

Lesson 1: Salish Sea Seaweeds

Subject

Algae Identification and Adaptations

Materials/Teacher Preparation

- Assorted Pacific Northwest algae species (one labelled example set)
- [Printed algae keys](#) with added scientific names
- Reference books and field guides on algae identification
- Optional: Live tank with clams and oysters and dissected oyster
- [Powerpoint](#)
- Have space on the board with a table for students to record species identified:

Chlorophyta (green, chlorophylls)	Phaeophyta (brown, carotenoids)	Rhodophyta (red, phycobilins)

Size/setting/duration

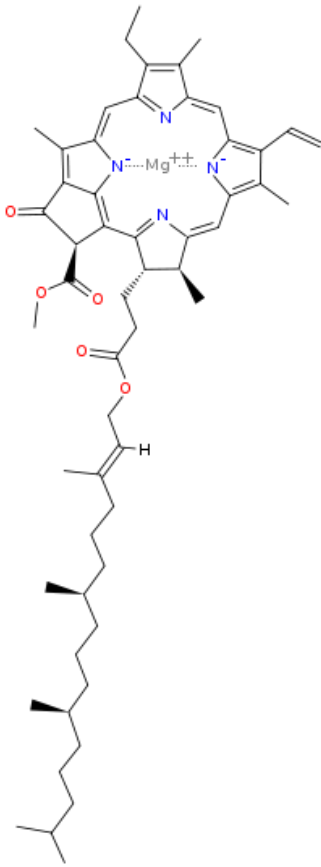
Full Class/Indoor/50 minutes

Background

Both algae and plants use photosynthesis to create energy, although plants have roots, stems, and some form of vascular tissue (veins in leaves) and algae do not. Algae can vary widely, but we tend to group the larger species into “seaweeds”. Seaweeds can be divided into three major groups based on the pigment of their photosynthetic cells: Chlorophyta (green), Phaeophyta (brown), and Rhodophyta (red). Algae contain different pigments that absorb different wave-lengths of light depending on their chemical structure.

Green seaweeds (Chlorophyta)

Green seaweeds, like plants, get their color from the presence of chlorophyll. Their phylum, Chlorophyta, takes its name from it.



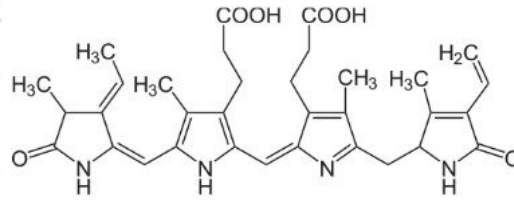
Wikipedia <https://en.wikipedia.org/wiki/Chlorophyll>

Red seaweeds (Rhodophyta)

Red seaweeds, have characteristic accessory pigments than chlorophyll, notably phycobiliproteins. The two main types are phycoerythrin (red) and phycocyanin (blue). The combination of the two results in a wide spectrum of colors, from deep red to electric blue.

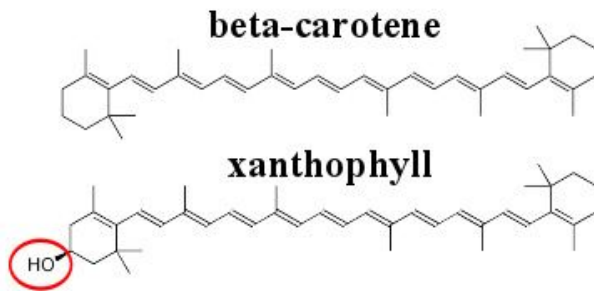
FUNCTION

- Phycoerythrin is an accessory pigment to the main chlorophyll pigments responsible for photosynthesis.
- The light energy is captured by phycoerythrin and is then passed on to the reaction centre chlorophyll pair, most of the time via the phycobiliproteins phycocyanin and via allophycocyanin
- R-Phycoerythrin and B-Phycoerythrin are among the brightest fluorescent dyes ever identified



Brown seaweeds (Phaeophyta)

Brown seaweeds get their color from another type of pigment, carotenoids. Among them, fucoxanthin is the most common. Other molecules, notably phlorotannins, similar to the tannins in wine, can influence their color as well.



