

# **Fisheries in European Marine Sites: review of ‘the matrix’ and associated documentation submitted to the Stakeholder Implementation Group (IG)**

7 November 2012



## **Fisheries in European Marine Sites: review of ‘the matrix’ and associated documentation submitted to the Stakeholder Implementation Group (IG)**

### **Preface**

This document is a review, by the Centre for the Environment, Fisheries and Aquaculture Science, of a draft matrix and supporting evidence that were provided by Natural England. The matrix is intended to help regulators to assess whether management measures should be introduced to protect features and sub-features in European Marine Sites from the impacts of a range of defined fishing gears.

### **Terms of Reference**

The Terms of Reference (ToR) for the review, as provided by Defra on 2 Nov 2012, were:

‘To provide independent assessment of the populated matrix with red, amber, green and blue categories, to look at sources and the audit trail used.

Based on the criteria for the matrix design, do you consider that:

1. The rating of the respective fishing activities and their effect on the associated habitats is reasonable?
2. Do you consider the supporting evidence, including expert opinion where used, for the rating sufficient to justify that rating?
3. Are there further sources of evidence that have not been included in the assessment that would have affected the rating given to a particular fishing activity on a particular feature?’

### **Timing and contents of this review**

Defra requested that a review focusing on ‘red’ categories should be submitted on 7 Nov 2012. Defra also requested that a review of all other categories should follow before 28 Nov 2012. This document presents the review focusing on ‘red’ categories in the matrix and the evidence supporting them.

The matrix, supporting evidence documents and source references for the ‘sub-feature’ and ‘fishing gear’ combinations that were classified as ‘red’ were provided by Natural England on 2, 5 and 6 Nov 2012.

The version of the matrix reviewed in this report is ‘IG4-1 v3 Matrix - Fisheries in EMS ex’. Annex II and IV species and SPA features are outside the scope of this review.

### **Author**

Simon Jennings

### **Reviewers**

Roger Coggan and Ed McManus

Submitted 7 November 2012

## **Fisheries in European Marine Sites: review of ‘the matrix’ and associated documentation submitted to the Stakeholder Implementation Group (IG)**

### **General comments**

1. To address ToR ‘1’ to ‘3’ it is necessary to review the process used to develop the populated matrix and to distinguish categories. The process relies on scientific evidence, impartial expert judgement and value judgement and it is this combination of approaches that determines which ratings (colour codes) are assigned to ‘gear’ and ‘sub-feature’ combinations. For this reason, paragraphs 2 to 5 assess the role of scientific evidence, impartial expert judgement and value judgement in the process.

### *Scientific evidence*

2. Scientific evidence can describe the changes in habitats that occur in response to fishing pressure (fishing impacts). Fishing gear contacts with a habitat will almost always result in impacts. However, to address the ToR, it is necessary to assess whether fishing leads to an impact, or risk of an impact, that results in the conservation objective not being met.
3. Relatively few scientific studies report on the sustainability of fishing impacts in relation to a specified objective, spatial-scale or time-scale. Thus the scientific evidence used to define the colour coded categories mostly comes from studies that simply report that fishing pressure changes habitat. Therefore, relationships between changes in the state of habitat and any objective for state usually have to be inferred.

### *Impartial expert judgement*

4. Scientific evidence describing the impacts of all gear types on all features and sub-features is not available. For this reason, expert judgement, including the interpretation of existing scientific reviews, has been used to assess the likely consequences of impact. Expert judgement is based on soliciting informed opinions from individuals with relevant expertise. Bias can affect expert judgement owing to differences in the education, experience and balance of experts, social and group influences on decision making, the way that a question is framed and the effects of experts’ existing and developing opinions on their acquisition and processing of information. While the reports do not state whether these biases have been considered or addressed directly, any bias would be expected to have a much smaller influence on the outcome of the colour coding process than value judgements about the interpretation of precaution and the interpretation of the conservation objective.

