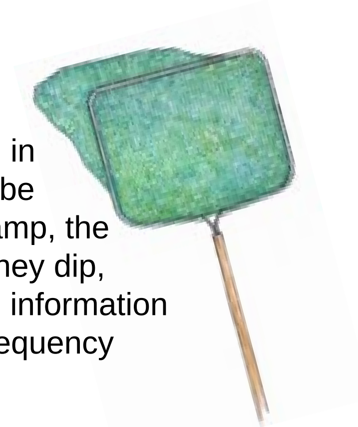
Resources for
LET'S TAKE A DIP

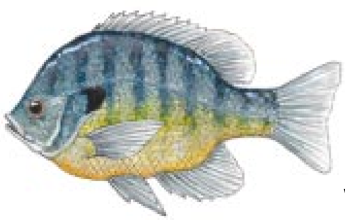


Introduction

In this Web site activity, the students will learn about the organisms found in four different wetland habitats at Hard Bargain Farm (HBF). Students will be instructed to "virtually" dip their nets in the creek, then proceed to the swamp, the marsh, and finally the river, dipping ten times in each habitat. Each time they dip, they will see a graphic image of their catch. They will be expected to read information on the screen about that organism and fill in their "Habitat Populations Frequency Table".

Similar to the field studies at HBF, scientists conduct stream investigations to evaluate the health of an aquatic system, to gain insight into the relationships between species, and to acquire knowledge about the dependency of organisms on the environmental conditions around them. Students, like scientists, learn about the world around them through observation and experience. For many elementary school children, the field studies at Hard Bargain Farm are their first "real-life" exposure to wetland areas.

"Let's Take A Dip" can be used either as a pre- or post-field trip activity. One option would be to perform the computer lab "dipping" as a pre-trip activity and complete the classroom



data analysis as a post-trip activity. As a pre-trip activity, this activity introduces, or augments the student's knowledge of, the scientific method, introduces the students to the habitats and creatures they may discover in the outdoor experience and encourages them to predict what they may find. As a post-trip activity, it can reinforce what they learned outdoors and gives them a basis to compare the "virtual" data with their "actual" field experience.

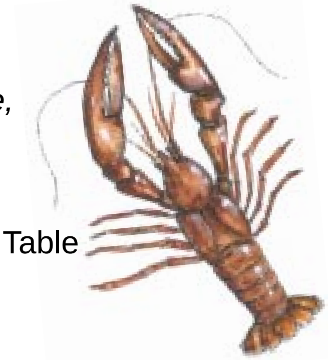
Overview

Students will "virtually" dip their nets ten times in each of four different aquatic habitats. They will read the information from the screen about each organism and keep a tally of the number and kinds of creatures caught using the "Habitat Populations Frequency Table" after each dip. Students will draw conclusions using their own data, then they will combine their data with their classmates and draw conclusions from the combined data. Finally, they will compare their individual conclusions to the conclusions from the group data.

Materials

For each student or pair of students *(We suggest having students work in pairs)*:

- one blank Habitat Populations Frequency Table
- pencil
- access to PC with Internet capability (*or a CD of HBF's Web site, call 301-292-5665 for information*)



For the class:

- one large poster version of the Habitat Populations Frequency Table or a transparency used with an overhead projector.

Procedure

Engage

Classroom instruction immediately prior to computer activity

1. Explain to the students that in this exercise they will collect data on the number and kinds of organisms (living things) found in four different aquatic (watery) habitats. Scientists conduct this type of research to learn about the health of the environment and look for patterns to help understand relationships between different living things and between organisms and their surrounding environment. Refer to “Scientific Method Applications” (pg 4) for discussion ideas.
2. Distribute a copy of the Habitat Populations Frequency Table (pg 5) to each student. This table allows the students to easily keep track of the data they collect. Discuss the meaning of the words habitat, population, and frequency. Review the classifications for the organisms (amphibian, fish, mollusk, reptile, crustacean, insect, plant, etc).

    habitat - a place that has the minimum required amounts of food, water, shelter and space for a particular species

    population - the total of individuals or organisms occupying a particular area

    frequency - the number of measurements in an interval of a frequency distribution. The ratio of the number of times an event occurs in a series of trials of an experiment to the number of trials of the experiment performed. For example, a banded killifish was caught in four out of ten dips in the marsh.

