Activity #9: Water Quality Bioassessment

Depending on the age of the students and the amount of time available, samples can be dealt with in different ways. Younger students can sort insects more or less to **order** in fresh water, right at the stream, and the insects can then be returned to their homes. **Order** is a very broad classification (i.e. the mayflies form an order called Ephemeroptera) and can be determined just by "eyeballing it" and recognizing a few distinguishing characteristics. Use the line drawings and pictures provided to sort your collection into yogurt cups or ice cube tray compartments. Tally the number of organisms you've collected on the **Bioassessment Worksheet (p. 41)** and multiply as directed in the bottom box. This will tell you the water quality index of your stream, and it can help predict what kind of fish will live there. Wild, reproducing trout need Class I waters.

Older students or more involved programs can take classification to the level of **family**, or even more detail. Biologists use these categories to classify every kind of organism:

Grouping	Human	Brook Trout	Baetis Mayfly (Blue-winged Olive)
Kingdom	Animal	Animal	Animal
Phylum	Chordata	Chordata	Arthropoda
Class	Mammalia	Osteichyes	Insecta
Order	Primates	Salmoniformes	Ephemeroptera
Family	Hominidae	Salmoninae	Baetidae
Genus	*Homo*	*Salvelinus*	*Baetis*
Species	*sapiens*	*fontinalis*	*tricaudatus*

These seven groupings are the standards. We always italicize genus and species, with genus capitalized. Students could find the classification, and perhaps the history of the classification, of one of their favorite fish or insects as a short research project.

Sorting insects to family usually requires the use of a dichotomous key. Using dichotomous keys is an important skill for young biologists to master. Several excellent keys are available online. Websites are listed in the **References** for this section .

Materials are the same as for the **Activity #8, Stream Safari (p. 35)** and should also include a copy of the **Bioassessment Worksheet (p. 41)** for each group of about 3 or 4 students.

Extensions

It will be easier to do family-level classifications in a classroom or lab, with dead specimens. If you intend to observe specimens in the lab, preserve them in vials (available at BioQuip, see references) filled with 70% ethanol. A dissecting scope will be necessary for looking at the specimens.

If students are really intrigued by the insects, or if you have some budding conservation biologists in your program, they can visit the EPA website to see how real-world environmental scientists work http://www.epa.gov/owow/monitoring/rbp/.

References: Dichotomous Keys and Biomonitoring Sites

- A wonderful key with line drawings is available online from the Izaak Walton League Save Our Streams Project at http://www.people.virginia.edu/~sos-iwla/Stream-Study/Key/MacroKeyIntro.HTML
- The New York Department of Environmental Conservation is creating a key with photographs. It does not yet include adult forms or the URL is http://www.dec.state.ny.us/website/dow/stream/index.htm
- The City of Santa Rosa (CA) has an interactive key and an extensive description of their local biomonitoring program http://ci.santa-rosa.ca.us/pworks/stormwater/biological_monitoring_programs.asp

Bioassessment Worksheet

Investigator Names		
Stream Name	Location	Date
Habitats Sampled	Stream Width at collection site	Qualitative Observations
Water Temp	Stream Depth at collection site	

Observations of Macrobenthos
Check off all of the types of macroinvertebrates that your group finds

Pollution Sensitive	Somewhat Sensitive	Pollution Tolerant
____Mayfly larvae ____Stonefly larvae ____Caddis larvae ____Dobsonfly larvae (hellamgramites) ____Gilled snails ____Planarians ____Water penny larvae ____Riffle beetle (adult)	____Clams ____Cranefly larvae ____Crayfish ____Alderfly larvae ____Fishfly larvae ____Scuds ____Planarians ____Sowbugs ____Damselfly larvae ____Dragonfly larvae ____Whirligig beetles ____True bugs (water scorpions, boatmen, backswimmers)	____Lunged snails ____Black fly larvae ____Midge larvae ____Leeches ____Worms ____Mosquito larvae
Types found X 3 = _____ (index value)	Types found X 2 = _____ (index value)	Types found X 1 = _____ (index value)

Add the index values to get the **water quality rating**_____

>22 is excellent, 27-22 is good, 11-16 is fair, and <11 is poor