

Name _____

Date _____

Seaweed Observation and Identification

Color	Common Name	Scientific Name	Drawing

Name _____

Date _____

Seaweed Observation and Identification, Continued

Color	Common Name	Scientific Name	Drawing

Questions:

How many algal species were in your bucket?

How many algal species were red, brown, or green?

Which color algae did you have the most of? Why do you think that is the case?

GREEN SEAWEEDS

Scale varies. Measurements are maximum recorded length of whole plants. Fragments or whole plants shown as indicated.

SEA LETTUCE *Ulva lactuca* p. 28
Ruffled or lobed sheets, usually unattached. To 3 ft. (900 mm).
See text for similar species. Whole plant.

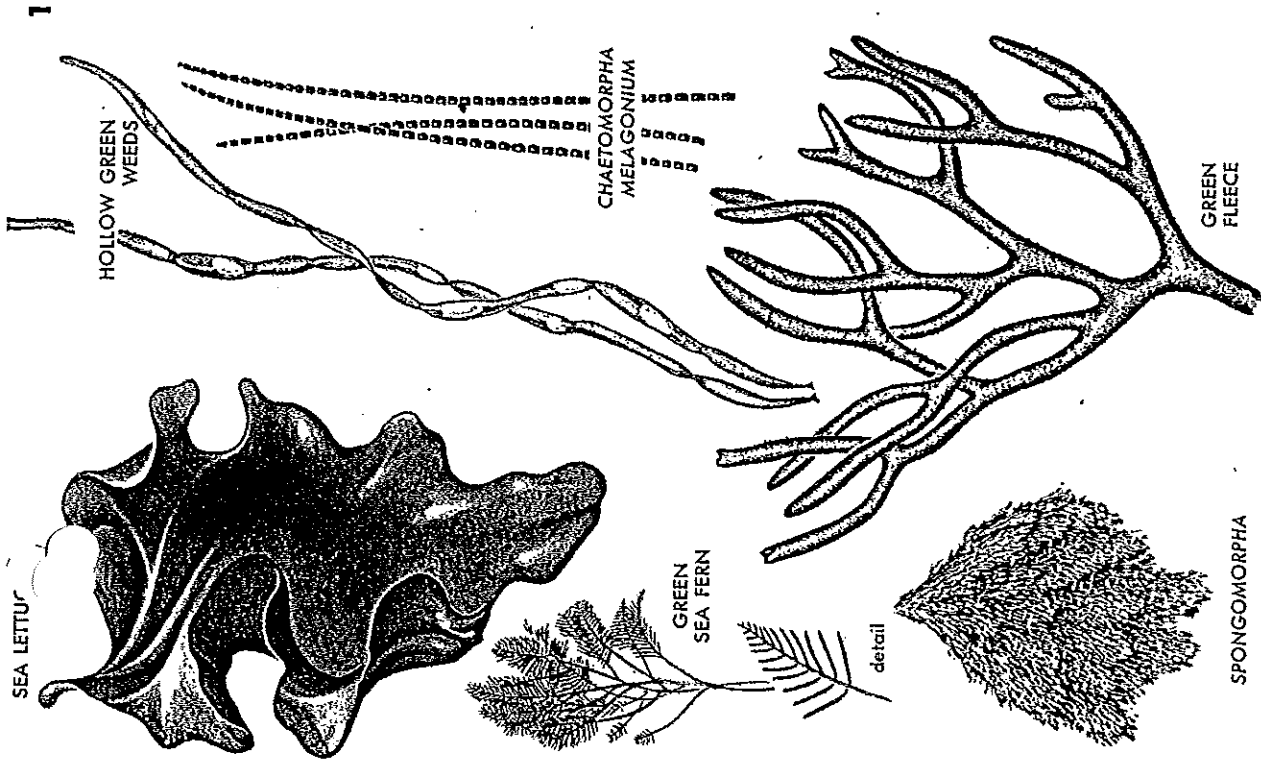
HOLLOW GREEN WEEDS *Enteromorpha* species p. 27
Tubular, at least in part; often containing air bubbles. *E. intestinalis* shown; to 1 ft. (300 mm). See text for other species.
Whole plants.

CHAETOMORPHA MELAGONIUM
Coarsely filamentous with cells visible to naked eye, unbranched. Stiff, wiry, blue-green. To 1 ft. (300 mm). See under Filamentous Seaweeds, p. 50. Fragments.

GREEN SEA FERN *Bryopsis plumosa* p. 29
Delicately bushy; fernlike with regular branching. To 4 in. (100 mm). See text for similar species. Fragment.

SPONGOMORPHA species
Filamentous in ropy tangles. To 6 in. (150 mm). See under Filamentous Seaweeds, p. 51. Whole plant.

GREEN FLEECE *Codium fragile* p. 28
Coarsely bushy with thick spongy branches. To 3 ft. (900 mm).
Fragment.



SEA LETTUCE

HOLLOW GREEN WEEDS

CHAETOMORPHA MELAGONIUM

GREEN SEA FERN

detail

GREEN FLEECE

SPONGOMORPHA

ROCKW. AND RELATED BROWN SEaweEDS

Scale varies. Measurements are maximum recorded length of whole plants. Only fragments are shown. Yellowish- or golden-brown to deep olive.

ROCKWEEDS *Fucus* species p. 36

Blades have a distinct midrib. To 3 ft. (900 mm).
F. vesiculosus. The only species with air bladders, usually in pairs within blade. Blades may be spiraled or bladders scarce to absent in some variants found in quiet water or in places exposed to heavy surf. Receptacles swollen, berry-shaped. The following species may resemble variant *F. vesiculosus*; best identified by receptacles, though even these vary.

F. spiralis. Blades usually twisted in spiral form; receptacles ridged. On upper mid-littoral rocks.
F. evanescens. Receptacles short, flattened. In quiet places, subtidal in shallow water.

F. edentatus. Receptacles long, flattened. On mid- to lower-littoral rocks exposed to surf.

F. filiformis. Receptacles long, swollen; blades slender. In tide pools in upper intertidal zone.

KNOTTED WRACK *Ascophyllum nodosum* p. 35
 Blades narrow, compressed, with single air bladders and short branchlets. Receptacles short, berrylike. Commonly to 2 ft. (600 mm), sometimes much longer. A runty quiet-water variant called *scorpioides* is also shown.

ASCOPHYLLUM MACKKAI

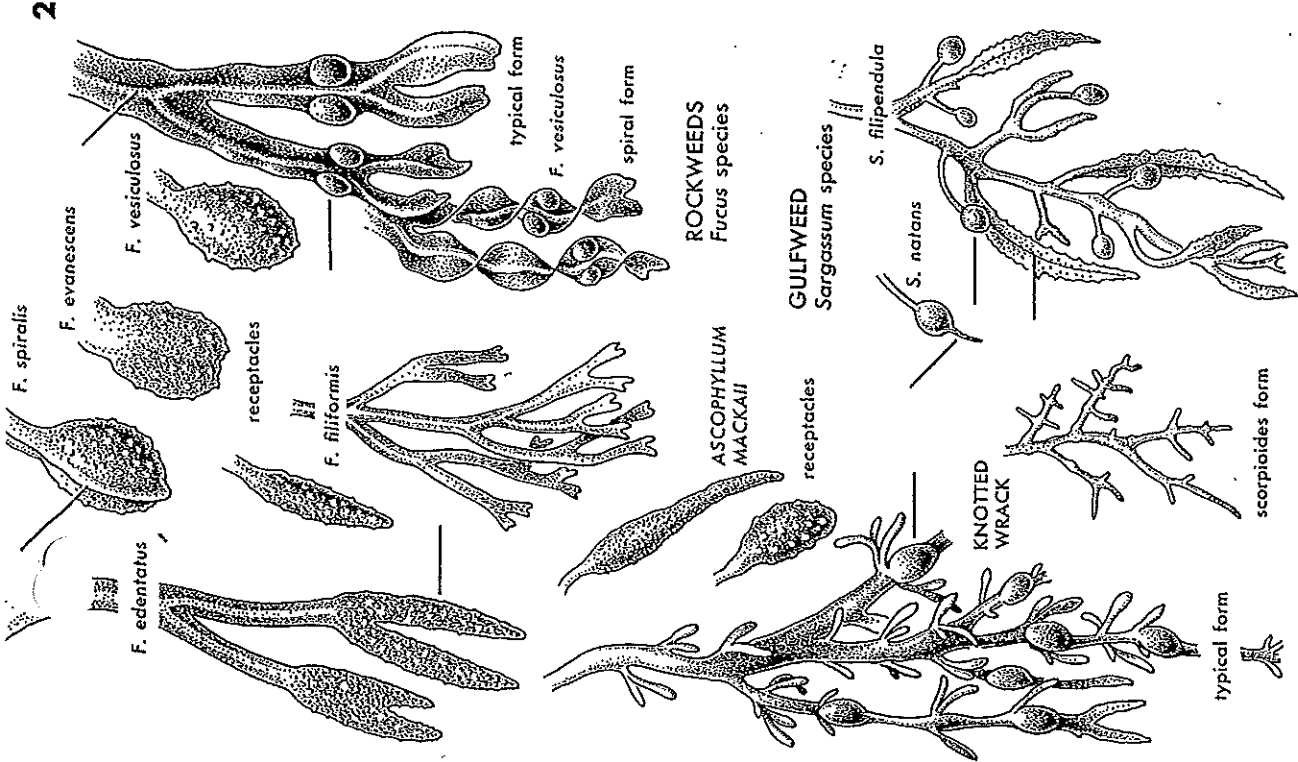
A dwarfed form, distinguished by long receptacles. To 8 in. (200 mm). See under Knotted Wrack, p. 35. Receptacle only shown.

GULFWEEED *Sargassum* species p. 37

Blades narrow, round, with air bladders on stalks, and with midrib. To 2 ft. (600 mm) or more.

S. filipendula. Blades have small, scattered, dark spots. An attached form, growing in lower intertidal zone or below.

S. natans. Leaves have few or no spots. Berries have a spike. Only found floating free. See text for *S. fluitans*, the other common pelagic species of Gulfweed.



KELP

Greatly reduced. Measurements are maximum recorded length of whole plants. Dark brown. Attachment is a branched holdfast.

SEA COLANDER. *Agarum cribrosum* p. 34

Blade ribbed, riddled with holes. To 6 ft. (1.8 m).

HORSETAIL KELP *Laminaria digitata* p. 34

Blade ribless, divided in straplike fingers. To 3½ ft. (1.1 m). See text for ecological variants.

