Discard Atlas of the North Western Waters Demersal Fisheries

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Executive summary

The landing obligation is a key element of the reform to the Common Fisheries Policy (CFP) which came into force on 1st January 2014. Other key changes include regionalised fisheries management and a legal commitment to fish sustainably. A ban on discarding comes into force for pelagic fisheries first, on 1st January 2015. Subsequently, it will cover demersal fisheries between 2016 and 2019. It only applies to fish stocks which are managed by catch limits, or quotas. Non-quota stocks are not covered by the discard ban.

The landing obligation, often referred to as the discard ban, is a ban on discarding fish which are subject to catch limits, so that all catches must be brought ashore, except where they are subject to specific exemptions. This means that quotas now control what is caught at sea, rather than what is landed onshore.

Article 14 of the new CFP basic regulation stipulates that "Member States may produce a "discard atlas" showing the level of discards in each of the fisheries covered by the landing obligation". For the North Sea, the 'Scheveningen Group' developed a discard atlas to document the current knowledge of how much discards are generated in the North Sea and to assemble information on strategies to mitigate discards. This latest report presents an analogous document, following the format of the North Sea work, to produce a discards atlas for the North Western Waters (NWW) region – specifically, for demersal fisheries.

The principle of the landing obligation is to provide a limit on total catch, whereby all catches of regulated species are landed, and once any of the quotas in a fishery are reached, fishing activities cease on species whose quotas are exhausted. It is anticipated this will motivate changes in fishing behaviour and practices. To maximize revenue from their catch, fishermen will attempt to avoid catching fish that will result in a curtailment of the fishing season (sometimes referred to as 'choke species') and avoid catching undersized, and low-value fish, which would be deducted from their quota for little or no profit. The level of incentive, and the potential impact for vessel operators, will be dependent on their catch and discard patterns and the quota availability.

The purpose of this discard atlas is to provide evidence of discard patterns for different fishing fleets in the North Western Waters region. This information may be used to assist regional managers with the identification of fisheries which may need more focussed attention in the transition to the landing obligation, and in the formulation of a Discard Plan and Multi-Annual Plans (MAPs). There is substantial detail presented in this atlas. The NWW Atlas is intended to be interrogated by regional managers to enable comparisons between fishing vessel groups (fleet segments), fisheries and species, and in turn facilitate priority setting. It is not the intention of the atlas to articulate different management options; hence there is limited analysis and discussion of the content.

With this purpose in mind, it is important to understand the quality of the data. The NWW Atlas is derived from the best available data. The results presented are based on the official STECF database which holds information on landings and discards between 2003 and 2012. The information on effort,

landings and discards in EU fisheries are derived from two sources - effort and landings from the national fisheries statistics, and discards data collected under the EU Data Collection Framework (DCF, EEC, 2000).

Discard data are sampled and recorded for less than 2% of all fishing operations, and these data are extrapolated to the fleet level. Where no data exist for a fishery, fill-ins are used from data from related fisheries, as is standard practice. If an estimate is largely derived from such filled-in data it may be less accurate. As with the North Sea atlas, the data quality of discard estimates was assessed by calculating the proportion of the discard estimate derived from actual observations relative to the overall amount of discards. However, this does not account for the level of initial extrapolation from the samples to the fleet, which can mean estimates are based on low samples. Known uncertainties in the data are described in the text that support the tables.

The STECF database was used to compile landings and discards data for some of the most-commonly caught species in the North Western Waters (STECF 2013a) using data from 2010 to 2012. The data presented are from the west of Scotland (VIa), Irish Sea (VIIa) and the Celtic Sea (ICES Divisions VII b-c and e-k). The data for the Eastern Channel (VIId) was compiled for the Discard Atlas of North Sea Fisheries and can be found in Annex 8. Discard ratios were used to express the percentage proportion of the catch that consisted of discards. Data are presented in the same format as that in the 'Discard Atlas of North Sea Fisheries' - estimated totals of landings and discards (in tonnes) by year and species, country and fisheries. The analysis of the pelagic fisheries was conducted prior to, and separately from, the demersal fisheries. The 'Discard Atlas of the North Western Waters Pelagic and Industrial Fisheries' can be found here.

Included within the NWW Discard Atlas is a review of some of the legislation introduced and research conducted to mitigate discards. To improve mitigation strategies, it is important to know the reasons for discarding. Unfortunately, precise reasons are often unknown, because they are not recorded by fishers, and also because a mix of market- and regulatory conditions may influence decisions to discard. Inferences on the drivers for discarding can be made based on the length of the fish and the presence of different regulations. This is further elaborated upon in the 'Discard Atlas of North Sea Fisheries' which can be found here.

The various reasons for discarding will necessitate different solutions. It should be understood that the methods most effective at mitigating discards of larger fish, driven by quota restrictions, will be different to discards that are undersized and are driven by the selective properties of fishing gears. Therefore, the data presented here should be used as a start point to identify fisheries which require more attention in the implementation of the CFP. More detailed analysis of the discard patterns in these fisheries is then required to determine appropriate mitigation and management strategies. It should also be noted that historical discard patterns (2010-12) indicate the potential issues under the future landing obligation, but pulses in recruitment or changing distributions of species may create different issues for fishing vessel operators than those that can be deduced from the historical data presented here.

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1 Introduction

Discarded catch at sea is often a response to regulatory and/or market forces during commercial fishing and is generally considered to be a waste of natural resources (Ulhmann *et al*., 2014). In the recognition of the economic and ecological consequences of discarding and the growing social awareness, the reformed Common Fisheries Policy (CFP) set out a gradual elimination of discards. Under the discard ban, or landing obligation, all catches of quota species have to be kept onboard, landed and counted against the quotas.

Article 14 of the basic regulation on the CFP states that "*member States may produce a "discard atlas" showing the level of discards in each of the fisheries covered by Article 15 (landing obligation)".* In this context, the North Western Waters (NWW) regional managers requested the production of a discard atlas for the North Western Waters region. The objectives of the NWW Discard Atlas are to document the current knowledge of how much is discarded in the North Western Waters, and to discuss strategies to mitigate the discards. The information presented in the NWW discard atlas can be used to prioritize actions and establish the North Western Waters regional discard plan.

The information presented in the NWW Discard Atlas has been compiled by a joint group of scientists and policy-makers from the associated Member States. The group agreed that the objectives of the NWW discard atlas are: 1) description of the fisheries operating in the North Western Waters, 2) quantify how much discards are generated by country and fisheries for the main species for each of the three areas - Celtic Sea (ICES Divisions VII b-c, e-k), Irish Sea (VIIa) and West of Scotland (VIa) (data for the Eastern Channel (VIId) is Annex 8), 3) compare the STECF and ICES discard estimates, and 4) document management strategies to mitigate discards based on what are currently legislated mitigation measures and those under development and research in each Member State. The data used in this atlas are based on the publically available database compiled by the STECF. To enable comparative analyses and ease of understanding, the structure of the NWW Discard Atlas is based on the structure used in '*The Discard Atlas of North Sea fisheries*' (Anon., 2014b).

2 Material and Methods

2.1 Description of the areas and fisheries

2.1.1 Physical and biological environment

The North Western waters include the shelf area west of Scotland (ICES Division VIa), the Irish Sea (ICES Division VIIa) and the Celtic Sea (ICES Divisions VII b-c and e-k) (Figure 2.1-1). The Celtic Sea is an extended shelf where most of the area is shallower than 100 m. It is limited to the west by the slope of the Porcupine seabight and the Goban Spur. To the west of Ireland, the Porcupine Bank forms a large extension of the shelf limited to the west by the Rockall Trough. The Irish Sea is shallow (less than 100 m deep in most places) and largely sheltered from the winds and currents of the North Atlantic.

The English Channel is a shallow (40-100 m) part of the continental shelf. Thermal stratification and tidal mixing generate the Irish coastal current which runs westwards in the Celtic Sea and northwards along the west coast of Ireland. In the Irish Sea, an inshore coastal current carries water from the Celtic Sea and St. Georges Channel northwards through the North Channel. The main oceanographic front in the NE Atlantic region is the Irish Shelf Front that occurs to the south and west of Ireland, and exists all year-round. This front marks the boundary between waters of the shelf

Figure 2.1-1. North Western waters overview

(often mixed vertically by the tide) and offshore North Atlantic waters.

2.1.2 Stocks and Fisheries

2.1.2.1 Celtic Sea

The variety of habitats in the Celtic Sea accommodates a diverse and abundant range of fish, crustaceans and cephalopods species that enables a wide variety of fisheries targeting different species assemblages.

The Celtic Sea groundfish community consists of over a hundred species and the most abundant 25 comprise 99% of the total estimated biomass and around 93% of total estimated numbers (Trenkel

and Rochet, 2003). The ecoregion has important commercial fisheries for cod, haddock, whiting and a number of flatfish species. Hake (*Merluccius merluccius*) and anglerfish (*Lophius spp*) are also fished across the whole area. The shelf slope (500-1800 m) comprises a distinct species assemblage, including roundnose grenadier (*Coryphaenoides rupestris*), black scabbardfish (*Aphanopus carbo*), blue ling (*Molva macrophthalma*) and orange roughy (*Hoplostethus atlanticus*), as well as deep-sea squalids (sharks) and macrouridae.

The major commercial invertebrate species is the Norway lobster (*Nephrops norvegicus*), targeted by trawl fisheries throughout the Celtic Sea. Common cuttlefish (*Sepia officinalis*) are also exploited in the Celtic Sea, whilst there is dredging for scallops and smaller bivalves in the western English Channel, Irish Sea and west of Scotland. Pot fisheries take place for lobster (*Homarus gammarus*) and edible crab (*Cancer pagurus*) in coastal areas of this region.

The main gear types used in the Celtic Sea are otter trawls, beam trawls, netters, dredges and pots. The description of main fisheries in the Celtic Sea is based on gear type and mesh size:

Celtic Sea otter trawls

- **TR1 (mesh size >=100mm)**

The otter trawlers with codend mesh size over 100mm are the predominant fishery in the Celtic Sea, with the highest fishing effort, accounting for 23% of the total effort (STECF 2013). It has a widespread distribution in the whole area, but most of the effort is exerted in ICES VII e, g and h (Figure 2.1-2). The countries that contributed with most effort were France, Spain, Ireland and England. The TR1 fishery is characterized to be a mixed fishery, mainly targeting 'gadoid' species, such as haddock (*Melanogrammus aeglefinus*), cod (*Gadus* morhua) and whiting (*Merlangus merlangus*) as well as anglerfishes and megrims. There is an important TR1 mixed fishery in ICES VIIj-k, mainly operated by Irish and Spanish vessels and targeting anglerfishes (*Lophius* spp), megrims (*Lepidorhombus whiffiagonis*), hake (*Merluccius merluccius*), haddock and whiting.

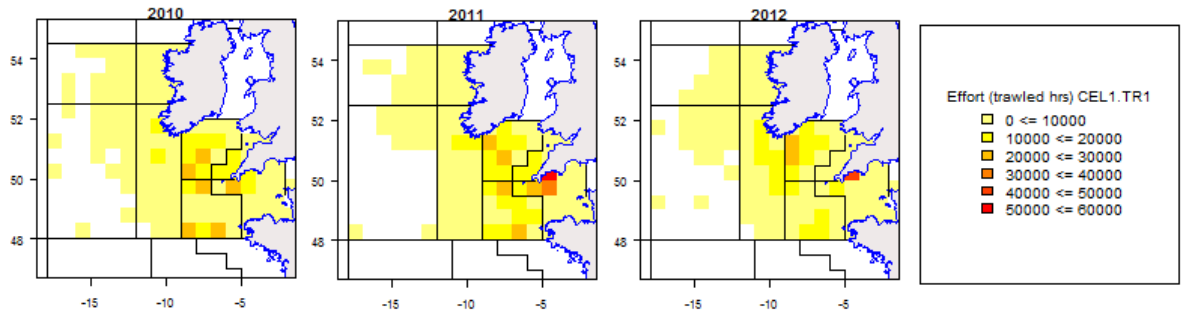


Figure 2.1-2 Distribution of Celtic Sea international fishing effort of TR1 fishery, in fishing hours, between 2010 and 2012. Source: STECF, 2013

- **TR2 (mesh size 70-100mm)**

The trawlers with a codend mesh size range 70-100mm is the fishery with second highest effort in Celtic Sea, accounting for 18% of the total effort. It is less widespread than the TR1, and the main

fishing areas are localized in ICES VIIe, close to the English and French shores (Figure 2.1-3) and in VIIg, close to the Irish shore. However, the TR2 effort is likely to be more widespread and higher than showed in the Figure 2.1-3. The TR2 fishery in the Celtic Sea is mainly characterized by: 1) fishery for Norway lobster (termed '*Nephrops*') operated mainly by Irish trawlers. There are significant *Nephrops* fisheries in the Smalls, Labidie and Porcupine bank that are not shown in the effort maps; 2) mixed fishery targeting anglerfish, gadoid species and non-quota species (cuttlefish and squid), taking place in VIIe close to the English and French shore; 3) Spanish-mixed fishery (otter trawl with codend mesh size 70-99mm) targeting flatfish, principally megrims and anglerfish, with hake as one of the main by-catches. Effort is distributed on shallow waters of Grand Sole and Porcupine Bank fishing mainly in Division VIIj. According with the STECF data (2013), most of the TR2 effort is mainly operated by English and French vessels, however most of the Spanish effort in the Celtic Sea are TR2 and is likely to be underestimated due to a lack of data.

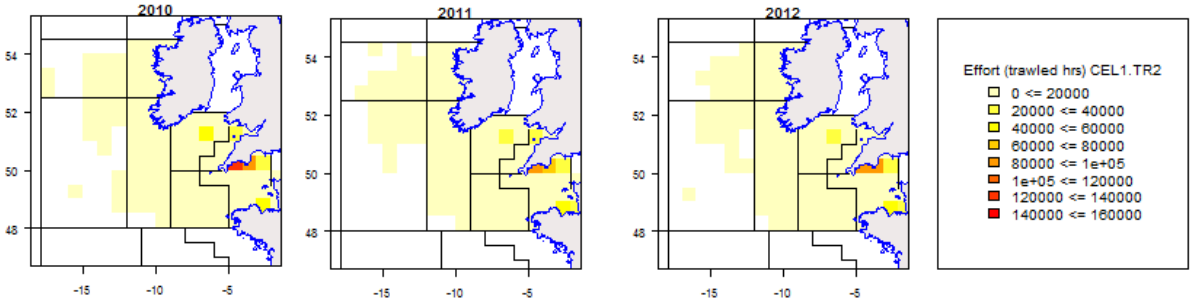


Figure 2.1-3 Distribution of Celtic Sea international fishing effort of TR2 fishery, in fishing hours, between 2010 and 2012. Source: STECF, 2013

- **TR3 (mesh size 16-31mm)**

The effort of small meshed TR3 fishery is relatively little compared with TR1 and TR2 fisheries, contributing with just 1% of the total effort. The TR3 effort is mainly localized in ICES VIIe and h and to a lesser extend in VIIb (Figure 2.1-4). In ICES VIIe this fishery targets mainly sprat (*Sprattus sprattus*) and is predominantly operated by English vessels. In ICES VIIh and b, the main target species is the boarfish (*Capros aper*), by the Scottish and Irish vessels, respectively.

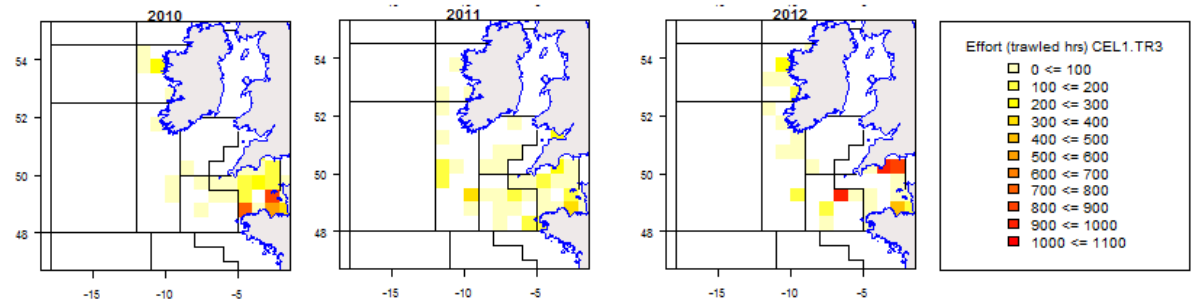


Figure 2.1-4. Distribution of Celtic Sea international fishing effort of TR3 fishery, in fishing hours, between 2010 and 2012. Source: STECF, 2013

Celtic Sea beam trawlers

Only one beam-trawl category operates in the Celtic Sea, the beam trawlers with 80-120mm codend mesh size (BT2). The BT1 (mesh size >120mm) have a negligible effort in this area. The BT2 effort accounts for 10% of the total effort in the Celtic Sea and is mainly carried out by English, Belgium and Irish vessels and is confined to ICES VIIe, f, g and h (Figure 2.1-5). This fishery is characterized by flatfish species including plaice (*Pleuronectes platessa*) and sole (*Solea solea*), as well as anglerfish and cuttlefish.

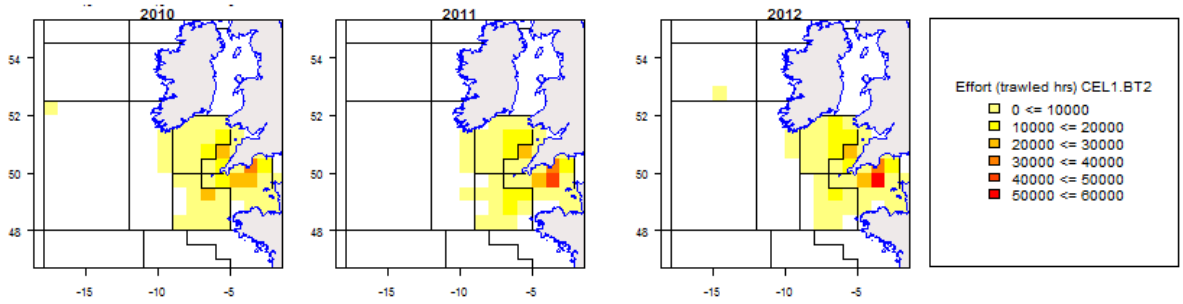
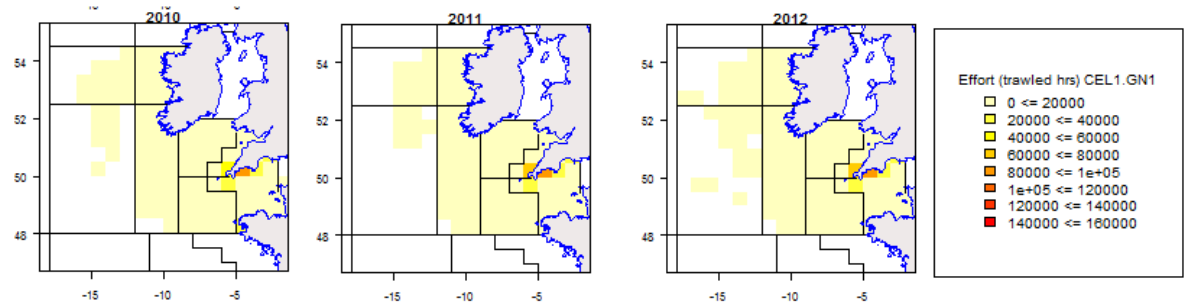


Figure 2.1-5. Distribution of Celtic Sea international fishing effort of BT2 fishery, in fishing hours, between 2010 and 2012. Source: STECF, 2013

Celtic Sea gill and trammel nets

The main gill (GN1) and trammel (GT1) nets effort are from the French and English fisheries. The GN1 effort is widely spread in the Celtic sea, but most the effort is close to the English and French shore (Figure 2.1-6). Both fleets mainly target demersal species including hake and pollack (*Pollachius pollachius*). The French fleet also targets for crustacean species (Spider crab and common crab). Also a Spanish small fleet (only 2 vessels) target hake operated in Divisions VII j and VIIk. A pilot survey in 2006 showed a discard rate < 5%, so discards sampling programme was not focussed on gillnets. There is an important Irish gillnet fishery targeting cod in VIIe between January and March. Much of this fishery is operated by vessels under 12m.

The trammel net effort is less wide spread than the gillnet fishery and most of the effort is carried out close to the Brittany coast. The targets species for this fishery are sole, anglerfish and crustaceans (Spider crab and common crab).



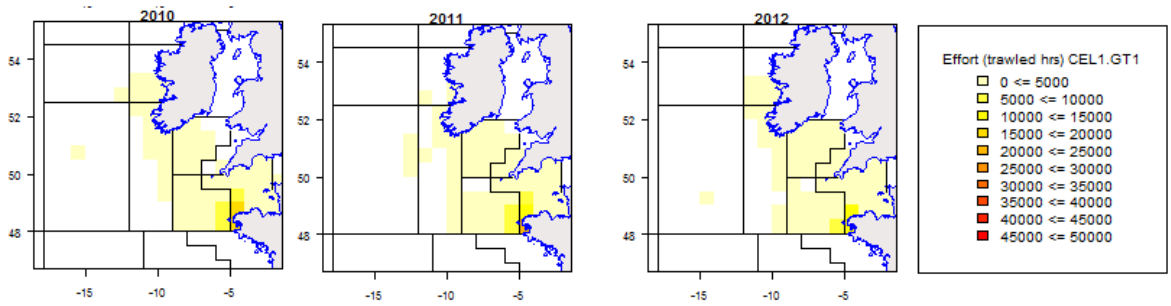


Figure 2.1-6. Distribution of Celtic Sea international fishing effort of gill (top) and trammel (bottom) nets fisheries, in fishing hours, between 2010 and 2012. Source: STECF, 2013

Celtic Sea other demersal fishing gears (dredges, pots, etc)

Dredging and potting fisheries are mainly carried out by England, France and Ireland and are usually confined to the coastal areas (Figure 2.1-7). The main target species for these fisheries are shellfish species - crabs for potting and scallops for dredges.

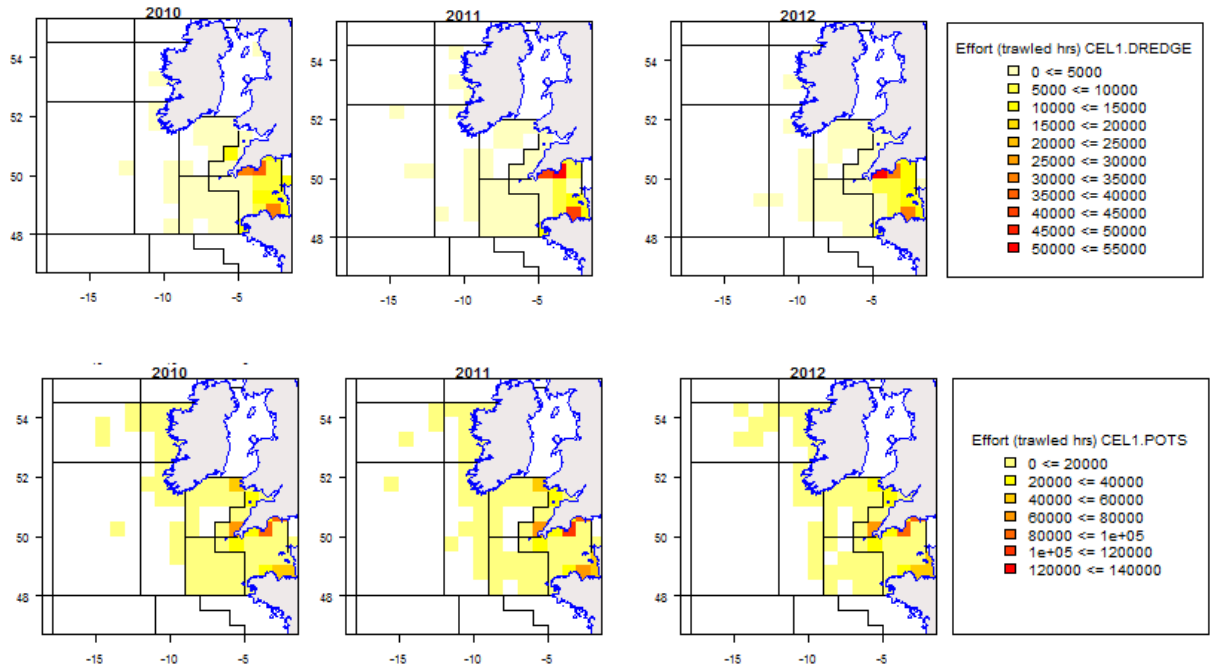


Figure 2.1-7. Distribution of Celtic Sea international fishing effort dredging (top) and potting (bottom) fisheries, in fishing hours, between 2010 and 2012. Source: STECF, 2013

Celtic Sea Long lines

A long line fishery is carried out by Spain mainly in Divisions VIIh, j. A pilot survey in 1994 showed long liners have a high specific selectivity for hake and a low percentage of discards (<10% of the catch), consequently, discards sampling programme was not focussed on long liners. The main discarded species are blue whiting, Greater silver smelt, skates and mackerel.

2.1.2.2 Irish Sea

Irish Sea otter trawls

Irish Sea fisheries are predominantly demersal trawling and seining (TR group) representing 55-60% of total Irish Sea effort. Within the TR group, the TR2 category (70-99mm mesh sizes) dominates, accounting for >80% of regulated gear effort since 2008. The trawl and seine effort in the southern Irish Sea is focussed on the Celtic Sea cod and for reporting purposes. The catches of cod and haddock in the ICES statistical rectangles 34E2 and 34E3 are reallocated and assigned to the Celtic Sea cod and haddock stocks and not to the Irish Sea stocks.

- **TR1 (mesh size >=100 mm)**

Historically, otter trawlers over 100mm were primarily targeting 'white fish' (cod, haddock, hake and whiting) and effort focused in the North Channel and western Irish Sea. A considerable decline in effort was observed between 2003 and 2007, linked to the reduction in catch opportunities for cod in particular. Subsequently, TR1 effort continued to decline at a slower rate to an overall low level. Figure 2.1-8 shows that the recent distribution of activity of TR1. With no directed fishing, effort distribution is uniform throughout the entire area. The TR1 effort is associated mainly with a demersal fishery targeting haddock and skates and rays. At present there is no commercial fishery directed at cod. The main countries contributing effort are Ireland and Northern Ireland, England and France.

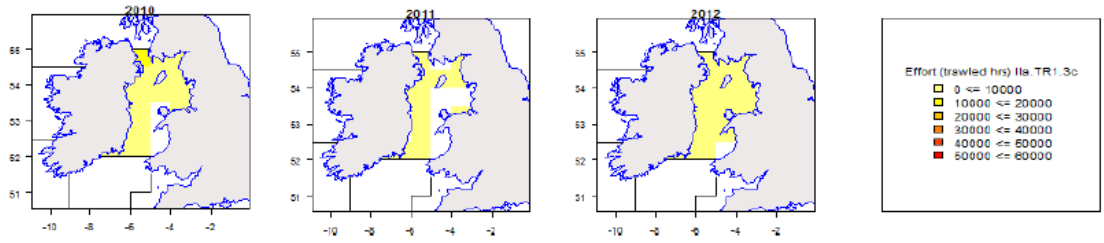


Figure 2.1-8. Distribution of Irish Sea international fishing effort of TR1 fishery, in fishing hours, between 2010 and 2012

- **TR2 (mesh size 70-100 mm)**

Nephrops are the primary focus of the TR2 category. This species lives on areas of soft clay muds which are distributed in two distinct patches, an area in the western Irish Sea and a smaller region in the eastern Irish Sea. The use of the gear is thus concentrated in the defined *Nephrops* regions, as illustrated in Figure 2.1-9. Highest TR2 effort is on the larger *Nephrops* grounds in the western Irish Sea. In contrast to the significant reduction in TR1 effort, TR2 effort has remained relatively stable (Figure 2.1-9). Recently, some TR2 effort has shifted to fisheries targeting queen scallops (*Aequipecten opercularis*). The main countries involved in this fishery are Northern Ireland and Ireland in both areas with contribution from English and Isle of Man vessels predominantly in the eastern regions.

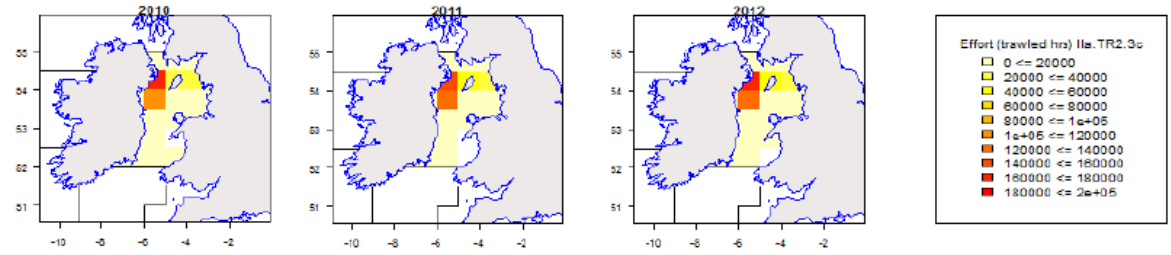


Figure 2.1-9. Distribution of Irish Sea international fishing effort of TR2 fishery, in fishing hours, between 2010 and 2012

Irish Sea beam trawls

Beam trawls operating within the Irish Sea belong to the BT2 (80-119mm) category. Beam trawls operating within the Irish Sea target sole, plaice, and rays. Beam trawl effort has significantly reduced in the Irish Sea, primarily due to the decreasing catch opportunities for sole. This gear has shown a continued contraction in fishing areas and effort reduction within the Irish Sea since 2003 (Figure 2.1-10). At present there are primarily two distinct focal areas continually exploited during 2010 – 2012, one in the central western Irish Sea and other in the central eastern Irish Sea. The main countries involved in this fishery are Belgian and Irish vessels.

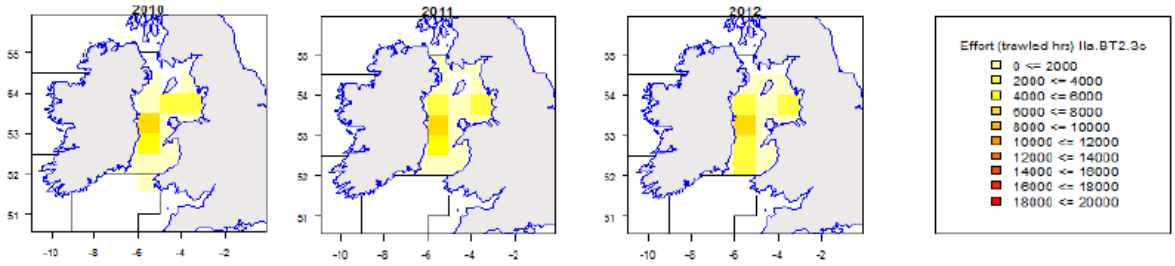


Figure 2.1-10. Distribution of Irish Sea international fishing effort of BT2 fishery, in fishing hours, between 2010 and 2012

Irish Sea gillnets

The primary target of gillnets in the Irish Sea is cod, which currently constitute ~50% of the landings. The current focus of the gillnet fishery is in the eastern Irish Sea above Wales (Figure 2.1-11). This concentration of effort into this area has increased in 2012.

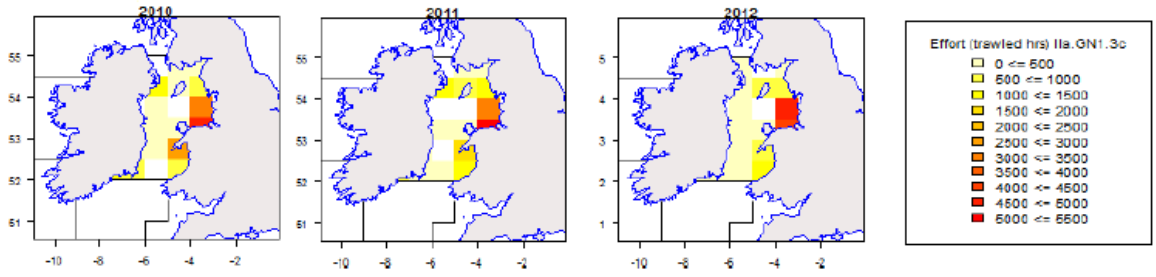


Figure 2.1-11. Distribution of Irish Sea international fishing effort of GN1 fishery, in fishing hours, between 2010 and 2012

Irish Sea other demersal fishing gears (dredges, pots, etc.)

A large proportion of overall effort in the Irish Sea comes from dredge fisheries targeting shellfish species, primarily scallops and queen scallop. Other fisheries operating within the Irish Sea include ubiquitous pot fishery for crustaceans (crabs and lobsters), undertaken by mainly small boats (<10m) in inshore areas.

2.1.2.3 West Scotland

West Scotland otter trawls

- **TR1 (mesh size >=100mm)**

Otter trawl gear is the most important gear used to the West of Scotland with 37% of all effort accounted for by the regulated otter trawls targeting demersal species. Three categories of these gears are present although one of them, TR3 (small mesh), is insignificant and not considered further. Demersal otter trawls with mesh size >100mm was traditionally the predominant gear but between 2003 and 2006 use of this gear declined markedly. Whereas in the past effort by this gear was distributed throughout VIa, its use in the most recent years has been most prevalent along the shelf edge (Figure 2.1-12), particularly in the more northerly regions. The countries utilising the most effort were Scotland, Ireland and Germany. The TR1 fishery can be characterised as a mixed fishery taking predominantly gadoid species such as haddock and saithe and groundfish species such as anglerfish and megrim. Historically, cod was more important but the depleted nature of the stock has reduced fishing opportunities. In recent years, hake has become increasingly important. In the deeper water on the shelf slope, species such as blue ling (*Molva dypterygia*) are also caught.

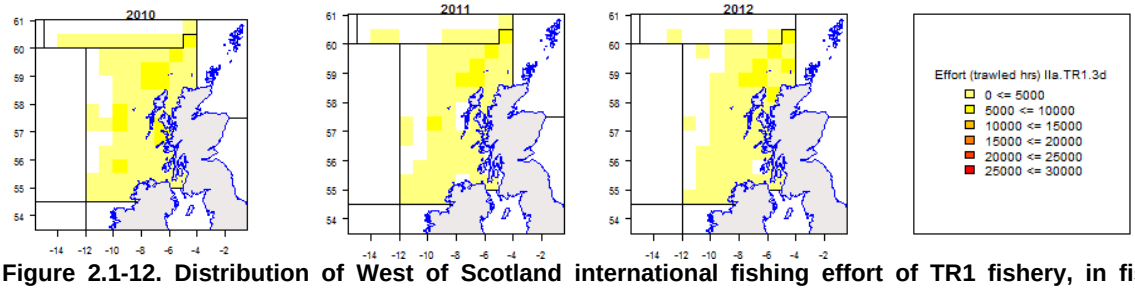


Figure 2.1-12. Distribution of West of Scotland international fishing effort of TR1 fishery, in fishing hours, between 2010 and 2012. Source: STECF, 2013

- **TR2 (mesh size 80-100mm)**

The other major demersal trawl fishery (TR2) operates with mesh in the size range 80-100mm. In earlier years, this was smaller scale fishery than TR1 but in the most recent years, the effort of the two categories has been more similar and, in 2012, TR2 exceeded that of TR1, due the decline of the TR1 effort. The main areas of operation of this gear are the more inshore areas of the North and South Minch and the Firth of Clyde. The main target of the TR2 fishery in the West of Scotland is the Norway lobster (*Nephrops norvegicus*) which inhabits soft mud habitats that predominate in the inshore areas described above (Figure 2.1-13). Effort in the Firth of Clyde is particularly intense. Some activity for *Nephrops* also takes place in the slightly more offshore area of Stanton Bank. A small by-catch of mainly gadoid fish species also occurs in this fishery. Scotland is the country expending most effort, with some activity from English and Irish vessels. Irish TR2 boats also sporadically operate a small mixed fishery for gadoids and groundfish in the southern parts of VIa.

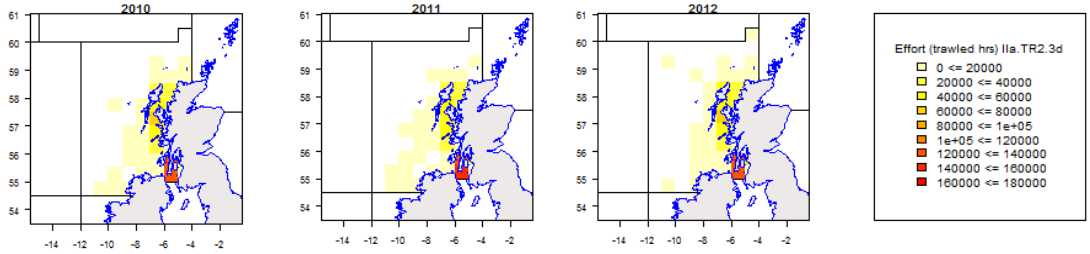


Figure 2.1-13. Distribution of West of Scotalnd international fishing effort of TR2 fishery, in fishing hours, between 2010 and 2012. Source: STECF, 2013

West of Scotland longlines

Longlines are the second most important of the regulated gear categories operating in the West of Scotland although the amount of effort expended is very small compared to otter trawls (Figure 2.1-14). A number of countries report using longlines including Spain, France, Ireland and the Netherlands. A Spanish discard pilot during 2011 and 2012 (in Division VIa) showed longliners have a high specific selectivity and a low percentage of discards (<10% of the catch). The main discarded species are blue whiting, sharks and Greater silver smelt. Most of the longline activity occurs along the continental shelf edge of the West of Scotland particularly in the more northerly parts although

there is also significant activity off the Irish coast near to the southern boundary of VIa. The main target species taken in the longline fishery is hake and in 2012, considerable increases are evident owing to the addition of the Spanish data to the database.

