

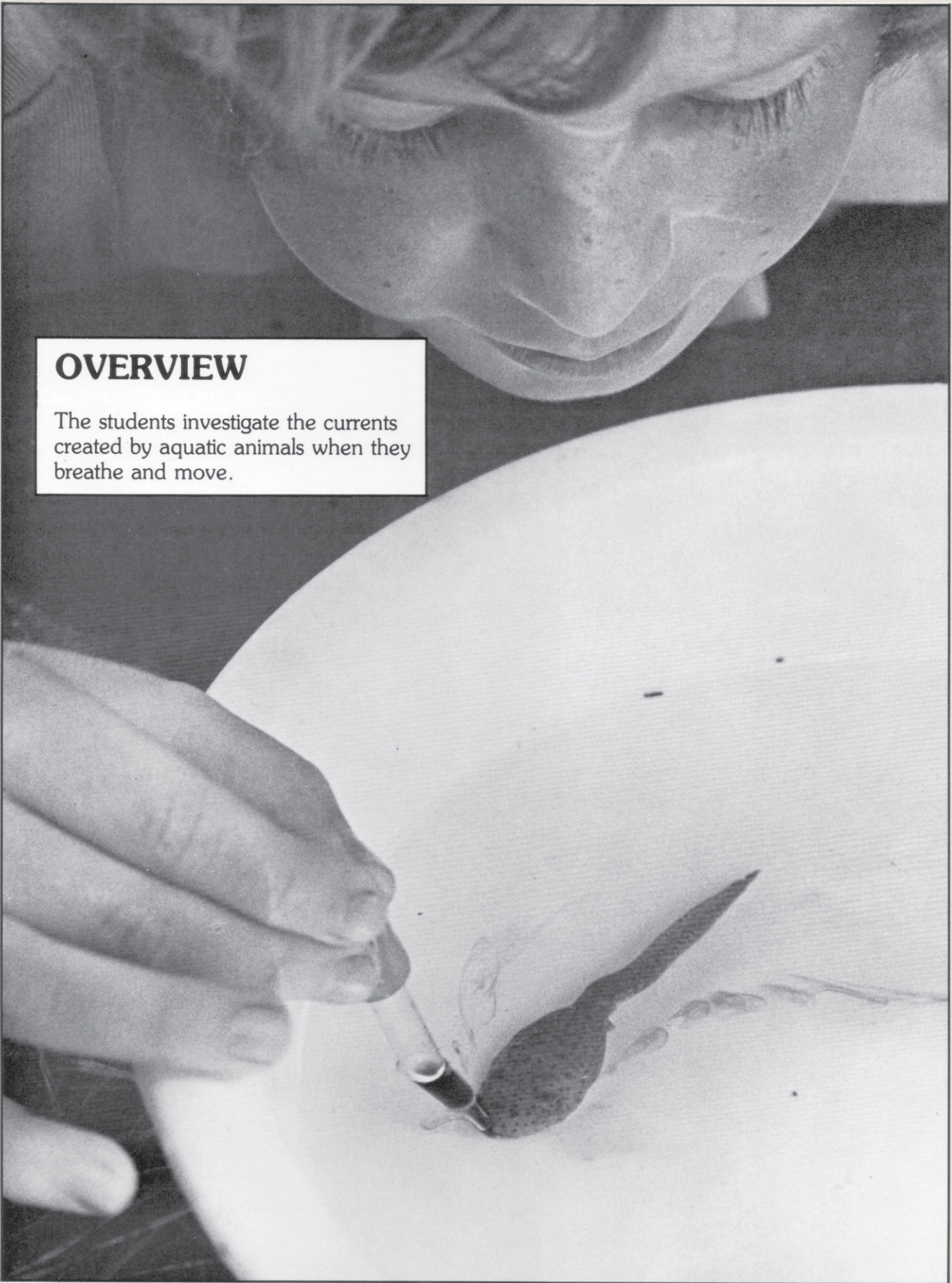
# WATER BREATHERS

**BIO  
KEY**

**Animal Investigation  
Bio-technique  
Adaptation**

## OVERVIEW

The students investigate the currents created by aquatic animals when they breathe and move.



## BACKGROUND

Many aquatic animals create water currents when they breathe, feed, or swim. In this activity, we refer to animals that actively pump or move water through their bodies as *water breathers*. You can find water breathers in both fresh and salt water. Tadpoles, fish, crayfish, clams, mussels, sponges, shrimp, and crabs are examples of water breathers.

The currents that water breathers create are usually difficult to observe because of the lack of color contrast between the currents and the surrounding water. You can solve this “invisible current” problem by *tracing* the currents with diluted food coloring, which safely passes through the water breathers’ bodies. This tracing technique provides enough color contrast to make animal-created currents visible.

