

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 waters¹ [4,5] is well underway with 132 sites (Table 1) [6] being designated representing 34.7% and 79,682.6 km² 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

¹ 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 1The extent of Marine Protected Area coverage in England inshore and offshore waters as of May 2017 (JNCC 2017).²

	Total area (km ²)	Total Marine Protected Areas*			Special Areas of Conservation with marine components			Special Protected Areas with marine components			Marine Conservation Zones Tranche 1 & 2 **		
		No.	Area km ²	%	No.	Area km ²	%	No.	Area km ²	%	No.	Area km ²	%
English inshore + 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 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 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

² 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.

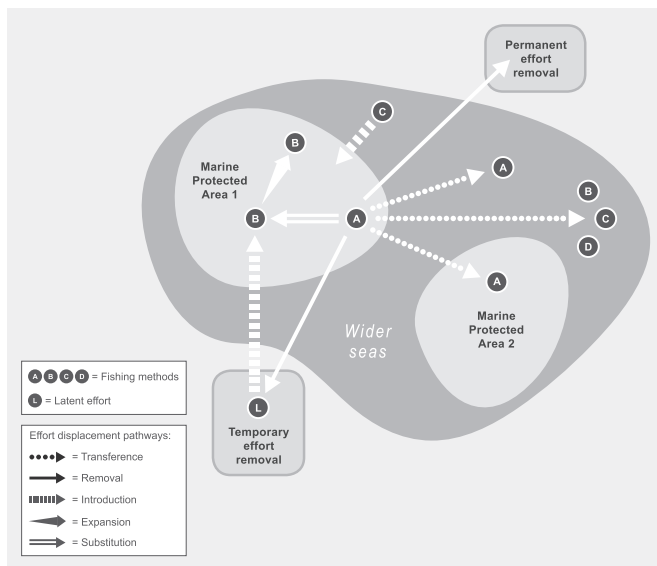


Fig. 1. Potential effort displacement pathways resulting from management measures that dictate that fishing type A is incompatible with the species and habitats protected within Marine Protected Area 1.

exist.

Fishers may be assumed to be making choices that mean they are already fishing in the most efficient manner and location for their individual circumstance. Fishers may be pushed into improving gear selectivity or directed towards alternative fishing grounds (to avoid choke species³) to ensure that they are able to comply with the Landings Obligation (LO) (more commonly referred to as a discards ban) introduced on 1 January 2015 and 2016 (for pelagic and demersal species respectively) under the reformed Common Fisheries Policy (CFP)[21]. Altering the fishing opportunities available to the fishers will inevitably cause conflict and introduce economic inefficiencies. Whilst this may be considered a bleak view, this is predicated on the fact that (a) fishing opportunities are a limited commodity, and (b) there is already significant latent capacity across many sectors in the fleet [22]. Development of alternative options for fishers to progress, such as aquaculture operations as advocated through blue growth [13], may lead to further displacement by excluding fishers from areas identified for aquaculture infrastructure/operations, leading to the subsequent concentration of existing fishing operations and impacts.

This paper aims to provide the reader with an understanding of the various facets of fishing effort displacement in the context of a rapidly expanding MPA network in England. It sets out the regulatory bodies that are responsible for assessing fisheries displacement in England and the legislative requirements for displacement to be assessed. This paper uses an existing definition of fishing displacement and expands on this to provide a framework that can be used to better describe fishing effort displacement. The paper then sets out the potential environmental implications of this displacement before suggesting management solutions.

2. Fisheries displacement

2.1. What is fishing displacement?

McLeod [23] defined displacement as: “the changes in fishing behaviour and patterns that could occur in response to new management

measures”. Changes in fishing behaviour could be “the adoption of a new fishing method, or target species, or stopping fishing”, whereas changes in fishing pattern could be “moving to other fishing grounds near or far”.

