Fisheries Paper

Describe the trends in catch and value for five representative focal species (cuttlefish, lobster, mackerel, cod, and sole) over the last ten years (2014-2023 inclusive) for all regions of the UK combined (England, Scotland, Wales, and Northern Ireland).

Pick one UK region (England, Scotland, Wales, or Northern Ireland) and explore changes in overall catch, value, and fleet size over the last ten years (2014-2023 inclusive).

**Executive Summary**

**Introduction**

Globally, fish stocks are increasingly overfished, yet, with a growing population, our demand for fish continues to increase (FAO, 2024; Thurstan et al., 2010). However, the only efforts to collate global fishing data is done by the FAO, and its reports have faced criticism for inaccurate representation of the state of current stocks, but underestimating catch and overestimating sustainability (Pauly and Zeller, 2016). To prevent damaging stock collapses, more accurate modelling and widespread fisheries data collection needs to be achieved. As a result, policy such as the European Union’s Common Fisheries Policy (CFP), was created in 1973, aimed at managing fisheries of member states and keeping stocks at Maximum Sustainable Yield (MSY) (Froese et al., 2018; Stewart et al., 2022). However, of Europe’s 397 stocks, in 2017, 69% were subject to overfishing (Froese et al., 2018).

As an island, the UK has access to some of the most productive fishing grounds in the world, mainly in the North Sea, North Atlantic, the Channel, and the West of Scotland (Akbari et al., 2022; Hatcher and Read, 2001). However, due to consistently high fishing pressure over the last few hundred years and the technological advancements in fishing equipment, many fisheries in these regions such as the northeast Atlantic are some of the most exploited despite their high productivity (Thurstan et al., 2010). The species exploited in these fisheries were predominantly captured through trawling, targeting demersal species such as cod, sole, and haddock

Thurstan et al. (2010) used historical landings data to understand the trends in the fish stocks, and they compared catch and fleet size numbers.

Despite the need to decrease fishing pressure, fuel costs are subsidized for many commercial fishing activities in the UK, which supports fuel-intensive trawling and dredging (Vaughan et al., 2023). Therefore, the true costs of fishing ,which take into consideration fuel cost reductions, are higher than annual revenue (Vaughan et al., 2023).

While in the UK, fishing contributes to a relatively small portion of the economy, it is culturally and politically significant across the country, and is especially important for the economic stability of Scottish coastal communities (Akbari et al., 2022; McAngus et al., 2018). After Brexit, the UKs management of its fishing stocks at MSY is directed by the Fisheries Act 2020, but management is devolved to each administration within the UK (Fox, 2022; McAngus et al., 2018). Scotland has been described as “the center of the UK’s commercial fishery sector”, but faces governance changes post-Brexit (Akbari et al., 2022).

Gathering fishing fleet statistics provides more insight into fishing effort “Therefore, the size, number, and efficiency of the fleet become important factors for the prosperity of the sector since they represent the amount of effort.” (Akbari et al., 2022).

There is both important regional and national legislation which provides the guidelines for fisheries management and monitoring. The European Union’s Common Fisheries Policy is aimed at managing fisheries of member states, and in 2019 implemented a requirement for all catch to be landed in an effort of mitigating high levels of discards (Froese et al., 2018; Morfin et al., 2017).

In 2009, the UK Marine and Coastal Access Act was established, and immediately thereafter the Marine Management Organization (MMO) was created to sustainably regulate the seas (Cross, 2010).

While goals are aimed at fishing at MSY, data on fish stocks is limited. Quota policies mainly rely on historical catch data when setting catch limits (Stewart et al., 2022). However, the trends observed in catch data can be consistent with true biomass of stocks (Froese et al., 2012).

The focal species represent the main different target groups, pelagic, demersal, shellfish, Sole is the highest priced demersal species. Cod is mainly fished outside of the UKs EEZ and goes into the Faroese waters and Svalbard Protected Zone (Davis et al., 2023) pg 23

There was an increase in Mackerel quote from 2022 to 2023, and the UK fleet catches more mackerel than any other species. However, 54% of the mackerel caught is caught in non UK EEZ. Lobsters are the only quota shellfish species.

