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What factors influence the strategies and choices of Scottish fishers? A feasibility study

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social research

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Executive Summary

This project aimed to gather evidence of what drives and influences the reasoning and decision making of fishers who operate in Scottish waters. Fishing is an important industry both nationally and locally, and improving our understanding of how fishers make decisions is key to creating effective fisheries' management policies.

The research team conducted a literature review followed by a qualitative research exercise (twelve interviews with fishers) to identify patterns and themes in fishers' decision making. The literature review focused on what type of choices fishers make, as well as the underlying drivers of these choices. Eight categories of choices were highlighted in the literature:

- Where to fish;
- Whether to remain in the industry;
- What fishing gear to use;
- Which species to target;
- Whether to go fishing (day-by-day);
- Whether to collect data while fishing;
- Where to sell.

The drivers of choices (underlying reasons that influence decisions) identified in the literature were divided into four categories and broken down into more specific sub-drivers:

- Social (knowledge, ability, skill, community, social networks, heritage, identity);
- Economic (costs/benefits, economic, profit, skills, value);
- Governance (regulation, legislation, industry power dynamics);
- Environmental (weather, seasonality, climate change, environment, sustainability).

In the literature review, social drivers were the most common drivers and influenced a variety of fishers' decisions. For example, knowledge of fishing grounds ('knowledge' falls into social drivers) played an important role when deciding 'where to fish' (Tidd et al, 2015). Knowledge about spatial and temporal distribution of target species accumulates through time and is refined through social interactions with other fishers (Turner et al, 2014; Calderwood et al, 2021). The decisions on 'where to fish' were also linked to economic drivers (e.g. considerations of fuel costs), but social drivers had more substantial weight in these decisions. Another example of the prominence of social drivers was revealed in relation to decisions on 'whether to remain in the industry'. Here, sub-drivers of 'heritage', 'community', and 'identity' showed that deep cultural and generational ties to fishing influence fishers' decisions to remain in the industry (Arias-Schreiber et al, 2018; Christy et al, 2021; Matić-Skoko and Stagličić, 2020; Ross, 2013). Whereas social drivers dominated fishers' decision making, the literature also showed that decision making is complex and often more than one driver influenced certain choice. For example, choices regarding 'what fishing gear to use' and 'which species to target' were based on a range of drivers (social, governance, economic, environmental).

The qualitative second part of the project involved interviews with fishers. Overall, seven main themes that influenced fishers' decisions were identified during the interviews:

- Difficulty recruiting and retaining crew;
- Seasonality and weather conditions;
- New policies and legislation;
- Recent and rapid changes in regulations;
- Access to quota;
- Level of government support and engagement;
- Mental burden on fishers.

The dominant theme in the interviews related to crew recruitment and retention. Interestingly, this theme did not emerge strongly in the literature review. Fishers mentioned a number of challenges around crew recruitment including seasonality of work, low wages, certification processes, competition from other industries, and reliance on migrant workers. In the analysis presented in the discussion section of the report, this theme was linked to social drivers and the 'knowledge' sub-driver in particular. Knowledge accumulates over time and is passed down to the next generation of entrants to the industry. Difficulties in crew recruitment represent a significant concern in relation to the sustainability of fishing communities and the preservation of valuable local knowledge about the marine environment developed through generations of fishing.

Apart from the crew retention theme, themes discovered through the interviews for the most part corresponded with the literature review findings. For example, linked to the governance drivers, interview participants focused on new policies such as Highly Protected Marine Areas (HPMAs), and stricter regulations. The HPMA proposal envisioned that at least 10% of Scotland's seas would be designated as HPMAs by 2026, including restricted fishing and other human activities in selected sites. The HPMA consultation[1] ran from December 2022 – April 2023. Following the consultation period, the Scottish Government confirmed that while it remained committed to the outcome of enhanced marine protection, it would no longer progress the HPMA proposals as consulted on[2].

With regards to the environmental sub-drivers, 'weather' and 'seasonality' were discussed. And in terms of economic sub-drivers, 'operating costs' were a prominent theme in the interviews. These drivers influenced when, where and whether to fish and what gear to use. They also appeared to be important in terms of the wider issues such as mental health, wellbeing, and feelings about the future in the industry. Overall, this study highlighted that often several drivers combine to influence the decision making of fishers and their outlook on the future. It also showed that there is a need for greater collaboration

[1] For the report analysing the responses to the HPMA consultation, please see https://www.gov.scot/publications/highly-protected-marine-areas-hpmas-analysis-consultation-responses-final-report/ (Accessed 05/12/2023).

[2] For the Scottish Government response to the public consultation on the HPMA proposal, please see https://www.gov.scot/publications/scottish-highly-protected-marine-areas-hpmas-consultation-scottish-government-response-consultation/ (Accessed 05/12/2023).

with the industry to support and preserve the sustainability and welfare of fisheries and fishing communities.

With regards to methodological insights, this pilot study showed that interviews offer a suitable method to explore fishers' decision making. Interviews allowed fishers to talk about in-depth issues (e.g. mental health) and uncovered topics that were not raised in the literature (e.g. crew recruitment). However, future studies need to consider time required to employ these methods, as raising awareness of the project, recruiting participants, conducting and analysing interviews takes a long time. Other methods, such as fieldwork on the ground and attending industry meetings, can supplement future research.

1. Introduction

1.1. Background

Fishing is an important industry for Scotland because of the social, cultural and economic benefits it generates for local communities and the wider nation.

In November 2022, the Marine Directorate[3] commissioned research to understand what drives and influences the reasoning and decision making of fishers who operate in Scottish waters. Fishers are constantly weighing up options and making choices as part of their short-term and long-term planning. When making these decisions, a number of factors may come into play. These may be circumstantial (i.e. marine policies, marine developments, regulations, climate change), practical (i.e. making a profit, making the best use of time and resources) and personal (i.e. values, fears, family, culture). Decision making involves balancing these factors as some factors may be more influential than others.

For example, when choosing whether to change gear type, a fisher may consider the following factors: the skills and knowledge they need to diversify, the cost of buying new gear, the potential profits, the hours involved with fishing using new gear, the implications of any current or upcoming marine developments or marine policy changes, the impact this might have on family life, the need for more or less crew, the knock on effect this might have for employment in the area, the change in identity associated with fishing with different gear, and many other factors.

These decisions may be influenced by a range of factors and pressures, both external and internal to the industry. For example, the impact of EU-exit, the ongoing cost-of-living crisis, and climate change may affect marine industries and ecosystems in different ways.

In addition, fishers operate within the context of a complex and dynamic shared marine space. They often navigate alongside other marine users and have impact on these users. It is a highly diverse industry, and it is particularly challenging to understand their interactions with other marine users.

The methods by which individual fishers adapt to meet the challenges and opportunities, as well as their interactions with other marine users, have implications for the crew, the wider local communities, and the environments that they operate within.

Understanding how these factors interact, which factors are most important, and in what situations these are more important is key to effective management and policies that enhance sustainable and responsible fishing practices.

This report describes the results of a project that was focused on building an understanding of how different factors play a role in fishers' decision making, and which factors are most important in specific situations.

[3] Previously known as Marine Scotland. Resources (e.g. privacy notice) that were produced before the name change may mention Marine Scotland instead of Marine Directorate in this report.

1.2. Aims and objectives

The project aimed to gain an understanding of how and why fishers make decisions, taking into account the context in which they operate. It also aimed to explore different behaviour and actions by fleet sectors as well as other criteria (e.g. geographic location, length of time fishing, age, gender). In order to achieve these aims, the project set the following objectives:

- Conduct an international literature review of evidence and deliver a report on the findings;
- Develop a study design and consider methodologies to research this topic in Scotland, including the approach to the collection of primary data using appropriate methods;
- Collect primary data, using appropriate social research methods, to expand on the findings from the literature review.

The main research question that informed the methodology focused on: What drives and influences the reasoning and decision making of fishers who operate in Scottish waters, with regard to their fishing activities?

The project was envisioned as a pilot study to test the research question and research methodology through a small number of interviews. It intended to indicate whether a follow up project should be conducted based on the pilot findings.

Given the relatively small number of interviews that were conducted (twelve interviews), the findings of this project should be treated as indicative only, as they may not be representative of all the views of wider fishing communities in Scotland.

2. Methods

2.1. Literature review

The aim of the literature review was to provide an overview of the range of decisions fishers make and the drivers that influence these decisions. The findings of the review were used to develop a plan and methodology for collecting primary data to explore the topic in more detail.

A systematic review of the available literature was conducted using primarily Google Scholar as well as other search engines. UK-based regulatory and management portals were also explored to collect evidence from various primary and secondary sources. For example, the review looked at peer-reviewed literature, grey literature, government reports and working group publications. Searches were narrowed to a 10-year period (2012 – 2022). The Boolean logic was used to combine search terms relating to various decisions fishers make on a daily, seasonal, and annual basis (See Annex 1: Literature Review Search Strings for further details on search terms used). Additional search terms specifying geography were included to identify literature of greater relevance to the study area. These geographical-based search terms focused on Europe, EU, North America, UK and Scotland. The search results were collated and catalogued in an excel collection log and then narrowed down into an excel literature framework database. The literature review collation log is available in Annex 2: Literature Review Collation Log.

Thematic content analysis was used to critically analyse and interpret the literature. The main focus of the analysis was on the descriptions of choices fishers made and the drivers for these decisions. These choices were coded and grouped under several broad categories. The frequency of different codes observed in the literature searches was also noted. An in-depth analysis into the patterns and context in which these choices were made (i.e. social or economic drivers) was conducted. This critical analysis was undertaken to:

- Collate and summarise the choices made by members of the fishing industry found within the literature;
- Gain an understanding of how and why fishers make decisions, accounting for the context in which they operate and various drivers affecting their decisions;
- To design a study and consider methodologies for exploring the topic of fishers' choice in more detail using an approach that is appropriate for the Scottish context.

2.2. Input from the industry representatives

In advance of the interviews with fishers the project team contacted Fishing Industry Representatives to discuss the project and explain its aims and objectives. In order to ensure the best available spread, the Scottish Fishermen's Federation (SFF) and the Communities Inshore Fisheries Alliance (CIFA) were contacted. The SFF is made up of eight associations representing 400 vessels from inshore to large pelagic vessels. CIFA is made up of nine associations and welcomes individual fishers as well as established

representative bodies. Individual Associations were also contacted along with a number of Producer Organisations covering the East and West Coasts of Scotland.

The draft interview guide (available in Annex 3: Interview Guide) was discussed with industry representatives, as well as the initial findings of the literature review. The purpose of this was to sense check the findings of the review and refine the interview guide, if needed. The feedback from these discussions was generally positive and no changes were made to the interview guide. Seeking advice in this way offered an opportunity for a follow up call to address any queries. It proved a very useful method to initiate a discussion.

The fishing industry representatives circulated the interview request to fishers within their organisations to raise awareness of the project and to ask those who wished to take part to come forward. It was recognised that there were a number of pressures on industry at the time of the study and that this was acknowledged in requesting people's time. The email template used for this introduction is provided in Annex 4: Introductory Email Template.

This initial engagement also enabled the project team to increase their understanding of the following areas in advance of conducting the pilot study:

Recommendations on the most effective way for engaging with individual fishers during the pilot study (e.g. engagement with local representatives);

Which fleet segments to include and how to group fishers (e.g. gear types);

How to consider different geographical regions.

In addition to this, the Research Advisory Group for the project included fishing representatives who had the opportunity to comment at each stage of the pilot study.