### *Value judgement*

5. Unambiguous colour coding of 'gear' and 'sub-feature' combinations requires:
  - (a) definition of the conservation objective;
  - (b) assessment of the impacts of a given fishing gear on a given sub-feature in relation to that objective;
  - (c) an approach to handle differences in sensitivity, and thus differences in the impact of a given fishing gear, within sub-features.

The choices made for (a) and (c) are value judgements rather than judgements based on scientific evidence. These value judgements will have a substantial effect on the colour codes assigned to 'gear' and 'sub-feature' combinations. For this reason, and to support the analysis of the colour codes, the effects of value judgements that result from the interpretation of conservation objectives and precaution are reviewed in paragraphs 6 to 20.

### **Conservation objectives**

6. An unambiguous definition of the conservation objective is needed. This will allow an assessment of whether the impact of a given gear on a given sub-feature results in changes to the state of the sub-feature that mean that the objective will/ will not be met. In the absence of explicit guidance, we assume that all the relevant conservation objectives for European Marine Sites will be to maintain or recover habitat to 'favourable' status. This means, based on the Habitats Directive, that:
  - (i) extent is stable or increasing;
  - (ii) the specific structure and functions necessary for its long-term maintenance exist and are likely to exist for the foreseeable future;
  - (iii) populations of typical species associated with the habitat are viable in the long term.

In practice, there are, and are likely to be, differences in the interpretation and specification of the conservation objective among SAC, unless a common, more precise and unambiguous definition is ultimately agreed.

7. When a sub-feature is exposed to increasing fishing pressure, so the sub-feature (or more typically the biological communities associated with the sub-feature, please see paragraph 16) changes from a state that is unimpacted by fishing to a state that is irreversibly changed. The state that is unimpacted by fishing is not necessarily a constant state, but a state that is affected by environmental rather than fishing impacts (e.g. consider the effects of storms on the extent of some *Sabellaria* reefs and kelp beds). At a point on the continuum of exposure to fishing pressure, the impact on state becomes unsustainable, and then irreversible, and the conservation objective would not be met.

8. If 'favourable' conservation status is not defined more precisely than at present, then 'favourable' state could be taken to lie anywhere between the unimpacted state and a sustainably impacted state that results in:
  - (i) extent being stable or increasing;
  - (ii) the specific structures and functions necessary for long-term maintenance existing and being likely to exist for the foreseeable future;
  - (iii) populations of typical species associated with the habitat being viable in the long term.

If a sustainably impacted state is assumed to meet the conservation objective then this objective will still be achieved in the presence of an increasing amount of exposure to fishing pressure (with a given gear) as the sensitivity of sub-features decreases. The philosophy behind the matrix presented appears to be consistent with the assumption that a sustainably impacted state can meet the conservation objective; but with some exceptions when dealing with the more sensitive habitats. A more precise and consistently applied operational definition of the conservation objective would help to clarify where this demarcation lies.

### **Assessment of fishing impacts in relation to the conservation objective**

9. The outcome of the colour coding process does not account for the amount of fishing pressure with any given gear that might affect a sub-feature. Consequently, the use of 'vulnerability' in the definition of colour categories might be referred to as 'sensitivity'. This distinction helps to clarify the rationale for the matrix entries because it is the vulnerability of features and sub-features, rather than their sensitivity, which will usually determine whether or not a conservation objective (or any other specified benchmark for the state of a habitat) is met or not met. The exception would be if/when the conservation objective was defined as the 'unimpacted state'.
10. Sensitivity can be defined as the recovery time of a sub-feature following a fishing impact of defined magnitude and duration (e.g. one pass of a beam trawl). More sensitive sub-features have longer recovery times. Recovery time is the time that the community takes to return to a defined state or function that is comparable with the state or function (in some cases after allowing for natural variation) prior to any fishing impact (e.g. 90% of unimpacted extent or biomass).
11. Vulnerability can be defined as the product of sensitivity and exposure. Exposure is a measure of the amount of pressure (in this case fishing pressure) affecting a sub-feature.
12. It is only when information on the exposure of a sub-feature to fishing pressure with a given gear type is known and reported that vulnerability can be assessed.
13. The exception to the statement in paragraph 12 occurs when sensitivity is so high that any exposure to fishing pressure with a defined gear type would result in high vulnerability. In this case, any exposure to fishing pressure is expected to mean that the conservation objective for the sub-feature would not be met, so high sensitivity would lead to the same categorisation as high vulnerability. This exception means that the most sensitive habitats can be classified as 'red' without information on exposure to fishing pressure.

