

## 5.2 Celtic Seas ecoregion – Fisheries overview, including mixed-fisheries considerations

### Executive summary

The commercial fisheries in the Celtic Sea target a large number of stocks. The pelagic fisheries, which account for the largest catches (by weight) in the region are the mid-water trawl fisheries for blue whiting, mackerel, horse mackerel, herring, boarfish, and sprat. The largest demersal fishery targets hake along the shelf edge using gillnets and longlines. There are also large mixed bottom-trawl fisheries targeting benthic species, *Nephrops*, and gadoids. The species composition of these mixed fisheries tend to vary, depending on the area and the countries involved in the fishery.

The relationship of biomass status or the fishing mortality to reference points is not known for more than 50% of the 106 stocks that are assessed in the ecoregion. Though only 29% of the stocks are fished below  $F_{MSY}$ , these stocks account for nearly 12% of the total landings. There has been a trend of declining fishing mortality since the mid-1990s for the benthic and demersal stocks with known status, and the average  $F/F_{MSY}$  ratio is now approaching 1 for the first time. The trend for stock size in assessed benthic and demersal stocks has been increasing over the same period. The trend in average  $F/F_{MSY}$  ratio for pelagic assessed stocks has been increasing in the last few years although the average stock size indicator remains above  $MSY_{Btrigger}$ .

The technical interactions in demersal mixed fisheries are described for three areas within the ecoregion. *Nephrops* account for the highest landings in the Irish Sea; they are mainly taken in trawl fisheries where they account for more than 90% of the total landings. In the Celtic Sea and west of Ireland hake account for the majority of the landings; they are mainly taken in longline and gillnet fisheries which are also dominated by hake. In the west of Scotland *Nephrops* again account for the highest landings; they are mainly taken using otter trawls, but also in pots.

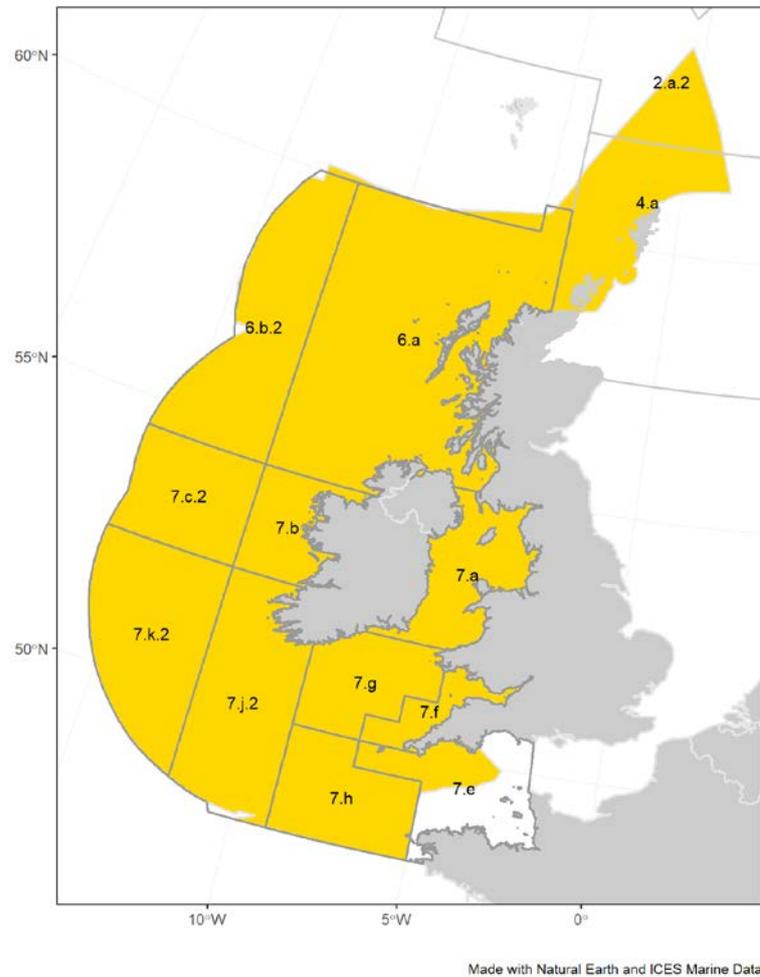
ICES carries out mixed-fisheries forecasts for cod, haddock, and whiting caught in mixed demersal fisheries in the Celtic Sea. These forecasts take account of the technical interactions not included in the single-stock forecasts. For 2019, no catch of haddock or whiting is consistent with the cod single-stock advice of zero catch. This is because all demersal fleets operating within the Celtic Sea catch cod to some extent.

### Introduction

The Celtic Seas ecoregion covers the northwestern shelf seas of the EU (Figure 1). It includes areas of the deeper eastern Atlantic Ocean and coastal seas that are heavily influenced by oceanic inputs. The ecoregion ranges from north of Shetland to Brittany in the south. Three key areas constitute this ecoregion:

- Northern parts; the Malin shelf, west of Scotland, eastern Rockall Bank, and north of Scotland (parts of Subdivision 2.a.2, divisions 4.a and 6.a, and Subdivision 6.b.2);
- the Celtic Sea and west of Ireland (Division 7.b and Subdivision 7.c.2; parts of divisions 7.e, 7.f, 7.g, 7.h, and subdivisions 7.j.2 and 7.k.2);
- the Irish Sea (Division 7.a).

In the north there are strong linkages with the North Sea, in the southeast a strong linkage with the channel area, and in the south a strong link with the Bay of Biscay. The eastern part of the Rockall Bank is within the geographic scope of the ecoregion although it is separated from the western European shelf by the Rockall Trough.



**Figure 1** The Celtic Sea ecoregion (highlighted in yellow).

The overview covers ICES subareas 27.7 (excluding Division 27.7.d) and 27.6, (hereafter, the “27” area prefixes are omitted). Some fisheries statistics do not allow the full differentiation of sections of subareas 4 and 2, and (in earlier years) western sections of subareas 6 and 7 as well as the southeastern section of Division 7.e. The overview provides:

- a short description of each of the national fishing fleets in the ecoregion, including their fishing gears and patterns. At present fisheries for diadromous species such as salmon and eel are not included, neither are recreational fisheries;
- a summary of the status of the fisheries resources and the level of exploitation relative to agreed objectives and reference points;
- an examination of mixed-fisheries considerations of relevance to the management of the fisheries; and
- an evaluation of the impacts of fishing gear on the ecosystem in terms of physical contact on subsurface and bottom habitats, and on the bycatch of protected species.

In the descriptions below, the term “landings” is used because the analyses are based on landings reported in logbooks. Elsewhere in ICES advice, the terms “wanted” and “unwanted” catch are used to take account of the EU landing obligation legislation that has been applied to some species since 2016.

Scientific names of all species are included in Table A3 in the Annex.

### Who is fishing

Fourteen nations currently have fisheries targeting the many marine stocks within this diverse and extensive ecoregion. The greatest amount of landings are by Norway, UK, Ireland, the Netherlands, and France. Lesser amounts are landed by

Germany, Spain, Belgium, Lithuania, Poland, and Estonia (Figure 2, but note that this figure includes some landings from waters to the west of the ecoregion).

Landings from several of these nations, including Norway, the Netherlands, Germany, Denmark, Lithuania, and Poland, are dominated by pelagic species. Other nations within the EU target a combination of pelagic, demersal (including *Nephrops*), deep-water, and shellfish species. Of these, the UK has the greatest landings, with an almost equal split between pelagic and non-pelagic landings. France has the highest reported effort (Figure 3). Effort levels for most countries show declining trends, with the most pronounced decline seen in Spanish effort.

### **Belgium**

The Belgian fleet consists of about 33 active vessels of which about 21 fish in the Irish Sea. The majority (89%) of the vessels are > 24 m, while the remainder of the vessels are between 18 and 24 m. The Belgian fleet uses beam trawls and otter trawls for rays, plaice, sole, and anglerfish. Since 2016, there has been no targeted fisheries for sole in Division 7.a.

### **Denmark**

Eight Danish vessels fish in this ecoregion, targeting blue whiting with pelagic trawls.

### **Faroe Islands**

Up to ten vessels from the Faroe Islands operate in this ecoregion, targeting blue whiting with pelagic trawls.

### **France**

The French offshore fishery in the Celtic Sea (divisions 7.g and 7.h) is mostly composed of bottom trawlers (18–35 m, around 350 vessels) targeting gadoids, *Nephrops* or anglerfish, megrim, and rays, with less than ten vessels using Danish seine. In the west of Scotland (Division 6.a) around ten bottom trawlers target both saithe and deep-sea fish (at depths less than 800 m) and fewer smaller vessels target hake using longlines or nets. Finally, two large pelagic trawlers target herring and mackerel, and one is also involved in the blue whiting fishery.

### **Germany**

About ten German vessels fish in the ecoregion. This includes vessels that mainly target anglerfish and hake with gillnets and longline, and about three large freezer-trawlers that target mackerel.

### **Ireland**

The Irish fishing fleet is very diverse with around 1500 < 10 m and 500 ≥ 10 m active vessels. Small vessels (< 10 m) operate inshore, typically targeting shellfish with pots or demersal fish with nets. On the shoreline, there is widespread hand gathering of periwinkles. The vessels ≥ 10 m target a wide variety of species using several types of gear. Vessels in the 12–25 m length range target *Nephrops* using trawls on several grounds around Ireland and on the Porcupine Bank. Both inshore and offshore mixed demersal fisheries use trawls and seine nets to target gadoids and benthic species. Vessels using gillnets target hake offshore and pollack, monkfish, and cod in inshore areas. Ten beam trawlers target benthic species such as megrim, anglerfish, flatfish, and rays. There are dredge fisheries for razor clams and scallops in inshore and offshore areas. About 100 vessels are engaged in aquaculture related activities, including dredging for seed mussels, and mussel and oyster dredging. Seventeen large (≥ 30 m) pelagic fishing vessels operate across the whole of the area. Vessels using pelagic trawls target mackerel, horse mackerel, blue whiting, boarfish, and sprat. Pelagic trawling for albacore tuna occurs in the ecoregion when the species' quota has not been exhausted in the Bay of Biscay.

### **Lithuania**

Two large Lithuanian freezer trawlers target pelagic species in this ecoregion.

## Netherlands

Around 10–15 large Dutch pelagic freezer-trawlers operate in this ecoregion, mainly targeting horse mackerel and mackerel.

## Norway

About 60 Norwegian vessels operate in this ecoregion. Pelagic trawlers mainly target blue whiting, but also other pelagic species. There is also a demersal longline fishery that mainly targets ling and blue ling.

## Spain

The Spanish fleet comprises 67 vessels >24 m that operate mainly in Subarea 7 (the Porcupine and Great Sole banks) and, to a lesser degree, in Subarea 6 (west of Scotland). All of these vessels target demersal species: set longlines targeting hake (44 vessels), bottom otter trawl targeting megrim, anglerfish, and hake (21 vessels), and set gillnet targeting hake (2 vessels).

## United Kingdom

### Scotland

Most fishing activity by Scottish vessels (754 boats in 2015) occurs in Subarea 6. Around 62 demersal trawlers (mostly >10 m) fish for mixed gadoids and benthic species such as anglerfish and megrim. A small number of boats target haddock at Rockall. In inshore areas, a fleet of 164 trawlers fish mainly for *Nephrops* – 34 of these boats are under 10 m. Pot or creel fishing is carried out by almost 400 vessels. Over 300 of these boats are under 10 m and target either *Nephrops* or lobsters and various crab species. Around 60 larger vessels (> 10 m) fish for crustaceans (mainly brown crab) in more offshore areas to the far north and west of Scotland. Scallop fishing is carried out by around 50 dredgers (mostly > 10 m) and by hand gathering (diving). Limited amounts of inshore longlining and gillnetting are also carried out. About 20 large pelagic trawlers fish in the northern parts of the Celtic Seas ecoregion.

In the Irish Sea, the main Scottish activity is dredging for scallops around the Isle of Man, performed by around 50 boats (mainly > 10 m). Pot fishing occurs along the Solway Firth coast (22 vessels), and about 12 trawlers take part in the Irish Sea *Nephrops* fishery. Trawling for *Nephrops* also occurs at the Porcupine Bank and in the Celtic Sea (divisions 7.c and 7.k). Mixed-fish trawling, longlining, and gillnetting occurs in the Celtic Sea and western English Channel (Division 7.e). Some boats also dredge for scallops in the western English Channel.

### Northern Ireland

The Northern Irish fleet consists of around 130  $\geq$  10 m and 180 < 10 m vessels. The fleet predominantly operates within divisions 7.a and 6.a. A small number of vessels target *Nephrops* or pelagic species in other parts of the ecoregion. Within the Irish Sea, demersal trawling for *Nephrops* dominates the fishing effort.

Vessels operating inshore typically target shellfish with pots, or by dredging (for king scallops) in divisions 6.a and 7.a. Both trawl nets and dredge gear are used to catch queen scallops in the Irish Sea and north of Rathlin Island in Division 6.a.

A small number of vessels trawl for haddock, hake, and (historically) cod. At present (2018), there is no permitted commercial targeted fishery for cod. A pelagic and gillnet herring fishery operates in late summer–early autumn in the pre- and post-spawning period. The gillnet fishery occurs on the western Irish Sea coastline whilst two large pelagic trawlers target herring aggregations in the northern English Channel and around the Isle of Man.

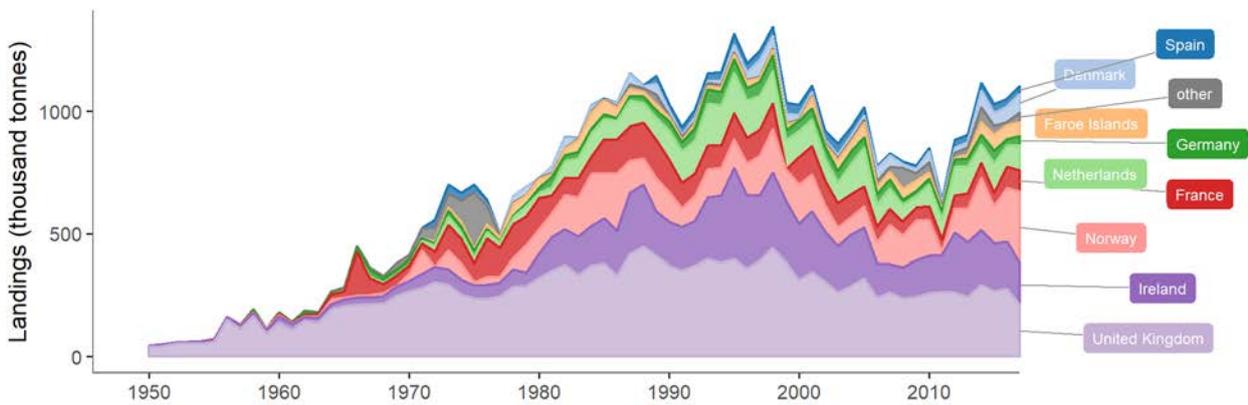
### England and Wales

The largest sector in terms of vessel numbers are the potting fleets targeting non-quota stocks such as crabs, lobsters (mainly in divisions 7.e, 7.f, and 7.g), and whelks in Division 7.a. The majority of these vessels are under 10 m in length (~600 vessels from a total potting sector of ~700) although more than 50% are polyvalent (vessels using multiple gears).

Vessels employing otter trawls (~300 vessels, around half of which are < 10 m) are mostly found in Division 7.e, with additional activity in divisions 7.a and 7.f; they take a mixture of demersal stocks although some target whitefish and elasmobranchs. The *Nephrops* fleet in Division 7.a comprises around 15 vessels in the 10–15 m sector, with < 10 vessels under 10 m. This sector employs otter trawls that use selective gear to reduce whitefish bycatch. Beam-trawling activity (~60 vessels) is dominated by vessels longer than 15 m (~45 vessels), taking a mixture of flatfish and anglerfish with evidence of an increasing targeted fishery for cuttlefish in Division 7.e. Dredge fisheries, predominantly for king scallops, operate in divisions 7.e and 7.a. Dredging activity occurs across all vessel sizes although there is proportionally less activity by < 15 m vessels in Division 7.a.

