Macroinvertebrate Match Game

Adapted from: An original Creek Connections activity.
Creek Connections, Box 10, Allegheny College, Meadville, PA 16335.

Grade Level: Basic and intermediate

Duration: 15-30 minutes

Setting: Classroom

Summary: Students match aquatic macroinvertebrate illustrations with their correct names on a game board.

Objectives: Students will be able to identify many common aquatic macroinvertebrates.

Vocabulary: Macroinvertebrate, taxon, binomial name, dichotomous key

Related Module Resources:
- Books and Identification Guides
- Aquatic Macroinvertebrate Reference Collection
- Aquatic Macroinvertebrate Unidentified Reference Collection

Materials (Included in Module):
- 6 Aquatic Macroinverterates Matching Game boards
- 6 envelope with 25 macroinvertebrate illustration game pieces
- Various dichotomous keys to aquatic macroinvertebrates (Resource binder)

Additional Materials (NOT Included in Module):
- None

ACADEMIC STANDARDS (ENVIRONMENT AND ECOLOGY)

7th Grade

4.3.7.C. Explain biological diversity.
- Explain the complex, interactive relationships among members of an ecosystem.
- Explain how diversity affects ecological integrity of the natural resources..

4.7.7.A. Describe diversity of plants and animals in ecosystems.
- Select an ecosystem and describe different plants and animals that live there.

10th Grade

4.1.10.C Describe the physical characteristics of a stream and determine the types of organisms found in aquatic environments.
- Identify terrestrial and aquatic organisms that live in a watershed.

4.3.10.C Explain biological diversity as an indicator of a healthy environment.
- Explain species diversity.
- Analyze the effects of species extinction on the health of an ecosystem

12th Grade

4.6.12. A. Analyze the interdependence of an ecosystem.
- Understand how biological diversity impacts the stability of an ecosystem.

4.7.12. A. Analyze biological diversity as it relates to the stability of an ecosystem.
- Examine and explain what happens to an ecosystem as biological diversity changes.
- Explain the relationship between species' loss and bio- diversity.

ACADEMIC STANDARDS (SCIENCE AND TECHNOLOGY)

7TH Grade

3.3.7.A. Describe the similarities and differences that characterize diverse living things.
- Explain how to use a dichotomous key to identify plants and animals.

10th Grade

3.3.10.A Explain the structural and functional similarities and differences found among living things.
- Identify and characterize major life forms according to their placement in existing classification groups.
- Describe organizing schemes of classification keys.
- Identify and characterize major life forms by kingdom, phyla, class and order.

BACKGROUND:

There is a lot more living in a stream, river, or pond then most people realize. Everyone thinks about fish, frogs, crayfish, or lily pads, but there are between 5,000 and 6,500 species of aquatic insects that often go unnoticed. It is estimated that 7% of the 91,000+ North American insects are aquatic or semi-aquatic. In every part and type of waterway, these organisms can be found. Aquatic insects are a varied group, but they all have one thing in common – at one stage during their life cycle, they rely on water.

Macroinvertebrates are organisms without internal skeletons that can be seen with the unaided eye (often considered larger than 0.5mm). Reference to the term "aquatic macroinvertebrates" can include arthropods (insects in all life cycle stages, nymph, larva, pupa, or adult or crustaceans or arachnids), mollusks, and worms. Examples of aquatic macroinvertebrates include mayfly nymphs, stonefly nymphs, dragonfly larvae, midge larvae, crayfish, leeches, aquatic worms, and water beetles.

In order to better understand the relationships between life on Earth, scientists have devised a classification system in which all organisms are placed into categories. These categories, or taxonomic ranks, form a hierarchy of classification. The major taxonomic ranks are as follows, proceeding from the higher, more inclusive ranks to the lower, less inclusive ones: phylum, class, order, suborder, family, subfamily, genus, and species. A **taxon** or taxonomic name is a name used for a group of naturally related organisms. A taxon may be used for a group at any taxonomic rank. For example, the stoneflies, or Plecoptera, represent a taxon recognized as an order. The name "stonefly" is a common name that varies among languages and in regional usage. Plecoptera is an internationally accepted scientific name based on rules of nomenclature. Scientific names most often have Latin or Greek derivatives. Basing the scientific naming process on a neutral language enables scientists around the world to have a common understanding of a single organism.

