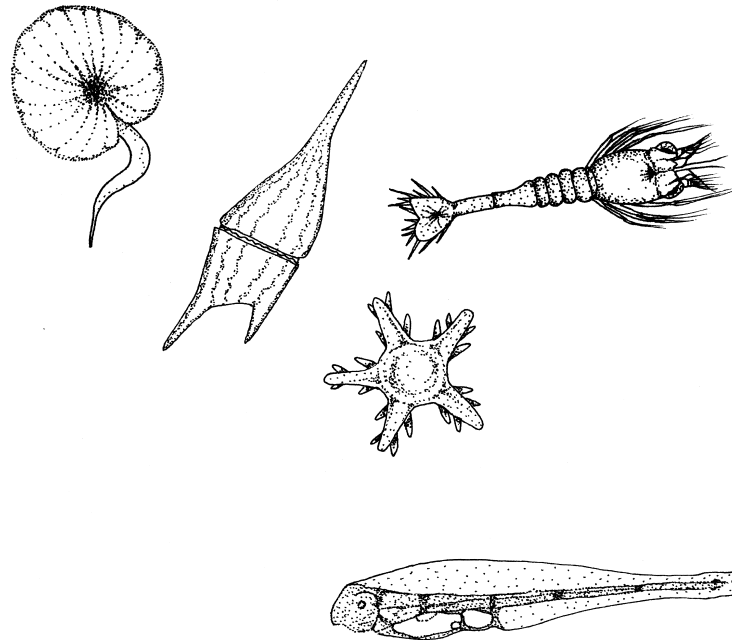


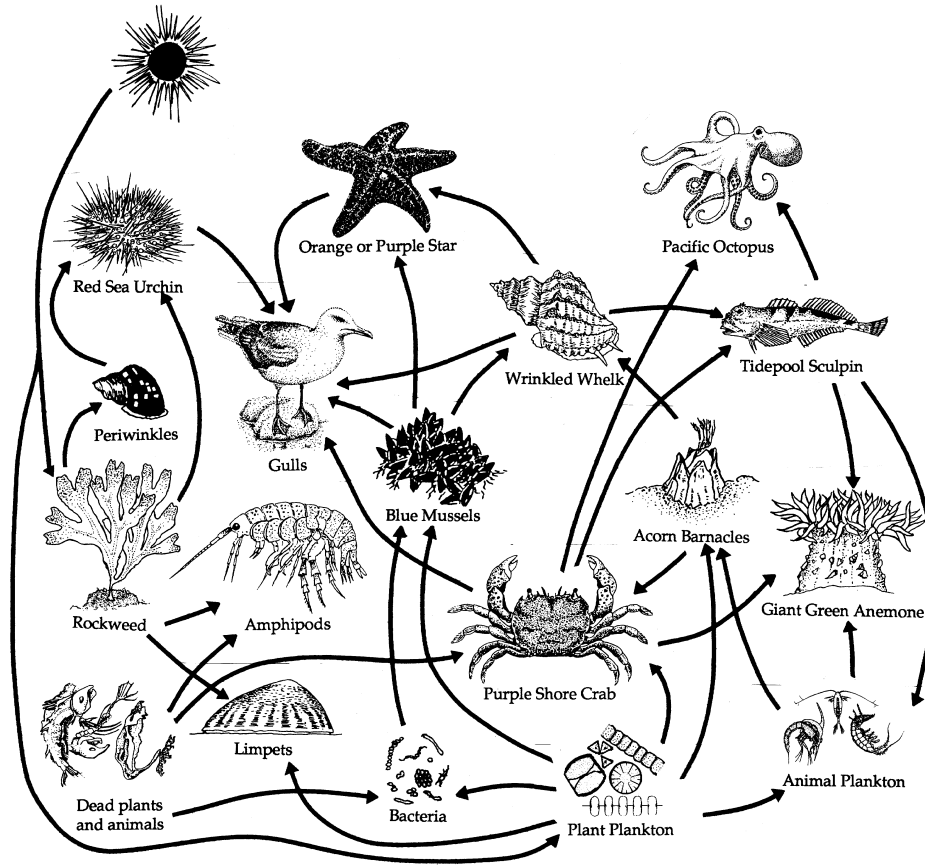
The Plankton Lab at Hatfield Marine Science center is designed to be a 50-minute program for 5<sup>th</sup>-12<sup>th</sup> grade students that involves both the collection of plankton in the field by students and the observation of live plankton and filter feeders in the lab. Students will learn about sampling and have the opportunity to use plankton nets as well as gain experience with microscopes as they attempt to identify planktonic organisms. Students will also discover the importance of plankton in food webs and in making the Earth a habitable place for all organisms.

