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# Practical implementation of Article 17 of the CFP

## Allocating fishing opportunities using environmental criteria

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# 1 Executive Summary

The reformed Common Fisheries Policy (CFP) entered into force on 1 January 2014, putting environmental sustainability at the heart of its objectives. One of its most important reforms is the introduction of Article 17, which requires Member States to use transparent and objective criteria including those of an environmental, social and economic nature when allocating fishing opportunities. Article 17 also requires Member States to endeavour to provide incentives to fishing vessels using selective fishing gear or fishing methods that have a reduced environmental impact. Alongside the Landing Obligation, which requires all catches to be landed and counted against quota, these reforms should serve as catalysts to dramatically improve the environmental credentials of EU fisheries.

In the UK and other Member States, fishing opportunities are generally allocated on the basis of historic access to the resource. Therefore, obliging Member States to use environmental, social and economic criteria when allocating fishing opportunities will require novel approaches and careful thought. This report explores and makes recommendations on how UK Governments can implement Article 17 of the CFP comprehensively and ambitiously, and allocate fisheries resources using transparent and objective environmental criteria, in addition to those of a social and economic nature. To this end, the report provides a set of practical actions that can be taken to ensure timely and effective implementation of the Article 17 requirements.

In developing these recommendations we used a combination of desk-based research and interviews with fisheries industry groups, Producer Organisations (POs) and Fisheries Administrations. We explored: the feasibility of using different environmental criteria to allocate fishing opportunities; the legal, financial, political and practical challenges that should be considered when using such criteria; examples and analysis of existing allocation systems that apply environmental criteria; and, the appropriateness of different forms of incentives to encourage fishing vessels deploying selective fishing gear or using fishing techniques with reduced environmental impact. The analysis was focused on three ways of allocating access to fisheries resources: quota-based fishing opportunities, effort-based fishing opportunities and spatial management.

**Environmental criteria**

In order to provide incentives to fishing vessels deploying selective fishing gear or using fishing techniques with reduced environmental impact, as Article 17 requires, it is necessary to distinguish between different gears and methods and make a choice as to which impacts are more important under the circumstances of the specific fishery. A number of criteria are therefore required against which to measure the environmental credentials of UK fishing activities. We propose using the Marine Stewardship Council (MSC) criteria as a proxy, given that they are well-established, internationally recognised and applicable, and numerous fisheries in the UK have already undergone MSC assessment or pre-assessment.

**Recommendations for allocating fishing opportunities**

The review of the current systems of allocating fishing opportunities in the UK has revealed that the consideration of environmental criteria in the distribution of access has developed

in an ad-hoc way, and the result is a piecemeal approach, with certain limited criteria being taken into consideration for some fisheries but not others (i.e. preferential access to defined areas and special allocations of quota in three pelagic handline fisheries, and incentives for selectivity measures within the Scottish Conservation Credits Scheme), and other environmental criteria not being used to distribute access at all. The main criterion by which fishing quota allocations have been distributed hitherto is catch history, a socio-economic consideration. The environmental advantages of the current systems of allocating fishing opportunities should be preserved, including the fixed nature of quota allocation (as this incentivises quota-holders to take a long-term and responsible approach to harvesting their target species), but more could be done to encourage greater use of selective gears, gear modifications and methods. This could be achieved in a number of ways:

1) The most simple and straightforward means of allocating opportunities according to environmental criteria is to have an underpinning arrangement, whereby a quantity of quota is set aside for vessels meeting the criteria. This is currently done in the UK for a small number of UK fisheries, and it should be investigated whether there are other fisheries in which a more environmentally friendly segment could be encouraged by setting aside an allocation of quota. This type of arrangement works well at a broader scale, to differentiate between different metiers, and at the very least it would support the lower impact operations that are already in place.
2) To go further and encourage vessels to switch to a lower impact fishery, it would be possible to reallocate quota from a segment with a greater impact. This creates potential, however, for perverse environmental incentives and divisions between vessel groups. Nevertheless, reallocating quota to a lower impact metier does have the potential for great social benefits, if factors other than net revenue are taken into account (such as employment) (see Crilly and Esteban, 2011). To avoid any perverse environmental outcomes it would be necessary to model the potential for underutilisation of quota by lower impact fishing operations and the cumulative impacts that could result from larger numbers of such operations. This would also require compensation to be paid to the original quota holders and this should be weighed against the potential social benefits.
3) To differentiate between environmental impacts on a finer scale (within a metier) it would be possible to apply a system of credits to quota shares. For the most part, quota allocation units could be allocated according to catch history as is currently the case, but a fixed percentage could be retained and allocated in the form of a 'quota bonus' according to environmental criteria. The Quota Management Rules could be amended to require POs to establish and define, subject to approval by Fisheries Administrations, the required gear modifications or desired results (such as bycatch levels) that would qualify for additional quota. These could be reviewed every few years, as well as the size of the 'quota bonuses', in order to ensure that they continually incentivise a race to the top. One advantage of this approach is that it is flexible, as credits can address multiple issues and be reworked to address new problems when they arise. Such a scheme should be developed, as was the case with the Scottish Conservation Credits Scheme, as a partnership between the fishing industry, governments and NGOs.
4) Managing authorities should not attempt to create a static quota allocation formula based on environmental criteria, as it would be too inflexible and risk creating perverse outcomes (such as replacing one environmental impact with another). Instead,

implementation should be achieved in accordance with a results-based management approach, with industry collaboration to design measures and incentives to meet fishery-relevant targets for the agreed environmental criteria. Such measures could include adopting specific gear modifications, agreeing to follow or refrain from following certain fishing practices, participating in scientific research projects, or going over and above the legal requirements with respect to monitoring (such as voluntary installation of a remote electronic monitoring system).

5) Area-based incentives can also be a useful tool to encourage switching to more environmental gear and practices, by giving exclusive area access to more sustainable fishing operations. A benefit of using spatial measures to distribute access to resources is that they do not rely on existing quota or effort management arrangements being in place. Given that a large proportion of UK capture fisheries production is not regulated through quotas, these incentives have the potential to distribute access to fisheries resources according to environmental criteria beyond the CFP-regulated quota species. There is also evidence to suggest for some fisheries that by closing certain areas to higher impact gears significant gains can be made in terms of productivity (see Beukers-Stewart and Beukers-Stewart, 2009 for example). UK Governments should therefore explore whether they are using spatial measures to their full potential as a fisheries management tool to provide incentives to meet environmental criteria. As with the underpinning arrangements, it is important to consider that for the implementation of spatial measures in the context of Article 17 there may need to be a cap on the total number of licences within an area, given that even low impact fisheries can have a cumulative detrimental effect if they grow too big.
6) UK Governments should make use of Article 36 of the EMFF in order to fund research projects establishing the feasibility and impacts of the approaches described above. Such projects could involve scoping for metiers and fishing communities that would benefit from underpinning and/or spatial management measures, or designing and piloting the proposed credits approach to allocating quota bonuses. UK Governments should also maximise the uptake of EMFF Articles 38 and 39 providing support for investments and innovations which limit the impacts of fishing on the marine environment (including investments in equipment that improves size selectivity or species selectivity of fishing gear, eliminates discards and unwanted catches of non-fish species, limits the physical and biological impacts of fishing on the ecosystem or the sea bed, and/or reduces the impact of fishing on protected predators).

# 2 Background

## 2.1 Introduction

The reformed Common Fisheries Policy (CFP) (Regulation (EU) No 1380/2013) entered into force on 1 January 2014. The new basic regulation places environmental sustainability at the forefront of its objectives, ensuring that '*fishing and aquaculture activities are environmentally sustainable in the long-term and are managed in a way that is consistent with the objectives of achieving economic, social and employment benefits, and of contributing to the availability of food supplies*' (Article 2.1). It also enshrines the ecosystem-based approach to fisheries management to make sure that Member States' implementation of the CFP will ensure that '*negative impacts of fishing activities on the marine ecosystem are minimised*', and '*aquaculture and fisheries activities avoid the degradation of the marine environment*' (Article 3). To underpin this, unprecedented attention is drawn (Article 2.5(j)) to the need for the CFP to be '*coherent with the Union environmental legislation*', and especially with the objective of achieving a good environmental status by 2020 under the Marine Strategy Framework Directive.

