

An underwater photograph of a seaweed forest. The water is clear and blue. A large, semi-transparent white number '7' is overlaid on the right side of the image. The seaweed is green and brown, with long, thin blades and some thicker, upright stems.

Have You Wondered?

1. What features distinguish the several groups of seaweeds?
2. Aside from primary production, what role seaweeds and plants play in the ocean?
3. How seaweeds and plants are distributed by depth, geography, and time?
4. What adaptations have allowed flowering plants, especially seagrasses, to invade the sea?
5. How coastal populations historically and societies today have made use of seaweeds and marine plants?

Multicellular Primary Producers

Multicellular Primary Producers



- Most of the primary production in marine ecosystems is done by phytoplankton, but seaweeds and flowering plants also contribute, especially in **coastal habitats**.
- Not only do coastal seaweeds and plants provide food directly to herbivores, but their decaying parts are **a significant source of detritus for detrital food chains**.
- In addition to their role as **primary producers**, these organisms **provide habitats for other marine organisms**. They define the structure of coastal marine communities and may be initial colonizers of disturbed areas.
- Marine flowering plants **keep the water clear** by trapping sediments, and their root systems stabilize the bottom sediments.

Seaweeds



(a)

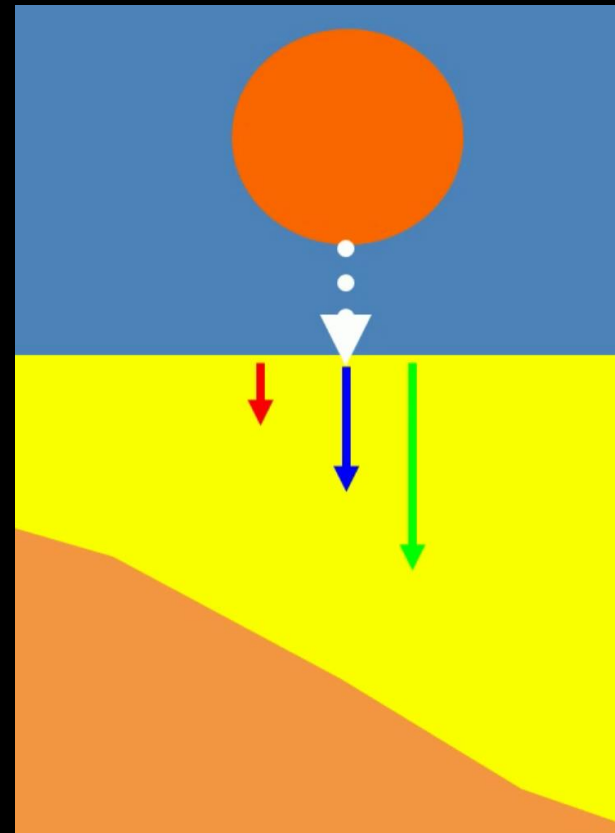
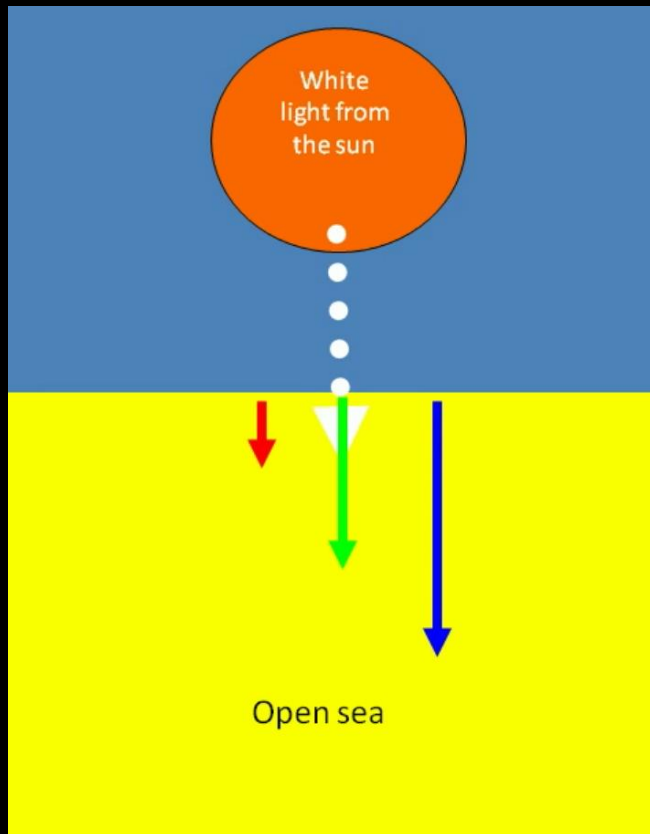