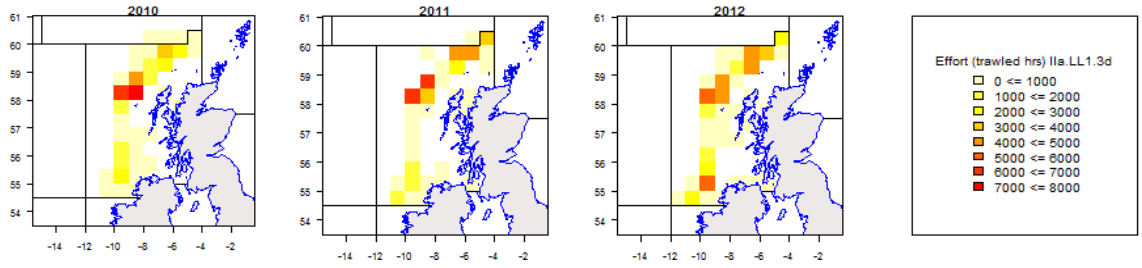


Figure 2.1-14. Distribution of West of Scotland international fishing effort of Longline fishery, in fishing hours, between 2010 and 2012. Source: STECF, 2013

West Scotland gillnets

Several countries (mainly France but also Germany and Scotland) use gill nets in the West of Scotland although the amount of effort is very small (Figure 2.1-15). Most of the effort occurs to the north and west of the area along the continental shelf and there is a small concentration off the Irish coast. Although effort is low, the LPUE of cod in this gear is relatively high (second only to the TR gears). Other species of some importance are hake and saithe. A Spanish discard pilot during 2006 (in Division VIa) showed gillnets liners have low discards rates (the main discarded species are hake, sharks, blue whiting and Greater silver smelt.

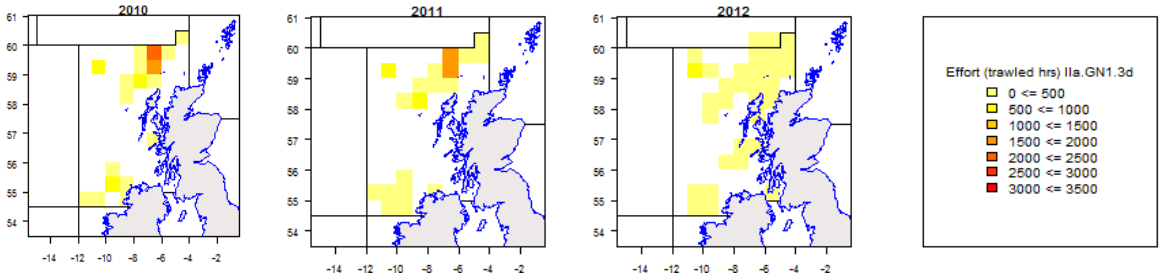


Figure 2.1-15. Distribution of West of Scotland international fishing effort of gillnets fisheries, in fishing hours, between 2010 and 2012. Source: STECF, 2013

West Scotland other demersal fishing gears (dredges, pots)

In terms of KWdays effort, pot fishing is the second most important of the 'other' gears (although this metric is not entirely suitable for a trap fishery). Pot (or creel) fisheries target a variety of species including *Nephrops* (in the inshore muddy areas of the sea lochs and firths), lobsters (in rocky habitats throughout the west of Scotland and particularly around the outer Hebrides) and edible crabs on mixed sandy, gravelly and rocky substrates especially to the north of Scotland (Figure 2.1-16).

While Scottish vessels are mainly responsible for catches of the first two species, crabs are taken by vessels from a number of countries including Scotland, England, Channel Islands and Ireland.

Dredging is also important in the West of Scotland and supports important scallop fisheries (the main target). Vessels involved in dredging are often itinerant, visiting periodically to target west coast grounds. Currently, the main areas of activity are located close inshore in the South Minch and West of Kintyre areas although this changes as the scallop stock abundance fluctuates through time.

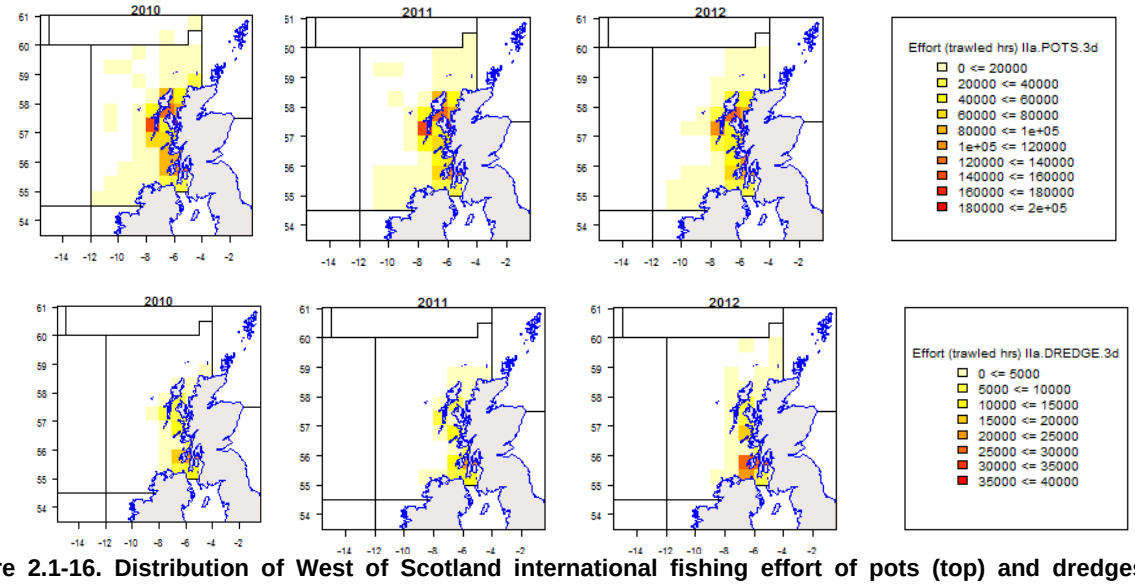


Figure 2.1-16. Distribution of West of Scotland international fishing effort of pots (top) and dredges (bottom) fisheries, in fishing hours, between 2010 and 2012. Source: STECF, 2013

2.2 Description of the national sampling programmes

The information on effort, landings and discards in EU fisheries are derived and estimated from two sources:

- Effort and landings from national fisheries statistics
- Discard data collected under the Data Collection Framework

Landings and effort data are derived from the official national fisheries statistics, recorded under the control regulation (Council regulation 1224/2009). This information is obtained from official logbooks, for vessels ≥ 10 metres, and/or sales slips for vessels under 10 metres. The logbooks and sales slips record information on the landings: weight by species, category grade and management area; and on fishing effort: fishing time, gear and mesh size.

Discard information is collected under the Data Collection Framework (DCF), where each Member State is obligated to collect information on the fleets and their activity, and biological data covering catches, including discards (EEC, 2000). Different sampling programmes are carried out in each country - observer programmes, self-sampling, reference fleet. The main objective of these programmes is to collect information on the catches of commercial fisheries, with special attention to the discard component. The quality of the discard data plays a vital role in the usability of these data. The results of discard sampling programmes play an increasing importance in stock assessments and fisheries management. The shift from landings to a catch quota management system would require that catch quotas are set based on the reliable estimates of discarded amounts and/or proportions (Miller *et al*., 2014; Uhlmann *et al*., 2014). The main sampling programmes to estimate discards in the Celtic Sea, Irish Sea and West of Scotland are the at-sea observer and the self-sampling programmes.

In observer programmes, fishing trips are sampled by scientists onboard commercial fishing vessels. These are generally considered to have the potential to generate good-quality data. The observers collect information on the catches, gear characteristics, fishing location, etc.. However, these programmes are costly and have low coverage; typically around 1% of the fishing effort is covered, which can lead to highly variable data. Uhlmann *et* al. (2014) showed high variability of discards estimates can result from the high diversity of fisheries. National discard observer programmes are not standardized at the European level and exhibit differences in coverage level, the way vessels are selected, the information recorded and the raising procedures (ICES, 2011b, 2012a).

In self-sampling programmes, fishing trips are sampled by fishers themselves. This can either imply that fishers collect and retain a part of the catch or discard fraction and bring this ashore where the sample is analysed by research institute staff or that the fishers carry out the entire sampling. Self-sampling programmes have the potential to generate relatively large amounts of data and increase the involvement of stakeholders in the data collection process. Feedback to the self-samplers is an important consideration to keep quality in sampling consistent over time and the validation of data is considered a key issue (ICES, 2011b; Uhlmann *et* al., 2011).

At the time of writing, no European country is currently employing a routine sampling programme involving CCTV cameras, although there are on-going projects to test the viability of using remote electronic monitoring (REM) technology to collect scientific fisheries data.

2.3 Description of the data sources

The following section provides an overview of data used in the discard atlas and a description of how the discard estimates were produced. Any issues of data quality to be considered when using the atlas to develop management measures are highlighted in the text supporting the tables, while a fuller description is included at Annex 1.

The main source of data used 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 (STECF 13-21), using national data supplied by each Member State, under the DCF requirements. The STECF data are presented at the level of fishery (metier). Data from stock assessments produced by the International Council for the Exploration of the Sea (ICES) are also presented, but this is available only at the stock level. In some cases there may be differences between the STECF discard estimates and those estimated by ICES at the stock level, which primarily relate to different raising procedures and spatial aggregations– this is discussed in Annex 2.

The STECF discard database details landings and discards estimates for a range of fisheries, areas and species covering 2003-2012. As data is more reliable in more recent years and the focus of the atlas is on those species subject to the landings obligation, only information on TAC (Total Allowable Catch) regulated species covering the years 2010-2012 are presented in the report.

While every attempt is made by STECF to provide robust estimates of discards for the fisheries and species, low coverage of national sampling programmes mean that confidence bounds around discard estimates are wide (see Section 2.2 above), 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.

The report includes a Data Coverage Index (denoted DQ% in tables) which has been provided as an indication of the level of empirical discard sampling that has contributed to the discard estimate for a given species. It is presented in terms of the percentage of a species discard estimate that has been estimated from national sampling schemes (as opposed to those that have been 'filled' by discard estimates from other strata in the STECF raising procedure).

It should be noted that the DQ% does not include information on strata not sampled by any Member State which are therefore not assigned any discard estimate and so may be an overestimate of the sampling coverage. Further it should not be interpreted as an overall indicator of the quality of the discard estimate (i.e. precision, confidence) because it takes no account of the level of sampling

coverage within a strata, which is some cases may be small. Such information is not available from the STECF database.

Quota allocation and usage

The data on quota allocations and uptake were taken from the Fishery Data Exchange System (FIDES, http://ec.europa.eu/idabc/en/document/2254/16.html#technical). FIDES automates the management of fishery data, accessible by national administrations in the EU Member States and the European Commission. The FIDES system acts as the link between Member State business processes and DG Fisheries providing a reference link connecting the user with the data. Presented here are data on quota allocations and quota uptake by stock and country.

These data indicate the level of quota usage relative to the original national allocations; differences between to the two are due to either, underutilising the quota, quota swapping or banking and borrowing. In the context of the landing obligation the movement of quota between Member States has been recognised as a mechanism to avoid the premature curtailment of fishing activities, caused by ‘choke’ species.

2.4 Description of the STECF data presented

The STECF data are aggregated according to either the geographical areas as defined by the cod management plan (Council Regulation 1342/2008) or for the Celtic Sea according to a both a wider and narrower definition of the sea area. For the NWW discard atlas, data were aggregated by the spatial areas shown in Table 2.4-1. For the Celtic Sea the data are aggregated based on the larger area definition (as opposed to Cel2 – ICES Division VII f and g), which was considered to more fully cover the range of fisheries and stocks of interest.

Table 2.4-1. Overview of the STECF areas included in the report.

Area	STECF ANNEX	STECF Areas	ICES management areas
Celtic Sea	**Cel1**	**7bcefghjk**	**VII bcefghjk**
Irish Sea	**IIa**	**3c**	**VIIa**
West Scotland	**IIa**	**3d**	**VIa**

For each species, the data are presented from the ICES sub-areas for the three areas (Celtic Sea, Irish Sea and West of Scotland), and so does not take account of the individual stock boundaries which vary by species. As a consequence the values may cover more than one stock or not the entire stock bounds of a species, but instead reflect the fisheries. The differences in discard estimates between the fishery (STECF) and stock (ICES) are indicated when comparing the STECF and ICES values Table 2.

The information on gear used and mesh size range is aggregated to provide discard estimates according to the fishery definitions under the long-term management plan for cod (Council Regulation 1342/2008) as follows:

Table 2.4-2. Fishery descriptions used in presentation of discard estimates

Fishery	Description
TR1	Bottom trawls and seines of mesh size ≥ 100 mm
TR2	Bottom trawls and seines of mesh size ≥ 70 mm < 100 mm
TR3	Bottom trawls and seines of mesh size ≥ 16 mm < 32 mm
BT1	Beam trawls of mesh size ≥ 120 mm
BT2	Beam trawls of mesh size ≥ 80 mm ≤ 119 mm
GN1	Gillnets, entangling nets
GT1	Trammel nets
LL1	Longlines
Other gears (including pots, dredges, pelagic seines)	Gears not regulated under the cod plan.

STECF discard estimates are presented for TAC regulated species only, covering the years 2010-2012. The mean landings, discards and discard rate (%DR) are presented for the three years 2010, 2011 and 2012. Landings and discard estimates are expressed in tonnage (weight).

The NWW discard atlas includes only data for the demersal fisheries, all the pelagic fisheries were removed from the analysis (STECF gear definitions: PEL_TRAWL; PEL_SEINE; PELAGIC TRAWLS and r-PEL_TRAWL). Information on the discard estimates associated with pelagic fisheries have been presented in the '*Discard Atlas of North Western Waters Pelagic and Industrial Fisheries*' (Anon., 2014a)

To enable comparative analysis and ease of understanding, the structure of the NWW Discard Atlas is based on the structure used in '*The Discard Atlas of North Sea fisheries*' (Anon., 2014b); five tables were produced for each of the three areas (Celtic Sea, Irish Sea and West of Scotland):

1: Overall landings (t?) and discards (t?) per species and year, with the top 20 species sorted in descending order on average catch 2010-2012. For each species was estimated the %DR (discards/total catch) and quality of the discard estimate (%DQ), which refers to the proportion of the discard estimates derived from actual data. The colour coding refers to the percentage of the data that is derived from actual data: more than 66% (green), between 33% and 66% (orange) and below 33% (red). The landings and discards estimates were based on the official STECF data, but the %DQ was based on the pre-processed data (See section 2.3 for details on the data process).

2: Initial and final quota positions by species and country, between 2010 and 2012. For each stock this was calculated as the percentage in change between the initial and final annual quota.

3: Landings (t) and discards (t) per species, country and year. The top 10 species sorted in descending order on average catch 2010-2012. Landings and discards were aggregated across all gears by species, country and year. The UK regions GBG, GBJ and IOM where not included in the table due to few data.

4: Landings (t) and discards (t) per country, species and year. The top 10 species sorted in descending order on average catch 2010-2012. Landings and discards were aggregated across all REG_GEAR and SPECON (Special conditions) by species, country and year. The UK regions GBG, GBJ and IOM where not included in the table due to few data.

5: Landings (t) and discards (t) per gear, species and year top 10 species sorted in descending order on average catch 2010-2012. Landings and discards were aggregated across all countries and SPECON (Special conditions) by gear, species and year.

In the first explorations with the Atlas data some errors in the Spanish data format were found:

- The data rows with special condition DEEP (deep trips identify for the EWG DEEP team) were not duplicated as special condition NONE (for the EWG general approach), therefore

almost half of the catches (both landings and discards) from the deep-sea trips did not appear in the area.

A reviewed STECF EWG set of data was produced for the Spanish data in October 2014 correcting these errors for the NWW Discard Atlas. The corrected Spanish data are presented in separate tables.

A further table is provided to enable a comparison of STECF and ICES discard ratio? estimates for all areas. Unlike for the North Sea eco-region, there has not been a comprehensive analysis previously conducted on the relationship between discard estimates derived from STECF and ICES data sources. It was possible to present discard ratio data from STECF and ICES, although the differences in the years and spatial aggregations do not allow for direct comparisons (see Section 4).

Also presented is a series of graphs which are designed to facilitate comparing the differences in discard rates between fisheries for each species in each area. An example of these figures is given below in Figure 2.4-1. Figures for all species-country-gear combinations are given in Annex 5. Figure 2.4-1 provides STECF discard data for whiting in the Irish Sea. The mean discard rate (proportion of catch discarded) is given for each country-gear combination (blue circles), the mean discard proportion is given (red line). Where the blue circles are above the red line, the fishery (country-gear) has an estimated discard rate above the average for cod in the Celtic Sea. The mean estimated weight of discards for fishery provides context in terms of the quantities of whiting caught and discarded in each fishery.

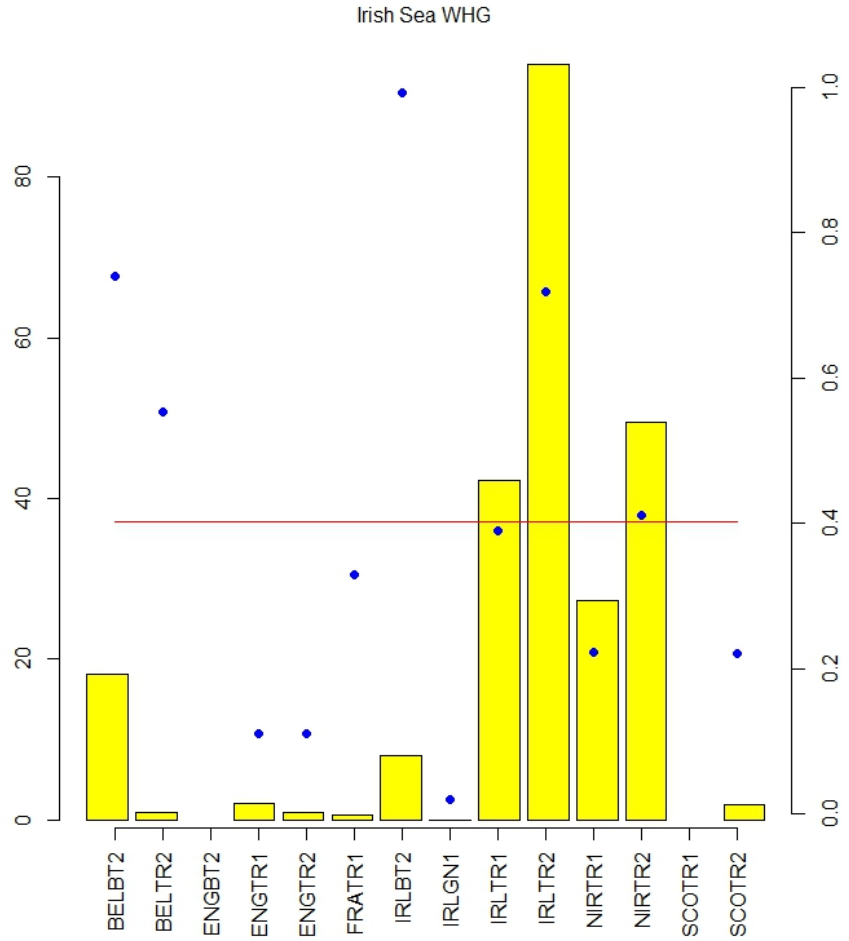


Figure 2.4-1. Example of graphical representation of STECF discard estimates (whiting in Irish Sea). Right y axis = Discard ratio, left y axis = Discards (tonnes). Yellow bars = mean discard estimated weight (tonnes) for each country-gear combination; blue circles = mean estimated discard ratio (proportion of catch discarded) for each country-gear combination, red line = mean estimated discard ratio for all country-gear combinations

3 Landings and discard data by area and fisheries

This section of the NWW discard atlas includes only data for the demersal fisheries, however pelagic species data are presented because they were caught in some demersal fisheries. The data presented in this atlas are available in the STECF database, without omissions or deletions. The one exception was for *Nephrops*, which was omitted from the Celtic Sea area. *Nephrops* discard data were not available from any other area, so to maintain consistency and because these data were clearly unreliable, they were omitted. Other data considered by the contributors to be inconsistent or unreliable are identified and discussed in the text supporting the tables. Spanish data were revised and corrected and presented in separate tables for the Celtic Sea and West of Scotland areas.

3.1 Celtic Sea (ICES Divisions VII b, c, e, f, g, h, j, k)

3.1.1 Celtic Sea discard ratios per species and quality of discard information

On average, 16% of the total catch in weight was discarded in the Celtic Sea, between 2010 and 2012. Overall, 69% of the discards consisted of haddock, whiting and cod, the three main stocks exploited. Average discard ratios were highly variable among species, ranging between 0% (for saithe and herring) and 71% for forkbeards (Table 3.1 – 1).

The highest average catch between 2010 and 2012 was estimated for haddock, with 50% of discard rate. Between 2010 and 2012 haddock discard rate increased from 37% to 72%. The discard peak in 2012 was due a strong recruitment pulse in 2009, with high abundance of young fish entering the fishery in 2010/2011. The high abundance of young fish and quota restrictions contributed for high discard rates in the area. Other roundfish species, hake, whiting, cod and pollack were among the top 10 species in relation to their average total catch between 2010 and 2012. Discard rates showed great differences between these species, varying between 3%, for hake and pollack, and 36% for cod. The variability is the result of abundance of the stocks, market value and quota restrictions.

Anglerfish had the second highest average catch, but had low discard rate (10%). The high market value of this species contributed to this result. Sole is also a high market value species with low discard rates between 2010 and 2012, with an average discard rate of 3%. This indicates the ability of fishermen to avoid unwanted sole catches.

Overall, the discard rates of each species were relatively stable between 2010 and 2012, except for stock that highlight in that period very strong year class, such as haddock and cod. The species with higher variation in the discard ratios were plaice and mackerel. Plaice discard rates increased from 29-21% in 2010 and 2011 to 41% in 2012. This increase could be related to quota restrictions or data artefact.

In the top 20 species captured in the Celtic Sea by demersal fisheries, 6 of them were pelagic species: boarfish, mackerel, *Trachurus spp*, blue whiting, herring and sprat. The inclusion of these species is mainly originating from the otter trawlers: unregulated otter (OTTER), 16-31mm codend mesh trawlers (TR3) and 70-99mm codend mesh trawlers (TR2). It should be considered that the

definitions of these otter trawlers could be wrong and include pelagic fisheries data. The country that contributed with most of the catches was Scotland.

Tables 3.1-1 and 3.1-2 highlights how much of the final discard estimates are derived from reported data by each country and how much had to be filled in by assuming an average discard ratio from countries that have submitted data for a given metier/fishery. The quality is expressed as %DQ (%discard quality) derived as the amount of discards from submitted data relative to the overall estimate of discard (in tonnes). Overall, the quality of discards estimates in the Celtic Sea was low, with %DQ values of 55% for 2010, 58% in 2011 and 27% in 2012. Most of the species discard estimates fall in the range 33% – 66% of the discards estimates are derived from actual data. Between 2010 and 2011 the discard quality improved for haddock, plaice, sole, anglerfish and hake. However, in 2012 the discard quality decreased for those species.

3.1.2 Celtic Sea Quota allocation and usage

Table 3.2-3 describes the quota available in the Celtic Sea, for each stock to each country in the beginning and end of the year, between 2010 and 2012. Table shows that substantial quota exchange occurs between countries for most of the species. Cod, hake, whiting and plaice are the species where most of the exchanges occurred, whereas pollack and sole were the species where less quota exchanges occurred.

Table 3.1-1. Celtic Sea (ICES Divisions VII b, c, e, f, g, h, j, k) demersal fisheries: landings and discards per species and year and area; top 20 species sorted in descending order on average catch 2010-2012

Species		2010					2011					2012					Average 2010-2012				
		Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ
HAD	Haddock	**8,781**	**5,171***	**13,952**	**37***	**60**	**12,463**	**8,806***	**21,269**	**41***	**70**	**15,645**	**40,107***	**55,752***	**72***	**35**	**12,296**	**180,288**	**30,325***	**50***	**35**
ANF	Anglerfish	11,774	871	12,645	7	30	17,367	1,787	19,154	9	42	20,924	3,560	24,484	15	19	16,688	2,073	18,761	10	19
HKE	Hake	7,412	182	7,594	2	26	9,858	184	10,042	2	53	19,271	1,284	20,555	6	31	12,181	550	12,731	3	31
WHG	Whiting	7,819	3,461	11,280	31	61	8,843	2,307	11,150	21	71	9,561	3,730	13,291	28	55	8,741	3,166	11,907	27	61
NEP	Norway lobster	6,512	NA	6,512	NA	38	4,874	NA	4,874	NA	4	6,773	NA	6,773	NA	1	6,053	NA	6,053	NA	1
LEZ	Megrims	7,095	856	7,951	11	51	1,107	1,097	2,204	14	42	9,419	3,088	12,507	25	39	7,695	1,684	9,379	17	39
COD	Cod	2,581	1,124	3,705	30	53	4,237	2,876	7,113	40	47	6,362	3,756	10,118	37	12	4,393	2,585	6,979	36	31
BOR	Boarfish	9,219	NA	9,219	NA	NA	912	NA	912	NA	NA	3,755	NA	3,755	NA	NA	4,629	NA	4,629	NA	NA
MAC	Mackerel	1,993	146	2,139	7	37	814	108	922	12	3	5,617	3,301	8,918	37	0	2,808	1,185	3,993	19	2
POL	Pollack	2,580	37	2,617	1	30	3,085	94	3,179	3	24	2,762	16	2,778	1	28	2,809	49	2,858	2	26
PLE	Plaice	1,509	630	2,139	29	55	1,723	466	2,189	21	69	1,745	1,213	2,958	41	71	1,659	770	2,428	31	66
SOL	Sole	1,678	167	1,845	9	42	1,928	22	1,950	1	76	2,040	6	2,046	0	43	1,882	65	1,947	3	46
LIN	Ling	1,361	92	1,453	6	29	1,653	89	1,742	5	46	2,003	147	2,150	7	32	1,672	109	1,782	6	32
SRX	Rays and Skates	1,376	78	1,454	5	79	1,436	34	1,470	2	78	1,439	17	1,456	1	81	1,417	43	1,460	3	80
JAX	Trachurus sp	435	NA	435	NA	NA	377	NA	377	NA	NA	3,262	NA	3,262	NA	NA	1,358	NA	1,358	NA	NA
WHB	Blue whiting	2,247	NA	2,247	NA	NA	0	NA	0	NA	NA	1,472	NA	1,472	NA	NA	1,240	NA	1,240	NA	NA
POK	Saithe	549	2	551	0	49	862	0	862	0	49	1,303	1	1,304	0	36	905	1	906	0	46
HER	Herring	874	0	874	0	81	414	NA	414	NA	NA	112	0	112	0	97	467	0	467	0	92
SPR	Sprat	29	NA	29	NA	NA	56	NA	56	NA	NA	1,163	NA	1,163	NA	NA	416	NA	416	NA	NA
FOX	Forkbeards	68	169	237	71	25	55	NA	55	NA	50	89	NA	89	NA	50	71	169	239	71	25
All species		**76,261**	**13,091**	**89,352**	**15**	**55**	**77,887**	**18,857**	**96,744**	**19**	**58**	**115,051**	**76,488**	**191,539**	**15**	**27**	**89,741**	**36,289**	**126,034**	**16**	**27**

Note 1: Data with * were identified to be unreliable and should not be used.

Note 2: %DR refers to discard ratio (discards/total catch). %DQ refers to the quality of the discard estimate (proportion of the discard estimates is derived from actual data). The colour coding refers to larger than 66% (green), between 33% and 66% (orange) and below 33% (red).

3.1-2- Celtic Sea (ICES Divisions VII b, c, e, f, g, h, j, k) Spanish demersal fisheries: landings and discards per species and year; top 20 species sorted in descending order on average catch 2010-2012

Country	Species		2010					2011					2012					Average 2010-2012				
			Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ
ESP	HKE	Hake	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	12,179	900	13,079	7	7	12,179	900	13,079	7	7
	LEZ	Megrims	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4,250	2,334	6,584	35	55	4,250	2,334	6,584	35	55
	BOR	Boarfish	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	5,145	5,145	100	NA	0	5,145	5,145	100	NA
	MAC	Mackerel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	4,737	4,737	100	NA	0	4,737	4,737	100	NA
	ANF	Anglerfish	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3,077	678	3,755	18	22	3,077	678	3,755	18	22
	JAX	Horse mackerel	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	3	3,097	3,100	100	99	3	3,097	3,100	100	99
	WIT	Witch	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2,430	324	2,754	12	13	2,430	324	2,754	12	13
	ARU	Greater silver smelt	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	2,313	2,313	100	NA	0	2,313	2,313	100	NA
	HAD	Haddock	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	161	1,895	2,056	92	1	161	1,895	2,056	92	1
	WHB	Whiting	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0	1,964	1,964	100	NA	0	1,964	1,964	100	NA
	BRF	Blackbelly rosefish	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	910	29	939	3	3	910	29	939	3	3
	LIN	Ling	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	612	212	824	26	35	612	212	824	26	35
	NEP	Norway lobster	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	333	237	570	42	71	333	237	570	42	71
	LEM	Lemon sole	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	195	0	195	0	0	195	0	195	0	0
	WRF	Wreckfish	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	103	0	103	0	0	103	0	103	0	0
	FOX	Forkbeards	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	86	0	86	0	0	86	0	86	0	0
	SBR	Blackspot seabream	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	37	0	37	0	0	37	0	37	0	0
	RED	Redfishes	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	23	0	23	0	0	23	0	23	0	0
	All species		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**24,398**	**23,864**	**48,262**	**49**	**58**	**24,398**	**23,864**	**48,262**	**49**	**58**

Table 3.1-3. Celtic Sea (ICES Divisions VII b, c, e, f, g, h, j, k) demersal fisheries: quota by species, country and year

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2012	Average Final Quota 2010 - 2012	Average % change 2010 - 2012
Cod	VIIb, VIIc, VIIe-k, VIII, IX and X; EU waters of CECAF 34.1.1	Belgium	167	161	-4%	167	203	22%	449	327	-27%	261	230	-3%
		Spain	0	0	0%	0	0	0%	0	0	0%	0	0	0%
		France	2,735	3,029	11%	2,735	4,086	49%	7,357	7,671	4%	4,276	4,929	21%
		Ireland	825	917	11%	825	911	10%	1459	1,597	9%	1,036	1,142	10%
		The Netherlands	1	3	200%	1	6	500%	1	6	500%	1	5	400%
		United Kingdom	295	326	11%	295	493	67%	793	865	9%	461	561	29%
		TAC	4,023	4,436	10%	4,023	5,699	42%	10,059	10,466	4%	6,035	6,867	19%
Anglerfish	VII	Belgium	2,984	2,836	-5%	2,984	2,961	-1%	2,835	1,688	-40%	2,934	2,495	-15%
		Germany	333	365	10%	333	370	11%	316	339	7%	327	358	9%
		Spain	1,186	3,145	165%	1,186	2,961	150%	1,126	2,974	164%	1,166	3,027	160%
		France	19,149	19,044	-1%	19,419	19,237	-1%	18,191	18,835	4%	18,920	19,039	1%
		Ireland	2,447	3,674	50%	2,447	3,372	38%	2,325	3,371	45%	2,406	3,472	44%
		The Netherlands	386	195	-49%	386	2	-99%	367	43	-88%	380	80	-79%
		United Kingdom	5,807	6,079	5%	5,807	6,475	12%	5,517	6,815	24%	5,710	6,456	13%
		TAC	32,292	35,338	9%	32,562	35,378	9%	30,677	34,065	11%	31,844	34,927	10%
Haddock	VIIb-k, VIII, IX and X; EU waters of CECAF 34.1.1	Belgium	129	175	36%	148	216	46%	185	243	31%	154	211	38%
		Spain	0	150	100%	0	156	100%	0	106	100%	0	137	100%
		France	7,719	8,318	8%	8,877	9,091	2%	11,096	11,357	2%	9,231	9,589	4%
		Ireland	2,573	2,815	9%	2,959	3,329	13%	3,699	3,745	1%	3,077	3,296	8%
		The Netherlands	0	5	100%	0	36	100%	0	90	100%	0	44	100%
		United Kingdom	1,158	944	-18%	1,332	1,646	24%	1,665	1,822	9%	1,385	1,471	5%
		TAC	11,579	12,407	7%	13,316	14,474	9%	16,645	17,363	4%	13,847	14,748	7%
Whiting	VIIb, VIIc, VIId, VIIe, VIIf, VIIg, VIIh, VIIj and VIIk	Belgium	133	189	42%	158	217	37%	186	326	75%	159	244	52%
		Spain	0	50	100%	0	15	100%	0	12	100%	0	26	100%
		France	8,180	9,679	18%	9,726	10,512	8%	11,431	11,899	4%	9,779	10,697	10%
		Ireland	4,565	4,589	1%	4,865	5,166	6%	5,298	6,102	15%	4,909	5,286	7%
		The Netherlands	66	437	562%	79	773	878%	93	624	571%	79	611	671%
		United Kingdom	1,463	1,153	-21%	1,740	1,143	-34%	2,045	1,750	-14%	1,749	1,349	-23%
		TAC	14,407	16,097	12%	16,568	17,826	8%	19,053	20,713	9%	16,676	18,212	9%
Hake	VI and VII; EU and	Belgium	284	122	-57%	284	13	-95%	284	23	-92%	284	53	-81%

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2012	Average Final Quota 2010 - 2012	Average % change 2010 - 2012
	international waters of Vb; international waters of XII and XIV	Spain	9,109	12,618	39%	9,109	12,061	32%	9,109	12,034	32%	9,109	12,238	34%
		France	14,068	12,425	-12%	14,067	12,768	-9%	14,067	13,474	-4%	14,067	12,889	-8%
		Ireland	1,704	2,126	25%	1,704	1,937	14%	1,704	1,873	10%	1,704	1,979	16%
		The Netherlands	183	183	0%	183	403	120%	183	56	-69%	183	214	17%
		United Kingdom	5,553	4,047	-27%	5,553	4,836	-13%	5,553	5,187	-7%	5,553	4,690	-16%
		TAC	30,901	31,521	2%	30,900	32,018	4%	30,900	32,647	6%	30,900	32,062	4%
Norway Lobster	VII	Belgium	0	15	100%	0	16	100%	0	72	100%	0	34	100%
		Spain	1,346	1,494	11%	1,306	1,440	10%	1,306	1,375	5%	1,319	1,436	9%
		France	5,455	6,122	12%	5,291	5,735	8%	5,291	4,416	-17%	5,346	5,424	1%
		Ireland	8,273	8,595	4%	8,025	8,900	11%	8,025	10,534	31%	8,108	9,343	15%
		United Kingdom	7,358	8,831	20%	7,137	8,155	14%	7,137	7,766	9%	7,211	8,251	14%
		TAC	22,432	25,057	12%	21,759	24,246	11%	21,759	24,163	11%	21,983	24,489	11%
Plaice	VIIB and VIIc	France	16	18	13%	16	18	13%	16	16	0%	16	17	8%
		Ireland	64	72	13%	62	69	11%	62	62	0%	63	68	8%
		TAC	80	90	13%	78	87	12%	78	78	0%	79	85	8%
Plaice	VIId and VIIe	Belgium	699	1,121	60%	763	1,121	47%	828	1,216	47%	763	1,153	51%
		France	2,332	2,177	-7%	2,545	2,189	-14%	2,761	2,381	-14%	2,546	2,249	-11%
		The Netherlands	0	38	100%	0	61	100%	0	65	100%	0	55	100%
		United Kingdom	1,243	1,361	9%	1,357	1,382	2%	1,473	1,473	0%	1,358	1,405	4%
		TAC	4,274	4,697	10%	4,665	4,753	2%	5,062	5,135	1%	4,667	4,862	4%
Plaice	VIIf and VIIg	Belgium	67	195	191%	56	214	282%	46	186	304%	56	198	259%
		France	120	142	18%	101	107	6%	83	93	11%	101	114	12%
		Ireland	201	69	-66%	200	74	-63%	197	72	-63%	199	72	-64%
		United Kingdom	63	60	-5%	53	49	-8%	43	42	-3%	53	50	-5%
		TAC	451	466	3%	410	444	8%	369	392	6%	410	434	6%
Plaice	VIIh, VIIj and VIIk	Belgium	7	7	0%	12	13	8%	11	2	-82%	10	7	-24%
		Spain	0	2	100%	0	0	0%	0	0	0%	0	1	100%
		France	14	49	250%	23	59	157%	22	66	200%	20	58	202%
		Ireland	156	124	-21%	81	88	9%	77	86	12%	105	99	0%
		The Netherlands	27	0	-100%	46	0	-100%	44	0	-100%	39	0	-100%
		United Kingdom	14	48	243%	23	45	96%	22	40	82%	20	44	140%
		TAC	204	182	-11%	185	205	11%	176	194	10%	188	194	3%