14. For less sensitive sub-features, exposure to fishing pressure will lead to impacts, but these impacts will still allow the broadly defined conservation objective to be met until they pass a threshold (the intensity of exposure associated with this threshold will depend on the sub-feature and the definition of the conservation objective). In cases where the sub-feature can withstand some fishing pressure, the exposure to fishing pressure ideally needs to be known so that vulnerability can be assessed.
15. Some of the issues addressed in paragraphs 9 to 14 are recognised in the document 'IG3-2 Protocol to inform completion of "The Matrix"' (version: 'IG3-2 v2.1 draft Matrix Protocol-Fisheries in EMS') that accompanies the matrix and states that:

'the completion of The Matrix is an exercise at the generic level, irrespective of pressure or natural variation in feature sensitivity, and as such can only act as a guideline to inform site level identification of risks and the prioritisation of assessment and management activity'

Therefore, the unambiguous rating of 'gear' and 'sub-feature' combinations as 'red' as opposed to 'orange' would only be consistently achieved if the conservation objective was interpreted as the unimpacted state for sub-features above a defined sensitivity threshold.

#### **Differences in sensitivity within sub-features and application of precaution**

16. In many cases, considerable differences in sensitivity within sub-features are expected. This is because the classification of features and sub-features may be based on entirely physical substrates (sea-bed types) and yet it is the biological communities associated with these substrates, rather than the substrates themselves, that are often impacted by fishing. Sub-features with the same name (including some of those that are linked with gear types that currently result in a 'red' categorisation) can therefore be associated with biological communities that differ markedly in their sensitivity to fishing pressure. In cases when the sub-features describe aspects of the physical habitat structure and the biological community (e.g. maerl) then variability in sensitivity within the sub-feature is expected to be relatively low.
17. Given variability in sensitivity within sub-features, the interpretation of precaution (as described in paragraph 10 of 'IG3-2 Protocol to inform completion of "The Matrix"') will affect the assignment of gear and sub-feature combinations to colour categories.
18. The interpretation of precaution that was applied in IG3-2 will, for most sub-features, mean that if any biological community associated with a sub-feature is sensitive to a given fishing gear then the whole sub-feature is categorised on the basis of that sensitivity. If management measures are taken in response to this interpretation of precaution, there is no risk that the conservation objective will not be met (as a result of fishing impacts). However, in such cases, this interpretation of precaution will also result in no fishing on less sensitive parts of sub-features, even though these might still be fished while meeting the conservation objective. In some cases the effects of variation in sensitivity within sub-features are not treated consistently in the approach that is used to apply colour codes. For example, for 'Estuarine rock' (document: IS4-2b v1 ESTUARINE ROCK audit) and Intertidal bedrock boulder and cobble reef (document: IG4-1b v1 INTERTIDAL BEDROCK BOULDER AND COBBLE REEF) are coded 'amber' with a recognition that site by site assessment may be required to identify 'red' sites.

