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The challenges of the landing obligation in EU fisheries

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Abstract

A feasibility study was conducted on the impacts of the new Common Fisheries Policy (CFP) rules requiring catches in regulated fisheries to be landed and counted against quotas of each Member State - the landing obligation (LO), and that catch of species subject to the LO below a minimum conservation reference size (MCRS) be restricted to purposes other than direct human consumption. The aim was to estimate the level of discarded fish likely to be covered by the new rules, the impact of the rules on EU fisheries and the regulatory challenges and responses to them. Data from EU's Scientific, Technical and Economic Committee on Fisheries (STECF) database were analysed to estimate the volume of unwanted catches produced by EU fisheries. Views were sought from policy officials and fisheries scientists through a questionnaire on the implications of the LO and the control of fisheries across Member States, and the potential adjustments that might be needed. Findings show that 11% (44,000 tonnes) of the total catches of EU countries from which data were available are of fish under MCRS. The species with the highest volume of undersized discards associated with the lowest quota, which would potentially restrict the fishing opportunities for other quota species (i.e. choke species), are plaice and haddock with 18,000 and 14,000 tonnes of undersized fish respectively, followed by whiting and cod with 5,000 and 6,000 tonnes of undersized fish respectively. Discards data shows that the Netherlands, United Kingdom, France and Belgium will be most affected by landings for non-human markets. Findings also show that existing infrastructure at landing ports in all Member States is limited because there are currently limited facilities in place to handle animal by-products produced by the catching sector. Policy officials maintained that while they could support the fishing industry through funding programmes, it is the responsibility of fishers to ensure they have the right infrastructure to handle unwanted catches. The expectation is that the LO combined with the restriction to non-human consumption purposes will encourage fishers to

internalise the costs of catching unwanted fish and motivate them to avoid unwanted catch.
This will be realised if sufficient flexibility is given to fishers to find their own solutions to
reducing unwanted catches. It is concluded that gear technology measures exist to enable the
regulated fisheries to increase gear selectivity.

Key words: Common Fisheries Policy; Discards; Fisheries regulations; Incentives; Remote
electronic monitoring; Undersized fish.

1. Introduction

High-levels of discards have been considered a big problem in European and global fisheries for many years [1,2]. Discards vary throughout EU fisheries – in some cases representing more than 60% of the catch, while in other cases – including pelagic fisheries – being very low [3]. In global fisheries, Kelleher [1] estimated that at least 7.3 million tonnes of catch are thrown away each year. There are several ecological and socioeconomic reasons for wanting to reduce fisheries discards. Discarding of dead or dying catch results in fishing mortality with no economic benefit as the catch cannot be sold or eaten, and cannot contribute to the fishery in future years [4]. Alverson et al [5] suggest that the foregone value of discards may match that of landings, equating to potentially billions of dollars lost. For commercial species discarding not only represents a waste of resources but may also threaten the future of stocks, endangering fisheries and the livelihoods of many fishers [6]. One of the major issues associated with discarding commercial species, particularly in EU fisheries, is that it means that catches are higher than the Total Allowable Catches (TAC), which can result in fishing mortality exceeding targets [7-9]. Non-target species may also be overexploited due to incidental capture and discarding [10]. Furthermore, the impacts of discarding extend beyond the commercial and non-target fish species [11], affecting the balance, diversity and functioning of ecosystems [4] including disruption of ecosystem nutrient cycles [7,12]. Discarding is therefore a major problem especially in mixed fisheries where it threatens endangered species, wasting resources, increasing fishery costs and impacting on food webs [13,14].

The need to reduce discards in European fisheries has long been recognised and the elimination of discarding and unwanted catches was identified as one of the main objectives under the 2012 reform of the Common Fisheries Policy (CFP). Article 15 of the new CFP Basic Regulation (Council Regulation No 1380/2013) introduces new rules on discards

including: (i) a landing obligation (LO) under which all catches of regulated species must be landed and counted against quotas of each Member State; and (ii) a requirement that catch of species subject to the LO below a minimum conservation reference size (MCRS) be restricted to purposes other than direct human consumption [15]. The new regulation was introduced on 1 January 2015 for pelagic fish which have a TAC such as mackerel, herring and sprat, and is being rolled out to all demersal species which have TACs in a phased manner between 2016 and 2019. The assumption behind the LO is that fishers will be incentivised to avoid catching fish under MCRS because it will be deducted from their catch quota and have to be sold in non-human consumption markets, with lower profit than that which can be achieved from the human consumption market [16,17]. These new rules for discards are the most important changes to fisheries management in the EU since the creation of the CFP, and therefore feasibility studies are needed to understand the foreseeable challenges and shortcomings of the new policy.

The LO is expected not only to gradually end discarding of dead fish, but also record fishing mortality more comprehensively and thereby improve the quality of data used for scientific stock assessments [15]. However, discard bans are a relatively novel approach to address the discards problem, and still only used in a relatively small number of countries (e.g. Faroe Islands, Iceland, Norway and New Zealand) or particular fisheries (e.g. US Alaskan and Canada's British Columbian ground fish trawl fisheries) [16,18]. Furthermore, past evidence shows that banning discards only works if supported by considerable data collection on the fishery (discarding rates, reasons for discarding, etc.) and integrated with incentives for compliance and additional mitigation measures [16,19]. In a management system with extensive mixed fisheries such as the EU, a LO could be particularly challenging for the viability of these fisheries, due to the high potential for 'choke' species (species with the lowest quota in a mixed-fishery, which restrict the fishing opportunities for other quota

species) [20]. The LO therefore has potential socio-economic and ecological consequences that need to be understood. Further, the odds for success of an EU LO need to be determined to enable fisheries managers put in place supporting measures to ensure success when fully implemented.

One of the most challenging impacts of the LO is the need to find uses for the fish under MCRS. The combined effect of the requirements to land this fish and to restrict use for non-human consumption is to increase the supply of fish (of different species) for the non-human consumption market. This presents some infrastructural and market challenges, and to meet them, there may need to be adaptations both in ports and in business organisations [17]. For instance, landing ports will need to have sufficient equipment, infrastructure and logistics to deal not only with an increase in landings, but also landings subject to separate regulatory conditions and destined for separate markets. In a UK based practical trial of the LO, Catchpole et al. [21] concluded that some ports, particularly the smaller ports, will have problems of congestion, logistical difficulties and added cost (for staff and transport) to deal with the previously discarded fish. They also concluded that with the various exemptions from the LO [15], it is difficult to predict the actual levels of material that will be landed and therefore the level of investment required for additional infrastructure (transport, storage bins, physical space, freezers, cold rooms). Moreover, given that discards cannot go to direct human consumption, they may need to fulfil all requirements provided in the EC Regulation 1224/2009, such as having a physical barrier to avoid cross contamination with catch destined for human consumption.

