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Seagrasses ecological assessment methods

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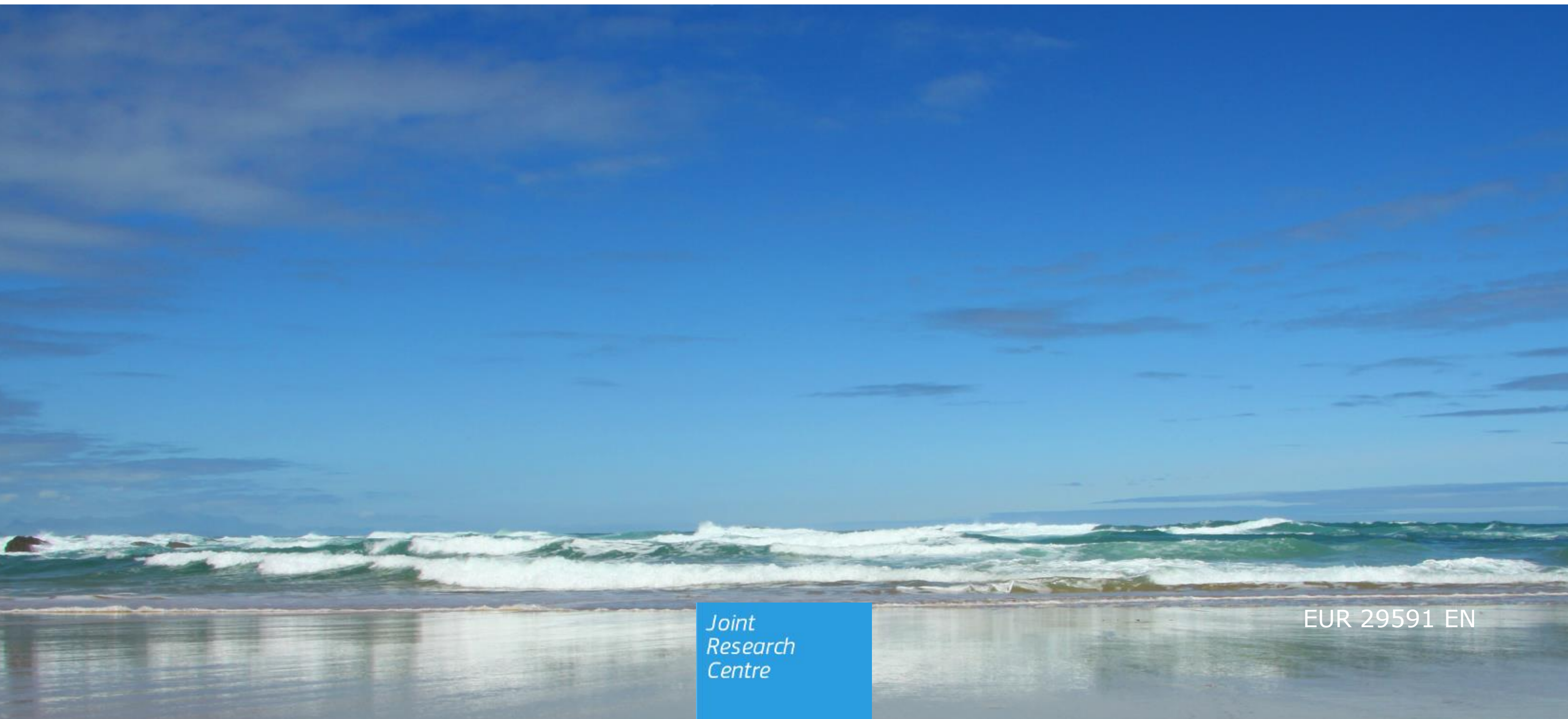

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Abstract

The European Water Framework Directive (WFD) requires the national classifications of good ecological status to be harmonised through an intercalibration exercise. In this exercise, significant differences in status classification among Member States are harmonized by comparing and, if necessary, adjusting the good status boundaries of the national assessment methods.

Intercalibration is performed for rivers, lakes, coastal and transitional waters, focusing on selected types of water bodies (intercalibration types), anthropogenic pressures and Biological Quality Elements. Intercalibration exercises are carried out in Geographical Intercalibration Groups - larger geographical units including Member States with similar water body types - and followed the procedure described in the WFD Common Implementation Strategy Guidance document on the intercalibration process (European Commission, 2011).

The Technical report on the Water Framework Directive intercalibration describes in detail how the intercalibration exercise has been carried out for the water categories and biological quality elements. The Technical report is organized in volumes according to the water category (rivers, lakes, coastal and transitional waters), Biological Quality Element and Geographical Intercalibration group. This volume addresses the intercalibration of the Coastal and Transitional Waters-North East Atlantic GIG seagrasses ecological assessment methods.

1 Introduction

This report constitutes a description of the Intercalibration Exercise – Phase 3 (IC3) implemented for SEAGRASS, a sub-element of the Biological Quality Element (BQE) ANGIOSPERMS, both for Coastal Waters (CW) (NEA 1/26) and Transitional Waters (TW) (NEA 11) in the North East Atlantic Geographical Intercalibration Group (NEA-GIG). The intention is to fulfil gaps and weaknesses identified by ECOSTAT and the external evaluation panel (Davies 2012) for the previous phase, and contribute to the full acceptance by ECOSTAT of results obtained for the BQE Seagrass during this IC. The report is not a full and detailed description of the Intercalibration process, but it compiles important issues and parts from those reports that are needed to support a better understanding and justification of the issues identified as problematic previous documents

In the first part of the report, we provide an overview of the national methods participating in the exercise, demonstrate their pressure-impact relationships, check their compliance with the WFD-criteria and address issues of intercalibration feasibility. The second part describes the comparison and adjustment of the national class boundaries

Part A

2 Geographical scope and participation of Member States

The exercise for sub-BQE seagrass included the participation of seven European Member States, covering the full coastal latitudinal gradient (France, Germany, Ireland, the Netherlands, Portugal, Spain and the United Kingdom), and making use of five distinct methodologies (SG-DE, SG-NL, SG-UK/IE, SQB/FR and SQI/PT) (Table 2.1). The participating MS share not only the presence of Seagrass in their waters, but they also considered it as an ecologically meaningful BQE, and so an important key on the assessment of the ecological quality of their waterbodies. For this reason (low significant expression when compared to other BQE) Norway was not participating in the exercise. Member States such as Denmark and Sweden did not participate in the exercise since those decided to perform a comparison between their own methods, inside CW NEA 8 common type.

Table 2.1 Member States participating in IC3, assessment method and indication if these were included or not in the present exercise

Member State	**Method**	Included in this IC exercise
DE - Germany	SG = Assessment tool for intertidal seagrass in coastal and transitional waters	Yes
FR - France	SBQ = Seagrass beds quality in coastal and transitional water bodies (same method for CW & TW)	Yes
IE – Republic of Ireland UK – United Kingdom	SG = Seagrass Intertidal tool	Yes
NL – The Netherlands	SG = Monitoring beds of SG per waterbody using aerial photographs, ground truth and specifying surface & density per species	Yes
PT - Portugal	SQI = Seagrass quality index	Yes
ES - Spain	AQI = Angiosperms Quality Index	No

Note: only one method is presented for the Republic of Ireland and the United Kingdom since these countries share the same methodology.

The process was conducted trying to cover the weaknesses detected and to fulfil the recommendations made by the evaluation panel on the results achieved during the IC2. It was performed based on data previously existing, which were updated when possible, aiming not to reproduce again the full IC process but rather constituting a reinforcement of the IC2 report. All Member States (MS) have participated when asked to, either through the recompilation of biological and pressure data, the calculation of assessment results, or by the clarification on the architecture and functioning of national methodologies. Member States sharing the same assessment methodology were also asked to provide a unique and agreeing assessment result, since the exercise was performed through comparison of methodologies and not of assessment results from different countries.

Since it was not possible to apply the Spanish national method (AQI) based on the existing dataset (see details below on methodologies description section), Spain sites were integrated in the Portuguese data set and assessed by the Portuguese national methodology (SQI – Seagrass Quality Index). This assumption is based on the geographical proximity of PT and ES sites, and aimed to avoid the reduction of available data.

3 Compliance of national assessment methods

The assessment methodologies, officially proposed by each MS, migrated from the previous IC and maintained all the earlier characteristics and assessment concepts. In this section is compiled the work done in the previous exercise concerning the compliance criteria, namely the agreement of adopted metrics with WFD requirements, their description and combination rule, as well as the assessment concept and the literature where the full methods can be found.

The compliance of metrics used by each methodology with WFD requirements has been previously analysed and can be summarised as shown in Table 3.1. In general, all methodologies include metrics covering the 'ABUNDANCE' requirement. The 'SENSITIVE SPECIES' parameter is automatically covered since all seagrass species are widely considered as sensitive taxa.

As a justification to the reductive comment made by the reviewers on the use of few seagrass species by the assessment methods included in IC2, it should be mentioned that this constitutes a problem with no other solution. The number of marine seagrass species present in European waters is four, growing from the intertidal (*Zostera noltei*) down to 5-15 meter depth in North European waters (*Zostera marina*) and to 50 meter in clear Mediterranean waters (*Cymodocea nodosa* and *Posidonia oceanica*) (Marbà et al. 2012). In brackish to freshwater species it is also possible to find *Ruppia* spp. in shallow waters (Short et al. 2007). This is a "euryhaline" taxa also considered by some MS in their assessments. Despite the low species richness in intertidal communities the loss or change in the composition of the seagrasses can represent a fundamental ecological change. It is important therefore to consider 'SPECIES COMPOSITION' in any ecological assessment. Because seagrass meadows are highly productive, influence the structural complexity of habitats, enhance biodiversity, play important roles in global carbon and nutrient cycling, stabilize water flow and promote sedimentation, thereby reducing particle loads in the water as well as coastal erosion (Jones et al., 1994; Hemminga and Duarte, 2000; Orth et al., 2006), these species are widely accepted as sensitive species and considered as good biological indicators of environmental quality (Benedetti-Cecchi et al., 2001; Soltan et al., 2001; Panayotidis et al., 2004; Melville and Pulkownik, 2006; Yuksek et al., 2006; Arévalo et al., 2007; Scanlan et al., 2007; Krause-Jensen et al., 2008). For that reason seagrass is considered as an important key element to be assessed in TW and CW under the WFD (WFD 2000/60/EC).

Table 3.1 Compliance of metrics used in different methods with the WFD requirements. Seagrass species considered in the assessment made by each Member State.

Member states	Seagrass metrics				Seagrass species
	Abundance			Sensitive species	
	Bed extent	Density of beds	Trends in abundance	Number of taxa	
DE	Yes	Yes	No	Yes	Intertidal seagrass beds of *Zostera noltei* and intertidal *Z. marina*
FR	Yes	Yes	Yes	Yes (trends)	Intertidal seagrass *Zostera noltei* and *Z. marina*
IE / UK	Yes	Yes	Yes	Yes	Intertidal seagrass *Zostera noltei, Z. marina* and *Z. angustifolia* and *Ruppia* spp (to genus only).

NL	Yes	Yes	Yes	Yes	Intertidal seagrass beds of *Zostera noltei* and intertidal *Z. marina*
PT	Yes	Yes	No	Yes	Intertidal seagrass *Zostera noltei* and intertidal *Z. marina*
ES					Habitat code 1110-A, 1110-B & 1140

The metrics included into different national methods can be described as shown in Table 3.2. All MS presented a full BQE methodology, including metrics to cover 'abundance', 'disturbance sensitive taxa' and also the 'diversity' parameters, and a combination rule for the articulation of those on the production of final EQR results. All methods, except the AQI (ES – Cantabrian District) follow very similar approaches and assessment procedures, allowing to say that all of them are comparable in terms of the assessment concept. The AQI integrates the saltmarsh plants and the seagrass components in the same assessment method and, for this reason was not possible to provide any EQR values based on the Spanish method.