EDIBLE KELP *Alaria species* p. 33

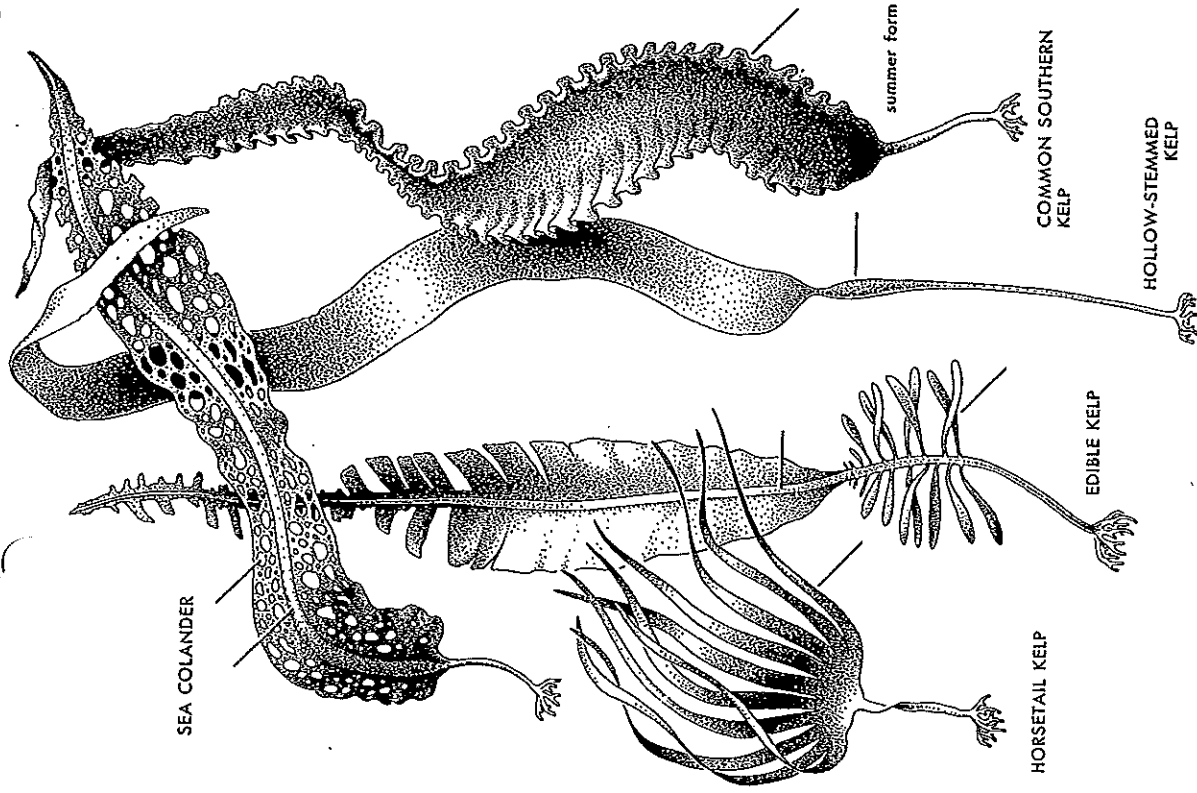
Blade ribbed, with bladelets basally. To 10 ft. (3 m). *A. esculenta*, the common species in our area, shown; see text for others.

HOLLOW-STEMMED KELP *Laminaria longicurvis*

Blade ribless, stem hollow and swollen above. To 15 ft. (4.5 m) or more. See under Common Southern Kelp, p. 34.

COMMON SOUTHERN KELP *Laminaria agardhii* p. 34

Blade ribless, stem solid. Blade has ruffled edge in spring-summer; is oarlike, unruffled, in winter. To 10 ft. (3 m). See text for similar species.



C. SING BROWN SEAWEEDS

Reduced; scale varies. Measurements are maximum recorded length of whole plants; often much smaller. Whole plants or fragments shown as indicated.

SMOOTH CORD WEED *Chorda filum* p. 33
Whiplike, without branches; with furlike colorless hairs in spring, bare in summer. To 15 ft. (4.5 m). (Smaller *C. tomentosa* has dark fur all year; see text.) Whole plant.

BOTTLEBRUSH *Cladostephus verticillatus* p. 29
Bushy, with whorls of tiny, curving branchlets. To 10 in. (250 mm). Fragment.

Largest branches longer than main axis.

BLACK WHIP WEED *Chordaria flagelliformis* p. 29
Dark. Main branches with few or no secondary branches. To 2 ft. (600 mm). See text for similar species. Whole plant.

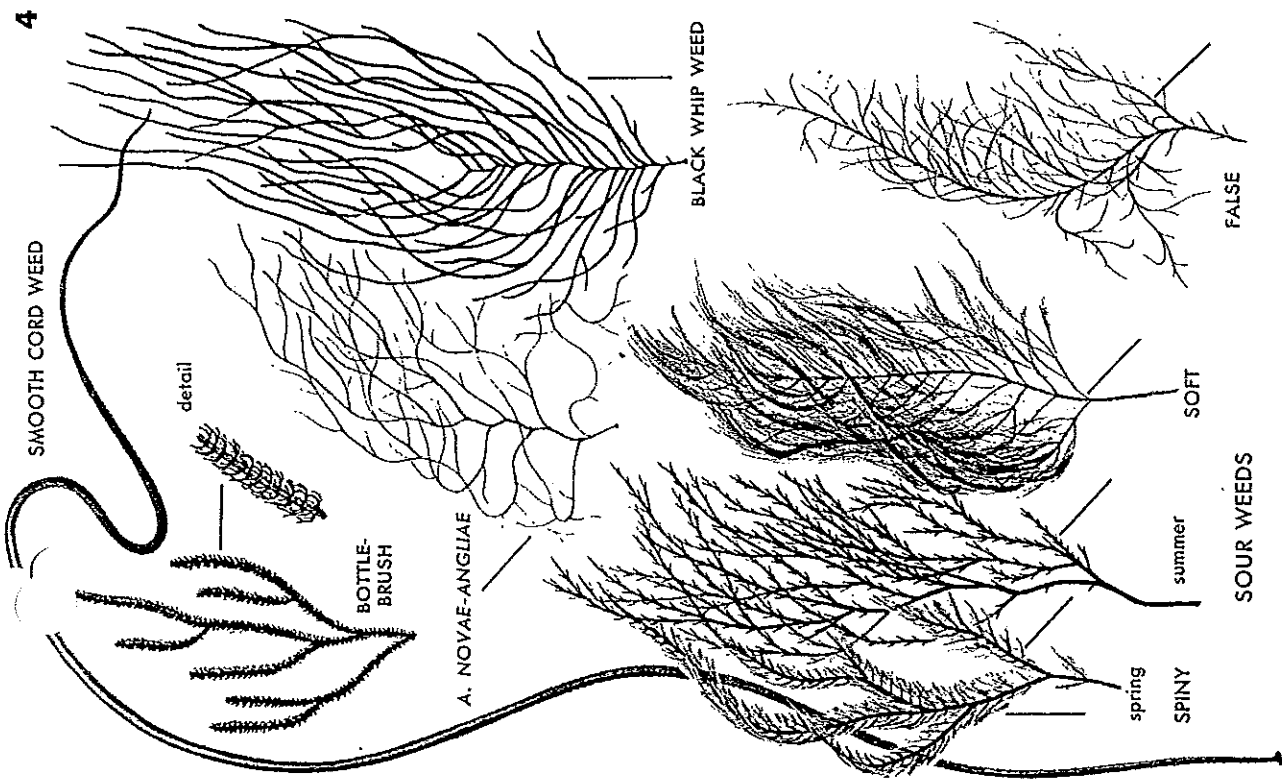
ACROTHRIX NOVAE-ANGLIAE
Pale. Main branches with many secondary branches. To 1 1/2 ft. (450 mm). See under Black Whip Weed, p. 29. Whole plant.

Largest branches shorter than main axis.

SPINY SOUR WEED *Desmarestia aculeata* p. 31
Main branches stiff, alternating on main axis; has tufts of fine filaments in spring, short spiny branchlets in summer. To 18 in. (450 mm). Whole plant.

SOFT SOUR WEED *Desmarestia viridis* p. 31
Main branches soft, opposite each other on main axis at regular intervals and cylindrical throughout. Sour smelling. To 2 ft. (600 mm). Whole plant.

FALSE SOUR WEED *Dictyosiphon foeniculaceus*
Main branches stiffer but finer than preceding; placed at random on main axis. Chiefly epiphytic on other seaweeds. To 2 ft. (600 mm). See under Soft Sour Weed, p. 31. Whole plant.



SEVERAL BROWN AND SOME RED SEaweEDS

Reduced; scale varies. Measurements are maximum recorded length of whole plants; often much smaller. Whole plants or fragments shown as indicated.

SEA POTATO *Leathesia difformis* p. 30
Lumpy, hollow; texture rubbery. To 4 in. (100 mm). Whole plant.

ROUGH TANGLE WEED *Stilophora rhizodes*
Branches roughened with fine bumps; pale brown. To 1 ft. (300 mm). See under Slippery Tangle Weed, p. 31. Fragment.

SLIPPERY TANGLE WEED p. 31
Sphaerotrachia divaricata

Branches smooth, slimy; end branchlets wide-angled. To 20 in. (500 mm). See text for similar species. Fragment.

BROWN SLIME WEEDS *Eudesme* species p. 30
Soft, gelatinous; light brown to greenish. *E. virescens* shown; to 14 in. (350 mm) with branches $\frac{3}{8}$ in. (9 mm) thick. See text for individual species. Fragment.

RED SLIME WEED *Nematton multifidum*
Soft, gelatinous; red to reddish brown. To about 10 in. (250 mm). See under Brown Slime Weeds, p. 30. Fragment.

SAUSAGE WEED *Scytosiphon lomentaria* p. 33
Hollow, unbranched, and constricted at intervals. To 2 ft. (600 mm). Whole plant.

ROUGH HOLLOW WEED *Asperococcus echinatus*
Blades hollow, unbranched, varying in width; with gritty surface. To 20 in. (500 mm). See under Sausage Weed, p. 33. Whole plant.

HALOSACCION RAMENTACEUM
Blades hollow, with short branchlets. An extremely variable species, other variants resemble Dumont's Red Weed (Plate 6). To 1 ft. (300 mm). See under Sausage Weed, p. 33, and Dumont's Red Weed, p. 38. Whole blades.

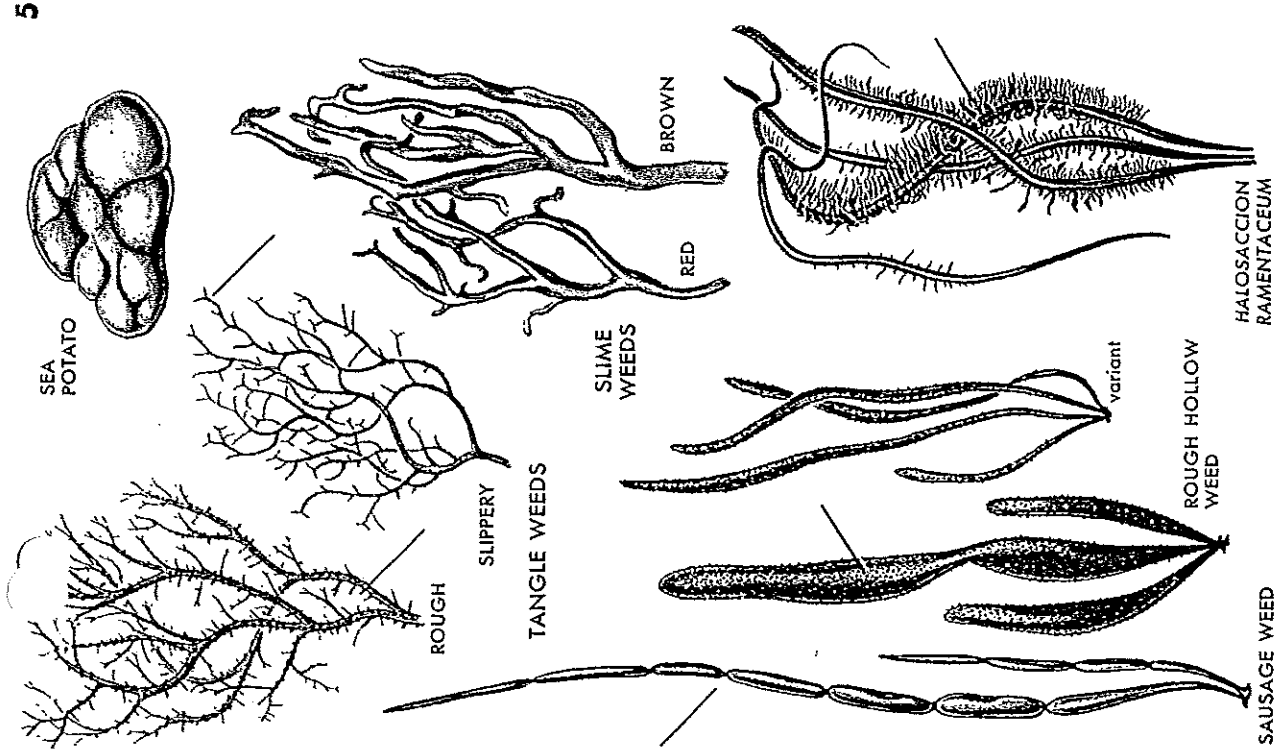




Plate 6
LEA,) AND BROWN SEAWEEDS

Scale varies. Measurements are maximum recorded length of whole plants; often much smaller. Whole plants or fragments shown as indicated.