2.3. Primary data collection

Primary data collection for the project consisted of a mixture of face-to-face interviews using the targeted interview guide developed via consultation with the industry representatives (see section above).

Engaging with fishers was carried out with sensitivity and ethical considerations at all times. It was acknowledged that the policy context that fishers operate in is very complex. A copy of the project privacy notice (available in Annex 5: Privacy Notice) was provided to all stakeholders and their permission to record the interview was obtained before the interview commenced. Opinion was sought from the following groups:

- Inshore static gear fishers;
- Inshore mobile gear fishers;
- Demersal fishers;
- Nomadic mobile gear fishers;
- Pelagic fishers.

Fishers were contacted using the network of fishers' representatives spanning different geographical areas (i.e. federations, associations, producer organisations), as well as through the recommendations of individual fishers. In this way, a reasonable sample from each group noted above was achieved. Overall, 12 interviews were carried out.

Initial contact was made either by email or phone depending on contact information provided by the participants and their preferred mode of communication. Once that initial contact was made participants were offered to give a one-to-one interview (options included phone interview, online, face-to-face). Every effort was made to accommodate participants' individual preferences.

During the interview, the structured interview guide (available in Annex 3: Interview Guide) was used to take the respondent through the questions. Interviewees were also given the opportunity to make further comments.

2.4. Approach to primary data analysis

After the interviews, primary data was analysed according to the detailed plan set out in Annex 6: Pilot study plan. This plan was discussed and confirmed with the Research Advisory Group before the interviews.

The interview guide generated background data and qualitative responses. Background data included demographic information, information about gear, vessel types and fishing patterns. Qualitative data derived from the interviews was analysed using thematic analysis that is widely used in social science. It has been assessed by the project team to be a suitable methodology for the study. There are six key steps within this approach:

- Familiarisation with the data: read through the transcripts/minutes and note meanings and patterns that appear.
- Creation of initial codes: a set of initial codes is created that represent the meanings and patterns seen in the data. Codes are applied to the data.
- Collate codes: all excerpts of data with the same code are grouped.
- Group codes into themes: coded data is sorted into potential themes. These themes point to the trends and patterns in the data, e.g. when certain themes are frequently raised by different participants.
- Review and revise themes: iteratively revise analysis to ensure that the coding, sorting and applying of themes is accurate and representative, sub-themes may emerge at this stage.
- Write up and summarise themes: writing up the narrative is the final step in the analysis. The themes are presented and explained in the context of their frequency and importance assigned by research participants. Representative quotes from the data set are used to demonstrate the themes.

3. Findings

3.1. Literature review findings

3.1.1. Papers selected for the final review

Initially, 48 papers were selected for the literature review. These papers were reviewed with regards to whether they discussed fishers' choices and drivers of choices. Other information, such as location and gear types, was also noted. As a result of this screening process, some papers were rejected if they were found to be irrelevant to the focus of the project (e.g. they contained no information on fishers' decision making or drivers of choice). Annex 2: Literature Review Collation Log provides a list of these 48 papers. Following the initial review, 19 papers were selected for a more in-depth study, these papers are listed in Annex 7: Research papers that informed this study.

All the papers included into the final analysis were geographically located in Europe. Ten papers focused on drivers of fishers' behaviour in the UK (seven in England, one in Scotland, one in the English Channel, one looking at the UK as a whole). Six papers did research in Northern Europe (four in Denmark, one in the Netherlands, one in the North Sea, one in the Baltic Sea). Four papers focused on the Mediterranean (one in Greece, one in Italy, one in Croatia, one looking at the Western Mediterranean). One paper looked at Ireland. Despite the inclusion of the search term 'North Atlantic', no papers from North America were identified and, therefore, this geographical area was not included in the review.

The selected papers covered a wide range of gear types and vessel sizes. Ten papers looked at different trawl fisheries (largely over 12 metres in vessel length), six focused on 'all gear types', five on passive gears (mainly under 12 metres in vessel length), and only one looked at scallop dredging.

3.1.2. Fishers' choices mentioned in the literature

The choices made by fishers were grouped and documented into the data framework. In total, eight broad categories were identified and the frequency of each documented choice was recorded (as shown in Table 1). These choices span both short-term (daily or weekly) and long-term (seasonal or annual) decision making processes.

Table 1: Fishers' choices mentioned in the literature.

Documented choice	Choice frequency within the literature
Where to fish	12
Whether to remain in the industry	11
What fishing gear to use	8
Which species to target	6

Whether to go fishing (day by day)	3
Whether to collect data while fishing	1
Where to sell	1
How to fish	1
Total	**43**

The four most commonly cited choices (i.e. where to fish, whether to remain in the industry, what fishing gear to use, which species to target) occurred in the literature over five times more frequently (n = 37) than the other four choices made by fishers combined (n = 6). The two most commonly cited (where to fish and whether to remain in the industry) accounted for over half of all fishers' choices, as reported in the literature.

3.1.3. Key drivers of fishers' choices

As part of the literature review, the key drivers for the choices expressed within the literature were noted to gain a better understanding of how and why fishers made these decisions. Drivers were split into four broad categories: social, economic, governance and environmental. Together, these four drivers of choice provide a comprehensive framework for understanding the complex factors that influence decision making processes.

Social: specific drivers included knowledge, ability, skills which can affect the choice in fishing grounds and fishing practices used by fishers. In addition, community, social networks, heritage and identity can influence fishing behaviour. For example, many fishers come from families with a long history in the industry. The traditional and cultural ties to fishing can influence the behaviours of fishers and their fishing patterns, as well as their willingness to adopt new practices or technologies.

Economic: specific drivers included costs/benefits, profit, and value.

Governance: specific drivers included regulation, legislation, and industry power dynamics.

Environmental: specific drivers included weather, seasonality, climate change, environment, and sustainability.

Because of the complexity of decision making, most choices were influenced by more than one driver. The most common drivers identified in this review were social, suggesting that the motivation behind fishers' decision making extends beyond a drive for profit or compliance with regulations. Social drivers accounted for 33 of the 81 noted drivers and were followed by economic (n = 19), governance (n = 19) and environmental (n = 11) drivers, respectively.

It is also important to note that each driver category encompasses a range of more nuanced sub-drivers. Table 2 provides a summary of the key drivers and sub-drivers identified in this review, and the frequency with which they were reported in the literature.

Table 2: Summary of drivers and sub-driver

Key driver	Total frequency	Sub-driver	Frequency
Social	33	Ability	4
		Community	7
		Heritage	5
		Identity	5
		Knowledge	7
		Morale	2
		Skills	3
Economic	19	Costs/Benefits	12
		Economic	1
		Profit	3
		Skills	1
		Value	2
Governance	19	Legislation	3
		Power	3
		Regulation	13
Environmental	11	Climate Change	1
		Environment	1
		Seasonality	4
		Sustainable	1
		Weather	4

With regards to sub-drivers, ‘knowledge’ was noted as one of the most significant factor influencing fishers’ behaviour (n = 7), it was the most common single sub-driver for

deciding where to fish (n = 5). ‘Community’, ‘heritage’ and ‘identity’ were also recognised as important factors due to the cultural ties and traditions of the industry, as well as the ‘social network’ fishing creates (n = 16). These factors had influenced many fishers’ choice of ‘whether to stay in the industry or not’ (n = 7).

In addition, ‘ability’ and ‘skills’ were documented frequently in the literature, largely influencing decisions on ‘what gear to use’ (n= 3) but also on ‘whether to stay in the industry or not’ (n= 3). This related to fishers’ confidence in their ability and skill, but also concerns that their skills were not easily transferable to occupations and contexts outside of the fishing industry (Ross, 2013). ‘Morale’ was identified as the least important factor and was the only motivation for ‘whether to collect data while fishing’ (n =1) as well as influencing ‘what gear to use’.

Economic sub-drivers appeared to be more homogonous, the most frequent sub-driver within this category being a calculation of ‘costs/benefits’. This was found to be an influence in 12 individual fishers’ decisions across six choices listed in Table 1, including the three most documented choices: where to fish (n = 4); whether to remain in the industry (n = 2); what fishing gear to use (n = 4).

Under governance sub-drivers, the most significant sub-driver was regulation (n= 13) which primarily influenced decision making on ‘where to fish’ (n= 4) and ‘what gear to use’ (n= 4) to reduce unwanted catches and comply with discard regulations.

Finally, environmental drivers, particularly weather (n= 4) and seasonality (n= 4) were associated with a wide range of decisions due to the cumulative effects these factors can have on safety at sea, seasonal abundance and location of different fish species.

3.1.4. Discussion of literature review findings

A discussion of which drivers influenced the top five fishers’ choices (see Table 1 for fishers’ choices) is provided below. The findings also consider whether the drivers differ between fleet segments.

1. Where to fish

Deciding ‘where to fish’ was the most commonly cited decision made by fishers found within the literature review. Out of the 12 research papers that mentioned choices regarding ‘where to fish’, social drivers were attributed to 10 of these decisions. Some research papers noted that a combination of choices (e.g. social and economic) influenced fishers’ decisions. With regards to ‘where to fish’, four research papers out of 12 mentioned above talked about purely social choices. The rest of these research papers talked about both social and other drivers influencing choice. The social sub-drivers were primarily related to fishers’ ‘knowledge’ of the marine environment, as well as ‘community’ and ‘ability’.

For example, prior knowledge of fishing grounds, as well as spatial and temporal distribution of target species, is an important driver of fishers’ location choice (Tidd et al, 2015). Over time, knowledge accumulates through a combination of personal experience,

learning from past fishing success and patterns, and social relationships with other fishers in the community who share and exchange information about their catch and locations. While the information gained through these relationships can be beneficial, Turner et al (2014) reported that the advantages gained through social networks are not always equally distributed, with fishers commonly choosing who they wanted to share their information with based on the perceived skill and success of a fisher. Turner et al (2014) found that fishers were most likely to disclose information to fishers they perceived as successful while successful fishers were less likely to share valuable information with less experienced or unsuccessful fishers. Therefore, fishers who are characterised by a higher level of fishing success are more central in information-sharing networks and are likely to have greater access to a wide range of information sources, perpetuating their fishing success. Together, personal experience and information sharing can increase fishing efficiency and contribute to more fishing success by utilising tactical choices to decide when and where to fish (Turner et al, 2014; Calderwood et al, 2021). This can also help fishers avoid unwanted catches and optimise quota use (Calderwood et al, 2021).

Economic drivers were attributed to fishers' choices in five research papers. Fuel costs and fluctuating market prices were key economic considerations to decide 'where to fish' in order to maximise profitability of the fishing activity (Andersen et al, 2012; Bastardie et al, 2013; Eliasen et al, 2013; Maltby et al, 2021). Increasing fuel costs can have a substantial impact on operating costs and therefore deciding 'where to fish' is often based on distance to the fishing grounds, trip length, vessel speed and whether to prioritise high fish density areas to increase the catch rate (Andersen et al, 2012; Bastardie et al, 2013; Maltby et al, 2021). In addition, fluctuating market conditions were reported to be the main driver when deciding whether or not to pursue fishing activity (based on the existence or absence of a market), and whether the market price would support the economic activity of fishing (Eliasen et al, 2013).

'Legislation' and 'regulations' were key governance sub-drivers in fishers' location choice due to quota restrictions, conservation measures (such as spatial closures), and increased interactions with other marine sectors (Tidd et al, 2014). The cumulative effect of these factors sometimes led to reduced or restricted access to historic fishing grounds. Research conducted by Maltby et al (2021) reported this has led to some fishers feeling uncertain about future domestic fisheries management and policy. This uncertainty stems from the need to navigate evolving restrictions and potential shifts in competition dynamics with other marine sectors. This results in fishers having to constantly adapt their practices to align with new regulations and overcome the potential risks of finding alternative fishing grounds or targeting different species.

