Macroinvertebrates as an Indicator of Water Quality

Summary

During this lesson, students will assess the quality of water by making observations about the species of macroinvertebrates that are found in it.

Main Core Tie

SEEd - Grade 6

Strand 6.4: STABILITY AND CHANGE IN ECOSYSTEMS Standard 6.4.4

Time Frame

1 class periods of 60 minutes each

Group Size

Small Groups

Materials

    Sein nets or sturdy long-handled nets to gather sediment.
    Plastic shoe-box sized containers to hold water samples.
    White ice-cube trays to isolate individual specimens.
    Plastic pipettes or eye-droppers.
    Small fish nets.
    Hand lenses.
    Macroinvertebrate guide (1 per student or group).
    Worksheet (1 per student or group)

Background for Teachers

Aquatic macroinvertebrates are found in lakes, streams, ponds and marshes. They help maintain the health of the water ecosystem by eating bacteria and dead or decaying plants and animals. Overall water quality effects which types of organisms can survive in a body of water. "Water quality" may include the amounts of dissolved oxygen and the levels of algal growth, pollutants which may be present and the pH level. Some macroinvertebrates such as stoneflies, mayflies and water pennies require a high level of dissolved oxygen and their abundance is an indication of good water quality. Other macroinvertebrates can survive at a lower dissolved oxygen level because they can come to the surface to get oxygen through a breathing or "snorkel" tube or carry a bubble of air with them around their bodies or under their wings. Several species of macroinvertebrates are indicative of water systems with lower dissolved oxygen levels and include aquatic worms and leeches. Lower dissolved oxygen levels are often associated with polluted waters while higher levels indicate good quality water.

There are several reasons why macroinvertebrates are used as water quality indicators:

    They are sensitive to changes in the ecosystem.
    Many live in an aquatic ecosystem for over a year.
    They cannot easily escape changes in the water quality

Student Prior Knowledge

Students need some knowledge of how to identify organisms using a field guide.

Intended Learning Outcomes

1. Use Science Process and Thinking Skills
   a. Observe objects and events for patterns and record both qualitative and quantitative information.
   g. Use field guides or other keys to assist in the identification of subjects studied.
   3. Demonstrate Understanding of Science Concepts and Principles
   d. Solve problems appropriate to grade level by applying scientific principles and procedures.
   4. Communicate Effectively Using Science Language and Reasoning
   a. Provide relevant data to support their inferences and conclusions.
   e. Use mathematical reasoning to communicate information.

Instructional Procedures

Use sein net or hand net to mix up the sediment at the bottom of the stream or pond that you are sampling from. Empty the sediment that you collected into a plastic bin with water.
Use plastic pipettes or small fish nets to sort through the sediment. Small rocks can also be collected and added to the bin.
Place any macroinvertebrates into single wells of an ice-cube tray.
Identify and record the numbers and species of macroinvertebrates that you find on the attached worksheet until you reach 100. (If macroinvertebrates are scarce, or time is an issue, continue until the class as a whole has identified 100 macroinvertebrates.)
Follow directions on handout to calculate Biotic Index Value and water quality.

Assessment Plan

Students show content mastery by completing the macroinvertebrate chart and successfully calculate the biotic index of the water sample.

Bibliography

Water What-ifs
Water Quality

Authors

Holly Godsey
Sydney Stringham