If you have questions or comments please contact: Dr. Jennifer Smith, NCEAS, UCSB, (805) 892-2522, email: jsmith@ucsb.edu

Additional Resources: http://www.botany.hawaii.edu/ReefAlgae/default.htm

**Kingdom Monera**

**Division Cyanophyta (cyanobacteria or blue-green algae)**

*Lyngbya majuscula* pg 37

Filamentous unbranched cyanobacteria black, chocolate brown to dark gray but can be shades of red, green or yellow. Wiry, resembles human hair. 5-20cm long may cause swimmers itch, found with other seaweeds, shallow tide pools and subtidal habitats, tends to bloom in summer and is associated with blooms of the sea hare *Stylochelius longicauda* which feed on it.

**Kingdom Plantae-True Plants**

**Family Hydrocharitaceae-Seagrasses**

*Halophila spp. (includes hawaiiana and decipiens)*

This is an endemic seagrass found only in the Hawaiian Islands. It is common in sandy areas both on shallow reef flats and in deeper sand flats. It can form extensive meadows in depths>100ft. Upright portions are bright with green leaves-oval to oblong in shape, leaves can be 2-4 cm long, colorless stems are usually subterranean, growing under the sand, and many small roots anchor the plants into the soft substrate. Small flowers can be seen on occasion.
Kingdom Protista
Division Chlorophyta (green algae)

Order Ulvales

*Ulva fasciata* pg. 33

Otherwise known as sea lettuce, *Ulva* is very common in shallow areas, near fresh water and nutrient input. It has a flat twisted blade that attaches to substrate with a small holdfast. Plants are 1-10cm wide and 5-100 cm long. Grass green in color, blades are translucent. Abundant in high nutrient water, near fresh water input and generally found on intertidal rocks and in tide pools.

**Hawaiian Name:** pālahalaha

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*Cladophora sericea*

Very fine, filamentous, bright green, has a very soft appearance and is heavily branched. Often grows in dense tufts, can be an epiphyte (growing on other plants) or can snag and grow on live or dead coral. Forms large blooms on the island of Maui in the summer months.
**Order Bryopsidales-single celled algae**

*Bryopsis spp.* pg. 17

Delicate soft featherlike appearance, central axis visible with side branches coming off in either opposite or whorled orientation, dark green and often iridescent color make this easily recognized. Found in shallow reef flats, and tidepools, and lower intertidal habitats with low wave action. 2-12 cm long.

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*Codium arabicum* pg. 25

A dark green spongy or felty mass, 0.5-3cm thick and up to 15cm wide, characterized by rolling bumps or convolutions on surface, found in intertidal, subtidal or on reef flats.

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*Codium edule* pg 25

Forms a spongy matlike mass of many intertwined dark green to yellow cylindrical branches. 3-8cm in diameter. There are many small attachment points on the underside of branches, branching pattern is dichotomous pattern. *C. edule* is found on reef flats, in lower intertidal habitats and in tidepools.

**Hawaiian Name:** wāwae‘iole
Codium reediae pg. 25
Dark green, often dirty with somewhat flattened branches, 1-2cm wide attached to bottom with a substantial discoid holdfast, branching is dichotomous and in one place. Plants grow upright from point of attachment and are generally larger that C. edule. It is found in fairly calm water such as deep tidepools and on deep reef flats growing to 10cm in length.

Order Caulerpales

Caulerpa racemosa pg 19
Looks like small bunches of grapes, light green in color. Plants can be up to 5 cm tall and can creep horizontally across the substratum for several meters. Plants consist of an upright portion which resembles bunches of grapes, a horizontal runner (connecting) the upright portions and then small root-like rhizoids which anchor the plant to the substrate.

Caulerpa serrulata p19
Cylindrical horizontal runner with flat uprights with edges that are serrated like a knife or saw. These uprights can be simple or branched, can be flat or spiraled and can be few to several cm tall, fine colorless rhizoids anchor plant to substrate.

Caulerpa sertularioides p19
Cylindrical horizontal runner with fine uprights-branched in one plane similar to a comb or feather, all branches are cylindrical (round not flat), fine colorless rhizoids anchor plant to substrate.
Caulerpa taxifolia pg 21
Featherlike branches green in color 3-15cm tall. Found in sandy areas of tidepools, and reef flats. Appears like Caulerpa sertularioides except branches are flat with angled edges giving a square or rectangular appearance.

