

HOW MANY ORGANISMS LIVE HERE?

BIO
KEY Sampling Technique
Aquatic Organism Diversity
Population Census

OVERVIEW

Using homemade sampling gear, the youngsters estimate the numbers of organisms living in a small area at the bottom of a pond.



BACKGROUND



During the warm months of the year, ponds and the near-shore waters of lakes are usually teeming with organisms such as frogs, tadpoles, fish, water bugs, aquatic beetles, snails, and cattails. Hidden beneath the water and not as well known are the organisms that live in the mud and sediment at the bottom of a pond or lake. Tubifex worms, clams, mussels, crayfish, seed shrimp, flatworms, scuds, snails, insect larvae, and insect nymphs are some of the more common

bottom-dwelling animals. In addition, many aquatic plants are attached to the bottom, and their root systems and holdfasts wind through the bottom sediments. The place where an organism lives, such as the bottom of a pond, is called its **habitat**.

A sampling tool such as a bottom scraper can be used to scoop up bottom organisms. Estimates of population density (the number of organisms per unit area) and organism diversity can be obtained by counting the numbers of organisms that are scooped up from a

given area of bottom sediment. A **population** is a group of organisms of the same kind that lives and reproduces in a particular area, for example, all the bullfrogs in a pond. **Organism diversity** refers to the number of different kinds of organisms living in an area.

CHALLENGE: FIND OUT HOW MANY ORGANISMS LIVE IN ONE SQUARE UNIT OF POND BOTTOM.

MATERIALS



For each team:

- 1 bottom scraper or long-handled dip net (See the "Preparation" section.)
- 1 observation tray* (See the "Aquatic Observation Aids" Equipment Card.)
- 1 magnifying lens*
- 1 wire-mesh kitchen strainer* or old nylon stocking
- 1 copy of the *OBIS Pond Guide**
- 4 sticks (one of them with a half-meter mark)
- 1 copy of the Census Card
- 1 pencil

For the group:

- 1 data board or large sketch pad*
- 1 red, 1 green, and 1 black marking pen*
- 1 meter tape* or meter stick*
- 1 "Aquatic Observation Aids" Equipment Card*
- 1 "Bottom Scraper" Equipment Card*
- 1 Team Census Card*

* Available from Delta Education.

PREPARATION



Note: If your group is not familiar with the aquatic life at your activity site, we suggest that you conduct the OBIS

activity *What Lives Here?* before conducting this activity.

Group Size. This activity is suitable for groups of up to sixteen youngsters. If you have more than sixteen, we recommend two groups, each with a separate leader.

Time. Plan on fifty to sixty minutes for this activity. The warm months, when aquatic life is abundant, are best.

Site. Choose a pond or lake with a shallow, soft bottom and a safe, accessible shoreline. Use a dipnet or bottom scraper beforehand to make sure the site contains lots of bottom organisms.

Site Impact. The water in your pond or lake site will probably turn brown with silt and mud as the teams work and will remain that way for several hours after the activity. Because of the disruption of rooted plants in the sample areas, wait at least a week before repeating this activity at the same site.

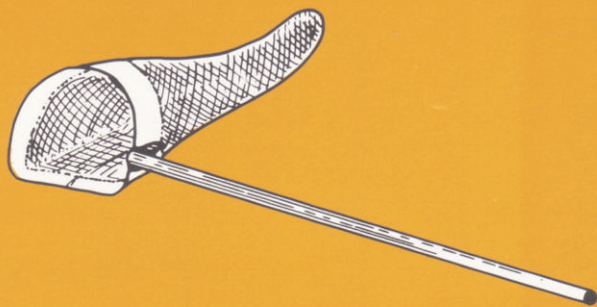
Safety. When working around the water, use the buddy system. (See the "Safety" section of the *Leader's Survival Kit* folio.)

Clothes. The youngsters may get wet and muddy, so suggest wearing old clothes and tennis shoes.

Materials

1. Bottom Scrapers or Dipnets. See the "Bottom Scraper" Equipment Card for instructions on making bottom scrapers. The pole model works better on bottom sediments within a meter of shore. The weighted can on a line is useful for sampling deeper water. A long-handled dipnet with a stiff rim and a sturdy bag also makes a good bottom scraper. The net bag can also be used to filter the scrapings. A dipnet's scraping





coverage can be enlarged by flattening out the lower edge of the net rim. (See the illustration.) Letting the youngsters construct their own bottom scrapers makes a good pre-activity session.

2. Sticks. Prepare four marker sticks for each team. On one of the sticks, mark a half-meter length with a marking pen.

3. Strainers. The reinforced toe areas of old nylon stockings or panty hose make excellent fine-mesh strainers. Simply dump the bottom scrapings into the nylon foot and squeeze and swish the mud-filled toe section in water to strain out all the mud. Turn the toe area inside out, and dip the contents into an observation tray filled with clear water to see the organisms that were retained.