The main value of the current-tracing technique, aside from the excitement of discovering such currents, is that it motivates youngsters to closely observe and study aquatic animals and their adaptations. An **adaptation** is a feature of an organism that helps it to survive and reproduce.

**CHALLENGE: INVESTIGATE THE CURRENTS THAT AQUATIC ANIMALS CREATE WHEN THEY BREATHE, FEED, AND PROPEL THEMSELVES THROUGH WATER.**



## MATERIALS

### For each team of two:

- 1 medicine dropper\*
- 1 small container of diluted food coloring (See “Preparation.”)
- 1 observation tray\* (See the “Aquatic Observation Aids” Equipment Card.)
- 1 large dip net\* (Optional: See Collecting Method B under “Preparation.”)

### For the group:

- 1 bottle of blue or green food coloring\*
  - 1 or 2 large buckets\* or dishpans to hold the animals before the activity
  - 2 small nets\* or cups to transfer animals
- \* Available from Delta Education.

## PREPARATION

**Group Size.** This activity is suitable for both small and large groups.

**Time.** Plan on thirty to forty minutes for this activity. We suggest familiarizing your group with aquatic organisms before conducting *Water Breathers*. You might conduct the OBIS activity *What Lives Here?* if you have it.

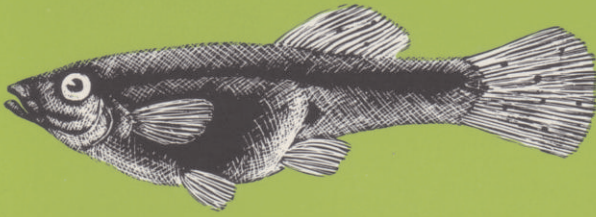
**Site.** Any freshwater or marine site with a variety of aquatic animals and fairly clear water is suitable.

### Organisms

**1. Collecting Method A.** Collect a variety of aquatic animals before the activity. (Include as many different kinds of water breathers as possible. See the “Background” section for examples.) If possible, collect two or more kinds of aquatic animals for each team. To keep the organisms comfortable and lively, keep them in the shade in buckets (or dishpans) full of water. Add a few aquatic plants and rocks from the site for shelter. If the air temperature is 20°C or above, use ice



sealed in a plastic bag to keep the container water between 10°C and 20°C. Tap water can be used for freshwater animals if it first is allowed to set for several hours (allowing the chlorine to escape).



MOSQUITO FISH

**2. Collecting Method B.** If you wish to have the youngsters catch their own organisms, you will need enough large dip nets for your youngsters to catch the animals at the beginning of the activity. The youngsters can place their organisms directly in observation trays. With this method, divide your activity period into two parts: a twenty-minute aquatic animal search, and, with nets put away, *Water Breathers*.

**Diluted Food Coloring.** Dark colors such as green and blue show up best. Dilute the food coloring by mixing one part liquid food coloring with eight parts water from the organism collection site. Mix up about 90 ml of "dye" for every ten students. Put 5 to 10 ml of the dye into a small container (pill vial or film canister) for each team.

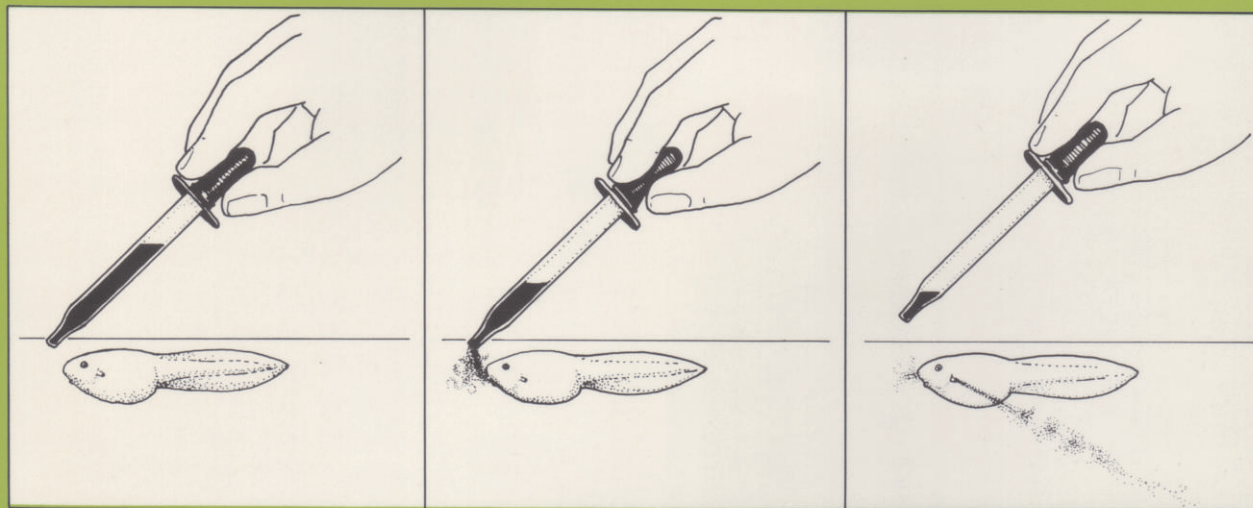
### The Current-Tracing Technique.