Halimeda kanaloana
Very common in the sandy expanses off of the islands of Maui and Molokai. Grows in dense beds and often will cover several hectares of the bottom from 20 ft to > 100 ft depth. Very large bulbous holdfast anchors plants into the sand, segments are clover shaped and strongly lobed, bright lime green, around 20 cm tall.

Halimeda discoidea pg. 29
Dark green outer segments; may have a calcified and whitish center, able to anchor in sand as well as on rock with very strong basal holdfast, segments are oval in shape and often bright green with several white (dead) segments on any individual, very common on shallow reef flats, not usually found in deeper water.
**Halimeda opuntia** pg. 29
Calcareaous green to whitish seaweed found in deeper water between rocks or under coral overhangs, plants often large and spreading, attaching to the substrate many times with small rhizoids, spreading laterally. Segments usually with midribs, segment shape is lobed but not as heavily as *H. incrassata*. 0.5-2cm wide segments, with lengths of 30 cm

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**Order Dasycladales**
**Neomeris annulata** pg. 31
Very distinct, fingerlike form grows 4 cm high, found in tide pools and reef flats, and in subtidal habitats. found in depressions of rocks. Top is green and fuzzy and bottom is calcified and white, rings of calcification are noticeable. Plants resemble small green cigars.

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**Dictyosphaeria cavernosa** pg. 27
Commonly known as the "Green Bubble Alga" due to the large round cells. When small the thallus is a hollow sphere, when larger the sphere may burst becoming convoluted and cup shaped. The seaweed is grass green in color and can form extensive mats over the reefs surface 1-10cm thick.
**Dictyosphaeria versluyi** pg. 27

Like *D. cavernosa*, also has bubble like cells, but is completely solid in middle and always remains rounded. Grass green in color, but sometimes bluish in color. 1-2 cm high and 1-5 cm wide.

**Microdictyon spp.** pg. 29

Single flattened blade consisting of a meshwork of fine connecting branches looks like a fine net. It is grass-green in color, from 1 to 6 cm wide and 1 to 4 cm high. This seaweed can be found in the low intertidal area of rocky coastlines, on flat reefs, and in between the branches of corals at deeper depths.

**Ventricaria ventricosa** pg. 35

*V. ventricosa*, also known as "Sailors eyes" is a liquid filled sack dark to silvery green, usually very metallic looking. Found in the nearshore, tidepools between branching corals and at deeper depths.
**Division Phaeophyta-Brown Algae**

*Dictyota spp.* pg. 41
- Flat small twisted blades forming with dichotomous branching (forming a repeated Y pattern). Blades are ribbon-like and can vary widely in color (from yellow to dark brown and often iridescent) and size (from 1 to 20 cm). Commonly found in tide pools and reef flats and deeper subtidal habitats.

*Lobophora variegata* pg. 47
- Flat, encrusting mustard yellow to orange or even dark brown seaweed, looks like shelf-fungi, round and lobed, 1-8 cm across, grows over rocky substrate or on dead coral, often found at the live coral interface on the corals *Porites compressa* or *P. lobata*, attached by rhizoids on the undersurface and can be difficult to remove.
**Padina spp.** pg. 47-49
Flat calcified brown blade. Can be rolled into a circle or flat and broad. Attaches to the substrate with a small holdfast. Degree of calcification can vary between species but is often visible in horizontal circular rings, upper surface is usually more calcified than the lower. Some species are small (less than a few cm) where other species can be greater than 20-30 cm tall. This genus is common in Hawaii and can be found in both intertidal and subtidal zones. *P. japonica* (right) is common in tide pools and basalt benches, other species can found in silty disturbed areas.

**Stypopodium hawaiiensis** pg. 55
Brilliant iridescent blue or green color, consists of many flat blades without the in-rolled margin as in the species *Padina*, not calcified. Found in wave swept beaches and reef flats, brightly colored so is noticeable. The edges of the blades are often ripped or torn.

**Sargassum echinocarpum** pg. 51
Found in wave swept rocky areas, near intertidal habitats, tidepools and reef flats. Golden to dark brown holly-leaf like blades with mid rib and flattened stems. Blades are often very thick and the margins have spiny projections, gas bladders are often large. Size is 5-70cm tall with blades at 0.3-2cm wide.

