Identification of Common Marine Plants of the West Coast

Key Concepts

1. Macroscopic marine plants of the West Coast can be divided into four basic groups: flowering plants, green algae, brown algae, and red algae.

2. External features can be used for identification of macroscopic marine plants.

Background

Many species of plants are found living in the marine environment. Marine plants are usually placed into one of four different divisions including seagrasses, green algae, brown algae, and red algae. Marine algae can be classified accurately based on pigmentation and reproductive life cycles, but these features require the use of microscopes and prepared cross-sections. Because the visible color of algae can sometimes be misleading, additional external features are often included in keys to identification.

The following key may be used as an aid to the identification of common visible marine plants, including the flowering seagrasses and algae found in Puget Sound and Monterey Bay. Most, but not all, of the plants included in this key can be found in both geographic areas. Many are found all along the west coast of the United States.

A glossary of terms to be used with the key is included.

Additional background information is found in the activities “Marine Ecology and Kelp Forests”, “Observing Algae”, and “Sea Forest”.

Materials

For each class:

- available specimens of marine plants (fresh or pressed, or pictures of algae labeled with common names only)

For each student or pair of students:

- copy of the Key to Identification
- copy of the glossary
- copy of the student worksheet

Teaching Hints

"Key to the Identification of Some Common Marine Plants of the West Coast" provides students with direct experience in the use of a dichotomous key. The key included can be used to identify common marine plants of the west coast. It is not required, and in fact may be difficult, to have all of specimens included in this key. If you are able to collect fresh specimens of drift marine plants, be sure to check state and local restrictions. You will need to collect a sufficient portion of a plant to allow identification.

Plants can be kept in plastic bags overnight in a refrigerator. You may want to put specimens in separate plastic bags before refrigeration. Also, be sure to keep fresh specimens of Desmarestia separated from other specimens. This alga is very acidic and may bleach other specimens. Do not add Desmarestia to an aquarium because the acid it produces will kill any animals in the tank. Fresh specimens may become very slimy, so rinsing them with fresh water before use in lab is desirable.

Since it is not always possible or convenient to obtain fresh algae specimens, you may want to consider making a class set of pressed algae herbarium specimens following the suggestions given in the activity "Pressing Algae". Some biological supply companies sell pressed specimens common to both the east and west coasts of the United States.

Provide trays of drift algae, pressed specimens, or pictures for identification. Each specimen needs to be placed at a separate station around the classroom. Each specimen needs to have its own station number (#1-34). Remind the students that the station number has nothing to do with the key, it is just a station marker. If you find specimens not listed in the key, they can be given their own station number (#35 and above as needed) and ask students to find the closest relative based on the key. If you can't tell whether a collected specimen is a red or brown seaweed, as a rule, it is probably a red algae (remember, color alone can be deceiving!).

This key is designed to separate the genera listed in the key (with the exception of the coralline algae). This key is not dichotomous because there are several options for each number. The key starts with steps 1A or 1B where you decide if the plant is a flowering plant or a seaweed. From that point there may be *several* letter choices for each numbered step, so be sure to remind students to choose from among all of the letters for a particular number. The process of choosing from among several choices can be clarified by identifying a specimen or two as a class. For example, have the class follow the sequence for sea lettuce, or Ulva, that is completed as an example on the student worksheet.

Since colors of specimens can be misleading, you can alleviate some frustration by letting students know if an alga is from the green, red, or brown division. Also note that within the key, step 8B can be a confusing. In the division Rhodophyta, order Cryptonemiales contains red algae with a range in morphology from calcareous crusts and filaments, to filamentous tufts, to

plants with blades. When students reach step 8, remind them to choose from among all of the letter choices in step 8 to narrow down the possibilities. Students can identify specimens in any order. Students who are stuck can also be given the scientific name of the plant and work backward through the key.

