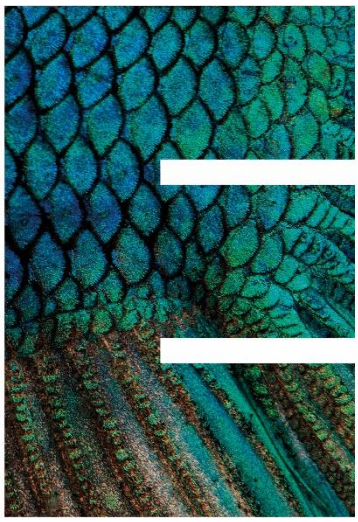

BRITISH ECOLOGICAL SOCIETY

A response from the British Ecological Society to Defra's 'UK Marine Strategy Part One' consultation

June 2019

The British Ecological Society: 'A world inspired, informed and influenced by ecology'
www.britishecologicalsociety.org

Founded in 1913, we are the world's oldest ecological society, with over 6,000 members worldwide. As the voice of the UK's ecological community, we communicate the value of ecological knowledge to policymakers and promote evidence-informed solutions.

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Key points:

- Overall, we welcome the Marine Strategy, and its broad suite of indicators, goals and steps for achieving them, as an important step forward in understanding and protecting the marine environment.
- However, the Marine Strategy needs to be more transparent regarding its evidence base.
- D1 & D6 Benthic Habitats – Sedimentary:
    - The two sedimentary benthic status indicators (IQI and BH3) do not fully capture the state of these habitats.
    - There is no clear rationale for the threshold used for the sedimentary benthic habitat indicators.
- D1 & D4 Birds:
    - The Marine Strategy should take into account important seabird species which visit during their non-breeding season.
    - The criterion regarding lack of breeding success in marine birds may not be stringent enough for long-lived and slow-breeding species. The term 'widespread' may not capture geographical differences in indicator value.
    - The levels of declines deemed acceptable by the proposed indicator seem far too high. Moreover, they would fail to capture declines in common species that would be of conservation concern.
    - Birds should be included in Table 3 (page 35).
- Missing indicators:
    - Dissolved oxygen should be a key physical-chemical feature.
    - Climate change should be addressed.
    - The impact of anthropogenic light should be addressed.
- Additional comments – Marine Protected Areas (MPAs):
    - MPAs need management measures in place in order to succeed.
    - Reducing offshore fishing to create further MPAs will help protect marine habitats.

1) Does the UK Marine Strategy Part One provide an accurate reflection of the state of UK marine waters and the economic and social uses of those waters?

Good Environmental Status as a measure

Good Environmental Status (GES) is a good conceptual framework for managing marine waters[1]. However, in practice, the operational targets for GES, particularly for species and habitats of conservation concern, are poorly qualified.

Annex 1 indicates how GES will be applied in the future. It suggests that GES will be met by preventing decline, rather than stimulating improvement of species/habitats/other aspects. For example, for cetaceans:

- "There should be no significant decrease in abundance caused by human activities"

[1] WISE Marine. Achieving Good Environmental Status. Available at: https://water.europa.eu/marine/policy/achieving-good-environmental-status

- "The UK target for population range is met if, for each species, there is no statistically significant contraction in their distribution caused by human activities"

For birds:

- "The population size of species has not declined substantially since 1992 as a result of human activities".
- "There is no significant change or reduction in population distribution caused by human activities".

To assess whether there has been a decline, the current indicator value is compared to a value in the past (in the Marine Strategy's case, 2012). Although there are additional quantifications to some of these claims, it assumes our marine environment was already in a good state in 2012.

Interpreting what has happened to each taxon or habitat of concern from table 1 will be very difficult, as an upwards arrow means GES has been achieved, but in practice could mean the group (or majority of species in the group) has remained stable in terms of population size.The table uses arrows to suggest whether there have been improvements for some species/habitats/other aspects, measured by "progress towards achieving Good Environmental Status (GES)". Upward arrows mean 'GES achieved' and horizontal arrows meaning 'GES partially achieved'. Given GES for a species group can mean 'no change' in a population, could a horizontal arrow mean that some species have shown no change, and some have shown a large decline? Could an upwards arrow mean that the majority of species considered showed no change, but a few showed a decline? The complexity of assessing against the GES target makes this very difficult to properly interpret. More details of how GES can be interpreted, specifically for marine protected areas, can be found in Stafford et al. (2015)[2].