**Hawaiian Name:** Limu kala
### Sargassum obtusifolium pg. 51

Found in tidepools and reef flats. Brown leaf-like blades with midrib, round smooth main stems and gas bladders on round smooth stalks. Blades are usually long and thin and much softer than *S. echinocarpum*. Plants are often densely branched and it can be difficult to see the main axis. Size is 5-50cm tall and 0.3-2cm wide.

![Sargassum obtusifolium](image1)

### Sargassum polyphyllum pg. 53

Found in wave swept benches, tidepools and on reef flats, and occasionally deeper depths. Many brown blades with a midrib, and when present gas bladders with leaf-like stalks. This species is usually intermediate in size between the other two species and is often covered with epiphytes (other small species of seaweed) giving it a fuzzy appearance. Stems show short spiny projections and grow 5-40cm tall with blades .5-1cm wide. Blades often have a wavy or curly margin and are less robust than *S. echinocarpum* but wider than *S. obtusifolium*.

![Sargassum polyphyllum](image2)

### Turbinaria ornata pg. 55

Very robust seaweed with distinctive angular turban-like blades and a central stipe. Very similar in overall morphology to Sargassum but instead of leaf-like blades, *Turbinaria* has rounded and spiked side branches. Overall these plants are very thick and robust. Light to dark brown in color and grows 2-20cm tall. Found on rocky intertidal coastlines in tidepools and on reef flats and crests often dominating wave-swept environments.

![Turbinaria ornata](image3)
**Order Scytosiphonales**  
*Colpomenia sinuosa* pg. 39  
Hollow saclike seaweed, golden brown in color and can have a smooth or convoluted surface. Found in several habitats. 1-5cm diameter, up to 20cm in diameter.

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**Hydroclathrus clathratus**  
p47  
Very similar to *Colpomenia* but with perforations throughout the sac or balloon-like morphology, resembles a brown, slimy swiss cheese. Few to several cm in diameter.

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**Division Rhodophyta (red algae)**

**Liagora sp.** pg. 83  
Pink to red, and gooey at the ends of the tips. Branching pattern is often irregular and plants are lightly calcified. Most commonly found during the spring months on reef flats and tidepools but can be found in deeper waters.

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Trichogloea sp. pg. 95
Slippery, round, gooey branches. Branches 3-6mm in diameter and height varies from 5-40 cm. This light pink and slightly calcified seaweed grows on reef flats and in deeper subtidal habitats to 10 m. Branching is alternate to irregular and plants are covered in a gelatinous polysaccharide-giving them a very slippery feel. Usually only found in spring to summer.

Dichotomaria marginata, pg. 70 (HRP)
Generally light pink to maroon. Plants are heavily calcified and regularly dichotomously branched. Branches are flattened like riboons but plants have are somewhat thick and robust. A discoid holdfast attached plants to the substratum. Often found growing in tidepools, on ledges or overhangs, common on vertical surfaces. Generally 10-15cm in length.
Asparagopsis taxiformis pg. 59
Very delicate looking, soft and feathery. Plants are red, pick to bluish violet in color. Plants are attached to the substrate with an intertwined mass of root-like rhizoids. Uprights have many small whorled branches giving the plants an overall fluffy appearance. Can grow from 3-15cm in height and is found in shallow to deep subtidal habitats.

Hawaiian Name: Limu Kohu

Gibsmithia hawaiiensis pg. 71
A gelatinous, gooey, lobed alga with a large and often “woody” stalk and attachment point. Plants somewhat resembling an anemone more so than an alga. Lobes are rarely branched, and ful of a gelatinous polysaccharide, the surface is often covered with many fine hairs giving it an overall fuzzy appearance. Color varies from red to white and size from 3-12 cm. Most commonly found growing in between branches of corals in waters deeper than 5 m but can be found on reef flats occasionally.

Predaea weldii pg. 91
Found in subtidal habitats, very similar to Gibsmithia but branches are much thinner, it is very gooey and often has bright orange tips, it grows between the branches of corals reaching a length of 5 cm. Branches are fluorescent red soft and gooey.
**Portieria hornemanni** pg. 65 ???

Produces a distinctive strong odor. Bright red to orange-red and grows 2-6cm high with branches that are always curled back at the tips. Found in almost any habitat. Delicate and intricate branching.

