Balanced Seas

Assessment of performance against principles

Response by the MPA Science Advisory Panel to the proposals made on 5th July 2010

Summary

Representativity: making good progress
Replication: making good progress
Adequacy: Existing MPA areas below minimum target, proposed including Broad Areas of Interest would reach maximum targets for some EUNIS level 3 habitats (but see notes below on how existing MPAs should be treated in calculations)
Viability: work in progress?
Connectivity: well spaced broad areas of interest – work to be done to demonstrate connectivity for each habitat and FOCI. Working to 40 km radius criteria.
Levels of Protection: no progress.
Best Available Evidence: yes, but there are known problems
Areas of Additional Ecological Importance: no progress.

1. **Detailed comments specific to Balanced Seas**

    1.1. The Balanced Seas region was divided into three sections which were considered by different working groups. All three groups were able to identify a number of Broad Areas of Interest (BAIs), with a total of 20 identified across the three regions. There were seven BAIs in the west, four in the central and nine in the east section. Altogether this is a very promising start, and it is good to see the working groups working well towards identifying Marine Conservation Zones.

    1.2. Good work has been done on species and habitat FOCI and their location within BAIs. There has been extensive tabulation of the FOCI, and EUNIS level 4 features within the BAIs and existing MPAs. Intertidal data are not yet available and work in this domain is still to be done.

    1.3. Broad areas of interest in the Thames Estuary are rather unrepresentative of the overall distribution of habitats there, missing as they do, most of the fully marine waters. The rationale for this given by the Balances Seas team is that there is a large area of SAC covering these offshore habitats so there is no need for any BAIs to be identified in this area. The team's submission states also, with regard to the achievement of habitat representation, viability, connectivity and other targets, that "The target sheet took into account the contribution of existing Protected Areas based upon an interim gap analysis undertaken by the project team (assuming ALL broad-scale habitats within PAs receive adequate protection)." However, it has not been demonstrated that this, or other existing MPAs, give adequate protection to all of the habitats within them. Indeed, it seems very unlikely that they do, especially given the narrow range of habitats for which they were established. This is an important problem with all the first submissions and is discussed more fully in paragraph 2.6.1 on how to treat existing zoning of activities in the sea.

1.4.   Overall, we are concerned that well-described and important sites in the Solent and estuarine areas of the western sub area are not currently BAI, and ask the RSG to review these areas given their known scientific and conservation importance. The offshore region is very well covered by BAIs. In the central section, coastal and offshore BAIs are well represented, but the shipping channel has been avoided. The team noted that: 'The Balanced Seas project area includes the busiest shipping lane in the world and contains a significantly high level of overlap between human activities. Since targets are set at the national scale, the RSG is concerned that these important regional constraints are not being taken into account, which will put huge pressure on commercial activities in the Balanced Seas project area."
We think it is a mistake to avoid shipping lanes for MCZs and that the shipping channel could be used effectively in conjunction with restrictions on mobile fishing gears, dredging etc. to provide good protection to seabed habitats, as well as water column species. See comments in paragraph 2.6.3 on treatment of existing zoning.

1.5.   The SAP applauds the test of the MPA reporting tool that was undertaken. It seems likely that the tool will be very helpful to the projects (and the SAP) in checking that submissions meet all the targets in the Ecological Network Guidance.

1.6.   It is clear that some of the data sets available to Balanced Seas were not up to date. *Crassostrea gigas* is not shown on the Essex coast where it has had a significant impact on blue mussel beds (a FOCI habitat). Whether the newer data layers due soon will rectify this deficiency remains to be seen. Other data are available (e.g. some mapping work in the Colne is complete and some underway). The Balanced Seas team should check whether they will obtain the up to date data in MB102 and if not to approach the Environment Agency for their data. More generally, there are Environment Agency plans underway for all of the Thames/Essex estuaries under the Water Framework Directive and there is a need for greater liaison with them on how to maximise the benefits of MCZ designation.

1.7.   No water column protection areas were identified in the proposals. The ENG is clear that areas of additional ecological importance should be considered in the MCZ process, as "ecosystem services" are important. Areas supporting particular ecological processes may be highly productive or support high biodiversity, for example, and these features contribute to maintaining ecosystem processes and ecosystem services (pp 55-56 of the ENG).   For a number of regions, water column protection should be considered in the next iteration. See more detailed comments in paragraph 2.4 on this topic.