Also among the reforms was Article 17, on 'Criteria for the allocation of fishing opportunities by Member States'. Member States continue to be responsible for deciding how to allocate the fishing opportunities available to them, but this new article requires Member States, when allocating the fishing opportunities, to:

> "*use transparent and objective criteria including those of an environmental, social and economic nature. The criteria to be used may include,* inter alia*, the impact of fishing on the environment, the history of compliance, the contribution to the local economy and historic catch levels. Within the fishing opportunities allocated to them, Member States shall endeavour to provide incentives to fishing vessels deploying selective fishing gear or using fishing techniques with reduced environmental impact, such as reduced energy consumption or habitat damage.*"

In the UK and other Member States, fishing opportunities are generally allocated on the basis of historic access to the resource - a primarily economic and social criterion. Therefore, obliging Member States to use environmental, social and economic criteria when allocating fishing opportunities will require novel approaches and careful thought. The Scottish Government is in the process of consulting on its system of allocating quota, with changes to the current arrangements and the option to move to an entirely new system both open for consideration (Marine Scotland, 2014a). As this report explains, there are currently some examples within the UK Governments' approaches to allocating fishing resources whereby environmental criteria are factored in and incentives are designed to encourage more sustainable behaviour. As with other examples of environmentally-based systems of allocating fishing opportunities worldwide, these cases have social and economic benefits too. This highlights the opportunities (environmental, social and economic) from applying this approach to the allocation of fisheries access.

Also under the reformed CFP, the Landing Obligation requires all of the catch to be landed and counted against quota. This requirement starts in 2015 with pelagic fisheries, extending to demersal fisheries in 2016, and to all species regulated through a total allowable catch by 2019. The Landing Obligation presents a strong incentive to fishermen to change their fishing practices and make modifications to their gear, in order to increase their selectivity and avoid catching unwanted fish. Article 17 complements the Landing Obligation, through its requirements on Member States to provide incentives to vessels deploying selective gear. A crucial difference however is that selectivity measures or alternative fishing practices implemented as a result of the discard ban will be designed to reduce unwanted catches of quota fish species, whereas Article 17 can incentivise for broader environmental objectives, e.g. measures designed to reduce incidental catches of marine mammals or damage to benthic flora. Article 17 also presents an opportunity to support the implementation of the EU Action Plan for reducing incidental catches of seabirds in fishing gears, which aims to minimise and, where possible, eliminate the bycatch of seabirds in EU and external waters, and calls on vessels to apply mitigation measures to prevent seabirds coming into contact with fishing gears.

These new provisions of the CFP present implementation and enforcement challenges. To overcome these there have been calls, not least from the fishing sector, to move away from the approach that has traditionally been taken towards fisheries management in the EU (characterised by top-down rules, micro-management, and when it comes to compliance, the burden of proof sitting with managing authorities) in favour of a co-management or results-based approach whereby the burden of proof is reversed (Fitzpatrick et al, 2011). The practical application of reversing the burden of proof has been increasing in EU fisheries. In the UK, full documentation of catches using Remote Electronic Monitoring has been used extensively (and successfully) for monitoring North Sea cod catches, and has been trialled for use in a multi-species no-discard mixed fishery context (Marine Scotland, 2013). This approach is not necessarily practical, proportionate or affordable for smaller vessels, however, and other potential enforcement options will need to be found for these. Such approaches can assist in enforcing Article 17 which could also have a role in incentivising the use of certain control measures through the allocation of fishing opportunities (to balance concerns about affordability or proportionality, for example).

This report explores and make recommendations on how UK Governments can implement Article 17 of the CFP comprehensively and ambitiously, and allocate fisheries resources using transparent and objective environmental criteria, in addition to those of a social and economic nature. To this end, the report provides a set of practical actions that can be taken to ensure timely and effective implementation of the Article 17 requirements. To support the implementation of Article 17, the European Maritime and Fisheries Fund (EMFF) (Regulation (EU) No 508/2014) provides financial assistance for "*the design, development, monitoring, evaluation and management of the systems for allocating the fishing opportunities*" (Article 36). In this regard, the report also proposes a number of project concepts that could be eligible for EMFF support.

In developing these recommendations, we have explored:

- the feasibility of using different environmental criteria to allocate fishing opportunities;
- the legal, financial, political and practical challenges that should be considered when allocating opportunities using such criteria;
- examples and good practices of existing allocation systems that apply environmental criteria; and,
- the appropriateness of different forms of incentives to encourage fishing vessels deploying selective fishing gear or using fishing techniques with reduced environmental impact.

The analysis was carried out through a combination of desk-based research and interviews with fisheries industry groups, Producer Organisations (POs) and Fisheries Administrations.

# 3 Using environmental criteria to allocate fishing opportunities

Different types of fishing vessels, gears and methods have varying impacts on the marine environment. These impacts are well documented, and can be classified in different ways, but they broadly include direct impacts from fishing activities on target species, on non-target commercial fish species and other unmarketable fish, on protected and vulnerable species, and on habitats (Dayton et al, 1995; Suuronen et al, 2013; Gascoigne and Willstead, 2009; Pauly et al, 1998; Grieve et al, 2014). Indirect impacts may arise from catch processing (through pollution from discharging organic waste), non-biodegradable litter such as lost nets that can continue to ghost fish, and the alteration of trophic structure and function through discarding and from targeting low trophic level fish (FAO, 2005-2014; Reeves and Furness, 2002; Heath et al, 2014). Emissions of carbon dioxide and other greenhouse gases also exert an indirect impact on the environment through climate change (Suuronen et al, 2013; Tyedmers, 2001). The presence and extent of these impacts in any particular fishery depend very much on the specific characteristics of the fishing operations (vessels, gears, and methods), the species targeted, and the management regime.

In order to provide incentives to fishing vessels deploying selective fishing gear or using fishing techniques with reduced environmental impact, as required by Article 17, it is necessary to determine the extent to which a particular gear/ method causes a particular impact, and then, given that a particular gear type/method will likely have multiple impacts, make a choice as to which impact is least damaging. A number of criteria are therefore required against which to measure the environmental credentials of UK fishing activities. The following chapter reviews different types of environmental criteria for measuring the impacts of fishing activities, and explores the feasibility of using them to allocate fishing opportunities.

## 3.1 Environmental criteria – a review

Several attempts have been made to review the impacts of fishing gears and practices on the environment (e.g. Gascoigne and Willstead, 2009; Hoskin, 2006; Morgan and Chuenpagdee, 2003; Broeg, 2008; Franco, 2007; Marine Conservation Society, 2013; Suuronen et al, 2013; Southall et al, 2013; Grieve et al, 2014). Gascoigne and Willstead (2009) conducted a meta-analysis on several of these studies (i.e. Hoskin, 2006; Morgan and Chuenpagdee, 2003; Franco, 2007; Broeg, 2008; as well as the Marine Stewardship Council (MSC) standard for sustainable fisheries[1]) to compare their results in order to determine whether a consensus exists. This produced a somewhat general classification of the direct impacts of fishing activities, with the indirect impact of carbon emissions considered separately. This classification of direct impacts is as follows:

- Selectivity for target species and size;
- Impacts on unwanted bycatch species, including from ghost fishing;
- Impacts on marine habitats;
- Impacts on marine mammals, birds and other vulnerable species.

