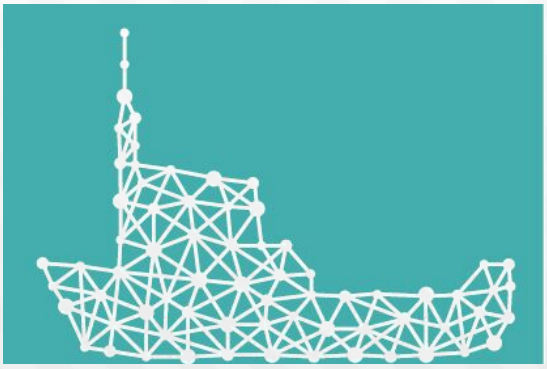

SIFIDS

Scottish Inshore Fisheries Integrated Data System

Work Package (4) Final Report

Assessment of Socio-economic and Cultural Characteristics of Scottish Inshore Fisheries

Project code: WP00(4)SIFIDS

EMFF: SCO1434

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EXECUTIVE SUMMARY

The European Maritime and Fisheries Fund (EMFF) has funded the 'Scottish Inshore Fisheries Integrated Data System' (SIFIDS) project, which aims to integrate data collection and analysis for the Scottish inshore fishing industry. SIFIDS Work Package 4 was tasked with assessing the socio-economic and cultural characteristics of Scottish Inshore Fisheries. The aim was to develop replicable frameworks for collecting and analysing cultural data in combination with defining and analysing already available socio-economic datasets. An overview of the current available socio-economic data is presented and used to identify the data gaps. Primary socio-economic and cultural research was conducted to fill these gaps in order to capture complex cultural, social and economic relationships in a usable and useful manner. Some of the results from this Work Package will be incorporated into the platform that SIFIDS Work Package 6 is building.

All primary research conducted within this work package followed the University of the Highlands and Islands (UHI) Research Ethics Framework and was granted Ethical Approval by the UHI Research Ethics Committee under code ETH895.

Approach

A well-developed and practical framework for analysing and integrating the socio-economic and cultural datasets was required in order to effectively describe and draw useful conclusions from different types of evidence (i.e. both qualitative and quantitative; social, economic, and cultural). Establishing a framework also ensured that the results could be updatable as required, which is useful for policy and regulation, with the added benefit of having a limited requirement for methodological development. The Sustainable Livelihoods Approach (SLA) was chosen as the most appropriate framework, as it identifies that there are both tangible and intangible components of a livelihood, which are critical to its sustainability and risk resilience. SLA was first developed by the Bruntland Commission on Environment and Development and has since been used extensively in inshore fisheries research and development programmes. It defines five 'capitals' which are critical to the function of individual households through to whole industries. These are; natural capital (e.g. marine ecosystems and weather); physical capital (e.g. harbours and roads); financial capital (e.g. income and access to loans); human capital (e.g. skilled crew and training opportunities) and; social and cultural capital (e.g. community and family relationships and cultural heritage).

Several methodologies were employed within the SLA framework to characterise the economic, social and cultural aspects of inshore fisheries:

- **Socio-Economic**

Macro-level analysis characterised the Scottish inshore fishing industry's contribution to the national economy, including the relevance of multiplier effects and broad national economic strategy, Cross Sector Market Linkages across value chain actors, and rules and industry functions.

Market System analysis was employed to contextualise inshore fishing within the rules, functions and associated industries. Case studies were used to identify linkages between fishers and their (upstream) suppliers and (downstream) buyers. Primary research was undertaken through interviews and surveys, and was cross-referenced with secondary sources (e.g. Seafish reports, Scottish Government Statistics and Marine Scotland landings data).

GIS enabled a cross-comparison of the Scottish Index of Multiple Deprivation (SIMD) and Marine Regions, and was employed to determine levels of deprivation in coastal communities and overlap with inshore fishing

- **Cultural**

Qualitative interviews conducted in four case study sites; Argyll, Forth and Tay, Solway, West Highlands Marine Regions with fishers and associated populations (e.g. supply-chain, family), which focused on relationships, tangible and intangible heritage, and changes (observed and felt). The data from the interviews was thematically analysed using QSR Nvivo software.

After the interviews, an internet enabled mixed methods survey (both quantitative and qualitative questions) was circulated to fishers across all marine regions. It was split into five sections developed from the themes which emerged in the interviews. The data from the survey was analysed using descriptive statistics and thematic analysis.

Key Findings

The analysis of 45 **interviews** conducted in the four case study regions in May 2017 produced 21 themes. *'Resource management'*, *'relationships'*, *'changes'*, and *'supply-chain'* were the themes that contained the most content from the interviews and across all case studies. Although there were differences in the focus of the interviews for each region, many of the themes were interlinked and crosscutting.

- *Resource management* - relates to the varying perception of sustainability of different types of inshore fishing (e.g. creeling vs dredging); the politics of how inshore fishers are represented; the perceived lack of integrating inshore fishers knowledge into scientific evidence and therefore management strategies; EU funding and; the Common Fisheries Policy. This theme was most prevalent in Argyll, West Highlands, and Solway Marine regions.
- *Relationships* - pertains to the relationships between fishers working with similar gear and across different gear types; between fishers and their local communities; between families; between boats; and between inshore fishing and other marine industries. The coverage of this theme was relatively evenly spread throughout the four case studies, with Solway only having slightly less coverage than the other three Marine Regions.
- *Changes* - covers 12 topics ranging from opinions on Brexit, to changing work patterns over the past three decades and the implications for succession, to environmental interactions such as the limitations imposed by extreme weather. The Forth and Tay

and West Highland interviews were more focused on changes than Argyll and Solway Marine Regions.

- *Supply-chain* - dominated by issues associated with transport, supply, and competition. Supply chain issues were most prevalent in the Argyll and Forth and Tay Marine Regions.

The **survey** was filled in by 133 fishers across all 11 Marine Regions in Scotland. 90% of respondents were skippers, 7% worked for fisheries associations and 3% were crew. Most respondents were male, had an average age of 51, and identified as being Scottish. Participation rates varied across the Marine Regions with the most responses collected from the Outer Hebrides and the least from the North Coast. Highlights from the survey results include the following:

- *Section 1: Boats Harbours and Transport Links* - Creels were the most prevalent type of gear (69%), followed by trawls (25%). Harbours were the most important physical infrastructure, followed by good road links.
- *Section 2: Skills, Learning and Career* – respondents felt that; not enough local people were interested in crewing; fewer young people are coming into the industry despite enough opportunities to learn the skill and; work patters have changed since they first started fishing.
- *Section 3: Jobs and Income* – most respondents estimated that between 81-100% of their income comes from inshore fishing. Most expenses are incurred by paying for crew and fuel.
- *Section 4: Community, Relationships and Culture* – gear conflict was seen as having either slight or significant, or extreme negative impacts on inshore fishing businesses; however these conflicts are put aside when a fellow fisher is in need, especially at sea. Respondents felt that they need representation, but are well represented by their regional inshore fisheries groups. Most feel that there is a change in fishing being a familial business.
- *Section 5: Marine and Natural Resources* – lobster, *Nephrops*, velvet crab and brown crab were the most common target species. Most respondents feel they are responsible for managing their local fishing areas and efforts, and that the future of fishing depends on good management by fishers. Suggestions for management improvement were focused on creel limitation and policing.

The **macro-level and market system analysis** resulted in a Value Chain Matrix which provided a clear summary of the economic aspects of Scottish inshore fisheries (Table 1). The different supply routes to market determine the degree of value capture Scotland / UK derives from the inshore fishing sector. Some local supply methods (e.g. ‘from boat to plate, locally’) can generate local value addition of ten times or more, but this is a small proportion of the market. Other supply methods (e.g. direct transport out of region) can have very low additional local impact, although there may be significant further national benefits across Scotland (and UK) where different types of processing services take place, often in areas with greater social deprivation. There are an additional five value chain models that have been identified and are described within this report.

Table 1. The Value Chain Matrix of Scottish inshore fisheries. Direct income and employment are from provisional Marine Scotland 2017; other figures are derived from Scottish Government multipliers and Seafish survey data.

Direct Income to inshore fishers (Scotland)	£63.66m
Direct Employment (Marine Scotland, 2018)	2,374 fishers
GVA of inshore fishing activity	£36.92m
Non-fishing income to Scotland generated through inshore fishing (Type II impacts additional to fishing including indirect and induced effects)	£38.20m
Employment across the value chain	3,086 (an additional 712 jobs beyond fishers)
Total value to Scottish Economy (including direct, indirect and induced impacts)	Income: £101.85m (an additional £38.20m to other sectors) Employment: 3,324 jobs (an additional 950 jobs in other sectors) GVA: £59.08m (an additional £22.15m to other sectors)
Strategic impacts	***Scotland Food and Drink:*** Scottish food provenance is of increasing value to the national economic strategy ***Tourism:*** inshore fishing is seen to present a positive image in coastal tourism. ***Trade-off with other marine sectors***: fishing must compete with other sectors for marine space – some activities are compatible while some are not, including other fishing methods.
Global value of Scottish inshore fishing* *Associated gross value of final use based on the fish product plus other inputs	£250-600m (likely between 5 and 10 times landing value achievable depending on supply route, but average ratios are unknown)
Impacts on local economies	Can be limited beyond the landing values unless local processing is undertaken. Often the wider economic impacts are significant but take place elsewhere. This is important for policymakers – jobs in Bellshill, Larkhall and Glasgow depend on inshore fishing – arguably, support for growth in processing could focus on more deprived areas than the fishing ports, though provenance is still a key selling point.
Risk / resilience	There is strong evidence of the economic de-risking of individual fishers through their activity – it is scalable. However, there is less evidence of significant de-risking of particular local economies.

The GIS cross comparison between the **SIMD and case study Marine Regions** found no geographical correlation between deprivation and areas of inshore fishing activity. However, further analysis of the case study results was conducted to draw out the similarities and differences between them.

- Argyll is characterised by a slowly contracting inshore fishing sector, with only 1.5% of employment provided by the industry.
- Forth and Tay had increased landings for 2017 and has the largest inshore fishing sector of all Marine Regions in terms of catch volume and value.
- Solway has a relatively small inshore fishing industry in terms of both employment and catch value in comparison with other Marine Regions.
- West Highlands is the second largest Marine Region in terms of volume of catch and value. It is more reliant on the inshore fishing sector for employment than other Marine Regions.

The results of the socio-economic and cultural analysis are integrated using the **SLA.** The importance of the interlinkages between the lives and assets of those in the Scottish inshore fishing sector is critically important. Policies are often directed at addressing the challenges of one 'capital', whereas the underlying driver may be in another area entirely. For example, addressing skills shortages in fishing may be important to fill clear gaps, but often the lack of human capital in certain areas is due to the younger generation pursuing other economic opportunities, either within fishing or in an entirely different sector. Equally, skills transfer into the sector from other industries can be barred by industry structures, social networks or policies, rather than a lack of training or education initiatives.

Assessment of the different assets of those living in the inshore fishing sector, across their social, financial, natural, human and physical capital, must be informed by two key cross-cutting themes; 1) risk and vulnerability to change and 2) the sector's distinct structure (its 'market system'), within which decision-making and outcomes are determined.

Diverse risks and vulnerabilities are apparent in the interview responses, the survey and through the economic analysis. These vary from the direct physical dangers inherent in fishing (which can shape the whole culture of communities), to succession planning (where it is unclear where the next generation of inshore fishers will come from), to the value-chain of the catch (which relies on buyer pricing). The wider sectoral political economy plays a significant role in determining fishers' livelihood strategies, and in turn, outcomes. This includes the support networks and associations (e.g. the rIFGs), regulatory bodies and the economic drivers in the supply chain itself. Brexit is an example of where the sectoral drivers will be determined by factors beyond the control of inshore fishers.

- *Social and cultural capital* - evidence of changing relationships, customs, values, and identities of the inshore fishing sector were found. Differences in practices and behaviour according to gear type, location / geography, personal motivation, and business opportunities were recorded. More local management was seen as a solution to the issues posed by these changes, in addition to clearly communicated evidence of how inshore fishers' knowledge and data is incorporated into top-down policy and management regimes.
- *Financial capital* - the full financial value of inshore fishing to Scotland is diffuse and often out of the immediate town and coastal region. The negotiating power of fishers

appears weak – while supply and demand 'should' give them power in price-setting, in practice fishers seem to be price-takers unless they are in a more integrated relationship with a buyer. As such, a holistic market system view of inshore fishing should be used in economic and social policy making.

- *Human capital* - inshore fishing is still a distinctive way of life, driven in the most part by personality and choice rather than lack of alternatives. Fishing skills are relatively transferable across other marine sectors (e.g. aquaculture). While the unpredictability of fishing work impacts quality of life and attractiveness for new entrants into the industry, experienced crew may struggle to get finance to buy a boat from a retiring skipper. Buyer financing and other models may help retain this valuable human capital (e.g. skills and knowledge of inshore fishing).
- *Physical capital* - boats are a large determinant of succession and industry sustainability, and they are seen as strategic assets between fishers and competing processors. The infrastructure used by fishers (harbours, road networks, and communications) mean that remote areas can be integrated into a wider, international network. The 'sharing' of infrastructure such as harbours is a direct policy discussion – in some cases the mixing of tourists and boats can pose safety and access complications.
- *Natural capital* - mostly related to the perceptions that fishers had of changes in the biophysical ecosystems they fished, their fishing practices, and management of their fishing grounds. This included Marine Protected Areas (MPAs), the differences between static and mobile gear types, and the rivalry for space within fishing grounds.

There are several characteristics of the Scottish inshore fishing sector which were common to all the different capitals within the SLA:

- *The three mile limit* - in the West Highlands case study, the re-introduction of the three mile limit was prominent. However, interviewees and survey respondents across all Marine Regions called for better representation for static gear fishers. Any changes to the three mile limit will impact relationships, culture and resource management which all come under social capital, but also economics (financial capital), employment (human capital), and fishery stocks (natural capital). In turn, this means that any changes to management regimens should not only be made on the merits of evidence relating to fish stocks and economics, but also on the social and human aspects of employment, relationships, and culture.
- *Succession and work pattern* - the lifestyle of fishers is seen as a strong counterbalance to profitability in the sector; it deters new entrants as crew or owners, and has an impact on the livelihoods of families. Many regard it as 'worth it' for the benefits it brings in terms of individual satisfaction and often, income, but the all-encompassing demands of fishing, and the safety risks involved, were evident.
- *Brexit* - Many of the interviewees were critical of the Common Fisheries Policy (CFP) (which is an EU level policy), but were also uncertain of whether their dislike for it was because of the EU, or the way that it is handled through the Scottish Government. Brexit could provide an opportunity to improve relations between Marine Scotland and the inshore fishing sector through the provision of detailed information on decision-making processes and better access to decision-makers (if devolved). The combination of Brexit and non-European demand could have significant implications for the structure of the industry.

- *Gender* - Women's role in the inshore fishing industry was mentioned across all regions, from familial relationships through to land-based industry work such as book-keeping, processing and administration. Technological advances are likely to decrease the physical nature of the industry, which means that the culture of inshore fisheries needs to and in very small steps, is already changing to become more inclusive of women working on the water.

Integrating Socio-economic and Cultural Data into Inshore Fisheries Assessments

This work packages differs from others within the SIFIDS project in that it was built on qualitative data, before moving on to collect quantitative data. The cultural assessment was reliant on qualitative data, which benefited the economic assessment by providing context to aid an understanding why the market system is the way it is, why there are discrepancies, and areas where these discrepancies have the potential to be reduced through adjustments in reporting and data collection strategies. As such, the format of integration with the Integrated Data System (WP6) was complex, given the very different nature of the subjects and types of data involved – inductive and constructivist philosophies (humanities and socio-economics) in the case of this work package, and deductive and positivist philosophies (natural sciences and information technology) in the case of the other data collection work packages. The integration is through provision of currently available cultural, social and economic data, and methods for data collection (interview topic guide / structure and survey / statistics from Marine Scotland and Seafish). As the data on the social and cultural characteristics of the Scottish inshore fishery is a reflection of reality at a single point in time, the results will shift according to the political environment, opinions, and social norms, the movement of people, and the biophysical environment. It is therefore recommended that these assessments are repeated on a regular basis – perhaps in line the standard political and policy terms of five years.

CONTENTS

Acronyms & Abbreviations

BRES	Business Register and Employment Service
CFP	Common Fisheries Policy
CPP	Community Planning Partnership
DFID	Department for International Development
EMF	European Fisheries Fund
EMFF	European Maritime Fisheries Fund
EU	European Union
FA	Fisherman's Associations
FAO	Food and Agricultural Organisation
FLAG	Fisheries Local Action Group
GDP	Gross Domestic Product
GIFS	Geography of Inshore Fishing and Sustainability
GIS	Geographic Information Systems
GVA	Gross Value Added
HIE	Highlands and Islands Enterprise
IFGs	Inshore Fisheries Groups
LDP	Local Development Plan
MMO	Marine Management Organisation
MPA	Marine Protected Area
NGOs	Non-Governmental Organisations
NMPi	National Marine Plan Interactive
OSPAR	The Convention for the Protection of the Marine Environment of the North-East Atlantic
PR	Public Relations
RET	Road Equivalent Tariff
rIFGs	Regional Inshore Fisheries Groups
RNLI	Royal National Lifeboat Institution
RSPB	Royal Society for the Protection of Birds
SAC	Special Areas of Conservation
SAMS	Scottish Association for Marine Science
SCFF	Scottish Creel Fishermen's Federation
SFF	Scottish Fisherman's Federation

SIFIDS	Scottish Inshore Fisheries Integrated Data System
SIMD	Scottish Index of Multiple Deprivation
SLA	Sustainable Livelihoods Approach
SPAs	Special Protection Areas
SRSL	SAMS Research Services Ltd.
SSSI	Sites of Special Scientific Interest
TACs	Total Allowable Catches
TTWA	Travel to Work Areas
UHI	University of Highlands and Islands
UNCLOS	United Nations Convention on the Law of the Sea
UK	United Kingdom
WP	Work Package

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We are grateful to and thank the people who voluntarily gave their spare time to provide us with data and advice, without which, this study would not have been possible.