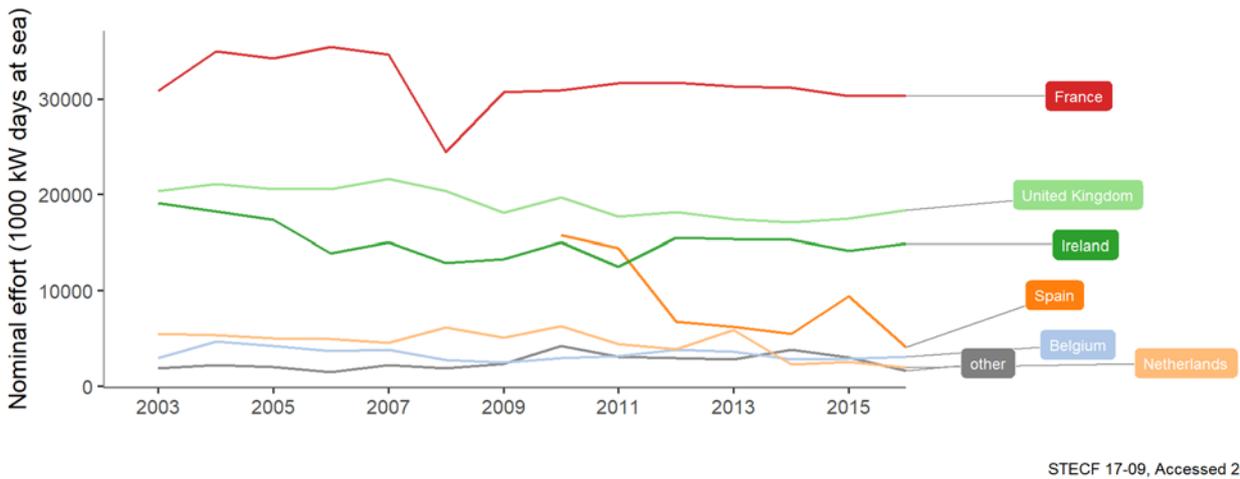
Isle of Man

The main fisheries undertaken in the Isle of Man’s territorial sea (12 nautical miles) are for king scallop, queen scallop, crab, lobster, and whelk.



Historical Nominal Catches 1950-2010,  
 Official Nominal Catches 2006-2016,  
 Preliminary Catches 2017. Accessed 2018/October. ICES, Copenhagen.

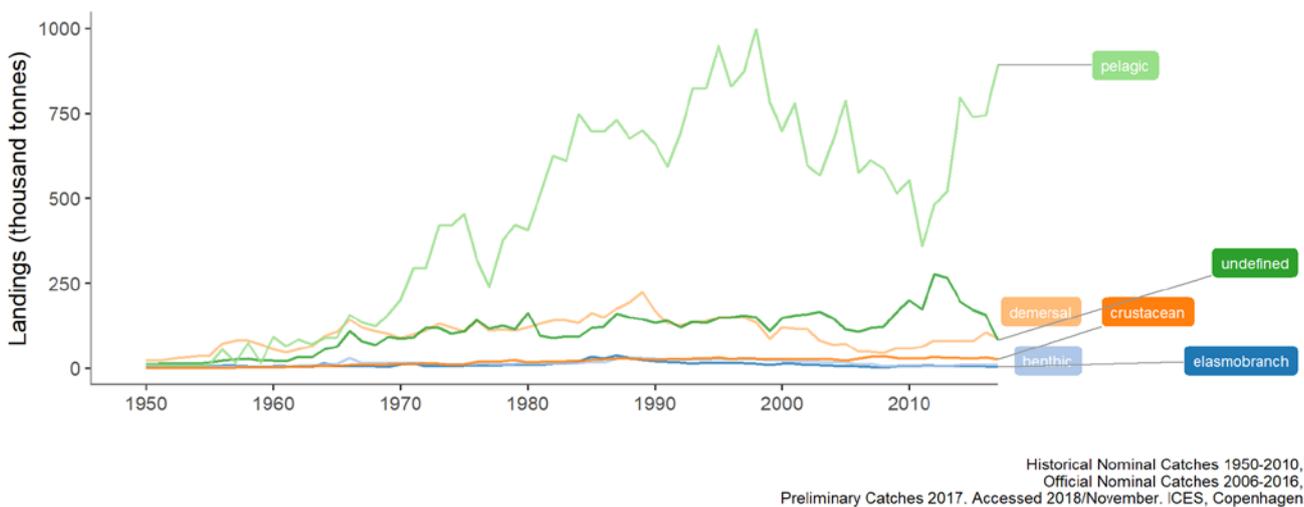
**Figure 2** Landings (thousand tonnes) from ICES subareas 6 and 7 (excluding Division 7.d). This approximates to the majority of the Celtic Seas ecoregion in 1950–2017, by (current) country. The nine countries having the highest landings are shown individually and the remaining countries are aggregated and displayed as “other”.



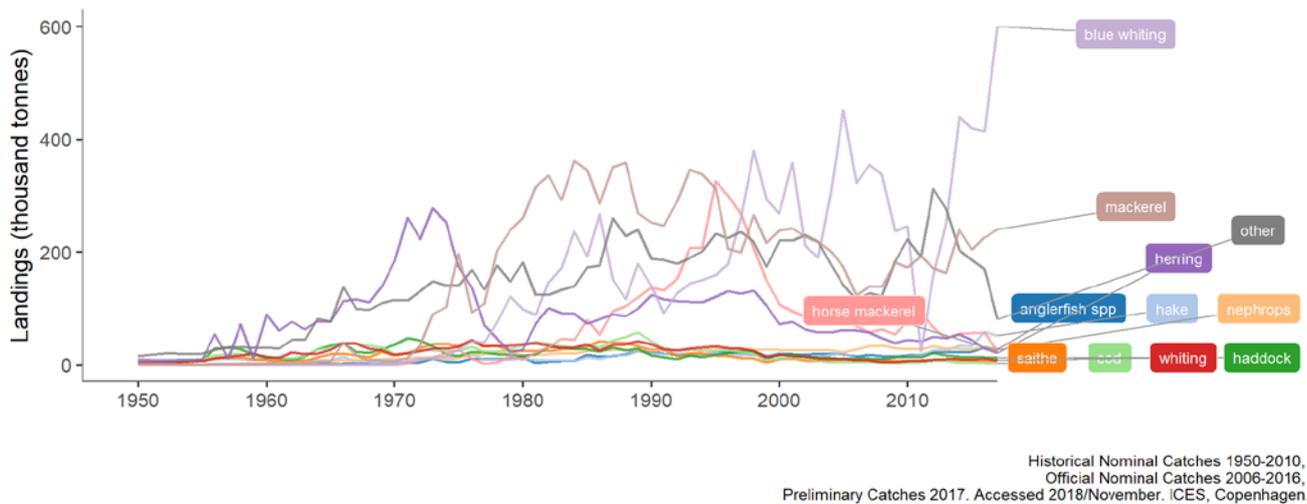
**Figure 3** ICES subareas 6 and 7 (excluding Division 7.d). Fishing effort (1000 kW days at sea) in 2003–2016 for EU Member States. STECF 17-09, Accessed 2018/May.

### Catches over time

Landings of pelagic species within the ecoregion showed an increasing trend from the 1960s until the mid-1990s, with a declining trend thereafter (Figure 4). Blue whiting and mackerel constitute the highest proportions of the catches, with herring and horse mackerel declining in relative importance in the last decade (Figure 5). The demersal fisheries show a generally increasing trend, with some declines in the early 1990s and mid-2000s (Figure 4). Hake, whiting, and haddock account for the highest landings of demersal species (Figure 5). Anglerfish and megrim are also very important, whereas the relative importance of cod, saithe, and ling has declined. Crustacean fisheries have remained relatively stable in the last few decades; *Nephrops* accounts for the highest landings (Figure 5). Other important crustacean species include scallop, crab, and lobster.

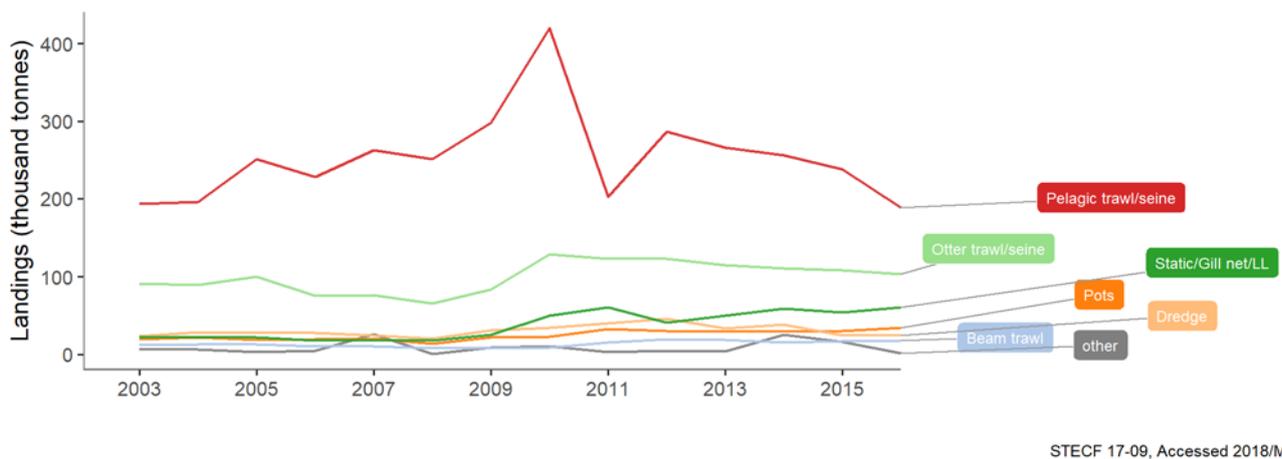


**Figure 4** Landings (thousand tonnes) from ICES subareas 6 and 7 (excluding Division 7.d) in 1950–2017, by fish category. Table A1 in the Annex details the species that belong to each fish category. Historical Nominal Catches 1950-2010, Official Nominal Catches 2006-2016, Preliminary Catches 2017. Accessed 2018/November. ICES, Copenhagen.



**Figure 5** Landings (thousand tonnes) from ICES subareas 6 and 7 (excluding Division 7.d) in 1950–2017, by species. The eleven species having the highest cumulative landings over the entire time-series are displayed separately; the remaining species are aggregated and labelled as “other”.

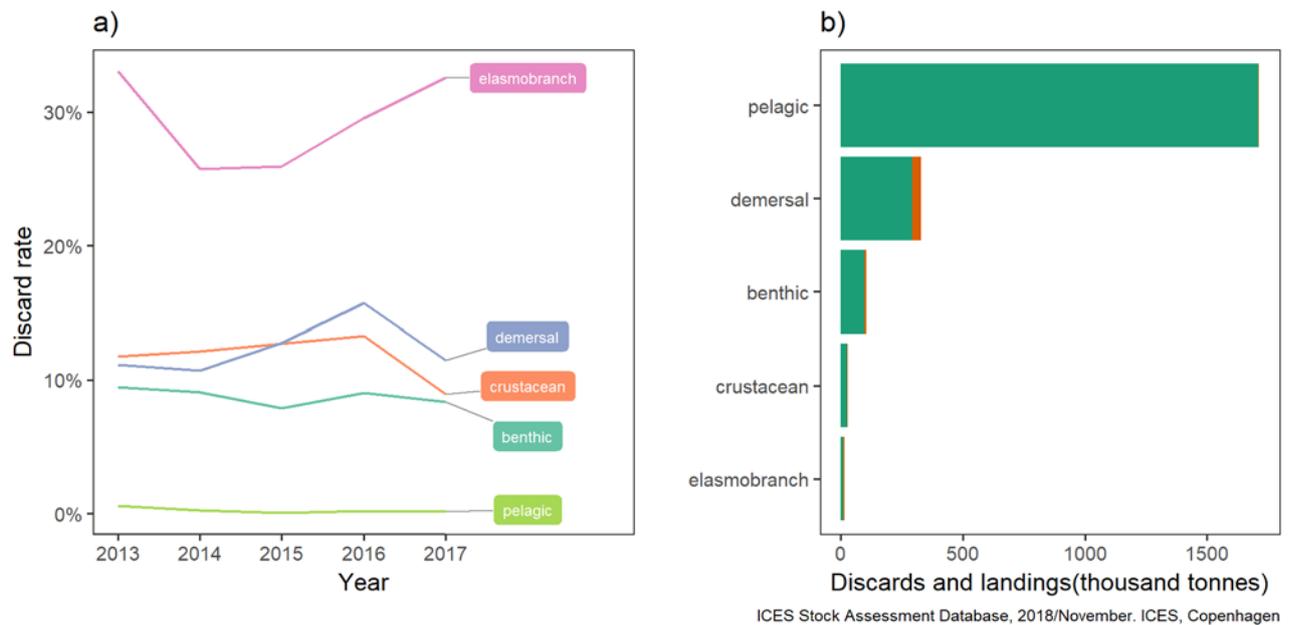
There are large fluctuations in pelagic landings (Figure 6). Landings by demersal otter trawls, beam trawlers, and pots have been more stable while static (mostly gillnet) landings have been increasing.



**Figure 6** Commercial landings (thousand tonnes) from ICES subareas 6 and 7 (excluding Division 7.d) in 2003–2016, by gear type (LL = longline) for EU Member States.

**Discards**

Total discard tonnage (and therefore rate) of pelagic species is estimated to be very low. Discards of demersal, crustacean, and benthic species are estimated to be around 10%. The discard rate for elasmobranchs is higher (around 30%), but overall the volume of elasmobranchs caught is very low. Discard rates for some species are very high in the ecoregion, for example plaice (around 60% of tonnage) and whiting (50–99% of tonnage). The EU’s landing obligation for demersal stocks came partially into force in 2016.

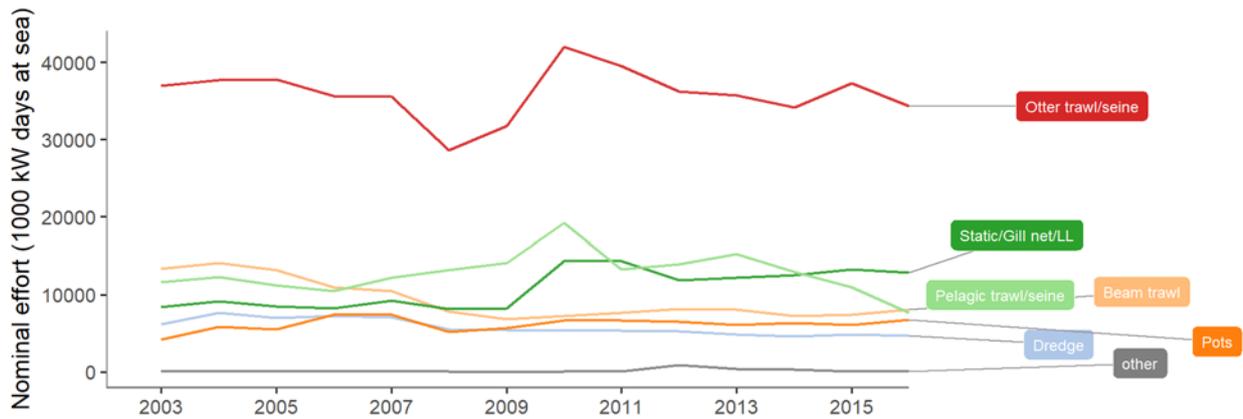


**Figure 7** ICES subareas 6 and 7 (excluding Division 7.d). Left panel (a): Discard rates in 2013–2017 by fish category, shown as percentages (%) of the total annual catch in that category. Right panel (b): Landings (green) and discards (orange) in 2017 by fish category (in thousand tonnes).

**Description of the fisheries**

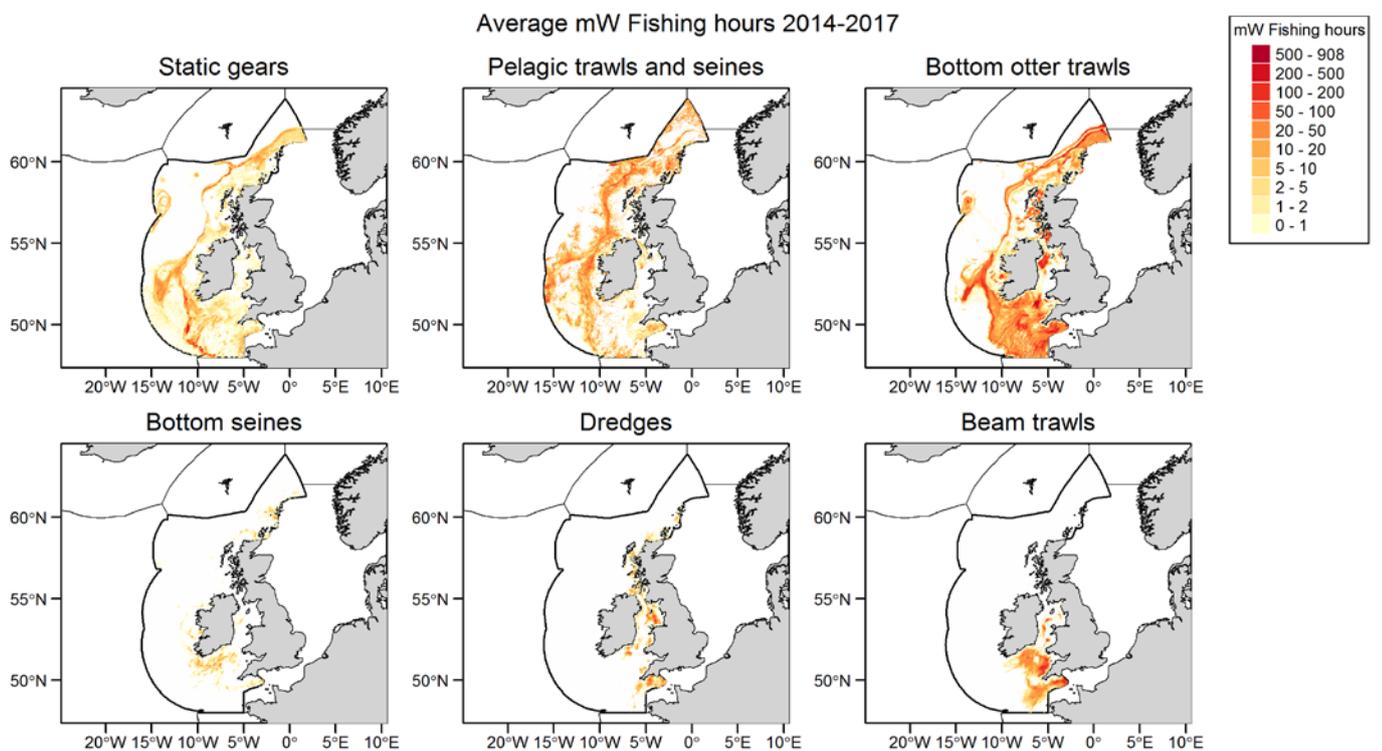
Fisheries that take place within the Celtic Seas ecoregion catch a wide range of different species, including those considered to be demersal, benthic, pelagic, widely distributed, and deep water.