This feasibility study reviews the impacts of the new CFP rules requiring catches in regulated fisheries to be landed and counted against quotas of each Member State (the LO), and requiring that catch of species subject to the LO below a MCRS be restricted to purposes other than direct human consumption. The study estimates the level of discarded fish likely to

be covered by the new rules, the impact of the rules on EU fisheries and the regulatory challenges and responses to them. The introduction of the LO has brought the need for a fundamental rethink of how fishing activities are managed and controlled in the EU. In particular, the LO provides an opportunity for a decisive move away from technical measures based on prescriptive rules to a radically more flexible and adaptable approach to achieving greater selectivity, focused at regional, fishery or even individual vessel level. Here, the major challenges facing the LO are explored and management recommendations are provided on how to (i) enforce the LO regulations, (ii) avoid unwanted catches, (iii) utilise fish under MCRS, and (iv) incentivise implementation of the LO.

2. Methods

2.1 Estimating levels of fish under the Minimum Conservation Reference Size (MCRS)

A preliminary question underlying the impact of the LO and the related requirements concerns estimates of the volume of unwanted catches produced by EU fisheries. Under the new CFP, only discarded fish under the MCRS will have to come ashore and put to the non-human consumption market. Unlike the old CFP, there will be no discarding of over-quota fish; all of which will go to the human consumption market. Estimates of the volume of fish under MCRS can provide not only an indication of the scale and nature of the problem, but also information on the ports that will be affected, the final destinations of catches, and potential uses that they could be turned into.

The main source of data for estimating the volume of discards was the EU's Scientific, Technical and Economic Committee on Fisheries (STECF) database compiled by the STECF Expert Working Group on the Evaluation of Fishing Effort Regimes in European Waters [22]. Under the Data Collection Framework (DCF) (<http://stecf.jrc.ec.europa.eu/web/stecf/ewg1313>), each EU Member State is obliged to carry

out data collection programs and quantify levels of discards using on-board observers. The STECF database has details of landings and discards estimates for a range of fisheries, areas and species covering 2003-2012 [22]. As data are more reliable in more recent years, and the focus is on species subject to the LO, only information on TAC regulated species covering the years 2010-2012 were used.

This paper is also only focused on demersal species under quota. Pelagic species were excluded since they have limited data on discard levels. It is important to understand the quality and limitations of the data presented. Although observer programmes provide good quality data from the sampled trips, owing to their cost they often have low coverage; typically, around 1% of all of the fishing activities. These data are therefore extrapolated to the fleet level. The low sampling levels and the inherent variation in discarding levels between trips can lead to high variability in the data. Further, the low coverage of national sampling programmes means that confidence bounds around discard estimates are wide and in some cases discard estimates for fisheries 'borrow' information from other fisheries where no specific discard information is available for that fishery under the assumption that discard patterns are comparable. Therefore, owing to the incomplete nature of information on discarded fish and the assumptions used to generate estimates, care should be taken in the interpretation of these data. However, these are the best available data. Data in the STECF database and its quality is determined by the data collected, estimated and submitted to the STECF Fisheries Dependant Information Working Group by each Member State and in this paper no data were omitted or deleted.

An age-length key enables the conversion between the length and the age of fish. The numbers of fish discarded at length was inferred from the numbers discarded at age available in the STECF database. The ICES DATRAS Database has age-length-keys generated by several trawl surveys covering the Baltic Sea, Skagerrak, Kattegat, North Sea, Bay of Biscay,

201 English Channel, Celtic Sea, Irish Sea, West of Scotland and Southern waters. At present,
202 there are more than 15 years of continuous time series data in DATRAS, but only data
203 between 2010 and 2012 were used. The species with age-length keys included cod, haddock,
204 whiting, saithe, megrim, sole and plaice. Other species with MCRS, such as hake, pollack,
205 ling, blue ling and bass did not have age-length information and they were not included for
206 the undersized discards analyses. Using the age-length keys for each geographical area
207 (North Sea, Baltic, North Western Waters and Southern Waters), the proportion of fish under
208 and over MCRS at age was estimated. If no age-length key was available for a certain species
209 in a geographical area, it was borrowed from the nearest area.

210 To estimate the biomass-at-age, weight-at-age information from the ICES assessment
211 working group reports, was applied for each stock [23-26]. For each year between 2010 and
212 2012, landings and discards biomass at age (tonnes) was estimated by multiplying the weight-
213 at-age with the number-at-age. The mean biomass at age of landings and discards for the
214 three years 2010, 2011 and 2012 were calculated. To ensure consistency, the aged biomass of
215 landings and discards were adjusted with the overall landings and discards (where these
216 differed). The proportion of fish under MCRS at age was multiplied with the biomass-at-age
217 to estimate the biomass at age that was under MCRS.

218 To understand how the fishing ports will be affected with the landing obligation and
219 undersized catches, the main European ports receiving fish from EU fleets were identified
220 from European Fish Auction DataNet. The only source of information available on the
221 overall landings (tonnes) per port was the European Fish Auction DataNet report [27], with
222 landings information in 2003, for seven EU countries - Ireland, UK, Portugal, Netherlands,
223 Denmark, France, and Belgium. Although these data are historic, these were the only official
224 landings data promptly available. The proportion of landings in each port in relation to the

total landings in the country was estimated and applied to the undersized discards estimates per country, to estimate undersize discards per port.

2.2 Assessing control issues of the Landing Obligation

To provide a reliable and up-to-date idea of the impact of the LO on the production, landing and potential markets for previously discarded fish, a questionnaire was developed for scientists and policy officials dealing with implementation of the new CFP. The questionnaire was designed to elicit the respondents' views on the implications of the landing obligation and the control of fisheries across EU Member States, and the potential adjustments that might be needed. The questionnaire included open – and closed-ended questions to gather specific information about the landing obligation in each country. The questions focused on gathering details from each Member State on:

- State of infrastructure at each key port where the unwanted catches would be landed. Respondents were asked to indicate the status of infrastructure for storage, handling, sorting and grading, logistics, and security that is needed or available to handle unwanted catches landed for non-human consumption market in the various ports in their country.
- Potential uses for unwanted catches. Respondents were asked to state utilisation opportunities that are available to use unwanted catches, and for each opportunity to provide the species used, whether the utilisation opportunity was already developed or yet to be developed and any comments including whether there are potential barriers in using discards.
- Perceptions of respondents regarding the principal measures in place in each Member State to regulate, monitor and enforce the landing obligation.

A list of policy officials and scientists dealing with the new CFP in the various Member States was compiled from past projects and contacts held by the Project Team. The list had names and email addresses of scientists from 15 Member States and policy officials from 7 Member States. Every person on the list was contacted to take part. In total, replies from eight Member States were received. Some of these had filled in the questionnaire while others just sent an email message providing the status of analyses related to the LO in their country. The responses were summarised for each Member State.

