NO PREP

Sponges

Filters of the Sea

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Name: Period: Date:

Sponges: Filters of the Sea

The World of Sponges

Sponges, belonging to the phylum Porifera, are some of the simplest animals on Earth, yet they are vital to the health of marine ecosystems. Unlike most animals, sponges lack tissues, organs, and nervous systems. Instead, their bodies are built from a network of specialized cells that allow them to filter vast amounts of water. Despite their simplicity, sponges are far from primitive. They have thrived in the oceans for over 600 million years, adapting to conditions from shallow coral reefs to the dark depths of the seafloor. What makes sponges remarkable is their ability to pump and filter water through their porous bodies. Some large sponges can filter thousands of liters of seawater per day, removing bacteria, plankton, and organic particles. This constant cycling not only provides the sponge with food but also helps maintain water clarity and balance in marine ecosystems. Sponges also provide habitat for small organisms such as shrimp, worms, and juvenile fish, making them important ecosystem engineers in their own right. Understanding sponges

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Structure and Feeding

The sponge body is made up of specialized cells with distinct functions. Choanocytes, or collar cells, line the interior chambers and use flagella to create currents that draw water into the sponge. These cells capture food particles on sticky collars while oxygen diffuses directly into the sponge's cells. Porocytes form the pores through which water enters, and amoebocytes move around within the sponge body, transporting nutrients and producing skeletal elements called spicules. Spicules, made of silica or calcium carbonate, provide structure and defense. Some sponges also produce chemical toxins that deter predators, making them less appetizing to fish and invertebrates. Sponges feed by filter feeding, one of the most efficient methods in the ocean. They can trap bacteria as small as 0.1 micrometers,

effectively cleaning the surrounding water. This function is crucial in coral reef ecosystems, where sponges recycle nutrients that corals and algae rely on for growth.

Ecological Roles and Threats

Sponges play multiple roles in marine ecosystems. They serve as filter feeders, nutrient recyclers, and habitat providers. By creating cleaner water, they improve conditions for corals and seagrasses. By housing tiny animals, they support biodiversity. By producing toxins and chemicals, they influence predator-prey interactions. However, sponges face threats. Climate change, rising ocean temperatures, and disease outbreaks have led to sponge die-offs in some regions. Overharvesting for the sponge trade has also reduced populations. Because sponges are slow-growing, recovery can take decades. Their decline can disrupt nutrient cycling and reduce reef resilience. Protecting sponges means protecting the reefs, fisheries, and human livelihoods connected to them.

Key Information: Table: Sponge Structure and Function

Sponge Part	Function
Choanocytes	Create currents, capture food particles
Porocytes	Allow water to enter the sponge body
Amoebocytes	Transport nutrients, produce spicules
Spicules	Provide structure and defense
Osculum	Large opening where water exits

Case Study: Sponge Symbiosis and Human Benefits

In the Caribbean, large barrel sponges are often called the "lungs of the reef." A single sponge can filter up to 50,000 liters of water daily, removing bacteria and producing clean water that supports corals and fish. These sponges are not just solitary creatures. Many host symbiotic bacteria and algae within their tissues. The bacteria help the sponge by producing nutrients, while the sponge provides a stable environment. Some of these microbial partners even produce compounds with antibacterial or antiviral properties. Scientists study these compounds in hopes of creating new medicines. One study found that Caribbean sponges contribute significantly to nitrogen cycling, releasing nutrients that feed nearby coral reefs. This makes them key players in nutrient recycling on reefs where nutrients are otherwise scarce. When sponges are removed from ecosystems—whether by disease, overharvesting, or pollution—the effects ripple outward. Algae may grow unchecked, corals may decline, and overall reef productivity decreases. Humans have also used sponges for centuries. In ancient Greece, divers harvested natural bath sponges from the Mediterranean. Today, some species are still used commercially, but many others are protected due to overharvesting. Modern researchers continue to study sponge chemistry, hoping to discover new pharmaceuticals. These humble animals remind us that even the simplest creatures can provide enormous ecological and human benefits.

1. Why are sponges sometimes called the "lungs of the reef"?

2. How do sponge-bacteria partnerships provide benefits to both the sponge and humans?

Multiple Choice

1. What is the main role of choanocytes in sponges?

    a) Produce spicules

    b) Capture food and create currents

    c) Form pores that allow water entry

    d) Transport nutrients

2. How do sponges benefit coral reef ecosystems?

    a) They build calcium carbonate skeletons like corals

    b) They produce oxygen through photosynthesis

    c) They prey on small fish

    d) They filter water and recycle nutrients

3. What are spicules made of in most sponges?

    a) Silica or calcium carbonate

    b) Sand and plankton

    c) Iron and salt

    d) Protein and lipid molecules

Matching

Write the letter of the correct definition on the line next to each term.

Term	Definition
1. ___ Create currents and trap food particles	A) Porocytes
2. ___ Large opening where water exits	B) Spicules
3. ___ Form pores for water entry	C) Amoebocytes
4. ___ Transport nutrients, produce spicules	D) Osculum
5. ___ Provide structure and defense	E) Choanocytes

Fill-in-the-Blank

1. Sponges belong to the phylum _____.

2. The cells that transport nutrients inside a sponge are called _____.

3. Sponges help maintain reef health by _____ large amounts of water.

Short Answer

Answer each question in 2-4 complete sentences.

1. Explain how sponges contribute to nutrient cycling in coral reef ecosystems.

_____

_____

_____

2. Describe one threat to sponges and explain how it impacts reef ecosystems.

_____

_____

_____

3. Why are scientists interested in the chemical compounds produced by sponges?

_____

_____

_____