Table 3.2 Description of metrics included in different national methodologies and combination rule used in the production of the final EQR results

Member State	Full BQE method	Abundance	Disturbance sensitive taxa	(Diversity)	Combination rule of metrics
DE	Yes	(Loss of) extent of combined seagrass beds in waterbody. Percentage cover density of beds.	(Loss of) Number of taxa in waterbody seagrass bed.	Number of taxa	Average metric scores
FR	Yes	*Zostera noltei* +intertidal *Zostera marina* : • (Loss of) extent of seagrass beds in waterbody • (Loss of) development of seagrass (shoot density and/or biomass and/or % cover)	Intertidal seagrass (*Zostera noltei* +intertidal *Zostera marina*) + Subtidal Seagrass (*Zostera marina*) Number of taxa (Loss of) in waterbody seagrass bed.	Number of taxa	Average metric scores
IE / UK	Yes	(Loss of) extent of combined seagrass beds in waterbody. Percentage cover density of beds.	(Loss of) Number of taxa in waterbody seagrass bed.	Number of taxa	Average metric scores
NL	Yes	(Loss of) extent of combined seagrass beds in waterbody. Percentage cover density of beds.	(Loss of) Number of taxa in waterbody seagrass bed.	Number of taxa	Weighted average metric scores
PT	Yes	(Loss of) extent of seagrass beds in waterbody. Plants' shoot density of seagrass beds.	(Loss of) Number of taxa in waterbody seagrass bed	Number of taxa	Weighted average metric scores

ES	Yes	Relative coverage of estuarine habitats (relative deviations from optimal coverage); Variations in the surface area of natural tidal habitats.	Richness of estuarine habitats defined by different communities.	Richness of habitats	Mean value

Note: The optional non-obligatory parameter diversity is written between brackets.

In general, all methodologies (except for AQI) make use of a similar set of measuring data, following also a very similar assessment concept (Table 3.3). The bed extent, the seagrass density (as the shoot number for PT, or as the coverage density for other methods) and the number of seagrass taxa present constitute the basic parameters measured during sampling events.

Table 3.3 Assessment concept used by each national methodologies and literature where its application or description can be found.

Method	Assessment concept	Publications
DE (SG-DE)	Based on bed extent plus density within the beds combined with species composition documented via field-mapping (GPS) and aerial photographs	Kolbe, 2007; Jaklin et al., 2007; Dolch et al., 2008;Adolph, 2010.
FR (SBQ)	Number (loss) of taxa and development state of seagrass beds (shoot density and/or biomass and/or % cover), completed by extent of beds	Foden & Brazier, 2007; Dalloyau et al., 2009. http://envlit.ifremer.fr/documents/autres_documents/fiches_descriptives/element_de_qualite_angiospermes
IE / UK (SG)	Quantitative assessment of seagrass beds on intertidal soft sediments. Includes taxa, bed density and extent.	Foden & Braizier, 2007; Foden & de Jong, 2007; UKTAG, 2014. See also: http://www.wfduk.org/resources%20/transitional-and-coastal-waters-intertidal-seagrass
NL (SG in TW)	Loss of species and coverage of meadows; Monitoring beds of SG per waterbody using aerial photographs, ground truth and specifying surface & density per species	de Jong, 2007; Wijgergangs & de Jong, 1999; Molen, 2004.
PT (SQI)	Quantitative assessment of seagrass beds on intertidal soft sediments. Includes taxa composition, shoots density and bed extent.	Neto et al., 2013.
ES (Cantabrian District) (AQI)	Richness of estuarine habitats; Relative coverage of estuarine habitats (relative deviations from optimal coverage); Variations in the surface area of natural tidal habitats	García et al., 2009.

More in detail, the combination rules used for the articulation of metric results are described in Table 3.4 for each assessment methodology, and are explained in the PDF documents attached to this report.

Table 3.4 Combination rules used on each national methodologies on the articulation of seagrass metrics.

Method	Metrics included	Metrics calculation and combination rule
DE (SG-DE)	M1. Seagrass acreage (seagrass bed extent) M2. Seagrass coverage (bed density in %) M3. Taxonomic composition (no. of *Zostera* species)	Bed extent (M1) is calculated and georeferenced based on field observations and aerial images. RefCond1 is the highest recorded bed extent value Seagrass coverage (M2) is estimated as the average seagrass density within the seagrass beds – measured at 10 observation sites per meadow. – RefCond2 is 35% for *Zostera marina* and 60% for *Z. noltei* and mixed beds Taxonomic composition (M3) is the number of *Zostera* species. – RefCond3 is "2" M1 (EQR_SG acre) is calculated from the %loss of seagrass acreage, compared to the RefCond1 – transferred to a value between 1 and 0 by means of a lookup-table with classification boundaries. M2M3 (EQR_SG_density/spec.) is calculated from the %loss of seagrass density, compared to RefCond2 **and** the no. of species lost, compared to RefCond3 - transferred to a value between 1 and 0 by means of a lookup-table with classification boundaries. Combination rule: EQR_{SG_DE} = ("M1" + "M2M3")/2
FR (SBQ)	M1. Seagrass acreage (seagrass bed extent) M2. Seagrass bed density M3. Taxonomic composition (*Zostera noltei* & *Z. marina*)	M1 is the ratio calculated as the measured bed extent / bed extent RefCond. Bed extent is calculated and georeferenced based on field observations, and mapping is carried out from satellite imagery or aerial orthophotographies in case of major seagrass beds. RefCond is the largest known historical extension. M2 is the ratio calculated as the measured seagrass density (expressed as abundance and/or biomass and/or % cover) / seagrass density RefCond. Seagrass density can be estimated as the % of area covered by seagrass, and/or the shoot density and/or the biomass in a determined station (stational approach). RefCond is/are the highest known historical values for each parameter. M3 is calculated as the no. of species present / no. species RefCond. RefCond is the highest historical number of seagrass taxa recorded for the system. Combination rule EQR_{SBQ} = Average of the three EQR obtained for each of the three metrics (composition, spatial extent and density)

EI / UK (SG)	Quantitative assessment of seagrass beds on intertidal soft sediments. Includes taxa, bed density and extent.	The indices are: • Taxonomic composition – seagrass species present • Shoot density – measured as the estimated percentage cover of seagrass using quadrats in a sampling grid • Bed extent – measured as area cover in m^2 of the continuous bed (deemed to be at >5% shoot density) Combination rule: EQR_{SG} = Average of the three EQR obtained for each of the three metrics (taxonomic composition, shoot density and bed extent)
NL (SG in TW)	M1. Quantity (seagrass bed extent) M2. Quality (seagrass bed density for different taxa present)	M1 is based on the percentage area of the waterbody occupied by *Zostera* area with > 5% coverage, in relation to RefCond. M2 is based on the estimated percentage cover of different seagrass taxa present in the system, in relation to RefCond. Combination rule: EQR_{SG} = [(MIN from M1 and M2)*2 + (MAX from M1 and M2)] / 3
PT (SQI)	M1. Seagrass acreage (seagrass bed extent) M2a. Seagrass coverage (no. of shoots per m2) M3. Taxonomic composition (no. of *Zostera* species)	M1 is the ratio calculated as the measured bed extent / bed extent RefCond. Bed extent is calculated and georeferenced based on field observations and aerial images. RefCond is the highest recorded bed extent value or ~5% of the available intertidal area. M2a is calculated as the ratio measured seagrass coverage / seagrass coverage RefCond. Seagrass coverage is estimated as the weighted average of the no. of shoots / m2. RefCond for shoot density is 12000/m2. M3 is calculated as the no. of species present / no. species RefCond. RefCond is the highest number of seagrass taxa recorded for the system. Combination rule EQR_{SQI} = (M1)*0.3 + (M2a)*0.5 + (M3)*0.2
ES (Cantabrian District) (AQI)	Richness of estuarine habitats (Ir); Relative coverage of estuarine habitats (relative deviations from optimal coverage) (Ic); Variations in the surface area of natural tidal habitats (In)	(Ir) is the no. of different habitat (Anex I, Habitat Directive) present in the WB (Ic) is calculated as: 100-(Σ(Optimal coverage hab_i– Measured coverage hab_i)/no. habitats) The optimal coverage is based on bibliographic information. (In) is calculated as the ratio anthropic habitat surface/total WB extent. Combination rule AQI=Ir+Ic+In

The reference condition defined for each national assessment method and the methodology used to derive it can be found in Table 3.5. Although specific criteria exist for the definition of reference sites, for the methodology to derive reference conditions and the variation expected inside High and Good quality classes (Table 3.5), those sites do not clearly exist throughout the European coasts.

Table 3.5: Criteria for definition, methodology to derive and standards of reference conditions. Definition of High/Good and Good/Moderate boundaries.

Member State	Criteria for RefCond definition	Methodology used to derive RefCond	RefCond standards, H/G and G/M boundaries
DE	RefCond values for each metric are based on expert knowledge and historical data.	M1. Seagrass acreage (seagrass bed extent) was estimated based on all available data for areas occupied by meadows with coverage density higher than 5% RefCond1: separately calculated for each waterbody from historical data: the highest ever recorded bed extent M2. Seagrass coverage (%cover) – from expert knowledge: *Zostera marina*: >/= 30% *Zostera noltei*: >/= 60% M3: Taxonomic composition – from historical data: RefCond = "2"	M1 - H/G: >10%loss compared to RefCond of the waterbody in question M1 - G/M: 30% loss compared to RefCond of the wb in question M2 – H/G: >10%loss compared to RefCond of the *Zostera* species in question M2 – G/M: >30%loss compared to RefCond of the *Zostera* species in question M3 – H/G: 1 species lost/one left M3 – G/MPB: no species left
FR	RefCond values for each metric were obtained from the highest available values for each metric, based on historical data and expert knowledge	Preliminary inventory of all data available for each seagrass beds	Class limits were derived from the first IC round (2004-2006) and adapted from French expert judgment for each single metric (more stringent than tools intercalibrated during the first IC round)

IE / UK	RefCond values for each metric are based on expert knowledge and historical data (In "natural" (ref/High) waters it is expectable that, when they occur, seagrasses often occur in monospecific stands with 1 of up to 3 potential species, on shores or shallow sub-littoral).	A combination of historic data, best available sites and expert judgement	As stress on existing seagrass beds increase we would expect to see a decrease in bed size and shoot density: a loss in bed extent >30% and shoot density >15% (or 30% in a single year) would threaten the integrity of a bed (more space for opportunistic algae) and would indicate moderate status, similarly a loss of ½ the taxa (usually 1 taxa in UK waters) would also indicate moderate status as diversity has decreased.
NL	RefCond values for each metric are based on expert knowledge and historical data.	M1. Quantity (seagrass bed extent) was estimated based on all available data for areas occupied by meadows with coverage density higher than 5% RefCond1: separately calculated for each waterbody from historical data: the highest ever recorded bed extent M2. Quality (seagrass coverage for area >5%) was estimated for each taxa present, from expert knowledge: *Zostera marina*: >/= 30% *Zostera noltei*: >/= 60%	M1 - H/G: >30% loss compared to RefCond of the specific waterbody M1 - G/M: 50% loss compared to RefCond of the specific waterbody M2 – H/G: >10% loss compared to RefCond of the *Zostera* species in question M2 – G/M: >30% loss compared to RefCond of the *Zostera* species in question
PT	RefCond values for each metric were obtained from the best attainable condition, equivalent to the expected ecological condition of least disturbed sites when the best possible management practices were in use for some period of time to allow a recognizable stabilization of	M1. Seagrass acreage (seagrass bed extent) was estimated based on all available data for areas occupied by meadows with coverage density higher than 5% (15 ha for the Mondego). M2a. Seagrass coverage (no. of shoots per m2) was estimated as the percentile 0.90 of the no. of shoots per m2 registered in samples collected randomly inside healthy meadows. M3. Taxonomic composition (no. of *Zostera* species) was	M1. RefCond - ~5% of available intertidal area (15 ha for the Mondego) M2a. RefCond - 12000 shoots / m2 M3. RefCond – usually 1 taxa but depending on the system also 2 taxa is possible. The H/G and G/M boundaries for individual metrics were not defined and have no meaning since the EQR is obtained after the combination of all metrics.

	meadows. Based on expert knowledge and historical data	obtained from all available information of taxa presences	
ES	RefCond values were established using the minor impacted sites and the expert judgment	Ir. The richness of habitats was estimated based on the available data for WB where the anthropic lands occupy less than 5% of the WB surface, no important changes were found in the morphological characteristics and no hydrodynamic changes are present Ic. RefCond was established as no deviation from optimal cover (bibliographic data). In. RefCond was established as absence of anthropic habitats	Ir. RefCond - ~12 different habitats Ic. RefCond – 0 In. refCond - 0

All methodologies were compiled into a calculating excel sheet, which was constructed with direct support of MS, and where the exact formulation for all methodologies included in the IC and the Reference Condition values (RC) were inserted. This possibility represented a higher independency, allowing less pressure to be exerted on MS by the continuous feedback needed during the work. MS had the opportunity to validate all the calculations when the final calculation sheet circulated through their national experts.