We would particularly also like to remember the lives of people that have been lost over the period of time that this study was taking place.

1 INTRODUCTION

1.1 Introduction to Scottish Inshore Fisheries

Scotland is the fourth largest sea fishing nation in Europe. It accounts for 80% of catch by weight of the total UK landings. The Scottish fishing fleet is comprised of vessels that are classified as over 10 m and under 10 m, the latter of which makes up the majority of the inshore fishing fleet, and also the majority of the total fishing fleet at 70% or 1,470 boats (2011) (Cook *et al*., 2016). Many inshore vessels have less than five crew members and are often crewed by single individuals (Marine Scotland, 2016a).

There are two species considered to be key for Scottish inshore fisheries; *Nephrops norvegicus* (langoustine/ scampi) and *Pecten maximus* (king scallop/ great scallop), but *Cancer pagurus* (brown crab/ edible crab), *Homarus gammarus* (European lobster) and *Necora puber* (velvet swimming crab/ devil crab) are also important. The top two species were valued at £78.3 million and £25.1m in 2009 respectively (Scottish Government, 2009). Some of these species capture span both inshore and offshore fishing sectors, and this has impacts not just operationally but in terms of how data for such species is commonly understood in the industry.

The inshore fishing industry landed £63.66m in 2017 by value (Marine Scotland, 2018a). This creates demand within an up-stream supply chain and product for down-stream transport, processing and retail functions. In some cases, such as within the boat building, repair and maintenance sector, worth £515m (Marine Scotland, 2016a), the inshore fishing supply chain can also be linked with oil and gas, aquaculture, transport, and marine construction services.

Although the economic value of the inshore fishing sector is small in comparison with other marine industries, it is an important part of the economy in rural and remote areas in Scotland, where job options are limited and many communities historically and presently rely on the marine environment for their livelihoods (Scottish Government, 2017a). As such, inshore fisheries can be described as a living heritage activity that is culturally embedded in many coastal communities (Urquhart *et al.*, 2013). Trade-offs with offshore sectors that can be competing for the same stock are contested, and policy decisions can affect the outcomes of both sectors.

Marine Scotland is the governmental agency responsible for managing all activities of fishing vessels within Scottish waters, covering the North Sea and West of Scotland out to 200 nautical miles (nm). It also manages the Scottish territorial waters, (that go out to 12 nm) in which much of the Scottish inshore fishing activities occur (see Figure 1.1). Marine Scotland, where relevant, works within legal measures for marine management set out by the European Union (Scottish Government, 2017a).

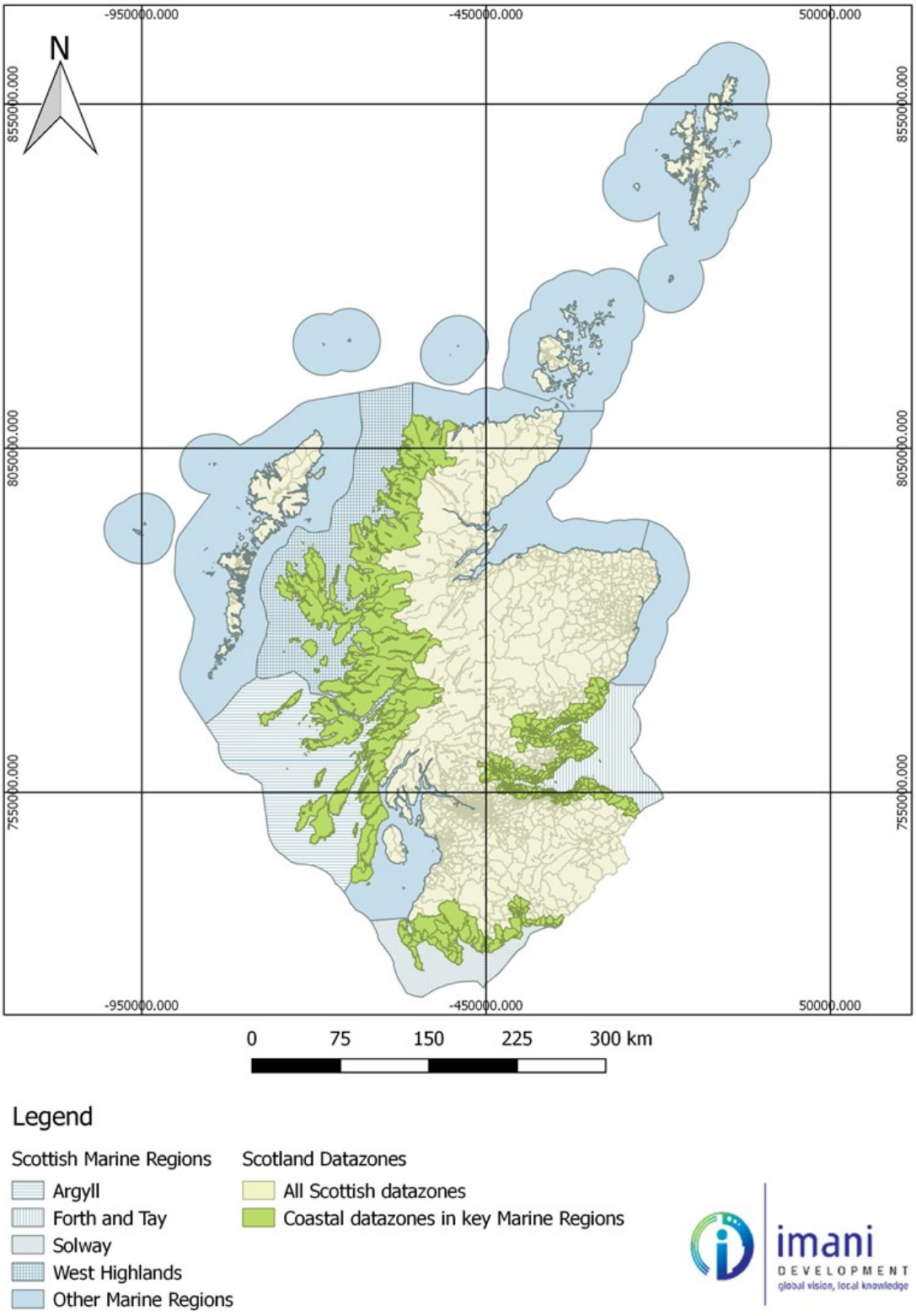

Figure 1.1. Marine Regions in Scotland with a focus on the key regions for this study, including the proposed landward extents for these regions. Source: Adapted by Imani Enterprise Ltd. from Scottish Government (2018a) data.

1.2 Purpose of this Report

The aim of this project is to develop descriptive frameworks and defined datasets and analysis to assess the socio-economic and cultural characteristics of Scotland's inshore fisheries, which are both replicable as a standard and updatable on a basis that is useful for policy-making and regulation. This assessment forms part of a wider attempt at integrating data on Scottish inshore fisheries, including quantitative measures of fishing effort, catch, and locations and the impact of the natural environmental and environmental changes on fishing behaviour through the EMFF funded Scottish Inshore Fisheries Integrated Data System (SIFIDS) project. The SIFIDS project is subdivided into 12 highly integrated "Work Packages" (WPs), ten of which are focused on the development of various aspects of the system and/or the collection of data relating to the inshore sector. The remaining two WPs encompass the engagement of the inshore industry and overall project coordination and oversight.

In this Work Package (WP4), an overview of the current available socio-economic data is presented and used to identify the data gaps. Primary research was conducted to fill these gaps and is presented alongside already available data to provide a robust overview of the sector. This socio-economic assessment is combined with primary research on the cultural characteristics of Scottish inshore fisheries in order to build a conceptual framework that captures complex cultural, social and economic relationships in a usable and useful manner.

At the start of this study the aim was to select four case studies to demonstrate economic impact in a particular context. However, at a specific port level, much of the relevant information is disclosive – i.e. if one splits by port and species, there becomes a very small number of fishers to whom it may be attributable. This was resolved by choosing four Marine Regions to provide regional results and summaries and by developing the following case study examples:

1. A typology of seven different market scenarios within the overall value chain
2. A breakdown of the revenues of an intermediary organisation, and
3. An individual fisher's earnings.

These are based on real company / organisation examples that have been anonymised. Where company figures are publicly available on Company's House, they have been stated so long as their information is not disclosive. Regional case studies (summaries) have included low level deprivation analysis covering individual data zone and the rest of the region's coast.

2 LITERATURE REVIEW

Inshore fishery sectors have several distinct features that set them apart from the rest of the sea fishing industry. Features include those that are clearly measurable, such as the size of vessels and type of catch, and those that are complex and less tangible, such as collective and individual identity, culture, heritage, and associated social and economic linkages. These characteristics are set within the context of global scale marine management agreements, supra-national legislation, and national and devolved (Scotland) policy.

2.1 Policy and Management Context

The UK and Scottish Governments are committed to the sustainable management of marine ecosystems, which includes inshore fisheries. The mechanisms that influence and / or direct the policy and management measures for the Scottish inshore fishery are; OSPAR[1] (managing the marine environment using an ecosystem approach), UNCLOS[2] (protect and preserve the marine environment), the Convention on Biological Diversity[3], the Bonn Convention[4] (conservation of migratory species), the United Nations Sustainable Development Goals[5] (marine conservation and sustainable use), the EU Habitats Directive[6] (Natura 2000 sites), the EU Marine Strategy Framework Directive[7] (achieving 'Good Environmental Status'), the EU Maritime Spatial Planning Directive[8] (reducing conflict, protecting the environment, and encouraging sustainable use), and the EU Common Fisheries Policy (fair competition and management of fish stocks).

The EU Common Fisheries Policy (CFP) aimed to increase fairness of competition through equal access to the waters around EU member states and provide integrated management of fish stocks through a quota system (European Commission, 2015). The CFP has been widely criticised by fishers and researchers alike due to its centralised structure (Prellezo and Curtin, 2015). Centralisation of management has been found to de-legitimise management measures as it excludes the practical and ecological knowledge and experience of those who are actually conducting the activity of fishing in a certain area (Berghöfer *et al*., 2008; Pita *et al*., 2010a). Although the Regional Advisory Councils brought in by CFP reforms were seen as a step in the

[1] Oslo and Paris Conventions – protection of the marine environment in the North-East Atlantic https://www.ospar.org/about

[2] United Nations Convention on the Law of the Sea – Article 192 Protection and Preservation of the Marine Environment http://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf

[3] The Convention on Biological Diversity – Aichi Targets (2010) for the promote sustainable use using the ecosystem approach https://www.cbd.int/sp/targets/

[4] The Bonn Convention – The convention on the conservation of migratory species of wild animals http://jncc.defra.gov.uk/page-1366

[5] United Nations Sustainable Development Goal 14 – 'Conserve and sustainable use the oceans, seas and marine resources for sustainable development https://sustainabledevelopment.un.org/sdg14

[6] EU Habitats Directive – provides protections for certain species and their habitats as well as management measures where species are exploited. http://www.snh.gov.uk/protecting-scotlands-nature/protected-species/legal-framework/habitats-directive/directive/

[7] EU MSFD – requires EU member stated to achieve Good Environmental Status for all of their marine environments by 2020. http://www.gov.scot/Topics/marine/seamanagement/msfd

[8] EU MSPD – requires EU member states to develop marine spatial plans, bringing together EU legislation for the marine environment as well as measures for sustainable development of 'Blue Growth' sectors. https://ec.europa.eu/maritimeaffairs/policy/maritime_spatial_planning_en

right direction, they excluded inshore fisheries from participating. As three out of four vessels in Scotland are part of the inshore fishery, these reforms were seen as ineffective in creating 'ownership' of fisheries management, which resulted in limited buy-in by fishers (Pita *et al*., 2010a).

The current legislative framework, working with EU legislation where relevant, for governing Scotland's inshore fisheries comprises: the Inshore Fisheries (Scotland) Act 1984, the Sea Fisheries (Conservation) Act 1967 and, the Sea Fish (Shellfish) Act 1967. A more recent addition to legislation is the Marine (Scotland) Act 2010 that aims for a more integrated management of Scottish territorial waters and marine resources by introducing streamlined licencing, monitoring, conservation and enforcement measures. Its main product to-date is the Scotland's National Marine Plan (waters extending to 200 nm) and the formation of 11 Marine Regions (Figure 2.1) for planning for inshore waters (out to 12 nm) (Scottish Government 2017a). Marine Scotland is responsible for the enforcement of these acts, which generally covers practical management measures for aspects such as vessel size, gear type, landing restrictions and either permanent or temporary closure of grounds, licencing, monitoring and planning (Scottish Government 2017a).

Marine Scotland has exclusive governance of Scotland's inshore fisheries (out to 6 nm), shared responsibility where there are historic rights to grounds (6 - 12 nm) and where EU legislation is not otherwise dictated. In a bid for more inclusive management, Marine Scotland formed Inshore Fisheries Groups (IFG) (2013-2016), which have been superseded by five Regional Inshore Fisheries Groups (rIFG) (2016 – present, see Figure 2.1). The aim of the rIFG is to capture the voices of inshore fishers at a local level (between zero and six nautical miles from the high tide mark (Marine Scotland, 2016b), and to feed into Regional Marine Planning Partnerships (the agency through which spatial decisions for the marine environment will be made) through a Fisheries Management Plan (Marine Scotland 2015).

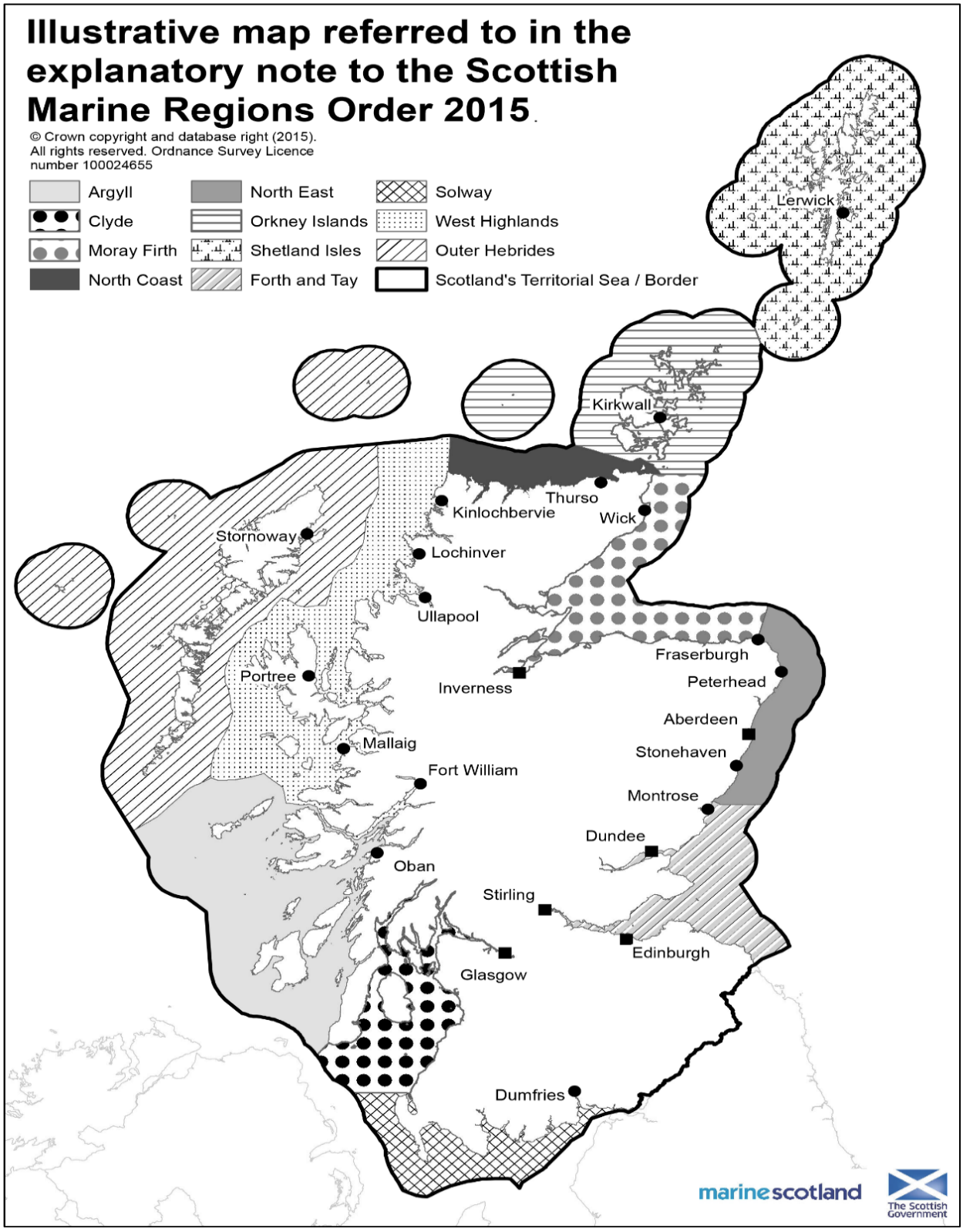

Figure 2.1. Scotland's Marine Regions. Source: Marine Scotland (2015a).