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2012	Average Final Quota 2010 - 2012	Average % change 2010 - 2012
Pollack	VII	Belgium	428	428	0%	420	420	0%	420	420	0%	423	423	0%
		Spain	26	26	0%	25	25	0%	25	25	0%	25	25	0%
		France	9,864	9,864	0%	9,667	9,667	0%	9,667	9,532	-1%	9,733	9,688	0%
		Ireland	1,051	1,051	0%	1,030	1,060	3%	1,030	1,165	13%	1,037	1,092	5%
		The Netherlands	0	5	100%	0	10	100%	0	4	100%	0	6	100%
		United Kingdom	2,401	2,396	0%	2,353	2,313	-2%	2,353	2,349	0%	2,369	2,353	-1%
		TAC	13,770	13,770	0%	13,495	13,495	0%	13,495	13,495	0%	13,587	13,587	0%
Saithe	VII, VIII, IX and X; EU waters of CECAF 34.1.1	Belgium	6	6	0%	6	6	0%	6	6	0%	6	6	0%
		Spain	0	10	100%	0	9	100%	0	9	100%	0	9	100%
		France	1,428	1,418	-1%	1,375	1,366	-1%	1,375	1,236	-10%	1,393	1,340	-4%
		Ireland	1,525	1,525	0%	1,516	1,516	0%	1,516	1,516	0%	1,519	1,519	0%
		The Netherlands	0	0	0%	0	0	0%	0	5	100%	0	2	33%
		United Kingdom	452	447	-1%	446	431	-3%	446	441	-1%	448	440	-2%
		TAC	3,411	3,406	0%	3,343	3,328	0%	3,343	3,213	-4%	3,366	3,316	-1%
Skates and Rays	EU waters of VIa, Vib, VIIa-c and VIIe-k	Belgium	1,209	1,209	0%	1,027	1,348	31%	895	1,422	59%	1,044	1,326	30%
		France	5,425	5,599	3%	4,612	5,325	15%	4,018	4,719	17%	4,685	5,214	12%
		Germany	16	16	0%	14	16	14%	12	14	17%	14	15	10%
		Ireland	1,747	1,573	-10%	1,485	1,305	-12%	1,294	1,311	1%	1,509	1,396	-7%
		The Netherlands	5	0	-100%	4	5	25%	4	12	200%	4	6	42%
		Spain	1,460	1,460	0%	1,241	1,387	12%	1,082	767	-29%	1,261	1,205	-6%
		United Kingdom	3,460	3,460	0%	2,941	3,114	6%	2,562	2,814	10%	2,988	3,129	5%
		TAC	13,322	13,317	0%	11,324	12,500	10%	9,867	11,059	12%	11,504	12,292	7%
Skates and rays	EU waters of VIId	Belgium	80	69	-14%	80	66	-18%	80	63	-21%	80	66	-18%
		France	670	670	0%	670	737	10%	670	744	11%	670	717	7%
		The Netherlands	4	12	200%	4	11	175%	4	12	200%	4	12	192%
		United Kingdom	133	136	2%	133	162	22%	133	159	20%	133	152	15%
		TAC	887	887	0%	887	976	10%	887	978	10%	887	947	7%
Common Sole	VIIb and VIIc	France	10	11	10%	7	7	0%	7	7	0%	8	8	3%
		Ireland	35	36	3%	37	37	0%	37	37	0%	36	37	1%
		TAC	45	47	4%	44	44	0%	44	44	0%	44	45	1%
Common Sole	VIId	Belgium	1,136	1,311	15%	1,306	1,472	13%	1,502	1,689	12%	1,315	1,491	14%
		France	2,272	2,595	14%	2,613	2,809	8%	3,005	3,286	9%	2,630	2,897	10%

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2012	Average Final Quota 2010 - 2012	Average % change 2010 - 2012
		United Kingdom	811	913	13%	933	989	6%	1,073	1,132	5%	939	1,011	8%
		TAC	4,219	4,819	14%	4,852	5,270	9%	5,580	6,107	9%	4,884	5,399	11%
Common Sole	VIIe	Belgium	22	23	5%	25	20	-20%	27	40	48%	25	28	11%
		France	233	259	11%	267	290	9%	293	289	-1%	264	279	6%
		United Kingdom	363	365	1%	418	431	3%	457	485	6%	413	427	3%
		TAC	618	647	5%	710	741	4%	777	814	5%	702	734	5%
Common Sole	VIIf and VIIg	Belgium	621	694	12%	775	844	9%	663	868	31%	686	802	17%
		France	62	69	11%	78	92	18%	66	85	29%	69	82	19%
		Ireland	31	30	-3%	39	44	13%	33	37	12%	34	37	7%
		United Kingdom	279	310	11%	349	371	6%	298	204	-32%	309	295	-5%
		TAC	993	1,103	11%	1,241	1,351	9%	1,060	1,194	13%	1,098	1,216	11%
Common Sole	VIIh, VIIj and VIIk	Belgium	41	46	12%	35	35	0%	35	39	11%	37	40	8%
		France	83	93	12%	71	74	4%	71	98	38%	75	88	18%
		Ireland	225	253	12%	190	190	0%	190	194	2%	202	212	5%
		The Netherlands	66	0	-100%	56	0	-100%	56	51	-9%	59	17	-70%
		United Kingdom	83	93	12%	71	73	3%	71	78	10%	75	81	8%
		TAC	498	485	-3%	423	372	-12%	423	460	9%	448	439	-2%

3.1.3 Celtic Sea Discard ratios by species by country

Table 3.1-4 describes the landings and discards of the top 10 species captured in the Celtic Sea, by country, between 2010 and 2012. The main discarded species in the Celtic Sea were haddock, whiting, cod and plaice. These species have consistent high discard rates across the top five countries (Table 3.1- 4). According with the STECF data, the country with highest haddock discards were Spain and France with 92% and 70% of being discarded, respectively (Table 3.1-5). The top 5 countries catching cod were France, Ireland, England, Belgium and Scotland. The discard rates for cod varied between 32% by France and 44% by England. France was the country with the highest absolute discard estimates. The majority of the cod discarded results from the highgrading behaviour occurring for all countries while discarding of undersized individuals is low for all fleets (WGCSE, 2013) and a strong recruitment year class. Due to the low TAC relative to the high magnitude of recruitment in 2009 and 2010, all countries, except France, had unusually high discards rates in 2011. Because gadoids are caught in a mixed fishery, restrictive quota in recent years have led to increased discarding of marketable fish as well as already considerable discarding of undersized fish.

The species with lowest discard rates were hake, anglerfish and pollack. The main countries capturing hake in the Celtic sea were France and Spain (Table 3.1-5). However no Spanish data was provided between 2010 and 2011.

The discard rates for pollack were the lowest and most consistent among the top 5 countries, varying between 1% of discard rate for Ireland and Belgium and 2% for England and France. On the other hand, mackerel was the species with the highest variability between countries, 0% for Ireland and 47% for France. The high discard rate for France might be an outlier or an artefact resultant from the discard sampling. For the remaining countries, Scotland and Ireland, no discards estimates were available.

When introducing the catch quota that takes into account the current discarding practices, the Member State and fisheries with the highest discard rates might have problems when the mean discard rates are used to calculate the catch quota.

Table 3.1-4. Celtic Sea (ICES Divisions VII b, c, e, f, g, h, j, k) demersal fisheries: landings (t) and discards (t) per species, country and year; table sorted in a descended order on the average catch 2010-2012, top 5 countries per species. Only for average total catch equal or greater than 20 t

Species		Country	2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total Catch	%DR
HAD	Haddock	FRA	**5,243**	**1,654***	**24***	**7,398**	**4,858***	**40***	**9,471**	**21,951***	**70***	**7,370**	**9,488***	**16,858***	**44***
		IRL	2,590	3,108	55	3,273	2,487	43	4,101	4,085	50	3,321	3,227	6,548	49
		ENG	668	218	25	1,200	662	36	1,158	648	36	1,008	509	1,518	32
		BEL	167	141	46	211	527	71	231	1,297	85	203	655	858	67
NEP	Norway Lobster	IRL	5,082	NA	NA	4,136	NA	NA	6,024	NA	NA	5,081	NA	5,081	NA
		FRA	846	NA	NA	515	NA	NA	375	NA	NA	579	NA	579	NA
		SCO	174	NA	NA	177	NA	NA	195	NA	NA	182	NA	182	NA
		NIR	328	NA	NA	8	NA	NA	33	NA	NA	123	NA	123	NA
HKE	Hake	FRA	4,716	102	2	7,109	114	2	9,578	625	6	7,135	281	7,415	3
		IRL	1,519	55	3	1,605	13	1	1,601	50	3	1,575	39	1,614	2
		ENG	589	18	3	875	41	4	737	60	8	734	40	774	5
		SCO	567	4	1	246	8	3	1,201	38	3	672	16	688	2
ANF	Anglerfish	FRA	2,161	26	1	7,427	720	9	9,703	1,241	11	6,430	662	7,093	7
		ENG	3,898	440	10	4,337	546	11	3,895	998	20	4,043	661	4,704	14
		IRL	3,461	269	7	3,045	266	8	3,099	516	14	3,202	351	3,552	10
		SCO	1,411	32	2	1,526	100	6	1,447	108	7	1,461	80	1,541	5
WHG	Whiting	IRL	4,309	2,025	32	4,699	915	16	5,811	2,062	26	4,939	1,667	6,607	25
		FRA	2,704	902	25	3,290	1,107	25	2,864	1,114	28	2,953	1,041	3,994	26
		ENG	550	318	37	490	142	23	483	233	33	507	231	739	31
		BEL	100	86	46	99	79	44	168	213	56	123	126	249	49
		NLD	76	83	52	152	35	19	133	81	38	120	66	187	36
COD	Cod	FRA	1,401	423	23	2,943	1,329	31	4,155	3,057	42	2,833	1,603	4,436	32
		IRL	901	542	38	851	753	47	1,399	379	21	1,051	558	1,609	35
		ENG	200	97	33	260	582	69	441	184	29	300	288	588	44
		BEL	52	34	40	123	177	59	289	95	25	154	102	256	41
		SCO	10	5	31	37	23	38	47	29	38	32	19	50	36
LEZ	Megrims	IRL	2,346	417	15	2,212	301	12	3,048	603	17	2,535	441	2,976	15
		FRA	1,997	193	9	1,613	372	19	1,948	685	26	1,853	417	2,269	18
		ENG	1,740	134	7	1,777	287	14	1,653	494	23	1,723	305	2,029	15
		SCO	743	100	12	645	129	17	683	220	24	690	149	840	18
MAC	Mackerel	ENG	746	56	7	29	3	9	5,404	5	0	2,060	21	2,081	5
		FRA	209	87	29	592	105	15	93	3,285	97	298	1,159	1,457	47
		SCO	823	0	0	1	0	5	0	0	24	275	0	275	10
		IRL	200	NA	NA	174	NA	NA	104	0	0	159	0	159	0
PLE	Plaice	ENG	841	100	11	916	146	14	935	394	30	897	213	1,111	18
		BEL	238	92	28	352	103	23	338	344	50	309	180	489	34
		FRA	271	167	38	291	107	27	265	154	37	275	143	418	34
		IRL	153	268	64	153	104	41	190	302	61	165	225	390	55
POL	Pollack	ENG	854	8	1	1,135	43	4	1,024	11	1	1,004	21	1,025	2
		FRA	884	22	2	1,030	36	3	733	1	0	882	20	902	2
		IRL	813	7	1	880	15	2	950	4	0	881	9	890	1
		BEL	22	0	0	26	0	1	33	0	0	27	0	27	1

Note: Data with * were identified to be unreliable and should not be used.

Table 3.1-5 - Celtic Sea (ICES Divisions VII b, c, e, f, g, h, j, k) Spanish demersal fisheries: landings (t) and discards (t) per species, country and year; table sorted in a descended order on the average catch 2010-2012, top 5 countries per species. Only for average total catch equal or greater than 20 t

Species		Country	2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total catch	%DR
HKE	Hake	ESP	NA	NA	NA	NA	NA	NA	12,179	900	7	12,179	900	13,079	7
LEZ	Megrims		NA	NA	NA	NA	NA	NA	4,250	2,334	35	4,250	2,334	6,584	35
BOR	Boarfish		NA	NA	NA	NA	NA	NA	0	5,145	100	0	5,145	5,145	100
MAC	Mackerel		NA	NA	NA	NA	NA	NA	0	4,737	100	0	4,737	4,737	100
ANF	Anglerfish		NA	NA	NA	NA	NA	NA	3,077	678	18	3,077	678	3,755	18
JAX	Horse mackerel		NA	NA	NA	NA	NA	NA	3	3,097	100	3	3,097	3,100	100
WIT	Witch		NA	NA	NA	NA	NA	NA	2,430	324	12	2,430	324	2,754	12
ARU	Greater silver smelt		NA	NA	NA	NA	NA	NA	0	2,313	100	0	2,313	2,313	100
HAD	Haddock		NA	NA	NA	NA	NA	NA	161	1,895	92	161	1,895	2,056	92
WHB	Whiting		NA	NA	NA	NA	NA	NA	0	1,964	100	0	1,964	1,964	100

3.1.4 Celtic Sea discard ratios by country by species

Table 3.1 – 6 shows the top ten species for the countries operating in the Celtic Sea. Most of the countries target roundfish (haddock, hake, cod and whiting) and anglerfish. The gadoid species were the most discarded species by all countries. The three main countries with the highest average catches between 2010 and 2012 were France, Spain (Table 3.1-5) and Ireland. The French catches are predominated by haddock, contributing with 36% of the total catches by this country. France and Ireland had similar catches patterns, both countries mainly target roundfish and anglerfish with large meshed otter trawls (TR1). According with the STECF data, the French fleet had highest discard ratios for haddock and mackerel with 44% and 47% average discard rate, respectively. The mackerel high discard estimates should be interpreted with care because it results from a high discard estimation from France, in 2012 (97%), which appears to be unreliable and should not be used. The other main species discarded by both countries were cod, haddock and whiting, which is related with quota restrictions and strong recruitment.

The Spanish effort in the Celtic Sea is mainly exerted by longliners and otter trawlers, targeting hake, anglerfish and megrims. The main discarded species by the Spanish fleet is haddock, with most of the catches being discarded (92%) (Table 3.1-7).

Ireland catches were predominated by Norway lobster, whiting and haddock. No discard estimates were available for Norway lobster, and the discard rates for haddock estimations are not reliable and should not be used.

Scotland presented different catches patterns from other countries, with the highest average catches for boarfish, anglerfish and megrims. The discard ratios for the pelagic species, boarfish were not available. The inclusion of pelagic species in top 10 species in demersal fisheries should be taken with care because these could be the result of gear miss-placement and some of the pelagic fisheries data were included in the demersal fisheries.

In the English and Belgian catch patterns included flatfish and roundfish being included in the top 10 species and were distributed more evenly over the flatfish and roundfish. For both countries the species with highest total average catches was anglerfish, and the discard rates ranged between 14% for England and 17% for Belgium. It should be noted that the discard weight (and discard rates) for anglerfish for Belgium might be slightly overestimated due to sand load in the mouth of some fish. The English data also include pelagic species in the top 10 species, which might be the result of data miss-placement. The main species discarded by both countries were haddock, whiting and plaice, which is related with quota restrictions.

The other countries operating in the Celtic sea were, Northern Ireland, Germany and Netherlands, but contributed with low total catches. The catch composition followed the same pattern of the other countries, with haddock, cod, whiting and anglerfish had the highest catches and high discard rates for the gadoid species.

Table 3.1-6. Celtic Sea (ICES Divisions VII b, c, e, f, g, h, j, k) demersal fisheries: landings (t) and discards (t) per country, species and year; table sorted in a descended order on the average catch 2010-2012, top 10 species per country. Only for average total catch equal or greater than 20 t

Country	Species		2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total Catch	%DR
FRA	HAD	Haddock	5,243	1,654	24	7,398	**4,858***	**40***	9,471	**21,951***	**70***	7,370	**9,488***	16,858	**44***
	HKE	Hake	4,716	102	2	7,109	114	2	9,578	625	6	7,135	281	7,415	3
	ANF	Anglerfish	2,161	26	1	7,427	720	9	9,703	1,241	11	6,430	662	7,093	7
	COD	Cod	1,401	423	23	2,943	1,329	31	4,155	3,057	42	2,833	1,603	4,436	32
	WHG	Whiting	2,704	902	25	3,290	1,107	25	2,864	1,114	28	2,953	1,041	3,994	26
	LEZ	Megrims	1,997	193	9	1,613	372	19	1,948	685	26	1,853	417	2,269	18
	MAC	Mackerel	209	87	29	592	105	15	93	3,285	97	298	1,159	1,457	47
	NEP	Norway Lobster	846	NA	NA	515	NA	NA	375	NA	NA	579	NA	579	NA
	POL	Pollack	884	22	2	1,030	36	3	733	1	0	882	20	902	2
	LIN	Ling	567	82	13	622	73	10	715	72	9	635	76	711	11
IRL	NEP	Norway Lobster	5,082	NA	NA	4,136	NA	NA	6,024	NA	NA	5,081	NA	5,081	NA
	WHG	Whiting	4,309	2,025	32	4,699	915	16	5,811	2,062	26	4,939	1,667	6,607	25
	HAD	Haddock	**2,590**	**3,108***	**55***	**3,273**	**2,487***	**43***	**4,101**	**4,085***	**50***	**3,321**	**3,227***	**6,548***	**49***
	ANF	Anglerfish	3,461	269	7	3,045	266	8	3,099	516	14	3,202	351	3,552	10
	LEZ	Megrims	2,346	417	15	2,212	301	12	3,048	603	17	2,535	441	2,976	15
	HKE	Hake	1,519	55	3	1,605	13	1	1,601	50	3	1,575	39	1,614	2
	COD	Cod	901	542	38	851	753	47	1,399	379	21	1,051	558	1,609	35
	POL	Pollack	813	7	1	880	15	2	950	4	0	881	9	890	1
	POK	Saithe	295	1	0	678	0	0	922	0	0	632	0	632	0
	SRX	Skates and rays	467	16	3	546	7	1	569	NA	NA	527	12	539	NA
SCO	BOR	Boarfish	9,219	NA	NA	NA	NA	NA	3,139	NA	NA	6,179	NA	6,179	NA
	ANF	Anglerfish	1,411	32	2	1,526	100	6	1,447	108	7	1,461	80	1,541	5
	LEZ	Megrims	743	100	12	645	129	17	683	220	24	690	149	840	18
	HKE	Hake	567	4	1	246	8	3	1,201	38	3	672	16	688	2
	HAD	Haddock	66	24	27	253	178	41	319	976	75	213	393	605	48
	NEP	Norway Lobster	174	NA	NA	177	NA	NA	195	NA	NA	182	NA	182	NA
	MAC	Mackerel	823	0	0	1	0	5	0	0	24	275	0	275	10
	LIN	Ling	149	0	0	125	2	1	312	3	1	195	2	197	1
	FOX	Forkbeards	49	104	68	25	NA	NA	16	NA	NA	30	104	134	NA
	WHG	Whiting	34	7	18	87	20	18	64	19	23	62	15	77	20
ENG	ANF	Anglerfish	3,898	440	10	4,337	546	11	3,895	998	20	4,043	661	4,704	14
	MAC	Mackerel	746	56	7	29	3	9	5,404	5	0	2,060	21	2,081	5
	LEZ	Megrims	1,740	134	7	1,777	287	14	1,653	494	23	1,723	305	2,029	15
	WHB	Blue whiting	2,245	NA	NA	NA	NA	NA	1,472	NA	NA	1,859	NA	1,859	NA
	HAD	Haddock	668	218	25	1,200	662	36	1,158	648	36	1,008	509	1,518	32
	PLE	Plaice	841	100	11	916	146	14	935	394	30	897	213	1,111	18
	POL	Pollack	854	8	1	1,135	43	4	1,024	11	1	1,004	21	1,025	2
	JAX	Trachurus sp	273	NA	NA	46	NA	NA	2,716	NA	NA	1,012	NA	1,012	NA
	HKE	Hake	589	18	3	875	41	4	737	60	8	734	40	774	5
	WHG	Whiting	550	318	37	490	142	23	483	233	33	507	231	739	31
BEL	ANF	Anglerfish	574	101	15	842	151	15	1,258	316	20	891	189	1,080	17
	HAD	Haddock	167	141	46	211	527	71	231	1,297	85	203	655	858	67
	SOL	Sole	655	51	7	805	16	2	894	1	0	785	23	807	3
	SRX	Skates and rays	632	62	9	709	26	4	801	17	2	714	35	749	5
	PLE	Plaice	238	92	28	352	103	23	338	344	50	309	180	489	34
	LEZ	Megrims	263	9	3	322	18	5	595	173	22	394	67	460	10
	COD	Cod	52	34	40	123	177	59	289	95	25	154	102	256	41
	WHG	Whiting	100	86	46	99	79	44	168	213	56	123	126	249	49
	LIN	Ling	NA	NA	NA	NA	NA	NA	55	17	24	55	17	72	24
	POL	Pollack	22	0	0	26	0	1	33	0	0	27	0	27	1
NIR	HAD	Haddock	48	26	35	93	58	38	268	909	77	136	331	468	50
	NEP	Norway Lobster	328	NA	NA	8	NA	NA	33	NA	NA	123	NA	123	NA
	WHG	Whiting	46	39	46	26	9	26	31	4	12	34	17	52	28
	COD	Cod	14	20	59	16	6	29	26	12	32	18	13	31	40
DEU	ANF	Anglerfish	251	1	0	185	3	2	266	NA	NA	234	2	236	NA
NLD	WHG	Whiting	76	83	52	152	35	19	133	81	38	120	66	187	36
	HAD	Haddock	NA	NA	NA	35	37	51	63	226	78	49	131	180	78
	JAX	Trachurus sp	67	NA	NA	39	NA	NA	92	NA	NA	66	NA	66	NA

Note: Data with * were identified to be unreliable and should not be used.

Table 3.1-7 Celtic Sea (ICES Divisions VII b, c, e, f, g, h, j, k) Spanish demersal fisheries: landings (t) and discards (t) per species and year; table sorted in a descended order on the average catch 2010-2012, top 10 species. Only for average total catch equal or greater than 20 t

Country	Species		2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total Catch	%DR
ESP	HKE	Hake	NA	NA	NA	NA	NA	NA	12,179	900	7	12,179	900	13,079	7
	LEZ	Megrims	NA	NA	NA	NA	NA	NA	4,250	2,334	35	4,250	2,334	6,584	35
	ANF	Anglerfish	NA	NA	NA	NA	NA	NA	3,077	678	18	3,077	678	3,755	18
	WIT	Witch	NA	NA	NA	NA	NA	NA	2,430	324	12	2,430	324	2,754	12
	HAD	Haddock	NA	NA	NA	NA	NA	NA	161	1,895	92	161	1,895	2,056	92
	ALB	Albacore	NA	NA	NA	NA	NA	NA	1,455	0	0	1,455	0	1,455	0
	BRF	Blackbelly rosefish	NA	NA	NA	NA	NA	NA	910	29	3	910	29	939	0
	LIN	Ling	NA	NA	NA	NA	NA	NA	612	212	26	612	212	824	0
	NEP	Norway lobster	NA	NA	NA	NA	NA	NA	333	237	42	333	237	570	42
	FOX	Forkbeards	NA	NA	NA	NA	NA	NA	86	0	0	86	0	86	0

3.1.5 Celtic Sea discard ratios by gear

The main operating gears in the Celtic Sea are the otter trawls: 1) >=100mm codend mesh (TR1) and 2) 70-99mm codend mesh (TR2), gillnetters (GN1) and beam trawls with 80-120mm codend mesh size (BT2). The TR1 are mainly used to target roundfish (e.g. haddock, whiting, cod), anglerfish and megrims and the main countries operating with TR1 fishery are France, Ireland and England (Table 3.1-8). The main discarded species by TR1 are haddock, cod and whiting with 44%, 27% and 20% of discard rate of the average total catches between 2010 and 2012, respectively. The discard rate for cod increased between 2010 and 2012 resultant of the quota restrictions in the mixed fisheries and recruitment variability. Spanish TR1 fishery showed low discard rates, varying between 0% and 9% (Table 3.1-9).

The smaller meshed trawlers (TR2) are the main gear for the *Nephrops* fishery. The *Nephrops* fishery in the Celtic Sea is relatively small when compared with other areas, such as the Irish or the North Sea. This fishery has higher discard rates than the TR1, and the main discarded species are roundfish species: cod (49%), haddock (47%), plaice (38%) and whiting (33%). %). Spanish TR2 fishery has the same discard pattern of the other countries, with discard rates for haddock (92), hake (65%) ling (62%) (Table 3.1-9)The drivers to discard these species are quota restrictions and undersized fish. *Nephrops* discards estimates were only available for 2012, and although the discards of this species are known to be low, STECF data showed high discard rates, mainly derived from the Irish TR2 fleet. These estimations were classified as erroneous and removed from the tables presented in this atlas.

Gillnets (GN1) are mostly operated by the French fleet and are the gear with the lowest discard rates. The target species are hake, anglerfish and pollack. Most of the species have discard rates ranging from 0% and 7%, except for cod with 20% of discard rate of the average total catches. The high discard rate for cod might be related with the quota restrictions.

Beam trawling in the Celtic Sea is mostly carried out by BT2 (80-119mm codend mesh size) and is mainly operated by England, Belgium and Ireland. This fishery targets flatfish species, such as sole

and plaice, and produced high discard ratios, especially for gadoid species, such as haddock (54%), whiting (49%) and cod (39%).

The other gears operating in the Celtic Sea and catching quota species include 'OTTER', trammel nets (GT1), otter trawls 16-31mm codend mesh size (TR3) and dredges.

The trammel nets (GT1) fishery mostly targets pollack, hake and anglerfish and is performed by the French, English and Irish fleet. Comparing with other fisheries in the Celtic Sea, it has the highest overall discard rate, but highly variable among species. Anglerfish and sole had discard rates of 15% and 0%, respectively, whereas other species such as whiting, cod, ling and hake had high discard rates, ranging from 46% to 63%. The reported data from this fishery is scarce and the discard estimates should be interpreted with care.

The "OTTER" gear includes all the otter trawls data that do not fall in to the codend mesh size range for the TR1 or TR2, or when no mesh information is provided. Data from this gear showed that the species with highest catches were boarfish, mackerel and blue whiting. Boarfish and blue whiting do not have discard estimates, which might indicate that these data are originated from pelagic trawlers. Data from this gear definition should be interpreted with extreme care because might include data from pelagic trawls.

For dredges the only species with discard estimates was anglerfish, with 15% of discard rates of the average total catches between 2010 and 2012. Other quota species, such as sole, have high catches, but discard estimations were not available.

Table 3.1-8. Celtic Sea (ICES Divisions VII b, c, e, f, g, h, j, k) demersal fisheries: landings (t) and discards (t) per gear, species and year; table sorted in descending order on the average catch 2010-2012, top 10 species per gear. Only for average total catch equal or greater than 20 t

Gear	Species		2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total Catch	%DR
TR1	HAD	Haddock	6,363	2,224	26	9,699	6,101	39	12,465	**24,864***	**67***	9,509	11,063*	20,572	44*
	ANF	Anglerfish	4,852	131	3	8,578	877	9	9,937	1,387	12	7,789	798	8,588	8
	WHG	Whiting	4,339	1,194	22	5,606	1,468	21	6,537	1,522	19	5,494	1,395	6,889	20
	LEZ	Megrims	4,227	400	9	3,963	823	17	5,251	1,653	24	4,480	958	5,439	17
	COD	Cod	1,457	363	20	2,975	835	22	4,510	2,828	39	2,981	1,342	4,323	27
	NEP	Norway Lobster	2,002	NA	NA	1,695	NA	NA	1,698	NA	NA	1,798	NA	1,798	NA
	HKE	Hake	2,122	46	2	2,537	150	6	3,477	713	17	2,712	303	3,014	8
	LIN	Ling	517	9	2	713	55	7	777	70	8	669	45	714	6
	POL	Pollack	521	1	0	765	1	0	674	0	0	653	1	654	0
	POK	Saithe	249	0	0	547	NA	NA	563	0	0	453	0	453	0
TR2	NEP	Norway Lobster	4,470	NA	NA	3,144	NA	NA	4,645	NA	NA	4,086	NA	4,086	NA
	HAD	Haddock	**1,883***	**26408***	**58***	**2,049***	**1,592***	**44***	**2,194***	**14,112***	**87***	**2,042***	**6,114***	**8,157***	**63***
	WHG	Whiting	3,301	1,828	36	2,995	720	19	2,613	1,925	42	2,969	1,491	4,460	32
	ANF	Anglerfish	1,908	147	7	2,491	275	10	3,913	713	15	2,771	378	3,149	11
	LEZ	Megrims	1,564	437	22	1,249	196	14	2,034	882	30	1,616	505	2,121	22
	COD	Cod	724	517	42	715	1,279	64	870	609	41	770	801	1,571	49
	PLE	Plaice	450	311	41	460	162	26	411	402	49	440	292	732	39
	HKE	Hake	486	0	0	410	NA	NA	569	360	39	488	180	669	39
	POL	Pollack	471	0	0	551	0	0	388	NA	NA	470	0	470	0
	SRX	Skates and rays	473	NA	NA	444	NA	NA	393	NA	NA	437	NA	437	NA
GN1	HKE	Hake	3,868	49	1	6,088	14	0	7,356	187	2	5,771	83	5,854	1
	ANF	Anglerfish	1,612	10	1	1,849	28	1	2,113	NA	NA	1,858	19	1,877	1
	POL	Pollack	1,400	10	1	1,566	65	4	1,535	15	1	1,500	30	1,531	2
	POK	Saithe	277	2	1	264	0	0	625	1	0	389	1	389	0
	LIN	Ling	301	5	2	431	2	0	355	4	1	362	4	366	1
	COD	Cod	153	19	11	210	67	24	346	114	25	236	67	303	20
	HAD	Haddock	106	1	1	177	1	1	168	2	1	150	1	151	1
	WHG	Whiting	37	3	7	56	10	15	105	5	5	66	6	72	9
	SRX	Skates and rays	60	NA	NA	73	NA	NA	66	NA	NA	66	NA	66	NA
	HER	Herring	3	NA	NA	13	NA	NA	104	NA	NA	40	NA	40	NA
BT2	ANF	Anglerfish	3,071	569	16	3,590	548	13	3,684	1,422	28	3,449	846	4,294	19
	LEZ	Megrims	1,274	NA	NA	1,323	82	6	1,947	542	22	1,515	312	1,827	14
	SOL	Sole	1,139	60	5	1,331	21	2	1,470	2	0	1,313	28	1,341	2
	HAD	Haddock	399	181	31	500	1,104	69	693	1,128	62	531	804	1,335	54
	PLE	Plaice	820	76	8	956	182	16	1,001	697	41	926	318	1,244	22
	SRX	Skates and rays	516	78	13	596	34	5	679	17	2	597	43	640	7
	COD	Cod	204	110	35	273	670	71	530	56	10	335	278	614	39
	WHG	Whiting	111	66	37	125	105	46	156	269	63	131	147	277	49
	LIN	Ling	70	3	4	97	NA	NA	177	19	10	115	11	126	7
	HKE	Hake	71	18	20	62	16	20	61	23	27	64	19	83	23
OTTER	MAC	Mackerel	1,599	44	3	113	NA	NA	5,397	3,290	38	2,370	1,667	4,037	21
	BOR	Boarfish	8,922	NA	NA	515	NA	NA	2,185	NA	NA	3,874	NA	3,874	NA
	WHB	Blue Whiting	2,245	NA	NA	NA	NA	NA	1,472	NA	NA	1,859	NA	1,859	NA
	JAX	Trachurus spp	315	NA	NA	268	NA	NA	2,681	NA	NA	1,088	NA	1,088	NA
	HER	Herring	298	NA	NA	317	NA	NA	4	NA	NA	206	NA	206	NA
	WHG	Whiting	10	309	97	6	2	26	3	0	8	6	104	110	44
	HAD	Haddock	15	115	89	11	3	22	11	1	5	12	40	52	38
	ANF	Anglerfish	5	0	1	23	22	49	19	0	1	16	7	23	17
GT1	ANF	Anglerfish	196	2	1	699	27	4	892	NA	NA	596	15	611	15
	COD	Cod	24	95	80	39	24	38	64	149	70	42	89	132	63
	POL	Pollack	72	25	26	51	27	35	50	0	1	58	18	75	20
	LIN	Ling	26	75	74	24	32	57	30	11	27	27	39	66	53
	SRX	Skates and rays	86	NA	NA	52	NA	NA	43	NA	NA	60	NA	60	NA
	HKE	Hake	10	70	88	4	4	50	54	0	0	23	25	47	46
	SOL	Sole	24	NA	NA	56	NA	NA	50	NA	NA	43	NA	43	NA
	WHG	Whiting	2	61	96	6	0	0	5	0	1	5	20	25	33
TR3	BOR	Boarfish	NA	NA	NA	NA	NA	NA	1,282	NA	NA	1,282	NA	1,282	NA
	SPR	Sprat	NA	NA	NA	12	NA	NA	1,106	NA	NA	559	NA	559	NA
	HER	Herring	NA	NA	NA	30	NA	NA	NA	NA	NA	30	NA	30	NA
	MAC	Mackerel	35	NA	NA	3	NA	NA	37	0	0	25	0	25	0
DREDGE	ANF	Anglerfish	119	12	9	107	9	8	106	38	26	110	20	130	15
	SOL	Sole	24	NA	NA	30	NA	NA	30	NA	NA	28	NA	28	NA
	SPR	Sprat	NA	NA	NA	24	NA	NA	NA	NA	NA	24	NA	24	NA

Note: Data in bold were identified to be unreliable and should not be used.

Table 3.1-9 Celtic Sea (ICES Divisions VII b, c, e, f, g, h, j, k) Spanish demersal fisheries: landings (t) and discards (t) per gear, species and year; table sorted in a descended order on the average catch 2010-2012, top 10 species. Only for average total catch equal or greater than 20 t

Gear	Species		2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total Catch	%DR
TR1	HKE	Hake	NA	NA	NA	NA	NA	NA	1,175	122	9	1,175	122	1,297	9
	WIT	Witch	NA	NA	NA	NA	NA	NA	1,047	17	2	1,047	17	1,064	2
	ANF	Anglerfish	NA	NA	NA	NA	NA	NA	303	0	0	303	0	303	0
	LEZ	Megims	NA	NA	NA	NA	NA	NA	275	20	7	275	20	295	7
	NEP	Norway lobster	NA	NA	NA	NA	NA	NA	160	NA	NA	160	NA	160	NA
	BRF	Blackbelly Rosefish	NA	NA	NA	NA	NA	NA	59	2	0	59	2	60	3
TR2	LEZ	Megims	NA	NA	NA	NA	NA	NA	3,292	2,314	41	3,292	2,314	5,606	41
	ANF	Anglerfish	NA	NA	NA	NA	NA	NA	2,236	678	23	2,236	678	2,915	23
	HAD	Haddock	NA	NA	NA	NA	NA	NA	146	1,895	93	146	1,895	2,041	93
	WIT	Witch	NA	NA	NA	NA	NA	NA	1,211	306	20	1,211	306	1,517	20
	HKE	Hake	NA	NA	NA	NA	NA	NA	419	778	65	419	778	1,197	65
	LIN	Ling	NA	NA	NA	NA	NA	NA	131	211	62	131	211	342	62
	NEP	Norway lobster	NA	NA	NA	NA	NA	NA	97	NA	NA	97	NA	97	NA
GN1	HKE	Hake	NA	NA	NA	NA	NA	NA	127	9	7	127	9	136	7
OTTER	LEZ	Megims	NA	NA	NA	NA	NA	NA	671	0	0	671	0	671	0
	ANF	Anglerfish	NA	NA	NA	NA	NA	NA	527	0	0	527	0	527	0
	HKE	Hake	NA	NA	NA	NA	NA	NA	234	0	0	234	0	234	0
	WIT	Witch	NA	NA	NA	NA	NA	NA	172	0	0	172	0	172	0
	NEP	Norway lobster	NA	NA	NA	NA	NA	NA	76	0	0	76	0	76	0
	LIN	Ling	NA	NA	NA	NA	NA	NA	21	0	0	21	0	21	0
	HAD	Haddock	NA	NA	NA	NA	NA	NA	14	0	0	14	0	14	0

3.2 Irish Sea (ICES Division VIIa)

3.2.1 Irish Sea discard ratios per species and quality of discard information

Catch information in the dataset is incomplete for some species and years, which makes it difficult to derive meaningful conclusions on overall catch and discard rates. The assessment of trends in relative catch by species during 2010 – 2012 is also not possible. Landings in the Irish Sea are dominated by *Nephrops*. Quality indicators of discard estimates of fish species suggest widespread sampling of discards across the fishing fleets segments in the region. In recent years sampling of discards has expanded to provide data for a greater range of species. It is considered that whilst discard sampling schemes have been in place during 2010 – 2012 that as sampling has increased the most accurate estimates of discards have been achieved toward the end of the series. Thirteen species were reported as having average catches > 20 t, which is likely to be an underestimate considering the partial representation of the data. The extremes of discard ratio range are represented by species with markedly different catch characteristics, both having relatively low landings (<100 t) but highly contrasting discard rates, 81% and 2% for whiting and pollack respectively. For species with average annual catches in the range 100 – 300 t all have a discard ratios below average, this includes sole, anglerfish and hake. With the exception of whiting and herring, all species with average annual catches < 300 t have the highest discard rates, of these cod has the lowest discard rate of 26% whilst haddock and plaice have the third and second highest rates of all species. With respect to herring and sprat it should be noted that the catch data are derived from demersal fishing activity whilst herring and sprat are targeted by vessels operating in pelagic fisheries. It is likely that the inclusion of herring and sprat results from national coding convention of unregulated gears within the STECF datasets.

