9.2 Greater North Sea ecoregion – fisheries overview

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Executive summary

Around 6600 fishing vessels are active in the Greater North Sea. Total landings peaked in the 1970s at 4 million tonnes and have since declined to about 2 million tonnes. Total fishing effort has declined substantially since 2003. Pelagic fish landings are greater than demersal fish landings. Herring and mackerel, caught using pelagic trawls and seines, account for the largest portion of the pelagic landings, while sandeel and haddock, caught using otter trawls/seines, account for the largest fraction of the demersal landings. Catches are taken from more than 100 stocks. Discards are highest in the demersal and benthic fisheries. The spatial distribution of fishing gear varies across the Greater North Sea. Static gear is used most frequently in the English Channel, the eastern part of the Southern Bight, the Danish banks, and in the waters east of Shetland. Bottom trawls are used throughout the North Sea, with lower use in the shallower southern North Sea, where beam trawls are most commonly used. Pelagic gears are used throughout the North Sea.

In terms of weight of catch, fish stocks harvested from the North Sea are being fished at levels consistent with achieving good environmental status (GES) under the EU's Marine Strategy Framework Directive; however, the reproductive capacity of the stocks has not generally reached this level. Almost all the fisheries in the North Sea catch more than one species; controlling fishing on one species therefore affects other species as well. ICES has developed a number of scenarios for fishing opportunities that take account of these technical interactions. Each of these scenarios results in different outcomes for the fish stocks. Managers may need to take these scenarios into account when deciding upon fishing opportunities. Furthermore, biological interactions occur between species (e.g. predation), and fishing on one stock may affect the population dynamics of another. Scenarios that take account of these various interactions can be used to evaluate the possible consequences of policy decisions. The greatest physical disturbances of the seabed caused by fishing activity in the North Sea is caused by mobile bottom-contacting gear in the eastern English Channel, in nearshore areas in the southeastern North Sea and in the central Skagerrak. Incidental bycatches of protected, endangered, and threatened species occur in several North Sea fisheries, and the bycatch of common dolphin in the western English Channel may be unsustainable in terms of population.

Supporting data used in the Greater North Sea fisheries overview is accessible at
https://doi.org/10.17895/ices.advice.21641360

Introduction

The Greater North Sea ecoregion includes the North Sea, English Channel, Skagerrak, and Kattegat. The Greater North Sea is a relatively shallow sea area on the European continental shelf, with the exception of the Norwegian Trench that extends parallel to the Norwegian shoreline. Pelagic species (primarily herring and mackerel) account for a significant portion of the total commercial fish landings in the region. Landings of benthic and demersal finfish species (primarily haddock, sandeel, flatfish, and cod) are also significant.

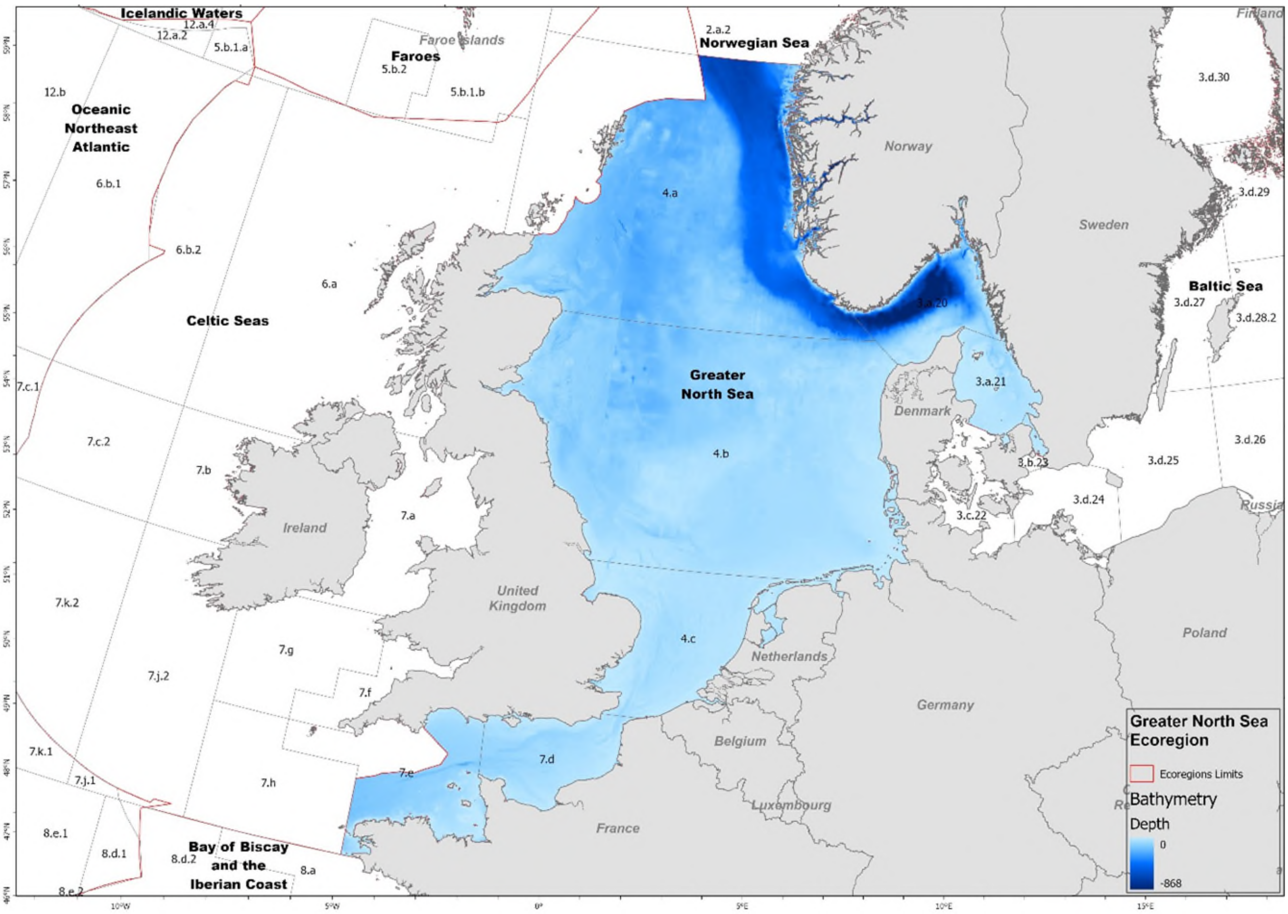


Figure 1 The Greater North Sea ecoregion and ICES statistical rectangles.

All of the Greater North Sea ecoregion lies within FAO Major Fishing Area 27; the prefix "27" in the ICES statistical area codes is therefore omitted in the following. This overview covers ICES Division 3.a, most of divisions 4.a, 4.b, 4.c, 7.d, and part of Division 7.e, as well as Subdivision 3.b.23. This overview does not include the fisheries in the western English Channel (Division 7.e) and in the Sound (Division 3.b.23).

Note that updates to the figures using data from the stock assessment graphs (SAG) include only advice published before 10 October 2022. Therefore anf.27.3a46, meg.27.7b-k8abd, rjn.27.678abd, and the Norway lobster stocks refer to the advice current at this time (the advice applicable for 2022).

This overview provides:

- a short description of each of the national commercial fishing fleets in the ecoregion, including their fishing gears, and spatial and temporal patterns of activity;
- a summary of the status of the fisheries resources and the level of exploitation relative to agreed objectives and reference points;
- mixed-fisheries considerations of relevance to the management of the fisheries; and
- an evaluation of the effects of fishing gear on the ecosystem in terms of the seabed and on the bycatch of protected, endangered, and threatened species.

The scientific names of all species described in this overview are listed in Table A2 in the Annex.

Who is fishing

Around 6600 vessels from nine nations operate in the Greater North Sea, with the largest numbers coming from UK, Norway, Denmark, the Netherlands, and France. Total landings peaked in the early 1970s and have since declined. The proportion caught by each country of the total annual landings has varied over time (Figure 2). The following country paragraphs highlight features of the fleets and fisheries of each country but are not exhaustive descriptions.

In the European Commission's Scientific Technical and Economic Committee for Fisheries (STECF) Fisheries Dependence Information (FDI) data call, "confidentiality" in the landings and effort tables by country was introduced. The data call suggests that data related to fewer than three vessels could be considered confidential. Given the disaggregation of this data call (e.g. vessel length, gear, mesh size, quarter) many entries were submitted as confidential. It is therefore not possible to assess the extent to which the effort data are impacted by confidentiality and whether this is consistent over time. As a consequence, and in a change from previous years, no effort by country was presented in this fisheries overview.

Belgium

The Belgian fishing fleet is composed of 65 active vessels, primarily beam trawlers both above and below 24 m in length. Few vessels are smaller than 12 m. Most of the catch is demersal species; sole is the dominant species in value, and plaice the dominant species in volume. Other important species include Norway lobster, anglerfish, turbot, shrimp, lemon sole, common cuttlefish, squid, rays, and cod.

Denmark

The Danish fleet in 2019 had 717 vessels operating in the Greater North Sea, representing around half of the entire Danish fleet (1560 vessels). The size of the fleet has been generally decreasing over the last decade and in 2010 there were 968 vessels operating (out of a total of 2220 vessels). In the following description a fishing operation is defined as a combination of vessel and gear, therefore any vessel operating more than one gear type will contribute to multiple operations.

- There were around 600 operations by smaller vessels (< 12 m) in 2019 compared to around 800 in 2010. This mainly consists of gillnetting operations supplemented by pot and trap operations for the smaller vessels and demersal operations for the larger vessels within this group.
- For the medium-sized vessels of 12–40 m in length, there were around 281 operations in 2019 mainly represented by demersal trawling. This represents a large reduction in operations compared to the 439 recorded in 2010.
- For the largest vessels above 40 m in length the 54 fishing operations in 2019 were split approximately in half between demersal trawlers and pelagic trawlers. This is also a substantial reduction from the level in 2010 where 75 operations were recorded.

The total value of the Danish fishery from the Greater North Sea has been relatively constant over the period 2010 to 2019. The most dominant fleets in value are the demersal trawlers, having around six times the value of gillnetters throughout the period. The value of demersal trawling is currently around 1.5 times the value of pelagic trawling, although this has decreased from the three times higher level in 2010. The most important demersal fisheries target cod, plaice, saithe, northern shrimp, and *Nephrops* using predominantly bottom trawls with some seine activity. This pattern has been consistent over the last ten years. The most important pelagic fisheries target herring and mackerel for human consumption, and sandeel, sprat, and Norway pout for reduction purposes (i.e. fish meal and oils), which is also consistent for the period.

France

The French fleet in the North Sea is composed of more than 600 vessels. The demersal fisheries operate mainly in the eastern English Channel and southern North Sea and catch a variety of finfish and shellfish species. Up until 2016, the largest fleet segments were gill- and trammelnetters (10–18 m) targeting sole, followed by demersal trawlers (12–24 m) catching a great diversity of fish and cephalopod species, and dredgers catching scallops. Since 2016, the activity of gill- and trammelnetters has decreased substantially, with part of the fleet converting to pot fishery targeting whelks and crustaceans, or stopping their activity altogether because of difficulty in catching sole in the northeastern part of Division 7.d and the southern part of Division 4.c. Smaller boats operate different gears throughout the year and target different species assemblages. There is also a fleet of six large demersal trawlers (>40 m) that target saithe in the northern North Sea and to the west of Scotland. The pelagic fishery is prosecuted by three active vessels catching herring, mackerel, and horse-mackerel.

Germany

The German North Sea fishing fleet comprises more than 200 vessels. Small beam trawlers of 12–24 m length constitute the largest fleet component (around 175 vessels in 2019) and almost exclusively target brown shrimp in the southern North Sea. In addition, some medium- and large-sized beam trawlers (eight vessels, 24–40 m length; three vessels > 40 m length) target sole and plaice, and farm and harvest mussel Several otter trawlers (ca. nine vessels, 18–24 m length) target Norway lobster and plaice in the North Sea. Medium-sized demersal trawlers (14 vessels, 24–40 m length) mainly target saithe in the northern North Sea, but also catch plaice, cod, hake, and haddock. A restructuring took place in this latter fleet segment with the building of two new trawlers and decommissioning of some older vessels. Large pelagic trawlers (five vessels > 40 m length in 2019) operate in the North Sea pelagic and industrial fisheries that primarily target herring but also catch horse mackerel, mackerel, sprat, and sandeel.

Overall, a reduction in the number of vessels was recorded for the German North Sea fishing fleet during the last ten years. Especially the number of smaller beam trawlers (12–18 m length, 35 fewer vessels or −25%) and demersal otter trawlers (18–24 m length, 14 fewer vessels or −50%) decreased. The number of large pelagic trawlers stayed stable with five vessels for the last ten years.

Netherlands

The Dutch fleet in the Greater North Sea consists of about 500 vessels. The main demersal fleet is the beam trawl fleet (275 vessels, of which 85 are > 24 m and 190 are < 24 m) that operates in the southern and central North Sea, targeting sole (dominant in value) and plaice (dominant in volume) as well as other flatfish species. Until the recent EU-wide ban on pulse trawling most of the > 24 m beam trawlers have used pulse trawls. Most of the smaller beam trawlers ("Eurocutters") seasonally target shrimp or flatfish. Pelagic freezer trawlers (seven vessels, > 60 m) target pelagic species, mainly herring, mackerel, and horse mackerel.

Norway

The Norwegian North Sea fleet is composed of about 1500 vessels. Approximately 94% of these catch demersal species, including fish, crustaceans, and elasmobranchs, while 33% catch pelagic species, including herring, blue whiting, mackerel, and sprat (i.e*.* 27% catch both pelagic and demersal species). This contrasts with the respective 78% and 54% fractions observed ten years ago (2009), and is mostly driven by a sharp increase in small vessels (< 11 m) catching demersal species only. Sandeel (by weight) makes up a significant part of the Norwegian fishery in the ecoregion. Over 75% of the fleet are small vessels (< 11 m; up from about 60% over ten years, corresponding to an increase of +445 vessels in this segment) that operate near the Norwegian coast and mostly use traps, pots, shrimp trawls and gillnets, catching mackerel, shrimp, crabs, Norway lobster*,* cleaner wrasses, and several other fish species. Medium-sized vessels (11–24 m) mainly target Norway lobster and crabs using pots and traps; shrimp using trawls; mackerel, horse mackerel, and sprat with purse-seines; and cod, saithe, and other demersal fish using gillnets or trawls. The number of vessels in this segment has dropped by over 35% over the last ten years. Larger vessels represent about 15% of the fleet (6% 24–40 m; 9% > 40 m) and target mostly pelagic fish, such as mackerel, Norway pout, and herring, as well as saithe for reduction purposes and consumption. Ten years ago, larger vessels accounted for over 20% of the fleet (9% 24–40 m; 13% > 40m), which factors in both the increase of the number of small vessels and a slight decrease in the number of vessels > 24 m (−13%). The largest vessels among them (>40 m) are mostly pelagic trawlers and purse-seiners that operate offshore and account for more than 80% of the total landings (up from 75% in ten years; +40% in absolute landing tonnage).

Sweden

The Swedish fleet in the Greater North Sea comprises more than 400 vessels. Most vessels operate in the Skagerrak and Kattegat, but around 25 of them also fish in the North Sea. In total around 130 vessels are involved in demersal trawl fisheries, catching several species in the Kattegat and Skagerrak; mainly Norway lobster, northern shrimp, cod, witch, flounder, and saithe. Around 15 of the demersal vessels also fish in the North Sea, where they mainly target cod, saithe, haddock, and northern shrimp. The fleets using mainly passive gears consists of around 270 vessels, of which most are using pots to target Norway lobster, lobster, and edible crab, but also gillnets and lines targeting both demersal and pelagic species. The Swedish passive gear fisheries are almost exclusively located in the Skagerrak and Kattegat. The pelagic fleet fishing with active gears consists of just over ten vessels that mainly target herring and sprat in the Skagerrak and Kattegat. Most of these vessels also fish for mackerel, herring, and sandeel in the North Sea.

The Swedish fleet has decreased by around 20% since 2009. The reduction was similar for vessels using both active gears and passive gears and for vessels larger than 10 m and those smaller than 10 m. The main reasons for the decline in the fleet are reduced fishing opportunities, poor profitability, scrapping campaigns, and the introduction of annually transferable fishing rights in the demersal fleets in 2017. The fleet reduction is most pronounced in the Skagerrak and Kattegat, whereas the pelagic fleet and the demersal vessels fishing in the North Sea have been rather stable in terms of number of vessels over the last decade.

UK (England)

The English fleet operating in the Greater North Sea ecoregion during 2019 was comprised of 1133 vessels, with a decrease of 33 vessels from 2018. The decrease is part of a longer running trend across many sectors, but most noticeably in the under 10 m fleet, which has reduced by around 200 vessels since 2009.

- The small vessel (< 10 m) sector (around 882 active vessels) operates in the eastern English Channel and coastal North Sea and catches a diversity of fish and shellfish species, with more vessels targeting non-quota shellfish than demersal fish and a small number of vessels (around 25) targeting pelagics.
- The 10–15 m sector has remained relatively stable with a current vessel count of 190 compared to 198 in 2009, although this is a decrease from a maximum of 213 in 2014. Landings from this sector are over 95% non-quota shellfish, with only around 16 vessels targeting finfish.
- The 15–40 m sector is comprised of 70 vessels, falling from 113 in 2009, although this number has been more steady in recent years. This sector predominantly targets cockle and edible crab, with only around 12 vessels targeting demersal finfish.
- There were 12 English vessels over 40 m operating in the North Sea in 2019 and this number has been virtually unchanged since 2009. This largest category of vessel targets finfish, mostly demersal but some pelagic.

UK (Scotland)

The Scottish North Sea fleet comprises around 1000 vessels. More than 120 demersal trawlers (almost all > 10 m) fish for mixed gadoids (cod, haddock, whiting, saithe, and hake,) and for groundfish such as anglerfish and megrim. A fleet of 139 trawlers fish mainly for Norway lobster in the North Sea: 48 of these vessels (< 10 m) operate on the inshore grounds, while 91 (> 10 m) operate over various offshore grounds. Pot or creel fishing is prosecuted by over 650 vessels (mostly < 10 m) targeting lobsters and various crab species on harder inshore grounds. Scallop fishing is carried out by around 80 dredgers (mostly > 10 m). Limited amounts of longlining and gillnetting are also conducted by Scottish vessels. Significant catches of pelagic species are harvested by 18 large vessels, primarily using pelagic trawls.

The Faroe Islands also fish in the Greater North Sea, but ICES does not have information on this fleet.