1.8.   Coastal and estuarine water column protection building blocks should also consider the Water Framework Directive targets (the Environment Agency have published all these in their River Basin Management Plans, which include transition [i.e. estuarine] and coastal waters) for these regions, with respect to land-based run off (primarily nitrate – there are winter nitrate concentration targets in that legislation to minimise nuisance phytoplankton blooms), which will impact on ecological functioning. Land based run- off is also a consideration for protection of coastal FOCI such as seagrass beds, *Ostrea edulis* and *Mytilus edulis* beds, coastal lagoons and intertidal sediments (nutrient run-off can cause macroalgal nuisance blooms that result in loss of FOCI species). There is an option for some joined up thinking here, meeting a number of national targets within coordinated actions.

1.9.   Like other Regional Projects, the team raised the issue of confidence in the data (or lack of it). "The quality and quantity of data (both biological and socio-economic) does not currently allow the recommendation of MCZs with high confidence", and "Inshore fishing fleet – Fishermap must address the gap in the representation of the smaller boats." Questions have also been raised within working groups about the EUNIS 3 level data and actual distribution of smaller offshore features. Hopefully some of the data weaknesses will be addressed before the next iteration. However, this and other teams will have to be robust in emphasising to stakeholders that they need to make decisions based on the best data available to them. The process can't be parked until better data are available – see paragraph 2.1.

1.10.   The team was also concerned about how to reach decisions on contentious sitings of MCZs: "Where conflicts of interest occur (between socio-economic sectors), insufficient guidance exists on how choices should be made and who will ultimately make them." It is the view of the SAP that this is very much the reason that Regional Stakeholder Groups were set up in the first place – to negotiate difficult issues among sectors and come to a view as to how they are best resolved. Clearly, it is not the job of the SAP to make those decisions, and nor will the Minister be well placed to take them. These issues need to be addressed within the Regional Stakeholder Groups otherwise there is a risk that proposals will be poorly supported and to ultimate decisions on placement that will be more contentious than if the locations were established by stakeholders. The Economic Impact Assessments should help stakeholders in reaching decisions over contentious sites.

2. General comments relevant to all the Regional Projects

2.1. Data quality, quantity and use of additional data sets and information.

2.1.1. The SAP is aware that there are questions concerning the validity of some parts of the data sets available to the regional project teams. We emphasise that the MCZ process requires the use of the "best available evidence". Some level of uncertainty in data is inevitable, and project teams should use the data provided unless there is robust evidence to the contrary available for particular areas. We encourage the regional teams and the regional stakeholder groups to take an integrated approach, viewing each data set as contributing to the final, most likely outcome. If there is a choice between locations where there is a high degree of confidence in the information available and a location where there is a low degree of confidence, the high confidence location will generally be preferred. Delaying progress on the basis that the next data set will be "correct"/perfect/more comprehensive is not a recommended approach.

2.1.2. Use of data on FOCI habitats and FOCI species - 30 year cut off?

Some of the regional projects have adopted a cut-off point of 30 years ago (1980?) for use of records of FOCI species. The SAP considers that there is a balance to be found between caution and the desire to include as many relevant data as possible. If a FOCI is self-perpetuating (i.e., a viable population in a region little impacted over time or a

stable habitat) then an old record is as valid as a recent one. There are examples of some rocky reefs and particular shores, where species have been consistently found over decadal time spans and much longer. If a recent survey has evidence that such a FOCI has gone, then it raises the question of whether human interference was the cause of loss. One of the aims of MCZ is to enable recovery of features, such that a location once supporting a particular FOCI could be considered as a site where, all other things being suitable, such a FOCI could re-establish. It is important in these decisions to consider the provenance of the data, and make an informed judgement on what action to take.

There is a problem with single records, particularly of mobile species, and knowledge is required as to whether there have been significant ecological changes in that area since. There is no doubt that many habitats and species in UK seas have greatly changed in the last 200 years, and they have changed most rapidly in the last 60 years. However, old records of the occurrence of species FOCI, and habitat FOCI known to have been seriously impacted (e.g., *Palinurus elephas*, beds of native oysters) are almost certainly unreliable indicators of their continued presence. Again, an informed judgement whether to include or exclude data needs to be made in all such cases. The SAP do not therefore recommend a policy of routinely discarding all data > 30 y old. The precautionary principal would suggest keeping such data within the data base, but perhaps flagging it as "data deficient". We also caution that some data which may apparently be recent, such as fish and spawning ground distributions, may merely be older data recently packaged in a more modern mapping format, e.g. compare the maps in the original MAFF Atlas from the 1970s, the Fishing Sensitivity Atlas from the 1980s and the more modern data layers – many of these have the same base data.

