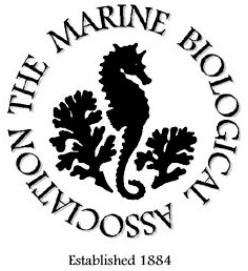

MarLIN
The Marine Life Information Network for Britain & Ireland

Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes.

Dr Keith Hiscock

Hugh Jones

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Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes

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Contents

Introduction

A Review of Marine Nature Conservation (RMNC) was established in 1999 by Defra to examine how effectively the UK system for protecting nature conservation in the marine environment is working and make proposals for improvements. As a part of the Review, work has been undertaken to develop criteria to define nationally important marine features (habitats, species, marine landscapes). The criteria are described in Appendix 1

and a full description is given in Lieberknecht et al. (2003) available from: www.jncc.gov.uk/marine/irishsea_pilot/pdfs/consultation_Sept2003/ Marine_landscapes.pdf.

A provisional list of 240 nationally important marine features has been prepared by JNCC from existing endangered or protected species lists and expert opinion. In order to test the applicability of the criteria, they have already been applied to a list of 16 features (Appendix 2 summarizes the outcome). For each feature, a dossier was created, drawing together information relating to each criterion and reaching a verdict on whether the feature meets each criterion or otherwise. The criteria have been tested, resulting in some suggestions as to how to modify the criteria to make them more useable (Lieberknecht *et al.* 2003). However, the test list of features was very short, and the work described here extends the testing for a further nine features.

The Marine Life Information Network (*MarLIN*) programme at the Marine Biological Association (MBA) was commissioned to undertaken the further testing on nine features:

- Fan mussel *Atrina fragilis* (species);
- Allis shad *Alosa alosa* (species);
- Long-nose skate *Dipturus oxyrinchus* (species);
- Bearded Anotrichium *Anotrichium barbatum* (species);
- Tide-swept kelp and seaweed communities (IR.HIR.KSed.XKT) (habitat);
- Deep sponge communities (CR.HCR.DpSp) (habitat);
- Intertidal mussel beds (LS.LMX.LMus) (habitat);
- Sea lochs (marine landscape), and
- Deep-water mud basins (marine landscape).

The criteria to be applied were:

1. Proportional importance (Global importance; Regional importance);
2. Rarity;
3. Decline, and
4. Threat of significant decline.

An Overall Verdict of 'National Importance' was then to be determined.

The work included:

1. Search for data and information relevant to the criteria from the literature.
2. Complete dossiers on each feature including reaching a verdict for each criterion.
3. Add descriptive text, including a section on likely sensitivity to human activities.
4. Produce a report that considers further, based on experience gained in applying criteria, whether any changes should be proposed that would make the importance criteria more effective in identifying species and habitats for protection.
5. Completed the full report and dossiers by 7 January 2004.

Methods

Data and information relevant to the criteria

Basic information Information that provides a general background describing the marine landscape, habitat or species has been obtained from descriptions in text books, in the JNCC marine biotopes classification and from research undertaken for *MarLIN* Biology and Sensitivity Key Information Reviews.

Reported distribution Data on distribution and abundance of species around the UK and in the north-east Atlantic has been accessed from readily available sources including text books, relevant Web sites and through contact with experts or data-holding organizations. Distributional data has been mapped as 'Known and expected distribution' onto outline maps of Britain and Ireland and of the north-east Atlantic and Mediterranean.

Biology and sensitivity key information has been accessed from the *MarLIN* Biology and Sensitivity Key Information pages wherever possible. Where information has not been researched by *MarLIN*, library research has been undertaken relevant to the specific factors associated with human activities that are believed to have an adverse impact on the feature. For the purposes of preparing the dossiers in this exercise, detailed collation of sensitivity information for landscape features has not been undertaken but inspection of *MarLIN* sensitivity reviews has been carried out.

Application of the criteria for special importance The criteria are those being developed by JNCC and described in Lieberknecht et al. (2003). Distributional records (to identify 'Proportional importance' and 'Rarity') have been obtained from various sources including text books, and relevant Web resources including www.jncc.gov.uk/mermaid and additional information collected by *MarLIN*.

Application of the criteria for threatened/declined features Information on decline is usually descriptive rather than quantitative in the case of marine species. Best possible information has been obtained.

Results of the reviews

The dossiers prepared for each test species are presented at the end of this report. They are 'stand-alone' and are each separately numbered.

Comments on application of criteria

Introduction. The criteria applied in the exercise described here have been carefully thought-through to be a practical but pragmatic approach to producing measures that can be used in a defensible way to prioritize action to protect marine features that may be threatened by human activities. It has been possible in the exercise described here to apply the criteria but rarely with quantitative information so that the phrase 'most likely' has had to be frequently used.

'Rarity' is a particularly difficult criterion to apply although one where quantitative information (on the number of 10 km x 10 km squares within the 3 mile limit of territorial seas occupied by a feature) can be used. The difficulty in using the criterion is because of:

Application to a relevant geographical area. "The UK" is a political entity and not one that makes sense biogeographically. 'Great Britain' is a reasonable entity to consider as it does not join to adjacent biogeographically similar areas that are different countries. 'Northern Ireland', a part of the United Kingdom of Great Britain and Northern Ireland, does not have a separate biogeographical character but is a part of the island of Ireland. From

the point-of-view of biogeographical affinities, the criteria for 'rarity' might best be applied to Britain and Ireland together.

Features rare in Britain and Ireland but common elsewhere. It is considered quite proper, but often has to be justified, to identify action to protect features that are rare in Britain but may be common in other parts of the north-east Atlantic and Mediterranean. For instance, Tittley (2002) specifically comments on the fact that *Anotrichium barbatum* is a member of a genus that is common in the warmer waters of the Atlantic and a family (Ceramiaceae) globally widespread. The review undertaken in the current exercise concluded that the 'Proportional importance' criterion was not met but that others were so that the species is identified as of national importance. The authors of this report concur with the conclusion in Lieberknecht et al. (2003) that "If something is nationally rare, it should be deemed nationally important because of its contribution to national biodiversity".

Deletion of guidelines text for globally and regionally rare. The modifications proposed by Lieberknecht et al. 2003 to the criteria include deletion of criteria for assessing global and regional rarity (although there are none for global). The deleted text is:

> "Globally rare: No guidelines available.
>
> Regionally rare: The 'limited number of locations' is set at 2% of the 50 km by 50 km UTM grid squares for each of the following three bathymetric zones in the north-east Atlantic:
>
> a. littoral (intertidal zone and splash zone)
>
> b. sublittoral (down to 200 m depth)
>
> c. bathyal / abyssal (below 200 m depth)"

The deletion of the above categories is explained in Lieberknecht et al. (2003) but it is felt here that the categories have value and any feature which qualifies as globally or regionally rare will automatically have national importance if it occurs in the UK and, furthermore, the UK will have special responsibilities for protection of the feature if it occurs in significant quantities. It seems important to maintain some means of assessing rarity on global and regional scales.

In applying a 'Globally rare' criterion, it must be born in mind that the great majority of continental shelf species have naturally geographically limited distributions and it might be that 'Globally rare' should only be applied to species that have a global distribution: usually highly mobile species and deep water species.

Threat of significant decline. The table to assess threat of significant decline (Gilliland, 2001: Appendix 1) does not include 'Very High' sensitivity. In the case of CR.HCR.DpSp, any decline in the occurrence is likely to be permanent and therefore 'Very High' sensitivity is appropriate and vulnerability to decline should be Very High even if exposure is low. The 'Threat' table anyway needs revision to take account of revision of the approach to sensitivity.

Application of criteria in relation to the implementation of the EC Habitats Directive. In the case of marine habitats, the Habitats Directive is targeted at physiographic (or 'landscape') features. Sea lochs and Deep mud basins, the two marine landscape features addressed in the dossiers prepared here, are poorly served by the Habitats Directive. Fjordic sea lochs as a feature are usually too deep to be 'shallow' inlets and bays although may be included and their rock habitats are 'Reefs' whilst diverse, fragile

and scarce maerl beds are 'Shallow sandbanks slightly covered by seawater all of the time'. Fjardic sea lochs are 'Shallow inlets and bays'. Deep mud cannot be interpreted into any of The Habitats Directive habitats. Furthermore, the main criteria used in the Habitats Directive (Extent and Representivity) do not include important conservation criteria such as rarity and sensitivity. Identification of representative, rare/scarce or sensitive sea loch and deep mud basin habitats for protection and management of human activities would therefore benefit from the criteria developed by JNCC and trialed in the exercise described here.

Application of the criteria in relation to the implementation of item 32(c) from the UN Conference on Sustainable Development for "the establishment of marine protected areas consistent with international law and based on scientific information, including representative networks by 2012".

The presence of 'nationally important' landscapes, habitats or species informs the process of identifying nationally important marine areas which relies on a wider range of well-established criteria:

Typicalness, Naturalness, Size, Biological diversity, Critical area (=Dependency), Importance (area for nationally important marine features).

Application of the criteria in relation to implementation of OSPAR Annex V.

Annex V of the OSPAR convention requires, amongst other actions, the identification of actual and potential adverse effects of human activity on specific species, communities and habitats and the taking of necessary measures to protect and conserve the ecosystems and the biological diversity of the maritime area. Those requirements, in turn, need information on features that are rare, threatened or in decline. OSPAR has therefore identified selection criteria for species and habitats. The exercise described here contributes to the testing and development of the OSPAR criteria and the quantitative measures that underpin those criteria.

The OSPAR criteria are well thought-through although quantitative measures of rarity and decline have often been difficult to apply because of lack of information. Nevertheless, they are important 'touchstones' for what must often, and most likely wisely, be expert opinion.

Application of the criteria against an incomplete classification of biotopes.

Application of assessment criteria is made difficult by the absence of a sediment classification for the 2003 version. It would also make the assessment process much easier if there was a 'read-across' table of 97.06 version biotopes and 03.02 biotopes. Although 'physiographic features' have been identified as comparison units for many years, some 'marine landscapes' have still to be defined in terms of the biotopes that characterize them and/or are only or mainly found in them. That definition of landscapes is needed for importance assessment based on component biotopes. Data analysis has not yet been completed for deep sponge biotopes and a non-expert interpretation of available information would suggest that the biotope has not been recorded in Britain. There would be value in further analysis of datasets.

The verdict

The verdict reached after consideration of evidence includes those categories previously used (see Appendix 3) but a further category has been added: "Unlikely to meet criterion".

References

Connor, D W Breen, J Champion, A Gilliland, P M Huggett, D Johnston, C Laffoley, D d'A Lieberknecht, L Lumb, C Ramsay, K and Shardlow, M (2002) *Rationale and criteria for the identification of nationally important marine nature conservation features and areas in the UK. Version 02.11*. Joint Nature Conservation Committee, Peterborough

Gilliland, P (2001). [Reference not available at time of printing.]

Lieberknecht, L M Vincent, M and Connor, D W (2003) *Criteria for the identification of nationally important marine features*. Peterborough, Joint Nature Conservation Committee.
Available from: www.jncc.gov.uk/marine/irishsea_pilot/pdfs/consultation_Sept2003/Marine_landscapes.pdf

Appendix 1. Results of applying the criteria to the 9 marine features, and comments related to criterion results.

Abbreviations for assessment criteria:

Prop. Impt = Proportional Importance; **Rare** = Rarity; **Decline** = Decline; **Threat decline** = Threat of significant decline. **Yes** = the criterion is met and the feature therefore qualifies as nationally important; **Yes*** = probably meets criterion based on available information; **(Yes)** = borderline case based on available information; **Poss** = possibly meets criterion; **No** = does not meet criterion; **?** = insufficient information to accurately predict if criterion is met.

Nat. Impt = National Importance. In this column the following abbreviations apply: **Yes** = Nationally Important; **No** = Not Nationally Important; **?** = Insufficient information to accurately predict National Importance.

Test Feature	Common Name	Feature Type	Assessment					Comments
			Prop. Impt	Rare	De-cline	Threat de-cline	Nat. Impt	
Alosa alosa	Allis shad	species	No	Unlikely	Yes	Yes	Yes	Some populations may be locally extinct. Decline may be reversed in some areas.
Anotrichium barbatum	Bearded Anotrichium	species	No	Yes	Yes	Yes	Yes	Decline may be due to natural variability.
Atrina fragilis	Fan mussel	species	No	Yes	Yes	Yes	Yes	
Dipturus oxyrinchus	Long-nosed skate	species	No	Yes	Yes*	Yes*	Yes	
CR.HCR. DpSp	Deep sponge communities	habitat	Yes*	(Yes)	Un-likely	Yes*	Yes	More data analysis required.
IR.HIR.Ksed. XKT	Tide-swept kelp and seaweed communities	habitat	?	No	Yes*	Yes	Yes	
LS.LMX.Lmus	Intertidal mussel beds	habitat	No	No	No	No	No	
Deep -water mud basins	Deep -water mud basins	landscape	Unlikely	No	Yes*	Yes	Yes	
Sea lochs	Sea lochs	landscape	Yes	No	Yes*	Yes*	Yes	

Appendix 2. Draft criteria for the identification of nationally important marine features (Connor et al., 2002 including suggested modifications in Lieberknecht et al., 2003).

