Field Guide to Marine Plants/Algae

Acadia National Park
Maine

National Park Service
U.S. Department of the Interior

The rocky coast of Acadia National Park contains many different kinds of marine algae, or seaweeds. These organisms thrive in the dynamic area between the high and low tide marks where the land meets the sea. Seaweeds that grow in the rocky intertidal zone must cope with both aquatic and terrestrial environments to survive.

Most of these algae are adapted to live in a particular part of the shore that is uncovered at low tide, not the entire shore. For example, many seaweeds in the lowest part of the shore live there because they cannot survive the long periods of high temperatures, drying (or freezing), and high light that occur higher on the shore at low tide.

Explore this field guide to algae in the waters surrounding Acadia National Park. The field guide (as well as this text) was developed by Joseph Stachelek and Sarah Hall, students at the University of Maine.

Green Algae

Acrosiphonia arcta This alga grows as a tufted mat in the lower intertidal zone. It looks unusually fuzzy because it has hooked filaments. This alga is a favorite place for small crustaceans to hide to escape drying stress at low tide. Present winter–summer.

Chaetomorpha melagonium grows as a thick, beaded tube. The cells are so large that you can see them with your naked eye. Found in tide pools in the lower intertidal zone. Present winter–summer.

Prasiola stipitata forms a short green turf (< 1 cm) near bird droppings (an excellent source of nutrients) in the upper intertidal zone. Small, individual blades curve like a mouse ear. Present spring–summer.

Ulothrix laetevirens forms slippery, dark-green patches on rocks in the upper intertidal zone. Individuals that make up the patches are unbranched filaments. There is a single, band-shaped chloroplast in each cell. Herds of herbivorous periwinkle snails feed at the edge of patches in spring and work their way inward until the patch disappears. Present winter–early summer.

Ulva lactuca "Sea lettuce" is a flat blade (two cell layers thick) that grows up to 20 cm long. This bright to dark-green sea vegetable is consumed by many invertebrates and also by humans in soups and salads. Blades that have upper white sections have just released reproductive cells; this occurs most often near full and new moons, just after dawn. Ulva lactuca is found in tide pools and in the lower intertidal zone. Present year round, but most abundant in summer–fall.

Ulva intestinalis This alga tolerates low salinity and is found in the upper intertidal zone in pools and areas of runoff. Young individuals are slender blades, whereas older individuals form a tube. Gas bubbles accumulate inside the tube and make it float. Gametes and zoospores are released shortly after dawn near new and full moons. Individuals that have released reproductive cells turn white.






Photos: (left to right, then down)
Acrosiphonia arcta (NPS/Joseph Stachelek)
Chaetomorpha melagonium (NPS/Joseph Stachelek)
Prasiola stipitata (NPS/Susan Brawley)
Ulothrix laetevirens (NPS/Sarah Hall)
Ulva lactuca (NPS/Susan Brawley)
Ulva intestinalis (NPS/Joseph Stachelek)

Brown Algae

Agarum clathratum ("sea colander") is a subtidal kelp, but can be found washed up after storms. This kelp is easily distinguished from Alaria esculenta because Agarum's blade is naturally full of holes in addition to having a thick, central ridge (midrib).

Alaria esculenta is found in the lower intertidal and shallow subtidal zones. It has a claw-like holdfast and a long, undivided blade with a thick ridge (midrib) in the center of the blade. This sea vegetable is economically important as human food. Present year round.

Ascophyllum nodosum ("rockweed") is most abundant on sheltered rocky shores in the mid-intertidal zone of the North Atlantic. This alga makes one air bladder a year, which can be used to determine the age of the alga. Orange receptacles (males) and green receptacles (females) release sperm and eggs on 1-2 spring tides in late May and early June, sometimes causing the water to turn orange. Present year round.

Desmarestia viridis Sometimes called "sourweed," stores sulfuric acid within its cells, which may keep this alga from being eaten. However, sea urchins feed on it during calm seas. Desmarestia viridis is a subtidal alga that is also found in the lowest part of the intertidal zone. If exposed too long during a hot, dry low tide, leaks sulfuric acid and turn this brown seaweed into a limp, green mess. Present winter–late spring.

