UKTAG – Biological Status Methods
Lakes – Benthic Invertebrate Fauna

WFD UK TAG
Water Framework Directive
www.wfduk.org

What do we use as an Indicator?

Benthic invertebrates (aquatic animals without backbones that dwell on or in the bottom sediments of lakes – e.g. dragon flies, snails, flat worms).

Why do we use benthic invertebrates?

Benthic invertebrate communities are good indicators of acidification which is caused by acidic pollution from precipitation and acids leaching from the surrounding soils. Benthic invertebrates are easily suited to biological monitoring as they are common, widespread and easily sampled. This method is based on the principle that different benthic invertebrates have different tolerances to acidification. The method only applies to acid sensitive lakes or lakes that naturally have a pH lower than 7.

Sampling

Benthic invertebrates are collected from the stony-bottomed area of the shallow parts of the lake in the spring. The invertebrates are collected by disturbing the substratum with the feet ("kick sampling") and passing a hand net (nominal mesh size: 1 mm) through the water in the disturbed area.

All the different habitats at the site are sampled within a 3-minute period. In addition, a pre-sample sweep to collect surface dwelling invertebrates and a post sample manual search, lasting one minute, are undertaken, during which any invertebrates attached to submerged plant stems, stones, logs or other solid surfaces and surface dwelling species are collected by hand and placed in the net.

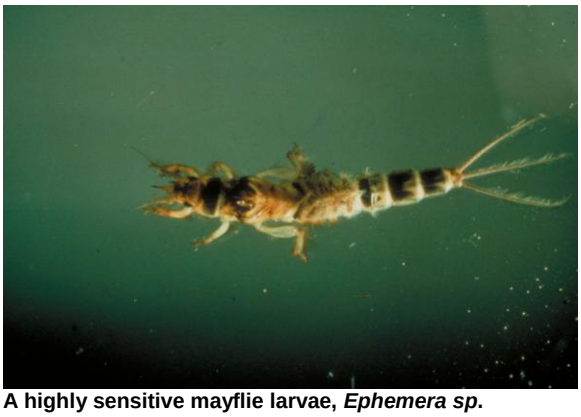
The invertebrate samples are then identified to the lowest practical taxonomic level (order, family and genus) or species. The number of individual invertebrates of each of the invertebrate taxa[1] are also noted.

What do we measure?

We measure the Average Score per Taxon

Each species/taxa is given a pressure sensitivity score ranges from 2 to 8; For instance *Chloroperla tripunctata* are given a pressure sensitivity score of 8 which shows that they are very sensitive to acidification. The lowest scoring invertebrates for example *Limnephilus* species are more tolerant to low pH ranges and score 2. Species are also given a weighting based on the range of pH that they can tolerate. We also take into account the relative abundance of each taxa present.

We then calculate the Average Score per Taxon of the sample by dividing the sum of the product of weightings, sensitivities and relative abundances for all taxa present by the sum of the product of weightings and relative abundances.



A highly sensitive mayflie larvae, *Ephemera sp*.

How do we decide the Biological Status?

The observed measures are then compared with the measures expected in undisturbed conditions. The outcome is expressed as an 'Ecological Quality Ratio' or EQR. An EQR close to 1 indicates that the benthic invertebrates are close to their natural state; those close to 0 indicate a high level of pollution or disturbance. To calculate the biological status the measure is divided into 3 of the bands required by the Water Framework Directive; see the table below. For the biological status lakes are divided into clear and humic lakes and are dependent on the concentration of dissolved organic carbon (DOC) in the lakes. A humic lake would have a concentration of over 5 mg/l whereas a clear lake would have a concentration of under 5 mg/l. We have not determined the bands for poor and bad status

Biological Status Boundary Values

Status	EQR Values	
Lake geological category	Humic lakes	Clear water lakes
High	0.83	0.86
Good	0.61	0.7
Moderate	-	0.54

For more details see UKTAG Lake Assessment Method BENTHIC INVERTEBRATE FAUNA, LAKE ACIDIFICATION MACROINVERTEBRATE METRIC (LAMM) ISBN 978-1-906934-05-7

[1] Taxon (pl.taxa) taxonomic unit e.g. family, genus, species

ENVIRONMENT AGENCY
NIEA Northern Ireland Environment Agency www.ni-environment.gov.uk
SEPA Scottish Environment Protection Agency