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# The economic implications of changing regulations for deep sea fishing under the European Common Fisheries Policy: UK case study

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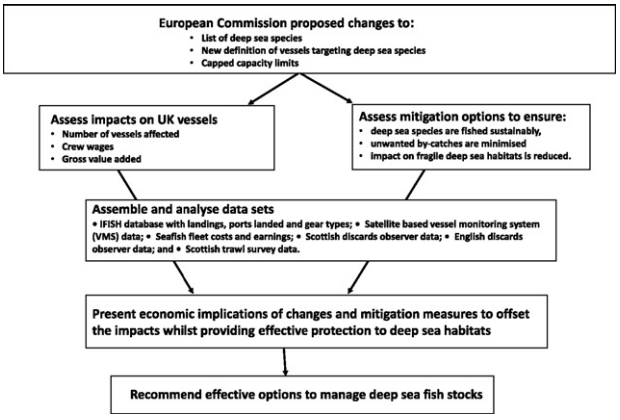
## HIGHLIGHTS

- Changes to species list and definition of deepsea fishing would affect many vessels
- In the UK 695 active vessels would be adversely affected by the proposed changes
- Ways to offset impacts and protect habitats include 400 m depth rule and core areas
- 400 m depth limit and core fishing area approach reduces impact of proposal to zero
- Risk-based approach supports control and sustainability of fisheries and ecosystems

## GRAPHICAL ABSTRACT

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## ABSTRACT

Economic impact assessment methodology was applied to UK fisheries data to better understand the implications of European Commission proposal for regulations to fishing for deep-sea stocks in the North-East Atlantic (EC COM 371 Final 2012) under the Common Fisheries Policy (CFP). The aim was to inform the on-going debate to develop the EC proposal, and to assist the UK fishing industry and Government in evaluating the most effective options to manage deep sea fish stocks. Results indicate that enforcing the EC proposal as originally drafted results in a number of implications for the UK fleet. Because of the proposed changes to the list of species defined as being deep sea species, and a new definition of what constitutes a vessel targeting deep sea species, a total of 695 active UK fishing vessels would need a permit to fish for deep sea species. However, due to existing and capped capacity limits many vessels would potentially not be able to obtain such a permit. The economic impact of these changes from the status quo reveals that in the short term, landings would decrease by 6540 tonnes, reducing gross value added by £3.3 million. Alternative options were also assessed that provide mitigation measures to offset the impacts of the proposed regulations whilst at the same time providing more effective protection of deep sea Vulnerable Marine Ecosystems (VMEs). The options include setting a 400 m depth rule

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that identifies a depth beyond which vessels would potentially be classified as fishing for deep sea species and designating 'core areas' for deep sea fishing at depths > 400 m to minimise the risk of further impacts of bottom fishing gear on deep sea habitats. Applying a 400 m depth limit and 'core fishing' area approach deeper than 400 m, the impact of the EC proposal would essentially be reduced to zero, that is, on average no vessels (using the status quo capacity baseline) would be impacted by the proposal.



## 1. Introduction

The availability of new technologies combined with the decline of many fish stocks on continental shelves have led to a rapid expansion of fisheries operating at the shelf break in deeper water (Merrett and Haedrich, 1997; Roberts, 2002; Norse et al., 2012). While the direct damage on habitats caused by bottom fishing gear has been well documented (Jennings and Kaiser, 1998; Watling and Norse, 1998; Bett, 2000; Gordon, 2003; Armstrong and van den Hove, 2008; Norse et al., 2012; Villasante et al., 2012), little is known about the wider ecosystem effects of deep sea fisheries. Deep sea species of fish and stocks are particularly vulnerable to fishing activity since they tend to be relatively slow-growing and long-lived (Winemiller and Rose, 1992; Koslow et al., 2000; Morato et al., 2006). Cailliet et al. (2001) reported that some species such as rougheye (*Sebastes aleutianus*) reach 200 years old. Furthermore, the habitats and ecosystems occupied by deep sea stocks are largely unknown and this fragile environment is regarded as slow to recover once damaged (Jennings et al., 1998; Morato et al., 2006; Clarke et al., 2015). Clarke et al. (2015) argue that the collateral damage caused by fisheries to biodiversity increases significantly at depths greater than 600 m. While fishing fleets have expanded into deep sea areas, governance arrangements (including licensing and effort controls) and monitoring compliance have not developed at the same pace (Worm and Vanderzwaag, 2007). In the EU, deep sea fisheries have only been subject to detailed management (total allowable catch limits, effort controls) since 2002 through the EC Regulation No 2347/2002 and 2340/2002 (Villasante et al., 2012).

