Intercalibration Review Panel

Review of XGIG

Large River Phytoplankton Methods

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Introduction

Intercalibration of national methodologies should ensure that good ecological status, one of the objectives of the Water Framework Directive for surface waters, is comparable across the EU. At the end of the 2nd round of the Intercalibration exercise that led to the Commission decision of 20th September 2013, there were still remaining gaps that need to be filled before the end of 2016. One such example was phytoplankton methods for large rivers. Some countries have provided justification for not using phytoplankton assessment for rivers, as they consider it not relevant to their river systems (FI, SE and NO). This is mainly because of the short residence time in their rivers which generally prevents phytoplankton development and, where present, this is usually just in short stretches where lake phytoplankton from upstream lakes are recorded. In Central & Eastern Europe conditions are different. Here large, slow-flowing rivers exist characterized by long residence times (e.g. Borics et al. 2007; Piirsoo et al. 2010; Mischke et al. 2011). In April 2016, a XGIG report was produced by Mischke et al. providing an overview of 13 national methods, their relationships with pressures and their compliance with the WFD. This IC review examines whether these national methods are WFD-compliant and sufficiently described in the Mischke et al. (2016) report. In this respect it examines six questions:

1. Are all parameters required for the BQE, according to WFD Annex V, included in the national method?
2. Have combination rules for the different metrics been defined?
3. Have type-specific near-natural reference conditions been defined adequately?
4. Have the high, good and moderate ecological status class boundaries been set in line with the WFD’s normative definitions?
5. Are significant and reliable pressure–response relationships provided for the national method?
6. Are the communities at high, good and moderate status described?

Are all parameters required for the BQE, according to WFD Annex V, included in the national method?

Annex V of the WFD highlights phytoplankton as a biological quality element (BQE) to be addressed in rivers, detailing measures of composition, abundance and the frequency and intensity of planktonic blooms, just as for lakes. All Member States (MS) use chlorophyll-a as their metric of phytoplankton abundance (Table p.22). There are a range of indices used for composition and the parameter “frequency and intensity of planktonic blooms” is missing in all methods. Most Member States measures of phytoplankton abundance (chlorophyll a) are based on frequent sampling (bi-weekly or monthly) in the vegetation period and, because of this, have declared that their methods are sufficiently indicative of the phytoplankton status as a whole (Mischke et al., 2016: p. 23). There is no common definition of “frequency and intensity of planktonic blooms” for rivers or lakes, although many lake methods have used the abundance of cyanobacteria during summer. In large rivers, it is often blooms of green algae that develop, not cyanobacteria. For these
reasons, I believe frequent measurements of chlorophyll-a provide an acceptable measure of blooms for rivers, and so the national methods are compliant. According to “Compliance Criterion 3 – relevant parameters” in the XGIG report, Estonia & Latvia do not carry out frequent sampling and so do not describe a bloom metric.

**Have combination rules for the different metrics been defined?**

There are no details of combination rules provided for the different metrics. A summary table should be added to the XGIG report.

**Have type-specific near-natural reference conditions been defined adequately?**

Mischke et al. (2016 p.26-28) give a brief overview of the national methods under “Compliance criterion 5 “reference conditions”. This refers to Schöll et al. (2012) [should this be Birk et al., 2012?] quoting “large rivers are relatively rare and exposed to substantial human influence for centuries. This is why none of the large rivers, at least in most of Europe, meet near-natural reference conditions anymore”. For this reason, existing reference sites were not used. However, Lithuania indicate that some existing reference sites were selected based on land-use and good chemical status e.g. TP <0.1 mg/L, TN <2mg/L). Two tables provide an overview of the MS methods, with “expert judgement” being the most frequently used method and “least disturbed conditions” and “modelling” also widely used. The most detailed approach is described from Germany which uses the MONERIS nutrient emission model to estimate background TP concentrations of <0.05 mg/L in the absence of human activities.

Apart from the German method, which appears well justified, it is impossible to judge the acceptability of reference conditions in the MS national methods. Several countries have adopted the German method (Austria, Belgium, Bulgaria) and should be acceptable. Where reference conditions are described using least disturbed sites (e.g. Czech Republic, Hungary, Lithuania, Romania) it needs to be clarified whether these were used as “alternative benchmark sites” e.g. good or moderate status (cf. Birk et al., 2012) or a percentile were used to represent reference conditions. More information also needs to be provided on how expert judgement was used to define reference conditions in many MS.

**Have the high, good and moderate ecological status class boundaries been set in line with the WFD’s normative definitions?**

Most MS have used statistical approaches to define class boundaries along a continuous gradient of anthropogenic pressure (Mischke et al., 2016: p.18-19). Germany and Latvia are most in line with the normative definitions, using discontinuities in the pressure-response relationship. Good status boundary appears to have been set in many MS based on the best available sites, e.g. Czech Republic define a reference value as 25% of metric values at the best available sites. Considering MS generally agree no reference sites exist for large rivers in Central & Eastern Europe, this approach does not appear to be
acceptable. Using a percentile of the best available sites to define the good/moderate boundary would be more acceptable. This needs further clarification in the report.

**Are significant and reliable pressure–response relationships provided for the national method?**

This is well documented in the XGIG report by all MS. It is noted that any future IC exercise has to be carried out without a common view across the national methods of the pressures addressed. As, besides eutrophication (nutrient enrichment), some Member States also include parameters that reflect saprobic conditions (organic pollution and associated high BOD). The report (p.5) importantly highlights that in large rivers, phytoplankton sensitivity to nutrient loads can differ with catchment size and the relationship with pressure is very dependent on water residence time and light limitation (Borics et al. 2007; Mischke et al. 2011). Some countries, e.g. Germany & Belgium, have sensibly adopted typologies separating sensitive rivers with lower flows, from less sensitive rivers with higher flows. Because of additional limiting factors, relationships have sometimes been examined for upper quantiles, rather than mean responses, e.g. Belgium highlights the TP-Chl relationship is clearer along the 75th percentiles for rivers with low run-off. Pressure-response relationships were further hampered by short pressure gradient lengths in some MS, so many comparisons were carried out in the context of larger XGIG datasets.

Overall, MS relationships with pressure were sometimes significant (Czech Republic, Germany, Hungary, Latvia, Poland). Due to limited pressure gradients in some MS, significant relationships were only observed in X-GIG analyses (e.g. Bulgaria combined with Germany). Austria did not provide any evidence of pressure-response relationships. The analyses clearly show that only certain large rivers are likely to be responsive to the pressure and the metrics should sensibly only be applied under these conditions (e.g. lower flows, low suspended sediment). In general, metrics appeared acceptable, although full statistical details were not always provided.

**Are the communities at high, good and moderate status described?**

No detailed descriptions are provided.

**Recommendations**

In summary, in general the national methods appear to be broadly WFD compliant. More detail is required on the setting of reference conditions and the use of least disturbed sites in boundary-setting. MS also need to be more explicit about under what conditions they can expect these metrics to be applicable.
References


