Echinoderms

Jessica Harwood
Douglas Wilkin, Ph.D.
Chapter 1. Echinoderms

Learning Objectives

- Give examples of echinoderms.
- Discuss the major features of echinoderms.
- Define radial symmetry.
- Describe the water vascular system.
- Summarize eating in echinoderms.

What is a sea cucumber?

A sea cucumber is not a vegetable! It is an invertebrate animal found in the ocean. Note the spines on this sea cucumber. The spines are a key feature of echinoderms.

What are Echinoderms?

You’re probably familiar with starfish and sand dollars (Figure 1.1). They are both echinoderms. Sea urchins and sea cucumbers are also echinoderms. What’s similar between these three organisms? They all have radial symmetry. This means that the body is arranged around a central point.

Echinoderms belong to the phylum Echinodermata. This phylum includes 7,000 living species. It is the largest animal phylum without freshwater or land-living members.

Characteristics of Echinoderms

As mentioned earlier, echinoderms show radial symmetry. Other key echinoderm features include an internal skeleton and spines, as well as a few organs and organ systems. Although echinoderms look like they have a hard exterior, they do not have an external skeleton. Instead, a thin outer skin covers an internal skeleton made of
tiny plates and spines. This provides rigid support. Some groups of echinoderms, such as sea urchins (Figure 1.2), have spines that protect the organism. Sea cucumbers use these spines to help them move.

Echinoderms have a unique water vascular system. This network of fluid-filled tubes helps them to breathe, eat, and move. Therefore, they can function without gill slits. Echinoderms also have a very simple digestive system, circulatory system, and nervous system. The digestive system often leads directly from the mouth to the anus. The echinoderms have an open circulatory system, meaning that fluid moves freely in the body cavity. But echinoderms have no heart. This may be due to their simple radial symmetry - a heart is not needed to pump the freely moving fluid. The echinoderm nervous system is a nerve net, or interconnected neurons with no central brain.

Many echinoderms have amazing powers of regeneration. For example, some sea stars (starfish) are capable of regenerating lost arms. In some cases, lost arms have been observed to regenerate a second complete sea star! Sea cucumbers often release parts of their internal organs if they perceive danger. The released organs and tissues are then quickly regenerated.

**How do Echinoderms Eat?**

Feeding strategies vary greatly among the different groups of echinoderms. There’s no one food or technique that’s shared by all echinoderms. Different eating-methods include:

1. Passive filter-feeders, which are organisms that absorb suspended nutrients from passing water. Some echino-
derms use their long arms to capture food particles floating past in the currents.

2. Grazers, such as sea urchins, are organisms that feed on available plants. Sea urchins are omnivorous, eating both plant and animals. The sea urchin mainly feeds on algae on the coral and rocks, along with decomposing matter such as dead fish, mussels, sponges, and barnacles.

3. Deposit feeders, which are organisms that feed on small pieces of organic matter, usually in the top layer of soil. Sea cucumbers are deposit feeders, living on the ocean floor. They eat the tiny scrap particles that are usually abundant in the environments that they inhabit.

4. Active hunters, which are organisms that actively hunt their prey. Many sea stars are predators, feeding on mollusks like clams by prying apart their shells and actually placing their stomach inside the mollusk shell to digest the meat.

How do Echinoderms Reproduce?

Echinoderms reproduce sexually. In most echinoderms, eggs and sperm cells are released into open water, and fertilization takes place when the eggs and sperm meet. This is called external fertilization, and is typical of many marine animals. The release of sperm and eggs often occurs when organisms are in the same place at the same time. Internal fertilization takes place in only a few species. Some species even take care of their offspring, like parents!

Summary

- Echinoderms show radial symmetry and have an endoskeleton and a unique water vascular system. Some have spines.
- Echinoderms generally reproduce by external fertilization; regeneration is fairly common among echinoderms.

Explore More

Use the resource below to answer the questions that follow.


1. What can sea star muscles do that our muscles cannot? How would this trait help sea stars living in the intertidal zone?
2. How are deep-sea sea cucumbers like earthworms?
3. Why are brittle stars often found with their arms raised in the water current?
4. What organ system do echinoderms possess that is not seen in any other animal group?
5. Where do sea stars have their "eyes"? How does this arrangement help them coordinate movement?
6. Some sea stars evert their stomachs to digest their prey, but *Pycnopodia* can do something else as well. What does *Pycnopodia* do to some of its prey?
Review

1. List three examples of echinoderms.
2. What is radial symmetry?
3. What are two important characteristics of echinoderms (other than radial symmetry)?
4. How do sea urchins eat?
5. Give an example of an echinoderm that is an active hunter.

References

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