4. Census Cards. Staple or glue copies of the Census Card to pieces of cardboard backing.

ACTION

1. Point out limits for the pond or lake activity site. Ask the kids to guess how many different kinds of organisms they think live in the sediment at the bottom of the pond. Tell the group that they are going to find out by scraping up half-meter squares of bottom sediment and then filtering the scrapings to observe and count the bottom organisms. Note: If bottom organisms are very abundant (that is, too numerous to count in a

half-meter sample) in your site, then reduce the sample unit size to 25 cm on a side.

2. Divide the group into teams of two and explain the buddy system.

3. Demonstrate the following bottom-scraping procedure:

- Fill an observation tray with clear water.
- Use four markersticks to outline the corners of a half-meter-square sample area next to shore. (Use the stick with the half-meter mark on it to measure out the sample area.) Mention that each team's sample area should be separated by at least a meter from any other team's area.
- Use a bottom scraper to scoop up the bottom sediments inside the sample area to a depth of *one to three centimeters*. Start at one side and rake the scoop or net in straight rows until you have covered the whole area. Empty your scraper into a strainer after each scoop, and ask one of the kids to start rinsing out the mud.



- Filter the scrapings through a kitchen strainer, net bag, or nylon stocking, taking care not to lose any scrapings. Dunk and swish the strainer in the pond to strain out all the mud. Then place the clean scrapings (including rocks, plants, and sticks) into the observation tray.



4. Tell the youngsters that after dumping the scrapings into the observation trays, they will observe and count the organisms in the trays. Tell the kids to check carefully for any organisms that might live on the plants, rocks, or sticks. Some organisms (hydra and flatworms, for example) are easily overlooked until the object they are attached to is immersed in water and left undisturbed for a few minutes.

5. Explain that each team will list on a Census Card the different kinds of organisms they find. Each team should also try to count and record the numbers of each kind of organism in their sample. Mention that the *OBIS Pond Guide* is useful for identifying the organisms found.

6. Give the teams their materials and let them work on their own. Suggest filling the observation trays with clear water before starting. Each team should take at least one census. Let the teams work until there are about fifteen minutes left in the period.

7. As the teams work, use the black pen to draw a large version of the census chart on the data board.

8. Give the teams a few minutes to share their organism discoveries. A good way to foster sharing is to have the teams set out their observation trays in a line so that the teams can move easily from tray to tray.

9. Ask the teams to read their census-card lists so that you can list the organisms on the data board. Use the red pen for listing animals and the green pen for plants. Also record each team's count for each kind of organism.

GETTING THE SCOOP!



1. Ask the youngsters:

- How many different kinds of plants were found? Animals? What were

the most numerous plants and animals in the samples?

- Why do you think each team did not catch the same kinds and numbers of organisms? (Some possible explanations are: differences in sample areas, uneven distribution of bottom-dwelling organisms, and differences in counting and scooping techniques.)

2. Explain that the organism counts can also be used to estimate population densities (that is, the number of organisms of each kind per unit area). Write out the term **population** and define it. (See the "Background" section.) Average the counts for each kind of organism to get estimates of population density for some of the organisms found.

3. Write the term **diversity** on the data board and define it. (See the "Background" section.) Explain that the census-chart list on the data board is a current measure of the diversity of bottom-dwelling organisms in the pond site. Ask if the youngsters are surprised by the diversity of organisms that they found. Why?

4. Ask the youngsters what impact they think they had on the pond today. How long do they think the effects will last?

Note: Have the teams return all their organisms to the pond.

BRANCHING OUT



1. Have the group determine the population size of highly visible organisms, for example: shore plants, water striders, frogs, or ducks.

2. Conduct the activity during a different time of year. Compare organism diversity and population sizes to those of the summer months.

How Many Organisms Live Here?

BOTTOM SCRAPER

Equipment Card 

Side One



BOTTOM SCRAPER I

A **bottom scraper** that works well with firm or plant-covered bottoms can be made by bolting or nailing a large fruit juice can to a wooden dowel or broomstick. The mouth of the can should point toward the user's end of the pole. Use the scraper as you would a rake to sample the bottom.

MATERIALS FOR ONE SCRAPER:

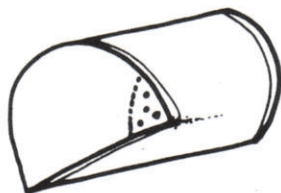
- 1 empty can (1 to 2 liters)
- 1 pole (a meter long)
- 1 hammer and nail
- 2 screws or bolts with nuts

TO MAKE THE BOTTOM SCRAPER:

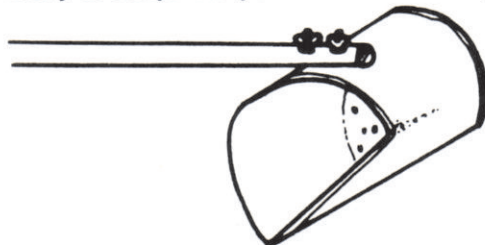
1. Punch several holes in the bottom of the can.