*D1 & D6 Benthic Habitats – **Sedimentary***

The Marine Strategy uses two different indicators to assess **sedimentary** benthic status. The Infaunal Quality Index (IQI)[3], developed for the Water Framework Directive, measures subtidal sedimentary habitats, whilst BH3, developed by OSPAR[4], measures the extent of physical damage to predominant and special habitats (e.g. trawl impacts). However, there appears to be little validation of either indicator in the published literature. In the few studies for which IQI and closely related indicators have been used, they were found to be poor indicators of eutrophication and other disturbances[5,6]. The other indicator, OSPAR BH3[2], was reviewed for the EU Directorate-General for Environment by the International Council for the Exploration of the Seas (ICES) and received severe criticism[7]. OSPAR BH3 uses

[2] Stafford, et al. (2015). Simple, policy friendly, ecological interaction models from uncertain data and expert opinion. *Ocean and Coastal Management*, 118.
[3] Phillips, et al. (2014). Infaunal quality index: Water Framework Directive classification scheme for marine benthic invertebrates. Environment Agency Report SC080016.
[4] OSPAR Commission. Biodiversity common indicators. Available at: https://www.ospar.org/work-areas/bdc/biodiversity-monitoring-assessment-1/biodiversity-common-indicators
[5] Borja, et al. (2011). Response of single benthic metrics and multi-metric methods to anthropogenic pressure gradients, in five distinct European coastal and transitional ecosystems. *Marine Pollution Bulletin*, 62.
[6] Gislason, et al. (2017). Lost in translation? Multi-metric macrobenthos indicators and bottom trawling. *Ecological Indicators*, 82.
[7] ICES (2016). EU request for guidance on how pressure maps of fishing intensity contribute to an assessment of the state of seabed habitats. ICES Special Request Advice, ICES, Copenhagen.

several categorisations in the process of scoring GES, but the ICES review group unanimously preferred quantitative approaches over categorical approaches. Categorisation approaches were “not easy to update transparently, cannot be used to assess consistently across different pressures (and therefore is difficult to use for cumulative assessment), and cannot provide consistent information on uncertainty”. On the other hand, a quantitative approach “will be more reliable and transparent and will allow for the development of objectively measurable, reliable, and meaningful indicators of the state of seabed habitats”[8].

Due to the short-comings of these indicators, we cannot be confident they accurately depict the state of UK **sedimentary** benthic habitats. However, given that most targets were not evaluated because of lack of data, there needs to be a significant improvement in monitoring, so that any future suite of indicators can fulfil their potential.

D1 & D4 Birds

The Marine Strategy seems to only focus on non-breeding waterbirds and breeding seabirds and these are used as indicators to assess the current environmental status in 2018 (page 53). However, UK waters are also important to many seabirds which breed elsewhere but winter near our shores. For instance, the Balearic shearwater, *Puffinus mauretanicus*, Europe’s only critically endangered seabird, breeds on the Balearic Islands in the Mediterranean Sea but several hundred (a substantial proportion of their remaining population) spend time in the English Channel and the Celtic Sea outside of the breeding season[9,10]. Therefore, our waters may be a key feeding ground for the species. As such, we would recommend that the Marine Strategy should also take into account important seabird species which visit during their non-breeding season.

2) To what extent are the proposed new criteria and associated targets sufficient to guide progress towards achievement of GES?

*D1 & D6 Benthic Habitats - **Sedimentary***

The threshold values and reference levels are difficult to interpret for **sedimentary** benthic habitat indicators (page 90). What is the baseline value? How is 100% defined? It is difficult to find the rationale for the threshold chosen, and how this relates to the structure and functioning of seabed ecosystems.

