
This paper was provided to the Joint Committee for decision/discussion or information. Please refer to the minutes of the meeting for Committee's position on the paper.

**JNCC 03 D09**
**September 2003**

**JOINT NATURE CONSERVATION COMMITTEE**

# THE 'NETWORK' CONCEPT APPLIED TO THE SELECTION OF MARINE NATURA 2000 SITES

**Paper by Malcolm Vincent**

## 1. Introduction

1.1 Article 3(1) of the EC Habitats Directive requires that a 'coherent European ecological network of special areas of conservation be set up under the title of Natura 2000..... composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed on Annex II..... The Natura 2000 network shall include the special protection areas classified by the Member States pursuant to Directive 79/409/EEC [the EC Birds Directive]'.

1.2 The purpose of the coherent European network for special areas of conservation is stated in Article 3(1) as being 'to enable the habitat types and habitats of the species to be maintained or, where appropriate, restored at a favourable conservation status in their natural range'. The issue of favourable conservation status was considered by the Joint Committee at its December 2002 meeting (JNCC 02 D07).

1.3 Under Article 3(2) of the Habitats Directive 'Each Member State shall contribute to the creation of Natura 2000 in proportion to the representation within its territory of the natural habitat types and the habitats of species.....'.

1.4 Article 10 makes provision for improving the ecological coherence of the Natura 2000 network, specifically by recognising the potential significance of features in the landscape which link sites, or which act as stepping stones, to aid the dispersal, migration and genetic exchange of wild species. Little further is said within the Habitats Directive about the concept of a coherent European ecological network, but inferences may be drawn from the provisions concerning the selection of sites contained in both the Habitats and Birds Directives.

1.5 This paper summarises the concept of coherent ecological networks insofar as it is developed within the two Directives, and interprets the concept further in relation to the prospective UK network of marine Natura 2000 sites.

## 2. The coherent ecological network concept as implied in the EC Habitats and Birds Directives

2.1 There are two main expressions of the concept of coherent ecological network implied in the Habitats and Birds Directives, and these co-exist side-by-side. In both these concepts there is a clear linkage to the ecological needs of the habitats and species for which sites are selected:

i. *Mobile species*

For mobile and migratory species, it is clear that the intention of the Directives is to support the conservation of the species by protecting those areas which are of crucial importance for the survival and reproduction of their populations. The concept is most explicitly expressed in relation to migratory species of birds in Article 4(2) of the Birds Directive, where Member States are required to select special protection areas 'as regards their breeding, moulting and wintering areas and staging posts along their migration routes'. Here, the concept is clearly intended to encompass a network of sites which support the biological needs of the migratory bird species both at crucial points in their life cycle and as they move from place-to-place.

A modified version of this type of concept is expressed in Article 4(1) of the Habitats Directive in relation to animal species ranging over wide areas, where site selection should 'correspond to the places within the natural range of such species which present the physical or biological factors essential to their life and reproduction'. For aquatic species which range over wide areas, sites will be (only) proposed where 'there is a clearly identifiable area representing the physical and biological factors essential to their life and reproduction'. For these wide-ranging species, the purpose of site selection is to protect areas which are crucial for the survival or reproduction of the species.

In this type of network, in which the sites are functionally linked, it is envisaged that the animals will use the sites for purposes crucial to the survival of the species (courtship, breeding, growth of juveniles, feeding etc), but that the animals will also be ranging outside these sites, and, in many cases, moving between them. In general, the sites selected from the Natura 2000 network will be those which will be identified for containing **concentrations or aggregations** of the species of animals listed in the Directives. For SPAs, the agreed practice is to relate site selection thresholds to a stated proportion of the national or biogeographical (as appropriate) population of the species.

ii. *Less mobile species and habitats*

For less mobile species and habitats, the network concept is of a somewhat different nature. For these, site selection is made on the basis of, in the Habitats Directive, the definitive criteria set out in

Annex III of the Directive, which cover (for habitats): issues of representativity, proportion of the national area of the habitat contained within the site, degree of conservation of structure and function, and the site's overall value for the conservation of the habitat. For species, the selection criteria cover: size and density of the species population on the site in relation to the national population, the degree of conservation of the habitat supporting the species, degree of isolation of the population present on the site in relation to its natural range, and the overall importance of the site for the species concerned.

In this concept, the sites are selected for their value in conserving the habitat or species. The important point is that the features should be maintained on the sites themselves; their dependency on adjacent or other areas of land or water is more limited, notwithstanding that they may contain mobile components capable of moving between sites. The degree to which sites are mutually supporting, or the degree to which sites support populations or habitat occurring outside the site series, is left open, with the provisions of Article 10 existing to support any 'linking' action that may be necessary. It is accepted that, in some cases, sites could be 'stand-alone' areas, which make an individual but independent contribution to the overall coverage of the site series. It is this 'totality' of the network (i.e. the sum of its sites rather than the ecological linkage between them), which is, perhaps, the main characteristic of this kind of network.

