



PROJECT OCEANOLOGY



Rocky Intertidal Shore Exploration

Overview

The rocky intertidal shore is a complex community where living organisms face unique challenges for survival. These challenges are driven by tidal movement, pounding waves and variations in both salinity and temperature. Living organisms exist in four different zones within the rocky intertidal, each defined by the average amount of air and water exposure of the rocks in that area. In this lesson, students replicate a diagram of the rocky intertidal's vertical zonation using knowledge about the features of this ecosystem. Students are challenged to identify the different zones within the rocky intertidal and its inhabitants. Students will explore the rocky intertidal shore outside to collect animals and algae and observe the obstacles faced by marine life in this environment. Students will investigate which organisms live on the rocky shore and observe how they've adapted to the conditions of the zone that they live in.

Alignment with NGSS (Elementary School)

Performance Expectations

ES-3-LS2-2 Construct an argument that some animals form groups that help members survive. *Students will explore the rocky intertidal zone (RIZ) and study species distributions in different zones of the RIZ.*

ES-3-LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all. *Students will examine the impact of abiotic factors on species in the RIZ. Students will examine species adaptations, migration patterns, and resource competition within the RIZ.*

ES-5-LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment. *Students will explore the RIZ and describe species distributions, adaptations (form and function), space and resource competition.*



PROJECT OCEANOLOGY



Science and Engineering Practices

Engaging in Argument from Evidence: Construct an argument with evidence, data, and/or a model. *Students will study the influence of abiotic factors on species distribution.*

Developing and Using Models: Develop a model to describe a phenomena. Science explanations describe the mechanisms for natural events. *Students will study species distributions and adaptations on each RIZ zone.*

Analyzing and Interpreting Data: Analyze and interpret data to make sense of phenomena using logical reasoning. *Students will collect specimens from each RIZ zone and observe their adaptations. Students will understand the relationship between abiotic and biotic factors.*

Crosscutting Concepts

Cause and effect: Cause and effect relationships are routinely identified and used to explain change. *Students will study species distributions due to abiotic factors (wind, tide, salinity, and temperature).*

Scale, Proportion, and Quantity: Observable phenomena exist from very short to very long time periods. *Students will observe the impacts of tide on species abundance and distribution. Students will spend time analyzing Japanese shore crabs (*Hemigrapsus sanguineus*) distribution throughout the RIZ zones.*

Systems and System Models: A system can be described in terms of its components and their interactions. *Students will explore various zones of the RIZ and its inhabitants. Students will analyze the interactions between biotic organisms and abiotic factors.*

Disciplinary Core Ideas

Social Interactions and Group Behavior: Being part of a group helps animals obtain food, defend themselves, and cope with changes. Groups may serve different functions and vary dramatically in size. *Students will analyze symbiotic relationships between organisms inhabiting the RIZ. Students will also observe the adaptations (form and function) species have developed to withstand the harsh conditions of the RIZ.*



PROJECT OCEANOLOGY



Ecosystem Dynamics, Functioning, and Resilience: When the environment changes in ways that affect a place's physical characteristics, temperature, or availability of resources, some organisms survive and reproduce, others move to new locations, yet others move into the transformed environment, and some die. *Students will study the impact of abiotic factors on species distribution and survival. Students will study behaviors and adaptations of RIZ species to thrive in the RIZ and ensure species abundance.*

Adaptation: For any particular environment, some kinds of organisms survive well, some survive less well, and some cannot survive at all. *Students will study the behavior of RIZ species to adapt to the conditions in the RIZ.*

Cycles of Matter and Energy Transfer in Ecosystems: Matter cycles between the air and soil and among plants, animals, and microbes as these organisms live and die. Organisms obtain gasses, and water, from the environment, and release waste matter (gas, liquid, or solid) back into the environment. *Students will observe interactions between RIZ species and their role in the food web.*

Interdependent Relationships in Ecosystems: The food of almost any kind of animal can be traced back to plants. Organisms are related in food webs in which some animals eat plants for food and other animals eat the animals that eat plants. Some organisms, such as fungi and bacteria, break down dead organisms (both plants or plants parts and animals) and therefore operate as "decomposers." Decomposition eventually restores (recycles) some materials back to the soil. Organisms can survive only in environments in which their particular needs are met. A healthy ecosystem is one in which multiple species of different types are each able to meet their needs in a relatively stable web of life. Newly introduced species can damage the balance of an ecosystem. *Students will study the biotic organisms' behaviors and determine their role in the ecosystem and food web.*