

# UKTAG – Biological Status Methods

## Rivers – Benthic Invertebrates



### What do we use as an Indicator?

Benthic invertebrates (aquatic animals without backbones that dwell on or in the bottom sediments of rivers).



### Why do we use invertebrates?

Benthic invertebrate communities are good indicators of organic enrichment and can be used to assess river water quality. Benthic invertebrates are also sensitive to toxic pollutants and the general degradation of the river. They are ideally 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 pollutants.



### Sampling

Benthic invertebrates are collected from shallow flowing waters by disturbing the substratum with the feet ("kick" sampling) upstream of a hand net (nominal mesh size: 1 mm) held vertically on the riverbed. Deep rivers are sampled by sweeping a long-handled pond net through any aquatic vegetation or sampling using a naturalist's dredge or an air-lift sampler.

In addition, a manual search is carried out, lasting one minute, and any invertebrates found attached to submerged plant stems, stones, logs or other solid surfaces are removed and placed in the net.

Samples are sorted in the laboratory to collect the macroinvertebrate fauna which are then identified to

the lowest practical taxonomic level (order, family, and genus) or species.

### What do we measure?

We measure two things:

#### Number of taxa<sup>1</sup>

This is a direct measure of richness in different types (taxa) of invertebrate, which generally increases with ecological condition. A high number of different types within a site indicate that the various water quality, habitat and food requirements are met. The index is calculated simply as the number of different macroinvertebrate taxa collected.

#### Average Score per Taxon

This is the average of the pressure sensitivity scores of all macroinvertebrate families or taxa found in the biological sample: calculated by dividing the total of the scores by the number of scoring families or taxa. The pressure sensitivity score ranges from 1 to 10; the presence of certain mayfly or stonefly taxa for instance indicate the cleanest waterways these taxa are given a pressure sensitivity score of 10. The lowest scoring invertebrates are worms (*Oligochaeta*) and midges (Chironomidae) which score 1.

### How do we decide the Biological Status?

Statistical models (RICT) have been developed to predict what the expected number of taxa and therefore, the average score per taxon should be under undisturbed conditions (reference conditions) for any site in the UK. The observed results are compared with these predicted results to calculate the Ecological Quality Ratio (EQR). EQR values close to one indicate invertebrate communities close to the natural state, those near to zero indicate a high level of pollution or disturbance.

To decide the Biological Status the two measures are combined and the range from 1 to 0 divided into the five bands required by the Water Framework Directive see the table below:

### Biological Status Boundary Values

Status	EQR Values
High	0.85
Good	0.71
Moderate	0.57
Poor	0.47
Bad	<0.47

For more details see - (UKTAG River Assessment Method Benthic Invertebrate Fauna River Invertebrate Classification Tool (RICT) ISBN 978-1-906934-07-1)

<sup>1</sup> Taxon (pl.taxon) taxonomic unit e.g. family, genus, species