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SELECTION CRITERIA AND GUIDING PRINCIPLES FOR SELECTION OF SPECIAL AREAS OF CONSERVATION (SACS) FOR MARINE ANNEX I HABITATS AND ANNEX II SPECIES IN THE UK[1]

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1. Introduction

In 1992, the European Community adopted Council Directive 92/43/EEC (the European Habitats Directive), which requires the designation of Special Areas of Conservation to protect species and habitats of European importance. The basis for the selection of Special Areas of Conservation is Articles 3 and 4 and Annex III of the Habitats Directive. Specifically, Article 3.1 provides for the setting up of a coherent European ecological network of Special Areas of Conservation comprised of sites hosting the natural habitat types listed on Annex I of the Directive, and of habitats of the species listed on Annex II. The purpose of the network is to enable the natural habitat types, and the habitats of the species, to be maintained or, where appropriate, restored at a favourable conservation status in their natural range. Article 3.1 introduces the key principles of *sufficiency* (the site series must enable favourable conservation status) and of *natural range*. Article 3.2 of the Directive requires Member States to contribute to the creation of the European network in proportion to the representation within its territory of the natural habitat types and of the habitats of the species listed on Annex I and Annex II respectively. A key principle introduced by Article 3.2, therefore, is the principle of *proportionality*.

The principles of sufficiency, natural range and proportionality indicate that the number and area of SACs selected by Member States should aim to contribute significantly to maintaining or restoring favourable conservation status of the habitats and species concerned, and be in proportion to the occurrence of that habitat or species within the Member State's territory. Article 4 of the Directive states that the selection of SACs should be in accordance with the criteria set out in Annex III of the Directive. It also requires that, for aquatic species which range over wide areas, SACs are proposed only where there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction.

The specific criteria for the selection of sites eligible for designation as Special Areas of Conservation are set out in Annex III of the Directive, and are separated into two stages: Stage 1 to be conducted by each Member State, and Stage 2 by the European Commission on a biogeographic basis. The Stage 1 criteria are:

Stage 1A (for habitats):

a) degree of representativity of the natural habitat type on the site;

b) area of the site covered by the natural habitat type in relation to the total area covered by that natural type within the national territory;

[1] Recommended reference for this document: JNCC (2009) Selection criteria and guiding principles for selection of Special Areas of Conservation (SACs) for marine Annex I habitats and Annex II species in the UK. Version 1.0. JNCC, Peterborough. Available online from: http://www.jncc.gov.uk/page-4165

c) degree of conservation of the structure and functions of the natural habitat type concerned and restoration possibilities;

d) global (overall) assessment of the value of the site for conservation of the natural habitat concerned.

Stage 1B (for species)*:*

a) size and density of the population of the species present on the site in relation to the populations present within the national territory;

b) degree of conservation of the features of the habitat which are important for the species concerned and restoration possibilities;

c) degree of isolation of the population present on the site in relation to the natural range of the species;

d) global (overall) assessment of the value of the site for the conservation of the species concerned.

Use and application of these criteria in SAC selection in the UK is outlined in Sections 3 to 6 of this paper.

2. Selection of UK SACs to contribute towards the Natura 2000 network

The European Commission assesses the SAC network in the context of biogeographic regions, using the Stage 2 selection criteria and the principles of sufficiency, natural range and proportionality. UK waters lie entirely within the Atlantic Biogeographic Region. The European Commission's list of Special Areas of Conservation for the Atlantic Biogeographic Region is now largely complete. However, a scientific reserve (indicating that the network has not been assessed as sufficient for this biogeographic region) is in place for SACs for the four marine habitats and four marine species considered in this paper. The purpose of this document is to provide updated guidance on the application of Habitats Directive Annex III Selection Criteria and Guiding Principles for the selection of SACs in UK waters for the habitats and species subject to this reserve. Its focus is on SACs 'away from the coast', including both offshore waters extending from 12 nautical miles out to 200nm or the limits of the UK's Continental Shelf, but also SACs for inshore waters to complete the UK SAC site series. This document updates and expands upon information on site selection included in Section 2 of JNCC's Report 325 on Natura 2000 in UK offshore waters (Johnston et al. 2002) and JNCC's Report 270 on terrestrial and coastal/inshore SAC selection (McLeod *et al.* 2005). It also takes account of EC Guidance on implementation of the Natura 2000 network in the marine environment prepared with contribution from the UK and other Member States between 2003 and 2006 (CEC, 2007). The EC guidance includes revisions to the EC Interpretation manual for the first three of the Annex I habitats listed in Section 3.

Although the assessment of Member State's contributions towards the network is carried out at a biogeographic level by the European Commission, in order to effectively advise UK Government on a suitable number and range of sites to propose to the Commission, JNCC have considered the network in a UK context, and, to a more limited extent, a wider European context. In assessing the completion of the UK contribution to the network for the Atlantic biogeographic region, we have considered the principles of sufficiency, natural range and proportionality introduced in Article 3 of the Directive. This is described in more detail below.

2.1. The principle of natural range

Article 3.1 of the Habitats Directive states that the network of sites must be sufficient to enable the natural habitat types to be maintained (and/or restored) at a favourable conservation status within their natural range. The natural ranges for the Annex I habitat types within UK waters have been mapped approximately using seabed sediment data for the UK produced by the British Geological Survey along with additional survey information from academia, industry and contracts let by JNCC and the UK conservation agencies. In 2003, the Joint Nature Conservation Committee agreed that in relation to offshore site selection, at least one example of each habitat sub-type (that meets the Annex III criteria) in each Regional Sea within the site series should be sufficient to ensure minimum representation for the habitat within its natural range in the UK (JNCC, 2003). However, more than one site for a particular habitat sub-type may be needed within

certain Regional Seas for those habitat sub-types which have a high proportion of their UK distribution within one or two Regional Seas (e.g. shallow sandbanks and *Sabellaria spinulosa* biogenic reef which are concentrated in the Southern North Sea and Irish Sea).

2.2. The principle of sufficiency

The European Commission provided guidance to inform the first biogeographical seminars on the degree of national representation for each habitat type that might be considered sufficient according to the principle of *sufficiency*. The indication was that less than 20% of the national resource of a particular habitat represented within the site series would be likely to be considered insufficient, and that more than 60% of the national resource would be likely to be considered sufficient. Although these percentages were not derived specifically with the marine environment in mind, and the figures are not targets for national contribution to the network (CEC, 2007), they provide broad guidance as to how much of the UK resource for each of the habitat types should be included within the UK contribution to the Natura network. Proportionality (paragraph 2.3) is also likely to be an important factor to inform judgements on sufficiency, but the European Commission cannot judge this fully until a complete submission of site proposals by all Member States within the Atlantic biogeographic region has been made. This parameter is also influenced by the consideration of structure and function issues.

2.3. The principle of proportionality

Article 3.2 requires each Member State to contribute to the Natura network in proportion to the representation of the Annex I natural habitat types within its territory. The only information available to assess the proportion of habitats within UK waters in relation to that of the rest of the Atlantic biogeographic region is in the Article 17 reports provided by Member States in 2007 (European Topic Centre on Biological Diversity, 2008). For the Article 17 reports, some Member States did not report habitat area, and others reported in different ways, so the figures are very approximate. According to these data, the UK holds 39% of the resource of Annex I Sandbanks and 98% of the resource of Annex I Reefs within the Atlantic biogeographic region. The figure for the UK proportion of reefs in particular is likely to be a considerable overestimate. There are no figures available for Annex I Submarine structures made by leaking gases. Therefore, based on the Article 17 reports, according to the principle of *proportionality* it could be expected that the UK would contribute to approximately 40% of all SACs designated for sandbank habitat within the Atlantic biogeographic region, and possibly more than 50% of all SACs designated for reef habitat. As set out in paragraph 2.2, proportionality is also likely to be an important factor in judgements of network sufficiency.

3. Annex I Habitat definitions and interpretations

As outlined in Section 2, four marine Annex I habitats are subject to a 'reserve' within the Atlantic biogeographic region, and additional SACs may therefore be proposed to the European Commission for these features. The four habitats are shown in Table 1 below.

Table 1 Habitats considered for SAC selection in UK waters 'away from the coast' (from Directive 97/62/EC amending Annexes I and II to Directive 92/43/EEC).

EU code	***Habitat name***
1110	Sandbanks which are slightly covered by seawater all the time
1170	Reefs
1180	Submarine structures made by leaking gases
8330	Submerged or partially submerged sea caves

There are three layers of definition/interpretation relating to these habitats:

a) EC Habitats Directive (EEC 1992) (as amended by Directive 97/62/EC) which lists the habitats in Annex I and indicates whether they have priority status or not;

b) EC Guidelines for the establishment of the Natura 2000 network in the marine environment (CEC, 2007) which supersedes previous European Commission's interpretation of three marine habitats.

c) National/local interpretation (in the UK, partially covered by McLeod *et al.* 2005; and Johnston *et al.*, 2002). This interpretation is likely to vary slightly between Member States, reflecting national and local differences in the character of each habitat.

Interpretation of the habitat types and additional information for three of the four Annex I habitats under consideration have been modified since 2002 through discussions between the European Commission and Member States, resulting in revised interpretations for these three habitats (finalised in July 2007).