[8] ICES (2016). Executive summary. The Workshop on guidance on how pressure maps of fishing intensity contribute to an assessment of the state of seabed habitats (WKFBI). 31 May–1 June 2016, ICES, Copenhagen.
[9] Yésou (2003). Recent changes in the summer distribution of the Balearic shearwater Puffinus mauretanicus off western France. *Scientia Marina*, 67.
[10] Wynn & Yésou (2007). The changing status of Balearic Shearwater in northwest European waters. *British Birds*, 100.

*D1 & D4 Birds (**Population demographic characteristics:** Widespread lack of breeding success in marine birds caused by human activities should occur in no more than three years in six.)*

While this criterion is based on OSPAR guidelines, there are some limitations acknowledged by OSPAR[11]. OSPAR state*:*

"The assessment methods for the marine bird breeding success / failure indicator currently focus on the extreme events of almost no chicks being produced by a colony, on average, per year. In doing so, they fail to identify other years where poor breeding success could still have significant negative impacts on the population in the longer term."

It is important to remember that many seabirds are long-lived and slow breeding species, and they will only raise a single chick (at best) per year. In most species, first year survival is very low, and most fledglings don't make it through their first winter. For example, the likelihood of survival to adulthood of a Manx shearwater fledging is ~25%[12] (a key species of UK breeding seabird, with > 80% of the world population breeding in the UK). As such, a pair of Manx shearwaters breeding successfully 3 years out of 6, and failing the other 3 due to human activity (considered acceptable within the GES framework), would need to breed for 16 years to produce two chicks surviving to adulthood and therefore replacing themselves (i.e. keeping a stable population level). On average, Manx shearwaters may only breed for 15-20 years, and so in this scenario, a pair of Manx shearwaters would only have a good chance of producing two surviving chicks if they experienced no breeding failure other than that caused by human activity 3 years out of 6, which is unlikely. This example is applicable to many other species. As such, the criterion may not be stringent enough.

Additionally, the word "widespread" may be problematic. Indeed, there are large differences between the productivity of UK colonies. For example, if we look at kittiwake breeding success, which is one of the indicators to be used to assess the status, their breeding success (and that of other seabird species dependent on the same food source, sandeels), has been much lower in Orkney and Shetland than further south[13]. Therefore, if we take the "UK Greater North Sea" region, these appear as outliers and may well be ignored, even though these are key UK seabird breeding colonies. The use of "widespread" may therefore cause issue or confusion in the future.

Finally, the Marine Strategy itself mentions (page 53) that "the indicators used were unable to distinguish human impacts from the effect of prevailing environmental conditions". This therefore makes this criterion less than useful, as unless we become able to distinguish causes of breeding failure in seabirds, it will be difficult, if not impossible (except in particular cases where failure is due, for example, to mortality due to oil spills), to measure whether the target was met or not. We would, therefore, suggest the addition of 'pressure' indicators, thereby enabling an understanding of what is causing changes in 'state' indicators, such as breeding success.

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[11] OSPAR Commission. Marine Bird Breeding Success / Failure. Available at: https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/biodiversity-status/marine-birds/marine-bird-breeding-success-failure/

[12] Perrins et al. (1973). Survival of Manx shearwaters *Puffinus puffinus*. *Ibis*, 115.

[13] JNCC (2016). Seabird Population Trends and Causes of Change: 1986-2015 Report. Available at: http://jncc.defra.gov.uk/page-3201.

3) To what extent are the proposed operational targets sufficient to achieve GES?

