

Mollusks, Worms, Arthropods, Echinoderms

section 4 Echinoderms

● Before You Read

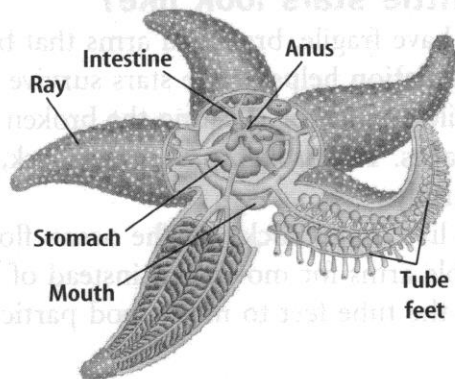
If you were walking on a beach by an ocean, what animals would you expect to see? After you read this section, see if any of the animals you named are echinoderms.

● Read to Learn

Echinoderm Characteristics

Echinoderms (ih KI nuh durmz) are found in oceans. They have a hard endoskeleton covered by a thin, bumpy, or spiny skin. Because they have radial symmetry, they can sense things in their environment from all directions.

All echinoderms have a mouth, stomach, and intestines, as shown in the figure below. They feed on plants and animals. Echinoderms have no head or brain. They do have a nerve ring that surrounds the mouth. They also have cells that respond to light and touch.



What You'll Learn

- the characteristics of echinoderms
- how sea stars obtain and digest food
- why echinoderms are important

Study Coach

Identify the Main Point

Read each subhead. Then work with a partner to write questions about the information found under each subhead. Take turns asking and answering the questions. Use the questions as a study guide about echinoderms.

Picture This

1. **Identify** Shade the mouth and intestines of the sea star.

✓ Reading Check

2. **Explain** What is the main purpose of tube feet?

What is the water-vascular system?

Echinoderms have a **water-vascular system**, which is a network of water-filled canals with thousands of tube feet connected to it. The water-vascular system allows echinoderms to move, exchange carbon dioxide and oxygen, capture food, and release wastes.

Tube feet are hollow, thin-walled tubes that end in suction cups. As the pressure in the tube feet changes, the animal is able to move along by pushing out and pulling in its tube feet. ✓

Types of Echinoderms

There are about 6,000 species of echinoderms living today. More than one third are sea stars. Other groups of echinoderms include brittle stars, sea urchins, sand dollars, and sea cucumbers.

What do sea stars look like?

Sea stars have at least five arms arranged around a central point. The arms have thousands of tube feet. Sea stars use the tube feet to open the shells of their prey. When the shell opens a little, the sea star pushes its stomach through its mouth and into its prey. The sea star's stomach surrounds the soft body of the prey and gives off enzymes that help digest it. When the meal is over, the sea star pulls its stomach back into its own body.

Sea stars reproduce sexually. Females release eggs and males release sperm into the water. Females can produce millions of eggs in one season.

Sea stars can grow new body parts through regeneration. If a sea star loses an arm, a new one will grow. If enough of the center disk is left attached to a severed arm, a whole new sea star can grow from the piece of arm.

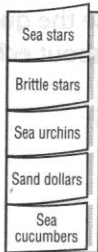
What do brittle stars look like?

Brittle stars have fragile, branched arms that break off easily. This adaptation helps brittle stars survive attacks by predators. While a predator is eating the broken arm, the brittle star escapes. The broken part grows back, or regenerates quickly.

Brittle stars live under rocks on the ocean floor. They use their flexible arms for movement instead of their tube feet. They use the tube feet to move food particles into their mouth.

FOLDABLES™

D Describe Make a five-tab book using notebook paper, as shown below. Describe the characteristics of five types of echinoderms.



What do sea urchins and sand dollars look like?

Another group of echinoderms includes sea urchins, sea biscuits, and sand dollars. They are disk-shaped animals covered with spines. They do not have arms, but sand dollars have a five-pointed pattern on their surface.

Sand dollars have stiff, hairlike spines and sea urchins have long, pointed spines that protect them from predators. Some sea urchins have sacs near the end of the spines that hold toxic fluid that is injected into predators. The spines also help the animals move and burrow. Sea urchins have five toothlike structures around their mouth.

What do sea cucumbers look like?

Sea cucumbers are soft-bodied echinoderms with a leathery covering. They have tentacles around their mouth and rows of tube feet on their upper and lower surfaces. When sea cucumbers are threatened, they force out their internal organs. These organs grow back in a few weeks. Some sea cucumbers feed on dead and decaying matter called detritus (de TRI tus) found on the ocean floor.

Value of Echinoderms

Echinoderms are important to ocean environments because they feed on dead organisms and help recycle materials. Sea urchin eggs and sea cucumbers are used for food in some places. Many echinoderms are used in research and some might be possible sources of medicines. Sea stars are predators that control the populations of other animals. However, because sea stars eat oysters and clams, they also destroy millions of dollars' worth of mollusks each year.

What is the origin of echinoderms?

A good fossil record of echinoderms exists. Echinoderms date back more than 400 million years. The earliest echinoderms might have had bilateral symmetry as adults and may have been attached to the ocean floor by stalks. Many larval forms of modern echinoderms have bilateral symmetry.

Scientists hypothesize that echinoderms more closely resemble animals with backbones than any other group of invertebrates. This is because echinoderms have complex body systems and an embryo that develops the same way that embryos of animals with backbones develop.



Think it Over

3. **Compare** What is one difference between sea stars and sand dollars?

Reading Check

4. **Explain** In what way are echinoderms important to the ocean environment?

● After You Read

Mini Glossary

tube feet: hollow, thin-walled tubes that each end in a suction cup

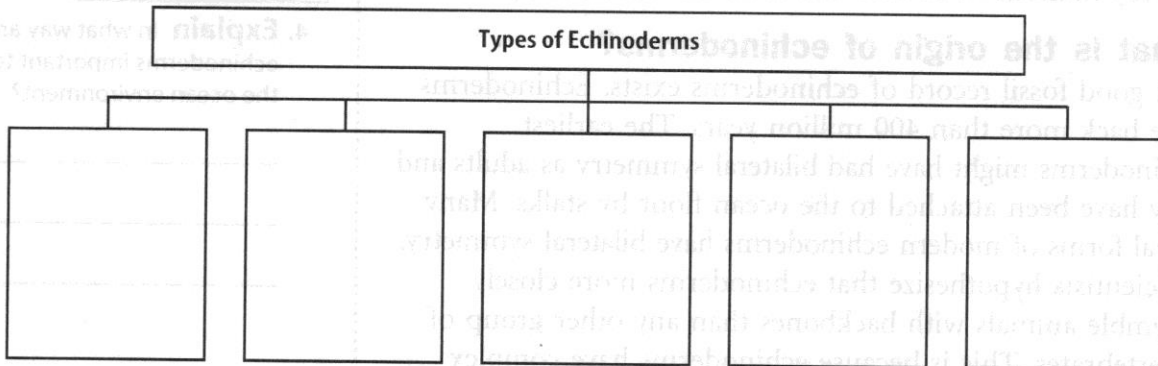
water-vascular system: a network of water-filled canals with thousands of tube feet connected to it

1. Review the terms and their definitions in the Mini Glossary. Write a sentence explaining how echinoderms use the water-vascular system.

2. Choose one of the question headings in the Read to Learn section. Write the question in the space below. Then write your answer to that question on the lines that follow.

Write your question here.

3. Complete the diagram below by identifying five types of echinoderms.



End of Section



Visit book.msscience.com to access your textbook, interactive games, and projects to help you learn more about echinoderms.