HOLD IT

OVERVIEW

After making a cork or sponge "animal" that can hold on against water currents, the youngsters investigate the holding adaptations of aquatic animals.

BACKGROUND

Organisms living in streams, rivers, creeks, and intertidal zones along the open coast share a common problem: withstanding swiftly flowing water or being swept away. Many organisms have special shapes and structures that enable them to withstand flowing water. Stonefly nymphs have streamlined flattened bodies and legs with hooks that allow them to cling tightly to submerged objects. The abalone has a broad, muscular foot that can exert a tremendous suction grip on underwater rocks. Kelp (large seaweeds) anchor themselves with strong holdfasts (anchoring structures) and have tough, rubbery stipes (stemlike stalks) that bend without breaking in strong currents.

Some organisms avoid turbulent waters by settling in protected areas. Clams burrow into mud or sand. Fish often rest in eddies or in the calm water behind rocks or logs while they wait for the current to carry food their way. Aquatic plants often grow thickly on the down-current side of rocks and logs.

Specialized shapes, holding structures, and holding behaviors are examples of adaptations for living in running water. An ***adaptation*** is any feature of an organism that allows it to survive and reproduce.

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MATERIALS

FOR PART ONE

For each buddy team:

2 cork or sponge "animal" bodies* (See the "Preparation" section.)
1 observation tray* (See the "Aquatic Observation Aids" Equipment Card.)

For the group:

1 *Hold-It* Junk Box* containing: waterproof tape (electrical, duct, etc.), clay, bobby pins, rubber bands, toothpicks, popsicle sticks, pipe cleaners, heavy thread or string
2 to 4 pairs of scissors*

FOR PART TWO

For each buddy team:

1 observation tray* (from Part One)
1 bug box* or magnifying lens*
1 dip net* (aquarium size)
1 plastic cup*
1 Hold-It Trough (See the "Hold-It Trough" Equipment Card.)

For the group:

1 "Hold-It Trough" Equipment Card*
1 "Aquatic Observation Aids" Equipment Card*

Optional: copies of the *OBIS Pond Guide** or other freshwater aquatic guides.

* Available from Delta Education.

PREPARATION

Group Size. This activity is suitable for any size group. For groups larger than fifteen, however, we recommend dividing the group in half and using two leaders.

Time. Plan on thirty to forty-five minutes for each part of this activity.

Site. Select a stream, creek, shallow river, or rocky marine site. You will need a shallow (less than 10 cm deep), fairly level, fast-moving stretch of water for checking holding abilities. At marine sites, work during a low tide so that intertidal organisms will be easier to locate. Sites with rocky bottoms generally have a richer variety of organisms than sites with muddy or sandy bottoms.

Equipment

1. Cut corks and sponges into a variety of shapes (ovals, squares, rectangles) and sizes (up to five centimeters in length). Make enough so that each youngster has one.

2. Obtain or make an observation tray for each team. (See the "Aquatic Observation Aids" Equipment Card. This card also contains information on equipment use for Part Two of the activity.)

3. Construct one Hold-It Trough for each team. (See the "Hold-It Trough" Equipment Card.) Each trough takes about eight to twelve minutes to make. Let the kids help you gather materials and make their own troughs before the activity.

Safety. See the *Leader's Survival Kit* folio for safety precautions to use in aquatic sites.

ACTION

PART ONE CHALLENGE: CREATE AN ORGANISM THAT CAN HOLD ON AGAINST CURRENTS IN RUNNING WATER.

Note: Keep the materials for Part Two under your control until needed.