Key Words

axial - rowing along the length of the plant rather than at the end.

blade - broad, leaf-like portion of algae.

calcareous - containing calcium carbonate ($CaCO_3$)

dichotomous - division by branching in two.

differentiation - tissues specialized to perform different functions.

encrusting - covering in a crust-like fashion forming a low profile over a substrate.

estuary - coastal marine bay with freshwater sources.

filamentous - thread-like or fibrous strands.

holdfast - structure that attaches algae to substrate.

infralittoral - low intertidal area exposed only during low spring tides.

littoral - narrow vertical band of coastline affected by the range of tides.

lobed - rounded projections from the algal blade.

macroscopic - large enough to be seen without magnification.

midrib - central line of tissue that may strengthen the blade.

midlittoral - band of coastline between that range of the tides.

pinnate - blade projections arranged on either side of a common axis.

pneumatocyst - air-filled bladder allowing for positive buoyancy.

receptacle - fertile area where reproductive cells are produced.

stipe - stalk springing from holdfast and attachment place for blades.

substrate - surface layer of material on which an organism can grow and multiply.

sublittoral - depth below the range of the tides.

succulent - fleshy plant material that may retain water.

supralittoral - elevation above the range of the tides.

thalli - plant bodies lacking differentiation into roots, stems, and leaves. Singular = thallus.

Answer Key

LIST OF SPECIMENS INCLUDED IN THE MARINE PLANTS KEY

Key to Zonation: Supralittoral:Sp., Midlittoral: M, Infralittoral: I, Sublittoral :Sb

Division	Common names	Scientific names	Zonation
Anthophyta	Pickle weed	Salicornia	Sp.
Vascular plants	Eelgrass	Zostera	I
	Surfgrass	Phyllospadix	I
Chlorophyta	Sea lettuce	Ulva	M
Green Algae	Tiny sea lettuce	Prasiola	Sp.
	Moss weed	Cladophora	Sp.
	Dead man's fingers	Codium	M
	Tube algae	Enteromorpha	Sp.
Phaeophyta	Acidic weed	Desmarestia	I
	Brown AlgaePointed weed		PunctariaI
	Whip tube weed	Scytosiphon	M
	Rockweed	Fucus	M
	Thin rockweed	Pelvetia	
	Drifting weed	Sargassum	I
	Bladder chain weed	Cystoseira	Sb
	Blade kelp	Laminaria	I
	Wing kelp	Alaria	I
	Ribbed kelp	Costaria	I
	Feather boa kelp	Egregia	I
	Bull kelp	Nereocystis	Sb
	Giant kelp	Macrocystis	Sb
Rhodophyta	Nori	Porphyra	Sp.
Red Algae	Cluster algae	Smithora	I
	Coralline algae	Family Corallinaceae	I
	Tuft algae	Endocladia	Sp.
	Beauty leaf algae	Callophyllis	I
	Iodine algae	Prionitis	I, Sb
	Slender algae	Gracilaria	M
	Tapered algae	Neoagardhiella	Sb
	Turkish towel	Gigartina	I
	Tiny Turkish towel	Mastocarpus	Sp.
	Rainbow algae	Iridea	M
	Sea grapes	Botryocladia	I
	Red membrane algae	Rhodymenia	I
	Sea sacks	Halosaccion	M
	Tiny branched algae	Micorcladia	I
	Grape tongue algae	Botroglossum	I
	Many-veined algae	Polyneura	I, Sb

Answer Key—Key to Identification of Common Marine Plants of the West Coast

Station #	**Common Name**	**Sequence of Key**	**Scientific names**
1	Sea lettuce	1 B, 4 A	Division Chlorohpyta ulva
2	Rockweed	1 B, 2 B, 5 A, 6 A	Division Phaeophyta fucus
3	Turkish towel	1 B, 2 C, 8 C, 11C	Division Rhodophyta order Gigartinales Gigartina
4	Bladder chain weed	1 B, 2 B, 5 A, 6 C	Division Phaeophyta Order Fucales Cystoseira
5	Slender algae	1 B, 2 C, 8 C, 11 A	Division Rhodophyta Order Gigartinales Gracilaria
6	Surfgrass	1 A, 3 B	Division Anthophyta phyllospadix
7	Nori	1 B, 2 C, 8 A, 9 A	Division Rhodophyta Order Bangiales Porphyra
8	Whip tube weed	1 B, 2 B, 5	Division Phaeophyta Escytosiphon

