

SALT WATER REVIVAL

BIO
KEY

Intertidal Animals
Bio-Technique
Animal Behavior



OVERVIEW

During a low tide, the youngsters create an artificial high tide and observe its effect on intertidal animals.

BACKGROUND



A living carpet of marine organisms covers the rocks in the intertidal zone at the seashore. When the tide ebbs, many of the plants and animals that are attached to rocks or other surfaces in the intertidal zone are left high and dry. This fascinating world is then on display until high tide. Scurrying crabs, brightly colored sponges, hermit crabs, sea

anemones, and starfish are popular attractions. Less obvious, but often present in large numbers, are barnacles, limpets, chitons, snails, oysters, tubeworms, and mussels that have retreated into their shells.

Almost all the intertidal animals are aquatic, requiring water to obtain life-sustaining oxygen. By “clamming up” or by pressing their shells tightly against the surface to which they are

attached, many intertidal animals trap a small amount of water between or under their shells. The trapped water keeps the animals' gills moist so the animals can continue to get the oxygen they need while the tide is out. When the tide returns, some of the animals that have retreated into their shells (such as barnacles) are triggered into activity by the spray and splash of the incoming water. Other "retreated" animals remain tightly "clammed up" until they are completely submerged.

You and your youngsters don't have to put on masks and snorkles and wait for high tide to see these intertidal animals in action. By creating an artificial high tide during a low tide, you can revive many of these animals and observe their behavior under water.

CHALLENGE: CREATE A HIGH TIDE AND SEE HOW IT AFFECTS INTERTIDAL ANIMALS.



TURBAN SHELL



PERIWINKLE

MATERIALS



For each team of two:

- 1 large milk carton or similar container*
- 1 lump of soft, plasticine clay* (about the size of a tennis ball)
- 1 hand lens*

For the group:

- extra clay*
- tide table (available at boating, fishing, and diving shops)
- 1 copy of the "Use of the Tide Table" Technique Card*
- Field guide to common intertidal organisms

For "Branching Out," for each team of two:

- 1 permanent-ink marking pen* (a different color for each team)
- 1 index card and pencil

* Available from Delta Education.

PREPARATION

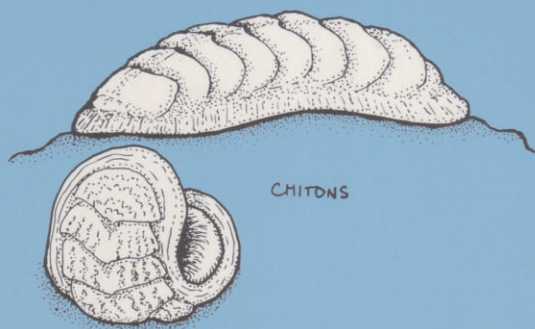


Group Size. This activity is suitable for both small and large groups. We suggest one leader for every twelve kids.

Time. Plan on one to two hours for this activity. Use a tide table to pick a time for this activity when there is a tide of two feet or less.

Site. Visit the coast during low tide, and choose a rocky site that is well populated with barnacles, snails, limpets, or other marine organisms. These animals live mainly in the upper half of the intertidal zone, so a low tide of two feet or less is fine. (See the "Use of the Tide Table" Technique Card.) Look in crevices or other shaded places among the rocks. Try out the artificial-high-tide techniques before conducting the activity. (See the "Action" section.)





Safety

1. No one should work alone around the water. Use the buddy system. (See the *Leader's Survival Kit* folio.)
2. Intertidal rocks can be extremely slippery. Caution your youngsters to avoid stepping on mossy-looking or kelp-covered rocks. Be very careful when walking in the intertidal zone.
3. There is always the possibility of miscalculation, so be careful that your group is not trapped by high tide.

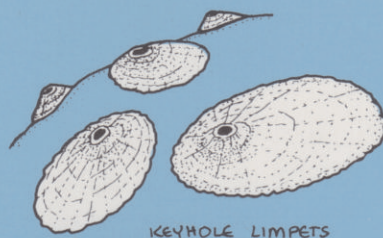
ACTION



1. Caution the youngsters about the slippery rocks before taking the group into the intertidal zone. Discuss general water safety and the buddy system.
2. Gather the youngsters around a cluster of barnacles or mussels, and explain that barnacles and mussels are aquatic animals that retreat into their shells during low tide. Ask the youngsters to think of ways to get the animals to come out of their shells so they can be seen in action. If necessary, suggest that the kids create an artificial high tide to revive the animals.
3. Announce that you have brought materials the kids can use to create a two-phase high tide. First, show the youngsters how to splash the animals several times with water from a milk carton to simulate wave action. Then

wait and watch what happens. Tell the group that splashing alone will trigger many animals into action.

