



MACROINVERTEBRATES INDOOR LAB TEACHER'S GUIDE

Learning Goal: Understand how water quality can impact which macroinvertebrates are found in lakes and how they are indicators of lake health.

Objectives:

- Identify and record macroinvertebrates in a sample.
 - Determine how to use macroinvertebrates as indicators of water quality.
 - Differentiate between complete and incomplete metamorphosis.
 - Observe traits of macroinvertebrates and use an identification key.
1. Write “benthic” and “macroinvertebrate” on the board in the front of the class.
 2. Introduce the guests in the room.
 3. Present a slideshow to introduce key concepts about the importance of aquatic macroinvertebrates and how they can be used to determine water quality.
 - a. Engage the students in a discussion by asking them if they can define key terms such as “benthic” and “macroinvertebrate”. Lead them in the right direction by breaking down components of the term, such as “macro” and “invertebrate”.
 - b. A brief introduction to the life cycles of aquatic invertebrates (complete and incomplete metamorphosis) helps students connect to broader topics (fishing and hatch-outs), and provides them with context for the use of terms like larvae and nymph in the identification key.
 4. Give instructions for the lab. Be sure to point to the specific locations where students should write their answers at each step.
 - a. Introduce the lab by showing the sample of aquatic macroinvertebrates and the identification key.
 - The sample can be done with real samples or by using the page provided in the lab. The “benthic macroinvertebrate samples” has an array of macroinvertebrates, simulating a collection sample.
 - b. Describe how to use the specific traits to identify organisms by their common name with the key.
 - If the students find more than one individual of the same species, it is only recorded once. We are determining the diversity of organisms present, not the abundance of each species.
 - c. Demonstrate how to tabulate the data and transfer the information from their worksheet to the summary page (with biotic index calculations).

- Explain that the left-hand column should be filled in with the total number of organisms in each of the four groups (sensitive, semi-sensitive, semi-tolerant, tolerant) that they found in their sample. Then, show the students that they should multiply column A with the appropriate ranking to fill in column B.
- d. Use an example to show how to calculate the biotic index.
5. After the students complete their lab work, have the preserved macroinvertebrate samples ready for students to identify.
 - a. There is a key that identifies the common name for each sample. The numbered samples and the key should be kept together.
 - b. Students will take a sample back to their desk. When they have identified the macroinvertebrate, they take it to an instructor or assistant to determine whether they are correct.
 - c. They are given an ink stamp or initial on their lab packet when they identify a sample correctly. After the lab is done, count the number of stamps/initials, awarding one extra credit point for each correctly identified sample.
 6. Be sure to save time (at least 3-5 minutes) for critical thinking discussion and their responses to the questions at the end of the lab.
 - a. Here is where you can talk about how the presence of certain species indicates higher water quality. Discuss how these organisms require higher oxygen availability or are sensitive to pollutants.
 - b. Connect to broader context, linking the importance of water quality to lake ecosystems and how we use water quality information to determine and manage the health of our lakes. You can discuss topics such as factors that determine good critical habitat, the presence of aquatic plants (increased oxygen and habitat availability), absorbing pollutants (phosphorus, nitrogen, etc.), sediment retention through shoreline restoration (clearer water).