### Background

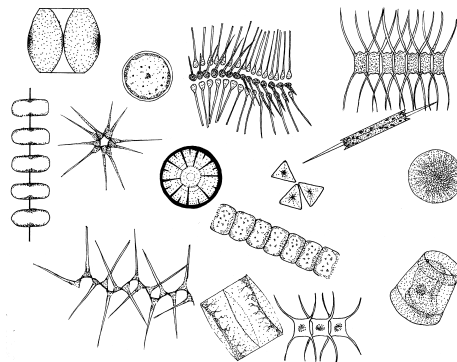
The word plankton is from the Greek word for "wandering". Although many of these organisms have some form of locomotion, they cannot move against the stronger oceanic currents that move them along. Some planktonic organisms can be quite large (like jellyfish); however, most are small enough that they have to be viewed under a microscope to be identified. Plankton that can photosynthesize are called **phytoplankton** and form the basis of oceanic food chains. **Zooplankton** are made up of tiny animals that feed on other plankton. Organisms that spend their whole lives as plankton are called **holoplankton**. Others that spend only part of their lives as plankton are called **meroplankton**. Most marine organisms are meroplankton and start out their lives as eggs and larvae dispersed by the currents.



The majority of photosynthesis and oxygen production occurs by phytoplankton in oceanic waters. Marine phytoplankton are also the first link in many marine food chains. Like terrestrial plants, phytoplankton utilize energy from the sun and nutrients from the water to produce food. Because they utilize sunlight, plankton growth and reproduction occurs in surface waters and is dependent upon the replenishing of nutrients in those waters through seasonal processes called **runoff** and **upwelling**, both of which often occur along coastlines. When the nutrients and sunlight are plentiful, phytoplankton may reproduce rapidly and a **bloom** may occur. With an increase in phytoplankton, zooplankton populations increase, often creating a chain reaction felt throughout the food web. About 90% of the world's fisheries occur in rich coastal areas because of the high densities of plankton that grow in these areas.

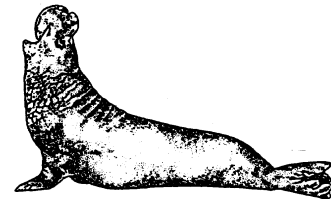
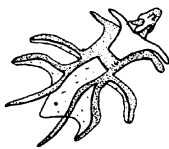
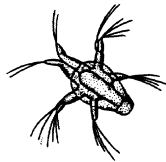


All plankton must avoid sinking. Phytoplankton require sunlight for photosynthesis, so they must stay within the **photic zone**, usually the top 100 meters of water. Zooplankton depend on phytoplankton and other zooplankton for food, so they must avoid sinking as well to stay near their food source. Plankton avoid sinking through increased surface area. Flattened bodies and appendages, spines, and other body projections slow sinking by adding surface area without increasing density. Some phytoplankton also avoid sinking by forming large chains. The use of low-density substances like oil or fat helps increase **buoyancy** and can serve as food reserves for some species.