Proportional importance[1]:

A high proportion of the marine landscape, habitat, or population of a species (at any time of its life cycle) occurs within the UK. This may be related to either the global or regional (north-east Atlantic or European) extent of the feature.

Features may be categorized as follows:

Globally important: a high proportion of the global extent of a marine landscape or habitat or a high proportion of the global population of a species (at some stage in its life cycle) occurs within the UK. 'High proportion' is considered to be more than 20% when known.

Regionally important: a high proportion of the regional (north-east Atlantic or European) extent of a marine landscape or habitat, or a high proportion of the regional population of a species (at some stage in its life cycle) occurs within the UK. 'High proportion' is considered to be more than 30% when known.

Rarity:

Marine landscapes, habitats and species that are sessile or of restricted mobility (at any time in their life cycle) are considered rare if their distribution is restricted to a limited number of locations. Rarity can be assessed as follows:

Nationally rare: recorded in less than 0.5% of the total numbers of the 10 km x 10 km squares in GB within the 3 nm limit (for species occurring inshore), or in less than 5% of the 10 km squares beyond the 3 nm limit (for species occurring offshore) – or one of the two for species with a wider distribution.

[Regionally rare and Globally rare categories have been removed from the 'Rarity' criterion and the following explanation given in Lieberknecht et al., 2003. "If something is nationally rare, it should be deemed nationally important because of its contribution to national biodiversity. If it is regionally and globally rare, but not rare nationally – then it would be likely to qualify under the proportional importance criterion. If it does not fulfil the proportional importance criterion, why should something that is not nationally rare be considered nationally important? It is, therefore, suggested that the regional and global categories be removed from this criterion."]

The criterion is suitable for sessile benthos, and has been applied in the past (Sanderson, 1996). For mobile species, as stated in the draft report, the criterion is not well defined enough to be workable. More guidance is needed.

If insufficient information is available to carry out the assessment, it is important to highlight this rather than simply recording a feature as not nationally important.

In the case of a mobile species, the total population size will determine rarity [needs further guidance].

The assessment should be dependent on scientific judgement regarding natural abundance, range or extent and the adequacy of recording.

---

[1] A combination of the OSPAR Texel-Faial criteria 'global importance' and 'regional importance'.

Decline:

An observed, estimated, inferred or suspected significant decline in numbers, extent or quality of a marine landscape, habitat or a species in the UK (for species, quality refers to life history parameters). The decline may be historic, recent or current and may be throughout UK waters. Alternatively, a decline at a global or regional level, where there is cause for concern that the proportional importance criterion will be met within the forseeable future.

	Extent	**Quality**
Marine landscapes and habitats	A marine landscape or habitat that has declined in extent to 90% or less of its former natural extent in the UK, or its distribution within the UK has become significantly reduced (e.g. lost from several sub-regions).	A marine landscape or habitat for which quality, based on change from natural conditions caused by human activities, is negatively affected by: (1) a change of its typical or natural components over a significant part of it's UK distribution, or (2) the loss of its typical or natural components in several sub-regions. Such judgement is likely to include aspects of biodiversity, species composition, age composition, productivity, biomass per area, reproductive ability, non-native species and the abiotic character of the habitat.
Species	Within the UK population of the species: there has been a recent significant decline in numbers of individuals / geographical range or numbers of individuals / geographical range are presently in marked decline or the present population is at significantly lower levels than in the past as a result of human activity (evidence for past significant decline)	The species has suffered a significant decline in one or more of the following: • loss of genetic diversity; • loss of fecundity; • reduction in the number of mature individuals; • fragmentation of the population.

Assessments of decline should be those that occur beyond what is known about long-term natural variability and resilience, as well as in an appropriate time frame for that feature.

Lesser degrees of decline than Significantly Declined will occur but will not qualify under this criterion. Evidence for decline can be based on actual evidence or reasonable expert judgement. The percentages suggested for categorizing habitat decline reflect the fact that habitats are far less likely to recover from even a small percentage loss compared to most species.

Threat of significant decline[2]: – the feature is expected to suffer significant decline in the foreseeable future due to its expected high level of exposure to damaging activities and to its inherent sensitivity to those activities. Where such potential decline is inferred or estimated, a precautionary approach should be adopted.

The following table offers a way of integrating relative sensitivity and the degree of exposure to damaging activities to give a threat of significant decline rating (equates to vulnerability) (Gilliland 2001).

	Sensitivity			
Degree of exposure	**High**	**Moderate**	**Low**	**None detectable**
High	High	High	Moderate	N/A
Medium	High	Moderate	Low	N/A
Low	Moderate	Low	Low	N/A
None	N/A	N/A	N/A	N/A

Sensitivity accounts for both the ease of damage to the feature by the activity and to its ability to recover from that damage. Sensitivity is therefore assessed against particular activities rather than applied once to a feature.

[The following additional comments are made in Lieberknecht et al. 2003:

"Do we need some guidance on recovery – if a feature suffered decline in the past but is at present recovering / has recovered to former status, it probably shouldn't qualify under 'past decline'. If a feature starts recovering after having previously qualified and placed on the nationally important list – should there be a periodic re-assessment of features with the option of removing features from the list?

There is a danger of complicating this criterion too far - bearing in mind the biggest problem in carrying out the assessments is a lack of information in the right format. It is considered best to keep the wording general and avoid having too many thresholds (e.g. 'a feature has to decline by x % to qualify'), to avoid features in need of conservation action falling through the net. If the wording is kept general, that will enable consideration of whatever information does exist about a feature, and the panel (see recommended assessment process outlined in section 8) can use common sense to reach a verdict."]

[2] From the OSPAR Texel-Faial criteria, where it is termed 'probability of significant decline'.

Appendix 3. Species previously assessed for national importance.

The first four assessment columns show which criteria each feature meets or fails to meet, or indicates that insufficient information was available to carry out the assessment. Abbreviations: PI = Proportional Importance; R = Rare; D = Decline; T = Threat of significant decline; NI = Nationally Important. Comments: yes = indicates criterion is met and the feature therefore qualifies as nationally important; yes* = probably meets criterion based on available information; (yes) = borderline case; poss. = possibly meets criterion; no = doesn't meet criterion; ? = insufficient information. The column labeled NI shows the overall verdict (yes = nationally important; no = not nationally important; ? = unknown).

Test Feature	Common name	Feature Type	Assessment					Comments
			PI	R	D	T	NI	
Axinella damicornis	Sponge	Species	?	no	?	?	?	Total lack of information
Balano-phyllia regia	Scarlet and gold star coral	Species	no	no	?	?	?	Total lack of information
Eunicella verrucosa	Pink seafan	Species	no	no	?	poss.	no	Suffers from lack of information despite recent research programmes
Funiculina quadrang-ularis	Tall sea pen	Species	no	no	yes	yes	yes	Suffers from lack of information despite recent research programmes
Palinurus elephas	Europea n spiny lobster	Species	no	no	yes	yes*	yes	
Cetorhinus maximus	Basking shark	Species	?	yes*	yes	yes	yes	Suffers from lack of information
Gadus morhua	Cod	Species	no	no	yes	yes	yes	Lots of relevant info is available.
Lophius piscatorius	Sea monkfish	Species	no	no	?	yes	yes	Possibly more information available especially with respect to past declines if there were any
Puffinus puffinus	Manx shear-water	Species	yes	?	?	poss.	yes	It would be best for bird experts to carry out these assessments for bird species - there is a lot of information available

Halich-oerus grypus	Grey seal	Species	(yes)	no	no	poss.	(yes)	Meets criterion for proportional importance at regional but not at global level. This is a "borderline" case.
Callophyllis cristata	Red seaweed	Species	?	?	?	?	?	Total lack of information
Ostrea edulis beds	Native oyster beds	Habitat	no	no	yes	yes	yes	should be dealt with at habitat level, though would also qualify at species level
Limaria hians beds	File shell beds	Habitat	?	?	yes	yes	yes	Inferences made from information about the species *Limaria hians* as little/no information found regarding the habitat.
Sabellaria spinulosa reefs	Ross worm reefs	Habitat	?	yes*	yes	yes	yes	Suffers from lack of information and different definitions of habitat
Modiolus modiolus beds	*Horse mussel beds*	Habitat	no	no	yes	yes	yes	Decided that should deal with at habitat level. suffers from lack of information and different definitions of habitat
Estuaries	Estuaries	Marine land-scape	no	no	yes	yes	yes	Should meet proportional importance criterion - threshold set too high. Meets "decline" criterion in terms of decline in quality.

Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes

Dossier for:

The allis shad *Alosa alosa* (Linnaeus, 1758)

Research undertaken by: Dr Keith Hiscock and Hugh Jones, Marine Life Information Network, Marine Biological Association, Plymouth PL1 2PB.

Plate 1. *Alosa alosa* from the Plymouth fish market. January 2004. (Image: © Keith Hiscock)

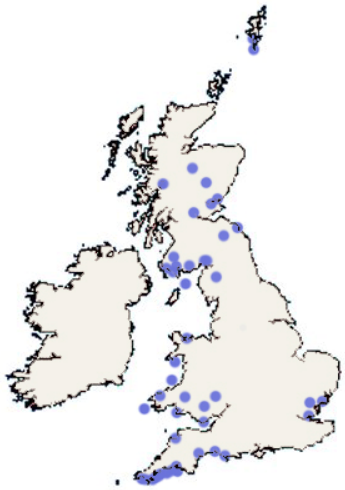

Figure 1: Recent records of *Alosa alosa* in the UK (adapted from Henderson 2003 and Potts and Swaby 1991).

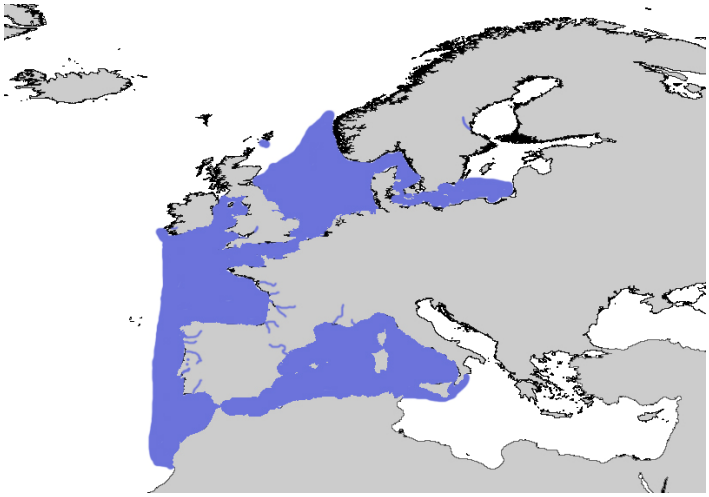

Figure 2: Recent records of *Alosa alosa* in Europe showing marine distribution and river spawning areas (rivers in blue)(adapted from Whitehead 1984, Swinney 2000, and Aprahamian et al. 2003)

Basic information

The Allis Shad (*Alosa alosa*) is a member of the herring family. A deep bodied species with circular scales, a notched upper jaw in the mid-line, and a lower jaw of equal length that fit inside the upper jaw (Potts and Swaby 1991). This anadromous fish measures between 30-50cm (Potts and Swaby 1993) and closely resembles the Twaite shad (*Alosa*

fallax), but maybe separated by examining the gill-rakers, (*A. alosa* has between 90-130 gill-rakers on the first gill arch while *A. fallax* has only 40-60) (Wheeler 1969).

Reported distribution

Distribution is well-reported as the species is caught commercially and by recreational anglers.

Biology and Key Sensitivity Information Review

There is no *MarLIN* Biology and Sensitivity Key Information Review for *Alosa alosa*. The species is likely to be intolerant of extraction but have a high recovery potential because of its very high fecundity so that it would be ranked as of Low sensitivity to extraction. However, it seems that the high recovery potential cannot be achieved because access to historical spawning areas has been blocked by construction or rivers are too polluted. Sensitivity to extraction must therefore be considered Very High in the case of stocks from now blocked rivers. Since fish may be faithful to the river in which they were born, local extinction may have occurred.

Application of the criteria for special importance

Proportional importance

Alosa alosa occurs along the eastern-Atlantic seaboard from Norway to North Africa (approximately 20^{o}N) and also in the western Mediterranean (Whitehead 1984). The only reported spawning population in the UK is that of the River Tamar (Maitland and Hatton-Ellis 2003), although the appearance of sub-adults and mature adults near the Solway Firth may indicate a spawning site (Potts and Swaby 1991) and adults have also been recorded in the English and Bristol Channels (Maitland and Hatton-Ellis 2003). The most important spawning rivers in northern Europe are the Loire and Gironde, and its possible British caught specimens are part of the Loire-Gironde population (Henderson 2003). Evidence from France indicating recolonisation of north-west rivers may suggest recovery of geographical range (Henderson 2003). Overall, the current UK population is not of regional importance as much larger spawning populations occur elsewhere.

Verdict: Does not meet criterion

Rarity

Criteria for assessing rarity of marine species and for coastal areas and are not directly applicable to anadromous species such as allis shad. Records from within coastal areas (see Henderson 2003 and Potts and Swaby 1991) identify the species as nationally scarce.

Verdict: Unlikely to meet criterion

Application of the criteria for threatened/declined features

Decline

Alosa alosa is known to have declined significantly throughout its range on the western coasts of Europe, from southern Norway to Spain, and in the Mediterranean eastwards to northern Italy. The most successful breeding populations are thought to be in a few rivers in western France and Portugal.