9	Wing kelp	1 B, 2 B, 5 B, 7 B	Division Phaeophyta Order Laminariales Alaria
10	Rainbow algae	1 B, 2 C, 8 C, 11 E	Division Rhodophyta Order Gigartinales Iridea
11	Pointed weed	1 B, 2 B, 5 D	Division Phaeophyta punctaria
12	Dead man's fingers	1 B, 2 A, 4 C	Division Chlorophyta codium
13	Iodine algae	1 B, 2 C, 8 B, 10D	Division Rhodophyta Order Cryptonemiales Prionitis
14	Feather boa kelp	1 B, 2 B, 5 B, 7 D	Division Phaeophyta Order Laminariales Egregia
15	Thin rockweed	1 B, 2 B, 5 A, 6 B	Division Phaeophyta Order Fucales Pelvetia
16	Giant kelp	1 B, 2 B, 5 B, 7 F	Division Phaeophyta Order Laminariales Macrocystis
17	Tuft algae	1 B, 2 C, 8 B, 10 B	Division Rhodophyta Order Cryptonemiales Endocladia

18	Coralline algae	1 B, 2 C, 8 B, 10 A	Division Rhodophyta Order Cryptonemiales Family Corallinaceae
19	Tiny Turkish towel	1 B, 2 C, 8 C, 11 D	Division Rhodophyta Order Gigartinales Mastocarpus
20	Tiny sea lettuce	1 B, 2 A, 4 B	Division Chlorophyta Prasiola
21	Sea grapes	1 B, 2 C, 8 D, 12 A	Division Rhodophyta Order Rhodymeniales Botryocladia
22	Tube algae	1 B, 2 A, 4	Division Chlorophyta Denteromorpha
23	Blade kelp	1 B, 2 B, 5 B, 7 A	Division Phaeophyta Order Laminariales Laminaria
24	Sea Sacks	1 B, 2 C, 8 D, 12 C	Division Rhodophyta Order Rhodymeniales Halosaccion
25	Eelgrass	1 A, 3 C	Division Anthophyta zostera
26	Acidic weed	1 B, 2 B, 5 C	Division Phaeophyta desmarestia

27	Beauty leaf algae	1 B, 2 C, 8 B, 10 C	Division Rhodophyta Order Cryptonemiales Callophyllis
28	Drifting weed	1 B, 2 B, 5 A, 6 C	Division Phaeophyta Order Fucales Sargassum
29	Moss weed	1 A, 4 B	Division Chlorophyta cladophora
30	Tiny branched algae	1 B, 2 C, 8 E, 13 A	Division Rhodophyta Order Ceramiales Microcladia
31	Bull kelp	1 B, 2 B, 5 B, 7 E	Division Phaeophyta Order Laminariales Nereocystis
32	Pickleweed	1 A, 3 A	Division Anthophyta salicornia
33	Cluster algae	1 B, 2 C, 8 A, 9 B	Division Rhodophyta Order Bangiales Smithora
34	Grape tongue algae	1 B, 2 C, 8 E, 13 B	Division Rhodophyta Order Ceramiales Botryoglossum
35	Ribbed kelp	1 B, 2 B, 5 B, 7 C	Division Phaeophyta Order Laminariales Costaria

36	Many-veined algae	1 B, 2 C, 8 E, 13 C	Division Rhodophyta Order Ceramiales Polyneura
37	Tapered algae	1 B, 2 C, 8 C, 11 B	Division Rhodophyta Order Gigartinales Neoagardhiella
38	Red membrane algae	1 B, 2 C, 8 D, 12 B	Division Rhodophyta Order Rhodymeniales Rhodymenia

Adapted from the “Key to The Major Taxonomy of Macroscopic Marine Plants of Monterey Bay” by Mike Guardino and Holly Shewbridge.