19. The interpretation of precaution that was applied will also affect the interpretation of scientific evidence for fishing impacts. Thus, when there is inconsistent evidence for impacts of a given gear on a given sub-feature (e.g. as on *Sabellaria*) the application of precaution as described in paragraph 10 of 'IG3-2 Protocol to inform completion of "The Matrix"' will mean that any evidence for an impact that may lead to a conservation objective not being met will determine the rating of the 'gear' and 'sub-feature' combination. Consequently, any evidence showing an impact that allows for a conservation objective to be met will be down-weighted.
20. Risk aversion and interpretation of appropriate precaution is a socio-political/ management decision and not a scientific one. However, the interpretation of precaution used means that the presence of any biological community with high sensitivity will lead to a 'red' classification for that sub-feature even if the sensitivity of a large proportion of the biological communities associated with the sub-feature is relatively low. The review of the document has been conducted on the basis that this interpretation of precaution is accepted by the IG. Therefore, paragraphs 16-20 are intended to explain some of the consequences of adopting this interpretation.
21. The colour-coding and the responses to the ToR for this review would differ if a 'more' or 'less' precautionary approach was adopted.

#### **Assigning sub-feature and gear combinations to the 'red' category**

22. The definition of 'red' provided with the matrix is: 'Where it is clear that the conservation objectives for a feature (or sub-feature) will not be achieved because of its vulnerability to a type of fishing - **irrespective of feature condition, level of pressure, or background environmental conditions in all EMSs where that feature occurs** [NE bold emphasis] - suitable management measures will be identified and introduced as a priority to protect those features from that fishing activity or activities'
23. In practice, some decisions to assign a sensitivity-gear combination to a 'red' category will not be influenced by the assumed definition of the conservation objective, the absence of information on exposure and assumed precaution. This is because any fishing (very low levels of exposure to fishing) would mean that the sub-feature did not meet any expected interpretation of the conservation objective (paragraphs 6-8): because the sensitivity of the sub-feature to fishing is so high.
24. Seagrass, maerl and to a lesser extent sub-tidal mussel on rock and *Sabellaria* spp. reef can be assigned to 'red' for the gear types that are identified (primarily towed demersal) without making assumptions about exposure, precaution or the conservation objective. For other sub-features there is a continuum of sensitivity and the boundary between 'red' and 'orange' is not clearly defined. This is the consequence of trying to conduct a risk assessment process without accounting for exposure to fishing, without an unambiguous conservation objective and without specifying the biological communities associated with many features and sub-features.



## **Review by feature type for 'red' categories**

25. These reviews can be divided into two groups. First, seagrass, maerl and to a lesser extent sub-tidal mussel on rock and *Sabellaria* spp. reef (emergent biogenic reef only) sub-features, for which assumptions about precaution and the conservation objective have no significant influence on the rating that would be assigned. Second, all other sub-features, for which alternate assumptions about acceptable precaution, or alternate operational interpretations of the conservation objective, could influence the ratings that are assigned.

### **Seagrass**

(document: IG4-2 v1 SEAGRASS audit)

26. The rating of the effects of the fishing gears on the seagrass sub-feature is reasonable. Any fishing with the gears described would mean that any expected interpretation of the conservation objective (paragraph 6) is unlikely to be met for this sub-feature.
27. The supporting evidence, including expert opinion when it is used, is sufficient to justify the rating.
28. We are not aware of further sources of evidence that would have affected the rating of the effects of any of gears on this sub-feature.

### **Maerl**

(document: IG4-3 v1 MAERL audit)

29. The rating of the effects of the fishing gears on the maerl sub-feature is reasonable. Any fishing with the gears described would mean that any expected interpretation of the conservation objective (paragraph 6) is unlikely to be met for this sub-feature.
30. The supporting evidence, including expert opinion when it is used, is sufficient to justify the rating.
31. We are not aware of further sources of evidence that would have affected the rating of the effects of any of gears on this sub-feature.