- Seaweeds inhabit about 2% of the seafloor.
- The environmental factors that are most influential in governing the distribution of seaweeds are light and temperature.
- The areas of the world most favorable to seaweed diversity include both sides of the North Pacific Ocean, Australia, southwestern Africa, and the Mediterranean Sea.

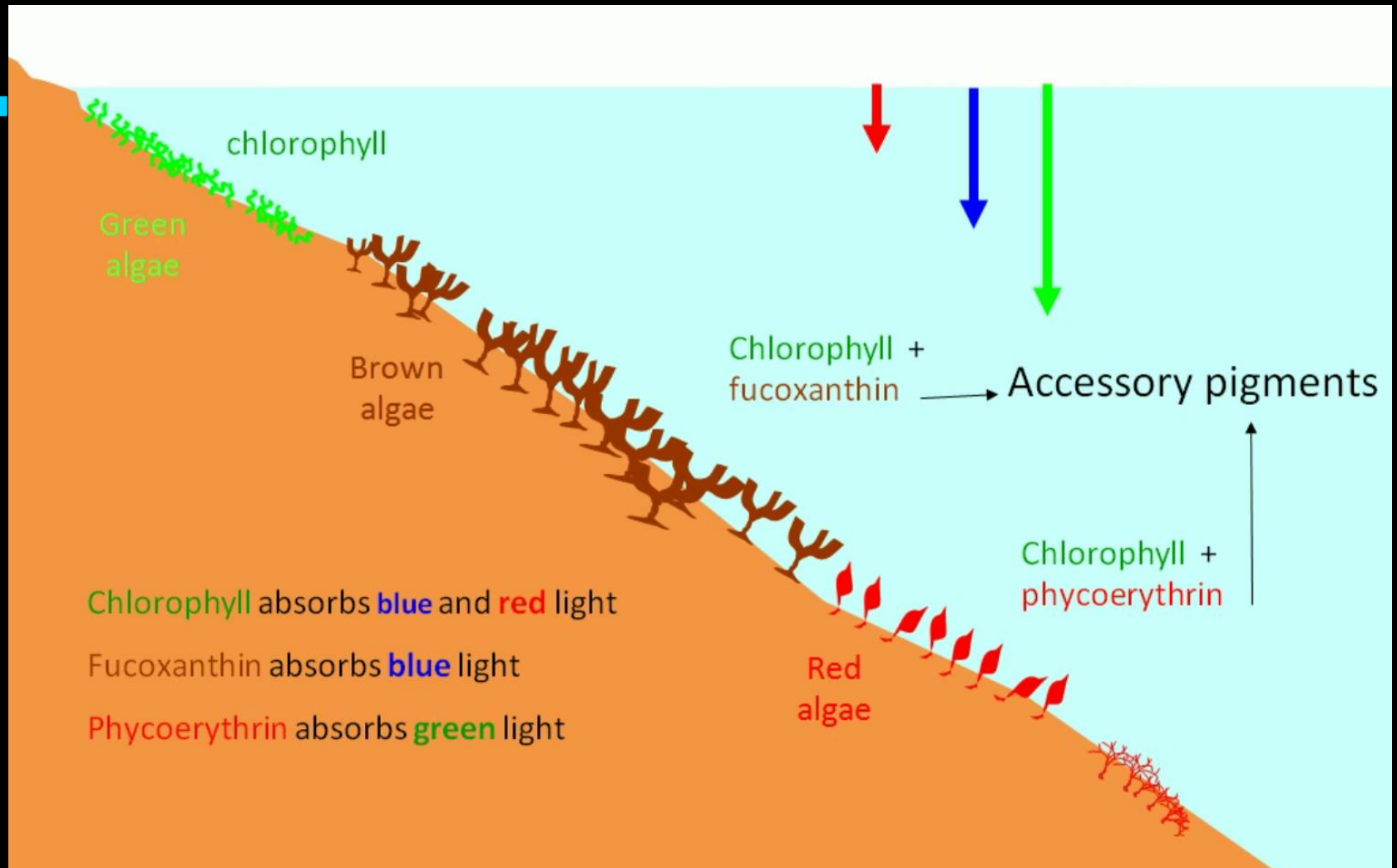
Effects of Light on Seaweed Distribution



