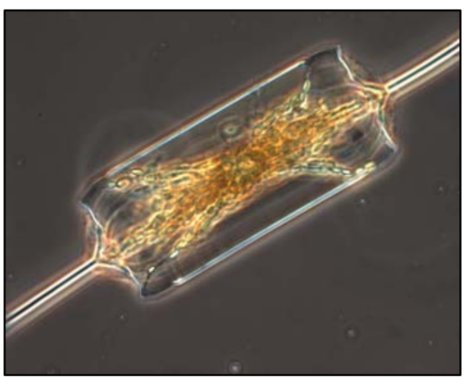
Southeast Phytoplankton Monitoring Network
Promoting a better understanding of Harmful Algal Blooms by way of Volunteer Monitoring
Partnering With: D H E C · Sea Grant

What are Phytoplankton?

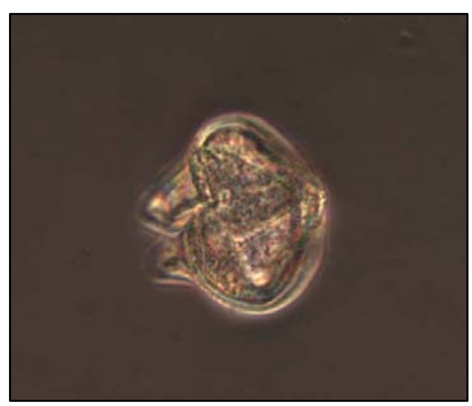
Marine phytoplankton are special and unique organisms that play a major role in our environment. These fascinating organisms provide numerous benefits to the atmosphere and other plants, animals, fish, marine mammals, and humans. But first, let's learn more about what are phytoplankton.

Phyto- comes from the Greek word *phuto*- meaning plant. Plankton is also based on a Greek word, *planktos*, which means wandering or drifting. The definition of phytoplankton is drifting or wandering plants. These organisms are single-celled and are normally microscopic (less than 100 microns in diameter). A micron is a millionth of a meter; 1000 microns is a millimeter. The average diameter of human hair is 80 microns.

Like land plants, phytoplankton utilize photosynthesis to produce their own food. Various factors can promote or inhibit phytoplankton growth: sunlight, salinity, temperature, pH, tides, currents, and nutrients such as nitrogen, phosphorus, carbon, silica, iron, and more. Phytoplankton are found in just about any type of water – fresh, brackish, estuarine, and salt. You can even sometimes find fossilized phytoplankton in various soils. There are many different types of phytoplankton. The two most common types in the marine environment are dinoflagellates and diatoms.



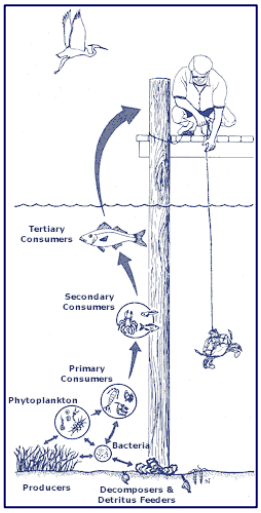
Diatoms are a class of algae which have a siliceous skeleton called a **frustule**. The "glass housing" and other physical characteristics such as pores, valves, spines, and processes aid diatoms in creating more surface area to help stay them afloat at the water surface. They are mostly non-motile; however, some have limited movement by secreting a sugary mucous-like substance from a longitudinal groove called a **raphe**. Diatoms are **autotrophic** (photosynthetic) and are limited to the **photic** zone (area of water where sunlight penetrates). Individual diatom cells range 20-200 microns in diameter or length; some are solitary and others form long chains.



Dinoflagellates are a class of algae that are characterized as having two **flagella** (long whip-like structures used for locomotion). The **transverse** flagellum encircles the body of dinoflagellates like a belt (often in a groove called the cingulum); the **longitudinal** flagellum is perpendicular to the transverse flagellum and acts as a tail or rudder. The two flagella work together to help the dinoflagellates move forward and spin. Some dinoflagellates have an **eye spot**, an organelle that senses light. The cell wall of many dinoflagellates is divided into plates or armor of cellulose known as a **theca**. Some dinoflagellates are **heterotrophs** (eat other organisms) and some are autotrophs

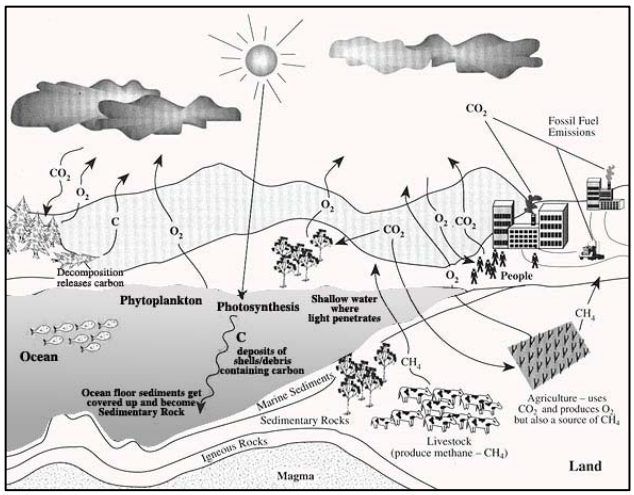
(photosynthetic). The majority of dinoflagellates are in the marine environment and some can produce a toxin that can adversely affect fish, shellfish, sea birds, marine mammals, and humans.

Benefits of Phytoplankton:



Marine phytoplankton are very beneficial to the environment. These organisms are the start of the marine food web. Zooplankton (microscopic drifting or wandering animals) feed on phytoplankton and small fish then feed on the zooplankton. The small fish are eaten by larger fish, sea birds, and larger marine animals. Plankton are also filtered through shellfish for food.

Phytoplankton are important in maintaining the global carbon cycle. During photosynthesis, phytoplankton uses carbon and returns oxygen to the water and atmosphere. When plankton die, the organism sinks to the bottom of the ocean taking the carbon with them, thus creating a “carbon sink” in the ocean. The amount of oxygen released into the atmosphere by phytoplankton is estimated to be around 50%! That means half of the air we breathe comes from phytoplankton.



There are many other economic benefits to phytoplankton as well. Many natural products are made by using phytoplankton and other marine algae: toothpaste, cosmetics, lotions, foods such as breads, pastries, ice cream, milk, and cheese, cement, polish, fertilizers, pool filters, pharmaceuticals, and many more.

Finally, phytoplankton are a good indicator of environmental change. Usually, phytoplankton will asexually reproduce once every 48 hours by dividing into 2 new individuals. However, if environmental conditions are perfect (i.e. sunlight, temperature, salinity, etc…), phytoplankton can double the rate of reproduction in the same time period. This sudden and massive growth of phytoplankton cells is called a **bloom**. Sometimes a bloom can discolor the water red, brown, pink, orange, or any other color. If the bloom is harmful to other plants, animals, or humans, then it is called a harmful algal bloom (HAB).