Alosa alosa was once abundant in the River Severn and supported a commercial fishery (Day 1890 cited in Henderson 2003). By the 1970s there was no indication that a spawning population still existed in either the Severn or other rivers in that region

(Henderson 2003). The report by Henderson (2003) is mirrored for many northern European rivers (River Rhine (De Groot 1990), Seine, Thames, Elbe, Meuse, (Maitland and Hatton-Ellis 2003), and Norway and Finland (Aprahamian et al. 2003). Southern European population have also shown decline (River Minho, Mondego, Douro, and Tagus (Maitland and Hatton-Ellis 2003)).

The decline has been attributed to overfishing, barriers to their migration (dam construction) (Maitland and Hatton-Ellis 2003) and destruction of spawning habitat (Aprahamian 2003). Pollution and deterioration of water quality in rivers may also be important (Potts and Swaby 1993).

Verdict: Meets criterion

Threat of significant decline

Threat of significant further decline is difficult to assess. It might be that the current population is 'in balance' with fishing effort and, without removal of physical barriers to migration is unlikely to increase or, indeed, decline further in abundance. Populations 'faithful' to a particular river may already be extinct. It is not expected that any further construction will affect the one known spawning stock in the UK, in the Tamar where improvement in water quality may encourage recovery. Similarly, for the Loire and Gironde populations (which may be the source of much of the UK population), improvement rather than further degradation seems likely.

Verdict: Does not meet criterion

Overall Verdict

Meets 'Decline' criterion, unlikely to meet 'Rarity' criterion and does not meet other criteria: should be on list of nationally important features

Other relevant information

Table 1. Summary of the European Conservation Designations for *Alosa alosa*. (Adapted from Elliott and Hemmingway 2002).

European Protection Designation	Level of Protection
Habitats Directive	II (Conservation requires the designation of SACs)
Habitats Directive	V (Exploitation subject to management measures)
Berne Convention	III (Exploitation shall be regulated)
UK Wildlife & Countryside Act 1981	Schedule 5 Section 9.1 (killing/injuring)
UK Wildlife & Countryside Act 1981	Schedule 5 Section 9.1 (taking)
UK Wildlife & Countryside Act 1981	Schedule 5 Section 9.4a
UK Biodiversity Action Plan	Short List – Priority
France Red Data Book	Vulnerable
Ireland Red Data Book	Vulnerable

Denmark	Extinct
Poland	Extinct
Spain Red Data Book 1992	Vulnerable, Extinct
Flanders Red Data Book	Endangered
Italy	Extinct

Acknowledgements

Our thanks to Douglas Herdson (National Marine Aquarium) for locating a specimen at the Plymouth fish market to illustrate this dossier.

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Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes

Dossier for:

Bearded Anotrichium *Anotrichium barbatum* (C Agardh) Nägeli, 1862

Research undertaken by: Dr Keith Hiscock and Hugh Jones, Marine Life Information Network, Marine Biological Association, Plymouth PL1 2PB.

Plate 1. Laboratory specimen of *Anotrichium barbatum*. Plant width ca 3 cm. **Image:** Christine Campbell / Culture Collection of Algae and Protozoa

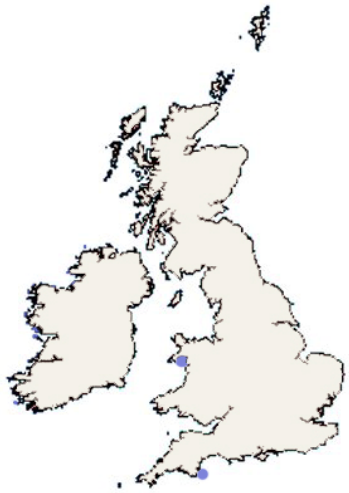

Figure 1. *Anotrichium barbatum* recorded and expected distribution in Britain and Ireland (from Wilson 2003 based on Hardy and Guiry 2003).

Basic information

A small, filamentous, rose-pink seaweed forming much-branched, extremely delicate tufts 2-6cm high. The whorl of branched hair-like filaments on younger vegetative cells, later bear the reproductive structures (Wilson 2003).

Reported distribution

Herbarium specimens in the Natural History Museum in London (Dr Ian Tittley, pers. Comm.) are from eight locations along the south coast of England from Cornwall to Sussex and from the recent record in North Wales. Hardy and Guiry (2003) report that the species was recorded from southern England in the nineteenth century, but was unknown in the 20th century until it was discovered in North Wales between Pwllheli and Abersoch. The record shown on Figure 1 for Lower Noss Point, Dart Estuary in South Devon was recorded during Nature Conservancy Council commissioned surveys in 1987 and is plotted from Hardy and Guiry (2003). It may be the record that they note as "The Cornish record here is probably a misidentification …". Maggs and Hommersand (1993) suggest that the report of *Anotrichium barbatum* at Lower Noss Point is possibly a misidentification of *Anotrichium furcellatum,* as are all other recent reports of *A. barbatum.*

Biology and sensitivity key information

There is no *MarLIN* Biology and Sensitivity Key Information Review for *Anotrichium barbatum* only a basic information review, principally due to lack of data.

Application of the criteria for special importance

Proportional importance

Known with certainty from only one extant location in the U.K. (Cardigan Bay between Pwillheli and Abersoch) (Anon. 1999).

Reported distribution from The NE Atlantic (Britain and Canary Islands) through the Mediterranean (Spain, Balearic Islands, Sardinia, Italy, Sicily, Malta, Adriatic, Greece, Turkey, Libya and Algeria) and into the SE Atlantic (Sierra Leone) (Guiry and Nic Dhonncha 2003). Tittley (2002) specifically comments on the fact that *Anotrichium barbatum* is a member of a genus that is common in the warmer waters of the Atlantic and a family (Ceramiaceae) globally widespread.

Verdict: Does not meet criterion

Rarity

Anotrichium barbatum is registered as a Nationally Rare Marine Species and is listed as a UK Biodiversity Action Plan Species (Plowman 1995).

Verdict: Meets criterion

Application of the criteria for threatened/declined features

Decline

Plowman (1995) indicates a decline in *A. barbatum* of between 50-100% in numbers/range in the UK in the last 25 years. A large number of *A. barbatum* herbarium specimens were collected in England and the Channel Islands from 1807 to 1900, with the majority of them dating from the 1890's. Most of them came from a few favourite collecting sites (Studland, Swanage and Jersey). Clearly this rare alga was highly desirable for collecting at the small number of sites where it could be found intertidally and affected U.K. populations (Anon 1999).

Verdict: Meets criterion

Threat of significant decline

It is not known whether there are any current causes of decline because only one, previously unknown, population has been located to date, and it has been examined on only one occasion. However, its Oyster Bank site is subject to several potential threats. The most serious of these is the possible dumping of spoil from channel dredging operations. As the population occupies a fairly small area, it could be entirely eliminated by spoil dumping. Bottom trawling is potentially damaging, but the shallow depth makes this unlikely. Pwllheli is being developed as a centre of harbour and water sports facilities, and the Oyster Bank will need appropriate protection (Anon 1999).

Verdict: Meets criterion

Overall Verdict:

Does not meet criterion for proportional importance but meets criteria for rarity, decline and threat of significant decline: should be on list of nationally important features.

Acknowledgements

Thanks to Dr Gavin Hardy and Henry Arnold for helping to track-down the Dart Estuary record and to Ian Tittley for information from the Natural History Museum herbarium database.

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Basic information

Large (30-48 cm long) triangular, thin, shell tapering to a point, light yellow- brown to dark brown in colour. Fan-mussels live with their pointed end embedded in sediment, attached by abundant fine byssal threads. The posterior (broad) end protrudes from the surface. Often solitary but populations occur as small groups or patches of individuals forming small beds. (Tyler-Walters 2003)

Reported distribution

Northern UK to the Iberian Peninsula and the Adriatic Sea.

Biology and sensitivity key information

The *MarLIN* Biology and Sensitivity Key Information Review provides a full sensitivity review for *Atrina fragilis* (see http://www.marlin.ac.uk/species/Atrfra.htm). *A. fragilis* shows 'high' sensitivity to many physical disturbance factors, in particular substratum loss, smothering and displacement. The documented impact of dredging on *A. fragilis* populations combined with the long-lived, low gamete production mean that this species population cannot be compensated for by an immediate reproductive response and recruitment (Tyler-Walters 2003).

This species has no ability to burrow upwards, or re-burrow themselves following a disturbance incident. The fragile shell is another reason for the susceptibility of *Atrina fragilis* to physical disturbance.

Atrina fragilis is therefore recorded as having 'high' intolerance to 'physical disturbance' 'substratum loss' 'smothering' and 'displacement' and a 'low' recoverability making this species 'high' sensitivity (see www.marlin.ac.uk for definitions of Intolerance and Recoverability and Sensitivity).

Application of the criteria for special importance

Proportional importance

In the UK, *Atrina fragilis* is recorded predominantly off southern and western shores (Seaward 1990). Global distribution is from northern Scotland to the Iberian Peninsula, including the Channel Isles and the Adriatic Sea (Seaward 1982, 1990, Turk and Seaward 1997, Woodward 1985, Simunovic et al. 2001). However, further investigation of records from the Mediterranean is required to ensure that the observations are of *Atrina fragilis*.

Atrina fragilis also had a reported distribution along the Atlantic coast of Africa, the Caribbean Islands and off of Madeira (Nobre 1938-1940 cited in Simunovic et al. 2001).

The UK population appears to be at the northern limits of the distributional range and populations are or have been much larger further south. For instance, populations exist in deep mud in the Bay of Concarneau where they are dredged to sell as curio shells (Dr J. Grall, pers. comm.). Given the wide distribution of *Atrina fragilis* and the likely greater abundance elsewhere in the north-east Atlantic, it is unlikely to meet this criterion.

Verdict: Does not meet criterion

Rarity

Protected under Schedule 5 of the Wildlife and Countryside Act 1981, and Wildlife (NI) Order 1985. *Atrina fragilis* is also recorded as a nationally scarce marine species, and is a UK Biodiversity Action Plan Species.

Atrina fragilis is a highly 'recordable' species because of its attraction (historically) to shell collectors and its conspicuous appearance. Nevertheless, records of its occurrence in UK waters have been few since records were first made systematically starting in the middle of the 19th century. It therefore seems to be a naturally scarce species in UK waters and records post-1970 would most likely qualify it as nationally rare. Although specimens are most likely caught from time-to-time by scallop dredgers, exceptionally few records have been made in recent years despite an awareness amongst diving biologists to look-out for individuals. The extreme difficulty finding individuals or populations suggests that decline in occurrence has occurred and, taking post-1970 records, it would qualify as nationally rare.

Verdict: Meets criterion

Application of the criteria for threatened/declined features

Decline

Around the UK and Ireland, the numbers of *Atrina fragilis* found in scallop beds that have been dredged have declined and few specimens remain (Anon. 1999). Most recent *Atrina fragilis* specimens have been found adjacent to dredged scallop beds or in areas subject to little dredging (Anon. 1999). This species was more common in scallop areas in the early 1900s. Presumably trawling and dredging of these formerly populated regions is the reason for the decline of this species (Dr D. Minchin pers. comm. to Dr H. Tyler-Walters). Dredging of a *Pecten maximus* bed off Glengad Head, Ireland, after 1975, removed many live specimens of *A. fragilis* in scallop dredges and the population of fan mussels is thought to have been destroyed by subsequent dredging (Anon. 1999). *Atrina fragilis* was recorded in *Zostera* sp. beds in the Isles of Scilly, however specimens have not been found since the *Zostera* sp. beds were lost (Turk 1982; Turk & Seaward 1997). Records from south west England in the Environmental Records Centre for Cornwall and the Isles of Scilly have shown that recordings of fan mussels have declined from inshore waters, and that the most numerous abundances in the last 20 years have come from deep water trawls suggesting that the absence of inshore shells may point to trawler fishing damage since the 1950s (Jean-Luc Solandt, pers. comm.). Searches for fan mussels have been carried out in Plymouth Sound, at sites in Pembrokeshire and the Oberon Bank in Scotland during 2003 to specifically look for shells that have been seen by other divers: none were found (Jean-Luc Solandt, pers. comm.). Following his presentation on changes in the benthos of the 'Grand Vasière', Bay of Biscay at the 2003 European Marine Biology Symposium, Dr F. Le Loc'h replied to the question "have any species been made extinct in the area as a result of trawling and dredging?" by suggesting that *Pinna fragilis* was now extinct in the area. However, it seems that populations exist in deep mud in the Bay of Concarneau where they are dredged to sell as curio shells (Dr J. Grall, pers. comm.). Since populations off the coast of France may be the source of larvae for recruitment to UK waters (Professor A.J. Southward, pers. comm.), further decline is likely as a result of stock depletion off continental Europe. The location for an individual *Atrina fragilis* in Plymouth Sound found in December 2003 (Dr K. Hiscock, own observations following report of several individuals being seen) is in an area of soft mud not subject to dredging.

Verdict: Meets criterion

Threat of significant decline

As *A. fragilis* is considered a long lived species and since aggregations are now very rarely encountered, this species is particularly vulnerable to future scallop dredging and possibly to demersal fishing.