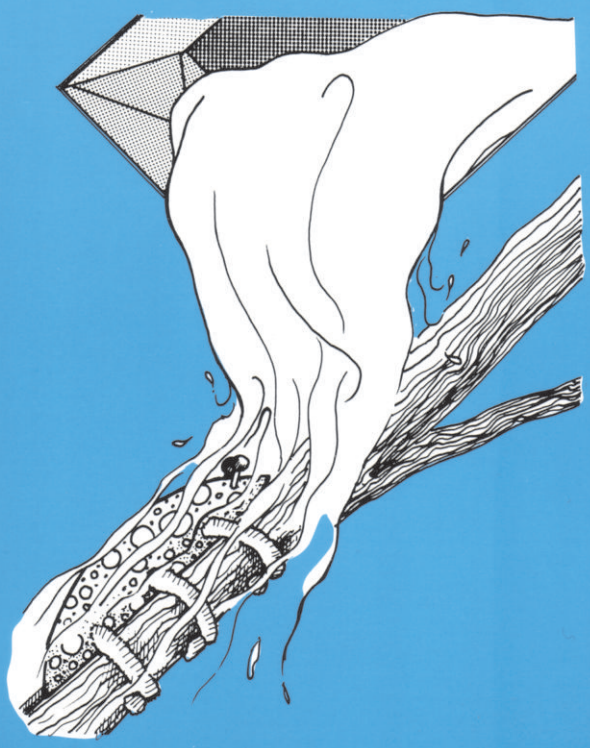
1. Divide the group into buddy teams, and limit the activity areas to a safely manageable size (ten to thirty meters of a stream, creek, or shore line).

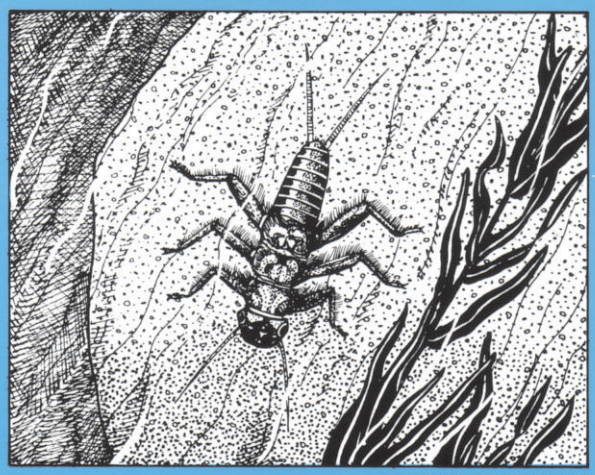
2. Stand by the water where everyone can observe. Hold up a cork or sponge "animal" body and tell the kids that it represents an animal that might live in this aquatic site. Drop the "animal" into moving water to show the kids how organisms can be swept away by currents.

3. Hand out one "animal" to each participant, and challenge the youngsters to place the animals in the water where they won't be swept away by the current.

4. When the youngsters have succeeded, explain that they have just discovered one way that organisms avoid being swept away: by seeking a spot protected from the current's main force.

5. Now demonstrate the "flood test." Dump an observation tray full of water into the stream next to one of the "animals." The animal should be swept away. Do this several times. Ask the youngsters how they might modify the animals so that the animals won't be swept away by a flood of water. (If the youngsters don't suggest holding structures of some kind, point out that legs, claws, spines, or hooks would probably hold the animals in place.)





STONEFLY NYMPH

6. Challenge the kids to add holding structures to their animals so that the animals can withstand the flood test. Bring out the Junk Box, and spread out the construction materials. The youngsters can also use sticks, rocks, and other natural materials.

7. Ask the teams to check the holding ability of their animals in the water. Give each team an observation tray for the flood test.

8. After everyone has tested the holding ability of their animals, mention that many real organisms living in the water have holding structures. These structures are examples of ***adaptations*** because they help the organisms to survive and reproduce.

PART TWO CHALLENGE: INVESTIGATE THE HOLDING ADAPTATIONS OF ANIMALS LIVING IN YOUR SITE.

Introduce Part Two by telling the kids that now they are going to examine the holding structures and behaviors of aquatic animals living in the site.

1. Challenge the kids to collect a variety of aquatic animals from the site. Give each of the teams a dip net and have them use their observation trays to hold the animals they collect.