FRAYED WEED *Rhodophyllis dichotoma*

Blade ribless, forking above; margin lined with short bladelets. To 3 in. (75 mm). See under Dulse, p. 44. Whole plant.

DUMONT'S RED WEED *Dumontia incrassata* p. 38

Coarsely branching; axis and branches hollow and twisted at ends. To 1 ft. (300 mm). See text for similar species. Whole plant.

SEA OAK *Phycodrys rubens* p. 46

Leaflike, deeply lobed, with midrib, lateral ribs, and riblets. To 6 in. (150 mm). See text for similar species. Fragment.

RIBBED LACE WEEDS *Membranoptera* species

Narrow-lobed with midrib dividing into main lobes but without smaller riblets. To 8 in. (200 mm). See under Sea Oak, p. 46. Fragment.

GRINNELL'S PINK LEAF *Grinnellia americana* p. 46

Filmy, elongate blade with fine midrib, no lobes. To 2 ft. (600 mm). Whole frond.

RIBBON WEEDS *Punctaria* species p. 32

Blade straplike, ribless, with padlike holdfast. See text for similar species.

Delicate Ribbon Weed, *P. latifolia*. Filmy; base of blade tapers abruptly. To 1 ft. (300 mm). Base of blade.

Coarse Ribbon Weed, *P. plantaginea*. Base of blade tapers gradually. To 1 ft. (300 mm). Whole blade.

ION RED SEAWEEDS,
MOSTLY NORTHERN

Scale varies. Measurements are maximum recorded length of whole plants; often much smaller. Whole plants or fragments shown as indicated.

LACY RED WEED *Euthora cristata* p. 39
Blade delicately lacy, without midrib. To 2 in. (50 mm). See text for similar species. Fragment.

WIRE WEED *Ahnfeltia plicata* p. 42
In tangles like steel wool, wiry and stiff, with random branching. To 8 in. (200 mm), branches less than 1/16 in. (1.6 mm) thick. See text for similar species. Fragment.

TWIG WEED *Polyides caprinus*
More flexible and robust than the preceding, with regular, Y-shaped branches. To 8 in. (200 mm), branches 1/16 in. (1.6 mm) thick. See under Wire Weed, p. 42. Fragment.

LEAF WEEDS *Phyllophora* species p. 42
Thalli 2-parted, consisting of a stalk and ribless, wedge-shaped or forked blades. To 6 in. (150 mm). See text for individual species. Fragments.

LAVER *Porphyra* species p. 38
Blade ribless, filmy and nearly transparent, undivided. To 1 ft. (300 mm). See text for individual species. Whole plant.

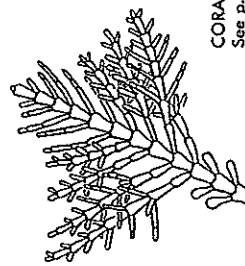
DULSE *Rhodomenia palmata* p. 44
Blade flat and ribless, rubbery, nearly opaque in life; often forking and with marginal bladelets. To 1 ft. (300 mm). See text for similar species. Fragment.

IRISH MOSS *Chondrus crispus* p. 43
Blades flat and ribless, profusely forking. Variable in form and color, often showing bluish iridescence underwater. To 7 in. (175 mm). Whole blades and fragments.

TUFTED RED WEED *Gigartina stellata* p. 43
Blades flat or partly curled, ribless and covered with short tufts. To 3 in. (75 mm). Whole blade.



Fig. 34.



CORAL WEED
See p. 39

ELY BUSHY RED SEaweEDS

Fragments shown. Measurements are maximum recorded length of whole plants; often much smaller. Largest branches of mature plants usually more than $\frac{1}{16}$ in. (1.6 mm) thick; see Plate 9 for more delicate forms. All are quite variable and should be identified in close consultation with the main text accounts.

BRUSHY RED WEED *Cystoclonium purpureum* p. 41
With many fine branchlets on outer parts. Shown also are a pigtail variant with finely coiled outer branchlets, and a faded individual with fruiting bodies (reddish bumps). To 2 ft. (600 mm). See text for similar species.

HOOKEED WEED *Hypnea musciformis* p. 41
Sparsely bushy with spiky branchlets; some branches ending in strong hooks. To 1½ ft. (450 mm). See text for similar species.

CHENILLE WEED *Dasya peiticeolata* p. 47
Few to many slender branches with a furry coating of fine, short branchlets. To 2 ft. (600 mm) or more.

GRACEFUL RED WEED *Gracilaria foliifera* p. 40
Coarsely bushy with at least parts of some branches flattened. To 1 ft. (300 mm).

AGARDH'S RED WEED *Agardhiella tenera* p. 40
Coarsely bushy with rounded branches tapering at base; fruiting bodies only slightly prominent (see Fig. 35, below). To 1 ft. (300 mm). See text for similar species.

FALSE AGARDHIELLA *Gracilaria verrucosa*
Similar to the preceding but branches not tapered basally; fruiting bodies more protuberant. To 1 ft. (300 mm). See under Agardh's Red Weed and Graceful Red Weed, both p. 40.

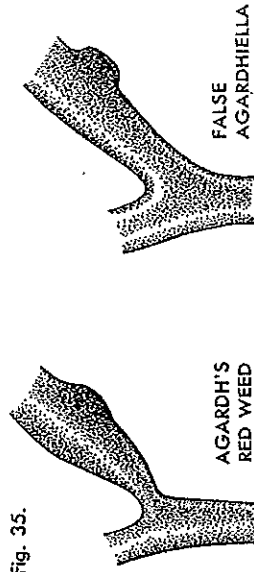
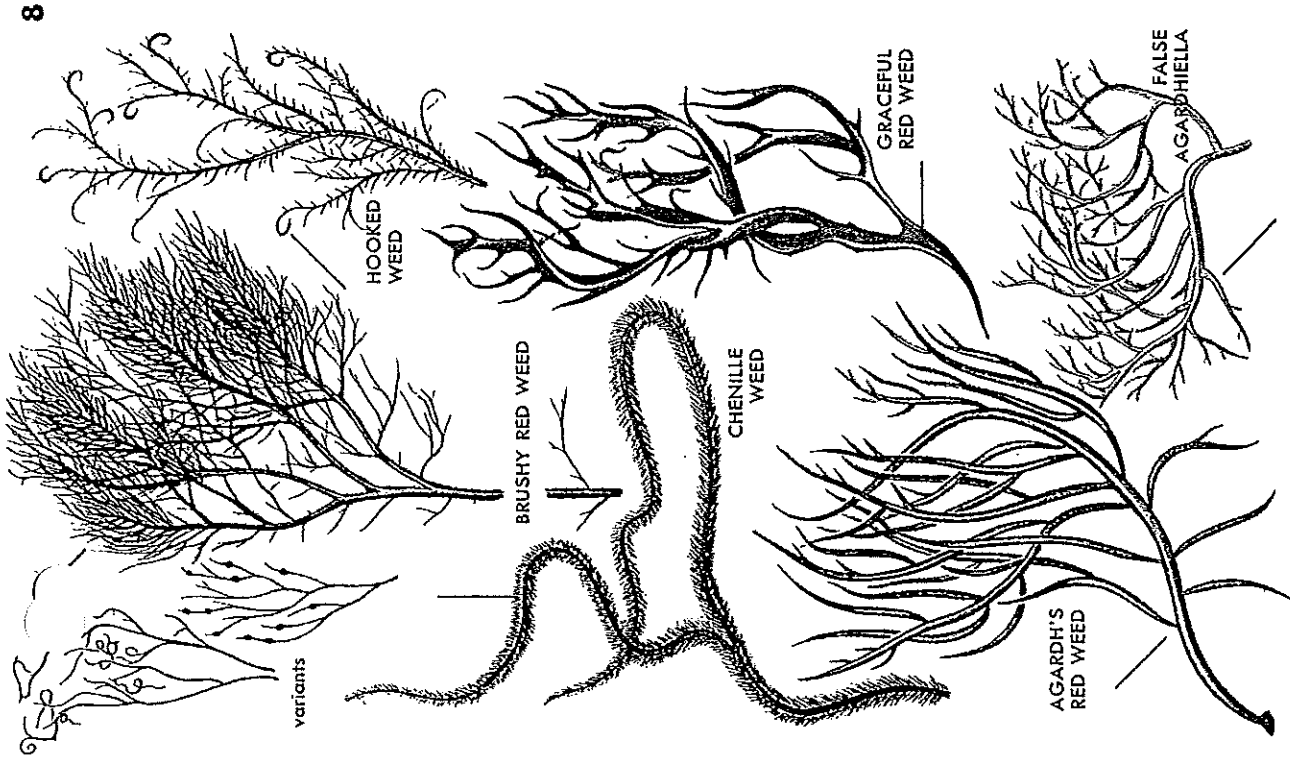


Fig. 35.



FINELY BUSHY RED SEaweEDS

Fragments shown about life size, details enlarged. Measurements are maximum recorded length of whole plants; often much smaller. Largest branches of mature plants usually less than $\frac{1}{16}$ in. (1.6 mm) thick; see Plate 8 for coarser forms.

PINK BEAD *Griffithsia globulifera* p. 45
Segmented, with segments varying in shape in different parts of plant. Commonly to $2\frac{1}{2}$ in. (62 mm). See text for similar species.

BARREL WEED *Champia parvula* p. 44
Segmented, with segments all about as broad or broader than long, diminishing toward ends; branching less regular than in preceding species. To 3 in. (75 mm).

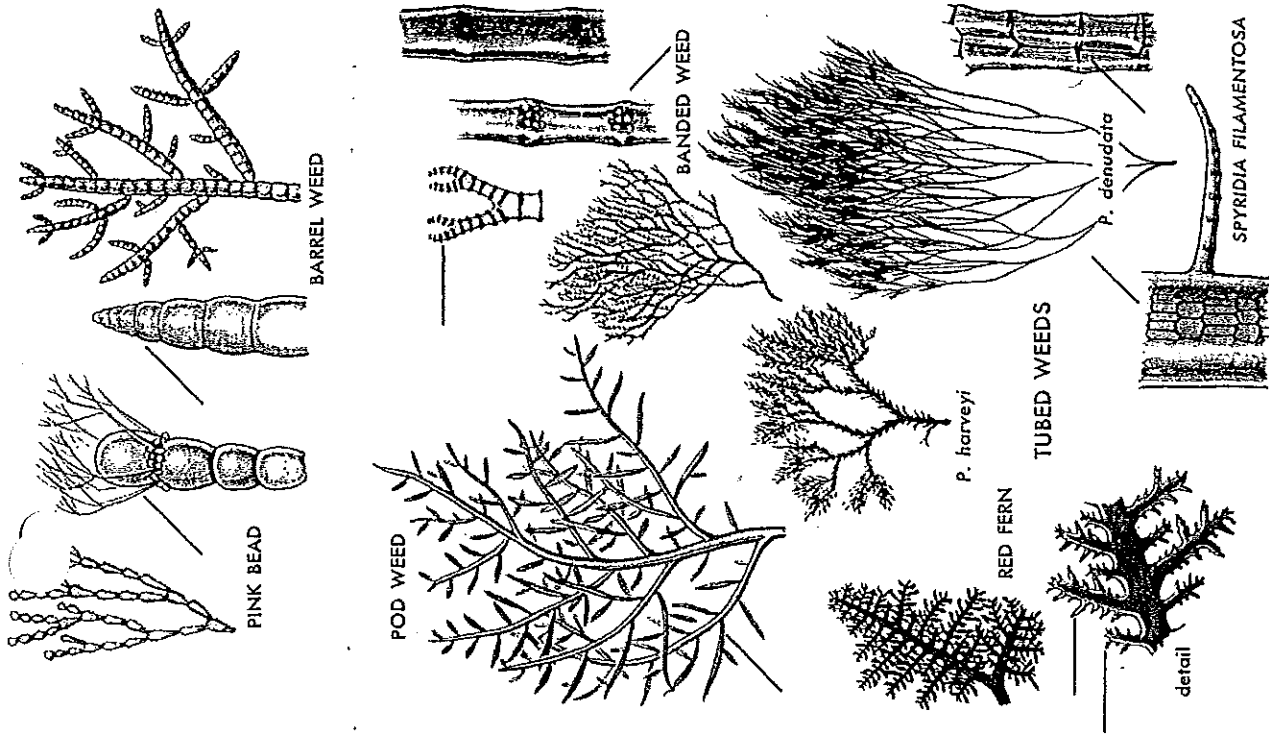
POD WEEDS *Chondria* species p. 47
Smaller branches short, club- to spindle-shaped. 4-10 in. (100-250 mm). See text for individual species.