[1] See www.msc.org

Gascoigne and Willstead (2009) argue that the advantage of this classification of direct impacts is that it is comprehensive, yet it is general enough to remain short, and, for the sake of clarity, overlap of impacts was avoided as far as possible. Although largely comprehensive, the Gascoigne and Willstead (2009) classification does omit wider ecosystem level impacts, such as knock-on trophic effects on predator species (e.g. seabirds and marine mammals) from exploitation of their prey. Although the report acknowledges that such indirect impacts can be substantial, they were not included in the classification because ecosystem impacts are usually a function of the target species rather than the fishing technique (fisheries on species at a low trophic level are considered likely to have greater ecosystem impacts than fisheries for high trophic level species). These indirect impacts are therefore likely to be better dealt with by adjusting *total* fishing opportunities for these species rather than adjusting how the existing opportunities are distributed. The report also notes another reason for their omission from the classification, namely that assessing these types of impacts frequently requires more information than is typically available.

The MSC (Marine Stewardship Council, 2010) standard for sustainable fisheries also focuses on direct impacts, and categorises them as follows:

- Impacts on the target species (MSC Principle 1);
- Impacts on non-target commercial species which are retained (MSC Principle 2.1);
- Impacts on species which are discarded (MSC Principle 2.2);
- Impacts on endangered, threatened or protected species (MSC Principle 2.3);
- Impacts on habitats (MSC Principle 2.4);
- Impacts on ecosystems (MSC Principle 2.5).

The advantages of the MSC criteria are that they are well-established, internationally recognised and applicable, having been developed in the late nineties through an extensive international consultative process (Marine Stewardship Council, 2010; Southall et al, 2013). Furthermore, for each of these criteria (or 'Principle components') there are three performance indicators, an outcome indicator that considers the status of the impact or the risk that the fishery poses to that component, an indicator that considers the basis, reliability and implementation of the management strategy for the component, and an information indicator that considers the nature, extent, quality and reliability of the monitoring and information that is relevant to developing/implementing the management strategy. There is detailed guidance accompanying the criteria to inform the assessments, so the scope for error arising from different interpretations is minimised. Numerous fisheries in the UK have already undergone MSC assessment. MSC pre-assessments have also been carried out on an extensive range of fisheries around the English coast as part of 'Project Inshore', which aims to produce tailored sustainability reports for every fishery (Southall et al, 2013).

Comparing the most common gear types used in the UK (or EU) against the MSC criteria (or similar) provides a general picture of where a particular gear sits compared to others. For example, in terms of selectivity of target species, there is broad consensus that trawls are the least selective gear, and lines and pots are considered to be more selective (Gascoigne and Willstead, 2009; Marine Conservation Society, 2013) However, any generalisations

about the impacts of gear ignore the fact that within a gear segment there are modifications that can be made to gear and fishing practices which may significantly limit the extent of environmental impact caused. Also, and perhaps more fundamentally, it is not the case that all the gear types discussed here are interchangeable, since for a given fishery only certain gear types may be used due to the nature of the species targeted and the environmental conditions. In addition, there may be impacts of gear which may be considered lower impact per unit but cumulatively can be detrimental, e.g. a critical mass of pots.

### 3.2 Fuel efficiency

It is difficult to rank fishing practices and the gears involved by the indirect impact of their greenhouse gas (GHG) emissions, however it is generally accepted that relative fuel consumption across fishing methods offers a reasonable surrogate. Member States are obliged to report the fuel efficiency of their fishing fleets under the Data Collection Framework, and data is available for the UK, broken down by year and by fleet segment. Fuel efficiency may be calculated in a number of ways but the DCF requires that it is expressed as the number of litres of fuel consumed for each kilogram of fish landed. It is therefore possible to rank different fleet segments according to their fuel efficiency, as a proxy for GHG emissions. Analyses of fuel consumption patterns by gear types indicate that passive fishing gears such as pots, traps, long-lines and gillnets generally require lower amounts of fuel (approximately 0.1–0.4 L of fuel per kg of catch) than active fishing gears such as bottom trawls (from 0.5 up to 1.5 L/kg) (Suuronen et al, 2013). Bottom seines rank between passive gear and bottom trawl in fuel consumption (Thrane, 2004; Winther et al, 2009; and ICES, 2010 in Suuronen et al, 2013). However, the amount of fuel consumed will be affected by such factors as operational techniques, the distances between fishing grounds and fishing ports, as well as vessel design and age. This means that within a fleet segment, there may be significant variation in fuel efficiency from vessel to vessel.

### 3.3 Interactions between environmental criteria

When attempting to rank fishing gears it soon becomes clear that gear types which might be positive for one environmental impact may be negative for another impact. In other words, there are trade-offs to be made when comparing gear types, e.g. the impact of a given gear type on benthic habitats will have to be weighed against an alternative gear type's impact on vulnerable species. Similarly, the criterion on fuel efficiency of fishing vessels could be considered to clash with other criteria, given that measures to improve fuel efficiency can increase the fishing efficiency and range of a vessel, a phenomenon known as technological creep. It is therefore necessary to look at the specifics of the fisheries in question, to make a judgement on which impacts are more important under the circumstances.

# 4 Feasibility and opportunities for using environmental criteria to allocate fishing opportunities in the UK

This chapter discusses the feasibility and opportunities for using environmental criteria to allocate access to fishing resources in the UK. In the EU context, a fishing opportunity is defined as "a quantified legal entitlement to fish, expressed in terms of catch and/or fishing effort" (Council Regulation (EC) No 1224/2009). But access to fisheries resources can be limited in ways other than catch and effort controls, for example through spatial measures, or licensing, and these are very relevant when considering viable means of allocating the opportunity to fish according to environmental criteria. We have therefore interpreted fishing opportunities more broadly, and this chapter seeks to analyse quota-based fishing opportunities, effort-based fishing opportunities and other spatial management tools that may be used to give preferential access to resources.

## 4.1 Quota-based fishing opportunities

### *4.1.1 Allocation of quota-opportunities in the UK – state of play*

Before discussing new approaches to the allocation of fishing opportunities in the UK, it is helpful to briefly explain how the allocation process currently operates. In the UK, fishing rights are conferred on UK-registered vessels by means of a licensing system. Linked to the licensing scheme is a system for regulating the uptake of national quotas. Ultimately fishing quota is allocated in the UK on the basis of historic access to the resource. This is the same basic starting point from which the EU allocates fishing quota to the UK (known as relative stability).

Since 1999, the UK quota arrangements have been a rights-based management system with the introduction of 'Fixed Quota Allocations' (FQA). FQAs entitle the holder access to a share of the quota for a particular fish stock. The fixed nature of quota allocations is not just a way of ensuring economic stability; it is also significant environmentally, the principle being that it provides those holding quota with an incentive to fish responsibly and comply with regulations in order to safeguard their rewards in the future (as evidenced worldwide with the application of such systems (see Costello et al (2008)). FQA units were based on vessels' historic landings (their track record) during a fixed reference period, which for most stocks was 1994 to 1996 (Defra et al, 2013). In previous years the track record was calculated annually, which was thought to unfairly penalise those who had experienced engine breakdowns or other problems, to encourage a race-to-fish, and even to encourage over-reporting to increase quota entitlements in the subsequent year (NFFO, 2011). Gradually the transferability of quota was increased, primarily to avoid the underutilisation of quota. FQAs can now be leased, traded permanently, or 'swapped' in the UK independently of vessel licences (MRAG et al, 2009).

The UK Government is the allocating authority for UK fish quotas. Since 2012, there has been an agreement (the 2012 Concordat[2]) through which the UK Government apportions UK fish quotas among the four UK Fisheries Administrations (i.e. Scotland, England, Wales

[2] The 2012 Concordat on Management Arrangements for Fishing Opportunities and Fishing Vessel Licensing in the United Kingdom

and Northern Ireland). This initial allocation to the devolved administrations is made according to FQAs associated with the fishing licences that are administered by each Administration (Defra et al, 2013). The Concordat devolves the decision on how to allocate the available quota to the national Fisheries Administrations.