Where there is an *a priori* justification to remove data, then that case should be made and the process should be auditable. The Regional Teams will have to make judgements on this, and expert opinion could be obtained if necessary. We note that a decision to identify an area as an MCZ should not be based on a single datum, especially if there is doubt concerning such information, but be part of a broader consideration with respect to the eight criteria laid down in the ENG.

2.1.3. EUNIS level 3 data accuracy.

Accuracy of information of seabed types is obviously an issue: The UKSeaMap data layer is the result of substantial work by DEFRA contractors and has been through a process of audit.   It should therefore be treated as the "best available evidence" unless specific, reliable data to the contrary are available. Whilst UKSeaMap does give an indication of the sort of seabed types and their distribution, it is clear that some areas that might be selected to represent a particular broadscale habitat may turn-out to be a different broadscale habitat.   Where large areas are being considered for MCZ (e.g. offshore) the SAP do not view this as a big problem, as 'on average' the EUNIS L3 designation will be correct. UKSeaMap is known to be incorrect at particular locations and if it is being used to identify a small, specific region, then that designation should

where possible be supported by evidence from other data layers or additional information. The UKSeaMap has an associated probability layer to show the overall level of confidence in the predicted seabed habitats. This layer should be made available and the probability value should be used quantitatively in the selection process - and possibly in the Marxan routines. If stakeholders can provide alternative evidence of the presence or absence of particular features or different EUNIS level 3 biotopes (photographs, direct observation, echo-location traces etc.) than those data should be incorporated into the decision-making process. Evidence based on recognised knowledge and experience of an area (i.e. of sound provenance) should be considered valid.

2.1.4. Accessing other sources of information

The SAP recommends that once broad areas of interest have been identified, the regional teams should endeavour to access other data where appropriate to help the RSG come to conclusions. This can include (for estuarine and coastal waters) data available from the Environment Agency, through encouraging stakeholders to use the on-line data entry tool to add further data, and through local knowledge (e.g., fishing community, conservation bodies etc.). We also recommend that where estuarine and coastal waters are being considered for MCZs, the RSG are made aware of the targets and plans for such BAIs under the Environment Agency River Basin Management Plans under its statutory duties under the Water Framework Directive. Similarly valuable data and information will come from the condition monitoring for SAC/SPA and Appropriate Assessments by the statutory nature conservation agencies, Environmental Impact Assessments and compliance monitoring as licence conditions by industries, the Strategic Environmental Assessment process for offshore spatial use and ad-hoc assessments by NGOs. There will be opportunities for synergy.

2.1.5. A comment on data and scientific judgement

The final outcome of the MCZ identification process must be an ecologically coherent network of MCZ, fulfilling the ENG criteria and guidelines. Spatial and temporal heterogeneity is an intrinsic part of the natural world and this means variability and uncertainty within data sets is considered "normal", and fully accepted within the scientific community. Decisions on the ecological merits of designating a particular area or site as a MCZ cannot be made solely on the basis of data-driven metrics, as a situation where all the data exist in perfect form, is a utopia. The metrics can only provide pointers to areas that might be suitable for MCZs, i.e. they are decision-support rather than decision-taking. Not all data contributing to a final decision on an MCZ network will be suitable or available in GIS format, but that should not prevent such data from being used. Conclusions on the overall ecological importance of particular areas have to be collated from various sources and presented to the RSG so that they are aware of the relative importance of particular BAI for ecology. The SAP encourage the regional teams to develop portfolios of ecological information for each BAI, detailing the additional merits of particular sites, e.g. biodiversity hotspots,

important plant areas for marine algae, species that are rare or threatened and locations of scientific interest and to list the evidence relating to that site. Annotated maps of each area using information from all sources will then create a defendable resource. This will enable the SAP to offer a scientific commentary on the merit of such areas as MCZs. Such portfolios would also be a useful start point for cataloguing future conservation objectives and for the design of monitoring strategies required to determine whether those objectives are being met. More generally, data collected during the MCZ project should be retained for future reference, subject to whatever privacy restrictions that are placed upon them.

2.2. Treatment of existing zoning in the planning process for MCZs

Regional Projects have sought advice on how existing zoning and uses of the environment should be treated in the MCZ identification process.