Identification of Common Marine Plants of the West Coast

Directions: Use the key to identification and the glossary to identify the scientific name of the specimen at each station. Write down the common name, the sequence of the key, and the scientific names including the division, order (when possible) and genus for each specimen (see example). You can identify specimens in any order.

Station #	Common Name	Sequence of Key	Scientific names
1	Sea lettuce	1 B, 2 A, 4 A	Division Chlorophyta Ulva
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

Station #	Common name	Sequence of Key	Scientific names
12			
13			
14			
15			
16			
17			
18			
19			
20			
21			
22			
23			

Station #	Common Name	Sequence of Key	Scientific names
24			
25			
26			
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35			
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37			
38			

Key to the Identification of Common Macroscopic Marine Plants of the West Coast

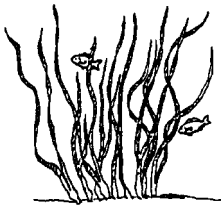
Choice	Description	Taxonomic Group	Go to
1A	Green plant with long grass-like blades or fleshy leaves with parallel veins. Includes seagrasses found in littoral zone, with roots, stems, leaves, seeds and flowers (in season).	Division Anthophyta	3
1B	Algae, plants not like 1A.		2
2A	Bright or dark green algae that lack visible differentiation.	Division Chlorophyta	4
2B	Brown or golden brown algae that feature holdfasts, stipes, blades, receptacles, and pneumatocysts. Length up to 20 m.	Division Phaeophyta	5
2C	Red algae that may range in colors including yellow, greenish, pink, red, purple, black.	Division Rhodophyta	8
3A	Dense plant, not submerged, with green and/or red succulent leaves. Lives in tidal mud flats and estuaries. Tastes salty.		

Salicornia

3B	Long, narrow (< 0.5 cm) bright green blades with dense root clump attached to rocks in littoral zone. Marker for "zero" tidal level.		

Phyllospadix

3C	Broad (> 0.5 cm) long blades with parallel veins. Grows in sandy substrate in subtidal zone of beaches or estuaries having reduced wave force.		



Zostera

4A Thin, flat, translucent sheets of green algae with small holdfasts and sometimes wavy margins. May be narrow (to 4 cm) or wide (to 1 m) sheets.....

Ulva

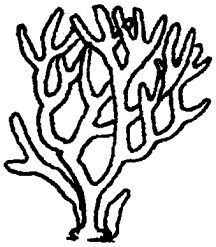
4B Plant with minute blade (< 1 cm tall) attached to hard surfaces in littoral zone. Near bird dropping areas. .....

Prasiola

4C Short, dense tufts of filamentous green algae, 3 - 5 cm tall. Grows on rocks of supralittoral zone. .....

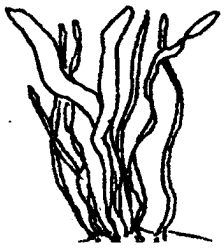
Cladophora

4D Clumps of dark green spongy "fingers" in infralittoral zone. "Fingers" up to 30 cm length, 0.5 cm wide.....



Codium

4E Tubes or "intestine" shaped green strands. Tube may be up to 1 m in length, 0.5 - 5 cm wide. Common near areas of freshwater seepage. Large masses may float and collect on shore. .....



Enteromorpha

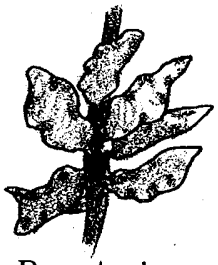
5A Small, dichotomously branched intertidal rockweeds and larger sublittoral algae. Tips thick and bumpy when sexually mature. ..... Order Fucales 6

5B Kelp plants differentiated into one or many blades, stipes, and root-like holdfasts. ..... Order Laminariales 7

5C Thin, flat, strap-like blades that contain sulfuric acid. May have strong odor, taste. To 2 m long by 1-2 cm wide. .....