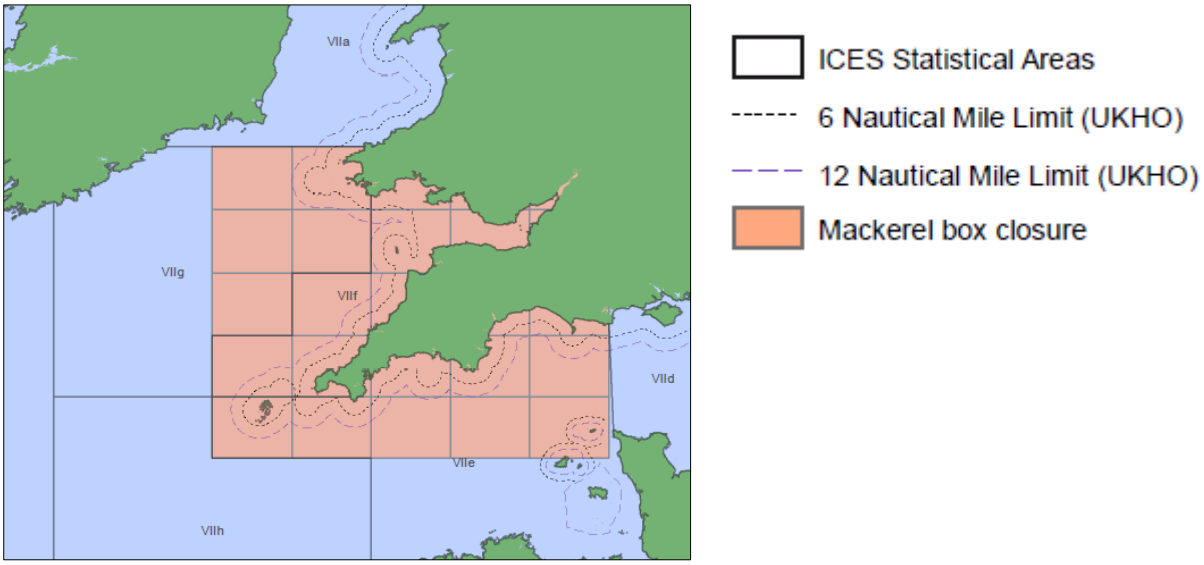
Fisheries Administrations allocate most of their quota to individual fish producer organisations (POs) which manage quota for their members. This responsibility was delegated to POs in order to create systems of allocation that are in tune with the specifics of the fisheries and operators, as opposed to "blunt and inappropriate quota rules imposed by relatively remote central fisheries managers" (NFFO, 2010). Once allocations are made to POs, the quota is fully within their control (subject to quota management rules). This has enabled the development of varied approaches taken by POs to allocate their quota to their members: some POs allocate their quota according to the FQA units of their members, while others pool the quota and allocate according to other factors. If they have members from all four countries, UK POs can, in theory, receive allocations from all four UK Administrations. POs are permitted to swap quota between themselves on an annual basis, to gain more quota if an allocation is under pressure, for example (Defra et al, 2013). At present there is a temporary moratorium on the permanent transfer of FQA units from Scottish fishing licences to non-Scottish licences, while the consultation on fishing quota is underway, although in-year leasing may continue as normal (Marine Scotland, 2014a).

For vessels which are not members of POs (which includes vessels over 10 metres known as the 'non-sector' and vessels of 10 metres and under in length) their landings are managed directly by the devolved Fisheries Administrations. Importantly there is a system of 'underpinning' for most 10 metres-and-under fisheries, whereby they are guaranteed a minimum level of quota if their allocations (based on their FQA units) fall below that level (Defra et al, 2013). This is a socio-economically driven measure to ensure the maintenance of the small scale fleet, given its importance to coastal communities. In England this minimum guaranteed amount was raised in 2012 as Defra performed a one-off reallocation to reduce some of the POs' rights to unused quota (in the form of FQA units) for certain fish stocks in favour of the inshore fleet (vessels of 10m and under). This was decided after consultation and was in response to calls from under-10 metre vessel operators, in collaboration with Greenpeace, to have greater access to quota.

In addition to this broad underpinning, there are special allocations for three specific fisheries: the South West mackerel handline fishery, the Area IVa and IVb 10-metres-and-under handline mackerel fishery, and the Mourne herring fishery (Area VIIa). These fisheries have been granted special access to quota, secured as either an absolute sum, or as a fixed percentage of the total quota allocation (whichever is greater). In addition to special quota allocations, other vessels have restricted access to the areas in which these fisheries operate (see Box 1 for example).

**Box 1: Handlining in the South West Mackerel Box**

The South West Mackerel Box (see Map 1) was established in 1983 by the EU Council of Ministers, in response to concerns about fishing pressure from offshore pelagic trawlers and purse seiners and to protect large concentrations of juvenile mackerel. Access to directed fishing of mackerel inside the Mackerel Box is limited to gillnetting and handlining. There are some derogations to this rule which allow 15 percent mackerel bycatch by vessels fishing for other species, and 25 percent bycatch by demersal trawls, Danish seines or other similar towed nets targeting a limited number of species (see Council Regulation (EC) No 850/98). As well as this restricted access, the handline fishery is entitled to an annual quota allocation equal to 1750 tonnes, or 0.83 percent of UK mackerel quota, depending on whichever is greatest (Defra et al, 2014). This guaranteed minimum allocation is known as underpinning and was introduced in 1994. The guaranteed allocation was calculated based on handline fishers' catch history in 1992 and 1993.




**Map 1: the Mackerel Box closure.** Source: Marine Management Organisation, 2014a.

As outlined above, the allocation of quota in the UK has evolved gradually over decades to meet certain challenges that have arisen. The main criterion by which fishing quota allocations have been distributed is catch history, a socio-economic consideration. The quota allocation system does have an environmental dimension given the fixed nature of allocation units and the special quota allocations for certain low-impact fisheries. This system of quota-allocation therefore incentivises quota-holders to take a long-term and responsible approach to harvesting their target species, eliminating the perverse economic incentive known as the 'race-to-fish', and in a small number of fisheries the provisions for special allocations support the use of more selective, low-impact fishing methods.

We argue that the environmental advantages to a fixed quota system should be preserved, but that more could be done to encourage greater use of selective gears, gear modifications and methods. This could be achieved in a number of ways:

1. Special allocations of quota to low-impact fisheries could be expanded to include more fisheries, with or without a reallocation of quota from a more harmful segment.

2. Quota management rules could be amended placing a requirement on POs to factor in environmental considerations when allocating their quota (for example, vessels fitted with a particular gear modification could be allocated more quota).

3. Fisheries Administrations could allocate the majority of their quota to the usual recipients, holding some back to allocate later in the season to those who demonstrate greater environmental credentials (lower bycatch levels, for example).

4. A fundamental reassessment of the current method of quota allocation, moving towards a method based on environmental (and social and economic) criteria, with or without reference to historic catch records.

### *4.1.2 Practical considerations to allocating quota-opportunities according to environmental criteria*

This report has identified a number of practical considerations to bear in mind when introducing more and stronger incentives to encourage fishing with lower impact on the environment. These were initially identified through desk-based research, and were supplemented and consulted on through interviews. The arguments surrounding the issues are presented below, grouped into four categories: financial or economic considerations, political and cultural considerations, practical and technological considerations, and legal and institutional considerations.

*Financial/ economic considerations*

Many fishing operators have invested in their operations (sometimes with the help of a bank loan) on the basis of their quota holdings. If an environmentally-based system of allocating quota was to reallocate quota dramatically it could lead to economic instability for these fishing operators. On the other hand, such a reallocation would lead over time to increased economic stability to those receiving the quota. Additionally, if a system was able to encourage operators which exert a greater environmental impact to transition to a new metier/ gear type of a lower impact, this would also require capital investment. There are therefore potentially two financial consequences, the loss of business and the cost of changing to new operations. Of relevance to the latter point is that the EMFF provides support for gear adjustments of this kind, assuming that the UK will include support for such measures in its operational programme. Given these potential financial shocks, there would need to be a transition period to allow operators to adapt.