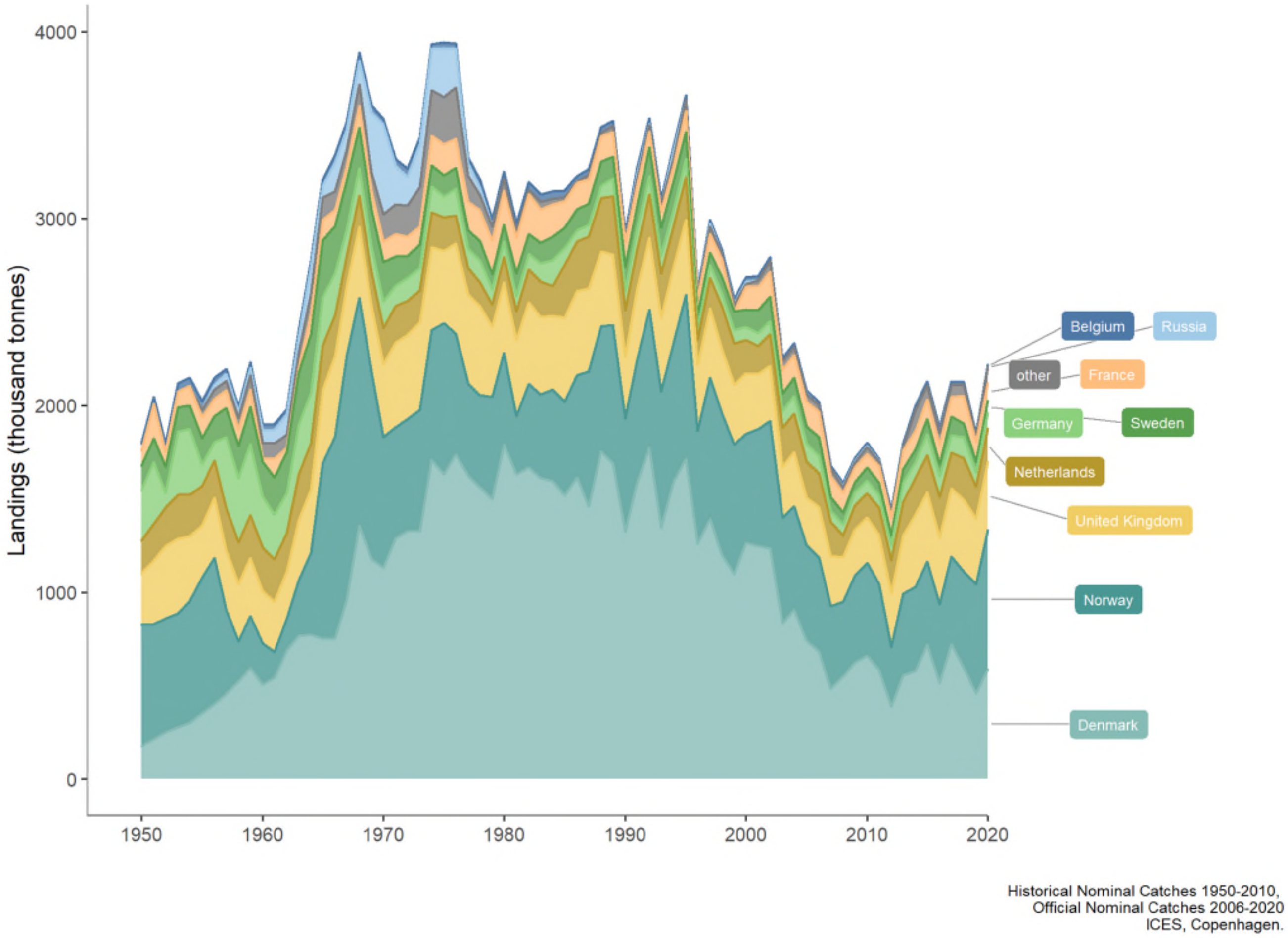


Figure 2 Landings (thousand tonnes) from the Greater North Sea 1950–2020, by country. The nine countries with the highest landings are displayed separately; the remaining countries are aggregated and displayed as "other".

Catches over time

Species caught in the fisheries are either landed or discarded. Landings and discards are considered separately below. Data on landings have been collected consistently for many years, whereas information on discards have only been collected consistently in the most recent years.

Landings

Fisheries in the Greater North Sea catch a large diversity of species. These have been categorized into species that are pelagic, demersal, benthic (e.g. flatfish), crustaceans, and elasmobranchs.

Total landings from the Greater North Sea varied between 2 and 3 million tonnes during the 1950s, then rose to between 3 and 4 million tonnes from the late 1960s to the mid-1990s (Figure 2). High catches of both pelagic species (mackerel and herring) and demersal species (cod and haddock) accounted for the increase in total landings in the late 1960s (figures 3 and 4). The landings shown in Figure 4 only include those species for which ICES gives advice. There are a number of stocks for which ICES does not give advice where landings may be substantial (e.g. Scallop, edible crab, brown shrimp, European lobster, blue mussel). Total landings declined after 1995 to a low of 1.4 million tonnes in 2012. This decline is attributed to overfishing and decreased productivity of important stocks such as cod and herring, but also to the successful reduction of fishing mortality to more sustainable levels after 2000.

Since 2003, the pelagic fisheries using pelagic trawl and purse seines have accounted for the largest proportion of the total landings, followed by the demersal and benthic fisheries (Figure 3). Overall landings increased slightly from 2011 after a rise in herring landings and again, most recently (in 2015), from increased catches of anchovy, sardine, and hake.

Recreational fisheries in the North Sea target a wide range of species, but few of these fisheries are monitored or evaluated. Recreational catches of seabass and salmon (including freshwater for the latter) are significant and are included in ICES assessment of these species. In contrast, the recreational fisheries of elasmobranchs is not widely monitored; however, the recreational harvest of these species (mainly dogfish and several species of skates and rays) appears to be negligible.

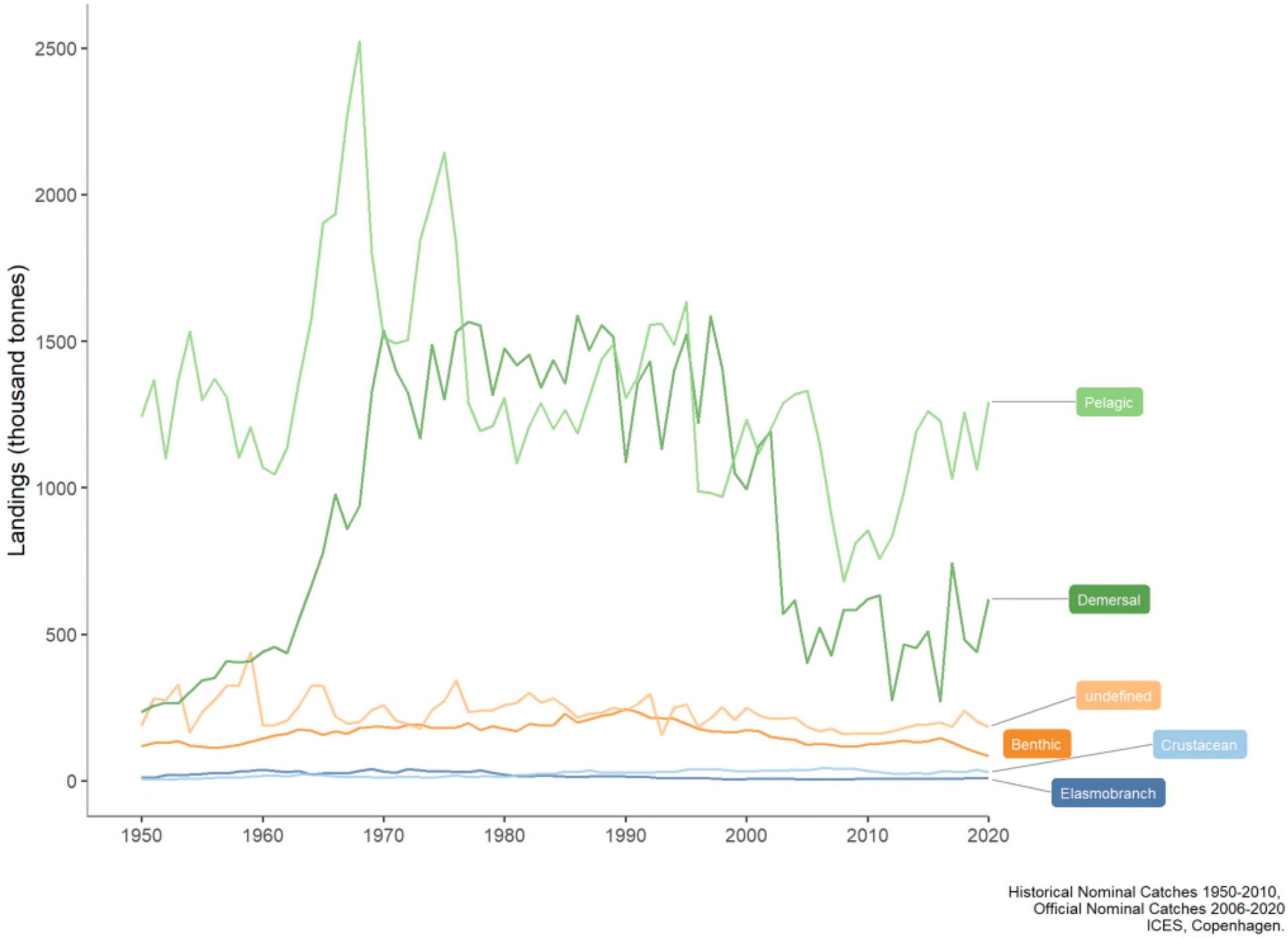


Figure 3 Landings (thousand tonnes) from the Greater North Sea in 1950–2020, by fish category. Table 1 in the Annex details which species belong to each fish category.

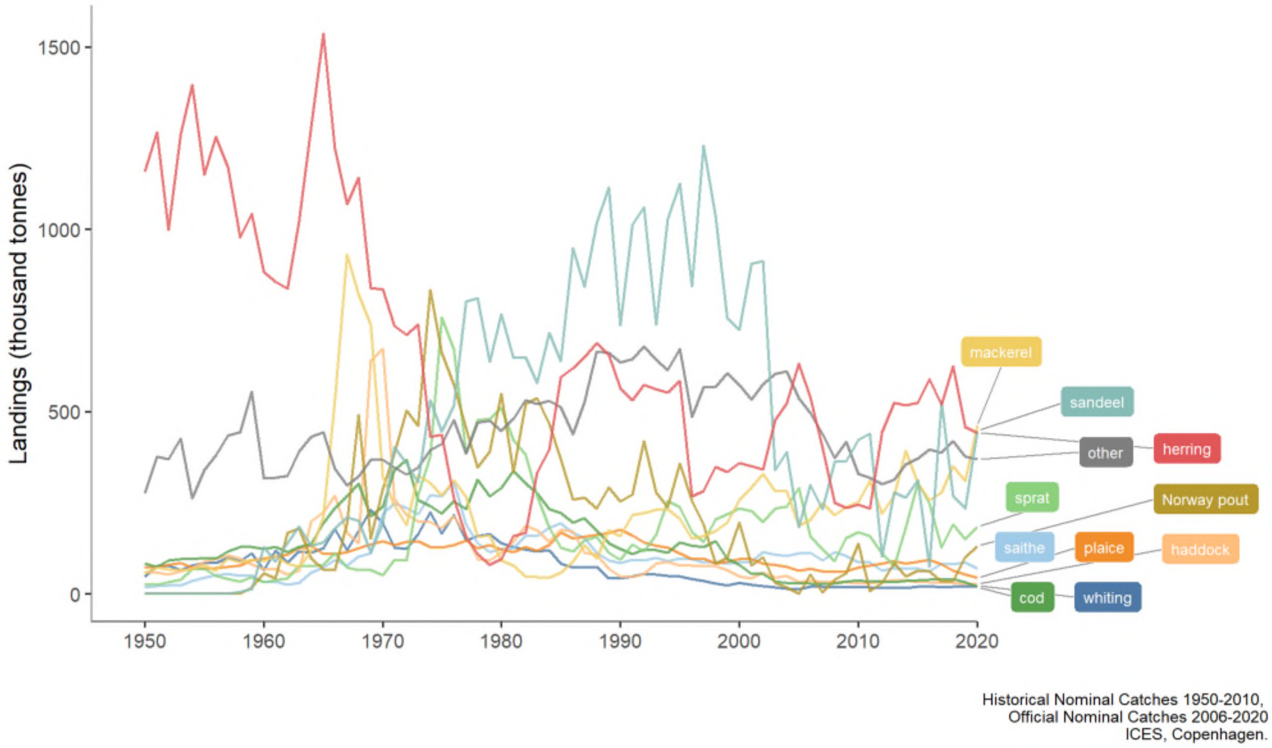


Figure 4 Landings (thousand tonnes) from the Greater North Sea 1950–2020, by species. The ten species with the highest landings are displayed separately; the remaining species are aggregated and labelled as “other”.

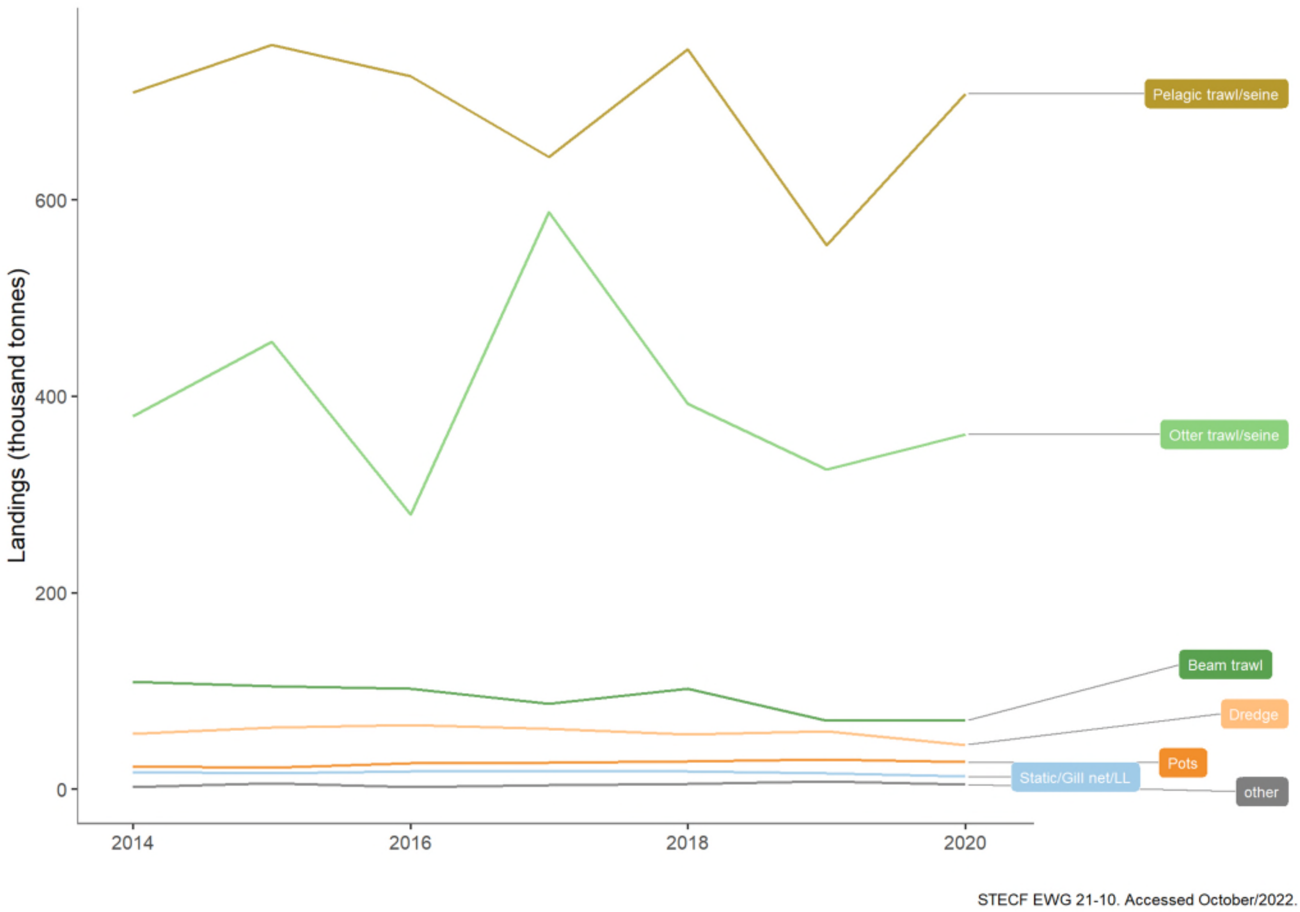


Figure 5 Commercial landings (tonnes) from the Greater North Sea 2015–2020, by gear type.

Discards

Discard data have been collected for some North Sea fisheries since the mid-1970s. Since 2000, discard data from North Sea commercial fisheries have been collected from various observer programmes implemented under the EU Data Collection Framework (DCF), and UK continued that commitment in retained law from 2020 after leaving the EU. However, complete discard data are only available from 2012 onwards. In 2015–2019, discard rates remained relatively stable. Discard rates of pelagic species were close to zero (Figure 6). Discard estimates for several species of elasmobranch are highly uncertain due to low encounter probabilities and so are not shown in Figure 6.

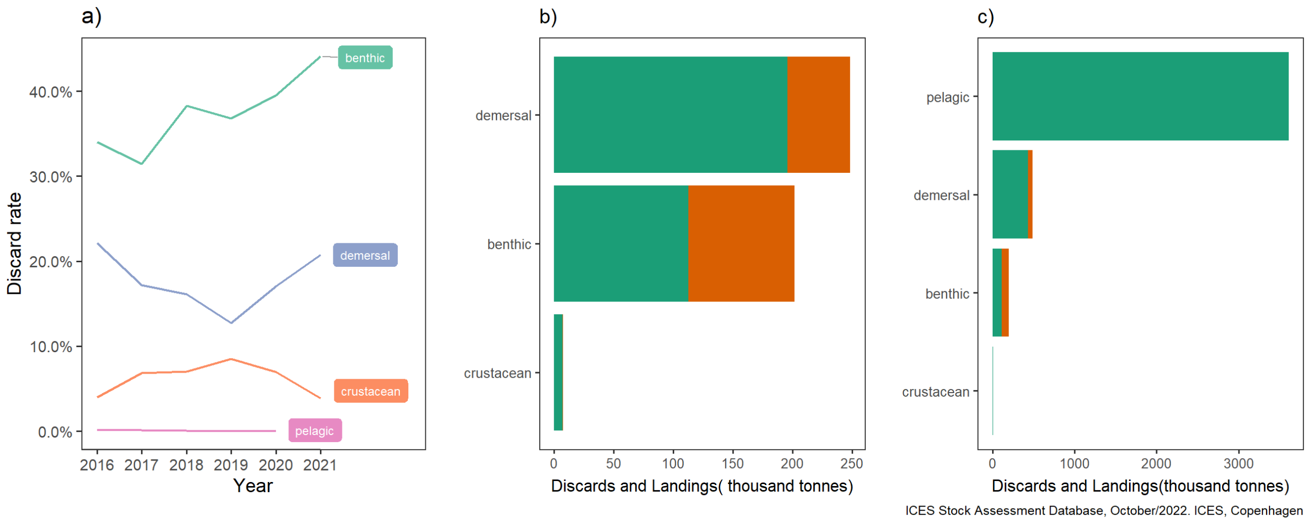


Figure 6 Left panel (a): discard rates 2016–2021 by fish category, shown as percentages (%) of the total annual catch in that category. Middle panel (b): landings (green) and discards (orange) in 2021 by fish category (in thousand tonnes) only of those stocks with recorded discards. Right panel (c): landings (green) and discards (orange) in 2021 by fish category (in thousand tonnes) of all stocks. (Note that not all stock catches are disaggregated between landings and discards.) Elasmobranch data are highly uncertain and therefore not presented here.

Description of the fisheries

Fishery resources in the Greater North Sea ecoregion are harvested using a variety of fishing gears.

Otter trawl and beam trawls are the main gears used in the region's demersal fisheries, and pelagic trawls and seines are the primary gears used in the pelagic fisheries.

The spatial distribution of fishing effort by gear type is depicted in Figure 7. The maps show the distribution of effort by vessels >12 m having vessel monitoring systems (VMS). Fishing effort by vessels < 12 m may be significant, especially in inshore areas. However, these vessels are not required to have VMS, and ICES does not have information on the spatial distribution of their effort; they are therefore not included in Figure 7.

