OSPAR Convention for the Protection of the Marine Environment of the North-East Atlantic

Meeting of the Intersessional Correspondence Group on Marine Protected Areas (ICG-MPA)

Edinburgh, UK: 21-23 January 2013

A matrix approach to assessing the ecological coherence of the OSPAR MPA network: trial of methodology in the Channel

Presented by the United Kingdom and France

This document invites ICG-MPA to consider the results of the trial application of the matrix approach to assessing whether the OSPAR MPA network in the Channel is ecologically coherent, and consider the applicability of scaling up the approach for use at the wider OSPAR level

Action requested

1. This document invites ICG-MPA to consider the results of the trial application of the matrix approach in the Channel, comment on the recommendations at the end of the document (pages 24-25), and consider the applicability of scaling up the approach to assess whether the OSPAR MPA network is ecologically coherent.

2. Due to the close timing of ICG-MPA and BDC meetings in 2013, ICG-MPA is requested to provide any initial comments on this paper via email to the UK task manager Jenny Oates (Jenny.Oates@jncc.gov.uk) by **16th January** in order that these comments can be included as an addendum with the submission to BDC.

Background

1. The OSPAR Convention requires Contracting Parties to establish an ecologically coherent network of MPAs in the north-east Atlantic by 2012 and ensure it is well-managed by 2016.

2. A matrix approach to assessing ecological coherence of the OSPAR MPA network was proposed by the UK in 2008 (MASH 08/5/6-E[1]). UK (JNCC) and France (AAMP) subsequently agreed to trial the matrix approach in the Channel. The original matrix approach to assessing the ecological coherence of the OSPAR MPA network assesses six elements of ecological coherence, as set out in OSPAR (2006)[2]. In a paper presented by the UK and France to BDC in February 2012[3], it was proposed that a simplified version of the matrix should be used for the trial in the Channel, which assesses five of the OSPAR principles (features, representativity, replication, resilience and connectivity).

[1] OSPAR (2008) A matrix approach to assessing the ecological coherence of the OSPAR MPA Network. OSPAR Convention for the Protection of the Marine Environment of the Northeast Atlantic, Meeting of the Working Group on Marine Protected Areas, Species and Habitats, 21-24 October 2008, Baiona, Spain. Meeting Document MASH 08/5/6-E, http://jncc.defra.gov.uk/pdf/0506_UK_OSPARMPAsEcoCoherenceAssessmt.pdf

[2] OSPAR 2006. Guidance on developing an ecologically coherent network of OSPAR marine protected areas. (Reference number 2006-3).

[3] OSPAR BDC 2012 (12/3/12-E) Progress report on trial application of the matrix approach to assessing whether the OSPAR MPA network in the Channel is ecologically coherent

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Summary

The main purpose of this paper is to provide a critical analysis of the matrix methodology for assessing ecological coherence of the OSPAR MPA network, which was proposed by the UK in 2008 (MASH 08/5/6-E[7]). The main issues which were encountered during the matrix trial are discussed in this paper in the context of considering the applicability of scaling up the approach for use at the wider OSPAR level (see Discussion: Scaling up the approach). It is not the objective of this paper to provide a detailed analysis of the ecological coherence of the OSPAR MPA network in the Channel, however it has been possible to draw some limited conclusions that may be useful when considering the concept of ecological coherence at a broader geographic scale (see Discussion: Ecological coherence of the OSPAR MPA network in the Channel).

The overall conclusion of the trial is that the matrix approach provides a robust methodology for assessing whether the network of MPAs is ecologically coherent. The trial highlighted the importance of expert

[4] OSPAR (2008) A matrix approach to assessing the ecological coherence of the OSPAR MPA Network. OSPAR Convention for the Protection of the Marine Environment of the Northeast Atlantic, Meeting of the Working Group on Marine Protected Areas, Species and Habitats, 21-24 October 2008, Baiona, Spain. Meeting Document MASH 08/5/6-E, http://jncc.defra.gov.uk/pdf/0506_UK_OSPARMPAsEcoCoherenceAssessmt.pdf

[5] OSPAR 2006. Guidance on developing an ecologically coherent network of OSPAR marine protected areas. (Reference number 2006-3).

[6] OSPAR BDC 2012 (12/3/12-E) Progress report on trial application of the matrix approach to assessing whether the OSPAR MPA network in the Channel is ecologically coherent

[7] OSPAR (2008) A matrix approach to assessing the ecological coherence of the OSPAR MPA Network. OSPAR Convention for the Protection of the Marine Environment of the Northeast Atlantic, Meeting of the Working Group on Marine Protected Areas, Species and Habitats, 21-24 October 2008, Baiona, Spain. Meeting Document MASH 08/5/6-E, http://jncc.defra.gov.uk/pdf/0506_UK_OSPARMPAsEcoCoherenceAssessmt.pdf

judgement, reported information on species/habitats, and spatial analysis using Geographic Information Systems (GIS) as complementary approaches to the assessment of ecological coherence.

The trial also highlighted that the level of analysis that is possible using the matrix method is limited by the extent of available data and scientific understanding. The success criteria for the trial are summarised in the methodology section. For future assessments at different geographical scales, alternative success criteria will need to be developed and it will be important to consider using all available scientific understanding to determine ecologically meaningful success criteria.

It is considered that this approach is suitable for scaling up for use at the wider OSPAR level, as long as due consideration is given to the issues and limitations outlined in the paper. A series of recommendations are presented at the end of the paper for further work which could be considered in order to facilitate the successful application of the methodology at the wider OSPAR level.