BANDED WEEDS *Ceramium* species p. 44
Species vary in form but are clearly banded at least in youngest branches; end branchlets usually form pincers. *C. rubrum* shown; 4-16 in. (100-400 mm).

RED FERN *Ptilota serrata* p. 45
Branches flattened, fernlike, with alternate short and long branchlets. To 6 in. (150 mm). See text for similar species.

TUBED WEEDS *Polysiphonia* species p. 47
Species vary in form but have fine cross and lengthwise partitions usually visible with a hand lens on some part of plant. Commonly to 16 in. (400 mm) tall. *P. harveyi* and *P. denudata* shown. See text for other species and related genera.

SPYRIDIA FILAMENTOSA
Coarser than most tubed weeds (preceding). Distinctive cellular structure is visible with a good hand lens. Smallest branches appear banded but lack pincer arrangement. To 1 ft. (300 mm). See under Tubed Weeds, p. 47.



and the leafy forms is called a *blade* or *frond*. The whole plant is called a *thallus* (plural *thalli*). Except for some of the kelps, seaweeds generally lack the elaborate water-conductive tissues of higher vascular plants, and the holdfast, lacking the more complex function of true roots, is simply for attachment.

Many seaweeds are seasonal in occurrence. A few develop quickly, mature, and are gone within periods as short as a month. Others are present through whole seasons or almost year-round. Many, especially the smaller species, are annuals. Others are perennials; some of these die back at the end of a growth season to a persistent holdfast, and some are present year-round as whole plants.

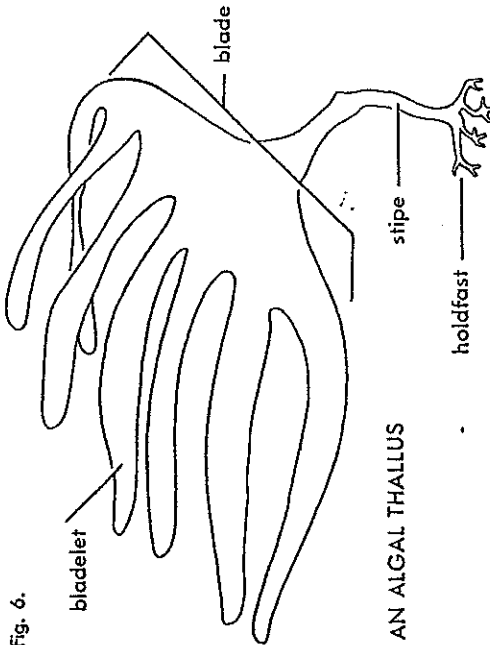


Fig. 6.

AN ALGAL THALLUS

Green Seaweeds: Phylum Chlorophyta

Thalli are usually grass-green when alive and healthy, sometimes tinged with yellow, blue, or black, but not with brown or red. For filamentous and crustose species see p. 48. Greens need plenty of light and are most common at higher intertidal levels or subtidally in shallow water.

HOLLOW GREEN WEEDS *Enteromorpha* species **Pl. 1**
Identification: *Tubular*, branched or not and sometimes flattened. *Grass-green*. Hollow structure in larger specimens is easily determined by the presence of air bubbles *within* the thallus. Ranges in width from $\frac{1}{8}$ in. (1.6 mm) or less to 1 in. (25 mm) or more, and 1 ft. (300 mm) or more long.

Numerous species; 2 are minute and inconspicuous. *E. linza* (not shown) resembles Sea Lettuce (see Plate 1 and next account). Identification of the remaining species is difficult; they fall into 2 groups: those with unbranched thalli and those with branches. *E. intestinalis*, the most common *unbranched* species, reaches the maximum dimensions given above. Most of the *branched* species are slender, $\frac{1}{8}$ in. (3 mm) or less wide, and less than 1 ft. (300 mm) long. *E. compressa* and *E. prolifera* (neither shown) are sparsely branched, the first with branches near the base, the second with scattered branches; they are $\frac{3}{8}$ -1 in. (16-25 mm) wide and about 1 ft. (300 mm) long.

Similar species: The more slender forms could be mistaken for filamentous green seaweeds (p. 50); *Enteromorpha* species are usually coarser but individual cells are *not visible* even with a hand lens.

Season: *E. linza*, winter-spring only. *E. intestinalis*, year-round. Most others are spring-summer annuals.

Where found: Several species, including *E. intestinalis*, range from the Arctic south to the Carolinas; the others south only to n. New England, Cape Cod, or n. N.J.

Remarks: These species occur in a variety of habitats. Common on rocks, dead shells, or wood in lower intertidal zone, on mud flats, drifting free, or even as epiphytes. Several grow at higher levels in tide pools or places kept wet by freshwater seepage; some have a wide tolerance for varying and greatly reduced salinity and penetrate deep into estuaries. *E. compressa* is a good candidate for seawater aquariums.
Family: Ulvaceae.

SEA LK

Ulva lactuca

PL. 1

Identification: Thallus a translucent *bright green sheet*, often lobed or ruffled at edges. Initially attached by a short marginal stalk but later drifting free. To 3 ft. (900 mm).

Similar species: (1) *Monostroma* species (not shown) are very similar, but can possibly be distinguished from Sea Lettuce by using the following 2 field tests: *Ulva* has consistency of *wax paper* and fingerprints are *indistinctly* visible through it; *Monostroma* is thinner, more like *tissue paper*, and fingerprints are *clearly* visible. Several species and varieties; microscopic study required to distinguish between them. To 1 ft. (300 mm). Often epiphytic, also in pools or on rocks in shallow, brackish to salt water. Annuals: early spring-summer. 4 of the 5 species in our area range from L.I. Sound or N.J. to n. Mass. or subarctic; *M. oxyspermum* south to Fla. (2) *Enteromorpha linza* (preceding account) is very similar in thickness and form to young elongated Sea Lettuce, but is usually attached by a *tubular tapering* stipe and basal disk to *upper* intertidal rocks; to 1 ft. (300 mm) long by 1 1/4 in. (31 mm) wide; late spring-summer; Carolinas to Gulf of St. Lawrence.

Season: Holdfast perennial; blade annual.

Where found: Subarctic to tropics.

Remarks: Sea Lettuce is one of the most familiar shallow-water seaweeds. It grows in a variety of places ranging from exposed rocks to quiet, semistagnant, brackish pools, where huge detached sheets carpet the muddy bottoms. Tolerant of or actually thriving in moderate pollution. Edible; see the *Field Guide to Edible Wild Plants of Eastern and Central North America*.
Family: Ulvaceae, including *Monostroma*.

GREEN FLEECE *Codium fragile*

PL. 1

Identification: Coarsely bushy, often branching in regular Y-shaped forks; branches *thick* -- to 3/4 in. (19 mm) -- ropelike or *spongy*. Dark green, bleaching to yellowish. To 3 ft. (900 mm).

Season: Various described as perennial, biennial, or "pseudo-perennial"; in any event often living for several years.

Where found: Accidentally introduced from Europe or North Pacific about 1957. Now found from Orient Point, Long Island, to Chatham, Cape Cod, and south to Barnegat Bay; a separate population in Boothbay Harbor.

Remarks: This distinctive plant lives in shallow water of sounds and bays but often washes ashore in heavy, ropy masses, dragging along its mooring of pebbles and shells. A serious pest where common because of its choking effects on shellfish. Other *Codium* species are tropical.
Family: Codiaceae.

GRE

Bryopsis plumosa

PL. 1

Identification: Delicately bushy, branching *regularly*; grows in *ferulike* tufts. Light green. Collapses out of water. To 4 in. (100 mm).

Similar species: (1) *B. hypnoides* (not shown) branches *irregularly* and is dark green. N.J. to Nova Scotia in lower intertidal zone. (2) See filamentous seaweeds (p. 50) and especially *Spongomorpha* species (Plate 1) which form conspicuous ropy tufts and tangles on intertidal rocks north of L.I. Sound.

Season: Perennial in South; annual northward.

Where found: Fla. to Cape Cod and less commonly north at least to Nova Scotia. In tide pools and on wood in fairly quiet water at shallow depths.

Family: Bryopsidaceae.

Brown Seaweeds:
Phylum Phaeophyta

Healthy weeds vary in color from light to dark brown; some are almost black, or yellowish to golden brown, and when tinged with green they usually appear a shade of olive. These are the conspicuous algae of rocky shores in the mid to lower intertidal zone; north of New York the large kelp species dominate the lowest levels exposed by the tides and extend down into the subtidal. A few browns are crustose or filamentous, p. 48, but most are medium to large seaweeds.

BOTTLEBRUSH *Cladostephus verticillatus*

PL. 4

Identification: Unlike any other brown weed; bushy with thickish -- 1/16 in. (1.6 mm) -- branches composed of a somewhat stiff central core and whorls of tiny curving branchlets. Resembles a very fine bottlebrush or pipe cleaner. Whole plant to 10 in. (250 mm).

Season: Perennial; dies back and sheds branchlets in winter.

Where found: N.Y. to Cape Cod, rarely northward. Subtidal at moderate depths in exposed places; washes ashore.
Family: Sphacelariaceae.

BLACK WHIP WEED *Chordaria flagelliformis*

PL. 4

Identification: Bushy; *upper branchlets* whiplike and *longer* than main axis; has *few* secondary branchlets. Texture firm, leathery but slippery. Dark brown or black. Often covered with epiphytes by late summer. To 2 ft. (600 mm) or more, axis and branches 1/16 in. (1.6 mm) thick.

Similar s: Black Whip Weed can easily be confused with several brown weeds. (1) *Acrothrix novae-angliae* (Plate 4) is a lighter olive-brown, more delicate weed with *more profuse* secondary branching; it also has some branches longer than axis but distinction between axis and branches is more subtle. Whole plant spreading to 12-18 in. (300-450 mm); axis and branches less than 1/16 in. (1.6 mm) thick. Matures late spring-early summer; epiphytic or subtidal in quiet places. L.I. Sound to Cape Cod; unknown before 1928 and possibly derived from a European relative. Family Acrothricaceae. (2) North of Cape Cod, Black Whip Weed is most easily confused with the sour weeds, *Desmarestia* and *Dictyosiphon* species (Plate 4). Season: Perennial. Where found; Formerly (and rarely) from New York harbor to Arctic; now chiefly north of L.I. Sound. On rocks or wood from lower intertidal zone to subtidal, in fairly exposed places. Family: Chordariaceae.

BROWN SLIME WEEDS *Eudesme* species **Pl. 5**
Identification: Slender and stringy; texture soft and gelatinous with hardly more substance than thickish egg white. A colorless core can be seen with hand lens if base of specimen is pressed between thin glass plates. Light brown, drying on paper to little more than a yellowish or greenish stain.
 2 species. (1) *E. virescens* is a coarsely branching form with main parts to 3/8 in. (9 mm) thick, whole plant to 14 in. (350 mm). (2) *E. zosterace* (not shown) is more delicate, sparsely branched; to 1/8 in. (3 mm) thick by 4-6 in. (100-150 mm) long. **Similar species:** Red Slime Weed, *Nematium multifidum* (Plate 5) is similar both in its slimy texture and cored structure but is *rusty to dark red*. To 10 in. (250 mm). On exposed intertidal rocks. Slippery. Maturing in midsummer. Long Island to Nova Scotia. Phylum Rhodophyta, Family Helminthocladiaceae. **Season:** (1) *E. virescens* matures spring-early summer. (2) *E. zosterace*, summer-fall. **Where found:** (1) *E. virescens*, Long Island to subarctic. Epiphytic on Eelgrass and larger seaweeds, also on pebbles subtidally. (2) *E. zosterace*, Gulf of St. Lawrence south to tropics; chiefly epiphytic on Eelgrass. **Family:** Chordariaceae.

