

SAP Response to Finding Sanctuary draft Final Recommendations

1. Overview

- 1.1. The Report together with references to the third iteration report conveys the information on characteristics and boundaries for both pMCZs and pRAs. There is clearly work to be done to complete sections and to identify conservation objectives but the Finding Sanctuary team and the stakeholders are to be congratulated on what is obviously a very large amount of work systematically assembled.
- 1.2. Most network design principles appear to have been followed and met (with caveats given) although we note that Finding Sanctuary do not feel the Viability measures are useful in network design and assume that means that viability measures are concerned with boundary setting. What we observe is that many Reference Areas are very small – at the minimum size for broadscale habitats (or less in the case of intertidal areas) and the minimum size for FOCI – and the bare minimum requirement of one example of each BSH and FOCI has been followed. We believe that this fails to meet the requirement of the ENG and comment further in sections 2 and 5. We note the difficulty found in identifying low energy circalittoral rock but would have expected some presence. We agree that ‘Subtidal biogenic reefs’, ‘Intertidal sediments dominated by aquatic angiosperms’ and ‘Intertidal biogenic reef’ as broadscale habitats can be represented by relevant FOCI habitats. The reasons for not accepting some records of FOCI species are generally well-made but some specific comments are given later. The detailed analysis of data sources to provide context to decisions is to be applauded.
- 1.3. The SAP was pleased to learn that the stakeholder meetings have been very constructive.
- 1.4. The SAP notes that the boundaries of some pMCZs have been extended to take account of conservation/science stakeholders regarding biodiversity features especially and that is to be commended.
- 1.5. The site-level descriptions are necessarily long documents (and will become longer when sections from the third iteration not carried across and draft conservation objectives are added). The SAP noted the very substantial size of the report (582 pp) which reflected the large number of pMCZs identified in the Finding Sanctuary Region and the detail of each of the site-level reports.
- 1.6. There are a significant number of technical questions about species occurrences and relevant habitats in the report that the marine ecologists/conservation stakeholders may not have been able to answer. These questions need to be addressed and additional specialists may be needed.
- 1.7. We note the comment that socio-economic arguments weighed heavily in the identification of both MCZs and Reference Areas. The SAP feels that this approach is appropriate if locations of similar character, viability and biological quality to any rejected have been identified for inclusion in the network but will comment if it feels that high quality locations are not included or targets are not being met.
- 1.8. We have concerns that some of the highest ranking sites for biodiversity, or special features might not go forward as Reference Areas, as some such sites are contended by fishing or other interest groups.
- 1.9. The whole report needs careful reading by someone with an eye for simple inconsistencies such as whether a term is consistently capitalised or not, for differences such as “additional ecological importance” becoming “added ecological importance”, for missing text, for instance “Further inshore, the South of Falmouth and South-East of Falmouth pMCZs coincide with [then no text]” etc.