Some coastal waters in the Greater North Sea ecoregion have fisheries targeting resident immature eels or migrating spawners. In addition, there are also fisheries targeting resident or migrating eel in some transitional waters.

Bottom otter trawl and seine

Otter trawls are the most common gear types in the Greater North Sea and are used intensively in most parts of the region, including the Skagerrak and the English Channel. Otter trawls typically catch gadoids, other groundfish, plaice, and Norway lobster; however, the species composition of the catch depends on the area and depth fished and the gear design, including codend mesh size. The mixed nature of most of the bottom fisheries and the spatial and temporal heterogeneity of target species challenge the simultaneous achievement of individual stock maximum sustainable yield (MSY) objectives, as well as the limitation of unwanted catches.

In the northern North Sea and the Skagerrak, otter trawls operate primarily with mesh sizes greater than 100 mm and target haddock, cod, whiting, anglerfish, megrim, and plaice, with economically important bycatches of Norway lobster and some flatfish species. Some vessels target saithe in deeper waters in the north of the region. Otter trawlers using smaller mesh otter trawls (70–100 mm) primarily target Norway lobster in soft mud areas. The proportion of Norway lobster landings from mesh sizes greater than 100 mm has recently been increasing.

In the southern North Sea and the eastern English Channel, the otter trawl fleet operates with mesh sizes less than 100 mm, catching a varied mix of fish and shellfish species (including cephalopods) and, in muddy areas, Norway lobster .

Bottom seine fisheries operate mainly in the Skagerrak, central North Sea, and in the eastern English Channel, with limited effort in the northern North Sea. Mesh sizes and targeted species are similar to the otter trawl fisheries in these areas.

Fisheries for northern shrimp, using otter trawl with mesh sizes larger than 35 mm, takes place in the deeper part of the northeastern North Sea and Skagerrak.

Beam trawl

Beam-trawl fisheries operate in the shallow parts of the southern and central North Sea, with particularly intense activity off the southeast coast of England. The most important species for beam trawlers are sole and plaice in terms of value and volume, respectively, and other flatfish species (e.g. turbot and brill). Because a relative small codend mesh size (80 mm) is used in beam trawls targeting flatfish, significant quantities of fish below minimum sizes are caught, resulting in high discard rates. Many small beam trawlers (< 24 m) also engage in targeted brown shrimp fishing in the southern North Sea and coastal areas using a 20–25 mm codend mesh size.

Part of the beam-trawl fleet had for several years moved from conventional beam trawls to electric pulse trawl in order to reduce fuel costs, seabed impacts, and unwanted catches. Following a change in European Union legislation (2019/1241), these vessels have started to convert back to conventional gears in preparation for the prohibition of electric pulse trawls in divisions 4.b and 4.c as of 1 July 2021.

Static gear (gillnet and longline)

Gillnet fisheries primarily operate in the shallower areas of the southern North Sea, the eastern English Channel, and the Skagerrak. Small and medium-sized vessels target flatfish and demersal fish, depending on the gear used. Gillnet fisheries conducted in deeper areas also target anglerfish. Discard rates in gillnet fisheries with larger mesh sizes (>100 mm) are generally low; however, bycatch of marine mammals and seabirds occurs. Gillnet fisheries with smaller mesh sizes (90 mm) usually target sole and may have considerable discard rates of dab.

Longline fisheries operate mostly in the northern North Sea and target saithe, cod, haddock, ling, and tusk.

Pelagic trawl and pelagic seine

Pelagic trawl and seine fisheries operate throughout most parts of the North Sea, except in the eastern portion of the central North Sea. The small-meshed (< 32 mm codend) pelagic trawl targets sandeel, Norway pout, sprat, and blue whiting for reduction purposes. The pelagic trawl fishery for human consumption is operated by refrigerated seawater trawlers (>40 m) and freezer trawlers (>60 m) and targets herring, mackerel, and horse mackerel. Some blue whiting is taken by these vessels in the northern North Sea.

Dredges

Significant dredge fisheries for scallop occur in inshore areas along the east coasts of Scotland and England and throughout the English Channel. These fisheries primarily occur on sand and gravel substrates and are affected by exclusion zones that protect sensitive habitats in some areas. Dredges are also used to harvest blue mussel in the nearshore southern and eastern North Sea.

Pots

Static gear pot fisheries, mainly for edible crab, lobster, and whelk operate in the inshore areas of several countries bordering the North Sea. Most of the vessels are small (< 10 m) however removals by larger (> 15 m) vessels can be substantial.

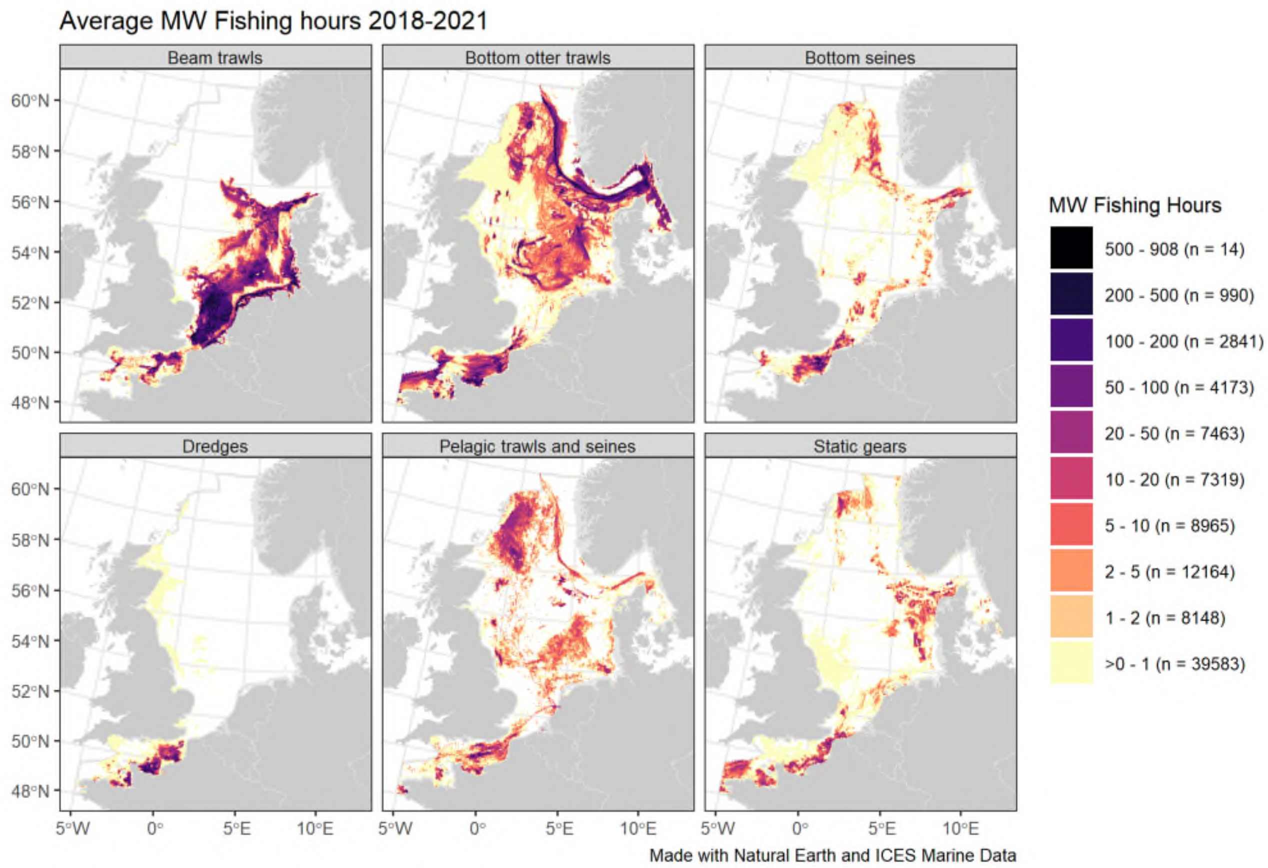


Figure 7 Spatial distribution of average annual fishing effort (MW fishing hours) in the Greater North Sea, by gear type. Fishing effort data are only shown for vessels >12 m with vessel monitoring systems (VMS)[†].

Fisheries management

Fisheries management in the Greater North Sea is conducted partly under the EU Common Fisheries Policy (CFP), partly under UK legislation, and partly under Norwegian legislation. Within UK and EU waters, catching opportunities for stocks under shared UK and EU competency are agreed during bilateral negotiations. For operations in EU waters, the CFP's regionalization policy implies that proposals on certain technical issues (for example discard plans) are made by the North Sea Regional Fisheries Group (Scheveningen Group). Since exiting the EU in 2021, UK now sets the rules on technical measures for operations in UK waters. National authorities manage activities in coastal waters (i.e. within 12 nautical miles) and activities on stocks under national competency (e.g. most shellfish stocks). In Norwegian waters, management of fishing activities in both offshore and inshore waters is conducted in accordance with Norwegian fisheries policy. For North Sea stocks shared between the EU, UK, and Norway (cod, haddock, whiting, saithe, herring, plaice, northern shrimp, and sprat), agreements are based on an annual trilateral negotiation process agreeing on catch opportunities and the sharing of these. For more widely distributed stocks that occur in the North Sea (for example mackerel), management is discussed in coastal state consultations.

[†] Details on countries submitting data can be found at https://data.ices.dk/accessions/allaccessions.aspx?search=vms

The North Atlantic Salmon Conservation Organization (NASCO) has managerial responsibility for the fisheries of salmon. Management of fisheries for large pelagic fish (e.g. tunas, etc.) is undertaken by the International Commission for the Conservation of Atlantic Tunas (ICCAT).

Collective fisheries advice, particularly on the state of stocks and on catch forecasts, is provided by ICES. Within EU waters, STECF provides broader advice that also covers technical and economic issues. Furthermore, the North Sea and Pelagic Advisory Councils also provide input to the management process.

Management plans

Several of the demersal stocks in the North Sea are shared between EU, UK, and Norway. For shared stocks where there is no agreed management plan that ICES has evaluated to be precautionary, ICES advice is based on the MSY approach. In the case of the Greater North Sea, no agreed, precautionary management plans are in place. Under the EU's CFP, a multiannual plan (MAP; 2016/0238) has been put in place for the North Sea (EU, 2018). This seeks to implement the MSY policy adopted under the CFP, following best scientific advice. This is done while having due regard to the fact that many species are caught together and that some of the species caught are not targeted but bycatch. Implementing the MSY principles has meant that target species are identified under the plans (species not listed as target are implicitly considered as bycatch) and that TACs are set on these species within a range about F_{MSY}, although the upper part of the range can only be used under the conditions set out in the MAP. On leaving the EU, the UK incorporated elements of the EU MAP into national legislation. For stocks not shared with UK or Norway ICES advice is based on the MAP. Both Norway and the UK are also developing new fishery management plans for North Sea stocks in its waters.

Status of the fishery resources

Fisheries exploitation and spawning-stock sizes of those North Sea stocks that are assessed by ICES have been evaluated against MSY and precautionary approach (PA) reference points, and the most recent status of these stocks is presented relative to safe biological limits (figures 8 and 9). Most (30 of 45) of the North Sea stocks that are analytically assessed are exploited at rates at or below F_{MSY}. Mean fishing mortality for crustacean, demersal, and benthic fish stock groups have declining trends since the late 1990s (Figure 10), but the mean F/F_{MSY} ratio remains above 1 for the demersal stocks. The status for spawning-stock biomass (SSB) is in general good, with mean SSB /MSY $B_{trigger}$ above 1 for all groups of stocks. Note that though the mean fishing mortality and biomass ratios are in a desirable condition, this does not imply that all stocks are in that condition. However, several North Sea stocks have current fishing mortality rates above F_{MSY} (e.g. two sole stocks, saithe and blue whiting; see figures 10 and 11). For stock-specific information, see Table A1 in the Annex.

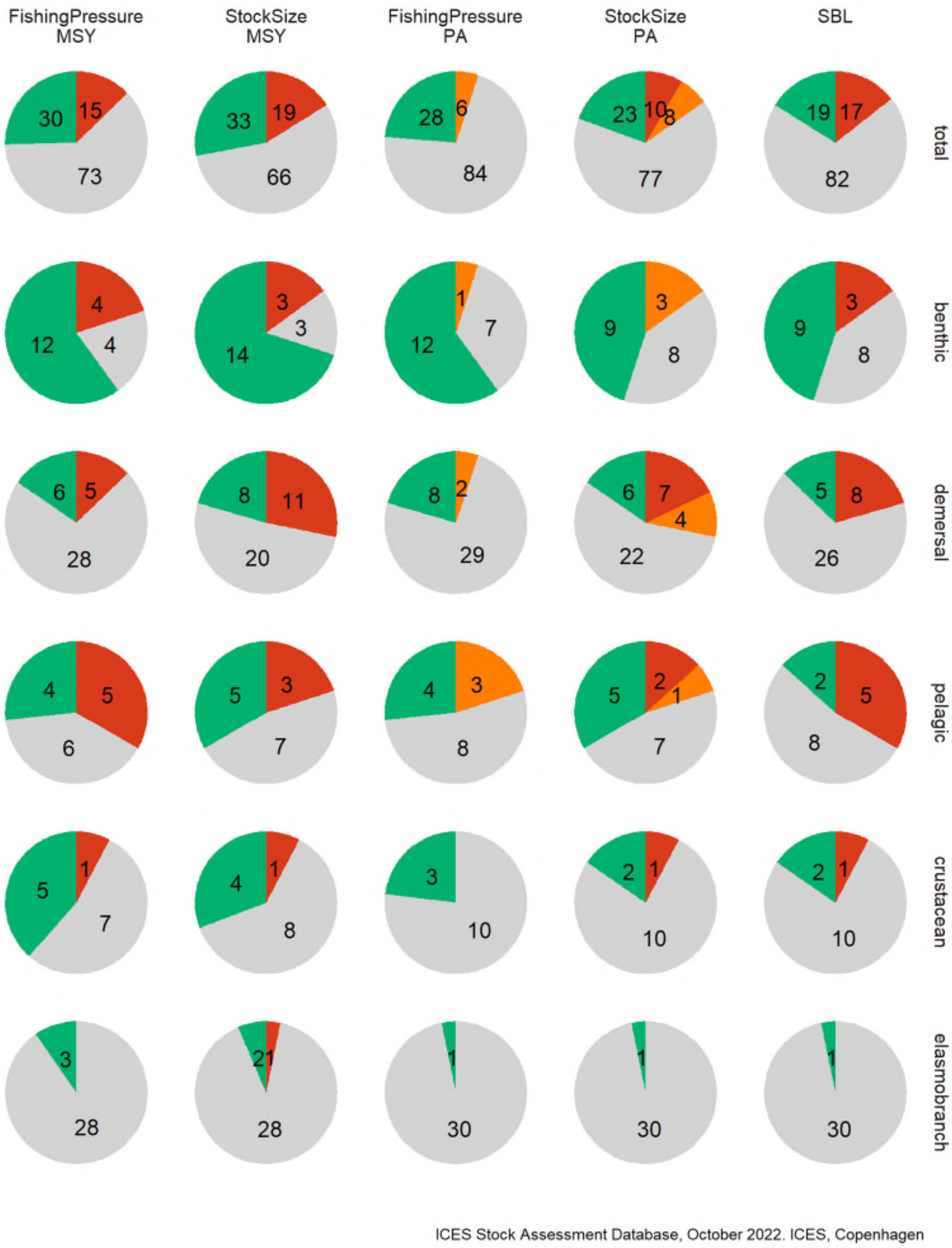
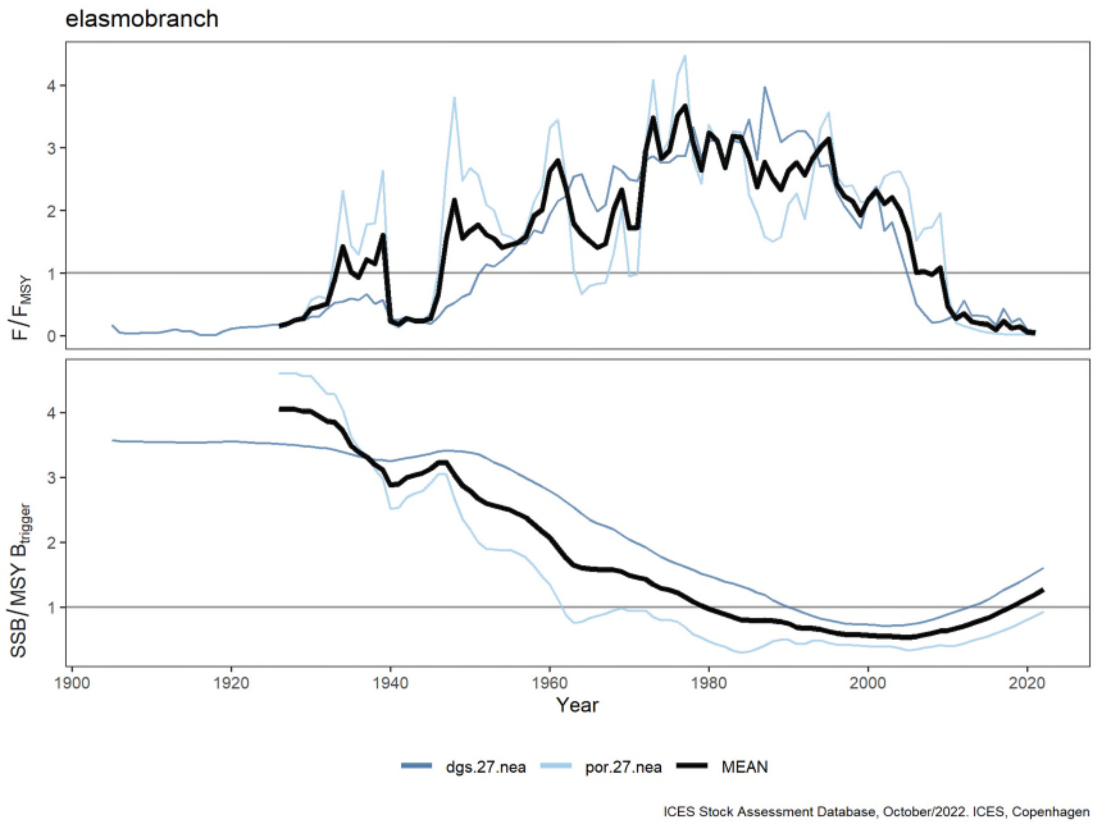
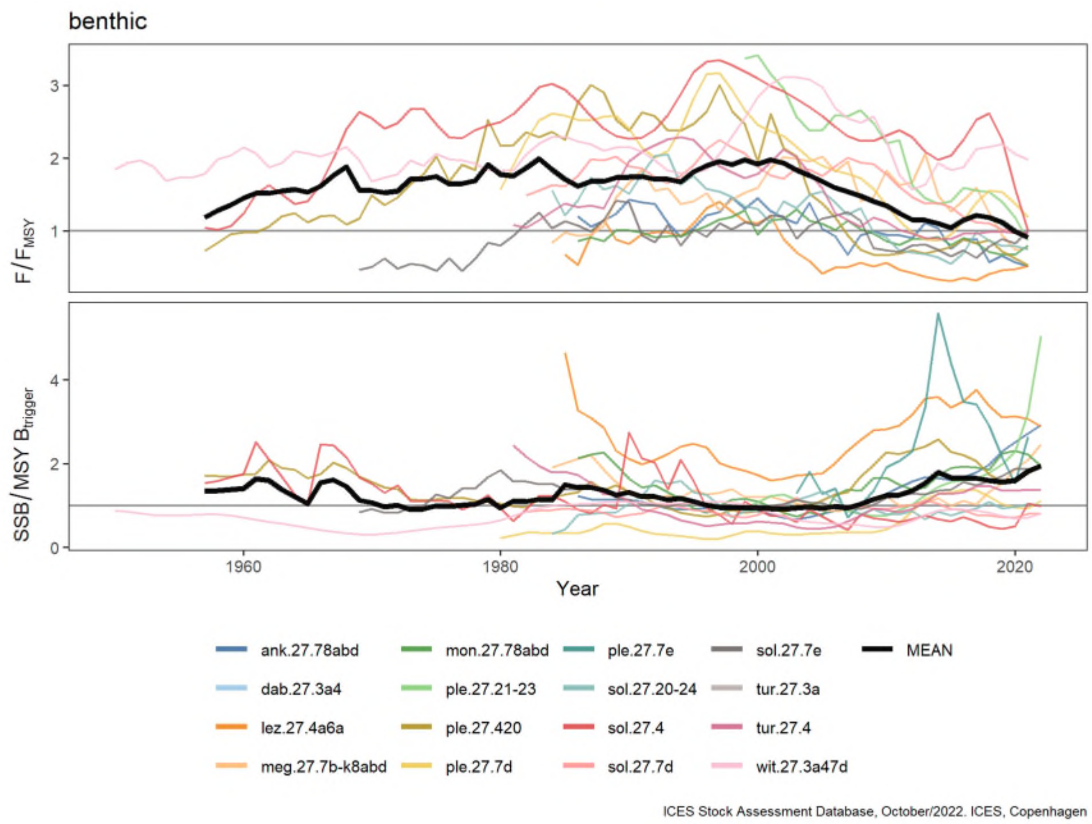


