Department
for Environment
Food & Rural Affairs

Southern North Sea and Eastern Channel Mixed Flatfish Fisheries Management Plan

Annexes

Date: July 2023

Version: public consultation

List of Annexes

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Annex 1: Evidence Statement

Date: July 2023

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Contents

Defra would like to acknowledge the advice, evidence and support that has been provided by the Association of Inshore Fisheries Conservation Authorization (IFCAs), Centre for Environment, Fisheries and Aquaculture Science (Cefas), Environment Agency, Joint Nature Conservation Committee (JNCC), Marine Management Organisation (MMO), Natural England, Natural Resources Wales, Seafish, and our stakeholders, throughout the development of this Fisheries Management Plan (FMP) and the evidence that underpins it,

Introduction

This Evidence Statement presents the current state of knowledge of flatfish (brill, dab, flounder, halibut, lemon sole, plaice, sole, turbot and witch) fisheries in English waters.

All of the fisheries data included within this FMP are considered to be accurate at the time of compilation, and represents the best available data at the time of drafting. Fisheries data inherently is variable due to retrospective amendments and corrections to reported data meaning revisions of a dataset may differ from another. Issues can sometimes be identified via ongoing data quality and assurance checks and retrospectively amended. Moreover, the methods used to produce estimates are constantly being assessed, iterated, and improved meaning those figures requiring additional processing may vary slightly compared to other similar datasets depending on the methods in use. Assumptions have been made (for example even distribution of landings across ICES rectangles) in order to apportion the data to the FMP area resulting in uncertainty in the absolute landings figures. In addition, fluctuations between years may need to be interpreted with caution due to the uncertainties described above in the data sets.

Scope, Methodologies and Method

MMO Data Extracts

The scope defined for the MMO data extracts presented in this FMP are described in Table 1. MMO UK landings data were extracted from the Sea Fisheries Statistics Annual Publication[1]. EU landings data were extracted from 2022 Data Collection Framework (DCF) Fisheries Dependent Information (FDI) data call[2]. Data were processed by MMO internal analysis to produce English water estimates.

Table 1: Scope of MMO data extracts included in the Southern North Sea and EasternChannel Flatfish FMP for English waters in terms of ICES divisions and species common name

Plan	Southern North Sea and Eastern Channel Mixed Flatfish
Fishery	English waters
ICES division	4b, 4c, 7d
Species	Brill, Dab, Flounder, Halibut, Lemon Sole, Plaice, Sole, Turbot, Witch

[1] UK sea fisheries annual statistics report 2021 - GOV.UK (www.gov.uk)

[2] Fisheries Dependent Information - European Commission (europa.eu)

Seafish Economics Data Extracts

This report includes data collected by Seafish during the Fleet Economic Surveys and is estimated based on the methodology described in the UK Economic Fleet Estimates and Fleet Enquiry Tool[3] as well as information shared with Seafish as part of the Data Collection Framework by MMO.

All economic data is collected and estimated by Seafish fleet segments, which groups all vessels catching different species using different gears to 33 homogeneous groups. To separate economic values by FMP area and specific species individual vessel level economic performance and employment indicators were partitioned following these steps:

- Individual vessels landings by rectangle were partitioned to FMP area based on MMO methodology published as part of the UK commercial sea fisheries landings by Exclusive Economic Zone of capture report[4]
- The FMP stock/species economic dependency[5] for each vessel in the fleet in relevant years was calculated. The calculations are based on associated species and FMP area definition calculated as part of step 1
- FMP economic dependency at vessel level is multiplied by each economic variable to obtain GVA (Gross Value Added), operating profit, net profit, and FTE (full time equivalent jobs) by FMP stock/species (assumption: all stocks/species landed by vessel are contributing to the total economic results by the same share as value landed)
- All results calculated at vessel level are summarised to FMP level

Biology of the target species

Life history and Distribution

The nine fish considered within this FMP are all flatfish. These are a species characteristic of a flat body where both eyes lie on one side of the head. Within the FMP area, the distribution of the nine species varies. Halibut and witch are mainly concentrated in the northern parts of the North Sea. Dab, lemon sole, plaice, turbot and brill are all commonly found within the eastern English Channel as well as the entire North Sea. Flounder and sole are mainly found within the eastern English Channel and the southern North Sea.

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3 UK Economic Fleet Estimates and Fleet Enquiry Tool - Methodology Report — Seafish

4 UK commercial sea fisheries landings by Exclusive Economic Zone of capture report 2019 - GOV.UK (www.gov.uk)

5 Economic dependency is calculated as a share of value of landings coming from the FMP stock/species to total value landed by vessel per reference year.

Brill

Brill (*Scophthalmus rhombus*) is a larger-bodied, demersal flatfish that attains a maximum length of approximately 68 cm. The brill population spawns between February and August, with peak spawning from April to July. Water movements transport the larvae to the surf zones of sandy beaches, and the youngest age classes are most frequent in shallow waters of exposed and semi-exposed sandy beaches. As brill grow, they move offshore and onto the main fishing grounds. There are limited published studies of the life-history of brill in the FMP area, but female and male brill mature at lengths of about 33-41 cm and 25 cm, respectively. Brill feed on small crustaceans when they are young, with fish (for example sand gobies, sandeels, and small gadoids) becoming increasingly important in the diets of larger brill.

In the North-east Atlantic, brill is distributed from western Norway and the Shetland Islands southwards to north-western Africa, including the western Baltic Sea, Mediterranean Sea and Black Sea, as well as all round UK waters (Figure 1). The biological stock units for brill across the distribution area are largely undefined. ICES assess and provide advice for one stock assessment unit, with this assessment unit covering the English Channel, North Sea and Skagerrak.

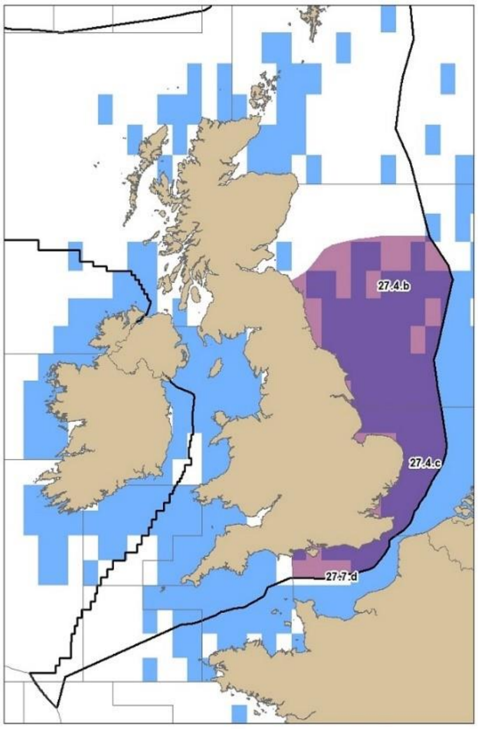

Figure 1. Recorded distribution of brill around the British Isles, based on data supplied by ICES Database of Trawl Surveys (DATRAS, http://datras.ices.dk) for the period 1966-2022 (blue shading). Purple shaded area highlights the geographical area covered by the FMP.

Dab

Dab (*Limanda limanda*) is a demersal flatfish that attains a maximum length of approximately 45 cm, but is usually less than 30 cm. The peak spawning time of dab is from April to June. After the eggs and larvae have developed, the young stages settle on the seafloor and can be found in both inshore and offshore waters. Female and male dab mature at lengths of about 22 cm and 17 cm respectively. Dab feed primarily on benthic invertebrates, including polychaete worms, molluscs, small crustaceans, and brittle stars. Larger dab may also eat small fish.

Dab is distributed in continental shelf seas of the North-east Atlantic, from northern Norway and Iceland southwards to the central Bay of Biscay as well as all round UK waters (Figure 2). The biological stock units for dab across the distribution area are undefined. ICES assess and provide advice for one stock assessment unit of dab, with this assessment unit covering the North Sea and Skagerrak.

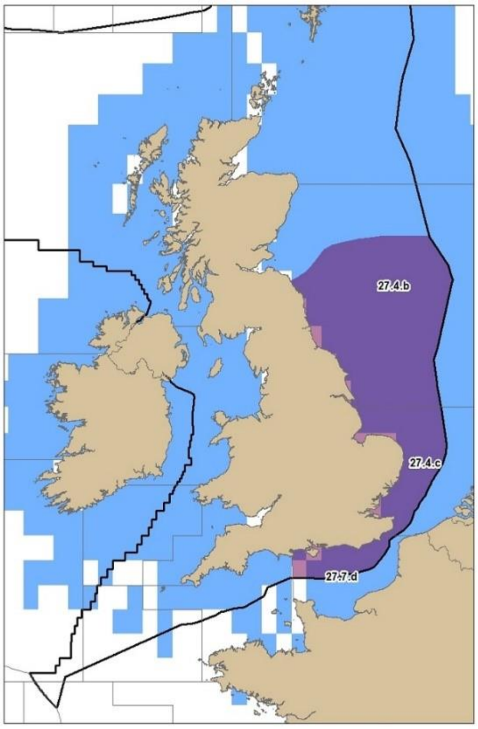

Figure 2. Recorded distribution of dab around the British Isles, based on data supplied by ICES Database of Trawl Surveys (DATRAS, http://datras.ices.dk) for the period 1966-2022 (blue shading). Purple shaded area highlights the geographical area covered by the FMP.

Flounder

Flounder (*Platichthys flesus*) is a demersal flatfish that attains a maximum length of approximately 50 cm, but is usually less than 40 cm. The peak spawning time of flounder is from late January to April, but spawning may extend into early summer in the northern parts of the FMP area. After the eggs and larvae have developed, the young stages settle in brackish water and estuarine ecosystems. Whilst large flounder are often found in estuarine and onshore waters, they will also occur in marine waters to depths of 60 m or so. Published studies of the life-history of flounder in the FMP area are limited, but females may mature at three to four years of age. Flounder feed primarily on benthic invertebrates, including polychaete worms, bivalve molluscs and small crustaceans, and larger flounder may also eat small fish.

Flounder is distributed in the inshore and coastal waters of the North-east Atlantic, from the White Sea, northern Norway and Baltic Sea southwards to the Iberian Peninsula and into the western Mediterranean and is distributed around the majority of the UK coastline (Figure 3). The biological stock units for flounder across the distribution area are undefined. ICES assess and provide advice for one stock assessment unit of flounder, with this assessment unit covering the North Sea and Skagerrak.

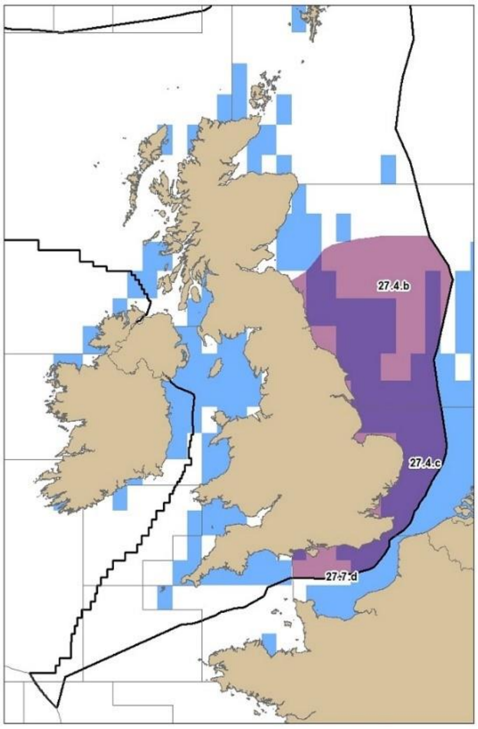

Figure 3. Recorded distribution of flounder around the British Isles, based on data supplied by ICES Database of Trawl Surveys (DATRAS, http://datras.ices.dk) for the period 1966-2022 (blue shading). Purple shaded area highlights the geographical area covered by the FMP.

Atlantic Halibut

Atlantic Halibut (*Hippoglossus hippoglossus*) (hereafter halibut) is a large-bodied demersal flatfish that attains a maximum length of at least 250 cm. Halibut spawning grounds are in the more northerly parts of their range (including Icelandic, Norwegian and Faroese waters), and spawning would not be expected in the FMP area. Halibut spawn from late December to late March, with a peak in January-February. Studies of the life-history of halibut in Faroese waters indicate that males mature at lengths of 55 cm (four and a half years) and females at 110-115 cm (seven years). Whilst halibut feed on invertebrates (for example, crustaceans) when small, they become increasingly piscivorous as they attain a larger size, with the largest individuals primarily feeding on fish.

Halibut is distributed in the northern waters of the North Atlantic. Within the North east Atlantic, halibut occurs off Greenland, Iceland, northern Norway and Russia, and as far south as the British Isles and northern Bay of Biscay. Towards the south of the range, halibut is generally confined to colder, deeper waters. Within the North Sea, halibut is most abundant in the northern parts (Figure 4), and it is caught only in small quantities in the central North Sea (Division 4.b) and very occasionally in the southern North Sea (Division 4.c). There is no assessment unit for Atlantic halibut that extends into the FMP area. The biological stock units are undefined. ICES do not assess Atlantic halibut and do not provide advice on its status. However, given the species distribution it is likely that any Atlantic halibut in the FMP area are individuals at the southern limits of a stock centred to the north.

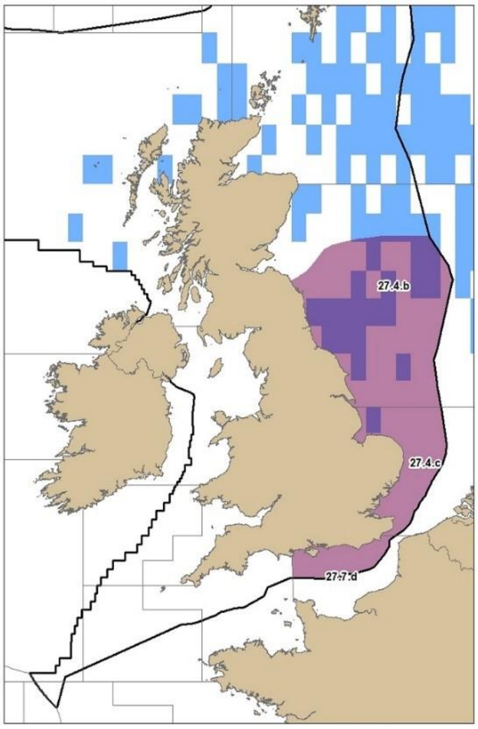

Figure 4. Recorded distribution of Atlantic halibut around the British Isles, based on data supplied by ICES Database of Trawl Surveys (DATRAS, http://datras.ices.dk) for the period 1967-2022 (blue shading). Purple shaded area highlights the geographical area covered by the FMP.

Lemon Sole

Lemon sole (*Microstomus kitt*) is a medium-sized, demersal flatfish that attains a maximum length of approximately 63 cm, but is mostly <45 cm. The lemon sole population has a relatively protracted spawning period (January to November). The post-larval stages settle out of the plankton on offshore grounds, but little is known about the habitats and distribution of these early demersal stages. Studies of the life-history of lemon sole off the Irish coast indicate that males and females mature at lengths of about 14 cm and 15.5 cm, respectively. Lemon sole feed on small crustaceans, polychaetes and brittle stars.

Lemon sole is distributed in the Northeast Atlantic from Iceland and northern Norway and Iceland southwards to the Bay of Biscay, as well as all waters around the UK (Figure 5). ICES assess and provide advice for one stock assessment unit, covering the eastern English Channel, North Sea and Skagerrak, but the biological stock units of lemon sole are undefined.

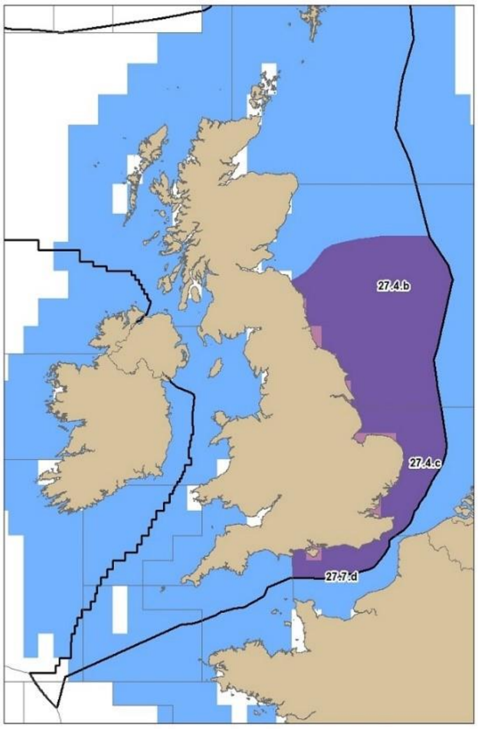

Figure 5. Recorded distribution of lemon sole around the British Isles, based on data supplied by ICES Database of Trawl Surveys (DATRAS, http://datras.ices.dk) for the period 1966-2022 (blue shading). Purple area highlights the geographical area covered by the FMP.

Plaice

Plaice (*Pleuronectes platessa*) is a medium-sized, demersal flatfish which is usually <50 cm in length, although larger individuals of between 79-91 cm have been reported. Plaice spawn between January and March in the FMP area. Water movements transport the larvae to shallow coastal waters where the post-larval stages will settle. Plaice move further from the shore, and onto the main fishing grounds, as they grow in size. Female and male plaice mature at lengths of about 31-33 cm and 25 cm, respectively. Plaice feed on small crustaceans, molluscs and polychaete worms, with larger individuals also eating some small fish species, such as sandeels.

Plaice is distributed in the North-east Atlantic from Iceland and northern Norway southwards to southern Portugal, including the western Baltic Sea, and all around UK waters (Figure 6). ICES assess and provide advice for one plaice stock in the North Sea and northern Skagerrak, and another stock in the eastern English Channel.

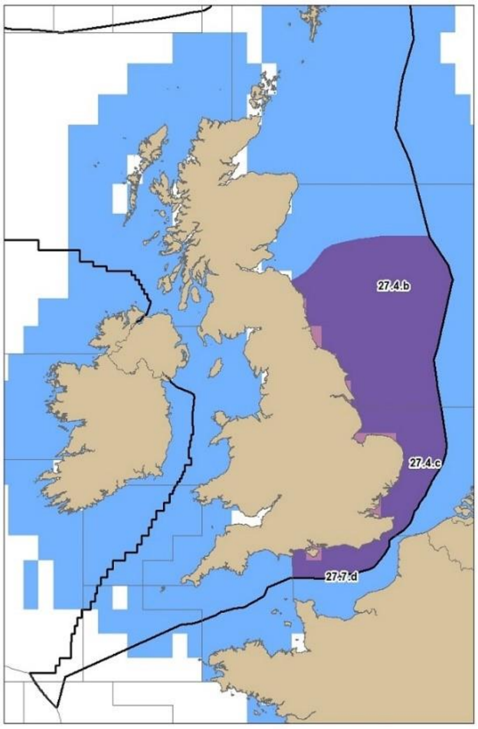

Figure 6. Recorded distribution of plaice around the British Isles, based on data supplied by ICES Database of Trawl Surveys (DATRAS, http://datras.ices.dk) for the period 1966-2022 (blue shading). Purple area highlights the geographical area covered by the FMP.

Sole

Sole (*Solea solea*) is a medium-sized, demersal flatfish which is usually <50 cm in length, although larger individuals of up to 70 cm have been reported. Sole spawn between late April and June in the FMP area. Water movements transport the larvae to shallow coastal waters where the post-larval stages will settle. Sole in their first year (0-group sole) typically remain in these shallow, coastal waters, but move further from the shore as they grow. Female and male sole mature at lengths of about 28 cm and 23-24 cm, respectively. Sole feed on small, benthic invertebrates, including small crustaceans and polychaete worms.

Sole is distributed in the Northeast Atlantic from Scotland and southern Norway southwards to north western Africa, including the western most parts of the Baltic Sea and much of the Mediterranean Sea, and are also found around the majority of UK waters but with limited occurrence in the northern North Sea (Figure 7). ICES assess and provide advice for one sole stock in the North Sea, and another in the eastern English Channel.

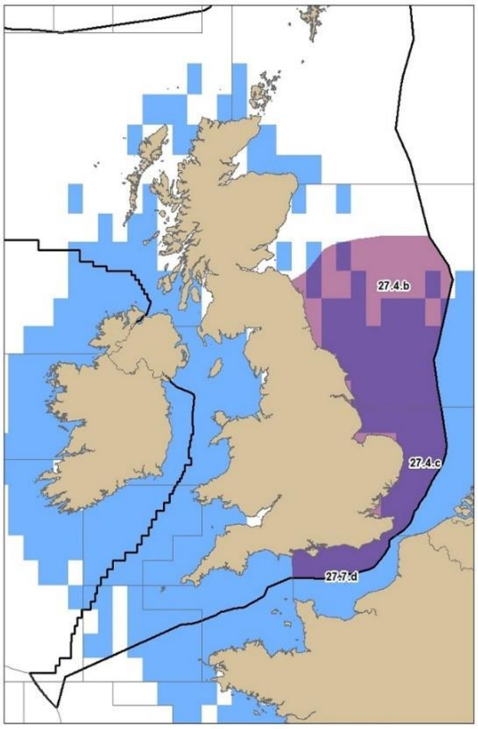

Figure 7. Recorded distribution of sole around the British Isles, based on data supplied by ICES Database of Trawl Surveys (DATRAS, http://datras.ices.dk) for the period 1966-2022 (blue shading). Purple area highlights the geographical area covered by the FMP.

Turbot

Turbot (*Psetta maxima*) is a larger-bodied, demersal flatfish that attains a maximum length of at least 88 cm, and may occasionally reach 100 cm. The turbot population spawn between March and August, with peak spawning in May and June. Water movements transport the larvae to the surf zones of sandy beaches, and the youngest age classes are most frequent in shallow waters of exposed and semi-exposed sandy beaches. As turbot grow, they move offshore and onto the main fishing grounds. There are limited published studies of the life-history of turbot in the FMP area, but female and male turbot mature at lengths of about 41-46 cm and 35 cm, respectively. Young turbot feed on small crustaceans (for example mysids and small shrimps) and small fish (for example sand gobies and sandeels), with larger individuals predating primarily on fish, including other flatfish, small gadoids and clupeids, as well as some larger crustaceans.

In the North-east Atlantic, turbot is distributed from Iceland and northern Norway southwards to northwestern Africa, including the Baltic Sea, Mediterranean Sea and Black Sea, and throughout the majority of UK waters (Figure 8). The biological stock units for turbot across the distribution area are largely undefined. ICES assess and provide advice for two stocks of turbot: one in the North Sea (Subarea 4) and another in the Skagerrak and Kattegat (Division 3.a).

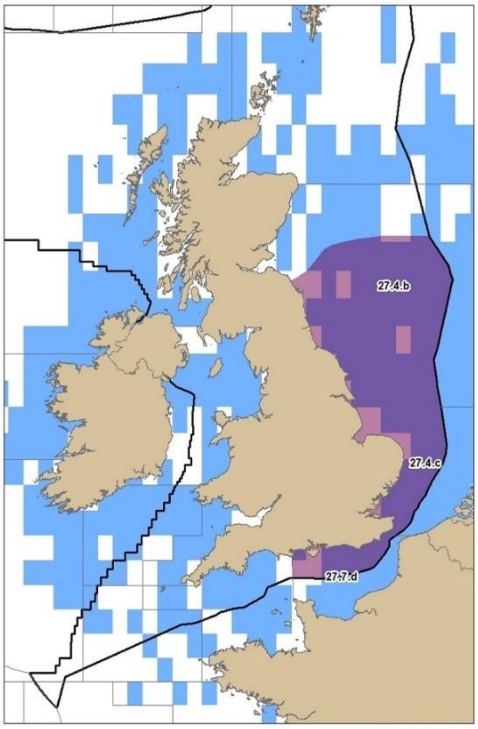

Figure 8. Recorded distribution of turbot around the British Isles, based on data supplied by ICES Database of Trawl Surveys (DATRAS, http://datras.ices.dk) for the period 1966-2022 (blue shading). Purple area highlights the geographical area covered by the FMP.