Otter trawlers and demersal seiners account for the majority of the fishing effort (Figure 8). Otter trawl fishing is highest on the *Nephrops* grounds in the Celtic Sea, and close to the continental shelf edge (Figure 9). Demersal seiners are mainly active in the Celtic Sea. Static gears (longlines and gillnets) account for the next highest levels of effort; these fisheries are also concentrated close to the continental shelf edge, particularly in the southern and northern parts of the ecoregion. Pelagic trawl fisheries occur throughout the ecoregion, but there is generally more effort close to the shelf edge (Figure 9). Beam-trawl effort is concentrated in the Celtic Sea and western English Channel, with some effort in the Irish Sea also. There is little beam trawling in the northern part of the ecoregion. Dredge fisheries are concentrated on scallop grounds around the Isle of Man, western English Channel, southeast of Ireland, and along the Scottish coast (Figure 9).



STECF 17-09, Accessed 2018/May.

**Figure 8** ICES subareas 6 and 7 (excluding Division 7.d). Fishing effort (thousand kW days at sea) in 2003–2016 by EU vessels, by gear type.



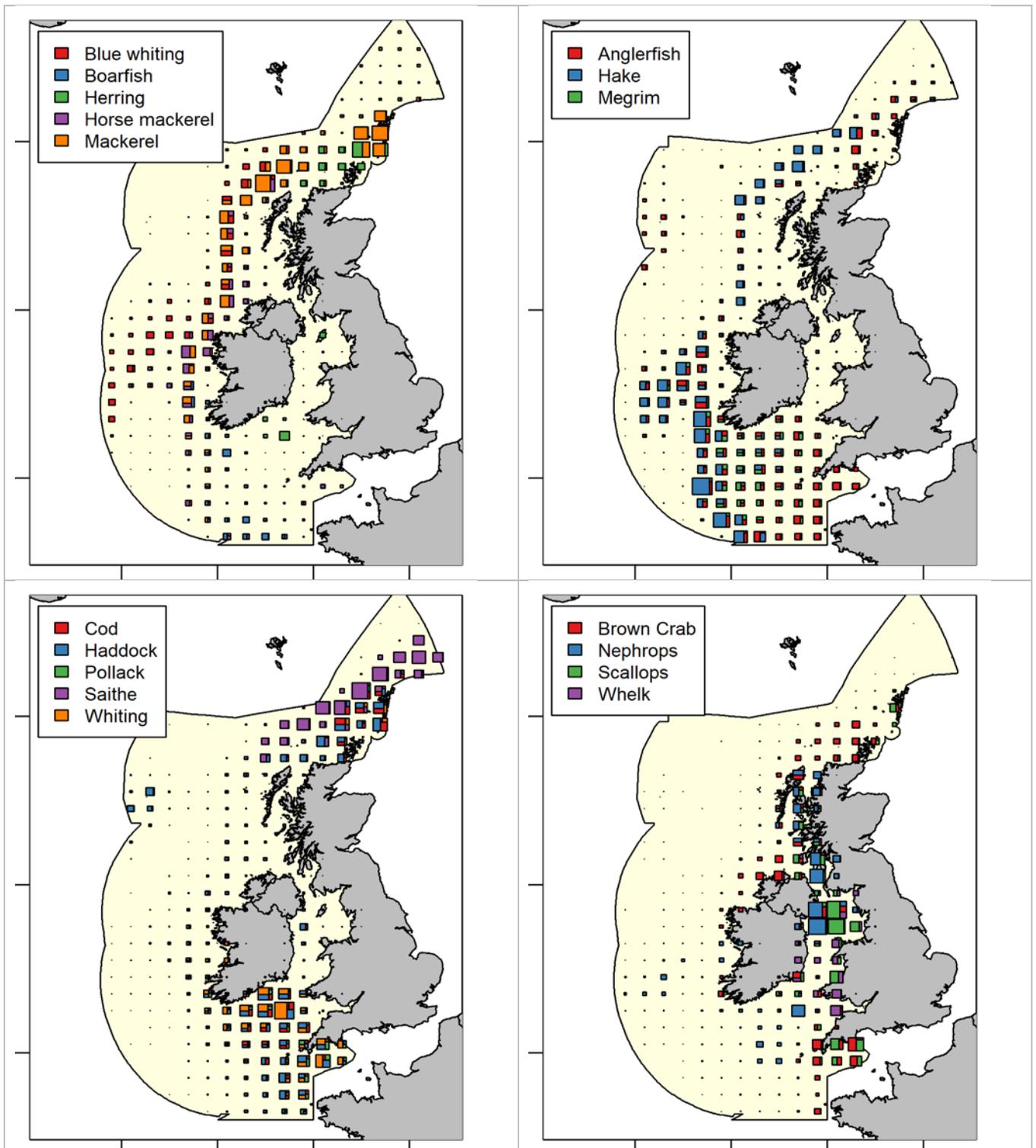
**Figure 9** Spatial distribution of average annual fishing effort (mW fishing hours) in the Celtic Seas ecoregion during 2014–2017, by gear type. Fishing effort data are only shown for vessels > 12 m having vessel monitoring systems (VMS), this will bias the distributions, particularly in coastal areas.

The catches of pelagic species varies both spatially and temporally. Mackerel and blue whiting are caught mainly on their southward migrations along the shelf edge to spawning grounds in spring. The highest mackerel catches in recent years have been in the northern part of the ecoregion, whilst the highest catches of blue whiting are around the Porcupine Bank (Figure 10). Horse mackerel are caught throughout the ecoregion and catches are highest west of Ireland in the spring. Herring catches are concentrated in three areas: north of Scotland, in the Celtic Sea, and around the Isle of Man. The highest boarfish catches are in the western Celtic Sea. The albacore tuna fishery occurs in the southwestern part of the ecoregion.

Hake are caught in deeper waters (> 70 m) throughout the ecoregion. Catches are concentrated along the continental shelf edge in the southern and northern parts of the ecoregion where the directed gillnet and longline fisheries occur (Figure 10). Anglerfish are also common throughout the ecoregion, with the highest catches on the shelf in the Celtic Sea and western English Channel. The highest megrim catches are in the western Celtic Sea.

Whiting catches are highest in the Celtic Sea south of Ireland where there are also significant catches of haddock and cod (Figure 10). Saithe are mainly caught in the northern part of the ecoregion. Pollack are mainly caught in inshore areas of Cornwall and along the southern coast of Ireland.

The main *Nephrops* catches are in the western Irish Sea, in the Minches, the Celtic Sea, and on the Porcupine Bank (Figure 10). There are also significant catches of scallops in the Irish Sea (around the Isle of Man) and off southern Cornwall. Brown crab catches mainly occur in coastal areas of Cornwall, northwest of Ireland, and north of Scotland.



**Figure 10** The spatial distribution of the landings for the main pelagic, benthic, gadoid, and shellfish species in the Celtic Seas ecoregion. Landings (tonnes) are represented proportionately within each panel, but not between panels. Based on data for > 10 m EU vessels, 2011–2016. Source: STECF FDI (<https://stecf.jrc.ec.europa.eu/dd/effort/graphs-quarter>).

## Otter trawl

Otter trawl is the main gear by effort used in demersal fisheries in the Celtic Sea ecoregion (Figure 8). The species caught depends on the area, depth-range habitat, and season fished as well as on the cod-end mesh size, but in all cases the catches consist of a mixture of different species.

### *Nephrops*-directed otter trawlers

*Nephrops* is an important target species on discrete muddy grounds within the ecoregion. Vessels typically, although not exclusively, use twin- or quad-rig trawls with 80 mm cod-ends. A small unwanted bycatch of fish species includes cod, haddock, plaice, anglerfish, and to a lesser extent sole. The use of selective gears (grids, square mesh, and separator panels) to reduce unwanted fish bycatch has increased over time, but significant discarding issues still exist on some grounds. Mixed fisheries target both *Nephrops* and finfish in the Celtic Sea using a larger mesh size (100 mm or more).

### Finfish-directed otter trawlers and seiners

Fish are targeted with both small (80–99 mm) and larger (> 99 mm) mesh sizes in different parts of the ecoregion, depending on regulation and target assemblage. Smaller mesh otter trawls and seiners are typically used to target a broad mixture of species, including gadoids, flatfish, and other benthic species. These fisheries primarily occur within the Celtic Sea, along the slope west of Ireland and Scotland, and in the western English Channel. Large-mesh otter trawlers (typically 100 mm or 120 mm) tend to target gadoids, anglerfish, or rays.

### Deep-water trawl fisheries

Until 2016, deep-water trawl fisheries were conducted in ICES subareas 6 and 7, principally by France, with some Spanish, Irish, and Scottish participation. Trawling deeper than 800 m has been banned since December 2016. This mixed deep-water trawl fishery mainly targeted roundnose grenadier, black scabbardfish, and blue ling, with a bycatch mainly of smoothheads and deep-water sharks on the continental slope and offshore banks of subareas 6 and 7.

### Beam-trawl fisheries

Beam trawlers operate on sandy grounds in the Irish and Celtic seas and in the western English Channel. The majority of the vessels use meshes in the range of 80–89 mm, and come from Belgium, the UK, and Ireland. In the Irish Sea, the vessels primarily target plaice and sole (although the sole fishery has declined significantly in the last decade). There is also a fishery for ray species in the southern Irish Sea. In the Celtic Sea, the beam-trawl fishery occurs on grounds where sole, anglerfish, cuttlefish, and megrim are abundant and the seabed is suitable for beam trawling. The fishery has bycatches of anglerfish, cod, haddock, and whiting. In the western English Channel (Division 7.e) beam trawling, using 80–90 mm mesh, mainly targets sole and cuttlefish.

### Gillnet fisheries

The main gillnet fishery, (mainly with 120 mm mesh size) in this ecoregion targets hake along the continental slope. Spanish, French, UK, and Irish vessels are involved in the fishery, which typically operates at depths of 150–600 m. In the shallower Celtic Sea, where mesh sizes used are 120–219 mm, target species include anglerfish, flatfish, and gadoids.

A large number of inshore gillnetters (< 12 m) are also active in the Celtic Sea ecoregion. The target species and gears used tend to vary spatially and temporally. In the first quarter, the primary target of inshore gillnetters operating in divisions 7.g and southern 7.a is cod. Fisheries around the Irish coast seasonally target anglerfish, flatfish, pollack, and dogfish.

Prior to 2006, UK, French, German, and Spanish gillnetters operated in deep waters of subareas 6 and 7 targeting hake, monkfish, and deep-water sharks. This fishery stopped or seriously reduced from 2006, following EU regulation of deep-water gillnetting at depths below 600 m.

## Longline and line fisheries

Spanish-, French-, and UK-registered longliners target hake along the continental slope with bycatches of ling, blue ling, and other deep-water species. An English hand-line fleet operates inshore around the coast of Cornwall in divisions 7.e–f targeting mackerel, in an area where other fishing methods for this species are not permitted.

## Pelagic trawls

The spatial distributions of the main pelagic species are shown in Figure 10.

### Blue whiting

The main fisheries target spawning and post-spawning fish west of Ireland and of Scotland. The fishery extends into Faroese and international waters west of the Porcupine Bank. Most of the catch (~90%) is taken in the first half of the year. The multi-national fleet targeting blue whiting mostly consists of large pelagic trawlers. Blue whiting is mainly used for fishmeal.

### Mackerel

The Northeast Atlantic mackerel stock ranges over a wide area, part of which includes the Celtic Sea ecoregion. Within the ecoregion the fleet consists of two pelagic trawl components: freezer-trawlers, which are commonly large vessels (up to 150 m) that usually operate a single mid-water pelagic trawl, although smaller vessels may also work as pair trawlers. Non-freezer trawlers vary in size, from 20 to 100 m, and operate both individually and as pairs. The larger of the pelagic trawlers use refrigerated seawater (RSW) tanks for storage.

### Horse mackerel

Germany, the Netherlands, and Ireland have trawl fisheries for horse mackerel. The Dutch and German fleets operate mainly west of the English Channel. Irish vessels fish mainly to the west of Ireland. Prior to the 1990s, most of the catches were used for meal and oil; this has changed so most of the catches are now used for human consumption.

### Herring

The herring fishery occurs in four main parts of the ecoregion.

- The fishery in Division 6.a North is conducted by single and pair RSW trawlers and by single-trawl freezer trawlers. Prior to 2006, there was a fairly even distribution of effort, both temporally and spatially. The UK and Ireland are the main exploiters, but vessels registered to the Netherlands, Germany, and France also participate in the fishery.
- In divisions 6.a South and 7.b–c, the fishery is conducted entirely by RSW pelagic trawlers and dry-hold vessels, both inshore and offshore on the northwestern Irish coast. In recent years, only Ireland has exploited herring in this area. The fishery is concentrated in quarters one and four.
- The herring Division 7.a North fishery has not changed in recent years. UK pelagic trawlers take the majority of catches in quarters three and four.
- The main herring fishery in divisions 7.a South and 7.g–k takes place on coastal spawning grounds, and on offshore feeding grounds south of Ireland. Ireland, the Netherlands, and Germany exploit this fishery using two types of vessels, larger boats with RSW storage and smaller dry-hold vessels.

### Boarfish

The fishery operates from September to March. Catches are generally free from bycatch from September to February. From March onwards a bycatch of mackerel can be found in the catches and the fishery generally ceases at this time. Information on the bycatch of other species in the boarfish fishery is sparse, bycatch numbers are thought to be minimal. The fishery uses pelagic trawl nets with mesh sizes 32–54 mm.

## Other fisheries

Sprat fisheries often develop in the south Minch and in Irish inshore waters during autumn and winter. In addition, a number of fisheries exist throughout the ecoregion for stocks where ICES does not provide routine assessments or

advice. For example, dredging for shellfish includes scallops, razor clams, cockles, clams, and oysters. There are also important pot and trap fisheries for crabs, lobsters, and whelks.

### Fisheries management

The Celtic Seas ecoregion includes all or parts of the Exclusive Economic Zones (EEZs) of three current EU Member States (Ireland, UK, and France) and of the Isle of Man. Within EU waters, management is conducted in accordance with the EU Common Fisheries Policy (CFP), and catching opportunities for stocks under EU competency are agreed during meetings of the Council of Ministers. Under the CFP's regionalization policy, proposals on certain issues (for example discard plans) are made by the North western waters Regional Fisheries Group. National authorities manage activities in coastal waters (i.e. within 12 nautical miles). The fisheries for some stocks are managed based on agreements by the North East Atlantic Fisheries Commission (NEAFC) and by coastal states. Salmon fisheries are managed nationally based on agreements at the North Atlantic Salmon Conservation Organization (NASCO), and fisheries for large pelagic fish are managed based on agreements at the International Commission for the Conservation of Atlantic Tunas (ICCAT). International fisheries advice is provided by the International Council for the Exploration of the Sea (ICES), the European Commission's Scientific Technical and Economic Committee for Fisheries (STECF), the Standing Scientific Committee of ICCAT, and the North Western Waters and Pelagic Advisory Councils.