Practice the technique on some water breathers. Fill the dropper with some dye. Wait for the animal to stop moving around. Submerge the tip of the medicine dropper, and bring it near the part of the animal you want to check for currents. Gently squeeze out a tiny amount of dye. Before you release your finger pressure on the bulb, slowly pull the dropper out of the water. (This prevents further dilution of the dye in the dropper.) Moving the dropper *very slowly* allows you to approach active animals such as fish more successfully.

### ACTION



1. Explain to the youngsters that many aquatic animals create a variety of water currents when they breathe, feed, or swim, and that these currents are usually difficult to observe.
2. Introduce the dropper and dye as tools to use in observing currents created by aquatic animals.
3. Place a water breather such as a tadpole in an observation tray filled with clear water. Demonstrate the tracing technique. Emphasize that only a tiny amount of dye needs to be squeezed out each time.



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**4.** Divide the group into teams of two. Distribute the materials, and have the teams fill their observation trays about one-half full with clear water. Then let each team choose an aquatic animal to investigate. Small nets or cups can be used to transfer organisms.

**5.** Challenge the teams to use the tracing technique to search for the currents their animals create, especially breathing currents. Help guide the investigation by asking:

- Where does the water enter the animal?
- Where does the water leave?
- Does the water flow in a steady stream or in pulses?

Encourage the kids to place the dye near parts of the animal other than the mouth.

**6.** Investigate some animals yourself. Help refill the teams' observation trays with clear water when their water gets too heavily dyed. (Be careful not to lose the aquatic animals during water changes.)

**7.** Encourage the kids to investigate several different kinds of aquatic animals.



CRAYFISH



DRAGONFLY NYMPH

## CURRENT IDEAS

- 1.** Which animals seem to breathe water (i.e. pump water in and out of their bodies)?
- 2.** Do any of the animals take in or expel water from areas other than their mouths? Which animals? Where are their water intakes and exhausts located?
- 3.** Would water breathers be affected by water pollution? Why?
- 4.** How might movement help an aquatic animal survive? (Food, oxygen, warmth, or protection.) Tell the kids that any feature of an organism (such as gills for breathing or a powerful tail for fast swimming) that helps it to survive and reproduce is called an **adaptation**.
- 5.** What adaptations (changes to your body) would allow you to live under water? (Mechanical devices such as scuba are not allowed.)

**Note:** Have the kids return the aquatic animals to their aquatic site.

## BRANCHING OUT

- 1.** Monitor a tadpole's or fish's breathing rate by watching the currents. Compare this breathing rate to your own.
- 2.** Compare the breathing rate of aquatic animals in cold (5°C to 10°C) water and warm (15°C to 20°C) water. **Note:** Many aquatic animals are very sensitive to sudden temperature change. Gradually vary the animal's water temperature to minimize the shock.

# AQUATIC OBSERVATION AIDS: For Aquatic Activities

Equipment Card  Side 1



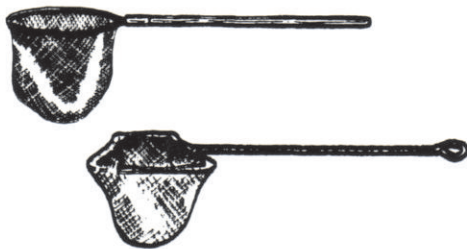
## Bug Boxes

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.



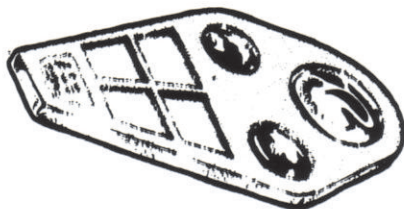
## Dip Nets

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.



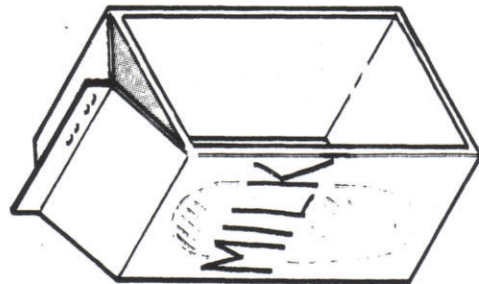
## Magnifying Lenses

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.