One of the aims of the original IFGs was to encourage more participation from inshore fishers. However, Msomphora (2015) found that although there was participation, the scale of the IFG

and therefore the balance of power between the different Fisherman's Associations (FA) involved, affected levels of participation and engagement. She found that within the smaller Outer Hebrides IFG there were higher levels of satisfaction with the participation, but where the IFGs were bigger, such as in the West Coast IFG, there were lower levels of satisfaction. Pieraccini and Cardwell (2016) argue that the limited number of FA involved in the IFG means that there is a 'problem of elite capture', where a small number of actors are dominant in the system, leading to limitation in democratic management and participation. Both Msomphora (2016) and Pieraccini and Cardwell (2016) found that the IFGs were limited by their 'consultant' status and by the small number of stakeholder groups involved. Msomphora (2016) advises that although participation of fishermen may be relatively high, the lack of accountability and management power given to the IFG has resulted in the tensions between Marine Scotland and fishermen remaining high.

Although the previous paragraphs in this section have focused on the mechanisms for the *management of* Scottish inshore fisheries, Nightingale (2013) provides an insight into why managing the sector is problematic. She explores the roles of self, subjectivity, emotion and experimental knowledge in relation to fishermen and fishing activities, presenting the argument that it takes more than a boat, gear and the ability to catch fish to be 'a fisherman'. To be 'a fisherman' is a knowledge and culture unto itself and one which is not shared with fisheries policy officers or regulators but is often admired by communities due to positive emotional, social, and economic connections (Urquhart *et al*., 2013). Nightingale's (2013) research, over eight years, shows how fishermen view themselves, how they are viewed by managing agencies, and the setting of meetings between the two, regardless of intent or practice, affects relationships – often in a negative way. This has created a friction between *management of* inshore fisheries and *management for* inshore fishers and fisheries, with evidence of the former often taking precedence in management approaches (Nightingale, 2013; Msomphora, 2015; 2016; Pieraccini and Cardwell, 2016).

2.2 Catch, Gear, and Vessels

The Scottish inshore fleet is diverse and includes trawlers, creelers, dredgers, netters, divers and hand gatherers. The vessels utilised are typically 8 – 10 m in length and have one or two-man crews who often work part time (Marine Scotland, 2016b). Other key characteristics involve the dominance of shellfish as target species, the majority of which are landed into small ports, harbours and other landing places (Marine Scotland, 2017). Types of catch, gear type and their associated regulations can be seen in Table 2.1.

Table 2.1. *Inshore fisheries species and gear type (adapted from Scottish Government 2017a).*

Species	Common name(s)	Gear type	Regulation
Nephrops norvegicus	Langoustine, Norwegian lobster	Trawling, Creels	CFP - have been allocated the majority of the Total Allowable Catch in Scottish waters.
Cancer pagurus	Brown crab	Creels	Scottish licence for landing anything over 25 units per day.
Homarus gammarus	European lobster	Creels	Scottish licence for landing anything over 5 units. Minimum landing size of 87 mm (Shetland and Western Isles have larger landing sizes). Maximum landing size of all females is 155 mm.
Pecten maximus	Great scallop, king scallop	Hand diving, Dredging	Minimum landing size of 105 mm (Shetland remains at 100 mm, Irish sea south of 55°N remains at 110 mm). Tow bars restricted to 7.5 m in length *or* a remote electronic system allowing Marine Scotland to monitor the number of dredges being used should be installed on vessels.
Aequipecten opercularis	Queen scallop	Hand diving, Dredging	Minimum landing size of 40 mm. Currently under consultation to increase landing size.
Necora puber	Velvet crab	Creels	Scottish licence for landing anything over 25 units per day. Minimum landing size of 65 mm (except Shetland).

Gear type, fishing effort, and bycatch are key aspects of fishing activities, which have environmental impacts (Gascuel *et al*., 2016; Heath *et al*., 2017). Trawling and dredging have long been identified as having significant impacts on seabed habitats and species (Jones, 1992; Watling and Norse, 1998), whilst bycatch and subsequent discards can increase the mortality of non-target species (Alverson *et al*., 1994; Heath *et al*., 2017). Creeling has been identified as causing mortality to cetaceans, reptiles, and elasmobranchs through entanglement (Northridge *et al*., 2010; Stelfox *et al*., 2016). Identification of these environmental impacts has resulted in increased management of inshore fisheries (Gascuel *et al*., 2016). Over the past 20 years, there has been a shift towards an Ecosystem Approach to Fisheries Management, which includes humans as part of the ecosystem, in a bid to create a more holistic strategy and better social, environmental and economic outcomes (Gascuel *et al*., 2016).

2.3 Culture

'For many the term 'fishing community' is more closely associated with a collective memory of the past than with a functional description of the present' (Williams, 2008)

There was a trend of ethnographical research describing inshore fisheries communities in the 1980s, but was dropped for more 'policy-relevant' research into the 1990s. Since then the cultural impact of inshore fisheries has often been overlooked in policy, management (Urquhart *et al.,* 2013) and is sparse and ad-hoc in recent research literature (Defra, 2011; Jamieson *et al.,* 2009). This is despite inshore fisheries being identified globally as both the social and the economic drivers of small coastal communities (Gustavsson *et al.,* 2017). However, this is slowly changing as it is becoming clear that some management strategies are not meeting their objectives due to unacknowledged social and cultural interactions (Symes *et al.,* 2015).

'Fishing communities' is a term generally used for communities which have a 5 - 10% reliance of the local population on the fishing industry (Jamieson *et al.,* 2009). This historical reliance on fishing as a livelihood, not only for individual families but for entire communities has led to a cultural attachment to the activity and as an individual and place-based identity (Reed *et al.,* 2013). The difficulty of the activity, hauling gear, being out in cold and dangerous conditions, often being alone for long periods of time, and providing for local communities has created a 'heroic' persona which other professions might not accrue (Msomphora, 2015). On an individual level, inshore fishers have certain personal characteristics, learned or otherwise, which enable or predispose them to be able to carry out these tasks (Msomphora, 2015).

Place identity and culture are described in the literature as a combination of several place-related factors such as individual and collective place attachment, place character and place meaning (Reed *et al.,* 2013). The inshore fishing industry can act as a conduit for these aspects of place, through their 'intimate and on-going relationship with the nature of a particular space'. This relationship resonates out through local communities and the wider general public, creating value and meaning for that specific locality. Pita *et al*. (2010b) list items such as family tradition, way of life and lack of other qualifications or lack of willingness to leave the industry as reasons why there are still inshore fishing communities present in coastal areas today. However, they also found that in Scotland place attachment was stronger than personal identity with the fishing industry. In other words, Scottish inshore fishers are more likely to leave the fishing industry than leave the location where they live. This finding was contrary to English, Greek and Italian inshore fishers, who would prefer to move locations than leave the industry. Pita et al. postulate that this is because of the historical context of the Highland Land Clearances and the resonating influence that it has had on Scottish culture, particularly in rural coastal areas.

In Scotland, the inshore fishery is not a large industry, especially in comparison to coastal tourism, aquaculture, and demersal and pelagic fisheries. This means that the resilience of rural coastal communities is no longer directly linked to the inshore fishing industry as it once was because it is no longer the 'dominant force' driving the local economic and social systems (Symes *et al.,* 2015). The rise of 'post-productionist' society – where most human populations are not connected with the production or harvesting of food – degrades the value of fishing both socially and economically. When this is added to a historical issue of overfishing and scientific uncertainty around stocks, fishers are deemed as 'unsuitable' for managing their resource without stringent regulation – something which is reflected in policy measures and the culture of regulating agencies today (Nightingale, 2013; Symes *et al.,* 2015). However, both Symes and Nightingale find in their case studies that regulatory culture and measures gleans results that are unintended, often resulting in poor outcomes for both fishers and stocks. They argue that this is because policy lacks a social understanding and therefore a social dimension, which could account for these issues. Nightingale shows that inshore fishers (mainly creelers) are some of the last people

in Scotland to have a real connection to the natural marine environment and can have conflicting behaviour when posed with different social scenarios. She explains her examples through feminist theory, where individuals are forced into a pattern of behaviour not through their own agency, but through a constructed social environment. One example Nightingale provides is where competition for space within a fishing ground, is pitted against the desire to fish sustainably. Another is where inshore fishers are perceived to be non-compliant by regulators/ NGOs from the outset and so feel no motivation to either continue or start compliant behaviour, and can instead live up to the 'reputation' projected onto them by third parties. This explains why fishers sometimes over-exploit fish stocks and push the boundaries of regulation whilst also caring deeply about their local marine environment.

However, the industry is dichotomous in that local fishers, both creelers and trawlers, feel a deeper connection to the sea than non-local fishers. Although there is fierce competition between fishers from the same community from an economic and spatial perspective, they also form a community at sea who will do everything they can to help if a member if in trouble. The hostility and danger of the job is shared between fishers, creating a relationship based on conditions (such as the weather) which are not often experienced in other industries (Nightingale, 2013; Msomphora, 2015).

Nightingale (2013) pointed out there was a behavioural difference between those who see fishing as a way of life and those who see it solely as a business. Boonstra and Hentati-Sundberg (2016) add to Nightingale's work by attempting to assess the characteristics of fishers not only by their behaviour but also by their motivations. From their findings, they advise that classifications of fishing type such as gear type, size of vessel, and target species should include social dimensions such as motivation as they also impact fisher behaviour. Fulton *et al*. (2010) found that management structures and culture are often adept at understanding scientific and economic uncertainty but fail when it comes to social networks and risk profiles. They describe where fisheries systems use a 'band-aid' approach to try fill management gaps created by poor or unexpected results from policies which neglected to account for the social dimension of fisheries, calling them inefficient. They note how fishers are less likely to be compliant where measures are ad hoc and too complex because of the difficulty of compliance and the perception that regulatory agencies are not competent or do not understand the industry. This rift between regulatory bodies and those who fish is a persistent theme in literature on the cultural and social characteristics of inshore fisheries. Symes *et al*. (2015) advises that this tension between regulators and inshore fishers is now an embedded part of fisheries culture on both sides, making any changes inherently difficult.

In their review of literature on Scottish fisheries between 2000 and 2009, Jamieson *et al*. (2009) found that some of the cultural practices of the inshore fishing fleet were changing – especially relating to using family connections to hire crew and sharing the value of catches between crews and boats. They put this down to pressure for inshore fisheries to remain economically viable, shifting from a culture of information sharing to one of competition. They logged the demise of 'family' boats, and a shift in fishing practices from a way of life to a business and subsequent change from day trip work patterns to four to six days out at sea. They considered this a concerning transformation, which was echoed by Boonstra and Hentati-Sundberg (2016), showing that there are differences in exploitive practices relating to how fishers view themselves and their fishing activity. Jamieson's review (2009) noted that fishing is now, more than ever, being seen as a 'heritage' activity. This does not mean this inshore fishing is no longer culturally

embedded, it just suggests that the economic value of the activity is moving away from the value of the fish caught and more towards the value of the activity in the eyes of visitors, i.e. tourism.

3 METHODOLOGY

3.1 Approach to Write Up

In order to assess both the cultural and socio-economic characteristics of the Scottish inshore fisheries in a meaningful and replicable way this work package combines several methodological approaches. The socio-economic aspects were captured through a macro-level analysis of present and available data on economic outcomes (income, social deprivation metrics) and fisheries inputs (spending data, fish landings, asset costs) as well as face-to-face interviews, mapping the linkages with other industries, such as tourism, food and drink and rural infrastructure, supported through economic modelling, consultation and research. The cultural aspects were captured through qualitative face-to-face interviews in four Marine Regions (Argyll, Forth and Tay, Solway and the West Highlands), which informed a quantitative survey which was sent out to fishers in all 11 of the Marine Regions in Scotland. The results of these data collection exercises were described using the Sustainable Livelihood Approach (SLA) – an integrative framework that shows the complex linkages between the factors required for individuals and communities to have a sustainable livelihood. All data collection involving human participants followed the University of the Highlands and Islands (UHI) Research Ethics Framework and was reviewed and consented by the UHI Research Ethics Committee in May 2017 and amended to include further supply-chain interviews in February 2018.

Within this section, the theoretical underpinnings of the approach are firstly presented by; 1) explaining the overarching framework of the SLA, 2) defining the economic theory behind the socio-economic methods and, 3) detailing the social theory behind the methods for exploring the cultural aspects of the inshore fishing sector. Secondly, the practical measures that were used for data collection are laid out including; the interviews, the survey, supply-chain consultations, Scottish Index of Multiple Deprivation (SIMD), and data mapping.

3.2 Sustainable Livelihoods Approach (SLA)

‘The Sustainable Livelihoods Approach (SLA) seeks to understand scenarios in which people and communities can better maintain or enhance the assets on which their livelihoods depend, can cope with and recover from stress and shocks, and can provide for future generations’
(Chambers and Conway,1991)

A key dimension of achieving this is empowerment, i.e. that people in communities have greater voice and opportunity to influence structures and processes, and power to claim their entitlements to assets and (public) services. The SLA relies on a participatory approach whereby consultation with community members can identify relevant views about fisheries and their impact local on natural, social and economic contexts.

The use of SLA techniques has been standard practice in International Development (used by Food and Agricultural Organisation (FAO) and the Department for International Development (DFID), for example), particularly for fisheries, for over two decades. It is a conceptual framework in which to include qualitative and quantitative data and is a checklist of impacts that industry and policymakers can use internally to work through different impact considerations.

Contextualising a sustainable livelihoods model is essential: for example, a community or individual may experience an improvement in welfare due to improving their human capital (e.g. skills), or social capital (e.g. support for community projects, family remaining in the local area) or financial capital (e.g. increased wealth through paid employment) but those improvements or impacts may be vulnerable to change or dependent on one company's decisions, or changes to an industry's policy framework. In addition, the natural and physical capital considerations are also key in providing context and enabling a holistic approach. A suitable account of sustainability therefore takes into account the vulnerability and policy frameworks around people's livelihoods and strives for the most beneficial and (ideally) resilient current status and future for communities. Figure 3.1 below sets out the SLA framework.

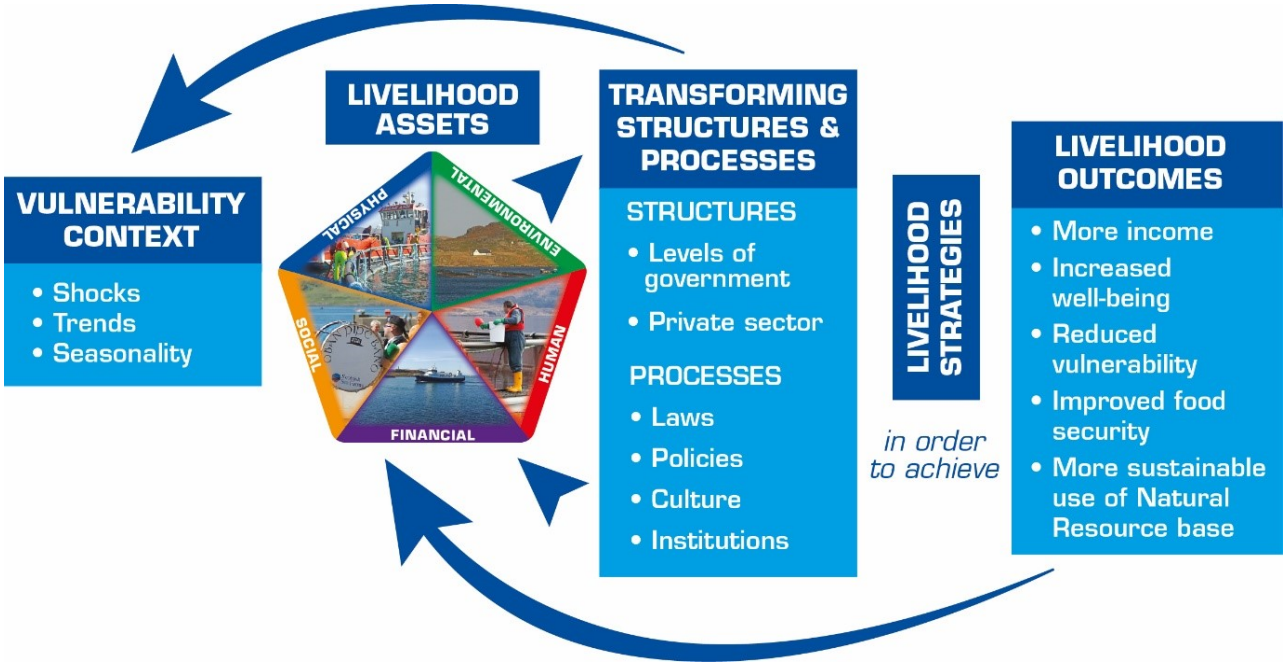

Figure 3.1. Sustainable Livelihoods Approach (SLA) Framework. Source: Imani Enterprise Ltd. 2018.

Taking a livelihoods approach provides alternative ways of thinking about the objectives, scope and priorities for the inshore fisheries sector within a community context – essentially it puts people and their priorities at the centre and starting point of development (Knutsson, 2006). People are given the opportunity to improve their well-being, avoid economic and environmental vulnerability, and face a viable future livelihood. This approach requires looking beyond raw economic Gross Value Added (GVA) data and identifies what health, social, risk-avoidance and environmental factors are also to be considered. A variety of research areas, primary case studies and local consultations provide evidence for these factors as appropriate.

There are five types of capital or livelihoods assets to consider within the SLA methodology:

- **Human** i.e. employment / skills / education / health[9]
- **Social** i.e. family / community life
- **Financial** i.e. income / earnings for business
- **Environmental/ Natural** i.e. land / water / wildlife / biodiversity
- **Physical** i.e. infrastructure / shelter / water / energy / communication.

