Annex 2.2.4 − Setting of boundaries

The boundaries defined by the Member State's river macroinvertebrate classification methods were compared using the Intercalibration Common Metric index or ICMi (described below). The ICMi with its sub-metrics is specifically designed to meet the normative definitions described in Annex V of the Water Framework Directive. The classification results for the screened macroinvertebrate samples provided by member states (MS) were compared for as many of the NGIG river types as possible/available within each country (sample numbers ranged from 33 to 2939 samples per type combined across MS).

Individual MS compared their national classification method with the corresponding ICMi values using regression analysis based on as wide a range of status classes as possible. The NGIG dataset used was therefore not confined to the sites listed in the official WFD Intercalibration Register but incorporated a wider range of status classes than the specified H/G and G/M boundary requirement. Linear regression analysis was used to predict status from ICMi and all sites were classified using the relationships between MS classification systems and the ICMi values.

A crucial step before the final comparison was to normalize the individual sub-metrics comprising the ICMi by refrence to the medianalue for the corresponding reference sites for the appropriate type. The use of type-specific reference conditions to normalize the metrics appears to have been quite successful in overcoming typological differences and even enabling combined type comparisons. The methodology used was the same as that used by the CBGIG and the details step-by-step methods are set out in Murray-Bligh et al. (2006)[1]. Reference samples were screened ensured compliance with the reference conditions and samples were compared with reference sites of similar type. Sufficient samples within each type and ideally an R-square value of >0.5 was required for the individual linear regressions comparing national classification with ICMi. This latter condition was not always achieved due to lack of sufficient dynamic range (particularly some northern countries lacked sufficient polluted sites within some types in order to provide a high R^2 value). Where R^2 values were less than 0.5 it was decided that these would be flagged and excluded from any subsequent harmonization, if harmonization were to be required. The ICMi values for the High/Good and Good/Moderate boundaries were then used to statistically compare the classifications arrived at by individual member states for the samples provided. Comparisons were made using the official NGIG river types and also by combining all types together. The results are outlined in Annex D and summarized in the main text.

[1] Murray-Bligh J, Buffagni A, Cazzola M, Birk S and Vlek H (2006). Procedure for Calculating the ICMi Index: Step-By-Step Instructions For Central-Baltic river GIG. Version 2.6, 19 March 2006

The Intercalibration Common Metric index (ICMi) (Buffagni et al. 2005[2]).

Intercalibration Common Metrics (ICMs) studied					
Information type	Metric type	Metric name	Taxa considered in the metric	Literature reference	weight
Tolerance	Index	ASPT	Whole community (Family level)	e.g. Armitage *et al.*, 1983	0.333
Abundance/ Habitat	Abundance	Log_{10} (Sel_EPTD +1)	Log(sum of Heptageniidae, Ephemeridae, Leptophlebiidae, Brachycentridae, Goeridae, Polycentropodidae, Limnephilidae, Odontoceridae, Dolichopodidae, Stratyomidae, Dixidae, Empididae, Athericidae & Nemouridae)	Buffagni *et al.*, 2004; Buffagni & Erba, 2004	0.266
	Abundance	1-GOLD	1 - (relative abundance of Gastropoda, Oligochaeta and Diptera)	Pinto *et al.*, 2004	0.067
Richness and Diversity	Taxa number	Total number of Families	Sum of all Families present at the site	e.g. Ofenböch *et al.*, 2004	0.167
	Taxa number	number of EPT Families	Sum of Ephemeroptera, Plecoptera and Trichoptera taxa	e.g. Ofenboch et al., 2004; Böhmer et al., 2004.	0.083
	Diversity index	Shannon-Wiener diversity index	$D_{S-W} = -\sum_{i=1}^{s}\left(\frac{n_i}{A}\right)\cdot \ln\left(\frac{n_i}{A}\right)$	e.g. Hering *et al.*, 2004; Böhmer *et al.*, 2004.	0.083

[2] Buffagni A., S. Erba, S. Birk, M. Cazzola, C. Feld, T. Ofenböck, J. Murray-Bligh, M.T. Furse, R. Clarke, D. Hering, H. Soszka & W. van de Bund (2005). Towards European Inter-calibration for the Water Framework Directive: Procedures and examples for different river types from the E.C. project STAR. 11th STAR deliverable. STAR Contract No: EVK1-CT 2001-00089. *Quad. Ist. Ric. Acque* 123, Rome (Italy), IRSA, 467 pp.

The ICMi value is calculated by the weighted sum of all the ICMs, according to the conceptual group to which they belong (Table 1), giving the same weight to each of the three groups.

The ICMi fulfils the requirements of the WFD normative definitions because each criterion is addressed by 2 or 3 of the metrics combined in the ICMi.

- The change in taxonomic composition and abundance is mainly evaluated through: Number of taxa, EPT taxa, and diversity (Shannon) index.
- The diversity is evaluated through Number of taxa and Shannon index.
- Sensitive taxa are mainly evaluated with ASPT (for organic + nutrient), abundance of selected EPTD (mainly accounting for hydro-morphological degradation).
- The 1-GOLD metric refers to quantitative changes in the balance of important functional groups.