A second issue is that in some cases the more profitable and efficient means of catching fish will have greater environmental impacts, which means that encouraging less impacting gears and methods in these cases will lead to reduced profitability. However, in some cases there will be opportunities to counteract this by obtaining higher prices for fish caught in more sustainable, less damaging ways. Detailed modelling would be required to estimate the likely extent of this effect. It is also important to consider that there are other societal benefits to be factored in, such as employment. Crilly and Esteban (2011) compared the 'social profit' (net benefits) of two fishing fleets – gillnets and trawlers – targeting UK North Sea cod quota, comparing them in terms of the value created for society by looking at net revenues, employment, subsidies, discards, GHG emissions, and other costs. Looking at this

broader picture, they observed that the gillnetters created a significant value to society (£865/tonne of cod landed), while trawlers destroyed value, with larger trawlers destroying more value (£1,992/tonne landed) than smaller ones (£115/tonnes landed).

Another financial consideration is that budget restrictions within Fisheries Administrations may limit the scope of a reallocation of resources. This could include the typical budgetary pressures that often hamper policy development, such as lack of staff, or insufficient investment in scientific knowledge and technical development, but it could also extend to a requirement to put up large sums in order to compensate previous quota holders for their quota losses. In 2012, as noted above, Defra performed a one-off reallocation of FQA units for certain fish stocks from the POs to the inshore fleet (vessels of 10m and under), and the UK Association of Fish Producer Organisations brought a judicial review claim against the Secretary of State for Environment, Food and Rural Affairs over the decision. The High Court ruled that the redistribution was legal, and that while the FQA units were "possessions" no compensation was due because the quota had been underused by the POs and consequently had no value (EWHC, 2013; Luk, 2013). The implications of this court ruling are that re-allocating FQA units is not unlawful under the European Convention on Human Rights, but any redistribution of used FQA holdings would have to be compensated for (Luk, 2013).

*Political and cultural considerations*

It was evident from the interviews held with POs that they support the current system of quota allocation, and are resistant to changing it. One interviewee described it as "well-established, well-understood and well-rooted". Another stated "we have had the current system for 14 to 15 years, and people know it, understand it, and live with it. Generally speaking it works and it has lots of advantages". Notwithstanding the legal obligation on the UK and other Member States to allocate fishing opportunities according to new criteria, given the support from POs for the current system it will be challenging to persuade them that environmental allocation criteria are necessary and are the most appropriate means of reducing and minimizing the environmental impacts of fishing operations.

On the other hand, there is significant opposition to the current system of allocation from the under-10m fleet, which strongly supports Article 17 in arguing for a greater share of fishing rights on social and environmental grounds. Any change to the current system of allocating quota would have to be developed in consultation with the whole industry. A one-size-fits-all approach would not work, therefore a collaborative and fishery-specific approach is most likely to succeed. The cooperation between the Fish Producers Organisation and the Ramsgate under-10 metre Community Quota Pilot Group provides a useful model whereby under-10 metre vessels can access additional quota, therefore a similar approach could be explored to implement the use of environmental criteria.

*Practical and technological considerations*

In addition to the financial and political considerations, there are a number of practical issues of importance, including, as is often the case in fisheries management, the potential for unintended consequences. An example of an unintended consequence that could potentially result from allocating quota to more environmentally-friendly vessels would be an increase in fishing pressure in inshore areas. This could arise from displacement if there was a large transfer of quota from a large offshore fleet to smaller inshore vessels. As there

is a cap on inshore vessels there would not be an increase in vessel numbers, but since they would have a smaller range, it would reduce the area in which the quota could be caught and would be likely to increase fishing effort in those areas. Excessive use of any gear type, even low impact, may cause overexploitation and adverse ecosystem impacts if total fishing effort is too high, therefore any incentives to encourage low impact fishing should maintain fishing effort and capacity at sustainable levels.

Another potential consequence of allocating quota to more environmentally friendly vessels is the underutilisation of quota by more-selective vessels. One interviewee explained that in the Bristol Channel for example, if there was a reallocation of dover sole quota from beam trawlers to gillnetters, the gillnetters would struggle to harvest the same quantities of fish. Another interviewee argued that this phenomenon had already occurred following the redistribution of quota in England to the under-10m fleet in 2012: as a result of the reallocation, in the Area VIIa plaice fishery the over 10m vessels are now short of quota and the under-10m fleet are catching less than 10 per cent of their allocation. However, many small scale vessel operators argue that they struggle to get enough quota at the moment and that there is a significant underutilisation of quota by large vessels. The degree to which there is an underutilisation or shortage of quota in any segment will depend on the region and stocks in question, and will vary from year to year. This implies again that a fishery-specific and collaborative approach would need to be taken, and that flexibility to deal with fluctuations in stocks and catches would have to be built in.

An important practical concern is that in mixed fisheries, the amount of quota held for different species has a large influence on the level of unwanted catches. The Landing Obligation will require catches which were previously discarded to be landed against quota. This will mean that low-value catches that have traditionally been discarded will now need to be covered by quota. Access to this quota will be important in ensuring that fishing operations can continue; many vessel operators will be faced with the choice of either paying a high price to lease quota (if possible) or staying in port. Matching TACs and quotas to the occurrence of each species within a catch enables the avoidance of the “choke species” problem. A potential consequence of allocating quota to more environmentally friendly vessels would be to create an imbalance of quota allocations for different species, leading to increased catches of unwanted fish. One interviewee argued that this would be a major issue, given that in their experience the industry has had to invest heavily in quota access over the last 15 to 20 years in order to obtain a good balance of quota for a mixed fishery. This investment was based on relatively stable fishing opportunities and allocation principles, and any changes to these would inevitably create problems. He suggested therefore that any change would have to be implemented gradually, to enable the fleet to adapt. Other interviewees argued that they currently faced serious issues due to the problem of quota shortages and “choke species”, so they did not know whether a change to quota allocations would make this phenomenon any worse. In recognition of this uncertainty, the Scottish consultation on the allocation of fishing quota Consultation Paper states that “it is not the Government’s intention to undertake a reallocation of quota in a way designed to anticipate the catches that vessels will be obliged to land when the Landing Obligation is in effect. We think it would be highly unlikely that it would be possible for the Government or any other planning body to anticipate with any degree of accuracy the catches that might be taken across the fleets” (Marine Scotland, 2014a).

Closely related to the issues of underutilisation and quota imbalances is the transferability of quota. Any reallocation of quota opportunities based on environmental criteria would not have the intended effect (i.e. that the opportunities are fished by more environmentally friendly vessels) if the quota is simply transferred, swapped and leased back to vessels of a greater environmental impact. This should not suggest that transferability should be stopped, as it plays an important environmental and economic function, providing the flexibility needed to allow operators to adapt to fluctuations in fish stocks, particularly in mixed-species fisheries, and especially when the Landing Obligation enters into force. To get around this issue it would be possible to retain transferability but design some limits on directions or quantities of swaps.

When designing incentives to encourage more environmentally friendly fishing operations, there may be technological obstacles to changing gear types. This is mainly due to the fact that it is not necessarily possible to replace one gear type with another and expect to catch the same quantities of fish. However, there are many modifications that can be made to more harmful gear types in order to reduce their impacts. Given the introduction of the Landing Obligation there will be a strong incentive on operators to adapt their gear. One interviewee argued that there is experience from other nations that can be drawn on to inspire different gear and management practices.