2.2. Fisheries management in England and the consideration of fisheries effort displacement

In England, all competent authorities must undertake a formal assessment (Habitat Regulations Assessment - HRA) of the implications of any new plans or projects which are capable of affecting the designated interest features of Natura 2000 sites before deciding whether to undertake, permit or authorise such a plan or project. The requirement for HRAs to be conducted is set out in The Conservation of Habitats and Species Regulations 2010 [24], which transposes into English Law the EU Habitats and Birds Directives [25,26]. Historically, the position in England has been that many commercial fisheries occurring within SACs/SPAs have not been routinely subject to HRA. Recently, Defra announced a change in its approach to the management of fisheries activities within Natura 2000 sites [27], and fisheries are now generally interpreted as a plan or project. Under this approach, action was taken (and is ongoing) to manage fishing activities within Natura 2000 sites where there was evidence (that may be inferred from other studies from which there may be good evidence of a likely effect) that these activities were incompatible with achieving the Conservation Objectives for the protected area (for a detailed description of the process, see: Clark 2017 [7]). The outcome of this project will be a step change in the management of fisheries and their impacts on protected species and habitats. For many sites, fisheries management measures have already been, or are expected to be, introduced that will restrict the temporal and spatial exploitation of fisheries.

2.3. Fisheries displacement and the European dimension

At present, Defra, on behalf of the UK Government, in its submission of *Joint Recommendations*,⁴ recognises that effort may be displaced and there may be associated impacts. This submission is based on guidance developed by the European Commission [28]. Displacement is one of eleven topics *Joint Recommendations* are expected to address, although limited evidence has enabled only very rudimentary consideration of displacement effects.

The definition developed by McLeod [23] provides a good starting point for displacement discussions and a model to build upon; however, the interpretation of fisheries displacement deserves further consideration to start to fill the existing guidance void for managers.

2.4. Elements of fishing effort displacement

Fig. 1 illustrates various potential pathways for fishing effort displacement from a spatial perspective; the coexistence of fishing and protected species in the same area at the same time should also be considered. Fishing effort can be altered in several ways in response to MPA management.

- 1) Fishing pressure is **removed** from the system entirely either permanently (e.g. removal of licence/permit/authorisation completely from the vessel) or temporarily (with the vessel being laid up and the associated licence becoming dormant, i.e. becoming latent effort).
- 2) There is the **substitution** of effort by the existing fishing fleet. In other words, a change in fishing practice within the site, e.g. fishers change their gear type – i.e. from mobile to static gear – but still

³ Fish species for which quotas are so limited relative to local or general abundance that the imposition of a landing obligation in a mixed fishery is liable to result in fishing vessels having to cease operations well before they have caught their main quota allocations.

⁴ A Joint Recommendation is a scientific and technical information package that is required by the European Commission when Member States request fisheries management measures to be introduced under the CFP (Regulation No 1380/2013 - Article 11).

fishing broadly the same grounds.

- 3) **Expansion** of other fishing effort already occurring *within* a site that fills the area vacated by the fishing activity that was incompatible with the protected features. There is **transference** and potential **intensification** of fishing effort where the original fishing pressure exerted within a site is relocated outside of the site (due to an unwillingness or inability of fishers to change gear types or species targeted to enable fisheries to continue within the site).
- 4) There may also be the **introduction** of new fishing activities that do not already occur within the MPA (*cf.* **expansion**) that may backfill the opportunities vacated by the original fishing pressure e.g. static gears replacing mobile gears.

2.5. The potential implications of fishing effort displacement

Where there is substitution of fishing effort (a change in the gear type used or the species targeted) within an MPA, the new fishing activities and the pressures they exert may: (1) interact with the same habitats and species of conservation importance in a different manner; (2) exert pressure at a different stage of the species' life history; (3) interact with other species or habitats that the protected species relies upon or interacts with (predator–prey relationships or ecosystem services such as shelter); or (4) interact with other protected species or habitats within that site.