The vulnerability context is a key consideration when working with fragile communities and so is important when looking specifically at the benefits of inshore fisheries to coastal areas. Issues such as policy change or changes in stock availability are 'shocks' to people's livelihoods, the effect of which will depend on their and their community's resilience. There can be an inherent trade-off between these capitals (for example, running down a natural resource for financial capital benefit), by tolerating a higher level of one capital over another. This may be seen to be risky or increase the vulnerability context unless sufficient mitigation strategies are developed. This can be a role for policymakers and democratic representatives to balance the livelihood assets mix appropriately.

Interviews formed the basis of content, which were then coded against these five types of capital to identify the drivers in social and economic factors for inshore fishers. Table 3.1 provides more detail on the types of impact, and different metrics and data that were considered from interviews, secondary research, statutory and national datasets, survey work and further primary interviews across the value chain.

[9] Note - Employment is often included in financial capital, however in this instance the consideration was the opportunity to participate in the workforce as opposed to level of financial remuneration

Table 3.1. Key components of the SLA for fishing.

Socio-economic Impact	Detail in fishing context (can include quantitative data and qualitative findings)
Human i.e. employment / skills / education / health, fulfilment, self-realisation	Employment data – focusing on careers and upgrading in remote / fragile economic areas. Skills data Relevant regional data Interview findings Regional findings
Social i.e. family / community life	As above – including community benefits, schools, population
Financial i.e. income / earnings for business	Landings data Value addition / downstream sectors Employment
Environmental/Natural i.e. land / water / wildlife / biodiversity	Access to fishing grounds Environmental impact – can be negative but in the SLA must be weighed in context with other impacts
Physical i.e. infrastructure / shelter / water / energy / communication	Roads, IT infrastructure, harbour provision, cold chain storage and export logistics
Risk and Vulnerability Impact	All the factors above were put through a risk and vulnerability 'screening' – i.e. how much risk / de-risking are all these factors. For example, a vulnerable area can be de-risked by new employment.

3.3 Economic Theory

Economic impacts of inshore fishing give policymakers and participants an understanding of why the activity is important for livelihoods. To assess the impacts, fishing activity was contextualised within its 'market system' that is, within the rules and supporting functions and associated industries (either geographically or economically related).

Data to assess impacts were built on national data on *outcomes and other economic factors* (social deprivation, Travel to Work Area (TTWA), employment) as well as the *inputs from* inshore fishing. Seafish economic performance survey data provides UK inshore fleet information. This was supplemented by survey work and interview data in this study. However, this data is not publicly available by Marine Region and is only one component of the full economic impact.

Many economic analyses of fishing focus on the optimal level of fishing effort to determine overfishing and effective resource management. While this is relevant in understanding the ongoing sustainability of the sector, the focus of the analysis in this report is on further understanding the socio-economic and cultural drivers of inshore fishing and the impacts beyond the fishers but which still derive from fishing effort, since these have been largely overlooked to date. Optimal fishing effort is not exogenous with respect to inshore fishing socio-economics and culture (fisher's livelihoods influence fishing activity), but the impacts of allocation policies and the market system (access rights, industry support measures, wider fishing industry quotas) on land-side activities are equally important.

3.3.1 Macro-Level: Macroeconomic Industry Analysis

During the analysis the team consulted with relevant stakeholders including data and regulatory bodies, fisheries groups and individuals to ensure its indicators were valid, desired and useable by the relevant institutions. Each data source has been recorded, noting what information is available at what level (e.g. national, regional, port, boat, individual), and has been combined with wider analysis and secondary publications on inshore fisheries to establish the significance to the Scottish economy.

This includes measuring the sector's economic performance emanating from landings, through the operational value chain models within the sector and demonstrating final impact. Evaluation of inshore fisheries economic multiplier effect on the regional and national economy has been modelled but has clear qualifications regarding assumptions used in the process. Technical multipliers (Type I indirect supply chain impacts, and Type II including wider economy impacts) reflect the circulation of additional investment in the sector for suppliers and for the wider economy, but is limited in giving sub-national results and does not fully account for impacts of different downstream value chain models, which must be described using qualitative research. The multiplier does not capture more conceptual or thematic linkages with other sectors, which were identified from initial interviews, such as tourism, food and drink, and rural infrastructure. These informed the focus of the value chain analysis to demonstrate supply-driven downstream impacts whereby inshore fishing volume indirectly drives processing GVA. This remains largely qualitative and greater focus on downstream linkages would be advisable beyond the more standard demand-driven multiplier methods. At present, this can be referred to as an impact beyond the stated direct GVA for fishers and type II GVA impacts for suppliers (indirect) and wider economy (induced) but would require more accurate attribution of inshore fishing inputs to

national processors through surveying processors specifically about inshore-caught intermediate products.

A supply-driven downstream impact is where inshore fishing volume to some extent indirectly drives processing GVA in the market system, either in Scotland or internationally, i.e. an additional 1 tonne of lobster caught will translate into up to 1 tonne of raw material input for a processor somewhere in the market system, which can in turn increase their processing output. Similarly, it has been argued that in forestry an extra tonne of timber derived from relatively fixed stock will translate into more local demand for timber processing (as set out in some detail in Roberts ed. (1999)) rather than be solely driven by final demand. While that does not apply in all industries, for inshore fishing processing, particularly local processing, it is evident that fish inputs would not be readily substitutable and that downstream jobs are attributable to Scottish catch. .The full realisable final value of Scotland's inshore fish products that is accumulated globally can be estimated, but within that total it remains uncertain exactly how much value is being captured by Scottish intermediaries, not least because inshore fishers can be largely disconnected from downstream actors and information of these flows remains very limited. Therefore, greater focus on quantitative surveying of downstream linkages through processors and retailers would be advisable from a policy context.

3.3.2 Cross Sector Market Linkages

The 'market system approach' has demonstrated how multiple players within a sector interact, illustrating to practitioners and non-practitioners how the inshore fisheries market operates, from government, rIFG, tourism industry, infrastructure, through to skippers and crew members (Figure 3.2).

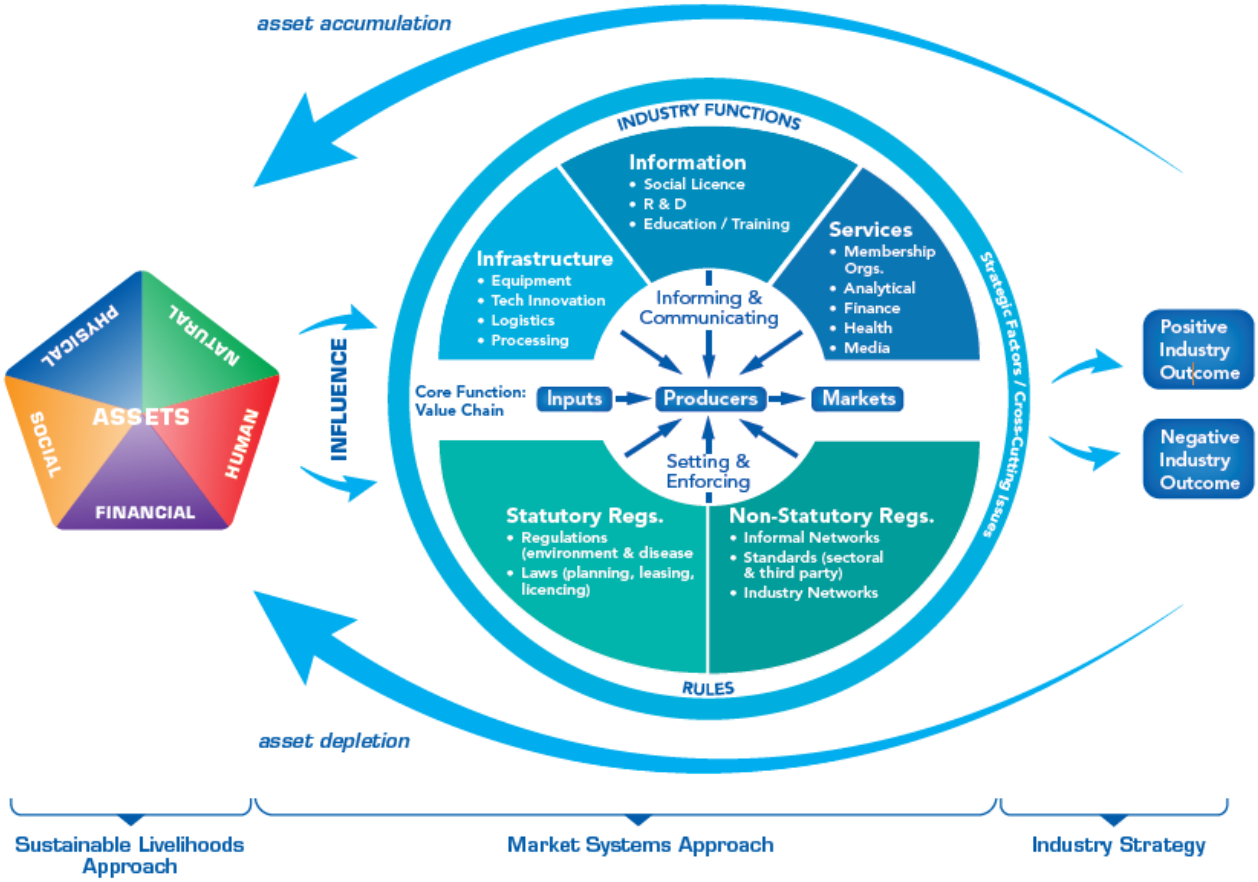

Figure 3.2. Market Systems Approach. Source: Imani Enterprise Ltd. and SRSL.

The market system – i.e. the rules, industry functions, and the actors in the value chain, create positive and negative outcomes that affect the asset base and livelihoods of the individual or local economy in question. This has been the framework in which inshore fishing value has been considered, i.e. as part of a larger market system that is dependent on, and influences, inshore fishing outputs.

The market system approach is particularly relevant in determining impacts where supply routes are changeable – for example, a fisher may be selling to one buyer then another over a given year or be selling (indirectly) into a European market. In such a context, the market as a whole is the relevant basis for analysis. Where supply routes are more fixed, as is the case with retailers requiring increasing traceability, the rules and functions at a market level required for such integration (for example, Marine Stewardship Council standards) are relevant.

3.3.3 Value Matrix of Results

Central to the project approach is to clearly articulate a summary of the impact at each level of economic analysis. The value matrix reporting disaggregates, where possible and where relevant, by species, geographic region and activity, subject to rules on data being disclosive (i.e. there may be very few individuals fishing a particular species in a particular region). The data

was collated using Scottish Government statistics, multipliers and Marine Scotland landings data. Some methods are acceptable at a national level but are not reliable at regional level. When this is the case, it has been stated in the text.

A non-hierarchical view of 'value' (i.e. one that considers strategic, social and risk factors beyond a narrow set of metrics) has been applied in line with the SLA – social and non-financial impacts were captured.

3.4 Social Approach

In this project, the description of the term 'culture' is adapted from the FAO (2001) Technical Paper on 'Understanding the cultures of fishing communities: a key to fisheries management and food security.' It is described as; the system of values, beliefs, normative behavioural patterns, attitudes, ideologies and taboos of a particular group of people at a particular time, that forms their way of life.

This project takes a mixed method approach for determining the cultural characteristics of the Scottish inshore fishing industry. Mixed method research within the social sciences is defined as the use of both qualitative and quantitative data within a study (Mason, 2006). The reasoning for using this approach is that qualitative data provided contextually rich regional summaries, where inshore fishing culture was characterised and differences between regions, revealed. Quantitative data provided a broad view of the key cultural aspects of the inshore fishing industry shared across the whole of Scotland. This section provides a brief overview of the thinking behind this approach, including the philosophy that informed the practical methodology.

Over the past two centuries, quantitative data was increasingly being seen as the epitome of social enquiry, with positivist (deductive) techniques dominating social science, psychology and to some extent, the humanities (Guba and Lincoln, 1994). However, this philosophy has changed to one of post-positivism (recognition that researchers/ observers interact with and can influence results), as the limitations of a purely quantifiable approach were realised. For example, directly observing and measuring the beliefs, values, thoughts, and emotions of people with certainty, is problematic at best. But this does not mean that these variables do not exist or that they do not have influence over individual behaviour, social interactions, and collective social constructions such as culture and governance/ policy arrangements. There are several forms of post-positivist philosophy. However, one of the most common and the one which underpins this work is constructivism – where individuals construct a view of the world based on their interactions and experiences. Constructivism rejects the idea that there is only one type of knowledge (that which is based on objective scientific enquiry), and accepts that knowledge can be experiential, plural and is coloured by the world-views of those collecting and presenting it (Trochim *et al*., 2015).

This philosophy filters down to the design of the social enquiry section of this work package as this mixed methods approach was driven by qualitative thinking (Mason, 2006). The qualitative approach was expanded through quantitative data collection. One of the key strengths of qualitative approaches is that they can reveal the lived and contextually rich complexities of the social world (Guba and Lincoln, 1994) and in this case, its links with the biophysical environment. In our work, the qualitative data informed the design of the survey (which collected mainly

quantitative data) so that the questions were grounded in evidence and contextual differences revealed between regions. Equally the quantitative data indicated whether certain aspects of the culture of inshore fisheries were context specific, or more generic across the whole of Scotland.

3.5 Interviews

The interviews followed a semi-structured format and were conducted with groups and individuals within the inshore fishing communities of four Marine Regions – Argyll, Forth and Tay, Solway, and the West Highlands. These regions were chosen in consultation with the other work packages in the SIFIDS project and Marine Scotland. They were carefully selected in order to maximise the amount learned from the study within the given time period (Stake, 1978). The criteria for selection of the case studies was that they represented some of the variation in contexts and nature of inshore fisheries but were also accessible and possible to research within the SIFIDS WP4 budget and time-frame. It was decided that Orkney would not be included in the case studies due to a study of a similar kind being undertaken at the same time, by the Orkney Fishermen's Association. Contact was developed and maintained with the Orkney researcher so that the two reports are comparable by use of similar methodologies. The Western Isles and Shetland were considered as they represent very different socio-economic and cultural scenarios to the mainland however, in consultation with Marine Scotland and the rest of the SIFIDS work packages, they were ruled out due to budgetary and time constraints. The Clyde was not considered because of the ongoing Marine Spatial Planning consultations and the engagement fatigue of inshore fisheries stakeholders within that region.

The interviews covered economic, social and cultural content (the topic guides can be found in Appendix 1). They followed a 'funnel semi-structure', beginning with open ended and broad questions and ending with more specifically targeted questions (Hove and Anda, 2005). This type of interview structure was chosen so that the participants felt comfortable during the interview, as there were no 'wrong' answers (Hove and Anda 2005). This technique tends to elicit detailed information, requiring less time than an extended sequence of closed questions (structured interview) (Dicicco-Bloom and Crabtree, 2006). It also allowed for flexibility during the interview and provided a large amount of insight into the interviewee views without moving too far off topic, as is the danger with unstructured interviews (Atkins, 1984). This insight was highly desirable as detail on the motivation/drivers, behaviour and views of the interviewees were critical to the project.

The interviews were recorded by written notes. There were two researchers at all of the interviews, one taking notes and the other asking the questions and engaging with the interviewee. The interviewees were contacted via email and phone with a paragraph describing the SIFIDS project, what the interviews were about, who the interviewers would be, and the way that the collected data was going to be used. The interviews for each region were conducted within one week (one week per region), equalling four weeks of fieldwork in total.

Before the interview commenced the interviewer stated that all of the data the interviewee provided would be anonymous, and used in journals, reports and articles and that if the interviewee wanted to withdraw from participating after the interview, they could contact the researchers via email or phone and the researchers would delete any information that they

provided. The interviewer then asked if the interviewee provided verbal consent for the interview to go ahead based on the terms above.

Data from the interviews was thematically analysed through a qualitative coding approach (Saldana, 2009) and QSR Nvivo software, so that the context of the statements was not lost. The strength of this method was not in its ability to extract exact truths (Maxwell, 1992), but rather to form an in-depth and contextual understanding of the processes, relationships, behaviours, and beliefs of the inshore fishing communities in each region. This enabled the researchers to build up a rich picture of what the social and economic aspects of the inshore fishery are really like in Scotland.

3.6 Survey

The qualitative data informed the design of a quantitative questionnaire that was administered throughout Scotland's fishing communities with the help of WP7 and using the Survey Monkey online platform. The emergent themes from the interviews formed the six sections in the questionnaire, and informed the questions asked within each section. The questionnaire combined dichotomous questions (yes / no) with Linkert scale questions (strongly agree, agree, disagree, strongly disagree), as well as standard demographic questions. A pilot survey was conducted with 12 respondents, including an expert in survey work, before the survey was sent out. As a result of the pilot, grammatical and spelling errors were limited, and a small number of questions were re-positioned and re-worded. At the request of WP8B, one question relating to the state of the sea was added to the survey. The survey questions can be found in Appendix 2.

Self-selection sampling was chosen as the project team wanted participants, whether individuals or organisations, to choose to take part in research of their own accord. This was an important consideration when the project team designed the research strategy for WP4 as the wider project requires access to, co-operation and ongoing collaboration with the inshore fishers in Scottish waters. The aim was to build a good relationship with fishers, whilst also testing data-collection frameworks that can be used in the future. The data collected was also to be useful to those participating in the exercise (and other interested parties). As such, it was determined that a probability-sampling regime was problematic at best. Especially when taking into consideration 1) the difficulty of defining the parameters of representativeness (e.g. gear type, fishing effort, vessels size, age, location, number of years working in the industry etc.), 2) the collaborative nature of this project, and 3) the ethical boundaries set by the UHI research ethics framework (below), under which this WP was operating.