Witch

Witch (*Glyptocephalus cynoglossus*) is a medium-sized, demersal flatfish that attains a maximum length of approximately 55 cm. The witch population has a relatively protracted spawning period (late spring to late autumn). The post-larval stages settle out of the plankton at a relatively large size (5-6 cm). The larval stage can be relatively prolonged, which may be due to these stages waiting until they are over suitable fine (muddy) sediment habitats until they settle. Subsequent stages of witch prefer relatively muddy sediments, and they are often caught in association with Nephrops. Studies of the life-history of witch indicate that the length and age at maturity can vary with location, with no published data specifically for the FMP area. Witch feed on small crustaceans, polychaetes, bivalve molluscs and brittle stars.

Witch is distributed in the North Atlantic and, in the Northeast Atlantic ranges from Greenland, Iceland and northern Norway southwards to the Bay of Biscay, as well as around the western and northern waters of the UK (Figure 9). The biological stock units of witch are undefined across the wider distribution area. ICES assess and provide advice for one stock assessment unit covering the North Sea (Subarea 4), Skagerrak (Division 3.a) and eastern English Channel (Division 7.d). Within the North Sea, witch is most common in the northern part (Division 4.a and the northern part of Division 4.b), and it is largely absent from the southern North Sea and eastern English Channel.

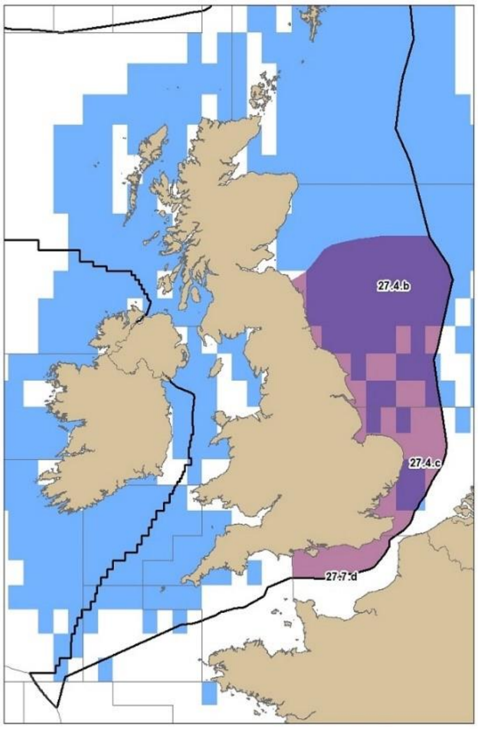

Figure 9. Recorded distribution of Witch around the British Isles, based on data supplied by ICES Database of Trawl Surveys (DATRAS, http://datras.ices.dk) for the period 1966-2022 (blue shading). Purple area highlights the geographical area covered by the FMP.

Stock assessments

Data collection to support stock assessments

For all species, data are available from national and international landings. Sea fisheries annual statistics are collected by the MMO, providing a broad picture of the UK fishing industry and its operations.

For all species additional data from commercial fisheries are also collected by at-sea observers, with these data including the numbers and length composition of the species taken by various fleets, and whether the captured individuals are discarded or retained, however for halibut these data may not be sufficiently robust to inform on stock status and for flounder observer coverage may be limited on those grounds where flounder are most abundant. For brill, sole, turbot, and plaice market (port) sampling provides additional information on the length composition of landed individuals.

Scientific trawl surveys provide fishery-independent information on the catches of all species, including numbers at length and associated biological information. Biological data collection provides the length, weight, sex and maturity stage of individual fish, with otoliths collected to provide information on age. Although, scientific trawl surveys may have only collected limited samples of flounder, as the shallowest coastal waters cannot be surveyed by larger research vessels. Also, the low numbers of halibut caught in the North Sea area may not be sufficient to support robust assessments of stock, or its status in the FMP area.

Stock assessment methodology

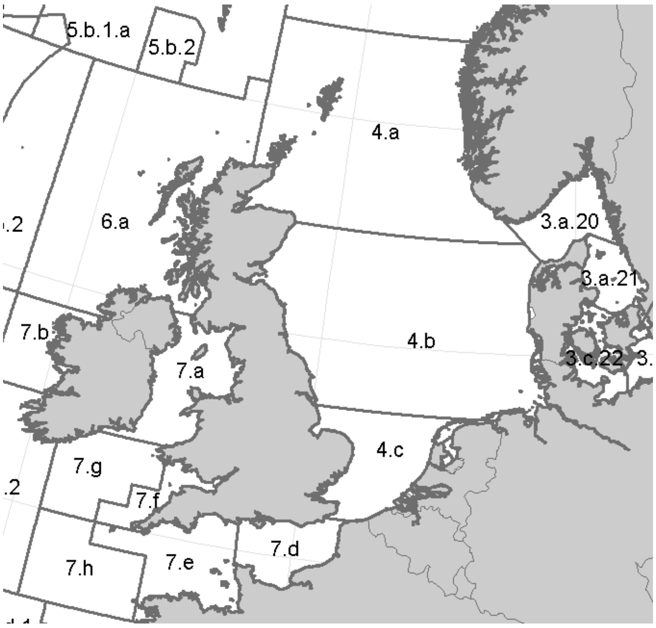

Figure 10: Map of ICES fishing areas in the FMP area and waters surrounding the UK. (Source: ICES, Maps and spatial information (ices.dk))

Brill

The stock assessment unit of brill adopted by ICES comprises the Skagerrak (Division 3.a), North Sea (Subarea 4) and English Channel (Divisions 7.d-e).

ICES considers brill a category 3 stock, with MSY (Maximum Sustainable Yield) advice based on the chr (constant harvest rate) rule. There is currently no analytical stock assessment for brill. The standardized landings per unit effort (LPUE) from the Dutch beam trawl fleet (vessels > 221 kW) is used as a biomass index of stock development. The advice is based on the biomass index, multiplied by a chr, a biomass safeguard, and a precautionary multiplier, with the addition of a stability clause where needed. In addition to the chr rule and associated input data, a length-based indicator, based on lengths from commercial catch data, is used to assess fishing pressure relative to an MSY proxy.

ICES provide annual advice on the status of one nominal stock of brill (see https://doi.org/10.17895/ices.advice.19447790), with more detailed information on the assessment, input data, and other data available provided in the annual reports of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK; see https://www.ices.dk/community/groups/Pages/WGNSSK.aspx).

Dab

The assessment unit of dab comprises the Skagerrak (Division 3.a) and the North Sea (Subarea 4). The several spawning grounds, morphological data and the wide distribution suggests the existence of more than one stock for dab. However, the selection of stock assessment units was not informed by biological studies of stock structure because ICES considers that available evidence remains too limited to discriminate stock units within the North Sea populations.

ICES considers dab a category 3 stock, with MSY advice based on the chr rule. Currently, a survey-only assessment model (SURBAR) is used to provide a survey-combined biomass index. The advice is based on the biomass index, multiplied by a chr, a biomass safeguard, and a precautionary multiplier, with the addition of a stability clause where needed. In addition to the chr rule and associated input data, a length-based indicator, based on lengths from commercial catch data, is used to assess fishing pressure relative to an MSY proxy.

Discard information is available from 2002 onwards for the most important fisheries. However, given the extremely high proportion of discards in the catch, the discard raising procedure may introduce uncertainty in the estimation of total catch. Furthermore, survival rates of discards are unknown.

ICES provide annual advice on the status of one nominal stock of dab (see https://doi.org/10.17895/ices.advice.19447901), with more detailed information on the assessment, input data, and other data available provided in the annual reports of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK; see https://www.ices.dk/community/groups/Pages/WGNSSK.aspx).

Flounder

The assessment unit of flounder comprises the Skagerrak (Division 3.a) and the North Sea (Subarea 4). Given the inshore nature of flounder, it is unclear whether this assessment unit includes multiple biological stocks.

ICES considers flounder a category 3 stock, with MSY advice based on the 2 over 3 rule. There is currently no analytical stock assessment for flounder. The North Sea International Bottom Trawl Survey Q1 (NS-IBTS) is used to derive a biomass index of stock development based on a Delta-GAM statistical model. The advice is based on the ratio of the mean of the last two index values and the mean of the three preceding values, multiplied by recent average catches; an uncertainty cap is applied when change is greater than 20%, and an additional precautionary buffer may be applied under certain circumstances. In addition to the two over three rule and associated input data, a length-based indicator, based on lengths from commercial catch data, is used to assess fishing pressure relative to an MSY proxy, and may be used to apply the precautionary buffer if fishing pressure exceeds the MSY proxy.

Discard information is available from 2002 onwards for the most important fisheries. However, no reliable data on discards are available for beam trawlers targeting brown shrimp. As most of the fishing effort of this fleet takes place in the coastal zone, which is the main distribution area of flounder, the discarding in these fisheries may have a considerable impact on the stock.

ICES provide annual advice on the status of one stock unit of flounder (see https://doi.org/10.17895/ices.advice.7753), with more detailed information on the assessment, input data, and other data available provided in the annual reports of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK; see https://www.ices.dk/community/groups/Pages/WGNSSK.aspx).

Halibut

There is no assessment unit for Atlantic halibut that extends into the FMP area. The biological stock units are undefined. ICES do not assess Atlantic halibut and do not provide advice on its status. However, given the species distribution it is likely that any Atlantic halibut in the FMP area are individuals at the southern limits of a stock centred to the north.

Lemon sole

ICES assess and provide advice for one stock assessment unit of lemon sole covering the North Sea (Subarea 4), Skagerrak (Division 3.a) and eastern English Channel (Division 7.d), thus equating with the North Sea ecoregion. Within the area, lemon sole is most common in the north western parts of Divisions 4.a and 4.b, the Skagerrak, around Helgoland in the German Bight, along parts of the south-east coast of England and in the Dover Strait. It is less frequent in the eastern parts of the Southern Bight.

ICES considers lemon sole a category 3 stock, with MSY advice based on the chr rule. A relative assessment based on a survey-only assessment model (SURBAR) is available for the stock but is not used as a basis for advice because it is unable to accommodate the most recent survey data. Therefore, the North Sea International Bottom Trawl Survey Q1 (NS-IBTS) is used to derive a biomass index of stock development based on a Delta-GAM statistical model. The advice is based on this biomass index, multiplied by a chr, a biomass safeguard, and a precautionary multiplier, with the addition of a stability clause where needed. In addition to the chr rule and associated input data, a length-based indicator, based on lengths from commercial catch data, is used to assess fishing pressure relative to an MSY proxy.

The catchability of lemon sole at younger ages appears to be low in the IBTS survey, and the survey index is noisy, variable from year to year (and within year), and does not track lemon sole cohort strength very well; however despite these issues the biomass index is considered appropriate to use in the North Sea lemon sole assessment. ICES provide annual advice on the status of lemon sole in the North Sea ecoregion (see https://doi.org/10.17895/ices.advice.19448039). More detailed information on the assessment, input data, and other data available is provided in the annual reports of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK; see https://www.ices.dk/community/groups/Pages/WGNSSK.aspx).

Plaice

The FMP area straddles two assessment units of plaice, namely the stock in the North Sea (Subarea 4) and northern Skagerrak (Subdivision 20), and the stock in the eastern English Channel (Division 7.d).

ICES considers plaice in the North Sea and northern Skagerrak a category 1 stock, with MSY advice based on the MSY approach using an age-based analytical assessment (SAM) and stochastic forecast. Input data include commercial catch, ages, and length frequencies from port and observer and self-sampling, five survey indices (combined BTS+IBTS Q3, BTS-Isis, SNS split into two reflecting historical and more recent data, and IBTS Q1. Both the BTS+IBTS Q3 and IBTS Q1 survey indices are updated yearly using a Delta-GAM model. Natural mortality is age dependent and time invariant and was estimated using the Peterson-Wroblewski method. Maturity-at-age is assumed constant over time. Plaice migrate into the eastern English Channel during quarter 1; 50% of the mature catches in the eastern English Channel during quarter 1 are therefore assigned to the North Sea plaice stock for the stock assessment.

ICES considers the 7.d plaice stock to be a category 1 stock, with MSY advice based on the MSY approach using an age-based analytical assessment (Aarts and Poos) and forecast. Input data include commercial catch and two survey indices (UK-BTS and FR-GFS index, the latter derived from a Delta-GAM statistical model). Natural mortality is age dependent and time invariant and was estimated using the Peterson-Wroblewski method. A fixed maturity ogive is based on biological sampling. The assessment model reconstructs discards for years where discard data are not available (before 2006). Catches of plaice in Division 7.d are considered to comprise a mix of the resident 7.d stock as well as individuals from the western Channel and North Sea stocks due to migrations during the first quarter of the year. There is however uncertainty as to the level of migration and the current assessment assumes migrations account for a fixed proportion of quarter 1 removals estimated from an historical tagging survey.

ICES provide annual advice on the status of two stocks of plaice in the FMP area: North Sea (https://doi.org/10.17895/ices.advice.19453586) and eastern English Channel (https://doi.org/10.17895/ices.advice.19453628). More detailed information on the assessment, input data, and other data available provided in the annual reports of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK; see https://www.ices.dk/community/groups/Pages/WGNSSK.aspx).

Sole

The FMP area straddles two assessment units of sole, namely the stock in the North Sea (Subarea 4), and the stock in the eastern English Channel (Division 7.d).

ICES considers sole in the North Sea a category 1 stock, with MSY advice based on the MSY approach using an age-based analytical assessment (Aarts and Poos) and forecast. Input data include commercial catches and two survey indices (a combined BTS index comprising Dutch, German and Belgian surveys for Q3, and SNS Q3). The assessment model reconstructs discards for years where discard data are not available (before 2002). The assessment model currently presents a large retrospective pattern in estimated SSB (spawning stock biomass) and fishing mortality, which could lead to further revisions in stock status. Possible explanations for this pattern are still not well understood. Between 2014 and 2018, the pulse trawl fleet was the main fishery targeting sole in the North Sea. Following the EU decision in February 2019 to revise the technical measures regulations, pulse gear was prohibited from 30 June 2021. This has caused changes in the selection pattern, which might contribute to the retrospective pattern of the assessment. Despite the retrospective pattern observed, ICES consider the advice to be in line with the ICES precautionary approach.

ICES considers sole in the eastern English Channel a category 1 stock, with MSY advice based on the MSY approach using an age-based analytical assessment (SAM) and stochastic forecast. Input data include commercial catches, three survey indices (UK-E&W-BTS, UK-E&W-YFS and FR-YFS), and three commercial indices (BE-CBT, FR-COTB, and UK-E&W-CBT). Discards are reconstructed from 1982–2003 (externally to the assessment model), and used in the assessment together with discard data from 2004 onwards. Poorer tracking of the cohorts in the most recent part of the time-series led to the exclusion of ages 1−3 from the UK BTS index from 2010 onwards.

ICES provide annual advice on the status of two stocks of sole in the FMP area, namely the stock in the North Sea (https://doi.org/10.17895/ices.advice.19453814), and the stock in the eastern English Channel (https://doi.org/10.17895/ices.advice.19453820). More detailed information on the assessment, input data, and other data available provided in the annual reports of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK; see https://www.ices.dk/community/groups/Pages/WGNSSK.aspx).

Turbot

The current assessment unit of turbot relevant to the FMP area is that from the North Sea (Subarea 4).

ICES considers turbot a category 1 stock, with MSY advice based on the MSY approach using an age-based analytical assessment (SAM) and stochastic forecast. Input data include commercial landings raised to international landings, two survey indices (SNS, BTS-Isis), and one standardized commercial biomass index (NL_BT2). A constant maturity ogive (over years) and natural mortality (over ages and years) is assumed. Discards are not included in the assessment because they are uncertain due to the limited availability of age-length information; however, discards are used to provide catch advice.

The age composition of the Dutch landings is available for most of the years and is derived almost entirely from the Dutch beam trawl fishery. This creates uncertainty in the assessment, because a fourth of the Dutch landings comes from other gears which are not as comprehensively sampled. Comprehensive Danish age-structured data are available since 2014.

The standardized commercial biomass index (NL_BT2) has been available since 1995 and is derived from landings and effort data for the Dutch beam trawl fleet. This index has the most weight in estimating the final biomass and strongly influences the trend in the assessment. The two age-structured index time-series of fisheries-independent surveys (BTS-ISIS and SNS) used in the assessment show a poor internal consistency, especially for older ages, leading to a poor tracking of cohorts over time.

ICES provide annual advice on the status of one stock of turbot for the North Sea (see https://doi.org/10.17895/ices.advice.19453871). More detailed information on the assessment, input data, and other data available is provided in the annual reports of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK; see https://www.ices.dk/community/groups/Pages/WGNSSK.aspx).

Witch

The assessment unit of witch comprises the Skagerrak (Division 3.a), North Sea (Subarea 4) and eastern English Channel (Division 7.d). This assessment unit equates with the North Sea ecoregion.

ICES considers witch a category 1 stock, with MSY advice based on the MSY approach using an age-based analytical assessment (SAM) and stochastic forecast. Input data include commercial catches and three survey indices (IBTS Q1, IBTS Q3, and BTS Q3) that are used as total biomass indices until 2008, and as age-based indices from 2009 onwards. A constant maturity ogive (over years) and natural mortality (over ages and years) is assumed. SSB is estimated at the middle of the year (for example spawning time). Discard information is included in the assessment from 2009 onwards.

Witch are generally distributed in deeper areas, and the current trawl surveys do not cover some of that habitat. A fisheries independent survey using gears suitable for catching large flatfish and covering the entire distribution of the stock would improve the assessment. Furthermore, age information is only included in the assessment from 2009 onwards, increasing the uncertainty prior to 2009.

ICES provide annual advice on the status of witch in the North Sea (Subarea 4), Skagerrak (Division 3.a) and eastern English Channel (Division 7.d.) (see https://doi.org/10.17895/ices.advice.19458614). More detailed information on the assessment, input data, and other data available is provided in the annual reports of the Working Group on the Assessment of Demersal Stocks in the North Sea and Skagerrak (WGNSSK; see https://www.ices.dk/community/groups/Pages/WGNSSK.aspx).

Stock assessment evidence gaps

Brill

Whilst there are some fishery-dependent data available, data from at-sea observer programmes are expected to be limited. Data relating to brill from scientific trawl surveys are limited, and do not provide information on temporal changes in stock size.

The current scientific surveys in the stock area are not designed for catching brill, especially large brill. A fisheries-independent survey that had adequate catchability of large flatfish and that covered the entire distribution area of the stock would improve the assessment. To address this issue in future assessments, a Dutch science–industry partnership initiated a new beam trawl survey in the central and southern North Sea for turbot and brill in 2019.

Given the relatively high commercial value of brill, more robust stock assessments may be appropriate to inform fishery management. Given the limited data from existing trawl surveys, one option for improved stock assessments could be using “Close Kin Mark Recapture” studies, which have been developed to inform on the stock sizes of other high-value commercial species.

Dab

Improved estimates of discard rates, discard survival studies and better understanding of stock structure would be appropriate to inform stock assessment and fishery management.

Flounder

Given the coastal and estuarine distribution of flounder, there may potentially be discrete stocks, or sub-stocks, and improved studies of stock delineation are required.

Halibut

Whilst some fishery-dependent and fishery-independent data are available, such data are likely to be limited for the FMP area. Given this is a highly valued commercial species, collaborative work to better identify stock units (or nominal stock units) in the North Atlantic are required, especially as to whether Atlantic halibut in the North Sea is simply the southern edge of a more widespread northerly stock.

Given the high value of Atlantic halibut, stock assessments could usefully be developed when appropriate stock units have been identified. One option for improved stock assessments could be using “Close Kin Mark Recapture” studies, which have been developed to inform on the stock sizes of other high-value commercial species.

Lemon sole

There are both fishery-dependent and fishery-independent data available for lemon sole. It is a frequently captured species in scientific trawl surveys, and such surveys provide biological information and inform on temporal changes in stock size and population structure. Improved information on age and length distributions in landings and discards from most countries participating in the fishery would be required in order to conduct a fully analytical assessment. A fishery-independent index covering the entire distribution area of the stock and targeting all length classes of lemon sole could also improve the assessment.

In terms of nursery grounds, there is limited information on the habitats of the earliest demersal stages. It is possible they occur on deeper grounds and/or grounds with coarse substrates, which could explain the limited numbers of small lemon sole observed on most scientific trawl surveys.

The biological stock units of lemon sole are undefined across the wider distribution area. Improved studies of stock delineation are required, especially in relation to potential connectivity between eastern and western Scotland.

Plaice

There are both fishery-dependent and fishery-independent data available for plaice. It is a frequently captured species in scientific trawl surveys, and such surveys provide biological information and help inform on temporal changes in stock size and population structure. Further research on the migration of plaice, including to/from Division 7.e and Subarea 4 is required to enhance the robustness of the assessments.

Sole

There are both fishery-dependent and fishery-independent data available for sole. It is a frequently captured species in scientific trawl surveys, and such surveys provide biological information and help inform on temporal changes in stock size and population structure. Further research on discard mortality and subpopulation structure of sole in the eastern English Channel (Division 7.d) would be appropriate to inform stock assessment.

There are more limited data for 0-group sole in the shallower coastal waters, including nursery grounds, of the FMP area. Of particular note is the Outer Thames Estuary, which is recognised as an important habitat for North Sea sole, and for which contemporary data collection on juvenile sole have been somewhat limited.

Turbot

The current ICES assessment unit of turbot relevant to the FMP area is that from the North Sea (Subarea 4). However, further work to investigate relevant biological unit(s) and examine potential connectivity with the English Channel could be considered, especially as the related brill has a different assessment unit.

Whilst there are some fishery-dependent data available, data from at-sea observer programmes are expected to be limited. Data relating to turbot from scientific trawl surveys are limited, and do not provide information on temporal changes in stock size. A fisheries-independent survey, having both adequate catchability of large flatfish and covering the entire distribution area of the stock, is needed to improve the assessment. To address this issue in future assessments, a Dutch science–industry partnership initiated a new beam trawl survey in the central and southern North Sea for turbot and brill in 2019.

Witch

There are both fishery-dependent and fishery-independent data available for witch. Witch is a frequently captured species in scientific trawl surveys, and such surveys provide biological information and may also inform on temporal changes in stock size and population structure. Improved estimates of fishing mortality and natural mortality, and better understanding of stock boundaries would be appropriate to inform stock assessment and fishery management.

All evidence gaps are listed within the Evidence Plan (Annex 2).

Fisheries landings:

Total landings

Summary

Dab, halibut and witch show fluctuating landings by UK vessels over the seven years between 2016-2022 (Table 2). The landings either increase overall or decrease just slightly. However, it is important to caveat that halibut and witch have very low landings so caution must be taken in inferring themes from these. In contrast, the remaining six species (brill, flounder, lemon sole, plaice, sole and turbot) show a general and gradual decrease in landings by UK vessels over the time period. Plaice is the highest landed species by UK vessels (approximately 1000-5000t a year across the time series), followed by sole with a range of approximately 400 to 700t a year (Figure 11). Brill, lemon sole, turbot, flounder and dab all range between approximately 10t and 150t a year.

