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Does banning discards in an otter trawler fishery create incentives for more selective fishing?

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ABSTRACT

Reforms of the European Union Common Fisheries Policy (CFP) will implement an EU wide ban on discarding phased in from 2015, requiring the landing of unwanted small and unmarketable fish. The Commission argues that this will create strong incentives for more selective fishing practices; however, there is little information to allow us to predict likely changes in fishing behaviour. Using detailed historic observer and logbook data from English North Sea otter trawlers and information on fish prices and landing costs, we examine the potential impact of a discard ban combined with either effort controls or catch quotas on the landings of an average trip. We calculate fishing incomes based on the assumption that existing fishing behaviour and catch compositions are maintained and compare this with incomes calculated on the assumption that all unwanted catch can be avoided. The difference provides an estimate of the maximum possible financial incentive for fishers to adopt more selective fishing practices. The calculations suggest that a discard ban in isolation will generate little economic incentive to operate more selectively. When combined with effort controls, a reduction in fishing effort may result in a proportional reduction in unwanted catches, but an incentive to actively avoid this catch is unlikely to be generated. Catch quotas would generate much stronger economic incentives, but only for the avoidance of the five quota species. So, contrary to the aims of the reformed CFP, a discard ban may not result in a dramatic reduction in unmarketable catches of all species.

1. Introduction

Discarding, the act of throwing catch back into the sea (Kelleher, 2005), wastes food and economic resources. It represents a major source of undocumented mortality, contributing to the overfishing of European fish stocks (European Commission, 2007a, 2011d). However, the focus of management under the existing European Union Common Fisheries Policy (CFP) is on landings rather than catches. It is illegal to land catch that does not match proscribed catch compositions, legal Minimum Landing Sizes (MLS) or TACs (European Commission, 2002). Discarding represents a legitimate means for fishers to comply with these regulations by disposing of catch which cannot be legally landed, as well as fish with a low economic value (Gezelius, 2008). So there is little incentive for fishers to operate more selectively and avoid this "unwanted catch" in the first place. However, discarding is perceived as unethical and a waste of resources (European Commission, 2011b). Moreover, permitting discarding can result in total catches far exceeding the recommended level of removals from stocks, threatening the sustainability of fisheries (Kindt-Larsen et al., 2011). Fish below MLS are often juveniles, and their removal may reduce the future spawning stock biomass, limiting the ability of stocks to replenish themselves (European Commission, 2002). If fishers were to operate more selectively, avoiding capturing unwanted fish, whether through the adoption of more selective gear, a change of target species, or a change in temporal or geographical distribution of fishing, fishing mortality could fall if marketable catches were unchanged. This would allow a greater number of individuals to survive and reproduce (Sigler and Lunsford, 2001), with a subsequent growth in the size of stocks and exploitable catch (European Commission, 2007b; Valdemarsen, 2002). The European Commission (CEC) has proposed reforms of the CFP that seek to reduce these unwanted catches and eliminate discards by 2019 (European Commission, 2012). Central to the reforms is a discard ban, supported by fishing effort controls or catch quotas (European Commission, 2011a,c,d). Fishing effort controls aim to constrain exploitation of stocks through restricting the time vessels may spend fishing (Cotter, 2010), whilst catch quotas place a direct cap on fishing mortality, requiring all catches to be deducted from quota (Kindt-Larsen et al., 2011). Once the quota is exhausted fishers must halt any activities that risk the capture of the regulated species within the designated

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fishing grounds (Course et al., 2011). The Commission argues that these measures will create strong incentives for the avoidance of unwanted catch through the adoption or development of more selective fishing gears and or other changes to fishing practices (European Commission, 2007a).

If effort controls or catch quotas are combined with a discard ban, having to retain and land unwanted catches may result in additional costs that lead to a fall in income, generating economic incentives to avoid unwanted catches. If hold capacity is limited, the obligation to retain and store unwanted catches may result in full holds (MRAG, 2007), with fish that would previously have been discarded displacing additional valuable landings. When operating under catch quotas, additional trips might have to be undertaken in order to maintain existing marketable landings, with an associated increase in costs. Under effort controls, where additional trips are not possible, fishers may be able to improve the efficiency of operations through gear modifications, investment in technology, or fisher knowledge and skill. This would increase the catches of valuable species per trip and reduce the loss in income generated by a reduction in fishing time (Catchpole et al., 2006; Kraak et al., 2013; van Oostenbrugge et al., 2008). However, an increase in target catches per trip may not be possible if hold space is exhausted by the retention of unwanted catch. As well as occupying hold space, retaining unwanted catch will require additional storage boxes and ice, and will incur additional landings charges (European Commission, 2007a; MRAG, 2007). Sales need to cover both landing charges and the cost of additional boxes and ice, or fishers will see a fall in income. Therefore, a rational fisher should act to avoid these costs and maximise revenue through more selective fishing, reducing the unwanted catch in the first instance (European Commission, 2007a; Johnsen and Eliasen, 2011; Valdemarsen, 2002; Vestergaard, 1996).