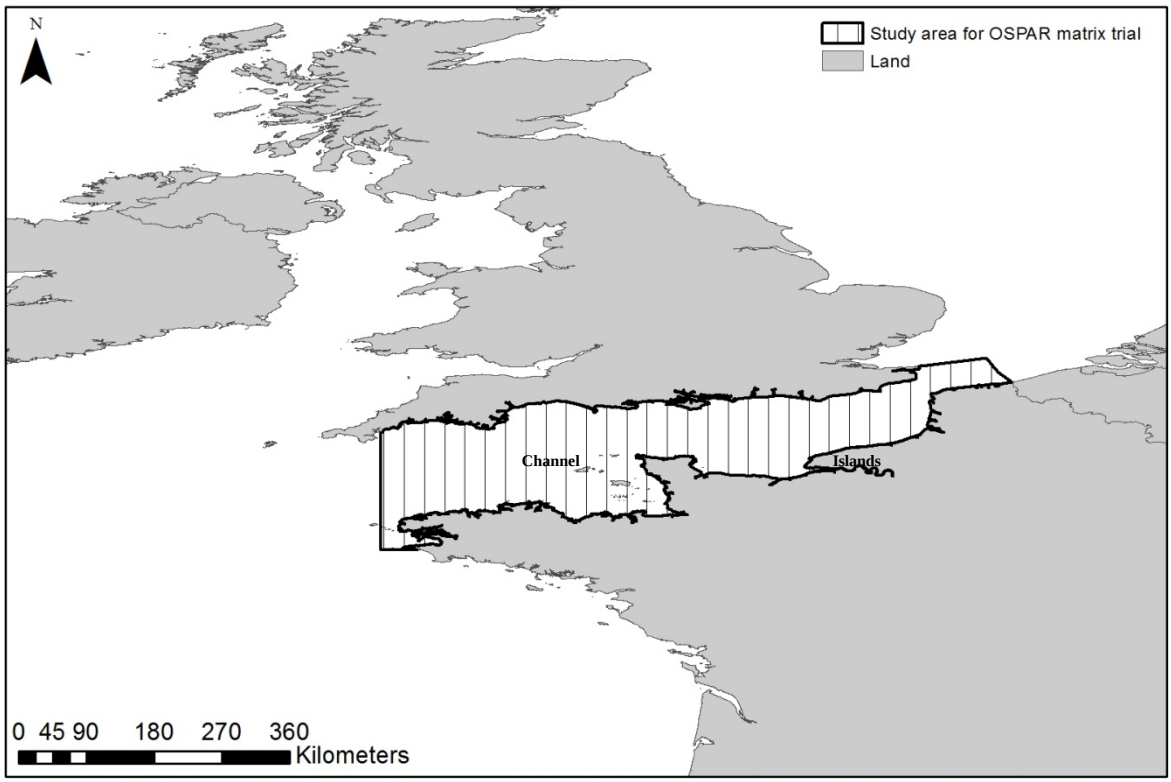
Methodology

Study area

The western boundary of the study area follows the limit of OSPAR Regions II and III. The eastern boundary follows the limits of French territorial waters (with neighbouring Belgium). From the northern point of this eastern boundary an arbitrary line was drawn from east to west to reach the English coast north of Ramsgate (Kent). At the English coastal zone the Mean High Water Mark was used to delimit the study area boundary and at the French coastal zone the Histolitt coastline[8] was used (highest water mark). Although no OSPAR MPAs exist in the Channel Islands waters, this marine area has been included in the spatial analysis to account for habitats and species present in this area.

Although not decided yet, this study area is currently the option favoured by the PANACHE project (Protected Areas Network Across the Channel Ecosystem) for the area of interest.

[8] http://www.shom.fr/les-services-en-ligne/donnees-en-telechargement/trait-de-cote/licence/



Map displayed in Cylindrical Equal Area (world) projection system. Land copyright NOAA - National Geophisycal Data Centre; Area of study copyright JNCC/AAMP.

Figure 1. Study area for OSPAR matrix trial

Habitats and species

Data from the OSPAR habitats database (2011) were used to determine which habitats on the OSPAR threatened/declining list (OSPAR T&D habitats) are present in the study area. It is important to note that although coral gardens, *Lophelia pertusa* reefs and *Modiolus modiolus* beds are listed as threatened and/or declining in OSPAR Region II, the OSPAR habitats database (2011) does not include any records and so they have been excluded from the assessment.

Predictive modelled data from EU SeaMap[9] were used to determine which EUNIS level 3 habitats are present in the study area. This dataset does not cover intertidal areas (EUNIS A1 and A2), so it was not possible to determine which A1 and A2 intertidal habitats are present in the study area; as a result this trial does not include an evaluation of the extent to which these habitats are protected within MPAs. EUNIS level 3 habitats were considered to be characteristic and therefore considered as part of the assessment of representativity if they occupied over 1% of the total study area. Taking this approach, eight EUNIS level 3 habitats were considered representative of the study area (Table 1).

In the absence of comprehensive data on the distribution of species on the OSPAR threatened/declining list (OSPAR T&D species) in the Channel, we started with the full list of OSPAR T&D species that occur in OSPAR Region II, and excluded four species that were assumed to be anecdotal within the channel (sturgeon, leatherback turtle, blue whale and northern right whale).

MPAs

[9] Cameron, A. and Askew, N. (eds.). 2011. EUSeaMap - Preparatory Action for development and assessment of a European broad-scale seabed habitat map final report. Available at http://jncc.gov.uk/euseamap

The trial included all French and UK MPAs within the study area that have been submitted to the OSPAR MPA database, in addition to those that are intended to be included in 2012 submissions to OSPAR. Where the study area boundary cut across an OSPAR MPA boundary, only the portion of the MPA falling within the study area was included in the analysis.

Protected features in MPAs

The trial included the features from the OSPAR list of threatened and/or declining species and habitats that are listed on the OSPAR MPA pro formas (or due to be listed) as being protected in each site, with the exception of those OSPAR T&D habitats listed in the pro formas for which there were no associated habitat data located within the relevant site boundaries in the OSPAR habitats database. Since these additional habitats have not been included in the matrix, this means that the results are likely to represent a conservative assessment.

The trial included EUNIS level 3 habitats protected by UK OSPAR MPAs. The relevant EUNIS level 3 habitats which are considered to be protected by the underpinning Natura 2000 designations in UK OSPAR MPAs were determined from an exercise that was carried out as part of the MCZ Project[10]. Only UK MPAs are included in the matrix for EUNIS level 3 habitats because an equivalent exercise has not yet been carried out to determine the EUNIS level 3 habitats which are protected by the designated features in French OSPAR MPAs.

Expert judgement (AAMP) was used to determine the areas of functional importance for OSPAR T&D species which are protected in OSPAR MPAs. It is important to note that knowledge on areas of functional importance for species is very heterogeneous and scarce for most of the species (sometimes completely absent for “non-Natura 2000” species).

Success criteria (main assessment)

The original matrix approach to assessing the ecological coherence of the OSPAR MPA network assesses six elements of ecological coherence, as set out in OSPAR (2006)[11]. In a paper presented by the UK and France to BDC in February 2012[12], it was proposed that a simplified version of the matrix should be used for the trial in the Channel, which assesses five of the OSPAR principles (features, representativity, replication, resilience and connectivity).

Following recommendations from the paper ‘A matrix approach to assessing the ecological coherence of the OSPAR MPA network’, and given that it is a trial of an approach to wider assessment of coherence, it is considered that the OSPAR principles under consideration will be considered to be met by the network of MPAs in the Channel if the following apply:

[10] SNCB’s MCZ Advice Project – Assessing the contribution of existing sites to the network (Technical Protocol H): http://www.naturalengland.org.uk/Images/protocol-H_tcm6-28378.pdf JNCC has produced a correlations table to assess the relationship between habitats used to drive the selection of MPAs across UK waters and is available at : http://jncc.defra.gov.uk/pdf/EUNIS_Correlation_2007-11_20101206v2.pdf

[11] OSPAR 2006. Guidance on developing an ecologically coherent network of OSPAR marine protected areas. (Reference number 2006-3).

[12] OSPAR BDC 2012 (12/3/12-E) Progress report on trial application of the matrix approach to assessing whether the OSPAR MPA network in the Channel is ecologically coherent

Features/Representativity:

- The network should represent all EUNIS Level 3 habitats and OSPAR T&D habitats and species for which MPAs are considered appropriate in the study area.

Replication and Resilience:

- The network should contain at least two MPAs for each EUNIS Level 3 habitat and at least three examples of OSPAR T&D habitats and species for which MPAs are considered appropriate which occur in the study area.

Connectivity:

- No quantitative target is proposed, however it is recommended that sites are selected to support OSPAR T&D species at key stages of their life cycle.

Additional information (not part of main assessment)

The principle of adequacy/viability is not included in the simplified version of the matrix methodology due to the difficulties associated with determining quantitative targets for adequacy/viability in the Channel area. This is because there is currently limited scientific understanding about the amount of any given habitat or species population which would be required in this area to achieve an ecologically coherent network.

As part of the exercise of compiling the data on species and habitats protected by MPAs in the Channel, additional information on habitats was collated which is not part of the main assessment (see Annex I). The additional information which has been compiled includes proportions of habitats protected within MPAs, habitat areas in MPAs, and distances between MPAs for each feature. The additional information is presented in this paper in order to provide examples of the type of information available and how this information could be presented to evaluate the network in terms of the principles of adequacy, viability and connectivity between habitats in the future. This is intended to support any future plans for expanding the methodology to include evaluation of other network design aspects. This additional information has not been evaluated against success criteria.

Results

MAIN ASSESSMENT

Features/Representativity

EUNIS level 3 habitats

The results indicate that all EUNIS level 3 habitats considered representative of the study area, with the exception of A5.3 (sublittoral mud), are afforded protection within MPAs (Table 1). The results are likely to represent a conservative assessment as French MPAs have not been considered at this stage due to the reason outlined in the Methods section. As noted above, intertidal habitats (A1 and A2) were not included in the EUNIS level 3 analysis.