HOLD IT

BIO KEY

Simulation
Animal Behavior
Adaptation

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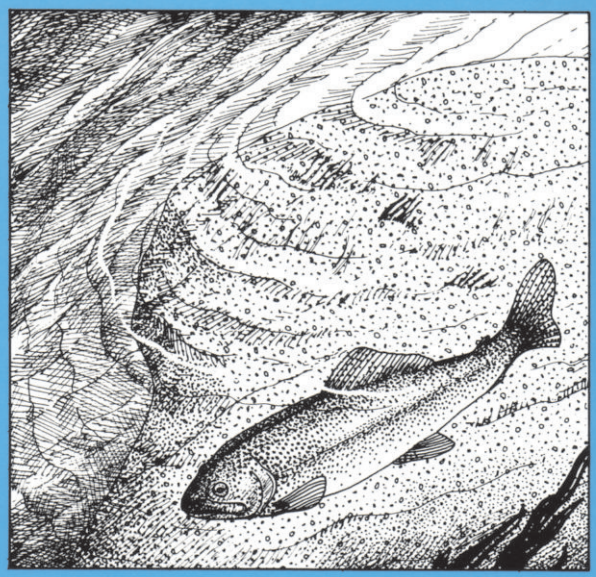


TROUT

2. After ten to twenty minutes, call the teams together and give them the opportunity to share their findings.

3. Show the teams how to use the Hold-It Trough. (See the "Hold-It Trough" Equipment Card.) Be sure to place some gravel, plants, or other bottom material in the trough.

4. Challenge the teams to use a trough to compare the holding abilities of the various animals they captured. Encourage the youngsters to look closely at the animals' shapes and holding structures (legs, suction disks, hooks). The youngsters should also observe the behavior (strong swimming, diving for the bottom, crawling among the rocks) of the animals as they hold on or move through the troughs. Give each team a Hold-It Trough and a magnifier, and let them begin.

CURRENT THOUGHTS

When five to ten minutes remain in the activity period, call the teams together and ask them to describe the holding adaptations they thought were most effective.

1. Which animals resisted the strongest currents?

2. Where were the animals with strong holding abilities found? Did they live in the same parts of the site?

3. What advantages might there be to living in swift currents?

4. What would you like your body to be like if you lived in fast-flowing water?

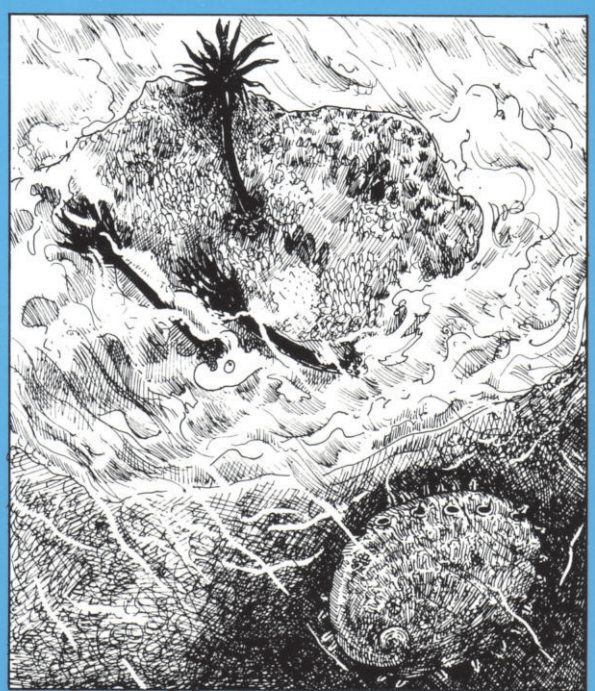
Returning the Organisms: Have the youngsters return the animals to the places where they were found. Ask the kids to see how quickly the animals disappear from sight.

BRANCHING OUT

1. Compare animals found in a fast-flowing section of a stream with those found in slower-flowing sections (e.g. a rocky bottom versus a muddy bottom).

2. Take a look at plants that live in streams. Find out how they hold on against currents.

3. Investigate pond animals, and compare their behavior with the behavior of stream animals when both are subjected to currents.



PALM KELP, ABALONE

AQUATIC OBSERVATION AIDS:
For Aquatic Activities

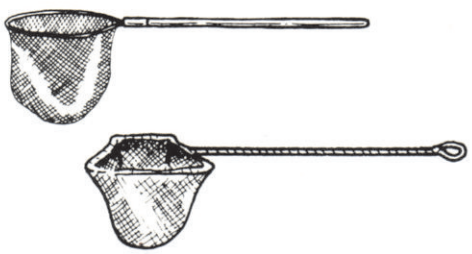
Equipment Card Side 1

Bug Boxes

A bug box is a small, clear plastic box with a magnifying lens for a lid. To use the bug box, place an object or organism in the box and replace the lid to magnify the contents. When exposed to direct sunlight a closed bug box heats up rapidly, so release organisms promptly after observing them. The lid can also be used separately as a magnifying lens.