*D1 & D4 Fish (**Large Fish Indicator**, LFI)*

Recent work in the North Sea highlighted that climate change interacts with and affects the size structure of wild fish populations[14]. Policy targets linked to size-base metrics such as the LFI thus need to consider these effects. Queiros et al (2018) specifically showed that the LFI will continue to decrease in the North Sea due to climate change through the 21st century, especially in UK waters. Ignoring this effect would mean that overly ambitious GES targets may be set for fish size in the North Sea that are actually not achievable, despite adequate management of fishing pressure. Although the initial 2012 assessment was largely based on fish size (length), it is unclear from the Marine Strategy what the operational targets for fish are at present, or what indicators will be used in the assessment. Regarding fish length, the above cited study and similar work, could help inform what could be appropriate target setting for fish communities, within the Marine Strategy. Please see below the projected LFI values for the North-Sea (OSPAR) assessment sub-regions, across various greenhouse gas emissions scenarios:

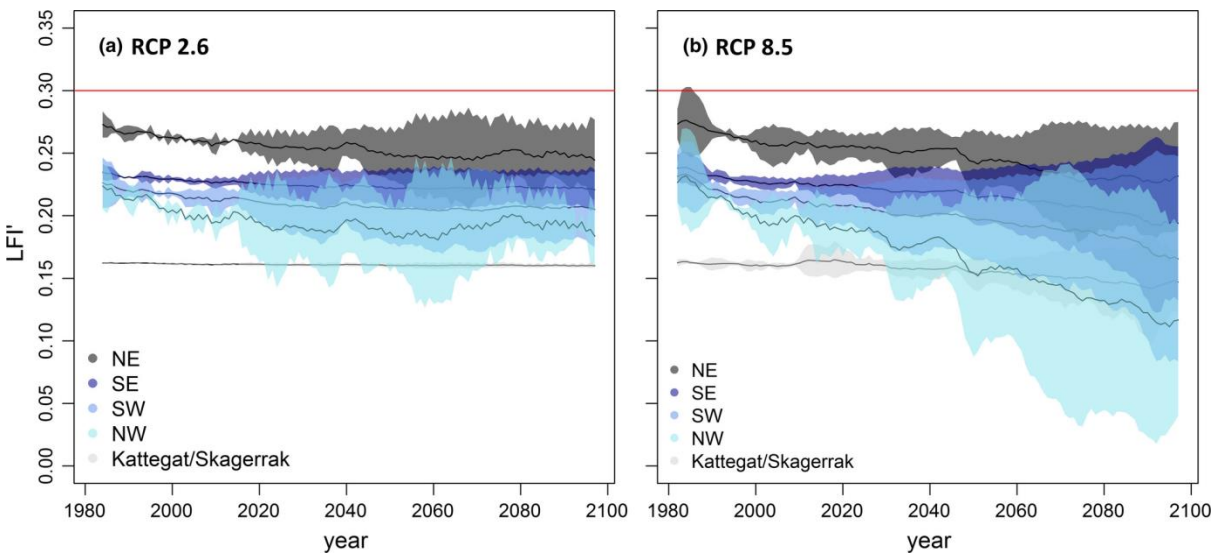

Figure 1. Early LFI'7 estimates per assessment subregion, averaged across all models (mean ± SD, 5-year rolling average) for AR5 RCP 2.6 (a, NEMO-MEDUSA and ESM2 Mb) and AR5 RCP 8.5 (b, all three models). Red line is the previously recommended LFI target (Greenstreet et al., 2010). "KS": Kattegat and Skagerrak. "NE": North-eastern North Sea. "NW": North-western North Sea. "SE": South-eastern North Sea. "SW": South-western North Sea. *In* Queiros et al. (2018).

D1 & D4 Birds

Population size (Annex 1, page 86)

Marine bird abundance (OSPAR indicator) – the threshold value is that "*for each functional group of species, the population size of at least 75 percent of the species is above the threshold values*".

[14] Queiros, et al. (2018). Climate change alters fish community size-structure, requiring adaptive policy targets. *Fish and Fisheries*, 19.

With the proposed indicator, which indicates a threshold of 0.7 of relative abundance for species which lay more than one egg, a scenario where 75% of the species laying more than one egg decline by 29% compared to baseline levels in several years, and a larger decline, e.g. 50%, in the remaining 25% of the species, would still achieve GES, despite indicating extremely worrying trends. This also applies to species which lay one egg, with 19% decline in 75% of the species, and greater declines for the others, achieving GES.