In general, EU vessels land considerably more of each species within the FMP area than UK vessels, apart from halibut and witch, with EU vessels accounting for approximately 70-79% of total landings of these flatfish species within the FMP area during this time series (Table 2, Figure 11). Landings liveweight show a similar trend to UK vessels, with fluctuating landings tonnage for dab, halibut and witch, and a more declining trend for brill, flounder, lemon sole, plaice, sole and turbot. Plaice and sole are the highest landed species by EU vessels (Table 2, Figure 11).

Table 2. Landings by tonne (t) and value (£) for UK and EU vessels within the FMP area for all nine species and the respective totals. EU data was not available for 2021.

			2016	2017	2018	2019	2020	2021	2022
Brill	UK	t	85	56	43	34	34	29	21
		£	386,566	291,814	240,778	156,059	109,532	151,708	148,185
	EU	t	418	404	373	357	286	170	-
		£	2,230,993	2,683,313	2,706,567	2,099,610	1,695,705	1,299,042	-
Dab	UK	t	79	112	149	109	136	156	132
		£	56,513	81,753	76,166	40,962	73,745	99,768	62,405
	EU	t	485	370	409	414	298	227	-
		£	357,979	296,401	318,915	271,224	200,669	143,934	-
Flounder	UK	t	43	25	26	22	13	24	18
		£	23,177	13,606	12,755	11,360	7,257	15,201	9,250
	EU	t	142	114	94	142	86	95	-
		£	86,632	86,119	77,234	94,925	55,296	38,509	-
Halibut	UK	t	18	29	27	31	16	16	12
		£	137,753	246,418	223,851	259,071	135,142	170,208	149,357
	EU	t	0.8	1.4	2.1	2.1	1.3	0.3	-
		£	5,944	12,420	19,358	18,447	11,372	2,116	-
Lemon Sole	UK	t	173	159	97	87	62	75	37
		£	453,611	449,005	271,389	201,663	94,443	135,346	91,454
	EU	t	240	169	149	120	96	80	-
		£	907,519	722,455	553,737	384,112	274,539	243,277	-
Plaice	UK	t	4,872	4,709	2,731	1,559	1,212	1,405	639
		£	6,317,478	6,122,751	5,291,791	2,404,194	1,416,638	1,441,803	1,341,561
	EU	t	8,114	7,184	6,744	4,254	3,055	2,893	-
		£	10,573,585	11,437,331	14,251,322	8,577,541	6,189,050	5,463,649	-
Sole	UK	t	732	596	570	405	355	404	439
		£	5,524,860	4,179,429	4,406,260	3,408,832	2,397,926	3,463,274	4,799,199
	EU	t	3,845	3,797	3,773	3,115	2,463	2,241	-
		£	33,158,817	35,295,976	37,606,921	31,080,129	24,425,314	21,122,948	--
Turbot	UK	t	151	145	91	80	74	69	44
		£	989,466	987,278	709,255	531,643	363,139	425,689	445,706
	EU	t	582	642	664	499	427	366	-
		£	4,152,161	5,259,121	6,110,059	4,279,445	3,581,032	3,378,855	-
Witch	UK	t	22	13	17	25	11	16	14
		£	21,291	12,331	18,633	26,123	9,628	14,604	12,681
	EU	t	7	5	21	11	10	2	-
		£	14,587	10,485	55,342	23,418	17,783	4,080	-
TOTAL	UK	t	6,175	5,844	3,751	2,352	1,913	2,194	1,356
		£	13,910,715	12,384,385	11,250,878	7,039,907	4,607,450	5,917,601	6,968,344
	EU	t	13,834	12,686	12,229	8,914	6,722	6,074	-
		£	51,488,217	55,803,621	61,699,455	46,828,851	36,450,760	31,696,410	-
Total		t	20,009	18,530	15,980	11,266	8,635	8,268	-
		£	65,398,932	68,188,006	72,950,333	53,868,758	41,058,210	37,614,011	-

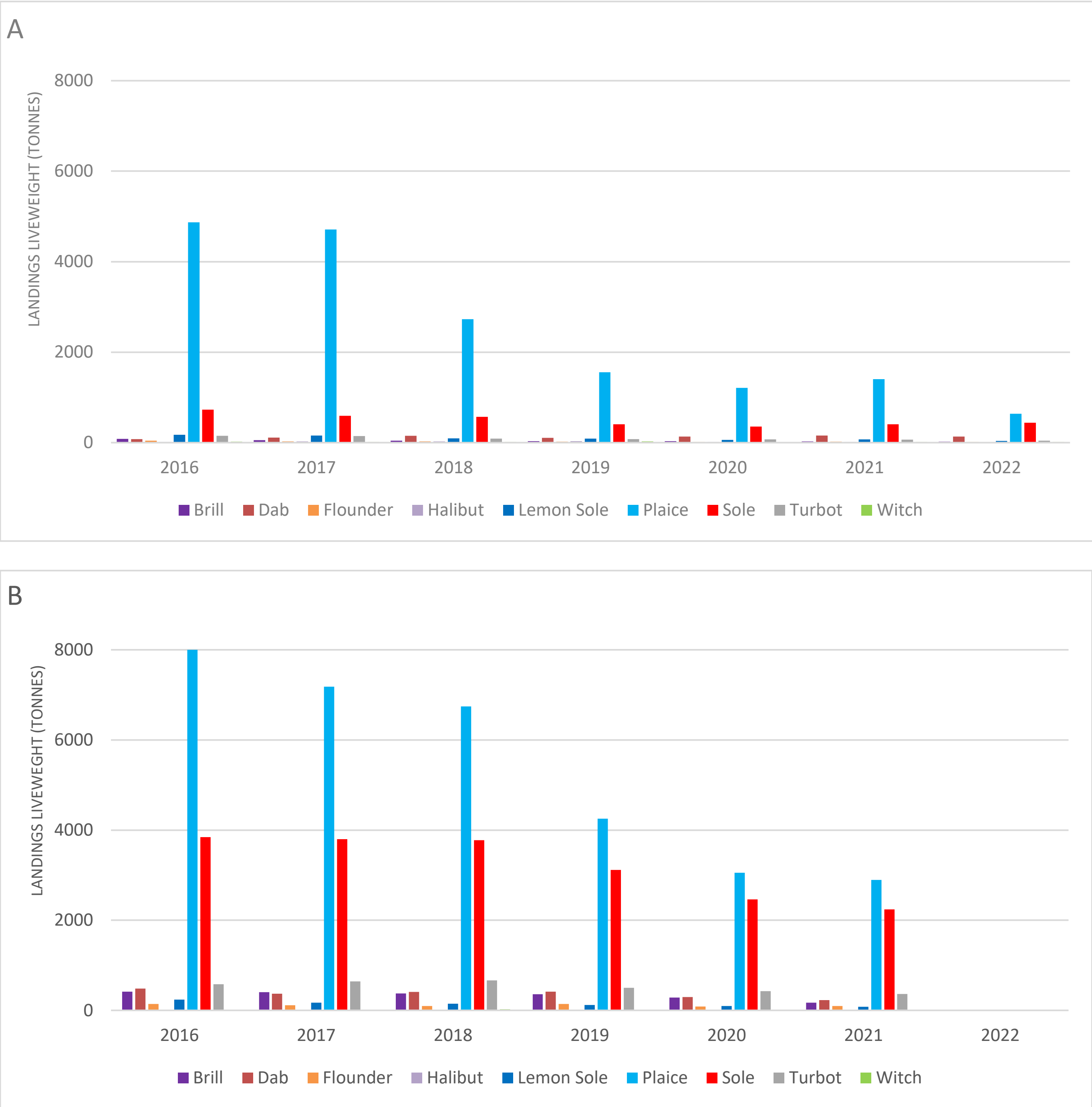

Figure 11. Landings liveweight (tonnes) of the nine FMP species by UK (A) and EU (B) vessels within the FMP area between 2016 and 2022 (2021 for EU vessels).

Brill

UK vessels: Within the FMP area**,** brill landings liveweight has decreased from 2016 to 2022 by 75%. Landed value also decreased by 72% from 2016 to 2020 before increasing slightly in 2021, then decreasing again in 2022. Looking at price per tonne, price has fluctuated over the time series with the highest price per tonne in 2022. Brill landings by UK vessels within the FMP account for 8-20% of total landings by UK vessels within all UK waters, with the proportion of landings within the FMP area decreasing over time.

EU vessels: Within the FMP area, landings of brill by EU vessels have decreased by 60% since 2016. Landed value increased from 2016 through to a peak in 2018, then decreased to 2021. Looking at price per tonne, prices increased from 2016 to 2018, before declining again to 2020 then increased again in 2021. EU vessels landed approximately 6-10 times the live weight of UK vessels, with EU landings making up 83-91% of total brill landings within the FMP area.

Dab

UK vessels: Within the FMP area**,** dab landings liveweight has fluctuated between 2016 to 2022, with the lowest landings in 2016 (79 tonnes) and the highest in 2021 (156 tonnes). Landed value has largely followed the same trend as landings. Looking at price per tonne, 2017 had the highest prices for dab per tonne, and 2019 the lowest price per tonne. Dab landings by UK vessels within the FMP area account for 32-68% of total landings by UK vessels within all UK waters.

EU vessels: Within the FMP area*,* landings of dab by EU vessels has also fluctuated over time, with the highest landings liveweight in 2016 (485 tonnes) and the lowest in 2021 (227 tonnes). The landed value followed a similar pattern. Price per tonne has also fluctuated between the years with the highest price per tonne in 2017, and the lowest in 2021. The value per tonne for EU vessels was higher than for UK vessels in each year. EU landings account for 60-86% of total landings within the FMP area, with proportion landed by EU vessels decreasing over time.

Flounder

UK vessels: Within the FMP area, flounder landings liveweight has fluctuated over the years with a general declining trend and a 58% decrease between 2016 and 2022. Landed value has largely followed the same trend as landings with an overall decrease. Price per tonne has fluctuated with the highest price per tonne in 2021, and the lowest in 2018. Flounder landings by UK vessels within the FMP area account for 34-58% of total landings by UK vessels within all UK waters.

EU vessels: Within the FMP area, landings of flounder by EU vessels have fluctuated with the highest landings in both 2016 and 2019 (142 tonnes), and lowest landings in 2020 (86 tonnes). Landed value followed a similar trend, but with a large decrease in value in 2020. This is also shown in price per tonne, with the lowest price in 2021. EU vessel price per tonne was also higher than the UK vessel price per tonne in all years apart from 2021. EU vessel landings account for 76-86% of total landings within the FMP area.

Halibut

UK vessels: Within the FMP area, halibut liveweight has fluctuated with an overall decrease in landings over the time series. Landed value has also varied over time. Price per tonne has generally increased over time, increasing by 38% between 2016 and 2022. Halibut landings by UK vessels within the FMP area account for approximately 10% of total landings by UK vessels within all UK waters.

EU vessels: Within the FMP area, landings and value of halibut by EU vessels have increased between 2016 and 2018, before then decreasing to 2021. UK vessels land the majority of halibut within the FMP area, with EU vessels accounting for 4-8% of total landings.

Lemon Sole

UK vessels: Within the FMP area, lemon sole liveweight of landings has generally decreased, with an overall decline of 78% between 2016 and 2022. Landed value has mirrored the decrease in liveweight landed, also declining by 79% across the time series. Price per tonne remained relatively consistent between 2016 to 2018, before declining in 2019. Lemon sole landings by UK vessels within the FMP area account for 3-5% of total landings by UK vessels within all UK waters.

EU vessels: Within the FMP area, landings of lemon sole by EU vessels has declined, with an overall decrease of 66% between 2016 and 2021. The landed value of lemon sole has also declined over the time series. Price per tonne was higher for EU vessel landings compared with UK landings in all years. EU vessel landings account for 51-60% of total landings with the FMP area.

Plaice

UK vessels: Within the FMP area, plaice liveweight landed has declined each year, with a 87% decline from 2016 to 2022. Landed value has largely followed the same trend as landings. Price per tonne increased from 2016 to a peak in 2018, before declining to 2021 and increasing again in 2022. Plaice landings by UK vessels within the FMP area account for 25-36% of total landings by UK vessels within all UK waters.

EU vessels: Within the FMP area, landings of plaice by EU vessels has also declined, with a 64% decrease between 2016 and 2021. Landed value for EU vessels followed the same trend as UK vessels, with an increase from 2016 to 2018 before declining. Price per tonne was higher for EU vessel landings compared with UK landings in all years. EU vessel landings account for 60-73% of total landings with the FMP area.

Sole

UK vessels: Within the FMP area, sole liveweight landed decreased between 2016 to 2020, before increasing again in 2021 and 2022. However, a general decrease of 40%

was observed between 2016 and 2022. Landed value followed the same trend. Price per tonne fluctuated across the time series with the highest price in 2022, and the lowest in 2020. Sole landings by UK vessels within the FMP area account for 20-26% of total landings by UK vessels within all UK waters.

EU vessels: Within the FMP area, landings of sole by EU vessels has also declined, with a decrease of 42% between 2016 and 2021. Landed value increased from 2016 to 2018 before declining to 2021. Price per tonne has also shown a similar trend with the highest price in 2019. EU vessel landings account for 84-88% of total landings with the FMP area.

Turbot

UK vessels: Within the FMP area, turbot liveweight has decreased by 71% between 2016 and 2022. Landed value has also shown the same trend, but with an increased landings value in 2022 compared with 2021. Price per tonne has fluctuated over time with the highest price in 2022, and the lowest price in 2020. Turbot landings by UK vessels within the FMP area account for 11-17% of total landings by UK vessels within all UK waters.

EU vessels: Within the FMP area, landings and value of turbot by EU vessels increased between 2016 and 2018, before declining to 2021. Price per tonne was higher for EU vessel landings compared with UK landings in all years. EU vessel landings account for 79-87% of total landings with the FMP area.

Witch

UK vessels: Within the FMP area, witch liveweight has fluctuated over the time series with a peak in landings in 2019 and the lowest landings in 2020. Landed value and price per tonne have also followed a similar trend. Witch landings by UK vessels within the FMP area account for approximately 2% of total landings by UK vessels within all UK waters.

EU vessels: Within the FMP area, landings and value of witch by EU vessels have also fluctuated with a peak in 2018, followed by a decline. Price per tonne was higher for EU vessel landings compared with UK landings in all years. EU vessel landings account for 11-55% of total landings within the FMP area with UK vessels landing more witch than EU vessels in all years apart from 2018.

Location of landings

The species in this FMP can be grouped into three categories as per the spatial distribution of landings within the FMP area:

- Northern North Sea – witch and halibut
- North Sea and eastern Channel – dab, lemon sole, plaice, turbot, brill
- Southern North Sea and eastern Channel – sole and flounder

Northern North Sea:

Halibut

All halibut landings by tonnage and value within the FMP area were recorded across the northern North Sea (Figure 12), with the highest landings found in ICES rectangles 39E8 and 39E9.

Figure 12. Halibut landings by UK vessels in English waters by ICES rectangle between 2016-2021. The larger the circle, the higher average landings from this area.

Witch

The majority of landings of witch by tonnage and value within the FMP area were recorded within the northern North Sea, with the highest landings from ICES rectangle 41F1, in the middle of the northern North Sea. Landings were also recorded in the southern North Sea in ICES rectangle 31F1 (Figure 13).

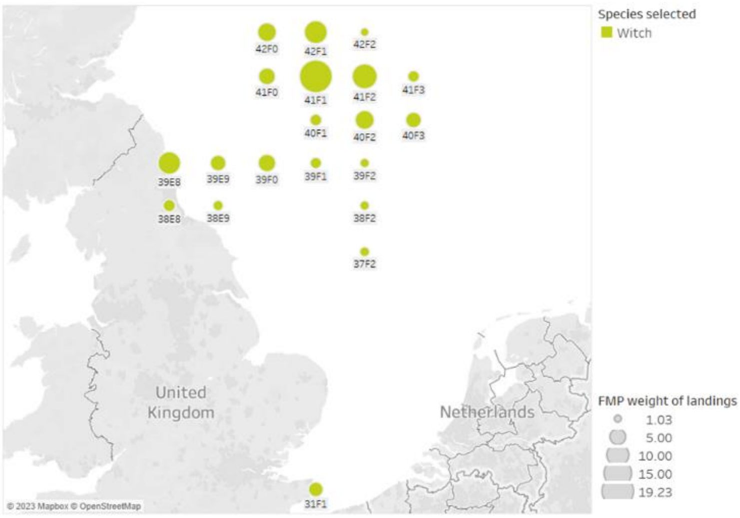

Figure 13. Witch landings by UK vessels in English waters by ICES rectangle between 2016-2021. The larger the circle, the higher average landings from this area.

North Sea and eastern Channel:

Dab

Landings of dab by tonnage and value within the FMP area were recorded throughout the North Sea and eastern English Channel (Figure 14). The highest areas for landings are the central northern North Sea (ICES rectangle 39F2) and the southeast coast of England (ICES rectangle 30F0).

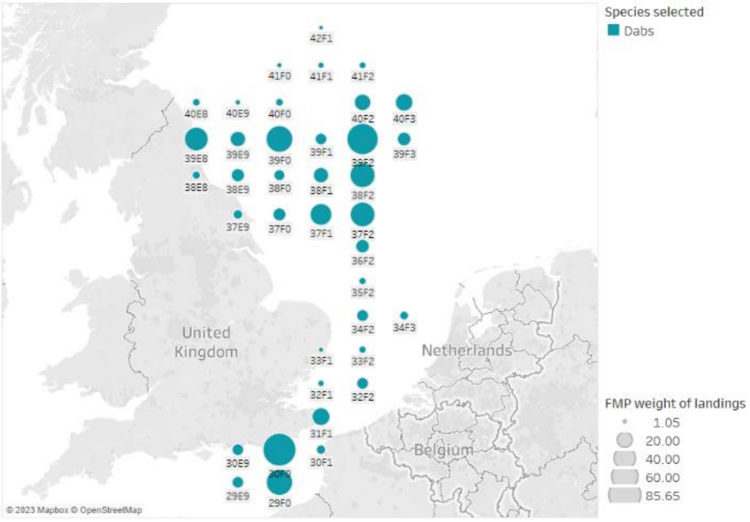

Figure 14. Dab landings by UK vessels in English waters by ICES rectangle between 2016-2021. The larger the circle, the higher average landings from this area.

Lemon Sole

Landings of lemon sole by tonnage and value within the FMP area were recorded throughout the North Sea and eastern English Channel (Figure 15). The highest areas for landings are the central northern North Sea (ICES rectangles 39F2 and 38F2) and the southeast coast of England (ICES rectangle 30F0).

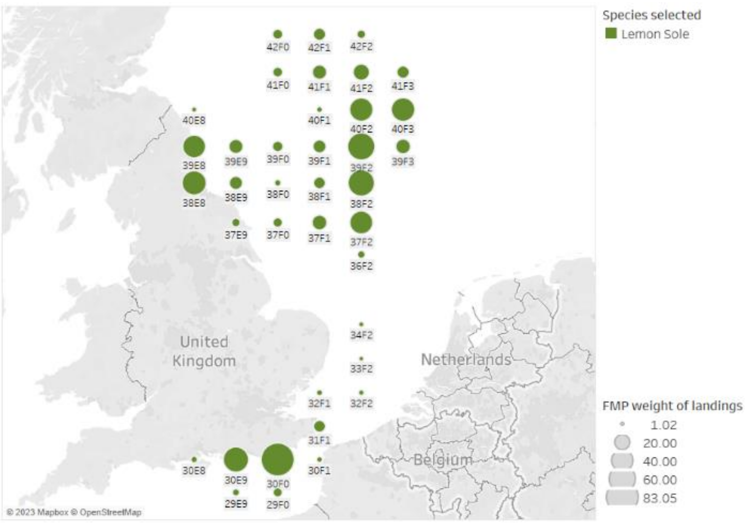

Figure 15. Lemon sole landings by UK vessels in English waters by ICES rectangle between 2016-2021. The larger the circle, the higher average landings from this area.

Plaice

Landings of plaice by tonnage and value within the FMP area were recorded throughout the North Sea and eastern English Channel (Figure 16). The highest areas for landings are the central northern North Sea (ICES rectangles 38F2 and 39F2) and the southeast coast of England (ICES rectangle 30F0).

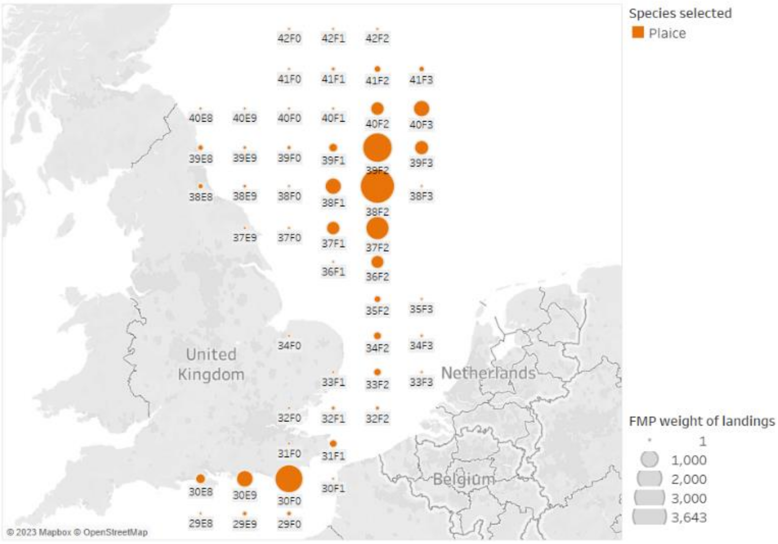

Figure 16. Plaice landings by UK vessels in English waters by ICES rectangle between 2016-2021. The larger the circle, the higher average landings from this area.

Turbot

Landings of turbot by tonnage and value within the FMP area were recorded throughout the North Sea and eastern English Channel (Figure 17). The highest areas for landings are the central northern North Sea (ICES rectangles 37F2 and 38F2) and the southeast coast of England (ICES rectangles 30F0 and 30E9).

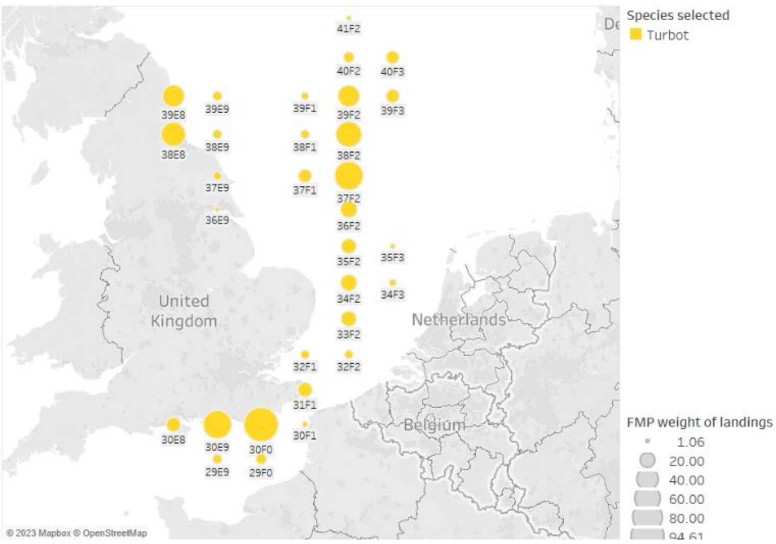

Figure 17. Turbot landings by UK vessels in English waters by ICES rectangle between 2016-2021. The larger the circle, the higher average landings from this area.

Brill

Landings of brill by tonnage and value within the FMP area were recorded in a patchy distribution across the North Sea and within the eastern English Channel (Figure 18). The highest areas for landings are southeast coast of England (ICES rectangles 30E9 and 30F0).