2.2.1. Existing Marine Protected Areas

Several Regional Projects have included existing MPAs in their exercises, looking at habitat representation within MPAs and Broad Areas of Interest within their regions. They appear to have taken this approach in following the letter of the Ecological Network Guidance which states that, "Before identifying MCZs, existing MPAs should be assessed for their contributions towards the guidelines on representativity, adequacy, replication, and connectivity".

It is very important though, that Regional Projects distinguish habitats for which existing MPAs were designated from other habitats which lie within the boundaries of these MPAs. Management measures are generally directed towards protecting only the former, not the latter. One of the important intentions of the Marine Act is to extend protection to a much wider and more representative range of marine habitats and species than is currently given via other legal means (e.g. Natura 2000 or Ramsar). A critical role of the Regional Projects is to consider existing MPAs for enhanced protection, whereby habitats (and their associated species) within existing MPA boundaries but not protected adequately can be given MCZ status. MCZs are designed to produce multiple benefits, and overlaying them across SACs, SPAs, Ramsar sites etc., will broaden the range of benefits delivered by these areas. To achieve this requires that Project Teams must distinguish what is protected from what is not within existing MPAs. Until this is done, such habitats should not be included in calculations of representation, replication or connectivity in the regions.

2.2.2. De facto MPAs

Some Regional Projects have drawn attention to what they call 'de facto' MPAs. These may include, for example, fishery zoning agreements, or areas with restricted access such as munitions dumps. If the activity for which an area is currently zoned does not preclude benefits from MCZ protection, then it can be considered for the creation of an MCZ. However, the site should not be counted as an existing MPA. This is because there is no guarantee that the area will continue to receive the 'protection' that it has at present. Fishery zoning arrangements can be changed, for example. The purpose of

MCZs is to provide enduring protection to the seas around England. That can only be done by giving sites statutory protection.

2.2.3. Treatment of other kinds of zoning, or marine activity in MCZ identification

There are several other important types of zoning. For example, many offshore wind farms (established and proposed) and oil and gas fields lie within the four project regions. Some of them overlie areas of habitat that are ecologically important. The SAP's advice is that it is wrong to rule out consideration of an area for designation of a MCZ on the grounds of inconvenience to one or more particular sectors. Wind farms, for example, may be suitable for MCZs (although not for Reference Zones). They are good in the sense of excluding some disruptive human activities. But they can act as stepping stones for invasive species (e.g. *Crassostrea*). There is some evidence for negative impacts of wind farms on migrating birds, and some claims that subtidal cables can influence the electrosensing ability of elasmobranchs. There is also evidence that man-made reefs concentrate existing fish, rather than resulting in increased stocks. Decommissioning wind farms could have negative impacts, but it is likely that future reliance on wind farms for energy supply will result in upgrading, not decommissioning. Existing foundations could be left in place as local reefs. These are all manageable/acceptable impacts when viewed against the potential gain from large MCZs. Avoiding existing or planned wind farms in the MCZ planning process could also put severe constraints on opportunities to protect certain marine habitats.

The same principle should apply in relation to other uses of the sea. All of the Regional Projects have so far taken an approach of mapping fishing effort and then designing MCZs around areas of high fisheries use or value. The stated aim is to minimise socio-economic impacts on fishermen. However, such an approach carries several risks: (1) that sites will be chosen for MCZs that are currently second rate from an ecological perspective; (2) that avoidance of such areas could undermine connectivity of MCZs; or (3) other stakeholders may feel that unfair advantages are being given to fisheries in the planning process.

Shipping routes (e.g. those of the English Channel Traffic Separation Scheme) have also been avoided in at least two of the regional projects. However, such areas could provide very useful protection if also designated as MCZs. In the Oresund region of the Kattegat, for example, there is a busy shipping route that has been off limits to trawling for many years. This now supports the healthiest population of cod in the southern parts of NE European seas, with many very large individuals present. On the caution side, shipping does have many impacts, including pollution, noise and the risk of boat strikes on wildlife. It may be significant (or it may not) that the least effective of the large-scale closures to trawling gear on Georges Bank is the one that lies beneath a very busy shipping channel. The best approach, in the opinion of the SAP, is not to avoid shipping channels for protected areas, but to ensure that there are also other representatives of the habitats to be protected that are not within shipping channels.