OSPAR Threatened and/or Declining Habitats

Of the eight OSPAR T&D habitats recorded in the study area, five are considered to be represented within OSPAR MPAs (Table 2).

Intertidal *Mytilus edulis* beds on mixed and sandy sediments, *Sabellaria spinulosa* reefs, and *Ostrea edulis* beds are not considered to be represented within the OSPAR MPA network in the study area. There are 22 point records of Intertidal *Mytilus edulis* beds on mixed and sandy sediments within the study area according to the OSPAR database. These records are sparsely distributed in patches across the English coastline. Although two of these records fall within OSPAR MPAs, these sites are not considered to afford protection to the feature. There are 239 point records of *Ostrea edulis* beds within the study area, but these are sparsely distributed and none are protected within MPAs. There are 93 point records *Sabellaria spinulosa* reef according to the OSPAR database. These records are fairly evenly distributed across the English coastline. Although nine of these records fall within OSPAR MPAs, these sites are not considered to afford protection to the feature.

OSPAR Threatened and/or Declining Species

Using the OSPAR MPA pro formas, and additional data synthesised on the French side of the Channel (AAMP 2012), OSPAR T&D species within the study area were assessed against the degree to which they were present in and protected by OSPAR MPAs in the Channel (Table 3a). Four OSPAR T&D species were considered in this study as not relevant species in the Channel (Table 3c), as explained in the methodology section.

Of the twenty five OSPAR T&D species that are considered relevant within the Channel (Table 3c), ten are considered to be represented within and protected by OSPAR MPAs (Table 3a).

Of the other OSPAR T&D species which are considered relevant within the Channel (known to occur frequently), fourteen species of fish and one invertebrate (*Nucella lapillus*) are not considered to be afforded protection by the current OSPAR MPA network (Table 3c).

Replication and Resilience

EUNIS level 3 habitats

With the exception of A5.3 (sublittoral mud), there is sufficient replication (i.e. more than once) of all EUNIS level 3 habitats which are considered representative of the study area (Table 1).

OSPAR Threatened and/or Declining Habitats

Of the five OSPAR T&D habitats which are represented within the study area, replication is considered adequate (i.e. more than twice) for four (Table 2).

There are a relatively low number of point records (4) of seapens and burrowing megafauna communities within the study area, one of which is considered adequately protected by the Plymouth Sound and Estuaries SAC. The other three records do fall within OSPAR MPAs but these are not considered to afford protected to the feature. The limited number of records mean that it may be inappropriate to apply the replication success criterion to this habitat. The low number of records may be a product of underreporting; alternatively it may be the case that the habitat is considered rare within the study area and therefore maybe inappropriate to consider in the context of this study.

OSPAR Threatened and/or Declining Species

Of the ten OSPAR T&D species which are protected within the OSPAR MPA network, replication is considered adequate (i.e. more than twice) for five (*Alosa alosa*, *Arctica islandica*, *Petromyzon marinus*, *Phocoena phocoena*, *Puffinus mauretanicus*) (Table 3a).

One invertebrate (*Ostrea edulis*) is only protected once and two fish (*Centroscymnus coelolepsis* & *Raja montagui*) are only protected twice: once by the Marine Natural Park and once by the national reserves (and not by Natura 2000 sites); these species are not considered to be adequately replicated (Table 3a).

Two species of birds (*Rissa tridactyla* & *Sterna dougalii*) for which there are few breeding colonies within the channel are also insufficiently replicated within the OSPAR Network (once only).

Connectivity

OSPAR Threatened and/or Declining Species

The principle of connectivity is addressed by the matrix methodology by referring to the existence of areas of functional importance for OSPAR T&D species within the network. Based on information collected on Natura 2000 species, the current network includes 7 spawning rivers (within 4 MPAs) for *Alosa alosa*, 5 spawning rivers (within 3 MPAs) for *Petromyzon marinus* and 1 breeding area for *Rissa tridactyla* (Table 3a).

Additional information on Natura 2000 species is provided in Table 3b, which indicates that the current network of MPAs has significant coverage for areas of functional importance for *Alosa alosa*, *Petromyzon marinus* and *Rissa tridactyla*. However, *Sterna dougalii* does not benefit from protection of areas that are known to be of functional importance for this species. Some species (*Phocoena phocoena* and *Puffinus mauretanicus*) have less stable distribution patterns therefore such an evaluation is difficult and may not be relevant.

Although this synthesis of information on key stages of species lifecycles is valuable, the results of this trial are limited to a qualitative assessment of connectivity, since it was not possible to set a threshold for meeting the “success criteria” of connectivity for OSPAR T&D species.

ADDITIONAL INFORMATION (NOT PART OF MAIN ASSESSMENT)

Connectivity for habitats

A spatial assessment of the configuration of OSPAR MPAs is considered to be an important element of the assessment of whether the network is ecologically coherent (OSPAR 2008[13]). The first of the three initial spatial tests detailed in OSPAR (2008) asks whether the OSPAR MPA network is spatially well-distributed, without more than a few major gaps. As part of the exercise considering EUNIS Level 3 and OSPAR T&D habitats protected in MPAs in the study area, a GIS analysis was carried out to calculate average distances between MPAs protecting the same habitats (based on a linear distance calculation performed in GIS). The approximate average distance between MPAs protecting the same habitat within the study area is provided in Tables 1 and 2 for EUNIS level 3 and OSPAR T&D habitats respectively.

[13] OSPAR (2008) Background document on three initial spatial tests used for assessing the ecological coherence of the OSPAR MPA network. OSPAR Commission Biodiversity Series.

This is largely an arbitrary assessment of connectivity between MPAs at this stage for illustrative purposes. It would be important for future assessments of connectivity between habitats to take account of important environmental parameters such as seabed topography, hydrographic processes and the life history of biological communities associated with typical examples of these habitats. Therefore, these figures should be used very cautiously.

Adequacy/viability

Generally there is a lack of quantitative data for total species populations and habitat areas for OSPAR T&D habitats and species in the Channel. Therefore it was not possible to evaluate the proportion of total resources of features that are protected for OSPAR T&D habitats and species in the study area.

The proportions of EUNIS Level 3 habitats protected within UK OSPAR MPAs in the study area were calculated (Table 1). Of the eight EUNIS level 3 habitats considered characteristic of the study area there are only three habitats for which a relatively large proportion (more than 10%) of the total habitat extent within the study area is protected (A3.2, A4.1 and A4.2). It is worth noting that although the EUNIS habitat A5.4 (sublittoral mixed sediments) is protected within several OSPAR MPAs (thus meeting the success criterion for replication), a very small proportion of the total extent of this habitat is protected in the study area, therefore it is unlikely that the principle of adequacy would be met for this habitat. In addition, the maximum area of this habitat protected within these MPAs is very small (see Annex I) therefore it is unlikely that viable examples of this habitat are protected. These examples highlight the potential additional information that could be gained from an assessment of adequacy/viability about the extent to which the MPA network is ecologically coherent.