Table 3.2 -1 highlights how much of the final discard estimates are derived from reported data by each country and how much had to be filled in by assuming an average discard ratio from countries that have submitted data for a given metier/fishery. The quality is expressed as %DQ (% discard quality) derived as the amount of discards from submitted data relative to the overall estimate of discard (in tonnes). Overall, the quality of discards estimates in the Irish Sea is very high, except for haddock and plaice in 2012.

3.2.2 Irish Sea Quota allocation and usage

Table 3.2-2 describes the quota available in the Irish Sea, for each stock to each country in the beginning and end of the year, between 2010 and 2012. The table shows that substantial quota exchange occurs between countries for most of the species. Hake, anglerfish, plaice and skates and rays are the species where most of the exchanges occurred. On the other hand, pollack (VII) was the species where less quota exchanges occurred.

Table 3.2-1. Irish Sea (ICES Division VII a) demersal fisheries: landings and discards per species and year; top 20 species sorted in descending order on average catch 2010-2012, only for average total catch equal or greater than 20 t.

Species		2010					2011					2012					Average 2012 - 2012				
		Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ
NEP	Norway lobster	9,216	NA	9,216	NA	NA	10,402	NA	10,402	NA	NA	10,649	NA	10,649	NA	NA	10,089	NA	10,089	NA	NA
HAD	Haddock	937	114	1,051	11	99	805	446	1,251	36	94	794	556	1,350	41	31	845	372	1,217	29	51
PLE	Plaice	342	268	610	44	80	577	589	1,166	51	77	454	1,077	1,531	70	34	458	644	1,102	55	48
SRX	Rays and skates	868	85	953	9	42	999	71	1,070	7	71	923	28	951	3	79	930	61	991	6	64
WHG	Whiting	120	212	332	64	96	107	636	743	86	95	64	893	957	93	80	97	580	677	81	88
COD	Cod	573	38	611	6	79	473	52	525	10	87	279	429	708	61	95	442	173	615	26	93
SPR	Sprat	186	NA	186	NA	NA	NA	NA	0	NA	NA	546	NA	546	NA	NA	366	NA	NA	NA	NA
SOL	Sole	272	16	288	6	69	324	13	337	4	89	286	0	286	0	82	294	10	304	3	78
ANF	Anglerfish	163	1	164	1	93	222	18	240	8	97	283	32	315	10	55	223	17	240	6	66
HKE	Hake	178	NA	178	NA	NA	106	9	115	8	99	69	14	83	16	94	118	12	130	12	97
POL	Pollack	80	NA	80	NA	NA	77	NA	77	NA	NA	45	1	46	2	100	68	1	69	2	100
HER	Herring	8	NA	8	NA	NA	22	14	36	38	100	92	21	113	18	100	41	17	58	28	100
LIN	Ling	61	NA	61	NA	NA	62	NA	62	NA	NA	39	3	42	7	98	54	3	57	7	98
All Species		**13,037**	**734**	**13,771**	**5**	**88**	**14,203**	**1,848**	**16,051**	**12**	**89**	**14,574**	**3,056**	**17,630**	**17**	**49**	**14,063**	**1,891**	**15,954**	**11**	**64**

Note: %DR refers to discard ratio (discards/total catch). %DQ refers to the quality of the discard estimate (proportion of the discard estimates is derived from actual data). The colour coding refers to larger than 66% (green), between 33% and 66% (orange) and below 33% (red).

Table 3.2-2. Irish Sea (ICES Division VII a) demersal fisheries: quota by species, country and year

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2013	Average Final Quota 2010 - 2013	Average % change 2010 - 2013
Cod	VIIa	Belgium	9	32	256%	7	38	443%	5	28	460%	7	33	386%
		France	25	26	4%	19	15	-21%	14	16	14%	19	19	-1%
		Ireland	444	325	-27%	332	341	3%	251	271	8%	342	312	-5%
		The Netherlands	9	0	-100%	2	0	-100%	1	0	-100%	4	0	-100%
		United Kingdom	194	387	99%	146	188	29%	109	124	14%	150	233	47%
		TAC	681	770	13%	506	582	15%	380	439	16%	522	597	15%
Megrims	VIIa	Belgium	494	548	11%	494	494	0%	470	659	40%	486	567	17%
		Spain	5,490	6,094	11%	5,490	5,490	0%	5,216	5,599	7%	5,399	5,728	6%
		France	6,663	7,396	11%	6,663	6,655	0%	6,329	6,688	6%	6,552	6,913	6%
		Ireland	3,029	2,962	-2%	3,029	2,988	-1%	2,878	2,888	0%	2,979	2,946	-1%
		United Kingdom	2,624	3,313	26%	2,624	2,673	2%	2,492	3,384	36%	2,580	3,123	21%
		TAC	18,300	20,313	11%	18,300	18,300	0%	17,385	19,218	11%	17,995	19,277	7%
Haddock	VIIa	Belgium	23	46	100%	21	36	71%	20	39	95%	21	40	89%
		France	103	113	10%	95	82	-14%	91	99	9%	96	98	2%
		Ireland	617	608	-1%	570	555	-3%	542	583	8%	576	582	1%
		The Netherlands	0	0	0%	0	0	0%	0	2	100%	0	1	33%
		United Kingdom	681	799	17%	631	644	2%	598	660	10%	637	701	10%
		TAC	1,424	1,566	10%	1,317	1,317	0%	1,251	1,383	11%	1,331	1,422	7%
Anglerfish	VII	Belgium	2,984	2,836	-5%	2,984	2,961	-1%	2,835	1,688	-40%	2,934	2,495	-15%
		Germany	333	365	10%	333	370	11%	316	339	7%	327	358	9%
		Spain	1,186	3,145	165%	1,186	2,961	150%	1,126	2,974	164%	1,166	3,027	160%
		France	19,149	19,044	-1%	19,419	19,237	-1%	18,191	18,835	4%	18,920	19,039	1%
		Ireland	2,447	3,674	50%	2,447	3,372	38%	2,325	3,371	45%	2,406	3,472	44%
		The Netherlands	386	195	-49%	386	2	-99%	367	43	-88%	380	80	-79%
		United Kingdom	5,807	6,079	5%	5,807	6,475	12%	5,517	6,815	24%	5,710	6,456	13%
		TAC	32,292	35,338	9%	32,562	35,378	9%	30,677	34,065	11%	31,844	34,927	10%
Whiting	VIIa	Belgium	0	10	100%	0	4	100%	0	5	100%	0	6	100%
		France	5	6	20%	4	5	25%	3	4	33%	4	5	26%
		Ireland	91	104	14%	68	105	54%	52	56	8%	70	88	25%
		The Netherlands	0	0	0%	0	0	0%	0	0	0%	0	0	0%
		United Kingdom	61	60	-2%	46	19	-59%	34	37	9%	47	39	-17%

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2013	Average Final Quota 2010 - 2013	Average % change 2010 - 2013
		TAC	157	180	15%	118	133	13%	89	102	15%	121	138	14%
Hake	VI and VII; EU and international waters of Vb; international waters of XII and XIV	Belgium	284	122	-57%	284	13	-95%	284	23	-92%	284	53	-81%
		Spain	9,109	12,618	39%	9,109	12,061	32%	9,109	12,034	32%	9,109	12,238	34%
		France	14,068	12,425	-12%	14,067	12,768	-9%	14,067	13,474	-4%	14,067	12,889	-8%
		Ireland	1,704	2,126	25%	1,704	1,937	14%	1,704	1,873	10%	1,704	1,979	16%
		The Netherlands	183	183	0%	183	403	120%	183	56	-69%	183	214	17%
		United Kingdom	5,553	4,047	-27%	5,553	4,836	-13%	5,553	5,187	-7%	5,553	4,690	-16%
		TAC	30,901	31,521	2%	30,900	32,018	4%	30,900	32,647	6%	30,900	32,062	4%
Norway Lobster	VII	Belgium	0	15	100%	0	16	100%	0	72	100%	0	34	100%
		Spain	1,346	1,494	11%	1,306	1,440	10%	1,306	1,375	5%	1,319	1,436	9%
		France	5,455	6,122	12%	5,291	5,735	8%	5,291	4,416	-17%	5,346	5,424	1%
		Ireland	8,273	8,595	4%	8,025	8,900	11%	8,025	10,534	31%	8,108	9,343	15%
		United Kingdom	7,358	8,831	20%	7,137	8,155	14%	7,137	7,766	9%	7,211	8,251	14%
		TAC	22,432	25,057	12%	21,759	24,246	11%	21,759	24,163	11%	21,983	24,489	11%
Plaice	VIIa	Belgium	42	382	810%	42	380	805%	42	433	931%	42	398	848%
		France	18	20	11%	18	20	11%	18	20	11%	18	20	11%
		Ireland	1,063	827	-22%	1,063	846	-20%	1,063	848	-20%	1,063	840	-21%
		The Netherlands	13	0	-100%	0	0	0%	13	1	-92%	9	0	-64%
		United Kingdom	491	548	12%	491	546	11%	491	506	3%	491	533	9%
		TAC	1,627	1,777	9%	1,614	1,792	11%	1,627	1,808	11%	1,623	1,792	10%
Pollack	VII	Belgium	428	428	0%	420	420	0%	420	420	0%	423	423	0%
		Spain	26	26	0%	25	25	0%	25	25	0%	25	25	0%
		France	9,864	9,864	0%	9,667	9,667	0%	9,667	9,532	-1%	9,733	9,688	0%
		Ireland	1,051	1,051	0%	1,030	1,060	3%	1,030	1,165	13%	1,037	1,092	5%
		The Netherlands	0	5	100%	0	10	100%	0	4	100%	0	6	100%
		United Kingdom	2,401	2,396	0%	2,353	2,313	-2%	2,353	2,349	0%	2,369	2,353	-1%
		TAC	13,770	13,770	0%	13,495	13,495	0%	13,495	13,495	0%	13,587	13,587	0%
Saithe	VII, VIII, IX and X; EU waters of CECAF 34.1.1	Belgium	6	6	0%	6	6	0%	6	6	0%	6	6	0%
		Spain	0	10	100%	0	9	100%	0	9	100%	0	9	100%
		France	1,428	1,418	-1%	1,375	1,366	-1%	1,375	1,236	-10%	1,393	1,340	-4%
		Ireland	1,525	1,525	0%	1,516	1,516	0%	1,516	1,516	0%	1,519	1,519	0%
		The Netherlands	0	0	0%	0	0	0%	0	5	100%	0	2	33%
		United Kingdom	452	447	-1%	446	431	-3%	446	441	-1%	448	440	-2%

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2013	Average Final Quota 2010 - 2013	Average % change 2010 - 2013
		TAC	3,411	3,406	0%	3,343	3,328	0%	3,343	3,213	-4%	3,366	3,316	-1%
Common Sole	VIIa	Belgium	186	312	68%	179	299	67%	131	246	88%	165	286	74%
		France	2	2	0%	2	2	0%	2	2	0%	2	2	0%
		Ireland	73	51	-30%	73	65	-11%	67	58	-13%	71	58	-18%
		The Netherlands	58	0	-100%	56	0	-100%	41	0	-100%	52	0	-100%
		United Kingdom	83	94	13%	80	69	-14%	59	37	-37%	74	67	-13%
		TAC	402	459	14%	390	435	12%	300	343	14%	364	412	13%
Skates and Rays	EU waters of VIa, Vib, VIIa-c and VIIe-k	Belgium	1,209	1,209	0%	1,027	1,348	31%	895	1,422	59%	1,044	1,326	30%
		France	5,425	5,599	3%	4,612	5,325	15%	4,018	4,719	17%	4,685	5,214	12%
		Germany	16	16	0%	14	16	14%	12	14	17%	14	15	10%
		Ireland	1,747	1,573	-10%	1,485	1,305	-12%	1,294	1,311	1%	1,509	1,396	-7%
		The Netherlands	5	0	-100%	4	5	25%	4	12	200%	4	6	42%
		Spain	1,460	1,460	0%	1,241	1,387	12%	1,082	767	-29%	1,261	1,205	-6%
		United Kingdom	3,460	3,460	0%	2,941	3,114	6%	2,562	2,814	10%	2,988	3,129	5%
		TAC	13,322	13,317	0%	11,324	12,500	10%	9,867	11,059	12%	11,504	12,292	7%

3.2.3 Irish Sea discard ratios by species and by country

Table 3.2.-3 shows the landings and discards of the top 10 species caught in the Irish Sea by country. Data for 2010 are incomplete and catch information for *Nephrops* are missing from the data source presented. In addition, country specific discard ratios are also missing for some species and years and the data need to be treated cautiously. Table 3.2.-3 highlights that for those species where discard estimates have been provided; there is large variation in discard ratios between countries. This is mostly associated with the make-up of the national fishing fleets and the associated proportional effort by metier with markedly different metier specific discard rates. Quota restrictions also cause variation between countries in some years, e.g., cod for Northern Ireland. Of the ten species selected, as species with average catch greater than 20 t, by a nation: Ireland (IRL) is included for eight of the ten species, with Belgium and Northern Ireland (NIR) included for seven species. England (ENG) and Scotland (SCO) are both included in *Nephrops* (landings only), and in the case of England, plaice whilst Scotland is included for haddock. For nations included in the calculation of discard rates for whiting this represents the highest rate observed rate.

Only Belgium and Ireland are included in the discard rates of sole which is the lowest of any derived rate, by either nation or species. Only Northern Ireland is included in a discard rate calculation of hake with an average of 10%. Belgium and Ireland are the only two countries included for rays and skates. For the majority of these instances, it is caused by incomplete data as oppose to being a reflection of discard practices, which makes it difficult to derive any sensible observation.

Table 3.2-3. Irish Sea (ICES Division VII a) demersal fisheries: landings (t) and discards (t) per species, country and year; table sorted in a descended order on the average catch 2010-2012, top 10 countries per species, only for average total catch equal or greater than 20 t.

Species		Country	2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total Catch	%DR
NEP	Norway Lobster	NIR	6,380	NA	NA	6,569	NA	NA	6,319	NA	NA	6,423	NA	6,423	NA
		IRL	2,588	NA	NA	3,603	NA	NA	4,038	NA	NA	3,410	NA	3,410	NA
		ENG	200	NA	NA	189	NA	NA	145	NA	NA	178	NA	178	NA
		SCO	48	NA	NA	39	NA	NA	141	NA	NA	76	NA	76	NA
HAD	Haddock	IRL	330	107	25	426	336	44	546	339	38	434	261	695	36
		NIR	590	NA	NA	350	79	18	208	98	32	383	89	472	25
		BEL	9	6	40	16	30	65	13	113	90	13	50	63	65
SRX	Skates and rays	IRL	553	49	8	498	20	4	468	NA	NA	506	34	541	6
		BEL	283	36	11	498	51	9	448	28	6	410	38	448	9
WHG	Whiting	IRL	97	206	68	93	389	81	55	458	89	82	351	432	79
		NIR	15	NA	NA	5	198	97	2	400	100	7	299	307	99
		BEL	5	5	50	4	33	90	4	20	82	4	19	23	74
PLE	Plaice	BEL	138	121	47	332	237	42	233	192	45	234	183	417	45
		IRL	88	147	63	115	210	65	98	232	70	100	196	297	66
		ENG	69	0	0	69	100	59	74	494	87	70	198	269	49
		NIR	48	NA	NA	60	41	40	50	157	76	52	99	151	58
SPR	Sprat	IRL	186	NA	NA	NA	NA	NA	546	NA	NA	366	NA	366	NA
COD	Cod	NIR	279	NA	NA	148	1	0	97	370	79	175	185	360	40
		IRL	260	29	10	272	23	8	151	35	19	227	29	256	12
		BEL	21	9	30	36	28	43	23	9	28	27	15	42	34
SOL	Sol	BEL	215	14	6	250	10	4	219	NA	NA	228	12	240	5
		IRL	47	2	5	48	0	1	49	NA	NA	48	1	49	3
HKE	Hake	NIR	160	NA	NA	93	9	9	57	13	19	103	11	114	10
ANF	Anglerfish	NIR	66	NA	NA	93	0	0	131	6	5	97	3	100	3
		IRL	80	1	1	99	16	14	69	15	18	82	11	93	11
		BEL	15	0	1	27	2	7	58	10	15	33	4	38	8

3.2.4 Irish Sea discard ratios by country by species

Comparison of Tables 3.2-3 and Table 3.2-4 shows that there is a high level of consistency between the nations and species catches greater than 20 t. For the remaining species more complex discard rates patterns are apparent with national variation in discard rate. For cod the average rate by nation varies from 12% to 40%, compared to with only Ireland having a rate below the average rate of 28% (Table 3.2-1). Similarly for haddock average discard rate to 25% to 65% between nations is observed with only Northern Irish vessels having a rate below the average of 29% (Table 3.2-1) in combination with the greatest average annual landings. These differences are likely to reflect seasonal and geographic focus of fleets of individual nations. Within the region the greatest volume of landings is of *Nephrops* by Northern Irish and Irish vessels and the abundance of juvenile cod and haddock on the *Nephrops* grounds is seasonal. During these periods when fishing activity is mainly undertaken by Northern Irish vessels high by-catch rates, by the *Nephrops* fleet, of cod and haddock has been observed. In the case of plaice, the discard rate derived for the Belgium fishing fleet is markedly reduced compared to other nations. This is gear related (BT2 compared to predominantly TR2 for other countries) but also likely to reflect local market demand, in Belgium, with one focus of the Belgian fleet being flatfish in the Irish Sea and plaice being the single most abundant species caught by Belgian vessels (Table 3.2-4). There are a small number of additional species included in Table 3.2-4 compared to Table 3.2-3. These are ling and pollack included in Northern Ireland and herring and pollack included Irish estimates. Ling and pollack discard rates by Northern Irish these are amongst the lowest rates observed for any species. Catches from Scotland and England are low in the Irish Sea compared to the other three countries.

Table 3.2-4. Irish Sea (ICES Division VII a) demersal fisheries: landings (t) and discards (t) per country, species and year; table sorted in a descended order on the average catch 2010-2012, top 10 species per country, only for average total catch equal or greater than 20 t.

Country	Species		2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total catch	%DR
NIR	NEP	Norway Lobster	6,380	NA	NA	6,569	NA	NA	6,319	NA	NA	6,423	NA	6,423	NA
	HAD	Haddock	590	NA	NA	350	79	18	208	98	32	383	89	472	25
	COD	Cod	279	NA	NA	148	1	0	97	370	79	175	185	360	40
	WHG	Whiting	15	NA	NA	5	198	97	2	400	100	7	299	307	99
	PLE	Plaice	48	NA	NA	60	41	40	50	157	76	52	99	151	58
	HKE	Hake	160	NA	NA	93	9	9	57	13	19	103	11	114	14
	ANF	Anglerfish	66	NA	NA	93	0	0	131	6	5	97	3	100	3
	LIN	Ling	45	NA	NA	39	NA	NA	25	3	11	36	3	39	11
	POL	Pollack	53	NA	NA	41	NA	NA	9	1	8	34	1	35	8
IRL	NEP	Norway Lobster	2,588	NA	NA	3,603	NA	NA	4,038	NA	NA	3,410	NA	3,410	NA
	HAD	Haddock	330	107	25	426	336	44	546	339	38	434	261	695	36
	SRX	Skates and rays	553	49	8	498	20	4	468	NA	NA	506	34	541	6
	WHG	Whiting	97	206	68	93	389	81	55	458	89	82	351	432	79
	SPR	Sprat	186	NA	NA	NA	NA	NA	546	NA	NA	366	NA	366	NA
	PLE	Plaice	88	147	63	115	210	65	98	232	70	100	196	297	66
	COD	Cod	260	29	10	272	23	8	151	35	19	227	29	256	12
	ANF	Anglerfish	80	1	1	99	16	14	69	15	18	82	11	93	11
	SOL	Sole	47	2	5	48	0	1	49	NA	NA	48	1	49	3
	HER	Herring	7	NA	NA	22	NA	NA	92	NA	NA	40	NA	40	NA
BEL	SRX	Skates and rays	283	36	11	498	51	9	448	28	6	410	38	448	9
	PLE	Plaice	138	121	47	332	237	42	233	192	45	234	183	417	45
	SOL	Sole	215	14	6	250	10	4	219	NA	NA	228	12	240	5
	HAD	Haddock	9	6	40	16	30	65	13	113	90	13	50	63	65
	COD	Cod	21	9	30	36	28	43	23	9	28	27	15	42	34
	ANF	Anglerfish	15	0	1	27	2	7	58	10	15	33	4	38	8
	WHG	Whiting	5	5	50	4	33	90	4	20	82	4	19	23	74
ENG	PLE	Plaice	69	0	0	69	100	59	74	494	87	70	198	269	49
	NEP	Norway Lobster	200	NA	NA	189	NA	NA	145	NA	NA	178	NA	178	NA
SCO	NEP	Norway Lobster	48	NA	NA	39	NA	NA	141	NA	NA	76	NA	76	NA

3.2.5 Irish Sea discard ratios by gear

The greatest abundance of landings in the Irish sea is by the vessels using TR2 gears (otter trawls, mesh size 70 – 99 mm). These are the main gear in the *Nephrops* fisheries. Larger meshed TR1 gears (otter trawls and demersal seines, mesh size greater than 99 mm) are mainly used to target round fish. The discard rates by species of these gears have contrasting character (Table 3.2-5). Despite the TR2 fishery being *Nephrops* directed, catches of roundfish exceed those of the TR1 fishery for all species, apart from haddock, the species with greatest average landings by the TR1 gear. This results greatly from the breakdown of effort between these fisheries with the TR2 dominating fishing effort in the area and effort in the roundfish directed TR1 fishery being very low. Comparison of the discard rates reported for these fisheries shows that the average rates for roundfish, observed in the TR1 fishery are in all cases lower than those in the TR2 fishery, with the rates being 58% vs. 3%, 90% vs. 39% and 30% vs. 1% for haddock, whiting and cod respectively. The catches and discard rates observed in the BT2 fishery (beam trawls) corresponds closely with the landings and discard patterns of the Belgian national catches. For the main species, plaice, rays and skates, and sole, caught in this fishery, the discard rates are comparatively low compared to other gear types. The catches reported under the gear type 'OTTER' appear to correspond to national gear coding of pelagic fisheries from Ireland and, therefore, should not be considered.

Table 3.2-5. Irish Sea (ICES Division VII a) demersal fisheries: landings (t) and discards (t) per gear, species and year; table sorted in descending order on the average catch 2010-2012, top 10 species per gear, only for average total catch equal or greater than 20 t.

Gear	Species		2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total catch	%DR
TR2	NEP	Norway Lobster	9,209	NA	NA	10,384	NA	NA	10,622	NA	NA	10,072	NA	10,072	NA
	PLE	Plaice	144	149	51	174	291	63	137	820	86	152	420	572	66
	WHG	Whiting	62	186	75	17	568	97	15	771	98	32	509	540	90
	HAD	Haddock	240	101	30	148	384	72	155	397	72	181	294	475	58
	COD	Cod	211	14	6	168	8	5	112	408	78	164	143	307	30
	ANF	Anglerfish	112	1	1	161	1	1	173	10	6	149	4	153	2
	SRX	Skates and rays	166	NA	NA	190	NA	NA	81	NA	NA	145	NA	145	NA
	HKE	Hake	39	NA	NA	30	9	23	55	14	20	41	11	53	10
	LIN	Ling	48	NA	NA	48	NA	NA	32	3	9	43	3	46	9
	SOL	Sole	22	5	19	38	2	5	23	0	2	28	2	30	8
BT2	SRX	Skates and rays	578	85	13	755	71	9	640	28	4	658	61	719	9
	PLE	Plaice	175	114	40	385	261	40	270	240	47	277	205	482	42
	SOL	Sole	248	11	4	285	11	4	260	NA	NA	265	11	276	4
	COD	Cod	40	23	36	71	43	38	42	19	31	51	28	79	35
	ANF	Anglerfish	35	0	1	53	3	5	91	15	14	60	6	66	6
	HAD	Haddock	9	7	42	16	32	67	12	122	91	12	53	66	67
	WHG	Whiting	4	7	63	3	38	92	3	34	91	4	26	30	82
TR1	HAD	Haddock	682	6	1	633	17	3	623	37	6	646	20	667	3
	COD	Cod	244	1	0	161	0	0	81	3	3	162	1	163	1
	SRX	Skates and rays	107	NA	NA	51	NA	NA	193	NA	NA	117	NA	117	NA
	WHG	Whiting	53	18	25	86	30	26	44	89	67	61	45	106	39
	HKE	Hake	136	NA	NA	73	0	0	10	NA	NA	73	0	73	0
	PLE	Plaice	23	5	17	17	14	44	48	12	20	29	10	40	27
	POL	Pollack	44	NA	NA	34	NA	NA	7	NA	NA	28	NA	28	NA
	SPR	Sprat	11	NA	NA	NA	NA	NA	29	0	0	20	0	20	0
OTTER	SPR	Sprat	174	NA	NA	NA	NA	NA	497	0	0	335	0	335	0
	HER	Herring	4	NA	NA	14	0	0	66	0	0	28	0	28	0
GN1	COD	Cod	78	NA	NA	70	NA	NA	44	NA	NA	64	NA	64	NA

3.3 West of Scotland (ICES Sub-area VI)

3.3.1 West of Scotland discard ratios per species and quality of discard information

On average, 10% of the total catch in weight was discarded in the West of Scotland, between 2010 and 2012. Overall, 67% of the discards consisted of saithe, haddock, cod and whiting. Amongst the top 20 species, average discard rates were highly variable among species, ranging between 0% (for ling and black scabbardfish) and up to 85% for cod (Table 3.3 – 1).

The top 20 species are ranked in order of highest average catch between 2010 and 2012 with *Nephrops* recording the highest catch, but no discards data were available. It should be noted however, that Scottish discard data are presently not included for a number of species including *Nephrops.* ICES reports *Nephrops* catch statistics by Functional Unit – these are generally quite low rates. It is hoped to include these data at the regional level in 2015. Of the species exhibiting high discard rates (cod at 85% and whiting 70%) stringent quota restrictions, due to their poor biological status, contributed to the high discard rates in the area and are considered to be significant choke species. Other roundfish species, such as saithe and haddock were among the top 4 species in relation to their average total catch between 2010 and 2012. In these cases, the relatively high discard rates arose from lack of quota and presence of small undersized fish .Some important species (ling and anglerfish), had low discard rate (1% or less)- in the case of the latter especially, the high market value of this species contributed to this result. Overall, the pattern of discarding between species was relatively stable between 2010 and 2012. The most marked variations occurred in the cases of saithe (which progressively increased) and haddock which decreased markedly in 2012.

In the top 20 species captured in the West of Scotland by demersal fisheries, 4 of them were pelagic species: mackerel, herring, *Trachurus spp*, and blue whiting. The inclusion of these species is mainly originating from the otter trawlers: unregulated otter (OTTER) and 70-99mm codend mesh trawlers (TR2). It is possible that the recorded codings of these otter trawlers could be wrong and that they should be included with pelagic trawl fisheries data.

Tables 3.3-1 (overall countries) and 3.3-2 (Spanish) highlights how much of the final discard estimates are derived from reported data by each country and how much had to be filled in by assuming an average discard ratio from countries that have submitted data for a given metier/fishery. The quality is expressed as %DQ (%discard quality) derived as the amount of discards from submitted data relative to the overall estimate of discard (in tonnes). Overall, the quality of discards estimates in the West of Scotland was high, with %DQ values of exceeding 90% in the period 2010-2012. Most of the species with the highest discard estimates (falling in the range 18% – 85%) are estimates derived from actual data (where proportions derived from actual data exceed 83%). These species include cod, haddock, whiting and saithe for which discards *are* extensively sampled and reported by Scotland and Ireland.

Table 3.3-1. West Scotland (ICES Division VIa) demersal fisheries: landings and discards per species and year; top 20 species sorted in descending order on average catch 2010-2012, only for average total catch equal or greater than 20 t.

Species		2010						2011						2012						Average 2010-2012					
		Landings	Discards	Total catch	%DR		%DQ	Landings	Discards	Total catch	%DR		%DQ	Landings	Discards	Total catch	%DR		%DQ	Landings	Discards	Total catch	%DR		%DQ
NEP	Norway lobster	10,187	NA	10,187	NA		NA	11,134	NA	11,134	NA		NA	12,409	NA	12,409	NA		NA	11,243	NA	11,243	NA		NA
POK	Saithe	5,178	502	5,680	9		97	6,327	1,135	7,462	15		99	7,076	2,439	9,515	26		100	6,191	1,358	7,550	17		99
HKE	Hake	5,942	0	5,942	0		100	6,551	161	6,712	2		66	8,643	0	8,643	0		94	7,045	54	7,099	1		67
HAD	Haddock	2,879	2,790	5,669	49		100	1,694	1,340	3,034	44		100	5,000	496	5,496	9		93	3,191	1,542	4,733	34		99
LIN	Ling	2,271	0	2,271	0		49	2,371	7	2,378	0		75	2,520	NA	2,520	NA		NA	2,387	4	2,391	0		74
ANF	Anglerfish	1,938	18	1,956	1		41	2,493	16	2,509	1		61	2,523	29	2,552	1		46	2,318	21	2,339	1		48
MAC	Mackerel	552	NA	552	NA		NA	5,603	NA	5,603	NA		NA	261	0	261	0		100	2,139	0	2,139	0		100
BSF	Black scabbardfish	1,912	1	1,913	0		100	1,615	9	1,624	1		32	1,727	NA	1,727	NA		NA	1,751	5	1,756	0		37
BLI	Blue ling	1,783	NA	1,783	NA		NA	1,448	13	1,461	1		60	1,420	NA	1,420	NA		NA	1,551	13	1,563	1		60
COD	Cod	218	963	1,181	82		60	190	1,414	1,604	88		100	159	965	1,124	86		99	189	1,114	1,303	85		88
RNG	Roundnose grenadier	1,614	1	1,615	0		93	884	89	973	9		56	1,040	NA	1,040	NA			1,179	45	1,224	4		56
LEZ	Megrims	1,346	36	1,382	3		29	1,028	23	1,051	2		32	916	60	976	6		13	1,097	40	1,136	4		21
WHG	Whiting	348	1,041	1,389	75		97	227	303	530	57		96	300	1,056	1,356	78		66	292	800	1,092	70		83
HER	Herring	1,081	NA	1,081	NA		NA	819	NA	819	NA		NA	10	NA	10	NA		NA	637	NA	637	NA		NA
JAX	Trachurus sp	5	NA	5	NA		NA	1,206	NA	1,206	NA		NA	516	NA	516	NA		NA	576	NA	576	NA		NA
WHB	Blue whiting	NA	NA	NA	NA		NA	NA	NA	NA	NA		NA	549	NA	549	NA		NA	549	NA	549	NA		NA
USK	Tusk	247	2	249	1		96	201	NA	201	NA		NA	209	NA	209	NA		NA	219	2	221	1		96
FOX	Forkbeards	173	NA	173	NA		NA	224	NA	224	NA		NA	252	NA	252	NA		NA	216	NA	216	NA		NA
SRX	Rays and skates	199	0	199	0		100	126	0	126	0		100	156	0	156	0		100	160	0	160	0		100
PLE	Plaice	56	2	58	3		21	42	30	72	42		44	57	19	76	25		61	52	17	68	23		51
All Species		38,381	8,433	46,814	12		91	44,289	4,539	48,828	9		96	45,925	5,064	50,989	10		90	43,382	8,092	51,474	10		92

Note: %DR refers to discard ratio (discards/total catch). %DQ refers to the quality of the discard estimate (proportion of the discard estimates is derived from actual data). The colour coding refers to larger than 66% (green), between 33% and 66% (orange) and below 33% (red).

Table 3.3-2 - West Scotland (ICES Division VIa) Spanish demersal fisheries: landings and discards per species and year; top 20 species sorted in descending order on average catch 2010-2012, only for average total catch equal or greater than 20t

Country	Species		2010					2011					2012					Average 2010-2012				
			Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ	Landings	Discards	Total catch	%DR	%DQ
ESP	HKE	Hake	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4,140	46	4,186	1	1	4,140	46	4,186	1	1
	LIN	Ling	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	869	11	879	1	1	869	11	879	1	1
	SFS	Silver scabbardfish	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	655	0	655	0	0	655	0	655	0	0
	ALC	Baird's slickhead	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	335	0	335	0	0	335	0	335	0	0
	RNG	Roundnose grenadier	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	258	0	258	0	0	258	0	258	0	0
	LEZ	Megrims	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	213	35	248	14	16	213	35	248	14	16
	RHG	Roughhead grenadier	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	191	0	191	0	0	191	0	191	0	0
	ANF	Anglerfish	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	142	3	145	2	2	142	3	145	2	2
	BRF	Blackbelly rosefish	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	78	0	79	1	1	78	0	79	1	1
	BSF	Black scabbardfish	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	68	0	68	0	0	68	0	68	0	0
	WIT	Witch	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	52	1	53	1	1	52	1	53	1	1
	All species		**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**NA**	**7,001**	**96**	**7,097**	**1**	**1**	**7,001**	**96**	**7,097**	**1**	**1**

3.3.2 West of Scotland allocation and usage

Table 3.3-3 describes the quota available for each stock to each country in the beginning and end of the year. Table shows that substantial quota exchange occurs between countries, for most of the species, except for plaice and common sole.