3 Results

3.1 Volume of undersized fish

The overall discard rates, based on all regulated species and including over-quota (large fish) and under MCRS discards vary between 1% in gears such as pots and traps, dredges and longlines, and 60%-70% for beam and otter trawlers (Table 1). Estimates indicate that 11% (around 44,000 tonnes) of the total catches (of species with minimum conservation reference sizes, excluding pelagic species) were of fish under MCRS, across all the countries from which data were available. The countries that show the highest discard rates of quota species (including large and small fish) are Netherlands (54% discard rate), Belgium (34%), Germany (26%) and France (21%). The discard rates in each fishery vary greatly among countries: the otter trawlers' discard rates range between 4% in Lithuania and 75% in the Netherlands; beam trawlers' discard rates vary between 13% in the UK and 73% in Germany; and the netters' discard rates vary between 1% in Germany and 29% in the Netherlands (Table 1).

[Table 1 here]

275

276

277 In most countries, under MCRS (i.e. that which will need to come ashore to the non-human
278 consumption market) discards represent 30-40% of the total discards. This indicates that most
279 discards in EU countries are due to quota restrictions and/or are market driven. Fish over the
280 MCRS may have been rejected by fishers owing to the low relative value compared with
281 other size grades (high-grading) or as a consequence of the quota being exhausted. In terms
282 of proportional catches, the countries that will be most affected by landing small juvenile fish
283 are Belgium, Netherlands and United Kingdom, with 13%, 10% and 8% of the total catches,
284 respectively, being undersized fish. In terms of the total weight of undersized discards, the
285 countries which have the largest volume of undersized catches are Netherlands (11,026 t),
286 UK (10,610 t) and France (4,593 t).

287 The species with the highest volume of undersized discards, and therefore potentially
288 choke species, are plaice and haddock, with 18,000 and 14,000 tonnes of undersized fish,
289 respectively, followed by whiting and cod, with 5,000 and 6,000 tonnes of undersized fish
290 (Table 2). Megrim and saithe have the lowest proportion of undersized discards, with 450 and
291 200 tonnes, respectively. Countries have different key species of undersized fish: in
292 Germany, Netherlands and Sweden the species with the highest undersized discards are
293 whiting, while in France and Ireland it is cod, and in the UK and Denmark it is haddock. The
294 figures provided here are the mean of three years to reduce the influence in the data of
295 particularly strong year classes that occur for some species. However, depending on the life
296 history and population dynamics of each species, yearly or occasional high pulses of
297 recruitment will dictate the catches of undersized and juvenile fish. So it is possible that other
298 species may be the most important during the implementation period of the landing
299 obligation.

[Table 2 here]

3.2 Dealing with undersized fishes subject to LO and MCRS that must be landed

Findings show little evidence on the ability of smaller ports to handle fish for the non-human consumption market, as there is currently little infrastructure at these ports to support the landing of this material. This could be problematic especially on coasts where there are many small ports with small quantities of undersized fish expected to be landed, and the fishers have low income and the nearest fish meal factory is several hundred kilometres away. As mentioned, the underlying data must be interpreted with care, and so it was only possible to make a cursory analysis on how each port will be affected by the LO. Belgium has three ports and the two that will be most affected are Zeebrugge and Oostende (Table 3). In Denmark, the landings are more spread out among the ports and the ports that potentially will be more impacted by landing of unwanted undersized landings are Skagen, Esbjerg, Thyboron and Elvrige Eavne. The French ports most affected by the undersize landings will be Bolougne Sur Mer, Le Guilvinee and Lorient. In the UK, the ports with the highest landings are in Scotland (Peterhead, Fraserburgh and Lerwick) while in England, the ports that will be most affected with landing of undersized fish are Newlyn, Brixham and Plymouth. Ireland has a major port, Killybegs that supports 46% of the landings and most certainly it will be most affected by the LO. The ports in Netherlands most affected will be Yerseke and Urk. Spain, Portugal, Sweden, Latvia, Lithuania, and Poland had no landings information per port.

325 [Table 3 here]

326

327

328 The existing infrastructure appears limited in all Member States because there are currently
329 limited facilities in place to handle animal by-products produced by the catching sector.

330 Policy officials maintained that while they could support the fishing industry through funding
331 programmes such as the European Maritime and Fisheries Fund (EMFF), it is the
332 responsibility of fishers to ensure they have the right infrastructure to handle unwanted
333 catches. In summary, the larger ports are able to handle at least some non-human
334 consumption landings as they already process industrial landings. However, it is not known
335 how smaller ports may deal with these issues as they do not possess most of the infrastructure
336 required.

337 The logistics towards transport of undersized fishes subject to LO and MCRS to a
338 central collection point and refrigeration will increase costs of handling this material. Storage
339 facilities will likely be required to enable the aggregation of sufficient quantities of material
340 from smaller ports to make subsequent transport or treatment more cost-effective. It can be
341 concluded that, in general, the Member States are not yet ready to receive these undersized
342 fishes and have some way to go before having sufficient infrastructures and logistics in place
343 to deal with it.

344 With regards to the challenges posed to business organisations, the commercial /
345 investment environment is difficult. Currently, it is hard to estimate both the level of supply
346 of these fish (and the location of that supply) and the demand (since some of the markets are
347 new). Moreover, since the overriding objective of the new discard rules is to reduce unwanted
348 catches as far as possible, and since it is anticipated that unwanted catches will be reduced –
349 for example through enhancements in fishing gear selectivity and changing fishing patterns

and behaviour – the supply of this fish has the potential to decrease over time. Another challenge is to ensure that products do not find their way into black markets or, once landed for the non-human consumption market, reappear back into the human consumption market. Many alternative ways of utilising undersized fishes subject to LO and MCRS do, however, already exist.

Across the Member States, the final destinations of the undersized fishes include processing into fish meal, fish oil, food ingredients, biogas, animal, pet, and aqua feed, pharmaceuticals, cosmetics and pot bait. Of these utilisation routes, processing into fishmeal and fish oil appears to show the highest potential, since it is already well developed for finfish species in Germany, Spain, England and Sweden. Pet food, food ingredients, and food for minks (fur industry) are already developed in Germany, Sweden and Denmark, while biogas has been partially developed in England and Germany. Others such as ensiling (liquefying fish), composting, rendering, and anaerobic digestion with energy recovery are available in England.