The guiding principle in considering existing zoning should be that if the area contains ecologically important habitats or species, then it should be considered for the establishment of a MCZ. Given the pressure on the marine environment, the aim should be to collocate compatible activities whenever possible. Socio-economic data

on uses and pressures will be useful in deciding among candidate sites for MCZs of similar ecological value. However, such data should not be used to narrow the initial choice of possible places to protect.

2.3. Reference Zones

The Ecological Network Guidance refers to Reference Zones as areas where "all extraction, deposition, or human-derived disturbance is removed or prevented." The regional projects have sought guidance from the SAP on what Reference Zones should be protected from.

Finding Sanctuary has interpreted Reference Zones to mean the exclusion of any preventable human use or disturbance, i.e. the establishment of 'no-use' zones. The SAP believes this is unnecessarily restrictive and will be counterproductive and alienating to stakeholders. We advise the regional projects to adopt a more widely acceptable definition for management of Reference Zones, as described below.

The purpose of Reference Zones, as set out in the ENG, is:
"Areas of reference provide a key opportunity to demonstrate the unimpacted state of a broad range of marine features, in the context of prevailing environmental conditions."
There is some ambiguity over what protection is intended by Reference Zones in the ENG. It goes on to define Reference Conditions as "the state where there are no, or only very minor, changes to the hydromorphological, physico-chemical, and biological quality elements which would be found in the absence of anthropogenic disturbance." In the definition of 'favourable condition' it states that reference conditions should be reached within several reporting cycles (i.e. a couple of decades) if all "extractive, depositional and other damaging activities are prevented".

The above wording now refers to human-derived 'damage' rather than disturbance. The question is, whether 'potentially damaging activities' should be excluded completely or managed at levels that prevent significant damage from occurring. This is a very important distinction to make for two reasons. The first is that it has a major impact on who can use the zone, and the second, which logically follows from the first, is on how much stakeholder and public support there will be for such zones. Furthermore, in describing the concept, the ENG refers to reports by PISCO that review global experience with 'highly protected marine reserves', rather than strict protection zones. Such zones exclude extractive, damaging and depositional activities, but permit well-managed, no take or killing activities such as wildlife watching, scuba diving, snorkelling, kayaking etc.

There are two key risks in taking a strict protection approach for Reference Zones. The first is that 'no-use' areas will find no champions within the stakeholder groups. Rather than seeing high levels of protection in a positive sense – a way of producing benefits for many stakeholders in the form of enhanced opportunities for recreation and enjoyment, and recovery of marine life that could have knock on benefits for adjacent fisheries – most stakeholders will view them negatively. The second risk is that Reference Zones will be seen in the planning process as a necessary evil at best. The scope for establishing such sites in the face of high intensities of use of the sea will be extremely limited, especially in inshore areas. This means they will be given a very low priority by stakeholders and sites chosen as reference areas will likely be anything but representative of the range of habitats and conditions present in the different regions.

They will contain pretty low quality habitat that nobody wants for other uses. This is not to deny that it would be of scientific interest to have one or two areas in the Secretary of State's waters that are completely no-go areas (as much as that is ultimately feasible)

In view of the above arguments, the SAP recommends that Reference Zones follow global practice in marine management and be defined as equivalent to 'highly protected marine reserve' zones. This would, in its view, lead to more representative and better supported proposals of sites for Reference Zones, and probably more sites put forward for this level of protection. This approach is sensible given that there are, in any case, limits to the human uses and impacts that can be excluded from Reference Zones, such as pollutants, invasive species, climate change effects, the right of innocent passage of vessels that is enshrined in the UN Law of the Sea, etc. It doesn't make sense to alienate all users in the pursuit of an unattainable standard of no-human disturbance.

2.4. Areas of Additional Ecological Importance (ENG pages 55-56)

2.4.1. The first iteration of identifying Broad Areas of Interest (BAI) has provided the stakeholders and Regional Project staff with the opportunity to engage and evolve the mechanisms of the process of selecting areas based on EUNIS level 3 broadscale habitats and stakeholder preference. However there is a danger that many of the areas selected by the 4 projects may have little ecological importance especially if they are selected by stakeholders primarily to minimise socio-economic impacts (e.g. selection of areas little used for fisheries).
"Areas of ecological importance are areas which – either by themselves or in a network – make a disproportionately greater contribution than other areas to ecosystem function, biodiversity, or resilience in the marine environment" (ENG).