Desmarestia

5D Plant found growing on eelgrass 1.5 - 2.5 cm wide. Light brown. Short stipe and disc-like holdfast. .....



Punctaria

5E Plant olive-brown. Looks like sausage links that taper to a point at the top. .....

Scytosiphon

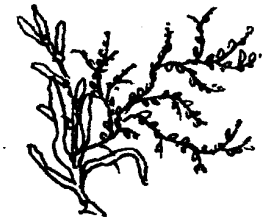
6A Wide, dichotomously branched rockweed (to 3 cm wide, 20 cm long). With bumpy, swollen receptacles at tips. Many stipes rise from small holdfast. .....

Fucus

6B Slender, tough rockweed. Long (to 15 cm) and narrow branching stipes ending in reduced blades that lack midribs. Small receptacles. .....

Pelvetia

6C Plant has multiple branching. Flattened lateral blades, not on main stipe, with midrib and serrated margins. Tiny air bladders attached between blades. .....



Sargassum

6D Cluster of flat, pinnate blades 1-2 cm wide at base. Blades taper into a long, thin stipe, up to 7 m, with string of small "beads" (3-5mm) at tips. .....

Cystoseira

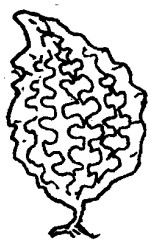
7A Single, smooth, leathery blade shaped like an oar arising from a tough, cylindrical stipe. Up to 2 meters tall. .....

Laminaria

7B Large, single flexible blade (1m to 2 m) with prominent midrib and smaller wing-like blades where stipe meets large blade. To 3 meters tall. .....

Alaria

7C Large, single ruffled blade with five long parallel ribs from top to bottom. From 1.5 to 2 m long. .....

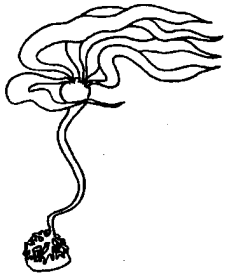


Costaria

7D Long, thick, strap-like stipe with many small, alternating blades and axial pneumatocysts. .....

Egregia

7E Long, thin stipe (up to 10 m) arising from a small holdfast. The stipe flares out and terminates in a single, fist-sized pneumatocyst with 6 to 8 flat blades. .....



Nereocycstis

7F Long, round stipes arising from a large holdfast. Fronds consist of large, alternating blades with pneumatocysts at their bases. .....

Macrocystis

8A Blades are flexible sheets that are reddish-green in color. Shiny when wet, crispy when dry..... Order Bangiales 9

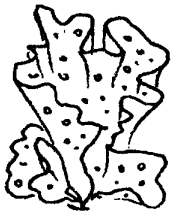
8B Calcareous (encrusting or branching) plant or filamentous plant or with blades. ..... Order Cryptonemiales 10

8C Plants red to dark red to black. Tough, elastic, small to large, smooth or bumpy. Blades with reduced holdfasts. ..... Order Gigartinales 11

8D Flattened blades or small fluid-filled sacs or bladders. ..... Order Rhodymeniales. 12

8E Small, delicate filaments or blades with lobed margins..... Order Ceramiales..... 13

9A Thin, smooth, flexible blades. Variable in color including brown, olive, red to black blades (to 20 cm). Plant is supralittoral, becomes brittle when dry. Known as nori or sushi seaweed.....



Porphyra

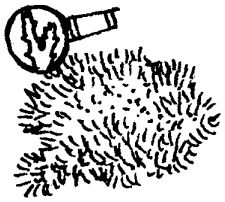
9B Purplish-red blades 3-6 cm long, 1-2 cm wide. Grows on blades of eelgrass and surfgrass.....

Smithora

10A Hard crust, or erect plant with hard shell-like segments and flexible joints. Pinkish color or white when dead. .....

Coralline algae

10B Dense, dark brown tufts of coarse filaments. .....