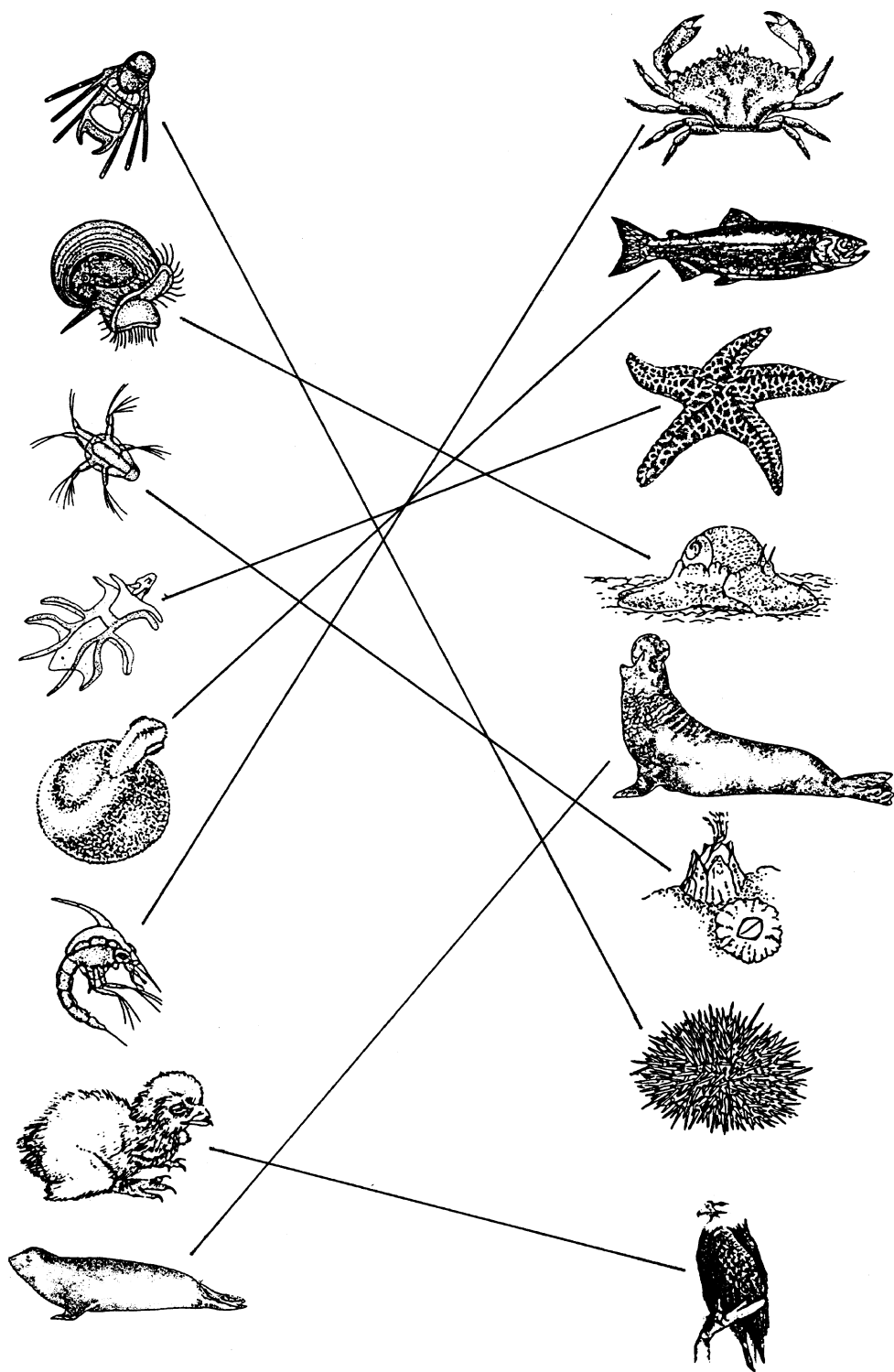


### Suggested Pre- and Post-Visit Activities and Resources

The majority of marine organisms start out their lives as plankton (a couple of exceptions are found below) although it is often difficult to match the young organisms to the adults as they look so different. Using the picture below, have students draw a line matching each young to the correct adult.