A **binomial name** (or two-name name) is used for the scientific name of a species. It is composed of the name of the genus to which the organism belongs, followed by its species name. The genus name is capitalized, while the species name is not; both names are italicized. For example, *Dineutus americanus,* is the scientific name for the Whirligig Beetle. The binomial species name is especially important since most organisms in a species are similar and can produce viable offspring in nature.

Scientists often identify organisms in a taxonomic group by the prominent feature or features the individuals share. Frequently scientists appropriately name these organisms using these features. When identifying an organism, specifically an aquatic insect it may be helpful to note characteristics such as presence or absence of a tail, number of tails, where the gills are located, body size and shape, length of or types of appendages, and type of mouth parts. For example, some types of mayfly and stonefly nymphes look very similar, therefore, a useful identifying tip is to count the number of tails on the organism. Mayflies generally have three tails, while stoneflies have two. On the other hand, a crane fly larva looks very different from both the mayflies and the stoneflies. Crane fly larvae have soft, cylindrical shaped bodies with no legs.

The most precise way to identify an aquatic insect is to use a **dichotomous key.** A dichotomous key is a biological tool for identifying unknown organisms to some taxonomic level. It is constructed of a series of choices describing characteristics of that particular organism. One of the choices describes the unknown insect, while the rest do not. Each choice will lead to another set of choices until finally only one choice is left,

which is the correct identification of the insect. The statements typically begin with broad characteristics and become narrower as more choices are required.

There are many kinds of aquatic macroinvertebrates, and some are more common than others. Often the presence or absence of certain macroinvertebrates can indicate the quality of a stream. Some macroinvertebrates are capable of living in water that is polluted, while others are very pollution-sensitive. If a good number of very pollution-sensitive macroinvertebrates are common in a waterway then that is a good indicator that that waterway is healthy. Thus, being able to key out different aquatic macroinvertebrates will be helpful when determining the health of a waterway.

OVERVIEW:

Students will match the illustrations of the aquatic macroinvertebrates with the correct name on a game board. This activity can be used as a review of identifying aquatic macroinvertebrates after a real stream study has been conducted, or used as a preview to what students will find in a stream. This activity can also incorporate the skill of using a dichotomous key.

PROCEDURE:

Student Activity:

1. Remove the macroinvertebrate cards from the envelope labeled "Aquatic Macroinvertebrates Game Set". Make sure the game card color correctly matches that of the game board.

2. Try to correctly match the pictures of the macroinvertebrates with the correct name by sticking them on Velcro. DO NOT LOOK UNDER THE FLAP!!!! CHEATERS NEVER PROSPER! Students may use a dichotomous key to identify the insects if they do not already know them.

3. Once all the cards have been stuck to board, lift the flap to check your answers.

DISCUSSION:

Which physical features did the students use to identify the macroinvertebrates? *They may have looked at presence or absence of tails, number of tails, where the gills were located, length of appendages, shape or size, etc.*

What kinds of features could they observe if these were living insects and in their natural environment? *Behavior and habitat.*

How does a dichotomous key work in general? *Refer to background section.*

Why do the macroinvertebrates have a common name and a scientific name? *Refer to background section.*

Explain to students that most of the scientific names shown on the game board are in the taxonomic rank "order" (some are in "class"). These are large groups, not species, like they are probably used to. Remind them that these insects can be keyed down to species.

EVALUATION:

- Have students correctly identify the most common macroinvertebrates
- Distinguish key identification characteristics
- Understand that aquatic macroinvertebrates have a common name and a scientific name

EXTENSIONS AND MODIFICATIONS:

- Have students use a dichotomous key to identify the insects.
- Use this activity as a quiz.
- Time students to see who is the fastest

NOTES (PLEASE WRITE ANY SUGGESTIONS YOU HAVE FOR TEACHERS USING THIS ACTIVITY IN THE FUTURE):

Activity Version: July 2002