3.1. Sandbanks which are slightly covered by sea water all the time

The Interpretation Manual of European Habitats (CEC, 2007) defines Sandbanks as:

Definition: Sandbanks are elevated, elongated, rounded or irregular topographic features, permanently submerged and predominantly surrounded by deeper water. They consist mainly of sandy sediments, but larger grain sizes, including boulders and cobbles, or smaller grain sizes including mud may also be present on a sandbank. Banks where sandy sediments occur in a layer over hard substrata are classed as sandbanks if the associated biota are dependent on the sand rather than on the underlying hard substrata.
Clarification: "Slightly covered by sea water all the time" means that above a sandbank the water depth is seldom more than 20 m below chart datum. Sandbanks can, however, extend beneath 20 m below chart datum. It can, therefore, be appropriate to include in designations such areas where they are part of the feature and host its biological assemblages.
Vegetation[2]**:** North Atlantic including North Sea: *Zostera* sp., free living species of the *Corallinaceae* family. *On many sandbanks macrophytes do not occur.*
Animals: North Atlantic including North Sea: Invertebrate and demersal fish communities of sandy sublittoral (e.g. polychaete worms, crustacea, anthozoans, burrowing bivalves and echinoderms, *Ammodytes* spp., *Callionymus* spp., *Pomatoschistus* spp., *Echiichtys vipera, Pleuronectes platessa, Limanda limanda*).
Corresponding categories:
The National Marine Habitat Classification for Britain and Ireland Version 03.02:
Relevant types within "Sublittoral coarse sediments (SCS), Sublittoral sands (SSA) and Sublittoral macrophytes communities (SMP)".
EUNIS classification:
Relevant types within "A4.4, A4.55, A4.1, A4.2, A4.51, A4.5, A4.53, A4.1, A4.2, A4.51, A4.5, A4.53, A4.4, A4.55, A7.32, A4.51, A4.53, A4.552, 4.521, A4.521, A4.513, A6.22, A4.51, A4.141, A4.13, A8.13".

At a national level, for the purpose of SAC selection for both inshore and offshore sites, the application of this interpretation of Sandbanks which are slightly covered by sea water all the time has been further clarified (in Johnston *et al.*, 2002 and subsequently):

Substratum: This habitat comprises a range of sandy sediments. In terms of Wentworth's classification it includes all types of sand (particle size range 0.0625-2 mm). In terms of Folk's classification used for British Geological Survey seabed sediment maps, this habitat may include all sands, muddy sands and gravelly sands (all sandy sediments in lower right quartile of the modified Folk triangle developed by BGS: specifically gravelly muddy sand; gravelly sand; muddy sand; sand; slightly gravelly muddy sand and slightly gravelly sand) and some forms of sandy gravels. Free-living *Corallinaceae* (i.e. maerl) are explicitly included in the EC definition. Eelgrass *Zostera marina* beds are also referable to this habitat type.
Height boundary: Chart Datum (Lowest Astronomical Tide may technically be more correct, but is in practice less easy to define on a map or chart).
Depth: The summit of the sandbank feature is in waters <20 m in depth from chart datum, but the sandbank feature includes the flanks of the bank, and may also include channels or other areas in >20 m water depth to ensure that the structure and functions of the bank feature are maintained.
Topography: Topography is variable but includes distinct banks (i.e. elongated, rounded or irregular 'mound' shapes) which may arise from horizontal or sloping plains of sandy sediment. Where the areas of horizontal or sloping sandy habitat are associated with the banks, they are included within the Annex I type.
Size: No lower limit, subject to the sandbank being large enough to maintain its structure and functions.

[2] Only vegetation and animals associated with Annex I Sandbanks in the North Atlantic are noted here.

3.2. Reefs

The Interpretation Manual of European Habitats (CEC 2007) defines Reefs as:

Definition: Reefs can be either biogenic concretions or of geogenic origin. They are hard compact substrata on solid and soft bottoms, which arise from the sea floor in the sublittoral and littoral zone. Reefs may support a zonation of benthic communities of algae and animal species as well as concretions and corallogenic concretions.

Clarifications:

- *"Hard compact substrata"* are: rocks (including soft rock, e.g. chalk), boulders and cobbles (generally >64 mm in diameter).
- *"Biogenic concretions"* are defined as: concretions, encrustations, corallogenic concretions and bivalve mussel beds originating from dead or living animals, i.e. biogenic hard bottoms which supply habitats for epibiotic species.
- *"Geogenic origin"* means: reefs formed by non biogenic substrata.
- *"Arise from the sea floor"* means: the reef is topographically distinct from the surrounding seafloor.
- *"Sublittoral and littoral zone"* means: the reefs may extend from the sublittoral uninterrupted into the intertidal (littoral) zone or may only occur in the sublittoral zone, including deep water areas such as the bathyal.
- Such hard substrata that are covered by a thin and mobile veneer of sediment are classed as reefs if the associated biota are dependent on the hard substratum rather than the overlying sediment.
- Where an uninterrupted zonation of sublittoral and littoral communities exist, the integrity of the ecological unit should be respected in the selection of sites.
- A variety of subtidal topographic features are included in this habitat complex such as: Hydrothermal vent habitats, sea mounts, vertical rock walls, horizontal ledges, overhangs, pinnacles, gullies, ridges, sloping or flat bed rock, broken rock and boulder and cobble fields.

Reef vegetation[3]**:**

North Atlantic including North Sea and Baltic Sea: A large variety of red, brown and green algae (some living on the leaves of other algae).

Examples of animals forming biogenic reefs:

North Atlantic including North Sea: Polychaetes (*e.g. Sabellaria spinulosa, Sabellaria alveolata, Serpula vermicularis*), bivalves (e.g. *Modiolus modiolus, Mytilus sp.*) and cold water corals (e.g. *Lophelia pertusa*).

Examples of non reef forming animals:

North Atlantic including North Sea: In general sessile invertebrates specialized on hard marine substrates such as sponges, anthozoa or cnidaria, bryozoans, polychaetes, hydroids, ascidians, molluscs and cirripedia (barnacles) as well as diverse mobile species of crustaceans and fish.

Corresponding categories:

The National Marine Habitat Classification for Britain and Ireland Version 03.02: "Littoral rock and other hard substrata (biotopes beginning with LR)", "Infralittoral rock and other hard substrata (biotopes beginning with IR)", "Circalittoral rock and other hard substrata (biotopes beginning with CR)", "Littoral biogenic reefs (biotopes beginning with LBR)" and "Sublittoral biogenic reefs (biotopes beginning with SBR)".

EUNIS classification :

Relevant types within "A1.1, A1.1/B-ELR.MB, A1.2, A1.2/B-MLR.MF, A1.3, A1.3/B-SLR, A1.4, A1.5, A1.6, A2.8, A3.1, A3.2, A3.2/M-III.6.1.(p), A3.2/H-02.01.01.02.03, A3.2/H-02.01.02.02.03, A3.3, A3.4, A3.5, A3.6, A3.6/B-MCR.M, A3.7, A3.8, A3.9, A3.A, A3.B, A3.C, A4.6, A5.1, A5.6", A6.2, A6.3.

At a national level, for the purpose of SAC selection for both inshore and offshore sites, the application of this interpretation of Reefs has been further clarified (in Johnston *et al.*, 2002 and subsequently):

Substratum: Bedrock, boulders and cobbles (cobbles generally >64 mm in diameter), including those composed of soft rock, such as chalk. Biogenic concretions, i.e. aggregations of a species to form a hard

[3] Only vegetation and animals associated with Annex I Reefs in the North Atlantic are noted here.

substratum, thus enabling an epibiota community to develop. Biogenic reef-forming species include *Serpula vermicularis*, *Sabellaria* spp., cold water corals (principally *Lophelia pertusa*) *Mytilus edulis* and *Modiolus modiolus*.

Height boundary: Highest Astronomical Tide (or in practice Ordnance Survey mean high water or mean high water springs in Scotland) where the intertidal zone is included in the site. (Note that intertidal areas are only included where they are connected to subtidal reefs).

Depth: No depth limit.

Topography: A variety of topographic features in the subtidal zone, including vertical rock walls, horizontal ledges, overhangs, pinnacles, gullies, ridges, sloping or flat bed rock, broken rock, and boulder and cobble fields. Caves and cave-like features are excluded (these are referable to the Annex I category Submerged or partially submerged sea caves) as are methane derived carbonate structures (see instead Annex I Submarine structures made by leaking gases). 'Arising from the sea floor' is taken in the sense that the reef is topographically distinct. Rocky structures that are covered by a thin and mobile veneer of sediment are classed as reefs if the associated biota are dependent on the rock rather than the overlying sediment.

Size: No lower limit, subject to the reef being large enough to maintain its structure and functions. Note that some biogenic reefs are inherently patchy and may contain relatively small individual colonies of, for example, *Serpula*.

Work is currently underway to develop the most appropriate methods for identifying and evaluating biogenic and cobble reefs as subtypes of Annex I Reef habitats (led by JNCC and funded in part by Defra's Aggregate Levy Sustainability Fund). In May 2007, JNCC hosted an inter-agency workshop on *Sabellaria spinulosa* reef definition and identification (Gubbay, 2007). Key defining elements of *Sabellaria spinulosa* reefs in the context of Natura 2000 were considered to be elevation (topographic distinctiveness), extent and patchiness (% cover). Further consideration of the quality of the reef for SAC selection can be determined by using a broad scoring system for a range of characteristics (including sediment consolidation, density, associated biodiversity and longevity) (Gubbay, 2007). An equivalent workshop was held by JNCC on stony reef definition and identification in March 2008 (JNCC in press). Key defining elements of Annex I stony reefs were considered to be composition, elevation, extent and biota.

3.3. Submarine structures made by leaking gases

The Interpretation Manual of European Habitats (CEC, 2007) defines submarine structures made by leaking gases as:

Definition: Submarine structures consist of sandstone slabs, pavements, and pillars up to 4 m high, formed by aggregation of carbonate cement resulting from microbial oxidation of gas emissions, mainly methane. The formations are interspersed with gas vents that intermittently release gas. The methane most likely originates from the microbial decomposition of fossil plant materials.

The first type of submarine structures is known as "bubbling reefs". These formations support a zonation of diverse benthic communities consisting of algae and/or invertebrate specialists of hard marine substrates different to that of the surrounding habitat. Animals seeking shelter in the numerous caves further enhance the biodiversity. A variety of sublittoral topographic features are included in this habitat such as: overhangs, vertical pillars and stratified leaf-like structures with numerous caves.