2. Detailed comments

- 2.1. **Representativity:** Largely complete – potential MCZs have been identified, coded, named and documented. We note that there has been some change in the position of offshore pMCZs but most such pMCZs are predominantly and conspicuously at the outer borders of the region. The rationale for this, in terms of the various socio-economic pressures that have been accommodated, still needs to be provided.
- 2.2. **Replication:** Completed wherever possible and reasons why not possible indicated.
- 2.3. **Adequacy:** analysis suggests that the targets are met at between the minimum and maximum levels and the ‘assignment’ of broadscale habitats listed in Table 6 of the ENG to be represented by FOCI habitats is accepted.
- 2.4. **Viability:** Site-level reports map the size and dimensions of each pMCZ and reference to viability guidance is clearly being made for the individual sites.
- 2.5. **Connectivity:** Has been demonstrated for 40 km and 80 km distances within the Finding Sanctuary region.
- 2.6. **Protection** is effectively defined by :
 - 2.6.1. **Conservation objectives** which have been defined for offshore sites. This task is to be completed for inshore sites. Guidance on the setting of conservation objectives has been provided by the SNCBs¹. In effect this requires an understanding of the sensitivity of a feature to pressures to which it is exposed. Where the feature is judged to have a high or moderate sensitivity to such pressures the conservation objective is set to ‘recover’, otherwise the objective is to ‘maintain’. Comments on this process are included in section 5. It is understood that the SNCBs are carrying out a sense check on the conservation objectives that have been assigned by each Regional Project, to check for consistency, and we look forward to seeing the results. In line with our previous advice, no conservation objectives have been set at offshore sites for seabirds and cetaceans, which are not included in the ENG list of mobile species requiring protection by MCZs, in the absence of sound cases and evidence justifying their inclusion. We comment further in section 5.
 - 2.6.2. **Reference Areas:** The conservation objective for each feature in a reference area is automatically, and correctly, set to “recover to reference condition”. Finding Sanctuary has proposed 13 reference areas, 3 offshore and 10 inshore. These appear to include all the broadscale habitats occurring in the region and those FOCI for which there is compelling evidence of their presence as permanent or regularly occurring features at a location. However, some of the broadscale habitat pRA areas are not viable for all of the constituent features. For example a 5x5 km reference area is proposed at Cape Bank and it is claimed that the all 5 broad-scale habitats present within it meet the viability criterion, even though only one broadscale habitat covers an area of 20 km²; the largest of the remainder occupies 2 km². We do not believe that these fragments can be offered as viable examples of a broadscale habitat reference area. The target of achieving an **average** size for broadscale habitat reference areas is missed – by a substantial margin. A summary table which details where viable potential reference areas for each broadscale habitat and FOCI are located will be of help in determining the extent to which ENG Guideline 16 and associated viability criteria are met.
- 2.7. **Best Available Evidence:** The Finding Sanctuary team have worked hard to identify and to provide stakeholders with the best available evidence for the distribution of the broadscale habitats and the FOCI habitats and species for which conservation targets have been set in the ENG. To ensure that the quality of evidence underpinning decisions is not in doubt, it is important to ensure that data traceability is maintained. There are clearly substantial gaps in knowledge about what is where but the final proposed MCZs do use best available evidence as effectively as possible for the listed habitats and species. There are, however, some specific comments below about how some information has been used.

¹ http://www.naturalengland.org.uk/Images/conservation-objective-guidance-summary_tcm6-24854.pdf

- 2.8. **Areas of Additional Ecological Importance (AAEI):** Finding Sanctuary is very explicit that pMCZ sites have been chosen based ‘on working assumptions on how those pMCZs might impact on human activities within the site’. There is no reference to maximisation of biodiversity or ecological richness in any of the site descriptions – although it is conceivable that this is ‘information to be added’ in the Final Recommendations. Similarly, there are no indications that sites have been prioritised on the basis of AAEI, as required by guideline 20. Indeed there is prima facie evidence that AAEI have not been used in this way in the iPDF provided with the draft Final Recommendations; there appears to be an anti-correlation between the measures of biodiversity and the location of PMCZs, particularly in the offshore areas. Biodiversity data are sparse in these areas so it is difficult to read too much into the comparison but the absence of pMCZs in the near offshore where biodiversity data are available is striking. As noted in paragraph 1.4, there is anecdotal evidence that biodiversity data have been used in boundary selection. In the past indicators of AAEI, such as bird foraging, have been used to justify so-called ‘water column protection’. Latterly the same indicators have been used to justify protection of the highly mobile predators, despite our advice on the subject in our responses to 3rd iteration proposals that this needed a well-argued case, i.e. the existence of AAEI were not sufficient in themselves. We comment further on this in paragraph 4.9 and Annex 1. We conclude that, whilst indicators of AAEI are available to Finding Sanctuary, they have not been used in the manner required by the ENG.
- 2.9. **Scientific value for research and monitoring:** There is no evidence to suggest that dMCZs or Reference Areas have been chosen to maximise their utility for scientific research or to ease monitoring. Nevertheless if the network design principles are followed through to designation and a full set of viable Reference Areas is chosen and implemented a valuable research resource will be created.
- 2.10. **MCZ boundaries:** The choice of dMCZ and Reference Area boundaries appears to have followed ENG guidance. However, it is not clear how far guideline 25, relating to incorporation of margins to protect enclosed features, has been followed. That could be included in the site notes with advantage.
- 2.11. **Geological and geomorphological features of interest:** The three geological and geomorphological features of interest that exist within the Finding Sanctuary area are represented within the network to some extent – one completely; approximately half of the other two fall within pMCZs. A summary table of these and the intersections with identified GCR sites is provided on p70. This is a creditable outcome.
- 2.12. Finding Sanctuary are congratulated on the targets that have been met but we have concerns that some of the highest ranking sites for biodiversity, or special features might be being replaced by sites that are not contended by fishing or other interest groups.