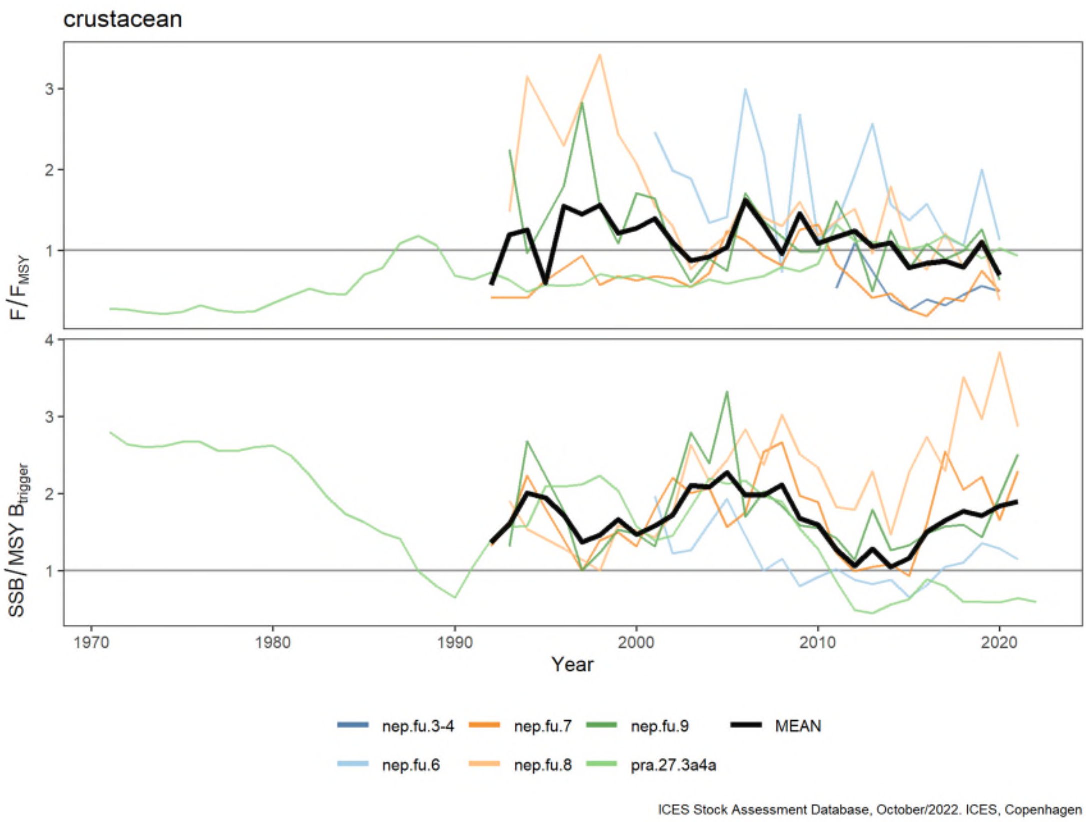
Figure 8 Status summary of Greater North Sea stocks relative to ICES maximum sustainable yield (MSY) approach and precautionary approach (PA). For the MSY approach: green represents a stock that is fished at or below F_{MSY} while its size is equal to or greater than MSY $B_{trigger}$; red represents a stock status that is fished above F_{MSY} or whose size is lower than MSY $B_{trigger}$. For the PA: green represents a stock that is fished at or below F_{pa} while its size is equal to or greater than B_{pa}; orange represents a stock that is fished between F_{pa} and F_{lim} or whose size between B_{lim} and B_{pa}; red represents a stock that is fished above F_{lim} or whose size is lower than B_{lim}. Stocks with a fishing mortality at or below F_{pa} and a size at or 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. Grey represents unknown reference points For stock-specific information, see Table A1 in the Annex.

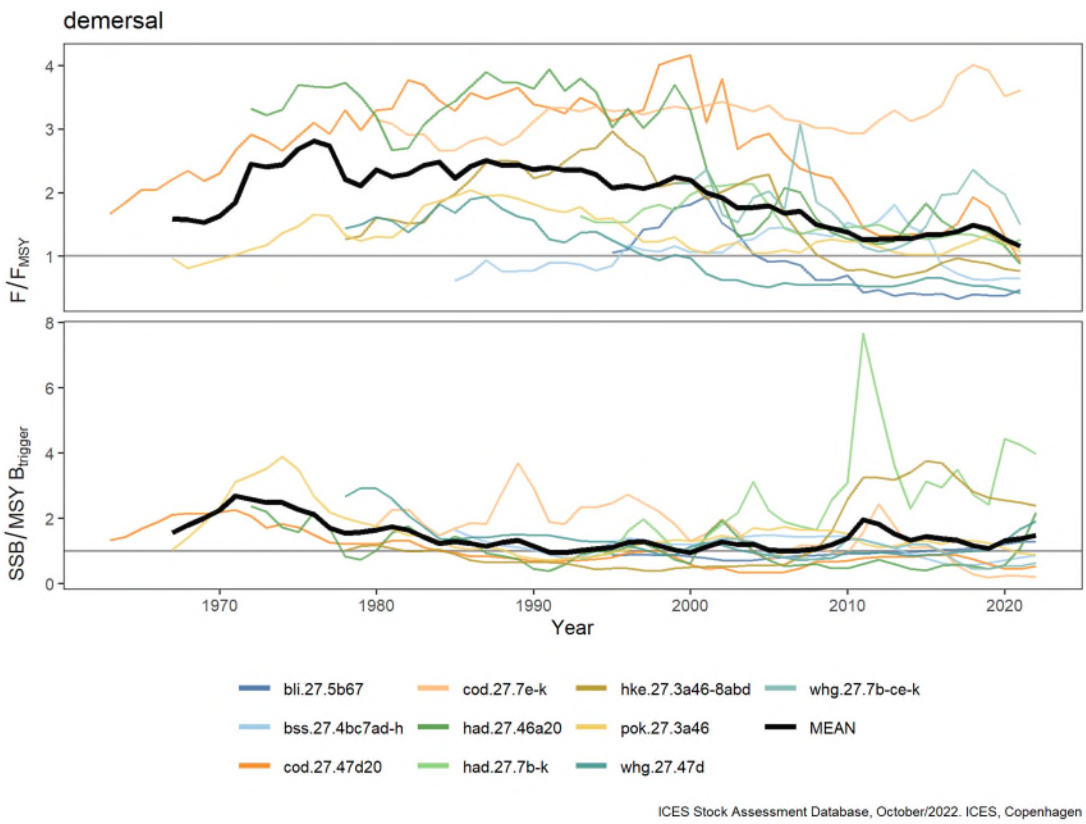
Figure 9 Status summary of Greater North Sea stocks in 2022 relative to the EU Marine Strategy Framework Directive (MSFD) good environmental status (GES) assessment criteria of fishing pressure (D3C1) and stock reproductive capacity (D3C2). Green represents the proportion of stocks fished below F_{MSY} or where stock size is greater than MSY $B_{trigger}$, for criteria D3C1 and D3C2. Red represents the proportion of stocks fished above F_{MSY} or where stock size is lower than MSY $B_{trigger}$ for criteria D3C1 and D3C2. Grey represents the proportion of stocks lacking MSY reference points. For stock-specific information, see Table A1 in the Annex.

Temporal trends (1960 onwards) in F and spawning-stock biomass (SSB) relative to MSY reference points are shown in figures 8 and 9 for North Sea benthic, crustacean, demersal, and pelagic stocks. For most benthic and demersal stocks, marked improvements in stock status (i.e. having SSB greater than MSY $B_{trigger}$) have occurred since 2000 as F has been reduced. There are no obvious trends in pelagic species. For crustaceans, annual changes in stock status have been more variable and there is a less obvious trend in F reductions.


elasmobranch
F/F_MSY
SSB/MSY B_trigger
Year
dgs.27.nea
por.27.nea
MEAN
ICES Stock Assessment Database, October/2022. ICES, Copenhagen


benthic
F/F_MSY
SSB/MSY B_trigger
Year
ank.27.78abd
dab.27.3a4
lez.27.4a6a
meg.27.7b-k8abd
mon.27.78abd
ple.27.21-23
ple.27.420
ple.27.7d
ple.27.7e
sol.27.20-24
sol.27.4
sol.27.7d
sol.27.7e
tur.27.3a
tur.27.4
wit.27.3a47d
MEAN
ICES Stock Assessment Database, October/2022. ICES, Copenhagen


crustacean
F/F_MSY
SSB/MSY B_trigger
Year
nep.fu.3-4
nep.fu.7
nep.fu.9
MEAN
nep.fu.6
nep.fu.8
pra.27.3a4a
ICES Stock Assessment Database, October/2022. ICES, Copenhagen


demersal
F/F_MSY
SSB/MSY B_trigger
Year
bli.27.5b67
cod.27.7e-k
hke.27.3a46-8abd
whg.27.7b-ce-k
bss.27.4bc7ad-h
had.27.46a20
pok.27.3a46
MEAN
cod.27.47d20
had.27.7b-k
whg.27.47d
ICES Stock Assessment Database, October/2022. ICES, Copenhagen

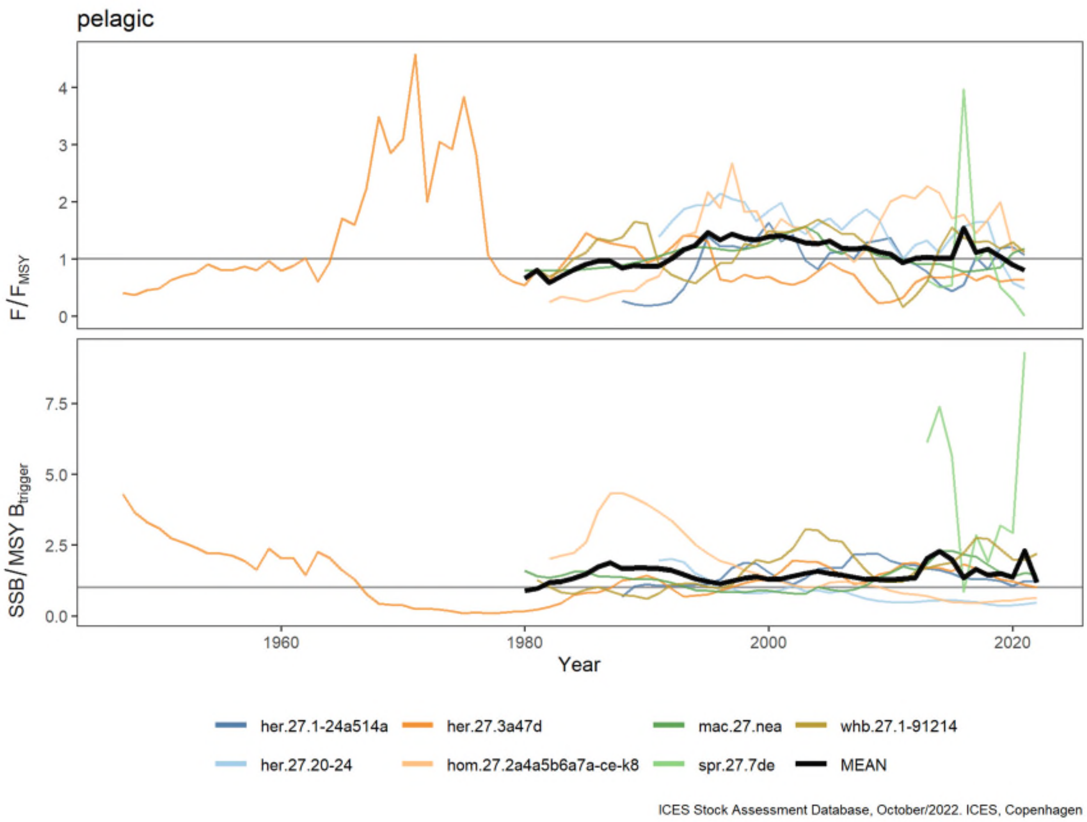
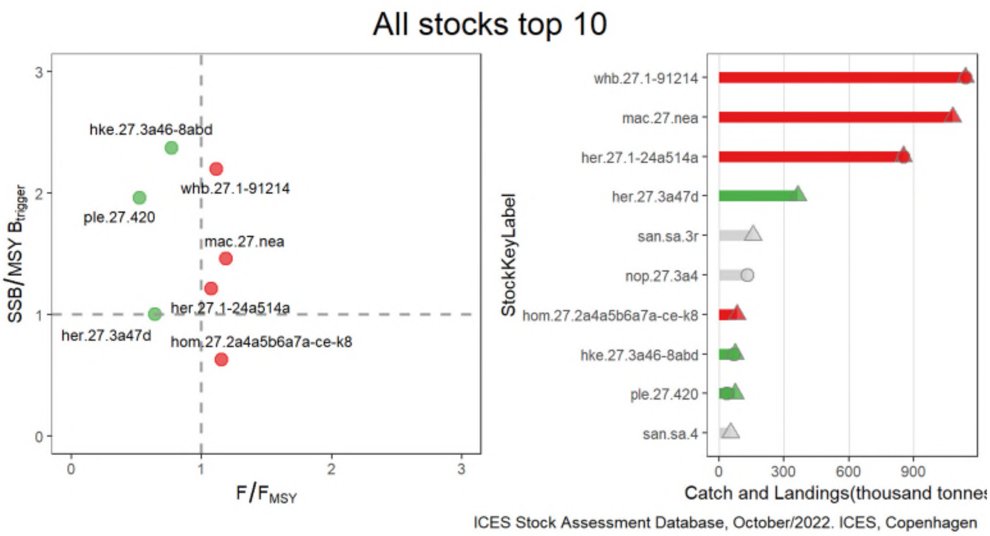
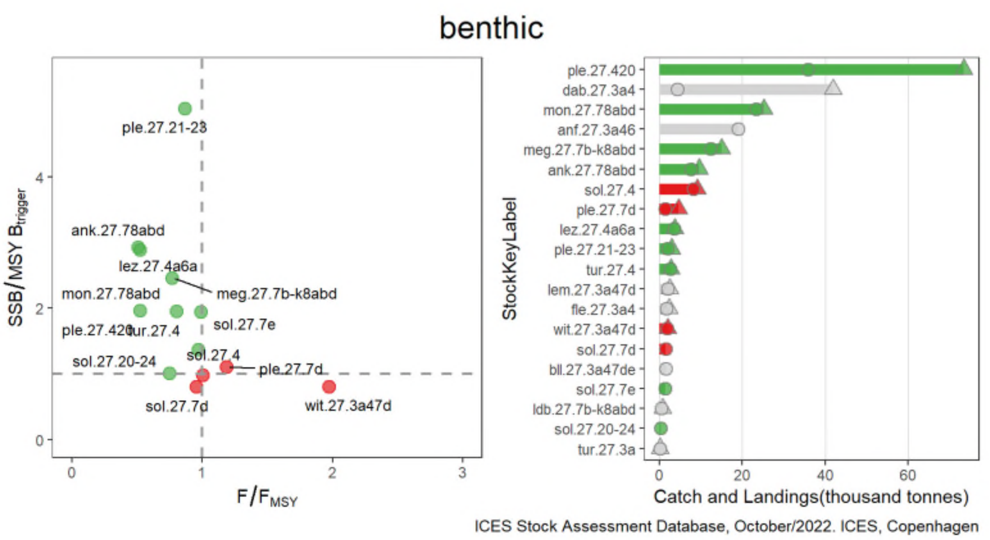
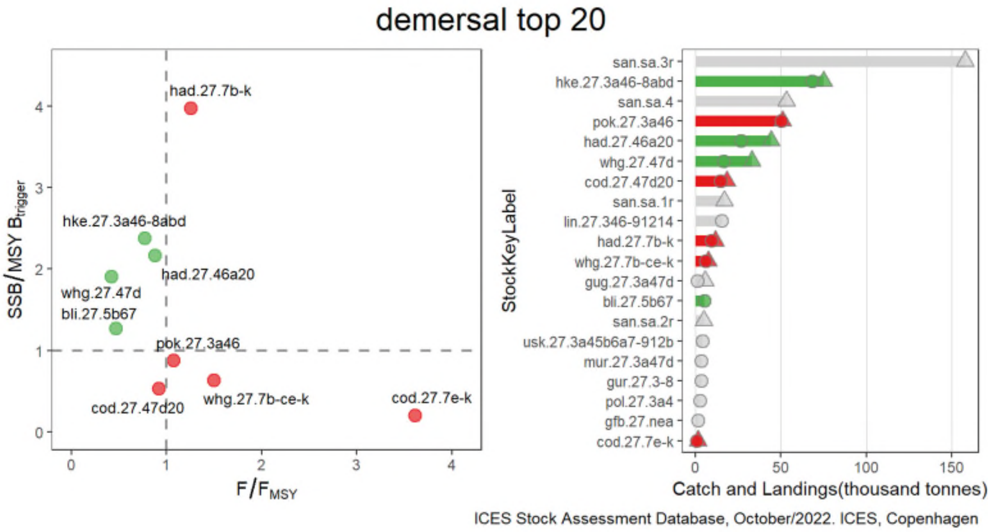


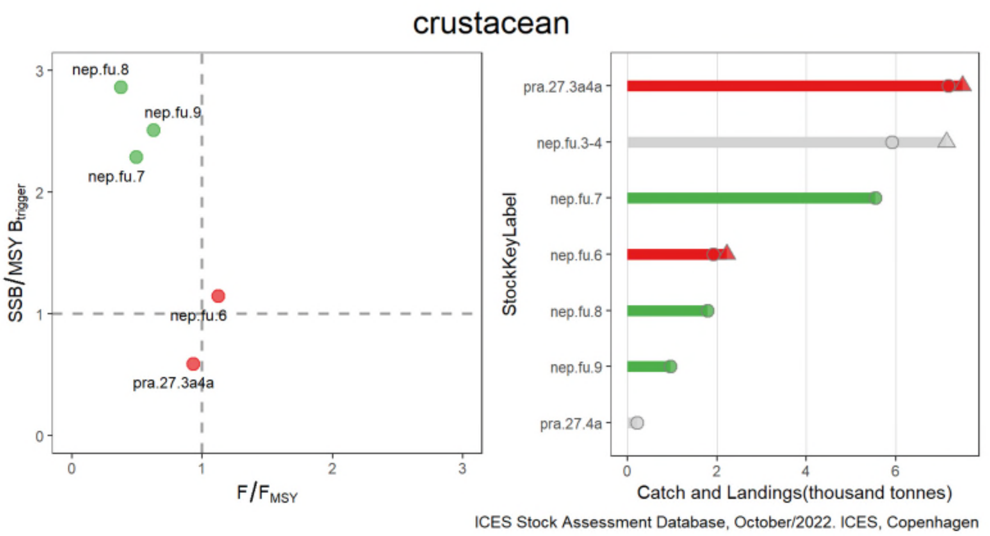
Figure 10 Temporal trends in F/F_{MSY} and SSB/MSY $B_{trigger}$ for North Sea benthic, crustacean, demersal, and pelagic stocks. Only stocks with defined MSY reference points are considered. For full stock names, see Table A1 in the Annex.