There have been recovery measures in place for Sole, as a Sole Recovery Zone (SRZ) was established in 2004 for vessels over 10 m in the Western Channel- these rules were further amended in the 2020 Fisheries Act (Davis et al., 2023). Sole is a valuable flatfish, and in the Western channel it is fished using beam trawls (Bjorndal and Bezabih, 2010). The UK has the largest share of the TAC of this fishery (Bjorndal and Bezabih, 2010; ICES, 2010). The stock was at its lowest biomass in 2007, however, landings have continued to remain steady and the price of sole was increasing until 2010.

The type of gear used can make a difference in the price of fish. For demersal fish, the price is higher using passive gear rather than active gear.

Trends in fishing fleet size, capacity, and energy usage can also provide information on the cost of fishing, as global fishing capacity has been estimated at double that required to catch the global landings (Bell et al., 2017).

In the UK, fisheries policy is devolved, and while the MMO collectes data from England, Wales, and Northern Ireland, Scotland’s fishing activities are managed by the Scottish Marine Directorate.

Scotland fishes the most quota species (in tonnes)- they landed 77% of UK landings of quota species in 2023.

Scotland’s economic productivity has historically relied on commercial fishing, and culturally, fishing practices remain important to coastal communities (Weir and Kerr, 2020). Despite decreased economic contribution from fishing, in 2023 Scotland’s fleet had more power and capacity than any other region in the UK, and is made up of large pelagic trawling and purse seine vessels (Davis et al., 2023; Sandison et al., 2021).

To sustainably manage the UK’s fisheries resources, landings and fleet data are an accessible and relevant tool to estimating the stocks and fishing effort. Here we describe the trends in catch and value for five focal species (cuttlefish, lobster, mackerel, cod, and sole) from 2014-2023 for all regions of the UK. Given the devolved nature of fisheries management policy in the UK, we also focus on the changes in catch, value, and fleet size over the same time period in Scotland, which contributes the most landings and the greatest fleet capacity in the UK (Davis et al., 2023).

**Methods**

Data Collection

The MMO is responsible for collecting fisheries data based on Clause 1 of the Fisheries Act 2020 which requires a ‘scientific evidence objective’. The data collection methods are described in the ‘Work Plan for Data Collection in the Fisheries and Aquaculture Sectors’, on the UK Government Website (MMO, 2024).

Fishing activity data is collected differently depending on vessel size and target species. Vessels over 10 m have logbooks, landings declarations, and sales notes. These contain details on the species, presentation, weight, and value of their landings and are recorded electronically at the local port offices. For vessels under 10 m, buyers and sellers are registered at the point of first sale, and sales notes are reported within 48 hours of the sale. These smaller vessels also provide voluntary logbooks and landing declarations. Shellfish vessels are also required to report monthly landings and activity to their local port offices. Since 2019, these smaller vessels are required to record their catch for each trip on an app, website, or customer contact center. Data on fleet capacity is collected by the Marine and Coastguard Agency’s Registry of Shipping and Seamen (RSS) who have information on registered fishing vessels, their gross tonnage (GT), and maximum continuous engine power (MCEP).

Data Description

Data on the quantity (landed weight in tonnes) and value (£) of landings for five focal species: mackerel, cod, sole, lobster, and cuttlefish from 2014 to 2023 was downloaded from the MMO website. Only data from landings into the UK by UK administered vessels were used for the focal species landings. Data of the fleet size and capacity of Scottish administered vessels was also downloaded from 2014 to 2023. The total quality and value of landings into Scotland from 2014 to 2023 were also downloaded.

Data Handling and Analysis

All data was downloaded into Excel directly from the MMO website. Only data from the five focal species and the total for all species were retained for analysis of landings in the UK by UK vessels. The value of catch reported by the MMO is at the value at the time of the transaction, with no adjustments made to account for changes in inflation. Therefore, we used the Consumer Price Index (CPI) to convert historical prices to most recent prices in the data (2023). Further calculations, conversions, and all figures were made in R Studio (V).