2. Flatten one side of the mouth of the can to make a broader scooping surface.



3. Bolt the stick to the upper half of the outside of the can at an angle to the long axis of the can (as illustrated). Your bottom scraper is now ready to scrape the pond bottom for samples.



A **bottom scraper** is used to bring up a sample of bottom mud and debris for close observation. It can be used in shallow or deep water, provided a tow line of sufficient length is used to keep the scraper traveling along the bottom. This device allows you to closely observe organisms that you would otherwise completely overlook.

BOTTOM SCRAPER II

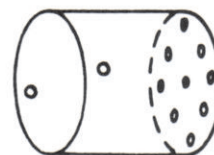
MATERIALS FOR ONE SCRAPER:

- 1 empty can with a capacity of about 1 liter
- 1 piece of #18 or #20 wire*, 5 cm longer than the diameter of the can
- 1 225-gram (8 oz.) fishing weight* or other convenient weight
- 1 nail and hammer to make holes in the bottom of the can
- 1 towline*

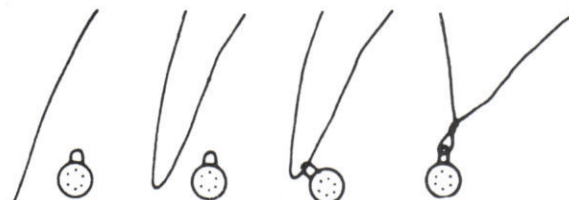
* Available from Delta Education.

MAKING THE BOTTOM SCRAPER:

1. Punch holes in the can: several in the bottom and two holes on the side of the can near the top, one directly across from the other.



2. Fasten the fishing weight to the center of the wire with a few twists. If you twist the wire so that a big eye-hole remains, you will have a convenient place to attach a towline.



How Many Organisms Live Here?

BOTTOM SCRAPER

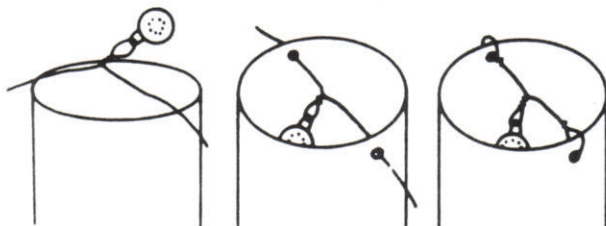
Equipment Card



Side Two

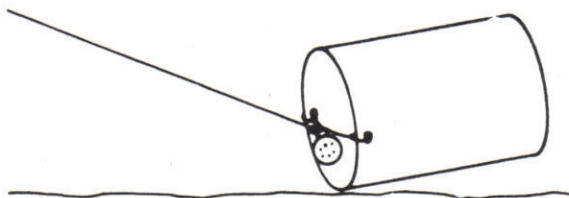


3. Now assemble the two parts by passing the two ends of the wire through the two holes you punched at the top of the can. Center the weight in the middle of the opening of the can, and twist the ends of the wire securely. Tie on the towline, and you are ready to sample the bottom of a pond.



USING THE BOTTOM SCRAPER:

To use the scraper, toss it underhand into the water and slowly pull it in. Filter the contents through a net or sieve to separate the organisms.



AQUATIC OBSERVATION AIDS:

For Aquatic Activities

Equipment Card



Side 1



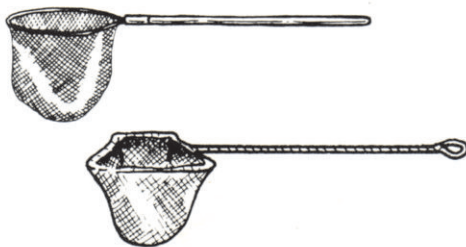
Bug Boxes

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.



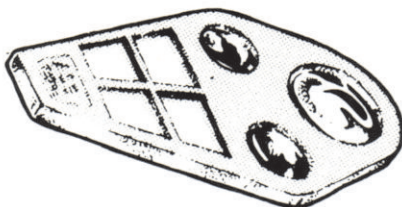
Dip Nets

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

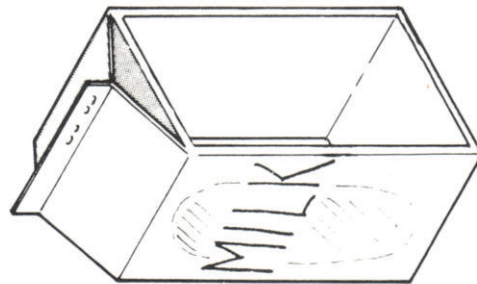
To use a magnifying lens, hold the lens close to one eye and move either your head or the object back and forth until you can see the object clearly.