Elachista fuciola This brown alga is often found growing in the mid-intertidal zone on other macroalgae, such as Fucus distichus ssp. edentatus. This alga grows up to 2 cm high from a basal cushion and consists of unbranched filaments. Present year round.

Fucus distichus ssp. distichus is a small rockweed that is found in tide pools in the upper intertidal zone. This alga survives under the ice when tide pools freeze in winter. It reproduces in winter and spring. Present year round.

Fucus distichus ssp. edentatus is found in the lower intertidal zone of rocky shores. The elongated tips (receptacles) are reproductive tissue containing eggs and sperm. All rockweeds contain high concentrations of tannins, which makes them taste badly to herbivores. Present year round.

Fucus spiralis This species of Fucus develops a ridge of tissue around the inflated branched tips (reproductive tissue, containing eggs and sperm). This rockweed lacks the paired air bladders found in F. vesiculosus. Fucus spiralis is found in the high intertidal zone of rocky shores in the North Atlantic and is reproductive during summer. Present year round.

Photos: (left to right, then down)
Agarum clathratum (NPS/Sarah Hall)
Alaria esculenta (NPS/Sarah Hall)
Ascophyllum nodosum (NPS/Susan Brawley)
Desmarestia viridis (NPS/Susan Brawley)
Elachista fuciola (NPS/Joseph Stachelek)
Fucus distichus ssp. distichus (NPS/Susan Brawley)
Fucus distichus ssp. edentatus (NPS/Joseph Stachelek)
Fucus spiralis (NPS/Susan Brawley)

Brown Algae continued

Fucus vesiculosus This rockweed dominates the mid-intertidal zone of moderately wave-exposed, rocky shores. Fucus vesiculosus often has paired air bladders, and individuals are dichotomously branched. However, individuals in the most exposed habitats sometimes lack paired air bladders. Rockweeds release gametes under calm, sunny conditions at high tide. Present year round.

Laminaria digitata This kelp is found in subtidal beds, but can be observed in tide pools in the lower intertidal zone. Dark stripes on Laminaria digitata are patches of sori, which contain specialized reproductive cells called zoospores. The bladed form is only half of the kelp life history, and the other half is filamentous and microscopic and produces eggs and sperm.

Leathesia difformis ("rat brains") is a hollow ball that commonly grows in groups of individuals in the lower intertidal zone. Present late spring–summer.

Saccharina latissima ("sugar kelp") has a leathery, undivided blade that is about 2 to 5 meters long. This kelp forms a substantial belt below the intertidal zone and is an important habitat and food source for animals such as sea urchins. Saccharina can be found in lower intertidal pools and on extremely low tides. Kelps are economically valuable as food and sources of alginate (a thickener in many foods, toothpaste etc.). Present year round.

Scytosiphon lomentaria are tubular algae that are constricted at intervals. This alga is found in the lower intertidal zone. Present winter–early summer.

Photos: (left to right)
Fucus vesiculosus (NPS/Susan Brawley)
Laminaria digitata (NPS/Sarah Hall)
Leathesia difformis (NPS/Joseph Stachelek)
Saccharina latissima (NPS/Sarah Hall)
Scytosiphon lomentaria (NPS/Sarah Hall)

Red Algae

Ahnfeltia plicata This lower intertidal alga has stiff and wiry branches. A few red algae are the sole source of agar, a gel-like polysaccharide that is widely used in hospitals and research laboratories to grow bacteria. Although not a commercial source, Ahnfeltia plicata contains agar in its cell walls, giving it a characteristic texture. Present year round.

Bangia fuscopurpurea is an unbranched filament that is found in masses high in the intertidal zone. These red algae have fossils that date to 1.2 billion years old and are among the oldest known fossils of advanced (eukaryotic) multicellular organisms. Present winter–spring.

Ceramium rubrum has pincers on the ends of its filamentous branches that can be seen with the naked eye. This red alga is abundant in the lower intertidal zone. Present nearly year round.

