OREGON MARINE SCIENTIST AND EDUCATOR ALLIANCE

How do Marine Invertebrates Obtain Oxygen from Seawater?

By MacKenna Hainey

An **aerobic** organism is an organism that can survive and grow in an oxygenated environment. Most animals are aerobic. Those that live on land use specialized structures such as lungs to obtain oxygen from the air, while those that live underwater extract dissolved oxygen from water using structures such as gills. Body parts like lungs and gills typically have lots of folds that increase the **surface area** of the structures.

In general, when surface area increases, but **volume** stays relatively the same, the ability to pull oxygen from the surrounding environment becomes more efficient.

Marine invertebrates are aerobic organisms, and they use a few different 'tools' to pull dissolved oxygen out of seawater, using various different body parts. These body parts can differ in size, shape and number; therefore, these body parts also have differing surface areas and volumes. Surface area and volume are important when thinking about the body parts that extract oxygen from seawater because those geometric relationships can determine how efficient that extraction process is.

Marine invertebrate body parts with respiratory functions may have lots of folds, projections, or other structures that increase surface area. Here are some examples of body structures involved in marine invertebrate respiration:

Example 1. Sea Snails (Phylum Mollusca)
Snails and other molluscs have a specialized gill, which looks like a fluffy feather. These fluffy looking gills have a very large surface area (like human lungs) and extract oxygen for the molluscs. Some very limited oxygen exchange might even occur across their skin!

Example 2. Sea Anemones (Phylum Cnidaria)
Sea anemones can pull oxygen in from the surrounding sea water through the skin on their body, tentacles, and gut.

Example 3a. Sea Urchins (Phylum Echinodermata)
Sea Urchins utilize thousands of tube feet and pedicellaria for locomotion and defense, and these structures also pull in oxygen from sea water.

Example 3b. Sea Stars (Phylum Echinodermata)
Sea stars also extract oxygen through their tube feet. They also have little, finger-like projections on their backs called ampullae, which bring oxygen from the seawater into the body of the sea star.

Example 3c. Brittle Stars (Phylum Echinodermata)
Similarly, basket stars and other brittle stars have tube feet which extract oxygen from the sea water. In addition, basket stars have special structures inside the main round body called bursae. These bursae are wrinkled sacs and expand (just like our lungs) to extract oxygen from the seawater that enters the bursae. Brittle stars can 'pump' their bursae to bring new oxygen-containing seawater into their bodies.