Explanatory Note

Interim Classification of Irish Coastal and Transitional Waters for the purposes of the EU Water Framework Directive.

November 2008

Introduction

The EU Water Framework Directive (2000/60/EC) establishes a framework for the protection, improvement and management of surface and ground waters.

The overall aim for surface waters, which include transitional (estuaries and lagoons) and coastal waters, is to achieve at least 'good ecological status' and 'good chemical status', by 2015, as well as preventing deterioration in those waters that have been classified as 'high' or 'good'.

These environmental objectives and the measures required to achieve them are to be identified and presented in individual River Basin Management Plans.

An essential step in this process will be the classification of the status of transitional and coastal waters, which in turn will assist in identifying the objectives that must be set in the individual RBMPs.

The approach to interim classification of transitional and coastal waters as of November 2008 is presented here. The interim classification is provided in an accompanying excel spreadsheet.

Material and Methods

The interim classification is primarily based on information and data collected by the EPA, Marine Institute and Central Fisheries Board between 2005-2008.

In some areas, where data from this period is not available, information from 2003 and 2004 has been used.

In addition, assessments of the conservation status of protected areas carried out by NPWS, were also taken into account.

The sections below describe how information from a range of different sources and components was assessed and combined to provide an initial draft of the surface water status of transitional and coastal waters.

Ecological Status

The ecological status of a water body is determined by the lower status of the biological and physico-chemical quality elements. In addition, the concentration of specific relevant pollutants is also taken into account when

assessing ecological status (i.e., the EQS for the relevant pollutant must not be exceeded).

Biological and physico-chemical quality elements were combined on the 'one out, all out' principle.

Water bodies were classified as 'high', 'good' or 'moderate' status. In most cases there was insufficient confidence to classify below 'moderate'. In water bodies where data confidence was very low status was set as 'unassigned'.

General Physico-Chemical Elements

A number of environmental quality standards (EQSs) based on thermal and oxygenation conditions, and nutrient concentrations, shown to be supportive of the biological elements have been used in this interim classification.

Specifically these include:

- dissolved inorganic nitrogen (DIN) in coastal waters;
- molybdate reactive phosphorus (MRP) in transitional waters;
- dissolved oxygen, as per cent saturation, in both transitional and coastal waters;
- biochemical oxygen demand (BOD) in transitional waters;
- and rise in ambient temperature upstream or downstream of a designated mixing zone adjacent to a discharge point.

The numerical values associated with each of these EQSs are presented in the Draft European Communities Environmental Objectives (Surface Waters) Regulations 2008.

Due to intrinsic differences in how biological elements in different water categories respond to changes in the physical chemical environment (i.e., nutrient limitation) the proposed nutrient EQSs are water category specific. However, given the connectivity between these water categories and to better inform the river basin management planning process, nutrient exceedances have been assessed even where the EQS does not apply to that water category. However, this information has not been included in the formal classification process.

Furthermore, in an attempt to provide greater resolution in the interim classification process, expert judgement has been used to provide a provisional high-good boundary for each of the EQSs listed above. It should be noted that these boundary values have not been formally reviewed or agreed.. However, given that the high/good boundary value falls between the reference value and good/moderate value, it is unlikely that the values for the high/good boundary will alter significantly. For example, the provisional high/good boundary value for dissolved oxygen undersaturation has been set at 85 per cent saturation which falls between the reference value for this EQS (i.e., 100 per cent saturation) and the good/moderate boundary set at 80 per cent saturation.

Biological Quality Elements
The biological elements used in the interim classification are those elements that have either wholly or partially been intercalibrated as part of the EU-wide intercalibration process.

Specifically these include:

- phytoplankton biomass (chlorophyll) in coastal and transitional waters;
- phytoplankton composition (bloom metric) in coastal waters;
- rocky shore macroalgae species multimetric in coastal waters;
- opportunistic macroalgal growths in coastal and transitional waters.

The numerical values and/or ecological quality ratios (EQRs) associated with each of these biological elements, are presented in the Draft European Communities Environmental Objectives (Surface Waters) Regulations 2008.

The approach used in assessing phytoplankton biomass (chlorophyll) in coastal waters, which has been intercalibrated, was also applied to transitional waters using the numerical criteria used in the EPA's existing Trophic Status Assessment Scheme (TSAS) (Toner et al., 2005). Information on phytoplankton bloom composition was obtained from the Marine Institute.

Ecological Quality Ratios for intertidal seagrass beds have been developed and partially intercalibrated. Some data for this BQE is included in this assessment but, as several years' data are required for a full assessment, this element was included for information only.

Information was also sought on the composition of fish communities in transitional waters but in the absence of a fully intercalibrated metric(s) was not formally included in the classification results at this time.

In the absence of a dedicated monitoring programme for benthic invertebrates in transitional and coastal waters no information on this BQE was available for the initial draft classification exercise.