This type of network, in which the sites are, to a large extent, functionally isolated, can, perhaps, be described as containing the sum of the sites which are **the best of what is left**. For rare habitats and species it may well comprise most of what is left.

2.2 The current UK Natura 2000 site series includes both of the general network elements described above. In the existing series of special protection areas, the network concept is strong, and the network component referred to in paragraph 2.1 i particularly prominent, and crucial in relation to migratory species. The rationale behind the UK SPA network is comprehensively explained in Stroud *et al* (2001). It is very likely that a similar network approach will be adopted in relation to marine SPAs. In relation to the present UK series of candidate special areas of conservation, the network concept referred to in paragraph 2.1 ii is dominant, though both types of concept apply.

2.3 The rationale for SAC site selection in the UK was set out, comprehensively, in JNCC Report No 270 *The Habitats Directive: selection of Special Areas of Conservation in the UK*, and updated as McLeod *et al* (2002). The process used follows the Annex III criteria very closely, with geographical range and ecological variation being given explicit attention also, following agreement on this at Atlantic Biogeographical Region meetings.

2.4 The process set out in JNCC Report No 270 was followed in the selection of the current suite of candidate marine habitat SACs, a methodology greatly assisted by the relatively high level of biological information available for the inshore marine environment in the UK. JNCC Report No 270 explains that, for the marine habitats, while the criteria given in Annex III of the Habitats Directive were followed in site selection, the suite of sites selected were intended to represent the main geographical and ecological range of variation of the respective habitat types in the UK. Note was also taken of the guideline, referred to by the European Commission in its consideration of the national site lists, that, for all but the most extensive habitats, at least 20% of the total national extent should be included in the site series (60% for priority habitats such as lagoons).

## 3. Issues arising in the extension of the UK marine Natura 2000 series out to 200n miles

3.1 The need to expand the current site series to encompass the UK's territory out to 200n miles has raised a number of practical issues for site selection, and many of these were included in the paper on Marine Natura 2000 (JNCC 03 P01) considered by the Joint Committee at its March 2003 meeting. Key amongst these issues, particularly with respect to habitat SACs, are:

i. the greatly increased extent of two of the Annex I habitats (shallow subtidal sandbanks and reefs) included in a UK territory extended to 200n miles. There is recognition that the 20% guideline for habitats may not be appropriate when applied to the offshore zone;

ii. the supposed greater uniformity of habitats in the offshore zone, together with the relative paucity of biological information, makes comparative evaluation between potential sites problematic;

iii. the relative lack of detailed biological information for offshore habitats restricts the level of community description of candidate sites which is possible without the undertaking of resource-intensive further survey.

3.2 Given the practical issues summarised above, it may be helpful to examine current thinking on the development of networks of marine protected areas, and consider whether this would assist in the completion of the marine Natura 2000 site list, especially in relation to special areas of conservation.

## 4. Issues relevant to the development of a network of marine protected areas (MPAs)

4.1 JNCC, as part of our work in relation to the Irish Sea Pilot, recently commissioned a review of current information and thinking on marine protected area network design from Professor Callum Roberts and his colleagues at York University. The following is a synopsis of the outcome of this work, and it is likely to have relevance for the completion of the UK marine Natura 2000 site series.

4.2 The main principles in the development of marine protected area networks have been described as follows:

i. networks should be designed to ensure that protected areas are mutually supporting (i.e. populations of animals and plants in one area should be capable of supporting, and be supported by, populations in other areas);

ii. networks should seek to incorporate the full spectrum of biological diversity (not just that subset which relates *inter alia* to rarity, endangerment, or other pre-selected importance values);

iii. examples of habitats (or concentrations of species) should be replicated in separate protected areas;

iv. the total area protected, and its distribution into different marine protected areas (MPAs), should meet the objective of sustaining species and their habitats in perpetuity;

v. the best available information should be used in site selection, but the development of the site series should not be delayed pending action to collect further information.

(principles adapted from Ballantine 1999, and Roberts, Gell and Hawkins 2003).

4.3 Paragraphs 4.4 to 4.9 below elaborate these principles somewhat, on the basis of current thinking.

***The principle that sites within a network are mutually supporting***

4.4 This principle relates closely to that summarised in paragraph 2.1 i above, but applies it to the generality of the marine site network. It recognises that many marine species have a planktonic egg and/or larval dispersal phase, and that many species within a given habitat have the potential (as a consequence of currents and more irregular water movements), to travel considerable distances. Genetic exchange between sites can, therefore, take place, and a species lost from a given site may be replaced by colonists from another. This potential for mutual support needs to be considered at the time of site selection, although, because water movements are so extensive and variable, detailed knowledge of dispersal patterns along them is not essential. Consideration of biogeography, and of the general layout of water masses, would generally be sufficient.