As a final remark, is to say that all methods included in the exercise are able to report into a scale of five quality classes, are in compliance with Normative Definitions in terms of setting boundaries between classes, and use similar methods for collecting data.

Part B

4 Data base

Since this BQE is considered as highly sensitive and usually present under very particular and narrow variation of environmental conditions, by analyzing a combined CW and TW (CTW) database will allow to check the general behaviour of the seagrass element along to its distribution range. Due to the BQE specificity, the taxonomic composition is not high and usually the same species are present both in CW and TW. Moreover, this procedure will allow also to solve the situation underpinned as a weakness in the previous IC phase by the evaluation panel as having low number of data on each category of water ("*Very few data are provided; however, the GIG made a justifiable effort to use all possible data in order to complete IC*").

From an initial dataset with 167 samples submitted by MS, 103 samples were selected based on the information they contained on the biology and pressure for each site (Table 4.1). In this sense, the final CTW database integrated 73 biological samples for TW and 30 for CW. Samples without any pressure data, presenting an incomplete set of pressure that was not covering the most significant pressure indicators, or without a coherent relationship between the pressure indicators quantified and the quality result, were excluded from the exercise (e.g., IE data).

Both the biological and pressure data were transfered from the previous exercise. They kept the same format and were complemented with information missing for any indicator or from MS (as new data). The biological data supplied by MS were the Number of Taxa, Bed Extent (ha), Bed Density (%) and the Shoots Density (no/m2), as described in Table 4.2. Were also provided the MS specific Reference Conditions for each metric. The pressure was also quantified as in the previous IC (Table 4.3), but was updated and complemented whenever needed by MS.

Table 4.1: Sampling sites selected for the exercise. Code, category and sampling date

Country	Sample Code	Water Category	Waterbody Name	Waterbody Code	Sample date(s)
DE	Übergangsgewässer der Weser_008	TW	Übergangsgewässer der Weser	DE_TW_T1.4000.01	2008
DE	Übergangsgewässer der Weser_013	TW	Übergangsgewässer der Weser	DE_TW_T1.4000.01	2013
DE	Übergangsgewässer Ems-Ästuar_008	TW	Übergangsgewässer Ems-Ästuar	DE_TW_T1.3990.01	2008
DE	Übergangsgewässer Ems-Ästuar_013	TW	Übergangsgewässer Ems-Ästuar	DE_TW_T1.3990.01	2013
ES	San Vicente de la Barquera_009	TW	San Vicente	ES113MAT000110	2009
ES	Ría de Mogro_009	TW	Ría de Mogro	ES092MAT000140	2009
NL	Eems-Dollard_96	TW	Eems-dollard	NL81_2	1996
NL	Eems-Dollard_97	TW	Eems-dollard	NL81_2	1997
NL	Eems-Dollard_99	TW	Eems-dollard	NL81_2	1999
NL	Eems-Dollard_000	TW	Eems-dollard	NL81_2	2000
NL	Eems-Dollard_001	TW	Eems-dollard	NL81_2	2001
NL	Eems-Dollard_002	TW	Eems-dollard	NL81_2	2002
NL	Eems-Dollard_003	TW	Eems-dollard	NL81_2	2003
NL	Eems-Dollard_004	TW	Eems-dollard	NL81_2	2004
NL	Eems-Dollard_005	TW	Eems-dollard	NL81_2	2005
NL	Eems-Dollard_006	TW	Eems-dollard	NL81_2	2001-2006
NL	Eems-Dollard_001_6	TW	Eems-dollard	NL81_2	2006
NL	Eems-Dollard_007	TW	Eems-dollard	NL81_2	2007
NL	Eems-Dollard_008	TW	Eems-dollard	NL81_2	2008
NL	Eems-Dollard_009	TW	Eems-dollard	NL81_2	2009
PT	Mondego-WB2_90	TW	Mondego-WB2	PT04MON0682	1990
PT	Mondego-WB2_92	TW	Mondego-WB2	PT04MON0682	1992
PT	Mondego-WB2_98	TW	Mondego-WB2	PT04MON0682	1998
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PT	Mondego-WB2_010	TW	Mondego-WB2	PT04MON0682	2010
PT	Ria Aveiro-WB1_010	TW	Ria Aveiro-WB1	PT04VOU0552	2010
PT	Ria Aveiro-WB2_010	TW	Ria Aveiro-WB2	PT04VOU0547	2010
PT	Arade-WB1_010	TW	Arade-WB1	PT08RDA1701	2010
PT	Guadiana-WB1_010	TW	Guadiana-WB1	PT07GUA1632	2010
FR	Estuaire Bidassoa_007	TW	Estuaire Bidassoa	FRFT08	2007
FR	Estuaire Bidassoa_013	TW	Estuaire Bidassoa	FRFT08	2013
UK	Carrick Roads Inner_008	TW	Carrick Roads Inner	GB520804814400	2008
UK	Carrick Roads Inner_009	TW	Carrick Roads Inner	GB520804814400	2009
UK	Carrick Roads Inner_010	TW	Carrick Roads Inner	GB520804814400	2010
UK	Carrick Roads Inner_011	TW	Carrick Roads Inner	GB520804814400	2011
UK	Carrick Roads Inner_012	TW	Carrick Roads Inner	GB520804814400	2012
UK	Carrick Roads Inner_013	TW	Carrick Roads Inner	GB520804814400	2013
UK	Exe_012	TW	Exe	GB510804505600	2012
UK	Exe_013	TW	Exe	GB510804505600	2013
UK	Foryd Bay_008	TW	Foryd Bay	GB521006501200	2008
UK	Foryd Bay_009	TW	Foryd Bay	GB521006501200	2009
UK	Foryd Bay_010	TW	Foryd Bay	GB521006501200	2010
UK	Foryd Bay_011	TW	Foryd Bay	GB521006501200	2011
UK	Foryd Bay_013	TW	Foryd Bay	GB521006501200	2013
UK	Milford Haven Inner_009	TW	Milford Haven Inner	GB531006114100	2009
UK	Milford Haven Inner_010	TW	Milford Haven Inner	GB531006114100	2010
UK	Milford Haven Inner_011	TW	Milford Haven Inner	GB531006114100	2011
UK	Milford Haven Inner_012	TW	Milford Haven Inner	GB531006114100	2012
UK	Milford Haven Inner_013	TW	Milford Haven Inner	GB531006114100	2013
UK	Pagham Harbour_009	TW	Pagham Harbour	GB570704700000	2009
UK	Pagham Harbour_010	TW	Pagham Harbour	GB570704700000	2010
UK	Pagham Harbour_011	TW	Pagham Harbour	GB570704700000	2011
UK	Pagham Harbour_012	TW	Pagham Harbour	GB570704700000	2012
UK	Pagham Harbour_013	TW	Pagham Harbour	GB570704700000	2013
UK	Portsmouth Harbour_010	TW	Portsmouth Harbour	GB580705140000	2010
UK	Portsmouth Harbour_011	TW	Portsmouth Harbour	GB580705140000	2011
UK	Portsmouth Harbour_012	TW	Portsmouth Harbour	GB580705140000	2012
UK	Portsmouth Harbour_013	TW	Portsmouth Harbour	GB580705140000	2013
UK	Severn Lower_011	TW	Severn Lower	GB530905415401	2011
UK	Severn Lower_012	TW	Severn Lower	GB530905415401	2012
UK	Severn Lower_013	TW	Severn Lower	GB530905415401	2013
UK	Thames Lower_008	TW	Thames Lower	GB530603911401	2008
UK	Thames Lower_009	TW	Thames Lower	GB530603911401	2009
UK	Thames Lower_010	TW	Thames Lower	GB530603911401	2010
UK	Thames Lower_011	TW	Thames Lower	GB530603911401	2011
UK	Thames Lower_012	TW	Thames Lower	GB530603911401	2012
UK	Thames Lower_013	TW	Thames Lower	GB530603911401	2013
DE	Euhalines Wattenmeer der Ems_008	CW	Euhalines Wattenmeer der Ems	DE_CW_N2_3100_01	2008
DE	Euhalines Wattenmeer der Ems_013	CW	Euhalines Wattenmeer der Ems	DE_CW_N2_3100_01	2013
DE	Wattenmeer Jadebusen und angrenzende Küstenabschnitte_008	CW	Wattenmeer Jadebusen und angrenzende Küstenabschnitte	DE_CW_N2_4900_01	2008
DE	Wattenmeer Jadebusen und angrenzende Küstenabschnitte_013	CW	Wattenmeer Jadebusen und angrenzende Küstenabschnitte	DE_CW_N2_4900_01	2013
DE	Wattenmeer Nordfriesland_012	CW	Wattenmeer Nordfriesland	DE_CW_N2.9500.01	2007-2012
FR	Arcachon amont_008	CW	Arcachon amont	FRFC06	2008
FR	Arcachon amont_013	CW	Arcachon amont	FRFC06	2013
FR	Pertuis Charentais_007	CW	Pertuis Charentais	FRFC02	2007
FR	Pertuis Charentais_012	CW	Pertuis Charentais	FRFC02	2012
FR	Lac d'Hossegor_008	CW	Lac Hossegor	FRFC09	2008
FR	Lac d'Hossegor_013	CW	Lac Hossegor	FRFC09	2013
FR	Pertuis Breton_007	CW	Pertuis Breton	FRGC53	2007
FR	Pertuis Breton_011	CW	Pertuis Breton	FRGC53	2011
FR	Golfe du Morbihan_007	CW	Golfe du Morbihan	FRGC39	2007
FR	Baie de Bourgneuf_006	CW	Baie de Bourgneuf	FRGC48	2006
FR	Golfe du Morbihan_012	CW	Golfe du Morbihan	FRGC39	2012
FR	Baie de Bourgneuf_012	CW	Baie de Bourgneuf	FRGC48	2012
UK	Milford Haven Outer_007	CW	Milford Haven Outer	GB641008220000	2007
UK	Milford Haven Outer_008	CW	Milford Haven Outer	GB641008220000	2008
UK	Milford Haven Outer_009	CW	Milford Haven Outer	GB641008220000	2009
UK	Milford Haven Outer_010	CW	Milford Haven Outer	GB641008220000	2010
UK	Milford Haven Outer_011	CW	Milford Haven Outer	GB641008220000	2011
UK	Milford Haven Outer_012	CW	Milford Haven Outer	GB641008220000	2012
UK	Milford Haven Outer_013	CW	Milford Haven Outer	GB641008220000	2013
UK	Solent_008	CW	Solent	GB650705150000	2008
UK	Solent_009	CW	Solent	GB650705150000	2009
UK	Solent_010	CW	Solent	GB650705150000	2010
UK	Solent_011	CW	Solent	GB650705150000	2011
UK	Solent_012	CW	Solent	GB650705150000	2012
UK	Solent_013	CW	Solent	GB650705150000	2013