3. Demonstrate what is meant by a tally mark. Explain that instead of actually dipping with real nets, they will dip by clicking (pressing the left mouse button with the index finger). Each dip will be recorded as one tally mark, regardless of how many organisms are pictured on the screen.

Note: Advise them to click carefully, one at a time, and record their data as they go.

4. Determine the level of computer/Internet expertise among students. Consider pairing inexperienced students with more experienced students, if necessary. Remind them to take turns at the controls. It is not useful if one student is always recording or “dipping”.

    Note: If a large number of students are inexperienced and computer lab time per session is limited, it would be advisable to schedule an exploratory session in the computer lab prior to attempting the “Let’s Take a Dip” activity. The students should practice getting on the Internet and exploring the Hard Bargain Farm Web site. We also advise that you, as the teacher, are familiar with how to navigate the Internet and the HBF Web site.

Explore

Computer lab activity (requires approximately 30 minutes)

5. Write the Web site address on the board in the computer lab - www.hardbargainfarm.org (no spaces). Instruct students to access Web site using the school's Internet browser.
6. When the HBF Web page appears on the screen, students will go to the Kids' Zone, then to the "Let's Take a Dip" activity.
7. Instruct them to read the information and directions on the screen, then to proceed at their own pace following those instructions. Use reminders as appropriate. (Reminders: start in the swamp first, click carefully, record data after each dip (click), dip and record 10 times in the swamp, then repeat in the next habitat, read the information about each critter caught, write the classification for each creature in the column on the data sheet.)

Note: This provides an excellent opportunity for them to read to follow instructions and read to acquire information. Students should work independently as much as possible.

8. If they didn't catch a certain creature, they can go to the "Critter List" to read about it.

Explain

Follow-up discussion and analysis in the classroom

9. Stimulate students to think about what conclusions they could make using only their data. Have them complete the "Data Analysis Questions" (pg 7), and provide supporting evidence that helps justify their answers.
10. Combine data from the class using large poster version of frequency table or transparency with overhead projector.
11. Draw conclusions as a group about the organisms and habitats using "Data Analysis Questions" as a guide. Do the group conclusions differ from their individual conclusions? Are conclusions based on more data more accurate than those based on less data?

Elaborate

Field Study at Hard Bargain Farm or other outdoor education facility

12. A staff-led exploration of various habitats within the Potomac River watershed, including a sampling activity (dip net or other technique) in at least one habitat, weather and water conditions permitting.
13. Discussion of actual sampling results compared to virtual results from Web activity.

Evaluate

14. Evaluate completed Tally Sheets and Data Analysis worksheets, use Data Analysis Background Information (pg 10) and Scientific Method Applications (pg 4) to assist with evaluation of responses.

SCIENTIFIC METHOD APPLICATIONS FOR LET'S TAKE A DIP

Introduction

Scientists make observations and collect data in order to learn about the world around us. Students will formulate a question that can be answered by looking for creatures using dip nets. They will evaluate whether the experimental design used in the Web site activity is a fair test. **BEFORE KIDS DO THE EXERCISE** - Class discussion of scientific method

- Which steps have been done for the students?
- Lead the students in a discussion to complete the remaining steps

Steps in the Scientific Method

- Ask a Question - what, how, when (not why)
- Formulate Question -
  How do the number and type of organisms differ between the creek, swamp, marsh, and river habitats?
- Design an Experiment - Fair Test
  ex. Let's look for creatures using dip nets, in order to answer the question: Is it comparable to dip 40 times in one place and 5 times in another? How do we make the study more fair? (same size nets, same number of dips, same method of dipping every time, same date, etc.)
- Expectations - Hypothesis
  ex. We will find different creatures in different habitats.
  ex. We will find more fish in the creek versus the swamp.
- Collect Data
  Data is numerical, recorded in easy-to-use chart or table.
- Data Analysis
  Compare results. Does it answer the question posed at the beginning of the investigation? Did your findings support your hypothesis? Explain your findings. Can it be reorganized and presented in a different way that will give us more information quickly by looking at a graph?
- Evaluate the Results