The presence of alien species was noted, but presence on its own did not result in a water body being placed at 'less than high status', unless the presence of that alien species impacted negatively on any of the biological elements present. The presence of an alien species in a water body was considered to mean that the water body could not be at reference condition.

Specific Relevant Pollutant Elements
Environmental quality standards have been developed at national level for 16 specific relevant pollutants listed in the Draft European Communities Environmental Objectives (Surface Waters) Regulations 2008.

In the absence of a dedicated monitoring programme for Specific Relevant Pollutants, data has been taken from the National Screening Exercise and the Marine Institute's shellfish waters monitoring programme and other related programmes.

It should be noted, however, that the level of confidence that can be assigned to this data is low to moderate given that:

- The data analysed was collected for the shellfish waters directive and therefore does not adhere to the sampling requirements of the WFD (Sampling points representative of 'status' within a water body, surveillance monitoring, and frequency (i.e., considerably less than 12 times per year).

- Issues with respect to exceedence of lead (mostly EC MAC-EQS), copper and zinc (mostly SI 12 2001 AA-EQS) standards, which may in part reflect the natural variability of metals in seawater and to some extent uncertainties associated with their sampling measurement as seawater is a difficult matrix for metal analysis.

- Further investigation is required to determine whether such exceedence reflects natural variability, artefacts, or anthropogenic inputs within the catchment.

- Data on contaminants in shellfish flesh are also available for many of these areas and these provide a good picture of water quality with respect to some metals and organochlorine contaminants, as shellfish act as time integrated samplers for these substances.

- For some substances there were issues with Limit of Quantification being higher than the EQS.

Hydromorphological Quality Elements

The morphological status of Irish TraC waters was assessed using the TraC MImAS tool and expert judgement. The hydrological status is still awaited but is likely to be based on freshwater flow standards utilising the Qn95 metric (transitional waters only).

Given the relative newness of the TraC MImAS tool all morphologal status results presented in the interim classification are reported at low confidence.

Ecological status assessment

The assessment of ecological status is calculated on a 'one-out all-out' basis for the available EQSs and EQRs in each water body. Where chemical data on specific relevant pollutants is available, this is also assessed, to produce an overall ecological classification for that water body.

Finally, water bodies found to be of 'high ecological status, are only confirmed as such when the hydromorphological conditions within that water body are also considered to be high.

Chemical Status
The chemical status of estuarine and coastal waters, which is to be assessed against compliance or otherwise with the environmental quality standards established for priority and priority hazardous substances, is incomplete due to the lack of monitoring data.

It has been possible, though, to provide some initial indication of the chemical status of some water bodies using existing data sources such as the National Screening Exercise and the Marine Institute's shellfish waters monitoring programme and other related programmes.

However as stated above the level of confidence that can be assigned to this data is low to moderate.

Protective Area Status
In relation to 'protected areas', which include those areas designated by the Bathing Water, Urban Waste Water Treatment, Shellfish Waters and Habitats and Birds Directives, are required to achieve compliance with the standards and objectives specified in the preceding directives. The approach taken in assessing the level of compliance for the purpose of interim classification is described below.

Bathing Water Directive
Water bodies containing bathing waters that were non-compliant with both EU mandatory and guide values were considered to be at 'less than good status'.

The assessment was based on bathing water quality results reported by the EPA between 2005 and 2007.

Sensitive Areas designated under the Urban Waster Water Treatment Directive
A total of 15 sensitive areas in estuarine and coastal waters have been designated by the Urban Waste Water Treatment (Amendment) Regulations 2001 with a further two areas being designated by Urban Waste Water Treatment (Amendment) SI 440 of 2004. Water bodies that include sensitive areas and have failed to meet the objectives and standards of the UWWTD regulations of 2001 and 2004, were considered to be at 'less than good status'.

Shellfish Waters
A total of 14 areas around the Irish coast have been designated as shellfish waters by the Quality of Shellfish Waters Regulations (SI 268 of 2006).

Water bodies containing designated shellfish waters that are non-compliant with the mandatory values listed in SI 268 of 2006, were considered to be at 'less than good status'.

Areas designated for the protection of Habitats and Species

Water bodies containing areas designated for the protection of habitats and species (under the Habitats Directive and the Birds Directive) were considered to be at less than good status, if the status of water within a water body was insufficient to allow the achievement of the conservation objectives.

The conservation status of these protected areas was provided through consultation with NPWS. In some cases, if the 'ecological' and 'chemical' status could not be assessed due to lack of data, a water body was given an 'unassigned' status, even where the conservation status was considered to be favourable.

Extrapolation of interim classification to non-monitored water bodies

The national WFD monitoring programme for coastal and transitional waters represents approximately 40 per cent (117) of the total number of water bodies (309) identified for WFD characterisation exercise. In reality the number of water bodies currently being monitored is less than this due to the fact that the first monitoring cycle (2007-2009) is still incomplete and to benthic data has yet been collected.

