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Environmental Scenario Planning: what if marine conservation hotspots in NE Atlantic increase under climate change?

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Marine biodiversity conservation in the north-east Atlantic needs a combination of more adaptable management strategies and international co-operation, a new study says. This is required to deal with a potential increase in marine conservation hotspots under climate change.

Priority marine habitats (PMHs) are used to prioritise marine biodiversity conservation and protection under the 1992 OSPAR Convention in the north-east Atlantic Ocean. They are as defined areas of 'threatened and/or declining species and habitats' such as mussel beds and coral gardens, which provide habitats for other species.

However, as environmental conditions change under climate change, species distributions and habitats can shift by tens, or even hundreds, of kilometres. This has implications for biodiversity conservation, since what works now may not work in the future, as habitable environments and marine populations shift location. Understanding the distribution of marine species and habitats is essential for setting conservation priorities and protecting biodiversity.

The researchers created a 'what-if' scenario to examine how potentially suitable areas for ten different types of PMH in the north-east Atlantic may develop under a 'worst case' climate change scenario by 2100, and what this might mean for national and international marine conservation policy.

A computer model simulated how changes in ocean temperature, would affect the distribution of the 'most suitable habitats' for PMHs (where a PMH is mostly likely to occur or develop). They considered changes under a 'baseline' scenario, based on 2009 conditions, and a future 'worst case' climate change scenario (based on the IPCC scenario A1B), which assumed a 4°C increase in ocean surface temperatures by 2100.

The researchers used the simulations to assess how the PMHs would change between 2009 and 2100 in terms of area, location and percentage within each OSPAR country's Exclusive Economic Zone (EEZ).

The model's results estimated that, while there are some losses in suitable area, the number of conservation management hotspots (which the authors describe as areas of sea with one or more PMH) will generally increase by 2100. The largest 'hotspot' gains between 2009 and 2100 were found in the EEZs of Belgium, France, Germany and the Netherlands. Hotspots in Norway, Sweden and the UK will remain relatively unchanged, suggest the model results.

For example, 36% of Belgium's coastal waters are currently designated as Marine Protected Areas (MPAs) – which restrict human activities for the purposes of sustainability and conservation. However, this study's results indicate that Belgium's coastal waters may play an even greater role in marine conservation towards 2100 as PMHs move through them. This may mean that even more areas need to be designated as MPAs.

Between 2009 and 2100 the total area of 'most suitable habitats' in which PMHs could survive or develop was projected to more than double from 34 148 km^2 (19% of the OSPAR MPA network) 70 192 km^2 (39% of the existing MPA network).

Alongside this change in area, it is inevitable that biodiversity hotspots will cross EEZ boundaries between countries. As such, protecting marine biodiversity will need co-operation between neighbouring countries and marine regions in order to provide a robust adaptive management strategy.

The study's authors say that their scenario's results highlight the need to develop adaptable management strategies for the marine environment that move beyond a primary focus on maintaining the *status quo* and towards planning and management for a changing climate.

Source: Gormley, K. S. G., Hull, A. D., Porter, J. S. *et al*. (2015). Adaptive management, international co-operation and planning for marine conservation hotspots in a changing climate. *Marine Policy* 53, 54–66. DOI:10.1016/j.marpol.2014.11.017. This study is free to view at: www.sciencedirect.com/science/article/pii/S0308597X14003182

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