Sand and gravel extraction may remove or damage this species and a number of environmental changes may affect *A. fragilis* such as increases in turbidity, sedimentation and pollutants (Anon 1999). Furthermore seawater temperature changes may affect recruitment patterns.

Verdict: Meets criterion

Overall Verdict:

Meets all of the criteria related to importance within UK waters: should be on the list of nationally important features.

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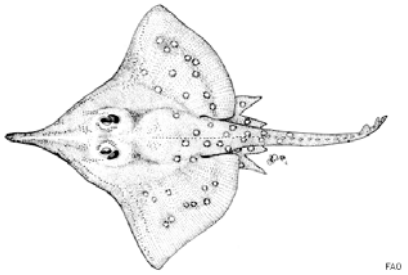
Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes

Dossier for:

***Dipturus oxyrinchus* (Linnaeus, 1758) (Long-nosed skate)**

Research undertaken by: Dr Keith Hiscock and Hugh Jones, Marine Life Information Network, Marine Biological Association, Plymouth PL1 2PB.



Dipturus oxyrinchus (image width ca. 1 m).

Sourced from www.fishbase.org and reproduced with permission from the Food and Agriculture Organisation of the United Nations.

Recorded and expected distribution of *Dipturus oxyrinchus* in the north-east Atlantic. Based on Wheeler 1969 and Whitehead et al. 1984. The areas shaded are within the depth contours where *D. oxyrinchus* is found.

Basic information

Dipturus oxyrinchus grows to around 250cm for females (Whitehead et al. 1984) and 150cm for males (Froese and Pauly 2003). This species has a long pointed snout and its disc has a smooth upper surface, which becomes prickly in larger specimens (Whitehead et al. 1984). The long-nosed skate is found on sand and sand-rock bottoms at 90m to 900m depth where it feeds on benthic species. *Dipturus oxyrinchus* produces eggs that are oblong shaped capsules with stiff pointed horns at the corners deposited in sandy or muddy seabed (Froese and Pauly 2003). *Dipturus oxyrinchus* is also known as *Raja oxyrinchus*.

Reported distribution

"Atlantic coasts northwards from the Canaries, Madeira and northern Morocco to the Faroes, the Shetlands and central Norway, also northern part of North Sea and to Skaggerak; Mediterranean (mainly at around 500m)" (Whithead et al. 1984). Recent records from UK waters (CEFAS and FRS – see Acknowledgements) confirm presence in depths greater than 100m to south-west, west and in the northern North Sea.

Biology and sensitivity key information

There is no *MarLIN* Biology and Sensitivity Key Information Review for *Dipturus oxyrinchus*. Ray species are typically slow growing and take several years to reach

maturity. The eggs of *Dipturus oxyrinchus* are large and most likely produced in small quantities. The species is fished and numbers appear to have declined (Wheeler 1969 notes that "the long-nose skate is relatively common in appropriate depths, and makes a considerable contribution to the fisheries statistics for rays and skates". However, CEFAS trawl surveys since 1990 have caught and recorded only four individuals). The 'Resilience' ranking on www.fishbase.org is "Low, minimum population doubling time 4.5 - 14 years". The species appears to be intolerant of the effects of fisheries so that it is of 'High' sensitivity to 'Extraction of this species' and, because of the small number of eggs produced, is likely to have a 'Low' recovery potential making the species 'High' sensitivity (see www.marlin.ac.uk for definitions of Intolerance and Recoverability and Sensitivity).

Application of the criteria for special importance

Proportional importance

Dipturus oxyrinchus is distributed in the Eastern Atlantic from central Norway to Senegal including the Faeroes and within the Mediterranean (Whitehead et al. 1984, Froese and Pauly 2003). Assuming that *Dipturus oxyrinchus* occurs at depths of 100-1000 m, the extent of the UK population is a significant but not high proportion of the global extent: possibly 20%. Records of occurrence are very sparse. The trawl database at Fisheries Research Services Aberdeen provides 52 records between 1925 and 2003, mostly at Rockall and off the Scottish west coast at depths of 100 to 300m (Dr Douglas Beard, pers. comm.). Ellis et al. (in press) note that *Dipturus oxyrinchus* were recorded occasionally in the northern North Sea and Celtic Sea in depths of 111 to 159 m. However, there have been only four records from CEFAS surveys since 1990, three from the Celtic Sea and one from the northern North Sea (Dr James Ellis, pers. comm.). Published information on distribution has also been obtained from Whitehead et al. (1984) and Froese and Pauly (2003).

Given that the UK area where *Dipturus oxyrinchus* occurs is a significant but not high part of the total distribution and that the abundance of this species is most likely higher to the south of the British Isles, the UK population is not of regional importance.

Verdict: Does not meet criterion

Rarity

Dipturus oxyrinchus is not currently registered under any conservation designations. A proposal has been submitted for the addition of *Dipturus oxyrinchus* to the Wildlife Conservation Act 1981 Schedule 5 in the Fourth Quinquennial Review [*pers. comm.* (letter) from Shark Trust to John Clorley (Defra) dated 14th December 2002].

Although total population size, historical (natural) abundance and range is poorly known, the species clearly has a low abundance in UK waters including within UK Fisheries limits and is **rarely encountered**.

Verdict: Meets criterion

Application of the criteria for threatened/declined features

Decline

Formally considered moderately common and regularly landed by longliners and trawlers in Northern Europe (Whitehead et al. 1984). Wheeler 1969 notes that "the long-nose skate is relatively common in appropriate depths, and makes a considerable contribution to the fisheries statistics for rays and skates". However, CEFAS trawl surveys since 1990 have caught and recorded only four individuals. Numbers maybe depleted due to

unregulated fisheries [pers. comm. (letter) from Shark Trust to John Clorley (DEFRA) dated 14th December 2002] although no sources for current/past population size exist. Published records of skate capture are not usually made on a species specific basis, i.e. Defra record 'skates and rays' as a single group, and as Sea Fisheries Committees have no legal obligation to collect fisheries data, no quantitative information exists at species level (Hood and Ballerstedt 2002).

The species has declined in abundance in historical times although there is insufficient information to give a quantitative measure of that decline.

Verdict: Probably meets criterion

Threat of significant decline

Long-nosed skate will continue to be caught in fisheries around the UK. As a species with a long-life, slow growth and low reproductive capacity, recovery to whatever natural levels may have been seems unlikely. It has not been possible to assess whether any further decline may occur or whether current population size is in a 'steady state' in relation to current fishing pressures.

Verdict: Probably meets criterion

Overall Verdict

Meets criterion for Rarity and probably meets criteria for Decline and Threat of significant decline: should be on the list of nationally important features.

Acknowledgements

Preparing this dossier has been assisted by advice and information received from Dr Douglas Beare (Fisheries Research Services, Aberdeen), Drs Richard Millner and James Ellis (Centre for Environment Fisheries and Aquaculture Science, Lowestoft), Ali Hood at the Shark Trust,

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Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes

Dossier for:

The fan mussel *Atrina fragilis* (Pennant, 1777)

Research undertaken by: Dr Keith Hiscock and Hugh Jones, Marine Life Information Network, Marine Biological Association, Plymouth PL1 2PB.

Plate 1: *Atrina fragilis* in soft mud in Plymouth Sound. (Image: © Keith Hiscock)

Plate 1: *Atrina fragilis* removed from soft mud in Plymouth Sound. Scale is 20 cm. (Image: © Keith Hiscock)

Figure 1: Recorded and expected distribution of *Atrina fragilis* for the UK and Ireland (Tyler-Walters 2003). (Many of the records shown here are historical and there are few recent records of live individuals).

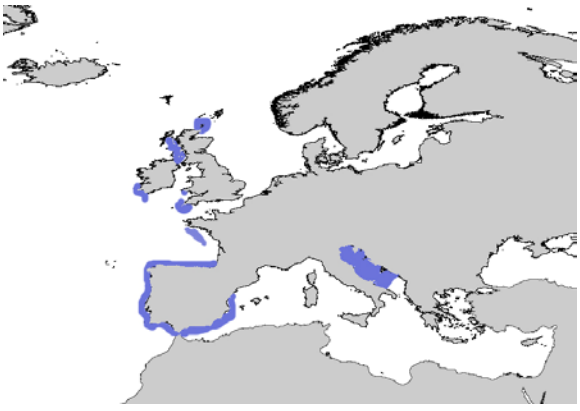

Figure 2: Recorded Distribution of *Atrina fragilis* in European waters. (Adapted from Tyler-Walters 2003 and Simunovic et al. 2001). (Whilst ascribed to *Atrina fragilis*, the Mediterranean records may be of *Pinna nobilis.*)

Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes

Dossier for:

Deep Sponge Communities (CR.HCR.DpSp)

Research undertaken by: Dr Keith Hiscock and Hugh Jones, Marine Life Information Network, Marine Biological Association, Plymouth PL1 2PB

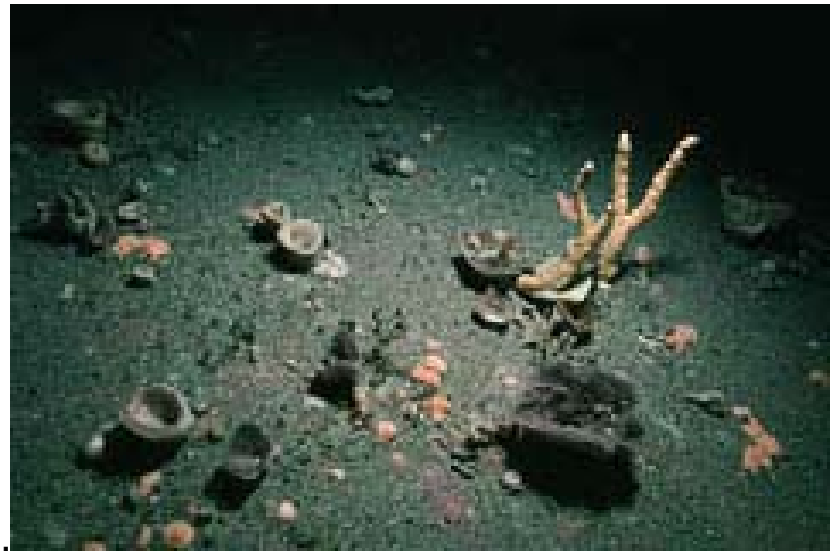

Plate 1. The biotope CR.HCR.DPSP.PhaAxi (*Phakellia ventilabrum* and axinellid sponges on deep, wave-exposed circalittoral rock). (Image from: www.jncc.gov.uk/marine/biotopes/biotope.aspx?biotope=JNCCMNCR00002113)

Plate 2. The biotope MCR.ErSSwi (Erect sponges and *Swiftia pallida* on slightly tide-swept moderately exposed circalittoral rock) from the 1997 classification (Connor et al. 1997). MCR.ErSSwi is similar to CR.HCR.DpSp. (Image source: JNCC)

Plate 3. A deep sponge biotope photographed at 25m depth at Gap Point in the Isles of Scilly and most likely CR.HCR.DpSp. (Image: © Keith Hiscock)

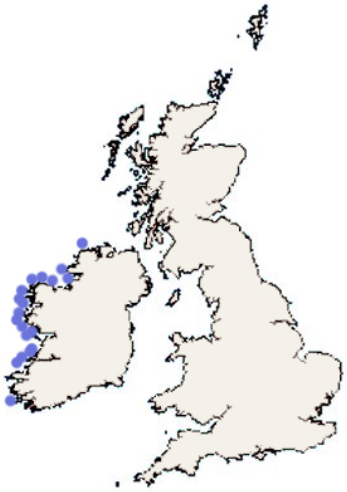

Figure 1. Recorded distribution of biotope complex CR.HCR.DpSp within the UK and Ireland (re-drawn from: http://www.jncc.gov.uk/marine/biotopes/biotope.aspx?biotope =JNCCMNCR00002122). (Further analysis of datasets is believed to be required and occurrences in western Scotland and the Isles of Scilly at least are likely.)

Basic information

The biotope complex CR.HCR.DpSp includes one biotope CR.HCR.DPSP.PhaAxi (*Phakellia ventilabrum* and axinellid sponges on deep, wave- exposed circalittoral rock) which occurs on the upper faces of deep wave-exposed circalittoral rock and is subject to negligible tidal streams (Connor et al. 2003). The sponge component of CR.HCR.DpSp is the most striking feature, with the sponges *Phakellia ventilabrum*, *Axinella infundibuliformis*, *Axinella dissimilis* and *Stelligera stuposa* dominating. Other sponge species frequently found on exposed rocky coasts are also present in low to moderate abundance. The cup coral *Caryophyllia smithii* and the anemone *Corynactis virdis* may be locally abundant in some areas, along with the holothurian *Holothuria forskali*. The soft corals *Alcyonium digitatum* and *Alcyonium glomeratum* are frequently observed. The bryozoans *Pentapora foliacea* and *Porella compressa* are also more frequently found in this deep-water biotope complex. Bryozoan crusts such as *Parasmittina trispinosa* are also occasionally recorded. Isolated clumps of large hydroids such as *Nemertesia antennina*, *Nemertesia ramosa* and *Sertularella gayi* may be seen on the tops of boulders and rocky outcrops. Large echinoderms such as *Echinus esculentus*, *Luidia ciliaris*, *Marthasterias glacialis*, *Strichastrella rosea*, *Henricia oculata* and *Aslia lefevrei* may also be present. The sea fan *Eunicella verrucosa* may be locally common, the top shell *Calliostoma zizyphinum* is often recorded as present (Connor et al. 2003).