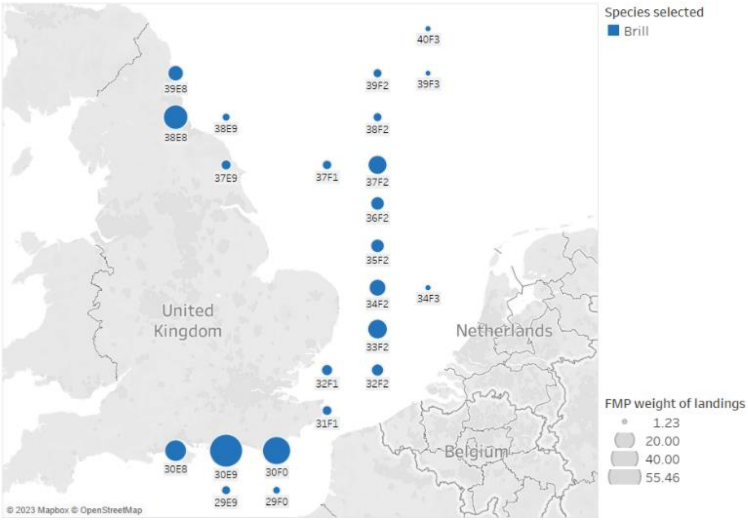

Figure 18. Brill landings by UK vessels in English waters by ICES rectangle between 2016-2021. The larger the circle, the higher average landings from this area.

Southern North Sea and eastern Channel:

Flounder

Landings of flounder by tonnage and value within the FMP area were recorded in the southern North Sea and within the eastern English Channel (Figure 19). The highest area for landings was the southeast coast of England (ICES rectangle 30F0).

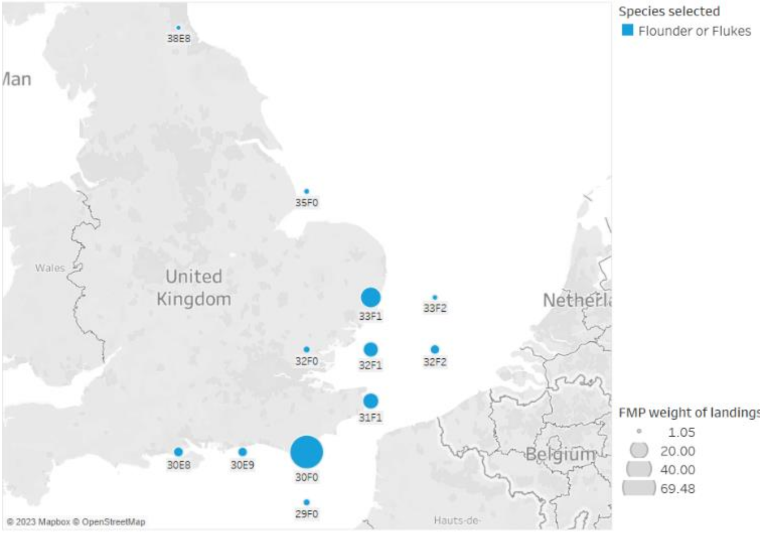

Figure 19. Flounder landings by UK vessels in English waters by ICES rectangle between 2016-2021. The larger the circle, the higher average landings from this area.

Sole

Landings of sole by tonnage and value within the FMP area were recorded mainly in the southern North Sea and within the eastern English Channel (Figure 20). The highest area for landings was the southeast coast of England (ICES rectangle 30F0).

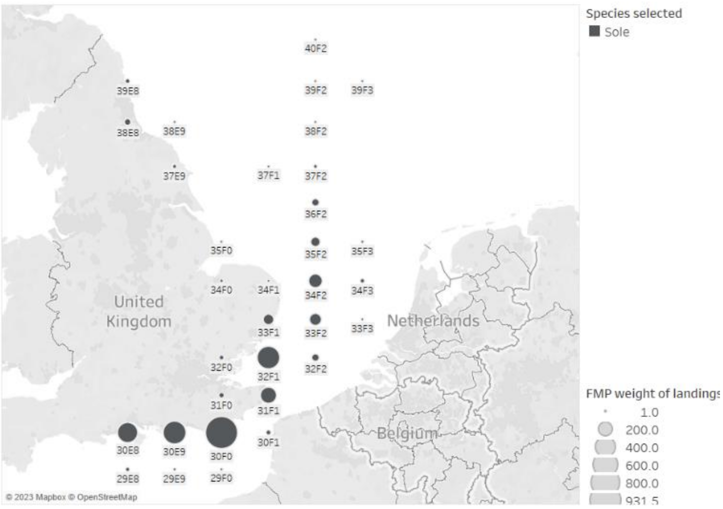

Figure 20. Sole landings by UK vessels in English waters by ICES rectangle between 2016-2021. The larger the circle, the higher average landings from this area.

Seasonality

Landings of plaice increase substantially in summer months, with landings increasing from less than 40 tonnes in May to over 400 tonnes in June and July (Table 3, Figure 21). Landings then decline again in autumn and winter. Landings of dab, halibut, lemon sole, turbot and witch also show increases in landings in June/July (Table 3, Figure 21).

Landings of sole also display some seasonality, with increased landings in autumn months compared to the rest of the year. Landings of flounder fluctuate throughout the year with peak landings in February. Landings of Brill remain relatively consistent throughout the year (Table 3, Figure 21).

Table 3. Seasonality by landings tonnage (t) and value (£000) for UK vessels within the FMP area for all nine FMP species in 2021.

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Brill	**t**	1.6	1.2	3.7	3.4	1.1	2.2	2.2	2.0	3.4	2.7	3.0	2.4
	£	6,552	6,004	16,865	12,775	5,628	11,228	96,94	15,493	19,469	15,950	17,669	14,379
Dab	**t**	7.0	13.3	16.4	20.9	7.3	27.4	22.0	12.2	10.8	8.4	6.8	3.4
	£	4,389	8,620	12,081	13,098	4,656	17,927	13,851	6,626	7,005	4,395	4,541	2,580
Flounder	**t**	2.3	8.5	3.4	0.3	0.9	0.6	0.9	0.5	1.3	1.3	3.5	0.2
	£	1,277	6,958	2,281	185	435	328	465	205	556	503	1,868	141
Halibut	**t**	0.8	0.7	1.5	1.6	0.6	3.1	1.5	1.4	1.6	1.5	0.7	0.7
	£	7,296	7,162	12,955	15,681	7,076	34,491	16,477	19,310	17,642	15,090	7,227	9,803
Lemon Sole	**t**	3.4	2.7	3.6	4.1	3.4	15.4	12.6	5.2	8.4	5.5	4.9	5.7
	£	7,366	5,803	5,814	7,898	4,611	20,617	17,644	13,020	16,666	7,431	9,579	18,896
Plaice	**t**	16	13	37	39	39	477	435	82	133	40	56	37
	£	18,554	15,230	37,688	47,164	38,198	444,711	404,221	96,126	143,910	57,584	89,839	48,578
Sole	**t**	10.5	4.5	31.4	25.0	11.7	29.7	33.4	41.9	79.7	53.1	57.9	25.8
	£	83,163	33,660	193,643	135,124	93,680	259,864	279,585	364,622	636,581	516,680	603,108	263,564
Turbot	**t**	3.5	1.9	3.7	4.2	2.6	13.7	11.2	2.8	5.2	6.2	8.8	5.5
	£	20,943	12,774	20,176	17,017	18,343	53,906	37,205	25,578	35,791	50,002	78,491	55,464
Witch	**t**	0.5	0.2	0.3	2.1	1.1	4.0	1.6	1.6	2.1	0.9	0.8	1.1
	£	427	244	363	1820	1454	3416	1840	1634	1556	609	676	564

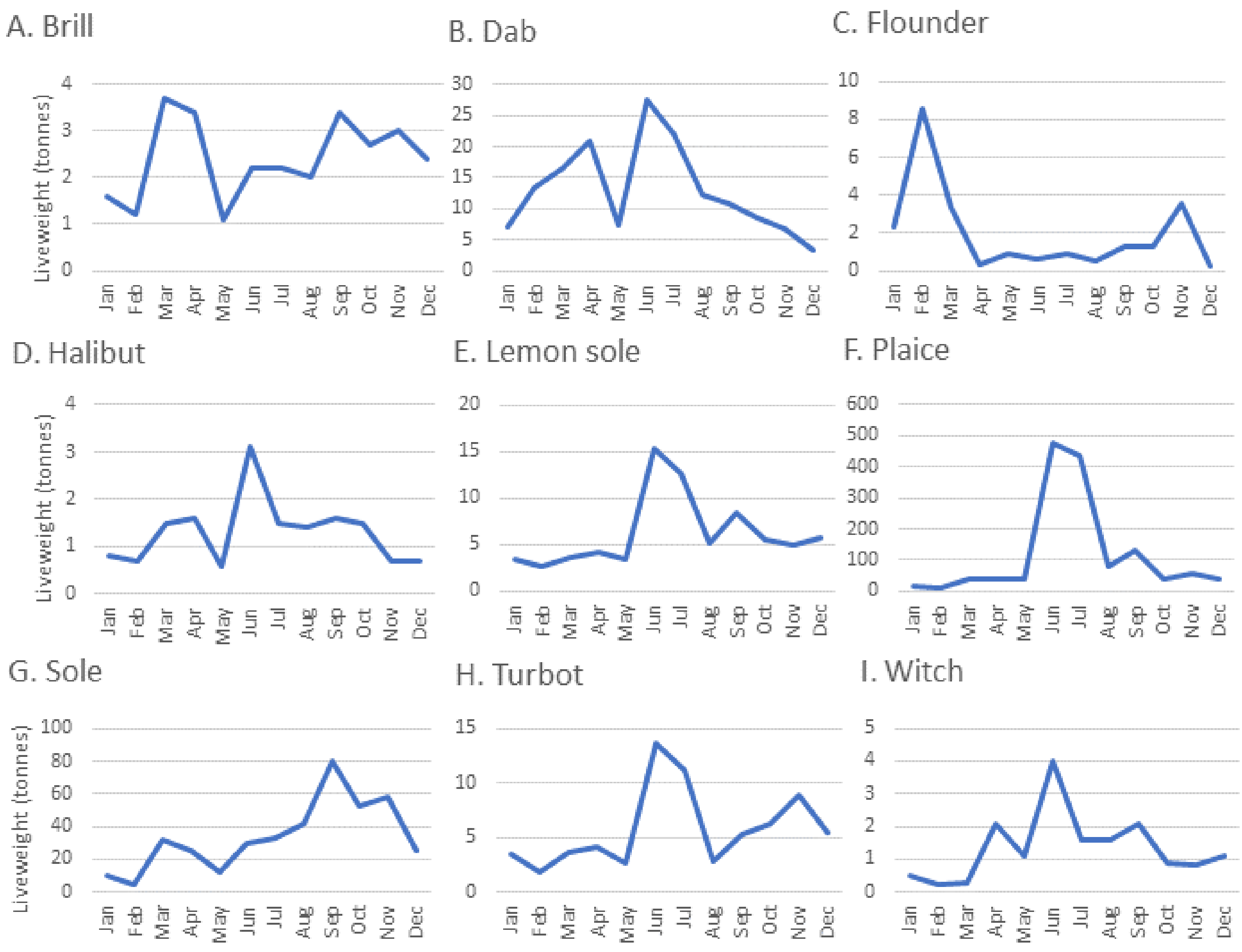

Figure 21. Seasonality (2021) by liveweight landings tonnage (t) for UK vessels within the FMP area for all nine FMP species.

Fleet characteristics

Total number of vessels (UK vessels)

The total number of vessels landing flatfish within the FMP area has declined since 2016 from 745 vessels to 558 vessels in 2021 (Table 4).

Table 4: Number of UK vessels landing flatfish (>1kg per month, per ICES rectangle, per gear type) within the FMP area between 2016-21.

	2016	2017	2018	2019	2020	2021
Number of vessels	745	706	632	643	587	558

Landings by vessel nationality

Table 5. Landings (tonnes) within the FMP area by UK and Crown Dependency vessels by nationality (E = England, S = Scotland, W = Wales, NI = Northern Ireland, CD = Crown Dependencies) in tonnes of all nine FMP species and the respective totals covering 2016 to 2021. All values listed as zero, have less than 0.5 tonnes of landings. Blank cells indicate no landings were recorded in that year.

Species		2016	2017	2018	2019	2020	2021	2022
Brill	**E**	78	50	35	30	30	24	18
	NI	0	0	0	0	0	0	0
	S	7	6	7	3	3	4	3
	W	0	0	2	0	1	-	-
	CD	-	-	-	-	-	0	0
Dab	**E**	72	82	105	74	82	100	81
	NI	0	-	3	7	4	4	5
	S	7	30	40	29	50	52	47
	W	0	0	0	0	0	-	-
	CD	-	-	-	-	-	-	-
Flounder	**E**	28	22	26	21	12	18	16
	NI	-	-	-	-	-	-	-
	S	0	-	0	1	1	6	2
	W	15	2	-	-	-	-	-
	CD	-	-	-	-	-	-	-
Halibut	**E**	12	20	20	19	6	10	7
	NI	0	0	1	1	1	1	1
	S	6	9	7	11	9	5	4
	W	-	-	-	-	-	-	-
	CD	-	-	-	-	--	-	0
Lemon Sole	**E**	138	115	58	55	34	46	24
	NI	0	0	0	1	0	0	1
	S	35	44	37	31	27	29	13
	W	0	1	1	0	1	-	-
	CD	-	-	-	-	-	0	0
Plaice	**E**	4,079	3,371	1,915	1,200	752	824	521
	NI	1	0	0	1	0	1	1
	S	792	1,327	803	357	458	580	117
	W	0	11	12	2	2	-	-
	CD	-	-	-	-	-	0	0
Sole	**E**	731	595	568	403	353	401	436
	NI	0	0	0	0	1	0	0
	S	1	1	1	2	2	3	2
	W	0	0	1	0	0	-	-
	CD	-	-	-	-	-	0	0
Turbot	**E**	126	117	69	61	54	49	36
	NI	0	0	0	1	1	1	1
	S	24	28	21	18	18	19	6

Species		2016	2017	2018	2019	2020	2021	2022
	W	0	1	1	0	1	-	-
	CD	-	-	-	-	-	0	0
Witch	E	8	6	5	10	3	7	4
	NI	0	0	0	1	0	0	1
	S	14	7	12	14	8	9	10
	W	-	-	-	-	-	-	-
	CD	-	-	-	-	-	0	0
Total	E	5,272	4,378	2,801	1,873	1,326	1,479	1,143
	NI	1	0	4	12	7	7	10
	S	886	1452	928	466	576	707	204
	W	15	15	15	2	4	0	0
	CD						0	0

All species, except witch, are landed predominantly by English vessels. Witch is landed predominantly by Scottish vessels (Table 5).

Brill

English vessels make up the vast majority of brill landings by weight (85-91%), followed by Scottish landings. Wales have very limited brill landings in the period of 2016 – 2022. Northern Ireland and the Crown Dependencies have negligible or no landings during this time.

Dab

English vessels make up the majority of dab landings (60-91%), with a higher proportion of landings in 2016 (91%) compared to subsequent years. Scottish vessels have the second highest landings of dab, with landings fluctuating but increasing overall over the past 6 years, but a slight decline in 2022. Northern Irish vessels have some landings of dab which vary between years. Welsh and Crown Dependencies vessels have almost negligible dab landings.

Flounder

English vessels make up the majority of flounder landings (65-100%). Welsh vessels had the second highest landings of flounder between 2016 and 2017, but then no landings have been made by Welsh vessels since 2017. Since 2018, Scottish vessels have landed the second highest volume of flounder. Northern Irish and Crown Dependencies’ vessels have no landings of flounder.

Halibut

English vessels make up the majority of halibut landings (37-71%) apart from in 2020 when Scottish vessels landed more halibut. Scottish vessels have the second highest landings of halibut overall. Northern Irish vessels landed small numbers of halibut over the time series, and Welsh and Crown Dependencies' vessels landed negligible quantities of halibut.

Lemon Sole

English vessels make up the majority of lemon sole landings (54-79%) with a general reduction in proportion of landings over time. Scotland has the second highest landings of lemon sole, with a decline in landings over time. Northern Irish, Welsh and Crown Dependencies' vessels have very limited to no landings of lemon sole over the time series.

Plaice

English vessels make up the majority of plaice landings by weight (58-83%), with decreasing landings between 2016 and 2020, but a recent increase in 2021 followed by another decline in 2022. Scottish vessels land the second highest volume of plaice. Scottish vessel landings have fluctuated over the past 6 years with a peak in 2017 at 1,327 tonnes and a low in 2022 at 117 tonnes. Welsh vessels also land some plaice within the FMP area, with the highest landings in 2017 and 2018. Northern Irish and Crown Dependencies' vessels have limited to negligible landings.

Sole

English vessels landed the majority of sole by weight with 99% of landings each year between 2016 to 2022. Scotland, Wales, Northern Ireland and Crown Dependencies have some landings, however all limited to under three tonnes.

Turbot

English vessels make up the majority of turbot landings by weight (71-84%). Scottish vessels have the second highest landings of turbot. Both English and Scottish landings showed a decline over the past 7 years. Welsh and Northern Irish vessels have some (~one tonne) landings of turbot which varies between years, whereas Crown Dependencies' vessels have negligible turbot landings.

Witch

Scottish vessels make up the majority of witch landings by weight (53-72%) and English vessels have the second highest landings. Northern Irish, Welsh and Crown Dependencies' vessels have limited to negligible landings.

Landings by vessel length

Table 6. Landings by vessel length, categorised as per <10m and >10m for UK vessels within the FMP area for all nine species and the respective totals.

			2016	2017	2018	2019	2020	2021	2022
Brill	**<10m**	**t**	35	24	17	15	14	12	10

			2016	2017	2018	2019	2020	2021	2022
		£	145,118	114,144	95,293	75,710	51,583	70,779	71,194
	>10m	t	51	33	26	19	20	17	11
		£	241,446	177,670	145,485	80,349	57,949	80,929	76,991
Dab	<10m	t	14	10	9	11	4	4	3
		£	6,838	5,574	4,058	4,468	2,147	1,520	1,209
	>10m	t	65	102	139	98	131	152	129
		£	49,675	76,180	72,107	36,494	71,598	98,248	61,196
Flounder	<10m	t	33	20	21	16	9	10	13
		£	18,641	11,062	9,913	7,640	3,926	4,136	5,622
	>10m	t	10	5	5	6	5	14	5
		£	4,535	2,544	2,842	3,720	3,331	11,065	3,628
Halibut	<10m	t	5	6	5	2	1	3	1
		£	36,701	47,282	42,235	20,981	8,425	27,967	14,491
	>10m	t	13	23	22	29	15	13	11
		£	100,976	199,136	181,617	238,090	126,717	142,241	134,866
Lemon Sole	<10m	t	36	21	12	12	5	5	5
		£	78,614	42,613	26,347	27,971	9,460	7,869	13,123
	>10m	t	138	138	85	75	58	70	32
		£	374,994	406,391	245,042	173,692	84,984	127,477	78,331
Plaice	<10m	t	541	575	601	490	239	189	220
		£	546,274	667,118	935,734	752,459	329,704	293,392	420,728
	>10m	t	4,332	4,134	2,130	1,069	973	1,215	419
		£	5,771,182	5,455,632	4,356,056	1,651,735	1,086,935	1,148,411	920,834
Sole	<10m	t	447	453	442	297	231	306	319
		£	3,161,152	3,030,239	3,336,635	2,549,006	1,826,077	2,696,713	3,520,092
	>10m	t	285	144	128	109	125	99	120
		£	2,363,702	1,149,190	1,069,625	859,826	571,849	766,561	1,279,106
Turbot	<10m	t	49	50	29	27	21	18	16
		£	323,975	359,339	244,527	220,107	154,145	181,946	167,931
	>10m	t	102	95	61	53	53	51	28
		£	665,227	627,939	464,729	311,536	208,994	243,744	277,775
Witch	<10m	t	1	1	0	1	0	1	1
		£	983	890	468	851	273	527	502
	>10m	t	21	12	16	25	11	16	14
		£	20,308	11,441	18,165	25,271	9,355	14,077	12,179
TOTAL	<10m	t	1161	1160	1136	871	524	548	588
	<10m	£	4,318,296	4,278,261	4,695,210	3,659,193	2,385,740	3,284,849	4,214,892
	>10m	t	5,017	4,686	2,612	1,483	1,391	1,647	769
	>10m	£	9,592,045	8,106,123	6,555,668	3,380,713	2,221,712	2,632,753	2,844,906

Overall, the majority of southern North Sea and English Channel flatfish landings by liveweight are from vessels >10m (57-81%), however the proportion of >10m vessels has decreased over time with 81% of landings in 2016 and 57% of landings in 2022. Landings value was greatest for >10m vessels between 2016 and 2018, but between 2019 and

2021 landings value has been greatest in <10m vessels (Table 6). Brill, dab, halibut, lemon sole, plaice, turbot, and witch are predominantly landed by >10m vessels. Flounder and sole are predominantly landed by <10m vessels.

Brill

The majority of brill landings by liveweight are by >10m vessels collectively (52-59%), however 31-39% of all landings are from 8 to 10m vessels, and 21-28% from vessels over 40m. Between 2016 and 2018, approximately 60% of landings value was from >10m vessels, but this decreased to approximately 51% in between 2019 and 2022.

Dab

The majority of dab landings in weight and value are from >10m vessels (88-97% of landed weight), with the majority landed by 24-40m vessels.

Flounder

The majority of flounder landings in weight and value are from <10m vessels in all years apart from 2021 (64-81% of landed weight, but 42% in 2021). Across all years the majority of flounder landings were by 8 to 10 m vessels.

Halibut

Most halibut landings by weight and value were from >10m vessels (72 – 94% of tonnage, and 73-94% of value). Most halibut are landed by 18 to 24m vessels, followed by 15 to 18m vessels.

Lemon Sole

Most lemon sole landings by liveweight were from >10m vessels (79-94%), with landings split between 18 to 24m vessels, 24 to 40m vessels and over 40 m vessels between the years. The majority of landings value are also from >10m vessels (83-94%).

Plaice

Most plaice landings by weight were from >10m vessels (65-91%), with the majority of landings from both 24-40m vessels and >40m vessels. Most landings value are also taken by >10m vessels (69-91%).

Sole

Most sole landings by weight were from <10m vessels (62-78%), with the majority of landings from 8 to 10m vessels. Vessels <10m also show the highest value of landings accounting for 57-78% of value.

Turbot

Most turbot landings by weight were from >10m vessels (64-74%), with the majority of landings from over 40m vessels and 24 to 40m vessels, but also a large tonnage landed by 8 to 10m vessels. The majority of value landed is also from >10m vessels (57-67%).

Witch

Most witch landings by weight and value were from >10m vessels (>93%), with volumes fluctuating between years. The majority of witch landings were by 18-24m vessels.

Gear types used to land Flatfish (UK vessels)

Table 7. Total Flatfish FMP landings (liveweight in tonnes) by gear between 2016 and 2021

Gear category	2016	2017	2018	2019	2020	2021	2022
Beam trawl	3,079	3,122	2,263	2,544	1,747	1,222	671
Demersal seine	275	551	380	178	40	64	34
Demersal / otter trawls	3,154	2,995	2,873	2,898	3,769	3,991	2,461
Dredge	9	13	21	8	4	15	9
Drift and fixed nets	690	728	818	606	610	539	564
Gears using hooks	1	2	2	1	2	4	6
Pots and traps	3	7	5	5	4	9	7

The most important gear types within the flatfish fishery are otter/demersal trawls, beam trawls and drift and fixed nets (Table 7). Halibut and witch liveweight landings are dominated by otter trawls (>92%). The majority of dab, flounder, lemon sole, plaice, and turbot liveweight landings are also by otter trawls followed by beam trawls and drift and fixed nets. The majority of sole landings are by drift and fixed nets, followed by otter and beam trawls. Brill is equally landed by otter and beam trawls followed by drift and fixed nets.