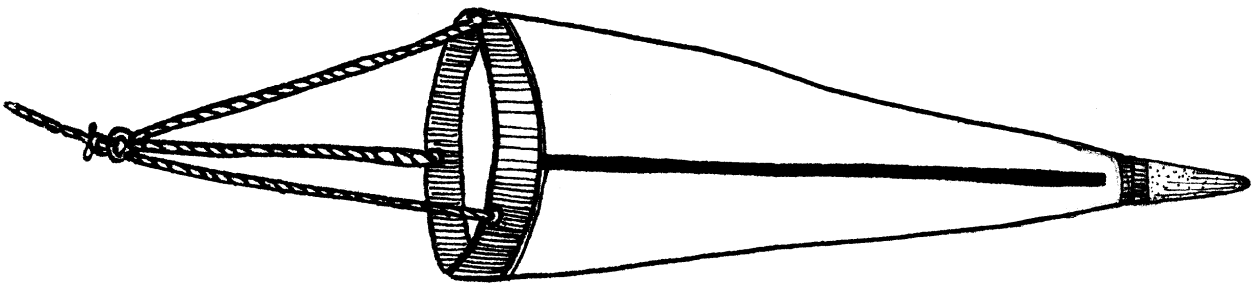
## Answer Key



Online Marine Plankton ID Guide Sheet:  
[www.cosee-ne.net/.../IdentificationofCommonMarinePlankton.pdf](http://www.cosee-ne.net/.../IdentificationofCommonMarinePlankton.pdf)

Create a marine food web by assigning each student a link in the food chain (sun/nutrients, bacteria, phytoplankton, zooplankton, filter feeders, predators, scavengers, etc.) and using a ball of yarn to demonstrate the complex linkages. The student with the “sun/nutrients” designation would begin the cycle by gently tossing the ball of yarn to the phytoplankton, who would then throw it to the zooplankton, and so on. Once all the students are connected, have one of them tug on the yarn. Ask all of those who feel the tug, to then tug on their connections. Soon, everyone in the food web should feel the effects.

Scientists use plankton nets to sample populations and monitor oceanic health and productivity. Nets vary in size depending on if they are to be deployed behind boats or pulled by hand, and mesh size depending on the size of plankton they are sampling. Have students work in small groups to design and create their own plankton nets using margarine tubs, pill bottles, wire clothes hangers, string, old nylons, cheesecloth, and other materials. Bring to HMSC or take to any local waterbody to test designs for durability and effectiveness.



Plankton Wars- Students design their own unique species of plankton using clay and other objects, students “battle” to see whose plankton can survive the longest by staying suspended in the water column: <http://marinediscovery.arizona.edu/lessonsF00/bryzoans/2.html>  
<http://www.cosee-ne.net/resources/documents/IdentificationofCommonMarinePlankton.pdf>  
[http://www.pwssc.org/education/media/Floatingfood\\_3-5.pdf](http://www.pwssc.org/education/media/Floatingfood_3-5.pdf)

Food Chain Checkers- Students pretend to be diatoms, copepods, herring, and orca whales as they discover how they are all connected: [www.windows.ucar.edu/teacher\\_resources/checkers\\_20march.pdf](http://www.windows.ucar.edu/teacher_resources/checkers_20march.pdf)

## Correlation to Oregon Science Education Standards

### **Grade 5**

5.2 Interaction and Change: **Force, energy, matter, and organisms interact within living and non-living systems.**

5.2L.1 Explain the interdependence of plants, animals, and environment, and how adaptation influences survival.

### **Grade 6**

6.2 Interaction and Change: **The related parts within a system interact and change.**

6.2L.2 Explain how individual organisms and populations in an ecosystem interact and how changes in populations are related to resources.

### **Grade 7**

7.2 Interaction and Change: **The components and processes within a system interact.**

7.2L.2 Explain the processes by which plants and animals obtain energy and materials for growth and metabolism.

### **High School**

H.2 Interaction and Change: **The components in a system can interact in dynamic ways that may result in change. In systems, changes occur with a flow of energy and/or transfer of matter.**

H.2L.2 Explain how ecosystems change in response to disturbances and interactions. Analyze the relationships among biotic and abiotic factors in ecosystems.

H.2E.4 Evaluate the impact of human activities on environmental quality and the sustainability of Earth systems. Describe how environmental factors influence resource management.