Transference and potential intensification of fishing effort into other MPAs may potentially expose protected species and habitats to pressure. Similarly, the fishing effort may now be directed in such a way whereby species or habitats sensitive to the pressure but outside of the MPA network become exposed; these areas could currently be lightly or unfished. Certain areas, thus far less fished, may attract effort [23] in response to the constraints on other areas with the potential risk of increasing fishing impacts on more pristine seabed habitats that have similar sensitivities to the fishing pressures [29]. This may result in unintended consequences for the marine ecosystems by increasing the mortality of other species or other fish life stages [30]. In the worst cases, this can lead to depletion of certain stocks and biological resources [31–33].

It is worth noting that fishers largely operate in such a way to maximise their returns. Therefore, if they are targeting species within the MPA network and now have to target them elsewhere, this may in turn lead to increased conflict with other marine users and fishers (for example, demersal trawling competing with potting grounds).

Indeed, if fishers are displaced from the areas that are the most efficient to fish, they may have to fish more intensively to maintain catch rates or profitability against increased costs such as fuel [23] from greater steaming time. Consider the following example. A beam trawler with a quota for plaice (*Pleuronectes platessa*) exhausts its quota in five days sweeping an area of 5 km². If displaced, the fisher may have to sweep the new ground more intensively to utilise their quota. The result of this is that habitats/species outside of the MPA network that were not previously exposed may now be exposed to greater pressure. This intensification of fishing effort within the wider seas may potentially undermine progression toward Good Environmental Status as required under the Marine Strategy Framework Directive [34]. Ideally, to avoid this, effort should be taken out of the system to retain the sustainable balance or at the very least to promote diversification of other less impacting gears so as to relieve the pressure on the habitats/species. A push towards the intensification of effort exerted by fishing activities will likely drive technological change, and future efficiencies in operation may lead to future increased pressures on both stocks (principally those that are not managed by quota or to Maximum Sustainable Yield (MSY)) and the wider marine environment. As with all management actions, there may be unintended consequences.

A possible result of designating MPAs inshore is that effort will be displaced offshore. This may result in the development of larger, faster, more capable vessels that can exert increased fishing pressure on the

available resources. This could lead to existing quotas being taken up more quickly, with fishers then focusing their effort on other stocks and areas. In essence, a negative feedback loop could be introduced, i.e. stocks in general are exposed to increased effort and associated habitats are subjected to increased exposure to fishing impacts. Therefore, there may be a requirement to alter future quotas to reflect the implications of spatial closures to mitigate against adverse effects.

Pushing smaller and often single-handed inshore fishing vessels further offshore can also increase the risk of accidents (increased exposure to poor weather, greater transit times and therefore longer working days). Fishers will also have to contend with an increased emergency response time in the event of an accident.

3. Management solutions

3.1. Understand the magnitude of the potential problem

There is a requirement for marine planning authorities/UK administrations to further the understanding of displacement issues within the marine management community as set out within the UK Marine Policy Statement [35]. There is also an imperative to understand current and potential fishing displacement. This understanding is required so that fisheries managers can work collaboratively to prevent an influx of fishing gear/methods as fleets are displaced from historically favoured grounds. (Notwithstanding Natura 2000 sites, in most instances MCZs were selected largely to avoid the most fished/valuable areas. In addition, management measures typically take the form of effort/zonal management which is designed to minimise the impact on fishers.)

It is unlikely to be appropriate to use emergency byelaws to manage displaced/replacement fishing effort (particularly within the MPA the original effort has been displaced from), as in some circumstances these may be regarded as foreseeable.⁵ Were this to be the case, the use of emergency byelaws could be deemed *ultra vires*. The implication of this is that byelaws will have to be developed through the regular process, which can be time-consuming, during which impacts on protected features may continue, or the use of Statutory Instruments to prevent damage will have to be explored. It is therefore advisable to consider the implications of effort displacement at the same time as developing management measures. However, it is imperative to document the consequences of management once in place, to enable regulators/advisors to refine measures to meet Conservation Objectives.