The second type are carbonate structures within "pockmarks". "Pockmarks" are depressions in soft sediment seabed areas, up to 45 m deep and a few hundred meters wide. Not all pockmarks are formed by leaking gases and of those formed by leaking gases, many do not contain substantial carbonate structures and are therefore not included in this habitat. Benthic communities consist of invertebrate specialists of hard marine substrata and are different from the surrounding (usually) muddy habitat. The diversity of the infauna community in the muddy slope surrounding the "pockmark" may also be high.

Characteristic species of sub-types:

i) "Bubbling reefs"

Plants: If the structure is within the photic zone, marine macroalgae may be present such as *Laminariales*, other foliose and filamentous brown and red algae.

Animals: A large diversity of invertebrates such as Porifera, Anthozoa, Polychaeta, Gastropoda, Decapoda, Echinodermata as well as numerous fish species are present. Especially the polychaete

Polycirrus norwegicus and the bivalve *Kellia suborbicularis* are associated species of the "bubbling reefs".

ii) "Pockmarks"
Plants: Usually none.
Animals: Invertebrate specialists of hard substrate including Hydrozoa, Anthozoa, Ophiuroidea and Gastropoda. In the soft sediment surrounding the pockmark Nematodae, Polychaeta and Crustacea are present.
Associated habitats:
"Bubbling reefs" can be found in association with the habitat types "Sandbanks, which are covered by sea water all the time (1110)" and "Reefs (1170)".
Geographical distribution and regional varieties:
Shallow water examples of "bubbling reefs" colonised by macroalgae and/or animals are observed in Danish waters in the littoral and sublittoral zone from 0 to 30 m water depth. They are present in the northern Kattegat and in the Skagerrak and follow a NW SE direction parallel to the Fennoscandian fault line.
"Pockmarks" are found in many areas of the European shelf seas. Deep water examples of pockmarks with benthic fauna communities exists at approximately 100 m water depth in the UK part of the North Sea as depressions in areas of predominantly muddy seabed. Examples of extensive areas with pockmarks are found on the Galician coast (Spain) at the bottom of Rias at a more shallow water depth compared to the pockmarks in the North Sea. Present emission of gas has been reported, as well as other inactive pockmarks filled by more modern sediments. Another difference with the "bubbling reefs" of the Danish coast is that gas stocks are closer to the present bottom surface.
Corresponding categories:
HELCOM classification: All subtypes under "Bubbling reefs (2.10)"
EUNIS: Relevant types under A3.C.

At a national level, for the purpose of SAC selection for offshore sites, the application of this interpretation of Submarine structures made by leaking gases has been further clarified (in Johnston *et al.*, 2002 and subsequently):

Substratum: Must consist of a carbonate cement structure resulting from microbial oxidation of gas emissions. Submarine structures found in association with pockmarks may lie outside the pockmark formations themselves.
Height boundary: No further national interpretation.
Depth: No depth limit.
Topography: No further national interpretation
Size: No lower limit, subject to the submarine structure being large enough to maintain its structure and functions.

3.4. Submerged or partially submerged sea caves

The interpretation of this habitat type has not been modified since earlier consideration in relation to SAC identification in offshore waters. The Interpretation Manual of European Habitats (EC 1999) defines this habitat as:

"Caves situated under the sea or opened to it, at least at high tide, including partially submerged sea caves. Their bottom and sides harbour communities of marine invertebrates and algae."

At a national level, for the purpose of SAC selection for both inshore and offshore sites, the definition of *submerged or partially submerged sea caves* has been further interpreted and clarified (Johnston *et al.*, 2002):

Substratum: No further interpretation.
Height boundary: No further interpretation.
Depth: No depth limit.

Topography: Needs at least to have some overhanging feature.
Size: No lower limit, subject to the cave being large enough to maintain its structure and functions.

4. Site selection criteria and additional principles used for site selection for Annex I habitats in the UK

The Habitats Directive (92/43/EC) includes, in Annex III, criteria for selecting sites eligible for identification as Sites of Community Importance and designation as Special Areas for Conservation (SACs) (see paragraph 1.4 of this paper).

Stage IA: Assessment at national level of the relative importance of sites for each natural habitat type in Annex I:

a) Degree of representativity of the natural habitat type on the site.
b) Area of the site covered by the natural habitat type in relation to the total area covered by that natural habitat type within the national territory.
c) Degree of conservation of the structure and functions of the natural habitat type concerned and restoration possibilities.
d) Global assessment of the value of the site for conservation of the natural habitat type concerned.

In the text of the Directive, reference is made to selection of sites using the above selection criteria and relevant scientific information. Once sites are identified at a national level and submitted by UK government to the European Commission, their Community Importance is assessed using the Stage 2 criteria included in Annex III to the Directive, as set out in Article 4.2 of the Directive. This Stage 2 assessment is carried out by the European Commission, with the help of The European Environment Agency and others, and in agreement with each Member State.

As well as the above selection criteria, additional principles for site selection were developed from text in the Articles of the Directive and in discussion between Member States and the European Commission at the Atlantic Biogeographical meeting in Edinburgh (UK) in 1994 (Hopkins & Buck 1995, McLeod *et al.* 2005, Johnston *et al.*, 2002). These principles involve consideration of:

- Priority status (Article 1d);
- Geographical range (Articles 1e and 3.1);
- General and Special UK responsibilities (Articles 3.1 and 3.2, 1994 Atlantic Biogeographical meeting);
- Multiple interest (Annex III Stage 2.2(d), 1994 Atlantic Biogeographical meeting);
- Rarity (1994 Atlantic Biogeographical meeting)

These additional principles are intended to supplement the Annex III selection criteria (McLeod *et al.* 2005), and provide Member States with greater guidance on how sites should be selected. These principles are not formally graded as with the Annex III criteria but nevertheless should be considered an integral part of site consideration, and can be incorporated into the Global Assessment selection criterion where relevant.

The following section outlines how these site selection criteria and additional principles should be applied to habitat SAC selection 'away from the coast' in the UK. Relevant extracts of text from the Directive and Annexes, and from the Atlantic Biogeographical Meeting in Edinburgh in 1994 (Hopkins & Buck 1995) are referred to herein. This section also incorporates parts of JNCC report 325 (Johnston *et al.*, 2002), McLeod *et al.* (2005) and The Natura 2000 Standard Data Form: Explanatory Notes (CEC, 1995).

Note that, although some Annex III criteria (e.g. area of habitat) can be quantified relatively easily, scaling or quantifying the assessments for many of the criteria is often necessarily arbitrary (see McLeod *et al.* 2005). For this reason, quantitative rule-based systems have so far not been widely adopted for the purpose of selecting statutory sites, either in the UK or elsewhere (McLeod *et al.* 2005). It is recognised that site selection is essentially a matter of judgement and relies on a group of experts, each of whom understands the

aims and guiding principles of the exercise, to make informed judgements to select an agreed list of sites (McLeod *et al*. 2005). The use of 'best expert judgement' is acknowledged as an appropriate means of ranking sites in the EC's guidance on the Natura 2000 Standard Data Form (CEC 1995).

4.1. Degree of representativity of the natural habitat type on the site (1A(a) of Annex III)

According to Article 3.2 of the Directive, sites should be selected to represent the range of habitat types present within the territory of the Member State. Representativity is the degree to which a given habitat corresponds to a described type, including not only the most typical form of the habitat, but also its main lines of ecological variation (McLeod *et al.*, 2005). At the Atlantic Biogeographical Region Meeting (Conclusions, paragraph 4) it was recommended that, "In considering the degree of representativity of Annex I habitat types on individual sites, Member States will take account of the best examples in extent and quality of the main type, (which is most characteristic of the Member State) and its main variants, having regard to geographical range" (Hopkins & Buck, 1995). Ideally, this should result in a suite of sites for each Annex I habitat which covers the geographical and ecological range of variation present in the territory of the Member State (JNCC, 2003). The Representativity criterion should be informed by the Interpretation Manual of European Habitats since this manual provides a definition of each habitat, a list of characteristic species and other relevant elements (CEC, 1995). Because the marine habitat types listed in Annex I to the Directive are very broad, a number of different habitat 'sub-types' may be present within the jurisdiction of a Member State. The range of sites selected for a particular habitat may be chosen to represent the range of habitat sub-types present, as well as the geographical range of the habitat itself.

In UK waters, Annex I habitats Reefs and Sandbanks slightly covered by seawater all the time are represented by different topographical and ecological sub-types. JNCC and the UK Conservation Agencies have identified a range of sub-types at a resolution suitable for the purposes of ensuring sufficient representation of these habitats across the UK site network for both coastal and offshore waters (listed in Appendix I). JNCC propose that the range of sub-types of Reefs and Sandbanks should be represented within the UK network of SACs where they occur, if they meet the Annex III criteria (JNCC, 2003). Additional sites away from the coast will be selected to complement the SACs for Annex I habitats already designated UK inshore waters. SACs will also be selected to represent Submarine structures made by leaking gases in UK waters (see Section 3.4).

JNCC recommend that an approach for UK offshore waters to covering range can be best met by the use of draft Regional Seas (JNCC, 2003). The draft regional sea boundaries were developed under the Irish Sea Pilot project (JNCC, 2004b; Defra, 2004) to reflect major biogeographic regions in UK waters[4]. It is proposed that the draft Regional Seas be used as a proxy to represent ecological variation in habitat types where sufficiently detailed knowledge of the habitats is lacking. The principle is that at least one example of each habitat sub-type for each draft UK Regional Sea (see Appendix II) should be represented within the SAC series (where suitable sites occur and meet the Annex III selection criteria). However, it should be borne in mind that the boundaries between the regional seas are indicative and should not be treated as 'hard' boundaries. This is particularly relevant where a habitat sub-type occurs either side of a regional sea boundary: ecological differences may not be detectable at this scale.

If quantitative field data for the comparison of Annex I habitats do not exist or if measurement of the Representativity criterion is not feasible, the 'best expert judgment' may be used to evaluate the habitat type (CEC 1995). This is particularly pertinent to the application of this criterion in the marine environment given the relative lack of knowledge of the extent and ecological variation of Annex I habitats in UK waters (JNCC 2004).