Table 4.2: Metrics used in the IC3. Format and description

Metric	Description
No of taxa	number of seagrass species present in the site
Bed extent (ha) for Z.marina	the size of Z. marina meadow covered by a density >5%
Bed extent (ha) for Z.noltei/mixed	the size of Z. noltei (or mixed) meadow covered by a density >5%
Bed density (%) for Z.marina	average density of Z. marina meadow covered by a density >5%
Bed density (%) for Z.noltei/mixed	average density of Z. noltei (or mixed) meadow covered by a density >5%
Shoot density (m2)	the average number of shoots per m2 in a meadow covered by a density >5%

Table 4.3: Criteria used to quantify the pre-selected pressures affecting the seagrass quality condition

Pressure indicator	Criteria	No change (0)	Very low (1)	Low (3)	Medium (5)	High (7)	Very high (9)
Land Claim (ha)	- area claimed from the sea or estuary. - consider both: mudflats and tidal marshes. - this indicator includes both anthropogenically induced changes and natural variations.	No change	<0.5% lost over the last decades	<1%	<5% lost	<10%lost	≥ 10% lost
% Shoreline re-enforcement	- intertidal and subtidal area affected by shoreline structures. - Consider both margins. - values as percentage of WB extension/margin.	No development	<5% of the coastline impacted by industrial or urban activities	<30%	< 60%	< 90%	≥ 90%
Maintenance dredging area (ha)	- the area (ha) designated for maintenance dredging in estuaries. - the % in relation to the WB surface area	No dredging	<1% of the surface area dredged	<10%	<30%	<50%	≥ 50%
Maintenance dredging volume (tons)	- the amount (ton) of dredged material from estuar	no disposal	< 5000 tons deposited annually	<100,000 tons	< 1 million tons	< 4 million tons	≥ 4 million tons
Maintenance disposal area (ha)	- the area (ha) where dredged material is dumped in estuaries. - consider both intertidal and subtidal areas.	no disposal	<1% of the subtidal area dredged	<10%	<30%	<50%	≥ 50%
Maintenance disposal volume (tons)	- the amount (ton) of dredged material dumped inside estuaries. - consider both intertidal and subtidal dumped volumes.	no disposal	< 5000 tons deposited annually	<100,000 tons	< 1 million tons	< 4 million tons	≥ 4 million tons
Other fisheries nearshore disturbance	- % of the length of coast (riverbank) affected by fishery. - % of estuarine (WB) area affected by fishery.	No fishery activities	< 10% of the length of coast (riverbank) affected by fishery	<30%	<60%	<90%	≥ 90%
Marina Development	- number of berths in marinas per km2 of WB surfa	No marina	< 100 berths in marina / km2	<150 berths / km2	<300 berths / km2	<500 berths / km2	≥ 500 berths / km2
Tourism and recreation	- % of the length of coast (riverbank) affected by tourism and recreation activity. - % of estuarine (WB) area affected by tourism and recreation activity.	None	< 10% of the length of coast (riverbank) or estuarine area affected by activities	<30%	<60%	<90%	≥ 90%
Nutrients (DIN winter median concentration) (µmol/L)	- TW normalized for 25 salinity; - CW polyhaline normalized for 25 salinity; - CW normalized for 32 salinity.	Winter DIN concentration lower than 6.5 µmol/L	< 10 µmol/L	<30 µmol/L	<60 µmol/L	<90 µmol/L	≥ 90 µmol/L
Natural turbidity: secchi disk (m) (mean)	- use same normalization criteria as for DIN (if possible). - use growing period values (May to September).	Secchi depth transparency ≥ 2.5 m	< 2.5 m	< 2 m	< 1.5 m	< 1 m	< 0.5 m

Although this is apparently a not very high number of samples, is worth full to mention that each sample corresponds to a year-record for a site (coastal area or estuary) and so, the increase on the number of samples (to include pressure and biology data) in a so short period of time (between the last and the present IC), represents a serious difficulty for any MS.

5 Calculation of national EQRs

Due to the similar architecture and data used by the assessment methodologies (e.g., taxonomic composition, bed extent and bed density), it was possible in the first approach to adopt Option 3, to calculate the EQR for all samples by all assessment methods (each assessment method produced an EQR for each sample).

However, some highlights have to be mentioned as solutions to overcome constrains revealed meanwhile during this exercise.

The PT original methodology is not including the metric bed density as the measure of the percentage density of species cover in a meadow, like most of the other methods are, but instead this metric is considered as the density of shoots of species in the meadow. For this reason, to reconstruct the data series needed for the application of SQI without restrictions, a regression equation was calculated to convert the "cover area (%)" into "shoot density (ind m^2)" values. The obtained equation (ShootDensity = $0.00001x^{4.676}$; where x is the cover area value; $r = 0.79$; $n = 6$) was constructed based on data from the Mondego Estuary and was used to provide shoot density values for sites where the metric was not assessed.

The UK/IE original methodology had Reference Conditions for each site defined on the basis of the best historic record (usually from the first WFD reporting round). To avoid penalizing the agreement between different methodologies, an update of the RC was implemented, the better value registered for each UK/IE site was assumed as the metrics' RC value in this exercise.

The EQR values calculated for different assessment methodologies can be found in Annex 1.

6 Pressure calculation and comparison against EQR values

After the compilation of pressures affecting each site, the different pressure indicators were assigned to different pressure index categories (Table 6.1). As mentioned above, sites with no pressure data, low pressure data input or with pressure data clearly poor in quality, were removed from further analyses.

To compare the EQR produced for each site againts the pressure affecting it, and the biological metrics quantified in there, individual pressure indicators were summed up for the respective pressure categories, and the EQR values composed to several pressure indexes (combining pressure categories) (Table 6.1). A correlation matrix was calculated for CTW with STATISTICA 7.0 software (StatSoft, Inc. 1984-2004), based on data of pressures (Annex 2), EQRs (Annex 1) and metric values (Annex 3), registered on sites.

Table 6.1: Pressure indexes developed and used to compare against EQR calculated for each site. (see units of each pressure indicator at Table 4.3)

Pressure Index	Pressure Category	Pressure Indicator
Hydromorphologic	Hydromorphologic	Land Claim
		Shoreline re-enforcement
Resource Use	Resource Use	Maintenance dredging area
		Maintenance dredging volume
		Maintenance disposal area
		Maintenance disposal volume
		Other fisheries nearshore disturbance
		Marina Development
		Tourism and recreation
Environtental Quality	Environtental Quality	Nutrients
		Natural turbidity: secchi disk
Hydromorphologic + Resources	Hydromorphologic + Resources Use	
Total Pressure	Hydromorphologic + Resources Use + Environtental Quality	

Correlations between all original EQR, pressure indexes and biological parameters were analysed for strength and statistical significance and the most meaningful selected as important pressure indexes affecting the seagrass BQE and compared with EQR calculated by each method (Table 6.2).

The pressure indexes Resource Use, Total Pressure and Hydromorphological + Resource Use, showed a significant relationship to all methods ($r > 0.3$; $p < 0.05$). The biological metric Bed Density was also significantly correlated to all assessment methods. The relationship between EQR produced by different assessment tool against the selected pressure index (Resource Use) quantified for each site is shown through a scattered plot, and correlation and strength estimated (Figure 6.1) quantified for each site is shown through a scattered plot, and correlation and strength estimated (Figure 6.1).

Table 6.2: Correlations for CTW, between pressure indicator's categories, EQR (final calculations) and biological parameters (seagrass metrics)

	DE	NL	PT	UK/IE	FR
Hydromorph.Pressues	-.0312	-.0740	-.0758	-.0148	-.0201
	p=.755	p=.458	p=.447	p=.882	p=.840
Resource Pressure	-.6812	-.6923	-.3851	-.7026	-.6754
	p=.000	p=.000	p=.000	p=.000	p=.000
Env.Qual Pressure	.1011	.0726	-.0883	.1168	.1086
	p=.310	p=.466	p=.375	p=.240	p=.275
Total Pressure	-.5725	-.6060	-.3998	-.5805	-.5612
	p=.000	p=.000	p=.000	p=.000	p=.000
Hyd+Res	-.6666	-.6902	-.3942	-.6823	-.6577
	p=.000	p=.000	p=.000	p=.000	p=.000
Bed extent (ha) for TOTAL bed	.1065	.1643	.2460	.0513	.0664
	p=.284	p=.097	p=.012	p=.607	p=.505
Bed density (%) for TOTAL bed	.6581	.6272	.6618	.6636	.6728
	p=.000	p=.000	p=.000	p=.000	p=.000
Bed Extent % Intertidal	.2332	.3238	.2676	.0687	.1682
	p=.018	p=.001	p=.006	p=.490	p=.089

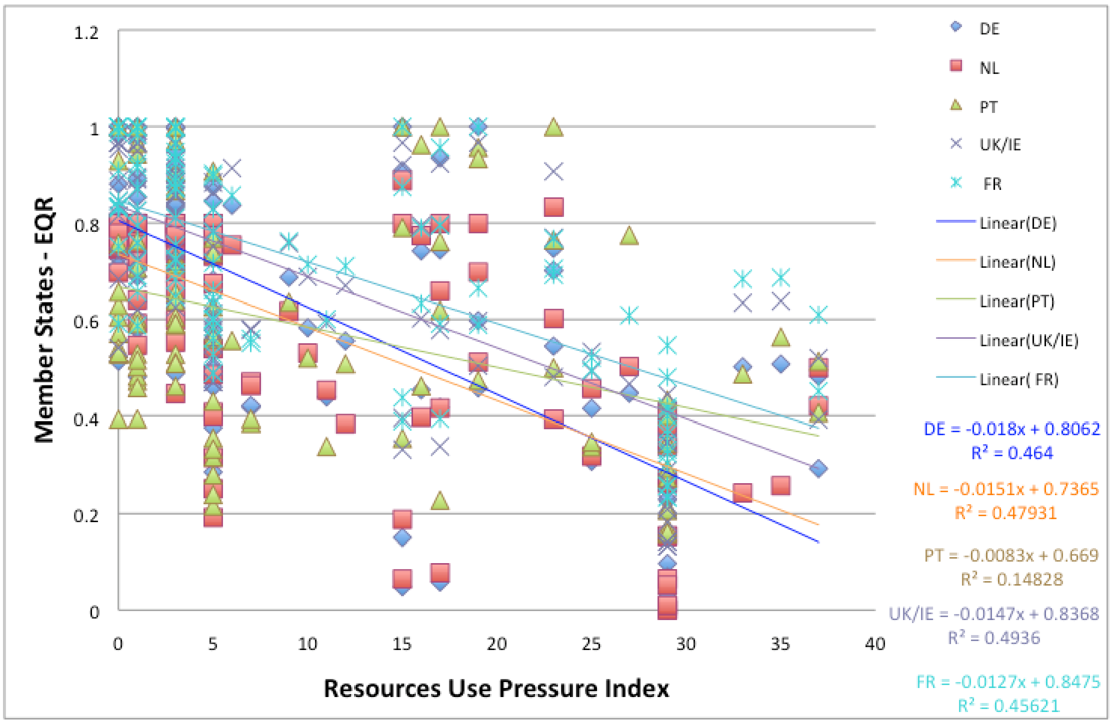

Figure 6.1: Response of assessment methods against Resource Use index pressure

7 Benchmark standardisation and offsets calculation

When reference sites are not available for all MS, the identification of the relationship between results provided by the different assessment methods may come difficult to recognise. For this reason, an alternative approach has been proposed, the benchmarking. The aim of this technique is then to identify and remove differences among national assessment methods not caused by differences in anthropogenic pressure, but else by systematic discrepancies such as differences on the methodology it self, biogeography, or the typology considered (Annex V, IC Guidance).