Table 1. EUNIS Level 3 habitat representation within the OSPAR MPA network in the Channel (UK OSPAR MPAs only)

General information			*Main assessment information*			*Additional information*	
EUNIS code	**Habitat type**	**Proportion within PANACHE area (%)**[14]	**Number of MPAs affording protection**	**Sufficiently replicated?**	**MPAs considered to afford protection**	**Proportion of total habitat protected within MPAs (%)**	**Minimum, average and maximum distance between MPAs (km)**[15]
A3.1	High energy infralittoral rock	2.25	6	Yes	Thanet Coast SAC, Lyme Bay and Torbay SAC, Plymouth Sound & Estuaries SAC, South Wight Maritime SAC, Studland to Portland SAC, Thanet Coast SAC and Thanet Coast and Sandwich Bay (SPA)	4.95	Min – 0 Av – 278.94 Max – 605.30
A3.2	Moderate energy infralittoral rock	1.29	5	Yes	Lyme Bay and Torbay SAC, Plymouth Sound & Estuaries SAC, South Wight Maritime SAC, Studland to Portland SAC, Thanet Coast SAC	12.65	Min – 18.14 Av – 232.81 Max – 605.30
A3.3	Low energy infralittoral rock	0.02	N/A	N/A	N/A	N/A	N/A
A4.1	High energy circalittoral rock	1.99	4	Yes	Lyme Bay and Torbay SAC, Plymouth Sound & Estuaries SAC, Studland to Portland SAC,Wight-Barfleur Reef SAC	26.93	Min – 13.70 Av – 92.24 Max – 229.41
A4.2	Moderate energy circalittoral rock	9.79	5	Yes	Lyme Bay and Torbay SAC, Plymouth Sound & Estuaries SAC, South Wight Maritime SAC, Studland to Portland SAC, Wight-Barfleur Reef SAC	10.01	Min – 13.22 Av – 97.55 Max – 267.88

[14] Note that the percentage coverage of all EUNIS level 3 habitats recorded does not equate to 100% coverage but 97.84%. This is due to mapping artefacts present within EU SeaMap.

[15] Based on polygon data only. Note that the minimum distance between MPA is 0 for some habitats. This is because MPAs affording protection to the same feature may adjoin one another and so there is no distance between them.

A4.3	Low energy circalittoral rock	0.49	N/A	N/A	N/A	N/A	N/A
A5.1	Sublittoral coarse sediment	53.7	6	Yes	Bassurelle Sandbank SAC, Chesil & The Fleet SAC, Thanet Coast SAC and Thanet Coast and Sandwich Bay SPA, Plymouth Sound & Estuaries SAC, Thanet Coast SAC, Wight-Barfleur Reef SAC	0.50	Min – 0 Av – 286.63 Max – 605.30
A5.2	Sublittoral sand	11.3	3	Yes	Bassurelle Sandbank SAC, Plymouth Sound & Estuaries SAC, Solent Maritime SAC	0.58	Min – 195.53 Av – 339.25 Max – 547.68
A5.3	Sublittoral mud	1.31	0	-	N/A	N/A	N/A
A5.4	Sublittoral mixed sediments	15.7	2	Yes	Solent Maritime SAC, Solent and Southampton water SPA and Solent Maritime SAC	<0.01	0[16]

[16] Note the figure is zero because the two MPAs considered to afford protection to A5.4 adjoin one another

Table 2. OSPAR T&D habitat representation within the OSPAR MPA network in the Channel (French and UK MPAs)

	Main assessment information			*Additional information*
Habitat	**Number of MPAs affording protection**	**Sufficiently replicated?**	**MPAs considered to afford protection**[17]	**Minimum, average and maximum distance between MPAs for habitat (km)**[18]
Intertidal mudflats	12	Yes	Fal and Helford SAC, Solent Maritime SAC, Solent and Southampton water SPA and Solent Maritime SAC, Plymouth Sound and Estuaries SAC, Abers - Cotes des legendes SAC, Baie de Saint Brieuc Est SAC, Baie de Seine Occidentale SAC, Cote de Granit Rose -Sept Iles SAC, Estuaire de la Seine SAC, Tregor-Goelo SAC, Tatihou Saint Vaast La Hougue SAC, Marais du Cotentin et du Bessin - Baie des Veys SAC	Polygon data – Min – 65.2 Av – 258.61 Max – 372.99 Point data – Min – 0.14 Av – 178.66 Max - 507.05
Intertidal *Mytilus edulis* beds on mixed and sandy sediments	0	-	N/A	N/A
Littoral chalk communities	3	Yes	Thanet Coast and Sandwich Bay SPA and Thanet Coast SAC, Littoral Cauchois SAC, Thanet Coast SAC	Polygon data - Min – 0 Av - 59.55 Max - 89.34 Point data data – 0[19]
Maerl beds	4	Yes	Baie de Morlaix SAC, Cote de Granit Rose -Sept Iles SAC, Iroise PNM, Tregor-Goelo SAC	Point data only Min – 0 Av – 46.09

[17] Based on both habitat polygon and point records

[18] Note in places that two sets of figures are provided based on polygon and point record data. The minimum distance between MPA is 0 for some habitats. This is because MPAs affording protection to the same feature may adjoin one another and so there is no distance between them.

[19] Note the figure is zero because two MPAs considered to afford protection to the habitat adjoin one another

				Max – 109.85
Ostrea edulis beds	0	-	N/A	N/A
Sabellaria spinulosa reefs	0	-	N/A	N/A
Sea-pen and burrowing megafauna communities	1	-	Plymouth Sound and Estuaries SAC	N/A (only one MPA)
Zostera beds	10	Yes	Plymouth Sound and Estuaries SAC, Solent maritime SAC, Abers - Cotes des legendes SAC, Baie de Morlaix SAC, Cote de Granit Rose -Sept Iles SAC, Cote de Granit Rose - Sept Iles SAC and Sept Iles NNR, Iroise PNM, Tregor-Goelo SAC, Tatihou Saint Vaast La Hougue SAC, Marais du Cotentin et du Bessin - Baie des Veys SAC	Polygon data Min – 0.014 Av – 154.47 Max – 354.55 Point data Min – 0.014 Av – 170.01 Max – 366.87

Table 3a. OSPAR T&D species representation within the OSPAR MPA network in the Channel
The species are split between Natura 2000 and non Natura 2000 species to highlight the differences in available scientific knowledge

SPECIES	Main assessment information			Additional information	
Natura 2000 species	**Number of MPAs affording protection**	**Sufficiently replicated?**	**Functional importance**	**Minimum population size in each MPA**	**MPAs considered to afford protection**
			3 spawning rivers		Tregor-Goelo (SAC)
				2603 (Vire 2011)	Baie de Seine occidentale (SAC)
			1 spawning river	143 (Seine; poses 2010)	Estuaire de la Seine (SAC)
			2 spawning rivers	2603 (Vire 2011)	Marais du cotentin et du Bessin-baie des Veys (SAC)
Alosa alosa	5	Yes	1 spawning river	Unknown	Plymouth Sound and Estuaries (SAC)
			2 spawning rivers		Tregor-Goelo (SAC)
Petromyzon			2 spawning rivers	16 (Vire 2011)	Marais du cotentin et du Bessin - baie des Veys (SAC)
marinus	3	Yes	1 spawning river	954 (Seine; poses 2010)	Estuaire de la Seine (SAC)
					Côte de granit rose - Sept-îles (SAC)
					Tregor-Goelo (SAC)
					Baie de Morlaix (SAC)
					Abers - côtes des Légendes (SAC)
Phocoena					Estuaire de la Seine (SAC)
phocoena	6	Yes	Uncountable	Biggest national concentration	Bancs de Flandres (SAC)
					Côte de granit rose - Sept-îles (SPA)
					Tregor-Goelo (SPA)
Puffinus					Iroise (Marine Natural Park)
Mauretanicus	4	Yes	0		Estuaire de la seine (Natural Reserve)
Rissa tridactyla	1	-	1 breeding area	1570 couples (decreasing according to recent surveys)	Falaise du Bessin Occidental (SPA)
Sterna dougalii	1	-	0		Estuaire de la seine (Natural Reserve)

Non Natura 2000 species					
					Sept Îles (Natural Reserve)
					Domaine de Beauguillot (Natural Reserve)
					Baie de Somme (Natural Reserve)
Arctica islandica	4	Yes			Estuaire de la seine (Natural Reserve)
Centroscymnus	2	-			Iroise (Marine Natural Park)

coelolepsis					Sept Îles (Natural Reserve)
Ostrea edulis	1	-			Sept Îles (Natural Reserve)
Raja montagui	2	-			Iroise (Marine Natural Park) Estuaire de la Seine (Natural Reserve)