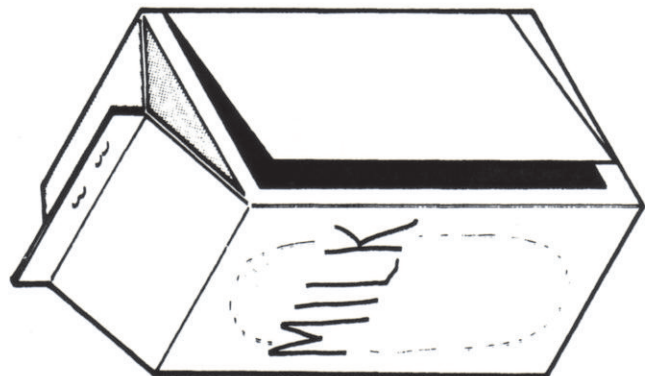
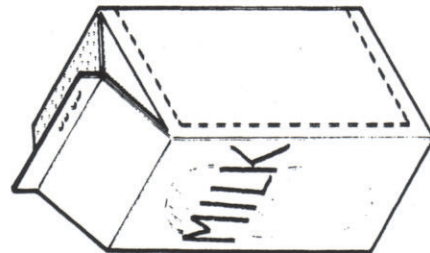


## Observation Tray

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.

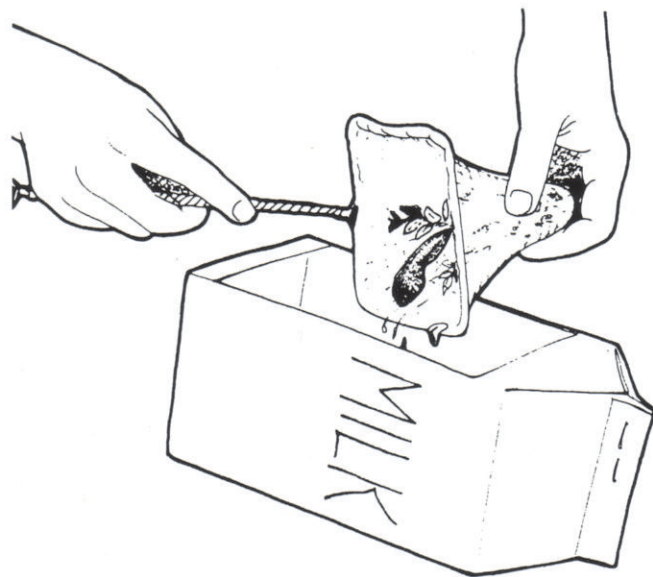


# AQUATIC OBSERVATION AIDS: For Aquatic Activities

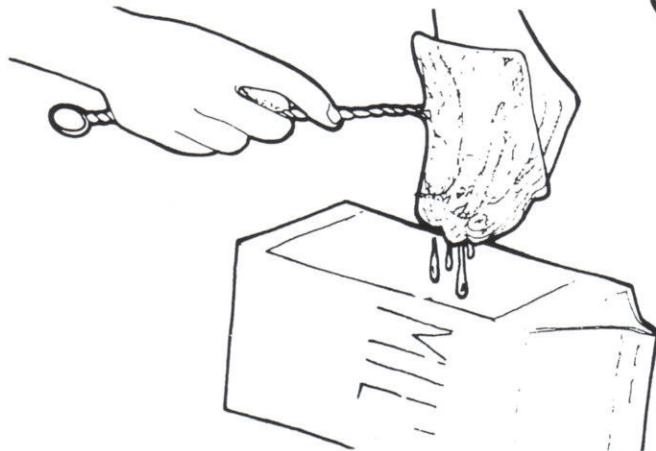
Equipment Card  Side 2



**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.



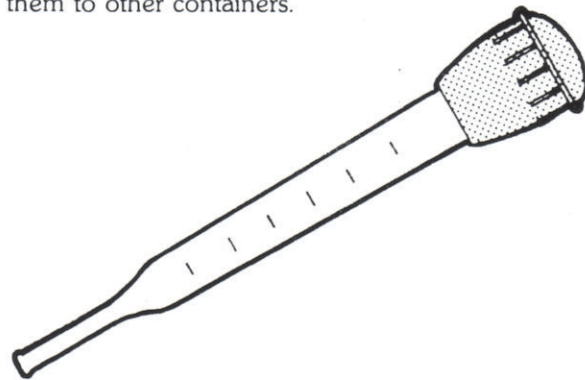
This will release netted organisms into the tray.

## 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.