SEA POTATO *Leathesia difformis* **Pl. 5**
Identification: Grows in lumpy, often hollow, saclike masses. Rubbery in texture, yellow-brown in color. Epiphytic on larger seaweeds or on rocks in lower littoral zone. Suggests a compact sponge but lacks porous structure of sponges; more like partly dried grapes. To 3-4 in. (75-100 mm) across. **Season:** Summer.

Where found: Newfoundland south to L.I. Sound and locally to N.C. usually epiphytic on Irish Moss, Coral Weed, and other plants, but sometimes choking out its host and spreading over rocks. **Family:** Chordariaceae.

SLIPPERY TANGLE WEED **Pl. 5**
Sphaerotrachia divaricata
Identification: A slender bushy weed, finely branched with ultimate branchlets *wide-angled*; texture *soft and slimy*. Largest branches less than 1/16 in. (1.6 mm) thick, plant spreading to 20 in. (500 mm). **Similar species:** Rough Tangle Weed, *Stilophora rhizodes* (Plate 5) is coarser, somewhat *stiff and brittle, finely roughened* with bumps. Pale- to yellowish-brown. Thickest branches to 1/8 in. (3 mm); whole plant to 1 ft. (300 mm). Summer; N.C. to Cape Cod and Prince Edward I. Epiphytic or drifting free in quiet shallow water. Family Stilophoraceae. **Season:** Summer. **Where found:** N.J. to Labrador; epiphytic. **Remarks:** Slippery Tangle Weed from protected and somewhat polluted coves is stiffer, less slimy than average. **Family:** Chordariaceae.

SPINY SOUR WEED *Desmarestia aculeata* **Pl. 4**
Identification: Bushy; branches somewhat stiff, alternating on main axis and often partly *flattened*. Seasonally variable: has tufts of fine brownish hairs in spring; summer form *bristly* with short, spiky branchlets. Dark brown fading to yellow-brown, often bleaching white or yellowish at tips when exposed by low tides. Usually to 18 in. (450 mm), axis 1/16-1/8 in. (1.6-3 mm) thick. **Similar species:** See next account. **Season:** Annual, spring and summer only. **Where found:** L.I. Sound to Arctic. On rocks or wood from lower intertidal to subtidal at shallow depths in fairly protected places. **Family:** Desmarestiaceae.

SOFT SOUR WEED *Desmarestia viridis* **Pl. 4**
Identification: Bushy, main branches *opposite* and regularly spaced, with abundant fine, terminal branchlets, and covered in spring with fine hairs. Pale brownish but fading rapidly out of water to yellowish olive. *Sour smelling* especially when out of water for any length of time. Usually to 2 ft. (600 mm), main axis 1/16-1/8 in. (1.6-3 mm). **Similar species:** (1) False Sour Weed, *Dictyosiphon foeniculaceus* (Plate 4) is more delicate-looking, though it is stiffer than

Soft Sou It lacks sour smell, is chiefly *epiphytic*, and more *rarely*..... and often sparsely branched. Light brown when alive, dries dark. To 2 ft. (600 mm) but main axis usually less than $\frac{1}{16}$ in. (1.6 mm). Perennial; L.I. Sound to Cape Cod, less common northward to Arctic; often in rock pools. Family Dictyosiphonaceae. (2) See Plate 4 for other similar species. Season: Annual. Winter in Barnegat Bay, but spring and summer from L.I. Sound northward.

Where found: N.J. to Arctic. On rocks and wood from lower intertidal zone to subtidal.

Remarks: The peculiar acid smell due to acidic cell sap is distinctive and symptomatic of this weed's delicate constitution. Do not store collected specimens with other algae; it self-destructs when picked, and in crowded buckets is destructive to other weeds. Specimen mounts should be made as quickly as possible.

Family: Desmarestiaceae.

RIBBON WEEDS *Punctaria* species

Identification: Ribbon- or oar-shaped, broad to narrow, veinless and undivided. Holdfast a small *pad*. Color light to dark brown sometimes tinged yellowish or olive.

2 species, readily distinguished from each other but not always from several related species in other genera. (1) Delicate Ribbon Weed, *P. latifolia*, tapers *abruptly* to a basal stalk, is lighter, yellowish or olive-brown, and filmy *thin*. (2) Coarse Ribbon Weed, *P. plantaginea*, tapers *gradually* to a short stalk, is *dark* brown and relatively thick and leathery. Both species usually up to 1 ft. (300 mm) but sometimes nearly twice that. Similar species: Ribbon weeds and both of the following differ from young kelp (Plate 3) in having a small padlike holdfast; kelp has a branching holdfast and a stipe $\frac{1}{4}$ in. (6 mm) or longer. (1) *Petalonia fasciata* (not shown) is easily distinguished *microscopically* but varies in form, resembling *both* ribbon weed species. When abruptly tapered basally (*latifolia*-like), basal parts are usually *asymmetrical*. When tapered gradually (*plantaginea*-like) stalk is usually longer and round; olive- to dark-brown; to 18 in. (450 mm) long. On rocks or wood in *upper* littoral. Sometimes perennial, best from winter-spring; through summer in Chesapeake Bay. Fla. to subarctic. (2) *Desmourtium undulatum* (not shown), a *paper-thin*, *light-brown* epiphyte on Eelgrass and algae, has narrowly tapered base; usually less than 3 in. (75 mm) but sometimes much longer. Best in early summer. Southern N.J. to Prince Edward I. Season: Winter-spring; decays in summer in some areas but flourishes elsewhere — for example, in lower Chesapeake Bay and south shore of Cape Cod.

Where found: (1) *P. latifolia* from s. N.J. to Gulf of St. Law-

rence; *epiphytic* on Eelgrass and larger weeds. (2) *P. plantaginea*..... Chesapeake Bay to Arctic; sometimes epiphytic but usually found on stones in pools or shallow water.

Family: Punctariaceae, including *Petalonia* and *Desmourtium*.

SAUSAGE WEED *Scytosiphon lomentaria*

Identification: Slender, *hollow*, unbranching thalli typically, but not invariably, *constricted* and twisted at intervals to resemble a chain of sausages. Usually in clumps. Golden brown to olive. To 2 ft. (600 mm).

Similar species: Young or variant individuals with few or no constrictions may resemble the following species. (1) Rough Hollow Weed, *Asperococcus echinatus* (Plate 5) is also hollow-bladed, varies greatly in width, and is sometimes twisted but lacks definite constrictions; surface rough, like *fine sandpaper*. To 20 in. (500 mm). In clumps, epiphytic on stones or wood; lower intertidal in somewhat protected places. Annual, early spring. Del. to Arctic. (2) Smooth Cord Weed (Plate 4) is whip-like; lacks gritty surface. (3) *Halosaccion ramentaceum* (Plate 5) is a hollow-bladed red weed that often fades to rusty- or golden-brown; to 1 ft. (300 mm). Extremely variable; some variants resemble Dumont's Red Weed (Plate 6) but others approach Smooth Cord Weed, Rough Hollow Weed, or Sausage Weed. *Halosaccion* lacks gritty surface and sharp constrictions, and usually has at least a few lateral *branchlets*. Phylum Rhodophyta, Family Rhodymeniaceae.

Season: Annual, winter-spring, usually gone by midsummer. Where found: Subarctic to Fla. Intertidal on rocks and ocean jeties in exposed places; also in quiet bays.

Family: Punctariaceae, including *Asperococcus*.

SMOOTH CORD WEED *Chorda filum*

Identification: A slender, *whiplike*, brown weed without branches. Young plants have a coating of very fine, *colorless* hairs, which are subsequently shed. Hollow-cored; buoyant in water. To 15 ft. (4.5 m) or more long but hardly more than $\frac{1}{4}$ in. (6 mm) thick.

Similar species: *C. tomentosa* (not shown) has a *persistent* coating of fine, *dark* hairs $\frac{1}{4}$ - $\frac{3}{4}$ in. (6-19 mm) long. To 3 ft. (900 mm) or longer by $\frac{3}{16}$ in. (5 mm) thick. Winter-spring.

Season: Annual; maturing in late summer.

Where found: From L.I. Sound to Arctic, attached to shells or stones from lower intertidal zone to subtidal.

Family: Laminariaceae.

EDIBLE KELP *Alaria* species

Identification: Long-bladed with *midrib*; usually much frayed. Stalk solid with *lateral bladélets* below main blade;

these reproductive function and are shed annually leaving *bumps* as a vestige. Dark brown. To 10 ft. (3 m).

5 species have been named; 2 are considered questionable. Traits are not well developed in young plants. (1) *A. esculenta* has edges of midrib well defined laterally. (2) *A. pylaui* and *A. grandifolia* (neither shown) have midrib edges feathered into the blade, the 1st species with short stalk (usually less than twice width of blade), 2nd with longer stalk.

Season: Perennial.
Where found: Arctic to Cape Cod and *A. esculenta* sparingly to L.I. Sound. Like most kelps, primarily subtidal, but sometimes the dominant seaweed at lowest level of the intertidal zone on exposed rocks or in low pools.

Remarks: The species name *esculenta* refers to this kelp's edibility. See *Field Guide to Edible Wild Plants of Eastern and Central North America* and Euell Gibbons' *Stalking the Blue-Eyed Scallop* for a detailed account of this plant's food uses.
Family: Laminariaceae.

SEA COLANDER *Agarum cribrosum* Pl. 3

Identification: This kelp is easily recognized by its *midrib* and *perforated blade*. Dark brown. To 6 ft. (1.8 m), sometimes twice that.

Season: Perennial.
Where found: Cape Cod to Arctic. Chiefly subtidal but can be found washed ashore.
Family: Laminariaceae.

HORSETAIL KELP *Laminaria digitata* Pl. 3

Identification: Mature plants have a wide blade split into 6-30 or more straplike "fingers"; young thalli have fewer divisions. Stalk *stiff*, woody, and flattened above; in cross section shows concentric growth rings. To 3½ ft. (1.1 m).

2 forms (not shown), previously considered separate species, are probably only ecological variants. (1) *L. stenophylla* has a weak *flexible* stalk *without* growth rings. Annual; on exposed rocks in lower intertidal zone, Gulf of Mexico to Newfoundland. (2) *L. intermedia* also has a weak stalk, *with* growth rings in older plants; blade sparsely or not at all divided, typically with no more than 3 or 4 "fingers." Annual, subtidal. L.I. Sound to New Hampshire.

Season: Perennial.
Where found: L.I. Sound to Arctic. On exposed rocks in extreme lower intertidal zone, or in pools in e. Maine; subtidal southward.

Family: Laminariaceae.

COMMON SOUTHERN KELP *Laminaria agardhii* Pl. 3

Identification: Long-bladed, *without* midrib; stalk *solid*, with

bra holdfast. Winter growth is thick-bladed, straplike; summer growth thinner, with ruffled edges. These variations appear in the following species as well. Dark brown. To 10 ft. (3 m).

Similar species: (1) Hollow-stemmed Kelp, *L. longicurtis* (Plate 3) has a long stalk that is solid below but expanded and *hollow* above, then pinched at base of blade. Usually to 15 ft. (4.5 m) but to 36 ft. (10.8 m) in deep water. Perennial; subtidal but washes ashore Arctic to Cape Cod, locally to L.I. Sound. (2) *L. saccharina* (not shown) is a problematic species distinguishable only by microscopic section; some authorities consider *L. agardhii* a form of this species. In tide pools and subtidal, a *northern* species, n. Mass. to Arctic. (3) *Saccorhiza dermatodea* (not shown) has a *cuplike* holdfast. In tide pools and subtidal, n. Mass. to Arctic. (4) Ribbon weeds (Plate 6) distinguishable from young kelp by small *padlike* holdfast.