### **Subtidal mussel on rock**

(document: IG4-8 v1 SUBTIDAL MUSSEL ON ROCK)

32. The rating of the effects of the fishing gears on sub-tidal mussel on rock is reasonable. The supporting evidence, including expert opinion when it is used, is sufficient to justify the rating. Any fishing with heavy towed demersal gears would mean that any expected interpretation of the conservation objective (paragraph 6) is unlikely to be met for this sub-feature. However, the justification for the 'red' rating of seines is not developed.
33. The supporting evidence is based on both scientific investigation and expert opinion and is sufficient to justify the rating. The justification for the 'red' rating of seines is not developed.

34. We are not aware of further sources of evidence that would have affected the rating of the effects of any of gears on this sub-feature.

**Sabellaria spp reef**

(document: IG4-4 v1 SABELLARIA audit)

35. The rating of the effects of the fishing gears on the *Sabellaria* spp reef sub-feature is reasonable, although the determination of 'red' rests on the way that precaution is interpreted in this document and not on the totality of the evidence base (some of which provides conflicting information on the impacts of towed gears). It is assumed the 'red' rating refers to cases where *Sabellaria* spp. have formed emergent biogenic reef and not to any habitats where *Sabellaria* spp. are encountered.
36. The supporting evidence, including expert opinion when it is used, is adequate to support the 'red' rating given the interpretation of precaution used in this document.
37. We are not aware of further sources of evidence that would have affected the rating, given the interpretation of precaution used in this document. However, if a less risk averse definition of precaution were adopted then there is some evidence that the recovery times of *Sabellaria* spp. can be high following significant impacts (e.g. aggregate extraction: Pearce, B. Taylor, J. & Seiderer, L.J. 2007. MAL0027 Recoverability of *Sabellaria spinulosa* following aggregate extraction. Marine Aggregate Levy Sustainability Fund. Marine Ecological Surveys Limited, Bath, 87pp. ISBN 978-0-9506920-1-2 and sources cited in OSPAR (2010) Quality status report 2010. Case Reports for the OSPAR List of threatened and/or declining species and habitats Update. *Sabellaria spinulosa* reefs) and that low levels of fishing impact with lighter demersal trawls may not compromise conservation objectives.

**Subtidal bedrock including chalk (document also includes audit for 'Subtidal cobble and boulder reef')**

(document: IG4-5 v1 SUBTIDAL BEDROCK REEF INCLUDING CHALK audit)

38. The rating of the effects of the fishing gears on sub-tidal bedrock including chalk relies on the way that precaution is interpreted in this document and not on the totality of the evidence base. Considerable variation in the sensitivity of this sub-feature is expected, based on the biological communities that are present. Some of these biological communities would be so sensitive to fishing gear impacts that assumptions about precaution and the conservation objective would have no significant influence on a 'red' rating. Many other biological communities would only receive a 'red' rating because precaution is applied at the level of the sub-feature rather than being applied to the biological communities.
39. The 'red' rating of the effects of fishing gears on some of the biological communities associated with this sub-feature is reasonable. However, the determination of 'red' rests on the precautionary principle as interpreted in this document and not on the totality of the scientific evidence base or expert judgement relating to the full range of biological communities associated with this sub-feature.
40. The supporting evidence, including expert opinion when it is used, is sufficient to justify the rating but available evidence does not imply a universally high sensitivity of the biological communities associated with this sub-feature.

## **Kelp**

(document: IG4-6 v1 KELP audit)

41. The rating of the effects of the fishing gears on the kelp sub-feature is primarily based on 'expert judgement' as interactions between towed gears and this sub-feature are infrequent and have not been investigated in detail (as recognised in the document). The determination of 'red' rests on the way that precaution is interpreted, but may be reasonable in the case of intensive fishing.
42. The scientific evidence is not sufficient to justify the rating and the rating is based primarily on 'expert judgement'.
43. The outcome of the assessment based on 'expert judgement' may have been different if publications on the relatively fast growth and short lifespan of kelp in temperate latitudes (e.g. Parke (1948) J Marine Biological Association UK 27: 651-709; Lüning (1979) Marine Ecology Progress Series 1: 195-207 and many others) had been reviewed and the high recovery rates of kelp following damage and loss (e.g. following winter storms) considered. Should kelp harvesting be considered a form of 'fishing'?