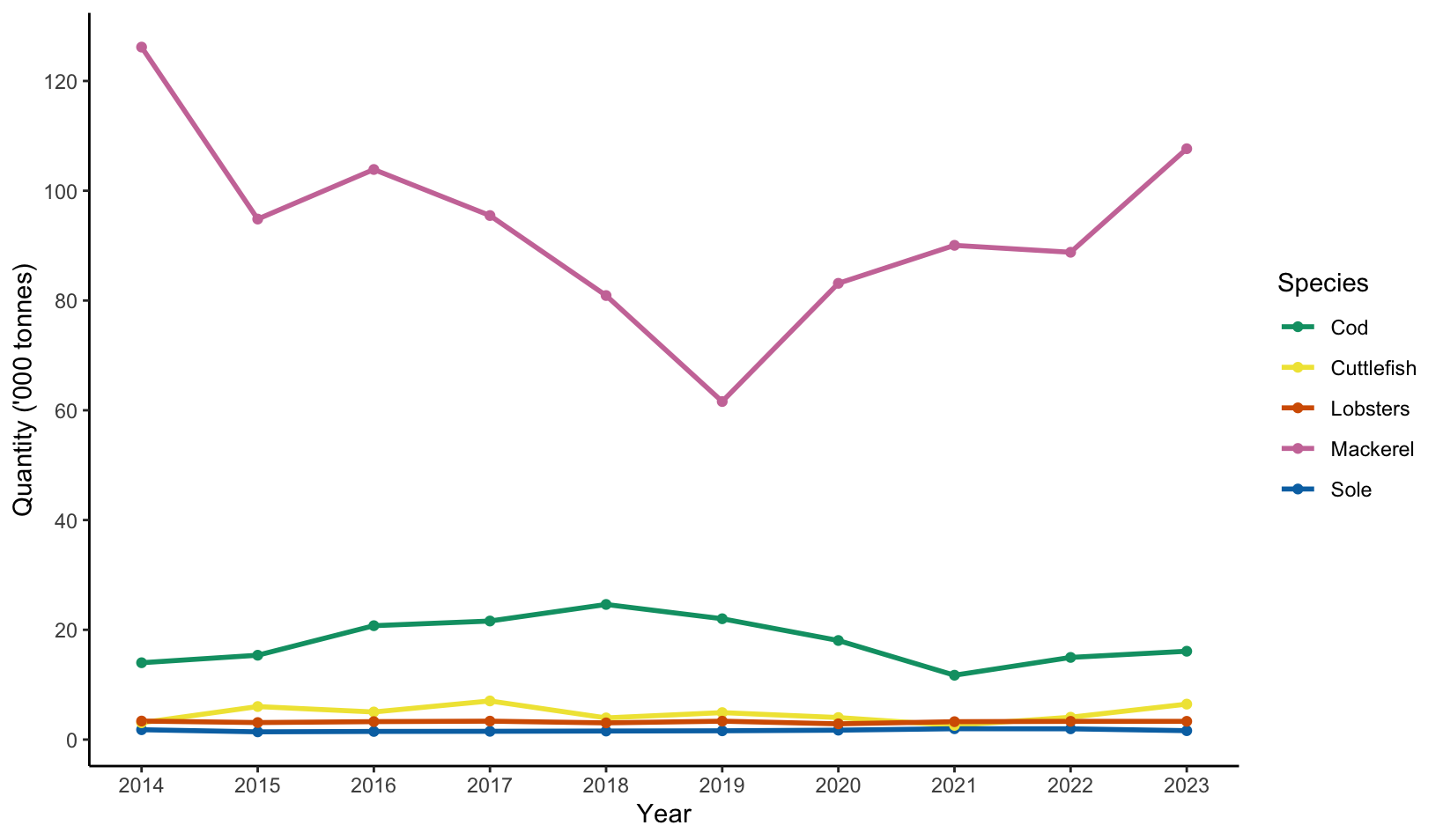
**Results**

Landings in the UK from UK Vessels

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**Figure 1.** Value of landings by species for UK vessels into the UK from 2014 - 2023. The value of landings has been converted to equivalent prices in 2023 using the CPI.