Consequently, it has been necessary to extrapolate the interim classification status results obtained from water bodies that are monitored to those that are not. When developing the monitoring network, waterbodies were selected in each RBD that would allow the data be extrapolated to the non-monitored areas.

Extrapolation was carried out using a statistical cluster analysis (PRIMER) that grouped monitored and non-monitored water bodies with similar characteristics.

The factors used in the cluster analysis included: waterbody size; catchment size (transitional waters only); risk assessment; typology (coastal waters only); and the 'likely status' of the inflowing river (transitional waters only).

Each RBD was analysed separately. A similarity matrix based on the Euclidean distance between each sample point (i.e., a water body) was constructed. A cluster analysis of the similarity matrix was undertaken using a hierarchical agglomerative clustering technique. A similarity profile (SIMPROF) test was then run to assess the structure of the data and identify significant groupings of water bodies within each RBD. The resultant clusters were examined by eye to identify any obvious misclassifications. The classification status of the monitored waterbodies in each cluster was then applied to the other non-monitored ones in each group.

Transitional and coastal lagoons were analysed separately as very little monitoring information was available. In most cases all lagoons have been placed at Moderate status unless data is available to suggest otherwise. Most of the available data comes from a recent NPWS survey of lagoons for the Habitats Directive.

Results of Interim Classification

The results of the interim classification exercise are summarised below. It should be noted that many of these draft classification results have low data confidence and no confidence-of-class associated with them. The data are presented by numbers of waterbodies and also by surface area.

Results of the monitoring programme classified 70 of the water bodies as moderate, representing 30% of water bodies by surface area. While only 23% of water bodies were of 'high' status they make up 63% of the total surface area (Fig. 1). Following the extrapolation procedure the number of moderate water bodies increased to 103, representing 33% of all water bodies. The 'unassigned' status category comprised the majority of water bodies and included many of the large coastal water bodies (mainly coastal water type 2) as some coastal lagoons.

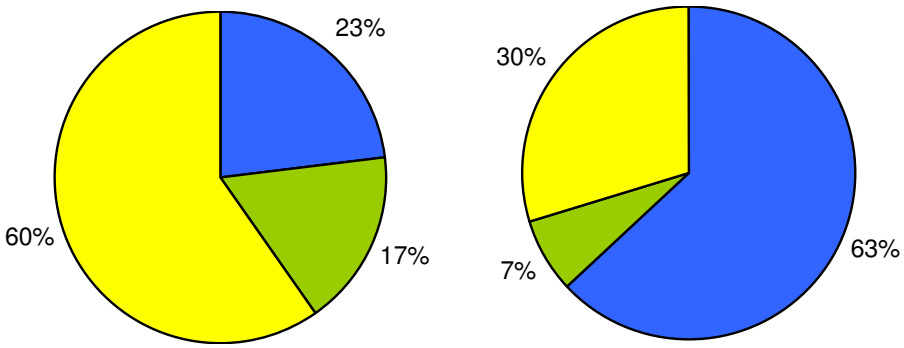
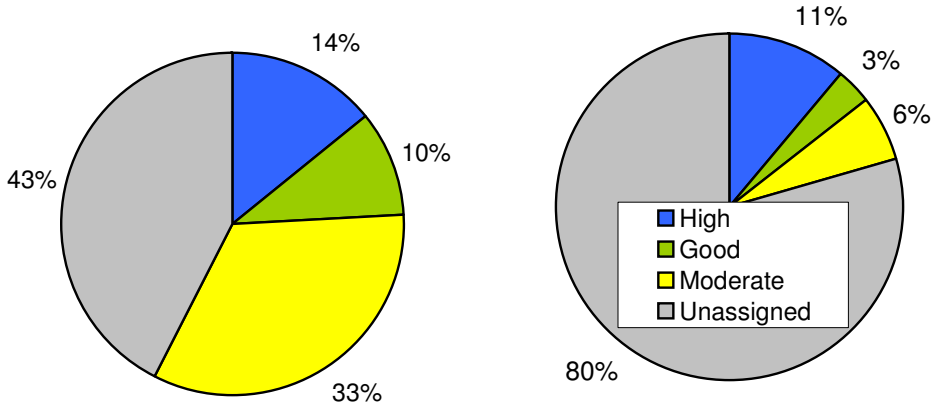


Figure 1: Proportion, by number (left) and surface area (right), of monitored TraC water bodies in each status class.



Proportion, by number (left) and surface area (right), of all TraC water bodies in each status class using extrapolated results. Where data confidence is very low water bodies were given 'unassigned' status.

Status of monitored water bodies

Status	Number of WBs	% by number	% by surface area (km^2)
High	27	23	63
Good	20	17	7
Moderate	70	60	30

Status of all water bodies extrapolated from monitoring data, where there is low data confidence water bodies status is 'unassigned'

Status	Number of WBs	% by number	% by surface area (km^2)
High	44	14	11
Good	31	10	3
Moderate	103	33	6
Unassigned	131	42	80

References

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