Since the benchmarking process must use harmonized criteria independent of national classifications, the EQR results provided by each assessment methodology must be compared to a common metric, which must show a theoretical relationship with changes in the abiotic environment due to pressures. At last, a comprehensive pressure index, able to represent significant pressures affecting the systems, can be used to show the agreement between the ecological response of the BQE and the value registered along the pressure scale. This was the adopted concept here, and the common metric selected was the pressure index presenting the highest significant correlation with the EQR values estimated by different assessment methodologies for the sampling sites, the Resource Use index (see section 6).

To estimate differences between the assessment methods, EQR values from each MS (dependent variables) were compared to the most significant pressure (Resource Use index) (continuous predictor), and the offsets calculated through a General Linear Model (GLM) in STATISTICA 7.0 software (StatSoft, Inc. 1984-2004). The offset calculated for each methodology (Table 7.1) was afterwards used to standardise the EQR results and the quality class boundaries, i.e. to reduce the deviation of each national method from the common metric (Resource Use index trend).

Table 7.1: Offsets calculated for all assessment methods when using the Resource Use index as common metric (GLM in STATISTICA 7.0 software).

	DE	NL	PT	UK/IE	FR
Resource Pressure	-0.01799	-0.01514	-0.00833	-0.01470	-0.01272

8 Comparison of assessment methods and boundaries harmonisation

The exercise was conducted by assessment methodology, independently of MSs involved, i.e. MSs presenting the same methodology (e.g., UK and IE) had one common set of results represented in the exercise.

The selection of the best calculation method to use on the harmonisation of boundaries depends on the relationship found between methodologies and their standard deviations. It should be select the appropriate calculation method (division or subtraction) by testing if the average value of all national EQRs per survey in the full dataset is significantly correlated with its standard deviation. In case of a significant positive relationship, i.e. national EQRs converge towards the bad end of the quality gradient, division is used. A non-significant relationship, i.e. constant distances between EQRs across the full gradient, required subtraction.

The correlation strength and its significance level were analysed on STATISTICA 7.0 software (StatSoft, Inc. 1984-2004). The non-significant correlation found ($r = -0.140$; $p = 0.163$) dictated subtraction as the best calculation method to use on boundaries harmonisation.

The harmonisation of boundaries was preceeded by the standardisation of the original boundary values and EQR values (operated with the calculated offsets; Standard value = EQR - Offset), after which those were inserted in the adequate Intercalibration Excel Template Sheets - IC_Opt3_sub_v1.24.xlsx (developed by Dirk Nemitz, Nigel Willby, Sebastian Birk, 2011). The same subtype was attributed to all samples, which were also classified as belonging to benchmark sites.

After inserting all data, as a significant result, it can be seen the estimated regressions between each methodology and the common view calculated as an average from all the other methodologies fulfils the IC requirement of achieving a $R^2 > 0.5$ (Figure 8.1). All the tested assessment methodologies were able to pass this test.

At last, boundaries bias were calculated (Table 8.1). The UK/IE and FR methodologies failed that requirement, showing too relaxed boundaries at G/M. These boundaries should be adjusted in order to fulfil the requirement of having a class bias lower than 0.25 of the class width (Annex V, IC Guidance) (Table 8.2).

To the harmonisation, the G/M boundaries were adjusted to reduce class width bias,. The boundaries were successfully modified and both methods were able to achieve harmonised values when compared to the other partners involved in the exercise. Some of the NL and PT boundaries were too stringent, but since this is not failing the requirements, they were not modified.

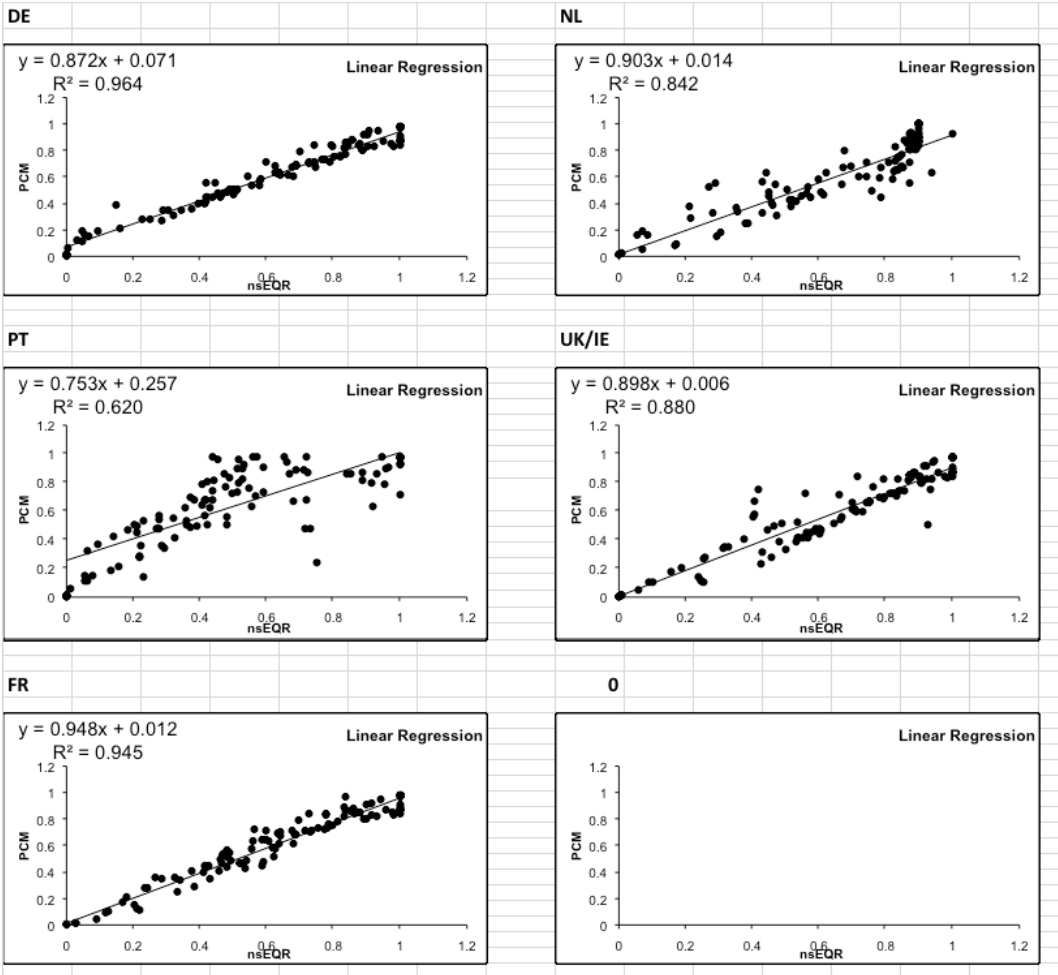

Figure 8.1: Regression results estimated for each assessment methods against the EQR based on the mean perspective of all other methods

Table 8.1: Results of boundaries' before harmonisation. Red cells represent the boundary values needing adjustment

	DE	NL	PT	UK/IE	FR
H/G	0.818	0.815	0.808	0.815	0.813
G/M	0.618	0.615	0.608	0.615	0.613
	DE	NL	PT/ES	UK/IE	FR
Max	1.018	1.015	1.008	1.015	1.013
H/G	0.818	0.815	0.808	0.815	0.813
G/M	0.618	0.615	0.608	0.615	0.613
M/P	0.418	0.415	0.408	0.415	0.413
P/B	0.218	0.215	0.208	0.215	0.213
PCM_Max	0.943	1.031	1.011	0.941	0.961
PCM_H/G	0.769	0.827	0.831	0.726	0.714
PCM_G/M	0.594	0.624	0.652	0.510	0.466
PCM_M/P	0.420	0.421	0.472	0.295	0.219
PCM_P/B	0.246	0.218	0.293	0.080	-0.029
H width to Max	0.174	0.203	0.179	0.215	0.247
G width	0.174	0.203	0.179	0.215	0.247
M width	0.174	0.203	0.179	0.215	0.247
H/G bias	-0.004	0.054	0.058	-0.048	-0.060
G/M bias	0.025	0.055	0.082	-0.059	-0.103
H/G bias_CW	-0.026	0.266	0.323	-0.221	-0.242
G/M bias_CW	0.144	0.269	0.459	-0.274	-0.417
N of Bm sites	103				

Table 8.2: Results of boundaries' after harmonisation. Red figures represent the boundary values adjusted to reach compliance (bias < 0.25 of class width)

	DE	NL	PT	UK/IE	FR
H/G	0.818	0.815	0.808	0.815	0.813
G/M	0.618	0.615	0.608	0.615	0.613
	DE	NL	PT/ES	UK/IE	FR
Max	1.018	1.015	1.008	1.015	1.013
H/G	0.818	0.815	0.808	0.815	0.813
G/M	0.618	0.615	0.608	0.622	0.658
M/P	0.418	0.415	0.408	0.415	0.413
P/B	0.218	0.215	0.208	0.215	0.213
PCM_Max	0.943	1.031	1.011	0.941	0.961
PCM_H/G	0.769	0.827	0.831	0.726	0.714
PCM_G/M	0.594	0.624	0.652	0.518	0.522
PCM_M/P	0.420	0.421	0.472	0.295	0.219
PCM_P/B	0.246	0.218	0.293	0.080	-0.029
H width to Max	0.174	0.203	0.179	0.215	0.247
G width	0.174	0.203	0.179	0.208	0.191
M width	0.174	0.203	0.179	0.223	0.303
H/G bias	-0.004	0.054	0.058	-0.048	-0.060
G/M bias	0.025	0.055	0.082	-0.051	-0.047
H/G bias_CW	-0.026	0.266	0.323	-0.221	-0.242
G/M bias_CW	0.144	0.269	0.459	-0.247	-0.247
N of Bm sites	103				

9 Quality class boundaries' proposal

After the boundaries harmonisation, those results have to be reversed. The opposite operation to the one used on the standardisation process has to be applied in order to re-establish the original range of values. In this sense, after that operation with offsets, the proposed H/G and G/M boundaries are the ones expressed on Table 9.1.

Table 9.1: Boundaries proposed after correction with offsets.

Quality Classes (original boundaries)	DE	NL	PT	UK/IE	FR
High (1)	1.000	1.000	1.000	1.000	1.000
High / Good (0.8)	0.800	0.800	0.800	0.800	0.800
Good / Moderate (0.6)	0.600	0.600	0.600	0.607	0.645
Moderate / Poor (0.4)	0.400	0.400	0.400	0.400	0.400
Poor / Bad (0.2)	0.200	0.200	0.200	0.200	0.200

10 Conclusion

The national assessment methods meet the WFD compliance criteria, and responds mainly to hydromorphological pressure and resources use.

All the national methods have been intercalibrated excepting the Spanish method (AQI), due to differences on assessment concept.

A proposal for class boundaries after the Intercalibration exercise has been established for coastal and transitional waters. In the case of UK/IE and FR original boundaries (G/M) have been adjusted.

The class boundaries will be applied for the establishment of high and good ecological status in the water bodies of the national types included in the common Intercalibration types.

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Annex 1

EQR values produced by different assessment methods. Selected methods used afterwards in the exercise are marked in bold.