To this end, it is recommended that (1) an overarching regional-seas-scale assessment is conducted of the degree to which fishing effort has been displaced to date as a result of the designation of an MPA network within English waters and (2) a site-specific assessment forms an integral component at the point when management measures are being identified. Where effort displacement/substitution impacts are envisaged, then appropriate mitigation strategies should be explored within the assessment.

It is suggested that the assessments are compiled or commissioned by Defra (governing body) with input from the IFCA, MMO (management bodies), and the Centre for Environment, Fisheries and Aquatic Science (scientific advisor), whereby the expected displacement is identified and the impacts are ascertained in conjunction with appropriate SNCB.

3.2. Removal of effort from the system so that it does not continue to exert pressure

The arbitrary and/or compulsory revocation of fishing licences is legally and politically unattractive in England. The removal of active

⁵ Section 157(2)(b) prevents an IFCA introducing an emergency byelaw without the consent of the Secretary of State if the circumstances could have reasonably been foreseen.

fishing licences would also be considered the antithesis of blue growth. However, significant vessel decommissioning schemes were used throughout the 1990s and early 2000s to reduce the capacity within the English commercial fishing fleet to bring capacity more in line with the available quota. This decommissioning was conducted for fisheries management rather than environmental management purposes. Whilst there is little desire to revisit decommissioning schemes for solely fishery management purposes (the schemes were only partially successful in reducing capacity – much of the money received from decommissioning vessels was spent on upgrading existing vessels or on commissioning new, more capable vessels [36]) – there is no impediment, other than cost, to introducing a decommissioning scheme targeted at displaced vessels on environmental grounds. The removal of effort is further complicated because one should not consider a vessel to be the fishing effort in itself, but the fishing licence and any quota or access rights associated with it, as these provide the ability of a vessel to access fishing opportunities and these can be moved from one vessel to another in many cases.

Because the MCZ designation process requires the socio-economic impacts of designation and not subsequent management to be taken into account (although some basic assumptions were made in the MCZ Impact Assessments), it may be that through analysing attributable displacement/substitution it becomes clear that there will be significant impacts both economically and environmentally as a result of the displacement. It may therefore be advantageous to remove effort from the fishery voluntarily through the recovery of fishing licences/permits using financial incentive schemes, whilst at the same time introducing legislation that prevents future incursion into particular areas by new vessels. It is recognised that government may be wary of this in case this implies that compensation should be paid for the removal of the right to fish; however, the right to fish in general is not being extinguished, merely the location that a fisher can legitimately fish.

The proposal above is potentially possible because the UK has recently agreed its operational framework for the provision of funding under the European Maritime and Fisheries Fund (EMFF)[37]. Further exploration of the ability to use the fund as above is warranted.

3.3. Support appropriate substitution

Substitution activities may be appropriate and compatible with the Conservation Objectives of the MPA if they are considered in a proactive manner. The introduction of the LO and the requirement for fisheries to reduce the levels of discarding is leading to significant developments in fishing gear technology and techniques. The EMFF operational programme for the UK has been developed to support appropriate changes to fishing practices. A key tenet of this funding stream is the support for fishers to adopt more environmentally benign activities; therefore, there may be scope to support appropriate substitution of fishing activities – this could be explored at both an individual and a fishery level.

Substitution of fishing effort within Natura 2000 sites would be subject to HRA and potentially appropriate management measures, e.g. effort caps as well as spatial and temporal measures, to ensure that the new fishing effort would be compatible with the interest features of the site.

However, there has been a recent trend of reducing the ability of fishers to change target fisheries, i.e. from finfish to shellfish (driven by concerns regarding the status of these stocks and the pressure being exerted upon them – these stocks are already exposed to significant levels of latent effort)[22,38,39]. The drive to ensure sustainable fishing of finfish and basing quotas on pressure stocks around MSY may have pushed fishing effort into activities that exert greater impact on the seabed, i.e. scallop dredging. This curtailing of fishers' ability to change between fisheries is due to the categorisation of commercial fishing licences, whereby fishers may or may not have shellfish entitlements attached to their white fish licences. However, securing some

degree of fishing effort substitution may be the best approach if compatible with the MPA objectives. This issue is further compounded as fishers exploring substitution as an option at present are likely to encounter problems, especially if they lack are required to provide evidence of a historical track record of fishing either within a particular area or for a particular species, but they cannot do so.

