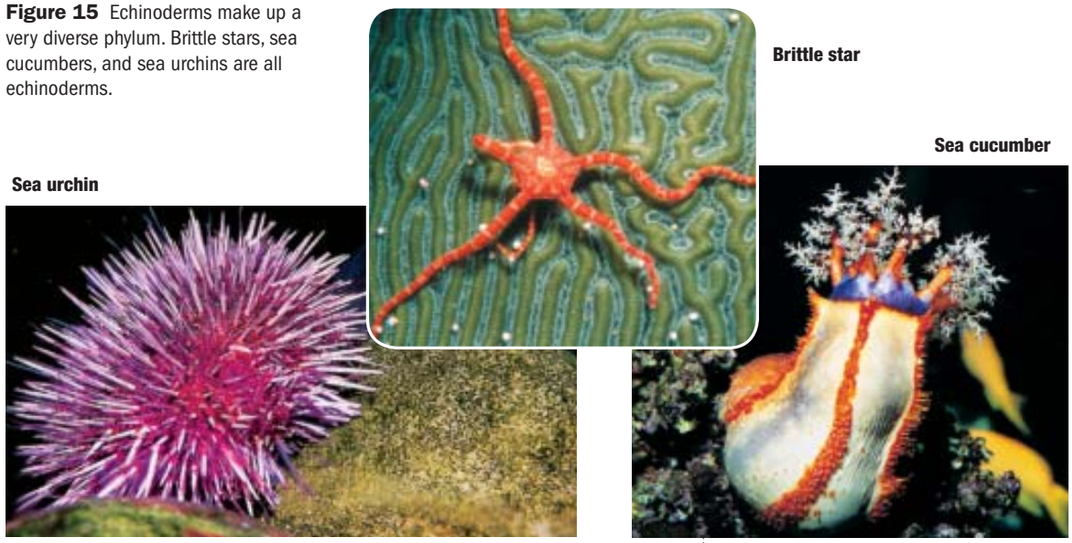
Figure 15 Echinoderms make up a very diverse phylum. Brittle stars, sea cucumbers, and sea urchins are all echinoderms.



Echinoderm Diversity

Figure 15 shows representatives of some echinoderm groups. **The living classes of echinoderms include sea stars, brittle stars and basket stars, sea lilies and feather stars, sea urchins and sand dollars, and sea cucumbers.** Sea stars, commonly called *starfish*, are perhaps the most familiar echinoderms. Brittle stars and basket stars are similar to sea stars, but the arms of brittle stars and basket stars are narrower and may be branched. Sea lilies and feather stars do not move around as most other echinoderms do. Their larvae, however, have the ability to swim, which allows them to disperse. Sea urchins and sand dollars lack arms. However, sea urchins have spines that provide protection from predators. Because of a sluglike shape and a lack of arms or spines, sea cucumbers look different from other echinoderms.

› Reading Check *Which echinoderms disperse as larvae?*

READING TOOLBOX

Outlining Use your outline of this section in order to write three sentences that relate the two key ideas to each other.

Section 4 Review

› KEY IDEAS

1. **Summarize** the four major characteristics of echinoderms.
2. **Summarize** the five major classes of echinoderms.
3. **Describe** which echinoderm structure carries out functions of a circulatory system.

CRITICAL THINKING

4. **Evaluating Conclusions** Sea cucumbers and sea lilies are relatively sessile as adults. Their larvae, however, are capable of swimming. Explain how swimming larvae provide an advantage for these echinoderms.
5. **Relating Concepts** Describe how sea stars use their water-vascular system to move along the sea floor.

METHODS OF SCIENCE

6. **Analyzing Data** A scientist collects several specimens of an unidentified animal. The scientist observes that they have tube feet, an endoskeleton, and a protostome pattern of embryonic development. Why is the classification of these organisms difficult?

READING TOOLBOX

Visual Literacy Have students look at **Figure 15** and describe the properties of echinoderms shown in these photographs. (radial symmetry, spiny projections) Ask students if they have seen a picture of a sand dollar. In what way does a sand dollar exhibit properties of echinoderms? (It has radial symmetry and an exoskeleton.)

READING TOOLBOX

Outlining Echinoderms vary greatly in appearance and mobility. However, all echinoderms have an internal skeleton, water-vascular system, and breathe through their skin. Some have arms, some have spines, some have neither, but all have five-part radial symmetry.

› Close

Formative Assessment

What structural feature that is unique to echinoderms controls their movement?

A. the arms (Incorrect. The arms don't actually move as a unit.)
B. tube feet (Incorrect. Tube feet aid in movement, but don't control it.)
C. spiny skin (Incorrect. Spines are used for protection.)
D. water-vascular system (Correct! Water in this canal system inflates the tube feet.)

Answers to Section Review

1. spiny skin, radial symmetry, a water-vascular system, and breathing through the skin.
2. sea stars and other "stars"—five-part radial symmetry and tube feet; sea urchins and sand dollars—no arms, radial symmetry; sea lilies and feather stars—no arms, radial symmetry, sessile; sea cucumbers—no arms or spines.
3. The coelom carries out the function of a cirulatory system.
4. Swimming larvae allow these organisms to increase their range.
5. Water enters the madreporite and travels into the ring canal and radial canals to the ampulla of the tube feet. When water enters the tube feet, they expand, and suckers attach to the surface. When water reenters the ampulla, the tube feet shorten and pull the sea star forward.
6. Sample answer: The species has characteristics of echinoderms, including tube feet and an endoskeleton. However, echinoderms are deuterostomes. Thus, classification into an existing phylum is difficult.