



# BACK BAY SCIENCE CENTER

## Rocky Intertidal Module

Activity I – Touch Tank, Intro  
Activity II – Feeding Mechanisms

### BACKGROUND INFORMATION

Amidst a small outcropping of rocks dotting the coastal shoreline is the diverse ecosystem known as the Rocky Intertidal. Plants and animals that live here have to contend with a dramatically changing habitat four times every day. Closer observation of a rock's vertical profile reveals specific microhabitats, based on zonation. These microhabitats and the availability of water have impacted feeding and reproductive adaptations. Because of their accessibility, beauty and diversity, these ecosystems have been impacted by humans.



Tide pool communities have to be able to withstand the constant changes in the tidal changes of the ocean. These changes occur minute to minute as the tides flow in and out. There are also seasonal changes, as well as periodic high intensity 'scouring' that can occur during severe storms. Each species has to solve the problem of

### CALIFORNIA STATE CONTENT STANDARDS

#### Grades 6 – 8

6th Gr. Science:  
Ecology - 5b, e

7th Gr Science:  
Genetics – 2a  
Evolution – 3a, b, e  
Physical Principles in Living Systems - 6d  
Investigation and Experimentation - 7a

8<sup>th</sup> Gr Science:  
Forces – 2b, c  
Density and Buoyancy – 8c

#### Grades 9 – 12

Science:  
Biology/Life Sciences –  
Ecology 6a, b, c, d  
Evolution 8b

AP Science - Science Practices SP 1.1,  
1.2

Earth Science ES 5.3  
Life Science LS 3.1 3.2

EEI P and C: Ic; IIa; IVb, c  
Ocean Literacy Principles: 1h; 5d, f, h;  
6e,g  
Climate Literacy Principles: 2d; 6c, d; 7d

finding a home, and then keeping a home. Mussels have evolved byssal

threads to attach to an anchoring substrate, barnacles 'glue', while sea stars use a water vascular system and suction for their tube feet. Fish do not attach at all, and clams burrow into the sand. Most of the mollusks have evolved hard shells to withstand the force of pounding waves, with the squishy bodied sea hares being obvious exceptions.

An entire tide pool community can exist in one or two rocks along the shore. Depending on the size of the rock, it may be completely inundated for part of the day. Larger rocks can have a spray or splash zone at their highest elevation which remains dry except for the incidental spray of the waves. Depending on their proximity to the shore, some tide pools may become completely exposed during low tide. Animals such as the anemones have evolved a flexible, flower-like morphology that allows them to 'close up' to protect themselves from the desiccating rays of sun, opening up when the tide comes in.

Animals living in tide pools have adapted to the changing water levels. The tides bring floating plankton and also stir up detritus (waste) that has settled. Very little is wasted within a Tide pool Food Web. Scavenging species such as shrimp and scallops feed on detritus. Barnacles that have attached their heads to a solid substrate extend their feathery feet to 'filter feed', and catch passing food. Sea stars are

able to maneuver the inundated bottoms of the rocks and scale up to the zone

where mussels live. Chitons living in the dry zone of the rock use a rasp-like radula to scrape off algae. Mutualism is

also seen in Tide pool communities. The anemone, with its stinging nematocysts and the sculpin, increase opportunities to lure in food and avoid predation.

The changing water level also impacts reproduction. Asexual reproduction is a common adaptation amongst marine organisms. The simultaneous release of gametes in water allows the eggs and sperm to float together and start the next generation, even though the parents are not side by side. This is imperative, considering that so many species have 'anchored' themselves, are not mobile or in proximity to each other.

The attraction of visiting a Tide pool is wide-spread. Humans can see an amazing and changing ecosystem without any elaborate equipment or long hikes. While this is a delight for the humans, it has become a disaster for the Tide pool community. It is common to see children and adults walking away from Tide pools carrying buckets filled with their new-found treasures. This is having a devastating impact, world-wide. Species do not live outside their habitat, and this also limits the gene pool within the habitat. The danger doesn't stop with collecting: Humans bring both visible and invisible threats. We can see the remnants of beach litter, as well as debris that has travelled from

upstream. What is not visible is the chemical pollution caused by the cigarette butts, nitrates from fertilizers

and phosphates from cleansers. The increasing acidification of the ocean is dissolving the shells of mollusks and crustaceans. In California, many Tide

pools are beginning to be safeguarded by the California Coastal Commission as Marine Protected Areas. Activities such as fishing and collecting are limited in these designated areas.

### Resources:

<http://www.coexploration.org/oceanliteracy/documents/OceanLitChart.pdf>

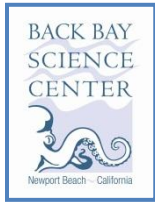
<http://www.dfg.ca.gov/mlpa/>

<http://www.mpa.gov/>

<http://oceanservice.noaa.gov/topics/oceans/mpa/>

[http://www.ocmarineprotection.org/mpa\\_sites\\_and\\_regulations.php](http://www.ocmarineprotection.org/mpa_sites_and_regulations.php)

<http://www.ocparks.com/tidepools/tidepools.htm> - Crystal Cove



## TEACHER GUIDE – Rocky Intertidal Module

### ACTIVITY I: Touch Tank, Intro

#### OBJECTIVES:

Students will be able to –

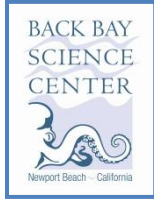
1. Identify the challenges that must be addressed in order to survive in this ecosystem.
2. List at least 5 different types of tide pool animals, and the adaptations which allow each to survive in the intertidal zone.

#### KEY TERMS:

Acidification    Adaptation    Asexual  
Reproduction    Byssal Threads  
Chemical Pollution    Debris    Detritus  
Ecosystem    Exposure    Filter  
Feeding    Food Web    Gamete  
Gene Pool    Intertidal Zone  
Inundation    Microhabitat    Mollusks  
Morphology    Mutualism    Niche  
Nematocyst    Plankton    Predation  
Radula    Scavenger    Simultaneous  
Spray    Substrate    Tube Feet  
Zonation

#### MATERIALS:

Lab Observation Worksheets and Analysis Question Sheets  
Plain and colored pencils  
Identification cards/slide show of tide pool animals



## TEACHER GUIDE – Rocky Intertidal Module

### ACTIVITY II: Feeding Mechanisms

Note: Sub-Units within this activity can be selected independently

#### OBJECTIVES:

Students will be able to –

1. Name at least 3 different feeding mechanisms of Intertidal animals.
2. Complete an ethnogram on at least 2 intertidal animals.
3. Identify how human interference impacts Tide pool Communities

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Zonation

#### MATERIALS:

Diagrams of radula, nematocysts, tentacles/claws, tube feet.  
Plastic box with hinged lid  
Turkey basters  
Plastic claw grabber  
Suction cup sheet/plunger (tube feet)  
Squeegee  
Yarn (mussel fibers)  
Food coloring  
Acrylic panel  
Models-sea star, anemone, octopus, crab, etc...  
Large plastic tub  
Colored glitter  
Coffee filters  
Cups

Rocky Intertidal - module • written by Marcia Matz

[www.backbaysciencecenter.org](http://www.backbaysciencecenter.org)

Ping pong balls  
Feeding Mechanisms Worksheets  
Feeding Mechanisms Analysis Questions  
Pencils