- Chromatic adaptation, right or wrong? (From 1883)



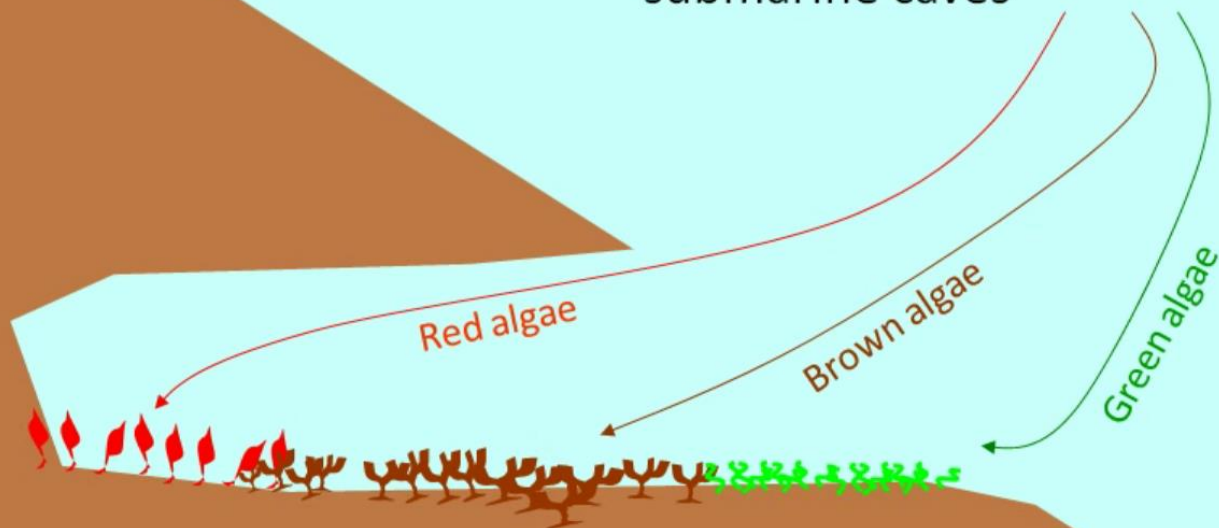
Effects of Light on Seaweed Distribution



Effects of Light on Seaweed Distribution



Diving ecologists noticed the same pattern in submarine caves



Quantity of light is more important than Color

Effects of Light on Seaweed Distribution



(a)