Table 3b. Additional information on OSPAR T&D species within the OSPAR MPA network underpinned by a Natura 2000 designation

This table is a continuation of table 3a for Natura 2000 species where more information was available

SPECIES	**Additional information on Natura 2000 species**			
	Comments on functional importance (FI)	**Number of known areas of functional importance in the OSPAR network**	**Number of known discrete areas of functional importance in the Channel**	**Percentage of known areas of functional importance in the Channel afforded protection in the OSPAR network**
Alosa alosa	The MPA network covers most of the spawning rivers for these species but due to the lack (absence) of data there are no measures taken in the marine environment for this species apart from surveys and research (although this relates more to the issue of effectiveness of the MPAs).[20]	6	14	43%
Petromyzon marinus		5	25	20%
Phocoena phocoena	International survey in the Channel shows major changes in the distribution of this species from 1994 (SCANN) 2005 (SCANN II) and 2012 (PACOMM). An analysis of the coherence of the MPA network would give very different results with these different sets of data.	Not applicable		
Puffinus Mauretanicus	As for *Phocoena phocoena*, the distribution of this species has been changing during the last few decades and the actual network which is mainly limited to the west side of the Channel could become incomplete in the coming years. The most recent migration sea watch data already reveal the presence of this species in the eastern part of the Channel.	0	0	/

[20] Etat des lieux des espèces et habitats marins Natura 2000 en Manche-Mer du Nord. AAMP 2012

Rissa tridactyla	Only one colony of this species is included in the OSPAR network but as it is a large colony, this covers a significant part of the French breeding population. However, the main colony in the north of France is not considered. Furthermore, we actually don't know the marine area which is used by this species for feeding during the breeding period so it is not possible to determine if the designated MPAs cover areas which are important for feeding for this species.[21]	1	6	17%
Sterna dougalii	3 MPAs are designated for this species but none cover the colonies. Both colonies are in SPAs but are not designated as OSPAR MPAs.[13]	0	2	0%

[21] cinquième recensement national des oiseaux marins nicheurs en France métropolitaine - 2009-2011 - 1ère synthèse : bilan intermédiaire 2009-2010 - Bernard CADIOU

Table 3c. Summary of protection afforded for OSPAR T&D species occurring in OSPAR region II by the current OSPAR MPA network in the Channel

Species are considered as "**relevant**" if they are known to occur frequently in the Channel and "**maybe relevant**" when there is uncertainty about their importance in the Channel (according to expert judgment). They are considered as "**Not relevant in the Channel**" if their presence in the Channel is only accidental. Furthermore, MPAs are considered not to be an appropriate tool for certain species in English waters according to the Ecological Network guidance (these species are underlined in this table).

Alosa alosa	Allis shad	*Alose vraie ou Grande Alose*	**Protected**
Arctica islandica	Ocean quahog	*Cyprine (praire, clam) d'Islande*	**Protected**
Centroscymnus coelolepsis	Portuguese dogfish	*Pailona commun*	**Protected**
Petromyzon marinus	Sea lamprey	*Lamproie marine*	**Protected**
Phocoena phocoena	Harbour porpoise	*Marsouin commun*	**Protected**
Puffinus Mauretanicus	Balearic shearwater	*Puffin des Baléares*	**Protected**
Ostrea edulis	Flat oyster	*Huître plate*	**Protected**
Raja montagui (synonym: Dipturus montagui)	Spotted Ray	*Raie douce*	**Protected**
Rissa tridactyla	Black-legged kittiwake	*Mouette tridactyle*	**Protected**
Sterna dougalii	Roseate tern	*Sterne de dougall*	**Protected**
Nucella lapillus	Dog whelk	*Pourpre petite pierre*	**Not protected but relevant**
Anguilla anguilla	European eel	*Anguille européenne*	**Not protected but relevant**
Gadus morhua	Cod	*Cabillaud (morue)*	**Not protected but relevant**
Hippocampus guttulatus (synonym: H. ramulosus)	Long-snouted seahorse	*Hippocampe à long bec*	**Not protected but relevant**
Hippocampus hippocampus	Short-snouted seahorse	*Hippocampe à museau court*	**Not protected but relevant**
Salmo salar	Salmon	*Saumon de l'Atlantique*	**Not protected but relevant**
Centrophorus squamosus	Leafscale gulper shark	*Petit squale*	**Not protected but maybe relevant**
Cetorhinus maximus	Basking shark	*Requin pèlerin*	**Not protected but maybe relevant**
Coregonus lavaretus oxyrinchus	Houting	*Corégone oxyringue*	**Not protected but maybe relevant**
Dipturus batis (synonym: Raja batis)	Common Skate	*Pocheteau gris*	**Not protected but maybe relevant**
Lamna nasus	Porbeagle	*Requin taupe*	**Not protected but maybe relevant**
Raja clavata	Thornback skate / ray	*Raie bouclée*	**Not protected but maybe relevant**

Rostroraja alba	White skate	*Raie à bec pointu*	**Not protected but maybe relevant**
Squalus acanthias	[Northeast Atlantic] spurdog	*Aiguillat commun*	**Not protected but maybe relevant**
Squatina squatina	Angel shark	*Ange de mer*	**Not protected but maybe relevant**
Acipenser sturio	Sturgeon	*Esturgeon d'Europe*	**Not relevant in the Channel**
Dermochelys coriacea	Leatherback turtle	*Tortue luth*	**Not relevant in the Channel**
Balaenoptera musculus	Blue whale	*Baleine bleue*	**Not relevant in the Channel**
Eubalaena glacialis	Northern right whale	*Baleine franche noire*	**Not relevant in the Channel**

Discussion

Ecological coherence of the OSPAR MPA network in the Channel

It is not possible to make comprehensive conclusions about the extent to which criteria for success on ecological coherence of the OSPAR MPA network are met in the Channel using the results of this trial given the limitations associated with the current lack of detailed ecological data and lack of detailed scientific understanding about appropriate success criteria. However, it is possible to make some limited conclusions about the ecological coherence of the OSPAR MPA network in the Channel using our results. It is important to note that within this trial the success criteria were applied within the defined study area, but different results may be obtained if equivalent success criteria were applied using a different geographical area (for example using the Dinter biogeographic regions as recommended by OSPAR[22]).

Overall, the results suggest that there is good representativity and replication in UK OSPAR MPAs for the EUNIS Level 3 habitats which are considered to be representative of the Channel area, with the exception of A5.3 (sublittoral mud). Given that the trial only included UK OSPAR MPAs for EUNIS Level 3 habitats, it is likely that this habitat may be protected within existing French OSPAR MPAs in the Channel.

Although many of the French and UK MPAs protect OSPAR T&D habitats and species in the Channel area, the results indicate that there are some gaps in the representation and replication of several habitats and species. It is worth noting that many records of OSPAR T&D habitats occurred within existing OSPAR MPAs but were not considered to be protected by the designated features within those MPAs, either because they are not explicitly mentioned on the OSPAR proformas for these sites or because the designated features do not correlate to OSPAR T&D habitats or species. Therefore the use of the matrix approach may highlight MPAs in which it may be worth considering extending existing management measures in order to protect these additional features.

In some instances OSPAR habitats were listed on the OSPAR MPA proformas for sites but no underpinning OSPAR habitat data were available in the OSPAR habitats database; these features were excluded from the analysis. For example, maerl beds are listed on the OSPAR MPA pro forma as a feature at Fal & Helford SAC, but there are no maerl bed data within the OSPAR habitats database. This assessment therefore represents a conservative estimate of representation and replication of features within the MPA network in the study area.

