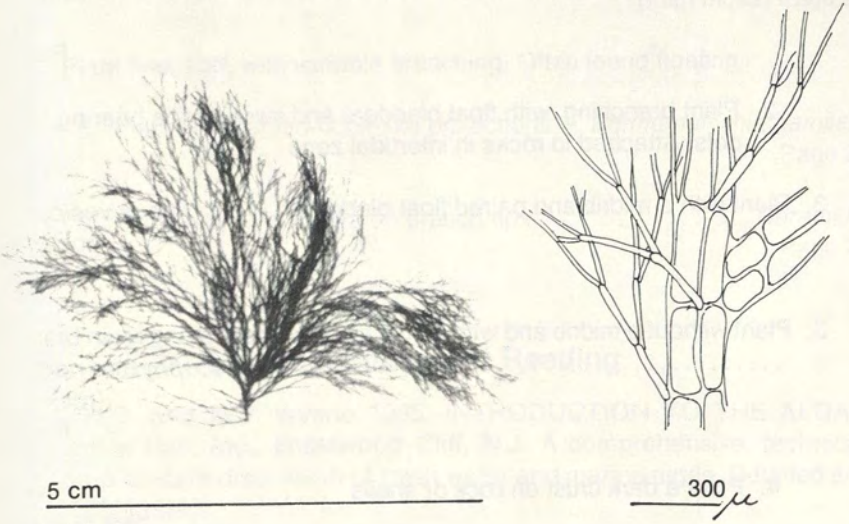


Fig. 27b Polysiphonia urceolata



Fib 27c Polysiphonia harveyi

Simplified Key to Some Common Seaweeds

Green Algae

1. Plant with thick, round, dark green, spongy branches. Often attached to shells ..... *Codium*
Page 12

1. Plant growing as a flat sheet or blade ..... 2.

2. Plant a narrow blade; grass-like. Often swollen to resemble miniature gut, or with curled margins ..... *Enteromorpha*
Page 15

2. Plant a flat sheet 15-60 cm. long ..... *Ulva lactuca*
(sea lettuce)
Page 11

Brown Algae

1. Plant coarse and leathery ..... 2.

1. Plant not coarse and leathery ..... 4.

2. Plant a strap-like blade with a large holdfast, up to 2 m. Often cast up on the beach ..... *Laminaria*
(kelp)
Page 17

2. Plant branching, with float bladders and swollen tips bearing tiny dots. Attached to rocks in intertidal zone ..... 3.

3. Plant with a midrib and paired float bladders ..... *Fucus vesiculosus*
(rockweed)
Page 19

3. Plant without a midrib and with single float bladders along main branches ..... *Ascophyllum nodosum*
(rockweed)
Page 19

4. Plant a dark crust on rock or shells ..... *Ralfsia*
(not illustrated)

4. Plant small, soft, finely branched, hair-like. Often found growing on other algae, pilings or rocks ..... *Ectocarpus*
Page 19

Red Algae

1. Plant not branched, sometimes lobed, flat sheet or crust-like ..... 2.

1. Plant highly branched ..... 4.

2. Plant sheet-like ..... 3.

2. Plant a red crust, coloring rocks and shells deep red in tide pools, intertidal zone ..... *Hildenbrandia*

3. Plant thin, soft, attached to rocks in the intertidal zone ..... *Porphyra* Page 24

3. Plant leathery, often with smaller plants growing from edges ..... *Palmaria palmata* (dulse) Page 25

4. Plant pink, coral-like, jointed. Grows on rocks in intertidal zone. Bleached skeletons often found on beach .... *Corallina officinalis* Page 23

4. Plant not as above ..... 5.

5. Plant crisp, lobed, miniature shrublike form. Often attached with *Corallina* ..... *Chondrus crispus* (Irish moss) Page 25

5. Plant fine, soft, with variable branching. Often found floating ..... 6.

6. Plant with curved-hook-like projections .. *Bonnemaisonia hamifera* Page 29

6. Plant with tiny pincers on branch tips ..... *Ceramium* Page 29

Recommended Reading

Bold, H.C. and M.J. Wynne 1985. INTRODUCTION TO THE ALGAE. Prentice Hall, Inc., Englewood Cliff, N.J. A comprehensive, technical, and up-to-date discussion of fresh water and marine algae. Detailed and well illustrated.

