

Unit 12: Plankton

Unit Focus

This unit describes the two predominant plankton types: phytoplankton (plant) and zooplankton (animal). Students will investigate the important role of plankton in the food chain and learn that some plankton are larval stages of larger marine organisms such as lobster, fish, and crab.

Student Goals

1. Define plankton.
2. Identify the two main types of plankton.
3. Discuss the importance of phytoplankton in the ocean environment.
4. Name and describe the two types of zooplankton.



Vocabulary

Study the vocabulary words and definitions below.

- copepods** small crustaceans that have two long antennae for movement and gathering food; most common zooplankton
- diatom** composed of two identical halves encased in a shell made of silica or “glass”; most common phytoplankton
- dinoflagellates** small plankton with characteristics of both plants and animals; causes red tide
(dy-noh-FLAJ-eh-laytz)
- flagella (FLA-gel-la)** tiny whiplike hairs used for movement or catching food
- foraminiferan** a single-celled holoplankton with a calcium carbonate shell
(fo-RAM-i-nif-e-ran)
- holoplankton** organisms that spend their entire lives as plankton
(hol-o-PLANK-ton)
- larva** form of an organism that is immature and very different looking from the adult organism; plural is *larvae*
- megalops (meg-A-lops)** planktonic larval stage of the crab; follows the zoeal stage
- meroplankton** organisms that spend only part of their lives as plankton
(mer-o-PLANK-ton)
- mesh** open spaces in a net or screen



- mysis** planktonic shrimp larva
- photic zone** the lighted region of the ocean; area where photosynthesis can occur; phytoplankton live in this region
- phytoplankton** small, usually microscopic plant plankton that float or drift in the ocean
- plankton** small, usually microscopic plant or animal organisms that float or drift in the ocean
- plankton net** a cone-shaped net of fine mesh that is pulled through the water to collect plankton
- pseudopod (SOO-duh-pod)** footlike projection
- radiolarian** a single-celled holoplankton with a transparent body or shell
(ray-dee-oh-LAYR-ee-uhn)
- tentacles** long, threadlike structures that hang from some organisms; may contain dangerous stinging cells
- zoaea (zo-E-a)** young planktonic larval state of the crab
- zooplankton** small, usually microscopic animal plankton that float or drift in the ocean

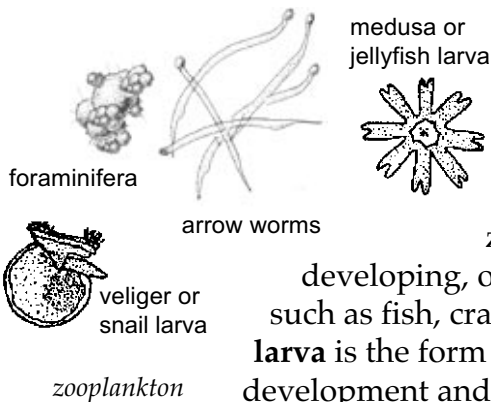


Introduction: Plankton—Small but Vital

Plankton are either plants or animals that float or drift in the water. In fact, the word *plankton* comes from the Greek word meaning *to drift*. Plankton may live near the surface of the water or near the ocean floor. Plankton are primarily carried along by ocean waves, tides, and currents. In spite of their size and their appearance as simple organisms, they are essential in sustaining life as we know it both in the sea and on land.

There are two main types of plankton—plant and animal. **Phytoplankton** (*phyto* means *plant*) are the floating or drifting plant plankton. As plants, phytoplankton need light to produce their own food through the process of photosynthesis; they must, therefore, live in the **photic zone**, where light can penetrate.

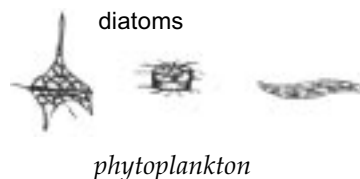
Zooplankton (*zoo* means *animal*) are the animal plankton, and they are the most abundant animals in the ocean. They do not need light and can live below the photic zone. Some zooplankton migrate up and down the water column to feed on phytoplankton or other zooplankton. Zooplankton include the developing, or *larval* stages, of larger adult animals such as fish, crabs, and other small organisms. The **larva** is the form of an organism that is immature in development and can be very different looking from the adult organism.