Season: Perennial.
Where found: L.I. Sound and off New York harbor to Gulf of Maine; locally to Arctic.

Remarks: This is the only common long-bladed kelp south of Cape Cod. It may be found washed ashore from deep water but also establishes a *laminarian zone* at the low tide line at Point Judith, R.I., and elsewhere. The species name *saccharina* refers to the sugary, sweet-tasting powder that forms on dry blades of this and other kelp.

Family: Laminariaceae, including *Saccorhiza*.

KNOTTED WRACK *Ascophyllum nodosum* Pl. 2

Identification: Long fronds of this olive-colored weed cover intertidal rocks below the upper band of rockweeds. "Knots" are air bladders placed along narrow *ribless* branches that also bear 1-2-in. (25-50 mm), rabbit-eared branchlets at intervals. Commonly to 2 ft. (600 mm), sometimes much longer. Knotted Wrack is highly variable. Early spring plants have *short*, contrastingly yellow *receptacles*, which are stalked, warty, fruiting structures that release motile sex cells, then fall off. A form that is called "scorpioides" (Plate 2) usually lacks bladders, has weak branchlets, and grows mainly in salt marshes.

Similar species: (1) *A. mackaii* (Plate 2) is also a marsh plant, has slender branches, small air bladders, and *long* podlike receptacles in late winter-early spring. To 8 in. (200 mm). L.I. Sound to Newfoundland. (2) Rockweeds (Plate 2) are ribbed.

Season: Perennial.
Where found: Arctic to L.I. Sound, but see below for variations in normal range.

Remarks: Consider that you are in effect walking over a thick bed of wet noodles concealing sharp rocks, deep crevices, and other pitfalls, and use appropriate care when exploring any expanse of rock covered by this slippery weed.

Kl. ack sometimes goes adrift as an oceanic plankton, washing ashore with Gulfweed far south of its normal range. It is also used as packing material for bait worms, lobsters, and the like, so may be found discarded far from home. Drift specimens resemble the typical form but may be golden or yellow-brown and may have oceanic hitchhikers such as goose barnacles attached. Benthic weeds also carry epiphytes, notably some of the tubed weeds (Plate 9), and *Pylaiella littoralis* (p. 50) among others.

Family: Fucaeeae.

ROCKWEEDS *Fucus* species

Pl. 2

Identification: Blades usually broad and flat with a strong midrib; dividing dichotomously (in more or less equal, Y-shaped forks). To 3 ft. (900 mm).

6 species, 5 shown; easiest to distinguish when "in fruit."
(1) *F. vesiculosus*, the most common and widespread species, is the only one that has paired, pea-shaped air bladders placed at intervals within the blade; they pop when you step on them. This is a variable species not always distinguishable from the following. (2) *F. spiralis* is similar but has twisted blades and lacks air bladders. (Note: A common variant of *vesiculosus* has even more distinctly spiraled blades than *spiralis*, and when found in quiet habitats — borders of bays, marsh ditches, and the like — it sometimes has fewer air bladders than the typical form.) When *spiralis* and *vesiculosus* occur together, the former is usually zoned at a higher level. (3) *F. serratus* (not shown) has blades with saw-toothed edges; note range (below). (4) *F. evanescens*, (5) *F. edentatus*, and (6) *F. filiformis* may be indistinguishable from variant *vesiculosus* and bladderless *spiralis* unless "in fruit." In any event, these 3 species are regarded by some botanists as merely ecological variants of *F. distichus* (not shown), a species reported from Newfoundland.

Season: Perennial.

Where found: (1) *F. vesiculosus*, N.C. to Arctic, mid- to lower-littoral (see p. 20); ecologically versatile with several named salt-marsh varieties. (2) *F. spiralis*, L.I. Sound to Newfoundland in upper mid-littoral. (3) *F. serratus*, Nova Scotia to Gaspé Peninsula in lower mid-littoral. (4) *F. evanescens*, L.I. Sound (sparingly) to Arctic, usually at the lowest intertidal level and subtidally in quiet places but sometimes on the exposed coast, too. (5) *F. edentatus*, L.I. Sound (sparingly) to Newfoundland, mid- to lower-littoral in places exposed to heavy surf. (6) *F. filiformis*, n. Mass. to subarctic, chiefly in high-tide pools.

Remarks: The weed-covered appearance of intertidal rocks, usually olive-colored but varying in tint from golden-yellow to deep green, is chiefly due to the rockweeds and Knotted Wrack. These plants also festoon pilings, grow around the bases of

salt-
epiphytes and epizoa grow on them. When the tide is out the sun may parch the surface layer of rockweeds but the underside remains cool and wet, sheltering a great variety of smaller plants and animals.

Family: Fucaeeae.

GULFWEED *Sargassum* species

Pl. 2

Identification: Bushy; narrow blades have toothed edges, a midrib, and small — $\frac{1}{4}$ in. (6 mm) or less — pealike air bladders on short stalks. Golden-brown when fresh, drying dark brown. To 2 ft. (600 mm) or more.

3 species in our area, 1 benthic (attached), the other 2 pelagic (free-floating); 2 species shown. (1) *S. filipendula*, like other benthic *Sargassum* species, has small dark spots scattered over the leaves; these are scarce or absent in the following. (2) *S. natans* and (3) *S. fluitans* (not shown) are both pelagic. *S. natans* has, and *fluitans* lacks, a short spike on top of each air bladder.

Season: Perennial, the benthic form dying back in winter in the North.

Where found: (1) *S. filipendula* occurs locally from Cape Cod to the tropics; abundant at Beaufort, N.C. (just south of Cape Hatteras) and on parts of the south shore of Cape Cod, forming a distinct zone on rocks or rock jetties at or just below the low tide line. Also reported in L.I. Sound a century ago, but now absent from New York harbor, Chesapeake and Delaware bays, and ocean jetties elsewhere along our coast. (2) *S. natans* and (3) *S. fluitans* are strictly pelagic but are washed ashore, particularly in N.C. and the open coast of Martha's Vineyard and Nantucket; *S. natans* is the more common species.

Remarks: Benthic *Sargassum* species reproduce sexually as well as asexually, while the pelagic species are strictly asexual.

A fascinating natural community centers on the drifting masses of pelagic *Sargassum*, famed as the principal weed of the Sargasso Sea. Epiphytic algae and a wide variety of encrusting hydroids, bryozoans, and tube worms live attached to the thalli. Shrimps, crabs, and other invertebrates, and several kinds of fish cling to or hide among the floating weeds. Most are peculiar to this community and are not found elsewhere. When pelagic *Sargassum* is found ashore, a search of the tangled plants and associated floats will often produce other exotics from far offshore. *Sargassum* has numerous benthic species in the West Indies, where it forms distinct plant associations intertidally as the rockweeds do on our coast.

Family: Fucaeeae.

Red seaweeds: Phylum Rhodophyta

These weeds are less consistent in color than the greens or browns. Usually the red shows through at least as a modifying tint in shades ranging from pink to purple; a few species, however, are almost black, others brownish, and some strongly tinged with green or yellow. Though usually smaller in size than brown weeds, the reds are greater in variety. For crustose and filamentous species see p. 48. In general, reds need less light than other weeds and are the most common species at lower intertidal levels.

LAYER *Porphyra* species

Pl. 7

Identification: Plants soft, paper-thin, and nearly transparent, in ribless, narrow to broad, ruffled blades or sheets. Color brown to purplish or reddish.

3 species, not readily distinguishable but differ somewhat in habitat; typical form shown. (1) *P. umbilicalis* grows on intertidal rocks or wood and becomes dry and waxy-looking between tides; to 1 ft. (300 mm) or more. (2) *P. leucosticta* is smaller — to 6 in. (150 mm) — and often epiphytic on intertidal seaweeds. (3) *P. miniata* is twice as thick (2 cells instead of 1) and rosy rather than drab-red as the others are; to 1 ft. (300 mm) or more; also epiphytic, but on weeds growing at lower littoral or laminarian levels (see p. 34).

Similar species: (1) For other broad-bladed, veinless red weeds see Dulse, p. 44. (2) Sea Lettuce (Plate 1) is similar but green and thicker. (3) See also ribbon weeds (Plate 6).

Season: (1) *P. umbilicalis*, best in late winter-early spring in June, or July-August in n. New England. (3) *P. miniata*, mid-spring-fall in Maine; sometimes year-round southward.

Where found: (1) *P. umbilicalis* and (2) *P. leucosticta*, Fla. to Newfoundland and Maine, respectively. (3) *P. miniata*, n. Mass. to Arctic, mainly in upper intertidal zone.

Remarks: For those inclined to try eating seaweeds, Laver has been recommended above all other species in our area; it may be used to make a clear soup or wrapped around a hamburger-based stuffing. Laver is cultivated in Japan and China. See also the *Field Guide to Edible Wild Plants of Eastern and Central North America*.

Family: Bangiaceae.

DUMONT'S RED WEED *Dumontia incrassata*

Pl. 6

Identification: Thallus consists of a main axis sparsely branched along its whole length; branches often longer and

thick. Axis and branches similar in form, $\frac{3}{16}$ in. (5 mm) wide, solid and tapering below, hollow and twisted above, tubular parts inflated or collapsed. Usually solitary. Dull red or bleached yellowish especially toward decaying ends. To 1 ft. (300 mm) tall.

Similar species: (1) *Halosaccion ramentaceum* (Plate 5) is a highly variable, hollow-bladed red weed, sometimes indistinguishable even microscopically. *Halosaccion* is usually firmer, less slimy, rarely spiraled, and usually grows in extensive patches in more exposed places than Dumont's Red Weed. Perennial in tide pools and lower intertidal zone. N. Mass. to Arctic. See also Sausage Weed, p. 33. Family Rhodymeniaceae. (2) Additional hollow-bladed coarse algae are either green (*Enteromorpha* species, Plate 1) or brown (Smooth Cord Weed, Plate 4, and Sausage Weed, Plate 5).

Season: Appears in early spring, decaying by July in South; winter-spring most abundant in North.

Where found: New York harbor (formerly?) and L.I. Sound to Nova Scotia; common in n. Europe but unknown here before 1913. In shallow water, usually in sheltered estuaries and salt-marsh ditches.

Family: Dumontiaceae.

CORAL WEED *Coralina officinalis*

Fig. 34 opp. Pl. 7

Identification: The fan-shaped tufts of this odd weed are unmistakable; thalli consist of hard, jointed, opposite-branching segments. On exposed rocks Coral Weed often forms an inch-deep turf of tightly packed plants; in the undergrowth of larger algae or other protected situations growth is more open and feathery. Pinkish white to deep purple; white when dead. To $1\frac{1}{2}$ in. (38 mm) tall, but varying according to habitat.

Season: Perennial.

Where found: L.I. Sound to Newfoundland; common from lower intertidal zone to subtidal in deep water.

Remarks: Coral Weed, along with *Lithothamnium* (p. 49) and a few other species of seaweeds, precipitates calcium and magnesium carbonate as a hard surface crust on the living thallus. This habit is more common in warm tropical waters where broken fragments of such plants make a substantial contribution to the sediments of lime-sand beaches.

Family: Corallinaceae.

LACY RED WEED *Euthora cristata*

Pl. 7

Identification: This elegant rosy pink to red weed, much sought after for decorative dry mounts, grows in broad lacy fans 2 in. (50 mm) high.

Similar species: (1) Ribbed lace weeds, *Membranoptera* species (Plate 6) are sometimes as delicate but have a distinct

mid. *livides* with the branches; see under Sea Oak, p. 46. (2) *verrucosa* term (Plate 9) is another decorative red weed, quite different in form.

Season: Perennial.

Where found: Arctic to Cape Cod, in tide pools or extreme lower intertidal zone, less common and in deeper water south to New York harbor. This and the red weeds mentioned above are common epiphytes on coarse seaweeds such as kelp (p. 34), and are often washed ashore.