The stock status relative to F_{MSY} and MSY $B_{trigger}$ are shown for all stocks and partitioned by stock groups in Figure 11. Several stocks have a high SSB relative to MSY $B_{trigger}$ (e.g. hake, *Nephrops* [functional units – FUs – 7, 8, and 9], and plaice) and are fished below F_{MSY}. Five stocks (cod in 7e-k, saithe, witch flounder, horse mackerel in 2a4a5b6a7a-c,e-k, and Celtic Sea whiting) are in the bottom-right quadrant with their SSB below MSY $B_{trigger}$ and F > F_{MSY}. This indicates that these stocks need to be rebuilt and that fishing mortality remains too high. Note that the Celtic Sea whiting stock is mainly distributed outside the Greater North Sea ecoregion. The first, second, and third ranked stocks in terms of landings – blue whiting, mackerel, and herring in subareas 1, 2, and 5 and divisions 4.a and 14.a – are located in the top-right quadrant, indicating that fishing mortality is higher than F_{MSY} although stock size remains above MSY $B_{trigger}$. Herring in Subarea 4 and divisions 3.a and 7.d (ranks fourth) and plaice in the North Sea and Skagerrak (ranks ninth) are located in the upper-left quadrant, indicating good stock status for both F_{MSY} and MSY $B_{trigger}$.


All stocks top 10
SSB/MSY $B_{trigger}$
F/F_{MSY}
hke.27.3a46-8abd
whb.27.1-91214
ple.27.420
mac.27.nea
her.27.1-24a514a
her.27.3a47d
hom.27.2a4a5b6a7a-ce-k8
StockKeyLabel
san.sa.3r
nop.27.3a4
san.sa.4
Catch and Landings(thousand tonnes
ICES Stock Assessment Database, October/2022. ICES, Copenhagen


benthic
SSB/MSY $B_{trigger}$
F/F_{MSY}
ple.27.21-23
ank.27.78abd
lez.27.4a6a
meg.27.7b-k8abd
mon.27.78abd
sol.27.7e
ple.27.420
tur.27.4
sol.27.4
sol.27.20-24
ple.27.7d
sol.27.7d
wit.27.3a47d
StockKeyLabel
dab.27.3a4
anf.27.3a46
lem.27.3a47d
fle.27.3a4
bll.27.3a47de
ldb.27.7b-k8abd
tur.27.3a
Catch and Landings(thousand tonnes)
ICES Stock Assessment Database, October/2022. ICES, Copenhagen


demersal top 20
SSB/MSY $B_{trigger}$
F/F_{MSY}
had.27.7b-k
hke.27.3a46-8abd
had.27.46a20
whg.27.47d
bli.27.5b67
pok.27.3a46
cod.27.47d20
whg.27.7b-ce-k
cod.27.7e-k
StockKeyLabel
san.sa.3r
san.sa.4
san.sa.1r
lin.27.346-91214
gug.27.3a47d
san.sa.2r
usk.27.3a45b6a7-912b
mur.27.3a47d
gur.27.3-8
pol.27.3a4
gfb.27.nea
Catch and Landings(thousand tonnes)
ICES Stock Assessment Database, October/2022. ICES, Copenhagen


crustacean
SSB/MSY $B_{trigger}$
F/F_{MSY}
nep.fu.8
nep.fu.9
nep.fu.7
nep.fu.6
pra.27.3a4a
StockKeyLabel
nep.fu.3-4
pra.27.4a
Catch and Landings(thousand tonnes)
ICES Stock Assessment Database, October/2022. ICES, Copenhagen

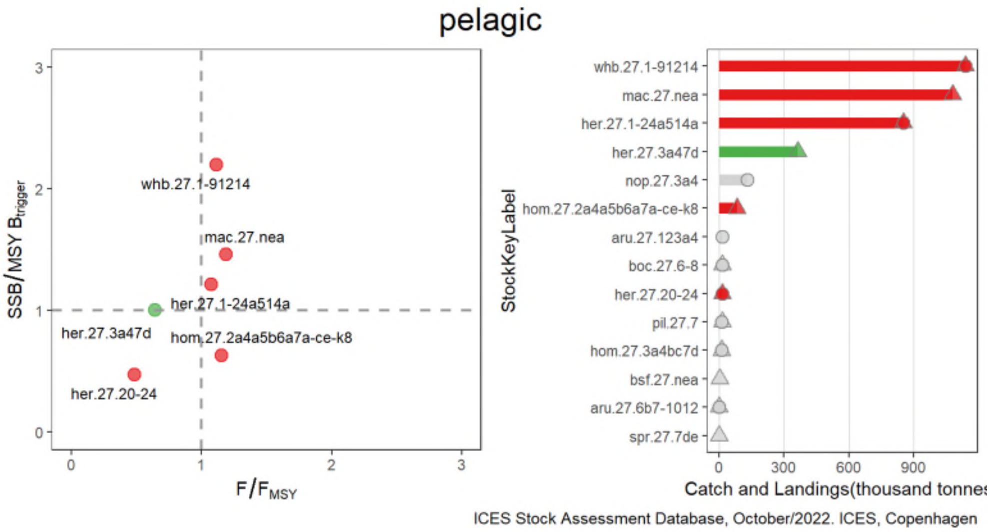


Figure 11 Status of North Sea stocks relative to the joint distribution of exploitation (F/F_{MSY}) and stock size (SSB/ MSY $B_{trigger}$ [left panels, by individual stocks]) and catches (triangles)/landings (circles) from the latest advice of these stocks [right panels]. The left panels only include stocks for which MSY reference points have been defined (MSY where available). Stocks in green are exploited at or below F_{MSY} while their size is also at or above MSY $B_{trigger}$. Stocks in red are either exploited above F_{MSY} or their size is below MSY $B_{trigger}$, or both. Stocks in grey have unknown/undefined status in relation to reference points or they have not updated advice this year. “All stocks” refers to the ten stocks with highest catch and landings across fisheries guilds in 2021. For full stock names, see Table A1 in the Annex.

Several of the stocks such as North Sea sprat, sandeel, and Norway pout are short-lived species that experience high natural mortality. ICES MSY approach for these stocks is aimed at achieving a high probability of having a minimum biomass left to spawn the following year so that the stock is capable of producing MSY. For catch advice, ICES uses a different approach than for longer-lived species and defines a biomass reference point, MSY $B_{escapement}$, which is the biomass that should remain after the fishery has taken place. For some short-lived stocks, an F reference point, F_{cap}, is also used to limit exploitation when biomass is high as large biomasses are often estimated with greater uncertainty.

For some short-lived species, assessments are so sensitive to incoming recruitment that the amount of biomass in excess of the target escapement cannot be reliably estimated until data are available on the incoming year class. In such cases, ICES catch advice is often provided just prior to, or at the beginning of, the fishing season.

A consequence of this approach is that the reference points for short-lived stocks cannot be readily compared and dealt with in the same way as those for longer-lived stocks. In Figure 11, this is reflected in the short-lived species being assigned a grey colouration. However, this does not mean that little is known about these stocks, or that they are incapable of producing MSY.

European eel cannot be assessed against any PA or MSY reference points. Recruitment of the species has declined sharply in recent decades. The non-fishing anthropogenic mortality factors affecting European eel are: (a) hydropower, pumping stations, and other water intakes; (b) habitat loss or degradation; (c) pollution, diseases, and parasites; and (d) other management actions that may affect levels of predation (e.g. conservation vs. control of predators).

Mixed fisheries

Mixed-fisheries advice considerations

In 2022, mixed-fisheries advice considerations are available for cod (cod.27.47d20), haddock (had.27.46a20), plaice (ple.27.420 and ple.27.7d), saithe (pok.27.3a46), sole (sol.27.4 and sol.27.7d), turbot (tur.27.4), whiting (whg.27.47d), witch (wit.27.3a47d), and Norway lobster (FUs 5–10, 32, 33, 34, and Subarea 4 outside of the FUs).

Based on current fishing patterns and single-stock catch advice, the most limiting stock for North Sea demersal fisheries is witch, whose advised catch for 2023 is first reached for 36 of 46 defined fleets. Whiting is the least limiting stock in 35 of 46 fleets making it overall the least limiting stock.

The forecasted effort variation for 2023 based on current fishing patterns and single-stock catch advice is shown in Figure 12. The advised catches for these stocks imply very different changes in effort level in 2023 relative to *status quo*. The largest reduction in effort across most fleets relative to *status quo* is seen for witch, which is the most limiting stock for North Sea demersal fisheries (the stock where catch advice implies the lowest level of effort by the fleets). Other stocks which show a reduction in effort across most fleets are sole (North Sea and eastern Channel), cod, and Norway lobster in FUs 6, 33, and 34. Conversely, an increase in effort is seen across most fleets for haddock, North Sea plaice, turbot, whiting and Norway lobster in FUs 7–9, 10, and 32. Little change from *status quo* effort is seen for eastern Channel plaice, saithe and Norway lobster in FU 5.

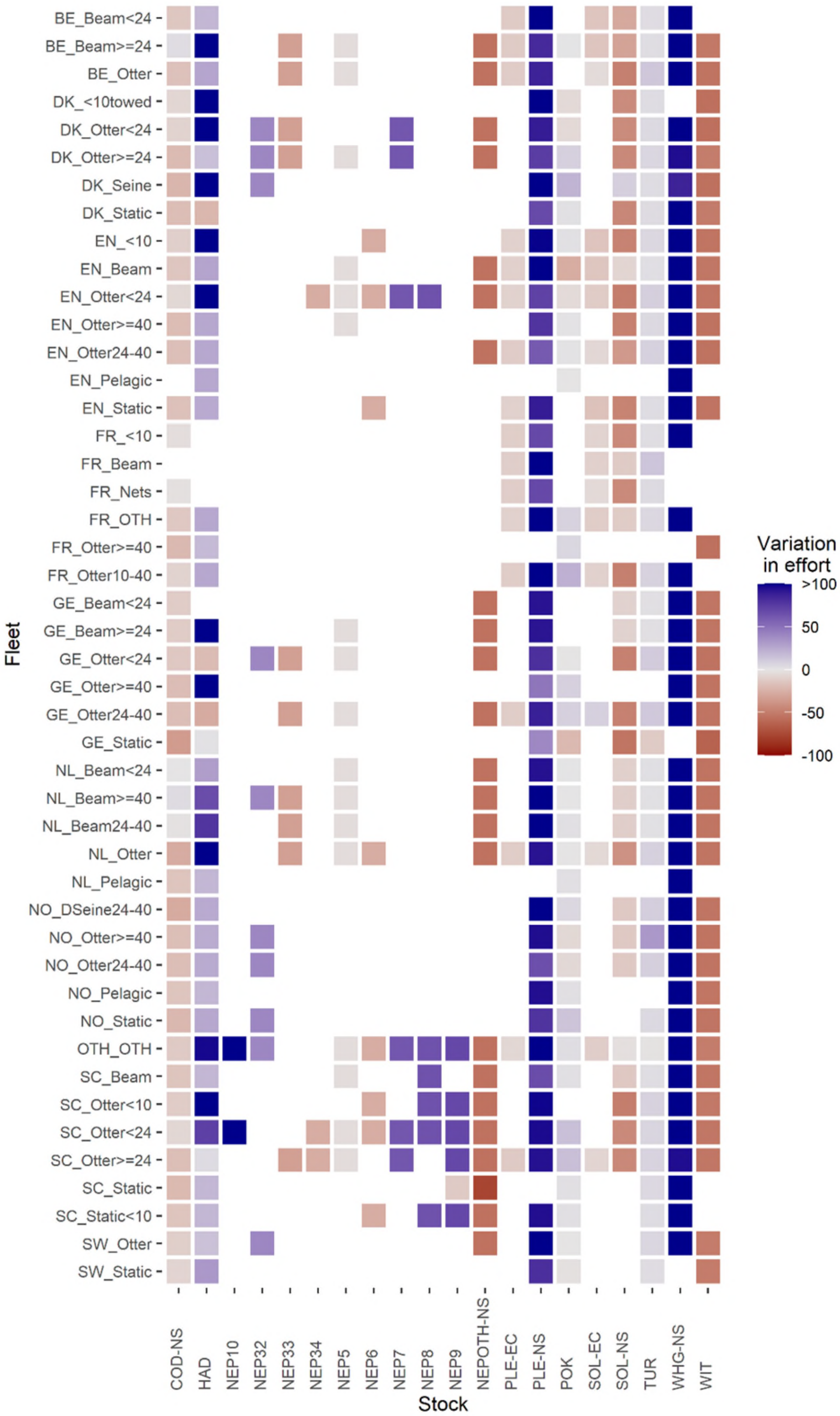


Figure 12 North Sea mixed fisheries. Percentage difference between *status quo* fishing effort and forecast 2023 effort for full quota uptake by fleet and stock. Visual presentation is restrained to ±100%. Empty squares indicate zero catch by that fleet.

Mixed-fisheries description

Many fishing gears catch more than one species at the same time, which means "technical interactions" occur between stocks when multiple species are captured in the same gear. Because these interactions may vary in time and space (e.g. can differ between day and night or occur at different times of the year or among different areas), it would be ideal if they could be identified at very small temporal and spatial scales. However, as most fisheries data are aggregated based on species, gear, mesh size range, ICES square, and calendar quarter, subtle interactions may be missed.

The analysis has been carried out at national level because it allows the incorporation of the effects of market considerations and quota availability on technical interactions. For this analysis, 2021 data on métier was used to provide a description of the technical interactions in the North Sea for the stocks incorporated in the mixed-fisheries model (cod, haddock, Norway lobster, plaice (North Sea and eastern Channel), sole (North Sea and eastern channel), pollack, saithe, turbot, whiting, and witch).

The North Sea has highly diverse mixed fisheries (Figure 13). North Sea plaice represent a large proportion of the catch for many countries (panel a in Figure 13). Saithe is the main stock caught by the Norwegian fleets. The Norway lobster stocks are mainly caught by Scottish and English fleets (panel b in Figure 13). The Dutch fleets mainly catch flatfish and Norway lobster and represent the main fishery for North Sea plaice, North Sea sole, and turbot. Regarding spatial patterns, French and Belgium fleets are the main actors in the English Channel.

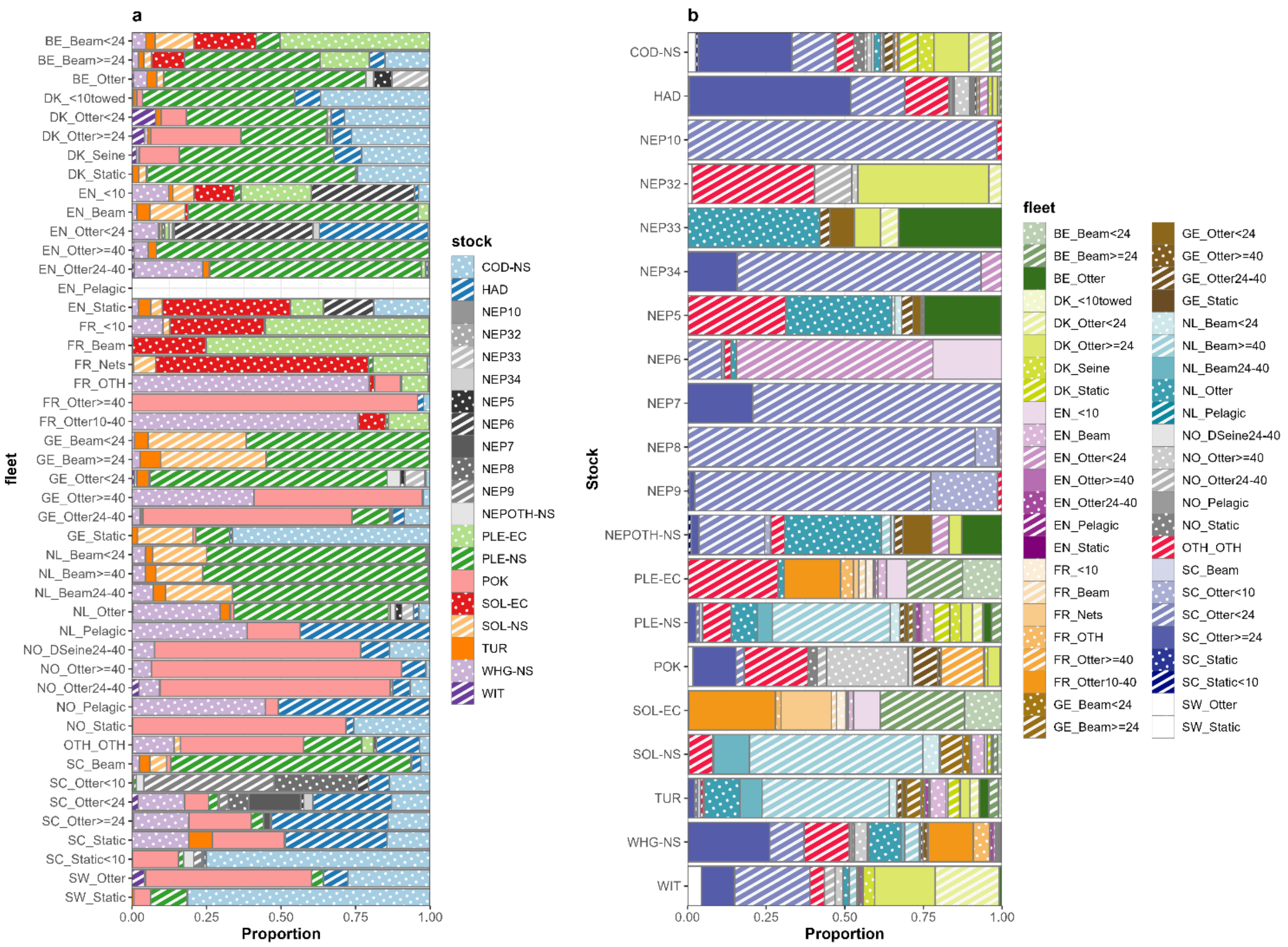


Figure 13 Description of technical interactions of demersal TAC species in the North Sea as proportions of 2021 catch. The left panel (a) shows the species composition of the main fleets operating in the North Sea. The *y*-axis label incorporates the country code, main gear, and vessel length. The right panel (b) shows the composition of the landings of each species accounted for by the different demersal fleets.