*Legal and institutional considerations*

This study identified a single but important issue of a legal nature, which stems from the fact that many stocks are shared with other European Member States. If UK quota were to be reallocated towards a less harmful segment in order to reward and encourage more sustainable practices and these operators had to compete with foreign vessels using more productive and environmentally-harmful fishing methods, it could (1) be difficult for the less harmful segment to compete, and (2) be considered unfair by the British equivalent of the more-harmful segment. One interviewee argued that this would be the case in the Bristol Channel if there was a reallocation of dover sole quota from beam trawlers to gillnetters, since the dover sole stock is shared with Belgian beam trawlers against which the British gillnetters would not be able to compete. This implies that not only must an underutilisation of quota by UK vessels be avoided, but that a level playing field is maintained with other Member States. If this appears to be a major barrier to implementing environmental access criteria, it behoves the UK administrations to cooperate with other Member States to develop regionalised solutions.

## 4.2 Effort-based fishing opportunities

### *4.2.1 Allocation of effort in the UK – state of play*

As explained, fishing opportunities can also be expressed in terms of fishing effort. Fishing effort exerted by UK vessels is monitored throughout the year in accordance with European legislation (the Cod Recovery Plan, the multiannual plan for the sustainable exploitation of sole in the Western Channel, and the Western Waters regime). In the recovery zones for cod and sole and the Western Waters (Area VII), fishing effort is managed through a system of allocation of days at sea to individual vessel owners. This is managed separately by each UK Fisheries Administration.

The Scottish Government's scheme for managing fishing effort is called the Conservation Credits Scheme which allocates limited fishing time to vessels that use particular types of fishing gear (principally, trawls for whitefish and Nephrops) and rewards them with additional time in return for the adoption of more environmentally-friendly fishing practices (Marine Scotland, 2014b; Marine Scotland, 2014c). Similarly, in England and Wales the Marine Management Organisation's effort management system rewards extra days to vessels which agree to fish using one of several specified selected gears (Marine Management Organisation, 2014b).

Because the EU Cod Recovery Plan required annual reductions in effort, fishers received an increasingly lower base rate of fishing effort and were compensated less for complying with more environmentally-friendly fishing practices. This lowered base rate essentially forced fishers to participate in the credits scheme and take the cod avoidance measures in order to retain a profitable level of access (Van Riel et al, 2013). Given these circumstances, the voluntary credit basis of the original Conservation Credits Scheme has been overshadowed by the regulatory control of the Recovery Plan. The Scottish Discard Steering Group is currently considering what additional measures will need to be introduced to the Scheme in order to comply with the Landing Obligation (Scottish Discard Steering Group, 2014). The Landing Obligation will likely have the same regulatory effect (forcing fishers to take avoidance measures). Despite this, the central principle of distributing credits (in this case extra days-at-sea) in exchange for changed fishing behaviour remains a valid principle (Van Riel et al, 2013).

### *4.2.2 Practical considerations to allocating effort-opportunities according to environmental criteria*

The Cod Recovery Plan has not met its objectives to ensure sustainable exploitation on the basis of maximum sustainable yield because it failed to reduce fishing mortality (STECF, 2011). There are fundamental problems with effort control as a means of reducing fishing mortality, as fishers faced with effort reductions can allocate their remaining effort such that they maximise catches of their targeted species to minimise the impact on their revenue – under restricted days-at-sea, fishers are incentivised to fish more intensively during their allotted days than they would otherwise do. However the principle behind the Conservation Credits Scheme and the English and Welsh buy-back arrangements is sound. Van Riel et al (2013) describe such systems as 'behavioural credits' and argue that they show 'considerable potential for incentivising changes towards achieving management goals that improve the environmental performance of fisheries'. They also highlight the flexibility of such systems as an advantage, arguing that credits can be reworked to include new problems when they arise, and address multiple issues (e.g. juveniles, vulnerable bycatch species, and habitats) as long as the goals of such measures are clearly specified and agreed upon (Van Riel et al, 2013). The challenge of credit systems is to create the right set of incentives to persuade fishers to invest in new gear modifications or to make changes to their fishing practices, even though such modifications may result in some upfront and ongoing costs to the vessel. This would require consultation and piloting to pitch incentives at the right level.

Given the problems associated with effort controls, it would be difficult to justify extending effort-based management in order to introduce a conservation credits scheme, due to the

potential for new problems to be created ("derby fishing"). The benefits of the behavioural credit concept could, however, be delivered by applying the approach to quota shares (i.e. a fisher is granted extra quota for implementing certain measures).

### 4.3 Using spatial management as an incentive to meet environmental criteria

Although not the main focus of this report, it is important to recognise the potential of spatial management for allocating access to marine resources. Spatial management measures can provide priority access to some users and restrict access to others. There is a strong logic that by providing preferential access to vessels fishing with lower impact gears or methods, you may encourage others to switch to such gears and methods in order to gain access. Area restrictions are a feature in many systems of allocating access to resources that use environmental criteria as their basis (see Grieve, 2009 for examples). Within the UK, spatial management is used in conjunction with special quota allocations to restrict access to the low impact mackerel and herring fisheries (see Box 1). Spatial measures are also used to restrict access to certain gear types in a few cases. In English, Welsh and Scottish shellfish fisheries, 'Several Orders' and 'Regulating Orders' spatially restrict fishing rights in a specific area of the sea or coastal zone in order to improve the management of private and natural shellfisheries (Marine Management Organisation, 2014c). In Northern Ireland, separate but similar arrangements apply. In Shetland for example, a Regulating Order grants the Shetland Shellfish Management Organisation (SSMO) the legal right to manage the commercial fisheries for lobsters, crabs, scallops, queens, whelks, razorshells, cockles, mussels and oysters within the area between the low water mark and the six mile limit. Amongst other things, the Order gives the SSMO powers to impose restrictions and regulations, such prohibiting the use of any form of hydraulic or suction dredge, or any similar type of gear, as well as 'French dredges' to take any of the prescribed species within the area (Shetland Shellfish Management Organisation, 2014).

A benefit of using spatial measures to distribute access to resources is that they do not rely on existing quota or effort management arrangements to be in place. Given that a large proportion of UK capture fisheries production is not regulated through quotas, these incentives have the potential to distribute access to fisheries resources according to environmental criteria beyond the CFP-regulated quota. Furthermore, in addition to prioritising access to lower impact fishers, this approach can have benefits for all stakeholders. For example, Beukers-Stewart and Beukers-Stewart (2009) propose a management plan for UK scallops whereby the inshore area up to 3 miles is considered a 'low impact zone' in which static gear fisheries (e.g. crab fishers) are permitted alongside scallop divers and other low impact uses such as recreation, and the 3-6 mile area is a 'medium impact zone' where most of the inshore scallop fleet using dredges or trawls should operate. They argue that the key to the success of this scheme for the scallop fishery would be to improve the productivity by increasing spawning stock biomass and improving the size class structure of the populations, thereby providing a much more profitable and stable income for its stakeholders (Beukers-Stewart and Beukers-Stewart, 2009). One important consideration for the implementation of spatial measures in the context of Article 17 is that there may need to be a cap on the total number of licences within an area, given that even low impact fisheries can have a cumulative detrimental effect if they grow too big.

# 5 Recommendations

A review of the current systems of allocating fishing opportunities in the UK has revealed that the consideration of environmental criteria in the distribution of access has developed in an ad-hoc way, and the result is a piecemeal approach, with certain limited environmental criteria being taken into consideration for some fisheries but not others, and other criteria not being used to distribute access at all. This report explores how UK Governments can implement Article 17 of the CFP comprehensively and ambitiously, and allocate fisheries resources using transparent and objective environmental criteria, in addition to those of a social and economic nature. What follows is a set of practical actions that can be taken to ensure timely and effective implementation of the Article 17 requirements.