Family: Kallymeniaceae.

AGARDH'S RED WEED *Agardhiella tenera* Pl. 8

Identification: A coarsely bushy red weed; both axis — $\frac{3}{16}$ in. (5 mm) thick — and branches *round*, tapering at ends *and base*. Texture fleshy and usually deep reddish. Variable; a more delicate and profusely branching form lives in quiet, somewhat brackish places, and another variant has axis and branches covered with short branchlets. To 1 ft. (300 mm).

Similar species: Individual plants of bushy, filamentous red weeds, such as tubed weeds, Banded Weed, and others (Plate 9), may equal coarser species in mass but axis and main branches are usually finer — no more than $\frac{1}{16}$ in. (1.6 mm) thick — and have a distinct structure visible with a hand lens. Agardh's Red Weed is more likely to be confused with the following species.

(1) Brushy Red Weed (Plate 8) and (2) *Gloiosiphonia capillararis* (not shown) appear delicate by comparison due to their finer, more numerous end branches; see p. 41. (3) In *Gracilaria* species (Plate 8 and next account) branches do *not* taper basally; color is usually tinged *yellowish*, particularly in *G. verrucosa*. Axis and branches are at least partially flattened in *G. foliifera*, and fruiting bodies are more protuberant (see Fig. 35 opp. Plate 8). (4) *Lomentaria baileyana* (not shown) is a small and delicate weed with main axis less than $\frac{1}{16}$ in. (1.6 mm) thick. Branches strongly tapered at base, hollow, and usually *curving* in gentle arcs; the smaller branches often mainly on one side of their supporting branch. Pink to dull reddish, drying brighter. To 3 in. (75 mm). Subtidal in shallow protected waters from Maine to the tropics. Family Champiaceae.

Season: Perennial in most of its northern range.

Where found: Cape Cod south to tropics, and locally north to cen. Maine.

Remarks: This, along with species of *Gracilaria*, is one of the most characteristic plants of warm bays and sounds south of Cape Cod, where it grows attached to shells and stones or is found drifting free.

Family: Solieriaceae.

GRACEFUL RED WEED *Gracilaria foliifera* Pl. 8

Identification: Coarsely bushy with at least some parts of axis

and br. *lattened*. Fleshy, reddish or purple but frequently bleached yellowish. Form varies in different habitats, becoming less distinctive in quiet, brackish water. To 1 ft. (300 mm); axis sometimes to $\frac{1}{2}$ in. (12 mm) or more wide.

Similar species: (1) False Agardhiella, *G. verrucosa* (Plate 8) is equally variable in color and form but has *round* axis and branches that do *not* taper basally. To 1 ft. (300 mm). A perennial with distribution similar to Graceful Red Weed and north in warm bays to Prince Edward I.; often abundant, drifting free over muddy bottoms. Not always distinguishable from Graceful Red Weed and lumped with it by some botanists. Graceful Red Weed is more common than False Agardhiella north of Cape Cod and tolerates more brackish water; southward False Agardhiella is the commoner form. (2) For comparison with other bushy red weeds see preceding account.

Season: Usually perennial.

Where found: Common in shallow bays and sounds south of Cape Cod and locally north to cen. Maine. Ranges to tropics.

Family: Gracilariaceae.

BRUSHY RED WEED *Cystoclonium purpureum* Pl. 8

Identification: Bushy, with main axis $\frac{1}{8}$ in. (3 mm) in diameter; larger branches sparsely divided but *fine branches abundant* in outer parts of plant. Variable; usually dark purplish or brownish red but bleaching to yellowish green, often with reproductive bodies remaining as *reddish burrs*. A distinct pigtail-like variant has tightly coiled end branchlets, and is less tufted than the typical form shown on Plate 8. To 2 ft. (600 mm).

Similar species: (1) *Gloiosiphonia capillararis* (not shown) has a pale and partly hollow axis, $\frac{1}{8}$ – $\frac{3}{16}$ in. (3–5 mm) in diameter, with *much* smaller main branches and numerous end branches; branching in Brushy Red Weed is from large to small *gradually*.

To 1 ft. (300 mm). In tide pools or subtidal; usually perennial, dying back in winter in some places. L.I. Sound to Newfoundland. Family Gloiosiphoniaceae. (2) For comparison with other bushy red weeds, see Agardh's Red Weed, p. 40.

Season: Perennial.

Where found: An abundant red weed from L.I. Sound to Newfoundland, mainly subtidal on sandy or shelly bottoms in both protected and exposed localities.

Family: Rhodophyllidaceae.

HOOKEED WEED *Hypnea musciformis* Pl. 8

Identification: A delicate, mosslike, sparsely bushy weed with numerous *short, spiky branchlets* in addition to longer branches with swollen *hooks*. Variable; usually bleached purplish-yellow to white, but may be green or reddish green, and the distinctive hooks may be scarce or absent. To 18 in. (450 mm).

Similar species: *Asparagopsis hamifera* (not shown) bears

even in not hooks; larger branches are more numerous, and more densely covered with short branchlets, giving them a fir- or spruce-like appearance. Purplish to rosy red. To 4 in. (100 mm). L.I. Sound to Cape Cod; naturalized from Europe. Subtidal but often found ashore in dense tangles or entwined with other weeds. Family Bonnemaisoniaceae.

Season: Usually perennial.

Where found: Abundant south of Cape Hatteras in shallow water of bays and sounds, local in warm coves north to Cape Cod. Subtidal.

Family: Hypneaceae.

WIRE WEED *Ahnfeltia plicata*

Pl. 7
Identification: Resembles coarse steel wool. Dark purplish or almost black when fresh, but bleaches white. To 8 in. (200 mm); branches less than $\frac{1}{4}$ in. (1.6 mm) thick and about equal width throughout.

Similar species: (1) Twig Weed, *Polyides caprinus* (Plate 7) has more regular Y-shaped branching, is somewhat less stiff and more robust — branches $\frac{1}{4}$ in. (1.6 mm) thick; whole plant to 8 in. (200 mm). In cold tide pools in e. Maine but chiefly subtidal in deep water southward; washes ashore from Long Island to subarctic. Family Rhizophyllidaceae. (2) *Polyisiphonia lanosa* (not shown) is a dark, tough epiphyte, growing in tufts to 2 in. (50 mm) on Knotted Wrack (Plate 2) and sharing its range; easily distinguished by its *polyisiphonous* structure, which is visible with strong hand lens; see tubed weeds (p. 47). Family Rhodomelaceae. (3) *Gelidium crinale* (not shown) is wiry or threadlike — less than $\frac{1}{2}$ in. (0.78 mm) thick — and grows in 2-in. (50 mm) tufts; terminal branchlets short, pinnate, and flattened. Intertidal, particularly on steep rock faces. Cape Cod south to tropics; a summer form north of Cape Hatteras. Family Gelidiaceae.

Season: Perennial.

Where found: New York harbor (formerly?) north to Arctic. Mainly subtidal from Cape Cod south but also in low tide pools and crevices northward. Often washed ashore in twiggy tangles. Family: Phylloporaceae.

LEAF WEEDS *Phyllophora* species

Pl. 7

Identification: Plants distinctly 2-parted with a sparsely branching stalk and ribless, wedge-shaped or broadly forking blades. Dark red or purple. 4–6 in. (100–150 mm).

2 common species, variable and often indistinguishable. (1) *P. brodiaei* has somewhat flattened stalk and gradually expanded blades; upper margin of fruiting blades with tiny globular projections. (2) *P. membranifolia* (not shown) has rounded stalk and abruptly expanded blades; fruiting bodies on face of blades.

Similar species: (1) Tattered pieces of Irish Moss (Plate 7) approach *membranifolia* but are nearly stalkless. (2) Fragments of Sea Oak (Plate 6) might suggest leaf weeds but are ribbed.

Season: Perennial.

Where found: Del. to subarctic. Chiefly subtidal.

Family: Phylloporaceae.

IRISH MOSS *Chondrus crispus*

Pl. 7

Identification: Variable in form and color. The flattened blades expand from a short stalk, forking broadly and repeatedly. Sometimes minutely divided into broad fans with somewhat overlapping bladelets; at other times sparsely branching with few and narrow blades. Color deep purplish red, often with bright bluish iridescence *underwater*; also brown or green; bleaches to yellowish or white. To 7 in. (175 mm) on exposed rocks; to 10 in. (250 mm) in quieter places.

Similar species: See Tufted Red Weed and leaf weeds (both Plate 7).

Season: Perennial.

Where found: L.I. Sound to Labrador. Lower intertidal zone, with a wider range vertically and in habitat than the next species.

Remarks: This is an important zone-forming plant; see Remarks under next species. Irish Moss has long been a popular food plant, used particularly in the preparation of blanchange. The commercial product *carrageenan*, which is made from Irish Moss; has had wide application as a gel in industry, pharmacy, and particularly in nutrition as a thickener in soups and dairy products. See *Field Guide to Edible Wild Plants of Eastern and Central North America*.

Family: Gigartinaeae.

TUFTED RED WEED *Gigartina stellata*

Pl. 7

Identification: This crisp, close-growing, dark brown or purplish weed has expanded blades, sometimes curled at the edges and covered with short bumps like Turkish toweling or terry cloth. To 3 in. (75 mm).

Similar species: Plants without bumps resemble variant Irish Moss (Plate 7) but stipe is usually curled.

Season: Perennial.

Where found: R.I. to Newfoundland. Pool edges and wave-beaten rocks in lower intertidal zone.

Remarks: This weed, with Irish Moss, often forms a definite zone between the rockweeds, which grow at higher levels, and the kelp and Coral Weed that fringe the lowest intertidal levels. Growing in a close turf, it provides safe footing and a welcome relief from the treacherously slippery tangles of rockweeds and Knotted Wrack on the upper shore.

Family: Gigartinaeae.

DULSE*enia palmata*

Pl. 7

Identification: Broad-bladed, ribless, and with a small, usually tapered stalk; forking above, and often with marginal leaflets. Tough and rubbery; nearly opaque in life, translucent and papery when dried. Deep purplish red. Dulse has an internal layer of large cells visible with a hand lens against the light. To 1 ft. (300 mm).

Similar species: (1) Laver (Plate 7) is more filmy and grows from a holdfast placed well within the margin. (2) Frayed Weed, *Rhodopyllis dichotoma* (Plate 6) also grows in ribless, purple-red, forked blades but is smaller — to 3 in. (75 mm) — and more fragile; typically with slender leaflets all along the margin. Intertidal or washed ashore; n. Mass. to Arctic. Family Rhodophyllidaceae.

Season: Perennial.

Where found: L.I. Sound to Arctic; a common plant from lower mid-littoral to deep water.

Remarks: Dulse, one of the edible seaweeds, is still harvested in the Canadian Maritimes and the Bay of Fundy, and packets of dull-red dried weed may be found in specialty stores. The texture of fresh dulse has been compared to salted rubberbands but improves on drying. See also the *Field Guide to Edible Wild Plants of Eastern and Central North America*.
Family: Rhodymeniaceae.

BARREL WEED *Champia parvula*

Pl. 9

Identification: Bushy, with axis and branches coarsely segmented; segments as broad or broader than long, $\frac{1}{16}$ – $\frac{1}{8}$ in. (1.6–3 mm) thick in main parts. Color variable but usually pale, reddish or pink to yellowish or greenish. Whole plant to 3 in. (75 mm) tall.

Similar species: Barrel Weed is not filamentous as defined on p. 50, since its segments are microscopically multicellular. Divisions are much coarser than any truly filamentous weeds except Pink Bead (Plate 9), which has a more regularly forking growth and differently shaped segments.

Season: Mainly summer-early fall, but year-round southward. Where found: Cape Cod to tropics, chiefly subtidal in quiet water, often epiphytic; washes ashore.
Family: Champiaceae.