4. Discussion

The new LO has generated a need to review and update the control and technical regulations for fishing in EU waters as monitoring and control shifts from landings to fishing activities at sea. Article 15(11) establishes the need for catches of species below the MCRS to be restricted to purposes other than direct human consumption, including fish meal, fish oil, pet food, food additives, pharmaceuticals and cosmetics. This imposes challenges to Member States including how to promote and ensure selectivity in their fisheries, how to manage the unwanted catches, how to ensure compliance with the new CFP and how to dispose of unwanted catches once landed. Indeed, successful implementation of the new CFP is going to require support through a range of measures and approaches, including those addressing

technical, commercial, social, legal or regulatory and enforcement aspects. However, there is little available data or analysis which directly addresses the composition of discards in terms of being undersized fish (i.e. fish discarded on account of it being undersized) or quota-driven discards (i.e. larger fish – over the legal MCRS but discarded due to lack of quota). Our analyses therefore fill this gap and show that 11% (44,000 tonnes) of the total catches (excluding pelagic species) are of fish under MCRS, across all the countries from which data were available. The data also showed that the Netherlands, United Kingdom, France and Belgium are the countries that potentially will be most affected with landings for non-human markets. The gears with the highest catches of under sized fish are the beam and the otter trawlers, with 15% and 10% of catches as undersized, respectively.

4.1 Enforcing the LO regulations

One of the key challenges of the LO is the need for new regulatory and enforcement mechanisms, as the focus of monitoring and control shifts from landing activities to activities at sea. This shift requires that fishing and discarding practices around the vessel are 100 per cent monitored during fishing in order to detect what is caught and whether there is discarding. Currently, traditional methods of monitoring, which include dockside and fish market checking; the use of aircraft (including drones) to fly over fishing vessels; patrol vessels to carry out inspections at sea; vessel monitoring systems (VMS) using satellite positional data to plot the speed and location of vessels; observers on board vessels to record catches and other scientific data; and self-reported data (E-log, paper logbooks, sale notes, landing declarations), can meet this need only to a limited extent [28].

In recognition of this, increasing attention is being applied to remote electronic monitoring (REM) systems as a means of attaining 100 per cent monitoring of fishing activities [28,29]. There are two aspects to monitoring compliance at-sea under the LO, both

relate to the documentation of the full catch. The first is ensuring that all catches of regulated species are retained on the vessel (unless exemptions are in place), and the second is the accurate recording of the full weight of the catch of regulated species so that removals of fish do not exceed allocated quotas. With the potential to deliver both aspects, REM systems entail the recording of fishing vessel activities through a system of sensors on fishing machinery and closed circuit television (CCTV) cameras which record footage of fish catching and processing, and the data and imagery is then reviewed onshore by compliance analysts [28,30,31]. REM technology is well tested in practice and its technical reliability has been proven [32]. Commenting on recent REM trials in the UK, Ulrich et al. [33] observed that "the impression of these trials is positive". Studies of Scottish and Danish trials have also indicated a high degree of satisfaction from the fishers who voluntarily participated [34,35]. Of course, it could be argued that in such voluntary trials it is hard to disentangle incentives arising from additional quota from those arising from the REM, and it might be the case that the skippers of voluntary vessels are those already most likely to comply and keenest to collaborate with scientists. It is thus difficult to infer how REM would work if it became compulsory for all vessels. However, experiences in Canada and USA demonstrated that larger discard reductions were achieved after REM became mandatory compared with the initial years when the system was voluntary [36]. This is because the system became more strictly enforced and included all vessels, including the less cooperative ones [33].

In monitoring a regulatory obligation such as the LO, two key questions must be asked of REM: whether it is a cost-effective alternative to more traditional monitoring methods, and whether it can detect discards accurately. A WWF report [37] claims that trials of REM which have been carried across the world for more than 15 years have shown that together with random audits, REM has encouraged high levels of regulatory compliance due to its spot-check nature. There is no doubt that REM shows great potential in being applied to

the LO, and in theory, it could replace other control monitoring [35,38]. A case study comparing the costs of on-board observers and REM based on data from the Scottish catch quota monitoring scheme indicated costs varied greatly depending on factors such as the number of analysts, equipped vessels and observers [38], but also on the type of data to be generated from the system (basic compliance with the LO, catch estimates, and/or scientific biological data). The UK government recently concluded that fitting REM equipment on all vessels in the main segment of the demersal fleet (vessels over 15m) would be prohibitively expensive due to the high costs to government of analysing the electronic records and purchasing the necessary equipment [39]. Similarly, an independent study warned that science monitoring and analysis resources could become overwhelmed by it [29]. However, although the capital cost of purchasing and running the REM system could be met by Member State governments, it is possible that it could be funded through the structural funding programmes such as the EMFF. Moreover, a risk-based approach could be applied to reduce the number of vessels required to have REM, by utilising the type of analyses presented here and other data sources, whereby monitoring would be targeted towards vessels/fleet segments with the highest catching capability and generating most historical discards, of both under and over MCRS fish.

REM can be applied to a wide range of tasks including monitoring compliance with technical regulations, catch offloads, transport arrangements, corroborating logbook data, making catch estimates, collecting scientific biological length and species data and for minimizing interactions with protected species. A key advantage of REM is its ability to record continuously a large numbers of trips (compared to traditional on-board observer schemes). However, REM has some technical limitations, especially in obtaining fine detail data, including distinguishing between smaller commercial and non-commercial species, and recording precise weight and length measurements of fish, though it may be possible to

overcome this limitation by new tools of electronic measuring. There is more doubt, however, about the capacity of REM to monitor more complex demersal fisheries effectively. For instance, a recent study [40] evaluated the efficacy of REM for cod catches on vessels in a mixed bottom-trawl fishery and tested the hypothesis that cod catches are difficult to detect with video monitoring, specifically in catches with large volumes of by-catch. Attempts to improve the accuracy of REM data are already underway, which could address these issues: for example, automatic image recognition software is being developed to detect by-catch [35] and to infer catch composition and length distribution from video footage [41]. Recent work in the UK indicates that validation trips with observers is necessary to provide quality control in the data generated through REM [42]. REM does offer the potential to meet both compliance and science needs, but careful consideration must be before blurring the lines between these two management functions, which may need different programme designs and receive different responses from the fishing industry.

4.2 Avoidance of unwanted catches

Enforcement of the LO regulations would be considerably easier if fishers were able to avoid catching unwanted fish by using more selective fishing gear or avoiding risky areas, and if they were to accept the need for the LO regulations. On selective gear, it is important to recognize that the introduction of the discard ban in itself is seen as a driving force for developing more selective gears and methods. Measures to further incentivise the use of more selective gear include limiting access to certain areas or at certain times to those fishers using approved gears, and/or awarding additional quota or effort allocation to those using approved gears. Different technical measures may be suitable in different fisheries, and there is considerable appeal in an approach which allows for flexibility at the level of a specific fishery to deploy the most suitable and effective technical adaptations.