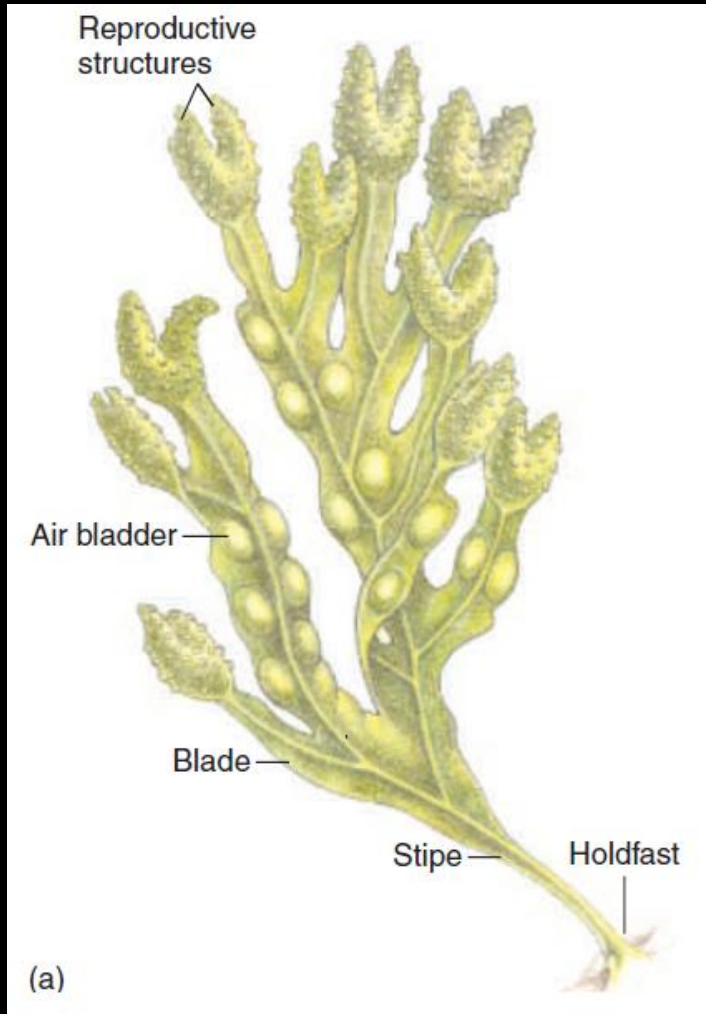
- In general, the distribution of seaweeds by depth is not explained by their possession of different combinations of photosynthetic pigments (the chromatic adaptation hypothesis).
- Instead, zonation is explained by the responses of seaweeds to competition, herbivory, and physiological tolerances to many climatic factors.

Effects of Temperature on Seaweed Distribution



- Temperature affects the distribution of seaweeds. The greatest diversity of algal species is in tropical waters. Farther north or south of the equator, the number of species decreases, and the species themselves are different.

Structure of seaweeds



- The seaweed body is called the *thallus*. All cells of the thallus are photosynthetic.

Biochemistry of seaweeds



- Photosynthetic Pigments
- Composition of Cell Walls
- Nature of Food Reserves

Green Algae

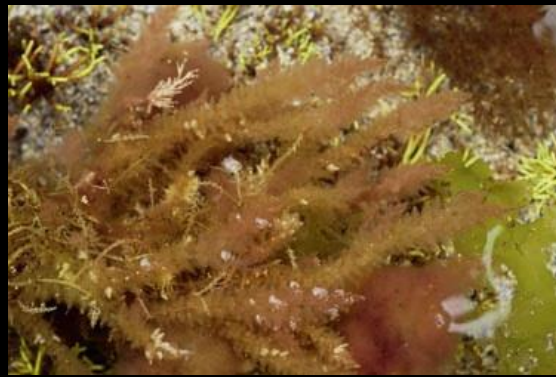
- Green algae are important as seasonal sources of food for marine animals. They also contribute to the formation of coral reefs. Green algae exhibit a rapid growth response to the presence of high levels of nutrients in polluted, near-shore waters and as such are members of fouling communities.



Red Algae

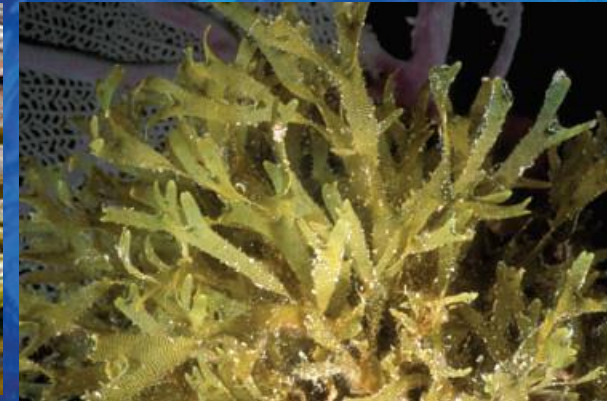


- Red Algae, in contrast to green algae, are primarily marine organisms. About 98% of the 6,000 species are marine, which means that red algae have the highest diversity among the seaweeds. Although they are most diverse in tropical oceans, they can also be found as significant ecological components at higher latitudes. Red algae are mostly benthic in distribution.



Brown Algae

- With rare exception, they are benthic.
- Brown algae range in size from microscopic, filamentous forms to the



coastlines of high latitudes than in the tropics. The majority of brown algae are found from the low tide line to a depth of about 10 meters



Kelp forest



- The larger forms, the kelps, grow so profusely that they form offshore kelp forests. These forests are very efficient at capturing sunlight and are extremely productive. They are home to a diverse group of marine animals, including sea urchins, fishes, crustaceans, molluscs, sea lions, sea otters, and many more.