> 'The UHI Ethics Framework is developed in keeping with accepted norms and practices of research in other higher education institutions and professional bodies in the UK and abroad, including:
>
> - Consideration of the research risks - 'does not harm';
> - The need for informed and voluntary consent of participants;
> - The need to respect confidentiality and the anonymity of participants.' – UHI Research Ethics Framework

The surveys were sent out to all rIFGs and the full list of fishers who were signed up to the project through WP7 in November 2017. The email contained information on the SIFIDS project, what

the survey was about, how long it would take, a statement that all of the data would remain anonymous, and the survey link. A follow-up email was sent by WP7 in January 2018 stating the closing date in March and the survey link was displayed on the SIFIDS website and was also promoted through the Scottish Association for Marine Science (SAMS) Twitter account.

The data collected from the dichotomous and Linkert scale questions were treated as items, and therefore classed as ordinal (where the variables have natural categories) and analysed accordingly, using descriptive statistics within MS Excel (mode/ frequency – reliability dependant on response rates) (Gable, 1994). The qualitative questions within the survey were manually coded in MS Excel and converted to quantitative data, as there was not a large enough amount to warrant the use of QSR Nvivo software. For example, when asked if there were any additional comments on how to best manage inshore fisheries, the number of times a certain strategy was mentioned was tallied. However, in some cases the qualitative data from the survey was reported as such, where the context of what was being said was deemed to be more important and relevant than the number of times it was said. The survey provided a Scotland-wide assessment of the social and cultural characteristics of inshore fisheries.

3.7 Value Chain

3.7.1 Value Chain Analysis Methodology

Analysis of the value chain was based on data from the initial interview phase to determine the linkages between fishers and their (upstream) suppliers and (downstream) buyers. This was important in the valuation and conceptual understanding of the inshore fishing to the region, nationally and across the whole value chain (often internationally). While many of these operations are based in coastal areas, they may be geographically very disconnected from the coast where inshore fish is landed. Primary research was undertaken through initial interviews, survey work and subsequent supply chain interviews, and cross-referenced with secondary surveys and reporting, e.g. Seafish reports and regional case studies (varying by remit). Where there are small numbers of inshore fishers catching particular species in a particular region, data can become disclosive (i.e. information on individual fishers may become identifiable), and therefore data is presented in a manner that prevents this.

The economic linkages cited by respondents in the interview phase were followed up with specific value chain questions (for which additional ethical approval was obtained in February 2018). Once categorised into a typology of different supply routes with different economic impacts locally and nationally, the proportion of product going through each route was estimated through interviews (since it is not disaggregated through other means). Where necessary and available, Companies House data has been used to understand the magnitude and impact of different processors, though with smaller scale businesses accounts information is more limited.

The use of case studies of commercial operations has been kept anonymous, but this study was still able to identify the dependencies and linkages between inshore fishing activities and overall economic benefit. This approach has been undertaken in the aquaculture sector (Alexander *et al.,* 2014), with a whole-value-chain approach, which examined the total economic impact of activities from direct economic activity of a primary industry through to indirect and induced

impacts. Often the indirect impacts can exceed the direct – however, it is crucial to identify the causality and dependencies involved. For example, a fish processor on Mull may depend almost entirely on local stock, whereas a fish processor in Grimsby may be able to substitute one supplier for another relatively easily, including imports.

Value chain analysis posed geographic challenges – a tightly defined study region provides limited insight when the economic value may quickly transfer (or 'leak',) to another region. The value chain approach identified the impacts – whether positive or negative – that were realised beyond the immediate vicinity of the economic activity.

Based on information regarding constraints and opportunities mentioned in interviews and survey work, areas where Scotland or the UK may increase its commercial value derived from inshore fishing were identified.

3.7.2 Challenges in Socio-Economic Methodology

Available data: The Riddington *et al*. report for Marine Scotland 'Management of The Scottish Inshore Fisheries: Assessing the Options for Change' (2014) sets out the value of landings based on ScotMap data, though this data is now no longer collected in the same manner for vessels under 15 metres. Landings data is broken down by region and species together, but risks disclosure of individual fisher data. Fisher costs and income are captured by Seafish surveys but aggregated at a UK level for publicly available data.

Scope: One function of understanding economic impacts is to assess comparative benefits. The SIFIDS analysis did not extensively compare the relative payoffs of different policies around inshore and trawling activity, which is an ongoing focus of analysis (for example, in the Scottish Creel Fisherman's Federation report (SCFF, 2017). This is often quite context or species-specific.

Landings data: The value per kg of product can be demonstrated, but aggregate values for the total industry depend on landing figures which were repeatedly doubted / questioned by fishers and processors during the interviews. If landing figures are unrepresentative, there are limitations in extrapolating from them. At the time of writing data taken from Marine Scotland's Fish 1 forms are currently in the process of being updated (i.e. 2017 forms are still being entered). It is not clear why reported landings might not reflect the true figure, but suggestions from interviews included under reporting for tax purposes, 'recreational' fishers not needing to declare their catch, and instances of illegal fishing activities (e.g. 'bandit' boats come into an area and raid it overnight).

Wild catch as a variable product: Gaining a representative gross margin analysis across multiple prices and seasonal variability is prone to error. Estimates are given based on those 'in the know', i.e. those who are most likely to see the trends in demand and through day-to-day activities have gained better visibility of where product is going.

Many impacts are not local or even national: The value per kg will depend on the size of the catch, seasonality, and prices on the European continent. The Scottish industry is a 'price-taker', i.e. it has limited impact or negotiating power on the market price in Europe, and therefore pricing strategies cascade back from that variable. Further, the full realisable value of product is based on overseas use.

Value of the industry: The value of inshore fishing is highly contested because its substitutability as a product is unknown (though there is secondary evidence for different prices for creeled vs trawled product – discussed in Section 4.3). It is also contested because the degree to which trawling is at the expense of creeling and vice versa is unresolved.

Causality: The scope of assessing *economic outcomes* in local areas will depend on the scale of inshore fishing to other economic activity. Where some areas have quite concentrated fishing activity, much of that may be unrelated to inshore fishing. This has been considered and evaluated (see below).

3.8 Scottish Index of Multiple Deprevation (SIMD)

This study aligned the Scottish Index of Multiple Deprivation (SIMD) with Marine Regions to determine levels of deprivation in coastal communities with the aim of determining whether any meaningful results can be drawn from it in relation to inshore fisheries. The definition of deprivation has been taken from Townsend (1993) and formed the basis for the development of the SIMD:

"People are relatively deprived if they cannot obtain, at all or sufficiently, the conditions of life – that is, the diets, amenities, standards and services – which allow them to play the roles, participate in the relationships and follow the customary behaviour which is expected of them by virtue of their membership of society. If they lack or are denied resources to obtain access to these conditions of life and so fulfil membership of society, they may be said to be in poverty."
(Townsend, 1993: p.36)

The SIMD is a tool used by the Scottish Government to help identify areas throughout Scotland that are considered to be deprived and to help improve the understanding about the outcomes and circumstances of the people and communities living within these areas. This Index contains 38 different indicators covering seven different dimensions of deprivation that are weighted according to: A higher weighting given to income, employment, education, and health, with a lower weighting given to housing, crime, and geographical access to key services. These are combined to create the overall SIMD, which ranks small areas (data zones) from the most deprived (ranked 1) to the least deprived (ranked 6,976). Deprivation is usually expressed by data zones below a certain level, i.e. the 10%, 20% of most deprived areas (Scottish Government, 2018a).

Although the SIMD is useful and has been used to target funding to help tackle poverty in areas of high multiple deprivation, there are a number of limitations associated with the SIMD that are relevant to this study. As the Scottish Government (2010) and Jones (2013) point out, the SIMD does not adequately identify deprivation in rural areas, partly because it classifies deprivation by the top (and bottom) 5%, 10%, and 15% across Scotland, which is dominated by cities, which are affected by deprivation in different ways to rural regions. As data zones are determined by population, usually between 500 and 1,000 household residents (Scottish Government, 2006) it means that they tend to be much larger in rural areas as households are spaced further apart, and do not tend to capture the dispersion of deprivation as well as urban areas are able to, which is reflected in the differences between the West Highlands and Forth and Tay Marine Regions. As in Jones' (2013) study, coastal areas are of interest in this study and therefore a similar methodology will be used. This study undertook the analysis based on The James Hutton Institutes' (undated) definition of coastal areas – areas within 5 km of the coast including estuary and river limits. This was done using Geographic Information Systems (GIS) software where all data zones that were within 5 km of the coastline including estuary and river limits were included. If a data zone was whole or partially within 5 km of the coastline, that data zone was included in the study. The key question addressed in Jones (2013) was whether fishing communities were suffering hardships or multiple deprivation because of a decline in fisheries. The results presented data at Local Authority Level and reported that there were no correlations between fisheries change and social conditions in fishing communities. This study however, looked at ways in which publicly available datasets can be used to help inform policy makers on the socio-

economic, and cultural aspects of inshore fisheries A qualitative summary on deprivation levels has been provided for each region in Section 5.

Data and the analysis is discussed in the context of the four regions; Argyll, Forth and Tay, Solway, and West Highland Marine Regions to determine the social and economic aspects of inshore fishing and coastal communities in these areas.

It is important to note that the analysis for this study is affected by the separate way in which the marine and terrestrial environments are considered. At present there is no overlap which means that getting the available data to link to both regions is limited. This will be discussed in more detail in Section 3.9 below.

3.9 Data Mapping

This section looks at a number of data issues that were encountered in trying to assess the socio-economic aspects of inshore fishing. At the start of this project, a data mapping exercise was undertaken to determine what economic data was available by Marine Region for the inshore fisheries sector.

3.9.1 Availability of Data

Figure 3.3 provides an overview of the data that was found and details the level at which this information is publicly available. The availability of the data was identified through interviews with Marine Scotland, Seafish, harbour authorities, and fisheries groups. This diagram shows that although there is a wealth of data on fisheries in Scotland, it is not necessarily readily available for the inshore industry, or by Marine Region. Further information and reasoning can be found in Appendix 3.

	Landings / Revenue / Processing				Inputs and economic data		Land / port side datasets		
	Marine Scotland (2018c)	Seafish Economic Performance	Sea Fisheries Statistics and MMO	Seafish Seafood Processing Statistics	Seafish Economic Performance	Survey and interviews	SIMD (Deprivation)	Travel to Work Areas (TTWA)	Survey and interviews
UK									
Scotland									
Region									
Marine Region									
Port level									
Individual									

KEY

	Data is not required at this level and is available through other national sources
	Data is publicly available at this level
	Available with some additional data processing
	Available on request from the provider
	Not available for inshore sector or by Marine Region to the study's knowledge; could require generating primary data

Figure 3.3. Data mapping exercise on the availability of data and level of coverage.

Due to data protection policies, Marine Scotland only shared data of inshore landings aggregated for each of the 11 Marine Regions. Data is provided to Marine Scotland at port level by individual fishers through Fish 1 forms and log books. Marine Scotland and WP2B of SIFIDS are looking at ways they can automate these forms to reduce the paperwork for both fishers and the authorities. Scottish ports were divided into the 11 Marine Regions, and data on landings, by volume (tonnes), value (£m), and species was provided from 2010 – 2017. Data was further broken down by vessels less than 10 m and vessels between 10 - 12 m. All vessels less than 12 m in length are considered to be 'inshore' vessels for the purposes of this study. It has been noted however, that the figures in this work do not match those produced in WP1 which looks at the 'Review and Optimisation of Shellfish Data Collection Strategies for Scottish Inshore Waters'. WP1 data for selected shellfish species is taken from the Scottish Sea Fisheries Statistics but does not give a breakdown of species by boats under 12 m, and larger vessels, thus capturing more landings than the definition used in this study.

The replicability of the socio-economic study relies on provision of data from Marine Scotland on a by request bias, as data are not currently publicly available by vessel length, species and Marine Region. In addition, the data that are publicly available is up to two years old, with only provisional data available for more recent years (i.e. 2017 and 2018). Marine Scotland are aware of this and are looking at ways to reduce the lag time on data, one of which is the automation of the Fish 1 forms.

3.9.2 Definitions, Boundaries and Data Sets

This WP relied on both land and marine data sets for its assessment of the socio-economic aspects of Scottish inshore fisheries. However, the geographical borders of land and coastal socio-economic data sets are not aligned. For example, the Argyll & Bute Council land boundaries fall within both the Argyll and Clyde Marine Regions, making it difficult to overlay SIMD and Marine Scotland datasets (Figure 3.4). The SIFIDS project defines inshore vessels as those that are <12 m in length. This study presents data for vessels under 10 m and between 10 - 12 m and included assessment of the land-side data to determine deprivation levels using the SIMD (as discussed in Section 3.8), and other socio-economic indicators such us housing, crime, access to services, income, and health, describing the populations that border the Marine Regions.

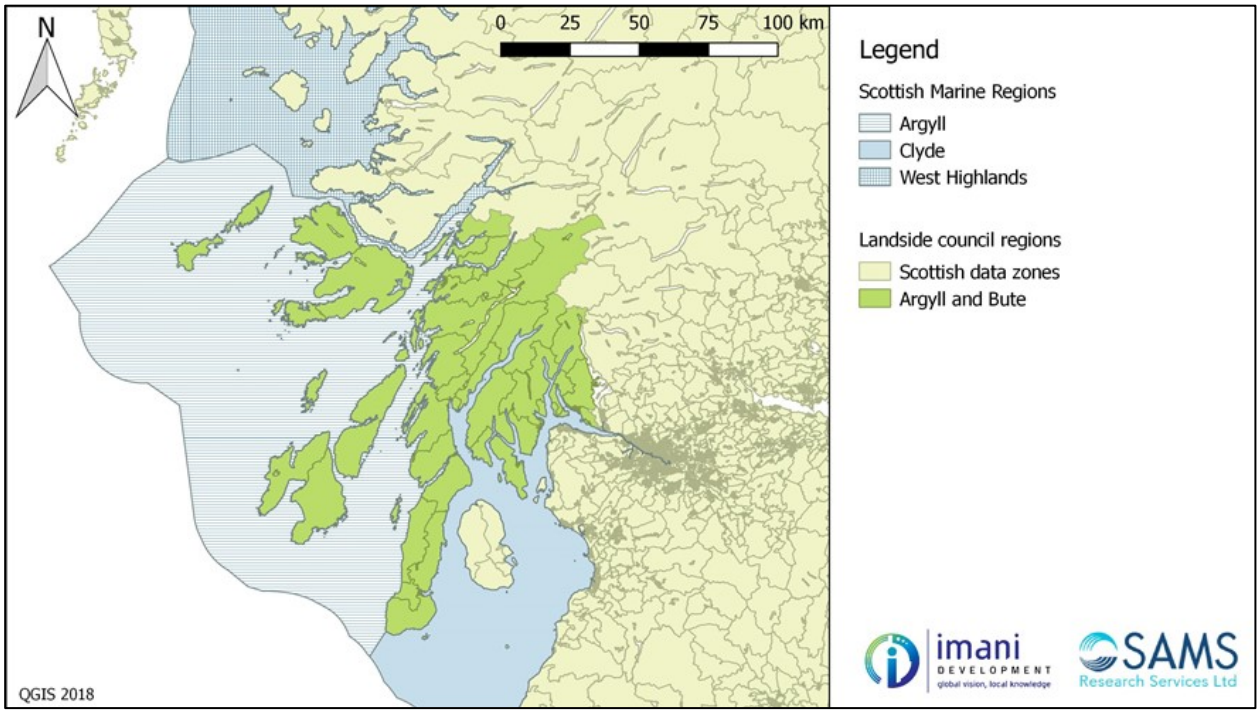

Figure 3.4. Illustration of the differences in land and marine datasets. Source: Adapted by Imani Enterprise Ltd. from Scottish Government (2018a) data.

There are several datasets that do not distinguish between offshore fishing activity and inshore fishing activity; the boundaries between these two fishing sub-sectors are not clearly defined. Although, some definitions of fishing activity do suggest that the inshore sector extends to 12 nm, this is not a standard definition that is widely used. In addition, it is unlikely that fishers will adhere to these boundaries, and it will be difficult to regulate fishers despite the use of AIS (Automatic Identification System) and other tracking systems as being investigated by WP8.

These data issues place categorical restrictions on dataset matching and data aggregation when it comes to analysis and create further challenges when trying to align this information to land-side data. Due to undefined land-sea boundaries, and the landward extent of these boundaries,

determining the diverse value chain characteristics and complementary industries, and widely ranging economic geography and connectivity (i.e. Forth and Tay versus Outer Hebrides) is complex and complicated by the variability of each region. The analysis undertaken using the SIMD attempts to merge the coastal and landward data, setting limits of 5 km as the Marine Regions do not have a defined land boundary. Links to areas included in the value chain analysis was also considered (see Section 4.3).

3.9.3 Economic Data

The economic valuation of inshore fishing is largely derived from the value of landings, which reflects the nominal value realised by fishers; interviewees repeatedly cast doubt on the reliability of volume figures from which these derive; nevertheless, they are only part of the full valuation story, because the fish product is then subject to transport and often processing and retail beyond the harbour, but these activities are fundamentally dependent on the original landed product. The upstream (inputs for inshore fishing) and downstream value (value addition to the fish further 'down' the supply chain) from the landings have therefore been included in a more comprehensive value chain discussion. Other valuation methods consider alternative uses of the same resource (often spatial resource): The 'Grid Economics Report', (Riddington *et al.,* 2014) is a comparative study of economic impacts of the inshore fishing sector and other interacting marine sectors. It sets out considerations for different types of economic and social valuation. It uses the value of landings based on ScotMap which collected information on all vessels <15 m. This is now no longer collected. However, the Scottish Sea Fisheries Statistics (Scottish Government, 2016) provides landings by species, from which some national and port-level values can be derived for those species that are inshore-only (i.e. scallops and *Nephrops* being subject to different fishing methods are not disaggregated by method). On request, Marine Scotland have provided the species data by vessel size, which provides detail by vessel, species and region.