ICES has evaluated the technical interactions between species captured together in demersal fisheries by examining their co-occurrence in the landings at the scale of gear, mesh size range, ICES statistical rectangle, and quarter (hereafter referred to as "strata"). The percentage of landings of species A, where species B is also landed and constitutes more than 5% of the total landings in that stratum, has been computed for each pair of species. Cases in which species B accounts for less than 5% of the total landings in a stratum were ignored. To illustrate the extent of the technical interactions between pairs of species, a qualitative scale was applied to each interaction (Figure 14). In this figure, rows represent the share of each species A that was caught in fisheries where species B accounted for at least 5% of the total landing of the fisheries. For example, a high proportion of the catches of lemon sole was taken in fisheries where plaice landings constituted at least 5% of the total landings; medium quantities of lemon sole were caught in fisheries where cod, haddock, hake, or saithe accounted for at least 5% of the total landings; low quantities of lemon sole were caught in fisheries where lemon sole constituted 5% or more of the total landings, indicating that there is no (or very limited) targeted lemon sole fishery.

The columns in Figure 14 illustrate the degree of mixing and can be used to identify the main fisheries (target fisheries) and the degree of mixing within these fisheries. Fisheries where plaice (species B) constitutes 5% or more of the total landings account for a high share (red cells) of the total landings of dab, lemon sole, plaice, sole, turbot, flounder, brill, haddock, and witch and a medium share (orange cells) of the landings of whiting, hake, and Norway lobster. This shows that the plaice fishery is a central fishery in the North Sea with a high degree of mixing. The lemon sole column shows that the landings of lemon sole, in fisheries where the species constituted 5% or more of the total landings, were low, and the relative landings of other species in this fisheries were also low. This confirms that there is no or very limited targeted lemon sole fishery.

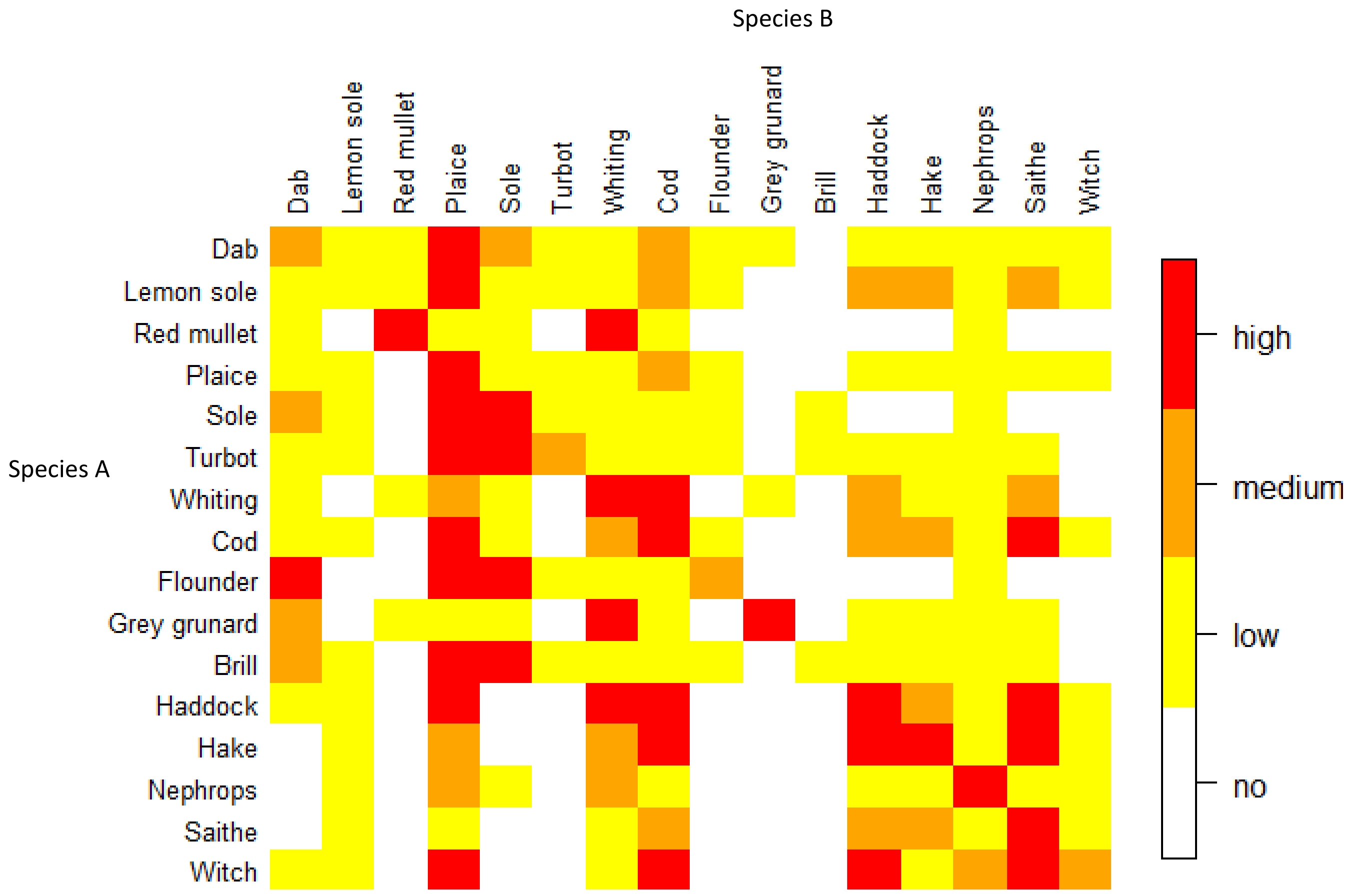


Figure 14 Technical interactions among Greater North Sea demersal stocks. The rows illustrate the fisheries where species A was caught. Red cells indicate the species B (listed as the columns) with which species A are frequently caught. Orange cells indicate medium interactions and yellow cells indicate weak interactions. The column shows the degree of mixing in fisheries where species B accounts for at least 5% of the total landings. A more detailed explanation of the figure is provided in the text.

The species interactions and relative proportions of catches in mixed fisheries are not likely to change greatly between years. Generally, the interactions between species and the selectivity of fisheries change gradually over time.

Multispecies considerations

Fish species are part of the marine foodweb and interact in various ways, including through predation and competition. Natural mortality is becoming more significant in the North Sea because fishing mortality has been markedly reduced on many stocks. Hence, natural processes are now having a relatively greater effect on the dynamics of these stocks. Predation mortality can occur from other fish, seabirds, and marine mammals. The abundance of larger fish and some mammal species has been increasing in the North Sea, while seabird populations have broadly decreased. Consumption of fish by these predators has been modelled and for several North Sea stocks (cod, haddock, whiting, sprat, sandeel, and herring), and predation mortality is now directly included in the assessments of these stocks. This ensures that temporal changes in natural mortality are explicitly accounted for in these assessments, as well as in the setting of stock-specific reference points.

The modelling results indicate that the yields of many North Sea 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 therefore 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. The SSB increases for these prey species are due to the reduction in predation pressure from whiting and haddock, which more than compensates for the increase in direct predation from a larger cod stock (indirect effect).

According to model simulations, it is not possible for all stocks to be simultaneously maintained above precautionary single-species biomass reference points. Whiting is the most extreme example of this. Small whiting are subjected to high predation by grey gurnard, and a strong recovery of the cod stock (another significant predator of whiting) increases the probability that the whiting stock will decline below its precautionary biomass reference point.

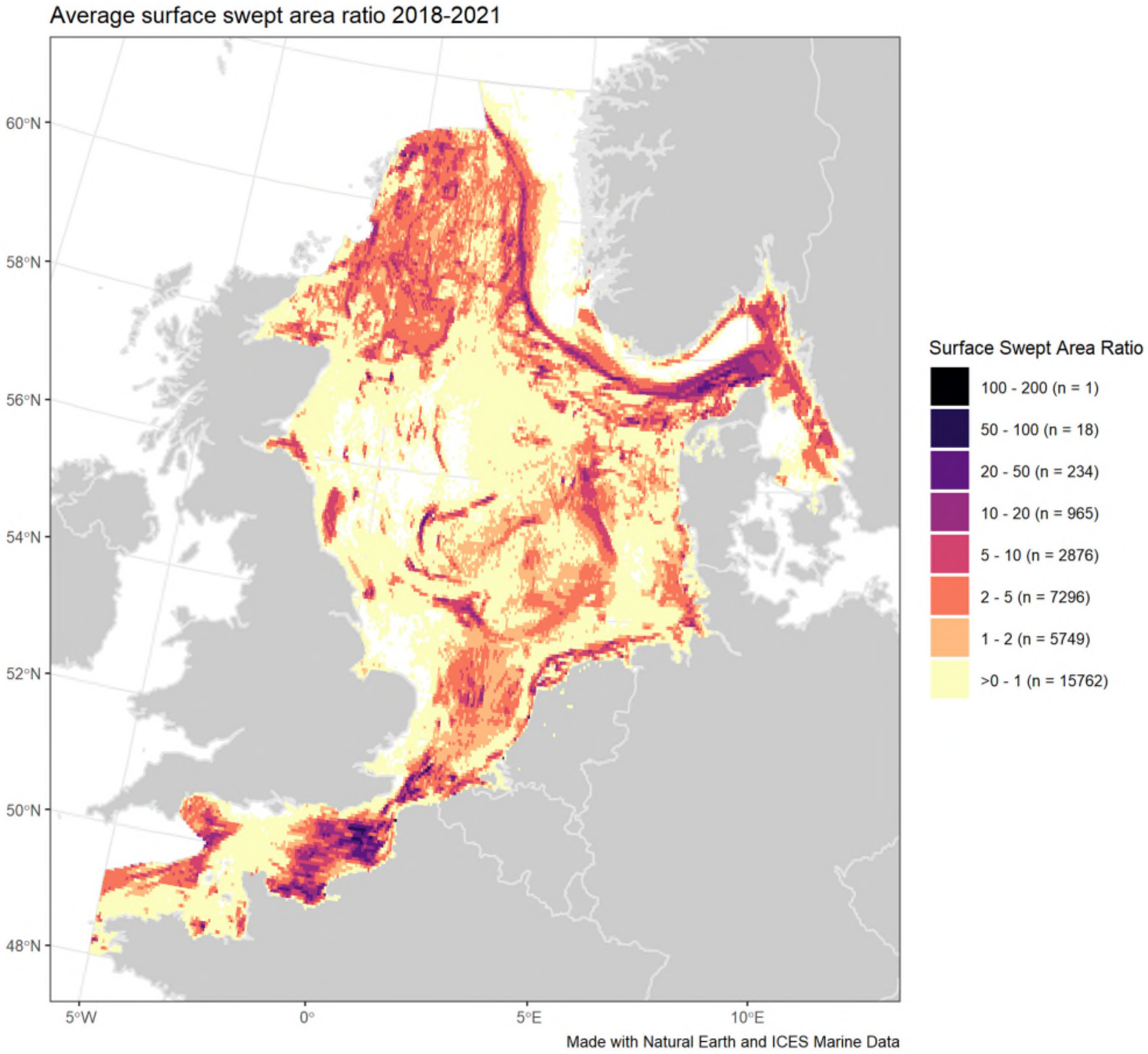
Any potential target multispecies F_{MSY} depends on management objectives and SSB constraints. No single maximum sustainable yield solution exists in a multispecies context, and policy choices (i.e. trade-offs) have to be made. However, model simulations show that fishing mortalities leading to close-to-maximum average yield (e.g. at least 95% of MSY) and which have a low probability of causing stocks to decline below B_{lim} can be estimated in a multispecies context. The simulations show that in the long term, cod and saithe could be fished at slightly higher Fs to limit predation pressure on their prey, thereby maintaining high SSB and yields of these prey species. In the case of cod, this would also avoid too much loss in cod yield due to cannibalism. The target F_{MSY} depends on managers defining agreed constraints and acceptable risk levels. ICES multispecies simulations of identified scenarios can be used to evaluate the possible consequences of different policy decisions.

Effects of fisheries on the ecosystem

Two different effects of fisheries on the ecosystem are described in this section: (1) the physical disturbance of benthic habitats by bottom trawl fishing gear; and (2) fisheries bycatch of protected, endangered, and threatened species.

Physical disturbance of benthic habitats by mobile bottom-contacting fishing gear

The extent, magnitude, and impact of mobile bottom-contacting fishing gear on the seabed and benthic habitats varies geographically across the North Sea (Figure 13). These maps are calculated in terms of a swept-area ratio. Swept area is calculated as hours fished × average fishing speed × gear width. Values for each of these factors were derived from VMS data and other sources. The swept-area ratio is calculated for all 0.05 × 0.05 degree grid cells in the North Sea and is the sum of the swept area divided by the area of each grid cell. The resultant values indicate the theoretical number of times the entire grid cell area would have been swept if effort had been evenly distributed within each cell. The swept-area ratio is calculated separately for surface and subsurface contact. Different gear types interact with the seabed in different ways and thus exert different levels of physical disturbance, in terms of the substrate areas affected and the penetration depth. Surface abrasion is defined as the damage to seabed surface features; subsurface abrasion as the penetration and/or disturbance of the substrate beneath the seabed surface. For further information on these effects, see the Greater North Sea ecosystem overview.



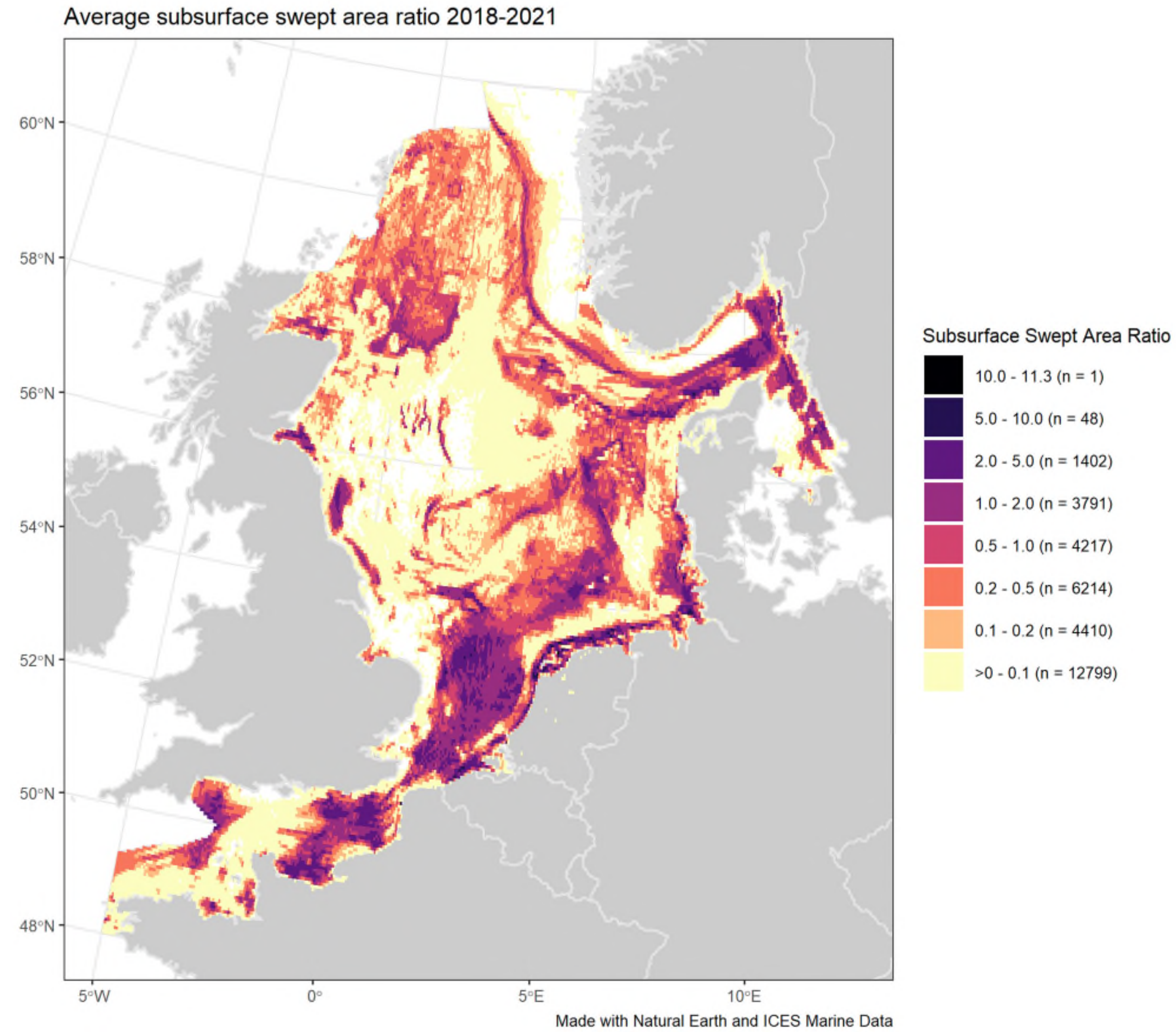


Figure 13 Average annual surface (top) and subsurface (bottom) disturbance by mobile bottom-contacting fishing gear (bottom otter trawls, bottom seines, dredges, and beam trawls) in the Greater North Sea, expressed as average swept-area ratios (SAR)[‡].

Bycatch of protected, endangered, and threatened species

All fisheries have the potential to catch protected, endangered, or threatened species, such as seabirds and marine mammals, as non-targeted bycatch. Data submitted to ICES through annual data calls indicated that between 2017–2021 ten ICES Member Countries had fisheries operating in the Greater North Sea ecoregion (ICES, 2022a). During the same period approximately 13 000 monitoring days were undertaken, primarily by at-sea observers, in a variety of static and mobile gears and on vessels ranging from under 8 m to over 40 m. Most bycatch data collection in the ecoregion is carried out within multipurpose programmes under the DCF and through dedicated bycatch monitoring programmes.

Bycatch records in 2021

In 2021, 47 marine mammals from at least four species were recorded as bycatch, mostly in net métiers. Forty-two seabirds from at least five species were recorded as bycatch in bottom trawl, longline, purse-seine and net fisheries (Table 1). Over

[‡] Details on countries submitting data can be found at https://data.ices.dk/accessions/allaccessions.aspx?search=vms

13 000 specimens of fish of potential conservation interest were recorded from a wide mix of static and mobile gears. Most of the fish records were tub gurnard (*Chelidonichthys lucerna*) in bottom trawls. No turtles were reported as bycatch.

Table 1 The five most frequently reported marine mammal, seabird, fish, and turtle species in the Greater North Sea ecoregion in 2021 based on data submitted through ICES data call and held in the bycatch database of ICES Working Group on Bycatch of Protected Species (WGBYC).

Marine mammals		Seabirds	
Species	Number reported	Species	Number reported
Harbour porpoise *Phocoena phocoena*	30	Velvet scoter *Melanitta fusca*	11
Common dolphin *Delphinus delphis*	8	Scoters *Melanitta* spp.	8
Harbour seal *Phoca vitulina*	6	Common eider *Somateria mollissima*	6
Seals *Pinnipedia* spp.	2	European herring gull *Larus argentatus*	2
Grey seal *Halichoerus grypus*	1	Northern gannet *Morus bassanus*	2
Fish		Turtles	
Species	Number reported	Species	Number reported
Tub gurnard *Chelidonichthys lucerna*	10172	None reported	0
John Dory *Zeus faber*	826		
Sand goby *Pomatoschistus minutus*	462		
Rabbitfish *Chimaera monstrosa*	252		
Velvet belly lanternshark *Etmopterus spinax*	247		

Multiannual bycatch rates

Highest bycatch rates were recorded for common dolphin in purse-seines (PS; Figure 14). Harbour porpoise (*Phocoena phocoena*) was bycatch was recorded in set gillnets (GNS), trammelnets (GTR) and anchored seine (SDN). Grey seals (*Halichoerus grypus*) and harbour seal (*Phoca vitulina*) were recorded in set gillnets (GNS), trammelnets (GTR) and midwater otter trawl (OTM). Reported bycatch rates in otter trawls and beam trawls were relatively low.