Finally, environmental sub-drivers, such as 'weather', 'seasonality' and the 'environment', were also important factors in decisions on 'where to fish' due to their influence on working conditions at sea. Many smaller vessels operated closer to shore. Fish abundance and fish distribution (due to migration and habitat preference) influenced fishers' 'seasonal' decisions (Andersen et al, 2012; Calderwood et al, 2021).

2. Whether to remain in the industry

When deciding 'whether to remain in the industry', social drivers were the most significant (n = 10). Within this category, the combination of 'heritage', 'community' and a sense of

‘identity’ influenced the majority of choices. Overall, ‘heritage’ was the most cited social sub-driver for decisions to remain in the fishing industry. This could be attributed to deep cultural and generational ties to fishing traditions which are commonplace in rural coastal communities where there is a long-standing history of fishing (Arias-Schreiber et al, 2018; Matić-Skoko and Stagličić, 2020).

In addition, ‘identity’ was highlighted as an important factor due to fishers’ desire for autonomy and freedom, their attitude towards risk and passion and pride in one’s fishing occupation, forming a positive source of self-identity (Ross, 2013; Christy et al, 2021). Collectively, this strong sense of identity facilitates kinship within a community, particularly in small-scale fisheries, but also on a wider scale within the industry due to a shared understanding and connection to fishing (Ross, 2013). This may be an underlying reason why fishers remain in the industry due to the values of fishing which cannot be replaced by financial value (Ross, 2013).

Other drivers influencing ‘whether to remain in the industry’ were related to economic (n = 3) and governance (n = 2) drivers. It is interesting to note that within the analysed literature, only one fisher had decided to leave the industry which happened to be the only case where economic factors were the sole driver for the decision due to the fisher’s perception of their ongoing ability to make money (Christy et al, 2021). In most cases, it is not stated in the literature whether the fishers remained in the industry, except in three cases where ‘community’, ‘ability’ and ‘identity’ were cited as reason for their decision to stay.

3. What fishing gear to use

Factors influencing ‘what fishing gear to use’ were fairly evenly spread across the drivers: social (n = 7), governance (n = 5), economic (n = 4), and environmental (n = 3). For social sub-drivers the most influential were the fishers’ ‘skills’ and ‘ability’ based on their personal experience of past fishing success, as well as information from other fishers in terms of catch rates (Andersen et al, 2012). Using their in-depth knowledge, fishers are able to adapt their gear and fishing practices to different seasons and fishing grounds to optimise landings of target species (Steins et al, 2022).

Governance sub-drivers included changes in regulations that encouraged fishers to seek gears with higher selectivity to reduce unwanted catches and discarding of species subject to TACs (total allowable catches) and size limits (Calderwood et al, 2021). This provided additional incentives for fishers to adjust their gear and change their fishing behaviour in order to comply with regulatory requirements while optimising economic yields from available quota (Calderwood et al, 2021). In terms of the economic drivers, the literature review highlighted that certain gears (e.g. gillnets) can be worked closer to port, reducing fuel use and associated costs (Andersen et al, 2012). In addition, success with certain gears led other fishers to adopt similar practices in search of greater yields (Andersen et al, 2012).

4. Which species to target

Deciding ‘which species to target’ was influenced by all driver categories: social (n = 4), governance (n = 4), economic (n = 4), and environmental (n = 2). However, the most

frequent sub-driver was ‘regulation’, where fishers targeted or avoided certain species as a reaction to certain regulations or legislation. For example the Landing Obligation[4], as part of the reformed Common Fisheries Policy, put in place a discard ban for all quota fish stocks, unless an exemption is in place. It came into force on the 1st of January 2019. This prompted fishers to avoid certain species (Mortensen et al, 2018), while the way in which quota is allocated has driven fishers to target non-quota species (Prosperi et al, 2019). In addition, Maltby et al (2021) found fishers also had concerns regarding the ‘perceived increases in consolidation of vessel ownership (hence quota) among fewer individuals’. For non-company owned boats, this risked future quota access leading to uncertainty on how this could affect markets and power dynamics within the fishing community (Maltby et al, 2021).

5. Whether to go fishing (day by day)

The primary drivers behind deciding ‘whether to go fishing’ were environmental, mainly ‘weather’ (n = 1) and ‘seasonality’ (n = 1). This also related to economic drivers, as fishers reportedly had to consider the ‘cost/benefits’ (n=1) of fishing based on fuel consumption and efficiency to reach their fishing grounds. Bad weather, especially for smaller inshore vessels can significantly influence fishers’ decision to go to sea (Andersen et al, 2012; Prosperi et al, 2019). Research into short-term choice behaviour in the Danish gillnet fishery reported gillnetters were relatively sensitive to weather conditions due to the small vessel size and reduced manoeuvrability when setting nets in poor conditions (Andersen et al, 2012). It was concluded that weather influenced fishers’ choices on whether to go out fishing based on the negative correlation of recorded wave height and total fishing effort reported by surveyed fishers (Andersen et al, 2012). In addition, bad weather can increase fuel consumption and costs associated with fishing activities, resulting in fishers either not heading out on a particular day or adapting their practices to save fuel. For example, fishers could reduce vessel speed when steaming, reduce trip length by targeting high fish density areas only, and reduce visits to distant fishing grounds (Bastardie at al, 2013).

6. Differences by vessel segment

Within the literature, it was not always possible to determine how choices differed between fleet segments such as vessel size and gear use (Seafish, 2022). However, it appeared that a number of distinctions existed between larger and smaller vessels.

For example, larger vessels were less likely to be influenced by the weather when deciding ‘whether to go fishing’, because these vessels are better equipped to handle a greater variety of weather conditions. Larger vessels had more capability to venture into deeper waters and travel longer distances to target offshore fish stocks. These vessels can also operate for extended periods of time due to greater storage capacity and fuel efficiency. In contrast, smaller vessels tended to remain closer to shore and often return to port in the same day.

In addition to this, larger vessels appeared to have more choice in terms of where to sell their catch, as they had greater resources and economies of scale at their disposal.

[4] Scottish Government Advice and Guidance on Landing Obligation and Discarding

Moreover, larger vessels receive a greater proportion of allocated quota which governs their decisions on ‘what species to fish’ and ‘what gear to use’ to ensure they do not exceed their quota and comply with discard regulations. In comparison, smaller vessels tended to target more non-quota species and use more selective gear to prioritise high value species to maximise their profits.

4. Interview findings

In total, 12 in-depth interviews were conducted with fishers from across Scotland. A summary table of the sample size from each region is provided in Table 3. The analysis of background data and qualitative data deriving from these interviews is provided below.

Table 3 Summary table of interviews by area

Area	Sample size
Shetland	1
Orkney	1
Western Isles	2
West of Scotland	3
North & East Coast	5

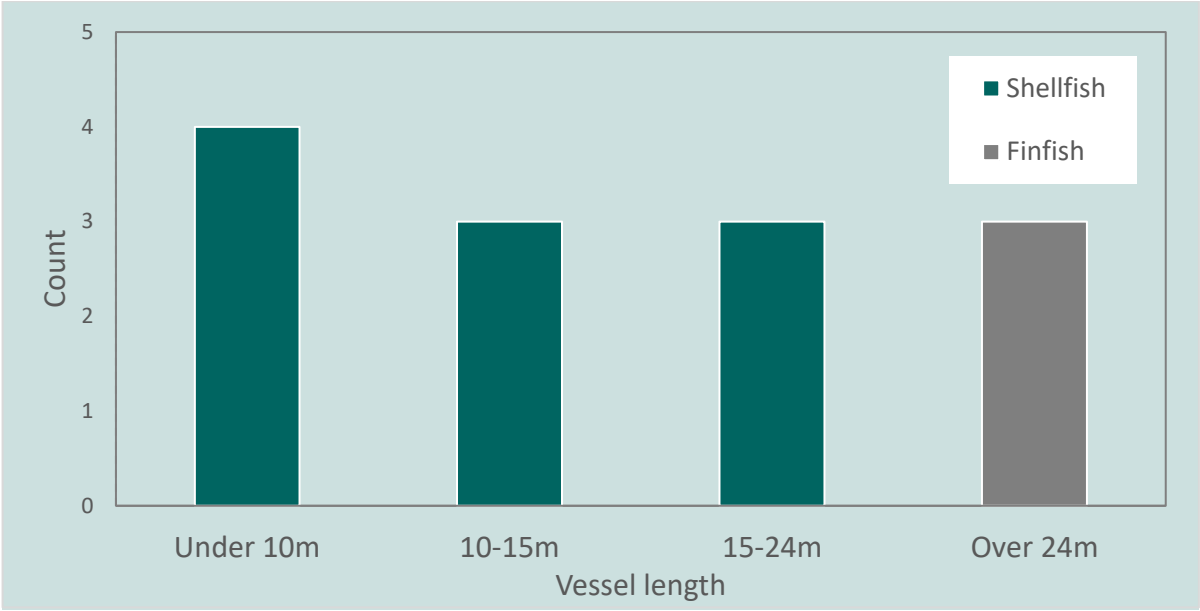
4.1. Analysis of background interview data

The analysis of background interview data demonstrated that some fishers had been working in the fishing industry for at least 24 years, with one fisher having over 50 years' experience. The majority of fishers interviewed worked in the shellfish catching sector (n=9) where the main species caught included lobster, velvet crab, brown crab, nephrops and squid, with some fishers diversifying to target cuttlefish in the English Channel. The remaining fishers worked in the finfish catch sector (n=3) and primarily targeted haddock, whiting, cod, saithe, hake, mackerel and herring[5].

Interestingly, there was a clear distinction between capture sector and size of vessel, with fishers targeting mainly shellfish operating a range of vessels up to 24 metres in length while fishers targeting finfish all operated vessels over 24 metres (see Figure 1). The size of a vessel typically determined the duration of fishing effort, with smaller vessels mainly conducting day trips while larger vessels going out for several days at a time. This was generally the case for the interviewed fishers whereby fishers operating vessels under 10 metres or between 10 – 15 metres in length would go out for the day; whereas larger vessels of between 15 – 24 metres and over 24 metres would typically spend over 4 days at sea, sometimes up to 14 days.