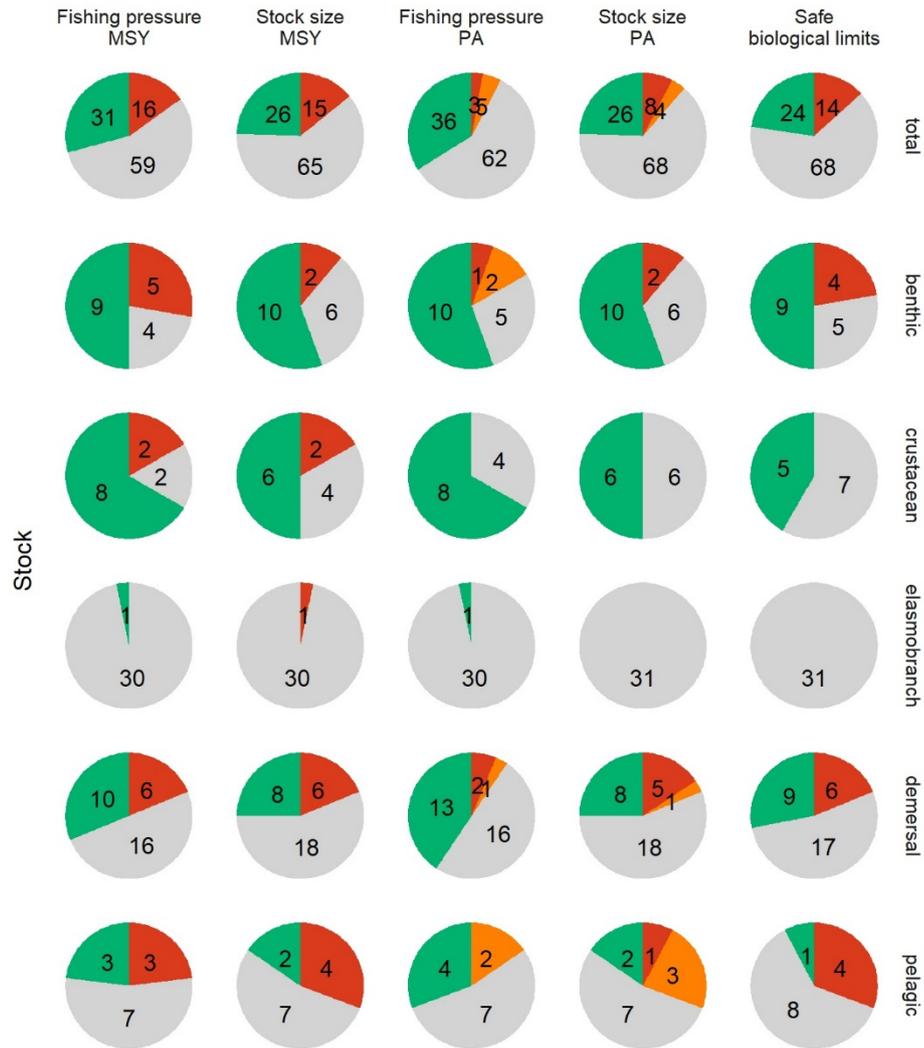
Total allowable catch (TAC) is the main fishery management tool in the ecoregion. These were introduced for most stocks in 1982, but the TACs (and quotas) were generally not restrictive until the early 1990s. The 2013 reform of the Common Fisheries Policy aimed to eliminate discarding through the introduction of the EU landing obligation (LO). The LO was introduced for pelagic species in 2015 and has been phased in for demersal TAC species since 2016. From 2019, the LO will apply to all TAC species, although there are some exemptions.

A large number of technical measures are in place. These include measures to improve the selectivity of towed gears (partly in order to reduce bycatch), and gear restrictions.

Spatial management also occurs, both for fisheries and for ecosystem reasons. Closed areas/seasons are used to protect e.g. spawning grounds for fish. Protected areas have also been designated for habitats and species listed by EU Nature Directives. Fishery regulations are in place to restrict certain fisheries that may affect relevant habitats and species, e.g. for cold-water corals.

### Status of the fishery resources

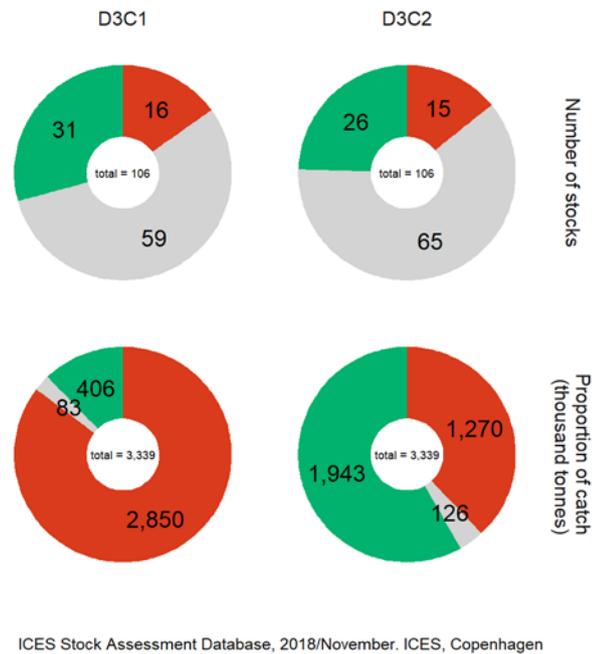
Fishing mortalities and spawning stock sizes have been evaluated against maximum sustainable yield (MSY) and precautionary approach (PA) reference points, and the status of these stocks has also been assessed relative to safe biological limits, i.e.  $F < F_{pa}$  and  $SSB > B_{pa}$  (Figure 11). Around 30% of the assessed stocks are fished at or below  $F_{MSY}$  target levels. The majority of benthic and crustacean stocks are fished below  $F_{MSY}$ , the status of nearly all elasmobranch stocks is unknown, and the status for the majority of the demersal and pelagic stocks is also unknown.



ICES Stock Assessment Database, 2018/November. ICES, Copenhagen

**Figure 11**

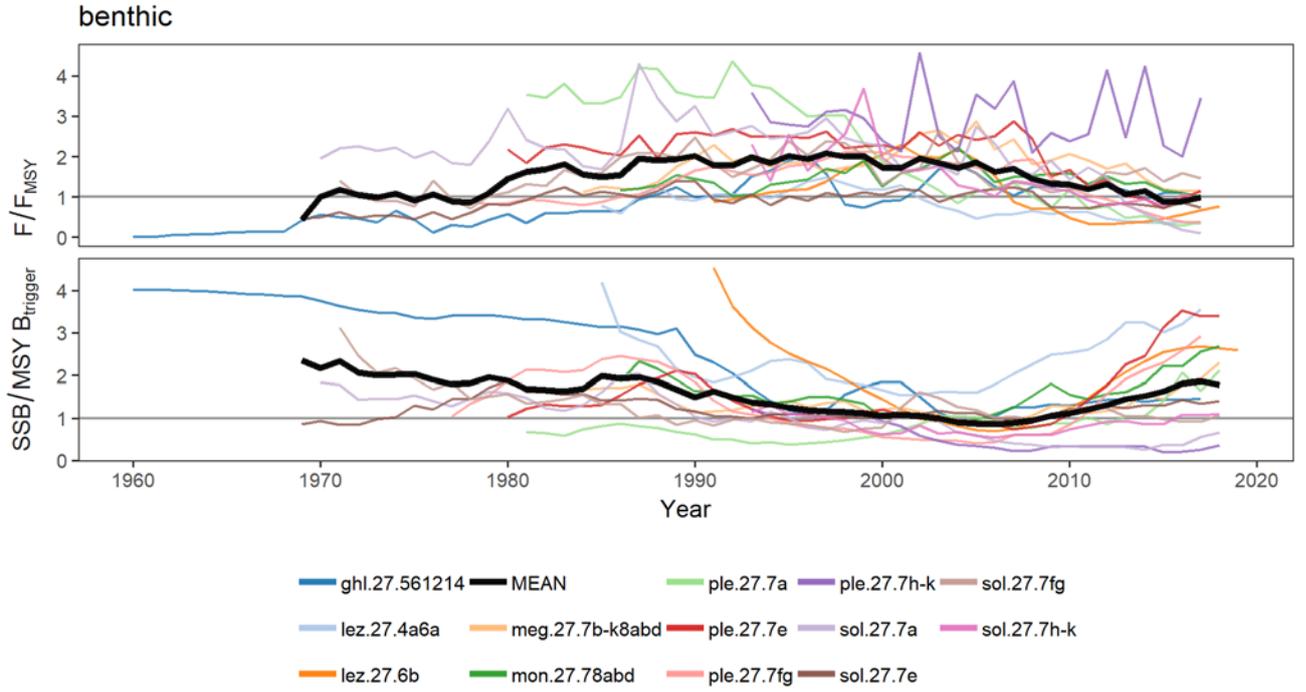
Status summary of Celtic Sea stocks in 2018 relative to the ICES maximum sustainable yield (MSY) approach and precautionary approach (PA) (excluding European eel, salmon, and sea trout). Grey represents unknown reference points. For the MSY approach: green represents a stock that is either fished below  $F_{MSY}$  or the stock size is greater than  $MSY B_{trigger}$ ; red represents a stock status that is either fished above  $F_{MSY}$  or the stock size is lower than  $MSY B_{trigger}$ . For the PA: green represents a stock that is fished at or below  $F_{pa}$  while the stock size is equal to or greater than  $B_{pa}$ ; orange represents a stock that is either fished between  $F_{pa}$  and  $F_{lim}$  or the stock size is between  $B_{lim}$  and  $B_{pa}$ ; red represents a stock that is fished above  $F_{lim}$  or the stock size is less than  $B_{lim}$ . Stocks having a fishing mortality below or at  $F_{pa}$  and a stock size above  $B_{pa}$  are defined as being inside safe biological limits. If this condition is not fulfilled the stock is defined as being outside safe biological limits. For stock-specific information, see Table A1 in the Annex.



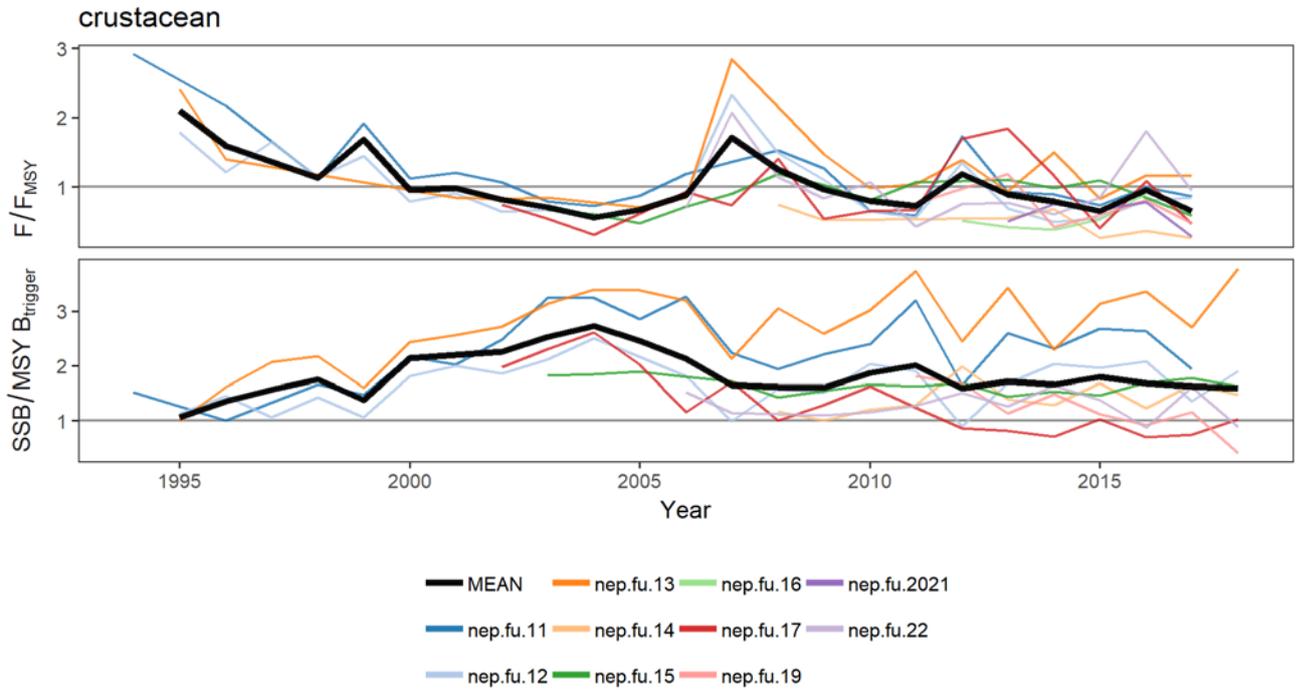
**Figure 12** Status summary of Celtic Sea stocks in 2018 relative to the EU Marine Strategy Framework Directive (MSFD) assessment criteria of the level of pressure of fishing activity (D3C1) and reproductive capacity of the stock (D3C2). Green represents the proportion of stocks that are either fished below  $F_{MSY}$  or the stock size is greater than  $MSY B_{trigger}$ , for criteria D3C1 and D3C2. Red represents the proportion of stocks that are either fished above  $F_{MSY}$  or the stock size is lower than  $MSY B_{trigger}$ , for criteria D3C1 and D3C2. Grey represents the proportion of stocks without MSY reference points. For stock-specific information, see Table A1 in the Annex.

The Celtic Seas ecoregion has 106 stocks for which ICES provided advice in 2018. These encompass the following categories: 18 benthic, 12 crustacean, 32 demersal, 31 elasmobranch, and 13 pelagic stocks. Of these the pelagic, *Nephrops*, and demersal stocks are the best known, having the highest number of quantitative assessments with forecasts (ICES data category 1 stocks). Approximately 29% are sustainably fished (i.e. D3C1 where  $F < F_{MSY}$ ); these account for around 12% of the total landings (Figure 12). Other groups, such as the elasmobranchs, have a more limited knowledge base. This limited data means there can be no forecasts and these stocks are placed in ICES categories 3, 5, and 6. While these “data-limited stocks” account for the majority of stocks (56%), they only account for less than 2% of the total landings (Figure 12). Around 25% of the stocks were assessed to be above  $MSY B_{trigger}$  (D3C2); these accounted for around 58% of the total biomass caught.

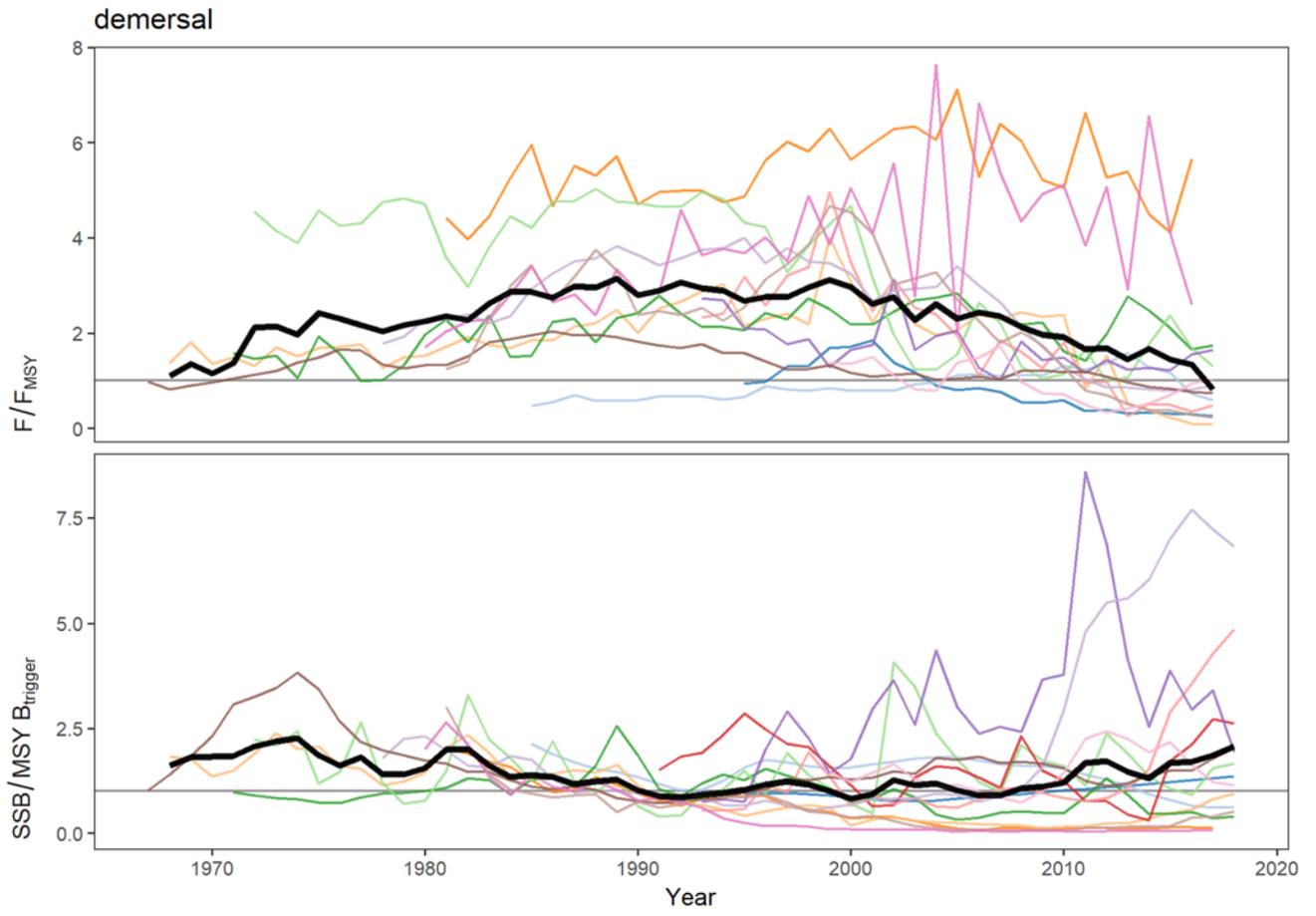
Clear trends show a declining fishing mortality ratio for category 1 benthic and demersal stocks since the mid-1990s (Figure 13). The mean fishing mortality is now at or below the  $F_{MSY}$  target. The SSB ratio shows an increasing trend over the same period and the mean values are now above  $MSY B_{trigger}$ . Note that though the mean fishing mortality and biomass ratios are in a desirable condition, this does not infer that all stocks are in that condition. The trends for the crustacean stocks are less clear, but the mean fishing mortality ratio is less than  $F_{MSY}$ . For pelagic stocks, the mean fishing mortality ratio declined between 2000 and 2012 but has been increasing in recent years to above the  $F_{MSY}$  target. The mean biomass ratio for pelagic species remains above  $MSY B_{trigger}$  but has also been declining in recent years.