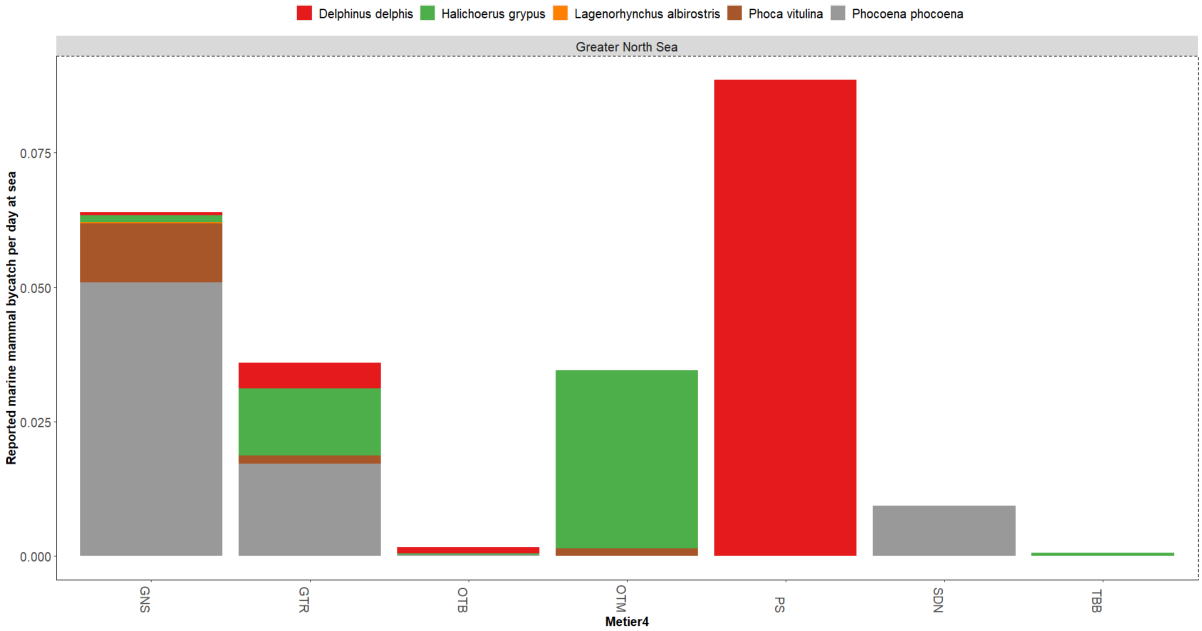


Figure 14 Reported marine mammal bycatch rates in the Greater North Sea Ecoregion 2017 –2021 by level 4 métier. For both this figure and Figure 15, data used for the calculation of bycatch rates was selected based on the following criterion: monitoring coverage within a métier (level 4) above an arbitrarily set limit of 50 days-at-sea[§]. GNS = set gillnets, GTR = trammelnets, OTB = otter trawls, OTM = midwater otter trawl, PS = purse-seine, SDN = anchored seine, TBB = beam trawl.

The highest seabird bycatch rate was recorded for northern fulmar (*Fulmarus glacialis*) in set longlines (LLS; Figure 15). Lower bycatch rates were recorded for northern gannets (*Morus bassanus*) in four métiers (LHM, LLS, OTB and PTB). Common murre/guillemot (*Uria aalge*) were reported in set gillnets, tanglenets and longlines (GNS, GTR, and LLS).

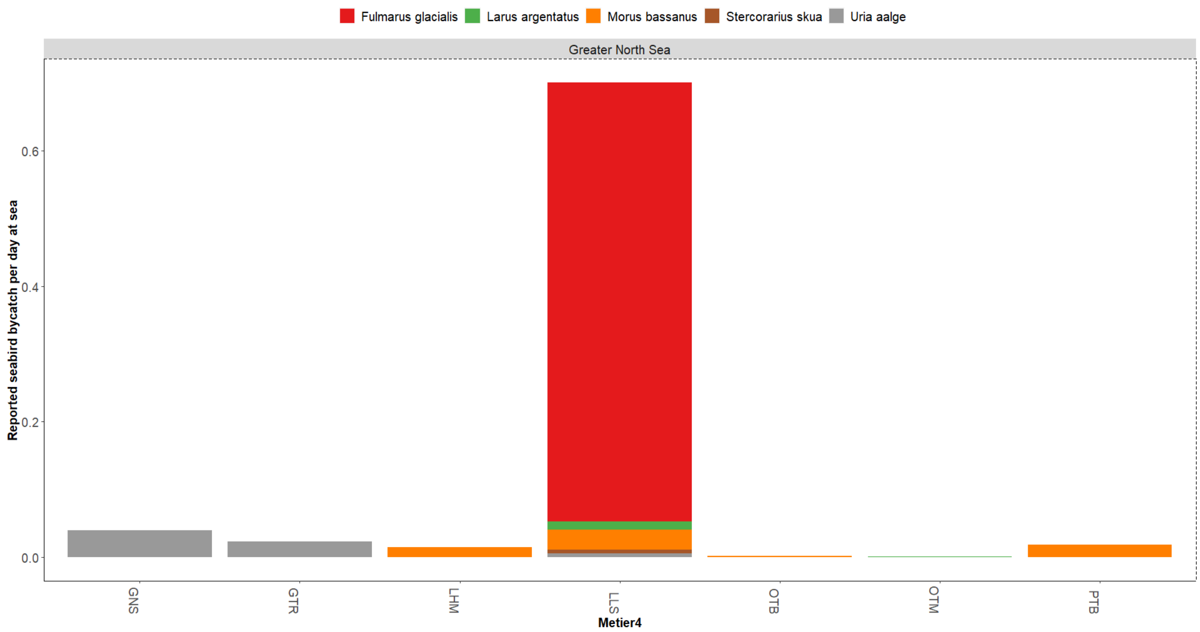


Figure 15 Reported seabirds bycatch rates in the Greater North Sea ecoregion 2017–2021 by level 4 métier. GNS = set gillnets, GTR = trammelnets, LHM = hand and pole lines, LLS = longlines, OTB = otter trawls, OTM = midwater otter trawl, PTB = bottom pair trawl

[§] A description of métiers can be found at https://vocab.ices.dk/?ref=1498.

Fishing effort

The highest fishing effort was reported in otter trawls (OTB) and beam trawls (TBB; Figure 16). These gears have generally low bycatch rates of marine mammals and seabirds. Set gillnets (GNS) account for around 50 000 days-at-sea, and this gear has relatively high bycatch rates for some marine mammals. There is a declining trend in longline (LLS) effort in the Greater North Sea, and this gear has the highest bycatch rate for some seabirds.

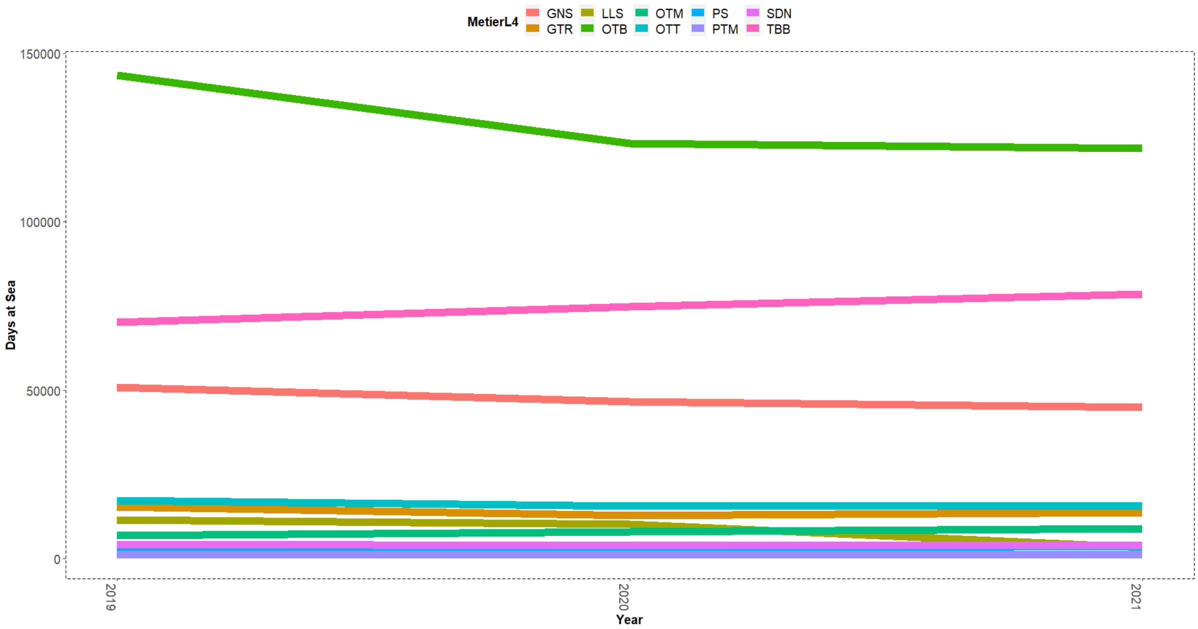


Figure 16 Fishing effort levels in the in the Greater North Sea ecoregion 2019–2021 by level 4 métier (data prior to 2019 were incomplete and not shown). GNS = set gillnets, GTR = trammelnets, LLS = longlines, OTB = otter trawls, OTM = midwater otter trawl, OTT = multirig otter trawl, PS = purse-seine, PTM = pelagic pair trawl, SDN = anchored seine, TBB = beam trawl.

Additional information

Eight species of elasmobranchs that occur in the Greater North Sea ecoregion are listed on OSPAR's list of threatened and declining species. Some of these are rare (e.g. basking shark, common skate, starry ray, and angel shark) and seldom caught in fisheries. Other species (e.g. spotted ray and thornback ray) are harvested in some targeted fisheries. Most often, elasmobranchs are taken as incidental bycatch and then discarded particularly when there is a zero TAC for a species. In 2021, seven common skate, five long-nosed skate, and 35 starry ray were reported in by-catch records in the greater North Sea ecoregion.

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Annex

Table A1 Status summary of Greater North Sea stocks in 2022 (excluding salmon and sea trout), relative to maximum sustainable yield (MSY) and ICES precautionary approach (PA) For MSY: green represents a stock that is fished below F_{MSY} or the stock size is greater than MSY $B_{trigger}$; red represents a stock that is fished above F_{MSY} or whose size is lower than MSY $B_{trigger}$. For PA: green represents a stock that is fished below F_{pa} or whose size is greater than B_{pa}; yellow represents a stock that is fished between F_{pa} and F_{lim} or whose size is between B_{lim} and B_{pa}; red represents a stock that is fished above F_{lim} or whose size is less than B_{lim}. Stocks with a fishing mortality below or at F_{pa} and a size above B_{pa} are defined as being inside safe biological limits. Grey represents stocks for which reference points are unknown. MSFD = EU Marine Strategy Framework Directive; D3C1 = MSFD indicator for fishing mortality; D3C2 = MSFD indicator for spawning-stock biomass; SBL = safe biological limits; GES = good environmental status. Stock codes contain a hyperlink for the most recent ICES advice.

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
agn.27.nea	Angel shark in subareas 1-10, 12 and 14	*Squatina squatina*	Angel shark	Elasmobranch	6.3	2019	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
alf.27.nea	Alfonsinos in subareas 1-10, 12 and 14	*Beryx*	Alfonsinos	Demersal	5.2	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
anf.27.3a46	Anglerfish in Subareas 4 and 6, and Division 3.a	*Lophius budegassa, Lophius piscatorius*	Anglerfish	Benthic	3.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
ank.27.78abd	Black-bellied anglerfish in Subarea 7 and divisions 8.a-b and 8.d	*Lophius budegassa*	Black-bellied anglerfish	Benthic	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
aru.27.123a4	Greater silver smelt in subareas 1, 2, and 4,	*Argentina silus*	Greater silver smelt	Pelagic	3.2	2021	PA	Maximum sustainable yield	✓	?	✓	?	?	?
								Precautionary approach	✓	?	✓	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
	and in Division 3.a													
aru.27.6b7-1012	Greater silver smelt in subareas 7-10 and 12, and Division 6.b	*Argentina silus*	Greater silver smelt	Pelagic	3.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
bli.27.5b67	Blue ling in subareas 6-7 and Division 5.b	*Molva dypterygia*	Blue ling	Demersal	1	2022	MSY	Maximum sustainable yield	✔	✔	✔	✔	✔	✔
								Precautionary approach	✔	✔	✔	✔		
bli.27.nea	Blue ling in Subareas 1, 2, 8, 9, and 12, and Divisions 3.a and 4.a	*Molva dypterygia*	Blue ling	Demersal	5.3	2019	PA	Maximum sustainable yield	?	✘	?	✘	✘	?
								Precautionary approach	?	✘	?	✘		
bll.27.3a47de	Brill in Subarea 4 and divisions 3.a and 7.d-e	*Scophthalmus rhombus*	Brill	Benthic	3.2	2022	PA	Maximum sustainable yield	✘	✔	✘	✔	?	?
								Precautionary approach	?	?	?	?		
boc.27.6-8	Boarfish in subareas 6-8	*Capros aper*	Boarfish	Pelagic	3.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
bsf.27.nea	Black scabbardfish in subareas 1, 2, 4-8, 10, and 14, and	*Aphanopus carbo*	Black scabbardfish	Pelagic	3.2	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
	divisions 3.a, 9.a, and 12.b													
bsk.27.nea	Basking shark in Subareas 1-10, 12 and 14	*Cetorhinus maximus*	Basking shark	Elasmobranch	6.3	2019	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
bss.27.4bc7ad-h	Seabass in Divisions 4.b-c, 7.a, and 7.d-h	*Dicentrarchus labrax*	Seabass	Demersal	1.2	2022	MSY	Maximum sustainable yield	✓	✗	✓	✗	?	✗
								Precautionary approach	✓	O	✓	O		
cod.27.21	Cod in Subdivision 21	*Gadus morhua*	Cod	Demersal	3	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
cod.27.47d20	Cod in Subarea 4, Division 7.d, and Subdivision 20	*Gadus morhua*	Cod	Demersal	1	2022	MSY	Maximum sustainable yield	✓	✗	✓	✗	✗	✗
								Precautionary approach	✓	✗	✓	✗		
cod.27.7e-k	Cod in divisions 7.e-k	*Gadus morhua*	Cod	Demersal	1	2022	MSY	Maximum sustainable yield	✗	✗	✗	✗	✗	✗
								Precautionary approach	O	✗	O	✗		
cyo.27.nea	Portuguese dogfish in subareas 1-10, 12 and 14	*Centrophorus squamosus, Centroscymnus coelolepis*	Portuguese dogfish	Elasmobranch	6.3	2019	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
dab.27.3a4	Dab in Subarea 4 and Division 3.a	*Limanda limanda*	Dab	Benthic	2	2022	PA/Stock status only	Maximum sustainable yield	✔	✔	✔	✔	?	?
								Precautionary approach	?	?	?	?		
dgs.27.nea	Spurdog in Subareas 1-10, 12 and 14	*Squalus acanthias*	Spurdog	Elasmobranch	1.2	2022	MSY	Maximum sustainable yield	✔	✔	✔	✔	✔	✔
								Precautionary approach	✔	✔	✔	✔		
ele.2737.nea	European eel throughout its natural range	*Anguilla anguilla*	Eel	Demersal	3.14	2021	PA	Maximum sustainable yield	?	✖	?	✖	✖	?
								Precautionary approach	?	✖	?	✖		
fle.27.3a4	Flounder in Subarea 4 and Division 3.a	*Platichthys flesus*	Flounder	Benthic	3.2	2021	PA/Stock status only	Maximum sustainable yield	✔	?	✔	?	?	?
								Precautionary approach	✔	?	✔	?		
gag.27.nea	Tope in subareas 1-10, 12 and 14	*Galeorhinus galeus*	Tope	Elasmobranch	5.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
gfb.27.nea	Greater forkbeard in subareas 1-10, 12 and 14	*Phycis blennoides*	Greater forkbeard	Demersal	3.2	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
gug.27.3a47d	Grey gurnard in Subarea 4 and divisions 7.d and 3.a	*Eutrigla gurnardus*	Grey gurnard	Demersal	2	2022	No advice	Maximum sustainable yield	?	✔	?	✔	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
gug.27.nea	Leafscale gulper shark in subareas 1-10, 12 and 14	*Centrophorus squamosus*	Leafscale gulper shark	Elasmobranch	6.3	2019	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
gur.27.3-8	Red gurnard in subareas 3-8	*Chelidonichthys cuculus*	Red gurnard	Demersal	3	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
had.27.46a20	Haddock in Subarea 4, Division 6.a, and Subdivision 20	*Melanogrammus aeglefinus*	Haddock	Demersal	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
had.27.7b-k	Haddock in Divisions 7.b-k	*Melanogrammus aeglefinus*	Haddock	Demersal	1	2022	MSY	Maximum sustainable yield	✗	✓	✗	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
her.27.1-24a514a	Herring in subareas 1, 2, 5 and divisions 4.a and 14.a, Norwegian spring-spawning herring	*Clupea harengus*	Herring	Pelagic	1	2022	MP	Maximum sustainable yield	✗	✓	✗	✓	?	✗
								Precautionary approach	O	✓	O	✓		
her.27.20-24	Herring in subdivisions 20-24, spring spawners	*Clupea harengus*	Herring	Pelagic	1.2	2022	MSY	Maximum sustainable yield	✓	✗	✓	✗	✗	✗
								Precautionary approach	✓	✗	✓	✗		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
her.27.3a47d	Herring in Subarea 4 and divisions 3.a and 7.d, autumn spawners	*Clupea harengus*	Herring	Pelagic	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
hke.27.3a46-8abd	Hake in subareas 4, 6, and 7, and divisions 3.a, 8.a-b, and 8.d, Northern stock	*Merluccius merluccius*	Hake	Demersal	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
hom.27.2a4a5b6a7a-ce-k8	Horse mackerel in Subarea 8 and divisions 2.a, 4.a, 5.b, 6.a, 7.a-c,e-k	*Trachurus trachurus*	Horse mackerel	Pelagic	1	2022	MSY	Maximum sustainable yield	✗	✗	✗	✗	✗	✗
								Precautionary approach	O	✗	O	✗		
hom.27.3a4bc7d	Horse mackerel in divisions 3.a, 4.b-c, and 7.d	*Trachurus trachurus*	Horse mackerel	Pelagic	3.2	2021	PA	Maximum sustainable yield	✗	?	✗	?	?	?
								Precautionary approach	?	?	?	?		
ldb.27.7b-k8abd	Four-spot megrim in divisions 7.b-k, 8.a-b, and 8.d	*Lepidorhombus boscii*	Four-spot megrim	Benthic	5.2	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
lem.27.3a47d	Lemon sole in Subarea 4 and divisions 3.a and 7.d	*Microstomus kitt*	Lemon sole	Benthic	2	2022	PA	Maximum sustainable yield	?	✓	?	✓	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
lez.27.4a6a	Megrim in divisions 4.a and 6.a	*Lepidorhombus*	Megrim	Benthic	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
lin.27.346-91214	Ling in subareas 3,4, 6–9, 12, and 14	*Molva molva*	Ling	Demersal	3.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
mac.27.nea	Mackerel in subareas 1-8 and 14 and division 9.a	*Scomber scombrus*	Mackerel	Pelagic	1	2022	MSY	Maximum sustainable yield	✗	✓	✗	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
meg.27.7b-k8abd	Megrim in divisions 7.b-k, 8.a-b, and 8.d	*Lepidorhombus whiffiagonis*	Megrim	Benthic	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
mur.27.3a47d	Striped red mullet in Subarea 4 and divisions 7.d and 3.a	*Mullus surmuletus*	Striped red mullet	Demersal	5	2021	PA	Maximum sustainable yield	✗	?	✗	?	?	?
								Precautionary approach	?	?	?	?		
mur.27.67a-ce-k89a	Striped red mullet in subareas 6 and 8, and divisions 7.a-c, 7.e-k, and 9.a	*Mullus surmuletus*	Striped red mullet	Demersal	5.2	2020	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
nep.27.4outFU	Norway lobster in Subarea 4,	*Nephrops norvegicus*	Norway lobster	Crustacean	5.2	2020	PA	Maximum sustainable yield	?	?	?	?	?	?