Such comparisons of relative payoffs for different policies around inshore and trawling activities are an ongoing focus of analysis and debate within Scotland, for example in the Scottish Creel Fisherman's Federation *Nephrops* report (SCFF, 2017). The SCFF report in turn highlights that different supply routes for *Nephrops* have different supply chain impacts and goes into comprehensive comparative detail of the economic and environmental impacts of trawling and dredging. The consideration of comparative direct, indirect and induced effects remains relevant, and demonstrates how dependent fishing outcomes are on a number of macroeconomic and policy factors. It also notes that substitution effects are unknown or at least contestable, i.e. what is the counterfactual economic activity, which may or may not replace current activity. This is a crucial factor in assessing whether the higher value of creeled rather than trawled *Nephrops* is realisable. In the context of a very large Continental market, it is possible that it is realisable, but would require further sensitivity analysis. A 2017 report into *Nephrops* values commissioned by the Scottish Fishermen's Federation (SFF) (Russell and Mardle, 2017) considers the relative values further.

The Grid Economics report (Riddington *et al.,* 2014) also highlights the challenge of assessing social outcomes with respect to dependency on fishing:

'Campbell (2010) examines the evidence [on fishing dependency] using Travel to Work Areas (TTWA). They found that crude measures of fisheries dependence can be misleading. In Scotland only three out of 38 coastal TTWAs show a level of employment dependence in excess of 10% (Fraserburgh 19.6%, Berwickshire 12.3%, and Uists and Barra 11.1%) and a further seven TTWAs over 5%. The measure of dependence is based on direct employment in fishing, fish processing and aquaculture. It excludes any multiplier to account for other local employment wholly or partly related to fishing activity (repair facilities; gear manufacture; box making; ice plants; transport firms etc.), let alone the proportion of local service sector jobs dependent on the local spending of incomes generated in the fisheries sector. Nor are there any regular, up to date, comparative data on value added revenues attributable to the local fisheries sector.' (p. 107)

The report covers claimant counts and concludes, similarly to Jones (2013), that while there can be dependencies on fishing (not just inshore fishing), the challenges in these communities '*appear to be no more extreme than problems regularly faced by their urban compatriots'* (p. 116).

The report highlights some of the challenges in attributing landing data to Inshore Fisheries Group areas, but in general landings data should be verifiable against purchases by registered buyers.

3.9.4 Quality of Data

Data on the shellfish stocks that the inshore fleet relies on is perceived as generally poor by the SFF, as is the relationship with inshore and offshore stocks (SFF, 2016). The SFF argues that it is important for industry to retain ownership of all the scientific data which they provide and participate in the collection of that data to inform the management of their fisheries (SFF, 2016). There is also scepticism among fishers about the reliability of data. However, authorities consider landings data to be of good quality and sufficient and improving with the development of Fish 1 forms. The Business Register and Employment Survey (BRES) employment data on associated '*static industries, fish processing, net making, and repair and boat repair should be accurate*.' (Riddington *et al.,* 2014). Seafish analysis across the UK provides extensive fisher economic data, species and vessel size split data, though it is not always available by species and region. Where relevant, commentary is given on the quality of the data available to demonstrate the level of data that is available, the reliability and ease of replicating it for future studies.

4 NATIONAL RESULTS AND DISCUSSION

4.1 Interview Results

A total of 45 interviews were conducted across the four Marine Regions. A breakdown of these can be found in Table 4.1. The interviewees covered a broad range of occupations related to the inshore fishing sector either by being a fisher, trade (supply-chain), family connections, regulatory agents, or locational proximity. Although most of the interviewees were male, there was a strong representation from women in business and business facilitation roles such as sales and marketing, public relations, finances, and administration. In the few cases that our interviewees had support during the interview, this support was provided solely by women.

Table 4.1. Number of interviews conducted in each Marine Region for this study.

	Women	**Men**	**Total**
Argyll	2	9	11
Forth and Tay	3	9	12
Solway	2	8	10
West Highlands	1	11	12
Total	**8**	**37**	**45**

The analysis of the interviews resulted in 49 codes, which were categorised into 21 themes, shown in Figure 4.1. *'Resource management'*, *'relationships'*, *'changes'*, and *'supply-chain'* were the themes which contain the most content from the interviews and across all case studies, whereas *'harbours'*, *'conflict'*, and *'East vs West'* had the least content and were mainly focussed on in the Solway and Forth and Tay case studies. Although there were differences in the focus of the interviews for each region, many of the themes and their 'daughter codes' were interlinked and crosscutting. As such, the results of each theme and their categorisation within the sustainable livelihood approach (SLA) are described within their own sections below, with reference to the interview locations where it is contextually important.

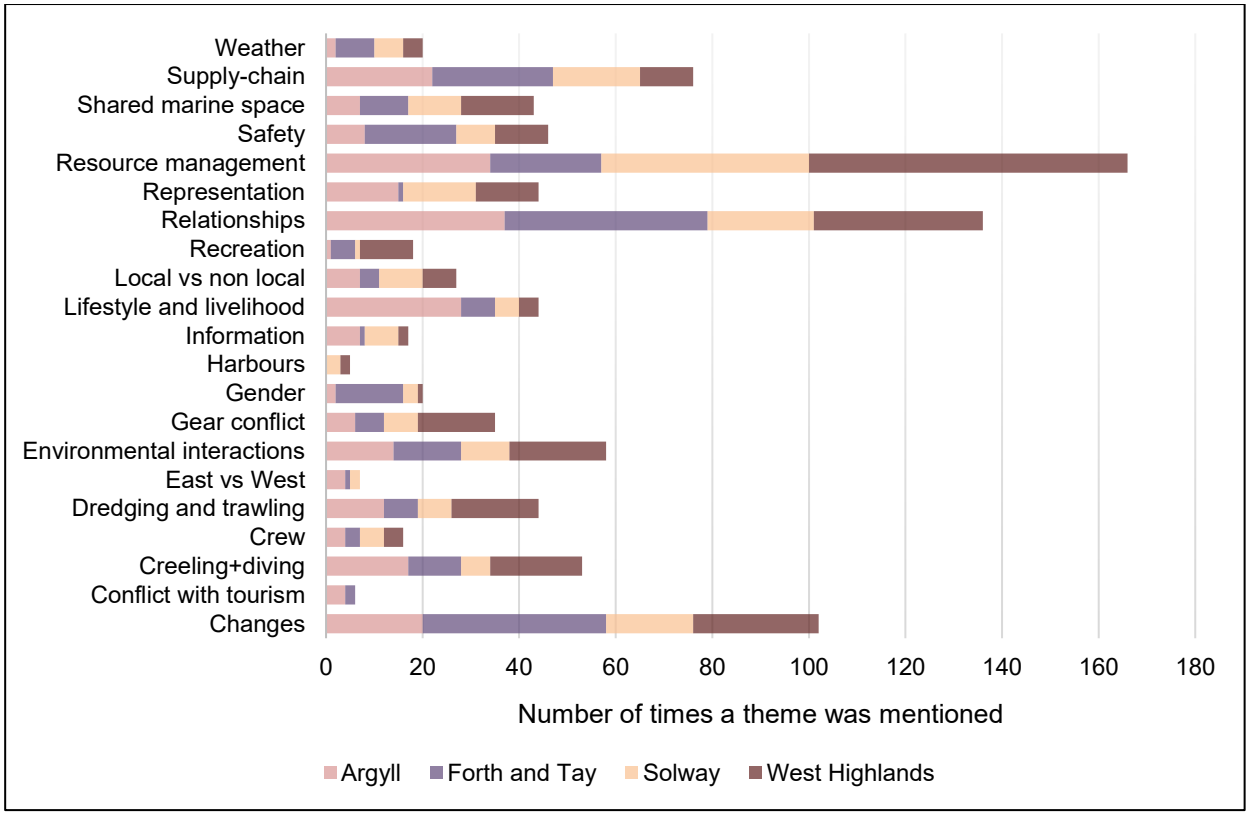

Figure 4.1. Stacked bar chart showing the number of times a theme was mentioned according to the interview region.

4.1.1 Resource Management

The **resource management** theme covered topics ranging from how fishers are represented within their own industry organisations to the management of marine resources by regulatory agencies. Its corresponding SLA category is therefore social capital. Figure 4.2 shows how many times the theme and its six 'daughter codes' were mentioned with in the 45 interviews. This is the most dominant theme of the interviews. The Argyll, West Highlands, and Solway case studies were more focussed on resource management than the Forth and Tay. This was represented by coverage of this theme per interview ranging from 2% in Forth and Tay, through to 49% in the West Highlands.

The *creeling and diving* code was mentioned the most in Argyll and the West Highlands. There was a general consensus between the interviewees that creeling and diving is a better option for the sustainability of the sector in comparison to trawling / dredging due to the nature of the gear and the practical restrictions of working in daylight. It was seen as an option for the old and the young, as trawling is too expensive to get into for the young and too hard for the old. Diving was seen as environmentally sustainable but not physically or economically viable. Trawling was viewed as unsustainable by creelers, but trawlers argued that if managed properly, their fishery could be sustainable as well. The management mechanisms suggested included area closures for limited time periods; Marine Protected Areas (MPA's) and no take zones. Some creelers considered 'their grounds' with a degree of ownership, or at least tacit allocation which could

nevertheless be broken by conflict with other gear types or fishers targeting other species, sometimes illegally.

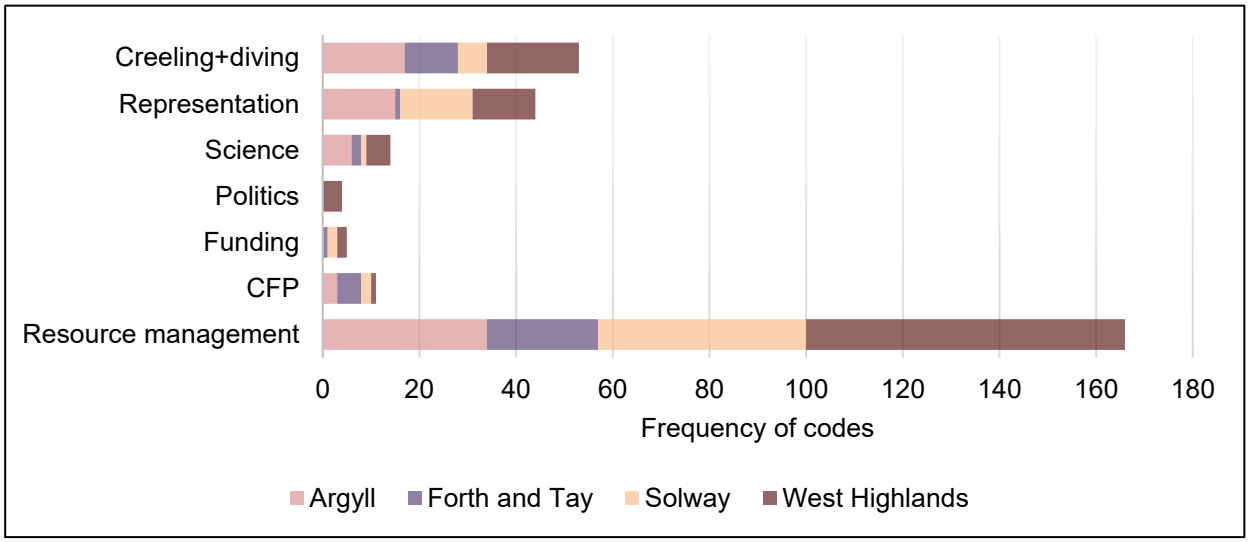

Figure 4.2. Stacked bar chart showing frequency of codes under the theme of resource management according to interview region.

Representation related to how different sectors within the inshore fisheries industry make their voices heard within the regulatory and political spheres. There is varying opinion on the success of rIFGs, although the general consensus is that there should be separate groups for static and mobile gear as they have differing views on how the fishery should be managed. It was also argued that trawlers had more 'power' because they have more economic impact and are part of the SFF. Creelers felt under-represented but also noted that it is more difficult to engage with them because of the individual nature of their business and the personal characteristics necessary to work alone at sea. In Argyll and the West Highlands, the interviewees advised that there needs to be more local control. However, recommendations on the mechanisms which would achieve this were not described.

Comments on management were strongly linked to the perception that the *science* that Marine Scotland relies on for decision-making is so separate from the industry that it is at best disjointed and at worst damaging the industry. Interviewees criticised Marine Scotland for the way that it conducts its data collection, advising that it neglects experience in the industry evident through its lack of engagement with fishermen and poor science communication.

Three interviewees expressed frustration at the lack of transparency around inshore fisheries policy, law and the science that is being conducted by Marine Scotland and Scottish Natural Heritage. This was attributed to *politics* on several levels, from devolved Holyrood management of Scottish fisheries, to Westminster controlled negotiations with the EU.

Funding was seen by the interviewees as both an opportunity and a barrier. For the supply-chain sector, funding through the Fisheries Local Action Group (FLAG) EFF and EMFF streams allowed for innovation in processing and preservation of catch. However, interviewees expressed a downside to funding in that the fishing businesses reduced their purchases of gear from suppliers

when there was funding available, whether or not they were going to apply for it. From a community perspective, funding is seen as essential to the maintenance of fishing villages and towns as it allows for the upkeep of physical infrastructure. The associated benefits that come with having working and good-looking harbours are described as both tangible and measurable (such as employment and tourism) and less tangible (such as social cohesion and community optimism).

The *Common Fisheries Policy* (CFP) inevitably came up during discussions around resource management. Perceptions ranged from the CFP being a terrible idea resulting in a 'leave' vote in the referendum of 2016, to the CFP working in theory but not in practice. There was a general consensus that the CFP has not worked in the favour of Scottish fisheries, inshore or otherwise. Interestingly, interviewees whose target catches are not managed by the CFP or whose businesses are not affected by the CFP were still vocal in their criticism of it.

All of the codes above pertain to specific aspects of how the inshore fishery is managed. However, throughout the case studies there was general discontent with the way that Marine Scotland regulates the industry. Communication was a significant issue, with interviewees criticising Marine Scotland for mismanaging their engagement with the industry on many levels, from individuals through to IFGs, and from fishers through to processing businesses. Most interviewees stated that they are expected to comply with new Marine Scotland instructions without any explanation of *why* the instructions are being made. One interviewee asserted that although the people working from Marine Scotland might have a doctorate in marine biology, they have limited knowledge of the realisms of fishing. Equally, the fishermen that we interviewed expressed that they feel undervalued and undermined as a source of information because their qualifications are practical and experiential rather than academic. Adding to the issues of management is confusion over the origins of legislation pertaining to inshore fisheries, with some interviewees specifically stating that they did not understand whether some mechanisms were from the EU, UK, or Scottish Governments and as such, they did not know who they should be talking to about the changes that impact them. The interviewees linked this with the drive for more local management, especially in Argyll and the West Highlands, with the hope that a less central model of management would result in better integration of science and industry experience. A direct consequence of the perception that the Scottish inshore fishery is not managed properly was the vote for Brexit. The topic of Brexit is covered in detail in the *changes* theme, Section 4.1.5.

4.1.2 Information

The **information** theme pertains to the information that regulating agencies need to control and manage the inshore fisheries sector efficiently and fairly. Equally, it covers the expectations of the timely use of the information that rIFGs and individual fishers provide regulatory agencies. Although this topic is touched on in all of the case studies, Argyll and the West Highlands had more coverage per interview. It is closely linked with *resource management* and corresponds to the SLA category of social capital. However, it came out in the interviews as a topic within its own right due to an emphasis on lack of information provided to and by fishers about scientific data collection and management. Interviewees advised that they are the best source of information for the management of inshore fisheries but are not being used to their full potential and feel

exploited in the process of scientific data collection, rather than feeling like they are part of the process. This was combined with the perception that there is a lack of data on the stocks of inshore fisheries target species and that rIFGs and individual fishers are expected to provide comprehensive information to Marine Scotland with little clarity of how it is used or going to be used, in return.

4.1.3 Lifestyle and Livelihood

The **lifestyle and livelihood** theme covers topics ranging from the feelings that fishers expressed when describing their work, through to occupations which are seen as compatible with their personal characteristics. Because of the diversity of this theme, it corresponds with several SLA categories including social and cultural, human, and financial capital. Figure 4.3 shows how many times the theme and its nine codes were mentioned within the 45 interviews. This theme was covered in all of the regions, although Argyll had the most coverage per interview at a mean of 15%.

