Spines, Feet, Regrowth

How echinoderm structures support survival

ZOO.6 "Students will understand the structure and function of phylum Echinodermata, and how they demonstrate the characteristics of living things..."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB As you read, underline three body structures and circle an action each structure helps perform. Number the two different outcomes of sea-star regrowth as 1 and 2.

Life on a Rocky Shore

1 A sea star crossing a rocky shore belongs to Echinodermata, a group whose name means "spiny skin." Its body is supported by an internal skeleton of small calcium carbonate plates. Spines project from these plates through the skin. A sea urchin's movable spines can make it hard for a fish to bite or swallow the animal. Sea cucumbers have much smaller skeletal plates and rely on other defenses. When attacked, some species expel sticky threads that tangle a predator, giving the cucumber time to escape. These different defenses help echinoderms respond to danger in their surroundings.

2 Inside a sea star, seawater enters through a sieve-like plate called the madreporite and flows through canals to its tube feet. Each foot connects to a fluid-filled bulb; squeezing the bulb extends the foot. The feet attach to rocks, then contract to pull the animal forward. They also grip prey and exchange gases with surrounding water by diffusion. To eat a mussel, a sea star can pull its shells slightly apart with its tube feet. It then pushes its cardiac stomach out through its mouth into the mussel, releases digestive enzymes, and draws the partly digested food back inside.

3 Many sea stars reproduce sexually: adults release eggs and sperm into the water, where fertilization occurs and larvae develop. Some also reproduce asexually. In certain species, an arm that breaks away with part of the central disc can grow into another sea star, while the original regrows its lost arm. Regrowing a lost arm repairs an individual; forming a new individual increases the population. Humans repair wounds but cannot regrow an entire arm. Researchers could compare the cells and chemical signals involved in sea-star arm regrowth with those in human wound healing. Such research might suggest treatments, but it does not prove human limb regrowth is possible.

2 ANSWER WITH EVIDENCE

Use the passage

1. How do a sea urchin's spines and a sea cucumber's sticky threads protect each animal? Include where the spines come from.

2. Explain how a sea star uses both its tube feet and its stomach to digest a mussel.

3. How does moving water through the sea star's body help it move, feed, and exchange gases?

4. How does sea-star reproduction with eggs and sperm differ from forming a new sea star from a broken arm? How is regrowing a lost arm different from both?

3 YOUR TURN

Your own words

A news post claims that sea-star regeneration means a medicine could make humans regrow arms. In four sentences, assess the claim, propose one comparison researchers should make, and explain what that comparison could and could not show.

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PART 1 · READ AND MARK

As you read, underline three body structures and circle an action each structure helps perform. Number the two different outcomes of sea-star regrowth as 1 and 2. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	How do a sea urchin's spines and a sea cucumber's sticky threads protect each animal? Include where the spines come from.	**The urchin's spines project from skeletal plates and make it difficult for a predator to bite or swallow it. Some sea cucumbers expel sticky threads that tangle a predator.**
2	Explain how a sea star uses both its tube feet and its stomach to digest a mussel.	**The tube feet pull the mussel's shells slightly apart. The sea star pushes its stomach into the mussel, releases digestive enzymes, and draws the partly digested food back inside.**
3	How does moving water through the sea star's body help it move, feed, and exchange gases?	**Water pressure extends the tube feet. They attach and pull the sea star forward, grip prey, and exchange gases with the surrounding water by diffusion.**
4	How does sea-star reproduction with eggs and sperm differ from forming a new sea star from a broken arm? How is regrowing a lost arm different from both?	**Sexual reproduction involves eggs and sperm released into water. In some species, a broken arm with part of the central disc can grow into a new individual without eggs or sperm. Regrowing a lost arm repairs the original individual.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

The claim is not supported because humans heal wounds but do not regrow whole arms. Researchers could compare signals active during sea-star arm regrowth with signals active during human wound healing. Shared signals might identify processes worth testing in human tissues. Even if the signals match, that would not show that a medicine could regrow a human arm.

Accept accurate descriptions of fluid pressure extending tube feet even if students do not name the fluid-filled bulbs. For Your Turn, accept a specific comparison of cells or chemical signals if the response distinguishes a promising research lead from proof of a treatment.