The following ranking system for Representativity should be used (CEC 1995):

Grade A: excellent representativity
Grade B: good representativity

[4] The draft Regional Sea boundaries are currently being updated by JNCC, in light of new oceanographic information.

Grade C: significant representativity

Furthermore, all cases where a habitat type is present on the site in question in a non-significant manner must be indicated in a fourth category:

Grade D: non-significant presence

According to the Natura 2000 Data Form Explanatory Notes, it is obligatory to document all occurrences of Annex I habitats (section 3.1) within SACs (CEC, 1995) and provide information on these occurrences. This applies even if the presence of the habitat is considered 'non-significant'. Explanation should also be provided by the member state as to why the presence of the habitat is non-significant (CEC 1995). Non-significant presence has not been defined by the EU. In consideration of this at a UK level, fragmentary habitat occurrences and habitats occurring outside their natural range have generally been regarded as 'non-significant presence' (McLeod *et al.* 2005).

In cases where the site representativity for the habitat type concerned is classed 'D: non-significant', no other indication is required for the other evaluation criteria concerning this habitat type on the site in question (CEC 1995). Non-significant occurrences are listed on the Natura 2000 Standard Data Forms but these features do not require conservation objectives nor protection under the Directive, as stated in the EC guidance document (CEC 2000 cited in McLeod *et al.* 2005).

4.2. Area of the site covered by the natural habitat type in relation to the total area covered by that natural habitat type within the national territory (1A(b) of Annex III)

The Explanatory Notes to the Natura 2000 Standard Data Form (CEC 1995) prescribe it necessary to estimate: i) the surface area covered by an Annex I habitat type within a site, and ii) the total surface of the national territory that is covered by the same habitat type, in order to ensure an adequate proportion of each habitat type is ultimately included within the SAC series. It is intended that proposed sites contain the largest examples of representative habitat types for which they have been selected (McLeod *et al.*, 2005). As such, the selection of sites that host a substantial proportion of the total (national) habitat resource should be prioritised (McLeod *et al.*, 2005). Nevertheless, it can be very difficult to accurately calculate areas of marine Annex I habitats. Estimates of the total surface of relevant habitats in UK waters have been derived using existing geological map interpretations, supplemented by other data sources. On the basis of these, proportions of Annex I habitats at the site in question (in relation to the total resource) can be estimated. These proportions are grouped into three categories:

Site contains **'15-100%'** of total resource of Annex I habitat **(Grade A)**
Site contains **'2-15%'** of total resource of Annex I habitat **(Grade B)** and
Site contains **'0-2%'** of total resource of Annex I habitat **(Grade C)**

Sandbanks which are slightly covered by seawater all the time

The evaluation of relative surface area is approximate as no accurate total extent figure is available for Annex I shallow sandbank habitat for UK waters. Therefore, as a best estimate to encompass the range of Annex I sandbank in UK waters, minimum and maximum estimates have been provided. The minimum estimate has been calculated as the total area of sandy sediments in less than 20m water depth. The maximum estimate has been calculated as the total area of sandy sediments in less than 20m water depth, plus the total area of sandy sediments in less than 50m water depth that adjoin areas of sandy sediment in less than 20m. The maximum estimate has been provided as the extent of individual sandbanks (in particular in offshore waters) is often larger than the area enclosed by the 20m contour, as the sandbank itself may extend into waters deeper than 20m according to the Interpretation Manual of European Union Habitats (CEC, 2007). Therefore the maximum figure aims to ensure the total extent of sandbanks is accounted for in the calculations. Both these estimates were derived from BGS 1:250,000 Seabed Sediment maps (Graham *et*

al., 2001), using 20m and 50m contours based on Chart Datum from Seazone, and supersede the area estimates provided for Article 17 reporting (JNCC, 2007)

Estimated minimum total area of **Annex I Sandbanks which are slightly covered by seawater all the time** = 1,720,000 hectares (1.72 million hectares, or 1720km^2)

Estimated maximum total area of **Annex I Sandbanks which are slightly covered by seawater all the time** = 8,010,000 hectares (8.01 million hectares, or 8010km^2)

This total extent figure results in the following thresholds for the grades for this criterion (CEC, 2007):

Using the 20m contour

Grade A: extents between 1,720,000 and 258,000 ha (15-100% of total resource);
Grade B: extents between 258,000 and 34,400 ha (2-15% of total resource);
Grade C: extents less than 34,400 ha (0-2% of total resource)

Using the 50m contour

Grade A: extents between 8,010,000 and 1,201,500 ha (15-100% of total resource);
Grade B: extents between 1,201,500 and 160,200 ha (2-15% of total resource);
Grade C: extents less than 160,200 ha (0-2% of total resource)

Reefs

An evaluation of relative surface area is approximate as no accurate total extent figure is available for Annex I reef habitat for UK waters. The closest approximation available is calculated as follows:

Inshore
Marine Recorder reef biotope data points inshore (within 12nm of the coast). An area of 500m diameter was added around each point to estimate total reef extent inshore.

Offshore

- Area of **bedrock** and **biogenic** reef offshore (beyond 12nm from the coast). This was derived from BGS 1:250, 000 Seabed Sediment maps (Graham *et al.*, 2001). The BGS stony reef polygons representing iceberg ploughmarks were excluded as it was not accurate to state that these consisted entirely of Annex I Reef.
- The area of the proposed Wyville-Thompson dSAC (stony reef)

[Note: Where there was 'overlap' between the data layers, the area generated was a merging of the two: i.e. there was no double counting of the same habitat due to overlapping polygons]

Estimated total area of **Annex I Reefs** = 7,180,000 **hectares**

This total extent figure results in the following thresholds for the grades for this criterion (CEC, 2007):

Grade A: extents between 7,180,000 and 1,077,000 ha (15-100% of total resource);
Grade B: extents between 1,077,000 and 143,600 ha (2-15% of total resource);
Grade C: extents less than 143,600 ha (0-2% of total resource)

Submarine structures made by leaking gases
It is not possible to make a realistic estimate of the total extent of Submarine structures made by leaking gases for UK waters (since all occurrences of this habitat are not known). However, evidence from known occurrences of the habitat shows that the extent at each occurrence is very small.

Submerged or partially submerged sea caves
A total extent figure is unavailable for submerged or partially submerged sea caves. This is because i) all occurrences of this habitat are not known and ii) those areas that have been identified have not been quantified in terms of extent.

4.3. Degree of conservation of the structure and functions of the natural habitat type concerned and restoration possibilities (1A(c) of Annex III)

The conservation status of an Annex I habitat is taken to be 'favourable' when, *inter alia*, the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future (Article 1(e) of the Habitats Directive). As outlined in the Explanatory Notes to the Natura 2000 Standard Data Form, habitat structure and functions are assessed through an evaluation of three inter-related components: **degree of conservation of the structure**, **degree of conservation of the functions**, and **restoration possibility** (CEC 1995). Although these sub-criteria are evaluated separately, their individual scores are combined to generate an overall grading for this criterion. It is anticipated that sites selected (and their boundaries) will reflect the structure and function requirements of the particular habitat (Johnston *et al.*, 2002). Until recently, guidelines on the assessment of structure and functions of Annex I features have focused predominantly on terrestrial habitats, and have had rather limited applicability in a marine context. However, two reports have recently been published which consider structure and function of marine habitats (Hiscock *et al.*, 2006; and Bremner *et al.*, 2006); these, along with further research commissioned by JNCC in 2007 (MRAG & UNEP-WCMC, 2008), have been considered in the evaluation of structure and functions for Annex I features.

i) Degree of conservation of structure

McLeod *et al.*, (2005) have described habitat structure as 'the variety of biotic and abiotic features, including species composition, the physical architecture of the vegetation, the ground morphology, the successional status of the vegetation, and species assemblages of plants, animals or both'. In a marine context, Hiscock *et al* (2006) defined habitat structure as, 'the combination of mutually connected and dependant biological and non-biological elements of a system that determine its nature.' When defining the extent of Sandbanks slightly covered by seawater all the time, consideration of non-biological elements of habitat structure are very relevant. This is because the European Commission (CEC, 2007) provides an interpretation of 'slightly covered' as being 'seldom more than 20 m below chart datum', yet some sandbanks in areas away from the coast extend into deeper waters, and the deeper parts of the sandbank will require protection to ensure the structure (and functions) of the entire interest feature are maintained.

An indirect method to estimate conservation of structure is to assess the naturalness of the habitat using information on location and intensity of damaging activities. These activities may impact the habitat directly (e.g. physical damage) or indirectly, by altering the environmental parameters (e.g. water quality) which determine habitat structure. By comparing present day data with historical data, the natural state of the habitat can be estimated. All available data on natural variability and likelihood of damage or vulnerability of the habitat need to be taken into account for assessing the conservation status (CEC, 2007) (for example, Vessel Monitoring System (VMS) data indicating the interest feature may have been exposed to mobile demersal fishing).The Natura 2000 Data Form Explanatory Notes recommend referring to the Interpretation Manual on Annex I Habitats to assist with the evaluation of this sub-criterion (CEC 1995) since it provides a description of the habitat in question (along with a list of characteristic species) against which the structure of the on-site habitat can be compared. It is expected that best expert judgement will be relied upon in the evaluation of this sub-criterion (CEC 1995).

I: excellent structure

II: structure well conserved

III: average or partially degraded structure

JNCC suggest that where there is evidence of damage to all or part of the feature, a grading of II or III for 'degree of conservation of structure' would be appropriate (depending on the degradation of the feature). Accordingly, it is assumed that the feature would benefit from restoration in order to return to favourable condition, and this may be reflected in the site's conservation objectives.

ii) Degree of conservation of functions

Ecological functions relates to the way in which the biotic and abiotic features interact over time (McLeod *et al.,* 2005). Functions include energy flows, biogeochemical cycles and many other processes (McLeod *et al.,* 2005). Biological functioning is considered in more detail from a marine environmental management and protection perspective, including identifying key functional species or species groups, in Hiscock *et al.* 2006.