A wide range of gear-based technical measures to reduce the capture of unwanted fish during fishing operations have been developed and trialled in numerous European fisheries, and a substantial amount of work has focussed on improving the selective properties of trawls [43,44]. These gear selectivity devices include: i) coverless trawls (cutaway trawl) that are designed to allow unwanted fish to escape over the top of the trawl, successfully used for haddock and whiting [45,46]; ii) Escape panels (Square mesh panels, benthos release panels) where sections of conventional netting in the trawl is replaced with netting of larger mesh size or with meshes at different orientation to facilitate the escape of unwanted catches [47,48]; iii) Selection grids (separator grids, inclined panels) that include additional material, rigid, flexible grid or netting that is attached to the inner circumference of the trawl. Marine organisms unable to pass through the grid are instead guided to their escape. These have been successfully used to separate shrimps and prawns from fish e.g. [49-52]; and iv) Separator trawls that are horizontally split by a separating panel of netting and terminate in two codends (bags). This design utilises the different behaviour of species during the capture process, some species tend to move upward inside the trawl (whiting, haddock, hake, squid) while others remain on the bottom of the trawl (anglerfish, cod, sole, Nephrops) e.g. [53-55]. Some of these gear-based technical measures have been developed specifically in response to adaptation to the discard ban, and have delivered positive results (56-58). It is important to note that there are two categories of fish to be avoided, low value small fish under MCRS that have to be landed, and catches of species with restricted quotas that could stop the fishery should they become exhausted (also known as ‘choke species’). Therefore, changes to gears will need to address both these categories of unwanted fish; potentially in the same fishery for different species in mixed demersal fisheries.

On avoiding risky areas, spatial measures may be helpful in steering fishers away from unwanted catches. The use of spatio-temporal fishery closures has been used to reduce

catches of both protected and catches of unwanted commercial species [14, 59, 60]. For example, Norway's practice of using real time closures (RTCs) to reduce catches of juvenile fish has been positive, contributing to that country's success in reducing reported discard levels by imposing a ban on discards in 1987. Initially, the economic cost to the fishing industry of compliance with the discard ban was relatively high as fishermen's landings contained higher proportions of small fish with lower values, and the period for which the fishing sector remained unprofitable was estimated to have lasted four years. Today, however, the Norwegian and Barents Sea fisheries are some of the most prosperous in the world [61]. In the USA, a similar success story is recorded of a discard ban in the Alaskan ground-fish fishery, which has been operational since 1998. The retention of some vulnerable and commercially important species is prohibited and, if these catches exceed specified levels, the fishery has to be relocated or closed [44]. These spatial measures to reduce unwanted catches have proven to be successful since they incentivised more selective fishing [16] and sharply reduced discard rates.

4.3 Utilising fish under MCRS

Overall, across the Member States, utilisation opportunities for finfish discards are greater than those for shellfish discards: finfish discards could potentially generate an income if supplied for fishmeal production, whereas shellfish discards to commercial companies are more likely to be at a cost to the fishers. In practice, however, the potential for business development will vary from sector to sector, and locality to locality. Seafish [62] found that the estimated demand for bait is significantly larger than the potential supply that could come from unwanted fish. Trials confirmed that any whitefish quota species could be effectively used as bait by potters targeting crabs.

With regards to the price fishers would be paid for their landings of undersized fishes subject to LO and MCRS, undersized fishes can be sold to fishmeal plants for 65-170 Euros per tonne. This compares with approximately 500 Euros per tonne for the lowest value species and grades sold on the human consumption market. Therefore, there is a considerable price differential between the human consumption and nonhuman consumption markets. It is believed that directing the otherwise unwanted undersized fish to currently available markets would act as a disincentive to catch unwanted fish, because fish by-product processing companies are unable to compete on the price paid for the fish that enters the human food chain.

The economic consequences of the LO will be influenced also by any additional costs imposed on the fishers for handling previously discarded material. For example, the crew may spend more time sorting the catch, to separate what will be landed for the human food chain from that for the non-human consumption. This may affect fishing operations, potentially reducing overall productivity, and it may even necessitate employing more crew [63]. In some cases, fish holds may be filled more rapidly due to the requirement to land all fish, leading to an earlier return to port. This, combined with the need to purchase extra boxes, ice and increased landing fees, means that fishers, even when securing top prices from fishmeal plants, may still make a loss when landing previously discarded material. Although other uses for the material may develop in time, and these may increase the demand and value of this material, the price differential between the discards and fish for the human food chain is so large it would seem unlikely that fishers would find economic advantage in targeting small fish for the non-human consumption market. It is much more likely that fishers will be motivated to avoid this material by adopting more selective gears or by discarding the material illegally.

A major worry does remain that the introduction of the LO for juvenile fish will stimulate black market trade. The specific concern is that since the LO will result in increasing numbers of juvenile fish being landed, these fish may find their way to human consumption black markets rather than the intended markets for non-human consumption. From a practical perspective, it is recognised that the LO may facilitate illegal trade because it will become usual to transport undersized specimens in the hold (whereas previously, such fish had to be discarded and could not be brought to land with risk of detection at sea); i.e. landing, storage and transportation of juveniles will be legal and this can simplify commercialisation via the black market. The risks of black market supply may be further enhanced if measures designed to support the LO are not properly or effectively deployed. A report examining the impact of the LO in the Mediterranean stated the apparent lack of incentives to land unwanted catches and the still unclear penalties for failure to meet this requirement in the Mediterranean, could encourage the illegal sale of fish below the minimum legal size [64]. In the absence of quotas and adequate monitoring of landings, the incentive for fishers to improve selectivity will likely remain low, and there is a recognised risk that undersized fish could be targeted by fishers for the human consumption market [65]. The LO of regulated species in the EU Mediterranean is thus raising some concerns about its effective implementation [66].

4.4 How to incentivise the LO implementation

Fishers' acceptance of LO regulations will be influenced by whether the implementation measures are considered fair, whether the imposed regulations are perceived as meaningful, and whether there is sufficient compatibility between the regulations and traditional fishing patterns and practices [67]. Without adequate mechanisms and approaches to make the deal more attractive to fishermen, it is always going to be a struggle to achieve the LO

574 management objectives sought. Given the limitations of the resources for fisheries control
575 and enforcement in the EU, it will be important to ensure the support from the fishers to the
576 LO regulations to create a higher degree of voluntary compliance behaviour among fishers.
577 Critical to the successful implementation of the new CFP will be effectively communicating
578 the aims of the reforms to the fishers in the context of conserving stocks and delivering
579 sustainable fishing opportunities. One way to ensure fishers' support for the LO would be to
580 persuade them of its ecological benefits. However, stakeholders at a session on the LO at the
581 2014 ICES Annual Science Conference considered that although having limits on total
582 catches could be scientifically supported, the objective of minimising waste and ecosystem
583 impact by utilising all of the fish caught could not be fully supported by scientific evidence.
584 Instead, the requirement to land all catches was thought to be mostly driven by societal and
585 ethical concern. The absence of clearly demonstrated ecological benefits of bringing all
586 catches to shore was believed could undermine the perceived legitimacy of the regulation and
587 the willingness to comply from the industry [21].