Table 3.3-3. West Scotland (ICES Division VIa) demersal fisheries: quota by species, country and year

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2012	Average Final Quota 2010 - 2012	Average % change 2010 - 2012
Cod	VIb, EU and international waters of Vb west of 1200' W and of XII and XIV	Belgium	0	0	0%	0	0	0%	0	0	0%	0	0	0%
		Germany	0	0	0%	0	0	0%	1	1	0%	0	0	0%
		France	13	14	8%	12	12	0%	12	12	0%	12	13	2%
		Ireland	18	13	-28%	17	17	0%	17	17	0%	17	16	-7%
		United Kingdom	48	45	-6%	48	48	0%	48	48	0%	48	47	-2%
		TAC	79	72	-9%	77	77	0%	78	78	0%	78	76	-2%
Cod	VIa; EU and international waters of Vb east of 12 00' W	Belgium	0	0	0%	0	0	0%	0	0	0%	0	0	0%
		Germany	0	0	0%	0	0	0%	0	0	0%	0	0	0%
		France	38	67	76%	29	39	34%	0	0	0%	22	35	58%
		Ireland	53	53	0%	40	44	10%	0	0	0%	31	32	4%
		United Kingdom	145	139	-4%	110	124	13%	0	0	0%	85	88	3%
		TAC	236	259	10%	179	207	16%	0	0	0%	138	155	12%
Megrims	EU and international waters of Vb; VI; international waters of XII and XIV	Spain	350	380	9%	385	385	0%	385	424	10%	373	396	7%
		France	1,364	1,342	-2%	1,501	1,451	-3%	1,501	1,646	10%	1,455	1,480	4%
		Ireland	399	438	10%	439	439	0%	439	483	10%	426	453	8%
		United Kingdom	966	1,225	27%	1,062	1,110	5%	1,062	1,173	10%	1,030	1,169	13%
		TAC	3,079	3,385	10%	3,387	3,385	0%	3,387	3,726	10%	3,284	3,499	8%
Anglerfish	VI: EU and international waters of Vb; international waters of XII & XIV	Belgium	200	0	-100%	196	0	-100%	186	0	-100%	194	0	-100%
		Germany	228	185	-19%	224	149	-33%	213	154	-28%	222	163	-23%
		Spain	214	286	34%	210	260	24%	199	275	38%	208	274	28%
		France	2,462	2,452	0%	2,412	2,350	-3%	2,293	2,516	10%	2,389	2,439	3%

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2012	Average Final Quota 2010 - 2012	Average % change 2010 - 2012
		Ireland	557	630	13%	546	626	15%	518	613	18%	540	623	19%
		The Netherlands	193	0	-100%	189	0	-100%	179	65	-64%	187	22	-86%
		United Kingdom	1,713	2,518	47%	1,679	2,071	23%	1,595	2,011	26%	1,662	2,200	34%
		TAC	5,567	6,071	9%	5,456	5,456	0%	5,183	5,634	9%	5,402	5,720	7%
Haddock	EU and International waters of Vb and VIa	Belgium	3	0	-100%	2	0	-100%	7	7	0%	4	2	-55%
		Germany	4	5	25%	0	0	0%	8	8	0%	4	4	-18%
		Spain	0	20	20%	0	14	100%	0	14	14%	0	16	733%
		France	147	151	3%	111	114	3%	332	331	0%	197	199	-15%
		Ireland	438	447	2%	328	403	23%	985	932	-5%	584	594	5%
		United Kingdom	2,081	2,468	19%	1,561	1,618	4%	4,683	4,935	5%	2,775	3,007	12%
		TAC	2,673	3,091	16%	2,002	2,149	7%	6,015	6,227	4%	3,563	3,822	9%
Whiting	VI; Eu and international waters of Vb; international waters of XII and XIV	Germany	3	9	200%	2	0	-100%	2	0	-100%	2	3	0%
		Spain	0	0	0%	0	0	0%	0	1	100%	0	0	100%
		France	53	59	11%	39	44	13%	37	40	8%	43	48	10%
		Ireland	129	118	-9%	97	169	74%	92	101	10%	106	129	19%
		United Kingdom	246	304	24%	185	155	-16%	176	202	15%	202	220	10%
		TAC	431	490	14%	323	368	14%	307	344	12%	354	401	13%
Hake	VI and VII; EU and international waters of Vb; international waters of XII and XIV	Belgium	284	122	-57%	284	13	-95%	284	23	-92%	284	53	-84%
		Spain	9,109	12,618	39%	9,109	12,061	32%	9,109	12,034	32%	9,109	12,238	34%
		France	14,068	12,425	-12%	14,067	12,768	-9%	14,067	13,474	-4%	14,067	12,889	-7%
		Ireland	1,704	2,126	25%	1,704	1,937	14%	1,704	1,873	10%	1,704	1,979	15%
		The Netherlands	183	183	0%	183	403	120%	183	56	-69%	183	214	-5%
		United Kingdom	5,553	4,047	-27%	5,553	4,836	-13%	5,553	5,187	-7%	5,553	4,690	-13%
		TAC	30,901	31,521	2%	30,900	32,018	4%	30,900	32,647	6%	30,900	32,062	4%
Norway Lobster	VI; EU and international waters of Vb	Spain	33	37	12%	28	32	14%	29	32	10%	30	34	12%
		France	130	0	-100%	111	126	14%	114	127	11%	118	84	-19%
		Ireland	217	76	-65%	185	210	14%	190	211	11%	197	166	-9%

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2012	Average Final Quota 2010 - 2012	Average % change 2010 - 2012
		The Netherlands	0	0	0%	0	0	0%	0	10	100%	0	3	100%
		United Kingdom	15,677	17,737	13%	13,357	15,131	13%	13,758	15,261	11%	14,264	16,043	12%
		TAC	16,057	17,850	11%	13,681	15,499	13%	14,091	15,641	11%	14,610	16,330	12%
Plaice	VI; EU and international waters of Vb; international waters of XII and XIV	France	20	20	0%	10	10	0%	10	10	0%	13	13	0%
		Ireland	258	258	0%	275	275	0%	275	275	0%	269	269	0%
		United Kingdom	417	417	0%	408	371	-9%	408	408	0%	411	399	-2%
		TAC	695	695	0%	693	656	-5%	693	693	0%	694	681	-1%
Pollack	VI; EU and international waters of Vb; international waters of XII and XIV	Spain	6	0	-100%	0	3	100%	6	6	0%	4	3	39%
		France	194	194	0%	190	190	0%	190	190	0%	191	191	0%
		Ireland	57	57	0%	56	56	0%	56	56	0%	56	56	-4%
		United Kingdom	148	148	0%	145	145	0%	145	145	0%	146	146	0%
		TAC	405	399	-1%	391	394	1%	397	397	0%	398	397	0%
Saithe	VI; EU and international waters of Vb, XII and XIV	Germany	660	285	-57%	543	0	-100%	395	13	-97%	533	99	-82%
		Spain	0	17	100%	0	3	100%	0	13	100%	0	11	100%
		France	6,556	6,539	0%	5,393	4,953	-8%	4,373	2,970	-32%	5,441	4,821	-71%
		Ireland	447	547	22%	429	429	0%	450	440	-2%	442	472	5%
		United Kingdom	3,443	3,718	8%	3,317	5,316	60%	3,686	5,468	48%	3,482	4,834	33%
		TAC	11,106	11,106	0%	9,682	10,701	11%	8,904	8,904	0%	9,897	10,237	-53%
Skates and Rays	EU waters of VIa, Vib, VIIa-c and VIIe-k	Belgium	1,209	1,209	0%	1,027	1,348	31%	895	1,422	59%	1,044	1,326	26%
		France	5,425	5,599	3%	4,612	5,325	15%	4,018	4,719	17%	4,685	5,214	10%
		Germany	16	16	0%	14	16	14%	12	14	17%	14	15	-11%
		Ireland	1,747	1,573	-10%	1,485	1,305	-12%	1,294	1,311	1%	1,509	1,396	-8%
		The Netherlands	5	0	-100%	4	5	25%	4	12	200%	4	6	23%
		Portugal	30	0	-100%			0%	22	25	14%	26	13	-36%
		Spain	1,460	1,460	0%	1,241	1,387	12%	1,082	767	-29%	1,261	1,205	-8%
		United Kingdom	3,460	3,460	0%	2,941	3,114	6%	2,562	2,814	10%	2,988	3,129	3%
		TAC	13,352	13,317	0%	11,324	12,500	10%	9,889	11,084	12%	11,522	12,300	5%

Species	TAC Areas	Country	Initial Quota 2010 (t)	Final Quota 2010 (t)	% Change	Initial Quota 2011 (t)	Final Quota 2011 (t)	% Change	Initial Quota 2012 (t)	Final Quota 2012 (t)	% Change	Average Initial Quota 2010 - 2012	Average Final Quota 2010 - 2012	Average % change 2010 - 2012
Common Sole	VI; EU and international waters of Vb; international waters of XII and XIV	Ireland	49	49	0%	48	48	0%	48	48	0%	48	48	0%
		United Kingdom	12	12	0%	12	12	0%	12	12	0%	12	12	0%
		TAC	61	61	0%	60	60	0%	60	60	0%	60	60	0%

3.3.3 West Scotland discard ratios by species by country

Table 3.3-4 describes the landings and discards of the top 10 species captured in the West of Scotland, by country, between 2010 and 2012. Amongst these species the main ones with discards in the West of Scotland were saithe, haddock, and cod. These species have variable discard rates across the top five countries (Table 3.3- 4). For saithe, the country with the highest discard rate was Scotland, (24%) largely arising through lack of quota. Other countries (France, Ireland and Germany) did not appear to have the same problem. In the case of haddock, Scotland and Ireland had discard rates above 10% and in the case of cod, all of the top countries exhibited discard rates in excess of 30% (some as high as 99% - Northern Ireland). Hake is amongst the most captured species in the West of Scotland; however the only countries with discard estimations were France and Spain, with low discard rates (1-3%).

The species with the lowest discard rate (where estimates were actually available by country) was anglerfish. Rates were consistently 2% or less. For other species there were too many instances of data 'not –available' to make any sensible observations.

When introducing the catch quota that takes into account the current discarding practices, the Member State and fisheries with the highest discard rates might have problems if the mean discard rates are used to calculate the catch quota.

Table 3.3-4. West Scotland (ICES Division VIa) demersal fisheries: landings (t) and discards (t) per species, country and year; table sorted in a descended order on the average catch 2010-2012, top 5 countries per species, only for average total catch equal or greater than 20 t.

Species		Country	2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total catch	%DR
NEP	Norway Lobster	SCO	8,234	NA	NA	8,639	NA	NA	9,973	NA	NA	8,949	NA	8,949	NA
		NIR	1,877	NA	NA	2,374	NA	NA	2,269	NA	NA	2,173	NA	2,173	NA
		ENG	45	NA	NA	87	NA	NA	137	NA	NA	90	NA	90	NA
		IRL	30	NA	NA	31	NA	NA	28	NA	NA	30	NA	30	NA
POK	Saithe	SCO	2,785	487	15	4,117	1,115	21	4,394	2,439	36	3,765	1,347	5,112	24
		FRA	1,626	0	0	1,807	19	1	2,313	NA	NA	1,915	10	1,925	1
		IRL	451	15	3	329	0	0	341	NA	NA	373	7	381	2
		DEU	275	0	0	NA	NA	NA	9	NA	NA	142	0	142	0
		ENG	42	NA	NA	74	NA	NA	8	NA	NA	41	NA	41	NA
HAD	Haddock	SCO	2,408	2,773	54	1,359	1,261	48	4,083	390	9	2,617	1,475	4,092	37
		IRL	399	16	4	281	75	21	845	99	11	508	64	572	12
		FRA	63	1	1	50	4	7	29	0	0	47	1	49	3
HKE	Hake	FRA	3,081	0	0	2,949	160	5	3,022	NA	NA	3,017	80	3,097	3
		SCO	2,342	NA	NA	3,342	NA	NA	2,600	NA	NA	2,761	NA	2,761	NA
		IRL	497	NA	NA	255	NA	NA	230	NA	NA	327	NA	327	NA
LIN	Ling	SCO	1,376	NA	NA	1,684	0	0	1,628	NA	NA	1,563	0	1,563	0
		FRA	728	0	0	594	7	1	529	NA	NA	617	4	621	1
		IRL	163	NA	NA	91	NA	NA	47	NA	NA	101	NA	101	NA
BSF	Black scabbardfish	FRA	1,839	1	0	1,579	9	1	1,693	NA	NA	1,704	5	1,708	1
		SCO	73	NA	NA	36	NA	NA	34	NA	NA	48	NA	48	NA
BLI	Blue ling	FRA	1,642	NA	NA	1,374	13	1	1,374	NA	NA	1,463	13	1,476	1
		SCO	142	NA	NA	75	NA	NA	47	NA	NA	88	NA	88	NA
RNG	Roundnose grenadier	FRA	1,591	1	0	877	89	9	1,037	NA	NA	1,168	45	1,213	5
ANF	Anglerfish	SCO	1,040	11	1	1,011	3	0	1,178	14	1	1,076	9	1,086	1
		FRA	293	3	1	942	3	0	942	2	0	726	2	728	0
		IRL	517	5	1	476	10	2	322	13	4	438	9	448	2
		DEU	86	NA	NA	59	NA	NA	62	NA	NA	69	NA	69	NA
COD	Cod	SCO	114	495	81	107	1,411	93	135	951	88	119	952	1,071	87
		NIR	3	269	99	1	NA	NA	1	NA	NA	1	269	271	99
		FRA	50	133	73	41	1	3	4	4	53	32	46	78	43
		IRL	49	66	57	39	1	3	18	10	36	35	26	61	32

3.3.4 West of Scotland discard ratios by country by species

Table 3.1 – 5 shows the top ten species for the countries operating in the West of Scotland. Most of the countries record catches of a mix of demersal species although the composition varies between countries. For Scotland and Northern Ireland, by far the most important species in terms of weight landed is *Nephrops*. This species is taken mainly in the inshore fisheries of the Minches and Firth of Clyde using the TR2 otter trawl gear. In Scotland a wide range of demersal gadoids and groundfish are also important constituents of the offshore TR1 fishery. The main species are saithe, haddock, hake, ling and anglerfish. Cod and whiting are also caught but restrictive TACs for these species has led to high discard rates and landings are small (87% and 80%, respectively). Catches of mackerel also figure in the list. In the case of Northern Ireland, catches of other species are restricted to small quantities of by-catch gadoids taken in the TR2 fishery.

France and Ireland have catches dominated by fish species but the compositions are rather different. In the case of France, catches of hake and saithe are the highest followed by a number of deeper water species such as black scabbardfish and groundfish such as ling and anglerfish. In all these cases, reported discard rates are very low (<5%). France also catches cod and here the discard rate is quite high (42%). Catches made by Ireland, on the other hand, contain mainly gadoids and groundfish and catches of several pelagic species (mackerel, horse mackerel and herring). Catches of haddock and whiting were associated with discard rates of 12 and 27% respectively.

Spanish catches were dominated by hake and ling was also important. Other species recorded were megrim and angler which were associated with low discard rates. In the case of Spain, data were only available for 2012 so some caution is required in case the data are not fully representative of the overall time period (Table 3.3-6). Data presented include estimates in subdivisions VIa and VIb. VIb's estimates contribute 23% in landings and 29% in discards.

The other countries operating in the West of Scotland were England, Denmark and Germany, but total catches and the number of reported species were low.

Table 3.3-5. West Scotland (ICES Division VIa) demersal fisheries: landings (t) and discards (t) per country, species and year; table sorted in a descended order on the average catch 2010-2012, top 10 species per country, only for average total catch equal or greater than 20 t.

Country	Species		2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total Catch	%DR
SCO	NEP	Norway Lobster	8,234	NA	NA	8,639	NA	NA	9,973	NA	NA	8,949	NA	8,949	NA
	POK	Saithe	2,785	487	15	4,117	1,115	21	4,394	2,439	36	3,765	1,347	5,112	24
	HAD	Haddock	2,408	2,773	54	1,359	1,261	48	4,083	390	9	2,617	1,475	4,092	37
	HKE	Hake	2,342	NA	NA	3,342	NA	NA	2,600	NA	NA	2,761	NA	2,761	NA
	MAC	Mackerel	181	NA	NA	5,228	NA	NA	3	NA	NA	1,804	NA	1,804	NA
	LIN	Ling	1,376	NA	NA	1,684	0	0	1,628	NA	NA	1,563	0	1,563	0
	ANF	Anglerfish	1,040	11	1	1,011	3	0	1,178	14	1	1,076	9	1,086	1
	COD	cod	114	495	81	107	1,411	93	135	951	88	119	952	1,071	87
	WHG	Whiting	245	1,008	80	79	276	78	202	977	83	175	754	929	80
	LEZ	Megrims	820	22	3	713	15	2	586	50	8	707	29	736	4
FRA	HKE	Hake	3,081	0	0	2,949	160	5	3,022	NA	NA	3,017	80	3,097	3
	POK	Saithe	1,626	0	0	1,807	19	1	2,313	NA	NA	1,915	10	1,925	1
	BSF	Black scabbardfish	1,839	1	0	1,579	9	1	1,693	NA	NA	1,704	5	1,708	1
	BLI	Blue ling	1,642	NA	NA	1,374	13	1	1,374	NA	NA	1,463	13	1,476	1
	RNG	Roundnose grenadier	1,591	1	0	877	89	9	1,037	NA	NA	1,168	45	1,213	5
	ANF	Anglerfish	293	3	1	942	3	0	942	2	0	726	2	728	0
	LIN	Ling	728	0	0	594	7	1	529	NA	NA	617	4	621	1
	USK	Tusk	194	2	1	174	NA	NA	167	NA	NA	178	2	180	1
	LEZ	Megrims	207	2	1	90	2	2	94	NA	NA	130	2	132	2
	COD	Cod	50	133	73	41	1	3	4	4	50	32	46	78	42
NIR	NEP	Norway Lobster	1,877	NA	NA	2,374	NA	NA	2,269	NA	NA	2,173	NA	2,173	NA
	COD	Cod	3	269	99	1	NA	NA	1	NA	NA	1	269	271	99
IRL	HAD	Haddock	399	16	4	281	75	21	845	99	11	508	64	572	12
	ANF	Anglerfish	517	5	1	476	10	2	322	13	4	438	9	448	2
	POK	Saithe	451	15	3	329	0	0	341	NA	NA	373	7	381	2
	JAX	Trachurus sp	2	NA	NA	1,008	NA	NA	68	NA	NA	360	NA	360	NA
	HKE	Hake	497	NA	NA	255	NA	NA	230	NA	NA	327	NA	327	NA
	MAC	Mackerel	371	NA	NA	375	NA	NA	87	NA	NA	278	NA	278	NA
	LEZ	Megrims	318	11	3	223	5	2	214	8	3	252	8	259	3
	HER	Herring	283	NA	NA	212	NA	NA	9	NA	NA	168	NA	168	NA
	WHG	Whiting	101	33	25	146	27	16	96	67	41	114	43	157	27
	LIN	Ling	163	NA	NA	91	NA	NA	47	NA	NA	101	NA	101	NA
DNK	JAX	Trachurus sp	NA	NA	NA	NA	NA	NA	438	NA	NA	438	NA	438	NA
ENG	MAC	Mackerel	NA	NA	NA	NA	NA	NA	171	NA	NA	171	NA	171	NA
	NEP	Norway Lobster	45	NA	NA	87	NA	NA	137	NA	NA	90	NA	90	NA
	POK	Saithe	42	NA	NA	74	NA	NA	8	NA	NA	41	NA	41	NA
DEU	POK	Saithe	275	0	0	NA	NA	NA	9	NA	NA	142	0	142	0
	ANF	Anglerfish	86	NA	NA	59	NA	NA	62	NA	NA	69	NA	69	NA

Table 3.3-6 West Scotland (ICES Division VIa) Spanish demersal fisheries: landings (t) and discards (t) per species and year; table sorted in a descended order on the average catch 2010-2012, top 10 species per country, only for average total catch equal or greater than 20t

Country	Species		2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total Catch	%DR
ESP	HKE	Hake	NA	NA	NA	NA	NA	NA	4,140	46	1	4,140	46	4,186	1
	LIN	Ling	NA	NA	NA	NA	NA	NA	869	11	1	869	11	879	1
	SFS	Silver scabbardfish	NA	NA	NA	NA	NA	NA	655	0	0	655	0	655	0
	ALC	Bardii's smoothead	NA	NA	NA	NA	NA	NA	335	0	0	335	0	335	0
	RNG	Roundnose grenadier	NA	NA	NA	NA	NA	NA	258	0	0	258	0	258	0
	LEZ	Megrim	NA	NA	NA	NA	NA	NA	213	35	14	213	35	248	14
	RHG	Roughhead grenaider	NA	NA	NA	NA	NA	NA	191	0	0	191	0	191	0
	ANF	Anglerfish	NA	NA	NA	NA	NA	NA	142	3	2	142	3	145	2
	BRF	Blackbelly rosefish	NA	NA	NA	NA	NA	NA	78	0	1	78	0	79	1
	BSF	Black scabbardfish	NA	NA	NA	NA	NA	NA	68	0	0	68	0	68	0

3.3.5 West of Scotland discard ratios by gear

The main operating gears in the West of Scotland are the otter trawls: 1) >=100mm codend mesh (TR1) 2) 70-99mm codend mesh (TR2) and 3) unregulated otter trawls; gillnetters (GN1) and long-lines. The TR1 gear is mainly used to target gadoids (e.g. haddock, whiting, saithe and cod), groundfish (eg anglerfish and megrims) and deepwater species (eg black scabbardfish and roundnose grenadiers and the main countries operating with TR1 fishery are Ireland, Scotland and France. The main discarded species by TR1 are saithe and cod with 18% and 86% discard rates respectively (of the average total catches) between 2010 and 2012, respectively.

The smaller meshed trawlers (TR2) are the main gear used in the *Nephrops* fishery. The *Nephrops* fishery in the West of Scotland is very significant. This fishery has relatively high discard rates of haddock (78%), and whiting (85%). The drivers to discard these species are mainly that the fish are undersized and to a lesser extent lack of quota. *Nephrops* discards are known to be low; however discard estimates are not available for this species at the west of Scotland level as a whole. This is because the data collection and scientific advice is given by smaller functional units (eg The North Minch or the Firth of Clyde) and discard rates differ between the areas. The Spanish TR2 fishery is relatively small in the West of Scotland, and mainly discards megrims (44%) (Table 3.3-8).

Unregulated otter trawls appear to take a variety of fish species including pelagic, gadoids and groundfish species. Landed quantities are smaller than in the TR1 category and discard rates are low or zero. The Spanish OTTER appear to take a varied of deep water species, black scabbardfish, smoothhead and grenadiers, with zero discards.

Gillnets (GN1) mostly catch hake and saithe and discard are below 6%. Catches by longlines (LL1) on the other hand are almost exclusively of hake and landings are up to 6 times those made in gillnets – discard rates are very low. Some care is required in interpreting trends since the Spanish data are only available for 2012 and not for earlier years.

Table 3.3-7. West Scotland (ICES Division VIa) demersal fisheries: landings (t) and discards (t) per gear, species and year; table sorted in descending order on the average catch 2010-2012, top 10 species per gear, only for average total catch equal or greater than 20 t.

Gear	Species		2010			2011			2012			Average 2010-2012			
			Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total Catch	%DR
TR2	NEP	Norway Lobster	9,190	NA	NA	10,183	NA	NA	11,392	NA	NA	10,255	NA	10,255	NA
	HAD	Haddock	25	2,547	99	78	1,077	93	554	379	41	219	1,334	1,553	78
	WHG	Whiting	5	12	70	14	241	95	61	614	91	27	289	316	85
	ANF	Anglerfish	43	0	0	63	0	0	139	0	0	81	0	82	0
	LEZ	Megrims	23	0	0	32	0	0	77	1	1	44	0	44	0
	HKE	Hake	28	NA	NA	36	NA	NA	43	0	1	36	0	36	1
	SRX	Skates and rays	41	NA	NA	14	NA	NA	14	NA	NA	23	NA	23	NA
TR1	POK	Saithe	4,885	502	9	5,977	1,111	16	6,289	2,439	28	5,717	1,351	7,068	18
	HAD	Haddock	2,845	243	8	1,606	253	14	4,425	117	3	2,959	204	3,163	8
	HKE	Hake	2,529	0	0	1,846	145	7	2,042	NA	NA	2,139	73	2,212	4
	ANF	Anglerfish	1,808	18	1	2,333	14	1	2,084	28	1	2,075	20	2,095	1
	BSF	Black scabbardfish	1,912	1	0	1,587	9	1	1,630	NA	NA	1,710	5	1,714	1
	BLI	Blue ling	1,783	NA	NA	1,440	13	1	1,356	NA	NA	1,526	13	1,539	1
	COD	Cod	208	963	82	177	1,413	89	148	965	87	178	1,114	1,292	86
	RNG	Roundnose grenadier	1,614	1	0	805	89	10	914	NA	NA	1,111	45	1,156	5
	LIN	Ling	1,234	0	0	1,167	5	0	1,031	NA	NA	1,144	3	1,147	0
	LEZ	Megrims	1,320	35	3	987	21	2	816	59	7	1,041	38	1,079	4
OTTER	MAC	Mackerel	536	NA	NA	5,518	NA	NA	221	NA	NA	2,092	NA	2,092	NA
	JAX	Trachurus spp	2	NA	NA	1,199	0	0	NA	NA	NA	601	0	601	0
	HER	Herring	977	0	0	805	0	0	0	NA	NA	594	0	594	0
	WHB	Blue whiting	NA	NA	NA	NA	NA	NA	549	NA	NA	549	NA	549	NA
	POK	Saithe	NA	NA	NA	88	NA	NA	204	NA	NA	146	NA	146	NA
	HKE	Hake	NA	NA	NA	55	NA	NA	190	NA	NA	122	NA	122	NA
	RNG	Roundnose grenadier	NA	NA	NA	79	NA	NA	126	NA	NA	103	NA	103	NA
	LIN	Ling	NA	NA	NA	40	NA	NA	114	NA	NA	77	NA	77	NA
	ANF	Anglerfish	0	0	57	29	2	7	172	0	0	67	1	68	21
	BSF	Black scabbardfish	NA	NA	NA	29	NA	NA	97	NA	NA	63	NA	63	NA
GN1	HKE	Hake	1,017	NA	NA	1,247	16	1	887	NA	NA	1,050	16	1,066	1
	POK	Saithe	290	NA	NA	251	17	6	555	NA	NA	365	17	382	6
	LIN	Ling	199	NA	NA	113	2	2	85	NA	NA	132	2	134	2
	ANF	Anglerfish	87	NA	NA	68	NA	NA	66	NA	NA	74	NA	74	NA
POTS	NEP	Norway Lobster	643	NA	NA	554	NA	NA	580	NA	NA	592	NA	592	NA
TR3	MAC	Mackerel	NA	NA	NA	58	NA	NA	29	NA	NA	43	NA	43	NA

Table 3.3-8 West Scotland (ICES Division VIa) Spanish demersal fisheries: landings (t) and discards (t) per gear, species and year; table sorted in descending order on the average catch 2010-2012, top 10 species per gear, only for average total catch equal or greater than 20t.

Country	Gear	Species		2010			2011			2012			Average 2010-2012			
				Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	%DR	Landings	Discards	Total Catch	%DR
ESP	TR2	ANF	Anglerfish	NA	NA	NA	NA	NA	NA	45	3	6	45	3	48	6
		LEZ	Megrims	NA	NA	NA	NA	NA	NA	17	14	44	17	14	31	44
	TR1	HKE	Hake	NA	NA	NA	NA	NA	NA	834	46	5	834	46	880	5
		LEZ	Megrims	NA	NA	NA	NA	NA	NA	190	21	10	190	21	211	10
		LIN	Ling	NA	NA	NA	NA	NA	NA	110	0	0	110	0	110	0
		ANF	Anglerfish	NA	NA	NA	NA	NA	NA	95	0	0	95	0	95	0
		BRF	Blackbelly rosefish	NA	NA	NA	NA	NA	NA	54	0	1	54	0	55	1
		WIT	Witch	NA	NA	NA	NA	NA	NA	24	0	0	24	0	24	0
	OTTER	SFS	Silver scabbardfish	NA	NA	NA	NA	NA	NA	655	0	0	655	0	655	0
		ALC	Baird's slickhead	NA	NA	NA	NA	NA	NA	335	0	0	335	0	335	0
		RNG	Roundnose grenadie	NA	NA	NA	NA	NA	NA	258	0	0	258	0	258	0
		RHG	Roughhead grenadie	NA	NA	NA	NA	NA	NA	191	0	0	191	0	191	0
		BSF	Black scabbardfish	NA	NA	NA	NA	NA	NA	68	0	0	68	0	68	0
		HKE	Hake	NA	NA	NA	NA	NA	NA	37	0	0	37	0	37	0
	GN1	all species		NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0
	POTS	all species		NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0
	TR3	all species		NA	NA	NA	NA	NA	NA	0	0	0	0	0	0	0

4 Comparing STECF and ICES discard rate estimates

4.1 Celtic Sea and Irish Sea

The STECF and ICES discard estimations are derived from different raising procedures due to different levels of aggregation of the data and to the STECF 'fill-in' allocation procedure to replace poor or lacking values (see Annex 1 and 2). The ICES discard estimations are stock based and the STECF are fleet based estimations. As a consequence the values may cover more than one stock or not the entire stock bounds of a species, but instead reflect the fisheries. These differences will potentially lead to substantial differences between the STECF and ICES discard estimations. The tables presented below compare the discard rates estimations between the latest ICES advice (2015) and the STECF average discard rate 2010-2012, therefore the data are not directly comparable but some observations can be made. The discard volume figures presented in this Atlas (STECF data) should be interpreted with caution since estimation of discards is not the main objective of STECF database. This database was designed to allow the analysis of the consequences of the effort regime plans. In fact, there are differences between the figures for discard volumes in the Atlas and those provided in the ICES assessment working groups, especially for the species with unallocated landings. The ICES information is considered the less biased, and reflects the total discards of the fleets. This is the case of the Spanish discards of European hake in the TR1 and TR2 fleets: a total of 900 t is the figure in the Atlas while in the ICES working group, the figure provided is 5035t.

For the Celtic and Irish Sea areas Table 4.1-1 shows that where the stock area and the STECF area are the same the discard rates have a fairly good agreement (e.g. whiting Celtic Sea, plaice VIIa, sole VIIa). As might be expected, there are large differences when the ICES stock areas are different from the STECF area (e.g. plaice VIIhjk, VIIde, VIIfg). The STECF discard rate for plaice was 31% (VIIbcefghjk), while the ICES discard rates for plaice ranged between 18% in the English Channel (VIIde) and 72% in the Bristol Channel (VIIfg), but discards are not included in the assessment for plaice VIIhjk. Although not included in the assessment, due to data limitation, ICES discard rate estimation for plaice VIIhjk was approximately 39%, in 2013. The ICES assessment considered the sole discards negligible, whereas the STECF estimations were 3% of discard rate.

For some species, there are discard estimates available from the STECF database; but data on discard levels have not been included in the ICES stock assessment process. Where no discard data has been included within the assessment, the ICES catch advice and landings advice is the same. The lack of discard estimates in the assessments is a key problem when trying to provide catch advice and more specifically to calculate the quota uplifts. Most notably, Celtic Sea cod has an STECF estimated discard rate of 36% (VIIbcefghjk) but discards are not presented in the ICES assessment for 2015 (VIIbc-e-k). The ICES discard rate estimations were much lower than the STECF estimations, across countries and metiers, around 10% of the catches in weight (8.7% average across countries in 2013) (WGCSE, 2013).

Table 4.1-1. Comparison between the STECF and ICES discard rate estimations for each stock in the Celtic and Irish Sea.

Stock	TAC 2015 Catches	TAC 2015 Landings	2015 Discards	ICES Discard rate (%) 2015	ICES assessment comment	STECF Average discard rate 2010-12	STECF Area
Wider Area VII							
Nephrops (VII)				Not quantified	Stocks assessed in Functional Units (FU), Discard rates varied between negligible (0%) and 54%	NA	VII bcefghjk
Cod Celtic Sea (VIIbc,e-k)	4024	4024	Not quantified	Not quantified	Known to occur, not available for full series, 10% discard rate in recent years	36%	VII bcefghjk
Haddock Celtic Sea (VIIb-k)	10434	5605	4829	46%		50%	VII bcefghjk
Whiting Celtic Sea (VIIb-k)	18501	14230	4271	23%		27%	VII bcefghjk
Megrim (VII)	Not quantified	Not quantified	Not quantified	21%	Discards known to occur, but are only quantified to part of the fisheries	17%	VII bcefghjk
Anglerfish (VII)	Not quantified	Not quantified	Not quantified	Not quantified	Discards known to occur, but are not quatified. Advice for both species. TAC landings: 10754 - *L. Budegassa* ; 26691 - *L. Piscatorius*	10%	VII bcefghjk
Plaice Channel (VIIde)	1885	1546	339	18%		31%	VII bcefghjk
Plaice Celtic Sea (VIIhjk)	Not quantified	135	Not quantified	Not quantified	Discards in Divisions VIIjk are in the order of 30% of the catches (average 2007-2013)	31%	VII bcefghjk
Plaice Bristol Channel (VIIfg)	1500	420	1080	72%		31%	VII bcefghjk
Sole Western Channel (VIIe)	851	851	0	0%	Discarding considered negligible	3%	VII bcefghjk
Sole Celtic Sea (VIIhjk)	225	225	0	0%	Discarding considered negligible	3%	VII bcefghjk
Sole Bristol Channel (VIIfg)	652	652	0	0%	Discarding considered negligible	3%	VII bcefghjk
Pollack Western (VII)	13495	4200	Unknown	Unknown	Discard information not available	2%	VII bcefghjk
Skates & Rays (VIa-b & VIIa-c, e-k)		Not quantified			Stock-specific advice that does not sum up to a generic advice for skates and rays in Sub-areas VI and VII	3%	VII bcefghjk
Greater Silver Smelt (V, VI, VII)	4316	4316	0	0%	Discarding considered negligible	0%	VII bcefghjk
Saithe (VII)	3176	3176	0	0%	Discarding considered negligible	0%	VII bcefghjk
Irish Sea							
Cod (VIIa)	No directed fisheries			36%	High levels of discards. Effective technical measures to reduce discards	26%	VIIa
Haddock (VIIa)	893	425	468	52%	High levels of discards. Effective technical measures to reduce discards	29%	VIIa
Whiting (VIIa)	0			~94%	Catches should be reduced to the lowest possible levels.High levels of discards. Effective technical measures to reduce discards	81%	VIIa
Plaice (VIIa)	1244	394	850	68%		55%	VIIa
Sole (VIIa)	0	0	0	0%		3%	VIIa

4.2 West of Scotland and Widely distributed stocks

For the West of Scotland (VIa), the STECF and ICES discard rates have a broad agreement for the considered stocks. The largest differences were for megrim in VI, 15% versus 4%, and haddock in VIa, 12% and 34%, respectively. The discard rates for cod, whiting, anglerfish and saithe have a fairly good agreement (Table 4.2-1).

The widely distributed and highly migratory stocks showed the largest differences in the discard rates estimations, probably due to the level of aggregation of the ICES areas. The most outstanding difference was for ling discard rates, where the ICES assessment considered the ling discards are considered negligible and the STECF discard rates varied between 17% in ICES IIIaN (Skagerrak) and 24% in IV and IIa.

Table 4.2-1. Comparison between the STECF and ICES discard rate estimations for each stock in the West of Scotland and widely distributed stocks

Stock	TAC 2015 Catches	TAC 2015 Landings	2015 Discards	ICES Discard rate (%) 2015	ICES assessment comment	STECF Average discard rate 2010-12	STECF Area
West of Scotland							
Cod (VIa)	0			80%	No directed fisheries	85%	VIa
Haddock (VIa)		Not quantified		12%	Discard rate estimated for the IV, IIIa and Via aggregated (See North Sea HAD)	34%	VIa
Whiting (VI)	No directed fisheries			81%	Included in the assessment since 1981, data series from the main fleets	70%	VIa
Saithe (VI)	7464	6848	616	8%	Inferred from advive - discard rate based on average area IIIa, IV and VI	17%	VIa
Nephrops (VI)				3-14%	Stocks assessed in Functional units (FU). Discard rates varied between 7% and 20%	na	VIa
Megrim (VI)	Not quantified	Not quantified	Not quantified	15%	Biennal stock advice 2013-2015. Discard estimates 15% in the last 3 years.	4%	VIa
Anglerfish (VI)	Not quantified	Not quantified	Not quantified	0%	Discarding considered negligible	1%	VIa
Plaice (VI)	Unknown	658	Unknown	Unknown		23%	VIa
Sole (VI)	Unknown	57	Unknown	Unknown		0%	VIa
Pollack (VI)	Unknown	397	Unknown	Unknown		0%	VIa
Widely Distributed Stocks							
Hake (VI & VII)	Not quantified	Not quantifed	Not quantiofied	18%	Stock assessed as the northern stock over a wider spatial scale than the indicated ICES' Divisions	1% (VI) / 3% (VII)	VIa / VII bcefghjk
Hake (IIa & IV)						25%	IV and IIa
Blue Ling (Vb, VI, VII)	5046	5046	0	0%	Discarding considered negligible	0%	VII bcefghjk
Blue Ling (II & IV)	No directed fisheries			0%	Discards are not known to occur.	0%	IV and IIa
Tusk (V, VI, VII)	8500	8500	Unknown	0%	All catches by Norway and the Faroe Islands are assumed to be landed. Reported discards by Spain.	0%	VII bcefghjk and VI
Tusk (IV)						0%	IV and IIa
Ling (VI-X, XII & XIV)	10800	10800	0	0%	Discards are estimated < 1% of the catch and are considered negligible.		
Ling (IV)						24%	IV and IIa
Ling (IIIa) Skagerrak & Kattegat						17%	IIIaN
Ling (I &II)		8800	0	0%	All catches are likely to be landed	24%	IV and IIa
Greater Silver Smelt (I, II) Barents and Norwegian	Not quantified	Not quantified	0	0%	Discarding considered negligible		
Spurdog Western (I, V-VIII, XII, XIV)		0		Unknown		na	

5 Management measures to mitigate discards

In the 'Discard Atlas of North Sea Fisheries' reference is made to a 2007 gear expert group from the EU and Norway which identified possible technical conservation measures to reduce discards of fish below marketable size, protected species (e.g. cod) and species of low commercial value (e.g. Norway pout in shrimp fisheries). The findings of this group were updated in March 2009 and a report updated in 2013. Details can be found in the 'Discard Atlas of North Sea Fisheries'. A similar exercise has not been undertaken for the NWW region. However, some of the fisheries in the North Sea will have similar characteristics and target species as those in the NWW and the information is also relevant.