Although it was not possible to make a quantitative assessment of connectivity for OSPAR T&D species as part of this trial, the synthesis of information on areas of functional importance indicated that there are some important gaps in protection of key lifecycle stages for OSPAR T&D species (for example, breeding colonies for *Sterna dougalii*).

There are a number of proposed new MPAs in the Channel area (Marine Conservation Zones in English waters and Marine Nature Parks in French waters) which may help to fill in some of the gaps that were identified in this trial, in addition to other types of spatial measure (e.g. fishery closures) which may be considered to contribute to the OSPAR MPA network in future.

Scaling up the approach

[22] OSPAR 2006. Guidance on developing an ecologically coherent network of OSPAR marine protected areas. (Reference number 2006-3).

Overall this trial indicates that the matrix approach provides a robust methodology for assessing whether a network of MPAs is ecologically coherent. However, this trial has also highlighted that the level of analysis that is possible using this method is limited by the extent of available information and scientific understanding. It is considered that this approach is suitable for scaling up for use at the OSPAR level, as long as due consideration is given to the issues and limitations outlined below. These issues have become apparent during the trial application of the matrix methodology and would be useful to consider as they have the potential to be more significant if this approach were to be scaled up to the level of the wider OSPAR area.

Matrix methodology

Three main approaches to assessing ecological coherence have been proposed within OSPAR: a) self-assessment based on expert judgement, b) species/habitat assessment based on reporting, and c) spatial assessment based on GIS data. Elements of each of these approaches were required in this trial assessment of the ecological coherence of the OSPAR MPA network in the Channel: expert judgement was required to identify sites of functional importance for species, information on reported species/habitats in OSPAR MPA pro formas was used to populate the matrix, and spatial assessment based on GIS data was required in order to calculate habitat areas and distances between MPAs. Therefore this trial confirms that it will be important for any future comprehensive assessment of ecological coherence to incorporate each of these complementary approaches.

For the purposes of the matrix trial, standard success criteria across all EUNIS Level 3 and OSPAR T&D habitats and species were used for features/representativity, replication and resilience. For future assessments at different geographical scales, it will be important to consider using all available scientific understanding to determine ecologically meaningful success criteria for these principles. In addition, where information is available, it may be worth considering whether the success criteria should be adapted on a case-by-case basis depending on the occurrence and vulnerability of habitats and species in the relevant biogeographic region. It will also be necessary to consider criteria for determining whether habitats and species are representative of biogeographic areas (1% threshold was used for EUNIS habitats in this trial).

This trial of the matrix approach included a scoping exercise to collate additional information including proportions of habitats protected within MPAs, habitat areas in MPAs, and distances between MPAs. This type of information could be used in future to evaluate the network in terms of the principles of adequacy, viability and connectivity between habitats. A significant amount of GIS processing was required in order to calculate these additional figures. This requirement for spatial analysis increased the time and resources required to populate the matrix for the trial. The amount of spatial processing required to populate the matrix could be reduced in future if the OSPAR MPA database contained fields in which Contracting Parties could provide key additional information which could then be used directly in the assessment of ecological coherence (for example areas of EUNIS L3 habitats protected in each MPA).

In order for these statistics to be meaningful, further research would be required to identify quantitative success criteria for proportions of habitats or species requiring protection within the MPA network (adequacy) or the minimum area required to maintain a population (viability). Greater understanding is required about the ecology of the communities of species or typical species

associated with these habitats to generate ecologically meaningful success criteria for minimum viable areas/proportions of habitats that should be protected to meet viability/adequacy criteria.

The interpretation of distances between MPAs which was carried out as part of the trial is limited because it does not account for some important environmental parameters (see Results). If a similar approach were to be applied at a wider scale it would be important to consider developing this methodology so that it provides a more robust assessment. Although still an evolving area of research, some other projects have used various methodologies for assessing distances between MPAs[23] [24].

Future work to develop ecologically meaningful success criteria and methodologies for evaluating whether the success criteria have been met at the wider OSPAR level would benefit from drawing upon all available scientific understanding. For example, a series of reports[25] were commissioned to underpin the guidance principles of representativity, replication, viability, connectivity and adequacy for the Ecological Network Guidance which was used to identify Marine Conservation Zones in England. These reports evaluate methodologies for determining success criteria for these principles, and identify the limitations associated with these approaches. It is important to note that future work to determine meaningful success criteria would also require further detailed ecological information on habitats and species in the OSPAR area.

Technical issues

During the application of the trial it was noted that there are differences between UK and France in terms of the interpretation of an OSPAR MPA. Some of these differences are due to the use of different national coastline boundaries, which consequently influences the extent to which intertidal features are considered to be represented in the network. For example, some spawning rivers for *Petromyzon marinus* are included in the species matrix which are protected by French OSPAR MPAs. There are two SACs on the South Coast of England which protect *Petromyzon marinus* (River Avon and River Axe) but these sites have not been included in the matrix as they have not been submitted as OSPAR MPAs in the UK. This is because the majority of the extent of these sites occurs above the national coastline limit of MHW and these sites are not considered to contain marine features. Another example which demonstrates a similar issue is Solent and Southampton Water SPA which protects *Sterna dougalii*, but this is not included in the species matrix because the part of this site below Mean High Water (MHW) which has been submitted as an OSPAR MPA is not considered to be functionally important for this species and so this species is not a feature of the OSPAR MPA. For

[23] Baltic Sea Environment Proceedings No 124.A. Towards an ecologically coherent network of well-managed Marine Protected Areas– Implementation report on the status and ecological coherence of the HELCOM BSPA network. Helsinki Commission.

[24] Natural England and the Joint Nature Conservation Committee. *The Marine Conservation Zone Project: Ecological Network Guidance.* Sheffield and Peterborough, UK: Natural England and JNCC, 2010.http://jncc.defra.gov.uk/pdf/100608_ENG_v10.pdf

[25] Natural England Research Report (NECR 018) - Representativity and replication for a coherent network of Marine Protected Areas in England's territorial waters (2009); Natural England Research Report (NECR 037) - Guidance on the size and spacing of Marine Protected Areas in England (2010);JNCC Report (438) - A review of methodologies that could be used to formulate ecologically meaningful targets for marine habitat coverage within the UK MPA network (2011);JNCC Report (439) - Meeting the MPA network design principles of representativity and adequacy: Developing species-area curves for habitats (2011)

the purposes of scaling up the approach to include biogeographic areas that span across several Contracting Party boundaries it will be necessary to ensure that issues arising from the use of different interpretations of OSPAR MPAs and coastal boundaries are considered.

For the purposes of calculating the areas of habitats protected in French and UK MPAs it was necessary to agree on a common projected coordinate system to be used for the spatial data. For the purposes of scaling up the approach to include biogeographic areas that span across several Contracting Party boundaries it would be necessary to ensure that this projection issue is addressed.

Setting the limits of the study area for the trial application of the matrix involved intersecting some MPAs that extended across the boundary of the study area; only the portions of these MPAs which fell within the study area were included in the trial. This results in ecological trade-offs which would be important to consider if the approach were to be scaled up.

Data availability

MPAs and protected features

During the trial application of the matrix it became clear that there was not equivalent information on features protected in OSPAR MPAs available for French and UK MPAs. It is important to note that this information is not simply whether these species and habitats occur in OSPAR MPAs but whether they are actually considered to be protected by the designated features in these sites. An exercise has not yet been carried out in the UK to determine which non-Natura 2000 species on the OSPAR T&D list may be protected in OSPAR MPAs; as a result it was not possible to provide information for UK MPAs in the matrix for non Natura 2000 species. Similarly, an exercise has not yet been carried out in France to determine which EUNIS Level 3 habitats are protected in OSPAR MPAs; as a result it was not possible to include French MPAs in the matrix for EUNIS habitats. This issue regarding the different availability of information on protected features in MPAs between different Contracting Parties and the resulting limitations on the ability to make consistent assessments across a biogeographic region is important to consider if the approach were to be scaled up.