Two additional incentives may be generated by a discard ban combined with catch quotas. Unsalable or low value catch of the regulated species will be deducted from a vessel's quota, reducing the amount of quota available for fishers to catch more marketable individuals, and reducing the value of a catch quota. In addition, catching unwanted fish will result in catch quotas being fulfilled more rapidly. This will reduce the duration of the fishing season and prevent continued fishing for other valuable species, reducing fishing income. Operating more selectively to avoid unwanted catch should increase profits (Kindt-Larsen et al., 2011).

These arguments that a discard ban will incentivise more selective fishing seem plausible. However, there is little information to allow us to predict the likely magnitude of changes in fishing behaviour that will result from a discard ban combined with either catch quotas or effort controls. Here, we use extensive observer, logbook and economic data from the English North Sea otter trawler fleet to predict the economic incentives for selective fishing that will be created. This is an important EU fleet where discarding is currently high (Enever et al., 2009). We also determine how the economic consequences of a discard ban are likely to be distributed across different fleet segments.

2. Materials and methods

2.1. Mean landings per trip under a discard ban

2.1.1. Landings weight and value

The reformed CFP (European Commission, 2012) includes a discard ban applied to all regulated fish species and Norway lobster (*Nephrops norvegicus*, hereafter referred to as *Nephrops*). Mean landings per trip were estimated, assuming 100% compliance with this ban. Trip data on the weight, size and species composition of discards from English North Sea otter trawlers under 24 m in length between 2008 and 2010, were extracted from the Centre for Environment, Fisheries and Aquaculture Science's (CEFAS) Observer Programme (COP). These vessels include otter trawlers of varying size primarily targeting *Nephrops* or whitefish (mainly cod, *Gadus morhua*; haddock, *Melanogrammus aeglefinus*; and whiting, *Merlangius merlangus*). The discard data comprised of 78 trips in which 424 hauls (approximately 90% of the total number of hauls) were sampled by on board fisheries observers. Discard rates, and therefore the impact of any discards policies, are known to vary between different sections of a fleet (STECF, 2008). So data were grouped into 6 vessel segments based on gear type, vessel length and engine power (Table 1), in line with the segment designations used by Seafish, the UK fishing industry authority. Landings data for vessels matching these segment designations were extracted from statistics for 2008–2010, held by the UK Department for Environment, Food and Rural Affairs (DEFRA) Fishing Activities Database (FAD). We assume that the behaviour of fishers was not altered by the presence of an observer, and that data from the COP is representative of similar unobserved vessels. In particular, for each segment of the fleet, we assume that the mean weight and size composition of the discarded catch of each species is the same as that in the observer programme. This may not be the case in reality (Benoît and Allard, 2009), however, as the focus of this analysis is the generation of economic incentives and the likely spread of economic impacts between vessel segments, rather than an attempt to forecast the actual economic consequences of implementing a discard ban combined with other measures, valid conclusions can still be drawn from the model. We assume that fish that are currently below marketable size, i.e. are below the minimum conservation reference size (MCRS) as referenced in CFP reform documentation, (European Commission, 2012) or are below the minimum size that is currently landed (minimum marketable size, MMS), cannot be sold, except for fishmeal and that the MCRS is set at existing MLS.

The mean weight in tonnes of marketable catch per trip for each segment and species, C_{vs}, is given by:

$$C_{vs} = \frac{\sum_s L_{vs}}{n_{\mathrm{FAD}_v}} + \frac{\sum_s M_{vs}}{n_{\mathrm{COP}_v}}$$

L_{vs} is the weight in tonnes of landings per species and segment; M_{vs} is the weight in tonnes of discards per species and segment that are of marketable size; n_{FAD_v} is the number of trips per segment documented in the FAD and n_{COP_v} is the number of trips per segment extracted from the COP. The subscripts v and s refer to vessel segment and species, respectively. In both management scenarios it is assumed that existing landings quota are removed and any catch of a quota species and marketable size could be sold for human consumption. The value of the mean marketable landings per trip for each segment, V_v, was calculated as:

$$V_v = \sum_s (C_{vs} \times V_s)$$

where V_s is the average first sale value per tonne of each species landed by the English North Sea otter trawler fleet in the FAD over the period 2008–2010. It was assumed that the marketable discards component of the marketable catch would attain the same price as individuals of the species that had been retained, and that an increase in catch entering markets would not alter sales values.

The mean weight in tonnes of unmarketable landings per trip for each segment, U_v, defined as discards that fall below MCRS or MMS, were calculated as:

$$U_v = \frac{\Sigma_s U_{vs}}{n_{\mathrm{COP}_v}}$$

where U_{vs} is the weight in tonnes of undersized fish of species s caught by all COP trips on vessel segment v.