WHAT KIDS WILL DO WHILE ON-LINE - dip, record data on chart, read information about creatures

WHAT TO DO WITH THE DATA - Analysis

- Compare the number and types of organisms found in each habitat by first using one individual's data. What can we say about ____ ? Refer to "Data Analysis Questions" (pg. 7).
- Combine data from the class members and compare using group data.
- Do conclusions differ? Which is better, that based on one sample set or many? Which data give more accurate information? Short of draining the entire habitat and counting every creature, we will never know exactly what organisms and how many of each are in the different habitats. Sampling gives us an estimate or approximation. This is how scientists conduct population studies!

Name:______________
Date:_______________

Habitat Populations Frequency Table

Tally and classify the organisms caught in each of the four habitats: creek, swamp, marsh, and river. Classify the organisms as AMPHIBIAN, CRUSTACEAN, FISH, INSECT, MOLLUSK, PLANT, or OTHER.

NAME OF ORGANISM	CLASSIFICATION	CREEK	SWAMP	MARSH	RIVER
American Toad					
Arrow Arum					
Backswimmer					
BandedKillifish					
Blacknose Dace					
Bluegill					
Caddisfly Larva					
Cranefly Larva					
Crayfish					
Dragonfly Nymph					
Eastern Mudminnow					
Freshwater Mussel					
Green Frog					
Hydrilla					
Isopod					
Mosquitofish					
Mud					
Mummichog Minnow					
Pill Clam					
Scud					
Silverside Minnow					
Snail					
So. Leopard Frog					
Tadpole					
Water Boatman					
Water Strider					
Whirligig Beetle					

Sample Habitat Populations Frequency Table

This table shows the relative frequencies of the species caught in each habitat. You can use this information to compare to the data your class collects.

NAME OF ORGANISM	CLASSIFICATION	CREEK	SWAMP	MARSH	RIVER
American Toad	amphibian			1	
Arrow Arum	plant		1	1	1
Backswimmer	insect	1			
BandedKillifish	fish	111	111	1111	11
Blacknose Dace	fish	1			
Bluegill	fish	1		1	1
Caddisfly Larva	insect	11			
Cranefly Larva	insect	1			
Crayfish	crustacean	11	11	11	
Dragonfly Nymph	insect	1	11	11	
Eastern Mudminnow	fish	1		1	
Freshwater Mussel	mollusk				11
Green Frog	amphibian			1	
Hydrilla	plant				11
Isopod	crustacean		11	11	
Mosquitofish	fish	1	1111	1111	
Mud	other				
Mummichog Minnow	fish	1			1
Pill Clam	mollusk				1111
Scud	crustacean	1	1111	111	
Silverside Minnow	fish				111
Snail	mollusk		1		111
So. Leopard Frog	amphibian			1	
Tadpole	amphibian	1	111	11	
Water Boatman	insect	1		1	
Water Strider	insect	11		11	
Whirligig Beetle	insect	11		1	

Let's Take a Dip
Data Analysis Questions

Part 1

1. Did you catch any amphibians? Make a list of the amphibians that you caught and a list of amphibians that you did not catch.

2. Which kind of fish did you catch most often?

3. In which habitat did you catch the largest number of different types (species) of fish?

4. Which habitat had the greatest diversity (the largest number of different species)?

5. In which habitat did you catch the most:

   Amphibians

   Crustaceans

   Mollusks

   Reptiles

   Insects

   Fish

Part 2

6. Construct a bar graph to display the data you collected for one habitat. How would you organize your information differently to display the data for more than one habitat?