Information on the OSPAR T&D species and habitats protected in OSPAR MPAs can be obtained from the OSPAR MPA database (where it has been provided by Contracting Parties), however there are currently no fields in the database for Contracting Parties to provide information on the EUNIS Level 3 habitats that are protected. It would be valuable if future development work on the OSPAR MPA database includes adding further fields to the database to capture this information. Also, in order for Contracting Parties to be able to make consistent decisions regarding which EUNIS Level 3 habitats are protected by the designated features of different MPA types it may be necessary to use an agreed correlation table for the relationships between marine habitat classifications and habitats which are listed for protection (similar to the JNCC habitat correlation table[26]).

If the approach were to be scaled up, it would be most efficient to populate the matrix with information on MPAs from several Contracting Parties by using data which has been compiled in the OSPAR MPA database.

[26] http://jncc.defra.gov.uk/pdf/EUNIS_Correlation_2007-11_20101206v2.pdf

During the trial application of the matrix it was noted that there are differences between France and UK in terms of the species that are considered appropriate for protection within MPAs. For example, according to the Ecological Network Guidance for the MCZ Project[27], it is considered that Spotted Ray (*Raja montagui*) is not appropriate for protection by MPAs, however this species is considered appropriate for protection by French MPAs. If this approach is scaled up, it will be important to consider the implications for the use of the matrix approach of these differences between Contracting Parties in terms of the species which are considered to be appropriate for protection by MPAs.

Species/habitats data

For the purposes of the matrix trial, modelled habitat data from EU SeaMap were used to determine the broadscale habitats which are present in the Channel and the proportions of these habitats which are protected in OSPAR MPAs. Coverage of the OSPAR area with habitat maps would be required for any future assessments of adequacy/viability in the OSPAR area which require information on areas of habitats. There are plans to extend the geographical scope of EU SeaMap in the future to provide more coverage of the OSPAR area, which would be useful for potential future use of the matrix approach at the OSPAR level. A current limitation of EU SeaMap data is that it does not provide coverage of the intertidal area, so it is not possible to evaluate the areas of EUNIS habitats in the categories A1 and A2; for this reason these habitats were excluded from the trial. In future it would be important to consider whether alternative sources of data can be compiled in the OSPAR area for intertidal areas so that an evaluation can be made regarding the extent to which these habitats are protected.

Due to the lack of comprehensive polygon data for the distribution of OSPAR T&D habitats it was not possible to carry out an evaluation of the proportions of OSPAR T&D habitats protected within OSPAR MPAs in the study area or the maximum/minimum habitat areas protected in OSPAR MPAs. This highlights the need for detailed data on the distribution and extent of OSPAR habitats in future in order to be able to carry out assessments of adequacy/viability.

The OSPAR habitats database is a useful central source of information on the distribution of OSPAR T&D habitats, however there is currently no equivalent central database containing information on OSPAR T&D species; it would be very helpful for potential future use of the matrix approach at the OSPAR level if this were to be developed. It will be important for this to be developed within the framework of the OSPAR Information System, and to look at where there may be links to other related work as part of ICG-COBAM.

A further issue is that in some instances OSPAR T&D habitats were listed on the OSPAR MPA pro formas for sites but no underpinning feature data for these habitats were available in the OSPAR habitats database. This highlights the need for Contracting Parties to ensure that the feature databases are kept up to date with current feature data before assessments are undertaken.

It is important to note that given the limited availability of data on the distribution of OSPAR T&D habitats and species in the Channel, it was difficult to make a conclusive assessment of whether these features are adequately protected. Given that the availability of data was limiting even in an

[27] Natural England and the Joint Nature Conservation Committee. *The Marine Conservation Zone Project: Ecological Network Guidance.* Sheffield and Peterborough, UK: Natural England and JNCC, 2010.http://jncc.defra.gov.uk/pdf/100608_ENG_v10.pdf

area with relatively good data coverage such as the Channel, this issue would potentially be more significant given the even sparser distribution of data across the whole OSPAR area. It is also important to note that for full implementation of the matrix approach, data is required on the distribution of habitats and species within and outside MPAs in the study area.

The trial highlighted that knowledge on areas of functional importance for OSPAR T&D species is very heterogeneous and scarce for most of the species (sometimes completely absent for "non-Natura 2000" species). Spatial analysis may complement this assessment in future; however further research and information is required.

Furthermore, in particular for species, some discrepancies between species behaviour can hamper the use of the same method. For instance, breeding areas can be identified for birds or anadromous fishes and the percentage of those areas within the network is a way to assess criteria of connectivity as well as adequacy/viability but for other species and other vital functions, the information may not be localised, and distribution maps must be used to assess criteria. For the T&D species that are underpinned by a Natura 2000 designation, a further analysis is proposed to be carried out in future, to take advantage of the work already done as part of this trial on the French side of the channel (AAMP 2012).

Prospects for further work through PANACHE project

Work has recently begun on the PANACHE project (an INTERREG funded project in the Channel), which includes a work package to investigate various methodologies to carry out an analysis of the existing and planned network of MPAs in the Channel area to determine whether the network is ecologically coherent. The PANACHE project presents a good opportunity to build upon and further develop the outcomes from the trial application of the matrix approach. Specifically, it would be useful for the PANACHE project to organise an expert workshop to collate information on areas of functional importance for species in the Channel in order to be able to make a more detailed assessment of connectivity for species. In addition, it may be useful for the PANACHE project to build upon the scoping work that was carried out in the trial of the matrix approach and other existing research to further develop tools and techniques for the spatial assessment of connectivity between habitats, adequacy and viability.

Recommendations

In order for the matrix methodology to be successfully scaled up for application at the wider OSPAR level, it is suggested that the following recommendations are considered:

1. In order to provide consistency in future assessments which include biogeographic regions that span across several Contracting Party boundaries, it is suggested that the following are considered:
    a) Agree a common projected coordinate system for all data used as part of the GIS element of the assessment
    b) Agree correlation tables for the relationships between marine habitat classifications and habitats which are listed for protection in that region (similar to the JNCC habitat correlation table[28]) in order for Contracting Parties to be able to make consistent

[28] http://jncc.defra.gov.uk/pdf/EUNIS_Correlation_2007-11_20101206v2.pdf

decisions regarding which habitats are protected by the designated features of different MPA types

2. Other ways of ensuring consistency across national boundaries could include:
   a) Invite Contracting Parties to identify which protected areas in their territory should be considered to be OSPAR MPAs for the purposes of the assessment, with discussions between Contracting Parties on common interpretations where necessary
   b) Discussions between Contracting Parties to determine which features are considered appropriate for protection in MPAs for the purpose of conducting the assessment of ecological coherence.

3. In order to provide up-to-date information on MPAs, habitats and species to facilitate straightforward application of the matrix methodology, it is suggested that the following are considered:
   a) Ensure that MPA and feature databases are kept up-to-date with all available data from Contracting Parties on MPAs, habitats and species
   b) Develop a central database containing data on OSPAR T&D species
   c) Include additional fields in the OSPAR MPA database in which Contracting Parties can provide key information required for populating the matrix (for example areas of EUNIS level 3 habitats protected in each MPA)

4. Support and maintain links with further work to develop ecologically meaningful success criteria for the OSPAR network design principles and methodologies for evaluating whether the success criteria have been met. It would be important for further work to build upon the results of this trial and other existing research. For example, it is suggested that links are maintained with the PANACHE project, which presents a good opportunity to build upon and further develop the outcomes from the trial application of the matrix approach.

