Background information

Macroinvertebrates are small animals without a backbone that can be seen without a microscope.

They live around living or dead vegetation, on the surface or in the sediments of water bodies. They include many larvae of insects such as mosquitoes, dragonflies and caddis flies that begin their lives in the water before becoming land dwelling insects when they mature. Other examples of common macroinvertebrates include crustaceans (such as crayfish), snails, worms and leeches.

Macroinvertebrates can populate ponds or streams in amazing numbers – some of them up to thousands in a square meter. They are an important part of the food chain. Macroinvertebrates can tell us a lot about the conditions within a water body. Many macroinvertebrates are sensitive to changes in pH, dissolved oxygen, temperature, salinity, turbidity and other changes in their habitat.

For the *Freshwater macroinvertebrates Protocols* we want to estimate biodiversity, examine the ecology of the water body and explore relationships among water chemistry measurements and organisms at your Hydrology Site.

Taking chemical measurements in a water body is like looking at a picture of what is going on in the water at that time. Taking biological measurements is like watching a movie of things that happened over time in the water in a single visit. Macroinvertebrates record the history of a water body because many are sessile or stay within a small area and live one or more years while the water flows by. Changes in the habitats (including water chemistry) most likely will cause changes in the macroinvertebrate assemblage.

GLOBE activities

Activity 17 :Defining your site and Mapping
The mapping activity is so important for this section as it allows the students to fully plan their sampling strategy prior to even entering the water. It also highlights the variety of different habitats in the area.

Activity 18 :Choosing a sampling protocol.
Rocky substrate in running water OR Multi habitat
The choice of sampling protocol is quite straight forward.

1. If your site is a body of visibly running water, shallower than 90cm with a rocky substrate, use: **Rocky substrate in running freshwater macroinvertebrate protocol**
2. If the water is deeper than 90cm or if many habitats are present, use: **Multi habitat freshwater macroinvertebrate protocol**

The students then need to assess the % cover of each habitat that they will sample. This will help the decide how many samples to collect from each habitat as a proportion of their total cover.

Activity 19 :Multi habitat Freshwater Macroinvertebrate Protocol
Students take 20 samples from their site in total. The number of samples per habitat type is proportional to its size.
Sampling should be done twice a year in the spring and autumn. Around the same time as the start of green up and green down

Activity 20 : Rocky substrate in running Freshwater Macroinvertebrate Protocol
Students take three samples in total. Where you sample depends on what is available at your site. Ideally select sampling areas in the following order

1. 3 different riffles
2. 2 different riffles, 1 run
3. 2 different runs, 1 riffle

If there is no combination of the above, then include a pool habitat as long as it contains a rocky substrate. If none of the above is present use the multi habitat protocol

Activity 21 : Identifying Freshwater Macroinvertebrates
This activity should be done once the samples have been collected. Vertebrates should not be included in the samples and should be returned to the water body immediately. These are organisms such as Fish and amphibians (frogs, toads and newts).

It is important that the macroivertebrates are sorted into groups. It is not necessary to identify them to species level but you should be able to classify them into **Phylum** at the very least, preferably into **Class** and even **Order.** The common name is also essential.

If you wish to identify to a more specific level than Order please do, however, it is not essential.

The entry page on the data base has a drop down menu of all possible species, however, they are in Latin. The ID sheets with this protocol do give many of the common species and their Latin classifications but if you find

something else and are unsure please contact us and we will assist in its identification

Equipment

- 1 x 1m quadrat
- trowel
- 0.5mm mesh Net
- 20 buckets/trays/containers or 3 buckets/trays/containers depending on your site and sampling activity
- Stopwatch
- ID guide
- Small containers
- Magnifying glass
- Spoons/basters/eye droppers/pipettes

Extra activities

- Practice the sampling techniques on dry land prior to taking the equipment into the water. This ensures that students understand the physical requirements of the activity before entering the more risky environment of the water
- Have the students carry out the risk assessment. This not only means a risk assessment is completed but also the students are actually more aware as they discovered the potential risks and have agreed minimisation strategies, therefore having more ownership

Further investigations

- Explore the relationship between one of the abiotic water measurements and the types of species found
- Explore the relationship between the types of Macroinvertebrates and the types of land cover surrounding the site
- Is there a seasonal variation?
- Is there variation within a season?
- Look for animals with different parts to their life cycles

Useful contacts and publications

http://www.ceh.ac.uk/

Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

The Centre for Ecology & Hydrology (CEH) is the leading body in the UK for research, survey, and monitoring in terrestrial and freshwater environments.

Water Teachers' guide

CEH's School Net is the educational section of CEH Web, and is intended to be used as a resource by teachers of primary and GCSE-aged school children. To explore the site please use the navigation buttons on the left - for a quick introduction to the purpose of School Net please visit For Teachers and/or For Students.
If you wish to learn more about the science CEH investigates please visit the main CEH Web site. If additional school-level information is needed feel free to contact one of our schools liaison officers, or view our links page to visit other web-sites which may prove to be useful.

Field Studies Council
Keys and id charts for use in the field
www.field-studies-council.org