Endocladia

10C Irregular branches, flat, fan-like. Dark red. Disk-like holdfast. .....

Callophyllis

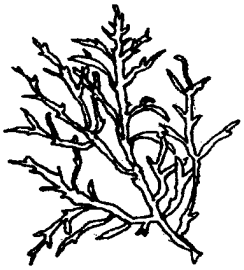
10D Plant brown to red to purple. Main axis is long, broad, and flat tapering to the end. With many smaller lateral blades, 10 - 35 cm tall.....

Prionitis

11A Long (5 - 30 cm), round, highly branched slippery slender strands.....

Gracilaria

11B Round stipe and round branches. Thalli very branched with cylindrical axes. Up to 0.5 m long.....



Neoagardhiella

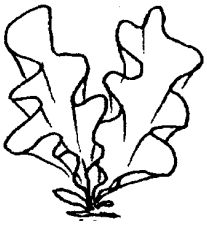
11C Large "Turkish towel" with thick rubbery blades and bumpy texture. Gigartina.....

Gigartina

11D Small (to 10 cm), dense clumps of rectangular blades with fine bumps. Found in supralittoral zones. Males smooth, yellowish-green. .....

Mastocarpus

11E Large, flat elastic blades with iridescent appearance, color varies from olive green to deep red.....

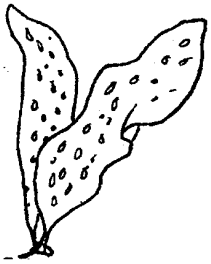


Iridea

12A Bright red "grape-like" sacs filled with gelatinous liquid.....

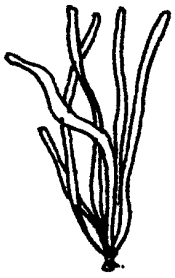
Botryocladia

12B Thin, flat, dichotomously branched blades with smooth margins.....



Rhodomenia

12C Firm, olive colored clusters of long, hollow, liquid-filled sacs. .....



Halosaccion

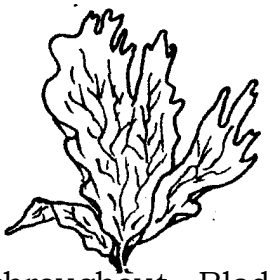
13A Delicate, filamentous plant found growing on kelp. .....

Microcladia

13B Thin, flattened blades with ruffled, wavy margins. .....

Botryoglossum

13C Broad, flat, fan-like blades, irregularly branched, with vein-like lines ..... throughout. Blades 1-20 cm tall.



Polyneura

Glossary of Terms for Key to Identification of Common Marine Plants

axial: Growing along the length of the plant rather than at the end.

blade: Broad, leaf-like portion of algae.

calcareous: Containing calcium carbonate ($CaCO_3$)

dichotomous: Division by branching in two.

differentiation: Tissues specialized to perform different functions.

encrusting: Covering in a crust-like fashion forming a low profile over a substrate.

estuary: Coastal marine bay with freshwater sources.

filamentous: Thread-like or fibrous strands.

holdfast: Structure that attaches algae to substrate.

infralittoral: Low intertidal area exposed only during low spring tides.

littoral: Narrow vertical band of coastline affected by the range of tides.

lobed: Rounded projections from the algal blade.

macroscopic: Large enough to be seen without magnification.

midrib: Central line of tissue that may strengthen the blade.

midlittoral: Band of coastline between that range of the tides.

pinnate: Blade projections arranged on either side of a common axis.

pneumatocyst: Air-filled bladder allowing for positive buoyancy.

receptacle: Fertile area where reproductive cells are produced.

stipe: Stalk springing from holdfast and attachment place for blades.

substrate: A surface layer of material on which an organism can grow and multiply.

sublittoral: Depth below the range of the tides.

succulent: Fleshy plant material that may retain water.

supralittoral: Elevation above the range of the tides.

thalli: Plant bodies lacking differentiation into roots, stems, and leaves. Singular = thallus.