1) With respect to the allocation of fishing quota, the most simple and straightforward means of allocating opportunities according to environmental criteria (and probably the means least prone to unintended environmental outcomes) is to have an underpinning arrangement, such as that currently in place to support mackerel handliners. It should therefore be investigated whether there are other fisheries in which a more environmentally friendly segment could be encouraged by setting aside an allocation of quota. This type of arrangement works well at a broader scale, to differentiate between different metiers, and at the very least it would support the lower impact operations that are already in place.
2) To go further and encourage vessels to switch to the lower impact fishery, it would be possible to reallocate quota from a segment with a greater impact. This creates potential, however, for perverse environmental incentives and divisions between vessel groups. To avoid the environmental pitfalls it would be necessary to model the potential underutilisation of quota and the cumulative impacts that could result from larger numbers of low impact vessels in order to establish a target or limit fleet size. It may also require collaboration between Member States in situations where stocks are shared, and compensation to be paid to the previous quota holders.
3) To differentiate between environmental impacts on a finer scale (within a metier) it would be possible to apply a system of conservation credits to quota shares (instead of days-at-sea as in the case of the Scottish Conservation Credits Scheme). For the most part, FQA units could be allocated according to catch history as is currently the case, but a fixed percentage could be retained and allocated in the form of a 'quota bonus' according to environmental criteria. The Quota Management Rules could be amended to require POs to establish and define, subject to approval by Fisheries Administrations, the required gear modifications or desired results (such as bycatch levels) that would qualify for additional quota. These could be reviewed every few years, as well as the size of the 'quota bonuses', in order to ensure that they continually incentivise a race to the top. Such a scheme could be developed, as the Scottish Conservation Credits Scheme was, as a partnership between the fishing industry, governments and NGOs.
4) The analysis has shown that managing authorities should not attempt to create a static quota allocation formula based on environmental criteria, as it would be too inflexible and would work against the results-based approach to managing catches under the discard ban. As well as reverting back to a top-down form of governance,

taking such an approach risks creating perverse outcomes (such as replacing one environmental impact with another). Instead, implementation should be achieved in accordance with a results-based management approach, with industry collaboration to design measures and incentives to meet fishery-relevant targets for the recommended proxy of MSC environmental criteria. Such measures could include adopting specific gear modifications, agreeing to take or refrain from taking certain fishing practices, participating in scientific research projects, or going over and above the legal requirements with respect to monitoring (such as voluntary installation of a remote electronic monitoring system).

5) Area-based incentives can also be a useful tool to encourage switching to more environmental gear and practices, by giving exclusive area access to more sustainable fishing operations. The benefit of using spatial measures to distribute access to resources is that they do not rely on existing quota or effort management arrangements being in place. This is an important point given that a large proportion of UK capture fisheries production is not regulated through quotas. There is also evidence to suggest for some fisheries that by closing certain areas to higher impact gears significant gains can be made in terms of productivity. UK Governments should therefore explore whether they are using spatial measures to their full potential as a fisheries management tool to provide incentives to meet environmental criteria. As with the underpinning arrangements, it is important to consider that for the implementation of spatial measures in the context of Article 17 is that there may need to be a cap on the total number of licences within an area, given that even low impact fisheries can have a cumulative detrimental effect if they grow too big.
6) Studies establishing the feasibility and impacts of the approaches described above would be eligible for funding under Article 36 of the EMFF. Such projects could involve scoping for metiers and fishing communities that would benefit from underpinning and/or spatial management measures. EMFF-supported projects could also be used to design and pilot the proposed conservation credits approach to allocating quota bonuses. Given that capital costs are often cited as a barrier to making gear modifications, UK Governments should maximise the uptake of EMFF Articles 38 and 39 providing support for investments and innovations which limit the impacts of fishing on the marine environment (including investments in equipment that improves size selectivity or species selectivity of fishing gear, eliminates discards and unwanted catches of non-fish species, limits the physical and biological impacts of fishing on the ecosystem or the sea bed, and/or reduces the impact of fishing on protected predators).

# 6 References


Beukers-Stewart, B.D. and Beukers-Stewart, J.S. (2009) Principles for the Management of Inshore Scallop Fisheries around the United Kingdom http://arrancoast.com/website_pdf/beukers_stewart_scallop_proposed_management_inuk.pdf

Broeg K. (2008) Toward Low Impact Fishery Techniques. WWF Germany, Frankfurt am Main, November 2008.

Costello, C., Gaines, S. and Lynham, J. (2008) Can catch shares prevent fishery collapse? *Science*, 321, 1678 -1681.

Council Regulation (EC) No 850/98 of 30 March 1998 for the conservation of fishery resources through technical measures for the protection of juveniles of marine organisms.

Council Regulation (EC) No 1224/2009 of 20 November 2009 establishing a Community control system for ensuring compliance with the rules of the common fisheries policy, amending Regulations (EC) No 847/96, (EC) No 2371/2002, (EC) No 811/2004, (EC) No 768/2005, (EC) No 2115/2005, (EC) No 2166/2005, (EC) No 388/2006, (EC) No 509/2007, (EC) No 676/2007, (EC) No 1098/2007, (EC) No 1300/2008, (EC) No 1342/2008 and repealing Regulations (EEC) No 2847/93, (EC) No 1627/94 and (EC) No 1966/2006.

Crilly, R. and Esteban, A. (2011) Value slipping though the net – Managing fish stocks for public benefit. A report by the new economics foundation. http://b.3cdn.net/nefoundation/ca653c8f1c06e3d579_5jm6bohab.pdf

Dayton, PK, Thrush, SF, Tundi Agardy, M. and Hofman, RJ. (1995) Environmental effects of marine fishing. *Aquatic Conservation: Marine and Freshwater Ecosystems*. Volume 5, Issue 3, pp 205–232.

Defra, Marine Scotland, Marine Management Organisation, Welsh Government, Department of Agriculture and Rural Development (2013) Fisheries quota management guidance. http://www.marinemanagement.org.uk/fisheries/management/documents/quotas/fqm.pdf

Defra, Marine Scotland, Marine Management Organisation, Welsh Government, Department of Agriculture and Rural Development (2014) Rules for the management of the UK's fisheries quotas in areas I, II, IV, VI and VII (and associated areas) and in Faroese waters (Vb) for 2014. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/313109/finalukrules2014.pdf

EWHC 1959 (2013) United Kingdom Association of Fish Producer Organisations v Secretary of State for Environment, Food And Rural Affairs, Case No: CO/4796/2012. http://www.bailii.org/ew/cases/EWHC/Admin/2013/1959.html

FAO (2005-2014) World inventory of fisheries. Impacts of fishery activities. Issues Fact Sheets. Text by Pere Oliver and Rebecca Metzner. In: *FAO Fisheries and Aquaculture Department* [online]. Rome. Updated 27 May 2005. [Cited 18 July 2014]. http://www.fao.org/fishery/topic/12273/en

Fitzpatrick, M., Graham, N., Rihan, D. J., and Reid, D. G. (2011) The burden of proof in co-management and results-based management: the elephant on the deck! *ICES Journal of Marine Science*, 68: 1656–1662.

Franco J. 2007. Environmental effects of fishing gears and the socioeconomic consequences of their modification, substitution or suppression. Report IP/B/PECH/IC/2006-179, European Parliament Policy Department: Structural and Cohesion Policies, Brussels, September 2007.

Gascoigne and Willstead (2009) Moving towards Low Impact Fisheries in Europe: Policy hurdles & actions. Published by Seas At Risk. http://www.seas-at-risk.org/1mages/SAR_LIF_1.pdf

Grieve, C. (2009) Environmental and Social Criteria for Allocating Access to Fisheries Resources. Published by Ocean2012. http://ec.europa.eu/fisheries/reform/docs/pew_annex1_en.pdf

Grieve, C., Brady, D.C., and Polet, H. (2014) Best practices for managing, measuring and mitigating the benthic impacts of fishing – Part 1. *Marine Stewardship Council Science Series* 2: 18 – 88.

