

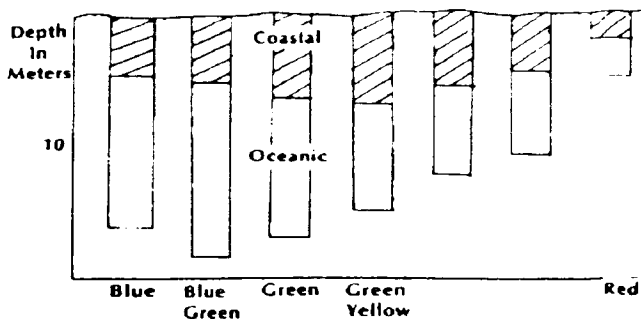
Activity 6

Catching Invisible Drifters

Introduction: Plankton consists of plants and animals that drift around on ocean currents. Plankton are abundant in the surface waters where sunlight and nutrients are readily available. Plankton is well adapted for drifting around on ocean currents. Most members of the plankton are transparent, making them difficult for predators to see. Some plankton produce oil droplets in their bodies to aid with flotation. Some animals (barnacles and crabs) hatch their larval young into the nutrient-rich plankton to ensure adequate food supply. Phytoplankton consists of microscopic plants that convert sunlight and nutrients into starch and organic materials. Not only does phytoplankton form the base of the ocean food chain, they also play a role in absorbing dissolved CO₂ from the atmosphere during photosynthesis.

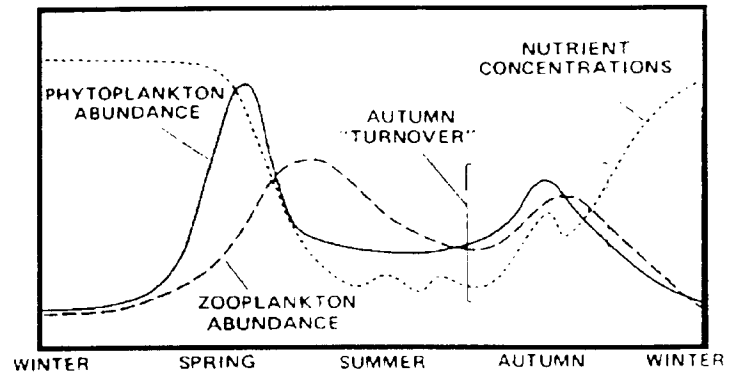
Did You Know...

Photosynthesis is possible only when the light reaching the phytoplankton is above a certain intensity? Phytoplankton is limited to the uppermost layers of the ocean (**photic zone**) where light intensity is sufficient for photosynthesis to occur. Sunlight, as it arrives at the oceans surface, is composed of a spectrum of wavelengths. This spectrum includes all visible colors ranging from violet to red. As these wavelengths enter into the sea water, the violet and red components are quickly absorbed by the water. The green and blue wavelengths are absorbed less rapidly and penetrate the deepest. In coastal waters the depth of light penetration is shallow because of the high number of suspended particles. The amount of light is insufficient for photosynthesis to occur below a few meters. In contrast, oceanic waters contain few interfering particles and light intensity may be sufficient for photosynthesis down to 100-150 meters.



Light penetration in coastal versus oceanic waters. Note that red wavelengths are least able to penetrate the water column, while the blue green wavelengths reach the deepest depths

The Challenge: See if you can predict what kinds of plankton you will collect on the day of your program. Use the clues provided in the text and the life history descriptions of plankton on the reverse side to make your prediction. You will need to refer to your weather predictions from *Activity 5* to complete your plankton predictions. Draw your samples in the petrie dishes provided on the reverse side.



Did You Know...

Temperature is a critical factor in determining plankton productivity in the ocean? The amount of light and solar energy varies seasonally in the waters off Dana Point affecting the thermal structure of the water column.

Winter: Low productivity occurs because of low light levels due to the low position of the sun on the horizon. Winter storms mix the water column carrying phytoplankton cells below critical depth for photosynthesis.

Spring: high productivity occurs because nutrients have been replenished in the upper layers of the water column from winter mixing. Increased light and solar energy increase the temperature of the upper layers preventing phytoplankton cells from being cast below the critical depth for photosynthesis.

Summer: Low productivity occurs because nutrients are rapidly depleted by phytoplankton in the upper water layers and no mixing occurs. The upper layers of the water column continue to heat up from high sun intensity and longer days creating an impenetrable barrier to the lower nutrient rich waters.

Fall: high productivity may occur because the sun intensity is less and the days are shorter, cooling the upper water layers. Thermal stratification begins to break up and nutrients are returned to upper layers of water. If calm weather alternates with mixing and phytoplankton cells are not carried below the critical depth, a bloom will occur because of increased nutrients.

Research Application: The Orange County Marine Institute, along with researchers with the State of California Department of Health, sample plankton weekly to monitor the relative abundance of two species of phytoplankton (the diatom *pseudonitschia*, and dinoflagellate *Alexandrium catenella*) that are potentially hazardous to human health. Both produce toxins that accumulate in tissues of filter feeding shellfish. When ocean conditions are optimal, many species of phytoplankton "bloom" blanketing the ocean surface. "Red tides" are a type of phytoplankton bloom. If relative abundances of either of these two species are high, then the health department will post a quarantine on mussels, scallops and other filter feeding shellfish.