Kingsbury, S.M. 1969. SEAWEEDS OF CAPE COD AND THE ISLANDS. The Chatham Press, Inc., Chatham, Mass. A collection of essays on habitat and ecological relationships of algae, interspersed among discussions of individual species. Beautifully illustrated book, with the information presented in an engaging style with a minimum of technical language.

Lee, T.F. 1977. THE SEAWEED HANDBOOK. AN ILLUSTRATED GUIDE TO SEAWEEDS FROM NORTH CAROLINA TO THE ARCTIC. The Mariner's Press, Boston. Good identification guide. Easy for a beginner to use.

Taylor, W.R. 1957. MARINE ALGAE OF THE NORTHEASTERN COAST OF NORTH AMERICA. 2nd Ed. Univ. Michigan Press, Ann Arbor. The phycologist's Bible. Invaluable for cellular and reproductive detail and for identification of species, but difficult for an amateur to use without a key such as we have presented here. Anyone who becomes seriously interested in marine algae will want to own it.

Selected Arboretum Bulletins

No. 12. Connecticut's Coastal Marshes: A Vanishing Resource, pp. 36. 1961. Testimony of various authorities as to the value of our tidal marshes and a suggested action program. 2nd program with supplement 1966. .40

No. 20. Tidal Marsh Invertebrates of Connecticut. pp.36. 1974. Descriptions and illustrations of over 40 species of mollusks, crustaceans, arachnids, and insects found on our tidal marshes. 1.25

No. 22. Our Dynamic Tidal Marshes: Vegetation Changes as Revealed by Peat Analysis. pp. 12. 1976. .50

No. 23. Plants and Animals of the Estuary. pp. 44. 1978. Descriptions and illustrations of over 70 estuarine species. 1.50

No. 25. Salt Marsh Plants of Connecticut. pp. 32. 1980. Illustrated guide to 22 different plants that grow in our tidal wetlands. 1.50

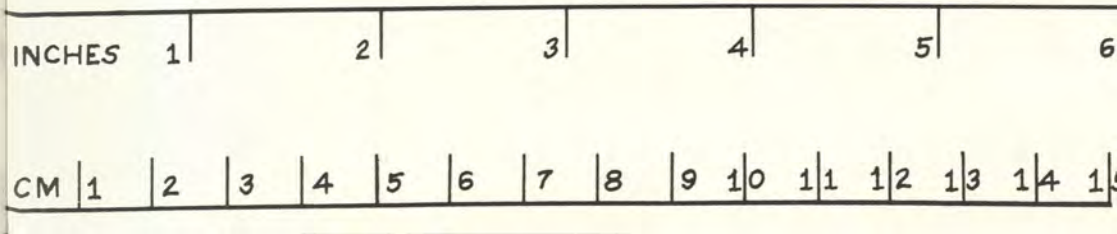
No. 27 Birds of Connecticut Salt Marshes. pp. 48. 1981. Illustrations and descriptions of 24 birds commonly seen on our tidal marshes. 1.50

Artistic map of Aboretum Showing Features and Trails. 1.00

Available from Connecticut Arboretum, Connecticut College, New London, Connecticut.
Include .70 postage per publication.