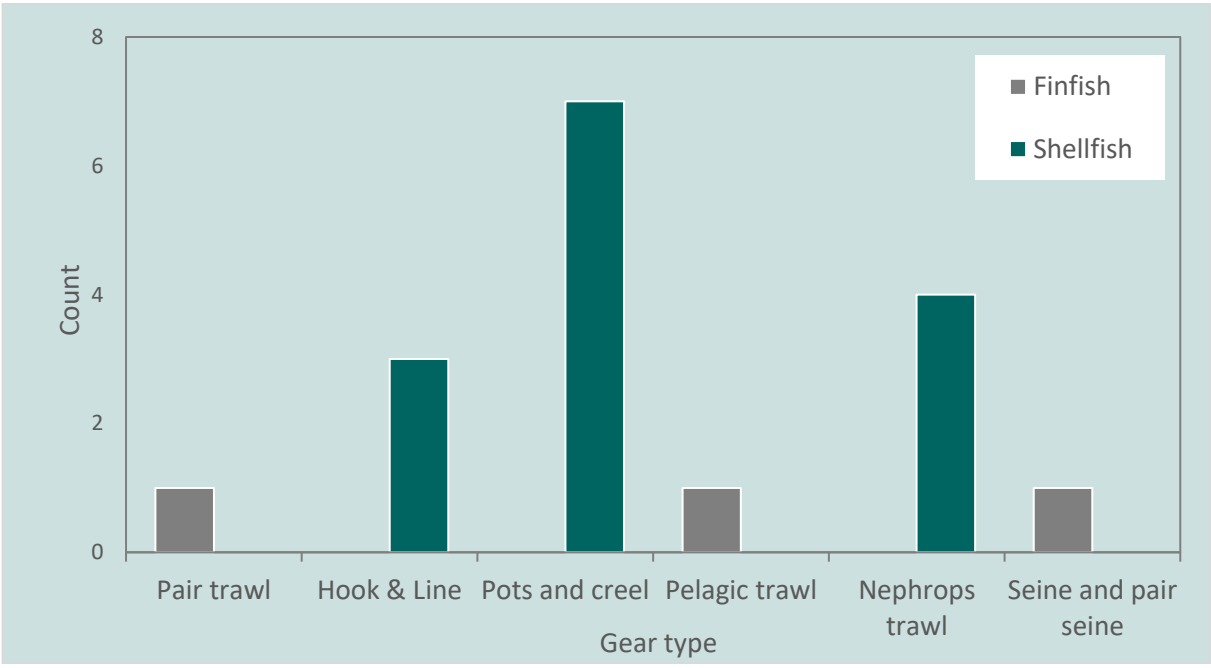
[5] Although fishers often have a primary target species, it is not uncommon for fishers to switch gears and target different species depending on the season etc. For this reason, some of the numbers quoted in following sections may not add up to 12.

Figure 1: Distribution of vessel size by capture sector



To catch their fish or shellfish, a range of fishing gear types were utilized by the fishers, as shown in Figure 2. Pots and creels were the main gear deployed by fishers (n=7) followed by nephrops trawlers (n=4), an expected outcome due to the high number involved in the shellfish sector. Interestingly, hook and line gear was only included in combination with potting, suggesting a seasonal diversification for the creel sector. Within the finfish sector, fishers mainly deployed mobile fishing gear, including pair trawls, pelagic trawls and seine and pair seine net gear.

Figure 2 Range of gear types used by fishers[6]



[6] Numbers may add up to more than 12 because some fishers used more than one gear type.

4.2. Analysis of qualitative data

During the qualitative analysis, interview transcripts were manually coded to identify common themes and patterns in fishers' responses. A summary of the key interview findings is provided in Annex 8: Interview Summaries. In this section of the report, each theme is presented as a narrative, explaining specific context and the importance for fishers' decision making. These themes are listed in a random order and are supported by representative quotes to illustrate the themes.

1. Difficulty recruiting and retaining crew

Throughout the interviews, a dominant concern raised by fishers (particularly fishers operating vessels between 15 – 24 metres) was the limited availability of local crew. Crew related issues were frequently mentioned when fishers were talking about daily and seasonal (three-month basis) planning. Recruitment into the industry was discussed as a challenge, because fishing work is often seasonal and wages are relatively low for a job which requires crew members to work long hours while undertaking physically demanding tasks in harsh conditions. In addition, crew members are required to have specific training and certificates, depending on the type and size of vessel, which can be time consuming and expensive to complete. These certificates ensure that individuals have completed basic safety training, are medically fit to work on a vessel, and have a valid Seafarers' Identity Document (SID). These complex demands often makes it difficult to attract workers to the industry, especially young people. One fisher summarised this by saying,

'The big issues are crew with very few people wanting to come into the industry and trying to get reliable crew is a nightmare. I would love to take a young crew member on but there is no one'.

Often, crew are family members who join to support and potentially carry on the family business. However, while tradition and culture are a major social driver for fishers entering the fishing industry, competition from other industries such as aquaculture farms presented a significant challenge to attract workers. One fisher said,

'It's really hard to get crew, fish farms offer workers two weeks on and two weeks off so the fishing industry can't compete'.

Because of the competition for workers with aquaculture sector, it was hard for fishers to retain crew once they've completed their training. One fisher commented that the success rate of home crew coming through training is only 5 – 10%, which means that many workers leave for other jobs shortly after receiving their training.

The difficulty in recruiting local crew has resulted in a high reliance on migrant workers from overseas. Fishers commented that this comes with its own complications due to the requirement of attaining work visas. Few fishers raised the issue that foreign crew may travel to their home, resulting in a reduced workforce until their return. This means that more local crew needed to be hired during such period which brings the issue full circle. The issue of crew recruitment was particularly important for fishers operating larger vessels (over 15 metres) on the west coast of Scotland. One respondent described the issue of crew recruitment in the west coast as 'in crisis', while another fisher said that 'the crew issue could be the end of the west coast'.

2. Seasonality and weather conditions

Fishing is a seasonal industry, with weather conditions and the abundance and availability of fish varying throughout the year. From the interviews, there was a clear consensus that seasonality plays a major role in fishers' decision making process. This includes influencing fishers' choices on where to fish (inshore or offshore), which gear type to use, and what fish species to target. For example, one fisher commented,

'Decisions are made based on the time of year. When it is winter, we fish more inshore for haddock'.

In addition to seasonality, local weather conditions and tidal events can dictate fishing activity on a daily and weekly basis. Fishing is very weather dependent due to safety concerns at sea, especially for smaller vessels (under 10 metre) or if the vessel is single-handed. Adverse weather conditions can make it difficult to handle fishing gear and navigate the vessel, endangering the crew, fishing gear and other vessels if something goes wrong. Many respondents said they monitored weather forecasts on a daily basis and longer-term forecasts to determine when it will be safe to haul gear. In conjunction with the weather, fishers also mentioned the tides can affect the best times to go out fishing. Tidal fluctuations can affect fish behaviour, availability of fish, accessibility of fishing grounds, as well as exit and entry to harbours. Fishers must, therefore, plan and adjust their daily fishing practices based on local weather conditions and tidal events.

3. New policies and legislation

On an annual basis, legislation was a primary factor influencing fishers' decisions regarding their fishing activity. Fishers frequently expressed concern regarding new policies and legislation and the impacts these have on the industry. For example, fishers viewed the designation of wind farms and enhanced marine protections as a major issue due to potential greater restrictions to where they can fish and reduced access to their traditional fishing grounds. Fishers commented that further 'spatial squeeze'[7] is likely to result in greater gear conflict. One respondent commented that it was already starting with 'more and more creels moving further out'. The combination of new policy and the 'spatial squeeze' was increasing pressure on the fishing industry, leading to long-term concerns about potential reduction in fishing opportunities. This has resulted in some fishers' reluctance to invest in the industry due to uncertainty about fishing business in the future. During the interviews, fishers indicated that the industry is likely to resist some of these policies, especially the proposals to designate at least 10% of Scotland's seas as Highly Protected Marine Areas (HPMAs) by 2026 (consultation about these proposals ran during the time of the project).

The HPMA proposal envisioned that at least 10% of Scotland's seas would be designated as HPMAs by 2026, including restricted fishing and other human activities in selected

[7] 'Spatial squeeze' a term that tends to be used by the fishing industry. It refers to the perceived reduction or restriction of traditional fishing grounds, often influenced by increasing competition from a number of different sectors and regulations, including fisheries management measures, closed areas and infrastructure development.

sites. The HPMA consultation[8] ran from December 2022 – April 2023. Following the consultation period, the Scottish Government confirmed that while it remained committed to the outcome of enhanced marine protection, it would no longer progress the HPMA proposals as consulted on[9].

The HPMAs were frequently referred to as a significant concern by fishers. The perceived lack of evidence and data on how HPMAs will work was commonly raised as a frustration for the fishers. Fishers also mentioned perceived lack of communication from the government to engage and cooperate with the industry. One respondent emphasised that HPMAs were being 'imposed on us', while another fisher called the HPMAS as 'a disaster for the west coast'. According to respondents, HPMA proposals caused a loss of trust between fishers and the government as fishers felt that the government does not understand the importance of fishing to local rural communities. One fisher commented,

'I am very worried about HPMAs and the impact this could have on the island community as well as MPAs where we have two already. There will be a hard fight to ensure that these HPMAs do not come about. There is no evidence and no basis for them'.

4. Recent and rapid changes in regulations

Related to concerns of more legislation, fishers were also worried about the increase in the level of regulation over the past few years. In particular, fishers identified the Maritime and Coastguard Agency (MCA) as a major source of stress. While fishers acknowledged the importance of improved safety onboard, the manner in which the MCA were carrying out their inspections to ensure compliance was characterised as a negative and stressful experience by some fishers who felt the process was too bureaucratic. In addition to the MCA, one fisher raised an issue about regulations concerning mesh size for a square mesh panel[10]. They felt that the regulation had changed without warning to trawlers and this had created a problem for him, because he had recently purchased a new net before becoming aware that the regulation changed. The respondent said,

'Manufacturers didn't even know about it and with Brexit you still cannot get the right sized mesh'.

Trying to keep up with changing regulations can, therefore, result in an economic burden on fishers due to the expense of new gear necessary to comply to new regulations.

5. Access to quota

Quota availability is a major economic driver of fishing activity as it dictates what fish species to target, where to deploy gear, and the duration of fishing effort based on how

[8] For the report analysing the responses to the HPMA consultation, please see https://www.gov.scot/publications/highly-protected-marine-areas-hpmas-analysis-consultation-responses-final-report/ (Accessed 05/12/2023).

[9] For the Scottish Government response to the public consultation on the HPMA proposal, please see https://www.gov.scot/publications/scottish-highly-protected-marine-areas-hpmas-consultation-scottish-government-response-consultation/ (Accessed 05/12/2023).

[10] Legislation requires that when measured with an Omega gauge, square Mesh Panels (SMPs) must measure 300mm on the inside measurement as described in EC 517/2008 (as retained in UK law).

much quota has been legally allocated to the Producer Organisation to which the vessel belongs. This can have an overall impact on how much revenue fishers generate from selling their catch, thereby enhancing the financial viability of their business. This means that a lack of quota can also be a constraint on fishing. For example, when fishing in a mixed fishery, quota must be available for all the targeted species. Therefore, fishers have to adjust their fishing practices to avoid potential issues from landing species for which they do not have quota. In addition, there is also the impression that quota is not representative of the full picture. One fisher emphasised that there is a 'disparity between what is being seen on the ground and the level at which the quota is set'. These frustrations are exacerbated by the perception that the government's promise to increase quota shares has not been fully implemented, prompting one fisher to comment that 'I would also like to know where the quota gained through Brexit has gone'.

6. Level of government support and engagement

As a result of the recent changes in fisheries management and the introduction of new policies and legislation, many fishers feel disenfranchised. Some fishers thought that the government does not sufficiently engage with industry. Fishers also felt that their concerns are not listened to. One fisher said,

'We want government to talk to us. I am experienced, I have been in the industry a long time and I want to use this'.

Similar responses were given by other fishers who wanted to see more engagement between the industry and the government, to work together in introducing legislation and policies via a collaborative approach, instead of the current top-down approach, as perceived by fishers.

