UKTAG – Biological Status Methods Coastal Waters – Phytoplankton

What do we use as an Indicator?

Phytoplankton[1]

Why do we use phytoplankton?

Phytoplankton are primary producers and form the basis of the food chain. They utilise sunlight energy and dissolved nutrients converting these into organic materials which are often consumed by higher life forms such as fish. As phytoplankton are short lived and derive their nutrients from the water; they are an ideal indicator of changing nutrient conditions and therefore useful for assessing pollution of coastal waters.

This method is based on the principle that additional nutrients (especially nitrogen) can alter the seasonal distribution of phytoplankton species in coastal waters. In natural waters a high number of different species of phytoplankton would be expected with high levels of growth in the spring and autumn. There would be a natural population decline due to nutrient depletion and grazing pressures in the summer. However if nutrients are not limiting then this can result in the rapid growth of opportunistic fast growing primary producers, changing the species composition of phytoplankton from diatoms to dinoflagellates.

Sampling

Phytoplankton samples are collected in coastal waters from close to the water surface, avoiding any surface film and without disturbing bottom sediments.
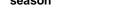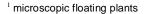

What do we measure?

We measure three things:

Phytoplankton biomass during the growing season

This is measured using the concentration of chlorophyll (a pigment found in all phytoplankton species) over the growing season (March to October). It is a direct measure of phytoplankton abundance.

Elevated counts of phytoplankton

This measure assesses the number of occasions that phytoplankton counts (chlorophyll, individual taxa cells and the total phytoplankton cells) exceed a threshold. Too many nutrients in the water may cause an increased number of blooms.

Seasonal succession of phytoplankton functional groups

The phytoplankton are split into two functional groups; diatoms and dinoflagellates. The seasonal ratios of each group in a sample are analysed.

How do we decide the Biological Status?

For the above three measures values were calculated to reflect what these would be for undisturbed waters. The observed results are then compared with these 'reference' results to calculate the Ecological Quality Ratio (EQR). EQR values close to one indicate phytoplankton communities are close to their natural state; those near to zero indicate a high level of pollution or disturbance. To decide the Biological Status the three measures are combined and the range from one to zero divided into the five bands required by the Water Framework Directive (see the table below).

Biological Status Boundary Values

Status	EQR Values
High	0.80
Good	0.60
Moderate	0.40
Poor	0.20
Bad	0

For more details see the UKTAG Coastal Water Phytoplankton Tool Method Statement

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[1] microscopic floating plants