Brill

The majority of brill landings by liveweight were taken by otter trawls (19-51%) and beam trawls (18-53%) followed by drift and fixed nets (17-28%). Landings have declined from 2016 to 2022 across the 3 dominant gear types. Beam trawls were more dominant in the earlier part of the time series but in the last 3 years demersal trawls dominate more. A small number of brill are also caught using demersal seines, pots and traps and dredges. The majority of landings value are accounted for by beam trawls (6-61%), followed by otter trawls (14-49%) and drift and fixed nets (21-31%). Again, beam trawls dominate value earlier in the time series but demersal trawls and drift and fixed nets in the latter part. Landing value declined from 2016 to 2020 across the 3 dominant gear types, before increasing in 2021 and 2022 in demersal trawls and drift and fixed nets, but not in beam trawls, where landing value continues to decline.

Dab

The majority of dab landings by liveweight were taken by otter trawls (33-81%) followed by demersal seines (9-52%) and beam trawls (0-46%). Landings have increased overall from 2016 to 2022 across demersal seines but decreased in otter trawls and beam trawls. Beam trawls have dropped significantly in landings and value dominance over the time series. A small number of dab are also caught using drift and fixed nets. The majority of landings value are accounted for by otter trawls (30-79% in each year), followed by demersal seines (8-69%) and beam trawls (1-18%). Landing value have also increased overall from 2016 to 2022 for demersal seines but decreased in beam trawls and otter trawls.

Flounder

The majority of flounder landings by liveweight were taken by otter trawls (39-61% in each year), followed by drift and fixed nets (15-55%) and beam trawls (2-16%). Drift and fixed nets were much more dominant in 2016 than any other year and their landed weight has steadily decreased as a proportion of the total landed weight since. Landings have declined overall from 2016 to 2022 across the three dominant gear types. A very small number of flounder are also caught using demersal seines, pots and gears using hooks. The majority of landings value are accounted for by otter trawls (28-62%), followed by drift and fixed nets (10-66%) and beam trawls (1-14%).

Halibut

The majority of halibut landings by liveweight and value were taken by otter trawls (95-99% and 93-99% respectively).

Lemon Sole

The majority of lemon sole landings by liveweight were taken by otter trawls (65-82%), followed by beam trawls (0-27%). Beam trawl landings decreased significantly across the time series. The majority of landed value across the time series was taken by otter trawls (59-81%) followed by beam trawls, but with demersal seines dominating more in value landed from 2020 onwards.

Plaice

The majority of plaice landings by liveweight were from otter trawls (41-82%) followed by beam trawls (7-50%) and drift and fixed nets (3-19%). Landings have generally declined from 2016 to 2022 across the three dominant gear types. A small number of plaice are also caught using demersal seines, pots and traps and dredges. The majority of landed value are taken by otter trawls (38-76%), followed by beam trawls (8-50%) and drift and fixed nets (3-18%). Landed value has generally declined from 2016 to 2022 across beam trawls and otter trawls but has increased overall in drift and fixed nets, but with significant fluctuation.

Sole

The majority of sole landings by liveweight are taken by drift and fixed nets (38-55%), followed by otter trawls (23-42%) and beam trawls (9-34%). A smaller number of sole are also landed by dredges, pots and traps and gears using hooks. The majority of sole landings by value were by drift and fixed nets (37%-57%), followed by beam trawls (7-39%) and otter trawls (19-38%).

Turbot

The majority of turbot landings by liveweight were taken by otter trawls (39-67%), followed by beam trawls (6-46%) and drift and fixed nets (10-19%). Landings have declined from 2016 to 2022 across the three dominant gear types. A small number of turbot are also caught using demersal seines, pots and traps and dredges. The majority of landed value are accounted for by otter trawls (34-64%), followed by beam trawls (5-51%) and drift and fixed nets (11-29%). Landed value has declined from 2016 to 2022 across the three dominant gear types.

Witch

The vast majority of witch landings by liveweight and value were taken by otter trawls (92-100% in both cases).

Key recreational fisheries

Brill

Recreational fisheries, especially vessel based angling, will interact with brill. As a prized food fish it is likely that brill would be retained for consumption. However, only a limited number of brill were reported during the annual recreational fisheries monitoring programme, and annual catches have not been estimated.

Dab

Dab is taken in recreational fisheries but is not usually valued as a food fish and so is mostly returned by anglers. Data from the sea angling diary programme indicate that annual catches[6] of dab within the FMP area comprise about 13-42 tonnes (17% Relative

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[6] These values are extrapolated estimates from a self-selecting diary programme. Whilst the absolute values given should be treated with caution, given there are large differences between this survey and an onsite probabilistic survey conducted in 2012, these values do help illustrate the relative importance of the different flatfish species in recreational fisheries, as well as the relative proportions that are retained or returned.

Standard Error (RSE)) of retained catch and 131-249 tonnes (14% RSE) of returned catch[7].

Flounder

Flounder is taken in recreational fisheries, especially in coastal and estuarine waters. Flounder occur in estuarine ecosystems, including those with poorer water quality, and it is likely that patterns of retention or release may be influenced by perceived water quality. Data from the sea angling diary programme[6] indicate that annual catches of flounder within the FMP area comprise about 16-27 tonnes (23% RSE) of retained catch and 153-272 tonnes (13% RSE) of returned catch[7].

Halibut

Halibut is taken in recreational fisheries elsewhere in its range (for example Norway). It is an occasional vagrant to the central and southern North Sea, and so it is caught occasionally by recreational fisheries in the FMP area.

Lemon sole

Lemon sole typically occur on offshore grounds in deeper water and are expected to be of limited interest to anglers. Only limited numbers of lemon sole have been reported in the annual recreational fisheries monitoring programme, therefore no catch estimates can be generated.

Plaice

Plaice is taken in recreational fisheries, especially in coastal waters. Plaice is a valued food fish and is often retained for consumption. Data from the sea angling diary programme[6] indicate that annual catches of plaice within the FMP area comprise about 52-167 tonnes (20% RSE) of retained catch and 82-114 tonnes (19% RSE) of returned catch[7].

Sole

Sole is a valued food fish but has limited interactions with recreational fisheries compared to other inshore flatfish. Data from the sea angling diary programme[6] indicate that annual catches of sole within the FMP area comprise about 13-30 tonnes (25% RSE) of retained catch and 16-39 tonnes (25% RSE) of returned catch[7].

[7] The Marine Recreational fisheries data are extracted from the sea angling diary survey, which has been running annually since 2016. However, it is worth noting that this survey produces higher estimates of catch than an onsite survey, which is considered the gold standard, that was conducted in 2012. The relative standard error (RSE) calculated by dividing the standard error of the estimate by the estimated value, which gives a percentage error that can be easily compared. Generally, RSE below 25% are considered acceptable, and above 50% is considered unsuitable for use. Where the uncertainty around the estimate is between 25-50% the estimates should be used with caution.

Turbot

Recreational fisheries, especially vessel based angling, will interact with turbot. As a prized food fish turbot is mostly kept by recreational fishers. Data from the sea angling diary programme[6] indicate that annual catches of turbot within the FMP area comprise about 18-129 tonnes (49% RSE) of retained catch and 6-18 tonnes (27% RSE) of returned catch[7].

Witch

Witch is a flatfish that typically occurs on offshore grounds and is expected to be of limited interest to anglers. It has not been reported in the annual recreational fisheries monitoring programme in the FMP area.

Economic importance

Flatfish are a commercially important group of species in the UK. In 2021, the total landed weight of flatfish by UK vessels within the FMP area was 2,194 tonnes (liveweight) with a value of £5.9m (Table 2).

Economic dependence by fleet segment

The total number of vessels that have economic dependence on the flatfish fishery has declined 25% between 2016 and 2021 (Table 4), with 745 vessels in 2016 and 558 vessels in 2021, which is also in line with decreased landings during this time period (Table 2). Economic dependence is defined here as the percentage of revenue associated with value of landings of flatfish in the FMP managed area compared to total fishing income.

The majority of vessels that fish for flatfish are from England, followed by Scotland. Between 2016-2021, more than 57% of the total number of vessels that landed flatfish in English waters had less than 20% economic dependence on the fishery (Figure 22) and caught between 13-43% of the total landings (Figure 23). At the other end of the scale, those vessels that had 80-100% economic dependence on the flatfish fishery made up less than 14% of the total number of vessels (Figure 22) and landed less than 14% of the total landings (Figure 23). In the same time period 17-43% of landed weight was by vessels with 20-40% dependence on the flatfish fishery (Figure 23). Therefore, the majority of landed flatfish was by vessels with 40% or less dependency on the fishery.

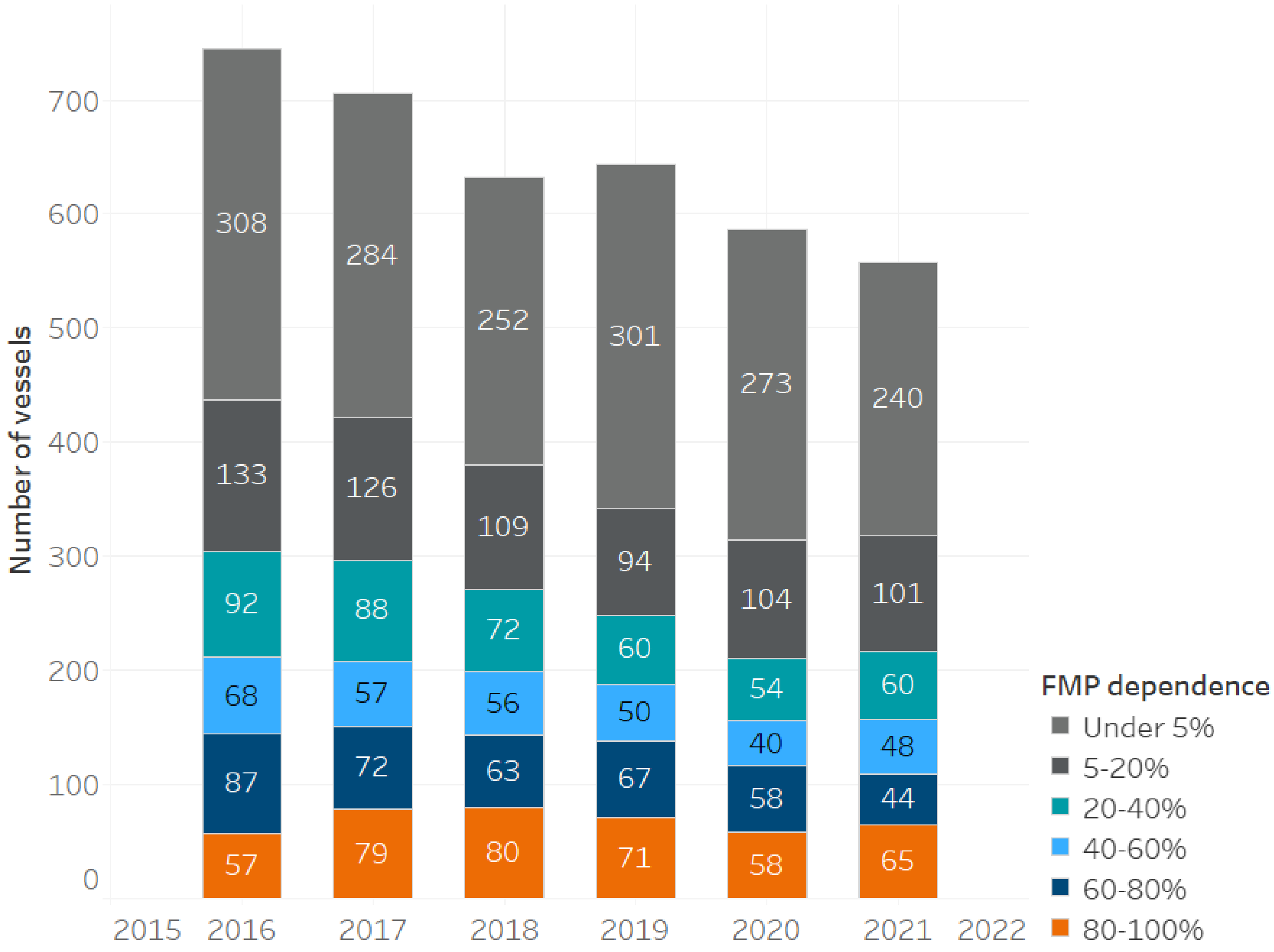

Figure 22. Number of vessels involved in the South North Sea and Eastern Channel Mixed Flatfish fishery by level of economic dependence.

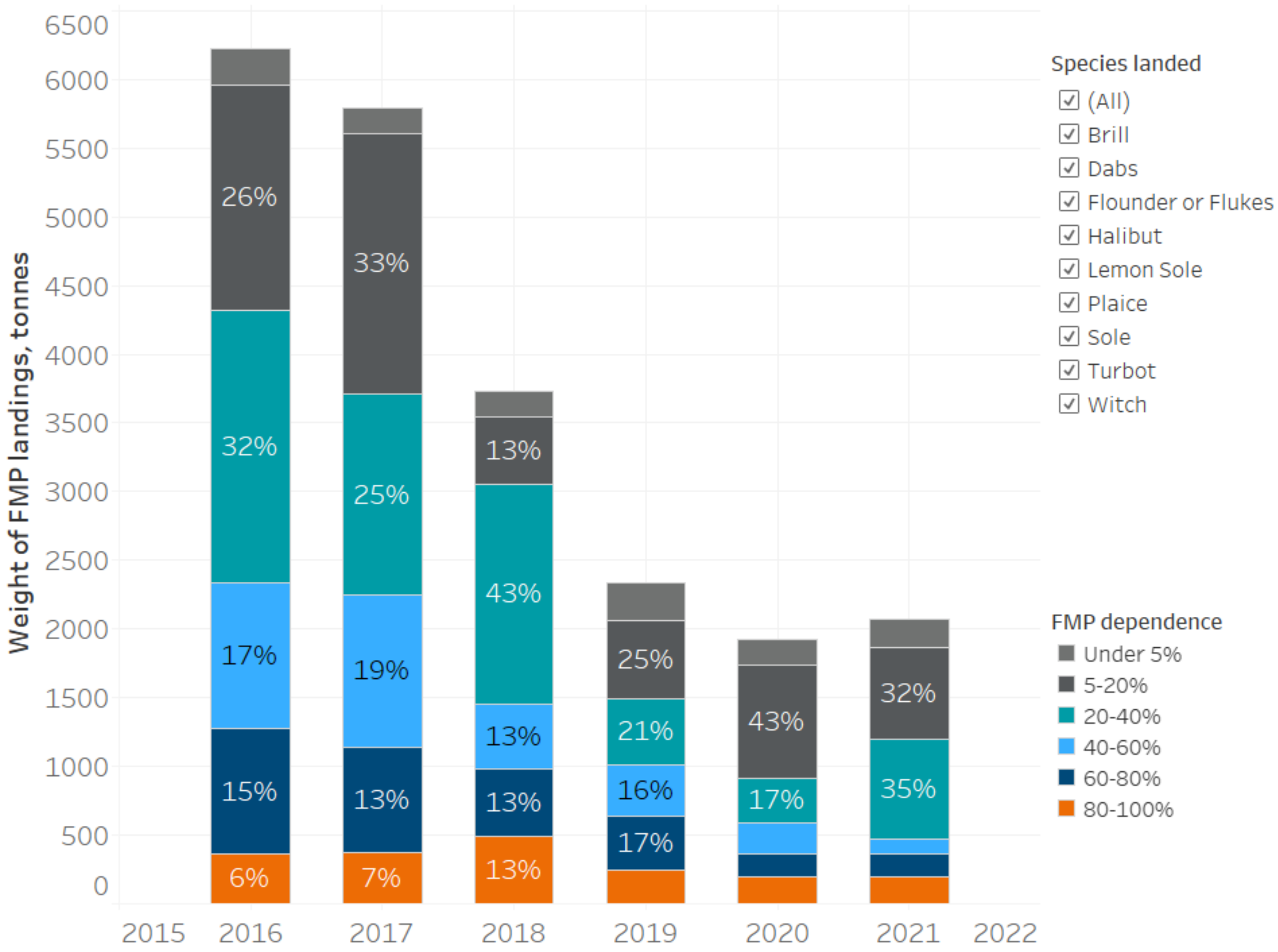

Figure 23. Weight of South North Sea and Eastern Channel Mixed Flatfish landed by level of economic dependence and significance of each group in terms of total landings

Ports reliance on the flatfish fisheries

Figure 24 shows the value of south North Sea and eastern Channel Mixed Flatfish species landings from English waters by ports as proportion of total value of landings in the relevant ports by all UK fishing vessels in 2016-2021.

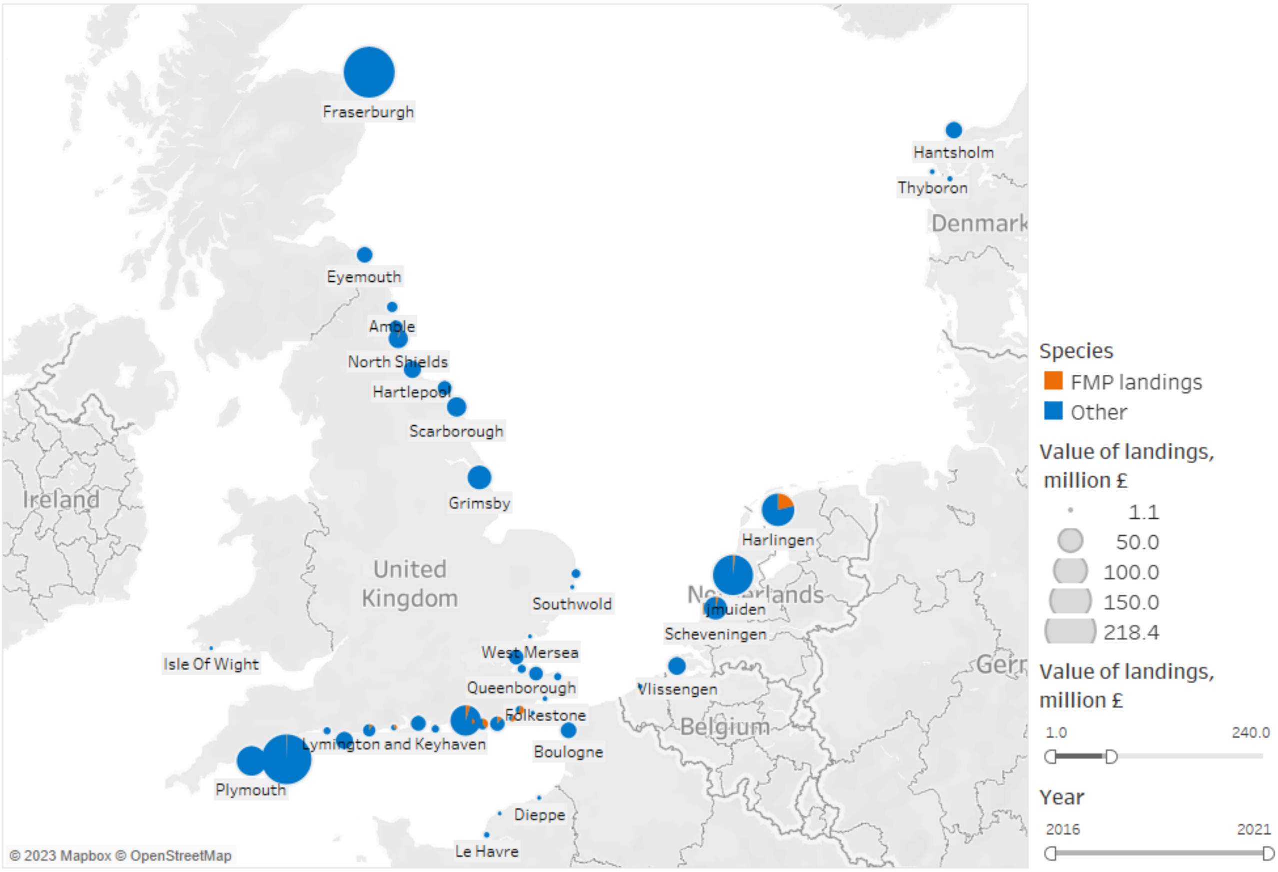

Figure 24. Ports reliance on landings of Southern North Sea and eastern English Channel Flatfish FMP species between 2016-2021.

No UK ports with higher values of landings rely on these FMP landings with little value accrued from species associated with this FMP. Only Harlingen in the Netherlands shows any reliance on flatfish landings from this FMP.

Harlingen in the Netherlands was the port with the greatest value of landings of flatfish species with the scope of this FMP, with a landed value of £999,379 in 2021 (Table 8). The next most valuable port for flatfish landings was Shoreham-by-Sea, with landed value in 2021 of £482,813, less than half the value of the number one port. Eight of the top 10 ports by value are in England. The total value of FMP flatfish species landed into the top ten ports was almost £4 million in 2021.

Table 8: Top 10 ports by value for landings of flatfish species within the scope of the FMP in 2021

Rank	Port of Landing	Port Nationality	Sum of Value Landed (2021)
1	Harlingen	Netherlands	£999,379
2	Shoreham-by-Sea	England	£482,813
2	Brixham	England	£447,354
4	Scheveningen	Netherlands	£383,064
5	Lymington and Keyhaven	England	£311,328
6	Poole	England	£297,843
7	Newhaven	England	£296,240
8	Rye	England	£282,503

Rank	Port of Landing	Port Nationality	Sum of Value Landed (2021)
9	North Shields	England	£248,641
10	Brighton	England	£220,812
	Top 10 total		£3,969,978

Economic data

In this section, economic indicators have been defined as follows:

- Economic dependence: percentage of revenue associated with value of landings of stocks/species in FMP managed area compared to total fishing income
- Fishing income: value of fish landed associated with FMP
- GVA (Gross Value Added): a measure of the value of goods and services produced by an industry. GVA is calculated as the sum of operating profit and crew share
- Operating profit: the difference between total income and operating costs
- Net profit: the result of subtracting finance costs, depreciation and interest costs from operating profit
- GVA to fishing income margin: the economic efficiency and profitability of operations, and evolution over time

Table 9 and Figure 25 set out the economic performance indicators associated with flatfish landings from English waters. The GVA is normally considered to be a proxy of sector contribution to gross domestic product and is important as a measure of value created by the sector to society. Operating, as well as net profits, are measures representing business performance and important for business owners as indicators of their business profitability. Operating profit only accounts for operating costs, while net profit is also considering depreciation of the capital invested and financial business costs, such as loan interest. Margin of each economic indicator as a ratio of fishing income could show economic efficiency and profitability of the operations and its evolution over time.

As shown in Table 9 and represented more visually in Figure 25, fishing income for flatfish has declined since 2016 but declined at a much faster rate from 2018-2020. In 2021 there was a slight increase in fishing income. GVA and profit for flatfish have steadily declined since 2021. These trends are in line with total landings by UK vessels (Table 2).