3. Recommendations for Action by Finding Sanctuary

- 3.1. Rationalise and explain those habitats and species that are not included (are crossed through) as requiring action in MCZs because they are already protected by other designations – or remove cross-throughs.
- 3.2. Re-visit the site-level descriptions for estuary sites to ensure that the seabed habitats and species that define them are the primary reason for their identification and that AAEI is secondary.
- 3.3. Proof read all material with an eye to correcting inconsistencies, ensuring correct and consistent capitalization etc.
- 3.4. Produce a synthesis of the proposals for reference areas that summarises the extent to which they meet guideline 16 and subsequent advice on the viability of protected sites in bounded areas, e.g. in intertidal areas.

- 3.5. A commentary is sought in the Final Recommendations on the extent to which connectivity has been established with ISCZ, Balanced Seas, and French and Irish Authorities, across their borders with Finding Sanctuary.
- 3.6. Act upon the suggestions made in paragraphs 5.8, 5.9, 5.10, 5.12, 5.14 and 5.16.

4. General Comments – addressed to all Regional Projects, the SNCBs and Defra

- 4.1. The SAP seeks confirmation that the draft MPA network has been designed to include all of the best areas for biodiversity in the d/pMCZ and Reference Areas, and where these were considered and rejected an explanation of why that was so - as set out in Government Expectations Note 1.
- 4.2. The SAP believes that to date Regional Projects and their RSGs have failed to meet important requirements of the ENG to identify a set of viable RAs. This is very regrettable given their importance in providing (a) the maximum feasible protection for flora and fauna that are rare, threatened or representative of UK biodiversity, and (b) sound scientific benchmarks for the future management of the MPA network. The criteria for viability of broadscale habitats and FOCI are set out in section 4.5 of the ENG - guidelines 9 and 10. Guideline 16 in section 4.7 indicates that these criteria are to be applied to reference areas.
- 4.3. Regional Projects and their RSGs have interpreted guideline 9 as implying that 5x5 km (=25 km²) is the target area for a broadscale habitat reference area away from the coast. It is not. The **minimum** acceptable diameter of 5 km for a single RA implies a minimum viable area of 20 km² and the goal is to achieve an **average** diameter of between 10 and 20 km, i.e. an average area of the broadscale habitat RAs within a region of between 80 and 310 km². Given that recommended individual reference areas for intertidal and near shore broadscale habitats are being recommended with areas of or less than 0.25 km², the present collection of potential or draft reference areas will fall substantially short of the average size target in all regions – perhaps by an order of magnitude. This compromises the scientific basis of the network of highly protected areas.
- 4.4. Matters have been compounded by the way the sensible advice of the SNCBs that RAs can contain more than one broadscale habitat has been followed. An RA of 5x5 km cannot accommodate more than one viable broadscale habitat occupying 20 km². We and the SNCBs have advised that small sites can make a useful contribution to MCZs and RAs in particular circumstances but we are deeply disappointed that this pragmatism has not been matched by recommendations for some large RAs containing viable amounts of a several broadscale habitats to achieve an average size that meets – or even approaches - the target set in the ENG. Finding Sanctuary and ISCZ have each identified one larger pRA (150 and 300 km² respectively) but this merely demonstrates that it is possible to do so. We accept that it is probably too late to make good this shortfall now but believe that the problem will have to be revisited in the future to meet ENG guideline 16.
- 4.5. Conservation Objectives (COs) give cause for concern as they are all either ‘maintain’ or ‘recover’ based on the (putative, assumed, predicted) impacts of activities on a particular habitat type. Most of the COs are to ‘maintain’ although no evidence is adduced by any of the Projects to demonstrate that such sites are in favourable status despite the large number of users/uses in their regions.
- 4.6. The logic of setting an objective that an area has to be managed to recover, when in fact there is no evidence that it (the particular site and/or feature) is in a degraded state, is flawed. A manager faced with this is going to be required to put in recovery measures based on only an assumption that there has been damage. When will he/she know that an area has recovered or will it be assumed that if the pressures are removed then the area will be as it should? It is acknowledged that the COs are all preliminary at present but this aspect needs addressing by the SNCBs and to be explained to stakeholders.