Defining and assessing the functions of a particular marine habitat at a specific site (and particularly to do this independently of other adjacent habitat types) is challenging, given the complexity of ecological functions and the limitations of our information on and understanding of these functions (McLeod *et al.,* 2005). In acknowledgement of these difficulties, the Explanatory Notes to the Natura 2000 Standard Data Form (CEC, 1995) suggests that it is useful to paraphrase 'the conservation of functions' by the prospects (capacity and probability) of the habitat type concerned on the site in question to maintain its structure for the future[5], given on the one hand possible unfavourable influences and on the other hand reasonable conservation effort (CEC, 1995).

The degree of conservation of functions should be ranked as follows (CEC, 1995):

I: excellent prospects

II: good prospects

III: average or unfavourable prospects

For SACs identified beyond 6nm of the UK coastline, JNCC recommends that the grading for the 'degree of conservation of functions' take into account the potential challenges of managing international activities (for example, fishing operations through the Common Fisheries Policy). In light of these uncertainties, it may be precautionary to grade an Annex I feature's prospects of maintaining its structure for the future as good (II) rather than excellent (I).

iii) Restoration possibilities

This criterion is used to evaluate the extent to which restoration of a habitat at the site in question could be possible (CEC, 1995). Where a sufficient number of examples of habitat types in good condition can be identified, it is not necessary to select sites that are damaged or in relatively poor condition (McLeod *et al.,* 2005). However, many sites may require adjustments to management or a modification in human impacts over part of their area. Equally, where the habitat type is rare in all or part of its range, options for site selection are more limited, and sites needing more significant restoration management may be selected (McLeod *et al.,* 2005). In these cases, the likelihood of successfully restoring structure and functions is a helpful consideration (McLeod *et al.,* 2005). Where qualifying interest features are not known to be damaged, this sub-criterion is an evaluation of the extent to which restoration could be possible if changes in habitat structure and functions were to occur**.** The interest feature can be assessed

[5] The presence of several characteristic species could be seen as evidence that habitat function is being conserved, for instance (McLeod *et al.,* 2005).

against this sub-criterion whatever its current condition, although scoring is not strictly required if the grading of the other two sub-criteria (Conservation of structure and Conservation of function) render this assessment redundant (see Synthesis guidelines below).

Potential for restoration will depend on the knowledge of the structure and functions of the habitat type and of the management plans needed to restore it (i.e. to stabilize or increase the percentage of area covered by that habitat type, to re-establish the specific structure and functions which are necessary for its long-term maintenance, and to maintain or restore a favourable conservation status for its typical species) (CEC, 1995).

In the case of damaged marine Annex I habitat, consideration should be given as to whether activities have profoundly and irreversibly affected the structure and functions of the habitat (as may be the case, for example, for bottom trawl damage to cold water coral reefs) and, therefore, if restoration would be possible. Whether restoration is cost-effective from a nature conservation point of view will also need to be considered during this evaluation (CEC 1995). Note that habitat restoration in marine areas usually focuses on the removal of impacts which should allow recovery where the feature has not been removed.

The ranking system should be the following, using 'best expert judgement':

I: restoration easy

II: restoration possible with an average effort

III: restoration difficult or impossible

Synthesis applying to the overall grading of the three sub-criteria above (CEC 1995). The degree of conservation of the structure and functions of the natural habitat type, and restoration possibilities should be graded as follows:

Grade A: excellent conservation [= excellent structure, independent of the grading of the other two sub-criteria, **OR** = structure well conserved and excellent prospects independent of the grading of the third criterion]

Grade B: good conservation [= structure well conserved and good prospects independent of the grading of the third sub-criterion, **OR** = structure well conserved and average/maybe unfavourable prospects and restoration easy or possible with average effort, **OR** = average structure/partially degraded, excellent prospects and restoration easy or possible with average effort **OR** = average structure/partially degraded, good prospects and easy restoration]

Grade C: average or reduced conservation [= all other combinations]

4.4. *Global assessment of the value of the site for conservation of the natural habitat type concerned (1A(d) of Annex III)*

The global assessment is an expert judgement of the overall value of the site for the conservation of the relevant Annex I habitat. It provides an integrated assessment of the previous selection criteria (and their gradings), and may also take into account the positive or negative influence of other relevant factors on the conservation of the habitat. These relevant factors will vary, but may include the ecological relationships between different habitats and species (McLeod *et al.,* 2005) or the human activities (either on-site or in neighbouring areas) that are likely to influence the conservation status of the habitat type. In the context of marine Annex I habitats, which are very broad types, the rarity or restricted distribution of a particular sub-type of Annex I habitat may be considered under this criterion. Best expert judgment can be used to assess this global value.

As an overall index of the site's value for the conservation of the habitat concerned, particular attention should be paid to the global assessment. Sites are to be graded 'A' (excellent conservation value) 'B' (good conservation value) or 'C' (significant conservation value) (CEC 1995), and in the UK these gradings have been interpreted for terrestrial and coastal SACs as follows (McLeod *et al.,* 2005):

Grade A: Site holds an outstanding example of the Annex I habitat in a European context.

Grade B: Site holds excellent stands of the Annex I habitat, but of somewhat lower value than grade A sites.

Grade C: Examples of the Annex I habitat are of at least national interest[6] but not significantly above this. These habitats are not the primary reason for the SAC being selected.

There is therefore a distinction between the principal features for which sites have been selected (those graded A or B) and those which are only of secondary interest (those graded C). This is a useful distinction but it is important to note that all three grades are *qualifying SAC interest features* (McLeod *et al.*, 2005). As such, they are all protected under the Habitats Regulations and should be assigned conservation objectives.

Selection of SACs for marine Annex I habitats relies considerably on ensuring adequate representation of each Annex I habitat type and sub-type across its natural range, assessed at a coarse scale. However, considerations of other aspects of conservation importance will be reflected within Global Assessment gradings for individual features based on expert judgement. In such cases, more than one sub-type of a marine Annex I habitat type may be represented within one regional sea where expert judgement indicates that there are good arguments for so doing.

4.5. Application of additional guiding principles for site selection for Annex I habitats in the UK

Priority/non-priority status

The Habitats Directive requires Member States to give special attention to sites containing priority habitat types as identified in Annex I to the Directive. These are defined in Habitats Directive Article 1 (d) as those which are in danger of disappearance, which are present in European territory and for the conservation of which the Community has particular responsibility in view of the proportion of their natural range which falls within European territory. At the Atlantic Biogeographical Region Meeting in 1994, Member States agreed to give significant additional emphasis in number and area to sites containing priority habitat types and species (McLeod *et al.*, 2005). None of the four marine Annex I habitats for which SAC selection is still being considered have priority status.

Geographical range

One of the principal goals of the Natura 2000 network is to reflect Annex I habitats' distribution within European territory. As outlined in Habitats Directive Article 3 (1): 'A coherent European ecological network of special areas of conservation shall be set up …to enable the natural habitat types…concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range.' Moreover, the favourable conservation status of a particular interest feature is dependent on its natural range and areas it covers within that range being stable or on the increase (Article 1(e) of the Habitats Directive). Annex I habitats 'away from the coast' are known to vary considerably in their patterns of distribution (Johnston *et al.*, 2002) though their exact range is uncertain. In the offshore area of the UK, due to the physical regime, sandbanks are clustered in the south and east of the UK and the Irish Sea, Submarine structures made by leaking gases (often associated with 'pockmarks') in the North Sea and Irish Sea, and reefs in the west (both north and south). No sea cave habitat is currently known in offshore waters (Johnston *et al.*, 2002).

JNCC believe that an approach to covering range within the Natura 2000 network can be best met by the use of draft Regional Sea areas, and this has been endorsed by JNCC Committee in relation to offshore SAC identification (JNCC, 2003). Eleven draft Regional Seas (marine biogeographic regions) have been delineated in the UK's waters (Defra, 2004; JNCC, 2004b, see Appendix II). As the regional sea divisions

[6] i.e. usually above the threshold for SSSI/ASSI notification

have been defined using environmental factors known to influence the development of ecological communities (such as water temperature, depth, stratification and currents), it is anticipated that within each of the Regional Seas, differing ecological communities will be supported by Annex I habitats. As such, in order to ensure SACs are chosen to reflect the geographic range of Annex I habitats, and also of their principle sub-types, JNCC propose that at least one site for each marine Annex I habitat sub-type (that meets the Annex III selection criteria) in each regional sea where this habitat is known to occur should be considered for inclusion within the site series.

Special responsibilities

According to the Habitats Directive, Article 3 (2): Selection of sites for relevant habitats within a Member State should be made in proportion to the representation of that habitat within the territory of the Member State. Member states may have special responsibility for certain Annex I habitat types where they hold a large proportion of the European resource (McLeod *et al.,* 2005). These states are expected to propose a proportion of the resource which is sufficient to contribute significantly to the maintenance of the habitat types … at a favourable conservation status (Atlantic Biogeographical Region Meeting Conclusions, paragraph 6 cited in Hopkins & Buck 1995). However, proposed sites will still be subject to the other selection criteria and additional principles so that selection is consistent and the sites of high quality (Brown *et al.* 1997). The UK does not have special responsibility for any marine Annex I habitats.

Rarity

At the 1994 Atlantic Biogeographical Region Meeting, it was acknowledged that Member States should take responsibility for proposing sites containing Annex I habitats that are particularly rare in that Member State, with a view to preserving the range (cited in Hopkins & Buck 1995). In a terrestrial context, habitats are considered rare if they cover less than 1,000 ha or if there is a significant representation of the habitat type at three or fewer sites (Brown *et al.,* 1997). None of the marine Annex I habitat types are rare according to Brown *et al.* (1997), although some sub-types of Annex I habitats may be considered rare. Such consideration would be included under the selection criterion Global Assessment.