Reported distribution

CR.HCR.DpSp is currently identified only from the west coast of Ireland on www.jncc.gov.uk/marine/biotopes. However, CR.HCR.DpSp appears very similar to MCR.ErSSwi (Erect sponges and *Swiftia pallida* on slightly tide-swept moderately exposed circalittoral rock, found on the west coast of Scotland) in the 1997 classification (Connor et al. 1997a). However, it has not been possible to match MCR.ErSSwi to a category in the 2003 classification. CR.HCR.DPSP.PhaAxi also appears similar to deep (<30 m) sponge dominated biotopes on open coast tide-sheltered areas on the east coast of St Mary's Isles of Scilly (K. Hiscock, own observations).

Overall, it is felt that there are probably several locations in Britain where at least very similar communities of species in the habitats characteristic of CR.HCR.DPSP.PhaAxi occur, i.e., the existing distribution map for CR.HCR.DpSp illustrated here is incomplete.

Biology and sensitivity key information

There is no *MarLIN* Biology and Sensitivity Key Information Review for biotope CR.HCR.DpSp (version 03.02 Connor et al. 2003) or MCR.PhaAxi (version 97.6 Connor et al. 1997) which is the predecessor to CR.HCR.DpSp.

Sensitivity of the biotope may be represented in part by research undertaken for the *MarLIN* review of MCR.ErEun (Erect sponges, *Eunicella verrucosa* and *Pentapora fascialis* on slightly tide-swept moderately exposed circalittoral rock) where sensitivity to substratum loss, physical abrasion and displacement is rated as 'Very High' (see www.marlin.ac.uk for definitions of Intolerance and Recoverability and Sensitivity). Little is known of the longevity and recruitment prospects for the sponges that characterise CR.HCR.DpSp but evidence from monitoring studies at Lundy (Hiscock, 1994) suggests that growth of *Axinella dissimilis* (as *Axinella polypoides*) and *Homaxinella subdola* is no more than about 2 mm a year (the sponges grow to a height of up to about 300 mm) and that all branching sponges included in photographic monitoring over a period of four years exhibited very little or no growth in that time. Furthermore, no recruitment of sponges was observed.

The predominance of erect sponges in CR.HCR.DpSp is likely to mean that the biotope will not recover following loss.

Application of the criteria for special importance

Proportional importance

Currently identified only from the west and north-west coasts of Ireland, CR.HCR.DpSp is recorded in depths below 30m and typically up to 50m. With the biotope occuring at such depths and probably deeper, it is possible that the biotope is more widely spread than the dataset indicates as it is beyond the depth of most diving surveys (Connor et al. 2003). Recent video recording of deep (50-70 m) rock habitats in the Isles of Scilly, reveal several locations with examples most likely of CR.HCR.DpSp (analysis by Dr K. Hiscock of video tapes supplied by Dr D. Parry). The closest European descriptions of this biotope from the EUNIS Habitat Classification version 2.2 (Davies and Moss 2002) are codes**:** A3.A1 - Animal communities of deep circalittoral rock habitats exposed to weak or no currents, and code**:**A3.91 - Animal communities of deep circalittoral rock habitats exposed to moderately strong currents. Both descriptions fail to specify a similar decription of CR.HCR.DpSp beyond habitat level 2, and therefore the distribution of this biotope outside UK and Irish waters remains unknown.

Until analysis of datasets or collation of observations from other regions of the north-east Atlantic occurs, Britain and Ireland must be considered to hold a high proportion of this biotope globally. However, it is unlikely that the UK will have as extensive a representation of the biotope as indicated for western Ireland. Nevertheless, the UK population is likely to hold a sufficient proportion of the known occurrence of this biotope to identify it as regionally important ("Globally important" is not relevant as the biotope is unlikely to occur with the same species outside of the north-east Atlantic.)

Verdict: Probably meets criterion based on available information

Rarity

It is possible that the biotope is more widespread than the dataset indicates as it is beyond the depth of most surveys (Connor et al. 2003). Examples of this biotope include species recognised under marine natural heritage importance lists (Table 1).

Within the UK seas, it is expected that the biotope will be scarce rather than rare but more data analysis is needed.

Verdict: Borderline case based on available information

Application of the criteria for threatened/declined features

Decline

Evidence for any decline in extent of occurrence of CR.HCR.DpSp is very sparse. Hiscock (1994) observes that, at Lundy, several branching sponges in monitoring sites were 'missing' in 1986 following persistent easterly gales and subsequent studies revealed no recovery. Populations of erect sponges at Lundy are likely to have been depleted by museum collecting in the early 1970's but no quantitative observations have been made. Bernard Picton (Ulster Museum, pers. comm.) has observed erect sponge communities on low rocks off Rathin Island (Northern Ireland) destroyed by scallop dredging although there are no return surveys to see if recovery is occurring. Loss of populations in recent years is most likely small but significant because of restricted occurrence.

Decline is unlikely to have been significant in terms of extent of occurrence.

Verdict: Unlikely to meet criterion

Threat of significant decline

The biotope occurs mainly in rocky areas that are unlikely to be subject to mobile fishing gear. Other factors that may adversely affect the biotope include collecting for natural history studies and it would be expected that knowledge of longevity and likely nil recovery of species would discourage collecting. There is a threat of collection of sponges for biomedical purposes. Sponges, including the nationally scarce *Axinella damicornis*, have medical potential. "Significant decline" cannot be viewed only in terms of quantity but the lasting effects must be considered. Any decline in the occurrence of CR.HCR.DpSp is likely to be permanent and therefore significant to natural heritage values.

Verdict: Probably meets criterion

Overall Verdict:

Probably meets Proportional importance, borderline for rarity and probably for threat of significant decline criteria: should be on the list of nationally important features.

Other available information

Table 1: Summary of species found within MNCR Biotope CR.HCR.DpSp and recognised under Marine Natural Heritage Importance Designations.

Species	Marine Natural Heritage Designation
Alcyonium glomeratum	Biodiversity – Long list (Plowman 1995)
Axinella damicornis	Nationally Scarce Marine Species
Echinus esculentus	IUCN (1994) - Lower risk least concern
Eunicella verrucosa	Biodiversity - long list (Plowman 1995), IUCN (pre-1994) - rare, UK B.A.P. Priority Species List, WCA 1981 Schedule 5 Section 9.1 (Injuring/Killing)(Taking), WCA 1981 Schedule 5 Section 9.2, WCA 1981 Schedule 5 Section 9.5a, WCA 1981 Schedule 5 Section 9.5b.
Tritonia nilsodhneri	Nationally Scarce Marine Species

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Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes

Dossier for:

Mixed kelp with foliose red seaweeds, sponges and ascidians on sheltered, tide-swept infralittoral rock (IR.HIR.Ksed.XKT)

Research undertaken by: Dr Keith Hiscock and Hugh Jones, Marine Life Information Network, Marine Biological Association, Plymouth PL1 2PB.

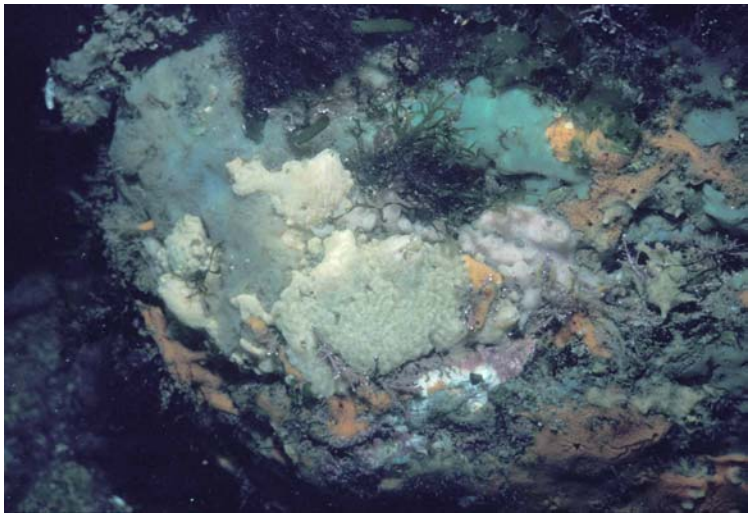

Plate 1. Part of IR.HIR.Ksed.XKT biotope in Linnhe Mhurich rapids, Loch Sween. (Image: © Keith Hiscock)

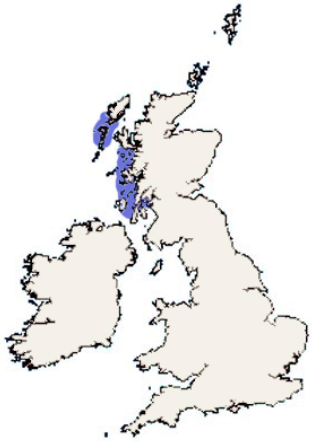

Figure 1. Reported and expected distribution of IR.HIR.Ksed.XKT (based on distribution of SIR.Lsac.T (Hiscock 2001) and descriptions from Connor et al. 2003).

Basic information

Stable, tide-swept rock characterised by dense kelp *Laminaria hyperborea* and/or *Laminaria saccharina* forest on scoured, coralline-encrusted rock. This biotope occurs in

the sheltered narrows and sills of Scottish sea lochs, where there is an increase in tidal flow. Although L. *hyperborea* (typically Common) generally occurs in greater abundance than *L. saccharina* (Frequent), either kelp may dominate, sometimes to the exclusion of the other (this biotope should not be confused with sheltered but silted LhypLsac). Large stands of the brown seaweed *Halidrys siliquosa* may also occur amongst the kelp along with *Dictyota dichotoma* on bedrock and boulders. In contrast to the scoured rock surface the kelp stipes themselves often support prolific growths of foliose red seaweeds such as *Phycodrys rubens, Membranoptera alata, Delesseria sanguinea* and *Plocamium cartilagineum*. Other foliose seaweeds may be present among the kelp holdfasts include *Chondrus crispus* and *Dilsea carnosa*. The scoured rock surface is characterised by encrusting coralline algae, barnacles *Balanus crenatus* and the tube-building polychaete *Pomatoceros triqueter*. The sponge *Halichondria panicea*, anthozoans *Urticina felina, Anemonia viridis* and *Sagartia elegans* can also occur on the scoured rock. Sponges, particularly *Halichondria panicea* and colonial and solitary ascidians *Botryllus schlosseri* and *Ascidiella aspersa* encrust the stipes, whilst hydroid growth of *Obelia geniculata* and seamats *Membranoptera membranacea* can cover the fronds, optimising the increased tidal flow. Mobile species such as the gastropod *Gibbula cineraria* can often be found on and around the kelp. The echinoderms *Asterias rubens, Ophiothrix fragilis* and *Echinus esculentus* can be found underneath the kelp canopy on the rock along with the crab *Carcinus maenas*. Where some protection is afforded from the scour anthozoans may occur on the rock such as *Alcyonium digitatum* or *Metridium senile* (Connor et al. 2003).

Reported distribution

IR.HIR.Ksed.XKT is reported as occurring specifically in the sheltered narrows and sills of Scottish sea lochs (SIR.Lsac.T in the 1997 classification was also recorded from the Menai Strait and at sites in west Wales and south Cornwall and Devon.)

Biology and sensitivity key information

The biotope (as SIR.Lsac.T) has a high intolerance to several factors that will destroy the habitat. Recoverability potential, if the same habitat remains after disturbance, is considered moderate and therefore sensitivity moderate (Hiscock 2001). However, it is notable that the human activities that are likely to damage IR.HIR.Ksed.XKT are often irreversible or very difficult to reverse and sensitivity would be very high to activities such as causeway building.

Application of the criteria for special importance

Proportional importance

There are no European descriptions of this biotope from the EUNIS Habitat Classification version 2.2 (Davies and Moss 2002) and therefore the distribution of this biotope beyond UK waters remains unknown. However, the biotope is likely to occur in the narrows between islands or at the entrance to fjordic or fjardic features in Scandinavia.

Verdict: Data deficient

Rarity

This biotope is, in part, similar to previous biotope SIR.Lsac.T (version 97.06) (Connor et al. 1997) which is included in an interest feature of the Habitats Directive Annex 1 Habitat 'Coastal lagoons'. Further it forms part of the UK Biodiversity Action Plans for 'Tidal Rapids' 'Saline lagoons' and 'Inshore subtidal rock'.

Current description of this biotope suggests it is primarily only found in Scottish sea lochs. Whilst SIR.Lsac.T is only recorded in two sea loch areas (Loch Roag, Lochs Leurbost and Erisort) (Beaver & Dipper 2002) this biotope is known to occur in other sea loch locations with a 'classic' example being Linne Mhurich rapids in Loch Sween, Argyll. So, although the biotope would be considered rare from available data that has been analysed, it is more likely a 'scarce' biotope. The restricted (small areas) in which it occurs does, though, make those locations important for the conservation of the biotope.

Verdict: Does not meet criterion

Application of the criteria for threatened/declined features

Decline

Building causeways across narrow tidal channels is a popular way of linking islands or 'short-circuiting' other links in the Outer Hebrides. Such causeways are usually solid barriers stopping water flow. It is possible that some examples of the IR.HIR.Ksed.XKT biotope may have been lost.