Overall, the uncertainty about the future of the fishing industry has cultivated a negative attitude towards government agencies. Many fishers also conveyed their frustrations that the government does not understand the industry, or the cultural and economic importance of fishing to rural coastal communities, and how fishing plays a major role in their identity and heritage. As a result, there is clear disappointment regarding the perceived lack of support from the government to help fishers diversify and build a more resilient business, against the backdrop of increased management and legislation. One fisher stated, 'We want Marine Scotland to champion the industry'. Another fisher felt that 'fishing is not promoted as it should be' and appealed for government agencies to be more active in their support of the industry. From these statements, it is evident there is enthusiasm from the fishing industry to work collaboratively with government in order to protect their livelihoods and ensure fishing is sustainable in the future.

7. Mental burden on fishers

Many fishers commented that the past year has taken a significant toll in terms of their mental health. While many respondents have not considered leaving the industry, a few had and one fisher mentioned their mental health as the main contributing factor to their decision to leave. The respondent explained they had now come ashore to manage the business stating,

‘This is due to my mental health which has suffered with the strain of trying to make a business work against a backdrop of regulation, environmental NGOs constant targeting of the fishing industry. I feel deflated and defeated’.

The increased stress and pressures on fishers was widely acknowledged, as well as the negative publicity targeted at fishers. One fisher summarised the general feeling by saying,

‘It is 50/50 whether I will stay in the industry which I have done all my life. The combination of crew issues, the constant barrage of pressure from environmental non-government organisations (ENGOs), the squeeze on fishing grounds and the impact it has had on my mental health will decide what I do’.

Fishers often have to make a variety of sacrifices due to the nature of the job. Fishing is time-consuming and requires long, unsociable hours, with many fishers spending extended periods of time away from home. Fishing requires high investments in equipment, crew, vessel. etc. There are many external considerations such as quota availability, seasonality, weather conditions and tides. Because of these issues, fishers often cannot schedule fishing operations to within normal working hours (i.e. 9am-5pm Monday to Friday). Fishers must take advantage when the conditions are right to ensure their business is viable and making a profit. This can cause additional stress and impose strains on personal circumstances. Some respondents said it is not uncommon for fishers to miss family events. However, many fishers explained they were now older and were striving to strike a healthy balance between family and fishing.

5. Discussion

Understanding what drives and influences decision making of fishers operating in Scottish waters is key for designing effective policies to enhance sustainable and responsible fishing practices. Overall, this research project found several key themes and started to build an evidence base of how different drivers interact and influence each other in fishers' behaviour. Synergies between the literature review and the findings of the interviews are discussed below.

5.1. Social drivers

Fishing has a long history and rich cultural heritage in Scotland. Several themes associated with social and socio-economic drivers prominently features in this research. Within the literature review, the main factors influencing fishers' choices related to knowledge, community, heritage, identity; building upon the social network fishing creates within the community.

Within the interviews, the main social themes included difficulty of recruiting crew and mental wellbeing of fishers due to the cumulative impact of multiple pressures on the industry. Interestingly, the issue of recruiting and retaining crew did not emerge as strongly in the literature, although the importance of knowledge and experience was a key theme.

In the literature review, social drivers such as identity, community and heritage were highlighted as reasons for staying in the industry, whereas during the interviews fishers often spoke of social drivers of poor mental health and wellbeing as potential reasons for leaving the industry.

The link between knowledge and crew

Knowledge accumulates from personal experience and information sharing through social relationships with other fishers. Knowledge also contributes to improving fishing ability and skill and over time, as these will be passed down to the next generation of entrants to the industry. However, within the pilot study, fishers frequently highlighted issues with crew recruitment and retention due to the lack of people willing to enter the industry. Difficulty recruiting and retaining crew was attributed to relatively low wages, often harsh working conditions, training and certificate requirements, and seasonal work schedule.

Respondents said that it was hard to find local people, especially young people, to do the work and described the situation regarding crew as being 'in crisis' on the west coast. This has resulted in a high reliance on migrant workers travelling from overseas to work which can solve the issue in the short term, but as these workers return home on a seasonal basis, the pressure to find crew persists in the long-term. Crew related issues were frequently mentioned when planning for the next season/three months ahead. These issues were also raised when planning for the longer-term future as competition from other industries such as aquaculture farms offered more stable and better paid jobs. In the literature, there were concerns reported that, over time, the inability to retain crew will result in a declining workforce which will have an adverse socio-economic effect on the industry and the coastal communities which depend on it (Maltby et al, 2021). This is

supported by one fisher's concern regarding the survival of coastal communities without fishing families. Overall, this represents a significant concern about the sustainability of fishing communities and the preservation of valuable local knowledge about the marine environment developed through generations of fishing.

Whether to leave or stay in the industry

From the pilot study it was clear that several factors, including the cumulation of new policies, stricter regulations, crew issues, 'spatial squeeze' on fishing grounds, lack of quota, negative publicity, and targeting from environmental NGOs has led to an industry-wide mental fatigue due to the stress and pressure exerted on the fishing industry. Mental health was regularly raised as an issue and attributed to pressures facing the industry as well as uncertainty about the business in the current economic climate. Poor mental health reported by fishers was exacerbated by the nature of the job that often demanded unsociable and long hours, and a lot of time spent away from families and support networks. Yet due to the investment capital of fishing equipment and external factors influencing when you can fish (i.e. weather and quota availability), fishers must make sacrifices to go out fishing at any time in order to maintain the profitability of their business. This can often put a strain and added stress on fishers, resulting in many fishers leaving the industry.

In contrast, the findings from the literature review found that social factors (heritage, community and identity) to be the most significant drivers for fishers deciding to remain in the industry. This was largely attributed to the cultural heritage and value of fishing, particularly for small-scale fisheries where the transfer of knowledge and strong sense of identity, community, and stewardship is passed down through the generations, forming tight-knit social networks within the industry (Ross, 2013; Arias-Schreiber et al, 2018; Christy et al, 2021). These socio-cultural values associated with fishing played a crucial role in retaining fishers in the industry as they are motivated by both extrinsic factors, primarily financial incentives, and intrinsic factors, such as emotional fulfilment, that stem from their connection to fishing.

5.2. Economic drivers

Access to quota was the main economic driver mentioned by fishers in the interviews, while other economic factors, such as market demand and fuel price, emerged as important factors in fisher decision making in the literature review.

Quota

Quota availability is a major influence on fisher choices as it determines the volume of fish fishers are legally allowed to catch, affecting the species they can target, where they fish, what gear they use and how much revenue they make. Fishers argued that the lack of quota was constraining their fishing efforts and felt that current quotas were not representative of what was happening on the ground. This was said to have a major impact on fisher behaviour, as fishers must be very careful during their fishing operations to only catch fish they have quota for in order to avoid landing non-quota fish. These

frustrations were exacerbated by the perception that the government's promise to increase quota shares after Brexit has not been fulfilled to the extent it was promised.

The importance of access to quota was also observed in the literature review. Maltby et al (2021) reported that fishers were concerned with the increases in the consolidation of vessel ownership and the associated access to quota compared to non-company owned vessels. The surrounding uncertainty regarding the total availability and distribution of quota was also echoed in research conducted by Prosperi et al (2019). According to this paper, fishers in the UK raised concerns regarding the unequal allocation and distribution of quota to larger-scale vessels, with the inshore sector only receiving 4% of the total allocated quota. This has led fishers to change their behaviours and target high value non-quota species to support their businesses.

Fuel costs and market conditions

The literature review identified increasing fuel costs as an important economic driver due to its influence on the operating cost and profitability of fishing. The cost of fuel was identified as a main driver on fisher location choice, i.e. distance to fishing grounds, vessel speed, trip length and visiting high density areas to increase the catch rate (Andersen et al, 2012; Bastardie et al, 2013; Maltby et al, 2021). In addition, fluctuating market conditions were reported as the main driver in the decisions of whether or not to pursue fishing activity, based on the existence or absence of a market and whether the market price would support the economic activity of fishing (Eliasen et al, 2013). Fuel costs did not emerge as a key theme in the interviews, although it was clear that fishers weigh up the costs and benefits of targeting different grounds and species.

5.3. Governance drivers

In the literature review, governance was an important driver primarily influencing where to fish, what gear to use and which species to target. These topics were also raised in the interviews, with respondents describing how the number and combination of rules and regulations, as well as the perceived pace of change in this area, was creating a shifting regulatory landscape that was difficult to navigate. The relationship with government and agencies was also discussed, with respondents wanting better communication and engagement from the government.

Regulation

In the pilot study, the majority of respondents expressed their concern and frustration regarding the introduction of new policies and stricter regulations. The increase in policies designating new conservation areas and renewable energy developments was considered a major issue due to further restrictions and the perceived 'spatial squeeze', something that fishers thought is likely increase gear conflict and reduce future fishing opportunities.

Fishers' concern regarding the 'spatial squeeze' from other marine sectors and increasing spatial restrictions from closed areas was also noted during the literature review (Tidd et al, 2015; Maltby et al, 2021). Here, fishers perceived conservation measures and competition from other commercial maritime activities as a risk to access traditional fishing

grounds or opportunities. Maltby et al (2021) reported this has led some fishers to feel uncertain about future domestic fisheries management and policy. In particular, the introduction of new policy and stricter regulations have left many fishers to feel disenfranchised as a result of their perceived exclusion from stakeholder consultations concerning HPMAs, as well as the frequent inspections carried out by the MCA to ensure compliance with stricter regulations.

Relations with government bodies

Participants in the pilot study felt there was a lack of government support and engagement and this has resulted a negative attitude towards government agencies. This has mainly stemmed from the perceived lack of dialogue and consultation by government with industry to discuss new policies and legislation. Many fishers felt that policies were imposed on them without any warning. The nature of the policies and perceived absence of communication and outreach to rural coastal fishing committees has led fishers to believe that government does not understand the importance of fishing and the economic, social and cultural benefits it brings to coastal communities. Respondents were clearly frustrated and felt that the government is not doing enough to champion the industry and protect fisher livelihoods. That said, respondents also mentioned that they had positive relations with civil servants they engage with and expressed enthusiasm for working collaboratively with government to grow the industry and onshore employment which rely on fishing.

5.4. Environmental drivers

Environmental drivers were discussed in the literature review and during the interviews, mostly in relation to weather and seasonal changes, and impact these have on choosing where and whether to fish, and how to do this safely.

Environmental factors such as weather and tides were considered to be the primary driver to dictate fishing activity on a daily and weekly basis. Local weather conditions and tidal events were frequently mentioned as the main considerations for informing daily decisions on where and what to fish. Time of day was also important due to tidal events that can affect accessibility to fishing grounds and sometimes exit and entry to harbour (Andersen et al, 2012; Prosperi et al, 2019). It was clear from the interviews that the underlying rationale for these decisions is based on safety, especially if fishing alone. Safety onboard a vessel is of paramount importance. Due to the nature of fishing (i.e. operating heavy gear in mostly wet and harsh conditions), fishers must plan and adapt their daily fishing operations around local environmental conditions to ensure the safety of the crew, particularly in smaller vessels.

In terms of environmental factors, it was interesting to note a lack of concern of the future impacts of climate change on fishing activity during the interviews. More targeted questions on the environment may elicit more responses on climate change in future. Similarly in the literature, only one paper included in the critical analysis focused on fishers' perceptions of climate change. It reported that climate is rarely considered as a risk to demersal fishers in the south-west UK when compared to a wider range of environmental, socio-economic and governance risks (Maltby et al, 2021). This was largely

due to climate change scepticism and perceived self-efficacy to adapt to future climate impacts (Maltby et al, 2021).

In December 2020, the Scottish Government launched Scotland's Fisheries Management Strategy 2020-2030 (FFM Strategy) which is the first Scottish fisheries policy instrument to include climate change regarding fisheries management. It is recommended that further research into fishers' perceptions of climate change is required to understand how future policy making will affect fishers' behaviour and resilience to climate impacts.

