



# Fishing effort displacement and the consequences of implementing Marine Protected Area management – An English perspective



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## ABSTRACT

The creation of Marine Protected Areas (MPAs) and MPA networks is increasing globally. This trend is reflected in England's waters, where 34.7% of waters are protected. MPA network creation can displace activities (primarily fisheries) that are thought to be incompatible with the habitats and species of conservation importance that the network has been established to protect. There is also an obligation on the UK Government to ensure that all of its waters achieve Good Environmental Status (GES) by 2020 under the Marine Strategy Framework Directive. The designation of MPAs and the subsequent introduction of management measures that displace activities may result in unintended impacts/consequences on protected benthic habitats or species within (a) the MPA where management measures have been introduced, (b) other MPAs or (c) wider UK or international waters. An incomplete understanding of the extent and type of fishing that is occurring within the MPA network (and throughout English waters in general), coupled with a paucity of information regarding how fishing effort is displaced as a result of MPA designation, may hinder the achievement of both GES by 2020 and MPA management goals. Better understanding of fishing effort displacement can inform the siting of future MPAs, aid marine spatial planning and improve existing MPA management. To aid the better description and understanding of the various facets of fisheries effort displacement, this paper proposes for the first time a structure to differentiate the types of fisheries displacement. Measures to mitigate the consequences of displaced fishing effort are also identified.

## 1. Introduction

### 1.1. The MPA network in England – moving from designation to management

The concept of Marine Protected Areas (MPAs) has gained prominence in the dialogue on marine conservation and fishery management since the early 1990s. Agenda 21, which urged coastal states to maintain biological diversity and productivity of marine species and habitats under national jurisdiction, was adopted at the 1992 UN Conference on Environment and Development (UNCED). This international instrument and others, including the Convention on Biological Diversity (CBD) [1] and the World Summit on Sustainable Development (WSSD) [2] in Johannesburg, 2002, encouraged the designation of protected areas. As a signatory to the CBD and the Oslo and Paris Convention (OSPAR) [3], which requires contracting parties to establish an ecologically coherent and well-managed network of MPAs across the North-east Atlantic by 2016, the UK is obligated to achieving this.

The establishment of a comprehensive, effective and coherent MPA

network within England inshore and offshore waters<sup>1</sup> [4,5] is well underway with 132 sites (Table 1) [6] being designated representing 34.7% and 79,682.6 km<sup>2</sup> of these waters. In England, the MPA network comprises Natura 2000 sites (consisting of Special Areas of Protection (SPAs) and Special Areas of Conservation (SACs)) as well as Marine Conservation Zones (MCZs) and Sites of Special Scientific Interest (SSSIs) – although this designation type makes a limited contribution to protecting intertidal habitats. Additional MCZs (called Tranche 3 sites) are currently being considered as are boundary extensions to existing SAC and SPAs.

One of the activities with the greatest potential to damage features designated for protection is fishing. As such, management of fishing activities may be required. The development of management measures for MPAs is now underway.

### 1.2. Fisheries management in England and the provision of conservation advice

The regulation of marine fisheries in England is ultimately the

<sup>1</sup> Inshore waters are 0–12 nm from baselines as set out in The Territorial Sea (Baselines) Order 2014. Offshore waters are 12–200 nm and extend out to the limits set out in The Exclusive Economic Zone Order 2013.

**Table 1**The extent of Marine Protected Area coverage in England inshore and offshore waters as of May 2017 (JNCC 2017).<sup>2</sup>

|                                      | Total area<br>(km <sup>2</sup> ) | Total Marine Protected Areas* |                      |      | Special Areas of Conservation with<br>marine components |                      |      | Special Protected Areas with<br>marine components |                      |      | Marine Conservation Zones<br>Tranche 1 & 2 ** |                      |     |
|--------------------------------------|----------------------------------|-------------------------------|----------------------|------|---|----------------------|------|---|----------------------|------|---|----------------------|-----|
|                                      |                                  | No.                           | Area km <sup>2</sup> | %    | No.   | Area km <sup>2</sup> | %    | No.   | Area km <sup>2</sup> | %    | No.   | Area km <sup>2</sup> | %   |
| English inshore +<br>offshore waters | 229,779.2                        | 132                           | 79,682.6             | 34.7 | 39  | 57,853.2             | 25.2 | 43  | 8233.1               | 3.6  | 50  | 20,424.2             | 8.9 |
| English inshore<br>waters            | 51,716.0                         | 117                           | 20,727.2             | 40.1 | 34  | 14,863.1             | 28.7 | 43  | 7864.4               | 15.2 | 40  | 3982.9               | 7.7 |
| English offshore<br>waters           | 178,063.2                        | 24                            | 58,955.4             | 33.1 | 9   | 42,990.1             | 24.1 | 1   | 368.7                | 0.2  | 14  | 16,441.3             | 9.2 |

responsibility of the Government's Department for Environment, Food & Rural Affairs (Defra), which superseded the Ministry of Agriculture Fisheries & Food (MAFF) in 2002. Defra delegates regulatory responsibilities to the Marine Management Organisation (MMO), which licences commercial fishing boats, and ten Inshore Fishery and Conservation Authorities (IFCAs) who regulate the waters within their districts (0–6 nm) through local byelaws and other management measures [7]. The Marine and Coastal Access Act (MACAA) not only established the IFCAs and the MMO but provided the mechanism with which to designate MCZs and to develop marine plans throughout English waters [8].