Multiple interest

Sites with multiple interests are of high intrinsic value (McLeod *et al.,* 2005). In the Atlantic Biogeographical Region Meeting Conclusions, paragraph 2, it states that 'Acknowledging the outstanding single interest sites in terms of quality, extent or range make an important contribution to the Natura 2000 network, special emphasis will be given to identifying and delimiting sites containing complexes of interest on Annexes I and II as valuable ecological units' (Hopkins and Buck, 1995). The Directive recognises this in its emphasis on the maintenance of biodiversity.

5. Annex II species

Four marine Annex II species are subject to a 'reserve' within the Atlantic biogeographic region, and additional SACs may therefore be proposed to the European Commission for these features. The four species are shown in Table 2 below.

Table 2 Species considered for SAC selection in UK waters 'away from the coast' (from Directive 97/62/EC amending Annexes I and II to Directive 92/43/EEC)

EU code	***Species name***
1364	Grey seal *(Halichoerus grypus)*
1365	Common seal *(Phoca vitulina)*
1349	Bottlenose dolphin *(Tursiops truncates)*
1351	Harbour porpoise *(Phocoena phocoena)*

6. Site assessment criteria and additional principles used for site selection for Annex II species in the UK

Article 4 of the Habitats Directive (92/43/EC), requiring Special Areas of Conservation (SACs) to be proposed for Annex II species, states that 'for aquatic species which range over wide areas, such sites will be proposed only where there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction'.

The Habitats Directive (92/43/EC) includes, in Annex III, criteria for selecting sites eligible for identification as Sites of Community Importance and designation as Special Areas for Conservation (SACs):

Stage IB: Assessment at national level of the relative importance of sites for each species in Annex II:

a) Size and density of the population of the species present on the site in relation to the population present within the national territory;
b) Degree of conservation of the features of the habitat which are important for the species concerned and restoration possibilities;
c) Degree of isolation of the population present on the site in relation to the natural range of the species;
d) Global assessment of the value of the site for conservation of the species concerned.

As is the case for Annex I habitats, in the text of the Directive, reference is made to selection of sites using the Annex III criteria and relevant scientific information. Once sites are identified at a national level and submitted by UK government to the European Commission, their Community Importance is assessed using the Stage 2 criteria included in Annex III to the Directive, as set out in Article 4.2 of the Directive. This Stage 2 assessment is carried out by the European Commission, with the help of The European Environment Agency and others, and in agreement with each Member State. As well as the above selection criteria, additional principles for site selection were developed from text in the Articles of the Directive and in discussion between Member States and the European Commission at the Atlantic Biogeographical meeting in Edinburgh (UK) in 1994 (Hopkins & Buck 1995, McLeod *et al.* 2005, Johnston *et al.*, 2002). These principles involve consideration of:

- Priority status (Article 1d);
- Geographical range (Articles 1e and 3.1);
- General and Special UK responsibilities (Articles 3.1 and 3.2, 1994 Atlantic Biogeographical meeting);
- Multiple interest (Annex III Stage 2.2(d), 1994 Atlantic Biogeographical meeting);
- Rarity (1994 Atlantic Biogeographical meeting)

These additional principles are intended to interpret and supplement the Annex III selection criteria (McLeod *et al.* 2005), and provide Member States with greater guidance on how the sites should be selected. Adherence to these principles is not formally graded as with the Annex III criteria but nevertheless should be considered an integral part of site consideration.

The following section outlines how these site assessment criteria and additional principles should be applied to selection of additional SACs, where justified, for these species in the UK. Relevant extracts of text from the Directive and Annexes, from the Atlantic Biogeographical Meeting in Edinburgh in 1994 (Hopkins & Buck 1995) are referred to herein. This section also incorporates parts of JNCC report 325 (Johnston *et al.*, 2002), McLeod *et al* (2005) and The Natura 2000 Standard Data Form: Explanatory Notes (CEC 1995).

Note that, although some Annex III criteria (e.g. species population) may be quantified, scaling or quantifying the assessments for other criteria is often necessarily arbitrary (see McLeod *et al.*, 2005). For these reasons, quantitative rule-based systems have so far not been widely adopted for the purpose of selecting statutory sites, either in the UK or elsewhere (McLeod *et al.*, 2005). It is recognised that site selection is essentially a matter of judgement and relies on a group of experts, each of whom understands the aims and guiding principles of the exercise, to make informed judgements to select an agreed list of sites (McLeod *et al.*, 2005). The use of 'best expert judgement' is acknowledged as an appropriate means of ranking sites in the EC's guidance on the Natura 2000 Standard Data Form (CEC, 1995).

6.1. Size and density of the population of the species present on the site in relation to the populations present within the national territory (1B(a) of Annex III)

Defining boundaries for sites which support a given percentage of the UK population of any mobile species occurring in UK offshore waters is somewhat problematic. This is due to the lack of natural boundaries (such as coast, topographical boundaries, etc.) in the open sea, the wide ranging behaviour of the species, and the mobile and wide ranging nature of the prey of the Annex II species concerned (Johnston *et al.*, 2002). Moreover, as noted in CEC (1995), the size of the national population is often difficult to evaluate, particularly for wide ranging species occurring in offshore waters. In many cases these judgements have to be based not on precise counts of individuals but on estimates of abundance (McLeod *et al.*, 2005).

As stated in the CEC (1995) an optimal measure for Member States would be to determine a percentage figure for each Annex II species, based on the ratio of the population in the site/population in the national territory (CEC, 1995). This estimate or class interval should be used to provide a grading for this criterion as outlined below:

Grade A: 100 % >= p > 15 %,

Grade B: 15 % >= p > 2 %,

Grade C: 2 % >= p > 0 %.

Furthermore, all cases where a population of the species concerned is present on the site in question in a non-significant manner must be indicated in a fourth category:

Grade D: non-significant population.

According to the Explanatory Notes to the Natura 2000 Standard Data Form, it is obligatory to document *all* occurrences of Annex II species (section 3.2.) within SACs (CEC, 1995) and provide information on these

occurrences[7]. This would include: i) (an indication of the) population size **or** population range in which it falls (see CEC, 1995 for appropriate ranges) **or** minimum/maximum population size ii) if no numeric information is available indicate whether the species is common (C), rare (R) or very rare (V). In the absence of any population data indicate it as being present (P).

If the population is classed as non-significant, explanation should be provided as to why (CEC, 1995). Non-significant population has not been defined by the EU, but may be best quantified by looking at the other categories available within the criterion. In other words, if the population of an Annex II species at the site cannot be judged as excellent, good or significant then, by definition, it is non-significant (i.e. the species has been recorded with the boundaries of the site but not in significant numbers). Note that an area must be shown to be essential to the life and reproduction of an Annex II species for it to be graded A-C (i.e. a qualifying feature). If it is only possible to ascertain species presence at a site, but not a *dependency* on the site, then regardless of the abundance of that species found at a particular point in time this population cannot be considered significant. This is particularly relevant for transient species, such as harbour porpoise.

Small populations of species and species occurring outside their natural range have also generally been treated as 'non-significant presences' (McLeod *et al.* 2005). As was concluded at the Atlantic Biogeographical Region Meeting (Paragraph 6 of conclusions): 'Where Annex II species populations are too small to be naturally viable, or where they occur only as vagrants or reintroduction, Member States may exclude them from consideration for site selection'(cited in Hopkins & Buck 1995). Species with non-significant presences are listed on the Natura 2000 Standard Data Forms but do not require conservation objectives and are not protected under the Directive, as stated in the EC guidance document (CEC 2000 cited in McLeod *et al.* 2005). Where a species is assessed as grade D for 'Population', no other indication is required for the other evaluation criteria concerning this species on the site in question (i.e. 'Conservation', 'Isolation' and 'Global evaluation' should not be marked) (CEC, 1995).

6.2. Degree of conservation of the features of the habitat which are important for species concerned and possibilities for restoration (1B(b) of Annex III)

According to the Explanatory Notes to the Natura 2000 Standard Data Form (CEC 1995) this criterion comprises two sub-criteria:

i. **Degree of conservation of the features of the habitat important for the species.** This criterion requires a global evaluation of the features of the habitat regarding the biological requirements of a given species.The features relating to population dynamics are among the most appropriate to evaluate. The structure of the habitat and some abiotic features should be assessed. The 'best expert judgment` should be used to rank this criterion (CEC, 1995).

ii. **Restoration possibilities**. This sub-criterion is to be taken into account only when the features are in an average or partially degraded condition. An approach analogous to that of criterion A (c) (iii) (see page 14) should be used, adding an evaluation of the viability of the population under consideration (CEC, 1995).

To evaluate sites using this criterion it is necessary to understand which habitat features are of importance for the species being considered (Johnston *et al.*, 2002). For wide ranging marine species, identifiable sites used for breeding and feeding are obviously important to that species' life and reproduction. There may also be identifiable sites used for other purposes which may be important for the species. However, whether any such site is "a clearly identifiable area representing the physical and biological factors essential to the life and reproduction" of the relevant species (Habitats Directive Article 4.1) needs to be carefully evaluated (Johnston *et al.*, 2002).

The **degree of conservation** of the features of the habitat important for the species should be ranked as follows (CEC, 1995):

[7] This applies even if the presence of the species population is considered 'non-significant' (as noted above).

I: elements in excellent condition,

II: elements well conserved,

III: elements in average or partially degraded condition

JNCC suggest that where there is evidence of damage to all or part of the habitat important for the species, a grading of II or III for 'degree of conservation' may be appropriate. Accordingly, it is assumed that the habitat would benefit from restoration and this may be reflected in the site's conservation objectives.

The **restoration possibilities** of features of the habitat important for the species should be ranked as follows (CEC, 1995):

I: restoration easy,

II: restoration possible with average effort,

III: restoration difficult or impossible.