BANDED WEEDS *Ceramium* species

Pl. 9

Identification: Bushy plants with axes and branches banded at regular intervals; tips of youngest branches with pincers; both details usually visible without hand lens. Banding sometimes partly obscured by multiplication of microscopic surface cells, and pincers sometimes missing from older plants. Color extremely variable, usually in shades of red, but bleaching to

yellowish

sh, or white. Soft and collapsing out of water. Main axes $\frac{1}{16}$ – $\frac{1}{8}$ in. more than $\frac{1}{32}$ in. (0.78 mm) thick — in most species about as thick as light sewing thread (#40); whole plants 4–16 in. (100–400 mm).

9 species, varying in size and form; require microscope for positive identification. Even the most widespread species, *C. rubrum*, is extremely variable and not always conspicuously banded.

Similar species: Other coarsely filamentous or delicately bushy genera found with the banded weeds are really quite different if examined closely. See tubed weeds (Plate 9) and filamentous seaweeds, p. 50.

Season: *C. rubrum* is perennial; other species best in summer-early fall.

Where found: Whole coast. Often epiphytic or attached to various substrata from lower intertidal zone to subtidal in shallow water. Together with the tubed weeds (see p. 47), these are important zone-forming plants.

Family: Ceramiaceae.

PINK BEAD *Griffithsia globulifera*

Pl. 9

Identification: Bushy, with axis and branches segmented; segments varying in shape in different parts from clublike to egg-shaped or spherical. In male plants segments become larger at tips but in females and spore-bearing plants, branchlets taper at the end. Segments are actually individual cells. Bright pink to nearly transparent. Fragile, collapsing completely when dried. Main parts to $\frac{1}{16}$ in. (1.6 mm) thick, whole plant to $2\frac{1}{2}$ in. (62 mm) or exceptionally to 8 in. (200 mm).

Similar species: (1) See Barrel Weed (Plate 9 and p. 44). (2) *G. tenuis* (not shown) is similar but segments are cylindrical, 3–6 times longer than wide and only $\frac{1}{64}$ in. (0.39 mm) thick. Branching is alternate and branches grow out from middle of supporting segment, whereas *G. globulifera* has regularly forked branches that grow from end of supporting segment. Summer; subtidal in quiet coves. Va. to Cape Cod. (3) Compare this species with other filamentous algae, p. 50, and banded weeds (Plate 9).

Season: Summer.

Where found: Cape Cod to tropics. Subtidal in quiet water, commonly washed ashore.

Family: Ceramiaceae.

RED FERN *Pilota serrata*

Pl. 9

Identification: Bushy, with main branches flat and fernlike. Use hand lens to see distinct branching system; branches are consistently opposite but one branch of each pair is well developed while its opposite is much smaller; in the next pair the

relations. . . . eversed, so that fully developed branchlets *alternate*. This system is usually carried through to the smallest branchlets. Dark red or brownish red fading to bright red. Whole plant to 6 in. (150 mm).

Similar species: *Plumaria elegans* (not shown) is very similar but branching is *less regular* and whole plant is more delicate; terminal branchlets *filamentous* under hand lens (see p. 50). Habits and distribution similar to Red Fern though it only ranges north to Gulf of St. Lawrence. To 8 in. (200 mm).

Season: Perennial.
Where found: Arctic to Cape Cod; rarely and in deeper water south to L.I. Sound. Subtidal, about bases of kelp, or occasionally epiphytic on coarse seaweeds. Commonly washed ashore.
Family: Ceramiaceae, including *Plumaria*.

GRINNELL'S PINK LEAF *Grinnellia americana* Pl. 6
Identification: Thallus a thin *undivided* leaf with a weak *midrib*. Translucent pinkish with darker spots — females have round spots; spore-bearing thalli, elongate spots; males unspotted. Female and spore-bearing thalli to 2 ft. (600 mm); males to 1 in. (25 mm).

Similar species: A delicately beautiful weed not likely to be confused with any other, but see Sea Oak (next account) for other *ribbed* red weeds.

Season: In North appears and disappears abruptly sometime during the summer, persisting little more than a month; season longer in South.

Where found: N. Mass. south at least to the Carolinas; subtidal.

Family: Delesseriaceae.

SEA OAK *Phycodrys rubens* Pl. 6
Identification: As the name implies, leafy, deeply lobed, with midrib and *lateral* ribs. Deep red, fading to pink. To 6 in. (150 mm).

Similar species: Other pink to red or purplish algae with *midrib* include the following. (1) Ribbed lace weeds, *Membranoptera* species (Plate 6), have finely divided *lacy* thalli; lateral ribs absent in *M. alata*, microscopic in *M. denticulata*. To 8 in. (200 mm) tall. Arctic southward — *M. alata* to n. Mass. and *M. denticulata* to L.I. Sound. Usually subtidal but may be washed ashore. (2) Grinnell's Pink Leaf (Plate 6) is undivided (without lobes) and has only a *weak* midrib. (3) *Caloglossa leptoceras* (not shown) is a more southern red weed with Y-forked, *narrow* thalli, and midrib only. To 2 in. (50 mm) tall. Conn. south to tropics; brackish to fresh water. (4) Tattered fragments of Sea Oak could be mistaken for leaf weeds (Plate 7), but Sea Oak is translucent, leaf weeds are not.

Season: 1 or biennial.

Where found: Arctic south to Cape Cod, less commonly to New York harbor. In tide pools or extreme lower intertidal zone northward; subtidal in deep water southward but often washed ashore. A common epiphyte on coarse seaweeds such as *Kelp*.
Family: Delesseriaceae, including *Membranoptera* and *Caloglossa*.

CHENILLE WEED *Dasya peticellata* Pl. 8
Identification: The *furry* strands of this graceful summer weed are unmistakable. Few to many branches; light to deep red or purplish. To 2 ft. (600 mm) or more.

Season: Annual; blooms briefly sometime between midsummer and late fall in North; season longer in South.

Where found: Maine or Nova Scotia to tropics. Subtidal, but often in the wash of quiet water in bays and inlets.

Family: Dasyaceae.

POD WEEDS *Chondria* species Pl. 9

Identification: Bushy, with rounded, alternate branches; end branchlets *short* — $\frac{1}{8}$ in. (5 mm) or less — and club- to spindle-shaped, *tapering at base*; general shape of thallus pyramidal. Color usually faded, purplish or brownish purple to straw-colored. Main branches no more than $\frac{1}{8}$ in. (3 mm) thick; whole plants 4–10 in. (100–250 mm) tall.

4 species, often difficult to distinguish; typical form shown on Plate 9. The 2 most common species, *C. tenuissima* and *C. baileyana*, collapse out of water; in *tenuissima*, branchlets *taper* at outer end while *baileyana* has *blunt-ended* branchlets. *C. baileyana* is usually epiphytic on rockweeds, Eelgrass, and the like; *tenuissima* seldom is. Compared side by side, *baileyana* is more delicate. The less common species, *C. sedifolia* and *C. dasphylla*, do not collapse out of water; in *dasphylla*, branchlets *taper* at outer end, whereas *sedifolia* has *blunt-ended* branchlets.

Season: Summer.

Where found: Nova Scotia to tropics; from lower intertidal zone to subtidal with banded and tubed weeds (Plate 9) on rocks or wood. Sometimes drifting free.

Family: Rhodomelaceae.

TUBED WEEDS *Polyisiphonia* species Pl. 9

Identification: Bushy plants with main axis and branches *polyisiphonous*. (This construction may be visualized roughly as consisting of bundles of filamentous fibers or tubes bound together. Usually visible with a hand lens, particularly in younger parts of plant, and appearing as in the detail on Plate 9 with *five* cross and lengthwise marks.) Light brown or yellowish brown,

pink 1
 $\frac{1}{32}$ – $\frac{1}{16}$ in. (0.78–1.6 mm) thick and usually less, but whole plants may be to 16 in. (400 mm) tall.

Numerous species, varying in size and form; microscopic study usually required to distinguish between them. *P. harveyi* and *P. denudata* shown. Another species, *P. lanosa* (not shown) is easily identified by its association with Knotted Wrack, on which it grows as an epiphyte; see Wire Weed (p. 42) for this species.

Similar species: (1) *Rhodomela* is a similar and frequently indistinguishable genus, and the genera *Seirospora*, *Callithamnion*, and *Pleonosporium*, although technically not polysiphonous, appear to be so in part. Altogether these represent about a dozen additional species; none shown. (2) *Spyridia filamentosa* (Plate 9) is coarser — main axis to slightly more than $\frac{1}{16}$ in. (1.6 mm) — with distinctive cellular structure just visible with 20X hand lens; covered with tiny branchlets that appear banded but lack pinners (see banded weeds, Plate 9); to 1 ft. (300 mm); brown or reddish when alive, bleaching to yellowish. Chiefly summer; Cape Cod to tropics in warm, quiet coves. Family Ceramiales for all species listed above except *Rhodomela*.

Season: Some species perennial, others summer annuals. **Where found:** Whole coast. Some epiphytic; several, with banded weeds, are important zone-forming plants on rocks and wood in lower intertidal zone south of Cape Cod. May also be found drifting free.

Family: Rhodomelaceae, including *Rhodomela*.

Additional Species

Two types of algal growth that are often conspicuous on the seashore require microscopic study for positive identification. The following accounts are only guidelines indicating general characteristics that will aid the reader in distinguishing some of the common forms. **Note:** Because of the large number of species discussed here, those that are shown are indicated rather than those that are not.

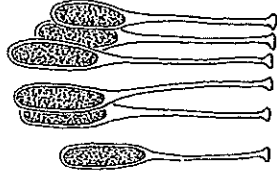
CRUSTOSE ALGAE: The encrusting algae that produce such vivid colors and "tar spots" in tide pools and on wave-washed rocks range in structure from feltlike, obviously organic forms to enamel-like coatings that might be mistaken for minerals or even paint. To identify, examine material under water; if obviously filamentous rather than crustose see that section below. The plants are grouped according to color.

Olive-Brown to Blackish: (1) *Calothrix* (Phylum Cyanophyta) is the commonest of several blue-green genera that form stainlike coatings in the upper spray zone. Caution: very slip-

pery w
 t. Whole coast. (2) Maritime lichens, *Verrucaria* species, form tarlike crusts at this same level. Mainly north of N.Y. (3) *Ralfsia* species (Phylum Phaeophyta) occur in crusts up to $\frac{1}{8}$ in. (3 mm) thick by several inches wide; texture varies from firm and tarlike to brittle and crumbly. In pools or on lower intertidal rocks. N.J. to Arctic.

Blackish Green: Several species (all Phylum Chlorophyta) are common on rocks in spray zone or upper intertidal: (1) *Prasiola stipitata* scrapes off in $\frac{1}{4}$ in. (6 mm) flakes. Found on rocks with liberal spattering of bird droppings. Cape Cod to Newfoundland. (2) *Codiolum* species form velvety or furry patches of erect club-shaped, unicellular filaments easily visible under hand lens. Patches are $\frac{1}{8}$ – $\frac{1}{4}$ in. (3–6 mm) thick. Maine to Newfoundland.

Fig. 7.



CODIOLIUM
 GREGARIUM

Dull Green: *Vaucheria* species (Phylum Xanthophyta) form thick films or mats (actually filamentous in structure) on intertidal sand or mud flats. Va. to Bay of Fundy.

White to Rose or Purple: Encrusting Corallinaceae (Phylum Rhodophyta) form chalky to stony crusts, ranging from thin and enamel-like to massive, knobby, or branching; infiltrated with calcium carbonate — hence will fizz with a drop or so of hydrochloric or other strong acid. *Lithothamnium* and *Phymatolithon* form heavy crusts usually on rock; *Melobesia*, *Lithophyllum*, and *Fosiliella* form more fragile patches on Eelgrass and larger seaweeds. Whole coast.

Bright Red, Sometimes Tinted with Orange, Brown, Purple, or Black: All belong to Phylum Rhodophyta. (1) *Petrocelis middendorffii*, forms thin, gelatinous, and slippery patches less than $\frac{1}{2}$ in. (12 mm) wide on rocks in low pools and subtidally. N. New England. (2) Various Squamariae: *Hildenbrandia prototypus* is found in thin but tough noncalcareous films, and is common and conspicuous in pools and on