Conservation advice is provided to the fishery regulators in England by two Statutory Nature Conservation Bodies (SNCBs). The first, Natural England, acts as the Government's advisor for inshore waters (and in English waters out to 200 nm for offshore renewable energy). The second, the Joint Nature Conservation Committee (the umbrella body through which the four national SNCBs deliver their statutory responsibilities for the UK as a whole), provides advice from 12 to 200 nm.

### 1.3. Fisheries structure and distribution of fishing effort in England

In England in 2015 the fishing industry had 3139 registered fishing vessels, of which 2598 were less than 10 m in length. Although not all active, the number of smaller vessels in the English fishing fleet is indicative of the scale and relative importance as a component of commercial fishing in England. The landings of all species of fish and shellfish into England by UK registered fishing vessels in 2015 were 101,000 t with a value of £161.3 million [9].

Information on the location of inshore fishing activity in England is limited (as there is no statutory satellite monitoring of smaller vessels (limited to vessels > 15 m length before 2012, > 12 m thereafter) although significant efforts have been made to fill this gap in knowledge [10–12]. The activities of fishing vessels > 12 m that have Vessel Monitoring Systems (VMS) have to be inferred from positional and course and speed data. There is no requirement to have fishing gear deployment sensors integrated to the VMS.

### 1.4. The blue belt v blue growth

There is a commitment at both a European and a national level to drive economic growth in the marine environment; this is termed “blue growth” [13]. The UK government is also committed to developing a “blue belt” [14] in England, which in essence equates to development of an ecologically coherent MPA network. Therefore the challenge is to balance economic growth against a backdrop of increasing environmental protection. While the two aims are not mutually exclusive, achieving sustainable development of England's coastal waters will be challenging due to the many competing demands for marine space.

The current impact assessments conducted during MCZ designation (required under the MACAA) do consider some socio-economic aspects

of displacement but they do not provide for a fuller ecological assessment of the impact that introducing an MCZ will have if fishing effort is merely displaced, and issues arising from that displacement remain unaddressed. Clearly there is a need to take a more holistic approach to assessing and mitigating fishing effort displacement.

### 1.5. Why fishers fish in the way they do

Most economic models of fisher behaviour – both theoretical and empirical – are based on the general premise that the key objective of the individual fisher is to maximise their individual profits from fishing. Profit-maximising behaviour does not necessarily mean that fishers obtain the highest level of profits possible. Instead, they respond in a way that would potentially increase their individual profitability. For example, fishers will switch gear if the benefits from the use of an alternative gear exceed the benefits of the current gear and the costs of switching gear (by way of example, such switches in gear could grant them access to areas from which they are currently excluded or they could be allocated additional quota). Similarly, fishers will not go to sea if the expected revenue from the catch does not cover the fuel and other running costs associated with the trip (as doing so would reduce their profit [15]). Fishers may, however, engage in marginal or unprofitable activities for the purpose of developing or maintaining a track record of fishing a particular species or area.

A number of alternative hypotheses have been proposed to explain fisher behaviour. In particular, personal habit has been thought to be characteristic of fisher behaviour [16,17]. That is, fishers are assumed to prefer to fish in the same areas with the same gear year after year. Similarly, Shepherd and Garrod [18] and Placenti et al. [19] assumed “inertia” existed in the fishery, with major improvements being necessary to encourage fishers to change their behaviour. In some studies, this “habit” or “inertia” has been linked to risk aversion [20]. That is, fishers are assumed to prefer to go where they know the likely outcome rather than try somewhere new, where the outcome is generally unknown. However, while habit, inertia and risk aversion may influence fisher behaviour in the absence of any changes in their regulatory, economic or natural environment, any disruption to this environment is likely to result in a response based on the economic incentives that

<sup>2</sup> The total MPA values\* do not include the contribution of Sites of Special Scientific Interest. These statistics should not be used as a direct indication of seabed protection as they include mobile species MPAs (such as harbour porpoise SACs) which direct protection at species in the water column and not at the seabed. Note however that the Conservation Objectives for the harbour porpoise SACs include reference to the protection of habitats on which the animals are dependent. All of these statistics are based on the site boundaries of MPAs and therefore assume that all of the area within an MPA is protected. In practice, protection may only be given to individual features or management zones within the site and not the entire extent of the site. These statistics therefore overestimate the true areal extent of MPA protection. MPAs can overlap each other, especially between designation types but also within designation types in exceptional cases. The ‘Total MPAs’ columns account for all of these overlaps. \*\* The eleven Isles of Sicily MCZs are treated as one site.

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