7. Use a bar graph to show how your data compares to the data displayed on the Sample Habitat Populations Frequency Table (in the Teacher Resources Section)? Do your data reflect the typical distribution of organisms in each habitat? Use your data from both sources to support your answer. (Explain how your dipnet results are similar to, or different from, the data on the Habitat Populations Frequency Table.)

8. Select two habitats you visited to collect information. What similarities and differences did you observe between the populations of the two habitats? What are some reasons that might explain the differences you observed? (*You might choose to organize your information in a Venn diagram*)

9. Mosquito larvae live in the swamp water. They are 3-15mm in length.
   a. Why do you suppose you didn't catch any in your dipnet?

   b. If you had used a net with smaller holes, would your data have been different? Explain your answer.

Challenge Questions

10. Why is it important to dip your net many times when collecting information about the organisms living in any of the habitats? How can combining your data with data collected by others affect the accuracy of your information?

11. According to the data from the Sample Habitat Populations Table (in the Teacher Resources Section), there are usually about 3 killifish for every 4 amphipods caught in the swamp at Hard Bargain Farm. You know killifish are predators of amphipods.
    a. Make a prediction about the changes that would occur in the distribution of organisms living in the swamp if the killifish population suddenly doubled. Use your knowledge of the swamp and the organisms living there to explain your prediction.

    b. If you were to use a net with much smaller holes, would your data and predictions have been different?

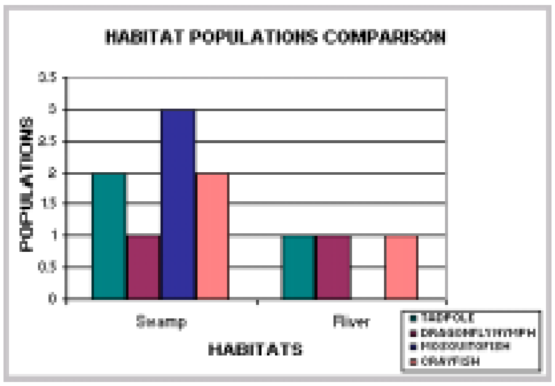
12. Does your collection technique give you a true idea of what actually lives in an aquatic environment? Justify your answer.

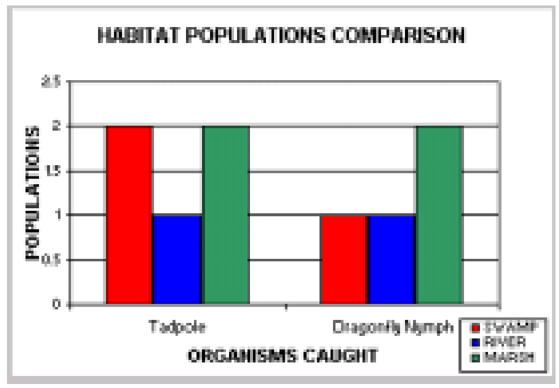
There are no set right or wrong answers for the data analysis questions because the data may vary from group to group. For your convenience we have put together some background information and sample answers for each question in Part 2.

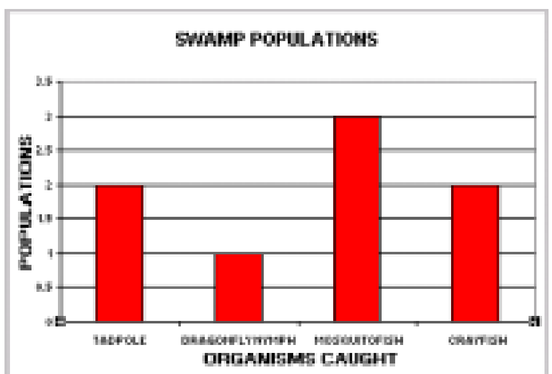
Part 2

6. Construct a bar graph to display the data you collected for one habitat. How would you organize your information differently to display the data for more than one habitat?