5.1 Drivers and incentives for discarding

To improve mitigation strategies, it is important to know the reasons for discarding. Unfortunately, these are often unknown, because they are not recorded by fishers, also because a mix of market- and regulatory conditions may influence decisions to discard. Inferences on the drivers for discarding can be made based on the length of the fish and the presence of different regulations. This is further elaborated upon in the 'Discard Atlas of North Sea Fisheries'.

5.2 Current legislation

It was observed that legislative measures introduced in the NWW region were related mostly to cod and haddock catch avoidance.

Cod

For cod, these measures relate to the EU Regulation No 1342/2008 of 18 December 2008 establishing a long-term plan for cod stocks and the fisheries exploiting those stocks, this regulation defines how the allocation of additional fishing effort can be awarded with the use of highly selective gear and cod-avoiding fishing trips, and to the Irish Sea Cod Recovery Plan.

Recovery plans for cod were first implemented in the Irish Sea in 2000. Two emergency closed areas were established (EC 304/2000) in which fishing for cod was prohibited between 14th February and 30th April. Subsequent regulations (EC 2549/2000 and EC.1456/2000) established additional technical measures for the protection of juveniles. The closed area in the western Irish Sea was continued in subsequent years. A derogation to fish inside this closed area has applied in all years for vessels fishing for *Nephrops*.

Emergency measures were enacted in 2001 for the West of Scotland consisting of area closures in the Clyde from 6th March to 30th April. An additional closed area, known as the windsock (EC 2287/2003) was implemented in 2004 and has remained in force since. In addition there have been unilateral closures, by Ireland, of a traditional fishery for juvenile cod off Greencastle. This voluntary

closure was in force for variable periods of time between 2003 and 2006. All the cod recovery plans were evaluated by STECF in 2011[1]

Haddock

In 2012, the use of square-meshed panels to improve the size selectivity of the gears used, to protect juvenile haddock (and whiting) entering the stock, became mandatory in parts of the NWW region. In October 2011, the North Western Waters Regional Advisory Council (NWWRAC) issued advice that the current technical measures in the Celtic Sea should be improved to reduce discards, especially of haddock and whiting, by requiring the use of an appropriately positioned square meshed panel. The regulation applies to fishing vessels operating with bottom trawls or seines in the ICES Divisions VIIf, VIIg and the part of VIIj that lies north of latitude 50° N and east of 11° W where a square-meshed panel must be used in a defined position and of a specified mesh size depending on the gear type and engine power of the vessel (EU Regulation No 737/2012).

5.3 Technical Measures and the Omnibus Regulation

Following the adoption of the new framework regulation and the decision to introduce a discard ban in important fisheries, the European Commission in December 2013 tabled the 'Omnibus Regulation'. The proposal is focused exclusively on removing immediate contradictions between existing EU fisheries regulations and the requirements contained in the forthcoming landings obligation whilst more detailed rules and practices are being developed. An example of this is the catch composition rules.

Catch composition rules for Western waters are contained in Regulation (EC) 850/989 and associated regulations. Catch composition rules set limits which must be met on a daily basis and at the end of a fishing trip. If fishermen are outside the limits they are obliged to discard components of the catch in order to balance the retained catch with the composition rules. Under the landing obligation fishermen will no longer be allowed to discard so there is a contradiction that needs to be addressed between continuing to regulate catch composition and obliging fishermen to land all catches.

Many technical measures that are currently in place will be revised during the implementation of the landing obligation; therefore any new technical measures must take account of and be accounted for in any new revisions of technical measures legislation. The omnibus regulation and technical consultation (2013a) indicate that at the European level, overarching regulations prohibiting specific gear use in some areas will be maintained, whereas regionalisation of some technical measures are sought to increase their effectiveness. Many of the current (2014) technical measures for the NWW region have been presented in a map created by BIM (Annex 6).

[1] Evaluation of multi-annual plans for cod in Irish Sea, Kattegat, North Sea, and West of Scotland (STECF-11-07) EUR 24901 EN - 2011

5.4 National discards mitigation legislation and research

Table 5.4-1 presents some of the national legislation introduced and research conducted to minimize discards in the North Western Waters Region. This is not an exhaustive list and further work has been conducted. For example, recent published scientific research on gear technology solutions to minimize discards in the North Western Waters Region is given in Annex 7.

Table 5.4-1 List of mitigation measures that are currently legislated (L) or researched (R) by member state.

Member State	Implementation stage	Description
Belgium	L	Since June 2013 the mesh sizes in the front of the top panel of the beam trawl gear should be in all areas at least 300 mm instead of the mandatory 180 mm. A sieve net in *Crangon* (brown) shrimp fisheries with TR3 gear is mandatory. Fishing with electric pulse is not allowed with two exemptions issued for research trials in the shrimp fishery.
	R	Over the past 8 years several experiments aboard research and commercial vessels have involved square-mesh and T90 codends, and benthic release panels (Polet and Vanderperren 2013).
England	L	Highly selective gears must be used by TR2 (*Nephrops*) fleet in the Cod Recovery Zone (CRZ). Days at Sea 2014/15 technical gear specifications for TR2 vessels fishing for *Nephrops* in the Irish Sea: 1. 200mm square mesh panel developed for the Nephrop fishery in North West England in 2012 and 2013 2. 200mm square mesh panel (only available for vessels 12 metres or under in length) 3. 300mm square mesh panel 4. Seltra '300' trawl 5. Seltra '270' trawl 6. Faithlie panel 7. Flip-Flap trawl 8. Net Grid or variants 9. Inclined separator panel 10. Swedish Grid
England	R	Irish Sea - selectivity trails to reduce plaice catches through modification in *Nephrops* trawls: 1) floating bridles; 2) Side-escape panel and 3) square-mesh panels Celtic Sea - Haddock avoidance through changes in the mesh size and position of diamond and square mesh escape panels (three separate projects). A database summarising EU gear selectivity trials and scientific literature – work ongoing. Vessels in the South West beam trawl fleet took part in a pilot in 2009 (Project 50%) to reduce discards by improving the selectivity of their nets. Nineteen vessels in South West otter trawl fleet took in a pilot in 2010 (SWOT) to reduce discards by improving selectivity. CCTV project, fully documenting catches from one otter trawler, and developing selective trawl designs to avoid haddock catches. Furthermore, as a condition of a sole-avoidance scheme in the South West of England (Channel), nine BT vessels must fully document their

		catch of plaice from their inshore sole fishery including non-marketable fish.
Northern Ireland		(to be completed)
Ireland	L	For Irish waters, a combination of measures regarding mesh size, technical conservation measures such as square-meshes, twine thickness and codend circumference; and catch composition rules have been regulated (see Figure XX – or link to the chart provided by BIM).
	R	Research initiatives focus on anticipating and finding solutions to potential problems arising from the implementation of the landing obligation. A catch comparison experiment has recently been completed on twin and quad rigged *Nephrops* trawls. Further work will focus on improving size selectivity for *Nephrops* and reduction of fish discards through a combination of square mesh codends and escape panels. The selectivity of various codend and square mesh panel mesh sizes in the Celtic Sea whitefish demersal trawl fishery will also be investigated.
Wales		(to be completed)
Scotland		(to be completed)
Ireland	L	(to be completed)
	R	(to be completed)
France	L	(to be completed)
	R	Selectivity trials focusing on reducing round and flat fish discards are on-going in the Celtic sea, through a cooperative project involving Ifremer and fisherman organisation Pêcheurs de Bretagne. Four selectivity devices are tested, additionally to the mandatory squared mesh panel, on twin trawlers (TR1 fleet): T90, squared mesh cylinder with and without dispersal buoys and monkfish escapement grid. Catch composition of the standard and selectivity trawls are collected by observers at sea quarterly during one fishing trip. Scientifics trip will be performed to validate the prototypes using underwater video camera.
Spain	L	Fisherman organizations convened from 2004 to control landings of megrim under 25 cm size through internal association quota by fishing boat (current mandatory MLS: 20 cm). This fishing sector measure aims small megrim avoidance fishing and marketing, otherwise high grading onboard.
	R	Over the past ten years several pilot projects aboard commercial vessels have tested selectivity gears, including square meshes and changes on mesh size and geometry. A selectivity trial has recently been carried out in Celtic sea on a combination of mesh sizes and turned mesh T90. Several selectivity projects have been carried out by Instituto Español de Oceanografia (IEO) in last years in NWW waters. Pilot studies on square mesh were conducted in the 90's. A project in 2010 set up the theoretical selectivity measures to test in Porcupine and Gran Sole (ICES Sub-area VII) and selectivity trails have been conducted in 2014 focus on mesh netting geometry and mesh size able to balance the roundfish by-catch avoidance.

5.5 Selectivity improvements and discard survival

The anticipated motivation for vessel operators to change the selectivity of fishing methods means that knowledge on methods to change selectivity must be effectively disseminated and research is needed to scientifically develop and improve more selective fishing practices. The changing incentive framework with the new CFP will likely mean that some methods currently available but not previously economically viable will become viable within the new legislative system. Economic assessments of selective characteristics of fisheries, the potential for changing catch patterns and the quota availability will inform which fisheries may be selected for exemption from the landing obligation under the *de minimis* provision.

Similarly, Article 15 paragraph 2(b) of the basic regulation allows for the possibility of exemptions from the landing obligation for species for which "scientific evidence demonstrates high survival rates, taking into account the characteristics of the gear, of the fishing practices and of the ecosystem". The STECF EWG 13-16 concluded the selection of a value which constitutes "'high survival' is subjective and likely to be species and fishery specific. The value will be based on 'trade-offs' between the stock benefits of the continued discarding of that survive the process i.e. their contribution to biomass and resultant reduction in fishing mortality, and the potential removal of incentives to change exploitation pattern as well as how this contributes to the minimisation of waste and the elimination of discards. EWG 13-16 considered that avoidance of unwanted catch should be the primary focus of such considerations. England, France and Belgium are currently conducting survivability studies, to quantify the survivability rate of different commercial species, and along with existing research will be used to inform managers where applying exemption under the high survival provision is most appropriate.

6 Discussion

The data used in the development of the atlas is derived from the STECF database. No data were altered from that which is publically available online and known uncertainties are described in the text. The one exception was for the Spanish data to which were found some errors in the STECF database. These errors were detected by the Spanish correspondents, corrected and new Spanish data set was used separetaly. The ICES stock assessment working groups also compiled discard estimates; however, these data are not readily available. It could be argued that, because it is the ICES assessment process that will advise on catch limits during the CFP implementation phase, ICES data would be more relevant to establish the potential impacts of the landing obligation. It was not possible to directly compare the ICES and STECF estimates at a stock level owing to the lag time in the availability in the STECF data. The methods for generating discard estimates differ between STECF and ICES, but there was generally a good correlation where comparisons could be made. Using STECF data did highlight where discards occur but are not currently accounted for in the ICES catch advice. This is relevant if ICES advised catch limits do not include discards that are known to occur.

In general, the STECF data from the Irish Sea was shown to be of the highest quality when using the quality indicator derived from the level of fill-ins. However, in the Irish Sea it was also highlighted that some key stocks are not presented in the STECF database. The West of Scotland region had intermediate data quality, and the Celtic Sea the lowest data quality, i.e. the level of data filling between fisheries where no data was available was the highest. However, the quality indicator used did not account for fisheries that are not sampled at all, nor does it account for the level of initial extrapolation, from the sampled trips to the raised estimate submitted to STECF. It was not possible to establish how these factors affected the quality of the data. Nonetheless, these data are best that is publically available and the best available that can inform management decisions.

In the Celtic Sea during the period 2010-2012, overall, 69% of the discards consisted of haddock, whiting and cod. The overall discard rate (proportion of the total catch discarded) varied between years and species. For example the haddock discard rate increased during the period from 37% to 72%, this was attributed to a strong recruitment year class in 2009. Substantial quota exchange occurred between countries for most of the Celtic Sea species. Cod, hake, whiting and plaice are the species where most of the exchanges occurred.

In the Irish Sea, whiting, plaice and haddock made up most of the discards. Species with the highest annual catches had intermediate overall discard rates, for example, 29% for haddock, 55% for plaice and 26% for cod. The extremes of discard rates were associated with species with lower catches for example, 81% for whiting and 2% for pollack. Substantial quota exchanges occurred between countries for most of the species. Hake, Anglerfish, plaice and skates and rays are the species where most of the exchanges occurred.

In the West of Scotland region, 67% of the discards consisted of saithe, haddock, cod and whiting. On average, 10% of the total catch in weight was discarded in the West of Scotland, between 2010 and 2012. Of the species exhibiting high discard rates (cod at 85% and whiting at 70%) stringent quota restrictions contributed to the high discard rates in the area. Some important species (ling and anglerfish), had low discard rate (1% or less). Substantial quota exchange occurred between countries during the period, for most of the species, except for plaice and common sole.

The purpose of this discard atlas is to evidence discard patterns for different fishing fleets in the North Western Waters region. The data derived from the STECF database has been processed to enable this. It enables comparisons to be made between species, areas, fisheries and countries and therefore inform a prioritisation process to assist in the implementation of the landing obligation. The information presented can be used to inform regional managers and enable identification of fisheries which may need more focussed attention in the transition to the landing obligation and in the formulation of a Discard Plan and multi-annual plans.

For example, the figures in Annex 5 show for each country and each fishery the estimated discard weight, and the discard rate for each species relative to the average discard rate for that species. This enables the identification of those fisheries in each country that may have a quota uplift that is lower than the current discard level along with the quantity of discards that need to either be accounted for in additionally sourced quota or avoided through changes in fishing practice. There is substantial detail presented in this atlas and this is intentional. It is not the aim of this atlas to make arguments for different management options; therefore, there is limited analysis and discussion of the content.

Included within the NWW Discard Atlas is a review of some of the legislation introduced and research conducted to mitigate discards. To improve mitigation strategies, it is important to know the reasons for discarding. Unfortunately, these are often unknown, because they are not recorded by fishers, also because a mix of market- and regulatory conditions may influence decisions to discard. Inferences on the drivers for discarding can be made based on the length of the fish and the presence of different regulations. This is further elaborated upon in the ‘Discard Atlas of North Sea Fisheries’.

The different reasons for discarding will necessitate different solutions. Quantities and rates of discards are provided here, but the length distributions were not available. It should be understood that the methods which are effective at mitigating discards of larger fish, driven by quota restrictions, will be different to discards that are undersized and are driven by the selective properties of fishing gears. Therefore, the data presented here should be used as a start point to identify fisheries which require more attention in the implementation phase of the CFP. More detailed analysis of these fisheries is then required to determine appropriate mitigation and management strategies. It should also be noted that historical discard patterns (2010-2012) indicate the potential issues under the future landing obligation, but pulses in recruitment or changing distributions of species may create different issues for fishing vessel operators than those that can be deduced from the data here.

7 References

Anon.(2014)a. Discard Atlas of North Western Waters Pelagic and Industrial Fisheries, Prepared by the Marine Institute, Galway, Ireland, Version 3, 21 March, 2014

Anon. (2014)b. The Discard Atlas of North Sea fisheries, A publication of the Scheveningen Group. Version: 22/1/2014

Broadhurst, M. K., Brand, C. P., & Kennelly, S. J. (2012). Evolving and devolving bycatch reduction devices in an Australian penaeid-trawl fishery. Fisheries Research, 113(1), 68–75. doi:10.1016/j.fishres.2011.09.006

Catchpole, T. L., & Gray, T. S. (2010). Reducing discards of fish at sea: a review of European pilot projects. Journal of Environmental Management, 91(3), 717–723. doi:10.1016/j.jenvman.2009.09.035

Catchpole, T. L., Frid, C. L. J., & Gray, T. S. (2005). Discarding in the English north-east coast *Nephrops norvegicus* fishery: the role of social and environmental factors. Fisheries Research, 72(1), 45–54. doi:10.1016/j.fishres.2004.10.012

Catchpole, T. L., J. P. Feekings, N. Madsen, A. Palialexis, V. Vassilopoulou, J. Valeiras, T. Garcia, N. Nikolic, M.-J. Rochet, 2013. Using inferred drivers of discarding behaviour to evaluate discard mitigation measures. ICES Journal of Marine Science, doi: 10.1093/icesjms/fst170.

EEC 2000. Council Regulation (EC) No 1543/2000 of 29 June 2000 establishing a Community framework for the collection and management of the data needed to conduct the common fisheries policy. Brussels. Official Journal of the European Union, L 176: 1–16.

EEC 2013a. Consultation document – development of new framework for technical measures in the reformed CFP.

EEC 2013b. Proposal for a regulation of the European parliament and of the Council amending regulations.

ICES 2007b. Report of the Workshop on Discard Raising Procedures (WKDRP). ICES CM 2007/ACFM:06, 55pp.

ICES 2008a. Report of the Workshop on Methods to Evaluate and Estimate the Accuracy of Fisheries Data used for Assessment (WKACCU). ICES CM 2008/ACOM:32, 41 pp.

ICES 2009a. Report of the Workshop on methods to evaluate and estimate the precision of fisheries data used for assessment (WKPRECISE), ICES CM 2009/ACOM:40, 43 pp.

ICES 2009b. Report of the workshop on sampling methods for recreational fisheries surveys (WKSMRF). ICES CM 2009/ACOM:41

ICES 2010a. Report of the Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS). ICES CM 2010/ACOM:39.

ICES 2010b. Report of the Workshop on methods for merging metiers for fishery based sampling (WKMERGE), ICES CM 2010/ACOM:40, 94 pp.

ICES 2011a. Report of the Workshop on Practical Implementation of Statistical Sound Catch Sampling Programmes, ICES CM 2011/ACOM:52

ICES 2011b. Report of the Study Group on Practical Implementation of Discard Sampling Plans (SGPIDS). ICES 2011 /ACOM:50

ICES 2011c. Report of the Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS), ICES CM 2011/ACOM:40.

ICES 2012a. Report of the Study Group on Practical Implementation of Discard Sampling Plans (SGPIDS). ICES 2012 /ACOM:50

ICES 2012b. Report of the Working Group on Recreational Fisheries (WGRFS). ICES CM 2012/ACOM:23.

ICES 2012c. Report of the second Workshop on Practical Implementation of Statistical Sound Catch Sampling Programmes. ICES CM 2012/ACOM:54

ICES 2012d. Report of the Planning Group on Commercial Catches, Discards and Biological Sampling; PGCCDBS 2012. ICES CM 2012/ACOM:50.

ICES 2013a. Report of the Working Group on Recreational Fisheries. ICES CM 2013/ACOM:23.

ICES 2013b. Report of the Study Group on Practical Implementation of Discard Sampling Plans (SGPIDS). ICES 2013/ACOM:56

ICES 2013c. Report of the Planning Group on Commercial Catches, Discards and Biological Sampling; PGCCDBS 2013. ICES CM 2013/ACOM:49.

Miller, D., Coers, A., Pastoors, M., Uhlmann, S. 2014. Delineating catch quotas for Dutch demersal fisheries: a theoretical pilot study. Report nr. C081/14. Institute for Marine Resources and Ecosystem Studies (IMARES), Ijmuiden, 21 pp.

Nedreaas, K., Stransky, C., Jardim, E. and Vigneau, J. 2009. Quality assurance framework—the concept of quality assurance applied to fisheries data and its operationalization under the ICES scope. ICES CM 2009/N:06.

Polet, H. and Vanderperren, E. (2013). Een overzicht van experimenten met de alternatieve boomkor. Advis II. Rapportnummer: TECH/2013/03a, ILVO, Oostende:

Sarda, F., Coll, M., Heymans, J., & Stergiou, K. (2013). Overlooked impacts and challenges of the new European discard ban. Fish and Fisheries, (May), 1–6. doi:10.1111/faf.12060

Scientific, Technical and Economic Committee for Fisheries (STECF) – Evaluation of Fishing Effort Regimes in European Waters - Part 2 (STECF-13-21). 2013. Publications Office of the European Union, Luxembourg, EUR 26327 EN, JRC86088, 863 pp.

Suuronen, P., Chopin, F., Glass, C., & Løkkeborg, S. (2012). Low impact and fuel efficient fishing—Looking beyond the horizon. Fisheries Research. doi:10.1016/j.fishres.2011.12.009

Uhlmann, S. S., Bierman, S. M., & Helmond, A. T. M. v. (2011). A method of detecting patterns in mean lengths of samples of discarded fish, applied to the self-sampling programme of the Dutch bottom-trawl fishery. ICES Journal of Marine Science, 68, 1712–1718. doi:10.1093/icesjms/fsr066

Uhlmann, S. S., & Broadhurst, M. K. (2013). Mitigating unaccounted fishing mortality from gillnets and traps, 1–47. doi:10.1111/faf.12049

Uhlmann, S. S., van Helmond, A. T. M., Stefánsdóttir, E. K., Sigurðardóttir, S., Haralabous, J., Maria Bellido, J., Carbonell, A., Catchpole, T., Damalas, D., Fauconnet, L., Feekings, J., Garcia, T., Madsen, N., Mallold, S., Margeirsson, S., Palialexis, A., Readdy, L., Valeiras, J., Vassilopoulou, V., and Rochet, M-J. (2013). Discarded fish in European waters: general patterns and contrasts. ICES Journal of Marine Science, doi:10.1093/icesjms/fst030.

Winger, P.D., Eayrs, S., Glass, C.W., 2010. Fish behaviour near bottom trawls. In: He, P. (Ed.), Behaviour of Marine Fishes: Capture Processes and Conservation Challenges. Wiley-Blackwell, New York, pp. 67–100.

Annex 1 Generating discard estimates from the STECF database

As the main source of discard estimates used was the STECF database, the following section briefly describes the process for developing discard estimates for that database. A detailed and extensive report on the data provided to the group and methods used by the group can be found in the report of the latest meeting (STECF, 2013).

National submissions – Member States are required to submit information annually to STECF according to a specified Data Collection Framework (DCF) data call using a data format which allows for analysis on landings, discard estimates and effort (measures in kw power x days-at-sea) disaggregated by Country, Year, Quarter, Vessel length category, Gear, Mesh size range, Fishery, Area and Special Condition (e.g. the use of a cod avoidance gear, if applicable). National submissions include information on landings and discard estimates provided according to national procedures which vary by country but are generally developed to provide the most precise estimates of discards possible with the level of observer coverage available (more information provided at Annex X).

Discard estimation procedure – The STECF expert group on fishing effort management regimes (STECF, 2013) has developed procedures for raising discard estimates for non-sampled national fisheries by utilising information provided by all EU Member States to the working group. The data aggregation and estimation procedures of the STECF effort group follow simple raising strategies and are generally considered consistent with the method used in the discard estimates published by the FAO (Kelleher, 2004). Fisheries specific discards and landings from each member state are used to replace poor or lacking values with aggregated information from other countries to get as complete a picture as possible of discarding in the various fisheries.

If a member state has not submitted discard information for a certain fishery in a certain area, the average discard ratio from other member states submitting discard information within the same fishery was used. Where no Member State has submitted a discard estimate for a particular metier segment and species, no discard estimate is provided (this is distinguished in the report from a zero discard estimate with the notation 'NA'= not available).

Let the following notation be: D=discards, L= landings, *snf* = sampled national fishery with a discard value from 0 to X, *unf* = un-sampled national fishery without a discard value. The available landings and discards information were aggregated (summed) over fisheries to metier level (by species, year, quarter, regulated area, gear group and special condition). Mean discard ratios (DR) were calculated:

$$DR = \frac{\sum_{snf} D_{snf}}{\sum_{snf} (L_{snf} + D_{snf})} \text{ if } D_{snf} \geq 0 \text{ and with } L_{snf} + D_{snf} > 0$$

Fisheries specific discard amounts were then calculated if no discard information was available by

$$D_{unf} = \frac{L_{unf}.DR}{(1-DR)}$$ where D_{unf} is null (empty)

If no country submitted discard information and no average DR could be estimated for a metier, it would remain without discard estimate.

Annex 2 STECF Data Quality

There are several steps involved in generating the fishery and species specific discard estimates produced by STECF and used within this report. The following section briefly outlines relevant factors that affect data quality. This includes a description of national sampling programmes/procedures, raising procedures and a discussion of the reasons for differences between ICES and STECF discard estimates.

National sampling programmes

1. Member States national laboratories collect biological information from fisheries at sea, including length distribution of the entire catch (retained fish and discards) according to criteria set out under the Data collection Framework (DCF). The framework includes targets per DCF level 6 strata (i.e. gear, mesh range, target species), with respect to minimum sampling effort (number of trips as a proportion of the overall trips by those strata) required to provide estimates with an associated precision. In the cases where a Member State (or a stratum?) does not have significant catches of a particular stock, no sampling of the fishery is required – and in many cases this means that no discard estimates are available for these fisheries.

2. Sending observers to sea is expensive and sampling coverage generally limited (0.5-1.5% per strata), and as a result confidence estimates around discard estimates are wide. In addition, there may be bias introduced by sampling skewed towards particular vessels or the presence of observers may also lead to changes in behaviour of the crew. All these practices and situations can lead to a potential bias which may affect the accuracy of any discard estimates.

3. Notwithstanding, such data provides the best estimates of discarding at sea currently available, and is utilised fully to provide estimates of total catch both for stock assessment purposes and to fulfil DCF data calls (such as the STECF data call).

National raising procedures for STECF DCF data call

1. The DCF data call to fulfil the requirements for the STECF expert group meeting on fishing effort management regimes requires submission of data at level which is much more disaggregated than national sampling schemes, according to the following criteria:

Criteria	Disaggregation
Country	3-letter country code
Year	2013
Quarter	1,2,3,4
Vessel length category	u10m, 10-15m or o15m

Gear	BEAM, DEM_SEINE, DREDGE, GILL, LONGLINE, NONE, OTTER, PEL_SEINE, PEL_TRAWL, POTS, TRAMMEL
Mesh size range	Specific to gear type, e.g. 70-79 mm
Fishery	e.g. DEEP for deep-sea fisheries
Area	e.g. (of relevance to NWW) 6a, 7a, 7b, 7cEU, 7e, 7f, 7g, 7h, 7jEU, 7kEU
Special Condition	e.g. FDF – fully documented fishery

2. Due to the highly disaggregated nature of the data, this can result in the provision of data with very few samples per strata or, in some cases, the same samples used across strata (e.g. across vessel length, special conditions etc.). The result of this is the potential for discard estimates which are the result of single samples, or only a small number of samples relative to the activity by the strata which can lead to discard estimates with wide confidence limits and low precision.

3. The design of a discard sampling scheme might differ depending on whether the objective was to estimate total discards, or discard for specific fleets. In the current context estimates from sampling schemes designed for the former purpose are being used for the latter purpose which again means the estimates should only be used with caution (STECF, 2013). Utilising the data at a level which it is not designed for may be the cause of some spurious discard estimates based on single samples, very low (or 0) landings being applied to raise the rest of the strata landings.

4. A substantial investigation into the quality of fisheries sampling programmes, data and associated analysis has been conducted by the ICES Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS), in their role to promote the ICES Quality Assurance Framework (Nedreaas *et al*., 2009), and by workshops and study groups established by PGCCDBS: WKPRECISE: (ICES 2009a) and WKACCU (ICES 2008a) on accuracy of sampling data; WKDRP (ICES 2007b) on discard raising procedures; WKMERGE (ICES 2010b), WKPICS (ICES 2011a, 2012c), SGPIDS (ICES 2011b, 2012a, 2013b) on design of commercial fishery sampling schemes and WKSMRF (ICES 2009b), WGRFS (ICES 2012b, 2013a) on recreational fishery surveys.

5. The main conclusion is that the present system of reporting data quality in DCF programmes is inappropriate. There is a lack of quality evaluation through a well-structured peer-review process supported by clear documentation of all components of the sampling programmes and the sampling outcomes. This type of review is a complex process that may be carried out in stages within Institutes and through external peer review, and requires appropriate experts in statistical survey design and practical implementation.

6. The following table highlights the key quality issues with national data capture and reporting.

Key quality issues with national data capture and reporting (WKPICS, 2013)

Stage	Quality issues
National data capture	Transcription errors; data entry errors; incomplete entry; ancillary data missing (e.g. missing link between a length sample and vessel data)
National data processing	incorrect allocation of trips to metiers or strata; use of weight-length relationships; errors or undetected changes in analysis software; Problems with code lists such as vessel tables; Failure to take sampling strategy into account. Use of inappropriate auxiliary (raising) variables. Wrong species code

STECF allocations for strata with no discard estimates

1. Following national submissions there is a data raising procedure which seeks to maximise use of all national submissions by 'filling-in' national strata with missing discard estimates that are calculated from the average of the other national submissions where discard estimates are available. The procedure follows simple raising strategies generally consistent with FAO guidelines (Kelleher, 2004) and is described in Section 2.3.

2. If no discard estimate is available from any Member State for particular strata, it is left without any estimate – but discard may occur for such strata, they are just not able to be estimated from the current EU observer programmes. It is important to recognise that this means the values provide are *not estimates of the total discards but an estimate of the discards for the strata for which discard estimates can be provided*. As such, total discards can be underestimated if only certain strata do not have any discard estimates for a particular species. Conversely, the application of a discard estimate from a single sample from a fishery with little to no landings to a fishery without a discard estimate but with significant landings may lead to an overestimate of discards for that species.

Outliers/data screening for STECF discard estimates

1. The 'fill-in' allocation procedure described above is an automated process, without expert judgment. As a further quality check procedure, national experts seek to identify any obviously unrealistic outliers that lead to discard estimates unlikely to be reflecting the level of discards in a particular fishery. For example, estimates which result from small samples (i.e. low discard volumes and low landings, but at a high %) are generally removed, but can result in unrealistically high discard estimates if included in the dataset. However, it is recognised that not all outliers can be detected and therefore this process is subject to some balance of judgement.

2. The STECF view is that the procedure should seek to make use of the most data available, and every attempt made to ensure that relevant and credible information is used, while ensuring that

maximum use is made of information available. STECF considers that overall, discards information in the Celtic Seas is not as good as for other areas (e.g. the North Sea) and therefore care should be taken in interpreting the information, particularly for fisheries with low or zero landings. STECF draws attention that in some cases very high discards values may appear in the results, particularly for uncommon species.

3. STECF underlines that it is not possible to track and remove every single outlier of every single species for every single country, given the size of the data base. The STECF database relies on individual countries to provide the best possible discards estimates. The combined outcomes of the database cannot be any better than the inputs (STECF, 2013).

Annex 3 Differences between STECF and ICES discard estimation procedures

1. There may be differences in the estimates of discards provided by STECF and ICES. These differences mostly result from the use of different raising procedures due to slightly different objectives (i.e. ICES for stock assessment seeks to estimate total catch and age distribution, while STECF seeks to provide metier-disaggregated catch information). The following table summarise the main differences in raising procedures between the two datasets:

Table I - Differences between ICES InterCatch and STECF discard estimation procedures

Stage	ICES InterCatch approach	STECF DCF data call approach
Data aggregation	National laboratories aggregate data according to national sampling programmes at DCF level 6 (note: metier definitions may differ by nation). Discard estimates are raised based on these aggregations, with outliers identified prior to submission.	National laboratories aggregate data according to specifications in STECF data call (note: metier definitions consistent across nations) [Some outlier detection takes place prior to submission ?]
National submissions	National laboratories may choose to allocate ('fill-in') a discard ratio to another of their metiers prior to submission	No discard rate allocation ('fill-in') take place prior to submission
Post-national data collation allocations	Stock coordinators allocate discard rates to metiers without discard estimates based on *expert judgement*. Note some metiers may be aggregated to an 'others' category before this takes place.	An automated JRC- process allocates ('fills-in') metiers without discard estimates without expert input. These estimates are then aggregated to the reported level (i.e. TR1, TR2 etc..) Experts scrutinise outputs and identify and outliers are obviously spurious estimates and iteratively refine discard estimations.

Final data	Used at aggregated (stock) level for input to assessments. Metier-disaggregated data is utilised for mixed fishery forecasts.	Final dataset used in reporting and published online.

Data Coverage Index (DCI)

1. The report includes a Data Coverage Index which has been provided as an *indication* of the level coverage of discard estimates by species. It provides the percentage of landings by strata that have an associated discard estimate provided by Member States in comparison to those that do not have an associated discard estimation (though may be assigned one through the STECF raising procedure, or left without a discard estimate). The procedure for generating the DCI was as follows:

   (Quantity of landings per strata with an associated discard estimate as submitted by Member State / Quantity of landings per strata without an associated discard estimate as submitted by Member State) * 100

2. It should be noted that it is not an indication of discard estimate quality (i.e. precision, confidence) which requires consideration of the number of trips of the strata sampled in relation to the overall effort: information not available for the STECF database.

3. STECF have noted that "While the DQI is a useful indicator of the proportion of landings by fishery by Member State and stock that are sampled for discards, it does not reflect the level of discarding each fishery carries out. Furthermore, the DQI does not distinguish between a fishery with a high discard rate and a fishery with a low discard rate, or the level of sampling allocated to each fishery. It's an exploratory tool that allows the identification of the proportion of overall landings by fishery that was sampled.

4. In order to aid interpretation of the DQI, the DQI is further classified into three separate groups as follows:

   A = 67 % or more of the landings have an accompanying discard estimate,

   B = 34-66 % of the landings have an accompanying discard estimate, and

   C = less the 33 % of the landings have an accompanying discard estimate.

STECF considers category A estimates to be sufficiently reliable to be used for assessment purposes, as the majority of the landings by species and fishery are accompanied with a discard estimate.

However it should be noted once again that this DQI cannot inform on the quality of the discard rate estimates supplied by nations (as affected for example by the proportion of fishing trips sampled for discards).

Category B discard estimates are considered to be less reliable than category A and require careful scrutiny before they are used for assessment purposes.

Category C discard estimates are the least reliable and STECF considers that they should not be used for assessment purposes.

Annex 4 References to ICES planning groups, workshops and study groups.

ICES. 2007b. Report of the Workshop on Discard Raising Procedures (WKDRP). ICES CM 2007/ACFM:06, 55pp.

ICES 2008a. Report of the Workshop on Methods to Evaluate and Estimate the Accuracy of Fisheries Data used for Assessment (WKACCU). ICES CM 2008/ACOM:32, 41 pp.

ICES 2009a. Report of the Workshop on methods to evaluate and estimate the precision of fisheries data used for assessment (WKPRECISE), ICES CM 2009/ACOM:40, 43 pp.

ICES 2009b. Report of the workshop on sampling methods for recreational fisheries surveys (WKSMRF). ICES CM 2009/ACOM:41

ICES 2010a. Report of the Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS). ICES CM 2010/ACOM:39.

ICES 2010b. Report of the Workshop on methods for merging metiers for fishery based sampling (WKMERGE), ICES CM 2010/ACOM:40, 94 pp.

ICES 2011a. Report of the Workshop on Practical Implementation of Statistical Sound Catch Sampling Programmes, ICES CM 2011/ACOM:52.

ICES. 2011b. Report of the Study Group on Practical Implementation of Discard Sampling Plans (SGPIDS). ICES 2011 /ACOM:50.

ICES 2011c. Report of the Planning Group on Commercial Catches, Discards and Biological Sampling (PGCCDBS), ICES CM 2011/ACOM:40.

ICES 2012a. Report of the Study Group on Practical Implementation of Discard Sampling Plans (SGPIDS). ICES 2012 /ACOM:50.

ICES 2012b. Report of the Working Group on Recreational Fisheries (WGRFS). ICES CM 2012/ACOM:23.

ICES 2012c. Report of the second Workshop on Practical Implementation of Statistical Sound Catch Sampling Programmes. ICES CM 2012/ACOM:54

ICES 2012d. Report of the Planning Group on Commercial Catches, Discards and Biological Sampling; PGCCDBS 2012. ICES CM 2012/ACOM:50.

ICES 2013a. Report of the Working Group on Recreational Fisheries. ICES CM 2013/ACOM:23.