Photos: (left to right)
Ahnfeltia plicata (NPS/Joseph Stachelek)
Bangia fuscopurpurea (NPS/Sarah Hall)
Ceramium rubrum (NPS/Joseph Stachelek)

Red Algae continued

Chondrus crispus This red alga ("Irish Moss") is found in the lower intertidal and shallow subtidal zones. It is a common source of carrageenan and is still harvested commercially on Prince Edward Island (Canada). The polysaccharide carrageenan is extracted from cell walls and forms a gel that is used commercially as a thickener (e.g., in ice cream). Chondrus turns white when exposed to freezing low tides in winter or very hot low tides in summer. Present year round.

Corallina officinalis is found in the lower intertidal zone, especially in tidepools. It feels hard because it is calcified; calcification may prevent herbivores from eating the alga, and calcification is hypothesized to increase photosynthesis. Calcifying algae are under threat from increasing acidity in oceans due to carbon emissions from cars and factories. Present year round.

Cystoclonium purpureum This red alga is found in the lower intertidal and shallow subtidal zones and is most abundant in summer. Cystoclonium purpureum sometimes grows on other coarse algae and is shown here on a bed of Corallina officinalis (see entry for Corallina). Present year round.

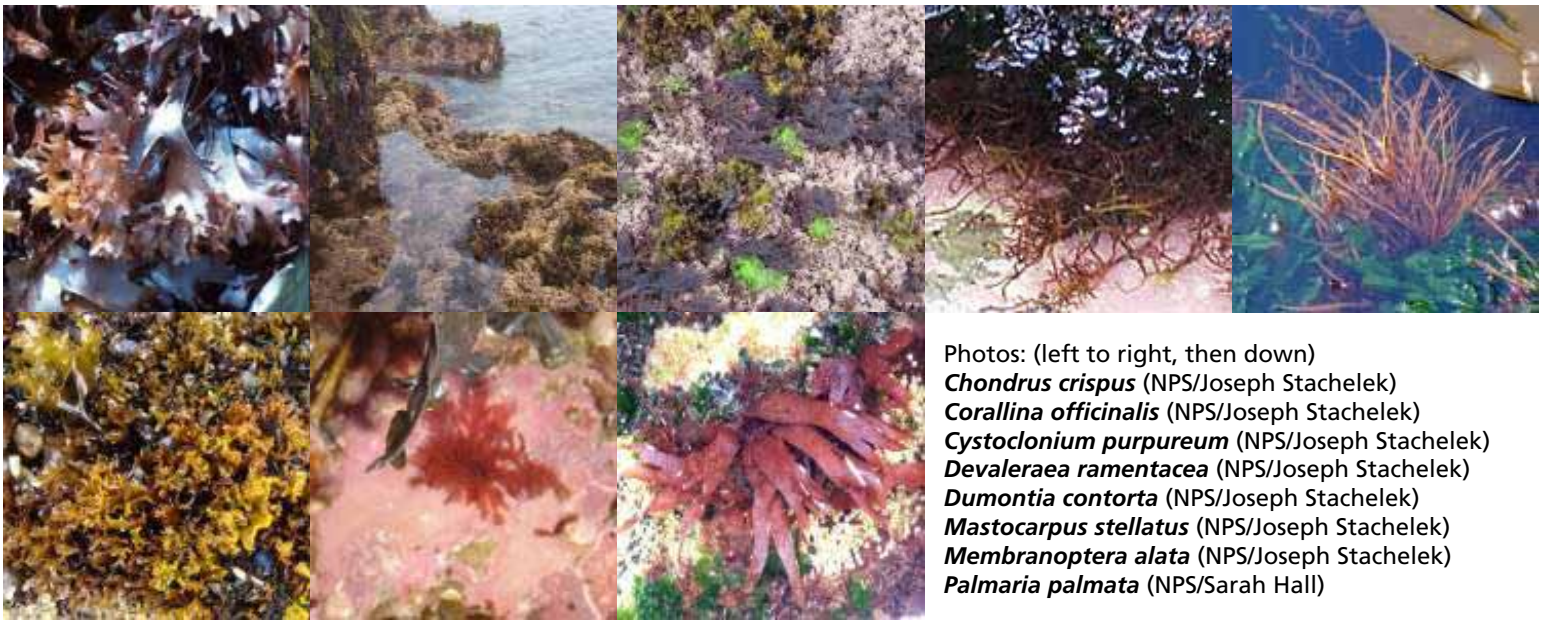
Devaleraea ramentacea is only able to survive in waters that are colder than 15°C. This alga becomes abundant in the lower intertidal (including tide pools) and in shallow subtidal zones. Common in winter-late spring.