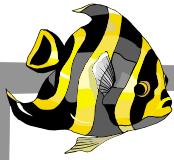


Phytoplankton

These small, usually microscopic sea plants are the dominant plant form in the ocean. Phytoplankton produce their own food through the process of *photosynthesis*. Phytoplankton are essential for life both in the ocean and on land. They are the primary food producers for all marine food chains. They also produce over 80 percent of the oxygen supply, which we need to survive.

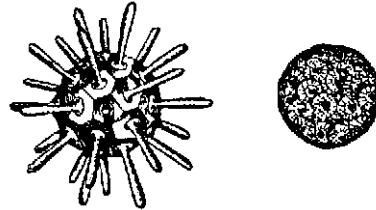
The most common type of phytoplankton in cold waters is the **diatom**. These organisms are very small, but they exist in large numbers. Each diatom has a shell made of silica, a glassy compound, with two equal halves.



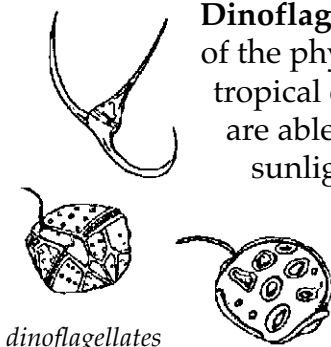


Diatoms reproduce by splitting in two. Each new diatom gets half its shell from the parent and grows another half to form a new organism. This is how it got the name *diatom*, which means *two atoms*. Diatoms are particularly abundant in cold Arctic waters.

Another type of phytoplankton is the *coccolithophore*. These small plants have chalky shells made of calcium carbonate and can swim by moving tiny, whiplike hairs called a **flagella (FLA-gel-la)**. Coccolithophores are usually found in warmer waters. Even though they are too tiny to be seen individually, a dense population in an area will give the water a milky appearance.



coccolithophores



dinoflagellates

Dinoflagellates (dy-noh-FLAJ-eh-laytz), another member of the phytoplankton, are often the most common plant in tropical oceans. Like other phytoplankton, these plankton are able to produce their own food with the aid of sunlight. Unlike most plants, they are able to move around with the aid of a flagellum. When there is not enough light to produce their own food, many dinoflagellates will eat other plankton. Many scientists classify dinoflagellates somewhere between plants and animals because they have characteristics of both.

In tropical or semi-tropical waters, dinoflagellate algae produce *red tide* by secreting toxins, or poisons, that can kill fish and other marine life. Such red tide *blooms* are common in the Tampa Bay area in Florida. Sea birds and even people are sometimes poisoned by eating shellfish or fish contaminated with these toxins.

Dinoflagellates, like fireflies, produce light without heat, a phenomenon called *bioluminescence*, the biological production of light. You can see this occurrence as twinkling lights in the water just above where waves break.

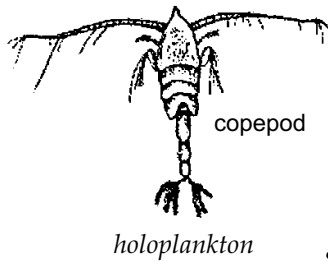
Zooplankton

Zooplankton, or animal plankton, are usually larger than the phytoplankton and cannot make their own food. To survive, they consume phytoplankton or smaller zooplankton. Zooplankton are divided



into major groups: **holoplankton** (**hol-o-PLANK-ton**), plankton that spend their entire lives as part of the plankton community. **Meroplankton** (**mer-o-PLANK-ton**), on the other hand, spend only part of their larval stages as plankton. They then *metamorphize* or change into their adult non-plankton stage.

Holoplankton: Permanent Members of the Plankton Community



copepod
holoplankton

Copepods, the most important and numerous members of the holoplankton, look like tiny shrimp. They have two long antennae which are used to help the copepod float and move around in the water. They also have six pairs of jointed legs and a tail. These antennae and bristly legs help the copepod trap its food—phytoplankton or small plant material. Copepods are the food source for many fish in the ocean. They help form the food chains that feed larger animals and humans.

The arrow worm, another member of the holoplankton, has a transparent head, body, fins, and a tail. They are predators that use grasping spines or *fangs* to grab their prey. Arrow worms are very common in areas occupied by copepods.