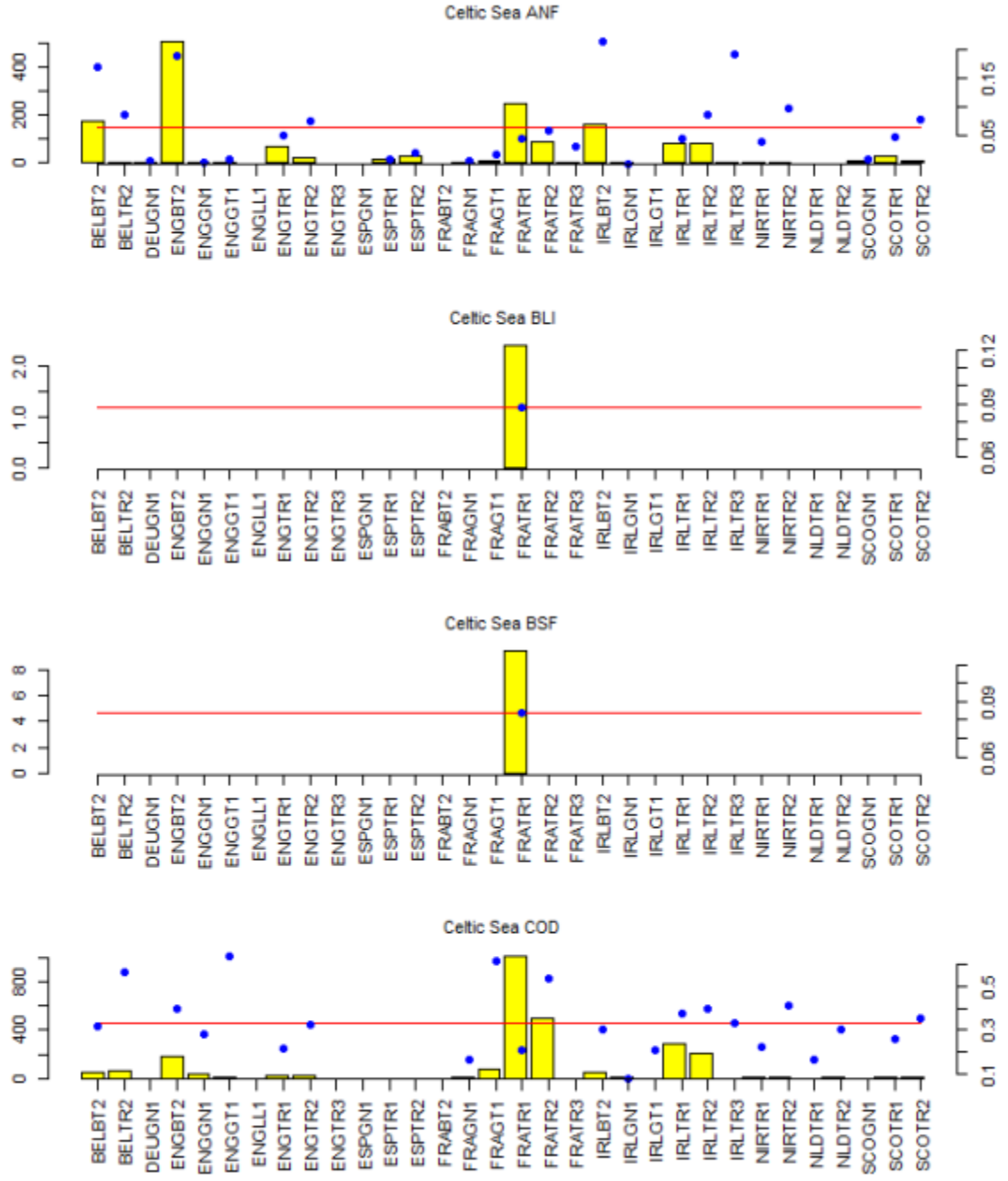
ICES 2013b. Report of the Study Group on Practical Implementation of Discard Sampling Plans (SGPIDS). ICES 2013/ACOM:56.

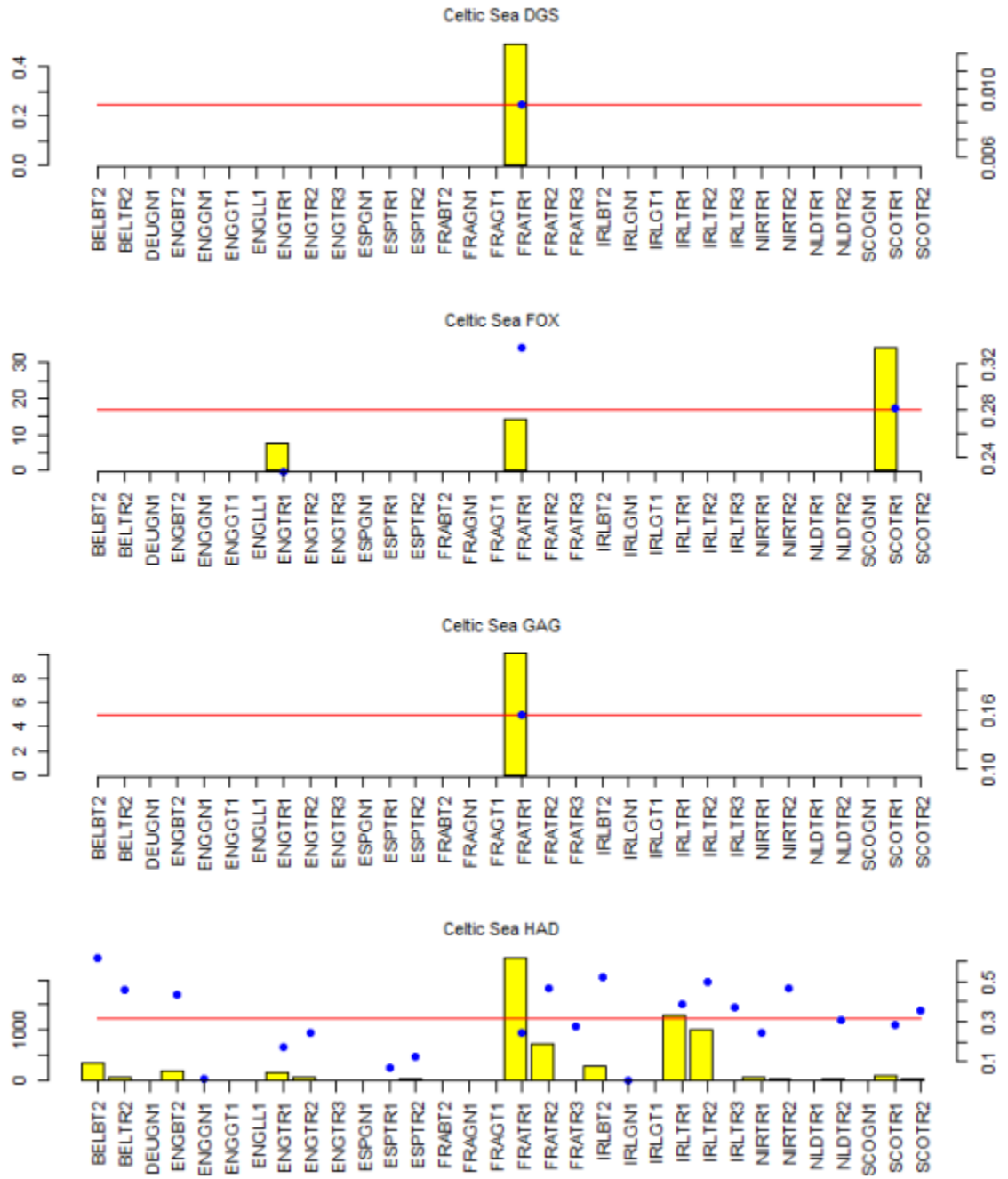
ICES 2013c. Report of the Planning Group on Commercial Catches, Discards and Biological Sampling; PGCCDBS 2013. ICES CM 2013/ACOM:49.

Nedreaas, K., Stransky, C., Jardim, E. and Vigneau, J. 2009. Quality assurance framework—the concept of quality assurance applied to fisheries data and its operationalization under the ICES scope. ICES CM 2009/N:06.

Annex 5 STECF discard estimation plots

Graphical representations of STECF discard estimates. Yellow bars = mean discard estimated weight (tonnes) for each country-gear combination (left axis); blue circles = mean estimated discard rate for each country-gear combination (right axis), red line = mean estimated discard rate for all country-gear combinations (right axis).

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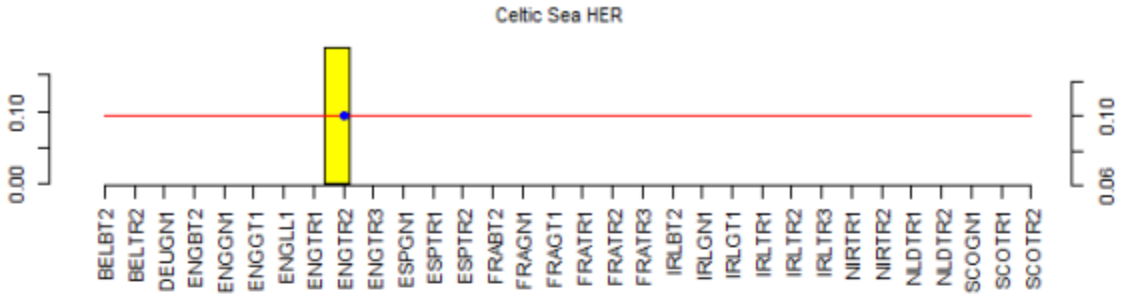
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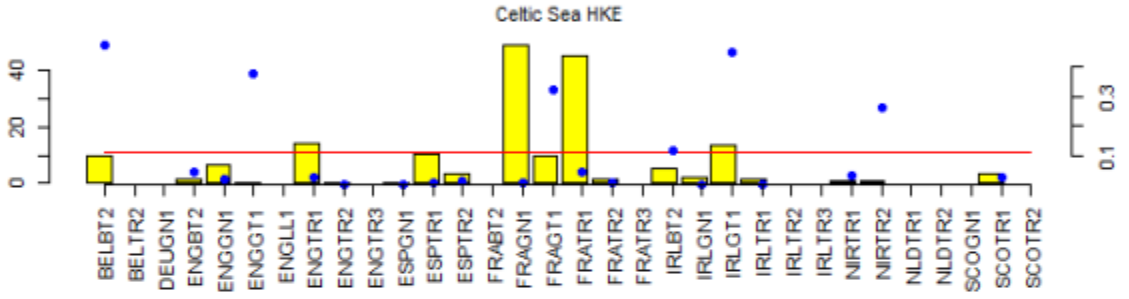
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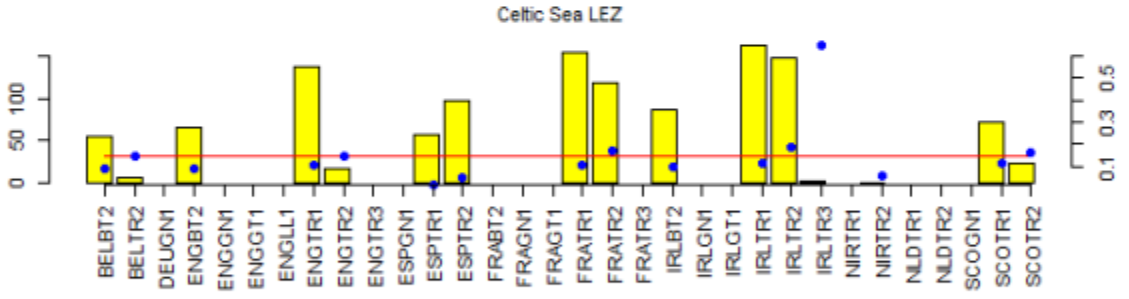
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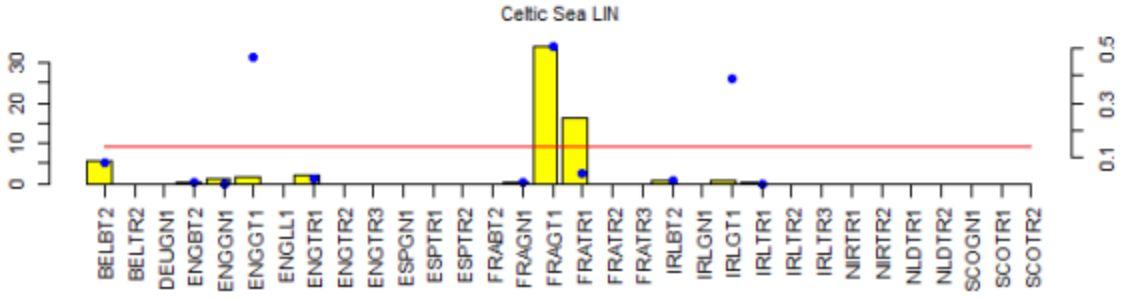
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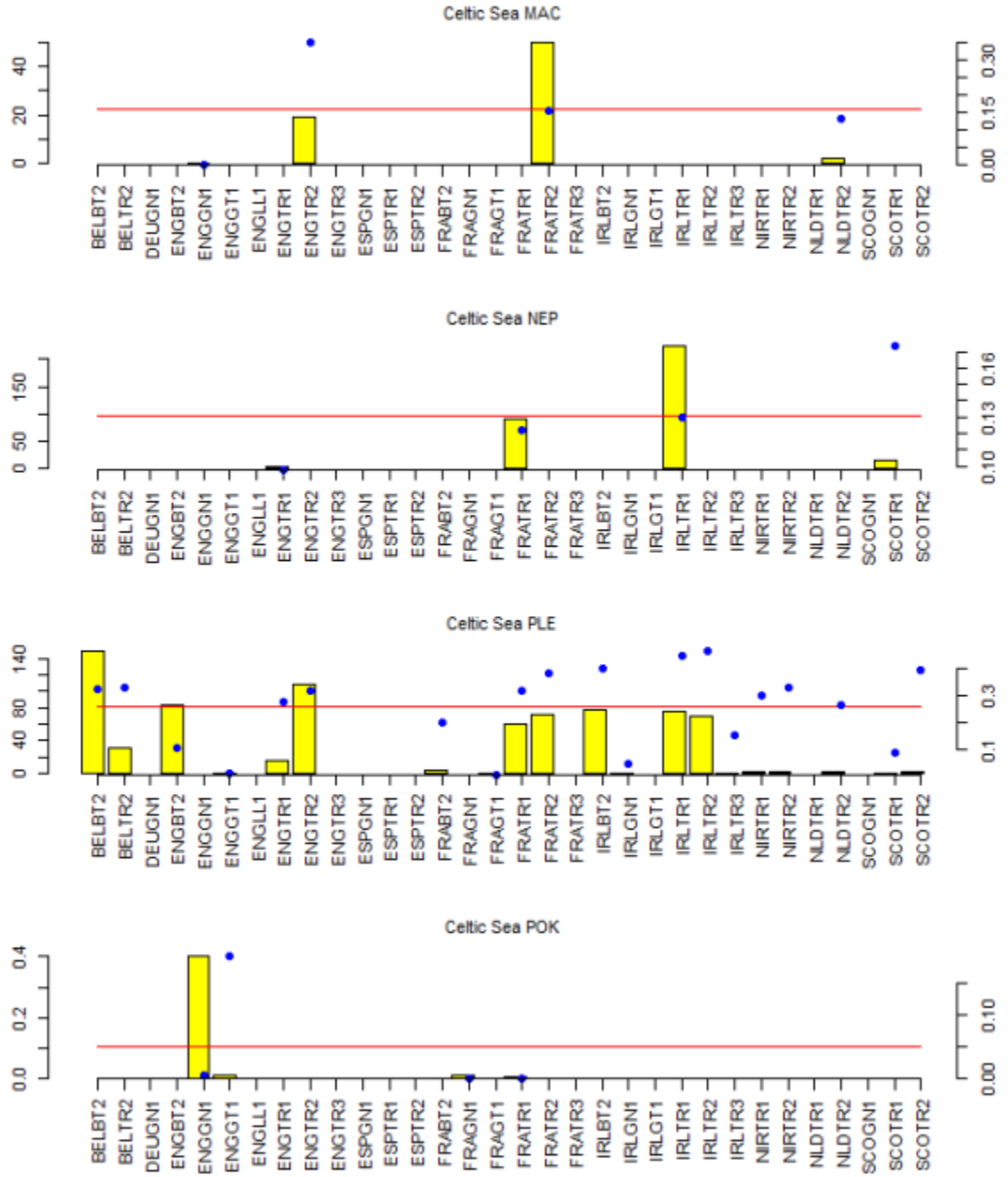
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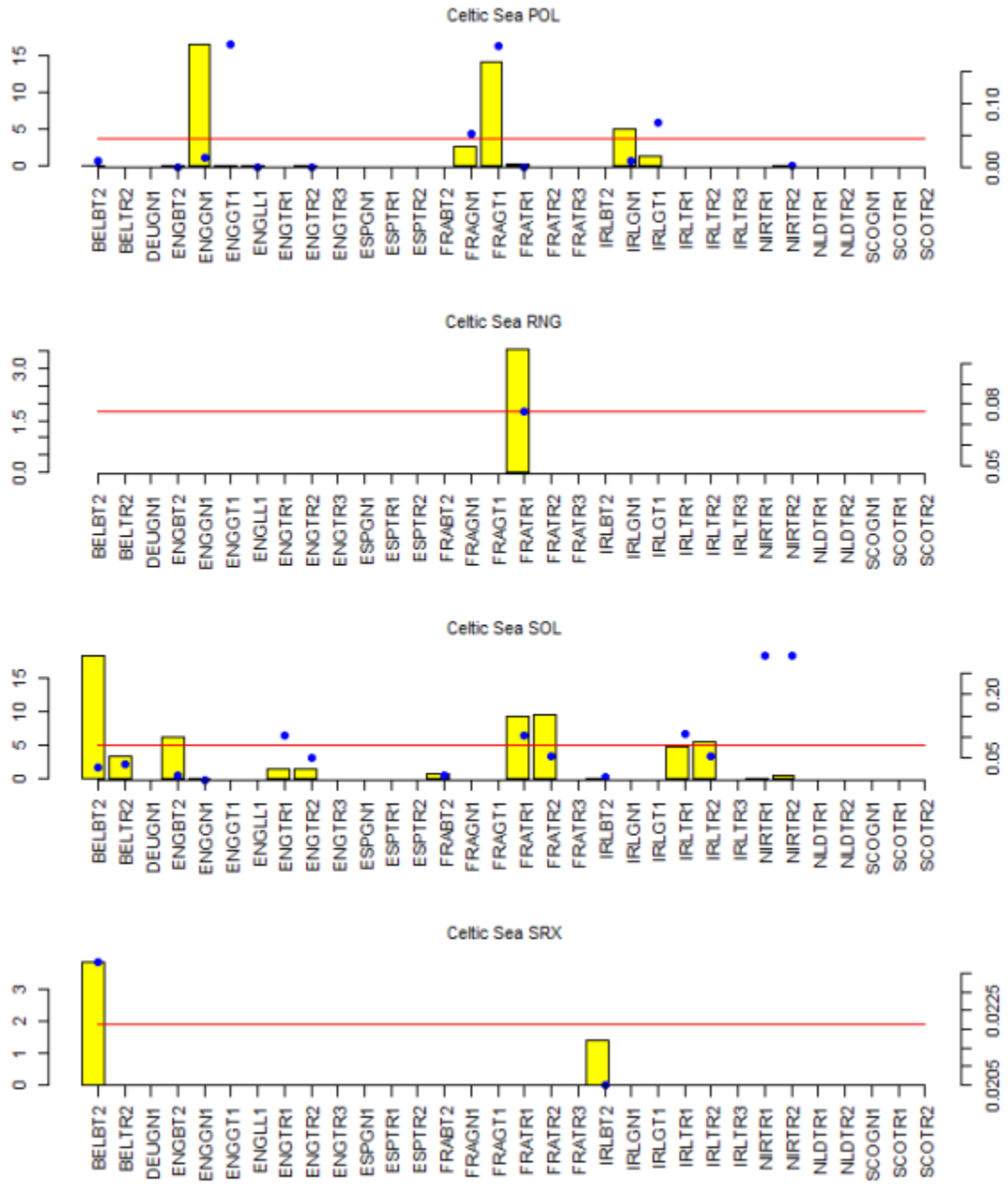
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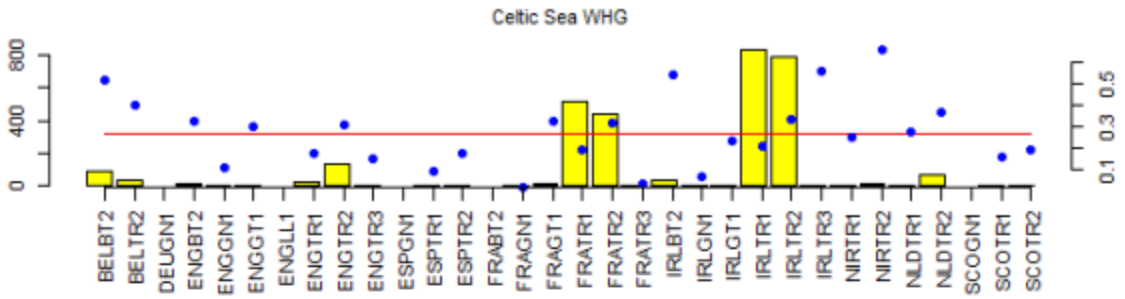
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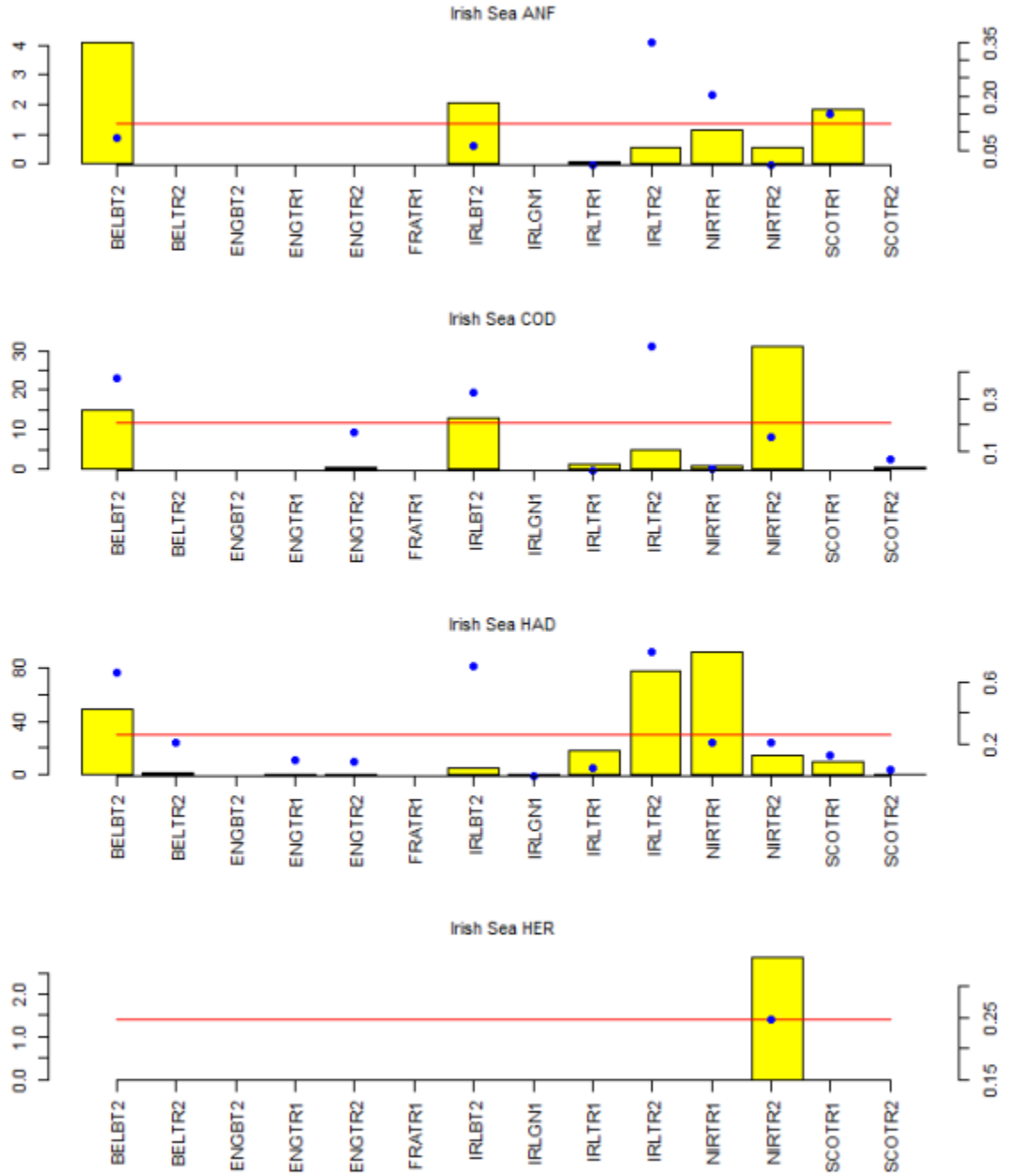
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0.2 0.6
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Irish Sea HER
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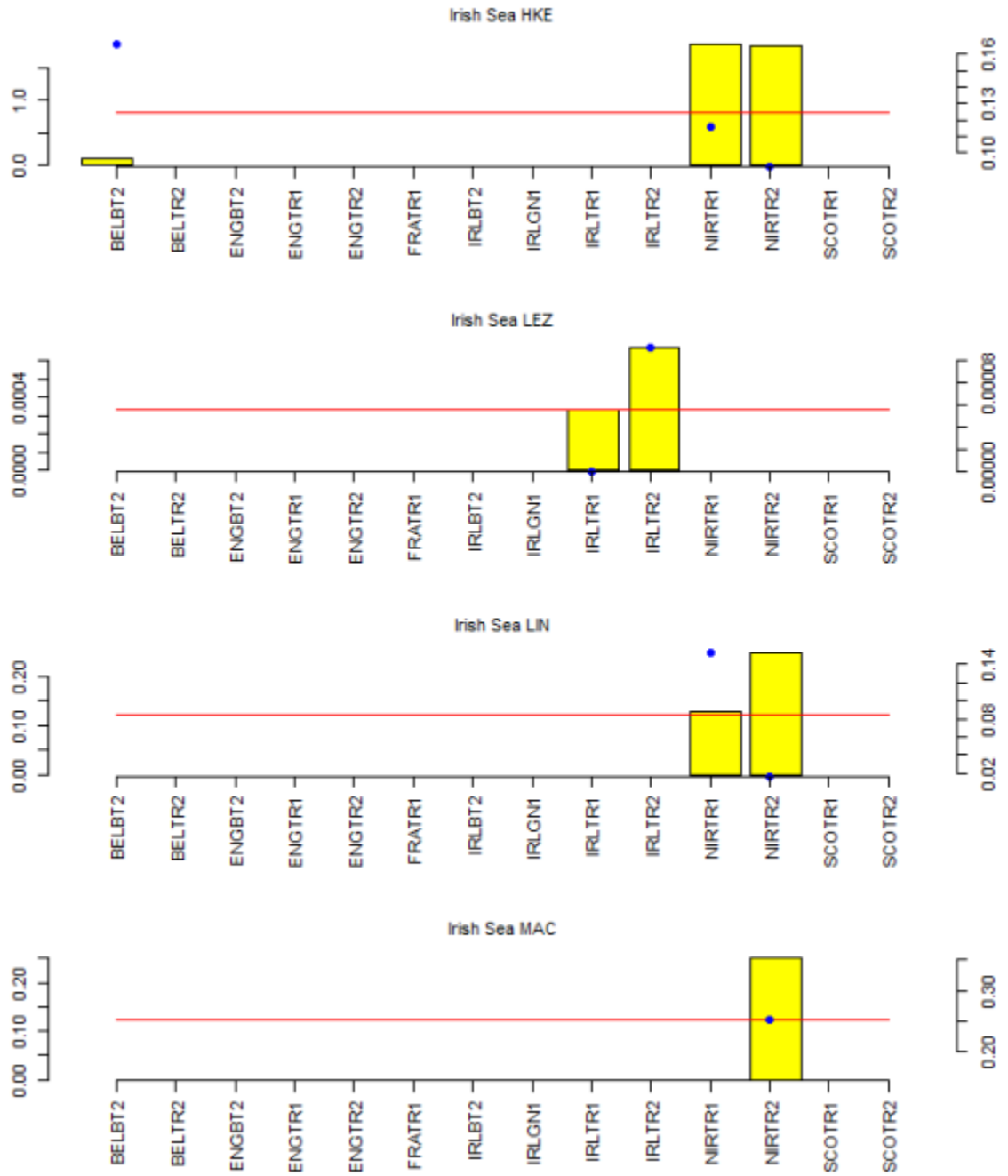
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1.0
0.10
0.13
0.16
Irish Sea LEZ
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0.00000
0.00008
Irish Sea LIN
0.00
0.10
0.20
0.02
0.08
0.14
Irish Sea MAC
0.00
0.10
0.20
0.20
0.30
BELBT2
BELTR2
ENGBT2
ENGTR1
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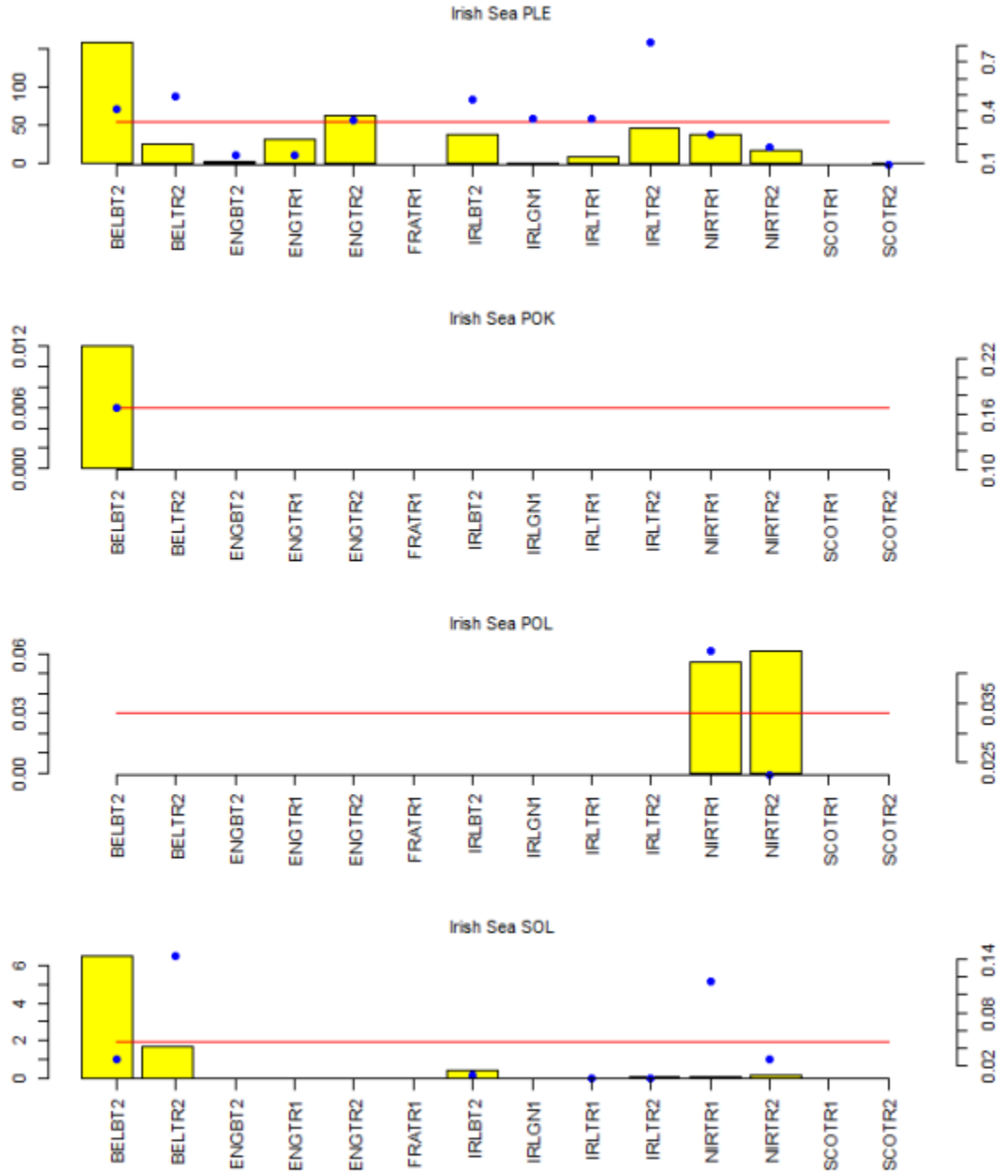
NIRTR1
NIRTR2
SCOTR1
SCOTR2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0.22
Irish Sea POL
0.00
0.03
0.06
0.025
0.035
Irish Sea SOL
0
2
4
6
0.02
0.08
0.14
BELBT2
BELTR2
ENGBT2
ENGTR1
ENGTR2
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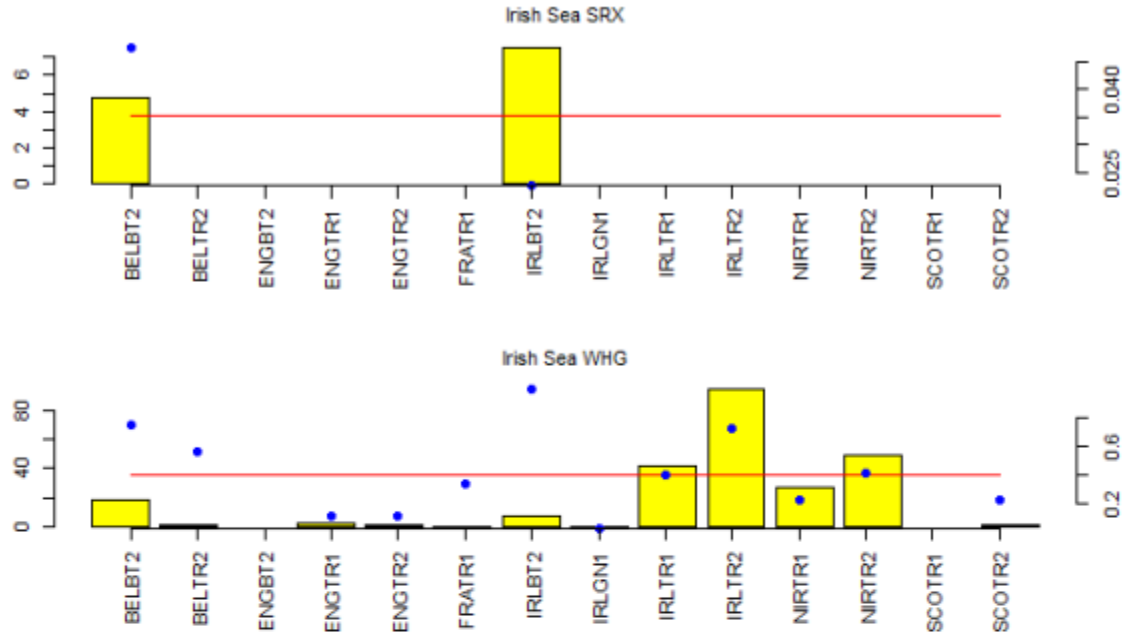
IRLTR2
NIRTR1
NIRTR2
SCOTR1
SCOTR2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6
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ENGTR2
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IRLGN1
IRLTR1
IRLTR2
NIRTR1
NIRTR2
SCOTR1
SCOTR2