588 Another way of ensuring fishers support for the LO is to make its implementation
589 more flexible. In recognition of the potential difficulties that fishing businesses may face
590 when making the transition to the new management system, the new policy includes a
591 number of exemptions and tools designed to assist in its successful implementation. Article
592 15 (13) of the CFP basic regulation states that measures be taken by Member States to ensure
593 compliance with the LO were subject to the principles of "efficiency and proportionality". In
594 line with proportionality, the Regulation contains, quota management flexibilities: inter-
595 species flexibility and inter-year flexibility, and limited and strictly prescribed exceptions to
596 discarding. Inter-species flexibility means the ability to deduct catches of a species, for which
597 quota is no longer available, from the quota of another species, by up to 9% of the quota of
598 the target species (Art 15 (8)). This provision will only apply to stocks of the non- target

species which are within safe biological limits. Inter-year flexibility, sometimes referred to as the ‘banking and borrowing provision’, means that up to 10% of a quota can be utilised in addition to the full quota or saved to be utilised in the next year (Art 15 (9)). Art 15 (4) allows exemption to the LO for species of which fishing is prohibited; species where scientific evidence demonstrates high survival rates and for catches falling under *de minimus* exemptions. The *de minimus* exemption means the ability to gain exemption from the landing obligation under two specific circumstances, namely, proven difficulties in improving selectivity; and disproportionate costs of handling the otherwise discarded material. This provision allows up to 5% (7% and 6% in the first two years respectively) of the total annual catch to be exempted from the LO (Art 15 (5)). Finally, quota management will account for the changes to the way catches are monitored under the landing obligation. A system of ‘quota uplift’ has been agreed whereby previously discarded catches, which were accounted for in estimates of fishing mortality, will become part of the allocated quotas rather than be treated as a separate component of mortality. Therefore, the same quantity of fish can be caught, but there is an increase allocated quota. Because all catches need to be deducted from quota, not just landings, overall this should be a zero-sum game, assuming estimates of discards are accurate. However, owing to Member States having different quota share and fleets having different discard rates, some will effectively gain quota, while others will have to avoid catching fish to avoid a premature end to the fishing season.

There is a risk that the inter-species and inter-year flexibility concessions and exemptions on the basis of high survival or *de minimis* will reduce the motivation of fishers to alter their catch compositions and avoid unwanted catches. However, because of the limitations and restrictions on the levels of banking and borrowing, interspecies flexibility, *de minimis* and survival exemptions, there is still anticipated to be substantial advantage for fishing businesses to change the selectivity of their fishing operations to avoid catching

previously discarded catches. Mangi and Catchpole [6] conclude that the relatively low value of fish for non-human consumption markets is unlikely to create an incentive for fishers to target more of the fish currently discarded with the implementation of the LO.

5. Conclusion and recommendations

The LO is one of the most significant changes there has been in the history of the CFP, calling for a fundamental review of how to manage and control fishing activities in the EU. The expectation is that the landing requirement combined with the restriction to non-human consumption purposes will encourage fishers to internalise the costs of catching unwanted fish and motivate them to avoid unwanted catch, for example by altering their fishing practices. However, in order to realise this, sufficient flexibility must be exercised to allow fishers to find their own solutions to reducing unwanted catches.

Close cooperation between industry and the public sector is needed to minimise uncertainties that act as a constraint on investment in utilisation schemes. Governments and sector leaders need to encourage the relevant parties to initiate collaborative pilot projects on the logistics and marketing opportunities of utilising otherwise unwanted catches, including supporting feasibility studies where possible. Financial support, including through the EMFF, should be provided for such schemes. Also, the efficacy of the marketing rules for using these catches needs to be kept under close scrutiny. The possibility should exist for incentive-based systems to be developed at the regional level and for different schemes to be developed in different regions, or even within the same region for different fisheries/products, to enable successful markets to emerge.

Measures should be taken by the EU to allow more flexibility in the application of the LO regulations in mixed fisheries where the inadvertent capture of choke species would prevent fishers from catching their legitimate quota of other species. In addition to the

649 exemptions permitting quota and discarding flexibilities in Article 15 of the CFP basic
650 Regulation, which should be used whenever appropriate, such measures could include more
651 relaxed rules on gear selectivity, a culture shift based on a flexible framework designed to
652 ensure better management, reward good practice, and rely less on detailed and prescriptive
653 technical rules. Attention should also be given to developing proposals for establishing a
654 system of rewards for vessels that are successful in increasing selectivity (for example, based
655 on models such as the Scottish Conservation Credit Scheme
656 [[http://www.seafoodscotland.org/ja/news-publications/publications/262-scottish-](http://www.seafoodscotland.org/ja/news-publications/publications/262-scottish-conservation-credits-scheme-info-leaflet.html)
657 [conservation-credits-scheme-info-leaflet.html](http://www.seafoodscotland.org/ja/news-publications/publications/262-scottish-conservation-credits-scheme-info-leaflet.html)]. Fishing gear adaptations should be fostered
658 within the regional framework, in close cooperation with industry, since industry is best
659 placed to know what works and what does not, and can exchange experience. Thus, while
660 basic or default requirements can be set at European level, there should be the option to
661 override these at regional and specific fishery level. Even at the level of the vessel, different
662 technical adaptations may be permissible provided that the result is increased selectivity. All
663 this should support an efficient quota market whereby international swaps can be agreed
664 between Member States to prevent fishers from stopping fishing when all other measures
665 have been taken. Together this would enable implementation of the landing obligation to
666 respond directly and flexibly to the particular realities of a fishery and to reduce the pressures
667 on the fishing sector in meeting the LO, thereby reinforcing compliance.

668 Remote electronic monitoring should be introduced for all vessels, or a representative
669 number, as soon as possible, because it is demonstrating sufficient potential to be pursued
670 more extensively. In the short-term, further trials should be developed and implemented and
671 analysis made of any technical and governance issues. These trials should continue to be
672 industry-led and reward-based, and funding in support of these initiatives should be made
673 available through the EMFF. Moreover, in the long-term, the European Commission should

develop a proposal for a Regulation on a governance and legal framework for REM, to clarify the distribution of responsibilities between the scientific and regulatory institutions in order to ensure adequate quality-proofing and proper use of the data (including storage and access to data, legal obligation to delete videos, choice of hauls to be monitored, estimation methods) and the proper role and use of REM data in enforcement processes.