Kelp forest



In Summary



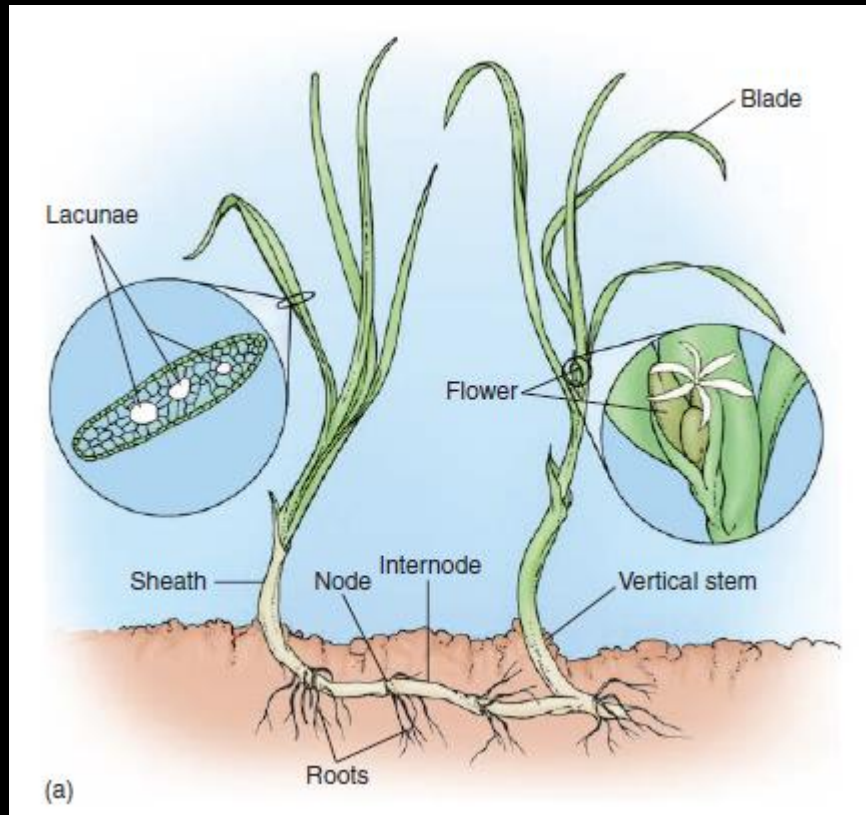
- Multicellular marine algae (seaweeds) are mostly benthic organisms. Their division into three major groups (red algae, brown algae, and green algae) is based on the photosynthetic and photoprotective pigments they contain.
- Red algae are the most diverse group of seaweeds and are widespread in the tropics. Most brown algae can be found along continental shorelines. Green algae are found in shallow coastal waters.
- Algae are a food source for many organisms, including humans, and they provide a habitat for many species.

Marine Flowering Plants



- Kelp beds are defined by the presence of the kelp, which establish the structure of the bed and which influence interactions among other inhabitants. Similarly, three other marine habitats are defined by their dominant plants: seagrass beds, salt marshes, and mangrove forests.

Seagrass



- Primary Producers
- Depositing and Stabilizing Sediments
- Habitat

Seagrass meadow



Mangro



The sea pencil



Mangrove



Points



Seaweeds and marine plants are confined to shallow water because they are limited mainly by

- A. Light
- B. Herbivores
- C. Pressure
- D. Temperature
- E. Minerals

Points



A type of brown alga that grows quite large and forms undersea forest is

- A. Sargassum weed
- B. Irish moss
- C. Kelp
- D. Rockweed
- E. Sea lettuce

Points



Each of the following is an important ecological role of marine plants except

- A. Improving water clarity
- B. Trapping nutrients
- C. Stabilizing bottom sediments
- D. Fixing nitrogen
- E. Providing a habitat

Points



Seaweeds and marine plants share all of the following except

- A. Chlorophyll a
- B. Cellulose
- C. Vascular tissue
- D. Alternation of generations
- E. A role as primary producers