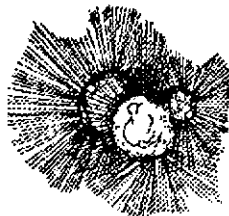


arrow worms
holoplankton



radiolarian

Some holoplankton are single-celled. The most common of these are the microscopic **radiolarian** and **foraminiferan** (**fo-RAM-i-nif-e-ran**). Radiolarians are transparent and have long spines that branch out from their body, like the spokes of a wheel. The branching spines of the radiolarian provide buoyancy and protection.



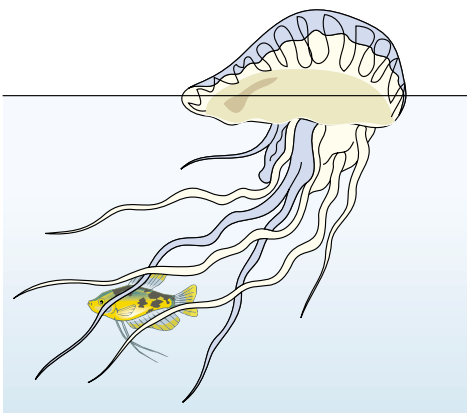
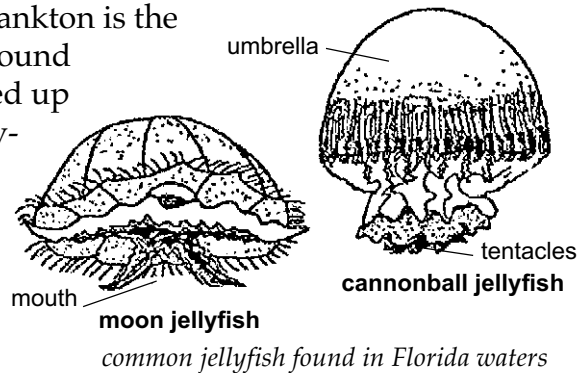
foraminiferans

holoplankton

Foraminiferans are enclosed in a shell made up of calcium carbonate. Forams have holes in their shells that allow the organism's **pseudopods** (**SOO-duh-pods**), or *footlike projections*, to flow out and catch food. When a foraminiferan dies, the shell of the animal falls to the ocean floor. Over a period of time, the shells accumulate on the ocean floor and form chalk deposits.



A larger type of permanent zooplankton is the jellyfish. Jellyfish are commonly found floating near the surface or washed up on the beach. A jellyfish has a jelly-like body called the *umbrella*, with a mouth on the underside surrounded by **tentacles**. The tentacles contain stinging cells that are used in defense and feeding. Some jellyfish may be harmful to humans, whereas others are harmless because we are not affected by the stinging cells. Above are two common jellyfish found in Florida waters.



Portuguese man-of-war

In tropical waters, you might see the Portuguese man-of-war. It is a large jellyfish-like colonial organism with a blue or pink float that resembles a floating plastic bag. Beneath the float are tentacles that may be up to 30 feet long. Portuguese men-of-war can be very toxic to humans—so it is best to stay clear of them.

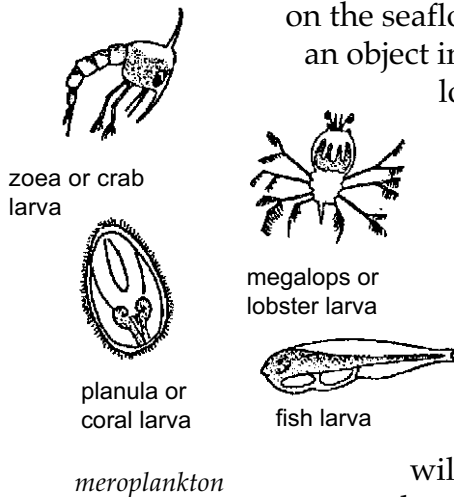
The stings of the jellyfish and the Portuguese man-of-war can be very painful. The following chart shows the symptoms and treatment of a jellyfish or man-of-war sting.