Water Body	DE	NL	PT	UK/IE	FR
Übergangsgewässer der Weser_008	**0.417**	**0.458**	**0.338**	**0.562**	**0.550**
Übergangsgewässer der Weser_013	**0.308**	**0.319**	**0.348**	**0.494**	**0.496**
Übergangsgewässer Ems-Ästuar_008	**0.000**	**0.000**	**0.160**	**0.132**	**0.233**
Übergangsgewässer Ems-Ästuar_013	**0.000**	**0.000**	**0.160**	**0.132**	**0.233**
Desembocadura Guadiana (Ayamonte)_009	0.175	0.122	0.594	0.417	0.442
Desembocadura Guadiana (Ayamonte)_011	0.031	0.021	0.592	0.320	0.365
San Vicente de la Barquera_009	**0.058**	**0.077**	**0.227**	**0.339**	**0.697**
Ría de Mogro_009	**0.838**	**0.755**	**0.558**	**0.914**	**1.000**
Santoña_009	1.000	0.800	0.938	1.244	1.000
Eems-Dollard_88	0.144	0.250	0.494	0.295	0.372
Eems-Dollard_91	0.032	0.131	0.193	0.198	0.316
Eems-Dollard_94	0.113	0.283	0.294	0.274	0.369
Eems-Dollard_95	0.240	0.434	0.756	0.359	0.423
Eems-Dollard_96	**0.484**	**0.502**	**0.515**	**0.521**	**0.611**
Eems-Dollard_97	**0.293**	**0.422**	**0.408**	**0.394**	**0.453**
Eems-Dollard_99	**0.096**	**0.262**	**0.274**	**0.263**	**0.364**
Eems-Dollard_000	**0.230**	**0.345**	**0.345**	**0.346**	**0.415**
Eems-Dollard_001	**0.347**	**0.382**	**0.403**	**0.409**	**0.482**
Eems-Dollard_002	**0.251**	**0.338**	**0.347**	**0.348**	**0.420**
Eems-Dollard_003	**0.396**	**0.411**	**0.434**	**0.446**	**0.548**
Eems-Dollard_004	**0.048**	**0.152**	**0.207**	**0.209**	**0.324**
Eems-Dollard_005	**0.033**	**0.153**	**0.213**	**0.219**	**0.332**
Eems-Dollard_006	**0.163**	**0.272**	**0.294**	**0.289**	**0.374**
Eems-Dollard_001_6	**0.008**	**0.065**	**0.171**	**0.182**	**0.304**
Eems-Dollard_007	**0.000**	**0.009**	**0.160**	**0.142**	**0.257**
Eems-Dollard_008	**0.000**	**0.010**	**0.160**	**0.142**	**0.257**
Eems-Dollard_009	**0.069**	**0.052**	**0.206**	**0.346**	**0.401**
Mondego-WB2_90	**0.689**	**0.618**	**0.637**	**0.759**	**0.763**
Mondego-WB2_92	**0.584**	**0.532**	**0.521**	**0.689**	**0.715**
Mondego-WB2_93	0.398	0.298	0.308	0.566	0.595
Mondego-WB2_98	**0.286**	**0.191**	**0.215**	**0.490**	**0.490**
Mondego-WB2_99	0.301	0.212	0.224	0.501	0.517
Mondego-WB2_000	**0.323**	**0.251**	**0.239**	**0.515**	**0.529**
Mondego-WB2_001	0.363	0.284	0.267	0.542	0.555
Mondego-WB2_002	**0.377**	**0.316**	**0.279**	**0.552**	**0.563**
Mondego-WB2_004	**0.418**	**0.409**	**0.317**	**0.579**	**0.585**
Mondego-WB2_005	**0.441**	**0.455**	**0.339**	**0.594**	**0.602**
Mondego-WB2_006	**0.471**	**0.487**	**0.356**	**0.614**	**0.632**
Mondego-WB2_008	**0.461**	**0.401**	**0.333**	**0.608**	**0.646**
Mondego-WB2_009	**0.727**	**0.753**	**0.561**	**0.785**	**0.782**
Mondego-WB2_010	**0.846**	**0.782**	**0.770**	**0.864**	**0.898**
Ria Aveiro-WB1_010	**1.000**	**0.800**	**0.957**	**0.967**	**1.000**
Ria Aveiro-WB2_010	**0.509**	**0.257**	**0.565**	**0.639**	**0.688**
Arade-WB1_010	**0.503**	**0.242**	**0.488**	**0.636**	**0.685**
Guadiana-WB1_010	**0.557**	**0.385**	**0.509**	**0.671**	**0.712**
Ballysadare Estuary_012	0.895	0.800	0.791	0.897	0.927
Ballysadare Estuary_009	0.784	0.737	0.900	0.823	0.823
Ballysadare Estuary_010	0.572	0.619	0.469	0.681	0.648
Colligan Estuary_012	0.486	0.469	0.448	0.624	0.619
Colligan Estuary_009	0.658	0.710	0.550	0.739	0.706
Colligan Estuary_011	0.987	0.797	0.996	0.958	0.991
Colligan Estuary_010	0.718	0.652	0.533	0.779	0.779

Colligan Estuary_007	0.752	0.776	0.668	0.801	0.803
Colligan Estuary_008	0.720	0.738	0.590	0.780	0.780
Cromane_012	0.982	0.800	0.994	0.954	0.988
Cromane_011	0.874	0.800	0.802	0.882	0.916
Cromane	0.857	0.800	0.690	0.871	0.876
Garavoge Estuary_012	0.840	0.786	0.656	0.860	0.860
Garavoge Estuary_010	0.557	0.604	0.462	0.671	0.638
Garavoge Estuary_008	0.850	0.792	0.940	0.867	0.867
Garavoge Estuary_009	0.796	0.800	0.750	0.831	0.858
Moy Estuary_012	0.684	0.578	0.514	0.756	0.761
Moy Estuary_010	0.943	0.800	0.983	0.928	0.962
Moy Estuary_011	0.892	0.800	0.844	0.895	0.928
Moy Estuary_009	0.710	0.797	0.686	0.672	0.760
Rogerstown Estuary_012	0.006	0.005	0.200	0.304	0.353
Rogerstown Estuary	0.013	0.009	0.200	0.308	0.356
Rogerstown Estuary_011	1.000	0.800	1.000	0.967	1.000
Estuaire Bidassoa_007	**0.419**	**0.472**	**0.387**	**0.580**	**0.553**
Estuaire Bidassoa_013	**0.423**	**0.464**	**0.396**	**0.582**	**0.561**
CARRICK ROADS INNER_008	**0.482**	**0.548**	**0.395**	**0.622**	**0.588**
CARRICK ROADS INNER_009	**0.637**	**0.730**	**0.474**	**0.725**	**0.692**
CARRICK ROADS INNER_010	**0.640**	**0.641**	**0.484**	**0.727**	**0.722**
CARRICK ROADS INNER_011	**0.855**	**0.762**	**0.943**	**0.870**	**0.873**
CARRICK ROADS INNER_012	**1.000**	**0.800**	**0.708**	**0.967**	**1.000**
CARRICK ROADS INNER_013	**0.690**	**0.737**	**0.530**	**0.760**	**0.760**
CONWY_009	0.573	0.428	0.766	0.682	0.720
CONWY_010	0.611	0.515	0.510	0.707	0.737
CONWY_011	0.608	0.510	0.795	0.705	0.736
CONWY_012	0.999	0.800	0.566	0.966	1.000
CONWY_013	0.608	0.510	0.657	0.705	0.736
EXE_012	**1.000**	**0.800**	**1.000**	**0.967**	**1.000**
EXE_013	**0.803**	**0.746**	**0.606**	**0.835**	**0.835**
FORYD BAY_008	**0.882**	**0.773**	**0.759**	**0.888**	**0.909**
FORYD BAY_009	**0.820**	**0.748**	**0.572**	**0.847**	**0.847**
FORYD BAY_010	**0.981**	**0.796**	**0.541**	**0.954**	**0.987**
FORYD BAY_011	**1.000**	**0.800**	**0.530**	**0.967**	**1.000**
FORYD BAY_013	**1.000**	**0.800**	**1.000**	**0.967**	**1.000**
MILFORD HAVEN INNER_009	**0.887**	**0.775**	**0.604**	**0.891**	**0.916**
MILFORD HAVEN INNER_010	**0.893**	**0.777**	**0.966**	**0.895**	**0.924**
MILFORD HAVEN INNER_011	**0.743**	**0.757**	**0.503**	**0.795**	**0.795**
MILFORD HAVEN INNER_012	**0.974**	**0.800**	**0.593**	**0.950**	**0.983**
MILFORD HAVEN INNER_013	**0.791**	**0.721**	**0.517**	**0.827**	**0.827**
Pagham Harbour_009	**0.515**	**0.698**	**0.395**	**0.542**	**0.593**
Pagham Harbour_010	**0.775**	**0.777**	**0.532**	**0.817**	**0.834**
Pagham Harbour_011	**1.000**	**0.800**	**0.630**	**0.967**	**1.000**
Pagham Harbour_012	**0.798**	**0.779**	**0.929**	**0.731**	**0.831**
Pagham Harbour_013	**0.728**	**0.751**	**0.658**	**0.684**	**0.752**
Portsmouth Harbour_010	**0.503**	**0.541**	**0.432**	**0.635**	**0.602**
Portsmouth Harbour_011	**0.678**	**0.732**	**0.577**	**0.752**	**0.718**
Portsmouth Harbour_012	**0.795**	**0.738**	**0.907**	**0.830**	**0.830**
Portsmouth Harbour_013	**0.877**	**0.800**	**0.739**	**0.885**	**0.902**
SEVERN LOWER_011	**1.000**	**0.800**	**1.000**	**0.967**	**1.000**
SEVERN LOWER_012	**0.997**	**0.800**	**0.764**	**0.965**	**0.998**
SEVERN LOWER_013	**0.580**	**0.593**	**0.460**	**0.687**	**0.658**
THAMES LOWER_008	**0.950**	**0.790**	**0.714**	**0.933**	**0.967**
THAMES LOWER_009	**0.902**	**0.780**	**0.657**	**0.902**	**0.935**
THAMES LOWER_010	**1.000**	**0.800**	**0.640**	**0.967**	**1.000**
THAMES LOWER_011	**0.922**	**0.791**	**0.606**	**0.915**	**0.948**
THAMES LOWER_012	**0.996**	**0.799**	**0.999**	**0.964**	**0.997**