<https://www.daviddarling.info/encyclopedia/C/carotenoid.html>

References:

[Algal Pigments Structure and Function Slideshow](#)

[Photosynthesis and Light Absorbing Pigments](#)

[Algae General Characteristics Slideshow](#)

[Photosynthetic Pigments](#)

Overview

Students will:

- *Identify common Pacific Northwest algae by morphological characteristics and the ecological role of photosynthesis.*

- *Describe the external and internal anatomy of common Pacific Northwest shellfish and finfish species, with an emphasis on physiological adaptations.*

Procedure

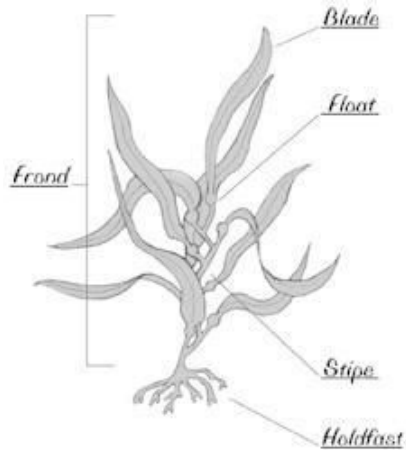
- Each table should be set up with a set of seaweed samples and keys for students to use.
- Land Acknowledgement: Let's take a moment to recognize where we are. The Coast Salish Peoples have a saying "when the tide is out, the table is set." The Coast Salish People rely on natural resources of the Salish Sea and have been stewards of this land and the traditional and customary fishing grounds for thousands of years and these resources continue to be used today.
- (10 min) ([Powerpoint here](#)) Start the class by explaining where the samples were taken from and some basics of the key that they will be using. Explain the three main groups of algae including the differences in their pigments and how they are adapted to different depths.
- (30 min) Students will key out the different species on the table and create a scientific drawing of at least two species with the features that they used to identify the species labeled. Students should work in groups to compare and confirm the identification and label each sample before leaving class. Identification should be confirmed using reference materials and a sample that has been keyed out by the teacher. Each group should add to a species list on the board.
- (5 min) Ask students for some of the adaptations that they observed and how they may help the organism live in the intertidal zone.

Next Generation Science Standards

Performance Expectations		
HS-LS1 From Molecules to Organisms: Structures and Processes Develop and use a model to illustrate the hierarchical organization of interacting systems that provide specific functions within multicellular organisms.		
Scientific and Engineering Practices	Disciplinary Core Ideas	Cross-cutting Concepts
Developing and Using Models	LS1.A: Structure and Function	System and System Models

Other Standards

Graphics



Algae Types and Scientific names

Red – Rhodophyta

Green – Chlorophyta

Brown – Phaeophyta

Vocabulary

- Chlorophyta - Green seaweeds
- Phaeophyta - Brown seaweeds
- Rhodophyta - Red seaweeds

Extension

- Extension questions for students to discuss/write about include:
 - Form and Function: Algae's structure differs from that of terrestrial (land) plants. Name one major difference in structure and explain how it works in the life cycle of the algae.
 - Communities: Algae plays an important role in environmental communities. Evaluate this importance and describe what role algae plays in the success of intertidal animal and plant communities.
 - Food Connections: Many creatures in the intertidal eat algae as a primary part of their diet. List two and describe what method they use to eat it.
 - Observe the dissection of the oyster. What color was the gut? Based on this, what do you think the main food source of oysters are?
 - Students can also use a biodiversity calculator [here](#) or [here](#) to determine the biodiversity from the species data that the previous class collected. This can also be used for GSSC or [MRC clam survey data](#). GSSC clam survey data powerpoint [here](#).

Worksheet

Students should put work in science notebooks. Each student should have at least two labelled scientific drawings.

Resources

- [Seaweeds of the Pacific Northwest, A Guide to Identifying 25 Seaweeds of the Washington Coast](#)

- [Sound Water Stewards EZ ID Guide](#)
- [Algae Dichotomous Key \(4th Grade\)](#)
- [NOAA Fisheries Kelp Forest](#)
- [Whatcom MRC Bull Kelp Monitoring](#)