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**Halymenia spp.**

Very attractive, deep red blade, usually attached with a small basal holdfast. Blade margins can be smooth to heavily ruffled and torn, most common on deeper reefs in rubble habitats. Size usually >5 cm-40 cm.

**Hawaiian Name:** lepe-o-Hina

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**Hypnea musciformis** pg. 79

Rounded main branches 1-3mm diameter with short pointed side branches, tips of branches have very characteristic “hooks” or tendril-like projections. Length grows from 3-30cm, bright yellow to dark red in shaded areas. Non-native species, forms blooms on south, west Maui.

**Note:** Alien species to Hawaii
**Acanthophora spicifera** pg. 57
1-3mm solid cylindric branches. Covered with many distinctive small spinelike branches. Grows to 3-20cm high and found abundantly in calm shallow reef flats, tidepools and intertidal benches. grows red, brown or dark green in color but turns yellow in bright sunlight.

**Note:** Alien species to Hawaii

**Gracilaria salicornia** pg. 73
Cylindrical branches 2-5mm in diameter, usually distinctive constrictions at the branching intersections, found in tidepools (Onekahakaha, Hilo) and reef flats where it forms mats 1-20 cm thick. Bright yellow to orange-brown.

**Note:** Alien Species to Hawaii

**Gracilaria coronopifolia** pg. 73
Solid cylindrical branches 1-4mm wide with short pointed tips. red in color but often bleaches to pink or white in bright sunlight. Found on reef flats and grows 6-20cm tall, but occasionally found in tidepools. When reproductive "bumps" appear on the surface, it is illegal to collect reproductive *Gracilaria coronopifolia*.

**Hawaiian Name:** Limu manauea
Laurencia spp.
Branching pattern variable, usually pink-purple to red but can have yellow and even green portions. Branch tips club-shaped with pits in the tips, usually plants range in size from a few cm. To about 20 cm. Very common in the intertidal.

Dasya irridescens
Cylindrical, round branches, not flattened. Branches are covered with very small delicate hairs giving the plant a fuzzy appearance. Color is often very iridescent and ranges from a light pink to a deep purple. Common in lower intertidal to deep subtidal reef and rubble habitats.

Amansia glomerata pg. 59
Grows to 15cm tall is bushlike with dark red central stipe and flattened semi-transparent blades 3-7mm wide. Often covered with epiphytic crustose coralline seaweeds giving a pink appearance. Found widespread in shaded areas of almost any habitat.
**Martensia fragilis**

Flat seaweed. Very delicate flat blade, usually iridescent pink, purple or blue colors. Blade may be whole or branched semi-dichotomously. It can be identified by alternating blade and mesh potions. The mesh (similar to lace or gauze) is very delicate and may contain holes from being torn. 1-8 cm tall and common in tidepools and reef flats. Variable color: pink to orange, to blueish iridescence.

**Martensia flabelliformis**

Flat blade is similar in appearance to *Martensia* however, the mesh is much more coarse and is thicker, it resembles gauze. Rather than having alternating mesh and whole blade as does *Martensia*, *Neomartensia* has only a small portion of blade where it attaches to the substrate—the remainder of the plant is mesh. Color is usually pink to orange and can also be very iridescent. Size: 1-20 cm tall, common subtidal and even on deep reefs >80 ft depth.

**Pterocladiella spp.**

Commonly found in tidepools and on reef flats, but can be easily overlooked due to dark green to blackish color. 2cm high with flattened branches.
Algal Functional Groups

- Based on basic morphological form and ecological role

- These functional groups are really communities of algae made up of several species.

Crustose Coralline Algae

Crustose coralline algae are among some of the most important species of algae on a reef. These organisms cement and bind the reef together and are particularly common in high wave energy areas but can also be found throughout all zones on a reef. Crustose corallines resemble pink or purple pavement. There are approximately 20 species in Hawaii and all are members of the Division Rhodophyta. Morphology can range from smooth and flat (left) to rough and knobby (right).

Turf Algae

Small species assemblages that can rapidly occupy and colonize bare substrates. Most common type of food for herbivorous fishes. An algal turf assemblage on a coral reef is often less then a few cm tall but can occupy large areas as is seen in the territorial damselfish *Stegastes fasciolatus* territories and can be composed of over 100 species of green, brown, red or blue-green algae.