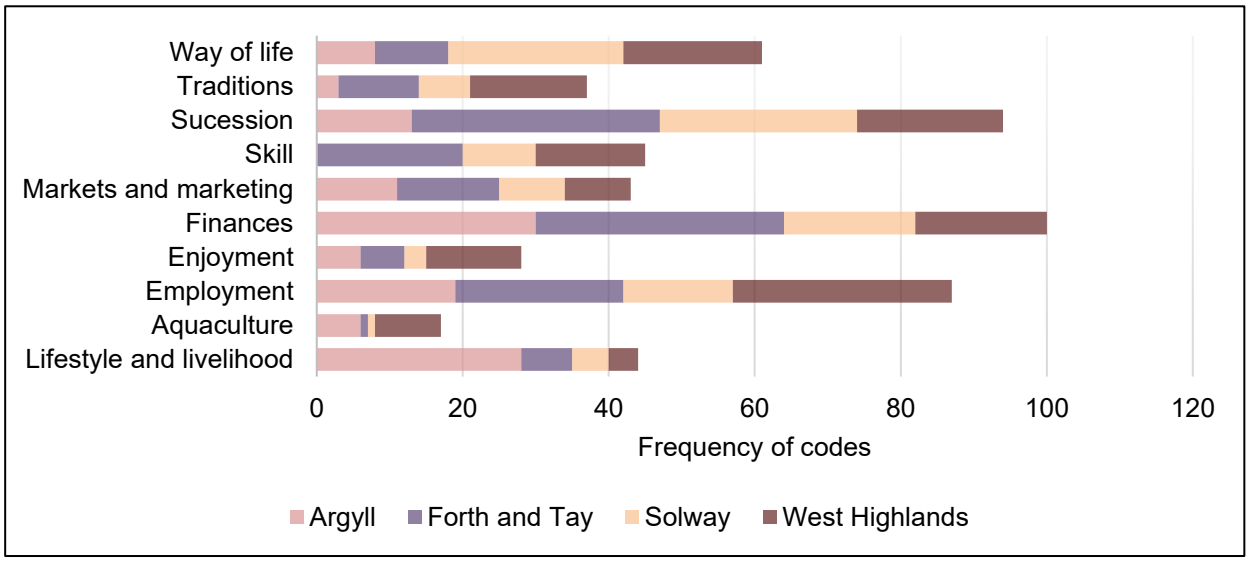

Figure 4.3. Stacked bar chart showing the frequency of codes grouped within the lifestyle and livelihood theme according to interview region.

Way of life was the fourth most important code within this theme. Here, interviewees described the less tangible reasons for why they were in the inshore fishing industry and its associated businesses. It related in many cases to the freedom of being self-employed, the freedom of the sea, the flexibility, the feeling that “it’s not a job”, but also the safety risks, the financial burdens, and being exposed to factors outside of their control (such as extreme weather events). Interviewees were honest about the personal characteristics needed to be an inshore fisher, advising that the desire for solitude, self-reliance, and in some cases danger, predispose them to this type of work. “It’s like gambling and being outside all the time.” This topic also included some references to the relationships between fishers, such as comradery at sea. Interview sections on relationship are described in detail in their own theme, Section 4.1.4.

Traditions are related to the way of life, but specifically highlight doctrines or customs and beliefs which are unique to the inshore fishing community. These include the traditions which are facing challenges, such as fishing being passed down through the male line of a family. Interviewees advised that fishing families are no longer prevalent, personal character and desire to do the job are more of a determinant in who fishes. Many interviewees stated that fishing "is the last of the hunters" and had mixed opinions on whether this is a good thing or not. Among the creelers there used to be a custom of fishing in the summer and fixing creels in the winter, this is no longer the case. One interviewee expressed their disappointment in resultant loss of skill as most creelers no longer know how to build or fix a pot / creel. One interviewee detailed some of the customs on board boats, such as not using certain words, not washing sugar bowls, and historically not wearing life-saving equipment. The reasoning being that "when the sea chooses to take you, it's your time or your fault for being an idiot". The interviewee stated, however, that the prevalence for wearing safety equipment has dramatically increased over the past few years.

Succession was a critical topic within this theme. It intersects with many of the other subjects covered by the interviewees as the ramifications of a change in the way people access and join the industry alters the whole culture and community. Succession was discussed in all four regions, with interviewees across the board stating that fishing is no longer a family business. The interviewees listed several reasons for this including; lack of interest from young people, lack of willingness to retire reducing space for younger generations, and the danger and unpredictable nature of the job is no longer compensated for by decent wages. This is also the case with small-scale supply-chain businesses, where interviewees stated that they were "reluctant to pass on the stress" of the business to their children and would rather they did something else. The interviewees advised that the ramifications of this shift is that the industry will go from one in which most fishers have motives for the long-term care of fish stocks, to one which is driven by money and wilful exploitation becomes more of a norm.

The *skill* topic covered how the interviewees learned their business and the skills necessary to continue in it. This includes processors, restaurateurs, regulatory bodies and fishers. Most of the fishers learned their trade on the job, either through family connections or by joining a boat at a young age. Many of the ancillary business interviewees had either spent time in the industry before moving on or had learned on the job. There were very few interviewees who had formal training other than mandatory certification. There is a fear among the fishers that the skill of fishing is going to die out because of the lack of young people currently in the inshore fishing sector. As mentioned previously, interviewees are worried that skills relating to the upkeep of gear are dying out because of a change in the seasonality of creeling, i.e. it is no longer seasonal, which means the pots are ordered in rather than hand-made and repaired. Some interviewees also suggested that in order to reduce the loss of skill and to provide access to fishing for younger people who have no family connections in the industry, as is becoming the norm, the Scottish Government should provide Further Education courses and financial help for those just starting out.

The *markets and marketing* topic was concerned with to whom and how the industry sells their catch. Most of the interviewees who commented on this were from ancillary businesses, namely processing. Most interviewees advised that because of the nature of fishing and the personal characteristics required to continue in such an industry, fishers are not interested in how they sell their catch but stick with a buyer once they have chosen one. Processors stated that if they lost a fisher, it is likely that they have lost them forever. In terms of promoting their catch the general

consensus from interviewees is that “fishers are crap at marketing”. All of the interviewees who touched on this topic proposed that Scottish catch should have a more cohesive marketing strategy to make the most of the products. The interviewees represented a number of different tactics including selling to local, national, and European markets. Some of the businesses are looking at the expanding into the Far East as they predict that Brexit will impact access to their current markets.

The topic of *finances* was the most prominent within the **lifestyles and livelihood** theme and represented a large portion of the interview content overall as well. It mainly pertains to the balance of lifestyle versus livelihood and the cost of operating within the inshore fishing sector. The interviewees stated that they are constantly considering the financial ramifications of their decisions with the knowledge that their choices impact directly on their quality of life. For example, the cost of having a deckhand reduces a skippers’ income, but also reduces safety risks and physiological wear and tear. The interviewees explained that these choices are linked to catch price and the “cyclical boom and bust” of inshore fisheries. Some went into detail about the expenses of running a vessel, with most agreeing that prices for creels were in the range of £50 - £60 per pot, fuel was expensive at between £0.78 - £0.80 per litre, and the cost of bait had increased over the past 10 years. One skipper advised that fuel and bait alone cost them £1000 per week. Most interviewees agreed that the cost of running a boat and buying gear is a major barrier to new entrants into the industry. Some interviewees stated that they are facilitating young entrants into the industry by buying boats and gear and loaning them on a long-term basis to potential future skippers. This set-up is linked with the reduction in succession of business ownership within families. All of the interviewees stated that they had faced financial stress at some point within their career, with some diversifying their income so that they could fund their fishing. This diversification includes processing, lorry driving, farming, running bed and breakfasts among others. There was a general consensus that the fishing industry “has always economised.”

There was a range of perspectives about the type of *employment* that inshore fishing provides and the ability to recruit crew; from pragmatic reasoning that it offers a good income to the perspective that it is an option of last resort for those who find fitting into society more challenging. One interviewee summed it up by saying that they knew fishers who had university degrees, fishers who “are just normal guys” and fishers who would otherwise be in jail. There was a consensus, however, that because of the difficulty and danger of inshore fishing, it should be paid well but is not in comparison to jobs such as joinery, electricians, and plumbing and the terms of employment are harsher by comparison; its provides a sporadic income stream, no sick leave, and has limited scope for “planning anything other than fishing” such as holidays. For many of the interviewees fishing means more than employment to them, this includes processing and restauranteurs, as it is seen a tradition and a way of life (as covered in the paragraphs above). Many of the interviewees who are skippers / owners of boats advised that they find it hard to recruit and retain crew. They suggest that this is because of the comparative difficulty of the job, lack of information about fishing for young people, and the time and money required ‘to climb’ the fishing career ladder. They also advised that new entrants opt for positions in the pelagic fisheries, reasoning that the danger and higher wages are more attractive to young men. There was agreement that in the *Nephrops* sector a significant portion of the crew are from Eastern European countries. Leaving the EU is a concern for those who require crew to go fishing; it is less of a concern for individual fishers.

The *enjoyment* that the interviewees attributed to the fishing industry was a topic brought up in all four regions and across the sector, from fishing to processing, to family members. Many of the fishers stated that they would not do anything else, but also that there were good days and bad days. When speaking about their enjoyment they often referred to interactions with wildlife such as minke whales, porpoises, dolphins, and eagles and the environment and weather such as sunrises, sunsets and glassy waters. Family members tend to accept that fishers are happiest at sea, but also expressed concern for their safety given the danger of the work. The associated businesses were more pragmatic, stating that fishing provided them with a decent living. Those who were less involved in the industry stated that being able to walk through working harbours is an attractive feature of coastal towns and villages in Scotland and that they enjoy watching the boats.

Aquaculture was brought up by some of the interviewees in relation to crossover of skills and working environment, such as the desire to be on the sea and outside, the aquaculture industry as a buyer of catch (wrasse and lumpsucker) and polarised views on the efficacy of aquaculture. In Argyll and the West Highlands, the interviewees stated that the aquaculture industry regularly employs fishers, ex-fishers, or those who would potentially be interested in fishing. They suggested that there is pay parity between the industries, but the working conditions are better on the farms. There are some interviewees that are supplementing their fishing income with aquaculture, mainly shellfish. Another way that the interviewees are connected to the aquaculture industry is by targeting wrasse and lumpsucker and selling them to the farms. This is the case in the Argyll and Forth and Tay regions, with a mention that it is also practiced in the Western Isles. In the West Highlands there is a polarisation of views on aquaculture with some interviewees stating that a diverse marine economy is a good thing for the region and others suggesting that the aquaculture industry is killing the lochs. There were few interviewees who portrayed a balanced view on aquaculture.

4.1.4 Relationships

The **relationships** theme was the second most prominent within the interviews and across all four regions. The coverage per interview ranged from 2% to 33%. It strongly overlaps with the **resource management** theme, but because the focus is broader than management, it has been given its own theme. It pertains to the relationships between fishers working with similar gear and across different gear types; between fishers and their local communities; between families; between boats; and between inshore fishing and other marine industries. As such its corresponding SLA category is predominantly social capital.

Most of the interviewees stated that it was easier to have a relationship with fishers who were local to the area. There were no positive comments about vessels that were not based locally. The interviewees advised that this is because it is more difficult to hold them accountable as they do not know who they are and do not have their phone numbers to call if there is an issue. There was a general consensus that the relationship between creelers and dredgers/ trawlers is okay when both parties are local because they can call each other to let them know where their gear is or where they will be trawling. Interviewees also stated that most of the fishers that they know follow the rules, but that it only takes “one bad egg” to tarnish the industry, especially from a conservation perspective. The emergency closure of a ground in Skye was mentioned several

times in relation to this. The Solway code of conduct was praised as a good example of working measures which manage the relationships and behaviour of people fishing with different gear types.

From a historical perspective most of the interviewees had family in the fishing industry before they joined. There was a feeling that this has changed, and the current fishers are the last of the 'fishing families'. This was also reflected in some of the other themes such as **changes** and **lifestyle and livelihoods**. Interviewees noted that there were positive changes within their personal relationships due to the advent of the internet, boat tracking, and mobile phones which mean that when fishers are at sea they can keep in contact with their partners and are therefore less likely to "lose" them.

Another dimension of relationships was the close connection of the industry with coastal communities, with one interviewee stating that 'you cannot talk to anyone in Argyll or the West Highlands who does not know or is not related to a fisher'. However, in Forth and Tay there was less of a connection with the community, with the interviewees explaining that most of the houses in harbour towns being owned by "yuppies" who enjoy the romantic notion of fishing but have no connection to it. The change in seasonality of inshore fisheries was also mentioned as a driver for the reduction of community links in Forth and Tay. The reasoning being that creelers used to get part time jobs during the winter and integrated with other circles of people within the community, but now there is no seasonality this integration has been lost. In the West Highlands and Argyll interviewees expressed frustration at the number of second home owners and retired people who objected to developments and changes within their communities, but who do not contribute to the communities in an economical way either. In Argyll and the West Highlands interviewees stated that they had mixed relationships with other marine industries such as aquaculture and marine tourism (aquaculture is covered in **lifestyle and livelihoods**, Section 4.1.3). The only comment on tourism in Argyll was on the lack of compatibility between wildlife tours and dredgers. In the West Highlands, marine tourism was seen as an alternative income to fishing. In Forth and Tay, there is conflict between recreational diving and fishing.

Safety at sea has its own theme (see Section 4.1.8), however it should be noted that many of the interviewees stated that their relationships with each other change when they are at sea and in trouble. Interviewees stated that there is an underlying culture of togetherness when things go wrong despite fierce competition for space and catch.

Processors and buyers stated that there is a reliance on word of mouth for them to gain and or lose ground with fishers, particularly if they are looking to recruit new vessels. There is another dynamic to these relationships when taking into account *gender,* as it significantly shapes the culture of this industry and as such, is discussed within its own theme under **changes** (see Section 4.1.5).

4.1.5 Changes

The **changes** theme covered topics ranging from work patterns to Brexit. Its corresponding SLA category is therefore predominantly natural capital. Figure 4.4 depicts how many times the theme and its 12 codes were mentioned within the 45 interviews. The Forth and Tay, and West

Highlands regions were more focussed on changes than Argyll and Solway. This was represented by coverage of this theme per interview ranging from 85% in Argyll, through to 16% in Forth and Tay.

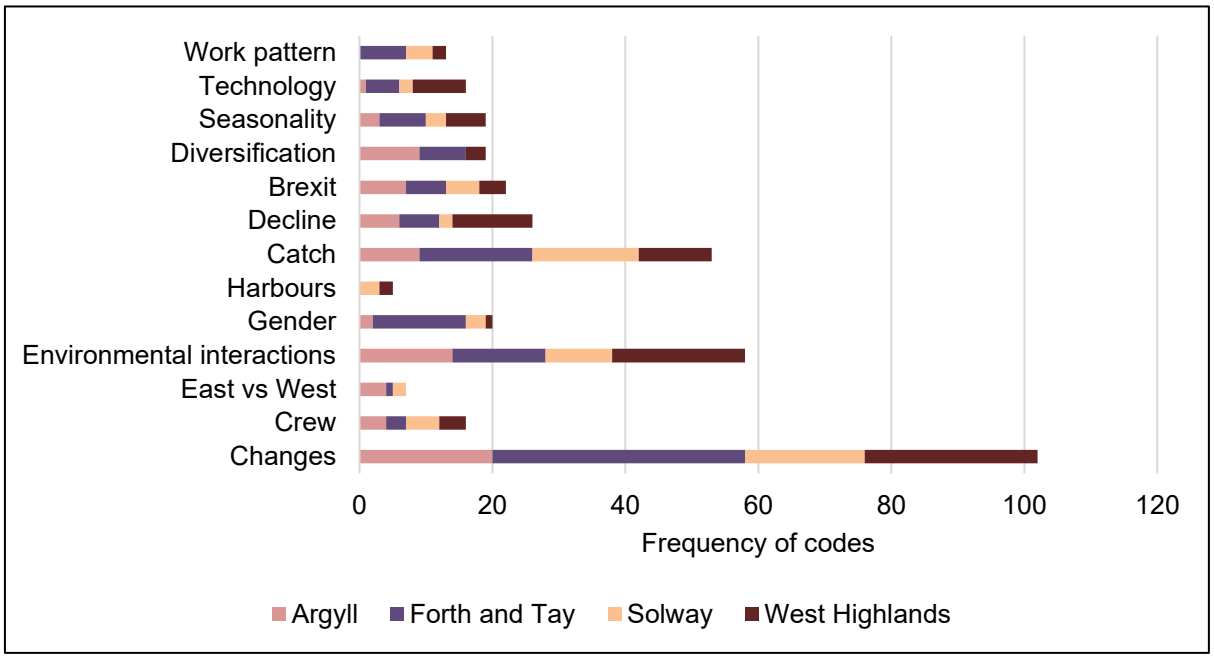

Figure 4.4. Stacked bar chart showing frequency of codes under the theme of resource management according to interview region.

The *work pattern* code was mentioned predominantly in the Forth and Tay Marine Region and was not mentioned in Argyll. Overall, interviewees agreed that there has been a change in time spent at sea. Trawlers are now going out for over a week compared to four days previously. There is also some consensus that work patterns are determined by the availability of the target species and as a result some fishers have had to target other species and have bought bigger boats in order to travel further, stay at sea for longer and to go out in weather that smaller boats would not be able to handle. The supply chain is also impacted by changes in work pattern with a couple of interviewees saying that they had to diversify their work when there were declines in fishing effort.

In addition, technological changes have also had an impact on work pattern. The *technology* code was mentioned most in the West Highlands Marine Region and in Forth and Tay, with limited mentions in both Argyll and Solway. Although fishers noted that they are generally slow to adapt to changes, interviewees have experienced positive results from these changes, with only one interviewee expressing views on the negative aspects. Technology changes have resulted in mechanisation of some aspects of fishing, such as lifting creels or hauling in nets which has made the job less physically demanding. Internet has made the boats more comfortable, with some having Wi-Fi and Sky TV. This has improved communication between fishers and enables fishers to keep in contact with their families. The negative aspect that was raised is that fishers have become too reliant on the technology in terms of navigation and are becoming increasingly removed from the natural environment.