THAMES LOWER_013	**0.887**	**0.789**	**0.590**	**0.891**	**0.924**
Euhalines Wattenmeer der Ems_008	**0.048**	**0.064**	**0.356**	**0.332**	**0.391**
Euhalines Wattenmeer der Ems_013	**0.150**	**0.188**	**0.791**	**0.398**	**0.440**
Wattenmeer Jadebusen und angrenzende Küstenabschnitte_008	**0.703**	**0.603**	**1.000**	**0.771**	**0.768**
Wattenmeer Jadebusen und angrenzende Küstenabschnitte_013	**0.546**	**0.395**	**0.501**	**0.907**	**0.706**
Wattenmeer Nordfriesland_012	**0.908**	**0.889**	**1.000**	**0.920**	**0.876**
Arcachon amont_008	**0.748**	**0.834**	**0.766**	**0.482**	**0.693**
Arcachon amont_013	**0.449**	**0.504**	**0.776**	**0.468**	**0.610**
Pertuis Charentais_007	**0.456**	**0.399**	**0.463**	**0.604**	**0.634**
Pertuis Charentais_012	**0.743**	**0.775**	**0.963**	**0.795**	**0.791**
Lac d'Hossegor_008	**0.419**	**0.418**	**0.762**	**0.579**	**0.593**
Lac d'Hossegor_013	**0.745**	**0.660**	**0.620**	**0.797**	**0.797**
Pertuis Breton_007	**0.460**	**0.513**	**0.475**	**0.505**	**0.590**
Pertuis Breton_011	**0.599**	**0.699**	**0.933**	**0.598**	**0.666**
Golfe du Morbihan_007	**0.580**	**0.676**	**0.565**	**0.472**	**0.602**
Baie de Bourgneuf_006	**1.000**	**0.800**	**1.000**	**0.967**	**1.000**
Golfe du Morbihan_012	**0.682**	**0.775**	**0.627**	**0.472**	**0.662**
Baie de Bourgneuf_012	**0.935**	**0.800**	**1.000**	**0.923**	**0.957**
Dublin Bay_012	0.650	0.534	0.507	0.670	0.750
Dublin Bay_009	0.814	0.753	0.614	0.870	0.843
Dublin Bay_011	0.733	0.747	0.750	0.880	0.788
Dublin Bay_010	0.833	0.753	0.930	0.900	0.855
Inner Tralee Bay_012	0.947	0.800	1.000	0.930	0.964
Inner Tralee Bay_011	0.797	0.778	0.689	0.860	0.832
Inner Tralee Bay_010	0.822	0.784	0.699	0.860	0.848
Killala Bay_012	0.688	0.584	0.515	0.860	0.763
Killala Bay_007	0.522	0.597	0.441	0.970	0.615
Killala Bay_010	0.320	0.375	0.342	0.710	0.507
Killala Bay_011	0.864	0.766	0.948	0.970	0.885
Killala Bay_008	0.510	0.559	0.432	0.890	0.607
Malahide Bay_012	0.690	0.745	0.661	0.860	0.746
Malahide Bay_011	0.815	0.746	0.919	0.890	0.843
Malahide Bay_009	0.708	0.743	0.719	0.890	0.772
Malahide Bay_010	0.701	0.601	0.520	0.790	0.767
Malahide Bay_013	0.439	0.464	0.412	0.650	0.577
Tramore Back Strand_009	0.804	0.760	0.841	0.970	0.836
Tramore Back Strand_011	1.000	0.800	1.000	0.970	1.000
Tramore Back Strand_007	0.551	0.614	0.457	0.950	0.634
Tramore Back Strand_008	0.679	0.724	0.568	0.970	0.725
Holy Island & Budle Bay_009	0.823	0.749	0.924	0.849	0.849
Holy Island & Budle Bay_010	0.738	0.773	0.648	0.792	0.784
Holy Island & Budle Bay_011	0.536	0.518	0.464	0.657	0.654
Holy Island & Budle Bay_012	0.538	0.500	0.474	0.659	0.676
Holy Island & Budle Bay_013	0.638	0.518	0.505	0.725	0.746
Milford Haven Outer_007	**0.627**	**0.600**	**0.731**	**0.718**	**0.726**
Milford Haven Outer_008	**0.490**	**0.448**	**0.463**	**0.627**	**0.648**
Milford Haven Outer_009	**0.625**	**0.696**	**0.529**	**0.717**	**0.683**
Milford Haven Outer_010	**0.635**	**0.663**	**0.512**	**0.723**	**0.698**
Milford Haven Outer_011	**0.903**	**0.781**	**0.971**	**0.902**	**0.936**
Milford Haven Outer_012	**0.666**	**0.554**	**0.510**	**0.744**	**0.755**
Milford Haven Outer_013	**0.768**	**0.736**	**0.593**	**0.812**	**0.812**
Solent_008	**0.858**	**0.773**	**0.906**	**0.872**	**0.894**
Solent_009	**0.999**	**0.800**	**1.000**	**0.966**	**1.000**
Solent_010	**0.834**	**0.792**	**0.722**	**0.856**	**0.873**
Solent_011	**0.687**	**0.743**	**0.592**	**0.758**	**0.725**
Solent_012	**0.838**	**0.770**	**0.877**	**0.859**	**0.875**

Solent_013	**0.842**	**0.775**	**0.868**	**0.861**	**0.886**

Annex 2

Pressure values registered for different sampling sites

Waterbody Name	Hydromorphology	Resources Use	Env.Quality	Total Pressure	Hyd+Res
Übergangsgewässer der Weser_008	12	25	12	49	37
Übergangsgewässer der Weser_013	12	25	12	49	37
Übergangsgewässer Ems-Ästuar_008	16	29	14	59	45
Übergangsgewässer Ems-Ästuar_013	16	29	14	59	45
Desembocadura Guadiana (Ayamonte)_009					
Desembocadura Guadiana (Ayamonte)_011					
San Vicente de la Barquera_009	12	17	9	38	29
Ría de Mogro_009	1	6	9	16	7
Santoña_009	10	19	9	38	29
Eems-Dollard_88					
Eems-Dollard_91					
Eems-Dollard_94					
Eems-Dollard_95					
Eems-Dollard_96	12	37	10	59	49
Eems-Dollard_97	12	37	14	63	49
Eems-Dollard_99	12	29	14	55	41
Eems-Dollard_000	12	29	9	50	41
Eems-Dollard_001	12	29	12	53	41
Eems-Dollard_002	12	29	12	53	41
Eems-Dollard_003	12	29	10	51	41
Eems-Dollard_004	12	29	12	53	41
Eems-Dollard_005	12	29	12	53	41
Eems-Dollard_006	12	29	9	50	41
Eems-Dollard_001_6	12	29	9	50	41
Eems-Dollard_007	12	29	12	53	41
Eems-Dollard_008	12	29	12	53	41
Eems-Dollard_009	12	29	12	53	41
Mondego-WB2_90	12	9	5	26	21
Mondego-WB2_92	12	10	8	30	22
Mondego-WB2_93					
Mondego-WB2_98	12	5	3	20	17
Mondego-WB2_99					
Mondego-WB2_000	12	5	3	20	17
Mondego-WB2_001					
Mondego-WB2_002	12	5	3	20	17
Mondego-WB2_004	12	5	8	25	17
Mondego-WB2_005	12	11	8	31	23
Mondego-WB2_006	12	5	8	25	17
Mondego-WB2_008	12	5	10	27	17
Mondego-WB2_009	12	5	8	25	17
Mondego-WB2_010	12	5	8	25	17
Ria Aveiro-WB1_010	12	19	8	39	31
Ria Aveiro-WB2_010	10	35	6	51	45
Arade-WB1_010	10	33	10	53	43
Guadiana-WB1_010	10	12	5	27	22
Ballysadare Estuary_012					
Ballysadare Estuary_009					
Ballysadare Estuary_010					
Colligan Estuary_012					
Colligan Estuary_009					

Colligan Estuary_011					
Colligan Estuary_010					
Colligan Estuary_007					
Colligan Estuary_008					
Cromane_012					
Cromane_011					
Cromane					
Garavoge Estuary_012					
Garavoge Estuary_010					
Garavoge Estuary_008					
Garavoge Estuary_009					
Moy Estuary_012					
Moy Estuary_010					
Moy Estuary_011					
Moy Estuary_009					
Rogerstown Estuary_012					
Rogerstown Estuary					
Rogerstown Estuary_011					
Estuaire Bidassoa_007	16	7	4	27	23
Estuaire Bidassoa_013	16	7	4	27	23
CARRICK ROADS INNER_008	8	1	18	27	9
CARRICK ROADS INNER_009	8	1	18	27	9
CARRICK ROADS INNER_010	8	1	18	27	9
CARRICK ROADS INNER_011	8	1	16	25	9
CARRICK ROADS INNER_012	8	1	14	23	9
CARRICK ROADS INNER_013	8	1	18	27	9
CONWY_009	14	0	12	26	14
CONWY_010	14	0	12	26	14
CONWY_011	14	0	12	26	14
CONWY_012	14	0	12	26	14
CONWY_013	14	0	12	26	14
EXE_012	16	0	18	34	16
EXE_013	16	0	18	34	16
FORYD BAY_008	14	0	12	26	14
FORYD BAY_009	14	0	12	26	14
FORYD BAY_010	14	0	12	26	14
FORYD BAY_011	14	0	12	26	14
FORYD BAY_013	14	0	12	26	14
MILFORD HAVEN INNER_009	6	1	16	23	7
MILFORD HAVEN INNER_010	6	1	16	23	7
MILFORD HAVEN INNER_011	6	1	16	23	7
MILFORD HAVEN INNER_012	6	1	16	23	7
MILFORD HAVEN INNER_013	6	1	16	23	7
Pagham Harbour_009	14	0	12	26	14
Pagham Harbour_010	14	0	12	26	14
Pagham Harbour_011	14	0	12	26	14
Pagham Harbour_012	14	0	12	26	14
Pagham Harbour_013	14	0	14	28	14
Portsmouth Harbour_010	16	5	12	33	21
Portsmouth Harbour_011	16	5	12	33	21
Portsmouth Harbour_012	16	5	12	33	21
Portsmouth Harbour_013	16	5	14	35	21
SEVERN LOWER_011	14	1	18	33	15
SEVERN LOWER_012	14	1	18	33	15
SEVERN LOWER_013	14	1	18	33	15
THAMES LOWER_008	16	3	18	37	19
THAMES LOWER_009	16	3	16	35	19
THAMES LOWER_010	16	3	14	33	19

THAMES LOWER_011	16	3	18	37	19
THAMES LOWER_012	16	3	14	33	19
THAMES LOWER_013	16	3	18	37	19
Euhalines Wattenmeer der Ems_008	12	15	10	37	27
Euhalines Wattenmeer der Ems_013	12	15	10	37	27
Wattenmeer Jadebusen und angrenzende Küstenabschnitte_008	14	23	12	49	37
Wattenmeer Jadebusen und angrenzende Küstenabschnitte_013	14	23	12	49	37
Wattenmeer Nordfriesland_012	10	15	8	33	25
Arcachon amont_008	6	23	1	30	29
Arcachon amont_013	6	27	3	36	33
Pertuis Charentais_007	12	16	3	31	28
Pertuis Charentais_012	12	16	3	31	28
Lac d'Hossegor_008	6	17	3	26	23
Lac d'Hossegor_013	6	17	3	26	23
Pertuis Breton_007	6	19	3	28	25
Pertuis Breton_011	6	19	3	28	25
Golfe du Morbihan_007	10	5	3	18	15
Baie de Bourgneuf_006	6	15	3	24	21
Golfe du Morbihan_012	10	5	3	18	15
Baie de Bourgneuf_012	6	17	3	26	23
Dublin Bay_012					0
Dublin Bay_009	0	0	3	3	0
Dublin Bay_011					0
Dublin Bay_010					0
Inner Tralee Bay_012					0
Inner Tralee Bay_011	0	0	16	16	0
Inner Tralee Bay_010	0	0	16	16	0
Killala Bay_012					0
Killala Bay_007					0
Killala Bay_010					0
Killala Bay_011	0	0	6	6	0
Killala Bay_008					0
Malahide Bay_012					0
Malahide Bay_011					0
Malahide Bay_009	0	0	6	6	0
Malahide Bay_010					0
Malahide Bay_013	0	0	6	6	0
Tramore Back Strand_009	0	0	0	0	0
Tramore Back Strand_011					0
Tramore Back Strand_007					0
Tramore Back Strand_008					0
Holy Island & Budle Bay_009	10	0	3	13	10
Holy Island & Budle Bay_010	10	0	3	13	10
Holy Island & Budle Bay_011	10	0	3	13	10
Holy Island & Budle Bay_012	10	0	3	13	10
Holy Island & Budle Bay_013	10	0	3	13	10
Milford Haven Outer_007	6	3	3	12	9
Milford Haven Outer_008	6	3	3	12	9
Milford Haven Outer_009	6	3	3	12	9
Milford Haven Outer_010	6	3	3	12	9
Milford Haven Outer_011	6	3	3	12	9
Milford Haven Outer_012	6	3	3	12	9
Milford Haven Outer_013	6	3	3	12	9
Solent_008	14	3	3	20	17
Solent_009	14	3	3	20	17
Solent_010	14	3	3	20	17

