Intercalibration Review Panel

Review of Greek
Phytoplankton Methods for Lakes & Reservoirs

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22nd December 2016
Introduction

As part of the WFD Intercalibration Review process, this report examines the WFD-compliance of the Greek method for reservoirs (Part 1) and natural lakes (Part 2). Methods for natural lakes in other Mediterranean countries have only been submitted by Spain, and an inter-calibration process has, therefore, only been carried out for reservoirs.

Part 1: Reservoirs

This review is based upon the report by Tsiaoussi et al. (2016a). The report describes the national phytoplankton assessment method applied for Greek LM 5/7 and LM 8 reservoirs using the New Mediterranean Assessment System for Reservoirs Phytoplankton (NMASRP), that was developed and intercalibrated by the Med GIG during the intercalibration process. This method, its ecological rationale and its boundaries have already been published (Pahissa et al 2015, EC 2008, EC 2013) and accepted by ECOSTAT. The report, therefore, presents a clear documentation of the application of the NMASRP method to Greek reservoirs. Following the structure of previous reviews, it still examines a number of questions on WFD compliance:

Are all parameters required for the BQE included in the method?

According to WFD Annex V, for phytoplankton, the following sub-elements should be included:

- Phytoplankton biomass
- Phytoplankton composition
- Frequency and intensity of planktonic blooms

The Greek method for reservoirs includes four parameters: two abundance metrics (chl-a, biovolume), 1 composition metric (modified Nygaard index) and 1 bloom metric (cyanobacteria biovolume). The method is described in detail in the report and the metrics used are comparable to many other countries methods.

Have combination rules for the different metrics been defined?

Yes. The lake assessment score is calculated as an arithmetic average of each metric score.

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

Yes. The approach follows MED GIG agreed criteria (land use, population density, and nutrient concentrations) for deriving maximum ecological potential (MEP), as described by de Hoyos et al. (2014) and Pahissa et al. (2015) and the Greek thresholds set for these reference criteria are acceptable and consistent with other GIG approaches. The values for MEP were based on 9 reservoirs which is a sufficient sample size. Usefully, the list of sites and their characteristics are given in the report.
My main concerns is that, following the pressure criteria, biological parameters (cyanobacteria biovolume) was also considered, and one reservoir was removed as a reference site. This second step does not follow guidance and provides circularity in the assessment scheme. It would be better to solely use the pressure criteria and if necessary choose a slightly different percentile of sites to define MEP.

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

The boundaries correspond to the intercalibrated boundaries, based on the Med GIG work during the 1st and 2nd phase of the intercalibration process.

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

Yes. The report includes regression plots demonstrating the highly significant strong relationship between NMASRP and TP in Greek reservoirs. This relationship could not be demonstrated for the LM8 type due to limited data availability (n=5). As these boundaries are based upon the agreed boundaries for this common type they are acceptable.

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

Section 6 describes the communities are described for LM5/7 and LM8 reservoirs.

**Do finalised reported results fulfil the Intercalibration guidance requirements and are they sufficiently described?**

Yes. This work follows Option 1 (EC 2010), adopting common boundaries developed for common types which have been already agreed and reviewed in the previous phase of IC.

**Can the national method be considered successfully intercalibrated?**

Yes. The NMASRP method is the phytoplankton assessment method developed and intercalibrated in the Med GIG intercalibration process. This method is identically applied in Portugal, Greece and Cyprus providing clear comparability in ecological assessment across Member States in the Med GIG.
Part 2: Natural Lakes

This review is based upon the report by Tsiaoussi et al. (2016). It examines a number of questions on WFD compliance.

Are all parameters required for the BQE included in the method?

According to WFD Annex V, for phytoplankton, the following sub-elements should be included:

- Phytoplankton biomass
- Phytoplankton composition
- Frequency and intensity of planktonic blooms

The Greek method for natural lakes includes two abundance (chl-a, biovolume), 1 composition (modified Nygaard index) and 1 bloom metric (Cyanobacteria biovolume). The method is described in detail in the report and the metrics used are comparable to many other countries methods.

Have combination rules for the different metrics been defined?

Yes. The lake assessment score is calculated as an arithmetic average of each metric score. The EQR calculation is, however, relatively simple and not necessarily bounded between 0 and 1. This may need some minor modification following approaches used in other countries.

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

In general, yes. The approach follows REFCOND guidance and the MED GIG agreed criteria (land use, population density, and nutrient concentrations) and the thresholds set for these reference criteria are acceptable and consistent with other GIG approaches. The number of reference lakes is very low and, therefore, there is some uncertainty in the limits, although the reference values are not that different from natural lakes elsewhere. If possible uncertainty could be reduced through further data collection.

My main concerns is that, following the pressure criteria, biological parameters (cyanobacteria biovolume, chl a) were also considered, and one more lake was added as a reference site within type GR-DNL. This second step does not follow REFCOND guidance and provides circularity in the assessment scheme. It would be better to solely use the pressure criteria, even if this restricts the availability of reference site data.
**Have the high, good and moderate ecological status class boundaries been set in line with the WFD’s normative definitions?**

The H/G boundary is based upon the 85th and 90th percentile of the distribution of the metric values in reference sites – this approach is in line with CIS Guidance and the approaches used in other GIGs.

The G/M boundary is determined using a set of pre-selected lakes with TP levels 20-50 μg/L. I am not overly keen on this approach as it isn’t really based upon the normative definitions in Annex V of the WFD. However, it is the approach used in the previously inter-calibrated MED GIG method for phytoplankton composition in reservoirs. The chlorophyll-a G/M boundary values are in line with the boundary values set in other countries (eg CB GIG – ca 10 μg/L for shallow and 20 μg/L for very shallow lakes). To follow the normative definition more closely, the boundary location should also be defined in term of species, or composition metric, changes and this may help provide further justification of what percentile of the metric values should be used for the different lake types.

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

Despite the limited data, there are significant and strong relationships demonstrated for 7 out of 10 of the metrics (e.g. For HelPhy-TP relationship R2 =0.74 for type DNL and R2=0.83 for type SNL) in Section 2.5. It is not clear if only one year of data was used per lake, if multiple years were used, these are not independent and year should really be included as a random effect in the regression model. I think this is particularly important in a small dataset if lake years are not balanced across all sites (i.e. some sites have a lot more years of data).

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

Section 5 describes the communities are described for two lake types: DNL and SNL and these appear to fit with expected changes.

**Are there convincing scientific reasons provided why IC is not possible?**

Intercalibration is not possible due to lack of common intercalibration types in the Med GIG - as agreed at ECOSTAT. Only Spain has published a method for natural lakes and this is not well documented and so is difficult to compare with the Greek method.

**Summary for Natural Lakes**

Overall, the Greek phytoplankton method appears WFD-compliant, and there are valid reasons for not carrying out Intercalibration. The dataset used for development of the method, particularly establishing reference conditions, is very limited and future revision
of the boundaries is recommended as more data becomes available and in comparison with other Med GIG countries, e.g. Spain.

References