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
	outside the functional units							Precautionary approach	?	?	?	?		
nep.fu.10	Norway lobster in Division 4.a, Functional Unit 10	*Nephrops norvegicus*	Norway lobster	Crustacean	4.14	2020	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
nep.fu.3-4	Norway lobster in Division 3.a, Functional units 3 and 4	*Nephrops norvegicus*	Norway lobster	Crustacean	1	2021	FMSY Ranges	Maximum sustainable yield	✓	?	✓	?	?	?
								Precautionary approach	?	?	?	?		
nep.fu.32	Norway lobster in Division 4.a, Functional Unit 32	*Nephrops norvegicus*	Norway lobster	Crustacean	4.14	2020	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
nep.fu.33	Norway lobster in Division 4.b, Functional Unit 33	*Nephrops norvegicus*	Norway lobster	Crustacean	4.14	2020	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
nep.fu.34	Norway lobster in Division 4.b, Functional Unit 34	*Nephrops norvegicus*	Norway lobster	Crustacean	4.14	2020	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
nep.fu.5	Norway lobster in divisions 4.b and 4.c, Functional Unit 5	*Nephrops norvegicus*	Norway lobster	Crustacean	4.14	2020	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
nep.fu.6	Norway lobster in Division 4.b, Functional Unit 6	*Nephrops norvegicus*	Norway lobster	Crustacean	1	2021	FMSY Ranges	Maximum sustainable yield	✘	✔	✘	✔	?	?
								Precautionary approach	?	?	?	?		
nep.fu.7	Norway lobster in Division 4.a, Functional Unit 7	*Nephrops norvegicus*	Norway lobster	Crustacean	1	2021	FMSY Ranges	Maximum sustainable yield	✔	✔	✔	✔	✔	✔
								Precautionary approach	✔	✔	✔	✔		
nep.fu.8	Norway lobster in Division 4.b, Functional Unit 8	*Nephrops norvegicus*	Norway lobster	Crustacean	1	2021	FMSY Ranges	Maximum sustainable yield	✔	✔	✔	✔	✔	✔
								Precautionary approach	✔	✔	✔	✔		
nep.fu.9	Norway lobster in Division 4.a, Functional Unit 9	*Nephrops norvegicus*	Norway lobster	Crustacean	1	2021	FMSY Ranges	Maximum sustainable yield	✔	✔	✔	✔	?	?
								Precautionary approach	?	?	?	?		
nop.27.3a4	Norway pout in Subarea 4 and Division 3.a	*Trisopterus esmarkii*	Norway pout	Pelagic	1	2022	MSY	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	✔	?	✔		
ory.27.nea	Orange roughy in subareas 1-10, 12 and 14	*Hoplostethus atlanticus*	Orange roughy	Demersal	6.3	2020	PA	Maximum sustainable yield	?	?	?	?	✘	?
								Precautionary approach	?	✘	?	✘		
pil.27.7	Sardine in Subarea 7	*Sardina pilchardus*	Sardine	Pelagic	3	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
ple.27.21-23	Plaice in subdivisions 21-23	*Pleuronectes platessa*	Plaice	Benthic	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
ple.27.420	Plaice in Subarea 4 and Subdivision 20	*Pleuronectes platessa*	Plaice	Benthic	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
ple.27.7d	Plaice in Division 7.d	*Pleuronectes platessa*	Plaice	Benthic	1	2022	MSY	Maximum sustainable yield	✗	✓	✗	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
ple.27.7e	Plaice in Division 7.e	*Pleuronectes platessa*	Plaice	Benthic	3.2	2022	PA	Maximum sustainable yield	?	✓	?	✓	?	?
								Precautionary approach	?	?	?	?		
pok.27.3a46	Saithe in Subareas 4, 6 and Division 3.a	*Pollachius virens*	Saithe	Demersal	1	2022	MSY	Maximum sustainable yield	✗	✗	✗	✗	✗	✗
								Precautionary approach	✓	o	✓	o		
pol.27.3a4	Pollack in Subarea 4 and Division 3.a	*Pollachius pollachius*	Pollack	Demersal	5.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
pol.27.67	Pollack in subareas 6-7	*Pollachius pollachius*	Pollack	Demersal	4.12	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
por.27.nea	Porbeagle in subareas 1-10, 12 and 14	*Lamna nasus*	Porbeagle	Elasmobranch	2	2022	MSY	Maximum sustainable yield	✓	✗	✓	✗	?	?
								Precautionary approach	?	?	?	?		
pra.27.3a4a	Northern shrimp in divisions 3.a and 4.a East	*Pandalus borealis*	Northern shrimp	Crustacean	1	2022	MSY	Maximum sustainable yield	✓	✗	✓	✗	✗	✗
								Precautionary approach	✓	✗	✓	✗		
pra.27.4a	Northern shrimp in Division 4.a West	*Pandalus borealis*	Northern shrimp	Crustacean	6.3	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
raj.27.3a47d	Other rays and skates in Subarea 4 and in divisions 3.a and 7.d	*Rajidae*	Rays and skates	Elasmobranch	6.9	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
raj.27.67a-ce-k	Other rays and skates in Subarea 6 and divisions 7.a-c and 7.e-k	*Rajidae*	Rays and skates	Elasmobranch	6.9	2022	No advice	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rhg.27.nea	Roughhead grenadier in the Northeast Atlantic	*Macrourus berglax*	Roughhead grenadier	Demersal	6.3	2020	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rja.27.nea	White skate in subareas	*Rostroraja alba*	White skate	Elasmobranch	6.3	2019	PA	Maximum sustainable yield	?	?	?	?	?	?

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
	1-10, 12 and 14							Precautionary approach	?	?	?	?		
rjb.27.3a4	Common skate complex and flapper skate in Subarea 4 and Division 3.a	*Dipturus batis*	Common skate	Elasmobranch	6.3	2019	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rjc.27.3a47d	Thornback ray in Subarea 4 and in divisions 3.a and 7.d	*Raja clavata*	Thornback ray	Elasmobranch	3.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rjc.27.7e	Thornback ray in Division 7.e	*Raja clavata*	Thornback ray	Elasmobranch	5.2	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rje.27.7de	Small-eyed ray in divisions 7.d and 7.e	*Raja microocellata*	Small-eyed ray	Elasmobranch	5.2	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rjf.27.67	Shagreen ray in subareas 6-7	*Leucoraja fullonica*	Shagreen ray	Elasmobranch	5.2	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rjh.27.4a6	Blonde ray in Subarea 6 and Division 4.a	*Raja brachyura*	Blonde ray	Elasmobranch	5.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
rjh.27.4c7d	Blonde ray in divisions 4.c and 7.d	*Raja brachyura*	Blonde ray	Elasmobranch	3.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rjh.27.7e	Blonde ray in Division 7.e	*Raja brachyura*	Blonde ray	Elasmobranch	5.2	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rji.27.67	Sandy ray in subareas 6-7	*Leucoraja circularis*	Sandy ray	Elasmobranch	5.2	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rjm.27.3a47d	Spotted ray in Subarea 4 and Divisions 3.a and 7.d	*Raja montagui*	Spotted ray	Elasmobranch	3.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rjm.27.7ae-h	Spotted ray in divisions 7.a and 7.e-h	*Raja montagui*	Spotted ray	Elasmobranch	3	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	?	?
								Precautionary approach	?	?	?	?		
rjn.27.3a4	Cuckoo ray in Subarea 4 and Division 3.a	*Leucoraja naevus*	Cuckoo ray	Elasmobranch	3.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rjn.27.678abd	Cuckoo ray in subareas 6-7 and divisions 8.a-b and 8.d	*Leucoraja naevus*	Cuckoo ray	Elasmobranch	3.2	2020	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
rjr.27.23a4	Starry ray in Subareas 2 and 4, and Division 3.a	*Amblyraja radiata*	Starry ray	Elasmobranch	3.14	2019	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rju.27.7de	Undulate ray in divisions 7.d-e	*Raja undulata*	Undulate ray	Elasmobranch	3.2	2020	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rng.27.1245a8914ab	Roundnose grenadier in subareas 1, 2, 4, 8, and 9, Division 14.a, and in subdivisions 14.b.2 and 5.a.2	*Coryphaenoides rupestris*	Roundnose grenadier	Demersal	6.2	2019	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
rng.27.3a	Roundnose grenadier in Division 3.a	*Coryphaenoides rupestris*	Roundnose grenadier	Demersal	3.2	2022	PA	Maximum sustainable yield	?	✗	?	✗	?	?
								Precautionary approach	?	?	?	?		
rng.27.5b6712b	Roundnose grenadier in subareas 6-7 and divisions 5.b and 12.b	*Coryphaenoides rupestris*	Roundnose grenadier	Demersal	5.2	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
san.27.6a	Sandeel in Division 6.a	*Ammodytes*	Sandeel	Demersal	6.3	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
san.sa.1r	Sandeel in divisions 4.b-c, Sandeel Area 1r	*Ammodytes*	Sandeel	Demersal	1	2022	MSY	Maximum sustainable yield	?	✗	?	✗	?	✗
								Precautionary approach	?	O	?	O		
san.sa.2r	Sandeel in divisions 4.b-c, and Subdivision 20, Sandeel Area 2r	*Ammodytes*	Sandeel	Demersal	1.2	2022	MSY	Maximum sustainable yield	?	✗	?	✗	✗	✗
								Precautionary approach	?	✗	?	✗		
san.sa.3r	Sandeel in divisions 4.a-b, and Subdivision 20, Sandeel Area 3r	*Ammodytes*	Sandeel	Demersal	1	2022	MSY	Maximum sustainable yield	?	✓	?	✓	?	?
								Precautionary approach	?	✓	?	✓		
san.sa.4	Sandeel in divisions 4.a-b, Sandeel Area 4	*Ammodytes*	Sandeel	Demersal	1	2022	MSY	Maximum sustainable yield	?	✗	?	✗	?	
								Precautionary approach	?	O	?	O		
san.sa.5r	Sandeel in Division 4.a, Sandeel Area 5r	*Ammodytes*	Sandeel	Demersal	5.3	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
san.sa.6	Sandeel in subdivisions 20-22, Sandeel Area 6	*Ammodytes*	Sandeel	Demersal	5.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
san.sa.7r	Sandeel in Division 4.a,	*Ammodytes*	Sandeel	Demersal	5.3	2021	PA	Maximum sustainable yield	?	?	?	?	?	?

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
	Sandeel Area 7r							Precautionary approach	?	?	?	?		
sbr.27.6-8	Blackspot seabream in subareas 6-8	*Pagellus bogaraveo*	Blackspot seabream	Demersal	6.3	2022	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
sck.27.nea	Kitefin shark in subareas 1-10, 12 and 14	*Dalatias licha*	Kitefin shark	Elasmobranch	6.3	2019	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
sdv.27.nea	Smooth-hound in subareas 1-10, 12 and 14	*Mustelus asterias*	Smooth-hound	Elasmobranch	3.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
sho.27.67	Black-mouth dogfish in subareas 6 and 7	*Galeus melastomus*	Black-mouth dogfish	Elasmobranch	3.9	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
sol.27.20-24	Sole in subdivisions 20-24	*Solea solea*	Sole	Benthic	1	2022	MP	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
sol.27.4	Sole in Subarea 4	*Solea solea*	Sole	Benthic	1	2022	MSY	Maximum sustainable yield	✗	✗	✗	✗	?	✗
								Precautionary approach	✓	O	✓	O		
sol.27.7d	Sole in Division 7.d	*Solea solea*	Sole	Benthic	1	2022	MSY	Maximum sustainable yield	✓	✗	✓	✗	?	✗

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
								Precautionary approach	✓	O	✓	O		
sol.27.7e	Sole in Division 7.e	*Solea solea*	Sole	Benthic	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
spr.27.3a4	Sprat in Division 3.a and Subarea 4	*Sprattus sprattus*	Sprat	Pelagic	1	2022	MSY	Maximum sustainable yield	?	✗	?	✗	?	✗
								Precautionary approach	?	O	?	O		
spr.27.7de	Sprat in divisions 7.d and 7.e	*Sprattus sprattus*	Sprat	Pelagic	3.2	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	?	?
								Precautionary approach	?	?	?	?		
syc.27.3a47d	Lesser spotted dogfish in Subarea 4 and divisions 3.a and 7.d	*Scyliorhinus canicula*	Lesser-spotted dogfish	Elasmobranch	3.9	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
syc.27.67a-ce-j	Lesser spotted dogfish in Subarea 6 and divisions 7.a-c and 7.e-j	*Scyliorhinus canicula*	Lesser-spotted dogfish	Elasmobranch	3.9	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
syt.27.67	Greater-spotted dogfish in subareas 6 and 7	*Scyliorhinus stellaris*	Greater-spotted dogfish	Elasmobranch	3.9	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
tsu.27.nea	Roughsnout grenadier in subareas 1-2, 4-8, 10, 12, 14 and Division 3a	*Trachyrincus scabrus*	Roughsnout grenadier	Demersal	6.3	2020	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
tur.27.3a	Turbot in Division 3.a	*Scophthalmus maximus*	Turbot	Benthic	2.11	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	?	?
								Precautionary approach	?	?	?	?		
tur.27.4	Turbot in Subarea 4	*Scophthalmus maximus*	Turbot	Benthic	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓
								Precautionary approach	✓	✓	✓	✓		
usk.27.3a45b6a7-912b	Tusk in subareas 4 and 7-9 and divisions 3.a, 5.b, 6.a, and 12.b	*Brosme brosme*	Tusk	Demersal	3.2	2021	PA	Maximum sustainable yield	?	?	?	?	?	?
								Precautionary approach	?	?	?	?		
whb.27.1-91214	Blue whiting in subareas 1-9, 12, and 14	*Micromesistius poutassou*	Blue whiting	Pelagic	1	2022	MSY	Maximum sustainable yield	✗	✓	✗	✓	?	✗
								Precautionary approach	O	✓	O	✓		
whg.27.3a	Whiting in Division 3.a	*Merlangius merlangus*	Whiting	Demersal	2	2022	PA	Maximum sustainable yield	?	✓	?	✓	?	?
								Precautionary approach	?	?	?	?		
whg.27.47d	Whiting in Subarea 4	*Merlangius merlangus*	Whiting	Demersal	1	2022	MSY	Maximum sustainable yield	✓	✓	✓	✓	✓	✓

Stock code	Stoc Description	Species Scientific Name	Species Common Name	Fisheries Guild	Data Category	Assessment Year	Advice Category	Approach	Fishing Pressure	Stock Size	D3C1	D3C2	GES	SBL
	and Division 7.d							Precautionary approach	✓	✓	✓	✓		
whg.27.7b-ce-k	Whiting in divisions 7.b-c and 7.e-k	*Merlangius merlangus*	Whiting	Demersal	1	2022	MSY	Maximum sustainable yield	✗	✗	✗	✗	✗	✗
								Precautionary approach	o	✗	o	✗		
wit.27.3a47d	Witch in Subarea 4 and divisions 3.a and 7.d	*Glyptocephalus cynoglossus*	Witch	Benthic	1	2022	MSY	Maximum sustainable yield	✗	✗	✗	✗	?	✗
								Precautionary approach	o	o	o	o		

Table A2 Scientific names of species.

Common name	Scientific name	Common name	Scientific name
Alfonsinos	*Beryx spp.*	Northern shrimp	*Pandalus borealis*
Angel shark	*Squatina squatina*	Norway lobster	*Nephrops norvegicus*
Anglerfishes	*Lophius budegassa, Lophius piscatorius*	Norway pout	*Trisopterus esmarkii*
Basking shark	*Cetorhinus maximus*	Orange roughy	*Hoplostethus atlanticus*
Black-bellied anglerfish	*Lophius budegassa*	Plaice	*Pleuronectes platessa*
Black-mouth dogfish	*Galeus melastomus*	Pollack	*Pollachius pollachius*
Black scabbardfish	*Aphanopus carbo*	Porbeagle	*Lamna nasus*
Blackspot seabream	*Pagellus bogaraveo*	Portuguese dogfish	*Centroscymnus coelolepis*
Blonde ray	*Raja brachyura*	Queen scallop	*Chlamys opercularis*
Blue ling	*Molva dypterygia*	Rays and skates	*Rajidae*
Blue whiting	*Micromesistius poutassouu*	Red gurnard	*Chelidonichthys cuculus*
Boarfish	*Capros aper*	Roughhead grenadier	*Macrourus berglax*
Brill	*Scophthalmus rhombus*	Roughsnout grenadier	*Trachyrincus scabrus*
Cod	*Gadus morhua*	Roundnose grenadier	*Coryphaenoides rupestris*
Common dolphin (Long-finned)	*Delphis delphinus*	Saithe	*Pollachius virens*
Common skate complex	*Dipturus batis-complex,* including flapper skate *Dipturus cf. flossada* and blue skate *Dipturus cf. intermedia*	Sardine	*Sardina pilchardus*
Cuckoo ray	*Leucoraja naevus*	Sandeel	*Ammodytes spp.*
Dab	*Limanda limanda*	Sandy ray	*Leucoraja circularis*
European eel	*Anguilla anguilla*	Seabass	*Dicentrarchus labrax*
Flounder	*Platichthys flesus*	Shagreen ray	*Leucoraja fullonica*
Four-spot megrim	*Lepidorhombus boscii*	Small-eyed ray	*Raja microocellata*
Greater forkbeard	*Phycis blennoides*	Smooth-hound	*Mustelus spp.*
Greater silver smelt	*Argentina silus*	Sole	*Solea solea*
Greater-spotted dogfish	*Skyliorhinus stellaris*	Spotted ray	*Raja montagui*
Grey gurnard	*Eutrigla gurnardus*	Sprat	*Sprattus sprattus*
Haddock	*Melanogrammus aeglefinus*	Spurdog	*Squalus acanthias*
Hake	*Merluccius merluccius*	Starry ray	*Amblyraja radiata*
Harbour porpoise	*Phocoena phocoena*	Striped red mullet	*Mullus surmuletus*
Horse mackerel	*Trachurus trachurus*	Thornback ray	*Raja clavata*
Herring	*Clupea harengus*	Tope	*Galeorhinus galeus*
Kitefin shark	*Dalatias licha*	Turbot	*Scophthalmus maximus*
Leafscale gulper shark	*Centrophorus squamosus*	Tusk	*Brosme brosme*
Lemon sole	*Microstomus kitt*	Undulate ray	*Raja undulata*
Lesser-spotted dogfish	*Scyliorhinus canicula*	White anglerfish	*Lophius piscatorius*
Ling	*Molva molva*	White skate	*Rostroraja alba*

Common name	Scientific name	Common name	Scientific name
Mackerel	*Scomber scombrus*	Whiting	*Merlangius merlangus*
Megrim	*Lepidorhombus whiffiagonis*	Witch	*Glyptocephalus cynoglossus*
Megrims	*Lepidorhombus spp.*		