Solent_011	14	3	3	20	17
Solent_012	14	3	3	20	17
Solent_013	14	3	3	20	17

Annex 3

Biological parameters (metrics) measured at different assessment methods

Waterbody Name	Bed extent (ha) for TOTAL bed	Bed density (%) for TOTAL bed	Bed Extent % Intertidal
Übergangsgewässer der Weser_008	96.910	31.000	0.629
Übergangsgewässer der Weser_013	126.730	17.000	0.822
Übergangsgewässer Ems-Ästuar_008	0.000	0.000	0.000
Übergangsgewässer Ems-Ästuar_013	0.000	0.000	0.000
Desembocadura Guadiana (Ayamonte)_009	0.150	26.700	0.037
Desembocadura Guadiana (Ayamonte)_011	0.009	5.500	0.002
San Vicente de la Barquera_009	0.980	5.000	0.300
Ría de Mogro_009	3.180	65.000	2.811
Santoña_009	181.380	85.000	15.724
Eems-Dollard_88	13.100	30.000	0.127
Eems-Dollard_91	9.700	12.000	0.094
Eems-Dollard_94	26.700	20.831	0.258
Eems-Dollard_95	32.100	33.579	0.310
Eems-Dollard_96	95.000	22.038	0.918
Eems-Dollard_97	63.100	21.271	0.610
Eems-Dollard_99	27.700	18.498	0.268
Eems-Dollard_000	56.000	16.339	0.541
Eems-Dollard_001	79.400	12.159	0.767
Eems-Dollard_002	60.100	13.198	0.581
Eems-Dollard_003	89.100	13.434	0.861
Eems-Dollard_004	14.300	12.000	0.138
Eems-Dollard_005	10.000	17.400	0.097
Eems-Dollard_006	42.530	13.040	0.411
Eems-Dollard_001_6	2.300	12.000	0.022
Eems-Dollard_007	0.000	2.500	0.000
Eems-Dollard_008	0.060	2.500	0.001
Eems-Dollard_009	0.810	12.000	0.008
Mondego-WB2_90	7.951	0.000	5.927
Mondego-WB2_92	5.798	0.000	4.322
Mondego-WB2_93	1.203	0.000	0.897
Mondego-WB2_98	0.020	0.000	0.015
Mondego-WB2_99	0.279	0.000	0.208
Mondego-WB2_000	0.885	0.000	0.660
Mondego-WB2_001	1.050	0.000	0.783
Mondego-WB2_002	1.600	0.000	1.193
Mondego-WB2_004	3.300	0.000	2.460
Mondego-WB2_005	4.154	0.000	3.097
Mondego-WB2_006	4.757	62.900	3.546
Mondego-WB2_008	3.142	66.200	2.342
Mondego-WB2_009	14.850	56.300	11.071
Mondego-WB2_010	15.140	69.200	11.287
Ria Aveiro-WB1_010	22.330	75.500	5.944
Ria Aveiro-WB2_010	10.373	85.000	0.134
Arade-WB1_010	0.240	40.000	0.050
Guadiana-WB1_010	5.400	26.722	0.854
Ballysadare Estuary_012	41.720	50.408	5.563
Ballysadare Estuary_009	27.870	56.613	3.711
Ballysadare Estuary_010	31.100	33.889	4.136
Colligan Estuary_012	1.000	33.750	0.134
Colligan Estuary_009	0.970	68.462	0.129
Colligan Estuary_011	1.214	94.000	0.162

Colligan Estuary_010	1.200	55.000	0.160
Colligan Estuary_007	1.081	77.581	0.144
Colligan Estuary_008	1.110	69.189	0.147
Cromane_012	179.150	89.981	5.882
Cromane_011	177.158	81.263	5.816
Cromane	182.520	73.200	5.992
Garavoge Estuary_012	6.410	51.806	0.892
Garavoge Estuary_010	5.100	34.474	0.709
Garavoge Estuary_008	5.130	66.491	0.712
Garavoge Estuary_009	5.800	58.676	0.804
Moy Estuary_012	23.930	26.067	4.602
Moy Estuary_010	22.560	55.735	4.338
Moy Estuary_011	23.050	51.786	4.433
Moy Estuary_009	22.260	47.933	4.281
Rogerstown Estuary_012	0.001	0.833	
Rogerstown Estuary	0.000	1.900	
Rogerstown Estuary_011	0.838	50.000	
Estuaire Bidassoa_007	1.270	24.000	0.789
Estuaire Bidassoa_013	1.370	22.000	0.851
CARRICK ROADS INNER_008	2.140	21.333	0.401
CARRICK ROADS INNER_009	2.420	30.144	0.454
CARRICK ROADS INNER_010	3.120	22.800	0.585
CARRICK ROADS INNER_011	2.860	46.128	0.536
CARRICK ROADS INNER_012	3.530	38.225	0.662
CARRICK ROADS INNER_013	2.410	34.300	0.452
CONWY_009	0.002	75.000	0.000
CONWY_010	0.002	62.500	0.000
CONWY_011	0.002	90.000	0.000
CONWY_012	0.007	48.667	0.001
CONWY_013	0.002	70.000	0.000
EXE_012	121.740	68.481	10.616
EXE_013	120.860	49.355	10.539
FORYD BAY_008	19.183	41.203	8.423
FORYD BAY_009	16.440	35.553	7.218
FORYD BAY_010	21.790	27.742	9.568
FORYD BAY_011	22.210	25.105	9.752
FORYD BAY_013	23.310	45.966	10.235
MILFORD HAVEN INNER_009	97.760	66.500	9.110
MILFORD HAVEN INNER_010	99.160	87.000	9.241
MILFORD HAVEN INNER_011	102.060	47.449	9.511
MILFORD HAVEN INNER_012	112.539	60.701	10.488
MILFORD HAVEN INNER_013	117.243	42.428	10.926
Pagham Harbour_009	5.010	49.128	2.098
Pagham Harbour_010	7.620	50.178	3.190
Pagham Harbour_011	8.620	57.891	3.609
Pagham Harbour_012	7.730	77.208	3.236
Pagham Harbour_013	6.520	67.740	2.730
Portsmouth Harbour_010	11.590	37.251	1.190
Portsmouth Harbour_011	13.040	56.664	1.339
Portsmouth Harbour_012	11.330	74.580	1.164
Portsmouth Harbour_013	74.040	63.688	7.605
SEVERN LOWER_011	229.130	17.489	2.135
SEVERN LOWER_012	139.950	15.260	1.304
SEVERN LOWER_013	114.020	8.351	1.063
THAMES LOWER_008	173.840	69.365	2.488
THAMES LOWER_009	165.130	66.339	2.363
THAMES LOWER_010	183.000	62.399	2.619
THAMES LOWER_011	174.720	60.367	2.501

THAMES LOWER_012	182.239	81.936	2.608
THAMES LOWER_013	172.560	58.885	2.470
Euhalines Wattenmeer der Ems_008	43.000	5.400	0.190
Euhalines Wattenmeer der Ems_013	238.000	7.100	1.052
Wattenmeer Jadebusen und angrenzende Küstenabschnitte_008	1164.000	30.300	4.054
Wattenmeer Jadebusen und angrenzende Küstenabschnitte_013	1583.000	8.300	5.514
Wattenmeer Nordfriesland_012	13552.000	48.800	15.058
Arcachon amont_008	4673.000	0.000	44.904
Arcachon amont_013	4363.000	0.000	41.925
Pertuis Charentais_007	1337.000	19.900	12.856
Pertuis Charentais_012	1337.000	79.000	12.856
Lac d'Hossegor_008	0.930	80.000	2.689
Lac d'Hossegor_013	4.480	59.000	12.952
Pertuis Breton_007	412.000	39.600	6.331
Pertuis Breton_011	412.000	67.500	6.331
Golfe du Morbihan_007	1801.000	0.000	49.478
Baie de Bourgneuf_006	586.000	100.000	5.795
Golfe du Morbihan_012	1801.000	0.000	49.478
Baie de Bourgneuf_012	586.000	93.500	5.795
Dublin Bay_012	1.830	36.400	0.188
Dublin Bay_009	1.830	66.250	0.188
Dublin Bay_011	1.347	83.125	0.138
Dublin Bay_010	1.400	90.900	0.144
Inner Tralee Bay_012	228.770	83.300	29.776
Inner Tralee Bay_011	219.080	68.600	28.515
Inner Tralee Bay_010	224.500	68.800	29.220
Killala Bay_012	0.640	25.000	0.056
Killala Bay_007	0.400	32.600	0.035
Killala Bay_010	0.290	20.300	0.025
Killala Bay_011	0.530	52.600	0.046
Killala Bay_008	0.440	28.000	0.038
Malahide Bay_012	3.470	60.300	2.074
Malahide Bay_011	3.500	70.300	2.092
Malahide Bay_009	3.440	63.200	2.057
Malahide Bay_010	4.800	35.300	2.870
Malahide Bay_013	3.300	27.400	1.973
Tramore Back Strand_009	6.620	71.000	1.486
Tramore Back Strand_011	8.290	74.400	1.861
Tramore Back Strand_007	5.700	45.700	1.280
Tramore Back Strand_008	6.770	55.100	1.520
Holy Island & Budle Bay_009	496.730	49.900	21.750
Holy Island & Budle Bay_010	576.200	40.491	25.026
Holy Island & Budle Bay_011	566.260	21.057	24.594
Holy Island & Budle Bay_012	595.100	19.092	25.847
Holy Island & Budle Bay_013	666.190	18.781	28.935
Milford Haven Outer_007	16.220	64.300	3.730
Milford Haven Outer_008	31.300	21.000	7.198
Milford Haven Outer_009	26.070	49.100	5.995
Milford Haven Outer_010	29.670	43.700	6.823
Milford Haven Outer_011	32.530	67.583	7.481
Milford Haven Outer_012	36.014	29.167	8.282
Milford Haven Outer_013	34.565	48.417	7.949
Solent_008	56.750	72.160	3.627
Solent_009	65.510	73.953	4.177
Solent_010	62.850	62.853	4.008
Solent_011	52.390	57.352	3.341

Solent_012	55.611	71.314	3.546
Solent_013	57.180	70.733	3.646

List of abbreviations and definitions

Key Terms

Assessment method: The biological assessment for a specific biological quality element, applied as a classification tool, the results of which can be expressed as EQR.

Biological Quality Element (BQE): Particular characteristic group of animals or plants present in an aquatic ecosystem that is specifically listed in Annex V of the Water Framework Directive for the definition of the ecological status of a water body (for example phytoplankton or benthic invertebrate fauna)

Class boundary: The Ecological Quality Ratio value representing the threshold between two quality classes

Common Intercalibration type: A type of surface water differentiated by geographical, geological, morphological factors (according to WFD Annex II) shared by at least two Member States in a GIG

Common metric: A biological metric widely applicable within a GIG or across GIGs, which can be used to derive a comparable understanding of reference conditions/alternative benchmark and boundary setting procedure among different countries/water body types
Compliance criteria: List of criteria evaluating whether assessment methods are meeting the requirements of the Water Framework Directive.

Continuous benchmarking: Option to perform the benchmark standardisation: Biological differences between national datasets were determined based on the country offsets (i.e. intercept and/or slope deviates) from the global pressure-biology relationship established using general linear models across the combined extent of the pressure gradient afforded by all countries

Ecological Quality Ratio (EQR): Calculated from the ratio observed value/reference value for a given body of surface water. The ratio shall be represented as a numerical value between zero and one, with high ecological status represented by values close to one and bad ecological status by values close to zero

Geographic Intercalibration Group (GIG): Organizational unit for the intercalibration consisting of a group of Member States sharing a set of common intercalibration types

Intercalibration: An exercise facilitated by the Commission to ensure that the high/good and good/moderate class boundaries are consistent with Annex V Section 1.2 of the Water Framework Directive and comparable between Member States

IC Option: Option to intercalibrate (IC) different national assessment methods

Joint Research Centre (JRC): European Commission Joint Research Centre which provides scientific and technical support for EU policy-making

Method Acceptance Criteria: List of criteria evaluating whether assessment methods can be included in the intercalibration exercise

Pressure: Human activities such as organic pollution, nutrient loading or hydromorphological modification that have the potential to have adverse effects on the water environment.

Reference/Benchmark sites: Reference sites meet international screening criteria for undisturbed conditions. Benchmark sites meet a similar (low) level of impairment associated with the least disturbed or best commonly available conditions

Water Framework Directive: Directive 2000/60/EC establishing a framework for Community action in the field of water policy

Abbreviations:

CW: Coastal waters

DE: Germany

ES: Spain

FR: France

G/M: Good-Moderate Boundary

H/G: High-Good Boundary

IC: Intercalibration

IC2: Intercalibration exercise, phase 2

IC3: Intercalibration exercise, phase 3

ICM: Intercalibration Common Metric

IE: Ireland

NEA GIG: North East Atlantic Geographic Intercalibration Group

NL: Netherlands

PT: Portugal

RefCond: Reference Conditions

TW: Transitional waters

UK: United Kingdom

WFD: Water Framework Directive

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