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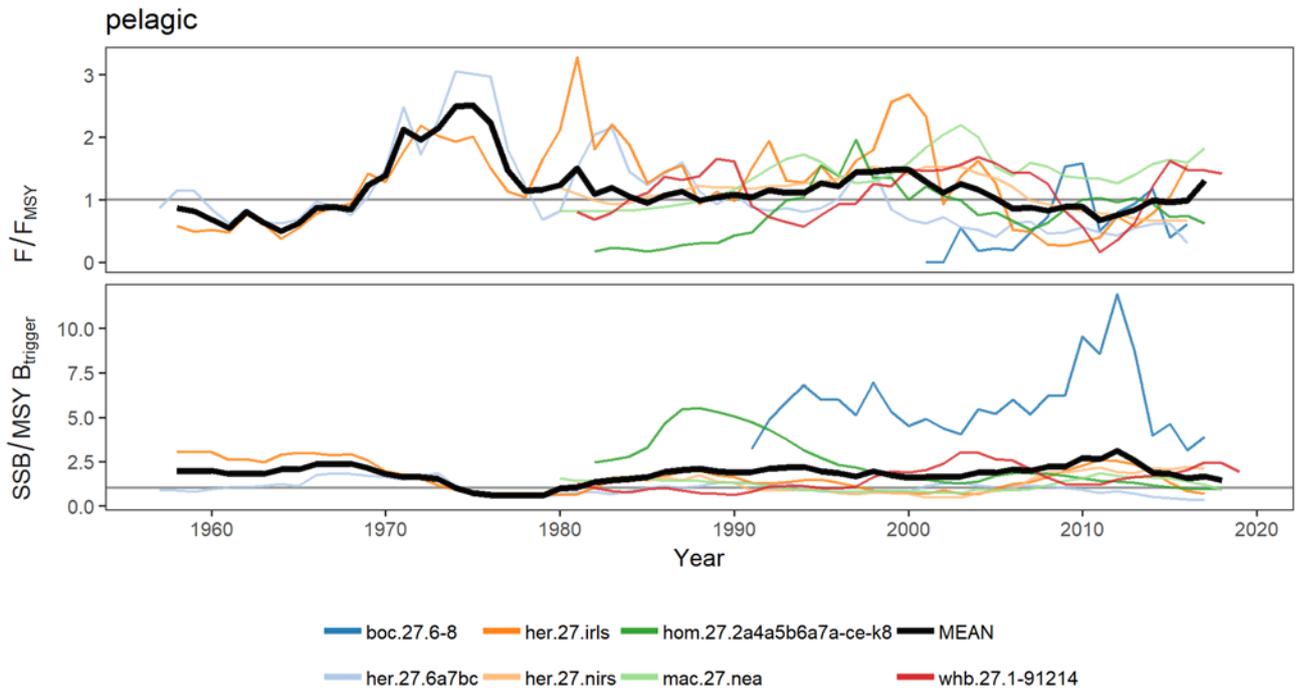


ICES Stock Assessment Database, November/2018. ICES, Copenhagen



- bli.27.5b67
  - cod.27.7a
  - had.27.6b
  - hke.27.3a46-8abd
  - whg.27.6a
  - whg.27.7a
  - MEAN
- bss.27.4bc7ad-h
  - cod.27.7e-k
  - had.27.7a
  - had.27.7b-k
  - pok.27.3a46
  - whg.27.7b-ce-k
- cod.27.6a
  - had.27.46a20

ICES Stock Assessment Database, September/2018. ICES, Copenhagen

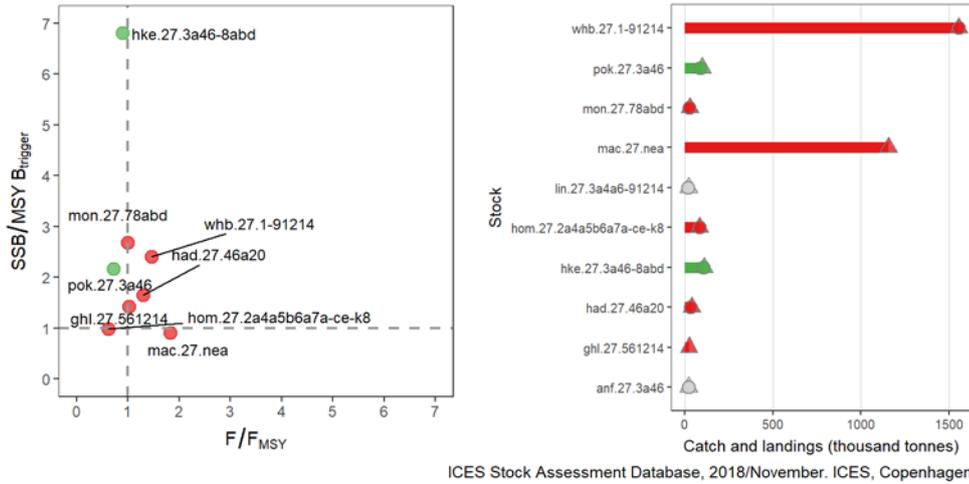


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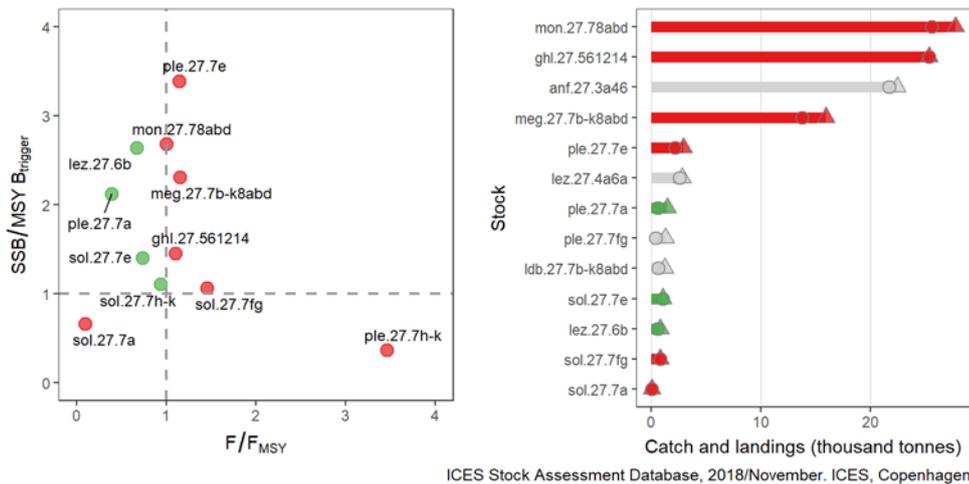
**Figure 13** Temporal trends in  $F/F_{MSY}$  and  $SSB/MSY B_{trigger}$  for Celtic Sea benthic, crustacean, demersal, and pelagic stocks. Only stocks with defined MSY reference points are considered. For full stock names, see Table A1 in the Annex.

The stock status relative to  $F_{MSY}$  and  $MSY B_{trigger}$  is shown for all stocks and partitioned by stock groups in Figure 14. This shows that the hake stock has the best status among all stocks (almost 7 times  $MSY B_{trigger}$  and fished below  $F_{MSY}$ ). Cod in Division 6.a has the worst stock status, being fished almost 6 times higher than  $F_{MSY}$  and with SSB well below  $MSY B_{trigger}$ . Blue whiting and mackerel account for the highest landings. Fishing mortality for both stocks is higher than  $F_{MSY}$ , and for mackerel the SSB is below  $MSY B_{trigger}$ . Four demersal, one benthic, and two pelagic stocks in the bottom right quadrant of the stock status plot indicate that they need to be rebuilt and that fishing mortality remains too high. Several stocks are in the bottom left quadrant, indicating that while fishing mortality is lower than  $F_{MSY}$ , stock size remains below  $MSY B_{trigger}$ . In general, the crustacean and benthic stocks have a better stock status than the demersal or pelagic stocks.

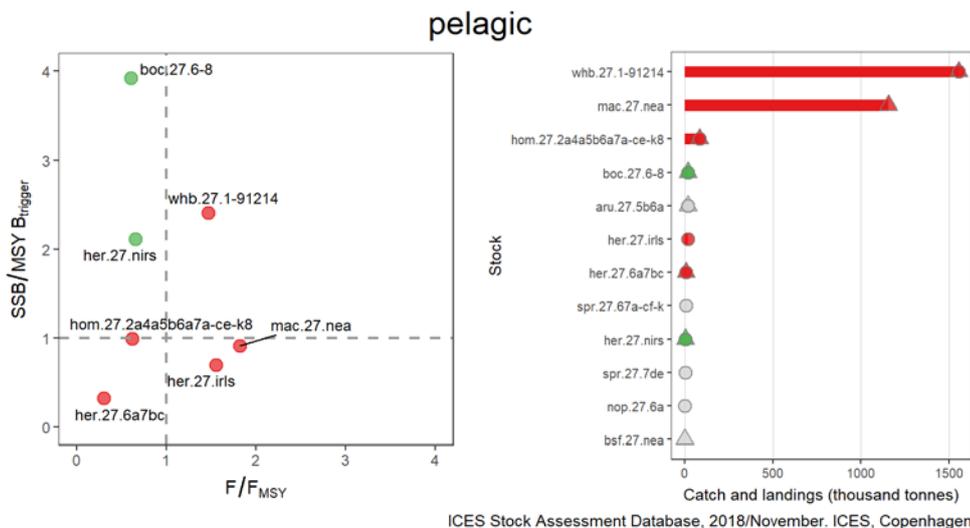
### All stocks Top 10



### benthic







**Figure 14** Status of Celtic Sea stocks relative to the joint distribution of exploitation ( $F/F_{MSY}$ ) and stock size ( $SSB/MSY B_{trigger}$ ) [left panels, by individual stocks] and catches (triangles) / landings (circles) from these stocks in 2018 [right panels]. The left panels only include stocks for which MSY reference points have been defined (MSY where available). Stocks in green are exploited at or below  $F_{MSY}$  while the stock size is also at or above  $MSY B_{trigger}$ . Stocks in red are either exploited above  $F_{MSY}$  or the stock size is below  $MSY B_{trigger}$ , or both. Stocks in grey have unknown/undefined status in relation to reference points. For full stock names, see Table A1 in the Annex.

### Mixed fisheries

Fishing operations typically catch more than one species at a time, although some fishing operations are more species selective than others. For example, pelagic trawling tends to catch only one species whereas demersal trawling normally catches several species simultaneously. These operations are reported to ICES at a level that is aggregated by EU Member State to the following key descriptors of fishing activity (hereafter called *métier*): gear, target assemblage, mesh size range, vessel length, ICES division, and quarter (quarters have been aggregated to year in the analyses below). The catch composition resulting from any fishing activity is described as a technical interaction.

In the absence of fine-scale spatial and temporal information on catches, analysis has been carried out at the EU Member State level. This allows the incorporation of effects of spatial and temporal variation in fishing patterns and market considerations on technical interactions, but not to distinguish between these factors. In the descriptions below, the term “landings” is used because the analyses are based on landings reported in logbooks. Elsewhere in ICES advice, the terms “wanted” and “unwanted” catch are used to take account of the EU landing obligation legislation that has been applied to some species since 2016.

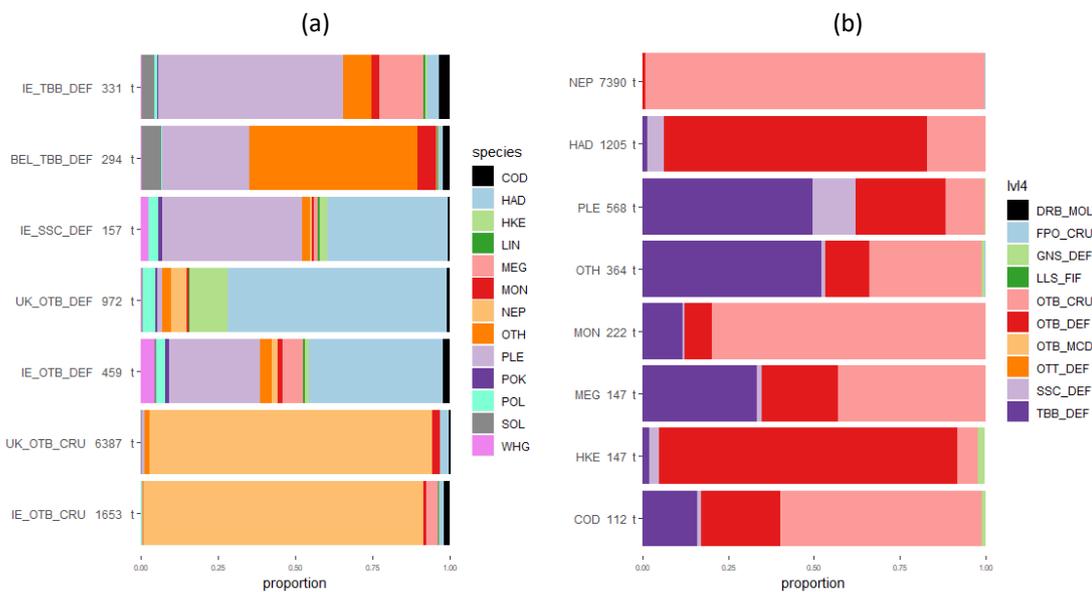
In this advice, only the technical interactions occurring within demersal fisheries in the Celtic Seas ecoregion are considered. For this analysis, an average of the 2015, 2016, and 2017 data on *métier* was used. The Celtic Seas ecoregion was subdivided into three distinct areas: Irish Sea (Division 7.a), Celtic Sea and west of Ireland (divisions 7.b–k, excluding Division 7.d), and west of Scotland (divisions 6.a and 6.b). The technical interactions within each of these areas are described in relation to the main demersal TAC species (cod, megrim, anglerfish, whiting, hake, haddock, *Nephrops*, plaice, sole, pollack, and saithe).

### Irish Sea

The seven demersal TAC species that dominate the landings in the Irish Sea (*Nephrops*, haddock, plaice, anglerfish, hake, megrim, and cod; Figure 15b) are predominantly landed by three countries (Ireland, United Kingdom, and Belgium) using

four main métiers (OTB\_CRU, OTB\_DEF, TBB\_DEF, SCC\_DEF – see Table A4 in the Annex for a definition of métiers) (Figure 15a).

*Nephrops* is the main demersal species landed within the Irish Sea mixed fisheries (mean 7390 tonnes year<sup>-1</sup>). They are primarily targeted using otter trawls (OTB\_CRU). Other species in the *Nephrops* fishery constitute a low proportion of the overall landings (< 10%; Figure 15a). However, there is evidence of significant discarding in these fisheries, including whiting. Haddock account for the second highest landings (1205 tonnes year<sup>-1</sup>) and are mainly caught in otter trawls targeting demersal fish (UK\_OTB\_DEF and IE\_OTB\_DEF; Figure 15b). Around 75% of haddock are caught by these two métiers (Figure 15a). Plaice accounts for the third highest landings (568 tonnes year<sup>-1</sup>) in the Irish Sea, mainly targeted by beam trawls, and have technical interactions with megrim, sole, and some other species (mainly rays; Figure 15b). There is some variation in the landings profiles of each métier at the EU Member State level, reflecting different fishing patterns, practice, and quota shares.

