Aquatic Ecosystems Research Project

OBJECTIVES

The living organisms in our world are varied in form, complexity, and diversity. During the course of the semester we will be looking at how this diversity meets the needs of organisms for nutrient procurement, gas exchange, excretion, and reproduction This project will allow you to observe the diversity of life in a dynamic environment.

After completing this project you will be able to:

- Use scientific literature
- Evaluate & summarize scientific information
- Study ecology
- Work cooperatively (group of 2)

BACKGROUND

Life on Earth is diverse and ubiquitous, filling large and small niches but limited by temperature, water, and energy resources. Individual organisms live in a community where they are competing for space and resources. The complexity of these communities can vary depending on location. Warm wet environments generally have greater species diversity than cold or dry environments.

The pool of water, which forms after a rain on a previously dry sidewalk, will in a short time flourish with many tiny organisms. The bark on a tree harbors many microorganisms, which are usually dormant when the bark is dry. When wetted these organisms come to life but are only visible with the microscope-aided eye. In ponds, organism are stratified at different levels in the water—all occupying different niches. You can go anywhere in the environment, collect organic material, give it moisture and nutrients and watch the many small organisms grow and compete among themselves for resources.

PROCEDURE

Work in groups of two students. Each group will have a MicroAquarium to study an aquatic microecosystem.

Setting up your MicroAquarium

In the lab will be an assortment of waters collected from various sources that can be used in your MicroAquarium. You can also collect your own material. Let your instructor know if you want to do the latter. Record the source of material used in your aquarium.

1. Obtain a MicroAquarium.
2. Place one of the provided colored dots on the lefthand side edge and write your initials on the dot.
3. A thin layer of **sediment** (0–5 mm) resting in the bottom of an upright MicroAquarium provides food and habitat for many invertebrates. A coffee stirrer can be used to position substrates in the bottom. Excessive solid matter can reduce visibility into the microcosm
4. Using a micropipette, extract water from one of the containers on the lab bench or from the water you collected.
   a. Extract enough water from the **bottom** of the container to fill the MicroAquarium tank about 1/3 full.
   b. Extract the next 1/3 of water for your tank from the **middle** layer.
   c. Then fill the rest of your tank with water from the **surface**.
5. Decorate it with some plant or other objects provided.
6. Replenish evaporative water loss as needed (ca. every 10 days) with distilled water.
   Food may be added at a later date.
7. Turn in **one written report per group**.

Observing the contents of your McroAquarium

You can observe the contents of the Micro-Aquarium with a dissecting or inverted compound microscope.

1. Remove the stand and lid from the MicroAquarium tank.
2. Gently lay the tank on the microscope stage with the open end away from you. Capillary action will keep the water in. When using the compound scope you can place it in the slide holder and move the tank with the appropriate knobs. On the dissecting scope lay the tank flat and manipulate it with your fingers.

Things to look for and record

The tank will have living organisms and various forms of debris. You are to observe the *living* organisms

1. Stationary vs. moving organisms.
2. If moving, a description of motion.
3. Single celled vs. multicellular organisms
4. Chlorophyll green vs. non-green organisms.
5. Habitat preference of the different organisms – bottom, middle or top
6. For each organism record:
    a. Identify it if possible or carefully sketch it so you can recognize it in subsequent observations.
    b. Record the number observed.
7. Is the water evaporating? Did you add water?
8. When and what food was added.

Observing your MicroAquarium weekly

You are to come and observe your Micro-Aquarium at least once a week over the next ten weeks.

Possible observations.

1. What changes have occurred since the last observation?
2. Have the numbers of each organism increased, decreased or stayed about the same?
3. Are there dead organisms in the bottom layer of the tank?

Your Weekly Log

Your wiki log is an open notebook of your activities while working on this project. You should add to your log each week – each week's entry should appear before Monday of the following week.

1. Things you should include
    a. The name of the water source you used including other objects you might have added.
    b. Observations you make each week from your MicroAquarium.
    c. Images of organisms: A minimum of four images are to be included. All images should be yours. NO IMAGES FROM THE WEB or copied from other sources. For each image, cite a source for its identification.
    d. When searching for information on the web include URLs you found useful and what information was pertinent to your project.
    e. A list of the organisms found in your MicroAquarium, numbers observed, date when first observed and date when last observed.
2. Other pertinent comments, questions, or images you want to add are up to you.
3. Make sure you compose complete sentences with correct spelling and grammar because your instructor will read this information.

Aquatic Ecosystems Research Report (One written report/student group)

1. Title page
2. **Six** (maximum) content pages. The text should consist of a student-worded analysis of your research during long hours in a library and in the lab.
   a. **Background.** A review of literature on some aspect of aquatic microecosystems. (See topics on the BIOL 215 website.) Put everything *in your own words* with the proper citation in parentheses: **do not** quote directly from other works. (12 pts)
   b. **Materials and Methods**. Include water source and microscope and camera equipment used. (5 pts)
   c. **Results.** Use prose to describe results and reference tables or graphs that illustrate your description. Do not just show raw data. (11 pts)
      1. Graph(s) of population changes. Must include primary producers. One graph must show a producer and consumer. A minimum of two graphs is required.
   d. **Discussion** (12 pts)
      i. An in-depth discussion on one of the organisms you observed. Put everything *in your own words* with the proper citation in parentheses: **do not** quote directly from other works.
         a) Include its scientific name.
         b) Classification to its known level: Domain; Kingdom; Phylum; Class; Order; Family; Genus; Species
      ii. Discuss the changes that occurred in your MicroAquarium over the past nine weeks. Note factors that might have influenced these changes.
      iii. Compare your data with another group's data. What was their sample? _____ *OR,* What was the effect of an introduced species? Explain differences.
   e. **Literature cited page**. Include resources used in identifying organisms and information sources for your background discussion. Include 6 references in correct format. You must use at least 3 journal articles; all references may *not* be books and websites. References must be cited somewhere in the content. Do not include references prior to 1980.
   In-text citations are noted with a number in parentheses corresponding to the number of the reference in your Literature Cited page. (6 pts)
3. **Three figures**.
   a. Figures can include one photograph or picture, food chain, phylogenetic tree; calculations; or graph. A figure can have (no more than) two parts. Note, tables are not figures, (9)
   b. Each figure must have a number and legend. E.g., *Figure YY. The population of Organism A decreased after Organism B…*
   c. Refer to each figure in the body of the text. For example, *Organism A started growth on Day X after organisms B (Figure YY).* Then explain why in the discussion.
4. **General form:** (5)
   Attach this page to your report.
   Followed all directions explicitly with no exceptions.
   Typed, double spaced.
   Presentation is neat and orderly throughout.
   Spelling and grammar are faultless.

Grade Structure for Term project.

1. Set-up and initial observations -4 pts
2. *Regular* log entries observations over nine weeks -4 pts each for a maximum of 36 pts
3. Written report -60 pts