Index to Species

**Mastocarpus stellatus, 1984.*



Improved Illustrations

Brown Algae

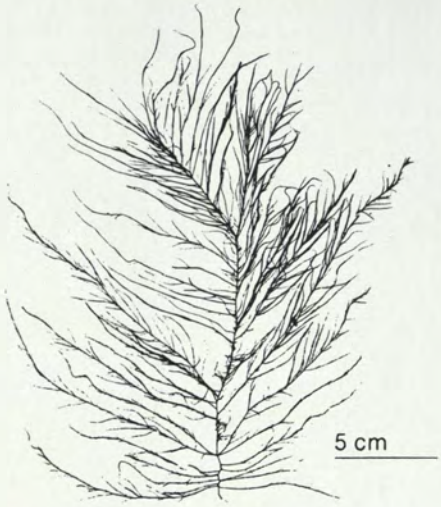


Fig. 12 Dictyosiphon foeniculaceus
Page 20

Red Algae

Fig. 19 Cystoclonium purpureum
Page 29

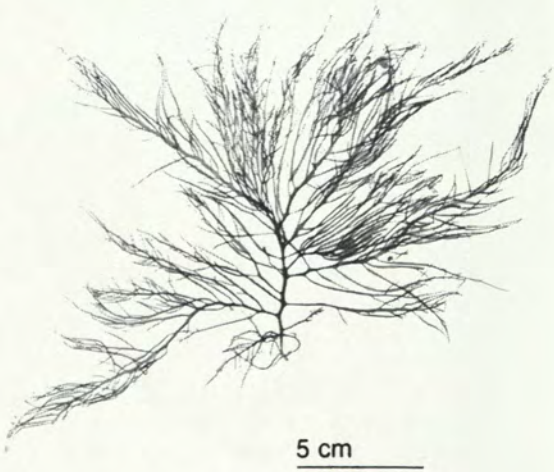
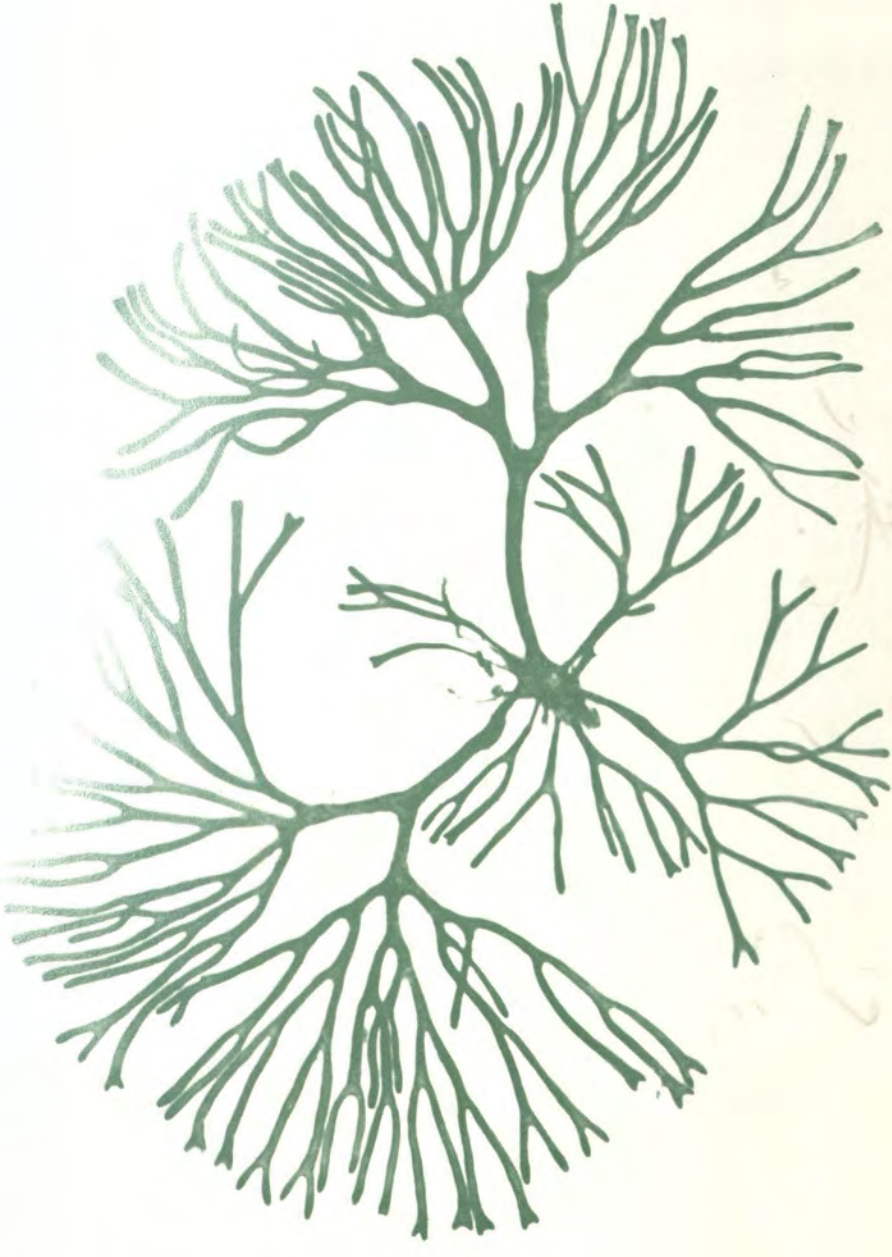


Fig. 21 Agardhiella subulata
Page 30



Codium fragile