Lastly, more use of spatio-temporal closures is needed to help fishers avoid areas with large numbers of undersized fish. There is scope to develop regional schemes which determine the practical modalities of the pattern that sets out when areas should be avoided and create information-sharing platforms that would enable move-on decisions to be made and communicated quickly. Along with the increased regionalization, already occurring in EU fisheries management as part of the reformed CFP, there should be greater consultation with stakeholders in the implementation of the LO. The consultation process needs to be more effectively executed, and all relevant stakeholders need to be given a realistic opportunity to input their views. In the longer-term, more extensive regional co-management needs to be developed. Any new controls must balance the need for effective control with the need to avoid making the industry less efficient.

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Table 1: Landings (t), discards (t) and proportion of discards under minimum conservation reference size (uMCRS) by country and gear. Table sorted in descending order on the average catch 2010-2012 within each country.

Country	Gear	Landings (t)	Discards (t)	Catch (t)	Proportion Discards (%)	Discards (t)		Proportion discards uMCRS	Proportion of catch uMCRS
						oMCRS	uMCRS		
Belgium	BEAM_TRAWLS	10,138	5,663	15,801	36%	2,315	3,344	59%	21%
	OTTER_TRAWLS	1,131	1,598	2,730	59%	1,147	451	28%	17%
	NETTERS	100	2	102	2%	1	1	30%	1%
Germany	OTTER_TRAWLS	19,594	7,578	27,172	28%	5,466	2,111	28%	8%
	BEAM_TRAWLS	1,794	1,484	3,278	45%	996	487	33%	15%
	NETTERS	1,656	57	1,713	3%	35	22	39%	1%
	LOGLINES	25	0	25	1%	0	0	47%	0%
	POTS&TRAPS	7	0	7	1%	0	0	62%	0%
Denmark	OTTER_TRAWLS	46,009	7,628	53,636	14%	4,585	3,043	40%	6%
	NETTERS	8,843	846	9,689	9%	661	183	22%	2%
	BEAM_TRAWLS	1,323	115	1,438	8%	12	103	89%	7%
	SEINES	569	76	646	12%	44	32	42%	5%
	LOGLINES	441	11	452	2%	6	4	41%	1%
	DREDGE	7	1	7	8%	-	1	100%	8%
	POTS&TRAPS	62	1	63	1%	0	0	60%	1%
Spain	OTTER_TRAWLS	1,543	10,929	12,472	88%	8,403	2,526	23%	20%
	NETTERS	2	0	2	3%	0	0	2%	0%
Estonia	OTTER_TRAWLS	519	89	607	15%	60	29	33%	5%
France	OTTER_TRAWLS	22,141	13,006	35,147	37%	8,494	4,512	35%	13%
	NETTERS	2,351	248	2,599	10%	201	47	19%	2%
	BEAM_TRAWLS	558	108	666	16%	75	34	31%	5%
Ireland	OTTER_TRAWLS	12,547	6,495	19,042	34%	3,503	2,991	46%	16%
	NETTERS	1,371	19	1,390	1%	17	2	10%	0%
	BEAM_TRAWLS	1,254	825	2,079	40%	607	218	26%	10%
Lithuania	OTTER_TRAWLS	2,487	153	2,640	6%	99	54	35%	2%
	NETTERS	326	50	376	13%	32	18	37%	5%
Latvia	OTTER_TRAWLS	2,690	408	3,098	13%	275	133	33%	4%
	NETTERS	1,796	147	1,943	8%	100	47	32%	2%
Netherlands	BEAM_TRAWLS	35,401	26,273	61,674	43%	17,637	8,637	33%	14%
	OTTER_TRAWLS	5,913	9,256	15,169	61%	6,866	2,389	26%	16%
	NETTERS	253	2	255	1%	1	0	23%	0%
Poland	OTTER_TRAWLS	7,714	1,114	8,827	13%	832	282	25%	3%
	NETTERS	3,533	254	3,787	7%	170	84	33%	2%
	LOGLINES	1,082	82	1,164	7%	48	34	41%	3%
	POTS&TRAPS	2	0	3	7%	0	0	66%	5%
Sweden	OTTER_TRAWLS	11,955	3,012	14,967	20%	1,956	1,057	35%	7%
	NETTERS	1,956	70	2,026	3%	43	27	39%	1%
	LOGLINES	667	35	702	5%	21	14	41%	2%
	POTS&TRAPS	8	0	8	1%	0	0	54%	0%
United Kingdom	OTTER_TRAWLS	71,734	25,316	97,050	26%	15,150	10,068	40%	10%
	BEAM_TRAWLS	3,183	1,474	4,657	32%	939	535	36%	11%
	NETTERS	660	67	726	9%	60	7	10%	1%
Total		285,347	124,488	409,835	30%	80,858	43,527	35%	11%

878 Table 2: Landings (t), discards (t) and proportion of discards under minimum landing size
879 (uMCRS), by country and species; table sorted in descending order on the average catch
880 2010-2012 within each country.