Heath, M.R., Cook, R.M., Cameron, A.I., Morris, D.J. and Speirs, D.C. (2014) Cascading ecological effects of eliminating fishery discards. *Nature Communications*, Article 3893. http://www.nature.com/ncomms/2014/140513/ncomms4893/full/ncomms4893.html

Hoskin M. (2006) *Census of opinions on interactions between fisheries and the environment: a summary report*. Invest in Fish South West, Work Programme 9: Evaluation of Wildlife Issues. Coastal and Marine Environmental Research Ltd., Falmouth, UK.

ICES, 2010. *Report of the ICES-FAO Working Group on Fishing Technology and Fish Behavior (WGFTFB).* ICES Fisheries Technology Committee. ICES CM 2010/SSGESST:14, 252 pp. Cited in Suuronen, P., Chopin, F., Glass, C., Løkkeborg, S., Matsushita, Y., Queirolo, D., and Rihan, D. (2013) Low impact and fuel efficient fishing—Looking beyond the horizon. *Fisheries Research*, 119–120 (2012) pp. 135–146.

Luk, S. (2013) Legal analysis: UK Association of Fish Producer Organisations v Secretary of State for Environment, Food and Rural Affairs. A briefing by ClientEarth. http://www.clientearth.org/reports/fish-producer-organisations-v-secretary-of-state-legal-analysis.pdf

Marine Conservation Society (2013) Fishing methods league table. http://www.mcsuk.org/downloads/fisheries/Most%20sustainable%20fishing%20methods.pdf

Marine Management Organisation (2014a) Mackerel Box Closure, 12 August 2014. Map produced using the WGS84 Coordinate Reference System. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/342783/Mackerel_boxes.pdf

Marine Management Organisation (2014b) Manage your fishing effort https://www.gov.uk/government/collections/manage-your-fishing-effort

Marine Management Organisation (2014c) Scoping the opportunities and challenges to using a 'core fishing grounds' approach to develop a spatial marine plan policy for fishing. A report produced for the Marine Management Organisation, pp 85 MMO Project No: 1074. ISBN: 978-1-909452-32-9. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/358081/1074.pdf

Marine Scotland (2013) Demersal Landing Obligation Trial. http://www.scotland.gov.uk/Topics/marine/Sea-Fisheries/19213/discards/DemersalLandingObligationTrial

Marine Scotland (2014a) Consultation on the Allocation of Scottish Quotas http://www.scotland.gov.uk/Topics/marine/Sea-Fisheries/allocationofscottishquotas

Marine Scotland (2014b) Quota and Effort Management. Last accessed: 09.10.2014. Updated: 25.09.2014. http://www.scotland.gov.uk/Topics/marine/Sea-Fisheries/17681

Marine Scotland (2014c) Scottish Government Conservation Credits Scheme: Scheme Rules. Version 5.0 (2 April 2014). http://www.scotland.gov.uk/Topics/marine/Sea-Fisheries/17681/2013

Marine Stewardship Council (2010) Fishery Assessment Methodology and Guidance to Certification Bodies. Version 2.1, Release date: 1 May 2010. http://www.msc.org/documents/scheme-documents/msc-scheme-requirements/methodologies/Fisheries_Assessment_Methodology.pdf

Morgan, L. and Chuenpagdee, R. (2003) Shifting gears: addressing the collateral impacts of fishing methods in U.S. waters. Pew science series on conservation and the environment. ISBN 1-55963-659-9

MRAG, IFM, Cefas, Azti Tecnalia and PoIEM (2009) An analysis of existing Rights-Based Management (RBM) instruments in Member States and on setting up best practices in the EU FINAL REPORT: PART II Catalogue of Rights-Based Management Instruments in coastal EU Member States. http://ec.europa.eu/fisheries/documentation/studies/rbm/rbm_2009_part2.pdf

NFFO (2010) Sustainable Access to Inshore Fisheries Advisory Group (SAIF) Consultation: NFFO Response http://nffo.org.uk/news/sustainable-access-to-inshore-fisheries-advisory-group-saif-consultation-nffo-response.html

NFFO (2011) Battle Lines Drawn on Transferable Fishing Concessions http://nffo.org.uk/news/battle-lines-drawn-on-transferable-fishing-concessions.html

Pauly, D., Christensen, V., Dalsgaard, J., Froese, R. and Torres Jr., F. (1998) Fishing Down Marine Food Webs. *Science*, Volume 279, No. 5352 pp. 860-863.

Reeves, S.A. and Furness, R.W. (2002) Net Loss – Seabirds Gain? Implication of fisheries management for seabirds scavenging discards in the northern North Sea. Published by RSPB. www.orvisitwww.rspb.org.uk/Images/**netloss**_tcm9-133057.pdf

Regulation (EU) No 1380/2013 of the European Parliament and of the Council of 11 December 2013 on the Common Fisheries Policy, amending Council Regulations (EC) No 1954/2003 and (EC) No 1224/2009 and repealing Council Regulations (EC) No 2371/2002 and (EC) No 639/2004 and Council Decision 2004/585/EC.

Regulation (EU) No 508/2014 of the European Parliament and of the Council of 15 May 2014 on the European Maritime and Fisheries Fund and repealing Council Regulations (EC) No 2328/2003, (EC) No 861/2006, (EC) No 1198/2006 and (EC) No 791/2007 and Regulation (EU) No 1255/2011 of the European Parliament and of the Council.

Scottish Discard Steering Group (2014) Draft Marine Scotland Landing Obligation Strategy. 28.08.2014. http://www.scotland.gov.uk/Resource/0045/00458660.docx

Shetland Shellfish Management Organisation (2014) Regulations in place. Accessed: 09.10.2014 http://www.ssmo.co.uk/page3.htm

Southall T. D, Cappell, R., Hambrey J.B., Hervas, A., Huntington, T.C., Medley, P.A.H., Nimmo, F., Pfeiffer, N. and Tully, O. (2013) Project Inshore Stage 2 DRAFTv4. Prepared by Food Certification International Ltd. http://www.seafish.org/media/921067/2013.07.23_project_inshore_s2_v5.pdf

STECF (2011) Evaluation of multi-annual plans for cod in Irish sea, Kattegat, North Sea, and West of Scotland (STECF-11-07). Edited by John Simmonds and Sarah Kraak. Luxembourg: Publications Office of the European Union.

Suuronen, P., Chopin, F., Glass, C., Løkkeborg, S., Matsushita, Y., Queirolo, D., and Rihan, D. (2013) Low impact and fuel efficient fishing—Looking beyond the horizon. *Fisheries Research*, 119–120 (2012) pp. 135–146.

Thrane, M., 2004. Energy consumption in the Danish fishery: identification of key

factors. J. Ind. Ecol. 8, 223–239. Cited in Suuronen, P., Chopin, F., Glass, C., Løkkeborg, S., Matsushita, Y., Queirolo, D., and Rihan, D. (2013) Low impact and fuel efficient fishing—Looking beyond the horizon. *Fisheries Research*, 119–120 (2012) pp. 135–146.

Tyedmers P. (2001) Energy Consumed by North Atlantic Fisheries, in Zeller, D., Watson, R. and Pauly, D. (eds.), *Fisheries Impacts on North Atlantic Ecosystems: Catch, effort and national/regional datasets*. Fisheries Centre Research Reports 9(3), 12-34.

Van Riel, M.C., Bush, S.R., van Zwieten, P.A.M. and Mol, A.P.J. (2013) Understanding fisheries credit systems: potentials and pitfalls of managing catch efficiency. *Fish and Fisheries*. doi: 10.1111/faf.12066.

Winther, U., Ziegler, F., Skontorp Hognes, E., Emanuelsson, A., Sund, V., Ellingsen, H., (2009) Carbon footprint and energy use of Norwegian seafood products. SINTEF Report Nr. SHF80 A096068, 91 pp. (www.sintef.no). Cited in Suuronen, P., Chopin, F., Glass, C., Løkkeborg, S., Matsushita, Y., Queirolo, D., and Rihan, D. (2013) Low impact and fuel efficient fishing—Looking beyond the horizon. *Fisheries Research*, 119–120 (2012) pp. 135–146.