***Network design should incorporate the full spectrum of biological diversity***

4.5 This principle is somewhat at variance with the approach of the Habitats Directive which pre-selects specific habitat types and species for area-based conservation action. However, the principle can be applied within the subset of habitats and species for which SACs are required by the Directive. The

main element here is to ensure that the sites selected reflect the range of geographical and ecological variation in the Annex I habitat or Annex II species population which is present in the UK. There are two, additional, related aspects to this, namely:

i. that a network of sites covering the full range of geographical and ecological variation will assist communities and species populations to accommodate to dynamic changes, including changes expected to occur as a result of climate change, and

ii. that sufficient protection needs to be afforded to sites to enable them to support the wealth of biodiversity naturally characteristic of them. Regulation of human activities which is confined to protecting 'key' elements of a given habitat may be resulting in the suppression or elimination of other elements, with the result that the MPA does not reach its full potential for that habitat.

***Site replication***

4.6 The purpose of site replication is to insure against the risk of individual sites being damaged, and their biological components being reduced or lost, as a result of a damaging natural occurrence or human activity. Several examples of the same site type are, therefore, selected in an effort to avoid this. Replicate sites should, ideally, be separated from each other sufficiently to ensure that an impact which damages one site does not also damage the others. However, the replicate sites should not be so far apart that organisms from an undamaged site cannot re-colonise and restore a damaged one.

***Extent of protected area***

4.7 i. *Total extent*

Notwithstanding a number of studies investigating the proportion of the area of habitat(s) necessary for incorporation into marine protected areas, in practice this will depend on a) the degree of variability of the habitat (i.e. a high level of variability is likely to lead to a requirement for a larger number of sites), and b) the degree to which non-protected areas are likely to be adversely affected by human activities (i.e. the greater the level of impact outside the protected areas, the greater the proportion included in such areas needs to be). As a guide, a consensus appears to be emerging which indicates the need for 10-15% of marine habitats to be included within MPAs. Where the habitat is limited in extent, the proportion should be higher (perhaps 30-40% and, in cases of habitat rarity, in excess of this), while if the habitat is widespread and relatively uniform, the proportion could be lower (perhaps 7-10%). These figures do not incorporate consideration of the area required to support mobile, commercially-exploited fish species (for which marine SACs are not explicitly required, although such species may be 'typical species' of a given habitat), about which there is a vigorous ongoing debate.

ii. *Site extent*

As on land, the general principle that large sites are preferable to small ones applies to the marine environment, but, also as on land, examples of some types of habitat (e.g. some reef systems or gas seep structures) may be sufficiently protected at fairly modest scales (e.g. 5km²), having due regard also to the practicalities of regulating potential adverse human impacts. Clearly, if the occurrence of a particular habitat-type is itself limited, this will constrain the size of sites. For habitat types which depend for their structure and function on processes potentially operating over extensive areas (e.g. shallow subtidal sandbanks), significantly more extensive sites (e.g. 1,000-5,000km²) may be needed.

***Use of most appropriate information***

4.8 Where detailed biological information exists, it should be utilised in site selection. Indeed, as regards identifying concentrations and aggregations of mobile species such as seabirds and sea mammals, the availability of adequate biological data is essential. However, for the purposes of identifying a representative series of habitat types within an MPA network, techniques have been developed which do not require such detailed biological information.

4.9 Faced with the need to identify a network of MPAs for Canada, with its great length of coastline and sea area, and for which there was only very modest biological information available, Roff and Taylor (2000) devised a marine classification which used primarily geophysical parameters (such as water temperature, depth/light, substrate type, exposure, slope). They considered that this classification could be used to develop a representative series of MPAs, without the need for detailed biological information, since, if a full range of habitats based on the variation of geophysical parameters were selected in the network, that network could be expected to support the range of biological communities present in the Canadian marine environment. However, to be efficient, this concept is dependent on the MPAs being protected from adverse human activities since, even if the constituent sites did not contain their natural biological communities (because of the effect of human impacts) at the time of selection, with protection these could be restored over time through the process of natural re-colonisation.

## 5. Discussion

5.1 As regards marine SPAs and marine species SACs, it is concluded that biological information needs to be sufficient, at a minimum, to:

- relate the size and density of the species population on site to the national and (where appropriate) biogeographical population;
- assess the degree of conservation (structure and function) of the habitat supporting the species on the site;
- assess the geographical distribution of the species nationally.

5.2 For habitat SACs the principles summarised in Section 4 above could be used to aid in the development of a coherent ecological network of marine Natura 2000 sites. The methodology summarised in paragraph 4.9 could be used to inform the selection of a site series for marine habitat SACs in the UK offshore zone, and indeed also in the inshore zone away from coastal areas (where, in the main, the existing suite of candidate marine SACs is located); both are zones where there is very limited biological information available but for which we do have geophysical data.