Relative stability⁶ and national allocations of quota species may also hinder the ability of fishers to diversify. By enabling and/or promoting appropriate substitution, fishers are able to maintain their connection with the area, thus providing continued employment and social stability. Where displacement forces fishers to exploit new areas with which they lack a historic connection, then fishers may be less inclined to take a stewardship view of the resources that they are targeting, as they will be concerned with maximising their income because of additional or new costs to their operation as they adapt techniques, relocate their shore-based activities or increase expenditure on fuel [40–43]. Where fisheries are forced into more nomadic fishery practices rather than new, but fixed, areas, the stewardship connection may become further weakened.

To promote effective substitution of activities (changes in gear type), lessons should be learnt from recent offshore industry developments, in which significant attempts have been made to deliver the co-location or co-existence of activities, i.e. offshore windfarm installations and commercial fisheries. It was initially thought that the co-location of these activities was not feasible; however, over time and through the use of improved technology and liaison with developers, fishers have gained the confidence to fish between structures.

Over time, the profitability of vessels might be reduced (from higher costs or altered catch rates, and constant fish prices) and the adaptive capacity of the fishing sector impaired, forcing fishers to leave the sector. Knowledge is still limited on how fishers react to the various constraints such as area restrictions, increased fuel expenses, and changed stock distribution and dynamics. Enhancing our knowledge of these dynamics is an important step in predicting the economic and ecological impacts of fishing displacement [43–48]. One way of achieving this would be to promote monitoring efforts that enable the displacement from existing (and soon to be implemented) management measures to be discerned.

3.4. Proactively prevent substitution through the release of latent effort

For substitution of fishing effort to occur in a controlled manner, the issue of latent effort must be tackled. Defra [22,38] consulted on the subject of reducing unused licences (latent capacity) in the English 10 m and under fishing sector. The response [39] highlighted that government were of the opinion that latent effort required addressing, and in the short term a decision has been made to proceed with temporary restrictions on licences for quota species and a temporary suspension of shellfish entitlements. If the issue of latent effort is not addressed, it will be more difficult to assist active fishers to change their fishing operations if they then have to compete with latent effort potentially being released and competing for access to areas where fishing is allowed. The response highlighted a previously made commitment to work with industry on any suggestions or proposals for an industry-funded decommissioning scheme. This would suggest that there is scope to further explore the use of the EMFF to address displacement impacts.

3.5. Invest in co-management institutions

As the introduction of management measures for sites gains

⁶ Total Allowable Catches (the amount of a particular commercial fish or shellfish species can be caught which have been derived from scientific analysis and/or political agreement) are shared between EU countries in the form of national quotas. For each stock, a different allocation percentage per EU country is applied for the sharing out of the quotas (national allocation). This fixed percentage is known as the relative stability key.

momentum, it is imperative that appropriate co-management opportunities/institutions are supported and provided with adequate resources to allow meaningful engagement. Successful co-management and, by extension, effective application of the outcomes approach⁷ [44] is very resource intensive and often iterative, with feedback loops allowing learning and adaptation to take place. These institutions need to be active listeners and effective communicators, with managers taking an enabling role in encouraging collaboration and conflict resolution between different stakeholder groups. The most appropriate organisations to do this within England are the IFCAs and the MMO. It is clear that managing displacement is not only about managing the environmental implications of displacement but also about conflict management. The marine environment is a very busy place, with many different sectors vying for the same space. In some instances there are opportunities for co-location, but in many cases the activities taking place are mutually exclusive – this applies not only to fishing type A and fishing type B, but also fishing and other sectors. In the best case scenario there may be opportunities for activities that were previously excluded from an area used for fishing to move (back) into that area.