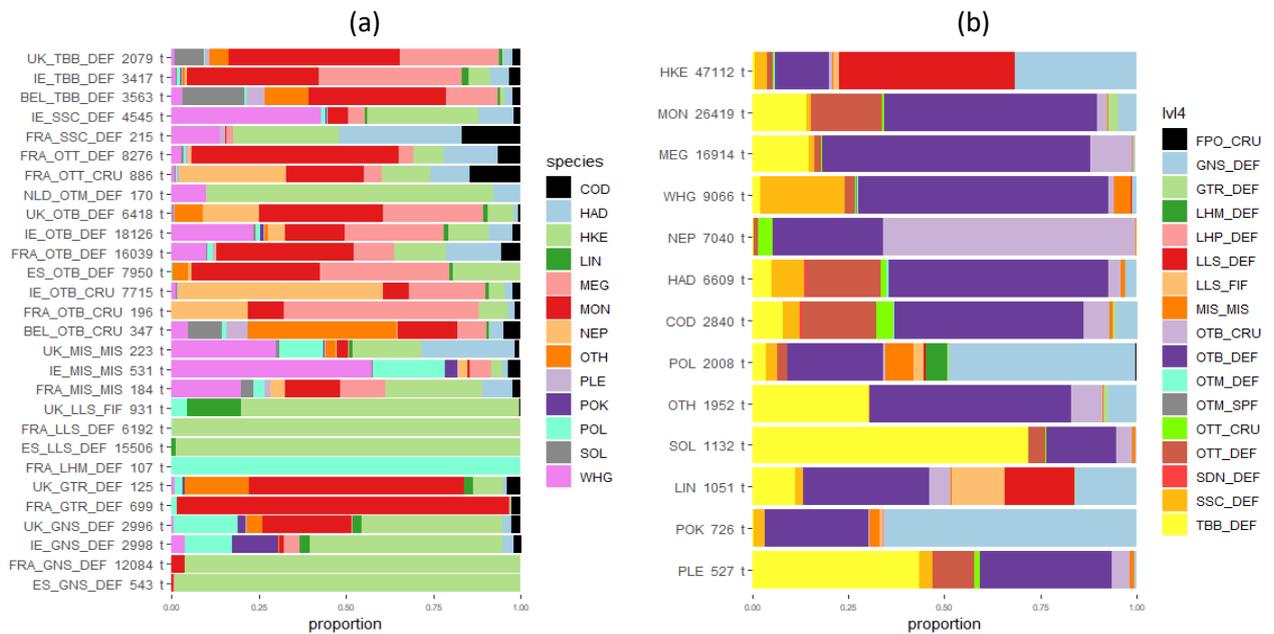


**Figure 15** Description of technical interactions of demersal TAC species in the Irish Sea. The left panel (a) shows the species composition of the main demersal métiers (landings > 100 tonnes) operating in the Irish Sea. The label incorporates the EU Member State, métier, and mean annual (2015–2017) landings (tonnes). The right panel (b) shows the proportion of the landings of each species accounted for by the different demersal métiers. The label includes the mean annual landings (2015–2017).

### Celtic Sea and west of Ireland

The Celtic Sea and west of Ireland has highly diverse mixed fisheries. Twelve demersal TAC species dominate the landings in the Celtic Sea (hake, anglerfish, megrim, whiting, *Nephrops*, haddock, cod, pollack, sole, ling, saithe, and plaice; Figure 16b). These are landed by six EU Member States (Ireland, France, United Kingdom, Spain, the Netherlands, and Belgium), using twelve main métiers (OTB\_DEF, LLS\_DEF, GNS\_DEF, TBB\_DEF, OTB\_CRU, OTT\_DEF, SCC\_DEF, LLS\_FIF, OTT\_CRU, GTR\_DEF, OTM\_DEF, and LMH\_DEF; Figure 16a). In this area, unlike the Irish Sea, landings profiles by métier vary greatly by EU Member State. For example, demersal otter trawl fisheries carried out by France, Ireland, and United Kingdom yield very different species compositions and therefore result in different technical interactions (Figure 16a).

Hake is the main species landed by demersal mixed fisheries (mean 47 112 tonnes year<sup>-1</sup>) from the Celtic Sea and west of Ireland. Hake are targeted primarily by longliners (LLS\_DEF) and gillnetters (GNS\_DEF; Figure 16a). The landings of other species in the hake directed fishery constitutes a low proportion of the overall catch (< 10%; Figure 16a). Hake are caught in the majority of métiers to varying extents. The slope species, anglerfish (26 419 tonnes year<sup>-1</sup>) and megrims (16 914 tonnes year<sup>-1</sup>), constitute the next highest landings. Both anglerfish and megrims are primarily targeted by otter trawls (OTB\_DEF; Figure 16b) and represent the dominant species of that métier (> 50%; Figure 16a). Most whiting are caught by otter trawls targeting fish; these trawls also catch haddock and varying amounts of other benthic and gadoid species. 80% of *Nephrops* are caught in crustacean trawl fisheries with minor catches of other species.

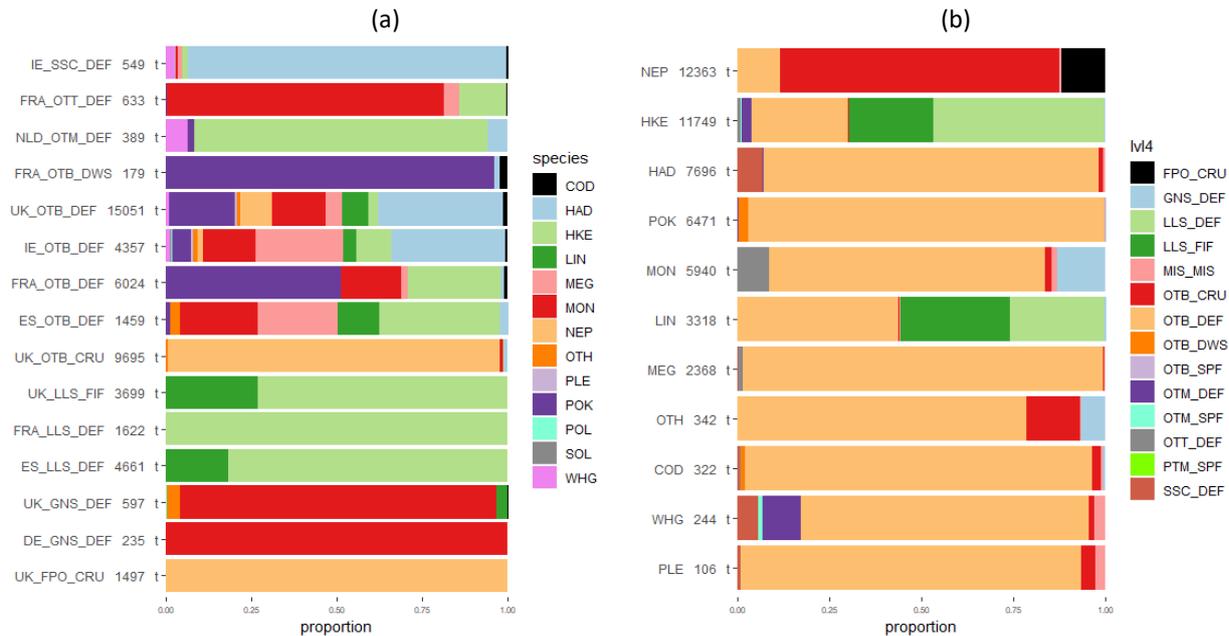


**Figure 16** Description of technical interactions of demersal TAC species in the Celtic Sea and west of Ireland. The left panel (a) shows the species composition of the main demersal métiers (landings > 100 tonnes) operating in the Celtic Sea and west of Ireland. The label incorporates the EU Member State, métier, and mean annual (2015–2017) landings (tonnes). The right panel (b) shows the composition of the landings of each species accounted for by the different demersal métiers. The label includes the mean annual landings (2015–2017).

**West of Scotland**

Ten demersal TAC species dominate the landings from west of Scotland (*Nephrops*, hake, haddock, pollack, anglerfish, ling, megrim, cod, whiting, and plaice; Figure 17b). These are landed by six countries (Ireland, United Kingdom, France, Spain, the Netherlands, and Germany) using ten main métiers (OTB\_DEF, OTB\_CRU, LLS\_DEF, LLS\_FIF, FPO\_CRU, GNS\_DEF, OTT\_DEF, SCC\_DEF, OTM\_DEF, and OTB\_DWS; Figure 17a).

*Nephrops* are the main species in the landings of the demersal fisheries of west of Scotland (average 12 363 tonnes year<sup>-1</sup>), and are primarily targeted by otter trawls (OTB\_CRU) and fishing pots (FPO\_CRU). The landings of other species in the *Nephrops* fisheries constitutes a low proportion of the overall catch (< 10%; Figure 17a). However, there is evidence of significant discarding in these fisheries. Hake has the second highest landings (11 794 tonnes year<sup>-1</sup>) in the fisheries. It is mainly caught by longliners (LSS\_DEF, LSS\_FIF; Figure 17b) and represents the dominant species of that métier (> 80%; Figure 17a). Haddock accounts for the third highest landings (7696 tonnes year<sup>-1</sup>); it is targeted mainly by otter trawls (OTB\_DEF) and has technical interactions with many other species, including hake, ling, pollack, anglerfish, and *Nephrops* (Figure 17b). As with the Celtic Sea, landings profiles in this area vary greatly depending on the EU Member State. For example, the demersal otter trawl fisheries carried out by France, Ireland, and the United Kingdom have very different species compositions and therefore result in different technical interactions (Figure 17a).



**Figure 17** Description of technical interactions of demersal TAC species for the west of Scotland. The left panel (a) shows the species composition of the main demersal métiers (landings > 100 tonnes) operating in these seas. The label incorporates the EU Member State, métier, and mean annual (2015–2017) landings (tonnes). The right panel (b) shows the proportion of the landings of each species accounted for by the different demersal métiers. The label includes the mean annual landings (2015–2017).

**Mixed-fisheries advice**

Due to technical interaction, single-species stock advice on its own cannot fully describe the consequences of mixed-species fisheries. ICES has developed a method to take these interactions into account when assessing the consequences of catch scenarios under single-stock advice. These mixed-fisheries considerations are based on the single-stock assessments combined with knowledge of the consequences of technical interaction on species composition in catches in the Celtic Seas fisheries.

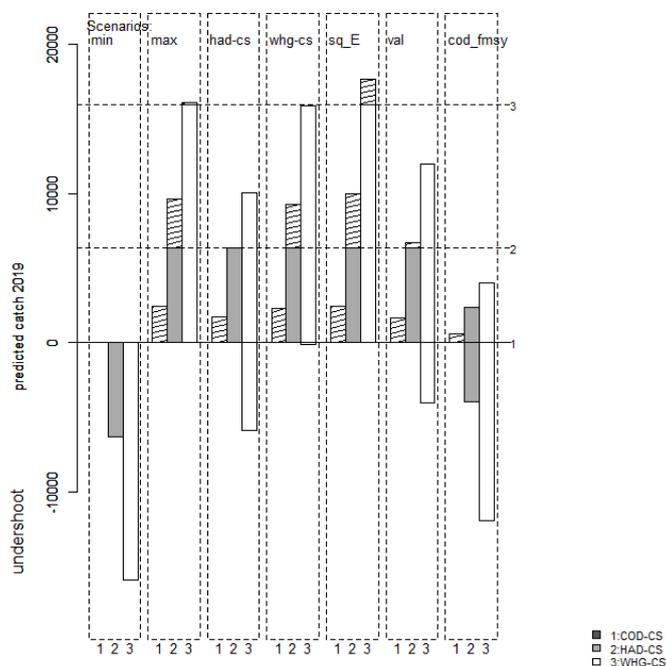
ICES has developed a range of possible scenarios of fishing opportunities that take account of these interactions (Table 1). Further scenarios are possible. Each of these scenarios would provide different likely outcomes on individual fish stocks. If managers wish to take account of the technical interactions, then a choice as to which scenario to follow in deciding upon fishing opportunities is required.

The 2019 forecasts indicate that no catch of haddock or whiting is consistent with the cod advice of zero catch. This mismatch is because all demersal fleets operating within the Celtic Sea catch cod to some extent, resulting in cod being a “choke” species for haddock and whiting. As a consequence, the “Min” scenario and the “Cod cs” scenario (not presented this year) result in zero catch for all three gadoids. Under the “Max” scenario, substantial overshoots for cod and for haddock are predicted if all fleets catch their quotas (Figure 18). This year, an additional scenario of cod catches under the MSY approach (“Cod\_fm<sub>sy</sub>”) is presented. The low value of F (0.12) under the cod MSY approach (assuming a non-zero catch) results in substantial undershoots of both haddock and whiting, as fishing is stopped when the cod quota is reached. The “range” scenario suggests that, with a zero cod TAC, the haddock and whiting TACs should be set at the bottom of their ranges (Figure 19). This scenario was also run using a cod TAC corresponding to fishing mortality within the uncapped reduced range (F<sub>MSY</sub> range [0.08–0.2]), which again resulted in haddock and whiting TACs being at the bottom of their respective F<sub>MSY</sub> ranges (Figure 19).

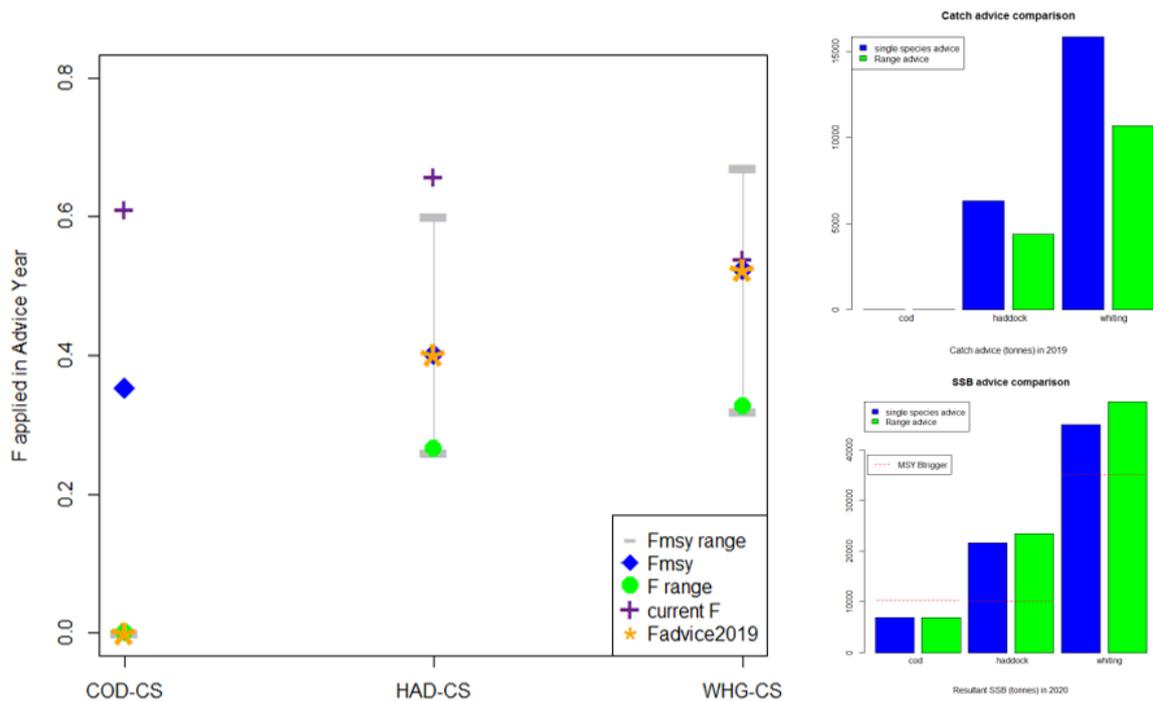
**Table 1** Scenarios currently developed to assess the impact of interaction in mixed fisheries.

Scenarios	Abbreviation	Explanation
Maximum	Max	For each fleet, fishing stops when all stocks have been caught up to the fleet’s stock shares*. This option causes catches that overshoot the single-stock advice given for most stocks.
Minimum	Min	For each fleet, fishing stops when the catch for any one of the stocks meets the fleet’s stock share. This option is the most precautionary option, causing undershoot of the single-stock advice given for other stocks.
Haddock MSY approach	Had	All fleets set their effort corresponding to that required to catch their haddock stock share, regardless of other catches.
Whiting MSY approach	Whg	All fleets set their effort corresponding to that required to catch their whiting stock share, regardless of other catches.
Status quo effort	Sq_E	The effort of each fleet is set equal to the effort in the most recently recorded year (2017) for which catch and effort data are available.
Value	Val	This scenario accounts for the economic importance of each stock for each fleet. The effort by fleet is equal to the average of the efforts required to catch the fleet’s stock shares of each of the stocks, weighted by stock-specific historical catch value. This option causes catches that overshoot some single-stock advice and undershoot other single-stock advice.
Cod F <sub>MSY</sub>	Cod_fm <sub>sy</sub>	All fleets set their effort corresponding to that required to catch their cod stock share, where the cod TAC is set according to a reduced F ( $F = 0.12 = F_{MSY} \times (SSB(2019) / MSY_{Btrigger})$ ), regardless of other catches.
Range		The “range” scenario minimizes the potential TAC mismatch in the catches of cod, haddock, and whiting in 2019 by setting target fishing mortality within the F <sub>MSY</sub> ranges. This scenario estimates a fishing mortality by stock that, if used for setting single-stock fishing opportunities for 2019, would reduce the gap between the most and least restrictive TACs, thus reducing the potential quota over- and undershoot.

\* Throughout this document, the term “fleet’s stock share” or “stock share” is used to describe the share of the fishing opportunities for each particular fleet, calculated based on the single-stock advice for 2019 and the historical proportion of the stock landings taken by the fleet.



**Figure 18** Mixed-fisheries advice for ICES divisions 7.b–c and 7.e–k. Celtic Sea mixed-fisheries projections. Estimates of potential catches (in tonnes) by stock and by scenario. Horizontal lines correspond to the single-stock catch advice for 2019. Bars below the value of zero show undershoot (compared to single-stock advice) where catches are predicted to be lower when applying the scenario. Hatched columns represent catches that overshoot the single-stock advice.