ANNEX I: Detailed matrix for EUNIS level 3 habitats (UK MPAs) and OSPAR T&D habitats (French and UK MPAs)

	General information				Main assessment information			Additional information					
Habitats and species	**Percentage EUNIS Lv 3 in Region (if applicable)**	**Total species count (if applicable**	**Type**	**EUNIS Code (if applicable)**	**Total number of MPAs affording protection (replication)**	**MPA names**	**Replication adequate? (EUNIS L3 habitats >1, OSPAR T&D >2)**	**Minimum; average; maximum distance (km) between MPAs for the feature**	**Total habitat area within MPAs (sqkm)**	**Total habitat area within study area (sqkm)**	**% of habitat within MPAs**	**Minimum/maximum habitat area (sqkm) in each MPA**	**Average size of MPA for the feature (sqkm)**
High energy infralittoral rock	2.25	-	EUNIS L3	A3.1	6	Thanet Coast SAC, Lyme Bay and Torbay SAC, Plymouth Sound & Estuaries SAC, South Wight Maritime SAC, Studland to Portland SAC, Thanet Coast SAC and Thanet Coast and Sandwich Bay (SPA)	Yes	Min – 0 Av – 279 Max – 605	95	1910	5	MIN 0.001; MAX 50	149
Moderate energy infralittoral rock	1	-	EUNIS L3	A3.2	5	Lyme Bay and Torbay SAC, Plymouth Sound & Estuaries SAC, South Wight Maritime SAC, Studland to Portland SAC, Thanet Coast SAC	Yes	Min – 18 Av – 233 Max – 605	138	1095	13	MIN 0.0008; MAX 70	178
High energy circalittoral rock	2	-	EUNIS L3	A4.1	4	Lyme Bay and Torbay SAC, Plymouth Sound & Estuaries SAC, Studland to Portland SAC, Wight-Barfleur Reef SAC	Yes	Min – 14 Av – 92 Max – 229	455	1691	27	MIN 0.07; MAX 352	515

Moderate energy circalittoral rock	10	-	EUNIS L3	A4.2	5	Lyme Bay and Torbay SAC, Plymouth Sound & Estuaries SAC, South Wight Maritime SAC, Studland to Portland SAC, Wight-Barfleur Reef SAC	Yes	Min – 13 Av – 98 Max – 268	829	8281	10	MIN 0.267; MAX 622	451
Sublittoral coarse sediment	54	-	EUNIS L3	A5.1	6	Bassurelle Sandbank SAC, Chesil & The Fleet SAC, Thanet Coast SAC and Thanet Coast and Sandwich Bay SPA, Plymouth Sound & Estuaries SAC, Thanet Coast SAC, Wight-Barfleur Reef SAC	Yes	Min – 0 Av – 287 Max – 605	225	45465	0	MIN 0.006; MAX 166	250
Sublittoral sand	11	-	EUNIS L3	A5.2	3	Bassurelle Sandbank SAC, Plymouth Sound & Estuaries SAC, Solent Maritime SAC	Yes	Min – 196 Av – 339 Max – 548	56	9554	1	MIN <0.01; MAX 45	47
Sublittoral mud	1	-	EUNIS L3	A5.3	0	None	No	-	0	-	0	-	0
Sublittoral mixed sediments	16	-	EUNIS L3	A5.4	2	Solent Maritime SAC, Solent and Southampton water SPA and Solent Maritime SAC	Yes	0 (MPAs adjoin)	0	13315	0	MIN 0.0016; MAX 0.014	27

Intertidal mudflats	-	-	OSPAR T&D HABITAT POLYGON	-	4	Plymouth Sound and Estuaries SAC, Fals and Helford SAC, Solent Maritime SAC, Solent and Southampton water SPA and Solent Maritime SAC	Yes	Min – 66 Av – 259 Max – 373	17	143	12	MIN < 0.0000001; MAX 7.42	24
Intertidal Mytilus edulis beds on mixed and sandy sediments	-	-	OSPAR T&D HABITAT POLYGON	-	0	None	No	-	0	-	0	-	0
Littoral chalk communities	-	-	OSPAR T&D HABITAT POLYGON	-	3	Thanet Coast and Sandwich Bay SPA and Thanet Coast SAC, Littoral Cauchois SAC, Thanet Coast SAC	Yes	Min – 0 Av - 60 Max - 89	23	37	62	MIN < 0.0000001; MAX 0.14	19
Maerl beds	-	-	OSPAR T&D HABITAT POLYGON	-	0	None	No	-	0	-	0	-	0
Ostrea edulis beds	-	-	OSPAR T&D HABITAT POLYGON	-	0	None	No	-	0	-	0	-	0
Sabellaria spinulosa reefs	-	-	OSPAR T&D HABITAT POLYGON	-	0	None	No	-	0	-	0	-	0
Sea-pen and burrowing megafauna communities	-	-	OSPAR T&D HABITAT POLYGON	-	0	None	No	-	0	-	0	-	0

Zostera beds	-	-	OSPAR T&D HABITAT POLYGON	-	7	Plymouth Sound and Estuaries SAC, Solent Maritime SAC, Abers - Cotes des legendes SAC, Baie de Morlaix SAC, Cote de Granit Rose -Sept Iles SAC, Iroise PNM, Tregor-Goelo SAC	Yes	Min – 0.014 Av – 154 Max – 355	18	-	45	MIN < 0.0000001; MAX 1.68	544
Intertidal mudflats	-	1157	OSPAR T&D HABITAT POINTS	-	11	Solent Maritime SAC, Solent and Southampton water SPA and Solent Maritime SAC, Plymouth Sound and Estuaries SAC, Abers - Cotes des legendes SAC, Baie de Saint Brieuc Est SAC, Baie de Seine Occidentale SAC, Cote de Granit Rose -Sept Iles SAC, Estuaire de la Seine SAC, Tregor-Goelo SAC, Tatihou Saint Vaast La Hougue SAC, Marais du Cotentin et du Bessin - Baie des Veys SAC	Yes	Min – 0.14 Av – 179 Max - 507	17	143	12	MIN < 0.0000001; MAX 7.42	-
Intertidal Mytilus edulis beds on mixed and sandy sediments	-	22	OSPAR T&D HABITAT POINTS	-	0	None	No	-	N/A	-	-	-	-

Littoral chalk communities	-	971	OSPAR T&D HABITAT POINTS	-	2	Thanet Coast and Sandwich Bay SPA and Thanet Coast SAC, Thanet Coast SAC	Yes	0 (MPAs adjoin)	N/A	-	-	-	-
Maerl beds	-	450	OSPAR T&D HABITAT POINTS	-	4	Baie de Morlaix SAC, Cote de Granit Rose -Sept Iles SAC, Iroise PNM, Tregor-Goelo SAC	Yes	Min – 0 Av – 46 Max – 110	N/A	-	-	-	-
Ostrea edulis beds	-	154	OSPAR T&D HABITAT POINTS	-	0	None	No	N/A	N/A	-	-	-	-
Sabellaria spinulosa reefs	-	93	OSPAR T&D HABITAT POINTS	-	0	None	No	-	N/A	-	-	-	-
Sea-pen and burrowing megafauna communities	-	4	OSPAR T&D HABITAT POINTS	-	1	Plymouth Sound and Estuaries SAC	No	N/A	N/A	-	-	-	-

Zostera beds	-	115	OSPAR T&D HABITAT POINTS	-	10	Plymouth Sound and Estuaries SAC, Solent maritime SAC, Abers - Cotes des legendes SAC, Baie de Morlaix SAC, Cote de Granit Rose -Sept Iles SAC, Cote de Granit Rose - Sept Iles SAC and Sept Iles NNR, Iroise PNM, Tregor-Goelo SAC, Tatihou Saint Vaast La Hougue SAC, Marais du Cotentin et du Bessin - Baie des Veys SAC	Yes	Min – 0.014 Av – 170 Max – 367	N/A	-	-	-	-