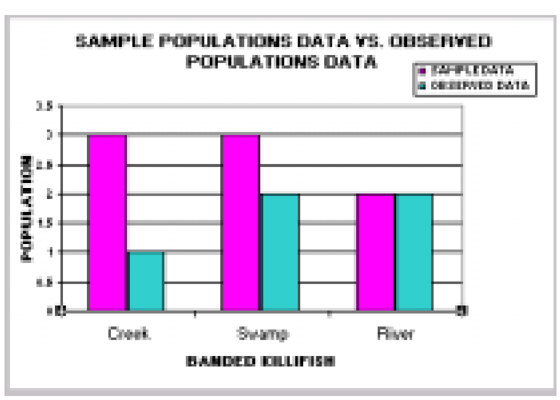
   Sample graphs:







7. Use a bar graph to show how your data compares to the data displayed on the Sample Habitat Populations Frequency Table (in the Teacher Resources Section)? Do your data reflect the typical distribution of organisms in each habitat? Use your data from both sources to support your answer. (Explain how your dipnet results are similar to, or different from, the data on the Habitat Populations Frequency Table.)



8. Select two habitats you visited to collect information. What similarities and differences did you observe between the populations of the two habitats? What are some reasons that might explain the differences you observed?

   A Venn diagram or a bar graph would be a great way to see the similarities and differences for a selected habitat. Let's say you compared the number of killifish in a swamp versus a river. Reasons for similarities might be that similar food is available in both places, predators might be equally common in both habitats, or hiding places (shelter) might be similar in both habitats. Some reasons for differences might be different water currents, a larger area for organisms to get away, or predator populations may be different for each habitat. Basically, think how the fish get their food, where they hide from predators, and the numbers of fish. Too many fish might mean less food for all, or not enough hiding places. Also, consider water depth, water temperature, or water clarity as possible explanations for data differences.

9. Mosquito larvae live in the swamp water. They are 3-15mm in length.
   a. Why do you suppose you didn't catch any in your dipnet?

      Perhaps the net holes were not small enough to catch the tiny larvae. Maybe you sampled in the wrong season, when larvae were not present. Maybe a predator ate most of them.

   b. If you had used a net with smaller holes, would your data have been different? Explain your answer.

      A net with holes smaller than the tiniest larvae would very likely catch any larvae present in the water. If the holes are larger, the larvae simply slip through the holes back into the water before you actually see them.

Challenge Questions

10. Why is it important to dip your net many times when collecting information about the organisms living in any of the habitats? How can combining your data with data collected by others affect the accuracy of your information?

    The more times you dip your net (assuming that the organisms are stored in a bucket), the more likely you are to catch all the organisms. Therefore, more dips will more accurately represent the actual composition of organisms in your habitat. However, one dip might scare the organisms away and you would not collect any other organisms. If you used that information for your graph, it would not accurately depict the actual number of organisms present in the habitat. Combining data is like taking more samples. Therefore, it is a more accurate representation of the habitat's populations.

11. According to the data from the Sample Habitat Populations Table (in the Teacher Resources Section), there are usually about 3 killifish for every 4 amphipods caught in the swamp at Hard Bargain Farm. You know killifish are predators of amphipods.
    a. Make a prediction about the changes that would occur in the distribution of organisms living in the swamp if the killifish population suddenly doubled. Use your knowledge of the swamp and the organisms living there to explain your prediction.

       The amphipods are food for the fish. If you suddenly have more fish competing for the same amount of food, this larger population will either drastically deplete the number of amphipods or totally wipe them out. Either way, this means less food for each fish, which could affect their long term health. Overcrowding often leads to the easier spread of diseases, which in turn, leads to a population decline. Keep in mind that killifish are also food for other swamp residents. An increase in the fish numbers might make them an easier target for larger predators. The food chain is clearly complicated.

    b. If you were to use a net with much smaller holes, would your data and predictions have been different?

       If we used nets with smaller holes we might have caught more amphipods. If the holes were already small enough to capture any size amphipod or baby fish, then it is unlikely that our data would be affected. If either amphipods or baby fish slipped through our net holes, then the population numbers we recorded would have been different.

12. Does your collection technique give you a true idea of what actually lives in an aquatic environment? Justify your answer.