6. Conclusion

Fishers are continuously making decisions and planning their activities over a range of scales, including both short-term (e.g. where to fish or whether to go to sea that day) and long-term (e.g. whether to remain in the industry or switch fishing gears) planning. An improved understanding of fishers' behaviour is key for the effective design and implementation of fisheries' management policy in Scotland.

The literature review found that the five most commonly cited choices made by fishers in the industry were: 1) where to fish; 2) whether to remain in the industry; 3) what fishing gear to use; 4) which species to target; and 5) whether to go fishing (day-by-day). The key drivers underpinning these choices related to social, economic, governance, and environmental considerations. Because of the complexity of decision making, most choices were influenced by more than one driver. Social concerns were identified as the most common drivers, with fisher knowledge and community recognised as the most significant social factors. Under governance drivers, regulation was the most common factor influencing fishers' behaviour, closely followed by costs/benefits under economic drivers.

A pilot study, involving 12 interviews with fishers from across Scotland was carried out as an effective way to gain a better understanding of what influences fishers' decision making. Some of the most notable factors impacting short-term decisions focused on weather conditions, while the introduction of new policies and stricter regulations were considered to be the main drivers for long-term decision making.

During the interviews, crew recruitment and retention were raised among the most significant concerns due to the declining number of local crew willing to stay in the industry. This resulted in a greater reliance on migrant workers and potential loss of socio-cultural value in coastal communities. Crew-related issues were rarely mentioned in the literature review. The literature review showed that social factors, such as community, heritage and identity, play a critical role in fishers' decisions to remain in the industry, despite the mental strain caused by cumulative pressures and ensuing stress experienced by fishing communities.

In addition, new policies and regulations were raised as a major concern of fishers due to the 'spatial squeeze' resulting from competition with other marine sectors (e.g. introduction of conservation measures, expansion of offshore renewables). Furthermore, changes in quota availability was raised as a key economic driver. Decision where to fish and which species to target were often based on fuel costs and market demand.

Overall, it is clear that a range of factors combine to influence the decisions fishers make. Greater collaboration is needed between the industry and policy makers to promote and support the sustainability and welfare of fishing communities in Scotland.

7. Methodological insights

The results of this pilot study showed how different drivers influence fishers' decision making. It is recommended that this pilot study's methodology is repeated on a larger scale in future to obtain more representative results. If a wider study was to be repeated there are some key learning points that could be considered.

Guided interviews take long time to complete, and in the future, more time needs to be allocated for this method. It took a considerable amount of time to secure the interviews and engage with participants beforehand to raise interest in the research project. Future research can be promoted by:

- attending association and federation meetings;
- attending Regional Inshore Fisheries Group (RIFG) meetings;
- using local Fishery Offices around the coast to disseminate information;
- exploring opportunities to speak to fishers (e.g. Aberdeen Fishing Expo);
- doing field research and engaging fishers on the ground.

The interview guide was a helpful tool and with some amendments it can become a good template for future work. For example, separate questions relating to temporal decisions (daily, 3-monthly, annual) were not clear. These questions need to be reviewed for future research. Some new questions (e.g. on climate change) could be added.

It would also be interesting to not only look at the pressures which impact on the fishing industry but also explore the positive aspects and opportunities that are available.

Most of the interviews were carried out using video calling and this seemed to be the preferred option for the majority of fishers. Given that the interviews were carried out by a single interviewer, the recording was important to ensure that all of the discussion was captured, and the transcript are as accurate as possible. All respondents were happy to allow recording on the basis that it was only available for the purposes of taking notes and then deleted.

Annex 1: Literature Review Search Strings

Search String	Google Scholar results (without time period)	Titles to Scan
Fisher* AND UK OR Scotland AND Decision OR Motiv* OR Influenc* OR Choice OR Driver* OR Behav* OR Adapt* AND gear	16,900	30
Fisher* AND UK OR Scotland AND Decision OR Motiv* OR Influenc* OR Choice OR Driver* OR Behav* OR Adapt* AND pelagic OR demersal	10,600	30
Fisher* AND UK OR Scotland AND Decision OR Motiv* OR Influenc* OR Choice OR Driver* OR Behav* OR Adapt* AND Landings	16,500	30
Fisher* AND UK OR Scotland AND Decision OR Motiv* OR Influenc* OR Choice OR Driver* OR Behav* OR Adapt* AND Vessels	16,900	30
Fisher* AND UK OR Scotland AND Decision OR Motiv* OR Influenc* OR Choice OR Driver* OR Behav* OR Adapt* AND “under 10” OR “over 10”	16,900	30
Fisher* AND ‘North Atlantic’ OR Europe OR EU AND Decision OR Motiv* OR Influenc* OR Choice OR Driver* OR Behav* OR Adapt* AND gear	16,900	30
Fisher* AND ‘North Atlantic’ OR Europe OR EU AND Decision OR Motiv* OR Influenc* OR Choice OR Driver* OR Behav* OR Adapt* AND pelagic OR demersal	11,900	30
Fisher* AND ‘North Atlantic’ OR Europe OR EU AND Decision OR Motiv* OR Influenc* OR Choice OR Driver* OR Behav* OR Adapt* AND Landings	16,600	30
Fisher* AND ‘North Atlantic’ OR Europe OR EU AND Decision OR Motiv* OR Influenc* OR Choice OR Driver* OR Behav* OR Adapt* AND Vessels	17,000	30
Fisher* AND ‘North Atlantic’ OR Europe OR EU AND Decision OR Motiv* OR Influenc* OR Choice OR Driver* OR Behav* OR Adapt* AND ‘under 10’ OR ‘over 10’	17,400	30

Annex 2: Literature Review Collation Log

Report Name	Link	Included/ Excluded	Reason
Estimation Comparison of Small-Scale Fisherman Decision on Choice Fishing Gear and Outboard Engine Power	http://eprints.unm.ac.id/18257/	Excluded	Not in planned geography (Indonesia based)
The perceptions of Scottish inshore fishers about marine protected areas	https://www.sciencedirect.com/science/article/abs/pii/S0308597X12000954	Excluded	Not on drivers
Perceptions of fishers and developers on the co-location of offshore wind farms and decapod fisheries in the UK	https://www.sciencedirect.com/science/article/abs/pii/S0308597X15001967	Excluded	Not on drivers
Marine renewable energy and Scottish west coast fishers: Exploring impacts, opportunities and potential mitigation	https://www.sciencedirect.com/science/article/abs/pii/S096456911300015X	Excluded	Not on drivers
Scepticism and perceived self-efficacy influence fishers' low risk perceptions of climate change	https://www.sciencedirect.com/science/article/pii/S2212096320300577	Included	Talks about future risks of fishers
The rise of the scientific fisherman: Mobilising knowledge and negotiating user rights in the Devon inshore brown crab fishery, UK	https://www.sciencedirect.com/science/article/abs/pii/S0308597X15003838	Excluded	Not on drivers
Attitudes of Scottish fishers towards marine renewable energy	https://www.sciencedirect.com/science/article/abs/pii/S0308597X12000930	Excluded	Not on drivers
Scotland as a case study for how benefits of marine ecosystem services may contribute to the commercial fishing industry	https://www.sciencedirect.com/science/article/pii/S0308597X16305619	Excluded	Not on drivers

Predicting fisher response to competition for space and resources in a mixed demersal fishery	https://www.sciencedirect.com/science/article/abs/pii/S0964569115000265	Excluded	Modelling not drivers
The voices that matter: A narrative approach to understanding Scottish Fishers' perspectives of Brexit	https://www.sciencedirect.com/science/article/abs/pii/S0308597X18308546	Excluded	Not on drivers
Thirty years of fleet dynamics modelling using discrete-choice models: What have we learned?	https://onlinelibrary.wiley.com/doi/abs/10.1111/faf.12194	Excluded	Not on drivers
Progress in designing and delivering effective fishing industry–science data collection in the UK	https://onlinelibrary.wiley.com/doi/abs/10.1111/faf.12279	Included	On drivers
Identifying choke species challenges for an individual demersal trawler in the North Sea, lessons from conversations and data analysis	https://www.sciencedirect.com/science/article/abs/pii/S0308597X17303809	Included	Analyses fishing behaviour
Balancing ecology, economy and culture in fisheries policy: Participatory research in the Western Mediterranean demersal fisheries management plan	https://www.sciencedirect.com/science/article/pii/S0301479721007908	Included	Talks of drivers
Marine protected area improves yield without disadvantaging fishers	https://www.nature.com/articles/ncomms3347	Excluded	Not on drivers
Vessel monitoring systems (VMS) reveal an increase in fishing efficiency following regulatory changes in a demersal longline fishery	https://www.sciencedirect.com/science/article/abs/pii/S0165783618301760	Excluded	To do with VMS not drivers
Short-term choice behaviour in a mixed fishery: investigating métier selection in the Danish gillnet fishery	https://academic.oup.com/icesjms/article/69/1/131/673193?login=false	Included	Talks about decision variables

Integrating individual trip planning in energy efficiency – Building decision tree models for Danish fisheries	https://www.sciencedirect.com/science/article/abs/pii/S0165783613000222	Included	Talks about their fishing practices
Socio-economic, technological and environmental drivers of spatio-temporal changes in fishing pressure	https://eprints.ncl.ac.uk/file_store/production/244574/75638A97-08F0-440A-A689-42AE5105DDE2.pdf	Included	Talks of drivers for location
Remote electronic monitoring and the landing obligation – some insights into fishers' and fishery inspectors' opinions	https://www.sciencedirect.com/science/article/pii/S0308597X16306030	Included	Talks of fishers' experiences
Fishers sharing real-time information about "bad" fishing locations. A tool for quota optimisation under a regime of landing obligations	https://www.sciencedirect.com/science/article/abs/pii/S0308597X15003267	Excluded	Modelling and proposing a new strategy, not drivers
Fishing for Space: Fine-Scale Multi-Sector Maritime Activities Influence Fisher Location Choice	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0116335	Included	Talks of drivers for location
Social networks and fishers' behavior: exploring the links between information flow and fishing success in the Northumberland lobster fishery	https://www.jstor.org/stable/26269547	Included	Talks of fishers' behaviour
Ready for co-management? Portuguese artisanal octopus fishers' preferences for management and knowledge about the resource	https://www.sciencedirect.com/science/article/abs/pii/S0308597X17308783	Excluded	Doesn't talk of drivers
An evaluation of the Fishing For Litter (FFL) scheme in the UK in terms of attitudes, behavior, barriers and opportunities	https://www.sciencedirect.com/science/article/abs/pii/S0025326X19302966	Excluded	Not on drivers