The SAP feel that a reminder is needed that the choice to use EUNIS level 3 habitats was a pragmatic one based on the fact that there was insufficient confidence in the higher order national data levels (i.e. EUNIS levels 4 & 5) to use more explicit habitat and species spatial distribution. Also, the mapping of seabed habitats at those higher levels results in a much more heterogeneous and patchy image of the seabed, in itself difficult for spatial marine planning. Therefore EUNIS level 3 is only a proxy for habitats and the dominant, characterising and otherwise structural species. Additional data and knowledge must be used to make informed decision that ensure with a high level of confidence that areas that are of ecological importance (and worth protecting) are the locations ultimately chosen for inclusion within a MCZ.

2.4.2. Advice on how to use additional data layers
Confidence issues with EUNIS 3.

The final UKSeaMap 2010 map is supposed to have an associated probability layer to show the overall level of confidence in the predicted seabed habitats. The confidence layers show the probability that class selected for that grid cell is correct (e.g. 'high' energy, 'circalittoral' biological zone). We suggest that the probability level be used as a weighting within the Marxan selection process with areas with low probabilities (i.e. < 50%, representing a 50/50 chance that the area actually is the habitat type). However the weightings might need to be different from just a 1:1 linear weighting -

with lower probabilities having exponentially lower weightings as we move below 50% - it is no more than a random chance that these areas are the correct habitat type.

Use of other national data layers – collectively

There are other data layers now, or soon to be available (please see the table below). A simplistic approach to using at least the sets of biological and bio-physical data is to assess the implications of taking them together. This can be done by adding up how often an area of possible interest occurs across all the relevant data layers.

For example if the area is a nursery area for a fish species, has a higher than the average level of seabird density, is fished by a range of methods, is within a thermal frontal area and has a sandbank system it would get 6 points. This would be compared to an area that was not within a frontal region, only had trawling and a lower than average density of seabirds which would only get 1 point.

At a later stage, there will need to be moderation process to identify whether an area identified for its high productivity and therefore possible aggregation of seabirds, cetaceans etc. is a suitable area for identification as a MCZ bearing in mind the potential for managing those factors that create the high productivity and/or attract the biodiversity features.

Use of other national data layers - individually

The other data layers can also be used individually and there is a Table (1) below suggesting the ecological 'use' that can be made of each of these layers.

Table 1 - Data layers available and examples of use.

Data layer	USE
Biological data	
FOCI species (benthic, non-mobile)	As prescribed in the ENG - the area has higher preference (weighting) if the species is present
FOCI habitats	As prescribed in the ENG - the area has higher preference (weighting) if the habitat is present
Biodiversity	Weight areas of higher biodiversity higher in Marxan If data are available, weight even higher if diversity is in more than one classification level (i.e. high diversity in benthic and pelagic organisms)
Benthic production	Weight areas of higher benthic production higher in Marxan
EUNIS levels 4 & 5	Use E4 and E5 layers where confidence layers are high (perhaps use only probability of occurrence > 50%)

Modelled density and foraging habitat for common seabirds	Higher density of seabirds indicates availability of catchable prey and therefore indications of areas of high productivity and high trophic transfer so higher densities can be used to weight Marxan towards higher probability of selection. Areas of low density can be downgraded and have much lower weights in Marxan.
	Different species indicate different habitat types - i.e. surface feeders indicate areas of upwelled (turbulent) water where prey is brought to the surface and deeper diving birds indicate abundance of bottom associated and schooling pelagic fishes.
Fish spawning areas	Use the number of different species that use the same location for spawning by adding a point for each species - the sum being a surrogate for ecological importance.
	Use species specific information to understand the area in more detail. For example, if a fish species produces pelagic eggs in that area it can be assumed to be good area for connectivity to productive habitats 'downstream'. If a fish species produces benthic (adhering) eggs - assume that area needs pristine bottom type - no activities allowed that would affect the bottom substratum. Use stakeholder fishing knowledge for more site specific uses.
Fish nursery areas	Use the number of different species that use the same location as a nursery area by adding a point for each species - the sum being a surrogate for ecological importance.
	Use species specific information to understand the area in more detail. Areas of nursery need to contain higher primary production and/or locations of cover/camouflage.
Fishing data	
Fishing effort (VMS)- each different gear types	Use each gear type individually as each gear implies a different range of species targeted and add up a 'prevalence' index for potential fish species and use as a weight for ecological importance.
Fishing effort (Fishermap) each different gear types	Use each gear type individually to the extent that each gear implies a different range of targeted species and add up to create a collective index for potential fish species and a surrogate for ecological importance.
Bio-physical data	
Seasonal oceanic thermal fronts	Areas of high primary productivity and locations of predicable foraging of many mobile and higher tropic order animals, i.e. seabirds, marine mammals, basking sharks. Therefore the locations of fronts should be