Converting percentages to numbers, consider the Charting Progress 2 report by Defra on the state of UK seas[15]. They report a 9% decline in the total number of seabirds breeding in the UK since the 1990s – this equates to a decline of 630,000 individuals, with acute falls in breeding success seen for black-legged kittiwakes and other species such as northern fulmar. The declines have continued since[16].

The small number of individuals in a rare species makes them vulnerable to declines in abundance[17]. A 9% decline, for example, in a rare species increases its vulnerability to extinction far more than that of common species, which have larger numbers of individuals and are therefore more resilient. The indicator does not account for the difference in proportion of decline for rare versus common species. Common species are the drivers of ecosystem service delivery and are sufficient for maintaining most ecological processes[18]. A decline of the same percentage in common species as in rare species would therefore see a greater detrimental impact on ecosystems[19].

As such, the levels of declines deemed acceptable by the proposed indicator seem far too high, and therefore the GES indicator currently proposed does not seem sufficient.

Pressures and associated activities in UK seas (Table 3, starting page 35)

This table does not mention birds under the first column: *descriptor or ecosystem component*, despite the known potential impact of fisheries on seabirds[20]. Birds should be included in the table. Some species of seabirds are particularly sensitive to by-catch in fishing gear. Balearic shearwaters, mentioned above, are sensitive to this, but many other UK breeding seabirds too[15].

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[15] Bradbury, et al. (2017). Risk assessment of seabird bycatch in UK waters. WWT Report MB0126. Available at: http://sciencesearch.defra.gov.uk/Default.aspx?Menu=Menu&Module=More&Location=None&Completed=0&ProjectID=18967

[16] JNCC (2016). Seabird Population Trends and Causes of Change: 1986-2015 Report. Available at: http://jncc.defra.gov.uk/page-3201.

[17] Gaston (2008). Biodiversity and extinction: the importance of being common. *Progress in Physical Geography*, 32.

[18] Winfree, et al. (2015). Abundance of common species, not species richness, drives delivery of a real-world ecosystem service. *Ecology Letters*, 18.

[19] Lyons, et al. (2005). Rare Species and Ecosystem Functioning. *Conservation Biology*, 19.

[20] Croxall et al (2012). Seabird conservation status, threats and priority actions: a global assessment. *Bird Conservation International*, 22(1).

4) Where gaps have been identified do you have suggestions on how these could be filled?

D1 & D6 Benthic Habitats

Regarding sedimentary benthic habitats we would recommend using more robust methods for assessing the seabed status that are less dependent on in-situ sampling (see the methods developed by ICES[21] for an example of how it could be done).

2.7 Status of physical and chemical features & D5 Eutrophication

The list of features considered includes one fundamental gap: changes in dissolved oxygen[22]. Changes in dissolved oxygen affect biological and biogeochemical processes in the ocean, including limited ocean productivity, changes in species distributions and biodiversity, and biogeochemical cycles. This is also strongly influenced by climate change, and affects primarily seabed habitats and species, both in the coastal and the deep ocean. Oxygen-minimum zones in the open ocean have expanded by several million square kilometres in the last 50 years. For instance, the 5th assessment of the IPCC[23] (soon to be updated) stated that "High agreement among analyses provides medium confidence that oxygen concentrations have decreased in the open ocean thermocline… The general decline is consistent with the expectation that warming-induced stratification leads to a decrease in the supply of oxygen to the thermocline from near surface waters, that warmer waters can hold less oxygen, and that changes in wind-driven circulation affect oxygen concentrations". Dissolved oxygen is strongly affected by nutrient loading of coastal areas, especially in estuaries where productivity is an essential driver of the UK-based marine economy. The importance of changes in dissolved oxygen for marine life and cycles have been highlighted in high level globally focused publications[21]. There are several hypoxic areas in UK waters that affect its species and habitats, deoxygenation is likely to be a key issue in an increasingly stratified future North Sea. It thus seems like a fundamental gap that dissolved oxygen is not considered as a key physical-chemical feature considered in the Marine Strategy in its own right, and not just in association with D5 (Eutrophication). There is sufficient expertise in the UK, as well as available data, to take this consideration more widely across the assessment.