3.6. UK Marine Policy Statement, Marine Spatial Planning and marine licensing

Expanding the use of marine plans may help address some elements of fishing effort displacement. The UK Marine Policy Statement [35] specifically mentions displacement and need for authorities to consider it:

3.8.10 Marine plan authorities should consider the potential social and economic impacts of other developments on fishing activity, as well as potential environmental impacts. They should, for example, have regard to the impacts of displacement and whether it is possible for vessels to relocate to other fishing grounds. They should also consider the potential impacts of this displacement on the viability of fish stocks and on the marine landscape in the alternative fishing grounds. They will also wish to consider and measure the impacts on local communities of any reduction in fishing activity, redistribution of fishing effort or associated impact on related businesses as the result of a marine development. Marine plan authorities should engage with other regions to where activity is displaced to ensure that a comprehensive picture of impacts is developed and unintended consequences are avoided. Wherever possible, decision makers should seek to encourage opportunities for co-existence between fishing and other activities. Inshore Fisheries Groups in Scotland and Inshore Fisheries and Conservation Authorities (IFCAs) in England will be expected to participate fully in wider marine planning.

There appears to be a presumption within the Marine Spatial Planning (MSP) regime that fisheries can occur throughout UK waters unless direct management interventions restrict their access. Neither MSP nor associated marine licensing (in particular of large infrastructure projects) considers in depth the implications of displacing fishing effort on the marine environment. Because fisheries are dependent on fish habitat and fisheries resources are variable in space [45], spatial restrictions due to MSP may lead to closure of highly productive marine areas or preferred fishing grounds, exacerbating the magnitude of effort displacement [46].

Given that the management structures to implement fishery management plans are already in place, they may provide a more cost-effective way of minimising the overall environmental impact of fishing than MPAs in many circumstances. The identification and management

of core fishing grounds in a spatial planning framework is also a ‘bigger picture’ approach, which considers the impacts of fisheries on the overall state of the environment rather than local environmental gains that might be achieved in MPAs despite costs elsewhere. The challenge will be to combine fisheries management and MPA management through the use of MSP to identify and secure access for fishers to key fishing grounds, as well as identifying those areas to avoid, and then manage both in a more co-ordinated manner [47–49]. Whilst this is likely to be initially very challenging, this may provide a long-term mechanism to reduce conflict and subsequent fisheries displacement.

4. Conclusions

In England, MPAs of all designations are recognised as multi-use sites. There is no imperative for MPAs to be exclusive of fishing activities, merely that the fishing activities that occur within them are compatible with the conservation goals of the habitats and species for which the sites are designated. Where this is secured as an outcome, this will help achieve blue growth but in a sustainable manner. However, it is clear that as there is a shift in focus from designation to the management of MPAs (as the network of MPAs is nearing completion), the opportunity to develop a strategic assessment framework that predicts the degree of potential fisheries displacement from the MPA network has been missed. The focus of managers should therefore be on assessing the spatial and temporal changes to fishing practices that have resulted from the introduction of management measures to date to better understand the implications of introducing MPAs and their management on both the environment and the fishing fleet. This understanding should aid in future management of MPAs as this will lead to reduced conflict between stakeholder groups and increase buy-in to the objectives of the MPA. This information should also help regulators consider and manage fishing activities that impact the marine environment outside of the MPA network. This understanding, when coupled with the development of a fishing effort displacement assessment template that managers can use, will assist in securing the long-term sustainable management of the marine environment. Increased understanding of how fishing effort displacement can occur and the likely outcomes from introducing MPAs and subsequent management can be used in the location analysis for future MPAs – although this information may have greater utility to countries that do not yet have extensive MPA networks in place.

The need for management tools that can identify fisheries displacement and the potential problems that arise from it, along with a clear framework of how these problems can be addressed, is required not only in England but also in any nation that is designating MPAs.

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⁷ The outcomes approach: looking for opportunities to establish positive working relationships based on shared objectives, reducing the need for regulation, commercial uncertainty and delays.

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