



MYSTICAL MARINE SPECIMENS: SEE WHAT'S IN THE SEA

Teacher Resource Guide
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Teaching Tips

These lesson ideas are developed with you in mind. We understand that you are the creative force within your classroom. You may choose to use the hand-held microscope in an inquiry center or you may have multiple scopes and teach in pairs, groups of four, or even groups of six. However you manage your classroom, these ideas will assist you in guiding your students as they observe, question, research, and experiment. These inquiry skills are invaluable life skills.

Making connections, being creative, problem solving, and questioning will engage your students as they discover the microscopic world. You can extend these lesson ideas and integrate the study of the specimens into your content areas to make them even more relevant. Be creative. There is no limit to what can be discovered!



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Lesson Ideas

- Observe and discover how the outer sea shell protects the animal
- Compare and contrast the texture and shape of shells
- Observe the plant structure visible in seaweed
- Compare and contrast ganoid scales with cycloid scales
- Compare a kitchen sponge to a Sea Sponge
- Compare and contrast coral structures

Advanced Inquiry

Have students research and report on a type of protective covering developed and used by humans (bullet proof clothing, fireproof clothing, scuba gear, etc.) or have students create a new idea for a protective covering.

Writing Ideas

- Describe one of the shells using as many adjectives as possible. When finished writing details, turn the card over and draw -- using colored pencils -- the inside and outside of their shells. Again, as students draw, they should pay close attention to the detailed markings of their shell. If their shell has a chip on it, they should draw it. If their shell has a hole in it, they should make sure it is drawn in the correct location. When the class is finished writing and drawing, make sure they have written their names on their cards. Collect all the cards and shells. Then place all the shells on a desk or table. Shuffle cards and pass out a card to each student. (Make sure no student gets his or her own card.) When every child has a card, give them about 5 minutes to read the card and study the picture. Send groups of 2 to 4 students at a time to the shell table. Give them time to find the shell that has been described on the card they hold. Once they identify the shell that goes with their card, have them share the shell choice with the student who wrote the description to see if they are correct.
- Pick a marine specimen and draw what can be seen with the naked eye. Then draw the specimen magnified. Be as detailed as possible.

Background Information About Starfish and Sand Dollars

Seashells are the external skeletons of a class of marine animals called mollusks. People have skeletons on the inside of their bodies while mollusks have their skeletons on the outside of theirs. This way the skeleton helps protect the creature from predators, strong currents, and storms, and helps camouflage the animal. Seashells are primarily made of calcium, a hard mineral, just as our own bones are.



Starfish:

Starfish are marine animals in the category of Echinodermata. That name means "spiny skin" in Greek. The starfish's skeleton is a series of calcium-rich hard plates just beneath the skin that are linked together to allow limited flexibility while maintaining the starfish's shape. The most familiar shape in the starfish is the five-armed body, although there can be fewer or many more arms.

The hard plates just below the skin also support the growth of sharp spines that protrude up from the skin, which act as a defense against being eaten. Be careful when picking one up! Starfish don't move about by bending their legs and "walking" like land animals do. Their legs are too rigid for that to work well. Instead, on their underside they have a great many small flexible tubes, which can be bent and moved, and act like tiny feet to help the starfish move around. The feet have small suckers on the end, allowing the starfish to have a strong grip on whatever it wants to hold onto.

Another odd thing: The eyes on starfish are at the ends of their arms. The eyes aren't very complex eyes like you'd see in rapidly-moving sea creatures such as fish, but they're able to sense varying degrees of light and darkness, which is sufficient for the slow-moving starfish's needs.