Synthesis applying to classification of the two sub-criteria above (CEC, 1995). The degree of conservation of the features of the habitat which are important for the species concerned and possibilities for restoration should be graded as follows:

Grade A: excellent conservation [= elements in an excellent condition, independent of the grading of the possibility of restoration]

Grade B: good conservation [=elements well conserved independent of the grading of the possibility of restoration, **OR** = elements in average or partially degraded condition and easy to restore]

Grade C: average or reduced conservation [= all other combinations]

As McLeod *et al.* (2005) note, the value of this factor in the comparison of sites is variable. For some Annex II species, a small number of habitat features are required to ensure survival; for others, many different elements are essential. For the four marine species in UK waters away from the coast, habitat features required for survival are not known. In cases where supporting data is lacking, the presence of a persistent population that is known to be stable could be seen as *prima facie* evidence that habitat conditions are favourable (McLeod *et al.*, 2005).

6.3. Degree of isolation of the population present on the site in relation to the natural range of the species (1B(c) of Annex III)

This criterion is intended to provide an approximate measure of the contribution of a given population to the genetic diversity of the species and of the fragility of the specific population at the site being considered (CEC, 1995). Using a simplistic approach one may say that the more a population is isolated (in relation to its natural range), the greater is its contribution to the genetic diversity of the species. Consequently the term 'isolation' should be considered in a wider context, applying equally to strict endemics, to sub-species/varieties/races as well as sub-populations of a meta-population.

In this context the following grading should be used:

Grade A: population (almost) isolated,

Grade B: population not-isolated, but on margins of area of distribution,

Grade C: population not-isolated within extended distribution range.

In the UK, isolation is viewed positively only where populations are large or display distinctive physiological, ecological or genetic features (McLeod *et al.*, 2005). As such, this criterion has been found to be relevant to only a small number of terrestrial species populations in the UK in previous selection of sites (Brown *et al.* 1997). In the context of SAC selection none of the UK cetacean or seal Annex II species are

considered to be isolated populations (mainly due to their mobility and the continuous nature of the marine environment) (Johnston *et al.*, 2002).

6.4. Global assessment of the value of the site for conservation of the species concerned (1B(d) of Annex III)

The global assessment is an expert judgement of the overall value of the site for the conservation of the relevant Annex II species. As indicated in the Explanatory Notes to the Natura 2000 Standard Data Form this criterion is used to sum up the previous criteria (and their gradings) and to assess other characteristics of the site thought to be relevant for a given species, using best expert judgement (CEC 1995). These characteristics vary from one species to another and might include human activities (on the site or in nearby areas) which are capable of influencing the conservation status of the species, the statutory protection of the site and ecological relations between the different types of habitats and species. Best expert judgment can be used to assess this global value.

As an overall index of the site's value *for the conservation of the species concerned*, particular attention should be paid to the global assessment. Sites are to be graded 'A' (excellent conservation value) 'B' (good conservation value) or 'C' (significant conservation value) (CEC, 1995). These gradings have been interpreted in the context of this document as follows:

Grade A: Site supports an outstanding population of the Annex II species in a European context.

Grade B: Site supports an excellent population of the Annex II species, but of somewhat lower value than grade A sites.

Grade C: Population of the Annex II species is of at least national interest but not significantly above this. This species is not the primary reason for the SAC being selected.

There is therefore a distinction between the principal species for which sites have been selected (those graded A or B) and those which are only of secondary interest (those graded C). This is a useful distinction but it is important to note that all three grades denote *qualifying SAC interest features* (McLeod *et al.*, 2005). As such, they are all protected under the Habitats Regulations and should be assigned conservation objectives.

6.5. Application of additional guiding principles for site selection for Annex II species in the UK

Priority/non-priority status

Priority species are identified in Annex II to the Habitats Directive, and defined (Article 1(h and g)) as those which are endangered, and for the conservation of which the Community has particular responsibility in view of the proportion of their natural range which falls within European territory. None of the marine Annex I species being considered for SAC selection in UK waters have priority status.

Geographical range

One of the principal goals of the Natura 2000 network is to reflect Annex II species' distribution within European territory. As with Annex I habitats, the favourable conservation status of Annex II species is dependent upon the maintenance of their geographical range (amongst other things) (McLeod *et al.*, 2005). This requires the conservation of the habitats on which they rely. As outlined in Habitats Directive Article 3 (1): 'A coherent European ecological network of special areas of conservation shall be set up …composed of sites hosting the … habitats of the species listed in Annex II, (which) shall enable the … species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range. The site series for Annex II species should be chosen to reflect their distribution in the UK. However, where a very high proportion of the population for a relatively widespread species or habitat type occurs in a given part of the UK, a high proportion of sites are commonly selected in these centres of distribution (McLeod *et al.*, 2005). Annex I species grey seal, common seal, bottlenose dolphin and harbour porpoise all

occur throughout UK waters, with the exception of the English Channel (Reid et al. 2003). Inshore SACs have already been selected for grey seal, common seal and bottlenose dolphin (which represent the geographical range of their occurrence inshore).

For the two seal species, analysis of data from recent tracking studies is required to determine whether 'sites essential to their life and reproduction' can be identified away from the coast. This analysis is likely to be completed in 2009. If it becomes possible to identify sites essential to the life and reproduction of seal species away from the coast, additional sites for these species should be selected to represent that part of these species' geographical range away from the coast. Existing data for harbour porpoise and bottlenose dolphin have not enabled the identification of offshore sites for which these two species are the primary reason for selection (JNCC Committee papers: September 2005 (05P10), March 2004 (04P05), September 2008 (08P10); Hammond and Macleod, 2006). However, where SACs have been identified for the protection of Annex I habitats, consideration will be made as to whether an Annex II species can be added as a C or D grade feature to the site.

Special UK responsibilities/proportion of European population

The UK may have special responsibility in the EU for certain species where it holds a large proportion of the total European resource (McLeod *et al.*, 2005), and is required by the Habitats Directive Article 3 (2) to contribute to Natura 2000 in proportion to the representation within its territory of the …. habitats of Annex II species. Where Annex II species are relatively common and extensive in certain Member States, these states should propose a proportion of the resource that is sufficient to contribute significantly to the maintenance of these Annex II species at a favourable conservation status (Atlantic Biogeographical Region Meeting Conclusions, paragraph 6 cited in Hopkins & Buck 1995).

In relation to the European Union populations, UK waters probably hold proportions above 30% of all four marine mammal species on Annex II of the Directive, with the grey seal population being of particular importance (Johnston *et al.*, 2002). However, the UK does not have formal special responsibility within the EU for any marine Annex II species.

Rarity

At the 1994 Atlantic Biogeographical Region Meeting, it was acknowledged that Member States should take responsibility for proposing sites containing Annex II species that are particularly rare in that Member State with a view to preserving the range (Paragraph 5 cited in Hopkins & Buck 1995). Grey seal, common seal, bottlenose dolphin and harbour porpoise are not considered rare in UK waters (Johnston *et al.*, 2002; Jim Reid, Pers. Comm., 2007). This is supported by recent UK assessments on the Conservation Status of Habitats Directive species, reported to the European Commission in 2007.

Multiple interest

Sites with multiple interests are of high intrinsic value (McLeod *et al.*, 2005). In the Atlantic Biogeographical Region Meeting Conclusions, paragraph 2, it states that 'Acknowledging the outstanding single interest sites in terms of quality, extent or range make an important contribution to the Natura 2000 network, special emphasis will be given to identifying and delimiting sites containing complexes of interest on Annexes I and II as valuable ecological units' (Hopkins and Buck, 1995). The Directive recognises this in its emphasis on the maintenance of biodiversity.

It is quite likely that foraging sites identified in offshore waters for any of the four Annex II species occurring in offshore waters, would be used by several or all of the species at various times (Johnston *et al.*, 2002). This is due to the overlap in prey species taken by the Annex II species concerned. It is also quite likely that there may be multiple interests in sites with Annex I sandbank habitat in shallow offshore waters, as this habitat is used by sandeel, which are prey for several of the Annex II species concerned. The latter aspect of multiple interest will be considered when determining any site boundaries for any of the Annex II species. The EU interpretation of the Annex I sandbank habitat as being 'seldom more than 20m below chart datum' (EC 1999), will, however, need to be considered when determining the extent of any sandbank site

which may also be of importance to Annex II species, as significant sandeel populations occur in sandbank habitat at much greater depths than 20m bcd (Johnston *et al.*, 2002).

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Appendix I: Ecological sub-divisions for Annex I Reefs and Shallow Sandbanks to inform assessments of Representativity within the Natura 2000 network

In UK waters Annex I habitats Reefs and Sandbanks slightly covered by seawater all the time are represented by several different topographic and ecological sub-types. Rather than classifying these sub-types outright, JNCC and the UK Conservation Agencies have identified a set of physical parameters (such as substratum, depth, salinity and coastal influence) which, in combination, determine the ecological communities associated with these two interest features. The physical parameters selected are those which are not sufficiently encompassed by proxy through the use of draft Regional Seas. It is not anticipated that every possible combination of parameters will result in distinct subtypes; significant ecological differences may not occur when only one physical parameter varies at a site. Lastly, characterisation is not intended to be exhaustive for every area of Annex I habitat within a Site or Area of Search but to provide an overview of the key type(s) present.

1. Sandbanks which are slightly covered by seawater all the time: Ecological variation

Section 3.1 provides the full EC habitat definition of 'sandbanks which are slightly covered by seawater all the time' as it currently stands. Inshore sites have been selected to cover the following sediment and biotope categories: **gravelly sand; sand; muddy sand**; and **presence of vegetation** (in particular, eelgrass *Zostera marina* beds and maerl (*Corallinaceae*) beds) (Brown *et al.* 1997 cited in Johnston *et al.*, 2002). In order to better assess representation of ecologically distinct sandbank communities across the network, the following physical parameters were considered[8].

1.1 Sediment type

This relates to the principal sediment type of the sandbank features at the site. Categorisation is according to the main type/types rather than indicating every type present. Sand is defined as sediment composed of particles between 2 and 0.0625 mm. Categorisation of sand type is anticipated to be a qualitative judgement based on best expert knowledge rather than on sediment analyses (although where the latter is available, it should be used preferentially).