Jellyfish and Portuguese Man-of-War Stings	
symptoms	treatments
<ul style="list-style-type: none"> • burning or itching pain • rash • swelling • possible breathing difficulty • cramps • nausea • fainting or dizziness 	<ul style="list-style-type: none"> • don't rub the affected area • rinse the affected area thoroughly with hot water • clean the area with alcohol; then carefully apply a paste of meat tenderizer and water • avoid the sun or water and rest • get medical treatment if necessary



Meroplankton: Temporary Member of the Plankton Community

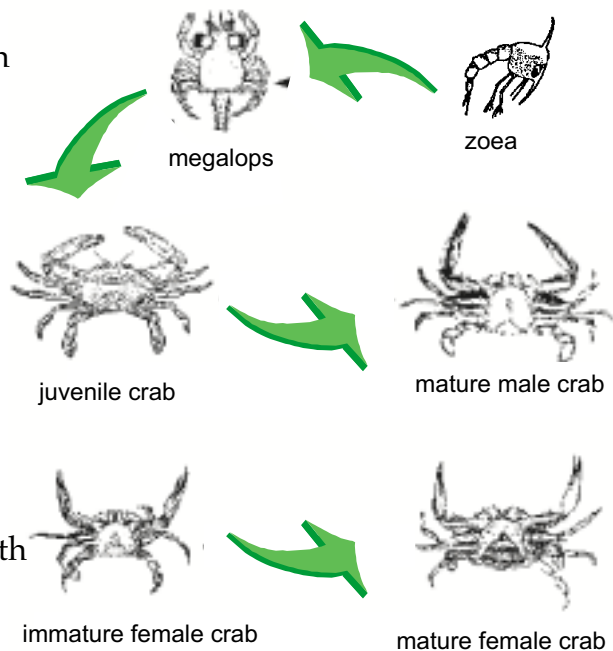
Meroplankton spend only part of their lives as plankton. Many invertebrates and vertebrates spend the early or young larval stages as meroplankton. As they mature, they metamorphose or move out of the planktonic stage. They spend their adult life either crawling on the seafloor, swimming, or permanently attached to an object in the ocean. Often, their planktonic stage looks completely different from their adult form.



Crabs, for example, are planktonic for a short time after they hatch. A crab's first larval stage is called the **zoea (zo-E-a)** stage. Its second larval stage is the **megalops (meg-A-lops)** stage, which is also planktonic but with some of the features of an adult crab. The megalops will then develop into the adult benthic crab and can no longer be classified as a plankton. See the illustration below.

Shrimp are also planktonic when they first hatch from eggs. The shrimp larva is called a **mysis** and closely resembles an adult shrimp.

Many other organisms also have meroplankton stages, including the oyster, barnacle, sea star (starfish), sea urchin, and many types of fish. During the meroplankton stages the young are distributed to new areas in the ocean by drifting with the tides and currents.

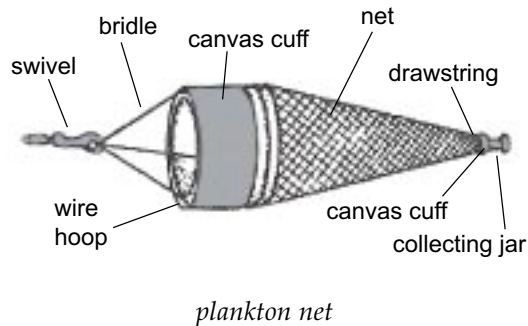


Life Stages of a Crab



Collecting Plankton

Because they are so numerous and have no defenses, plankton are easy to collect and observe. A **plankton net** is pulled through the water with the mouth or large end of the net leading. Water passes through the net's mouth and out the small **mesh** of the net as the plankton are trapped on the inside of the net.



Summary

Plankton are organisms—both plant and animal—that float or drift in the ocean waves, tides, or currents. Plant plankton, or *phytoplankton*, live in the *photic* (lighted) zone for photosynthesis. As the primary food producers, they are essential to all marine food chains. Animal plankton, or *zooplankton*, can live in deeper parts of the ocean and migrate up and down the column to feed on phytoplankton and smaller zooplankton. Organisms, such as the copepods and jellyfish, that spend their entire lives as zooplankton are called *holoplankton*. Two of the larger zooplankton, the jellyfish and Portuguese man-of-war, have tentacles that can cause a painful sting. *Meroplankton*, such as the crab, shrimp, oyster, and sea star in their larval stages, are temporary members of the zooplankton, changing as they mature. Plankton are easy to collect in a plankton net for study in the lab.