881

Country	Gear	Landings (t)	Discards (t)	Catch (t)	Proportion Discards (%)	Discards (t)		Proportion discards uMCRS	Proportion of catch uMCRS
						oMCRS	uMCRS		
Belgium	Plaice	5,970	5,443	11,413	48%	2,429	3,015	55%	26%
	Sole	3,428	302	3,730	8%	100	199	67%	5%
	Cod	960	180	1,139	16%	83	97	54%	9%
	Haddock	278	844	1,123	75%	534	310	37%	28%
	Megrim	575	160	735	22%	155	5	3%	1%
	Whiting	158	333	491	68%	163	171	51%	35%
	Saithe	2	0	2	4%	0	0	6%	0%
Germany	Cod	9,523	994	10,517	9%	609	385	39%	4%
	Saithe	9,882	249	10,131	2%	231	18	7%	0%
	Plaice	3,843	7,858	11,701	67%	5,678	2,181	28%	19%
	Haddock	692	88	779	11%	39	48	55%	6%
	Sole	445	28	473	6%	12	16	57%	3%
	Whiting	90	51	141	36%	12	39	77%	28%
Denmark	Cod	27,138	3,795	30,933	12%	2,686	1,109	29%	4%
	Plaice	19,754	3,761	23,516	16%	2,186	1,576	42%	7%
	Saithe	7,219	195	7,414	3%	176	19	10%	0%
	Haddock	2,461	888	3,349	27%	244	643	72%	19%
	Sole	673	26	699	4%	18	6	25%	1%
	Whiting	94	23	117	20%	7	16	69%	14%
Spain	Haddock	38	10,015	10,052	100%	7,579	2,435	24%	24%
	Megrim	1,504	912	2,416	38%	823	90	10%	4%
	Whiting	4	2	5	31%	1	0	24%	7%
Estonia	Cod	885	143	1,028	14%	91	52	36%	5%
France	Haddock	8,030	9,500	17,530	54%	6,464	3,036	32%	17%
	Cod	3,699	1,750	5,449	32%	751	1,000	57%	18%
	Saithe	4,439	3	4,442	0%	3	0	3%	0%
	Whiting	2,927	1,042	3,969	26%	705	337	32%	8%
	Megrim	1,976	418	2,395	17%	379	39	9%	2%
	Plaice	1,755	607	2,361	26%	442	164	27%	7%
	Sole	2,228	42	2,270	2%	26	17	40%	1%
Ireland	Haddock	4,241	3,652	7,893	46%	1,870	1,782	49%	23%
	Whiting	5,100	2,077	7,177	29%	1,271	806	39%	11%
	Megrim	2,956	589	3,545	17%	553	37	6%	1%
	Cod	1,304	611	1,915	32%	203	408	67%	21%
	Saithe	1,128	5	1,134	0%	5	1	15%	0%
	Plaice	267	431	698	62%	242	189	44%	27%
	Sole	177	11	189	6%	10	2	13%	1%
Lithuania	Cod	2,889	221	3,110	7%	144	77	35%	2%
Latvia	Cod	4,675	609	5,284	12%	409	200	33%	4%
Netherlands	Plaice	30,217	32,090	62,307	52%	23,274	8,816	27%	14%
	Sole	8,644	1,461	10,104	14%	707	754	52%	7%
	Cod	2,152	251	2,403	10%	145	106	42%	4%
	Whiting	424	1,582	2,007	79%	277	1,306	83%	65%
	Haddock	145	146	291	50%	101	45	31%	15%
	Saithe	17	0	17	1%	0	0	11%	0%
Poland	Cod	12,414	1,369	13,783	10%	1,033	336	25%	2%
	Plaice	45	117	162	72%	43	74	63%	46%
Sweden	Cod	12,946	2,526	15,472	16%	1,683	843	33%	5%
	Saithe	1,361	184	1,545	12%	167	17	9%	1%
	Plaice	233	350	582	60%	181	168	48%	29%
	Haddock	277	134	411	33%	31	103	77%	25%
	Whiting	43	4	47	9%	1	4	86%	8%
	Sole	23	0	23	1%	0	0	24%	0%
United Kingdom	Haddock	29,688	9,748	39,436	25%	3,902	5,845	60%	15%
	Saithe	13,991	4,776	18,767	25%	4,396	380	8%	2%
	Cod	12,908	4,903	17,811	28%	3,486	1,416	29%	8%
	Whiting	9,235	5,032	14,267	35%	2,731	2,301	46%	16%
	Plaice	4,476	1,795	6,271	29%	1,081	617	36%	10%
	Megrim	4,563	585	5,148	11%	542	43	7%	1%
	Sole	787	22	809	3%	14	8	35%	1%
Total		287,993	124,936	412,929	30%	81,127	43,707	35%	11%

882

883 Table 3: Proportion of the total landings at each port in 2003 (source: EAFPA, 2005) and
884 estimates on proportion of undersize discards per port. *The landings from UK are from
885 2013.

Country	Number of ports	Port name	Proportion of total landings	Indicative uMCRS per port (t)	Country	Number of ports	Port name	Proportion landings	Indicative uMCRS per port (t)		
Belgium	3	Zeebrugge	68%	>1000	United Kingdom*	51	Peterhead	28%	>1000		
		Oostende	31%				Others	13%			
		Nieuwpoort	1%	50 - 100			Lerwick	12%			
Denmark	9	Skagen	24%	500 - 1000			Fraserburgh	6%		100 - 500	
		Esbjerg	22%				Brixham	1- 3%			
		Thyboron	17%				Scrabster				
		Elvrige Eavne	14%	Plymouth							
		Hanstholm	9%	Newlyn							
		Hirtshals	7%	Ardglass							
		Bornholm	2%	Kinlochbervie							
		Greni		Douglas							
		Hvide Sande		Kirkcudbright							
France	44	Boulogne/Mer	16%	>1000			Kilkeel	1- 3%	100 - 500		
		Le Guilvinec	8%	500 - 1000			Ullapool				
		Lorient	7%				Mallaig				
		Granville	6%				Holyhead				
		Concarneau	5%				Leigh-on-Sea			1%	50 - 100
		Saint Guenole	5%	Scalloway and Isles							
		Erouy	4%	Portavogie							
		Saint Quay Portrieux		Milford Haven							
		La Turballe		Shoreham							
		Cherbourg		3%			Bridlington				
		Port En Bessin					North Shields				
		Saint Jean De Luz	Newhaven								
		Loctudy	Kings Lynn								
		Sete	Ilfracombe								
		Saint Gilles	Saundersfoot	<1%			<50				
		Les Sables D'Olonne	Boston								
		Fecamp	Lochinver								
		Roscoff	Whitstable								
		Ole Ron	Campbeltown								
		Dieppe	Troon								
		Douarnenez	1%	Teignmouth							
		Le Croisic		Cullivoe							
		Port La Nouvelle		Whitehaven							
		Copemart		Grimsby							
		Grau Du Roi		Oban							
		La Rochelle	Eastbourne								
		Arcachon	Stromness								
		Noirmoutier	1%	Portsmouth							
		Grandcamp		Weymouth							
		Ile D Yeu		Scarborough							
		Proguaport		Port St Mary							
		Loguivy		Salcombe							
		Brest	Fishguard								
		Port De Bouc	<1%	Blyth							
		Saint Malo		Peel							
		Ouiberon		Whitby							
		Dunkerque		Stornoway							
		Agde		Wells							
		Audierne		Warrenpoint							
		Port Vendres									
		Royan									
		Cancale									
		Lesconil									
		Grand-Fort-Philippe									

Country	Number of ports	Port name	Proportion landings	Indicative uMCRS per port (t)
Ireland	39	Killybegs	46%	>1000
		Rossavea I	7%	500 - 1000
		Other Ports	6%	
		Cobh	5%	
		Dunmore East	4%	
		Wicklow	4%	
		Rathmullan	3%	100 - 500
		Dingle		
		Castletownbere		
		Howth		
		Pena		
		Greendastle	2%	
		Union Hall	1%	
		Downings		
		Kilmore Quay		
		Kinsale		
		Battimore		
		Schull	1%	
		Malin Head		
		Clogherhead		
		Moviller		
		Crosshaven		
		Durmenori/St. Helen	<1%	<50
		Burtonport		
		Valehtia		
		Pailycotion		
		Skerries		
		Helvick		
		Arklow		
		Parma Gee		
		Gast Egregory		
		Dunlaogha Ire.		
		Courtown		
		Garrigaholt		
		Werford		
		Athills		
		Carna		
		Aran Islands		
		Bantry		
Netherlands	13	Yerseke	34%	>1000
		Urk	19%	
		Harlingen	9%	
		IJmuiden	7%	500-1000
		Den Helder	5%	
		Goedereede		
		Vlissingen		
		Den Oever	3%	100 - 500
		Scheveningen	3%	
		Breskens	2%	
		Colijnsplaat	1%	
		Zoutkamp	0%	