Verdict: Probably meets criterion

Threat of significant decline

The sorts of narrow shallow sounds where IR.HIR.Ksed.XKT occurs are attractive for bridging. Further examples of IR.HIR.Ksed.XKT may be lost if solid causeways are constructed.

Verdict: Meets criterion

Overall Verdict

Data deficient for Proportional importance, unlikely to meet criterion for Rarity, probably meets 'Decline' and meets 'Threat of significant decline' criteria: should be on list of nationally important features.

References

Connor, D W Allen, J H Golding, N Lieberknecht, L M Northen, K O and Reker, J B (2003) *The National Marine Habitat Classification for Britain and Ireland Version 03.02*.[on-line]. Joint Nature Conservation Commitee.12/12/03. Available from http://www.jncc.gov.uk/marine/biotopes/default.htm

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Davies, C E & Moss, D (2002) *EUNIS Habitat Classification. Final Report to the European Topic Centre on Nature Protection and Biodiversity*. European Environment Agency

Hiscock, K (2001) *Laminaria saccharina, foliose red seaweeds, sponges and ascidians on tide-swept infralittoral rock*. [On-line]. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme.18/12/2003. Available from http://www.marlin.ac.uk

Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes

Dossier for:

Intertidal mussel beds (Mixed sediment shores with mussels) (LS.LMX.LMus)

Research undertaken by: Dr Keith Hiscock and Hugh Jones, Marine Life Information Network, Marine Biological Association, Plymouth PL1 2PB.

Plate 1. Photograph of LS.LMX.Lmus as SLR.MytX (*Mytilus edulis* beds on eulittoral mixed substrata) (Image from: www.jncc.gov.uk/mermaid).

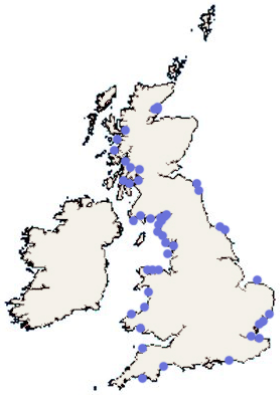

Figure 1. Recorded and expected distribution of biotope complex LS.LMX.Lmus in the UK and Ireland

Basic information

Mixed sediment shores characterised by beds of adult mussels *Mytilus edulis* occur principally on mid and lower eulittoral mixed substrata (mainly cobbles and pebbles on muddy sediments) in a wide range of exposure conditions. In high densities the mussels bind the substratum and provide a habitat for many infaunal and epifaunal species. This biotope is also found in lower shore tide-swept areas, such as in the tidal narrows of Scottish sea lochs. A fauna of dense juvenile mussels may be found in sheltered firths, attached to algae on shores of pebbles, gravel, sand, mud and shell debris with a strandline of fucoid algae. There are two biotopes in this biotope complex, **LS.LMX.LMUS.MytFab** (*Mytilus edulis* and *Fabricia sabella* in littoral mixed sediment) and **LS.LMX.LMUS.Myt** (*Mytilus edulis* on littoral sediments). Samples of the former are mainly infaunal, and of the latter mainly epifaunal (Connor et al. 2003). There are three sub-biotopes in LS.LMX.LMUS.Myt:

LS.LMX.LMUS.Myt.Mu *Mytilus edulis* beds on littoral sand.

LS.LMX.LMUS.Myt.Sa *Mytilus edulis* beds on littoral sand.

LS.LMX.LMUS.Myt.Mx *Mytilus edulis* beds on littoral mixed substrata.

Reported distribution

The biotope complex is widely distributed.

Biology and sensitivity key information

There is no *MarLIN* Biology and Sensitivity Key Information Review for biotope complex LS.LMX.LMus (version 03.02 Connor et al. 2003) or SLR.Mx.Myt (version 97.6 Connor et al. 1997) which is the predecessor to LS.LMX.LMus. Biotope MLR.MytFves has been researched and used to represent the sensitivity of LS.LMX.LMus (see: www.marlin.ac.uk/biotopes/bio_basicinfo_MLR.MytFves.htm). The biotope IMX.MytV (*Mytilus edulis* beds on variable salinity infralittoral mixed sediment) has also been researched (Tyler-Walters 2001) is also similar and has been used here to assess sensitivity.

LS.LMX.LMus is likely to show 'high' intolerance to physical disturbance (wave exposure, displacement, and smothering) and chemical factors (hydrocarbon compounds). Recovery is recorded as 'moderate' as a single good recruitment event may recolonize the substratum within a year. However, recovery may take up to 5 years, and is some circumstances significantly longer. For instance, Edwards (1997) notes that the commercial development of natural beds is hampered by sporadic and unpredictable recruitment. Overall sensitivity is recorded as 'moderate'.

Application of the criteria for special importance

Proportional importance

The closest European description of LS.LMX.LMus from the EUNIS Habitat Classification version 2.2 (Davies and Moss 2002) is code A2.411/B-LMX.MytFab - *Mytilus edulis* and *Fabricia sabella* in poorly-sorted muddy sand or muddy gravel shores. This is biotope LS.LMX.LMUS.MytFab and is described from only two European sites (Dornoch Firth and Moray Firth). The other biotopes described in this complex are widely distributed across the UK, but no satisfactory description of them exists at present in the EUNIS classification.

It is likely that much more extensive mussel beds that may constitute the biotope complex occur elsewhere in Europe as evidenced by the harvesting of mussels from such beds where British mussel production is relatively small comprising only 5% of total European Community production (Edwards, 1997).

Verdict: Does not meet criterion

Rarity

This biotope complex is widely distributed across the UK although the biotope MytFab has a far more limited distribution being only recorded at 2 sites, which would suggest that this biotope would realise the 'rare' criterion.

No characterising species of this biotope complex are listed in any marine conservation designations, however the biotope is included in the Habitat Directive Annex I habitat 'Mudflats and sandflats not covered by sea water at low tide'.

Verdict: Does not meet criterion

Application of the criteria for threatened/declined features

Decline

LS.LMX.LMus biotopes may vary greatly in extent and abundance with time. They are subject to catastrophic events such as displacement by storms or consumption by starfish *Asterias rubens*. They may also be fished in an unsustainable way. Studies of variability in extent of mussel beds in the UK that may help in assessing 'Decline' have not been

found. However, studies on the North Sea coast of continental Europe suggest that distribution of beds over periods of up to 50 years remained rather constant with abundances of the mussels varying considerably due to irregular mass spat fall, ice drift, storm surges and parasitism (reviewed in Holt et al. 1998). Overall, mussel beds are not believed to be in long-term decline.

Verdict: Does not met criterion

Threat of significant decline

Mussel beds are not believed to be significantly threatened by pollution but may be reduced in extent and possibly in an unsustainable way by fisheries. However, recruitment and likely recovery is rapid and overall, beds of mussels are not, in the UK, believed to be threatened by decline.

Verdict: Does not meet criterion

Overall Verdict:

LS.LMX.LMus does not meet any of the criteria: should not be on the list of nationally important features

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Connor, D W Allen, J H Golding, N Lieberknecht, L M Northen, K O and Reker, J B (2003). *The National Marine Habitat Classification for Britain and Ireland Version 03.02*. Peterborough, Joint Nature Conservation Committee ISBN 1 86107 546 4 (internet version)

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Tyler-Walters, H (2001). *Mytilus edulis* beds on variable salinity infralittoral mixed sediment IMX.MytV. *Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme* [on-line]. Plymouth: Marine Biological Association of the United Kingdom. [cited 26/11/2003]. Available from: http://www.marlin.ac.uk

Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes

Dossier for:

Deep water mud basins (Marine Landscape)

Research undertaken by: Dr Keith Hiscock and Hugh Jones, Marine Life Information Network, Marine Biological Association, Plymouth PL1 2PB.

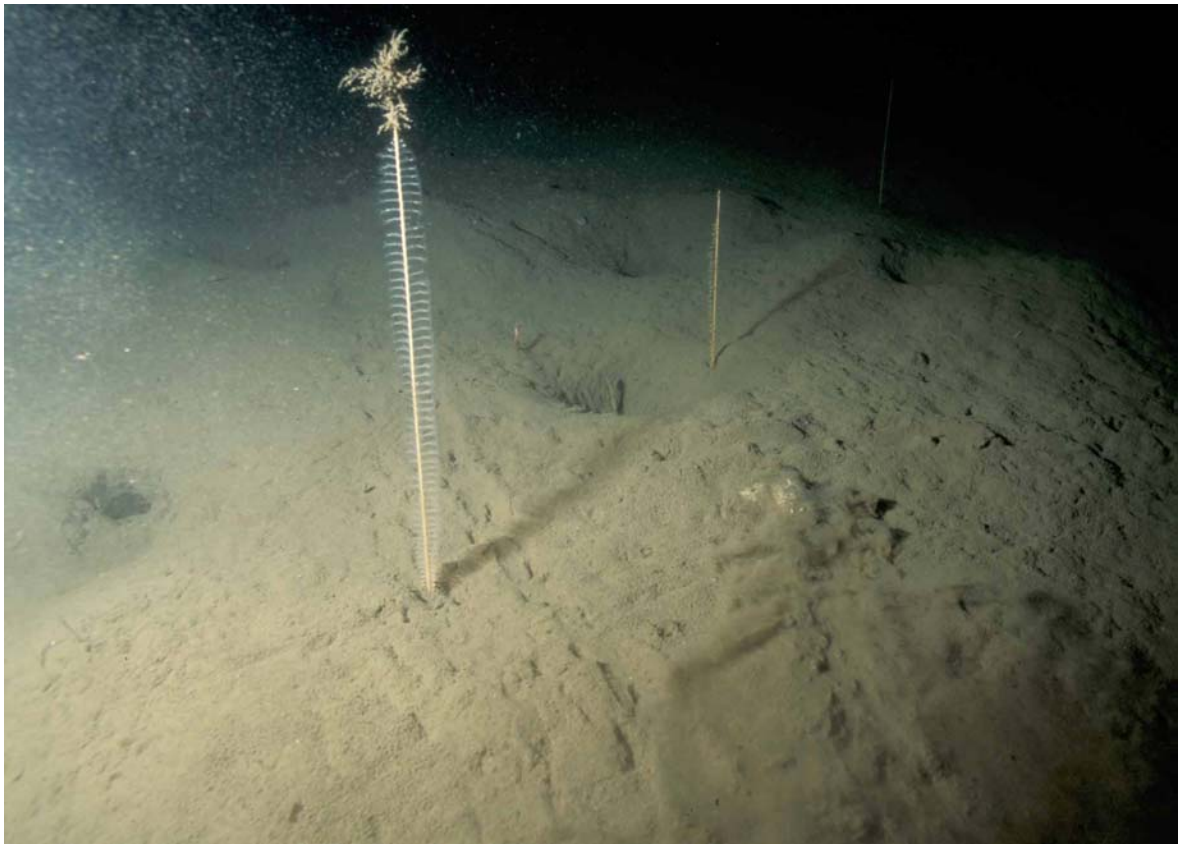

Plate 1. A deep mud basin with the sea pen *Virgularia mirabilis* and burrows of *Nephrops norvegicus*. Loch Duich. (Image: © Keith Hiscock)

Figure 1. Expected distribution of deep water mud basins around Britain and Ireland (map not available).

Basic information

Deep water mud basins are described as circalittoral mud's located in water in excess of 50m depth, and occurring within depressions of the seabed which are subject to very weak currents (Golding et al. 2003). In this review, those mud basins are taken to include deeper parts of sea lochs although it is recognised that assumption creates a marine landscape within a marine landscape.

Table 1. Summary of biotopes found within Deep water mud basins and recognised as constituting the UK Biodiversity Action Plan Habitat. The comparative biotopes for The National Marine Habitat Classification for Britain and Ireland - Version 03.02 (Connor et al. 2003) (received from Dr. K. Howell pers. comm.)

1997 Marine Biotope Classification (Version 97.06) (Connor et al. 1997).	**Comparative biotope for The National Marine Habitat Classification for Britain and Ireland – Version 03.02 (Connor et al. 2003)**	**Marine Natural Heritage Designation**
COS.Sty *Styela gelatinosa* and other solitary ascidians on very sheltered deep circalittoral muddy sediment (Partly fulfils SMU.Omu).	**SMU.Omu** Circalittoral offshore cohesive sandy mud and mud communities.	U.K. Biodiversity Action Plan – Mud Habitats in deep water. Nationally Rare Marine Biotope.
COS.ForThy Foraminiferans and Thyasira sp. in deep circalittoral soft mud (Partly fulfils SMU.Omu).	**SMU.Omu** Circalittoral offshore cohesive sandy mud and mud communities.	U.K. Biodiversity Action Plan – Mud Habitats in deep water.
COS.AmpPar *Ampharete falcata* turf with *Parvicardium ovale* on cohesive muddy very fine sand near margins of deep stratified seas (Partly fulfils SMU.Omu).	**SMU.Omu** Circalittoral offshore cohesive sandy mud and mud communities.	U.K. Biodiversity Action Plan – Mud Habitats in deep water.
CMS.AbrNucCor *Abra alba, Nucula nitida* and *Corbula gibba* in circalittoral muddy sand or slightly mixed sediment.		U.K. Biodiversity Action Plan – Mud Habitats in deep water.
CMU.BriAchi *Brissopsis lyrifera* and *Amphiura chiajei* in circalittoral mud (Partly fulfils SMU.CfiMu).	**SMU.CfiMu** Circalittoral (deep) marine mud communities.	U.K. Biodiversity Action Plan – Mud Habitats in deep water.
CMU.SpMeg Seapens and burrowing megafauna in circalittoral soft mud (Partly fulfils SMU.CfiMu).	**SMU.CfiMu** Circalittoral (deep) marine mud communities.	U.K. Biodiversity Action Plan – Mud Habitats in deep water.

