Lesson: Dinoflagellates

Members of another protist group often found near the ocean's surface are the dinoflagellates. They are classified in phylum Pyrrophyta, which means "red (or fire) algae."

How do dinoflagellates compare with diatoms? Dinoflagellates have two flagella. A flagellum (singular) is a microscopic hairlike structure. Each flagellum whips back and forth, helping to move the dinoflagellate along, although it still floats with the currents. In contrast, diatoms are not able to propel themselves at all; instead, they are just pushed along by the movement of water.

Dinoflagellates also possess chloroplasts and, like diatoms, are able to make and store their own food. Many dinoflagellate species have an eyespot that is sensitive to light. They use the eyespot to move toward the light, thus increasing their ability to make food. Unlike diatoms, dinoflagellates are also able to take in food. In this way they resemble the euglena, a freshwater protist that is able both to make food and to ingest it. The cell walls of dinoflagellates and diatoms differ in structure and composition. Notice the plates and grooves of the dinoflagellates. Dinoflagellate cell walls are made of cellulose like those of plants, not of silica like those of diatoms. A cellulose cell wall is not as transparent as a diatom's glassy cell wall.

Effects of Dinoflagellates

Some dinoflagellates, like Noctiluca (meaning "night light"), are rather spectacular for so small an organism. Have you ever run your fingers through the ocean water at night and seen it sparkle? In places where many Noctiluca are present, the water will glow in the dark when it is disturbed mechanically. The movement of a boat propeller or the splashing of fish can cause the Noctiluca to emit a greenish-blue light. This ability of an organism to produce light, called bioluminescence, is also seen in a few other species of phytoplankton and in some deep-sea fishes as well.

Another interesting, although unpleasant, phenomenon associated with dinoflagellates is the red tide. Suddenly, with no warning, some shallow coastal waters turn red during the summer. At the same time, many hundreds of fish die; this is called a fish kill. When the water is analyzed, marine biologists find large numbers of a dinoflagellate that belongs to the genus Gymnodinium. This dinoflagellate contains a pigment that produces the red color in the water. Powerful toxins (poisonous substances produced by living things) made by these organisms accumulate in shellfish such as clams and mussels, which eat the algae and then poison the other organisms that eat them, such as fish, marine birds, and even humans. The algal bloom also reduces oxygen levels in the water, which further contributes to the fish kill.

Another dinoflagellate that produces a red tide belongs to the genus Gonyaulax. This organism causes paralytic shellfish poisoning, which leads to illness and death in fish and in humans. Gonyaulax contains a toxic substance called saxotoxin. This toxin interferes with the functioning of the nervous system in vertebrates. Saxotoxin is transferred from

one organism to another during feeding. For example, mussels feed on Gonyaulax in the water. The mussels are not affected by the saxotoxin, but it accumulates in their body tissues. People who eat mussels that are contaminated by saxotoxin become sick and may even die.