One option proposed, with the intention of ensuring that deep sea species are fished sustainably, unwanted by-catches are minimised, and the impact on fragile deep sea habitats is reduced, is to reinforce the licensing system and gradually phase-out fishing practices that specifically target deep sea species using bottom trawls and bottom-set gill nets. The main policy changes proposed include: i) the introduction of target species and by-catch species permits which would restrict the number of vessels allowed to catch deep sea species; and ii) the prohibition of bottom trawling and fishing by bottom set gillnets on deep sea stocks (EC COM 371 Final, 2012). These specific conditions to fishing for deep-sea stocks in the North-East Atlantic put forward by the European Union (EU), are meant to ultimately repeal the EC Regulation No 2347/2002. Defining a list of fish species which are predominantly found in the deep sea, as a basis for assessing if a vessel is targeting deep sea species or not, adds further complications since several species of fish which are found in the deep sea are also found over a very wide range of depths including shelf depths shallower than 200 m, e.g. ling (*Molva molva*), tusk (*Brosme brosme*) and conger eel (*Conger conger*). A rigorous economic impact assessment of the EC policy proposal is therefore required to inform decisions on how best to manage deep sea fisheries to protect VMEs and sensitive by-catch species whilst minimising the economic impact on fisheries operating in such areas.

Governments throughout the world seek to minimise the impacts of fishery management measures on all aspects of the marine ecosystem, e.g. social, economic and ecological dimensions (Lee and Kirkpatrick, 2006; Cecot et al., 2008). Economic impact analysis typically measures or estimates the level of economic activity at a time when the policy is to be implemented, and calculating the difference from what would otherwise be expected if the policy did not occur (Lee and Kirkpatrick, 2006; Ruddy and Hilty, 2008). Focusing on the UK fishing industry, this study estimates the changes in fishing activity and revenues of the catching sector due to the limitation of licenses permitting the catch of deep sea species, and prohibition of bottom trawls and bottom-set gill nets for those vessels targeting deep sea species as defined by the EC proposal (EC COM 371 Final, 2012) and EC regulation No 2347/2002. Even with improved licensing or effort controls, sustaining deep sea stocks will be challenging because they can be depleted or destroyed much too rapidly for these mechanisms to work. We therefore conduct an appraisal of alternative options including assessment of depth and spatial limits to reduce the risk of impacts to deep sea vulnerable marine ecosystems (VME).

The paper is organised as follows. Section 2 describes the data analyses used to estimate the economic impacts of the EC proposal and presents the changes to income and employment on the UK fleet. In Section 3, empirical analyses of fisheries independent stock assessment survey data and landings data are used to explore how a depth limit could be assigned to define fisheries targeting deep sea species. Section 4 assesses how areas of high biodiversity associated with sponges and cold water corals could be defined to protect sea floor VME from the impacts of bottom fishing activities. Section 5 provides a general discussion of the results and further work.

## 2. Economic impacts of EC proposal on UK fleets

### 2.1. Data sets

In order to understand the economic impacts of the EC proposal (EC COM 371 Final, 2012) data for vessels that catch and land deep sea stocks were extracted from the fishing activity database (IFISH), which contains details of all UK and non-UK registered fishing vessels landings into the UK. The database includes weights and values of landings, ports landed, gear types used and other parameters. Landings and catch information were extracted from the database and summed for each fishing trip. The data from both English and Scottish observer databases of commercial catches were raised against landings for all trips in order to estimate total catches for all trips. Other data sets used included: i) satellite vessel monitoring system (VMS) data, which provide information on vessel position and activity. The EU adopted VMS to monitor the activities of all vessels > 24 m overall length from 1 January 2000. By 1 January 2005 the EU had extended monitoring to all vessels > 15 m long (European Commission, 2003) and from 1 January 2012 to all vessels 12 m or longer overall (European Commission, 2009). ii) Seafish fleet costs and earnings database, containing financial, economic and operational performance indicators for UK fleet segments. The parameters used included the number of days at sea, vessel length, number of crew, proportion of deep sea species in landings and gross value added.

Only vessels landing any number or mix of deep sea species, as defined by the list of species in the EC proposal (Table 1), were selected and entered into a master dataset subsequently used to progress the analyses for all tasks in the present study. The master dataset was analysed to identify vessels that would most likely be impacted by capacity restrictions (potentially limiting the number of permits as defined in EC regulation No 2347/2002) and the banning of bottom trawls and bottom-set gillnets. Only vessel trips defined as targeting deep sea species were selected, based on the fishing authorisations detailed in Chapter II of the EC proposal (EC COM 371 Final, 2012): annual