1.1.1 Gravelly sand

Percentage of gravel in the sediment is less than 30% but greater than 1% and the sand to mud ratio is greater than 9:1.

1.1.2 Sand

Percentage of gravel in the sediment is less than 1% and the sand to mud ratio is greater than 9:1.

1.1.3 Muddy sand

The sand to mud ratio is between 1:1 and 9:1 and percentage of gravel in the sediment is less than 5%.

1.2 Vegetation

The habitat interpretation manual identifies vegetated sandbanks as a clear sub-type for inclusion in the network, and distinguishes between those sandbanks which are vegetated and those which are not. Maerl and seagrass are the main types of vegetation known to occur on sandbanks, but those with seaweed have also been highlighted for characterisation purposes.

1.2.1 Maerl

Presence of maerl species on sandbank.

1.2.2 Seagrass

[8] Depth was not an included parameter since the Annex I habitat is depth-limited according to the Interpretation Manual (EC, 1999). Equally, energy was not considered explicitly as a parameter for sandbanks since topographic divisions give a strong indication of energy levels associated with sandbank features.

Presence of seagrass species on sandbank.

1.2.3 Seaweed

Presence of substantial covering of seaweed species on sandbank.

1.2.4 Non-vegetated

Where the sandbank feature is not vegetated.

1.3 Salinity

This is intended as a qualitative judgement based on best expert knowledge. It is intended to denote the main character of the area in which the feature is found. Therefore, for estuarine features which are only occasionally subject to full salinity water, solely their reduced/low/variable salinity status should be noted.

1.3.1 Full salinity

Water with a salinity of 30 ppt or above.

1.3.2 Reduced/Low/Variable salinity

Water with a salinity below 30 ppt or those which fluctuate regularly between full salinity and measurements below 30 ppt.

1.4 Coastal influence

This parameter is intended to encompass a range of variables which correlate with proximity to land. These include: turbidity, salinity, nutrients, sediment, source of propagules, terrestrial inputs and influence of oceanic water masses. It is a qualitative judgement[9]. All shallow sandbanks in UK waters occur on the continental shelf, and are therefore influenced to some degree by coastal process. As such, the 'Minimal/No coastal influence' parameter is not considered here.

1.4.1 Strong coastal influence

Where terrestrial inputs are a strong ecological driver for the system and fauna and flora propagules are abundant. Oceanic water masses have no or minimal influence on the ecosystem. It is envisaged that this category would apply to areas/sites which are attached to or immediately adjacent to the main land mass of the UK.

1.4.2 Intermediate coastal influence

Where terrestrial inputs are still significant in determining the ecology of the system but are diminished. Oceanic water masses may have an influence on the ecosystem. It is envisaged that this category would apply to areas/sites which are detached from the main land mass of the UK but still occur within shelf seas.

1.5 Topography

Classification of the first three types (which are tidal current sandbanks) is according to Dyer and Huntley (1999).

1.5.1 Headland associated

Dyer and Huntley (1999): "Tidal eddies produced by headlands can create 'banner banks, but when the headland is retreating 'alternating ridges' can be formed which can become isolated from the coast as it recedes." "With very slow retreat the surplus sand will accumulate as a banner bank in a position of convergence. With coastline retreat, a series of alternating banks will result with each successive one more distant from the shoreline." Banner banks are only a few km in size and have an elongated pear-shaped form with the broad end being orientated towards the tip of the headland. Alternating ridges may be linear or V or S shaped. Examples include Haisborough Bank/Winterton Shoal (alternating ridges) and The Skerries Bank in Start Bay (banner bank).

[9] Research commissioned by CCW on sandbank epifaunal and enfaunal assemblages (Darbyshire, *et al.*, 2002; Kaiser, 2004) suggests that sandbanks located away from the coast support significantly different ecological communities to those shallow sandbanks attached to the coast.

1.5.2 Open shelf ridge

Dyer and Huntley (1999): 'Nearly all shallow tidal seas, where currents exceed about 05 m s-1 and where sand is present, have ridges. These can be up to 80km long, and typically average 13km width and tens of metres in height. Their spacing tends to be proportional to their width. The bank crests are flat in shallow water, but are sharp when water depth is large enough to limit wave effects.' Examples include South Falls and Indefatigables.

1.5.3 Estuary mouth

Dyer and Huntley (1999): "…in general linear sand ridges are associated with the mouths of macro-tidal estuaries (wide mouth), and tidal deltas are associated with meso-tidal or micro-tidal estuaries (narrow mouth)." The banks are generally "aligned with the tidal current flow and migrate away from their steeper face." Example include Long Sand and Gunfleet Sand (in the Thames Estuary) and banks in The Wash.

1.5.4 Sandy mounds

Distinct sandbanks (i.e. elongated, rounded or irregular 'mound' shapes) which cannot be categorised as any of the other types.

2. Reefs: Ecological variation

Section 3.2 provides the full EC habitat definition and interpretation of Reefs. Inshore sites have been selected to cover the following reef categories: **bedrock**, **stony** and **biogenic** (Brown *et al.* 1997 cited in Johnston *et al.*, 2002). In order to better assess representation of ecologically distinct reef communities across the network, the following physical parameters were considered.

2.1 Bedrock type

This parameter refers to the type of bedrock which constitutes the reef. "The rock type is significant in two respects, affecting overall topography and the surface texture for colonisation. Soft limestones and chalks have a pitted surface which can affect species composition, whilst these types, plus peats and clays, are soft enough to be bored" (Connor *et al.*, 1995).

2.1.1 Hard (e.g. igneous or metamorphic)

Bedrock types which cannot be burrowed into by fauna or which are not friable.

2.1.2 Moderate & soft (e.g. limestone/chalk)

Bedrock types which are friable or can be burrowed into by fauna.

2.2 Topographic complexity (bedrock reef only)

This parameter is a qualitative appraisal of the topography of the reef, and again should be based on expert judgement. "Topography has a marked influence on the variety of communities which may occur. Variations in topography which lead to vertical faces, overhangs and gullies all increase habitat and micro-habitat diversity compared to more uniform areas of rock" (Connor *et al.*, 1995). Topography in this context should be considered at a scale of tens or hundreds of metres.

2.2.1 High to medium topographic complexity

For example, reefs with gullies, strong vertical features or which are undulating.

2.2.2 Low topographic complexity

Reefs with little topographic variation or which could be described as flat.

2.3 Stony reef

Stony reefs are composed of elevated aggregations of sediments consisting of predominantly cobbles and boulders (particles greater than 64 mm in diameter).

2.4 Biogenic reef

Reef-forming species should be noted where biogenic reef is considered to be an interest feature of the site.

2.4.1 *Mytilus edulis*
Reefs composed of *M. edulis*.

2.4.2 *Modiolus modiolus*
Reefs composed of *M. modiolus*.

2.4.3 *Sabellaria alveolata*
Reefs composed of *S. alveolata*.

2.4.4 *Sabellaria spinulosa*
Reefs composed of *S. spinulosa*.

2.4.5 *Serpula vermicularis*
Reefs composed of *S. vermicularis*.

2.4.6 Cold water corals
Reefs composed of cold water corals e.g. *Lophelia pertusa*.

2.5 Depth zonation

This relates to the depth zones in which significant areas of the reef feature are found.

2.5.1 Intertidal
Encompassing the supralittoral (splash zone or strand-line) as well as the eulittoral.

2.5.2 Infralittoral
Algal dominated or wave disturbed shallow subtidal zone.

2.5.3 Circalittoral
Animal dominated communities where wave action is still an influence.

2.5.4 Deep circalittoral (50/70m-200m depth)
Animal dominated and thermally stable subtidal zone where wave action has minimal or no influence.

2.5.5 Greater than 200m
Animal dominated and thermally stable environment typically beyond the continental shelf break.

2.6 Salinity

This is intended as a qualitative judgement based on best expert knowledge. It is intended to denote the main character of the area in which the feature is found.

2.6.1 Full salinity
Water with a salinity of 30 ppt or above.

2.6.2 Reduced/Low/Variable salinity
Water with a salinity below 30 ppt or those which fluctuate regularly between full salinity and measurements below 30 ppt.

2.7 Coastal influence

This parameter is intended to encompass a range of variables which correlate with proximity to land. These include: turbidity, salinity, nutrients, sediment, source of propagules, terrestrial inputs and influence of oceanic water masses. It is a qualitative judgement.

2.7.1 Strong coastal influence
Where terrestrial inputs are a strong ecological driver for the system and fauna and flora propagules are abundant. Oceanic water masses have no or minimal influence on the ecosystem. It is envisaged that this category would apply to areas/sites which are attached to or immediately adjacent to the main land mass of the UK.

2.7.2 Intermediate coastal influence
Where terrestrial inputs are still significant in determining the ecology of the system but are diminished. Oceanic water masses may have an influence on the ecosystem. It is envisaged that this category would apply to areas/sites which are detached from the main land mass of the UK but still occur within shelf seas.

2.7.3 Minimal/No coastal influence

Where terrestrial inputs into the marine environment have minimal influence in determining the ecology of the system, flora and fauna propagules are reduced and oceanic water masses have a strong influence on the ecosystem. It is anticipated that this category would apply to areas/sites beyond the continental shelf break.

2.8 Energy

This parameter relates to the energy levels associated with the reef feature, encompassing wave action, tidal currents, oceanic currents and internal waves.

2.8.1 High energy

Reefs subject to high wave exposure or strong currents (c. >3 knots) or to high bed stress.

2.8.2 Moderate energy

Reefs subject to moderate wave exposure or moderately strong currents (c. 1-3 knots) or intermediate bed stress

2.8.3 Low energy

Reefs sheltered from wave exposure or subject to weak/negligible tidal currents (less than 1 knot) or low bed stress.

Appendix II: Draft Regional Seas in UK waters (JNCC, 2004; Defra, 2004)