

UKTAG – Biological Status Methods

Lakes – Phytobenthos

What do we use as an Indicator?

Phytobenthos (Microscopic plants that live attached to substrates such as rock/stone or large plants)

Why do we use Phytobenthos?

Phytobenthos are good indicators of nutrient enrichment and can be used to assess lake water quality. Diatoms are the main plant groups that we use because their silica cell walls make them easy to identify under the microscope. The method is based on the principle that different diatoms have different environmental preferences, so we record the species found, along with their abundance.

Sampling

The sampling method involves collecting samples of benthic diatom species by brushing or scraping the upper surface of cobbles or small boulders obtained from the bottom of the lake. This removes the thin coating known as the “biofilm” found on their surfaces. This biofilm contains the diatoms as well as other algae.. Where there are no cobbles or small boulders present in the lake at the sampling site, samples can be collected from submerged portions of emergent plants such as the common reed, *Phragmites australis*.



The samples are then analysed to identify the presence, and the number of each of the diatom taxa¹.

What do we measure?

We measure the **Lake Trophic Diatom Index**

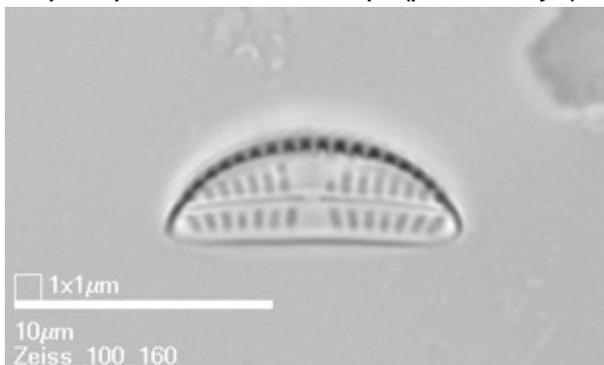
This is the measure of the different number of species and their relative abundance identified as present in the biofilm. The diatom taxa are assigned a nutrient sensitivity score depending on how sensitive they are to nutrient pollution. For example, *Brachysira vitrea*. has a low sensitivity to nutrient enrichment so will

have a low nutrient sensitivity score whilst *Amphora pediculus* tends to be associated with polluted sites and has a high nutrient sensitivity score.

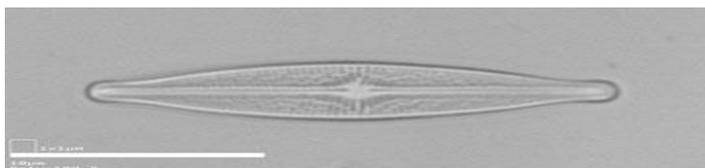
How do we decide the Biological Status?

The scores for the taxa in the sample are compared with scores for taxa expected in undisturbed conditions. The outcome is expressed as an 'Ecological Quality Ratio' or EQR. An EQR close to 1 indicates that the phytobenthos 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 the 5 bands required by the Water Framework Directive; see the table below.

Amphora pediculis. Scale bar: 10 µm (photo: M. Bayer)



Brachysira vitrea (photo: M. Bayer)



Biological Status Boundary Values

Status	EQR Values	
	Low alkalinity lakes	Moderate and high alkalinity lakes; and marl lakes
High	0.90	0.90
Good	0.63	0.66
Moderate	0.44	0.44

For more details see (UKTAG Lake Assessment Method, MACROPHYTES AND PHYTOBENTHOS - DIATOM ASSESSMENT for RIVER ECOLOGICAL QUALITY (DARLEQ) ISBN: 978-1-906934-00-2)

¹ taxon (pl.taxa) taxonomic unit e.g. family, genus, species