Table 9. Economic performance indicators associated with FMP in 2016-2021. ***Note: forecast based on 2021 preliminary activity data provided by MMO and 2020 costs structure.***

Home Nation	2016	2017	2018	2019	2020	2021 (note)
Fishing income (£000)	13,999	12,625	11,261	7,027	4,621	5,295
GVA (£000)	6,122	5,373	4,219	2,606	2,129	1,751
Operating profit (£000)	2,468	2,144	1,221	829	716	177
Net profit (£000)	1,325	1,449	198	383	-197	

GVA to fishing income margin	44%	43%	37%	37%	46%	33%

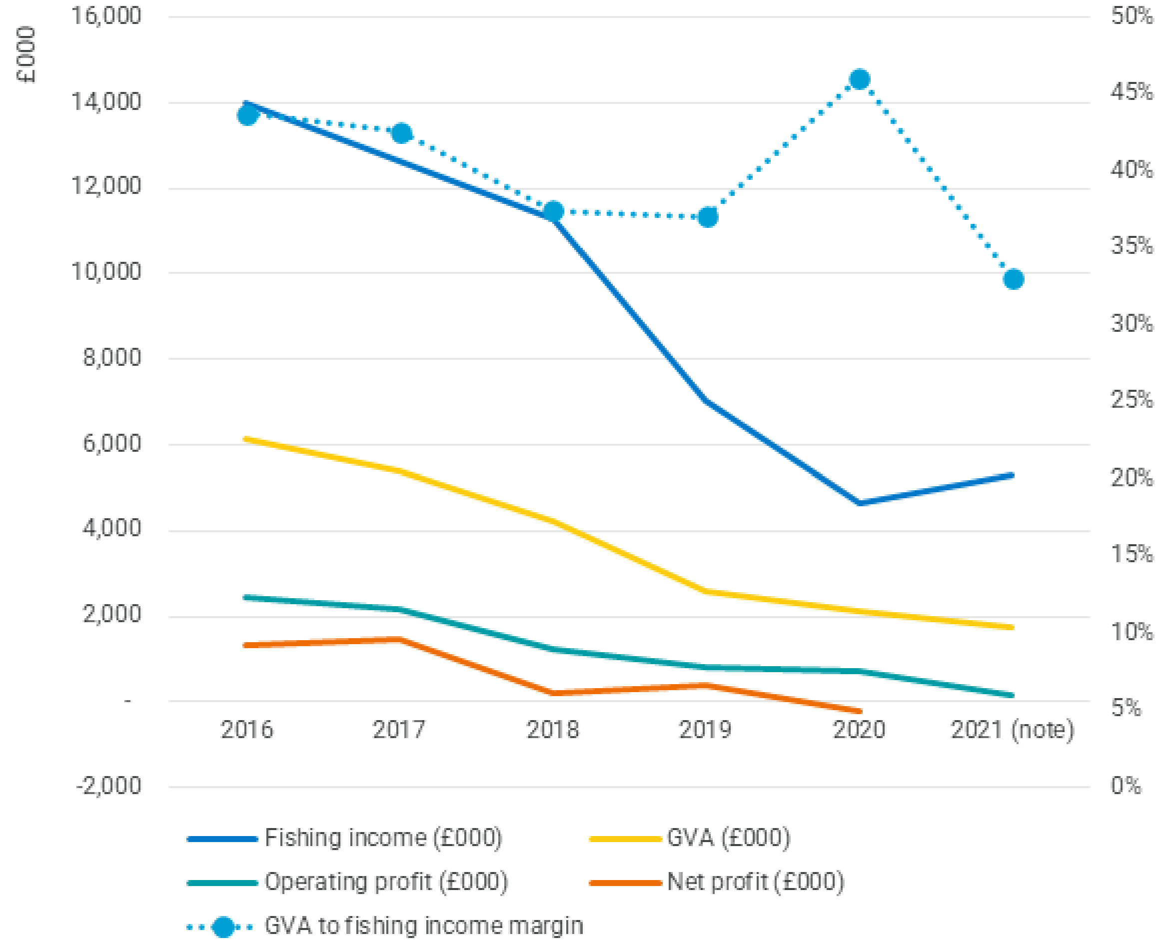

Figure 25. Economic performance indicators associated with Southern North Sea and Eastern Channel Mixed Flatfish landings from English waters, 2016-2021. ***Note: forecast based on 2021 preliminary activity data provided by MMO and 2020 costs structure.***

Figure 26 shows weight by species of Southern North Sea and Eastern Channel Mixed Flatfish landed from FMP regulated area per month (bars) in 2016-2021 and average price (orange line) evolution during the same period.

Landings of flatfish are dominated by plaice and have declined substantially from 2018. Landings are seasonal, with peaks generally in summer months and as such prices are also seasonal with lower prices when there are increased landings, and higher prices when landings are low. During peak season, average flatfish prices are around £500/kg.

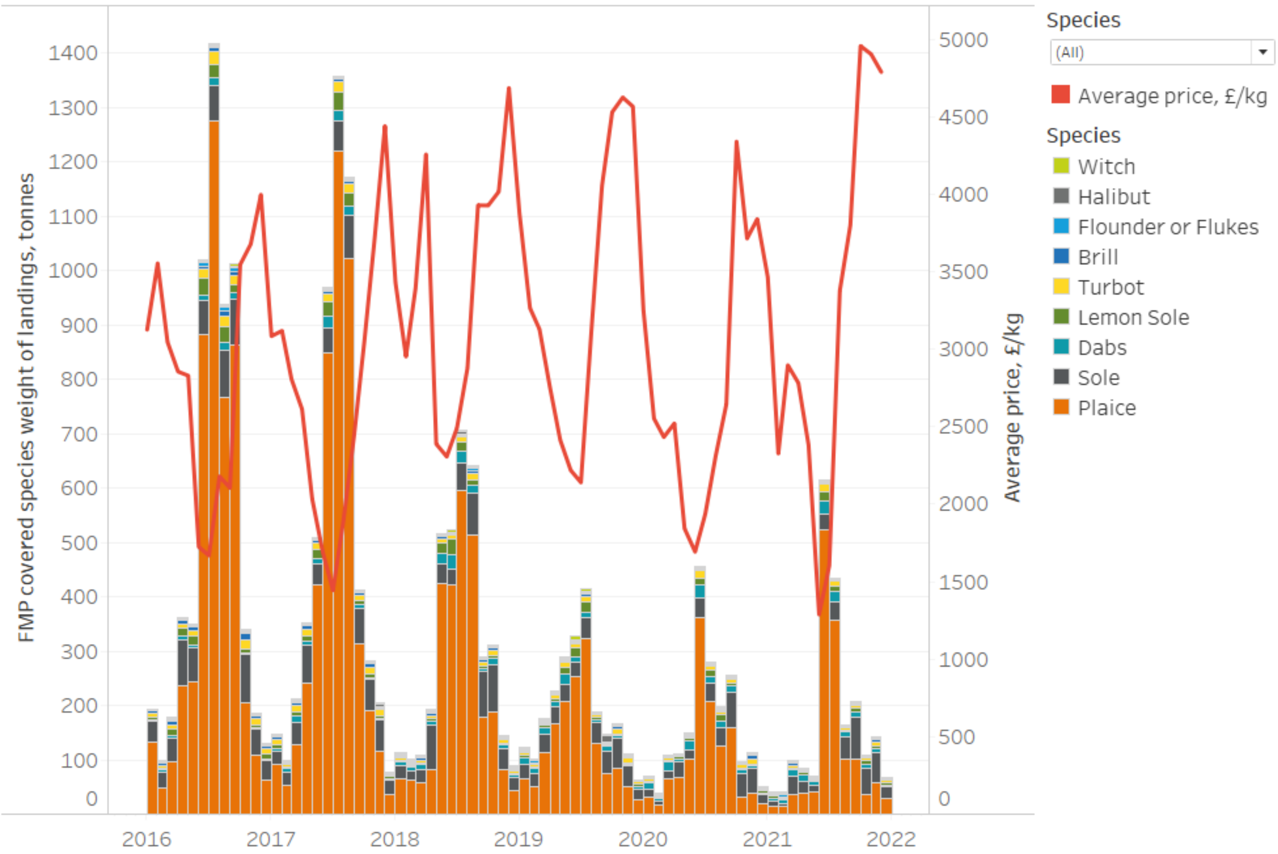

Figure 26. Southern North Sea and Eastern Channel Mixed Flatfish landed from FMP regulated area price evolution and seasonal fluctuations in 2016-2021.

International sales and exports

Flatfish considered in the FMP are moderately economically valuable for trade accounting for 1.6% of the total value of UK fish exports in 2022. The 3,500 tonnes exported over this year were valued at £29m. In 2022 there was a trade deficit of £8 million for the considered flatfish species, reflecting the UK importing 5,200 tonnes of flatfish valued at £37 million. The most valuable UK export is sole, while the most valuable UK import is plaice.

Exports

In 2022, the UK exported 3,500 tonnes of flatfish valued at £29 million. This was a large reduction in tonnage compared to the average across 2020 and 2021, which was 6,500 tonnes, but an increase in value with the 2020 and 2021 average value standing at around £25 million. In 2022 99% of flatfish exports went to the EU market. Sole (74%), and plaice (12%) made up over 85% of the export market, with the third largest export species being other flatfish at 11%.

Imports

In 2022, the UK imported 5,200 tonnes of flatfish valued at £37 million. This was a slight reduction in tonnage compared to average across 2020 and 2021, which was 5,100 tonnes, but an increase in value with the 2020 and 2021 average value standing at around £30 million. In 2022, 52% of flatfish imports were from the EU market with 48% coming from non-EU markets. Plaice made up over 34% of the import market in 2022, the second biggest import species was the catch all other flatfish at 33%, followed in third by halibut at 23%.

Economic impacts of Covid-19

Covid-19 restrictions caused considerable changes across the catching sector over 2020. The initial lockdown had significant operational impact on the UK catching sector. Demersal and pelagic species were less affected than shellfish because of the dependence the latter had on domestic food service, as well as the international export market. When comparing 2020 with 2019, flatfish landings by UK vessels values fell 34%, and landings weight fell by 19%. This would have had a knock-on effect on other seafood sectors e.g., processors, gear manufacturers, auctions.

9. Social importance

Employment (FTE) by fleet segment

Figure 27 shows employment calculated in full time job equivalent and partitioned based on the same methodology used as for economic performance indicators. Information regarding the social and demographic characteristics of the employees are published as part of 2021 Employment in the UK Fishing Fleet report[8]. Socio-demographic characteristics can't be partitioned to FMP level, however use of fleet segments associated with FMP can help to understand potential demographic profile of employees.

The number of full-time employees connected to vessels catching flatfish has declined from 220 people to 86 people from 2016 to 2021. This is a decrease of 61%.

[8] 2021 Employment in the UK Fishing Fleet — Seafish

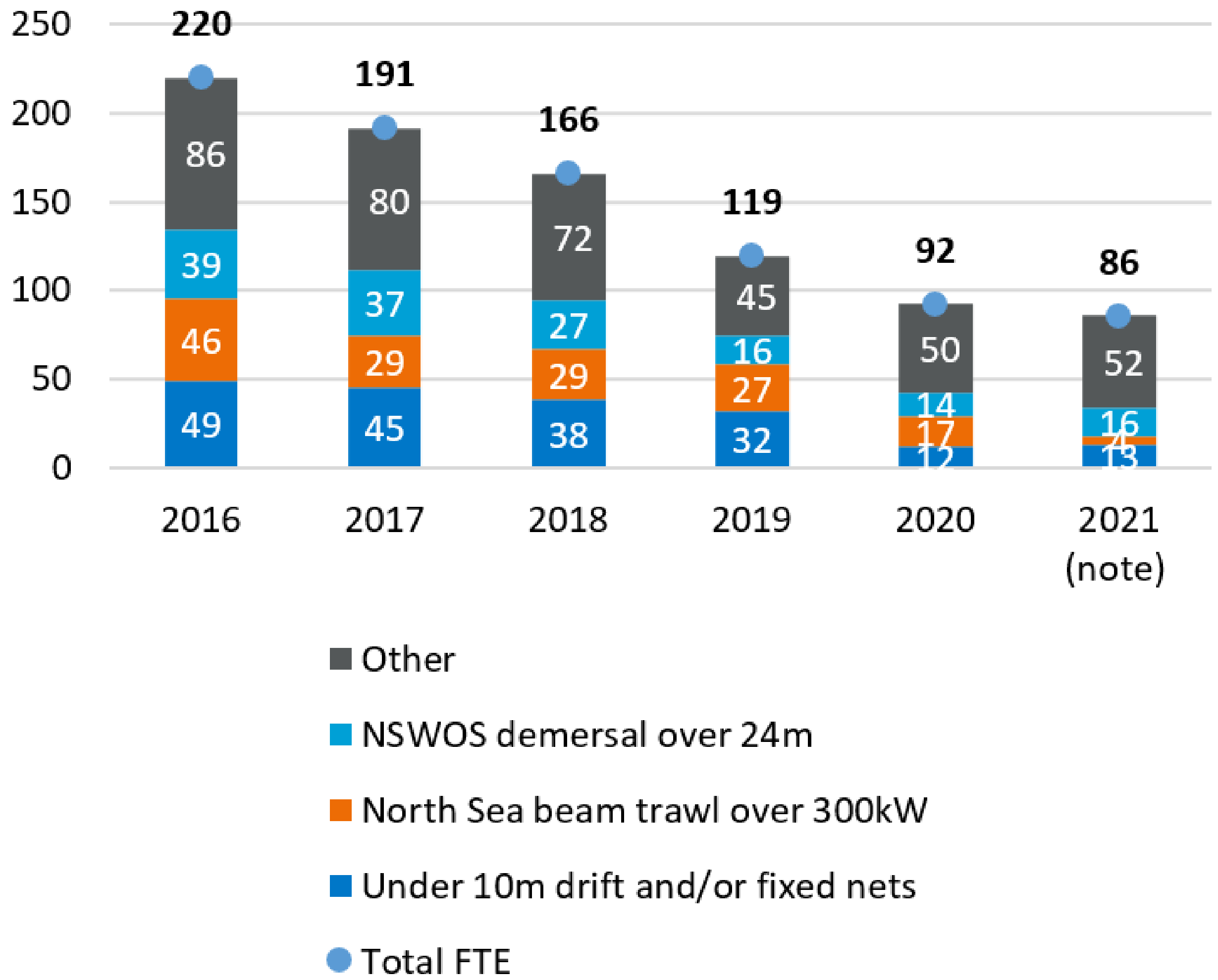

Figure 27. Employment (FTE) associated with FMP by Seafish fleet segments in 2016-2021.*Note: forecast based on 2021 preliminary activity data provided by MMO and 2020 costs structure.*

Ecological impacts

All FMPs are subject to legal and environmental obligations arising from the Habitats Regulations, Marine and Coastal Access Act, UK Marine Strategy (UKMS), and the Environmental Principles policy statement for the Environment Act 2021.

Defra sought advice from JNCC and Natural England on the potential risk posed by the flatfish fisheries to the features in flatfish fisheries and whether these are likely to affect any of the UKMS descriptors and our ability to achieve the targets for Good Environmental Status (GES). The evidence and advice provided by JNCC and Natural England are described in Annex 3 and a summary is provided below.

Flatfish fisheries have the potential to impact the wider marine environment, which can cause disruption to ecosystem state and function. This subsection focuses on the wider environmental goals of the Flatfish FMP including the link and risk to the protection of Marine Protected Areas and the links and risks to GES. The Southern North Sea and

Eastern Channel flatfish fishery is dominated by the use of bottom towed gears. The majority of UK flatfish landings within the plan areas were caught by otter trawl (58%) and beam trawl (30%) during the period 2016-2020, therefore the below evidence focuses on the impacts of these gears.

Seafloor integrity

Bottom trawling causes physical disruption of the seabed through contact of the gear components with the seafloor and can also result in the resuspension of sediment into the water column in the turbulent wake of the gear. Pressures associated with trawling include abrasion and penetration of the seabed, and damage to organisms living on and in the habitat, removal of species and smothering and siltation[9]. The number of organisms can decrease by up to 90% following a single pass of a demersal trawl[10]. These losses can result in a change in community structure and an overall loss of biodiversity[11] [12]. The magnitude of the impact is determined by the speed of towing, the physical dimensions and weight of the gear, the type of sediment and the strength of the currents in the area fished[25]. On sandy or muddy surfaces, bottom trawling resuspends sediments causing siltation and reduced visibility[25], as well as lowering the nutritional quality of the sediment[13]. The effects of bottom trawls are also dependant on the natural variability of the region, with effects lasting only for a few hours in shallow, turbulent waters where natural disturbance is high, but up to decades in deep, stable environments[14]. Bottom trawl fisheries could also have detrimental impacts on releasing carbon and pollutants trapped

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9 Cantrell R, Covey R, Relf C, Irving R, and Nicholson J. 2023. Fisheries Impacts on Marine Protected Habitats – A Review of the Evidence. Natural England Evidence Review, Number NEER023

10 Cook, R., Farinas-Franco, J.M., Gell, F.R., Holt, R.H., Holt, T., Lindenbaum, C., Porter, J.S., Seed, R., Skates, L.R., Stringell, T.B. & Sanderson, W.G. (2013). The substantial first impact of bottom fishing on rare biodiversity hotspots: a dilemma for evidence-based conservation. PloS one, 8(8), p.e69904.

11 Jennings, S. & Kaiser, M.J. (1998) The effects of fishing on marine ecosystems. 201-352, s.l. : Advances in marine biology, Vol. 34.

12 Hinz, H., Prieto, V. & Kaiser, M.J. (2009) Trawl disturbance on benthic communities: chronic effects and experimental predictions. 761-773, s.l. : Ecological Applications, Vol. 19.

13 Chuenpagdee, R., Morgan, L. E., Maxwell, S. M., Norse, E. A., & Pauly, D. (2003). Shifting gears: assessing collateral impacts of fishing methods in US waters. Frontiers in Ecology and the Environment, 1(10), 517-524.

14 Jennings, S., Pinnegar, J.K., Polunin, N.V. & Warr, K.J. (2001) Impacts of trawling disturbance on the trophic structure of benthic invertebrate communities.. 127-142, s.l. : Marine Ecology Progress Series, Vol. 213.

into the seabed through resuspension of sediment, increasing carbon emissions into the water column and potentially resulting in the release of CO_2 to the atmosphere[15] [16].

Marine litter

Gear specific estimates of rates of abandoned, lost, and discarded gear have low certainty due to a small number of studies and low sample sizes. Risks are highest in static gear fisheries[17] where significant quantities of gear are deployed into the marine environment. Mobile gears are a lower risk but may be a source of plastic ropes and netting which contribute to non-biodegradable marine litter when lost, abandoned, or discarded at sea.

Bycatch

Bottom trawled gear can be a risk to diving seabird species but have been found to be a higher risk to surface feeding birds in the North Sea and English Channel[18], due to entanglement in nets and collisions with trawl cables[19].

Marine mammal bycatch risk in bottom towed gear is relatively low[20], with incidences not thought to occur with enough regularity to warrant specific targeted marine mammal monitoring[21]. Historically, there is evidence that shows harbour porpoise are occasionally caught by beam and otter trawlers (CEFAS observer programme report, 2015; unpublished). However, the current understanding is this is not at a level that would have

15 Cavan, E.L. & Hill, S.L. (2021) Commercial fishery disturbance of the global open-ocean carbon sink. bioRxiv, 2020-09.

16 Pusceddu, A., Bianchelli, S., Martín, J., Puig, P., Palanques, A., Masqué, P., & Danovaro, R. (2014). Chronic and intensive bottom trawling impairs deep-sea biodiversity and ecosystem functioning. Proceedings of the National Academy of Sciences, 111(24), 8861-8866.

17 French, N., Pearce, J., Howarth, P., Whitley, C., Mackey, K., Nugent, P. 2022. Risk-based approach to Remote Electronic Monitoring for English inshore fisheries. Natural England Commissioned Reports, Number 437

18 Castro, José, José Rodríguez-Gutiérrez, Eva María Velasco, Mark James, Alastair Pout, Liz Clarke, Katja Ringdahl et al. (2016) Strengthening regional cooperation in fisheries data collection. The fishPi Project.

19 Sullivan, B. J., Reid, T. A., & Bugoni, L. (2006). Seabird mortality on factory trawlers in the Falkland Islands and beyond. Biological Conservation, 131(4), 495-504.

20 Brown, S. L., Reid, D., & Rogan, E. (2013). A risk-based approach to rapidly screen vulnerability of cetaceans to impacts from fisheries bycatch. Biological Conservation, 168, 78-87.

21 Northridge, S., Kingston, A., Mackay, A. & Lonergan, M. (2011). Bycatch of Vulnerable Species: Understanding the Process and Mitigating the Impacts. Final Report to Defra Marine and Fisheries Science Unit, Project no MF1003. University of St Andrews. Defra, London, 99pp.

impacts on the population. However, bottom trawl fisheries can be a high risk to skate, ray and elasmobranch bycatch[22,23].

Environmental impacts

Impact of climate change on flatfish populations

Under future climate change, modification of temperature and salinity are expected to result in shifts to distributions of marine organisms, including commercial fish species[24] . In an analysis of 50 abundant species in the waters around the UK and Ireland, 72% of the fish species were shown to have responded to warming in the region already, by changing distribution and abundance[25]. Specifically, warm-water species have increased in abundance while cold-water species have decreased, with these trends expected to continue in the future[26] . Townhill et al.[15] predicted future distributional shifts for the FMP species (flounder was not included in this analysis) and found that waters around the UK are predicted to become more suitable in the future for sole, brill, turbot and witch, but less suitable for dab, plaice, halibut, and lemon sole. For all FMP species, apart from halibut with a southward shift, there was a predicted northward shift in habitat suitability by 2060. Plaice and dab were some of the species with the greatest projected northward shift.

Climate change mitigation – reaching Net Zero

The stocks within the Southern North Sea and Eastern Channel Flatfish FMP are primarily caught by demersal trawls (witch; >95%, turbot; 55-65%, plaice; 64-83%, lemon sole; 68%, halibut; 98%, flounder; 40-63%, dab; 62-86%), as well as drift and fixed nets and beam trawls.

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[22] Molina, J. M., & Cooke, S. J. (2012). Trends in shark bycatch research: current status and research needs. *Reviews in Fish Biology and Fisheries*, *22*, 719-737.

[23] Silva, J. F., Ellis, J. R., & Catchpole, T. L. (2012). Species composition of skates (Rajidae) in commercial fisheries around the British Isles and their discarding patterns. *Journal of Fish Biology*, *80*(5), 1678-1703.

[24] Townhill, B., Couce, E., Rutterford., L., & Pinnegar, J. (2018). Future projections of commercial fish distribution and habitat suitability around the British Isles. Report of BX006 work package: Long-term distribution shifts and zonal attachment. CEFAS, Lowestoft.

[25] Simpson, S. D., Jennings, S., Johnson, M. P., Blanchard, J. L., Schön, P. J., Sims, D. W., & Genner, M. J. (2011). Continental shelf-wide response of a fish assemblage to rapid warming of the sea. *Current Biology*, *21*(18), 1565-1570.

[26] Poloczanska, E. S., Burrows, M. T., Brown, C. J., García Molinos, J., Halpern, B. S., Hoegh-Guldberg, O., ... & Sydeman, W. J. (2016). Responses of marine organisms to climate change across oceans. *Frontiers in Marine Science*, *3*, 62.

Recent analysis has shown that the total UK fishing fleet segment using demersal trawls and seines, which comprises of 402 vessels produced approximately 30% (249kt CO_2e) of the total carbon emissions at sea each year across the UK's fishing fleets. Drift and fixed net fisheries (237 vessels) produced approximately <2% (13kt CO_2e), and beam trawls (73 vessels) produced approximately 13% (107kt CO_2e). Whilst passive gears are generally less emission-intensive than mobile gears, quantification of carbon emissions across the fishing fleet supply chain (for example, preharvest through to postharvest) is required to truly understand the fisheries carbon footprint[27] .

