Student Reading – *An introduction to Plankton in the Chesapeake Bay*

The following is an excerpt from The Chesapeake Bay Program website (*http://www.chesapeakebay.net).*

What are plankton?

The name plankton, is derived from a Greek word that means "wanderer" or "drifter". Plankton are ubiquitous in almost all aquatic environments. Plankton are subject to the movements of the water in which they live for example, marine plankton are at the mercy of ocean currents.

Plankton is any organism, plant (Figure 1) or animal (Figure 2), which lives either part (meroplanktonic) or all (holoplanktonic) of its life in the water column. Plankton ranges in size from a single-celled organism to a large multicellular organism like a jellyfish.

What types of plankton live in the Chesapeake Bay?

Plankton can be divided into three major classes: phytoplankton; zooplankton; and bacteria and viruses.

Phytoplankton (Phyto – meaning "plant")

Major groups of phytoplankton in the Chesapeake Bay include:

- Diatoms (Bacillariophyta)
- Golden brown algae (Chrysophyta)
- Green algae (Clorophyta)
- Blue-green algae (Cyanophyta)
- Dinoflagellates (Pyrrophycophyta)
- Cryptomonads (Cryptophyta)
- Microflagellates (Prasinophyta, Euglenophycota, Protozoa)

Figure 1. Diatom (Bacillariophyta). Note the cell extensions - an adaptive method to increase surface area and thus decrease sinking rate.

Pytoplankton are mostly microscopic, single-celled plants that live in aquatic habitats. As we have learned previously, they require sunlight and nutrients to produce food via photosynthesis. Phytoplankton are vital organisms in the environment because, they serve as the base of the food chain and produce vast quantities of oxygen.

Zooplankton (Zoo – meaning "animal")

Zooplankton are animals that range in size from single-celled protozoa to tiny fish larvae to larger jellyfish. One gallon of water can contain more than a half-million zooplankton.

Figure 2. A crab larvae, an example of a meroplanktonic organism. (Image by Dr Richard Kirby, University of Plymouth: http://www.dailymail.co.uk/sciencetech/article-1099729/The-little-monsters-sea.html#ixzz0xNEZUVrs)

The zooplankton community is composed of both primary consumers (which eat phytoplankton) and secondary consumers (which feed on other zooplankton). Nearly all fish depend on zooplankton for food during their larval phases, and some fish continue to eat zooplankton their entire lives. One herring may consume thousands of copepods — the most abundant type of zooplankton found in the Bay.

- The smallest zooplankton are able to recycle nutrients found in the water column. Because of this, they are often closely tied to nutrient pollution measurements.
- Larger zooplankton are important food for forage fish and fish larvae. They also link the primary producers (phytoplankton) with larger or higher trophic level animals.
- Zooplankton also feed on bacteria and particulate plant matter.
- Tiny larvae of fish and invertebrates, which feed on copepods, are also considered zooplankton. Although this planktonic stage is only temporary (meroplanktonic), larvae are significant parts of the zooplankton community because they are a food source for larger animals.

Zooplankton are distributed according to salinity and the availability of phytoplankton, their main food source. Like phytoplankton, zooplankton are excellent indicators of environmental conditions within the Chesapeake Bay because they are sensitive to changes in its health. Scientists can get a good picture of current Bay conditions by looking at the amount and diversity of different species of zooplankton.

Bacteria

Bacteria play an important function in the Chesapeake Bay:

- Bacteria are the Bay's decomposers, breaking down dead matter. Through this process, nutrients in dead plant and animal matter again become available for growing plants.

- Bacteria are food for zooplankton and other filter-feeding organisms in the Bay.

Bacteria can be residents of the Bay or be introduced through various pathways, including human sewage and polluted runoff from the land.

How are plankton important?

Figure 3. A spectacular "red tide" bloom (non-toxic) of *Noctiluca scintillans* in New Zealand. (Photo by M. Godfrey)

Plankton communities form the base of the Chesapeake Bay food web, acting as food for fish, shellfish and other upper trophic level organisms. All fish and shellfish depend on plankton for food during their larval phases, and some species continue to consume plankton their entire lives.

Plankton are often used as indicators of environmental and aquatic health because of their short life span and high sensitivity to environmental change.

The ability to predict algal blooms, especially harmful algal blooms (HAB's) (figure 3) is important for ecosystem managers. Red tides, like the bloom pictured in figure 3, are caused by dinoflagellates. Harmful algal blooms may cause harm through the production of toxins or by their accumulated biomass, which can affect co-occurring organisms and alter food-web dynamics. Impacts include human illness and mortality following consumption of or indirect exposure to HAB toxins; substantial economic losses to coastal communities and commercial fisheries; and HAB-associated fish, bird and mammal mortalities. To the human eye, blooms can appear greenish, brown, and even reddish-orange depending upon the algal species, the aquatic ecosystem, and the concentration of the organisms.