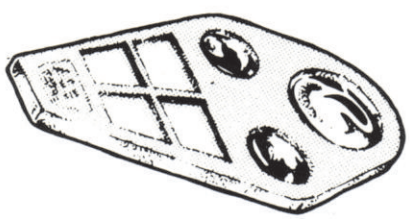
Dip Nets

Nets can either be made or bought. Aquarium nets work fine. You may want to extend the reach of an aquarium net by attaching a dowel, a stick, or a similar extension to the handle. A gradual, gentle scoop of the net is usually more successful and less damaging to organisms than a sudden, violent scooping motion. To prevent eye accidents, ask that the nets never be raised above shoulder level.



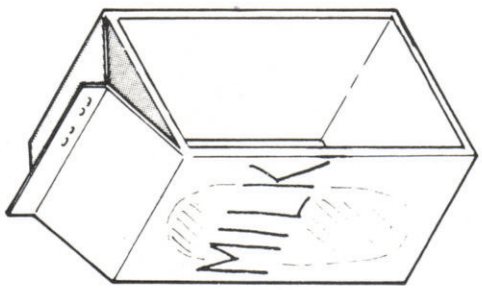
Magnifying Lenses

To use a magnifying lens, hold the lens close to one eye and move either your head or the object back and forth until you can see the object clearly.

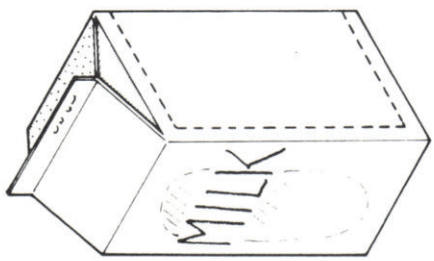


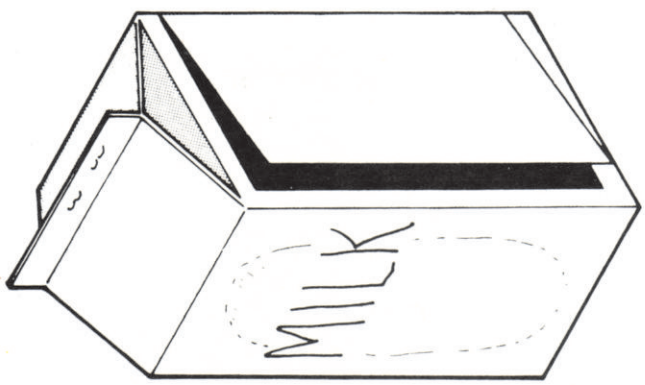
Observation Tray

Any container that will hold water can serve as an observation tray. Containers with light-colored bottoms are best for easy viewing of organisms that have been added. Half-gallon milk cartons can be made into deluxe observation trays. To make one, staple the pouring spout closed and cut out the carton wall on the same side as the stapled pouring spout.



To make a hinged-top observation tray, just cut along three sides (two short and one long) of the carton wall on the same side as the stapled spout.