CMU.SpMeg.Fun Seapens, including *Funiculina quadrangularis*, and burrowing megafauna in undisturbed circalittoral soft mud (Partly fulfils SMU.CfiMu).	S**MU.CfiMu** Circalittoral (deep) marine mud communities.	U.K. Biodiversity Action Plan – Mud Habitats in deep water.
No Previous code.	**SMU.CsaMu** Circalittoral cohesive sandy mud and muddy sand.	U.K. Biodiversity Action Plan – Mud Habitats in deep water.

Table 2. Summary of species found within Deep Water Mud Basin Biotopes and recognised under Marine Natural Heritage Importance Designations.

Species	**Marine Natural Heritage Designation**	**97.06 Biotope**
Pachycerianthus multiplicatus	Biodiversity – Long list (Plowman 1995) Nationally scarce species	CMU.SpMeg CMU.SpMeg.Fun
Funiculina quadrangularis	Species statement in UK Biodiversity Action Plans Nationally scarce species	CMU.SpMeg.Fun
Styela gelatinosa	UK B.A.P. Priority Species List Nationally rare species	COS.Sty

Biology and Key Sensitivity Information Review

There is at present no *MarLIN* Biology and Sensitivity Key Information Review for Landscapes within the *MarLIN* Web pages, however *MarLIN* Biology and Sensitivity Key Information Reviews do exist for key biotopes which occur within deep water mud basins. In the work undertaken by the MBA for JNCC in the Irish Sea Pilot, the following biotopes (likely dominant biotope in terms of extent are shown in bold) were especially linked to Deep water mud basins:

CMU.BriAchi - *Brissopsis lyrifera* and *Amphiura chiajei* in circalittoral mud

COS.AmpPar - *Ampharete falcata* turf with *Parvicardium ovale* on cohesive muddy very fine sand near margins of deep stratified seas

COS.ForThy - Foraminiferans and *Thyasira* sp. in deep circalittoral soft mud

CMU.SpMeg - Seapens and burrowing megafauna in circalittoral soft mud

CMS.AbrNucCor - *Abra alba*, *Nucula nitida* and *Corbula gibba* in circalittoral muddy sand or slightly mixed sediment

The information outlined in Tyler-Walters et al. (2003) suggests that the benthic communities of deep mud basins in the Irish Sea are of **intermediate tolerance** to physical disturbance at the benchmark level but that most species would probably **recover**

within ca 5 years, suggesting a **sensitivity of low**. Recovery will be slower where long-lived, slow growing species are recorded. Such species may include the fireworks anemone *Pachycerianthus multiplicatus* which is present in Scottish sea loch deep mud basins.

Application of the criteria for special importance

Proportional importance

Maps showing the distribution of deep water mud basins have not been located. It seems likely that there are extensive and well-developed deep water mud basins in Scandinavian fjords, in the Kattegat (Petersen 1918) and the Grand Vasière off Gascony, France at least in the north-east Atlantic. Deep water mud basins also occur in the Mediterranean. It is notable that a case is being made (see http://www.ngo.grida.no/wwfneap/Publication/briefings/GrandeVasiere.pdf) for the Grand Vasière to be "a showcase example for the OSPAR System of marine protected areas". Deep water mud basins within UK territorial seas or the UK EEZ are unlikely to constitute a major proportion of the north-east Atlantic resource for this marine landscape.

Verdict: Unlikely to meet criterion

Rarity

Tables 1 and 2 identify designations that apply to biotopes and species that are part of deep mud basins. Only **COS.Sty** *Styela gelatinosa* and other solitary ascidians on very sheltered deep circalittoral muddy sediment (Connor 1997) is a rare biotope together with its characterising species. It may be that the nationally rare fan mussel *Atrina fragilis* also occurs in deep soft mud.

Verdict: Does not meet criterion

Application of the criteria for threatened/declined features

Decline

Whilst the physical habitat is unlikely to decline, the biotopes that characterise the habitat are likely to have been substantially changed by fishing activities especially for the Norway lobster *Nephrops norvegicus*. Le Coc'h and Hiley (in press) found that in the Grand Vasière, only 82 of the 144 (in 1966) and 150 (in 2000) species sampled by dredge were common to both surveys and only 28% of stations were similar in community composition. Ball et al. (2000) also describe significant change to benthic communities in areas dredged for *Nephrops*. In a personal communication to K. Hiscock following the presentation of the paper by Le Coc'h and Hiley at the 2003 European Marine Biology Symposium, Christian Hiley indicated that epifauna species in particular had been adversely affected by demersal fishing and that the fan mussel *Atrina fragilis* may have been made locally extinct in the area. There is therefore a suspected significant decline in fragile (epifaunal) species including some rare or scarce species in Deep mud basins and the habitat is likely to have lost several of its natural components. The extent of change due to human activities is likely to be substantial (see Le Coc'h and Hiley, in press).

Verdict: Meets criterion

Threat of significant decline

Expansion of trawling activities especially in restricted areas such as the deep mud basins of the Scottish sea lochs is likely to cause further decline in the abundance of erect epifaunal species.

Verdict: Meets criterion

Overall Verdict:

Biotopes characteristic of deep mud basins are likely to be quantitatively and qualitatively changed with the loss if some sensitive species as a result of human activities. Therefore the marine landscape Mud basins in deep water meets criteria of 'Decline' and 'Threat of significant decline': should be on list of nationally important features.

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Testing criteria for assessing 'national importance' of marine species, biotopes (habitats) and landscapes

Dossier for:

Sea lochs (Marine Landscape)

Research undertaken by: Dr Keith Hiscock and Hugh Jones, Marine Life Information Network, Marine Biological Association, Plymouth PL1 2PB.

Plate 1. Fjardic landscape. Neavag Bay, Benbecula, Outer Hebrides. (Image: © Keith Hiscock)

Plate 2. Fjordic sea loch. Loch Leven, western Highlands. (Image: © Keith Hiscock)

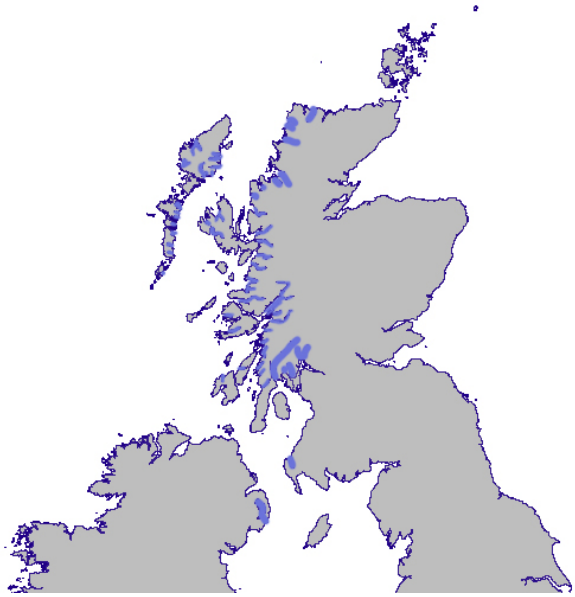

Figure 1. Distribution of fjordic and fjardic sea lochs within the UK and Ireland. (Adapted from Hiscock 1998).

Basic information

Sea lochs are separated into two distinctive types: fjordic and fjardic.

Fjordic sea lochs occur in the more mountainous areas of the Scottish west coast and islands and were formed by the scouring action of glaciers and ice sheets. The result was

Appendix D2 to this dossier indicates biotopes found in sea lochs and, where available, information on national status. There is insufficient information from other relevant locations in Europe and Scandinavia to assess regional rarity. Biotopes that occur in sea loch habitats that are rated as rare or uncommon (for instance some maerl beds, *Serpula vermicularis* reefs, *Limaria hians* beds) and do not contribute to the assessment of rarity of the sea loch landscape unit.

With in excess of 60 sea lochs present in Britain, the landscape is not considered rare.

Verdict: Does not meet criterion

Application of the criteria for threatened/declined features

Decline

The landscape feature is not in decline. However, biological features (species, biotopes) within sea lochs have been adversely affected, most likely by human activities. For instance, reefs of Serpula vermicularis have been lost from Linne Mhuirich in Loch Sween leaving only Loch Cretan as a location for them – possibly due to run-off following forest clear-felling; trawling within sea lochs is almost certainly damaging sea pens and sea anemones only found within the lochs whilst the results of scallop dredging (possibly together with nutrification and other factors) has resulted in loss of horse mussel communities in Strangford Lough (Magorrian et al. 1995). Scallop dredging may also be damaging maerl beds and removing populations of the rare fan mussel *Atrina fragilis* from within sea lochs. Fish farms are generally considered to have localised effects only but some of the basins in which they are established are small with weak tidal flow so that even a small 'footprint' is significant. All-in-all, it does seem that the quality of biological features within the sea loch marine landscape is being affected locally at least and, in some sea lochs subject to use of mobile fishing gear, extensively. There are, however, few quantitative studies to identify degree of impact from human activities.

Verdict: Probably meets criterion

Threat of significant decline

There is little evidence to suggest that significant action is being taken to identify the human activities causing damage, to quantify damage or to take measures, including precautionary measures, to prevent or reduce decline in the quality of sea loch features caused by human activities. Main 'culprits' of damage to marine natural heritage features are likely to be inappropriately sited aquaculture and the use of mobile bottom fishing gear especially.

Verdict: Probably meets criterion

Overall Verdict:

Meets criterion for Regionally Important and probably meets criterion for Decline and Threat of significant decline: should be on the list of nationally important features.

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Connor, D W (1991) *Norwegian fjords and Scottish sea lochs: a comparative study*. Peterborough, Joint Nature Conservation Committee, Marine Nature Conservation Review Report, No. MNCR/SR/18

an over-deepened basin (with some examples recording a charted depth of 200 m) or a series of basins connected to each other and to the open sea by narrow and shallow 'sills' at depths of less than 30 m, with many less than 20 m. (Anon. 1999). Fjordic lochs are deep with steep rocky sides. Strong gradients of wave exposure from outer sections to extremely sheltered inner basins occur. Freshwater influence is limited in most lochs, but water exchange between the sea and the loch may also be very limited, with a very long turnover time for the entire water body that it contains. Deep basins may have temporary or permanent thermoclines and/or haloclines and may become seasonally deoxygenated (Fowler 2003).

Fjardic sea lochs are much shallower than fjordic lochs often with a maze of islands and shallow basins connected by rapids, which are usually less than five metres deep and often intertidal. Fjardic sea lochs are found mainly in the Western Isles (Anon 1999).

The variability of sea lochs in size, shape, number of basins and length and depth of sills, produces a wide range of marine communities particularly related to substratum type and degree of exposure to tidal currents.

Biology and Key Sensitivity Information Review

There is at present no *MarLIN* Biology and Sensitivity Key Information Review for Landscapes within the *MarLIN* Web pages. However *MarLIN* Biology and Sensitivity Key Information Reviews do exist for key biotopes which occur within sea lochs (see Appendix D1 to this dossier).

Some biotopes are likely to have a high intolerance to physical disturbance and a slow recoverability. For instance, CMX.ModHo and SCR.ModHAs are likely to have a high intolerance of abrasion and physical disturbance, a low recoverability and therefore are high sensitivity (see Tyler-Walters, 2001). For the highly characteristic sea loch biotope SCR.NeoPro, many factors show high intolerance and moderate recoverability potential leading to a sensitivity of moderate (see Jackson, 2000). The deep mud biotopes present within sea lochs such as CMU.SpMeg (see Hill, 2002) are assessed as having intermediate intolerance to abrasion and physical disturbance and high recoverability so that sensitivity is low. However, if likely slow growing and long-lived species such as the fireworks anemone *Pachycerianthus multiplicatus* are affected, recovery is likely to be slow and therefore sensitivity high. With such a range of sensitivity assessments for different biotope components of sea loch landscapes sensitivity to human activities should be identified as high but intermediate or low in places.

Application of the criteria for special importance

Proportional importance

Whilst fjordic and fjardic habitats are more extensive on the western coasts of Scandinavia than in Scotland within the north-east Atlantic area, the Scandinavian fjords are subject to less water exchange and have weaker tidal flows over sills (see Connor 1991). Scottish fjordic and fjardic habitats therefore appear to be characterized by distinctive biotopes several of which do not occur or are poorly represented in Scandinavian fjordic or fjardic physiographic features

Verdict: Meets criterion for Regionally Important

Rarity

The sea loch landscape supports UK Biodiversity Action Plan habitats: 'Tidal Rapids', 'Mud Habitats in Deep Water', 'Maerl Beds', and '*Modiolus modiolus* beds' (Anon 1999).