	considered areas of higher ecological importance and should weight these areas higher in Marxan.
Physical data	
Marine Processes (banks)	Banks / troughs areas of abrupt topographically change most likely have higher levels of productivity within 5 to 10 km range but this production may only be sub-surface. Therefore the locations of banks or troughs should be considered an area of high primary production and of higher ecological importance.

Advice to encourage incorporation of as many ecological data as possible

Focus on areas that have been agreed as areas of broad interest first and focus in on the species and/or habitats within the areas that are to be protected.

Make all the other biological data layers available to stakeholders and begin an iterative process on how to make more use of this information.

Use any supplementary data with reliable provenance from stakeholders and elsewhere- do not limit them to nationally approved data layers or those that are digitised. Bring them into a GIS layer as simply as possible - a point, a circle. Such supplementary information might include knowledge of where rare, in decline or threatened with decline species occur that are not listed as FOCI.

2.5. Replication

2.5.1. Introduction

Replication in the ENG is defined as follows: "Replication is the protection of the same feature across multiple sites within the MPA network, which should include replicate sites for all features, taking biogeographic variation into account. Replicates should be spatially separate." Replicates as defined in the ENG are not synonymous with statistical replicates (i.e. not identical copies, independent of each other). The SAP view of the ENG definition is of spatially separated, distinct sites / locations that encapsulate local or regional variation in the habitat / FOCI concerned and are geographically spaced to mitigate biodiversity loss due to deleterious events or impacts at a local or sub-regional scale. Although no two sites which contain the same feature will be identical, it should be possible to select sites which protect the same feature, even if the species composition is not identical. Replicates therefore have the potential to protect often different species and biotopes in apparently the same broad-scale or FOCI habitats (especially with regard to broad-scale habitats).The guidelines (4.3.3 in the ENG) are clear as to the numbers of MPAs per habitat and how many examples of each feature should be protected within each RP area. This needs to be taken into account by each region independently when assigning replicate sites for a feature, assuming that feature occurs in that RP area.

2.5.2. Biogeography

The ENG definition of replication states 'taking biogeographic variation into account." Figure 4 in the ENG (p. 27) illustrates the 12 JNCC Regional Seas for UK waters and these appear to be reasonable divisions when considering replication in relation to biogeography. There is a risk that if a replicate of a feature falls into a different biogeographic zone from the one in which it is designated within a RP area, if the feature is lost, then a replicate in a different biogeographic zone will not serve to conserve all aspects of the feature: species might be lost or not occur. Therefore, if possible, if a feature occurs in more than one biogeographic zone within a RP area, then MPAs for that feature should be in each biogeographic zone and each have replicates within its biogeographic zone. This could result in more than two replicates of a particular habitat or FOCI in a region, and RSG should accept this as a consequence of biogeography. This spread will also help safeguard against unexpected disasters and collapse of species populations in one location and ensure that natural variation within features is captured.

2.5.3. Separation

The ENG states that "Replicates should be spatially separate." Spatial separation is important to minimize the risk of an ecological catastrophe removing both replicates. The site and physical and temporal scale of the catastrophe and the nature of residual wind and water currents will determine whether features are sufficiently far apart for at least one to be unaffected. However for planning purposes a precautionary rule of thumb is suggested. The ENG states that MPAs of similar habitats should be separated where possible by no more than 40-80 km. For replicates, spatially separate could be therefore be interpreted as c. 80 km which might be enough to allow one replicate to escape damage in the event of a small scale event and in the absence of strong residual interconnecting currents. The SAP believes that this is the minimum separation of replicates that should be permitted in the design of the MPZ networks and hopes that greater separation than this will be achieved generally. Provided at least this separation is achieved the SAP believes that replicates could be located in a sufficiently large MCZ.

2.6. Conservation Objectives

Although the timescale of the drafting of conservation objectives is dependent to some extent upon further guidance from the SNCBs – annex 5 of the ENG – the SAP believes that iteration 2 of the Regional Project proposals would benefit from the drafting of such objectives for pMCZs as soon as possible.