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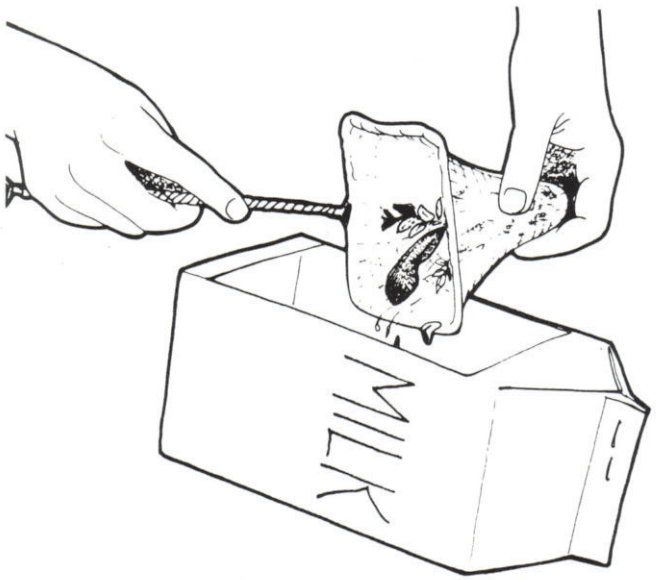
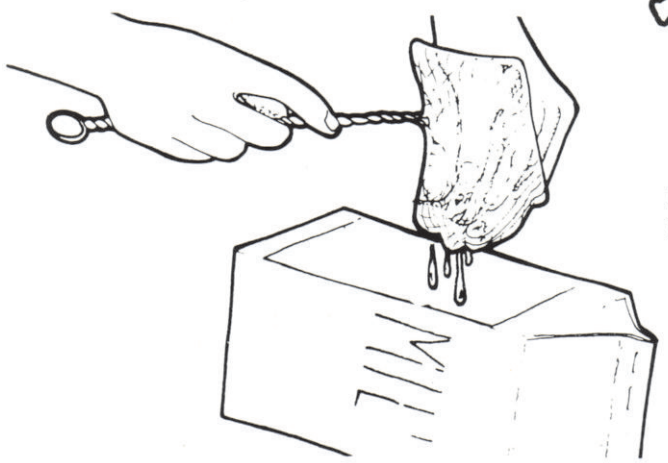
AQUATIC OBSERVATION AIDS:
For Aquatic Activities

Equipment Card 2 Side 2

Transferring critters to observation trays. When using a net to transfer critters, first swish the net through the water without releasing the organisms. (You can use the pond or stream you are investigating.) The rinsing removes any sediment you may have netted. Fill your observation tray about one-half full of water (preferably water from the organism site). Hold the net hoop over the tray,



turn the net inside out, and dip the net bag into the water in the tray.

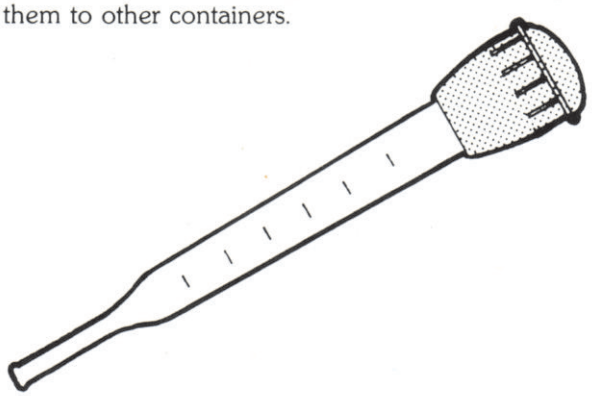


This will release netted organisms into the tray.

Spoons and Clear Plastic Cups

Spoons and cups are useful for transporting tiny organisms and observing them at a close range.

Simply dip up tiny organisms with a spoon or cup and place the organisms in a container partially filled with clear water. Turkey basters are also useful for sucking up tiny organisms and transferring them to other containers.



Note: All of these aids are available from Delta Education.

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Hold It

HOLD-IT TROUGH

Equipment Card

Side 1

MATERIALS FOR ONE TROUGH:

3 half-gallon milk cartons
1 sharp knife

1 stapler
1 roll of waterproof tape* (electrical or duct tape)

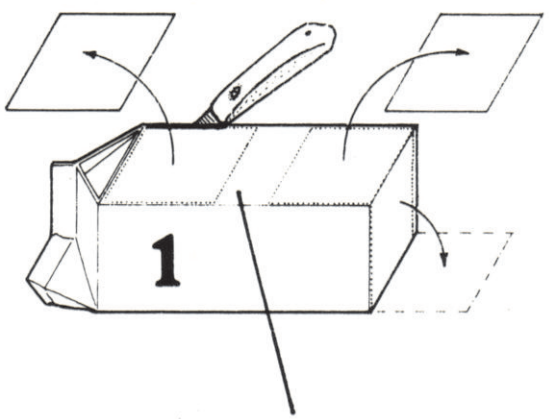
* Available from Delta Education.