Connor, D W Brazier, D P Hill, T O and Northen, K O (1997a) *Marine biotope classification for Britain and Ireland. Volume 1. Littoral biotopes*. Peterborough, Joint Nature Conservation Committee

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Appendix D1. Biotopes exclusively or especially found in sea lochs. Biotope codes and nomenclature are from MNCR Version 97.06 (Connor et al. 1997a,b).

Code	Name	Represented in *MarLIN* Biology and Sensitivity reviews by:
SLR.Fserr.Vs	*Fucus serratus* and large *Mytilus edulis* on variable salinity lower eulittoral rock.	**MLR.BF**
SLR.Fx.AscX.mac	*Ascophyllum nodosum* ecad *mackaii* beds on extremely sheltered mid eulittoral mixed substrata.	**SLR.Fx.AscX.mac**
SLR.FserX.T	*Fucus serratus* with sponges, ascidians and red seaweeds on tide-swept lower eulittoral mixed substrata.	**SLR.FX.FvesX**
SIR.Lsac.Pk	*Laminaria saccharina* park on very sheltered lower infralittoral rock.	**SIR.Lsac.Pk**
SIR.LsacRs.Psa	*Laminaria saccharina* and *Psammechinus miliaris* on slightly reduced salinity grazed infralittoral rock.	**SIR.LsacRs**
SIR.LhypLsac.Ft	Mixed kelps *Laminaria hyperborea* and *Laminaria saccharina* forest on sheltered upper infralittoral rock.	**SIR.LsacRs**
SIR.Lhyplsac.Pk	Mixed kelps *Laminaria hyperborea* and *Laminaria saccharina* park on sheltered lower infralittoral rock.	**SIR.LsacRs**
SIR.EchBriCC	*Echinus*, brittlestars and coralline crusts on grazed infralittoral rock.	**MIR.LhypGz**
SCR.AntAsH	*Antedon* spp., solitary ascidians and fine hydroids on sheltered circalittoral rock.	**SCR.AntAsh**
SCR.AmenCio	Solitary ascidians, including *Ascidia mentula* and *Ciona intestinalis*, on very sheltered circalittoral rock.	**SCR.SubSoAs**
SCR.AmenCio.Met	Large *Metridium senile* and solitary ascidians on grazed very sheltered circalittoral rock.	**SCR.SubSoAs**
SCR.NeoPro	*Neocrania anomala* and *Protanthea simplex* on very sheltered circalittoral rock.	**SCR.NeoPro**
SCR.ModHAs	*Modiolus modiolus* beds with fine hydroids and large solitary ascidians on very sheltered circalittoral mixed substrata.	**MCR.ModT**
CR.Ant	*Antedon bifida* and a bryozoan/hydroid turf on steep or vertical circalittoral rock.	**CR.FaV.Bug**

IGS.Phy	*Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand	**IGS.Mrl.Phy.HEc**
IGS.Lgla	*Lithothamnion glaciale* maerl beds in tide-swept variable salinity infralittoral gravel.	**IGS.Lgla**
CMS.VirOph	*Virgularia mirabilis* and *Ophiura* spp. on circalittoral sandy or shelly mud.	**CMS.VirOph**
CMS.VirOphHAs	*Virgularia mirabilis* and *Ophiura* spp. with hydroids and ascidians	**CMS.VirOph**
CMS.Ser	*Serpula vermicularis* reefs on very sheltered circalittoral muddy sand	**CMS.Ser**
IMU.AreSyn	*Arenicola marina* and synaptid holothurians in extremely shallow soft mud.	**IMU.AreSyn**
IMU.PhiVir	*Philine aperta* and *Virgularia mirabilis* in soft stable infralittoral mud	**IMU.PhiVir**
IMU.Ocn	*Ocnus planci* aggregations on sheltered sublittoral muddy sediment	**IMU.Ocn**
CMU.SpMeg	Seapens and burrowing megafauna in circalittoral soft mud	**CMU.SpMeg**
CMU.SpMeg.Fun	Seapens, including *Funiculina quadrangularis*, and burrowing megafauna in undisturbed circalittoral soft mud.	**CMU.SpMeg**
CMU.Beg	*Beggiatoa* spp. on anoxic sublittoral mud	**CMU.Beg**
IMX.Lim	*Limaria hians* beds in tide-swept sublittoral muddy mixed sediment	**IMX.Lim**
CMX.ModHo	Sparse *Modiolus modiolus*, dense *Cerianthus lloydii* and burrowing holothurians on sheltered circalittoral stones and mixed sediment	**(None)**
COS.Sty	*Styela gelatinosa* and other solitary ascidians on sheltered deep circalittoral muddy sediment	**COS.Sty**
MCR.ErSSwi	Erect sponges and *Swiftia pallida* on slightly tide-swept moderately exposed circalittoral rock	**MCR.ErSEun**
MCR.Oph.Oacu	*Ophiopholis aculeata* beds on slightly tide-swept circalittoral rock or mixed substrata.	**MCR.Oph**
IMX.Tra	Mats of *Trailliella* on infralittoral muddy gravel.	**IMX.LsacX**

Appendix D2. Summary of biotopes found within Sea lochs including matches between the MNCR Biotope classification (97.06) (Connor et al. 97a,b) and The National Marine Habitat Classification for Britain and Ireland - Version 03.02 (Connor et al. 2003) where possible. Biotopes that are included in Marine Natural Heritage Importance designations and, where information is available, national status are indicated.

1997 Marine Biotope Classification (Version 97.06) (Connor et al. 1997).	**Comparative biotope for The National Marine Habitat Classification for Britain and Ireland - Version 03.02 (Connor et al. 2003)**	**Marine Natural Heritage Designation**
SLR.Fserr.Vs *Fucus serratus* and large *Mytilus edulis* on variable salinity lower eulittoral rock.	**LR.LLR.FVS.FserVS**	
SLR.Fx.AscX.mac *Ascophyllum nodosum* ecad *mackaii* beds on extremely sheltered mid eulittoral mixed substrata.	**LR.LLR.FVS.Ascmac**	EC Habitats Directive: Reefs, Bays and Lagoons. UK BAP- *Ascophyllum nodosum* ecad mackaii beds National Status: Scarce
SLR.FserX.T *Fucus serratus* with sponges, ascidians and red seaweeds on tide-swept lower eulittoral mixed substrata.	**LR.LLR.F.Fserr.X**	
SIR.Lsac.Pk *Laminaria saccharina* park on very sheltered lower infralittoral rock.	**IR.LIR.K.Lsac.Pk** *Laminaria saccharina* park on very sheltered lower infralittoral rock.	
SIR.LsacRs.Psa *Laminaria saccharina* and *Psammechinus miliaris* on slightly reduced salinity grazed infralittoral rock.	**IR.LIR.K.Lsac.Gz** *Laminaria saccharina* and *Psammechinus miliaris* on variable salinity grazed infralittoral rock.	
SIR.LhypLsac.Ft Mixed kelps *Laminaria hyperborea* and *Laminaria saccharina* forest on sheltered upper infralittoral rock.	**IR.LIR.K.LhypLsac.Ft** Mixed *Laminaria hyperborea* and *Laminaria saccharina* forest on sheltered upper infralittoral rock.	

1997 Marine Biotope Classification (Version 97.06) (Connor et al. 1997).	Comparative biotope for The National Marine Habitat Classification for Britain and Ireland - Version 03.02 (Connor et al. 2003)	Marine Natural Heritage Designation
SIR.LhypLsac.Pk Mixed kelps *Laminaria hyperborea* and *Laminaria saccharina* park on sheltered lower infralittoral rock	**IR.LIR.K.LhypLsac.Pk** Mixed *Laminaria hyperborea* and *Laminaria saccharina* park on sheltered lower infralittoral rock	
SIR.EchBriCC *Echinus*, brittlestars and coralline crusts on grazed infralittoral rock.	**?**	
SCR.AntAsH *Antedon* spp., solitary ascidians and fine hydroids on sheltered circalittoral rock.	**CR.LCR.BRAS.AntAsH** *Antedon* spp., solitary ascidians and fine hydroids on sheltered circalittoral rock	EC Habitats Directive: Reefs, Bays National Status : Uncommon
SCR.AmenCio Solitary ascidians, including *Ascidia mentula* and *Ciona intestinalis*, on very sheltered circalittoral rock.	**CR.LCR.BRAS.AmenCio** Solitary ascidians, including *Ascidia mentula* and *Ciona intestinalis*, on wave-sheltered circalittoral rock	
SCR.AmenCio.Met Large *Metridium senile* and solitary ascidians on grazed very sheltered circalittoral rock.	**?**	
SCR.NeoPro *Neocrania anomala* and *Protanthea simplex* on very sheltered circalittoral rock.	**CR.LCR.BRAS.NeoPro.FS** *Neocrania anomala* and *Protanthea simplex* on very wave-sheltered circalittoral rock	EC Habitats Directive: Reefs, Bays National Status : Uncommon
SCR.ModHAs *Modiolus modiolus* beds with fine hydroids and large solitary ascidians on very sheltered circalittoral mixed substrata.	**?**	
CR.Ant *Antedon bifida* and a bryozoan/hydroid turf on steep or vertical circalittoral rock.	**CR.FCR.FAV.Ant ?**	

1997 Marine Biotope Classification (Version 97.06) (Connor et al. 1997).	Comparative biotope for The National Marine Habitat Classification for Britain and Ireland - Version 03.02 (Connor et al. 2003)	Marine Natural Heritage Designation
IGS.Phy *Phymatolithon calcareum* maerl beds in infralittoral clean gravel or coarse sand	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	
IGS.Lgla *Lithothamnion glaciale* maerl beds in tide-swept variable salinity infralittoral gravel.	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	EC Habitats Directive: Bays, Sandbanks, Lagoons. UK BAP: Maerl Beds National Status: Scarce
CMS.VirOph *Virgularia mirabilis* and *Ophiura* spp. on circalittoral sandy or shelly mud.	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	EC Habitats Directive: Bays. UK BAP: Mud Habitats in Deep Water. National Status: Common
CMS.VirOphHAs *Virgularia mirabilis* and *Ophiura* spp. with hydroids and ascidians	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	EC Habitats Directive: Bays. UK BAP: Mud Habitats in Deep Water. National Status: Common
CMS.Ser *Serpula vermicularis* reefs on very sheltered circalittoral muddy sand	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	EC Habitat Directive: Reefs, Bays UK BAP: *Serpula vermicularis* reefs National Status: Rare
IMU.AreSyn *Arenicola marina* and synaptid holothurians in extremely shallow soft mud.	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	EC Habitat Directive: Bays, Lagoons UK BAP: Saline Lagoons
IMU.PhiVir *Philine aperta* and *Virgularia mirabilis* in soft stable infralittoral mud	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	EC Habitat Directive: Bays, Lagoons UK BAP: Mud habitats in deep water National Status: Uncommon

1997 Marine Biotope Classification (Version 97.06) (Connor et al. 1997).	Comparative biotope for The National Marine Habitat Classification for Britain and Ireland - Version 03.02 (Connor et al. 2003)	Marine Natural Heritage Designation
IMU.Ocn *Ocnus planci* aggregations on sheltered sublittoral muddy sediment	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	
CMU.SpMeg Seapens and burrowing megafauna in circalittoral soft mud	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	EC Habitat Directive: Bays UK BAP: Mud habitats in deep water
CMU.SpMeg.Fun Seapens, including *Funiculina quadrangularis*, and burrowing megafauna in undisturbed circalittoral soft mud.	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	EC Habitat Directive: Bays UK BAP: Mud habitats in deep water
CMU.Beg *Beggiatoa* spp. on anoxic sublittoral mud	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	EC Habitat Directive: Bays, Lagoons UK BAP: Mud habitats in deep water
IMX.Lim *Limaria hians* beds in tide-swept sublittoral muddy mixed sediment	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	EC Habitat Directive: Bays National Status: Scarce
CMX.ModHo Sparse *Modiolus modiolus*, dense *Cerianthus lloydii* and burrowing holothurians on sheltered circalittoral stones and mixed sediment	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	
COS.Sty *Styela gelatinosa* and other solitary ascidians on sheltered deep circalittoral muddy sediment	Sublittoral Sediment Classification not currently available from Connor et al. 2003.	U.K. BAP: Mud habitats in deep water. National Status: Rare

1997 Marine Biotope Classification (Version 97.06) (Connor et al. 1997).	Comparative biotope for The National Marine Habitat Classification for Britain and Ireland - Version 03.02 (Connor et al. 2003)	Marine Natural Heritage Designation
MCR.ErSSwi Erect sponges and *Swiftia pallida* on slightly tide-swept moderately exposed circalittoral rock	**In part:** **CR.MCR.ECCR.CarSwi.Aglo** *Caryophyllia smithii*, *Swiftia pallida* and *Alcyonium glomeratum* on wave-sheltered circalittoral rock. And **CR.MCR.ECCR.CarSwi.LgAs** *Caryophyllia smithii*, *Swiftia pallida* and large solitary ascidians on exposed or moderately exposed circalittoral rock.	
MCR.Oph.Oacu *Ophiopholis aculeata* beds on slightly tide-swept circalittoral rock or mixed substrata.	**?**	
IMX.Tra Mats of *Trailliella* on infralittoral muddy gravel.	Infralittoral Sediment Classification not currently available from Connor et al. 2003.	