## **Intertidal chalk reef**

(document: IS4-7 v1 INTERTIDAL CHALK REEF audit)

44. The rating of the effects of the fishing gears on intertidal chalk reef relies on the way that precaution is interpreted in this document and not on the totality of the evidence base. Considerable variation in the sensitivity of this sub-feature is expected, based on the biological communities that are present. Some of these biological communities would be sufficiently sensitive to justify a 'red' rating. Other biological communities would only receive a 'red' rating because precaution is applied at the level of the sub-feature rather than being applied to the biological communities associated with the sub-feature.
45. The 'red' rating of the effects of fishing gears on some of the biological communities associated with this sub-feature is reasonable. However, the determination of 'red' rests on the precautionary principle as interpreted in this document and not on the totality of the scientific evidence base or expert judgement relating to the full range of biological communities associated with this sub-feature. Some of the biological communities are resilient as they are found in areas subject to very high levels of natural disturbance.
46. The supporting evidence, including expert opinion where used, is sufficient to justify the rating but available evidence does not universally imply high sensitivity of the biological communities associated with this sub-feature.

## **Additional comments**

47. Interactions between 'Intertidal bedrock boulder and cobble reef' (document: IG4-1b v1 INTERTIDAL BEDROCK BOULDER AND COBBLE REEF) and 'Estuarine rock' (document: IS4-2b v1 ESTUARINE ROCK audit) were classified as 'amber' with a possibility of 'red' for some sites; implying that site-specific assessment was required. We note that this treatment of the sub-features was not consistent with the treatment for sub-features such as 'Subtidal bedrock including chalk. The documents for 'Intertidal bedrock boulder and cobble reef' and 'Estuarine rock' were not reviewed in the absence of site-specific information.
48. 'Coastal lagoons' and 'dredges' were rated as 'red' on the matrix but we did not receive a supporting document for review.



## About us

Cefas is a multi-disciplinary scientific research and consultancy centre providing a comprehensive range of services in fisheries management, environmental monitoring and assessment, and aquaculture to a large number of clients worldwide.

We have more than 500 staff based in 2 laboratories, our own ocean-going research vessel, and over 100 years of fisheries experience.

We have a long and successful track record in delivering high-quality services to clients in a confidential and impartial manner.  
([www.cefass.defra.gov.uk](http://www.cefass.defra.gov.uk))

Cefas Technology Limited (CTL) is a wholly owned subsidiary of Cefas specialising in the application of Cefas technology to specific customer needs in a cost-effective and focussed manner.

CTL systems and services are developed by teams that are experienced in fisheries, environmental management and aquaculture, and in working closely with clients to ensure that their needs are fully met.  
([www.cefastechnology.co.uk](http://www.cefastechnology.co.uk))

## Head office

Centre for Environment,  
Fisheries & Aquaculture Science  
Pakefield Road, Lowestoft,  
Suffolk NR33 0HT UK

Tel +44 (0) 1502 56 2244

Fax +44 (0) 1502 51 3865

Web [www.cefass.defra.gov.uk](http://www.cefass.defra.gov.uk)

## Customer focus

With our unique facilities and our breadth of expertise in environmental and fisheries management, we can rapidly put together a multi-disciplinary team of experienced specialists, fully supported by our comprehensive in-house resources.

Our existing customers are drawn from a broad spectrum with wide ranging interests. Clients include:

- international and UK government departments
- the European Commission
- the World Bank
- Food and Agriculture Organisation of the United Nations (FAO)
- oil, water, chemical, pharmaceutical, agro-chemical, aggregate and marine industries
- non-governmental and environmental organisations
- regulators and enforcement agencies
- local authorities and other public bodies

We also work successfully in partnership with other organisations, operate in international consortia and have several joint ventures commercialising our intellectual property