CONSTRUCTION OF THE TROUGH

The trickiest part is cutting the cartons. For safety, the leader should cut the cartons.

Carton #1

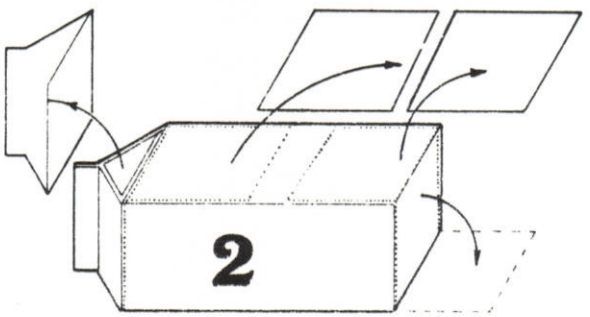
With the spout side *DOWN*, cut two windows in the top. Then cut the bottom of the carton loose so it flaps down.



Leave this cardboard bridge.

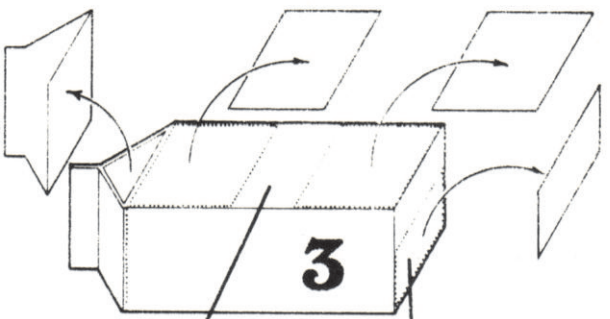
Carton #2

Cut off the spout and throw it away. Cut two windows in the top and then cut the bottom flap and fold it down.



Carton #3

Cut off the spout end and throw it away. Cut out two windows in the top. Cut the *lower half* of the bottom out.



Cut off this part of the bottom.

Again, leave this bridge for strength.

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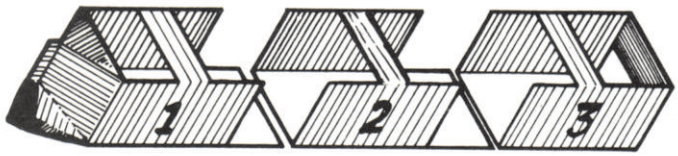
Hold It

HOLD-IT TROUGH

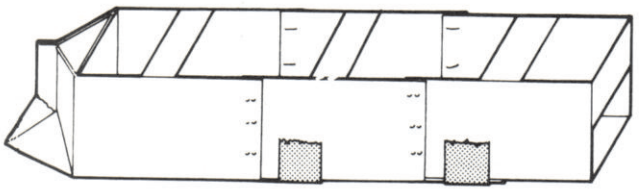
Equipment Card

Side 2



Assembling the Three Cartons

Slip carton #2 part way into carton #1. (The edges of carton #1 should overlap with the edges of carton #2 about two centimeters.) In the same way, slip carton #3 into carton #2.



Staple the sides where the cartons overlap and securely *tape* the bottom flaps down.

There! You have a Hold-It Trough.

USE OF THE TROUGH

To use the trough, you will also need:
1 aquarium net*
1 small plastic cup*

* Available from Delta Education.

The trough is a tool for investigating the ability of various aquatic organisms to withstand the force of currents. Here is how to use your trough:

1. Capture some stream critters and put them in a cup.

2. Set your trough in a shallow, level portion of the stream. The cut-out bottom of carton #3 should be upstream and the open spout downstream. You may need to brace the sides and spout end of the trough with rocks to hold the trough in place. The current should run swiftly through your trough.

3. Choose the bottom materials (rocks, twigs, plants, etc.) you want and arrange them in the bottom of your trough. The water in the trough should cover the bottom materials and still be flowing swiftly.

4. Put your net over the spout to catch any animals that don't hold on.

5. Dump your stream animals into the trough near the end where the water enters the trough.

6. Observe how, where, and the speed at which different creatures grab hold.

7. Vary the speed of the trough currents by trying the trough in different areas.

8. Trough currents can be artificially created by dumping water just above the trough.

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