How Is Fisheries Management Perceived by Croatian Small-Scale Fishers: Should I Stay or Should I Go?	https://link.springer.com/chapter/10.1007/978-3-030-37371-9_8	Included	On drivers
Technical and tactical measures to reduce unwanted catches in mixed fisheries: Do the opinions of Irish fishers align with management advice?	https://www.sciencedirect.com/science/article/abs/pii/S0308597X20309362	Included	Talks of opinions and drivers
Small-Scale Fisheries in Europe: Challenges and Opportunities	https://link.springer.com/chapter/10.1007/978-3-030-37371-9_28	Excluded	Focused on national context
How Resilient Are Europe's Inshore Fishing Communities to Change? Differences Between the North and the South	https://link.springer.com/article/10.1007/s13280-013-0458-7	Excluded	Not on drivers
Fishers' perceptions of the European Union discards ban: perspective from south European fisheries	https://www.sciencedirect.com/science/article/abs/pii/S0308597X17301008	Excluded	Opinions on the ban, not drivers
A comparative review of fisheries management experiences in the European Union and in other countries worldwide: Iceland, Australia, and New Zealand	https://onlinelibrary.wiley.com/doi/abs/10.1111/faf.12147	Excluded	Not on drivers
Preferences for derelict gear mitigation strategies by commercial fishers	https://www.sciencedirect.com/science/article/abs/pii/S0308597X21002736	Excluded	Not on drivers
The role of technical protocols and partnership engagement in developing a decision support framework for fisheries management	https://www.sciencedirect.com/science/article/abs/pii/S0301479718307151	Excluded	Not on drivers
The EU landing obligation and European small-scale fisheries: What are the odds for success?	https://www.sciencedirect.com/science/article/abs/pii/S0308597X15003279	Excluded	Not on drivers

Integrating collaborative research in marine science: Recommendations from an evaluation of evolving science-industry partnerships in Dutch demersal fisheries	https://onlinelibrary.wiley.com/doi/full/10.1111/faf.12423	Excluded	Not on drivers
Implementing the Landing Obligation. An Analysis of the Gap Between Fishers and Policy Makers in the Netherlands	https://link.springer.com/chapter/10.1007/978-3-030-26784-1_14	Excluded	Not on drivers
A Review of the European Union Landing Obligation Focusing on Its Implications for Fisheries and the Environment	https://www.mdpi.com/2071-1050/10/4/900	Excluded	Not on drivers
Fishers' opinions on marketization of property rights and the quota system in France	https://www.sciencedirect.com/science/article/abs/pii/S0308597X1730012X	Excluded	Not on drivers
Institutions and governance in the European Common Fisheries Policy: An empirical study of Spanish fishers' attitudes toward greater participation	https://www.sciencedirect.com/science/article/abs/pii/S0308597X16303505	Excluded	Not on drivers
An evaluation of socioeconomic factors that influence fishers' discard behaviour in the Greek bottom trawl fishery	https://www.sciencedirect.com/science/article/abs/pii/S0165783617301777	Excluded	Not talking to fishers - patterns
Introduction: Social Issues in Sustainable Fisheries Management	https://link.springer.com/chapter/10.1007/978-94-007-7911-2_1	Excluded	Not on drivers
Fishing for Justice: England's Inshore Fisheries' Social Movements and Fixed Quota Allocation	https://journals.sagepub.com/doi/abs/10.1177/194277861801100103?journalCode=huga	Excluded	Not on drivers
Governing the Governance: Small-Scale Fisheries in Europe with Focus on the Baltic Sea	https://link.springer.com/chapter/10.1007/978-3-319-94938-3_19	Included	On drivers

Fishing against the odds: fishers' motivations to carry on fishing in the wake of the hindering EU Common Fishery Policy—a case study in North Shields, UK	https://pubmed.ncbi.nlm.nih.gov/35300279/	Included	On drivers
Adaptation strategies of small-scale fisheries within changing market and regulatory conditions in the EU	Adaptation strategies of small-scale fisheries within changing market and regulatory conditions in the EU - ScienceDirect	Included	On drivers
Socio-economic and institutional incentives influencing fishers' behaviour in relation to fishing practices and discard	https://academic.oup.com/icesjms/article/71/5/1298/640460	Included	On drivers
Exploring concepts of fisheries 'dependency' and 'community' in Scotland	Exploring concepts of fisheries 'dependency' and 'community' in Scotland - ScienceDirect	Included	On drivers
Territoriality as a Driver of Fishers' Spatial Behavior in the Northumberland Lobster Fishery	https://www.tandfonline.com/doi/abs/10.1080/08941920.2012.709313?journalCode=usnr20	Included	On drivers
Being able is not necessarily being willing: governance implications of social, policy, and science-related factors influencing uptake of selective gear	https://academic.oup.com/icesjms/article/80/3/469/6530388	Included	On drivers

Annex 3: Interview Guide

Question	Answer
Q1 Please confirm that you have received and read the Privacy notice and give consent to be interviewed (and recorded)	Yes
	No
Q2 Do you work in the fish or shellfish catching sector and how long have you been in the industry	Yes
	No
Q3 Where to you consider to be your home port?	
Q4 What gears do you use (primarily):	**Static:**
	Hook and Line
	Nets
	Pots
	Mobile:
	Beam Trawl
	Otter Trawl
	Nephrop Trawl
	Dredge
	Pelagic Trawl
	Twin Trawl
	Seine
	Other? Please detail:
Q5 What size of vessel do you operate?	Under 10m
	10 – 15m
	15-24m
	Over 24m

Q6 Please list the five main species that make up your catch (by weight) and then by value (GBP). Please rank in order of most significant (1 = largest component; 5 = smallest component)	Weight	Value
	1.	1.
	2.	2.
	3.	3.
	4.	4.
	5.	5.
Q7 When you go out to fish do you go out for:		Day trips
		2/3 days
		4 days or longer
Q8 Please take me through your day and the sorts of decisions you make? How are practical considerations (e.g., crew availability, best use of time and resources) impacting on your job and the decisions you make?		Open question
Q9 Please take me through your next three months and the sorts of decisions you will make?		Open question
Q10 Please take me through a 'normal' year for you, and the kinds of decisions you make? How are wider circumstances (i.e., marine policies and regulations, political changes, climate change) impacting on your job and the decisions you make?		Open question
Q11 Overall, which of those decisions is the most critical, and why?		Open question
Q12 What is important for you when making longer term decisions on fishing? (Whether to fish, where, when, and how to fish next year)		Open question
Q13 Have you changed fisheries in the last 5 years?		Yes
		No
Q14 Which fishery have you changed from and to?		Open question
Q15 What were the factors which drove this change?		Open question
Q16 Have you changed your vessel in the last five years and what change did you make (e.g. decarbonisation, engine size)?		Open question

Q17 How are your personal circumstances impacting on your job, or affecting the decisions you make in your work? (e.g., family considerations, your values, mental health, any other personal reasons)?	Open question
Q18 Which of the following policies are you aware of? In what ways do they influence on your work? Blue Economy Vision Remote Electronic Monitoring Marine Protected Areas Scotland's Fisheries Management Statement The Future Catching Policy Just Transition to Net Zero The Bute House Agreement	Open question
Q19 Have you seriously considered leaving the fishing industry?	Yes No
Q20 What made you consider leaving, and what made you stay? Consider such factors as: Personal and family life Social factors (e.g. heritage, community, self-identity) Economic factors (e.g. profit or debt) Legislation and governance Environmental factors (e.g. weather, seasonality, climate change)	Open question
Q21 Would you like to add anything else?	Open question

Annex 4: Introductory Email Template

Good afternoon,

Aquatera, Aegir and MRAG have recently been appointed by Marine Scotland to conduct a literature review supported by stakeholder engagement which aims to understand what drives and influences the reasoning and decision making of fishers who operate in Scottish waters. Fishers are constantly weighing up options and making choices as part of their short-term and long-term planning. When making these decisions, a number of factors may come into play. For example, these may be circumstantial (i.e., marine policies, marine developments, regulations, climate change), practical (i.e., making a profit, making the best use of time and resources) and personal (i.e., values, fears, family, culture). Decision making will most likely involve balancing these factors, and it may be that some factors are more influential than others.

Understanding how these factors interact, and which factors are most important and in what situations, is key for designing effective policies. We would very much welcome your input into this review process as a key fisheries stakeholder in Scotland.

This introductory email contains a questionnaire[11] informed by the initial findings of a literature review we recently conducted into this topic. We now wish to follow up with a 1-2-1 meeting over the phone or via video conference (whichever is preferable) to discuss your responses to the questionnaire and the outputs from the literature more broadly. This will be an opportunity for stakeholders to provide specific feedback in relation to the project.

All findings will be collated into a final report which will be shared with stakeholders once published by Marine Scotland.

Please do not hesitate to get in touch should you have any further queries.

[11] Referred to as interview guide in this report.

Annex 5: Privacy Notice

Information Sheet, Privacy Notice and Consent Form

This form explains the information that Aquatera wishes to collect from you including any personal data, how we intend to use it, what we do to protect the information we collect and what your legal rights are. We will seek your consent to participate in the survey and for your personal data to be processed as described below.

About the survey

Aquatera and MRAG on behalf of Scottish Ministers want to gather evidence to provide a first step in understanding what drives and influences the reasoning and decision making of fisheries who operate in Scottish waters, with regard to their fishing activities; to understand what methods or techniques can be used to research what drives and influences the reasoning and decision making of fishers who operate in Scottish water, with regard to their fishing activity; and finally, to develop a plan for carrying out this work in Scotland and to implement a pilot study to test the efficacy of this plan.

As a first stage of this study, we are developing an interview guide which we hope to be completed by fishers, through a 1 to 1 interview, which will help to inform the above objectives. The interviews will be anonymous and only identified by the fleet sector, targeted catch, gear type and vessel size. We are very aware of the number of consultations and pressures that there are around the commercial fishing industry, but we are confident that by completing the study interview you will be helping to shape future policy direction.

You are invited to participate in a short interview with Aquatera which will be conducted either in person or via remote video call (Teams or similar) or a phone call, depending on your preference. We ask permission to record these interviews to ensure all information is captured and as evidence required by the project conditions. Should recordings not be acceptable, we seek permission to take comprehensive notes that will be treated with the same discretion and destroyed upon completion.

If neither option is acceptable, we would ask that you complete a questionnaire which can be issued as an online form or as a word document which can be emailed to you or printed out and posted to you for completion as is most suitable. Some personal data may be collected during the interview such as your name/ name of your business, your role and your opinions and experiences. This is just for identification purposes while analysing the feedback form the interviews. The final report, which will be made publicly available, will only include the following information:

- Fleet sector;
- Targeted catch;
- Gear Type; and
- Vessel Size

After you have completed the interview, your responses will be analysed by Aquatera along with the interviews completed by other people participating in the survey, and the findings will be set out in a report for Marine Scotland. The recording of your interview and notes taken will only be accessed and used by the research team at Aquatera. Marine Scotland may publish this report; however, your individual responses will not be published and any information which could personally identify you will be removed in the published report.

You should also be aware of the Freedom of Information (Scotland) Act 2002 (FOISA) and the Environmental Information (Scotland) Regulations 2004 (EIRs) which enable the public to request access information held by the Scottish Government and its agencies. Any such request for information may be handled as a Freedom of Information (FOI) or Environmental Information Request (EIR) request. However, any personal and sensitive data will be removed prior to a release of information under the acts.

Data handling and processing

The lawful basis for the collection and processing of the data is Article 6(1)(e) – 'processing is necessary for the performance of a task carried out in the public interest or in the exercise of official authority vested in the controller'.

The completed interview and any personal data that you provide will be held in strictest confidence, and will be securely stored in the Aquatera document management system and deleted when the project is complete.

Your rights

Participating in this study is entirely voluntary and is done so with your consent. You have the right to withdraw your consent and to object to our processing of your personal data at any time;

You do not have to answer all the questions asked;

You can choose to leave the interview and not take part in the study at any time, during or after the interview. In this case any information we have gathered will be destroyed and will not be used in the study;

You have the right to access your personal data within the period that Aquatera holds it;

You also have the right to rectify any incorrect or out-of-date personal data about you which we may hold;

If you want to exercise your rights, please contact Aquatera (details below); and

You have the right to lodge a complaint with the Information Commissioner's Office (ICO), if you have concerns on how we have processed your personal data. You can find details about how to contact the Information Commissioner's Office at https://ico.org.uk/global/contact-us/ or by sending an email to: casework@ico.org.uk.