Background Information About Starfish and Sand Dollars

Starfish eat many things, depending on the type of starfish. Some eat mollusks -- either by boring through their shells to reach the animal inside, or in some cases by holding on to both halves of a bivalve and simply slowly pulling the two halves open to reach the animal inside. When they eat the soft parts of a mollusk they leave behind the hard shells, which become the seashells we all admire for their beauty. Other starfish burrow through mud and eat the small edible bits and pieces they find there, and still others eat coral reefs. One particular species of starfish, the Crown of Thorns, is presently causing great damage to the Great Barrier Reef, eating the living portions of it faster than it can regenerate itself.

Sand Dollar:

A sand dollar shell looks sort of like a round white coin, which is where it gets its name. When you see a sand dollar that's washed up on the beach, it usually appears to be a round, white circular disk, typically one inch to four inches in diameter. When they're alive they're actually a dark color, covered with short dark spines that look almost like fur. These spines are moveable, and the sand dollar uses them both to move around on the sea bottom and to push small pieces of food to its mouth.

Just as the common sea star or starfish has five arms, most sand dollars have a pattern of five sets of pores on them. These are used to move sea water into the sand dollar's body, which is then pumped to where it's needed to aid in movement or other internal functions. Sand dollars like smooth, sandy, or muddy ocean bottoms. They mainly live in shallow water, near land.

If the water is fairly calm where they live they will often stand on edge, partly in the mud and partly exposed to the clear water. If they live in an area with strong currents, sand dollars can hold their position by burrowing into the soft bottom. They will also swallow sand grains to build up their weight so they don't get washed away!



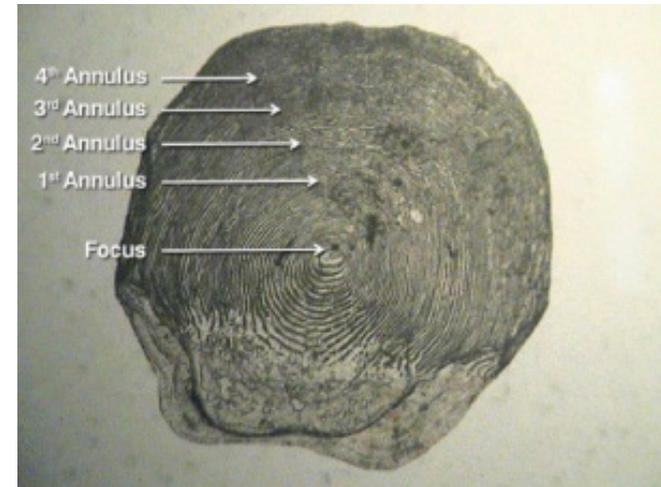
Fish Scales

What is a scale? A scale is a plate-like structure that covers various animals, especially fish and reptiles. Scales are thin and flat. (Some scales curl when dried.)

Fish scales are different from reptile scales. Here are some basics:

- Snake scales are imbedded in the skin, attached together.
- Usually, snake scales are much smaller than fish scales.
- Some fish scales have "growth rings" similar to those found in a tree. As the fish grows, the scales grow larger. See the How to "Read" a Fish Scale below to learn how to age a fish.
- Snakes shed their scales every few months so they do not develop growth rings.
- Fish scales are rounder and thicker than snake scales which are more diamond shaped.

Most bony fish have cycloid scales, which are flat, thin, and somewhat round. The cycloid scales in this kit are those of a Drum. When you compare the cycloid scale to the ganoid scale, the Gar scale in this kit, you will notice very distinct differences. Although they are made of the same material as other fish scales, garfish have ganoid scales that are thick with a shiny, enamel like finish. Growth rings are not evident.



How to "Read" a Fish Scale

Cycloid fish scales, like those of trout and salmon, add rings ('circuli') as they grow. The rate at which fish, and their scales, grow depends on how much food is available, water temperature, and other stressors. In temperate climates where the winters are cold and there is less food available, very little growth occurs and the rings are closer together. During the summer months when food is more abundant, the growth rings are more widely spaced. Annuli, usually identified as a zone of crowded circuli, are formed each year and are counted to estimate the age of the fish.

Have a question or comment?

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