**Figure 19** Range scenario advice for ICES divisions 7.b–c and 7.e–k using the advised zero catches for cod. **Left:** the fishing mortality rates for each stock which reduce the mismatch between opportunities for the three stocks (green point), along with the current fishing mortality (purple cross), the fishing mortality corresponding to the single-stock advice (yellow star), and the  $F_{MSY}$  (blue diamond) and the  $F_{MSY}$  ranges (grey lines). **Right:** Comparison of the outcomes in terms of total catches in 2019 (top) and SSB in 2020 (bottom) between the  $F_{MSY}$ -based single-stock advice and the F-range-based forecast.

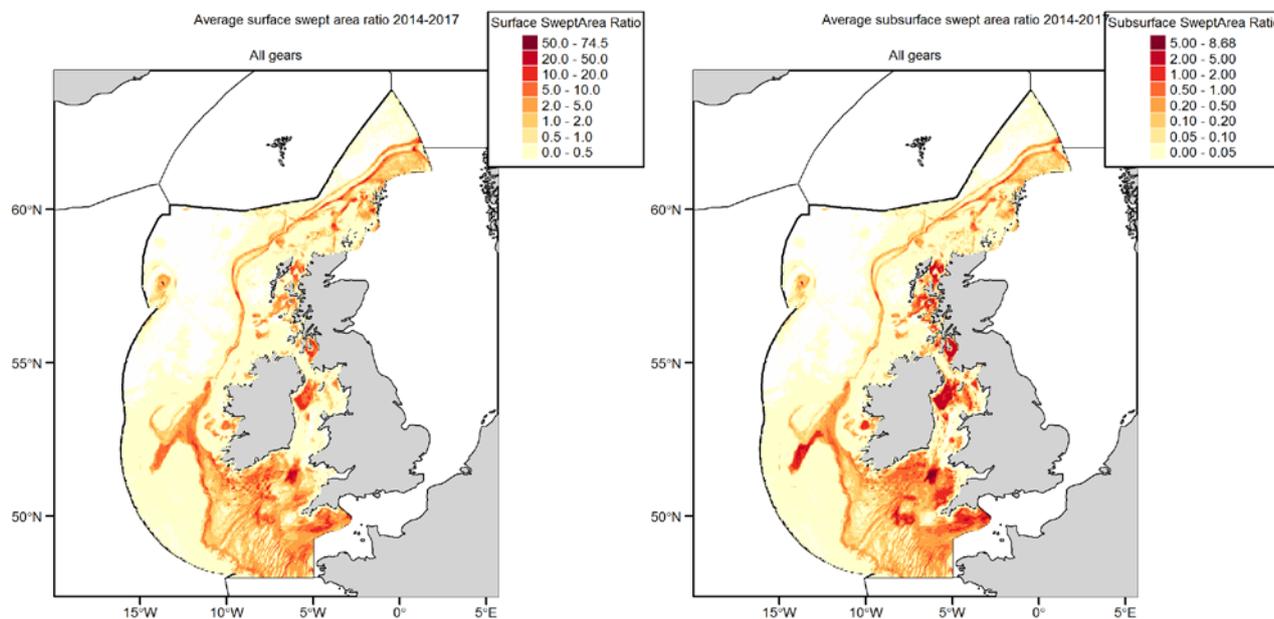
### Species interaction

Fish species are part of the marine foodweb and interact in various ways, including through predation and competition. Natural mortality is becoming proportionately more significant in the Celtic Seas ecoregion because fishing mortality has been reduced on many stocks. Predation mortality can occur from other fish, seabirds, and marine mammals. The abundance of some mammal species has been increasing in some parts of the ecoregion.

There has been no multispecies modelling of the interactions of Celtic Seas species to quantify predation mortality. However, in the North Sea, the modelling indicates that the yields of many stocks are strongly affected by the abundance of cod, saithe, and mackerel, which are the main predator fish species. Changes in fishing mortality on these species influences the abundance and yield of other fish stocks. Indirect predation effects are also important. For example, reduced fisheries exploitation on cod increases cod biomass, which not only leads to reductions in SSB and yields of whiting and haddock (direct predation effect) but also to increases in SSB and yield of herring, sandeel, Norway pout, and sprat. Similar interactions could be expected in the Celtic Seas ecoregion.

**Effects of fisheries on the ecosystem**

Abrasion of the seabed by mobile bottom-contacting fishing gears has been investigated to describe the extent, magnitude, and effects of fishing on benthic habitats. Mobile bottom-contacting gears are concentrated on the *Nephrops* grounds, along the continental shelf edge, and throughout the Celtic Sea (Figure 20). There is little activity by mobile bottom-contacting gears in much of the area west of Scotland and west of Ireland.



**Figure 20** Average annual surface (left) and subsurface (right) disturbance by mobile bottom contacting fishing gear (bottom otter trawls, bottom seines, dredges, beam trawls) in the Celtic Seas ecoregion during 2014–2017, expressed as average swept-area ratios (SAR).

**Bycatch of protected, endangered, and threatened species**

The total harbour porpoise bycatch in gillnet fisheries in the southern part of the Celtic Seas ecoregion in 2016 was approximately 620–1391 individuals. These figures represent approximately 1.1% and 2.4% of the harbour porpoise abundance in this area. The upper estimate exceeds 1.7% of abundance and ICES has noted that this would be deemed unacceptable by the Agreement on the Conservation of Small Cetaceans of the Baltic and North Seas (ASCOBANS).

The total common dolphin bycatch in the southern part of the Celtic Seas ecoregion and in the Bay of Biscay in 2016 was likely to have been 153–1607 individuals in mid-water trawls, and 904–4355 individuals in nets. Combined, these figures represent approximately 0.5% and 1.6% of the common dolphins present in the two areas.

High bycatch rates for elasmobranchs were observed for some vulnerable (e.g. spurdog, thorny skate), and near threatened (e.g. thornback ray) species (as currently classified by the International Union for Conservation of Nature [IUCN]), especially in trawl gears in the Celtic Sea.

Under EU TAC regulations, it is prohibited to fish for or to land basking shark, porbeagle, Norwegian skate, or angel shark if caught within the Celtic Seas ecoregion.

Starry ray, leafscale gulper shark, Portuguese dogfish, birdbeak dogfish, kitefin shark, great lanternshark, smooth lanternshark, thornback ray, undulate ray, and white skate have spatial restrictions on fishing and landings.

Tope may not be caught using longlines within the ecoregion, and it is prohibited to catch spurdog (piked dogfish) unless vessels are part of a monitored bycatch avoidance programme.

ICES has previously advised zero catches in this ecoregion for stocks of rare or threatened species such as basking shark, porbeagle, angel shark, the common skate complex, white skates, undulate rays, orange roughy, deep-water sharks (kitefin shark, leafscale gulper shark, Portuguese dogfish), and greater silver smelt. These stocks have been either targeted or by-caught in fisheries in the past and are now considered depleted. Information on these stocks is sparse, but they require special management attention to conserve remaining populations.

### Sources and references

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**Annex**

Supporting data used in the Celtic Seas Fisheries overview is archived at ICES 2018c.

The following annex table is a status summary of the Celtic Seas ecoregion stocks in 2018.

**Table A1** Status summary of the Celtic Sea ecosystem stocks in 2018, in regards to the ICES maximum sustainable yield (MSY) approach and precautionary approach (PA) for stocks within the Celtic Seas ecoregion. Grey represents unknown reference points. For the MSY approach: green represents a stock that is fished below  $F_{MSY}$  or the stock size is greater than  $MSY B_{trigger}$ ; red represents a stock status that is fished above  $F_{MSY}$  or the stock size is less than  $MSY B_{trigger}$ . For the PA: green represents a stock that is fished below  $F_{pa}$  or the stock size is greater than  $B_{pa}$ ; yellow represents a stock that is fished between  $F_{pa}$  and  $F_{lim}$  or the stock size is between  $B_{lim}$  and  $B_{pa}$ ; red represents a stock that is fished above  $F_{lim}$  or the stock size is less than  $B_{lim}$ . SBL = Safe Biological Limits; MSFD = EU Marine Strategy Framework Directive; D3C1 = MSFD indicator for fishing mortality; D3C2 = MSFD indicator for spawning-stock biomass; GES = good environmental status.

Stock code and name	Fish category	Reference point	Data category	SBL	Fishing pressure			Stock size			MSFD descriptor		
					2015	2016	2017	2016	2017	2018	D3C1	D3C2	GES
<a href="#">ank.27.78abd</a> Black-bellied anglerfish in divisions 7.b–k, 8.a–b, and 8.d (west and southwest of Ireland, Bay of Biscay)	benthic	PA	3	?	✗	✗	✓	?	?	?	?	?	?
<a href="#">aru.27.5b6a</a> Greater silver smelt in divisions 5.b and 6.a (Faroes grounds and west of Scotland)	pelagic	PA	3	?	✓	✓	✓	?	?	?	✓	?	?
<a href="#">bli.27.5b67</a> Blue ling in subareas 6–7 and Division 5.b (Celtic Seas, English Channel, and Faroos grounds)	demersal	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">bss.27.4bc7ad-h</a> Sea bass in divisions 4.b–c, 7.a, and 7.d–h (central and southern North Sea, Irish Sea, English Channel, Bristol Channel, and Celtic Sea)	demersal	MSY	1	✗	✗	✓	✓	✗	✗	✗	✓	✗	✗
<a href="#">cod.27.6a</a> Cod in Division 6.a (west of Scotland)	demersal	MSY	1	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
<a href="#">cod.27.7a</a> Cod in Division 7.a (Irish Sea)	demersal	MSY	1	✗	✓	✓	✓	✗	✗	✗	✓	✗	✗
<a href="#">cod.27.7e-k</a> Cod in divisions 7.e–k (eastern English Channel and southern Celtic Seas)	demersal	MSY	1	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
<a href="#">dgs-nea</a> Spurdog in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	elasmobranch	MSY	1	?	✓	✓	✓	✗	✗	✗	✓	✗	✗
<a href="#">ele.2737.nea</a> European eel throughout its natural range	demersal	PA	3	?	?	?	?	✗	✗	✗	?	✗	✗
<a href="#">ghl.27.561214</a> Greenland halibut in subareas 5, 6, 12, and 14 (Iceland and Faroos grounds, west of Scotland, north of Azores, east of Greenland)	benthic	MSY	1	✗	✗	✗	✗	✓	✓	✓	✗	✓	✗
<a href="#">had.27.46a20</a> Haddock in Subarea 4, Division 6.a, and Subdivision 20 (North Sea, west of Scotland, Skagerrak)	demersal	MSY	1	✓	✗	✗	✗	✗	✓	✓	✗	✓	✗
<a href="#">had.27.6b</a> Haddock in Division 6.b (Rockall)	demersal	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Stock code and name	Fish category	Reference point	Data category	SBL	Fishing pressure			Stock size			MSFD descriptor		
					2015	2016	2017	2016	2017	2018	D3C1	D3C2	GES
<a href="#">had.27.7a</a> Haddock in Division 7.a (Irish Sea)	demersal	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">had.27.7b-k</a> Haddock in divisions 7.b–k (southern Celtic Seas and English Channel)	demersal	MSY	1	✓	✗	✗	✗	✓	✓	✓	✗	✓	✗
<a href="#">her.27.6a7bc</a> Herring in divisions 6.a and 7.b–c (west of Scotland, west of Ireland)	pelagic	MSY	1	✗	✓	✓	✓	✗	✗	✗	✓	✗	✗
<a href="#">her.27.irls</a> Herring in divisions 7.a South of 52°30'N, 7.g–h, and 7.j–k (Irish Sea, Celtic Sea, and southwest of Ireland)	pelagic	MSY	1	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
<a href="#">her.27.nirs</a> Herring in Division 7.a North of 52°30'N (Irish Sea)	pelagic	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">hke.27.3a46-8abd</a> Hake in subareas 4, 6, and 7, and divisions 3.a, 8.a–b, and 8.d, Northern stock (Greater North Sea, Celtic Seas, and the northern Bay of Biscay)	demersal	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">hom.27.2a4a5b6a7a-ce-k8</a> Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a–c, and 7.e–k (the Northeast Atlantic)	pelagic	MSY	1	✗	✓	✓	✓	✗	✗	✗	✓	✗	✗
<a href="#">lez.27.4a6a</a> Megrims in divisions 4.a and 6.a (northern North Sea, west of Scotland)	benthic	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">lez.27.6b</a> Megrims in Division 6.b (Rockall)	benthic	PA	3	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">lin.27.3a4a6-91214</a> Ling in subareas 6–9, 12, and 14, and divisions 3.a and 4.a (Northeast Atlantic and Arctic Ocean)	demersal	MSY	3	?	✓	✓	✓	?	?	?	✓	?	?
<a href="#">mac.27.nea</a> Mackerel in subareas 1–8 and 14 and Division 9.a (the Northeast Atlantic and adjacent waters)	pelagic	MSY	1	✗	✗	✗	✗	✓	✓	✗	✗	✗	✗
<a href="#">meg.27.7b-k8abd</a> Megrim in divisions 7.b–k, 8.a–b, and 8.d (west and southwest of Ireland, Bay of Biscay)	benthic	MSY	1	✓	✗	✗	✗	✓	✓	✓	✗	✓	✗
<a href="#">mon.27.78abd</a> White anglerfish in divisions 7.b–k, 8.a–b, and 8.d (southern Celtic Seas, Bay of Biscay)	benthic	MSY	1	✓	✗	✗	✓	✓	✓	✓	✓	✓	✓
<a href="#">nep.fu.11</a> <i>Nephrops</i> in Division 6.a, Functional Unit 11 (west of Scotland, North Minch)	crustacean	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">nep.fu.12</a> <i>Nephrops</i> in Division 6.a, Functional Unit 12 (west of Scotland, South Minch)	crustacean	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">nep.fu.13</a> <i>Nephrops</i> in Division 6.a, Functional Unit 13 (west of Scotland, the Firth of Clyde and Sound of Jura)	crustacean	MSY	1	?	✓	✗	✗	✓	✓	✓	✗	✓	✗

Stock code and name	Fish category	Reference point	Data category	SBL	Fishing pressure			Stock size			MSFD descriptor		
					2015	2016	2017	2016	2017	2018	D3C1	D3C2	GES
<a href="#">nep.fu.14</a> <i>Nephrops</i> in Division 7.a, Functional Unit 14 (Irish Sea, East)	crustacean	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">nep.fu.15</a> <i>Nephrops</i> in Division 7.a, Functional Unit 15 (Irish Sea, West)	crustacean	MSY	1	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">nep.fu.17</a> <i>Nephrops</i> in Division 7.b, Functional Unit 17 (west of Ireland, Aran grounds)	crustacean	MSY	1	✓	✓	✗	✓	✗	✗	✓	✓	✓	✓
<a href="#">nep.fu.19</a> <i>Nephrops</i> in divisions 7.a, 7.g, and 7.j, Functional Unit 19 (Irish Sea, Celtic Sea, eastern part of southwest of Ireland)	crustacean	MSY	1	?	✓	✓	✓	✗	✓	✗	✓	✗	✗
<a href="#">nep.fu.2021</a> <i>Nephrops</i> in divisions 7.g and 7.h, functional units 20 and 21 (Celtic Sea)	crustacean	MSY	1	?	✓	✓	✓	?	?	?	✓	?	?
<a href="#">nep.fu.22</a> <i>Nephrops</i> in divisions 7.g and 7.f, Functional Unit 22 (Celtic Sea, Bristol Channel)	crustacean	MSY	1	?	✓	✗	✓	✗	✓	✗	✓	✓	✗
<a href="#">ple.27.7a</a> Plaice in Division 7.a (Irish Sea)	benthic	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">ple.27.7e</a> Plaice in Division 7.e (western English Channel)	benthic	MSY	3	✓	✓	✓	✗	✓	✓	✓	✓	✓	✓
<a href="#">ple.27.7fg</a> Plaice in divisions 7.f and 7.g (Bristol Channel, Celtic Sea)	benthic	MSY	3	✓	✓	✓	✓	✓	✓	?	✓	?	?
<a href="#">ple.27.7h-k</a> Plaice in divisions 7.h-k (Celtic Sea South, southwest of Ireland)	benthic	MSY	3	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗
<a href="#">pok.27.3a46</a> Saithe in subareas 4 and 6 and Division 3.a (North Sea, Rockall and west of Scotland, Skagerrak and Kattegat)	demersal	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">sol.27.7a</a> Sole in Division 7.a (Irish Sea)	benthic	MSY	1	✗	✓	✓	✓	✗	✗	✗	✓	✗	✗
<a href="#">sol.27.7e</a> Sole in Division 7.e (western English Channel)	benthic	MSY	1	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
<a href="#">sol.27.7fg</a> Sole in divisions 7.f and 7.g (Bristol Channel, Celtic Sea)	benthic	MSY	1	✗	✗	✗	✗	✗	✗	✓	✗	✓	✗
<a href="#">sol.27.7h-k</a> Sole in divisions 7.h-k (Celtic Sea South, southwest of Ireland)	benthic	MSY	3	✓	✓	✗	✓	✓	✓	✓	✓	✓	✓
<a href="#">usk.27.3a45b6a7-912b</a> Tusk in subareas 4 and 7-9 and divisions 3.a, 5.b, 6.a, and 12.b (Northeast Atlantic)	demersal	MSY	3	✓	✓	✓	✓	✓	✓		✓	✓	✓
<a href="#">whb.27.1-91214</a> Blue whiting in subareas 1-9, 12, and 14 (Northeast Atlantic and adjacent waters)	pelagic	MSY	1	✓	?	✗	✗	?	✓	✓	✗	✓	✗
<a href="#">whg.27.6a</a> Whiting in Division 6.a (west of Scotland)	demersal	MSY	1	✗	✓	✓	✓	✗	✗	✗	✓	✗	✗
<a href="#">whg.27.7a</a> Whiting in Division 7.a (Irish Sea)	demersal	MSY	1	✗	✗	✗	✗	✗	✗	✗	✗	✗	✗

