



**Harmoni-CA**

**< Optimisation of biological monitoring for  
the Water Framework Directive\_>**

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**Abstract:**

As required by the EU Water Framework Directive (WFD), the status of water bodies must be classified in time to enable a presentation in map form in the River Basin Management Plans of the results of the monitoring programmes for the status of surface water. By the end of 2009, the first Plans must be published. This means that by this date, Member States will have to have achieved an acceptable level of confidence and precision for assigning water bodies to an appropriate class. Estimates of the level of

confidence and precision of the results provided by the monitoring programmes must also be given in the plan.

To comply with the requirements of the WFD, there is a need for (1) scientific evidence that will give the confidence in selecting what to monitor at which site, when and how frequent; and (2) tools that can estimate the uncertainty linked to the monitoring and subsequent status classification of a site.

1) Scientific evidence that will give the confidence in selecting what to monitor at which site, when and how frequent

Three types of monitoring need to be implemented as set by the WFD: surveillance, operational and investigative monitoring. We do not need to monitor all biological elements at all locations, this will depend on the type of monitoring and the condition and characteristics of the site. To develop this monitoring network and use the biological samples determine the ecological status of water bodies or groups of water bodies, scientific evidence needs to be in place. This scientific evidence can be present and used under different formats as there are for example local expert knowledge, a review of existing scientific knowledge, (historical) monitoring data.... This knowledge can be structured in such a way that decision support tools can use it to obtain the development of a cost-effective biological monitoring network.

[This part will be mainly illustrated on a conceptual basis.](#)

2) Tools that can estimate the uncertainty linked to the monitoring and subsequent status classification of a site.

The need for an estimation of uncertainty linked to biological monitoring and subsequent classification of ecological status is obvious because of:

- (1) this is a legal requirement of the WFD (Article 8);
- (2) these estimates need to inform the monitoring (related to the 'amount' of monitoring which is linked to the number of sites and the frequency of monitoring);
- (3) these estimates need to inform the Programmes of Measures (PoMs). The biological monitoring will result in Ecological Quality Ratios (EQRs) for biological elements. Biological elements (together with the chemical and hydro-morphological status elements and the supporting elements) will trigger the Programmes of Measures. An estimation of the degree of uncertainty of the status classification of a certain water body (or group of water bodies) is needed to inform policy makers about the risk of

'having it wrong' which could mean for example 'classifying a disturbed site as undisturbed' (the Type II error) or 'classifying an undisturbed site as disturbed' (the Type I error);

- (4) these estimates can be used to evaluate the sensitivity and robustness of the current classification tool and metrics (if the tool is multimetric). It is as such a decision support tool that allows the further refinement of specific metrics within biological classification tools.

It is essential to have a common understanding of all aspects linked to uncertainty estimation and how current tools relate to each other. First of all, it is important to define a common set of key statistical terms based on the WFD legislative text, the WFD Guidances (eg ECOSTAT), scientific literature and the terms as used currently by Environment Agency. Second, existing techniques for uncertainty estimation need to be compared and evaluated based on a set of criteria.

In this study a relative simple and straightforward method for uncertainty estimation for the WFD has been worked out and applied on the FAME fish tool. The method relies on different assumptions that were all extensively discussed. Some of these assumptions were scientific, others were more linked to all broader aspects of river management under the WFD.

Different case studies (based on the FAME fish tool and data) will be used to illustrate specific issues related to the estimation of the uncertainty when classifying a site. The link with the development of a biological monitoring network will be given.

\* FAME = Fish-based assessment method for the ecological status of European rivers