Dumontia contorta can be identified by its overall twisted structure. This alga is most abundant in tide pools and the lower intertidal zone. Present winter–late spring.

Mastocarpus stellatus looks similar to Chondrus crispus but has higher tolerances to physical stresses, including freezing and drying. Consequently, it is most abundant near the borders of the mid- and low intertidal zones. It also grows in pools in the high intertidal zone. Females of Mastocarpus stellatus are typically covered with distinctive bumps, giving the blades a rough texture. Present year round.

Membranoptera alata grows as small, flattened, and alternately branched blades with distinctive midribs. Reproductive in winter to spring, this alga can be found growing in tide pools and in the shallow subtidal zone. The dark balls on the blade are reproductive structures called tetraspores. Present year round.

Palmaria palmata ("dulse") is a traditional food in maritime North America that is used in condiments, soups, and appetizers. Dulse is found in the lower intertidal and shallow subtidal zones. Sometimes it grows on other algae. Present year round.



Photos: (left to right, then down)
Chondrus crispus (NPS/Joseph Stachelek)
Corallina officinalis (NPS/Joseph Stachelek)
Cystoclonium purpureum (NPS/Joseph Stachelek)
Devaleraea ramentacea (NPS/Joseph Stachelek)
Dumontia contorta (NPS/Joseph Stachelek)
Mastocarpus stellatus (NPS/Joseph Stachelek)
Membranoptera alata (NPS/Joseph Stachelek)
Palmaria palmata (NPS/Sarah Hall)

Red Algae continued

Plumaria plumosa is characterized by delicate branching. The Latin word "plumosa" describes this species as feathery. This red alga is found in the lower intertidal zone and tide pools. Present year round.

Polysiphonia lanosa is a branched, filamentous alga that is very common in the mid-intertidal zone growing on Ascophyllum nodosum. Dark balls (see microscopic photograph) found in several upper branches of this alga are reproductive structures called tetraspores. Present year round.

Polysiphonia stricta This delicately branched alga is found in lower intertidal and tide pool habitats. Every branch has an inner, straw-like filament (see microscopic photograph). Present in winter–spring.

Porphyra amplissima grows up to a meter long and is found in the low intertidal and shallow subtidal zones. In Asia, other Porphyra ("nori") species are important aquaculture crops; nori harvested for human food is worth about $1.2 billion a year. Present spring–early summer.

Porphyra umbillicalis ("purple laver," "nori") is most common in the mid-intertidal zone. Its irregularly-shaped, reddish-brown blade is edible. Porphyra umbilicalis is very resistant to drying during low tide and contains natural UV sunscreens. This red alga turns green in summer because of low nutrients and exposure to temperatures above its tolerance level at low tide. Present year round.

Rhodomela confervoides The upper portions are densely branched. When present, this red alga is common in tide pools. It contains bromophenols, which are compounds that have antibacterial properties. The scale bar to the left of the photo is 7 cm long. Present late winter–mid-summer.

Photos: (left to right, then down)
Plumaria plumosa (NPS/Joseph Stachelek)
Polysiphonia lanosa (NPS/Joseph Stachelek)
Polysiphonia stricta (NPS/Joseph Stachelek)
Porphyra amplissima (NPS/Joseph Stachelek)
Porphyra umbillicalis (NPS/Joseph Stachelek)
Rhodomela confervoides (NPS/Joseph Stachelek)

Benthic Diatom

Navicula sp. is a tube-dwelling diatom that is particularly abundant in spring from the high to the lower intertidal zone. The outer covering of each diatom, which is a single cell, is made of two silica valves ("shells"); diatoms live in "glass houses." This diatom often fools experts, because it can look like a filamentous brown alga.

Photos:
Navicula sp. (NPS/Sarah Hall)