**Figure 2.** Quantity (tonnes) landed by species into the UK by UK vessels from 2014 -2023.

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**Figure 3.** Total value (orange) and quantity (blue) of all species landed in the UK by UK vessels. The monetary value has been converted to prices in 2023 using the CPI.

Total landings in Scotland from UK vessels

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**Figure 4**. Total catch (green) and value (yellow) of landings into Scotland by UK vessels from 2014- 2023. The value of landings has been converted to equivalent prices in 2023 using the CPI.

Scottish fleet

There was a 13% increase in total GT from 2014 to 2023, but a 5.8% decrease in the GT of the under 10 m fleet. However, the opposite trend is seen in fleet size, with under 10 m vessels having increased by 3% from 2014 to 2023, and

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**Figure 5**. Size of the fleet under Scottish administration and vessel sizes from 2014 – 2023 by different size class.

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**Figure 6**. Capacity of the fleet (Gross Tonnage) under Scottish administration and vessel sizes from 2014 – 2023 by different size class.

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**Discussion**

Of the five focal species caught by UK fisheries and landed in the UK, mackerel is both the most lucrative and caught fish. While experiencing some fluctuations, the value of mackerel caught and landed in the UK has increased by 28.3%, however, the overall tonnage of mackerel caught has decreased by 14.7%.

The focal species here are representative of the demersal, pelagic, and crustacean groups, and may therefore serve as a proxy for the type of fishing and gear used (Davis et al., 2023).

While the catch for many species such as sole, cuttlefish, and lobster have remained relatively low and consistent, their value has gone through much greater fluctuation (**Fig. 1, 2**).

Sole, lobster, and mackerel have experienced increases in value since 2015, while cod and cuttlefish experience some declines in value, and have only started to recover in 2021 (**Fig. 1**).

To better understand the state of the focal species’ stocks, further reporting should analyze the size of the caught species to determine if there are trends in species caught under the size requirements, or if size is decreasing. This information

Changes in the Scottish fleet’s capacity and size have experienced opposite trends from 2014 to 2023, with the overall number of vessels and over 10 m vessels decreasing, but with a total capacity increase of 13% (GT). This also indicates that despite more under 10 m vessels in 2023, the capacity of the Scottish fleet is almost entirely driven by the over 10 m vessel (**Fig. 6**). Despite fluctuations in the overall quantity and value of landings to Scotland, the fleet size and capacity has remained constant (**Fig. 5, 6**).

Vessel capacity has been used as a proxy for fishing effort, however, it assumes that vessels will fish proportionally to their GT. A more robust estimate of the Scottish fleet’s effort might involve data obtained from AIS to map fishing activity spatially and temporally (Rousseau et al., 2024).

They have also been known to target higher quantities of lower priced species, which results in them having larger vessels with greater carrying capacities. Their fleets also land the highest quantity and value of fleets from other regions in the UK, with approximately % of total fish caught in the UK in 2023 (Davis et al., 2023).

However, since Brexit, the UK, one of the major contributors to fishing in European waters, has left the CFP, and established its own fisheries policy to regain control - the Fisheries Act 2020 (McAngus et al., 2018; Stewart et al., 2022).

While many fishing organizations, such as the Scottish Fishermen’s Federation (SFF), believed that Brexit would give fishers more access to their waters, the data shows a steep decrease in the total value of landings in Scotland in 2020 (Figure 5) (Weir and Kerr, 2020).

However, solely looking at landings and fleet data misses out on the spatial element of fishing. Incorporating statistics such as days at sea from individual vessels and in which locations they have been fishing will give us a more holistic understanding of where management needs to be focused.