Climate change mitigation – blue carbon

Healthy coastal and marine environments can provide nature-based solutions to help tackle climate change. For example, certain marine habitats that are home to these flatfish species, such as saltmarshes, seagrasses and muddy sediments are able to store carbon and therefore these are known as blue carbon habitats. If left undisturbed, these habitats can contribute to greenhouse gas emissions reductions. Habitat disturbance through fishing practices may affect seabed carbon dynamics. Evidence is beginning to suggest that overfishing reduces the carbon storage potential of the ocean not only through removal of biomass, but by reducing the mean size of individuals in the population, the quantity of faecal pellets excreted and the number of large carcasses sinking to the seabed. Evidence is emerging that indicates that fisheries management could play a positive role in the marine carbon cycle through maintaining sustainable stocks beyond MSY limits and adopting Ecosystem Based Fisheries Management[28]. As further research develops in this area, it will be considered for future iterations of the FMP.

Definitions and Terminology

ICES Categories

For the purposes of identifying the advice rule to be applied when giving advice on fishing possibilities, ICES classifies stocks into six main categories on the basis of available knowledge.

[27] Engelhard, G.H., Harrod, O.L. & Pinnegar, J.K. (2022) Carbon emissions in UK fisheries: recent trends, current levels, and pathways to Net Zero Final report for Defra project C8118. Centre for Environment, Fisheries & Aquaculture Science (Cefas), Lowestoft, UK

[28] Hickman, J., Jones, T., Attrill, M. & Austen, M. (2023) Final Report for Defra: Fish Carbon in the UK EEZ. University of Plymouth.

Category 1 – stocks with quantitative assessments. Includes the stocks with full analytical assessments and forecasts as well as stocks with quantitative assessments based on production models.

Category 2 – stocks with analytical assessments and forecasts that are only treated qualitatively. Includes stocks with quantitative assessments and forecasts which for a variety of reasons are considered indicative of trends in fishing mortality, recruitment, and biomass.

Category 3 – stocks for which survey-based assessments indicate trends. Includes stocks for which survey or other indices are available that provide reliable indications of trends in stock metrics, such as total mortality, recruitment, and biomass.

Category 4 – stocks for which only reliable catch data are available. Includes stocks for which a time-series of catch can be used to approximate MSY.

Category 5 – landings only stocks. Includes stocks for which only landings data are available.

Category 6 – negligible landings stocks and stocks caught in minor amounts as bycatch. Includes stocks where landings are negligible in comparison to discards and stocks that are primarily caught as bycatch species in other targeted fisheries.

Terms and reference points

MSY - Maximum Sustainable Yield: The point at which the amount of fish caught is maximised over the long term while still maintaining the population size of the fish stock at that same point.

Proxy - For stocks which are more data limited (ICES category 3-6) proxy reference points are used as part of a precautionary approach to provide advice on the biomass and catch for that stock.

B – Biomass: Total amount of a given stock in a given area, usually expressed in tonnes. Can be thought of as the population size.

SSB - Spawning Stock Biomass: The biomass of a stock that can reproduce, usually expressed in tonnes.

B_{MSY} - The SSB of the stock required to produce MSY. This is highly dependent on the relationship between the stock and its environment and fluctuates even with a constant fishing pressure.

MSY $B_{trigger}$ - Seen as the lowest point of natural stock fluctuation around B_{MSY}. If SSB falls below this reference point it triggers a cautious response and a reduction in the advised catch for that stock.

B_{lim} - SSB is lower still than MSY $B_{trigger}$. If SSB falls below this reference point, there will be a high risk of the number of fish entering the spawning stock will be impaired. meaning the stock size will likely decline over time as it is unable to replenish itself.

B_{pa} - If SSB falls below this reference point the population may be unable to replenish itself and will be at high risk for decline, so a reduction in catch for that stock will be advised. This reference point is designed to build in a safety margin limiting the effects of data uncertainty when exact biomass cannot be estimated.

F - Fishing Mortality: Easiest to think of this as the amount of fish caught. In actuality, it is the instantaneous rate of fishing mortality and is expressed on an exponential scale. For example, F=0.5 means that 100*(1-EXP-0.5) = 39% of the fish in stock are removed by fishing each year.

M - Natural mortality: Basically, the fish that die due to natural causes, predation, disease etc. M+F = Z. Z is the total rate of instantaneous mortality, so the number of fish lost from a population from any cause)

F_{MSY} - Fishing mortality when fishing at MSY, the most amount of fish that can be caught without reducing the SSB.

F_{lim} - The fishing mortality which in the long term will result in an unsustainably low stock size. Fishing at levels higher than F_{lim} will result in a population decline towards an unsustainably low size.

F_{pa} - The fishing mortality precautionary reference point which sits between F_{lim} and F_{MSY}, it is designed to act as a precautionary buffer to avoid fishing mortality being above F_{lim}.

HCR – Harvest Control Rule: An algorithm for pre-agreed management actions as a function of variables related to the status of the stock. For example, a control rule can specify how F or yield should vary as a function of spawning biomass. Also known as ‘decision rules’ or ‘harvest control laws’.

Harvest rate (harvest ratio) **-** Ratio between landings and total stock abundance.

Department for Environment Food & Rural Affairs

Southern North Sea and Eastern Channel Mixed Flatfish Fisheries Management Plan

Annex 2: Evidence plan

Date: July 2023

Version: public consultation

Evidence Gaps

FMPs have identified evidence gaps which may need to be filled to achieve the stated FMP goals. In the short term, Defra will collate and prioritise these evidence gaps across the FMP programme, to look to deliver evidence to support in addressing some of the most pressing and key questions identified within the FMPs. However, all evidence gaps identified across the FMP programme will not be able to be funded by Defra alone. In the longer term, to support the phased approach of FMPs and progress towards meeting the Fisheries Act Objectives, Defra are developing an evidence pathway that promotes collaboration between industry, academia and fisheries managers to address these identified evidence gaps for FMPs.

Reference	Evidence gap	Actions	Progress
1. Sustainable Fisheries – stock assessments			
1.1	Improve understanding of stock structure/units.	Review relevant information on stock units for dab, flounder, witch, brill, halibut, turbot, lemon sole and sole, and identify key data gaps and uncertainties. Initiate enhanced data collection on existing trawl surveys in the area with a view to (a) collect material for future genetic studies, (b) undertake contemporary conventional tagging programme.	

Reference	Evidence gap	Actions	Progress
		Develop prioritised research plan to provide more robust information on stock delineation. Initiate close-kin mark recapture studies for brill and turbot, including through the collection of genetic material from both market sampling and surveys.	
1.2	Life-history studies of commercially important flatfish.	Updated analyses of life-history parameters for brill, turbot, and lemon sole. Review the distribution of nursery grounds for plaice, sole, lemon sole, and witch, and identify data gaps.	
1.3	Discards and discard survival.	Analyse existing UK (England) observer data to provide information on the discard/retention of flatfish (lemon sole, plaice, dab, sole, brill, turbot, witch, halibut) by metier and ICES Division.	Previous work on survival exemptions: CP017-04-F5 Cefas Report Template (publishing.service.gov.uk).

Reference	Evidence gap	Actions	Progress
		Provide estimates of discards for the main fleets and mesh size ranges. Review available information on discard survival by species and gear, identify which important fleets (from previous action) require further information. Initiate studies to inform on discard survival for prioritised species and metiers as required.	
	Utility of fishery-dependent data for providing indices of stock size.	Using available data (landings and observer data) to identify which metiers/vessels have consistent catches of turbot and/or brill and evaluate the utility of selected vessels providing appropriate data on catches and effort, with a view to developing a small ‘reference fleet’ to provide temporal data on stock size and size distribution. Investigate temporal changes in stock size of brill.	Dutch science–industry partnership initiated a new beam trawl survey in the central and southern North Sea for turbot and brill in 2019.

Reference	Evidence gap	Actions	Progress
		In collaboration with fishing industry, initiate a trial scheme for enhanced data collection for brill and turbot.	
2. Sustainable fisheries – wider marine environment			
2.1	Improve understanding of flatfish fisheries on protected species bycatch.	• Quantify the bycatch risk of flatfish fisheries to seabirds. Quantify the bycatch risk of flatfish fisheries to marine mammals. • Quantify the bycatch risk of flatfish fisheries to elasmobranchs.	The bycatch monitoring programme (BMP) has been providing bycatch estimates for marine mammals and recently bycatch estimate for seabirds. The current BMP is evolving to increase and diversify monitoring. CleanCatch UK and Insight360 are developing sensitive species bycatch monitoring tools and mitigation methods. This could provide information on the interactions between bass and sensitive species. Initial scoping work into the development of regional bycatch risk prioritisation frameworks.

Reference	Evidence gap	Actions	Progress
			These hopefully will provide more granular detail of the fishery.
2.2	Improve understanding of flatfish fisheries on unwanted stock bycatch and scale of discarding.	Quantify the bycatch risk of flatfish fisheries to unwanted stocks. Synthesize existing selectivity evidence for key gear types used within the flatfish fishery.	An evidence base is in development regarding the quantity of discarding of different TAC species, the gear type risk in relation to discarding, and better understanding mixed fisheries.
2.3	Investigate effective and practical bycatch mitigation methods.	Increased selectivity work on different gear types, impacted species, and regional areas. Innovation of new gear types and associated trials to reduce bycatch.	CleanCatch UK and Insight360 are developing sensitive species bycatch monitoring tools and Clean Catch is trialling mitigation methods. This could provide information on the interactions between flatfish and sensitive species. Bycatch Monitoring Programme: Sampling designs, data collection protocols, alternative data collection approaches (for example electronic monitoring), and potential uses of other data sources (for example self-reported data) will be used under the new

Reference	Evidence gap	Actions	Progress
			Bycatch Monitoring Programme contract to inform possible improvements to the bycatch programme and catch sampling programmes' data collection activities, and guide the long-term development of bycatch monitoring in the UK. This will help ensure that the Bycatch Monitoring Programme provides a robust and comprehensive evidence base to support scientific investigations into the impacts of commercial fishing activities on a wide range of sensitive species populations, and enable us to identify where bycatch mitigation methods will need to be introduced.
2.4	Improve understanding of the contribution of the flatfish fishery to marine litter.		

Reference	Evidence gap	Actions	Progress
2.5	Better understand the impact of fishing gear on the benthic marine environment.		
		3. Social and Economic	
3.1	Increase understanding of the social and cultural importance of the flatfish fishery to coastal communities.	Engage with employees and businesses to understand why employment has been decreasing, and the social impact of this.	
3.2	Increase understanding of the economic importance of the flatfish fishery to coastal communities.	Monitor UK ports' reliance on landings of different species. Assess the impact of a price change on the fleet and onward supply chain.	
		4. Climate Change	
4.1	Improve understanding of the impacts of climate change on North Sea and	Develop improved models to predict the impact of climate change on flatfish populations.	MCCIP adaptation project on fish, fisheries, and aquaculture underway.

Reference	Evidence gap	Actions	Progress
	English Channel flatfish stocks.		
4.2	Improve understanding of the impacts of climate change on flatfish fisheries.	Assess the risk and adaptive capacity of the flatfish fishery.	MCCIP adaptation project on fish, fisheries, and aquaculture underway. Seafish's Climate Change Adaptation in Wild Capture Seafood Report is in the process of being updated.
4.3	Calculate the carbon footprint of the flatfish fishery and assess how it could be reduced.	Quantify fuel usage by fishing vessels targeting and landing flatfish. Determine interim carbon mitigating solutions for UK fishing vessels. Determine long term carbon mitigating solutions for UK fishing vessels.	Improved fuel use calculations by Seafish are underway for the UK fishing fleet. Review the planned range of available, market ready interim solutions to reduce fuel use and carbon emissions. Carbon abatement potential and cost benefit analysis of different carbon mitigating solutions for UK fishing vessels projects are complete.

Annex 2: Evidence plan for mixed flatfish FMP

Southern North Sea and Eastern Channel Mixed Flatfish Fisheries Management Plan

Annex 3: Advice from Statutory Nature Conservation Bodies on Wider Environmental Considerations

Date: July 2023

Version: public consultation

Contents

Background

All Fishery Management Plans (FMPs) are subject to legal and environmental obligations arising from the Habitats Regulations, Marine and Coastal Access Act, UK Marine Strategy, and the Environmental Principles policy statement for the Environment Act 2021.

Defra sought advice from the Joint Nature Conservation Committee (JNCC) and Natural England (NE) on the potential risk posed by the flatfish fisheries to the features in MPAs. JNCC and Natural England were also commissioned to provide advice on whether flatfish fisheries are likely to affect any of the UK Marine Strategy (UKMS) descriptors and our ability to achieve the targets for Good Environmental Status (GES).

Risks and impacts arising from flatfish fisheries to the designated interest features of Marine Protected Areas (MPAs)

This fishery is dominated by the use of bottom towed gears. The majority of UK flatfish landings within the plan areas were caught by otter trawl (58%) and beam trawl (30%) during the period 2016-2020.

Risk of bottom towed gear

Risk of bottom towed gears to mobile fish MPA features

Demersal gears have the potential to result in the unintentional catch of a range of fish species. Some of these may be species that are mobile features of MPAs or other protected sites. There are five species that are designated features of Special Areas of Conservation (SACs) that spend part of their lifecycle in coastal and marine waters (Atlantic salmon, allis shad, twaite shad, river lamprey, and sea lamprey), as well as the five Marine Conservation Zone (MCZ) fish species (long snouted seahorse, short snouted seahorse, giant goby, Couch’s goby, and smelt). Based on the limited data available, there is a risk of demersal towed gear from this fishery catching the two shad species. Reported total landings of shad per year vary but can be several thousand kilogrammes (ICES 2014)1. The highest landings were reported from ICES subdivision 7d, though landings of several hundred kg were also reported from 4b and 4c in some years.

The only UK spawning populations of both species are restricted to rivers and estuaries in the southwest of the UK and these are designated as SACs. There are seven SACs in the UK with shad as a qualifying feature. Plymouth Sound and Estuaries SAC protects allis shad, the Severn Estuary SAC protects twaite shad, and the remaining five sites protect both species.

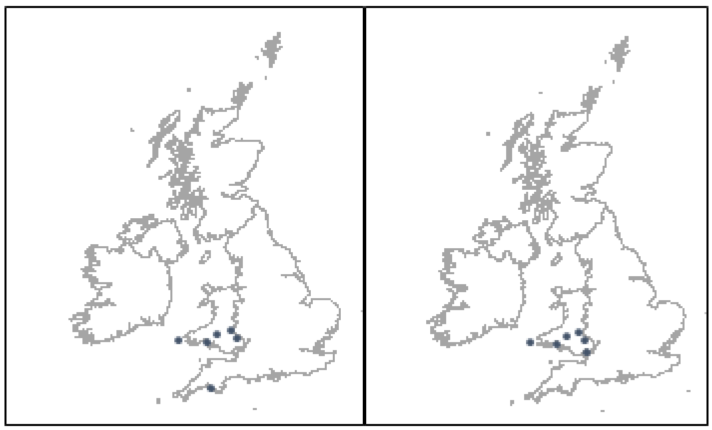

Figure 1. SACs with allis shad (left) and twaite shad (right) as a qualifying feature. Dots represent centre point of site. From JNCC's ([Natura 2000 (N2K) site summary details spreadsheet | JNCC Resource Hub]).

A study by Trancart et al. (2014)[2], aiming to model shad distribution, used observer programme data to identify bycatch in French commercial fishing activities from the coast to continental shelf of North-Western France and throughout the English Channel. The study used a large dataset (2003 – 2010; >9000 trawls, 43 different gear types, 6 – 320mm mesh size range) and found benthic bottom trawls (notably beam and otter trawls) accounted for 16.31% of shad bycatch occurrences. While this showed shad species being caught in the eastern channel by otter trawls, these may be associated with populations spawning in continental rivers rather than the UK SACs in the west.

[1] ICES (2014). Report of the Working Group on Bycatch of Protected Species (WGBYC), 4–7 February 2014, Copenhagen, Denmark. ICES CM 2014/ACOM:28. 96 pp.

[2] Trancart, T., Rochette, S., Acou, A., Lasne, E. & Feunteun, E. (2014) Modelling marine shad distribution using data from French bycatch fishery surveys. Marine Ecology Progress Series, 511, 181 – 192.

Cefas' Observer programme (2015: unpublished[3]) reports shad caught in the southern North Sea as well as in the Channel. Again, these may be associated with continental populations rather than UK SACs in the west, but this is based on simple geographic proximity rather than a comprehensive understanding of how shad populations migrate.

The evidence indicates that there is a bycatch risk of shad from demersal gear. The overlap between records of individuals caught and the main areas where flatfish are landed is most evident in the eastern Channel. The data are not sufficient to understand the scale or the spatial resolution of bycatch, or where shad caught in areas some distance from spawning rivers may originate from. A simple assessment of proximity would suggest catches associated with this fishery may be from continental populations, but there is a lack of understanding about shad movements. It should be noted that continental populations may also be associated with SACs on mainland Europe. Further data would help establish the locations and scale of bycatch, alongside ongoing research looking at understanding shad movements offshore. Improving reporting pathways and bycatch monitoring programmes will help improve understanding.

There is also the potential to catch other protected species, although there is no direct evidence readily available to draw on.

Risk of bottom towed gears to mobile bird MPA features

There are many bird species that are protected under their own type of designated site (Special Protection Area – SPA). Of the 109 UK SPA species and subspecies listed by JNCC, 39 can be considered 'seabirds' for the purposes of this work. Benthic trawling does pose a particular risk to certain species. This is highlighted by both anecdotal reporting during fish bycatch monitoring (CEFAS observer programme report (2015; unpublished[3])), and by previous work looking at the relative risk of bird bycatch that incorporated the behavioural traits of different species (Bradbury et al 2019[4]). This latter work highlights deep diving shags, scaups, eiders, scooters, guillemots, great northern divers, and cormorants as the most sensitive to demersal towed gears.

[3] C6273 report (CEFAS observer programme report (2015) (unpublished))

[4] Bradbury, G. Shackshaft, M. Scott-Hayward, L. Rexstad, E. Miller. D and Edwards. D (2017) Risk Assessment of Seabird Bycatch in UK Waters. Wildfowl & Wetlands Trust

Benthic trawling is not included in more recent work looking at seabird bycatch (for example Northridge et al, 2020)[5] as it is not generally considered to present a high bycatch risk to birds, with work usually tending to focus on the impacts of netting, longlining, and in some cases pelagic trawling. A working assumption could be made that the likelihood of bird bycatch from this fishery having significant impacts on SPAs is therefore low. An improved monitoring regime on benthic trawlers will help fill the current data gaps and therefore reduce the uncertainties. This could potentially be done by adapting or expanding existing observer programmes, or through the appropriate use of Remote Electronic Monitoring (REM).

Risk of bottom towed gears to mobile marine mammal MPA features

Four marine mammal species are features of MPAs in the UK. Harbour porpoise, grey seal, common seal, and bottlenose dolphin. Benthic trawling is not included in the current UK Bycatch Monitoring Programme, because it is not currently considered to present a high bycatch risk to marine mammals. However, the 2019[6] report did also include information from non-dedicated sampling under the English/ Welsh Data Collection Framework discard programme which focuses heavily on demersal trawl gears. No marine mammals were recorded but it is noted that sampling protocols are not specifically designed for quantifying protected and sensitive species. Historically, there is evidence that shows harbour porpoise are occasionally caught by beam and otter trawlers (CEFAS observer programme report (2015; unpublished[3])). However, the current understanding is that this is not at a level that could have impacts on population. It is therefore also unlikely that isolated instances of bycatch outside of the boundaries of MPAs for harbour porpoise (or any other marine mammal) is of a scale to impact conservation objectives.

Conclusion

There is a risk that bottom towed gear in this fishery could catch shad species, although it is not clear if these would be associated with UK SACs or continental populations. Continental populations may also be associated with SACs on mainland Europe. The

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[5] Northridge. S., Kinston. A. and Coram. A. (2020). Preliminary estimates of seabird bycatch by UK vessels in UK and adjacent waters. Scottish Ocean Institute, University of St Andrews. Final report to JNCC

[6] Northridge, S., Kingston, A. and Thomas, I. (2019) Annual report on the implementation of Council Regulation (EC) No 812/2004 during 2018. Sea Mammal Research Unit. Available at [Science Search (defra.gov.uk)] [Accessed 02/11/2022]

data are not sufficient to understand the scale or the spatial resolution of bycatch and the impact this may have on conservation objectives of the SACs. Further data would help establish the locations and scale of bycatch. Improving reporting pathways (for both fishermen and fisheries managers) and bycatch monitoring programmes will help improve understanding and our ability to determine whether any mitigatory action is necessary.

The bycatch of certain bird species protected within SPAs within bottom towed gear outside of sites may be occurring. While it is difficult to assess the scale as the data is sporadic at best, bottom towed gear is not generally considered to present a high bycatch risk to birds. A working assumption could be made that the likelihood that bird bycatch is having significant impacts on SPAs is therefore low. An improved monitoring regime on benthic trawlers may be needed to fill the current data gaps and reduce uncertainties. This could potentially be done by adapting or expanding existing observer programmes, or through the use of REM.

Bycatch of harbour porpoise (or other marine mammal) may occur on occasion, but current understanding is that bycatch from towed demersal gear outside of site boundaries is unlikely to be at a level that could impact MPA conservation objectives.

Summary of bycatch risk from static nets

Around 9% of flatfish landings within the plan areas are fish caught in static nets. While the proportion is relatively low, compared with demersal towed gear, netting is considered to have a much higher bycatch risk associated with it for the species we are concerned about.

Risk of nets to mobile fish MPA features

Previous advice provided by NE and JNCC for the Bass FMP highlighted the risk of salmon and shad bycatch from static nets, but there is insufficient data to understand the scale of the risk or undertake a quantitative assessment. It is acknowledged that there is existing management (IFCA byelaws) that reduces the risk of bycatch, but previous advice concluded that more data are required on activity (for example through iVMS et cetera) and levels of bycatch (for example through targeted bycatch monitoring and/or reporting) to provide more robust evidence on the scale of the risk and/or the efficacy of management.

For static netting associated with the southern North Sea and eastern Channel flatfish fishery, the risk is likely to be substantially lower for two reasons.

Firstly, much of the main landings are from areas a great distance from the protected sites (offshore in 4b) meaning the risk of bycatch of fish associated with them is low. The possible exception is any static netting in the coastal areas of 7d, as both the Itchen and the Avon (both SACs for salmon) drain into this area.

Secondly, the type of set nets that are being used to target flatfish (tangle / trammel nets or other nets set on the seabed) are considerably less likely to capture salmon, which tend to travel higher in the water column.

The risk to SAC conservation objectives is therefore likely to be below the level that would be of concern. However, the assumptions on which this is based would benefit from validation. Better data are required on levels of bycatch (for example through bycatch monitoring and / or reporting) and activity (for example through iVMS and clarification on gear used) to confirm that the scale of bycatch associated with this fishery is not at a level that is of concern.

Risk of static nets to mobile bird MPA features

Gillnets are known to pose a significant risk of bycatch of certain bird species. There are insufficient data to allow estimates of bird bycatch with any degree of confidence, but preliminary estimates suggest the combined impact of static nets across all UK fisheries could be of a scale that is having population level effects for some bird species that are also features of SPAs (Miles et al. 2020[7]). Large foraging ranges for some species and movements outside the breeding season means bycatch remote from the SPA may have a significant effect on classified bird features.

The proportion of the total estimated impact that can be attributed to this flatfish fishery is not clear. Methods exist to investigate the relative importance of mortality of designated birds outside of sites (and are used in offshore wind casework) but the lack of good bycatch data at a suitable resolution prevents this being the case for fisheries. Reports looking into UK seabird bycatch hotspots are due to be published. Better data are required on levels of bycatch. Developing existing programmes such as the UK bycatch monitoring programme will contribute to resolving the issue. Additional data through REM or self-reporting will increase our understanding and thereby allow better decision-making regarding mitigations on what and where mitigation may be required.