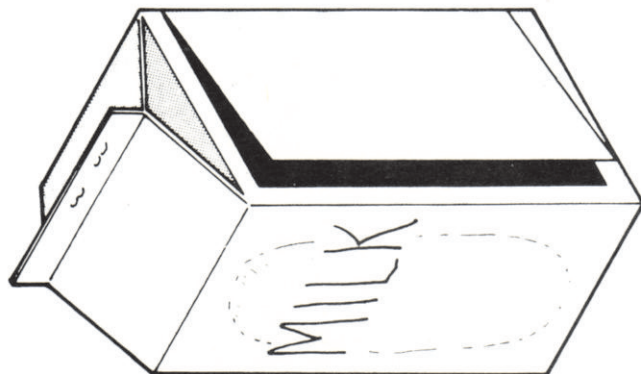
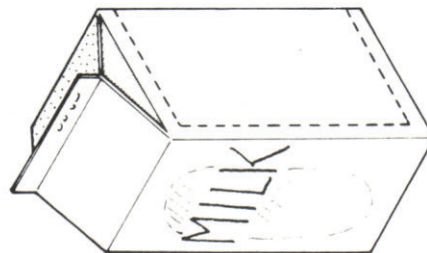
Observation Tray

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

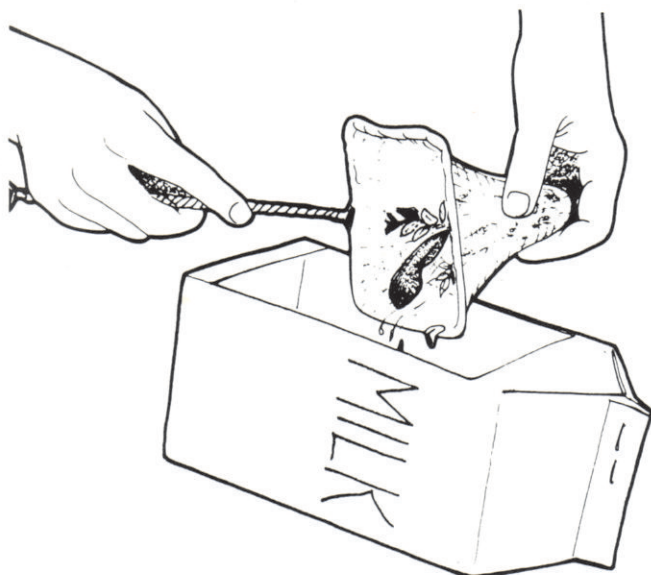


Side 2

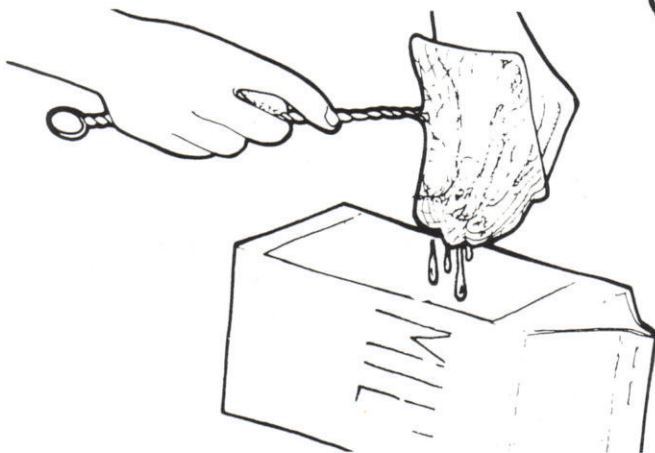


Transferring critters to observation trays.

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.



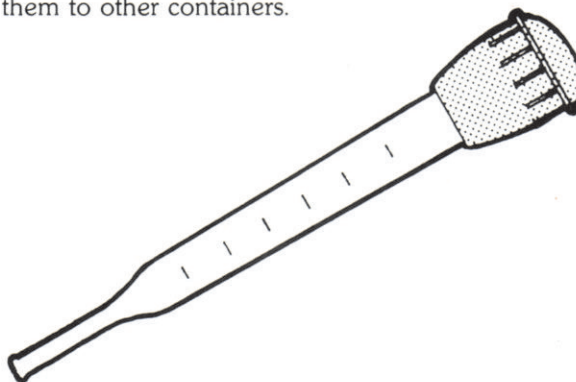
This will release netted organisms into the tray.

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.

How Many Organisms Live Here?

Census Card



	LIST EACH KIND OF ORGANISM THAT YOU FIND.	LIST THE NUMBER OF EACH KIND OF ORGANISM.
 ANIMALS		
 PLANTS		