Irish Sea WHG
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40
80
0.2
0.6
BELBT2
BELTR2
ENGBT2
ENGTR1
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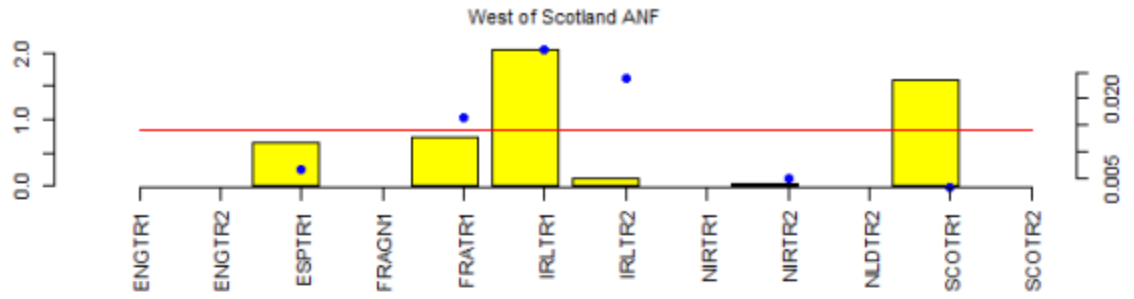
SCOTR2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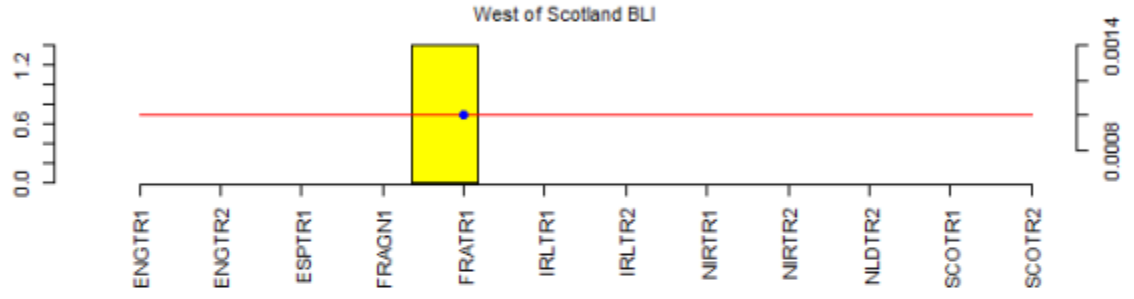
NIRTR1
NIRTR2
NLDTR2
SCOTR1
SCOTR2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ENGTR2
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NIRTR2
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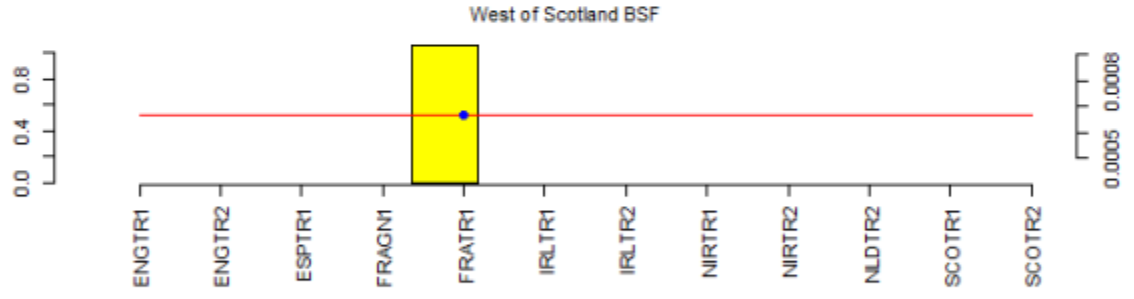
SCOTR1
SCOTR2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ENGTR2
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NIRTR2
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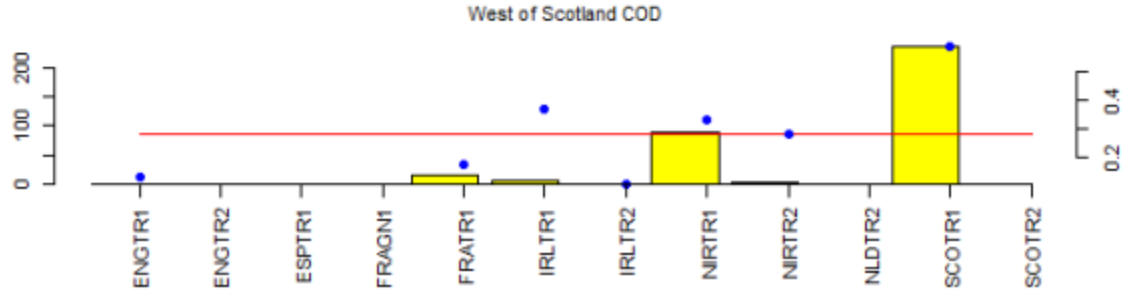
SCOTR1
SCOTR2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0.4
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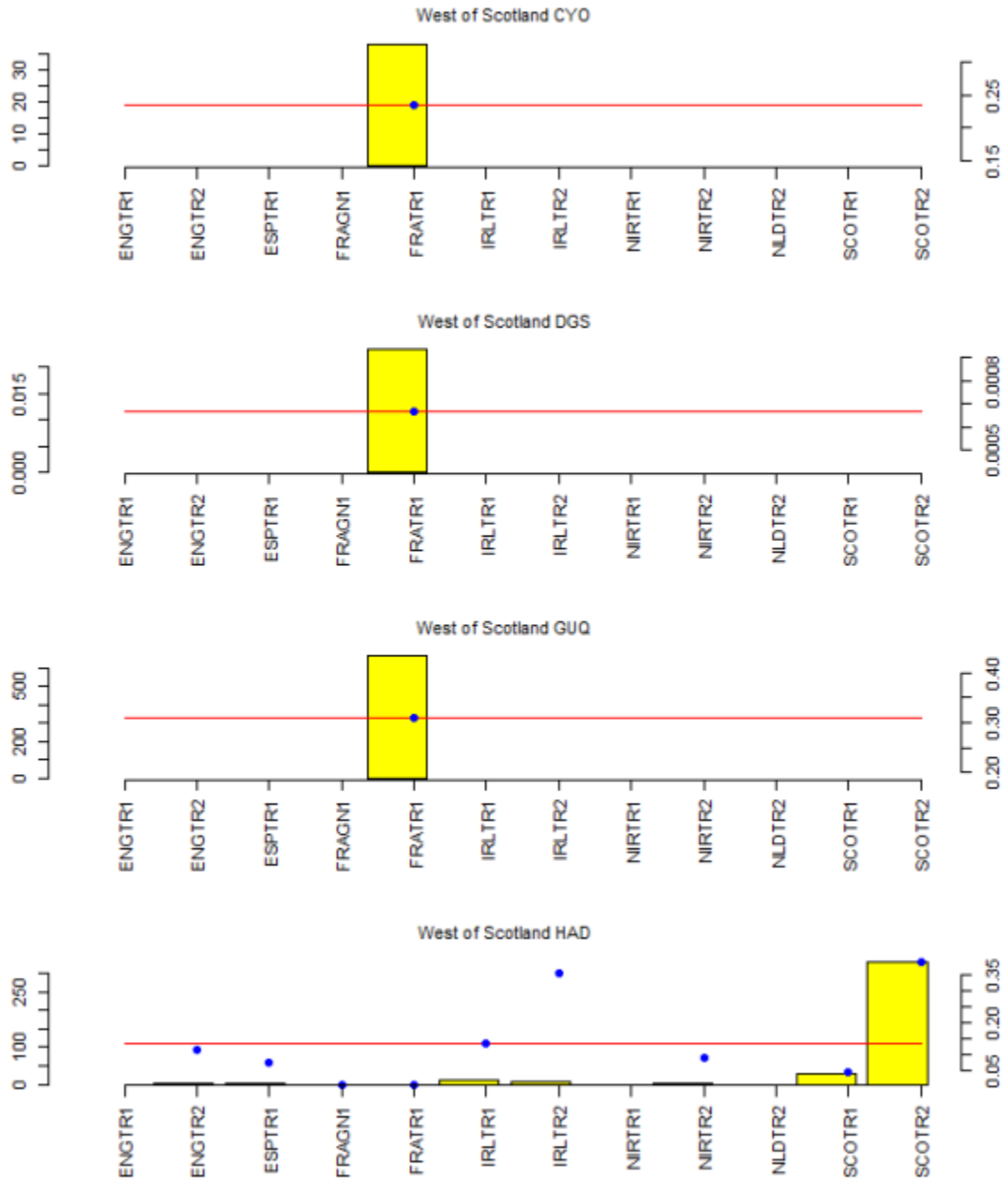
NIRTR2
NLDTR2
SCOTR1
SCOTR2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West of Scotland DGS
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0.0005 0.0008
West of Scotland GUQ
0 200 500
0.20 0.30 0.40
West of Scotland HAD
0 100 250
0.05 0.20 0.35
ENGTR1
ENGTR2
ESPTR1
FRAGN1
FRATR1
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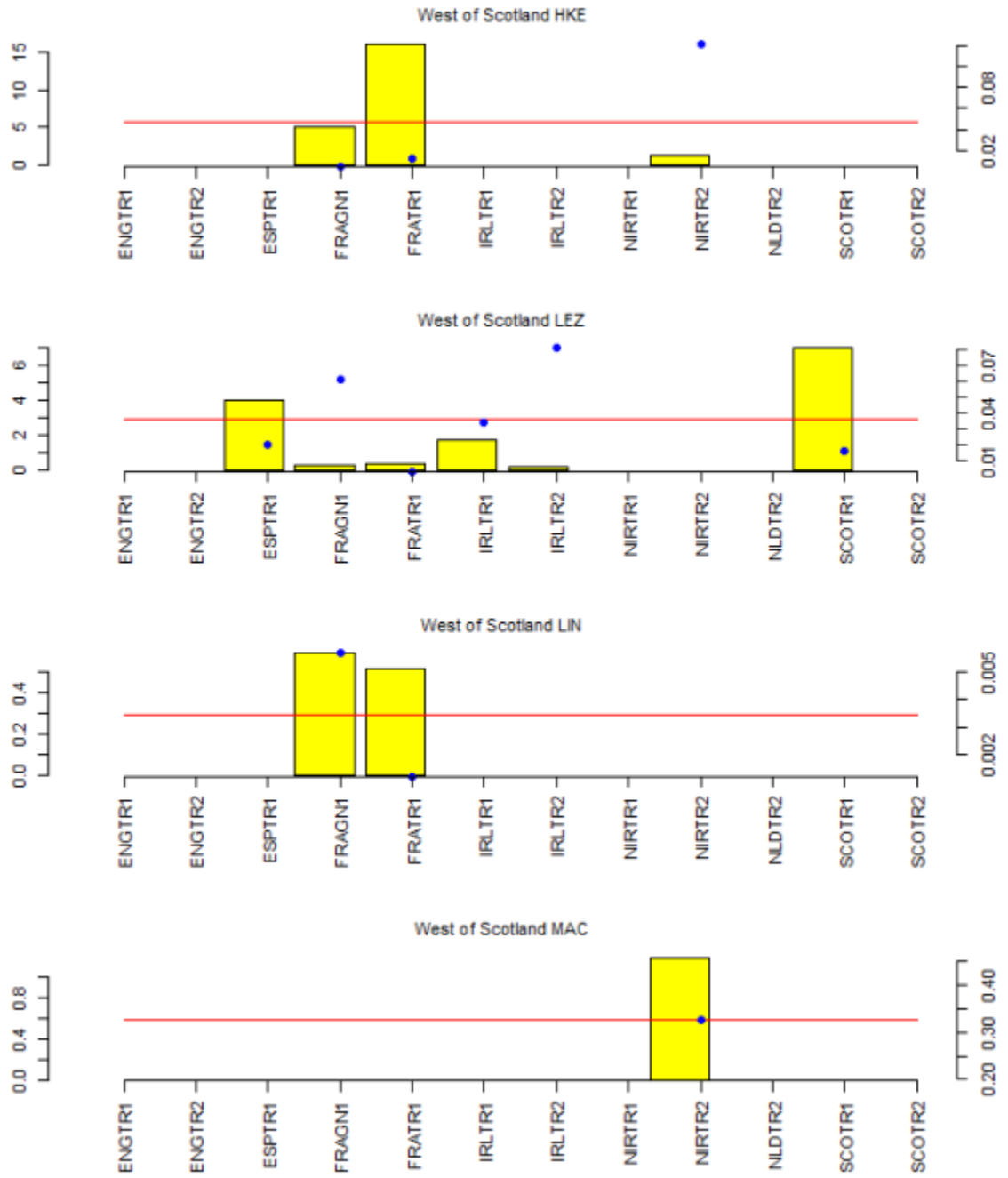
SCOTR2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West of Scotland LEZ
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0.01 0.04 0.07
ENGTR1 ENGTR2 ESPTR1 FRAGN1 FRATR1 IRLTR1 IRLTR2 NIRTR1 NIRTR2 NLDTR2 SCOTR1 SCOTR2
West of Scotland LIN
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0.002 0.005
ENGTR1 ENGTR2 ESPTR1 FRAGN1 FRATR1 IRLTR1 IRLTR2 NIRTR1 NIRTR2 NLDTR2 SCOTR1 SCOTR2
West of Scotland MAC
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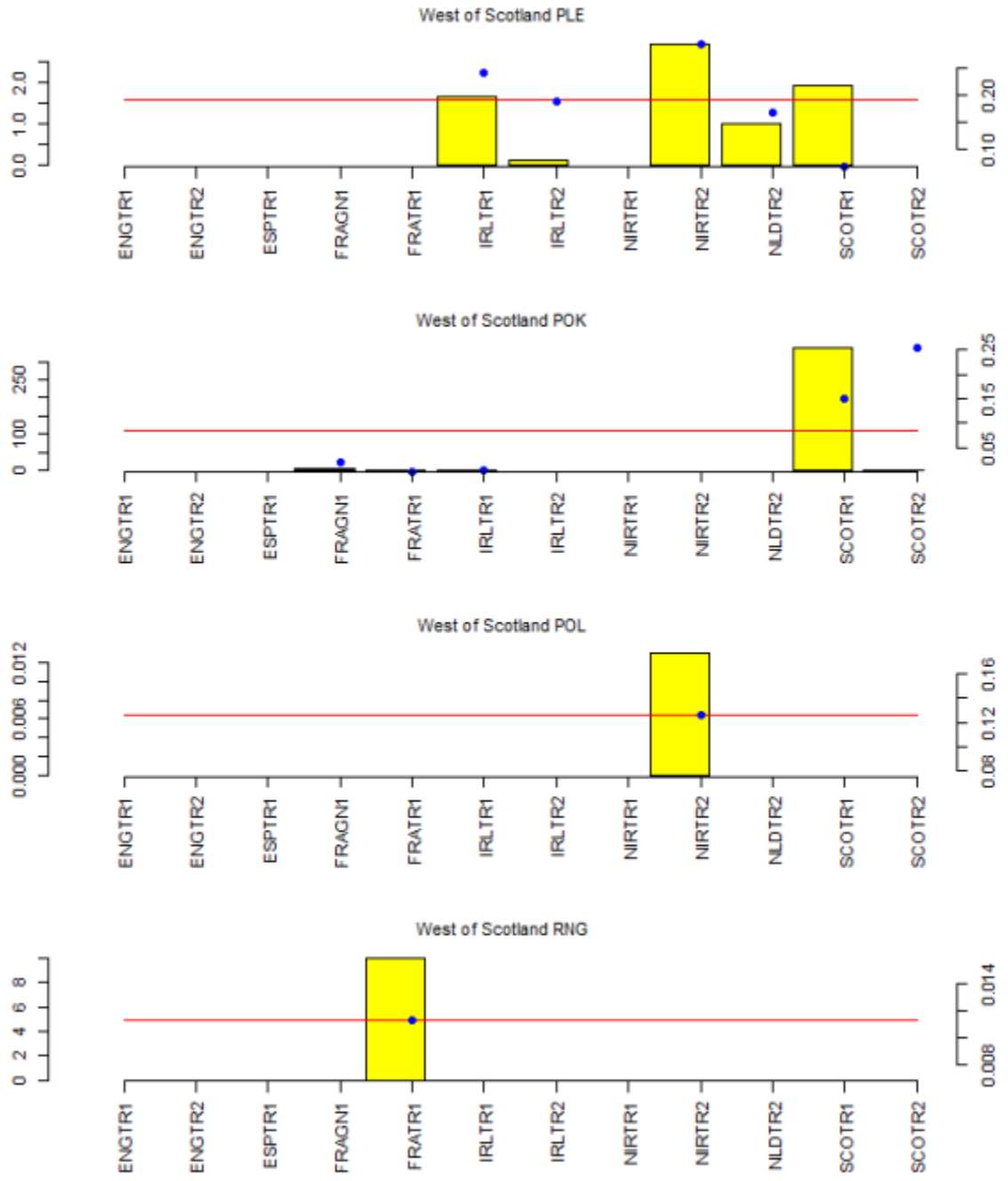
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ENGTR1 ENGTR2 ESPTR1 FRAGN1 FRATR1 IRLTR1 IRLTR2 NIRTR1 NIRTR2 NLDTR2 SCOTR1 SCOTR2
West of Scotland POL
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0.08 0.12 0.16
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West of Scotland RNG
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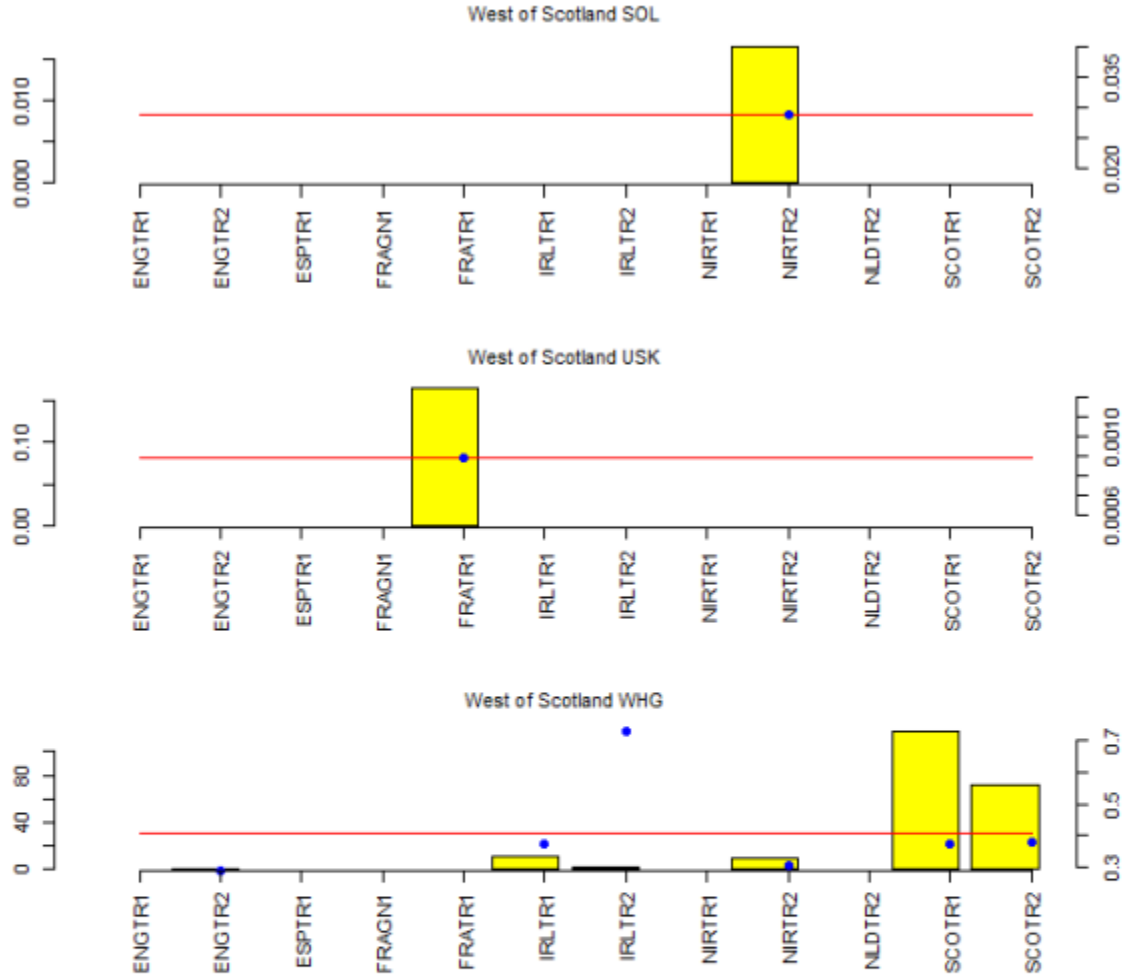
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ENGTR2
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FRATR1
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IRLTR2
NIRTR1
NIRTR2
NLDTR2
SCOTR1
SCOTR2
West of Scotland USK
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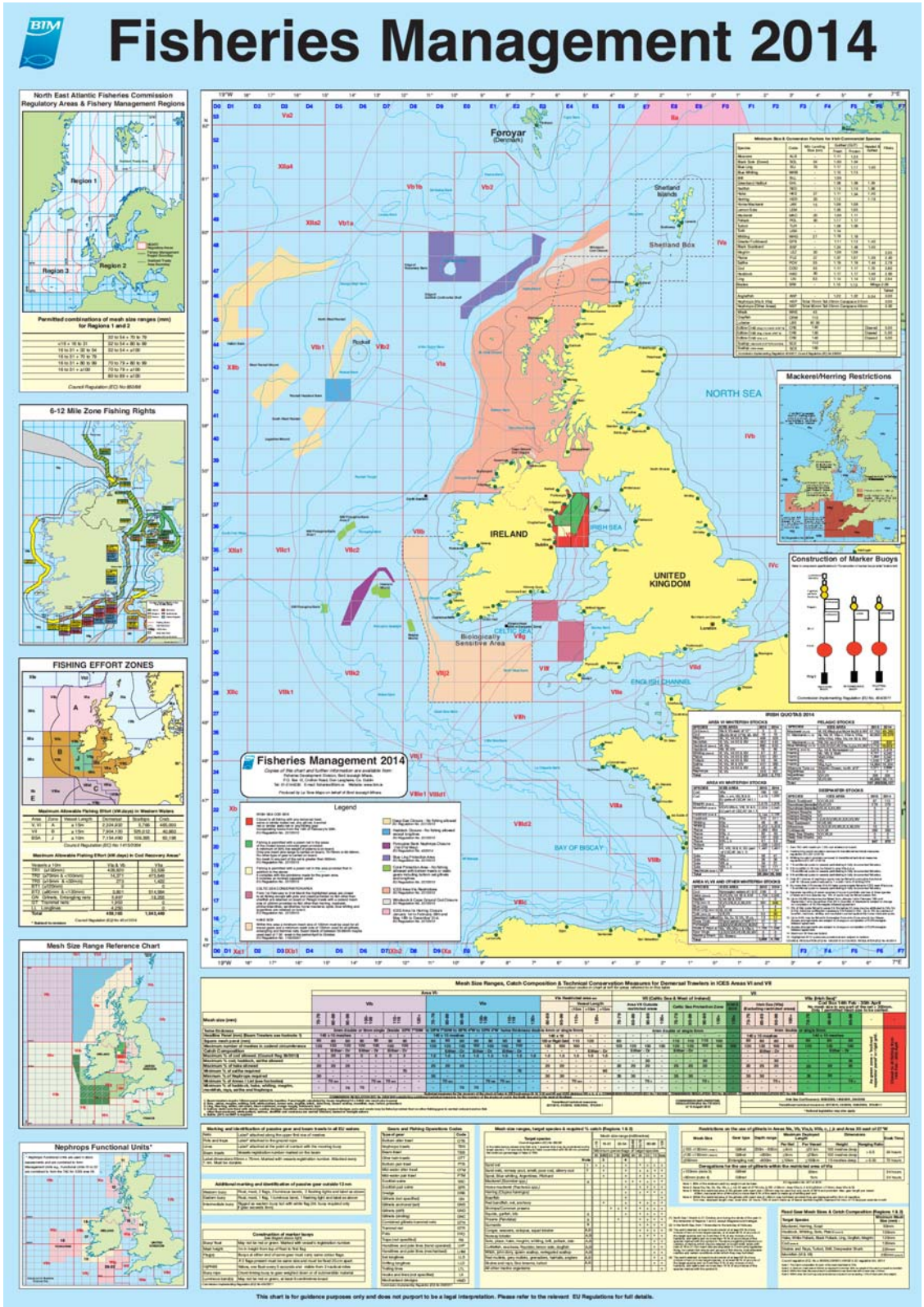
0.10
0.0006
0.0010
ENGTR1
ENGTR2
ESPTR1
FRAGN1
FRATR1
IRLTR1
IRLTR2
NIRTR1
NIRTR2
NLDTR2
SCOTR1
SCOTR2
West of Scotland WHG
0
40
80
0.3
0.5
0.7
ENGTR1
ENGTR2
ESPTR1
FRAGN1
FRATR1
IRLTR1
IRLTR2
NIRTR1
NIRTR2
NLDTR2
SCOTR1
SCOTR2

Annex 6 NWW region technical measures map

http://www.bim.ie/media/bim/content/downloads/BIM%20FMC2014.pdf



Annex 7 Recently published scientific research on gear technology solutions to minimise discards in the North Western Waters Region

Scientific Reference/ Link	Selectivity Category	species	result for species
(2007). Technical measures can be shown by experiment to reduce capture of unwanted fish, but can we see the effect on the stock in a stochastic world? International Council for the Exploration of the Sea, Palaegade 2-4 DK 1261 Copenhagen K Denmark.	coverless (topless, cut back) trawl	HKE - hake	42% reduction in number
	coverless (topless, cut back) trawl	NEP - Nephrops	13% increase in number
	coverless (topless, cut back) trawl	WHG - Whiting	51% reduction in number
(2011) Southwest Otter Trawl Discards Project (SWOT discards), Cefas Project Report, Tom Catchpole, Dave Peach & Sam Smith	box trawl	HAD - haddock	% change in discards = -100
	box trawl	PLE - plaice	% change in discards = -50
	box trawl	WHG - Whiting	% change in discards = -56
	diamond codend mesh size	HAD - haddock	% change in discards = 86
	diamond codend mesh size	PLE - plaice	% change in discards = -50
	diamond codend mesh size	WHG - Whiting	% change in discards = -13
	diamond codend mesh size	WHG - Whiting	% change in discards = -80
	large meshes in trawl	HAD - haddock	% change in discards = -100
	large meshes in trawl	HAD - haddock	% change in discards = 29
	large meshes in trawl	HAD - haddock	% change in discards = -68
	large meshes in trawl	PLE - plaice	% change in discards = 33
	large meshes in trawl	PLE - plaice	% change in discards = 67
	large meshes in trawl	WHG - Whiting	% change in discards = 0
	large meshes in trawl	WHG - Whiting	% change in discards = -39
	large meshes in trawl	WHG - Whiting	% change in discards = -72
	square mesh codend	HAD - haddock	% change in discards = -100
	square mesh panel	HAD - haddock	% change in discards = -100
	square mesh panel	HAD - haddock	% change in discards = -21

Scientific Reference/ Link	Selectivity Category	species	result for species
	square mesh panel	HAD - haddock	% change in discards = -25
	square mesh panel	HAD - haddock	% change in discards = -7
	square mesh panel	PLE - plaice	% change in discards = -41
	square mesh panel	WHG - Whiting	% change in discards = -10
	square mesh panel	WHG - Whiting	% change in discards = -100
	square mesh panel	WHG - Whiting	% change in discards = -7
	T-90 sections	PLE - plaice	% change in discards = 39
	T-90 sections	WHG - Whiting	% change in discards = -21
	T-90 sections	WHG - Whiting	% change in discards = 23
Briggs, R. P. (2010). A novel escape panel for trawl nets used in the Irish Sea *Nephrops* fishery. Fisheries Research (Amsterdam) 105(2): 118-124.	square mesh panel	HAD - haddock	54% reduction in mainly of small haddock
	square mesh panel	NEP - Nephrops	no change
	square mesh panel	WHG - Whiting	64% reduction
Depestele, J., H. Polet, et al. (2008). A compilation of length and species selectivity improving alterations to beam trawls, Instituut voor Landbouw en Visserij-onderzoek, Sectie Technisch Visserijonderzoek, Oostende, Belgium.	Benthos release panel	HAD - haddock	70% reduction in number
	Benthos release panel	WHG - Whiting	Reduction of 35% by number
	T-90 codend	HAD - haddock	59% reduction in number
	T-90 codend	HKE - hake	90% reduction in number
	T-90 sections	HAD - haddock	66% reduction in number
	T-90 sections	WHG - Whiting	47% reduction in marketable numbers
Drewery, J., D. Bova, et al. (2009). Scottish selectivity experiments using the Swedish grid and 120mm square mesh panels. Marine Scotland Science Internal Report 17/09. Aberdeen, Marine Scotland Science: 7.	selection grid (rigid/flexible)	COD - cod	No COD >34 cm
	selection grid (rigid/flexible)	HAD - haddock	No HAD >35 cm
	selection grid (rigid/flexible)	NEP - Nephrops	No HKE >41 cm
	selection grid (rigid/flexible)	NEP - Nephrops	No significant loss of smaller *Nephrops* (<40 mm carapace length). Loss of 10-25% larger *Nephrops* (41-58 mm)

Scientific Reference/ Link	Selectivity Category	species	result for species
	selection grid (rigid/flexible)	WHG - Whiting	No WHG >38 cm
Drewery, J., D. Bova, et al. (2010). The selectivity of the Swedish grid and 120 mm square mesh panels in the Scottish *Nephrops* trawl fishery. Fisheries Research 106(3): 454-459.	selection grid (rigid/flexible)	COD - cod	Significantly fewer cod than control at >24cm. 54% retention at 24cm decreasing to <1% above 44 cm
	selection grid (rigid/flexible)	HAD - haddock	Significantly fewer haddock than control at all lengths (19-38cm). Retaintion was estimated to be 24% at 19cm decreasing to <1% above 37cm
	selection grid (rigid/flexible)	HKE - hake	Significantly fewer hake than control for lengths 20-56cm. Retention was 44% at 20cm and 57% at 56cm.
	selection grid (rigid/flexible)	PLE - plaice	Significantly fewer plaice than control for lengths above 18cm, with retention estimated to be 61% at 18cm, decreasing to 3% at 35cm.
	selection grid (rigid/flexible)	WHG - Whiting	Significantly fewer whiting than control at lengths 21-43cm. Retention was 24% at 21cm decreasing to 2% at 43cm
	selection grid (rigid/flexible)	WIT - Witch	Significantly fewer witch than control for lengths >28cm with retention estimated to be 61% at 28cm reducing to 16% at 35cm.
	square mesh panel	COD - cod	Significantly fewer cod than control for lengths <32cm with retention of 40%.
	square mesh panel	COD - cod	Significantly fewer cod than control for lengths between 26 and 42cm with retention at around 70%.
	square mesh panel	HAD - haddock	Significantly fewer haddock than control at all lengths (19-38cm). Retention was 30%
	square mesh panel	HAD - haddock	Significantly fewer haddock than control at all lengths (19-38cm). Retetion was estimated to be 15%
	square mesh panel	HKE - hake	Significantly fewer hake than control for lengths 20-56cm. Retention was 19% at 7cm
	square mesh panel	HKE - hake	Significantly fewer hake than control for lengths 20-56cm. Retention was 72% at 37cm
	square mesh panel	PLE - plaice	Significantly fewer plaice than control between 19 and 21cm
	square mesh panel	PLE - plaice	Significantly more plaice than control

Scientific Reference/ Link	Selectivity Category	species	result for species
			between 22 and 26 cm
	square mesh panel	WHG - Whiting	Significantly fewer whiting than control at lengths 21-43cm. Retention was 10%.
	square mesh panel	WHG - Whiting	Significantly fewer whiting than control at lengths 21-43cm. Retention was 30% .
	square mesh panel	WIT - Witch	Catch for with did not differ significantly with control
	square mesh panel	WIT - Witch	Significantly more witch than control between 30 and 32cm.
Enever, R., A. S. Revill, et al. (2010). Discard mitigation increases skate survival in the Bristol Channel. Fisheries Research 102(1-2): 9-15.	diamond codend mesh size	HAD - haddock	No significant difference for haddock over 32cm
	diamond codend mesh size	PLE - plaice	No significant difference for plaice over 27cm
	diamond codend mesh size	SKA - Skates and rays	Equal proportions caught between control and experiment net
	square mesh codend	PLE - plaice	No significant difference for plaice over 25cm
	square mesh codend	SKA - Skates and rays	Equal proportions caught between control and experiment net but control (80mm codend) had a greater proportion of smaller skate
Madsen, N., R. Skeide, et al. (2008). Selectivity in a trawl codend during haul-back operation - An overlooked phenomenon. Fisheries Research 91(2-3): 168-174.	diamond codend mesh size	HAD - haddock	Escape at surface = 16% of total escape; Escape during haul = 17%
	diamond codend mesh size	NEP - Nephrops	Escape at surface = 38% of total escape; Escape during haul = 28%
	diamond codend mesh size	WHG - Whiting	Escape at surface = 12% of total escape; Escape during haul = 8%
Revill, A. S. and S. Jennings (2005). The capacity of benthos release panels to reduce the impacts of beam trawls on benthic communities. Fisheries Research (Amsterdam) 75(1-3): 73-85.	Benthos release panel	SOL - Sole	17% reduction in SOL >MLS
	Benthos release panel	SOL	20% loss of SOL >MLS
	Benthos release panel	SOL	9% loss of SOL >MLS
	Benthos release panel	SOL	No Significant loss of SOL >MLS

Scientific Reference/ Link	Selectivity Category	species	result for species
Revill, A., J. Cotter, et al. (2007). The selectivity of the gill-nets used to target hake (*Merluccius merluccius*) in the Cornish and Irish offshore fisheries. Fisheries Research 85(1-2): 142-147.	gillnet mesh size	HKE - hake	120mm mesh caught mostly large hake catching few below 60cm
Rihan, D. J. and J. McDonnell (2003). Protecting spawning cod in the Irish Sea through the use of an inclined separator panel in *Nephrops* Trawls, International Council for the Exploration of the Sea, Palaegade 2-4 DK 1261 Copenhagen K Denmark.	separator trawl	COD - cod	65% in Zone Ia and 85% in Zone IIa of cod retained in the upper codend
	separator trawl	COD - cod	70% of cod retained in upper codend
	separator trawl	HAD - haddock	98% of haddock retained in the upper codend
	separator trawl	NEP - Nephrops	No significant difference between separation into top or bottom codend. No significant difference of catches of *Nephrops* between control and experiment
	separator trawl	WHG - Whiting	68% of whiting retained in the upper codend

Annex 8 – Landings and discards estimations of the Eastern Channel (ICES Division VIId) demersal fisheries

The data and text presented here are available in the Discard Atlas of the North Sea Fisheries (Anon., 2014b).

In the Eastern Channel, more than 400 small (<12 m long) beam- and otter trawlers and netters predominate the fleets. Beam trawlers target mainly sole and otter trawlers other demersal species. Large otter trawlers operating further offshore target cod, whiting, plaice, mackerel, gurnards and cuttlefish.

Whiting, plaice and sole dominate the catches (Table Annex 8- 1). Between 10-15% of dab, plaice and lemon sole catches are being discarded. In 2010, the highest discard:catch ratio was observed for dab with 64%. For many of the demersal species discard:catch ratios varied by in some cases an order of magnitude between years. Overall, only small amounts of round fish (cod, haddock, saithe, hake) were caught, indicating that these were not the main target species.

Conclusion

The quality of the discard information in the Eastern Channel is generally low. The two species with the highest discard ratios in the demersal fishery (whiting and plaice) are to a large extent reliant on fill-ins for unsampled metiers. Because the quality of the discard information was low, the only tables presented in this report refer to the overall landings and discards. More detailed tables by country or gear do not provide reliable additional information.

Table Annex 8 – 1 Eastern Channel || demersal fisheries: landings and discards per species and year and area, table sorted in descending order on average catch 2010-2012.

SPECIES		2010 LAND	2010 DISC	2010 Catch	2010 %DR	2010 %DQ	2011 LAND	2011 DISC	2011 Catch	2011 %DR	2011 %DQ	2012 LAND	2012 DISC	2012 Catch	2012 %DR	2012 %DQ	Avg LAND	AVG DISC	AVG CATCH	AVG %DR	AVG %DQ
WHG	Whiting	5492	599	6091	10%	19%	6294	61	6355	1%	29%	3341	946	4287	22%	5%	5043	535	5578	10%	11%
PLE	Plaice	2804	809	3613	22%	47%	3082	607	3690	16%	70%	2791	67	2858	2%	20%	2892	494	3387	15%	55%
SOL	Sole	2657	156	2813	6%	78%	3180	94	3274	3%	71%	3029	2	3031	0%	5%	2955	84	3039	3%	75%
DAB	Dab	980	1707	2687	64%	9%	1228	364	1592	23%	41%	998	285	1283	22%	53%	1069	785	1854	42%	19%
COD	Cod	1001	14	1015	1%	56%	981	402	1382	29%	1%	805	22	827	3%	11%	929	146	1075	14%	4%
LEM	Lemon sole	176	14	190	8%	96%	420	51	472	11%	89%	397	88	485	18%	96%	331	51	382	13%	94%
TUR	Turbot	219	55	274	20%	39%	275	1	277	1%	73%	290	1	292	0%	71%	262	19	281	7%	41%
POL	Pollack	148	0	148	0%	99%	185	0	185	0%	0%	107	0	107	0%	0%	147	0	147	0%	99%
ANF	Anglerfish	152	18	170	10%	98%	143	7	150	4%	97%	87	18	105	17%	96%	127	14	141	10%	97%
BLL	Brill	134	0	134	0%	100%	121	2	122	1%	100%	103	1	104	1%	100%	119	1	120	1%	100%
HKE	Hake	28	0	28	0%	0%	60	0	60	0%	0%	13	0	13	0%	0%	34	0	34	0%	#DIV/0!
HAD	Haddock	14	0	14	0%	0%	36	0	36	0%	0%	17	0	17	0%	0%	23	0	23	0%	#DIV/0!
POK	Saithe	17	0	17	0%	#N/A	14	0	14	0%	#N/A	4	0	4	0%	#N/A	11	0	11	0%	#N/A
LIN	Ling	8	0	8	0%	#N/A	10	0	10	0%	#N/A	12	0	12	0%	#N/A	10	0	10	0%	#N/A
LEZ	Megrims	14	0	14	0%	#N/A	3	0	3	0%	#N/A	1	0	1	0%	#N/A	6	0	6	0%	#N/A
NEP	Norway lobster	4	0	4	0%	#N/A	8	0	8	0%	#N/A	1	0	1	0%	#N/A	4	0	4	0%	#N/A
Grand Total		**13849**	**3372**	**17221**	**20%**	**25%**	**16042**	**1589**	**17631**	**9%**	**45%**	**11997**	**1431**	**13428**	**11%**	**22%**	**13963**	**2131**	**16093**	**13%**	**29%**

Note: **%DR** refers to the discard : catch ratio (discard/catch). **%DQ** refers to the quality of the discard estimate (the proportion of the discard estimate derived from actual data). The colour coding refers to larger than 66% (green), between 33% and 66% (orange) and below 33% (red).