- 4.7. To what degree have certain activities influenced site selection? For instance, activities with management implications (beam-trawling, otter trawling, scallop dredging, beach replenishment, coastal protection) have led to COs for ‘recover’ – are these the only activities which require management (aggregate extraction is not included) or have all the sites been chosen to exclude activities such as aggregate extraction, with a buffer, on principle irrespective of their ecological benefit? The matrices for the CO giving the sensitivity of areas and the confidence in the assessment are very valuable but the implications of this need to be considered further, for example an area of high sensitivity but low confidence will may be discounted and management concentrates on areas that are high for both – this is not a precautionary approach.
- 4.8. All the Regional Projects need to consider the implications of the term ‘recover’ as a CO – does this presume to remove pressure, return to ‘normal’, define according to a reference area or reference status. Following WFD discussions, the areas with which sites are compared can be deemed in good condition either through the absence of pressures (which is easy to determine) or the presence of a good ecology (which is costly to determine). However, it is emphasised that unless there are well-defended arguments for indicating that a site needs to recover from pressures or to a pre-defined state then there will be challenges from user groups.
- 4.9. Notwithstanding the advice we provided in Annex 1 to our response to the 3rd iteration reports on AAEI some Regional Projects continue to bring forward proposals to designate p/dMCZs for birds and cetaceans without cases to do so, or vulnerability assessments or conservation objectives or indications of possible management measures. IS CZ have promised to bring forward a case for the black guillemot *Cephus grylle* in their Final Recommendations which we look forward to seeing. The SNCBs are the formal source of guidance on these matters. We can help by offering advice to augment this from a scientific viewpoint. Rather than repeat that earlier advice and its implications (which remain extant), in Annex 1 to this response we provide a ‘How to Guide’ to help in assembling a suitable case. There should be no difficulty in setting out vulnerability assessments where habitats are the subject of designation, but we are unable to provide general advice on the preparation of such assessments where the highly mobile species itself is viewed as vulnerable. Section 3 of the ‘Guide’ suggests the issues that need to be addressed **before** a vulnerability assessment is provided in that case.
- 4.10. The SAP understands that the Regional Projects have been advised that only tide-swept channels where the velocity of currents exceeds 7 knots are to be considered for identification of FOCI habitats. The effect of this advice is that there are no locations that qualify as ‘Tide-swept channels’ in any of the Regions. A rescue operation by the SNCBs is needed. This should take account of the existing BAP description..

5. Site Specific Issues

- 5.1. The justification for sites would benefit from the identification of the designated taxa that are present there in addition to FOCI species.
- 5.2. The SAP acknowledges that estuaries have clearly been identified to exclude port areas but are pleased that the Regional Project stakeholders are willing to see such a large number included in the network.
- 5.3. The identification of estuary pMCZs appears to have been undertaken in an ‘uneven’ fashion and for possibly flawed reasons. It is noted (pg 77) that “Estuaries are of added [sic] ecological importance because of their high levels of productivity and ecological function as spawning and nursery areas”. If that is the reason for their identification then it is contrary to guidelines regarding AAEI which should be used to prioritise locations identified as representative of broadscale habitats and FOCI. Some of the estuary pMCZs are already part of Special Areas of Conservations (SACs) RSG and it is unclear why additional MCZ status is needed. For others, it is unclear what benefit MCZ status

will give them or whether they are a 'good' example of the estuary habitat (for instance, the Fowey upper estuary). There will need to be a clear case that those estuary areas suggested add to the network (including MCZ status providing protection to existing SACs) and are therefore 'needed' and that excluded areas of socio-economic interest are not needed.

