**Determination of Overall Water Quality Using a Quantitative Macroinvertebrate Survey**

**Objectives:**   
Students will be able to:

* identify various types of macroinvertebrates found in water ecosystems.
* perform a quantitative macroinvertebrate survey to determine the overall water quality of a water ecosystem.

**Materials:**   
Water sample from a local stream or pond (sample must be fresh and contain debris from the bottom and edges of the water)   
Macroinvertebrate Identification charts   
Assorted trays and petri dishes for separation of sample   
Dissecting microscope and hand lenses   
Small paintbrushes   
Pipets

**Procedure:**   
1. Working with a partner, take an approximate 500 ml sample of the water including the debris.   
2. Pour a portion of the sample into a petri dish and examine it under low power on the microscope.   
3. Using the identification charts, count and identify 100 macroinvertebrates. Try not to hunt for only the large ones or your sample will be biased. If you can not find 100 macroinvertebrates in your sample, take an additional 500 ml sample. Continue this procedure until you and your partner have counted and indentified 100 macroinvertebrates.   
4. Identify and count the numbers of each type of organism listed below.   
5. Multiply the number of each type by its biotic value.   
6. Add up all the numbers and divide by 10. This gives the Biotic Index Value. Check the Biotic Value chart at the bottom of the page to determine the quality of your water sample.   
7. Compare your group value with the class values. Do they agree? Why or why not?

**Class I    Pollution intolerant: These organisms are highly sensitive to pollution.**   
**Class II   Somewhat pollution tolerant: These organisms will be found in clean and slightly polluted waterways.**   
**Class III  Pollution tolerant: These organisms will be found in polluted, as well as clean aquatic ecosystems.**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Class I | Biotic Value | Number  Found | Class II | Biotic   Value | Number   Found | Class III | Biotic   Value | Number   Found |
| Stonefly nymph | 10 |  | Beetle larva | 8 |  | Midge fly larva | 5 |  |
| Mayfly nymph | 10 |  | Sowbug | 8 |  | Snails | 4 |  |
| Dobsonfly larva | 10 |  | Scud | 6 |  | Leech | 2 |  |
| Caddisfly larva | 10 |  | Clams, Mussels | 6 |  | Aquatic worms | 0 |  |
| Riffle beetle | 10 |  | Crayfish | 6 |  |  |  |  |
| Water penny | 10 |  | Cranefly larva | 6 |  |  |  |  |
|  |  |  | Dragonfly nymph | 6 |  |  |  |  |
|  |  |  | Damselfly nymph | 6 |  |  |  |  |
|  |  |  | Black fly larva | 6 |  |  |  |  |
| Total |  |  | Total |  |  | Total |  |  |

**For example if you find:**

|  |  |
| --- | --- |
| **25 mayflies** | 25 x 10 = 250 |
| **15 caddisflies** | 15 x 10 = 150 |
| **20 stoneflies** | 20 x 10 = 200 |
| **20 scuds** | 20 x  6 = 120 |
| **20 midge larva** | 20 x  5 = 100 |
| **Total** | =  820 / 10 = 82 |

**Based on the Biotic Index value the water quality is excellent.**

**Biotic Index**

|  |  |
| --- | --- |
| **Excellent** | >70 |
| **Good** | 60-79 |
| **Fair** | 40-59 |
| **Poor** | <40 |