Stock code and name	Fish category	Reference point	Data category	SBL	Fishing pressure			Stock size			MSFD descriptor		
					2015	2016	2017	2016	2017	2018	D3C1	D3C2	GES
<a href="#">whg.27.7b-ce-k</a> Whiting in divisions 7.b–c and 7.e–k (southern Celtic Seas and eastern English Channel)	demersal	MSY	1	✓	✓	✓	✗	✓	✓	✓	✗	✓	✗

**Table A2** List of those stocks in the Celtic Seas ecoregion in 2018 that do not have a full set of reference points.

Stock code	Stock name	Fish category	Reference point	Data category
<a href="#">agn.27.nea</a>	Angel shark in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	elasmobranch	PA	6
<a href="#">alf.27.nea</a>	Alfonsinos in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	demersal	PA	5
<a href="#">anf.27.3a46</a>	Anglerfish in subareas 4 and 6, and Division 3.a (North Sea, Rockall and west of Scotland, Skagerrak and Kattegat)	benthic	PA	3
<a href="#">aru.27.6b7-1012</a>	Greater silver smelt in subareas 7–10 and 12, and Division 6.b (other areas)	demersal	PA	3
<a href="#">boc.27.6-8</a>	Boarfish in subareas 6–8 (Celtic Seas, English Channel, and Bay of Biscay)	pelagic	PA	3
<a href="#">bsf.27.nea</a>	Black scabbardfish in subareas 1, 2, 4–8, 10, and 14, and divisions 3.a, 9.a, and 12.b (Northeast Atlantic and Arctic Ocean)	pelagic	PA	3
<a href="#">bsk.27.nea</a>	Basking shark in subareas 1–10, 12, and 14 (Northeast Atlantic and adjacent waters)	elasmobranch	PA	6
<a href="#">bss.27.6a7bj</a>	Sea bass in divisions 6.a, 7.b, and 7.j (west of Scotland, west of Ireland, eastern part of southwest of Ireland)	demersal	PA	6
<a href="#">cod.27.6b</a>	Cod in Division 6.b (Rockall)	demersal	PA	6
<a href="#">cyo.27.nea</a>	Portuguese dogfish in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	elasmobranch	PA	6
<a href="#">gag.27.nea</a>	Tope in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	elasmobranch	PA	5
<a href="#">gfb.27.nea</a>	Greater forkbeard in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	demersal	PA	3
<a href="#">ldb.27.7b-k8abd</a>	Four-spot megrim in divisions 7.b–k, 8.a–b, and 8.d (west and southwest of Ireland, Bay of Biscay)	benthic	PA/Stock status only	5
<a href="#">mur.27.67a-ce-k89a</a>	Striped red mullet in subareas 6 and 8, and divisions 7.a–c, 7.e–k, and 9.a (North Sea, Bay of Biscay, southern Celtic Seas, and Atlantic Iberian waters)	demersal	PA	5
<a href="#">nep.27.6aoutfu</a>	<i>Nephrops</i> in Division 6.a, outside the functional units (west of Scotland)	crustacean	PA	5
<a href="#">nep.27.7outfu</a>	<i>Nephrops</i> in Subarea 7, outside the functional units (southern Celtic Seas, southwest of Ireland)	crustacean	PA	5
<a href="#">nep.fu.16</a>	<i>Nephrops</i> in divisions 7.b–c and 7.j–k, Functional Unit 16 (west and southwest of Ireland, Porcupine Bank)	crustacean	MSY	1
<a href="#">nop.27.6a</a>	Norway pout in Division 6.a	pelagic	PA/Stock status only	6
<a href="#">ory.27.nea</a>	Orange roughy in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	demersal	PA	6
<a href="#">pil.27.7</a>	Sardine in Subarea 7 (southern Celtic Seas, English Channel)	pelagic	PA	5
<a href="#">ple.27.7bc</a>	Plaice in divisions 7.b–c (west of Ireland)	benthic	PA	6
<a href="#">pol.27.67</a>	Pollack in subareas 6–7 (Celtic Seas and the English Channel)	demersal	PA	4
<a href="#">por.27.nea</a>	Porbeagle in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	elasmobranch	PA	6
<a href="#">raj.27.67a-ce-h</a>	Rays and skates in Subarea 6 and divisions 7.a–c and 7.e–h (Rockall and west of Scotland, southern Celtic Seas, western English Channel)	elasmobranch	No advice	6
<a href="#">rhg.27.nea</a>	Roughhead grenadier in subareas 5–8, 10, 12, and 14 (Northeast Atlantic and Arctic Ocean)	demersal	PA	6
<a href="#">rja.27.nea</a>	White skate in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	elasmobranch	PA	6
<a href="#">rjb.27.67a-ce-k</a>	Common skate complex in Subarea 6 and divisions 7.a–c and 7.e–k (Celtic Seas and western English Channel)	elasmobranch	PA/Stock status only	6
<a href="#">rjc.27.6</a>	Thornback ray in Subarea 6 (west of Scotland)	elasmobranch	PA	3
<a href="#">rjc.27.7afg</a>	Thornback ray in divisions 7.a and 7.f–g (Irish Sea, Bristol Channel, Celtic Sea North)	elasmobranch	PA	3
<a href="#">rjc.27.7e</a>	Thornback ray in Division 7.e (western English Channel)	elasmobranch	PA	5

Stock code	Stock name	Fish category	Reference point	Data category
<a href="#">rje.27.7de</a>	Small-eyed ray in divisions 7.d and 7.e (English Channel)	elasmobranch	PA	5
<a href="#">rje.27.7fg</a>	Small-eyed ray in divisions 7.f and 7.g (Bristol Channel, Celtic Sea North)	elasmobranch	PA	3
<a href="#">rjf.27.67</a>	Shagreen ray in subareas 6–7 (west of Scotland, southern Celtic Seas, English Channel)	elasmobranch	PA	5
<a href="#">rjh.27.4a6</a>	Blonde ray in Subarea 6 and Division 4.a (North Sea and west of Scotland)	elasmobranch	PA/Stock status only	5
<a href="#">rjh.27.7afg</a>	Blonde ray in divisions 7.a and 7.f–g (Irish Sea, Bristol Channel, Celtic Sea North)	elasmobranch	PA/Stock status only	5
<a href="#">rjh.27.7e</a>	Blonde ray in Division 7.e (western English Channel)	elasmobranch	PA/Stock status only	5
<a href="#">rji.27.67</a>	Sandy ray in subareas 6–7 (west of Scotland, southern Celtic Seas, English Channel)	elasmobranch	PA/Stock status only	5
<a href="#">rjm.27.67bj</a>	Spotted ray in Subarea 6 and divisions 7.b and 7.j (west of Scotland, west and southwest of Ireland)	elasmobranch	PA	3
<a href="#">rjm.27.7ae-h</a>	Spotted ray in divisions 7.a and 7.e–h (southern Celtic Seas and western English Channel)	elasmobranch	PA	3
<a href="#">rjn.27.678abd</a>	Cuckoo ray in subareas 6–7 and divisions 8.a–b and 8.d (west of Scotland, southern Celtic Seas, western English Channel, Bay of Biscay)	elasmobranch	PA/Stock status only	3
<a href="#">rjr.27.23a4</a>	Starry ray in subareas 2 and 4, and Division 3.a (Norwegian Sea, North Sea, Skagerrak and Kattegat)	elasmobranch	PA	3
<a href="#">rju.27.7bj</a>	Undulate ray in divisions 7.b and 7.j (west and southwest of Ireland)	elasmobranch	PA	6
<a href="#">rju.27.7de</a>	Undulate ray in divisions 7.d and 7.e (English Channel)	elasmobranch	PA	3
<a href="#">rng.27.5b6712b</a>	Roundnose grenadier in subareas 6–7 and divisions 5.b and 12.b (Celtic Seas and the English Channel, Faroes grounds, and western Hatton Bank)	demersal	MSY	5
<a href="#">sbr.27.6-8</a>	Blackspot seabream in subareas 6–8 (Celtic Seas, the English Channel, and Bay of Biscay)	demersal	PA	6
<a href="#">sck.27.nea</a>	Kitefin shark in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	elasmobranch	PA	6
<a href="#">sdv.27.nea</a>	Smooth-hound in subareas 1–10, 12, and 14 (the Northeast Atlantic and adjacent waters)	elasmobranch	PA	3
<a href="#">sho.27.67</a>	Black-mouth dogfish in subareas 6 and 7 (west of Scotland, southern Celtic Seas, and English Channel)	demersal	PA/Stock status only	3
<a href="#">sol.27.7bc</a>	Sole in divisions 7.b and 7.c (west of Ireland)	benthic	PA	6
<a href="#">spr.27.67a-cf-k</a>	Sprat in Subarea 6 and divisions 7.a–c and 7.f–k (west of Scotland, southern Celtic Seas)	pelagic	PA	5
<a href="#">spr.27.7de</a>	Sprat in divisions 7.d and 7.e (English Channel)	pelagic	PA	3
<a href="#">syc.27.67a-ce-j</a>	Lesser-spotted dogfish in Subarea 6 and divisions 7.a–c and 7.e–j (west of Scotland, Irish Sea, southern Celtic Seas)	elasmobranch	PA	3
<a href="#">syt.27.67</a>	Greater-spotted dogfish in subareas 6 and 7 (west of Scotland, southern Celtic Sea, and the English Channel)	elasmobranch	PA/Stock status only	3
<a href="#">thr.27.nea</a>	Thresher sharks in subareas 10, 12, Divisions 7.c–k, 8.d–e, and subdivisions 5.b.1, 9.b.1, 14.b.1 (Northeast Atlantic)	elasmobranch	PA	6
<a href="#">tsu.27.nea</a>	Roughsnout grenadier in subareas 1–2, 4–8, 10, 12, 14, and Division 3.a (Northeast Atlantic and Arctic Ocean)	demersal	PA	6
<a href="#">usk.27.6b</a>	Tusk in Division 6.b (Rockall)	demersal	PA	5
<a href="#">whg.27.6b</a>	Whiting in Division 6.b (Rockall)	demersal	PA	6

**Table A3** Scientific names of species.

Albacore tuna <i>Thunnus alalunga</i>	Norway lobster <i>Nephrops norvegicus</i>
Angel shark <i>Squatina squatina</i>	Norway pout <i>Trisopterus esmarkii</i>
Alfonsinos <i>Beryx spp.</i>	Norwegian skate <i>Dipturus nidarosiensis</i>
Anglerfish <i>Lophius budegassa</i> , <i>Lophius piscatorius</i>	Orange roughy <i>Hoplostethus atlanticus</i>
Basking shark <i>Cetorhinus maximus</i>	Oyster <i>Ostrea edulis</i>
Birdbeak dogfish <i>Deania calcea</i>	Plaice <i>Pleuronectes platessa</i>
Black-bellied anglerfish <i>Lophius budegassa</i>	Pollack <i>Pollachius pollachius</i>
Black-mouth dogfish <i>Galeus melastomus</i>	Porbeagle <i>Lamna nasus</i>
Black scabbardfish <i>Aphanopus carbo</i>	Portuguese dogfish <i>Centroscymnus coelolepis</i> ,
Blacksport seabream <i>Pagellus bogaraveo</i>	Queen scallop <i>Chlamys opercularis</i>
Blonde ray <i>Raja brachyura</i>	Rays and skates Rajidae
Blue ling <i>Molva dypterygia</i>	Razor clam <i>Ensis magnus</i>
Blue whiting <i>Micromesistius poutassou</i>	Red gurnard <i>Chelidonichthys cuculus</i>
Boarfish <i>Capros aper</i>	Roughhead grenadier <i>Macrourus berglax</i>
Brown crab <i>Cancer pagurus</i>	Roughsnout grenadier <i>Trachyrincus scabrax</i>
Clam <i>Spisula</i>	Roundnose grenadier <i>Coryphaenoides rupestris</i>
Cockle <i>Cerastoderma edule</i>	Saithe <i>Pollachius virens</i>
Cod <i>Gadus morhua</i>	Salmon <i>Salmo salar</i>
Common dolphin (Long-finned) <i>Delphis delphinus</i>	Sandy ray <i>Leucoraja circularis</i>
Common skate <i>Dipturus batis</i> -complex includes flapper skate	Sardine <i>Sardina pilchardus</i>
<i>Dipturus cf. flossada</i> and blue skate <i>Dipturus cf. intermedia</i>	Seabass <i>Dicentrarchus labrax</i>
Cuckoo ray <i>Leucoraja naevus</i>	Sea trout <i>Salmo trutta</i>
Cuttlefish <i>Sepia officinalis</i>	Shagreen ray <i>Leucoraja fullonica</i>
European eel <i>Anguilla anguilla</i>	Small-eyed ray <i>Raja microocellata</i>
Four-spot megrim <i>Lepidorhombus boscii</i>	Smooth-head <i>Alepocephalus bairdii</i>
Great lanternshark <i>Etmopterus princeps</i>	Smooth-hound <i>Mustelus spp.</i>
Greater forkbeard <i>Phycis blennoides</i>	Smooth Lanternshark
Greenland halibut <i>Reinhardtius hippoglossoides</i>	Sole <i>Solea solea</i>
Greater silver smelt <i>Argentina silus</i>	Spotted ray <i>Raja montagui</i>
Greater-spotted dogfish <i>Scyliorhinus stellaris</i>	Sprat <i>Sprattus sprattus</i>
Haddock <i>Melanogrammus aeglefinus</i>	Spurdog (Piked dogfish) <i>Squalus acanthias</i>
Harbour porpoise <i>Phocoena phocoena</i>	Starry ray <i>Amblyraja radiata</i>
Herring <i>Clupea harengus</i>	Striped red mullet <i>Mullus surmuletus</i>
Hake <i>Merluccius merluccius</i>	Thornback ray <i>Raja clavata</i>
Horse mackerel <i>Trachurus trachurus</i>	Thorny skate <i>Amblyraja radiata</i>
Kitefin shark <i>Dalatias licha</i>	Thresher sharks <i>Alopias spp.</i>
Leafscale gulper shark <i>Centrophorus squamosus</i>	Tope <i>Galeorhinus galeus</i>
Lesser-spotted dogfish <i>Scyliorhinus canicula</i>	Tusk <i>Brosme brosme</i>
Ling <i>Molva molva</i>	Undulate ray <i>Raja undulata</i>
Lobster <i>Homarus gammarus</i>	White anglerfish <i>Lophius piscatorius</i>
Mackerel <i>Scomber scombrus</i>	White skate <i>Rostroraja alba</i>
Megrim <i>Lepidorhombus whiffiagonis</i>	Whelk <i>Buccinum undatum</i>
Megrim <i>Lepidorhombus spp.</i>	Whiting <i>Merlangius merlangus</i>

**Table A4** Métier definitions.

Area	Gear type	Target assemblage	Métier label
west of Scotland (Division 6.a) and Rockall (Division 6.b)	Pots and traps	Crustaceans	FPO_CRU
	Gillnets	Demersal fish	GNS_DEF
	Longline	Finfish	LLS_FIF
	Otter trawl	Crustaceans	OTB_CRU
		Demersal fish	OTB_DEF
		Deep-water species	OTB_DWS
		Molluscs	OTB_MOL
	Mid-water trawl	Demersal fish	OTM_DEF
		Small pelagic fish	OTM_SPF
Seines	Small pelagic fish	SSC_SPF	
Others	Miscellaneous	MIS_MIS	
Irish Sea (Division 7.a)	Pots and traps	Crustaceans	FPO_CRU
		Molluscs	FPO_MOL
	Gillnets	Demersal fish	GNS_DEF
	Otter trawl	Crustaceans	OTB_CRU
		Demersal fish	OTB_DEF
		Molluscs	OTB_MOL
	Beam trawl	Demersal fish	TBB_DEF
Others	Miscellaneous	MIS_MIS	
West of Ireland (divisions 7.b–c) and Celtic Sea slope (divisions 7.k–j)	Gillnets	Demersal fish	GNS_DEF
		Deep-water species	GNS_DWS
	Otter trawl	Demersal fish	OTB_DEF
		Deep-water species	OTB_DWS
		Molluscs	OTB_MOL
		Small pelagic fish	OTB_SPF
		Crustaceans	OTB_CRU
	Midwater trawl	Small pelagic fish	OTM_SPF
		Demersal fish	OTM_DEF