- 5.4. We appreciate that the Finding Sanctuary Regional Stakeholder Group (RSG) has identified Reference Areas without proposing areas in the Isles of Scilly. Leaving aside concerns that the results do not represent a complete set of viable RA sites, we have consistently argued and confirm now that the decision is the RSGs to make. Nevertheless, the SAP continues to be disappointed that the Isles of Scilly stakeholders cannot agree to some locations being Reference Areas. Those of us that have been involved in surveys of the southwest of England know that the Isles offer some of the best locations for sites that deserve high levels of protection, for their own sake and the scientific understanding that could be unlocked. We understand that protection, which stops short of this but is nevertheless substantial, is being offered. This does not lessen the sense that an opportunity has been missed.
- 5.5. Subsequent to the meeting on 3rd June, we were informed that Regional Projects had been advised by SNCBs to consider only locations where tidal streams exceeded 7 knots as 'Tide-swept channels'. This means that there are no areas in south-west England (except possibly adjacent to Flatholm and Steepholm islands) that qualify on physical characteristics. This advice discounts Tide-swept channels in the Isles of Scilly as valid candidates. The SAP considers this an unsatisfactory situation and, bearing in mind that the opportunity to re-visit site selection has passed, advise accordingly.
- 5.6. Table II.2.2.b 'Feature list' (and subsequent text in the separate site-level descriptions and COs list) for each pMCZ has some cross-through features, some of which are explained and some not. For example, there are many places where maerl is crossed through as "single record only" and yet what are probably single records of seahorses remain. Similarly, it is unclear why "Protected by existing SAC/SSSI" results in a feature being crossed through – it is surely still a feature of the MCZ. For instance, why is *Palinurus elephas* not crossed-through at Lundy when a host of other species are? Overall, a quality control/consistency check or a clear explanation of why cross-throughs occur is needed **OR** cross-throughs should be completely removed as irrelevant. There need s to be consistency with other Regional Projects, where no such crossing-through occurs.
- 5.7. The Lyme Bay potential Reference Area is tiny and borders on areas of infralittoral and circalittoral reef that could be significant reference areas. The logic for such a small area is not given.
- 5.8. The 'Celtic Deep' potential Reference Area is not a viable size for Mud habitats in deep water and is simply not realistic for location and enforcement. It needs to be enlarged to a realistic size.
- 5.9. Seahorses pop-up everywhere but not, in most cases, from survey data it seems. Records are in fact very few and are anyway serendipitous. The species should only be mentioned if there is a survey record that provides evidence of a permanent or regular population.
- 5.10. The boundary of the Torbay pMCZ had been extended beyond Berry Head at the suggestion and agreement of the stakeholder group but for cetaceans and seabirds. The MCZ contribution to the MPA network is for listed seabed habitats, sessile, limited mobility and mobile species prioritised but not led by Areas of Additional Ecological Importance. Birds and cetaceans are not listed mobile species, but their presence as indicators of high productivity through their foraging are useful indicators of Areas of Additional Ecological Importance. The extension of the boundary of this pMCZ to accommodate cetacean and seabird interests does not correspond to the application of the criteria. Furthermore, our understanding is that there is already a byelaw in place

protecting the area and, if that byelaw is not being enforced or is un-enforceable, we question how a MCZ will provide the apparently needed protection.

- 5.11. The upper Tamar estuary is important because of the extent of hard substratum both intertidally and subtidally and the presence of hard substratum species typical of variable/low salinity. The measures of extent of hard substratum seem low and the importance could be better described.
- 5.12. The Reference Area identified at Haig Fras includes only a small amount of mapped hard substratum (listed for 'Moderate energy circalittoral rock') and may not adequately represent the circalittoral rock habitats and any FOCI habitats that have been identified there. The boundary of the Reference Area should be reviewed. The map suggests about 4 sq km although the site-level description about 30 km² of rock.
- 5.13. pMCZ12 is a Reference Area that seems to be c. 1 km across and there may be others that are smaller than guidance. See the general comment to all Regional Projects.
- 5.14. *Sabellaria alveolata* reefs – the much published 'classic site' for *Sabellaria alveolata* reefs is "near Bude" – at Duckpool - and they were there 17 months ago at least - so not anecdotal. Also, on p 79, the suggestion is made that Lyme Bay candidate Reference Area will include intertidal biogenic reef habitat in the form of *Sabellaria alveolata* reef. The *Sabellaria alveolata* reefs in Lyme Bay are believed to be very poor examples. The Duckpool reefs are well-developed, have a history of monitoring going back to the 1950s and good information on temporal change in them. They should be considered as a (additional) Reference Site for intertidal biogenic reefs.
- 5.15. The identification of additional species considered important by the local group in the Bideford to Foreland Point pMCZ is welcome (pp 473-4) but some mentioned species are widespread and common and more scrutiny is needed including adding important species that they do not mention but which occur there.
- 5.16. Check that the blue mussel beds in the SE of Portland Bill RA are indeed on sediment – part of the habitat definition.

Annex 1

How-To guide: to help make the case for protecting locations that benefit highly mobile species, within the ENG guidelines.