5.3 However, notwithstanding that the approach summarised in paragraph 4.9 appears scientifically and ecologically valid, it is necessary to consider whether it is also compliant with the site selection criteria set out in Annex III of the Habitats Directive (referred to in 2.1 ii above). In general, the answer to this question is 'yes', and the methodology for doing so was set out in the paper on Marine Natura 2000 (JNCC 03 P01), and adopted by the Joint Committee at its March 2003 meeting for the purposes of wider informal consultation.

5.4 However, there are some caveats to this. Firstly, there needs to have been sufficient verification that the habitats identified using available geophysical data are, indeed, the habitats listed on Annex I of the Habitats Directive (primarily, as regards the offshore zone, shallow subtidal sandbanks, reefs, structures made by leaking gases and, if they occur in the offshore zone, sea caves). A potential problem with existing geophysical data is that the data sometimes reflect seabed sub-surface characteristics, while biological communities reflect seabed surface characteristics. JNCC 03 P01 identified a number of localities where areas provisionally identified as an Annex I habitat type needed to have this identification confirmed because there was uncertainty over the seabed surface characteristics. The need for such validation is reinforced by a recent survey commissioned by JNCC to verify whether rocky sea mounds present in the Irish Sea were indeed 'rocky'. The result was that while some were, in others, the mounds were overlain by a veneer of silt. Sufficient verification of habitat type is, therefore, necessary.

5.5 Secondly, it would be necessary to be satisfied that the structure and function of the site and/or its restoration capability, are satisfactory to enable the site to make its anticipated contribution to favourable conservation status of the habitat type in the long-term. Again a sufficient level of verification would be necessary. Nonetheless, the levels of verification required under paragraphs 5.4 and 5.5 are far less resource-intensive than the level of additional survey required to obtain detailed biological information.

5.6 Thirdly, however, information needs to be sufficient to enable evaluation of the site's 'overall value for the conservation of the habitat'. The traditional approach to site selection and management of Natura 2000 sites has been to found selection on fairly detailed knowledge of the biological communities hosted on the sites. While this approach does not, necessarily, reflect the actualities of dynamically-changing communities which are responding also to the effects of climate change (ie the biological communities recorded at the time of survey may alter significantly over time), on balance, it could be

concluded that the nature and level of information, taken as a whole, should be such as to enable the 'overall value' of the site to be evaluated. Whether, or the degree to which, that assessment should encompass biological information is a matter as likely to be determined by the development of a widely-shared opinion on the purpose of the network, as by scientific analysis of the data needs of individual sites. Such an opinion will also influence the data needs for post-site selection regulation of human activity on the site.

5.7 The above are all issues which need to be discussed further both at the UK and European Union levels to ensure that a shared view on these issues is obtained and the necessary levels of compliance with the Directives achieved.

5.8 In conclusion, while the type of network envisaged for marine SPAs, and for mobile marine species for which SACs are selected, will follow that outlined in paragraph 2.1 i, the relatively inter-connected and coherent nature of marine habitats allows for a network concept similar to that described in Section 4 to be adopted for marine habitat SACs, rather than relying on the network type summarised in paragraph 2.1 ii which has to be used for the more fragmented terrestrial habitats. Since the 'coastal' marine SACs already submitted to Government and the European Commission encompassed the need to address the issues of geographical and ecological variation, these sites should readily slot into a wider network of this nature.

## 6. References

Ballantine, W.Y. (1999). *Marine reserves in New Zealand. The development of the concept and principles.* Paper for workshop of MPAs: KORDI, Korea, November 1999.

Brown, A.E., Burn, A.J., Hopkins, J.J. and Way, S.F. (1997). *The Habitats Directive: selection of Special Areas of Conservation in the UK.* JNCC Report No 270.

McLeod, C.R., Yeo, M., Brown, A.E., Burn, A.J. and Way, S.F. (Eds) (2002). *The Habitats Directive: selection of Special Areas of Conservation in the UK.* 2nd Edition. JNCC, Peterborough.

Roberts, C.M. Gell, F.R. and Hawkins, J.P. (2003). *Establishing a network of nationally important marine protected areas in the Irish Sea Pilot Project Region.* York University report to JNCC.

Roff, J.C. and Taylor, M.E. (2000). *National frameworks for marine conservation - a hierarchical geophysical approach.* Aquatic conservation: Marine and Freshwater Ecosystems. **10**: 209-223.

Stroud, D.A., Chambers, D., Cook, S., Buxton, N., Fraser, B., Clement, P., Lewis, P., McLean, I., Baker, H., and Whitehead, S. (2001). *The UK SPA Network - its scope and content.* 3 volumes. JNCC, Peterborough.