[7] Miles, J., Parsons, M. and O'Brien, S. (2020). Preliminary assessment of seabird population response to potential bycatch mitigation in the UK-registered fishing fleet. Report prepared for the Department for Environment Food and Rural Affairs (Project Code ME6024).

Risk of static nets to mobile marine mammal MPA features

Nets have long been recognised as posing a risk to marine mammals. The Bycatch Monitoring Programme has been established since 1996 and evolved to collect data on marine mammal bycatch to meet various international obligations. The results of the programme estimated that in 2019, between 502 to 1560 harbour porpoises, 375 to 872 seals (both grey and harbour), and 165 to 662 common dolphins were caught[7]. Four marine mammal species are features of MPAs in the UK. Harbour porpoise, grey seal, common/harbour seal, and bottlenose dolphin.

Using point estimates, of the 883 harbour porpoises thought to have been caught as bycatch in 2019, 437 were estimated to have been caught by tangle / trammel nets and 36 were estimated to be caught in light gillnets for targeting flatfish. Spatially, most harbour porpoise were caught in ICES division 7e (304), 7d (199) and 7f (183) in the English Channel & Celtic Sea, and 4c (92) in the Southern North Sea. Only 7f and 4c overlap with this fishery.

Assessing the impact of bycatch occurring outside the site boundary on the conservation objectives of SACs is complex. Existing MPA management work (Stage 4 of MMO byelaw process) will address site level bycatch. There is also ongoing work focusing on understanding and mitigating the impact of bycatch on the wider population being progressed through Defra's Marine wildlife bycatch mitigation initiative (BMI) and the Clean Catch UK programme, however an action plan to deliver the BMI has not yet been published. Together these should ensure that SAC conservation objectives are met. Building the evidence base through self-reporting of bycatch events will help endorse such an assessment.

While figures for seal bycatch are presented together (common & grey species), most bycatch observations are for grey seals. Estimations suggest the vast majority of bycatch occurs in tangle / trammel nets (using annual point estimates, 445 of 488 seals). The highest estimations are outside the area of this fishery (ICES division 7f, 7e with point estimates of 125 and 151 respectively), but some seal bycatch is estimated to occur within 7d (91) 4c (47) and 4b (3).

Twenty five SACs have seals (grey and/or harbour) as a feature.

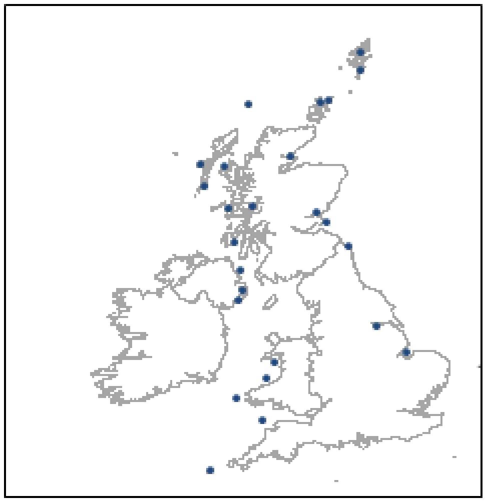

Figure 2. SACs with grey seal and/or harbour seal as a qualifying feature. Dots represent centre point of site. From JNCC's ([Natura 2000 (N2K) site summary details spreadsheet | JNCC Resource Hub]).

Seal SACs tend to be small and are often associated with haul-out sites. Photo ID has shown that seals can travel extensive distances and individuals found within SACs are often spotted many miles away at other locations (for example Sayer et al (2019)[8]), so bycatch outside the site boundary has the potential to be of relevance.

The only sites in relatively close proximity to the fishery area are the Humber Estuary SAC for grey seal and the Wash & North Norfolk Coast SAC for common seal. The regions of coast these sites are found are not near the main fishing area (according to UK landings data), which is offshore in 4b and coastal areas of 7d. For grey seals, the 2019 report estimates that annual bycatch accounts for 1.5-2.9% of wider population but notes that the recent population trajectory of grey seals is still increasing. Therefore at a very broad scale, population sizes within SACs such the Humber Estuary SAC may not be being impacted significantly by bycatch, unless there are localised issues (that we have currently not been made aware of). For the North Norfolk Coast SAC and common seal, it would appear from the bycatch data that this species is less at risk from bycatch, so impacts are not likely to be of a scale that is a concern.

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[8] Sayer S, Allen R, Hawkes LA, Hockley K, Jarvis D, Witt MJ (2019). Pinnipeds, people and photo identification: the implications of grey seal movements for effective management of the species. Journal of the Marine Biological Association of the United Kingdom 99, 1221–1230. https://doi.org/10.1017/S0025315418001170

Risk of prey species bycatch

None of the species scoped into this FMP (plaice, sole, turbot, witch Brill, lemon sole, sole, dab, flounder, halibut) are considered forage fish.

The beam-trawl fisheries targeting flatfish in the southern and central North Sea, tend to use a relatively small cod-end mesh size (80 mm), resulting in significant quantities of fish below minimum sizes being caught, thus resulting in high discard rates (ICES 2021[9]). In the southern North Sea and the eastern English Channel, the otter trawl fleet also operates with mesh sizes less than 100 mm, catching a varied mix of fish and shellfish species. Some of the bycatch may be species considered to be forage fish.

If the fish species most likely to be bycaught are gadoids such as juvenile cod and whiting, whilst these species are considered to be forage fish as juveniles, the direct risk to seabirds and marine mammals is likely to be low. This is because species that consume a lot of gadoids tend to be more generalist feeders. Only weak interactions between forage fish populations and predators occur when predators on forage fish are opportunistic generalists, feeding on whichever species happen to be abundant (Dickey-Collas et al. 2014[10]). If other forage fish species such as sandeel, herring, sardine, anchovy, or sprat are bycaught in large numbers, the risk may need to be reassessed.

Nature conservation risks arising from FMPs to UK MS Descriptors

Under the UK Marine Strategy Regulations (2010), the UK has a responsibility to take the necessary measures to achieve or maintain GES, set out through the UKMS. The UKMS provides the policy framework for delivering marine policy at the UK level and sets out how the vision of clean, healthy, safe, productive, and biologically diverse oceans and seas will be achieved. The target for GES is measured through 11

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[9] ICES (2021): Greater North Sea ecoregion – Fisheries overview. ICES Advice: Fisheries Overviews. Report. https://doi.org/10.17895/ices.advice.9099

[10] Dickey-Collas, M., Engelhard, G. H., Rindorf, A., Raab, K., Smout, S., Aarts, G., van Deurs, M., Brunel, T., Hoff, A., Lauerburg R. A. M., Garthe, S., Haste, Andersen, K., Scott, F., van Kooten, T., Beare, D., and Peck, M. A. (2014) Ecosystem-based management objectives for the North Sea: riding the forage fish rollercoaster. – ICES Journal of Marine Science, 71: 128–142.

qualitative descriptors, which describe what the environment will look like once GES has been achieved.

The following risks to UK Marine Strategy descriptors in English and Welsh waters arising from the key gear types in the Flatfish FMP (beam trawl, demersal trawl, demersal seine, and drift and fixed net fisheries) have been identified below.

Gear	D1, D4 Biodiversity and food webs, Cetaceans	D1, D4 Biodiversity and food webs, Seals	D1, D4 Biodiversity and food webs, Birds	D1, D4 Biodiversity and food webs, Fish	D3 Commercial fish and shellfish	D4 Foodwebs	D1, D6 Seafloor integrity	D10 Marine Litter
Beam trawl (TBB)	Better evidence required.	Better evidence required.	Better evidence required.	Further work by ALBs required in first instance.	No action required beyond FMP scope.	No action required beyond FMP scope.	Collaborative, strategic response required.	More data collection required. Some strategic mitigation possible.
Bottom otter trawl (OTB)	Better evidence required.	Better evidence required.	Better evidence required.	Further work by ALBs required in first instance.	No action required beyond FMP scope.	No action required beyond FMP scope.	Collaborative, strategic response required.	More data collection required. Some strategic mitigation possible.

Bycatch:

D1 & D4 - Biological diversity of cetaceans, seals, and seabirds.

The highest direct risk identified posed by fisheries on cetaceans, seals, and seabirds is their incidental bycatch. Benthic trawling is not included in the UK Bycatch Monitoring Programme, because it is not currently considered to be a high-risk activity. However, the report of bycatch levels in a 2019 report[11] did also include information from non-dedicated sampling under the English / Welsh Data Collection Framework discard

[11] Kingston, A., Thomas, I. & Northridge, S. (2021) UK Bycatch Monitoring Programme Report for 2019. Sea Mammal Research Unit. Available at Science Search (defra.gov.uk) [Accessed 02/11/2022]

programme, which focuses heavily on demersal trawl gears. No marine mammals were recorded but it is noted that sampling protocols are not specifically designed for quantifying protected and sensitive species. Historically, there is evidence that shows harbour porpoise are occasionally caught by beam and otter trawlers (CEFAS observer programme report, 2015; unpublished[12]). However, the current understanding is this is not at a level that would have impacts on the population.

Benthic trawling does pose some degree of bycatch risk to certain bird species, highlighted by anecdotal reporting during fish bycatch monitoring, for example CEFAS observer programme report (2015; unpublished[12]). This highlights deep diving shags, scaups, eiders, scooters, guillemots, great northern divers, and cormorants as the most sensitive birds to gears used in deep waters near the seabed.

Benthic trawling is not included in more recent work looking at seabird bycatch (for example Northridge et al, 2020[13]) and is not generally considered to present a high bycatch risk to birds, with work tending to focus on the impacts of netting, longlining and in some cases pelagic trawling. Benthic trawling is also not highlighted within NE recommendations to ESCaRP as an activity of concern related to seabird bycatch.

Therefore, while there are current data gaps that lead to uncertainties, current thinking is that bird bycatch by benthic trawlers is not at a scale that is likely to threaten GES descriptors. An improved monitoring regime is needed to fill gaps in data and understanding. This could potentially be done by adapting or expanding existing observer programmes, or through the appropriate use of Remote Electronic Monitoring.

The risk to both other fish species and bird / mammal / sensitive fish species is currently **unclear**. A better understanding of the actual risk posed by this fishery will require a closer look at the bycatch associated with this activity.

Seafloor integrity:

Descriptor D1 & D6 Seafloor integrity

Essentially, all mobile demersal gears pose a risk to this descriptor. Where demersal mobile gear is used, there is a concern around benthic disturbance and the contribution

[12] C6273 report (CEFAS observer programme report (2015) (unpublished).

[13] Northridge. S., Kinston. A. & Coram. A. (2020). Preliminary estimates of seabird bycatch by UK vessels in UK and adjacent waters. Scottish Ocean Institute, University of St Andrews. Final report to JNCC.

to current failure to meet targets for D6 seafloor integrity. This is considered a **high** risk issue as there is a clear link between activity and failure to meet GES indicator targets[7].

Marine Litter:

D10 Marine Litter

Loss of gear such as trawls and nets will add to overall levels of fishing related litter within the sea and can have unintended consequences such as ghost fishing. Consideration of how best to avoid or minimise loss and achieve sustainable end of life disposal is important. This risk is considered moderate.

Gear specific estimates of rates of abandoned, lost, and discarded gear have low certainty due to a small number of studies and low sample sizes. Risks are highest in static gear fisheries (French et al 2022[14]) where significant quantities of gear are deployed into the marine environment. Mobile gears are a lower risk but may be a source of plastic ropes and netting which contribute to non-biodegradable marine litter when lost, abandoned, or discarded at sea. Abandoned, lost, or discarded fishing gear is associated with entanglements and ghost fishing. However, fishing litter is likely to be a relatively small component of overall marine litter, therefore fishing measures alone are unlikely to contribute significantly to the achievement of GES.

[14] French, N., Pearce, J., Howarth, P., Whitley, C., Mackey, K., Nugent, P. 2022. Risk-based approach to Remote Electronic Monitoring for English inshore fisheries. Natural England Commissioned Reports, Number 437 Risk-based approach to Remote Electronic Monitoring for English inshore fisheries - NECR437 (naturalengland.org.uk).

Department for Environment Food & Rural Affairs

Southern North Sea and Eastern Channel Mixed Flatfish Fisheries Management Plan

Annex 4: Record of stakeholder engagement

Date: July 2023

Version: public consultation

Contents

Summary

This annex is a summary of the stakeholder engagement carried out by Defra during the development of the flatfish FMP from early 2022 up until consultation in July 2023. Between these dates, Defra engaged with a range of stakeholders with interests in this fishery through existing fisheries stakeholder forums. The overall rationale for following an approach which uses existing forums is to try and reduce the burden on stakeholders. The purpose of any engagement was to:

- Raise awareness about development of the FMP, and
- Present draft FMP content to stakeholders to gather feedback to determine whether they are fit for purpose

This annex has been compiled by Defra based on the information gathered throughout the stakeholder engagement events and used to inform the drafting of the FMP content.

Stakeholder identification

Defra attended a mix of engagement events, covering different individuals with a variety of interest levels to ensure as many stakeholders as possible had the opportunity to discuss and provide feedback on the direction of the FMP.

To identify the appropriate stakeholders, an analysis was carried out internally. The first stage was creating a list of all the possible stakeholders that will have an interest in the FMP. The next step was identifying all of the existing forums that Defra could attend to keep stakeholders informed of the FMP development.

Initial engagement

Between April and July 2022, Defra carried out initial engagement, to gather stakeholder's comments, issues, or priorities that they foresaw for the FMP. This initial engagement ensured to include a variety of stakeholders across different meetings. These initial meetings included:

- Fishers/ Producer Organisations/ NFFO
- Statutory Nature Conservation Bodies
- Environmental Non-Government Organisations (eNGO)
- Finfish Industry Advisory Group (FIAG), which include representatives from:
    - Active fishers (inshore and offshore)
    - Recreational fishers
    - Fishermen’s Associations

- Producer Organisations
- Processors
- Researchers
- Regulators
- Retail

These meetings were carried out in a variety of existing forums and some selective bespoke meetings where we identified gaps in our stakeholder variety. Between this time frame a total of nine meetings were held and attended by over 80 stakeholders. These initial meetings discussed the scope of the FMP and were used to start the conversation on the direction of travel for the FMP. After these meetings, an email was sent to the attendees which included a comments document (please see the bottom of this annex for the template). This provided an opportunity for stakeholders to provide some further detail on the stocks included in the plan.

Ongoing engagement

Defra attended a mixture of engagement opportunities with a variety of stakeholders to ensure as many stakeholders as possible had the opportunity to discuss and provide feedback on the draft FMP. Between August and October 2022, a further 10 meetings were held with stakeholders. These meetings had over 90 attendees. These meetings included representatives from the following stakeholder groups:

- Fishers/ Producer Organisations/ NFFO
- Statutory Nature Conservation Bodies
- Environmental Non-Government Organisations (eNGO)
- Finfish Industry Advisory Group (list of representatives could be found in the above initial engagement section)
- IFCAs
- Retail

Throughout the development of this FMP, the Defra held regular meetings with eNGO at an FMP programme level to allow them to be kept up to date with progress of all FMPs. At these meetings they were able to share their comments on the plan.

A pause in the engagement was carried out between October 2022 – January 2023, this is due to the FMP being led on by Defra’s EU negotiations team, and work was paused for the team to focus on the negotiations during this time.

The first engagement event on return to the FMP development was with the Fisheries Management and Innovation Group. This meeting alone was attended by over 100 stakeholders. The focus of the engagement of this meeting was to discuss the lessons learnt from the FMP work, as the frontrunner FMPs are being developed in different ways.

After this meeting, a further five meetings were attended by Defra. This included two meetings with FIAG, one with eNGO, and one attending the MMO working group for the Channel Non-Quota Demersal FMP.

A dedicated FMP email inbox was also created and made available to attendees to share further thoughts and feedback on the FMP. Project updates were also shared via the Defra stakeholder bulletin, and other bulletin channels.

FIAG FMP Sub-Group

The other meeting attended on 9 May 2023 was the FIAG sub-group and was well attended by around 30 stakeholders. Following engagement with FIAG members in 2022 it was agreed that a single combined finfish FMP sub-group would be formed, with the possibility to convene meetings that are FMP-specific as required. This approach is being taken to minimise duplication of effort, reduce burden on stakeholders, and ensure that there is a single point of engagement on finfish-related FMP work. The intention is that the FMP sub-group will cover the current tranche 2 FMPs through the remainder of the drafting and consultation processes, and also cover tranche 3 FMPs when these become a focus. Membership of the FMP sub-group is expected to change over time to ensure that there is appropriate representation of stakeholders relevant to each FMP as development progresses and is open to all industry stakeholders (commercial and recreational).

The combined FMP sub-group will serve to:

- Provide stakeholders with an opportunity to engage informally in FMP development
- Allow stakeholders to communicate directly with FMP delivery leads
- Enable FMP drafting teams to use the sub-group as a sounding board for ideas, establish support for proposed management approaches, and sense check draft content or ideas with members
- Manage expectations by giving transparency to the development process
- At the current time the group will be of most relevance to those with interest in the tranche 2 finfish FMPs as follows:
    - Bass in English and Welsh waters FMP
    - Southern North Sea and Eastern Channel mixed flatfish FMP, and to a lesser extent
    - Channel Non-Quota Species FMP (the Channel Non-Quota Species FMP already has an existing working group, facilitated by the MMO, and as such prospective attendees who only have an interest in the

Channel NQS FMP are invited to join the group, but there will be less focus on this FMP)

A general update on the group's progress and discussions will be relayed at the subsequent FIAG meeting. There is currently no fixed schedule for frequency of FMP sub-group meetings, and members will be asked for input on planning to maximise benefits for both stakeholders and FMP delivery leads.

A summary of comments from all stakeholder meetings is provided in the section below.

Summary of feedback during each stage

Engagement feedback

- Survey work for sole 7d was disturbed due to covid. Would encourage a new 7d survey going forward to help understand the uncertainties due to covid
- The Atlantic halibut is the largest flatfish species in the world and have seen significant population declines across their range because of heavy levels of fishing. They are a slow growing, late maturing species making them especially vulnerable to the impacts of overfishing. The FMP should include measures to protect halibut to ensure that fish are reaching mature sizes
- The inclusion of witch, lemon sole, turbot, and brill in a single TAC remains a concern that leaves both species vulnerable to overfishing. The FMP should consider setting out a timetable for moving towards a single species TAC. As for all species the harvest control rule should be included in the FMP to prevent confusion as to what the rules are
- Confirmation on which stocks are economically viable either as target or bycatch
- Dab - caught and discarded in large numbers because of low market price. TAC was removed to prevent it from becoming a major choke
- The biological stock straddles the boundaries of the proposed FMP, would any of the management measures applied to halibut in western channel and/or 3a have an impact on the SNS FMP?
- Questions on how the FMP will deal with negotiations and joint management of stocks with other coastal states
- How the FMP will deal with stocks where their boundary crosses into other areas not covered by the FMP
- The need to be holistic and consider things such as environmental impacts
- How the FMP will deal with issues such as trawling
- How the FMP will reflect mixed fisheries
- Understanding discards – especially for flounder and dab

MMO Channel NQS engagement feedback (for stocks that are covered by both FMPs)

- Stakeholders have highlighted these as key species to the fishery – requiring protection during the juvenile life stages of the stocks. Their concerns surround the catch and discard or landing of very small individuals associated with smaller mesh sizes – these individuals are worth very little to the fishers and fishing them out of the population reduces the future recruitment population and harvestable stock. We cannot quantify how big the problem is, this is a matter of gathering more evidence. However, the fishers raised this as a priority concern for them, sufficient enough to require addressing urgently under the FMP. Fishers cited that the removal of the Minimum Conservation Reference Sizes (MCRS) for these species was a mistake
- The fishers requested that the introduction of an MCRS is coupled with the standardisation of the mesh size at 100mm to complement the MCRS for these species. Concerns were highlighted surrounding the sustainability of fishing impacts on the stocks from using gears with a mesh size of 80mm or less. Specifically, these smaller mesh sizes result in the landing of juvenile individuals, prior to them reaching maturity, impacting on the spawning and recruitment potential of these stocks

FIAG Subgroup feedback

- Members raised that the Joint Fisheries Statement (JFS) talks about world class sustainable management through three areas, including fish stocks for the wider benefit of all and maximising the benefits for coastal communities. Management of fisheries is not just about delivering sustainable stocks, but also making the most of those stocks. How could the proposed changes to MCRS exist alongside the national management landscape? This will be difficult to manage, including ensuring future FMPs consider measures that have been put in place
- Members raised that going from an 80mm to 100mm mesh size isn't workable for sole fishing, and this opinion is likely to be shared by all Regional Fisheries Groups. Members felt it was unlikely that anyone from the industry would want this measure, and that it has been tried before and failed. Delivery leads clarified that this issue has been noted and they're looking into likely impacts of management changes. One group of fishermen are keen to implement a 100mm derogation, which could be effective at reducing fly-seining vessels effort in UK waters, however this is not a widely accepted view. Overlaps between fisheries make the landscape complex meaning there are no easy solutions. For this measure, members suggested that a closer focus on specific gear types is required. FMPs set out the proposed management

approach – there are opportunities through discussions with arms-length bodies (ALBs) to better understand what is viable. The management measures are proposals now, the measures themselves will come in following the FMP process

- Members asked for clarity on the status of plans if a new government comes into power following a general election. It was emphasised that there is a commitment to the JFS and to FMPs in the Fisheries Act 2020. Any change in government following the next general election would be after the publication of the tranche two FMPs
- Members raised that it becomes complicated with several different species in mixed plans, and crossover of species and areas across FMPs. Delivery leads reminded members that all the plans are being developed in different ways, and there will be a continued need for communication between delivery leads to ensure plans are compatible and complementary where possible
- Members were concerned that with turbot and brill, there could possibly be a knock-on effect of splitting the TAC, creating a choke on witch. Members were curious about how maximum sustainable yield (MSY) management versus discard minimisation would be handled and were concerned the plan may not be following ICES advice for these stocks
- A member raised that the Kent and Essex IFCA are looking at a minimum landing size (MLS) of 27cm for lemon sole, whereas a 25cm MLS is proposed in the FMP

Comments document sent out to stakeholders

Southern North Sea and Eastern Channel mixed flatfish FMP

Under each stock please could you provide any comments, issues or priorities you would like to raise to be considered during the development of this FMP.

Name(s): *Primary contact / person filling template in*	
Company / Organisation(s): *Who you represent*	
Contact email:	
Date completed:	

Biological Stock	TAC Code (if applicable)	Common Name	Comments
bll.27.3a47de	T/B/2AC4-C	Brill	
lem.27.3a47d	L/W/2AC4-C	Lemon Sole	
ple.27.7e ple.27.7d	PLE/7DE.	Plaice (English Channel)*	
ple.27.420	PLE/2A3AX4	Plaice (North Sea)	
sol.27.7d	SOL/07D.	Common Sole (Eastern Channel)	

Annex 4: Stakeholder engagement for mixed flatfish FMP

Biological Stock	TAC Code (if applicable)	Common Name	Comments
sol.27.4	SOL/24-C.	Common Sole (North Sea)	
tur.27.4	T/B/2AC4-C	Turbot	
dab.27.3a4	DAB	Dab	
wit.27.3a47d	L/W/2AC4-C	Witch (North Sea)*	
fle.27.3a4	FLE	Flounder or Flukes	

Annex 4: Stakeholder engagement for mixed flatfish FMP

Biological Stock	TAC Code (if applicable)	Common Name	Comments
hal.27.3a47de	HAL	Atlantic Halibut	