Working from the top down to make the case from the bottom up:

- 1) What does the mobile species eat?
 - a) If for example the answer is a prey species that doesn't move much i.e. mussels or invertebrates (or even small bodied fish, or juvenile fish) that live on / within kelp beds, etc. Then it is a simple case of protecting the habitats which gives rise to mussel and/or kelp beds, etc.
 - b) If the prey of the mobile species also moves around a lot, then one has to ask 2 more questions,
 - i) What does the prey eat - and if that happens to be a sessile or easily defined seabed habitat then repeat 1) (i.e. for top predator such as the Black Guillemots whose prey includes benthic invertebrate with clear habitat preferences and sandeels which require specific sand/gravel grain size and bottom current speed for their habitat and don't move far from this habitat while feeding (Van der kooij et al 2008) OR
 - ii) If the prey of the prey also moves around a lot then one has to ask the following question
- 2) Are there specific characteristics of locations where the top predator is repeatedly seen foraging i.e. where prey is more available, easier to catch for some physical reason? Specific characteristics can be
 - a) Frontal regions, where there is a rapid change in horizontal or vertical gradient of temperature. This is a habitat captured as an Area of Additional Ecological Importance (AAEI) in this case P. Miller's thermal fronts, and can be defined spatially as the locations where the ratio of the depth of the water column divided by the mean monthly speed of the tide is approximately 2.7 - 2.9 (Simpson and Hunter 1974, Sharples 2008). Mobile species such as basking sharks are known to target this type of habitat for foraging (Sims et al 2000).
 - b) Areas with high primary productivity either at the surface as would be found in locations in 2 a) or sub surface productive areas that are most likely caused by internal wave mixing over bumpy topography (Scott et al 2008) which can be defined in space by variation in depth of bottom features (again areas of AAEI such as banks and troughs).
 - c) Areas with high tidal speeds (> 2 m/s) are also known to attract many top predators for feeding (i.e. Black Guillemots which also generally forage close (< 5 km) to nest sites and Harbour porpoise are now well documented at using particular < 1 km² sites for repeated foraging (Pierpoint 2008)). As the reasons for high tidal high speeds are predictable and mostly topographically driven these areas can be easily defined spatially.
- 3) Then it is necessary to specify the features that will be designated at the site and their conservation objectives. In the case of 1 (a) and 1 (b)i it is straightforward to designate the habitats that enable the prey to flourish and, given that the mobile species is successfully exploiting these locations, it is likely that the conservation objective will be to maintain the habitats, unless they are under moderate or high pressure from some other activity. In the case of 2, the ENG requires the spatially defined AAEI to be used to preferentially select MCZs that deliver against the network design principles of Representativity, Replication, Viability, Adequacy and Connectivity for broadscale habitats or the listed FOCI.

In principle it is possible to protect highly mobile species by making the case to expand the list of such FOCI beyond the bony fish identified in Table 4 of the ENG. The methodology for doing so is reviewed in Annex 2 of the ENG where it is concluded (Box 1, p75) that the case will depend on:

- Knowledge of the species ecology and behaviour and in particular whether the species has localised distribution, exhibits site fidelity or aggregates at some point in its life cycle;
- whether applicable and useable spatial data exist to provide the necessary evidence;
- whether MCZs are the most appropriate tool to deliver conservation benefits.

As explained above there are many reasons to suppose that site based protection may be appropriate, although systematically gathered spatial evidence to support clear identification and prioritisation of sites is not readily available. However the key consideration is likely to be whether conservation benefits are likely to be delivered by MCZs or mechanisms such as bylaws, codes of practice and technological developments that reduce the pressures to which the species is vulnerable.

No such cases have been seen by the SAP to date.

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Scott, B.E., Sharples, J., Ross, O.N., Wang, J., Pierce, G.J. and Camphuysen, C.J. 2010 Sub-surface hotspots in shallow seas: fine scale limited locations of top predator foraging habitat indicated by tidal mixing and sub-surface chlorophyll. *Mar Eco Prog Ser* 408: 207-226

Sims, D.W., Southall, E.J., Quayle, V.A. & Fox, A.M. 2000. Annual social behaviour of Basking sharks associated with coastal front areas. *Proceeding of the Royal Society of London. B.* **267**: 1897-1904

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Simpson JH, Hunter JR (1974) Fronts in the Irish Sea. *Nature* 250:404–406

Van der kooij, J., Scott, B.E. and Mackinson, S., 2008. The effects of environmental factors on daytime sandeel distribution and abundance on the Dogger Bank. *Journal of Sea Research*, 60(3) 201-209.