Climate Change

We would like to draw attention to the removal of climate change from the evaluation. While we appreciate that climate change is a wider environmental concern, climate change is one of the biggest drivers of ecosystem change in UK waters, alongside fishing, and exceeding that of plastic waste[24].

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[21] ICES (2019). Interim Report of the Working Group on Fisheries Benthic Impact and Trade-offs (WGFBIT). 12–16 November 2018, ICES, Copenhagen.
[22] Breitburg, et al. (2018). Declining oxygen in the global ocean and coastal waters. *Science*, 359.
[23] IPCC (2014). Climate Change 2014 Synthesis Report. Available at: https://www.ipcc.ch/report/ar5/syr/
[24] Stafford & Jones (2019). Viewpoint - Ocean Plastic Pollution: a convenient but distracting truth. *Marine Policy*, 103.

Marine Litter

The Marine Strategy does not adequately address the general problem of Marine Litter. We question the statement on page 8 that meaningful "[a]dditional measures have also been put in place ... to tackle the scourge of marine litter". There are very few actions (such as encouragement for large food chains to ban plastic straws) which have actually taken place[23]. Bycatch and plastic ingestion are mentioned in the table on page 53 where it says that they do not threaten marine bird populations. Yet the ingestion of marine litter (plastic) may have an effect on UK seabirds. It has been shown to have highly detrimental effects in non-UK species such as albatrosses and shearwaters[25]. We believe research in UK seabirds is underway, but based on results elsewhere, it is likely that there will be effects on some species.

Anthropogenic light

The Marine Strategy does not address the impact of anthropogenic light on marine organisms (circadian rhythms and reproduction) and the marine environment. Night-time lighting, for example, has been shown to alter the composition of temperate epifaunal marine invertebrate communities[26]. UKRI have funded a project looking at the ecological impacts of artificial light on the natural light cycles of coastal habitats.

Accountability and data sharing

The Marine Strategy is unclear on where its sources of information are from. The Government should demonstrate that the Marine Strategy is based on scientific evidence, even if the sources are not publicly available,

Additional Comments

Management of Marine Protected Areas (MPAs)

We welcome the new designations of Marine Protected Areas (MPAs) in UK waters in recent years (from 217 sites covering 8% of UK waters in 2012 to 314 designated MPAs protecting 24% of UK waters in 2019). However, there are very few MPAs with meaningful management measures put in place to prevent damaging activities. The incorporation of management to achieve protection for stated features is urgently needed.

Creating new MPAs in offshore fishing areas

Fishing which is deemed sustainable will still result in ecological changes to marine systems, and potentially contribute to climate change emissions[27]. Fishing activities should be concentrated on inshore fisheries (those currently 12 nautical miles from the coast) and smaller boats which use fewer damaging gears[26]. The restriction of offshore fishing could

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[25] Lavers, et al. (2014). Plastic ingestion by Flesh-footed Shearwaters (*Puffinus carneipes*): Implications for fledgling body condition and the accumulation of plastic-derived chemicals. *Environmental Pollution*, 187.
[26] Davies, et al. (2015). Night-time lighting alters the composition of epifaunal marine communities. *Biology Letters*, 11.
[27] Stafford (2019). Sustainability: a flawed concept for fisheries management? *Elementa: Science of the Anthropocene*, 7.

create large no-take MPAs to replenish the currently depleted stocks[28]. Both the use of less damaging gears and the presence of well enforced coastal MPAs can prevent delicate coastal habitats (e.g. seagrass, kelp forests) from being damaged. The increase in available fish to inshore fishers (the bulk of the industry by number, but a tiny percentage of overall quota allowance), and these landings into coastal communities would revive fisher livelihoods and help regenerate coastal towns.

[28] White & Costello (2014). Close the high seas to fishing? *PLoS Biology*, 12.