Aquatera and Marine Scotland Contacts

If you have any questions about the survey please contact: shane.quill@aquatera.co.uk

The SG Data Protection Officer in the Scottish Government can be contacted at DataProtectionOfficer@gov.scot.

Consent

Please read the following questions and check the boxes below to indicate consent.

☐ I have ready and understood the information provided in this form

☐ I consent to completing the interview being administered by Aquatera

☐ I consent to the interview being recorded by Aquatera

☐ I consent to a questionnaire instead of an interview being administered by Aquatera

☐ I consent to my responses being used for the purposes outlined above

☐ I understand any information I give will be treated confidentially and securely, in accordance with the terms of the Data Protection Act

☐ I understand that my participation is voluntary and that I can withdraw from the interview at any time without giving any reason and my data will not be processed

Annex 6: Pilot study plan

How interviews were conducted (e.g. recorded/noted, face to face/phone)?

People were offered their preferred method of meeting, either in-person, online or by phone. All respondents asked to use WhatsApp video as their preferred method. All conversations were recorded using the voice memos facility. The interviews were at a time convenient to the respondent which varied from day time to evening interviews.

Who was taking interviews?

The interviews were carried a researcher employed by Aquatera using the interviews guide to have a structured discussion with the fishers.

How were interviews analysed?

A combination of background data and qualitative data was obtained from interviews. For background data, information on years of experience in the fishing industry (only 6 respondents answered), catching sector, target species, vessel size, fishing duration and range of gear types used was analysed and graphically presented in bar charts in the main text of the report, highlighting the difference between capture sectors. The analysis of the qualitative data was carried out using thematic analysis. Thematic analysis is a qualitative method that involves identifying patterns in qualitative data. Interview transcripts were manually coded to identify common themes and patterns in fishers' responses. The coded data was then interrogated to identify key trends based on the frequency and importance assigned by fishers. The codes were then collated and sorted into key themes. These themes were reviewed to ensure they were accurate and representative of the interview transcripts. Each theme is presented in the main body of the report alongside explanation of their importance and influence on fishers' decisions. These descriptions are supported by representative quotes to illustrate the themes.

Anonymity of research participants.

Only information that cannot identify individual people is resented in the report. For example, there are two tables in the report that mention which gear participants use and where they are located. These two types of information are not cross-linked to make sure that participant anonymity is protected.

How were interviews carried out? What methodological choices were made?

The interviews were conducted using the interview guide to ensure consistency of questions. Interviewer strived to carry out interviews in informal conversation style to allow fishers explore topics that were interested to them. The level of detail given in the answers varied. Interviewer encouraged research participants to elaborate on their responses. Interviews were recorded to ensure accuracy of the reporting. In general fishers were very pleased to participate and expressed interest in participating should this pilot research result in a full-scale study.

Annex 7: Research papers that informed this study

Project Title	Geographic location	Vessel size	Gear type	Type of study
Adaptation strategies of small-scale fisheries within changing market and regulatory conditions in the EU	England	Under 10 m	All	Literature review and focus groups
	Italy	All	All	Literature review
Balancing ecology, economy and culture in fisheries policy: Participatory research in the Western Mediterranean demersal fisheries management plan	Western Mediterranean	All	Demersal trawl	Questionnaire and multi-stakeholder workshop
Being able is not necessarily being willing: governance implications of social, policy, and science-related factors influencing uptake of selective gear	Netherlands	All	Mainly demersal trawls	Interviews and an online survey
Exploring concepts of fisheries 'dependency' and 'community' in Scotland	Scotland	All	All	Interviews and participant observation
Fishing against the odds: fishers' motivations to carry on fishing in the wake of the hindering EU Common Fishery Policy—a case study in North Shields, UK	England	All	All	Interviews and field observations
Fishing for Space: Fine-Scale Multi-Sector Maritime Activities Influence Fisher Location Choice	English Channel	All	Scallop dredger	Data modelling
Governing the Governance: Small-Scale Fisheries in Europe with Focus on the Baltic Sea	Baltic Sea	All	All	Desk-based studies
How Is Fisheries Management Perceived by Croatian Small-Scale Fishers: Should I Stay or Should I Go?	Croatia	Under 12 m	Passive fishing gears	National survey

Identifying choke species challenges for an individual demersal trawler in the North Sea, lessons from conversations and data analysis	North Sea	Over 24 m	Demersal trawl	Meetings and interviews
Integrating individual trip planning in energy efficiency – Building decision tree models for Danish fisheries	Denmark	Over 15 m	All	National survey
Progress in designing and delivering effective fishing industry–science data collection in the UK	UK	All	All	Literature review and online survey
Remote electronic monitoring and the landing obligation – some insights into fishers' and fishery inspectors' opinions	Denmark	All	Mainly trawl	Questionnaire and fisher interviews
Scepticism and perceived self-efficacy influence fishers' low risk perceptions of climate change	England	Under 10 m	Bottom trawls, static nets or pots	Fisher interviews
		Over 10 m	Beam trawl or scallop gear	Fisher interviews
Short-term choice behaviour in a mixed fishery: investigating métier selection in the Danish gillnet fishery	Denmark	All	Gill net	Survey questionnaire
Social networks and fishers' behavior: exploring the links between information flow and fishing success in the Northumberland lobster fishery	England	Under 12 m	Potting	Fisher interviews
Socio-economic and institutional incentives influencing fishers' behaviour in relation to fishing practices and discard	Denmark	10–18 m	Nephrops trawl	Fisher interviews
	Greece	over 16 m	Otter trawl	Fisher interviews
	England	Mainly under 10 m	Trawl	Fisher interviews

Socio-economic, technological and environmental drivers of spatio-temporal changes in fishing pressure	England	Under 12 m	Potting	Desk-based studies and fisher interviews
Technical and tactical measures to reduce unwanted catches in mixed fisheries: Do the opinions of Irish fishers align with management advice?	Ireland	All	Demersal gear	Fisher interviews
Territoriality as a Driver of Fishers' Spatial Behavior in the Northumberland Lobster Fishery	England	Under 12 m	Potting	Fisher interviews

Annex 8: Interview Summaries

Question	Summary
Please note that background data collected through questions Q1-Q6 is summarised in the main body of the report.	
Q7 Please take me through your day and the sorts of decisions you make? How are practical considerations (e.g., crew availability, best use of time and resources) impacting on your job and the decisions you make?	Daily decisions mainly focus on environmental conditions such as weather and tides. This typically determines where and what fish species to catch. In addition, crew related issues were commonly mentioned due to the difficulty in recruitment and retainment, particularly for the medium to larger-sized vessels.
Q8 Please take me through your next three months and the sorts of decisions you will make?	When planning over a 3-month period, weather is a key consideration, largely informed by weather forecasts and season. In addition, quota availability is a major factor in decision making as it dictates the legal amount fishers can harvest per fish species. Therefore, fishers must forecast their fishing operations to ensure they do not exceed their allocated quota and do not catch any non-quota species. Due to the seasonality of fishing, crew related issues are still a problem as it is difficult to attract workers to do seasonal work when the money is relatively low.
Q9 Please take me through a 'normal' year for you, and the kinds of decisions you make? How are wider circumstances (i.e., marine policies and regulations, political changes, climate change) impacting on your job and the decisions you make?	On an annual basis, legislation and regulations are the primary factors influencing fisher decisions. This is mainly based on the introduction of new policies and stricter regulations which fishers feel are reducing fishing opportunities. In particular, fishers mentioned windfarms, MPAs and HPMAs which fishers believe are increasing the pressure on the industry. This has resulted in wide spread concern and reluctance to invest in the industry due to the uncertainty on the viability of fishing businesses in the future.
Q10 Overall, which of those decisions is the most critical, and why?	The most critical decisions for the fishers were a mix of legislation and regulation, weather, crew and quota availability.
Q11 What is important for you when making longer term decisions on fishing? (Whether to fish, where, when, and how to fish next year)	When making long-term decisions, fishers emphasised the most important factors were weather, season and quota.
Q12 Have you changed fisheries in the last 5 years?	Out of the 12 fishers interviewed, only two fishers had changed fisheries in the past five years.

Q13 Which fishery have you changed from and to?	One of the fishers said he had changed from fishing prawns full time to prawns and brown crab, while the other fisher had to change from scallops to prawns because his vessel's scallop entitlement had frozen. In addition to the two fishers who said they had switched fisheries, one fisher mentioned he had diversified to targeting cuttlefish in the channel.
Q14 What were the factors which drove this change?	The rationale for changing fishery was primarily based on fish abundance, change in regulation and loss of income.
Q15 Have you changed your vessel in the last five years and what change did you make (e.g. decarbonisation, engine size)?	Out of the 12 fishers interviewed, only three fishers had changed vessel in the past five years, largely to improve crew safety, fuel efficiency and ensure best quality for the fish being landed. One fisher did buy a boat six years ago to accommodate his son working with him.
Q16 How are your personal circumstances impacting on your job, or affecting the decisions you make in your work? (e.g., family considerations, your values, mental health, any other personal reasons)?	Personal circumstances were shown to have a major impact on fisher decision making. Many fishers are now trying to create a better work-life balance, although this is largely due to the age range of fishers interviewed who want to spend more time with their children and grandchildren. However, one fisher explained that he had come ashore to manage his business due to his mental health which had suffered from the strain of trying to make a business work against a backdrop of regulation and environmental NGOs constantly targeting the fishing industry.
Q17 Which of the following policies are you aware of? In what ways do they influence on your work?	The majority of fishers said they were not aware of the Blue Economy Vision policy and therefore it did not have an influence on their work.
	All the interviewed fishers were aware of REM and some said it would have an influence on their work.
	All the interviewed fishers were aware of MPAs and said they have an impact on their work.
	There was a 50/50 split between the number of fishers who were aware of Scotland’s Fisheries Management Statement
	The majority of fishers said they were aware of The Future Catching Policy

	The majority of fishers said they were aware of Just Transition to Net Zero and there were mixed opinions of the benefits to fishers.
	All the interviewed fishers were aware of The Bute House Agreement and many fishers expressed concern regarding the designation of HMPAs and emphasised the industry strongly disagreed with them based on the lack of evidence or data.
Q18 Have you seriously considered leaving the fishing industry?	Out of the 12 fishers interviewed, five fishers had seriously considered leaving the industry, with only one fisher actually leaving and then returning. Many fishers see fishing as their way of life, however, a few fishers explained that due to the stress of crew issues, the constant barrage of pressure from environmental NGOs, the squeeze on fishing grounds and the impact it has had on their mental health it is a consideration.
Q19 What made you consider leaving, and what made you stay?	Out of a list of several factors posed to fishers, the factors influencing fisher decisions to leave or stay in the industry were mainly social, economic and governance.
Q20 Would you like to add anything else?	A few fishers made further points on the lack of government understanding on how important fishing is and the social and economic support it provides to rural coastal communities. Many fishers wish to see Marine Scotland champion the industry by engaging more with industry with regards to new policies and regulations which benefit both the fishers and status of the fishery. Recently, there has been a loss in social capital and trust between government and industry due to the increased pressure and negative publicity on the industry. Stricter regulations and the manner in which they are enforced, particularly by the Maritime and Coastguard Agency (MCA) was described as a negative and stressful experience. However, fishers are still keen to work with government, share their data and help promote the industry to protect their livelihoods and the communities which depend on them.

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