Next, show the youngsters how to build a clay dam around an animal. (Pulling animals off the rocks to place them in a bucket of water causes trauma and injury to the animals. It is better to bring water to the animals than to take the animals to water.) Then flood the dam with fresh seawater to submerge the animal. Mention that some intertidal animals need to be covered with water for several minutes before they will open up.



4. Divide the group into buddy teams. Give each team one water container, one lump of clay, and one hand lens (for close observation).
5. Challenge the teams to duplicate and observe the effects of a high tide on different marine animals. Help the teams locate animals that have drawn into their shells. (Begin with barnacles, because a little bit of splashing often triggers them into action. Snails, limpets, chitons, and mussels are slower to respond.) Ask the youngsters to make clay dams around animals that don't respond to splashing, and to fill the dams with fresh seawater. The youngsters should then check the animals periodically. To prevent the animals from overheating or using up all the oxygen in the water, ask the teams to flood the dams with fresh seawater every five minutes.
6. Circulate among the teams as they work with the animals, and lend encouragement and assistance as needed. Some of the behaviors the kids might observe include the raking motion of a barnacle's feathery "feet"; the slight

spreading apart of the shells of a mussel or oyster and the extension of its mantles (that is, the fleshy lips near the shell edges); and a chiton, limpet, or snail releasing its tight hold on a rock and extending its antennae.

7. Ask the teams to remove all of the clay they placed on rocks before gathering for the discussion.



CLUSTER OF MUSSELS AND
GOOSENECK BARNACLES

MOVING THOUGHTS



1. How did the various animals respond when splashed with water? When submerged? Which of the animals were quickest to respond? Slowest?
2. What did the revived animals do when you removed the artificial high tide?
3. Why do you think these animals retreat into their shells during low tide? (To avoid temperature extremes and drying out.)
4. How were the artificial high tides different from real high tides?

BRANCHING OUT



Limpet Marking. This part of the activity requires a visit to the seashore at night. Many limpets live in the middle to upper parts of the intertidal zone, and move about on solid surfaces to graze on algae at night. After their feeding forays, many return to the same starting spot

(called a "limpet scar") night after night. Your group can investigate this behavior by following this procedure:



1. In the daytime, each team should find a group of limpets during a medium to low tide. Ask the youngsters to draw a straight line with a permanent-ink marking pen from the center of the limpet's shell off the edge of the shell and onto the rock for about a centimeter. Each team should use a different colored pen to mark ten to twenty limpets on one rock. Ask each team to record on an index card and on the rock the number of limpets they marked, and to mark their rocks so that they can be located again later.
2. If possible, return to the limpet site the same night during low tide. With flashlights, look at the marked limpets. (The ink marks last about a week, so you don't have to come back the first night.) Ask each team to record on their index card how many of their marked limpets are "at home" and how many are gone. Ask the teams to try to find some of the missing marked limpets. What are the limpets doing?



3. Return to the site the next day at low tide. Have the teams check their limpets. How many are at home? Are they in the same position as they were when marked (that is, does the mark on the shell match the mark on the rock)? Ask the youngsters what they can tell about limpet behavior from this experiment.



USE OF THE TIDE TABLE For Aquatic Activities



Technique Card

In a tide table (available from boating, fishing, and diving shops), you can find the height of the tide in your area for any time of day. Leaf through your table. You may see a range of tides from minus several feet to plus six to ten feet, depending on your area of the coast. Areas may differ, but the range will be consistent for your area month after month.

From the information in the table, you can determine the vertical height of the intertidal zone. (Subtract the lowest low from the highest high.) Let us say that in looking in the tide table for the day and time you wish to investigate, you find that the tide is two feet. This means that all but two feet of the intertidal zone is exposed.

If it is not a high or low tide at the time you want to study your coastal community, you will have to estimate the height of the tide.

Example: You meet your group at 10:00 a.m.

The tide table reports:

Low Tide:	6:53 a.m.	1.5'
High Tide:	1:10 p.m.	5.1'

10:00 a.m. is about half way between 6:53 a.m. and 1:10 p.m., so your tide will be about half way between 1.5' and 5.1', or about 3.2', and coming in (flood tide). After 1:10 p.m. the tide will be going out (ebb tide).