There was consensus among the interviewees that the *seasonality* of fishing has changed, with fishers having to fish in winter, rather than the traditional spring and summer fishing seasons. This was more important in the West Highlands Marine Region and in Forth and Tay. Fishers used to have winter jobs such as mending creels and other gear, boat maintenance and paid part-time work such as house building and farming. This meant that fishers were more involved in other aspects of the community, whereas now they feel like they do not interact as much. Some fishers still rely on these part-time jobs as fishing is not able to meet their financial needs. The interviewees provided several reasons for the change in seasonal fishing. The main reason was to do with the seasonality of different species. For example, they would fish prawns in spring, then crab and lobster over the summer and would stop fishing around September / October time each year. Better weather which allows fishers to go out more, and the opportunity to make money are all factors in these seasonal changes. A few interviewees indicated that fishing all year round was a choice for some people rather than a necessity. In some areas, seasonal fishing still exists as a result of governance, i.e. forced closures of fishing grounds to allow stocks to recover. A couple of interviewees implied that the lack of seasonal fishing is impacting fish stocks, making the industry less sustainable.

The *diversification* code was mentioned most frequently in the Argyll Marine Region but was not a factor in Solway. Interviewees talked about diversification in terms of jobs, species, and markets. It is clear among interviewees that in order to survive, they had to diversify. Some interviewees stated that inshore fishers have always had other jobs, which has allowed them to earn an additional income, and move into other industries such as Aquaculture and Oil & Gas, although this used to be more seasonal. Now, fishers tend to either fish full-time or leave the industry entirely. There is consensus, that once a fishery collapses, fishers would move to the next species. Several interviewees named finfish species that could be available to fishers now, but they do not have quota for them (e.g. cod). Market diversity has also changed, mainly with the advent of fish farms and their need for cleaner fish (wrasse and lumpsucker) for management of salmon sea lice.

Brexit was inevitably mentioned across all four regions, with interviewees exhibiting very mixed reactions. Many respondents felt that the initial consequences were positive, as prices for shellfish increased because of the weakening pound (£). Some saw Brexit as a way to take back ‘our’ waters and have more control over the seas, whilst growing the Scottish fleet as a result of less European boats in Scottish waters. There was also an argument among interviewees regarding the potential for increasing and even growing the Scottish market, as well as increasing sustainability within the industry. However, the main feeling among interviewees was one of uncertainty. This came through strongly in most cases where Brexit was mentioned. Some interviewees were worried that they would be priced out of their own markets and saw uncertainty in market changes; availability of European workers; and jobs in general. Some also voiced concern over potential tariffs that they would be required to pay, additional paperwork and resulting barriers that this would introduce. A couple of interviewees also expressed concern over the political negotiations and felt that fishers would not get a good deal.

The general *decline* in the fishing industry was more important in the West Highlands region followed by both Argyll, and Forth and Tay. It was seen as less of an issue in the Solway region. Interviewees mentioned decline in four different areas: number of boats, catch, fishers, and buyers. There was consensus that the number of boats and fishers is in decline, as well as the number of buyers. In terms of the volume of catches, and size of catch, however, there was

limited consensus regarding the decline in fish species and overall stocks. Interviewees noted that in some areas and species, stock was increasing, while others were still declining. A few interviewees felt that the decline was a result of fishing undersized fish/shellfish, but also because worsening environmental conditions are impacting stocks (e.g. increased frequency of more extreme weather). Interviewees noted that the decline in the fishing industry is having an impact on the supply chain as these ancillary services are dependent, in a lot of areas, on the fishing industry. In addition, the decline in volume of catches means that boats have to travel further and increase their fishing effort for less catch (i.e. catch per unit effort). A decline in infrastructure in 'fishing villages' was also mentioned as a result of a decline in the fishing industry.

The *catch* code was mentioned throughout the four regions, but predominantly in Forth and Tay and Solway. Changes in catch are explained by; seasonality, differences between local areas, and new markets and diversification opportunities (such as aquaculture). Some interviewees made the point that they can only fish what is there, and this is dependent on multiple factors including; climate change, environmental conditions, and fishing practises (i.e. overfishing). Quotas were also mentioned in determining the species that can be caught, with a number of interviewees across the West Highlands, Argyll, and Forth and Tay commenting on the collapse of whitefish stocks around the country.

There was no consensus among regions and interviewees about whether the volume of catch is increasing or decreasing. Some interviewees felt that catch is declining, whilst others report that levels are stable. Some mentioned that stocks were depleting and that the size of shellfish was declining. Although some stocks might be sustainable, over-fishing is seen as a problem for the industry.

Interviewees suggested that although many *harbours* are run down, they are still important, particularly to fishing communities in the West Highlands and Solway Marine Regions. Interviewees noted that some places would not exist if it was not for the harbour, as they now bring in marine leisure and tourists. There are few active harbours in some areas because funds are not generally available for maintenance. In some cases, communities have managed to buy and maintain their harbours, but this is not common.

East vs West was mainly mentioned in the Argyll region and did not feature in the West Highlands. The main aspect to emerge from interviewees was that fishing on the East and West coast was very different, and should thus be treated separately, especially in terms of policy. However, some interviewees noted that this is true for all regions, not just for the East and West Coasts.

The main changes in *crew*, according to interviewees, have been the reduction in the number of crew on vessels. This has been driven by increasing costs in fuel and bait, resulted in less profit. Skippers have taken on fewer crew, with most now working on their own. Although this is true for both creelers and trawlers, there was some difference in crew numbers between the two with trawlers indicating that they have more of a need for crew members. However, there have also been changes in the culture of the younger generation and perception of the industry which has meant it has been harder to get crew. This impacts on succession planning for the industry. Additionally, with the increase in fish farms, locals are able to find alternative employment where it once would not have been.

Women's role in the fishing industry was mentioned across all regions, and particularly in the Forth and Tay region. There is a perception that the inshore fishing and perhaps fishing as a

whole, is a man's job, and superstitions that still exist, partly account for the *gender* split in the industry. Women tend to be land based working in processing factories, as book keepers for their husbands / sons, and taking care of general business functions (i.e. insurance, correspondence, sales and so on). There is still a bias against women in the industry and some interviewees stated that women were not always accepted or treated as equals. However, there are other reasons why women are not as involved in the industry as men with male interviewees pointing out that often women are not interested in being fishers and the practicalities of life on a boat are not attractive to women. This includes the lack of facilities and the physical nature of the work. A traditional view of women's roles in raising families, and the practicalities of taking care of early life (e.g. breastfeeding), also means that women tend to stay in land-based roles rather than going out to sea.

Topics from environmental damage to lack of understanding, and responsibility were discussed as part of the *environmental interactions* code. There was consensus from the interviewees that trawlers are responsible for damage to the environment (i.e. the sea bed) and that people would rather see creelers at sea than trawlers. However, it should be noted that creelers do pose a threat to other marine wildlife such as whales, which may get tangled in their gear. In terms of other users of the marine environment, there is no consensus among interviewees on the role that designations, such as MPAs (discussed in Section 4.1.6) play with inshore fisheries. Some interviewees felt that these designations are necessary and positive, whilst others see them as a source of conflict. Changes in players in the marine environment such as fish farms are seen by some interviewees as having negative impacts on the marine environment, while others feel they are not an issue so long as they do not take up too much space. One interviewee noted that these managerial issues are set against a complex backdrop of environmental variables such as tide, weather, bathymetry etc. Other interviewees also note that marine areas are different, and factors such as tide and swell direction will influence the type of fishing and the target species for that fishing community. Although the interviewees are dependent on fishing for their livelihood, they noted that there is still a lot that is not fully understood. For example, some interviewees mentioned not knowing why particular swell directions result in good or bad catches.

The unknown nature of these variables makes it difficult to manage inshore fisheries. However, many interviewees felt responsibility towards protecting the environments that they rely on, to look after their stocks. They also recognised that it is not just the responsibility of fishers to manage the marine environment. For example, interviewees want the aquaculture industry to take more responsibility and to be held accountable for any damage that they are doing to the sea. Interviewees felt that the Government and Non-Governmental Organisations (NGOs) also have a responsibility to help increase understanding of the marine environment with the aim of better management practices.

4.1.6 Shared Marine Space

The **shared marine space** theme was dominated by issues associated with gear conflict but included topics such as the relationships between boats and other marine users. Its corresponding SLA category is therefore natural capital. Figure 4.5 shows how many times the theme and the five codes were mentioned over the 45 interviews. Issues surrounding shared marine space were most prevalent in the West Highlands, followed by Argyll.

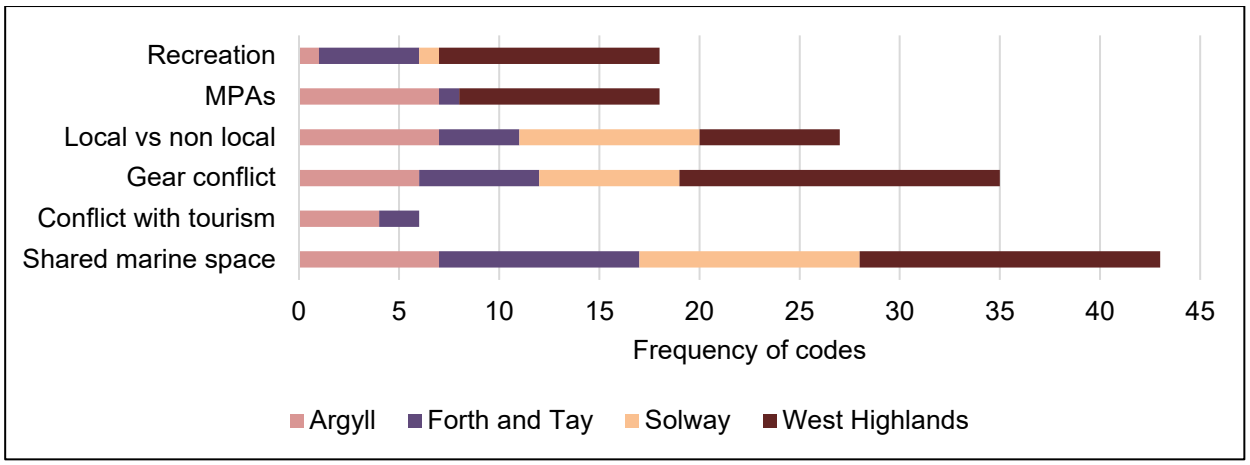

Figure 4.5. Stacked bar chart showing frequency of codes under the theme of shared marine space according to interview region.

The *recreation* code was mentioned most in the West Highlands Marine Region followed by the Forth and Tay. It was mentioned less frequently in the Solway and Argyll regions. The consensus among interviewees is that there has been a shift in focus away from fishing and towards tourism in many areas. There is a general feeling that tourism has revived some of these smaller port areas. Interviewees feel that the fishing industry and associated traditions needs to be preserved to attract tourists. Although a growing industry, a few respondents mentioned the seasonality of tourism, implying that it was not necessarily a positive thing, mainly due to the influx of tourists over a short period of time. In terms of recreation, some interviewees indicated that once fishers had retired, they still wanted to be part of it – as a hobby, or by going down to the harbours.

MPAs were mentioned more in the interviews in the West Highlands and Argyll but were not mentioned in Solway. Some interviewees had negative views on MPAs as they felt they constrain their fishing activity because of the way that they are implemented and managed. It was seen as a way for the Scottish Government to implement control of waters and activities that are undertaken, based on what the fishing interviewees perceived as; poor scientific evidence, limited data, and a lack of understanding of the role of MPAs. Poor management is a key issue in this argument because of perceived conflicting agendas of the different authorities (e.g. Scottish Government and Scottish Natural Heritage). Juxtaposed with this view was the opinion that more MPAs which are catalysed by the inshore fishing industry are required in order to protect creeling waters from trawlers. Uncertainty about the benefits of MPAs to fishers, the likelihood of the benefits only being felt in the long term, and the changing nature of MPAs (e.g. expansion, additional closures and exclusions etc.) were reasons why some of the interviewees viewed MPAs with scepticism. There was a divide between trawlers and creelers, with the trawlers expressing more negative views of MPAs. Some of the interviewees acknowledged the potential of MPAs to help the sustainability of the inshore sector, especially where the various authorities and the fishers worked in cooperation.

Issues around *local vs. non-local* vessels were important in all regions but considered greater in the Solway Marine Region where local boats and workers, versus non-local was the main focus (i.e. non-local includes foreign or fishers from other areas in Scotland). Some interviewees mentioned local markets and produce including the local connections that they had with the area

they lived in and the need to protect the local fisheries. A couple of interviewees tried to buy local produce where possible and as a result opted to stop supplying European markets. There was a distinction in the interviews between local/non-local boats and local/non-local workers. Feelings towards non-local boats was negative because they were seen to not contribute to the local economy, they employ less people, and they have an unfair advantage over the static fishers. It is implied that non-local boats are mobile fishers and issues arise from the way they fish and around paying for damages to creel pots. In terms of non-local people, or crew, there are differing opinions among the interviewees with some seeing them as the problem as in some cases they do not contribute to the local economy. Other interviewees state that non-local crews are hard-working and more willing to work than the local youngsters. In addition, non-local people have been good for the population in some areas, but this means that there are more people fishing the same resource which can lead to problems, even between static fishers. Overall, interviewees felt that relationships with locals, i.e. Scottish fishers were better than non-local (foreign) fishers.

The *gear conflict* code was mentioned most in the West Highlands and was the most common code mentioned throughout all regions under the **shared marine space** theme. It is important to note that the most common form of gear conflict is between the mobile and static sectors. However, interviewees spoke about conflict between static fishermen, as well as conflict between local and foreign boats, or outsiders.

Conflict for space was a key issue under the *gear conflict* code, which is exacerbated in areas where grounds are good for both the mobile and static sector. In locations where only one operates, the interviewee suggested that there are fewer incidents of conflict. Creelers often mark their grounds by leaving creels in the water to the detriment of the other marine users. This results in conflict between mobile fishers and as creels are damaged or lost when mobile gear is towed over them. These marker creels create conflict within the static sector as it reduces the amount of space available for fishing. Some interviewees suggested creating zones (spatial separation) for species and looking at ways in which the mobile and static sectors can compromise, but this is problematic as fishers are already constrained by other policies such as MPAs, as mentioned above.

Interviewees suggested that the *behaviour* of creelers**,** and the work pattern and gear type of the mobile sector creates conflict between the two, across all regions. They proposed that there are inherent differences in the way that each sector acts towards the stocks that they fish, the marine environment in general and the power that is available to them when things go wrong. Static gear interviewees gave the example of where the mobile sector cuts creels when they become entangled with their gear, resulting in a substantial monetary loss to creelers and limited ability to claim any compensation – especially in the case of foreign or nomadic boats. Interviewees stated that conflict also arises because of competition for space due to pressures from MPAs, defence zones, other marine users, and other inshore fisher types (mobile/ static). Although trawling and dredging are not illegal, interviewees were unhappy with the volumes that are fished, and the damage caused to the seabed and other shellfish, before mobile boats move on to the next area. They also cite a lack of integration and contribution to the local economy. Some interviewees feel that within three nautical miles of the shore only static gear should be permitted. However, some also noted that static gear fishers also have a responsibility to look after the grounds and ensure that they fish sustainably.

The *conflict with tourism* code was mentioned most in Argyll followed by the Forth and Tay regions but was not mentioned in the Solway or West Highlands Marine Region. In most cases, this conflict stems from the availability of space and the perceived conflicts between creelers and recreational users of the marine environment, such as sport divers. Although important, some interviewees do not see tourism as the answer for small communities, stating that inshore fishing is keeping schools and businesses open. However, others point out that the industry is changing and is gearing up for marine tourism (such as marinas and yachting), and old fishing towns are becoming more tourism focused creating a sometimes-hostile relationship between tourism and fishing. However, diversification of economic activity is one of the reasons why some of the old ports and harbours remain in existence. There was the perception that tourists see the 'romantic' version of fishing, which is often not representative of a practical working harbour.

The majority of interviewees believe that the current management of the inshore area contributes to conflicts between different gear types, with many saying that better management of the grounds could reduce the conflict that arises. Some interviewees stated that the 3 nm limit should be re-introduced (i.e. banning trawlers) to reduce pressure between mobile and static gear. In addition, communication between the separate groups (i.e. static, mobile, Authorities etc.) was believed to solve some of the problems.

The lack of policy in some areas and that lack of accountability and resulting prosecutions are two of the perceived key issues relating to the management of shared marine space. Although grounds are shared and working relationships are maintained in most areas, these are tentative. Where there is no policy in place, interviewees feel like fishing is a free for all, with very few welcoming the lifting of the three-mile limit. At present there is very little that creelers can do to prevent nomadic trawlers from fishing in an area. Current laws do not consider gear damage as an act of vandalism, and as such, fishers responsible for this damage are not prosecuted. Some interviewees believe that this has meant that some fishers in the mobile sector have become more powerful, using intimidation and violence because they know that they will be able to get away with it.

4.1.7 Supply Chain

The inshore fisheries **supply chain** is characterised at the fishing level by largely small, independent operators working on their own or with a very limited number of crew. However, beyond the landing of stock there is a variety of actors within the supply chain, from the household actors (family members, often a spouse, delivering administrative support and covering domestic demands), to intermediary buyers (buying from fishers and delivering basic processing and on-sale, often with specialist retail units for passing tourism), to a network of larger scale transporters, processors and exporters. A supply chain typology and value chain analysis can be found in Section 4.3. The supply chain theme was dominated by issues associated with transport, supply, and competition. The supply chain covers aspects of all the SLA categories. Figure 4.6 shows how many times the theme was mentioned over the 45 interviews. *Supply chain* issues surrounding were most prevalent in the Argyll and Forth and Tay regions.

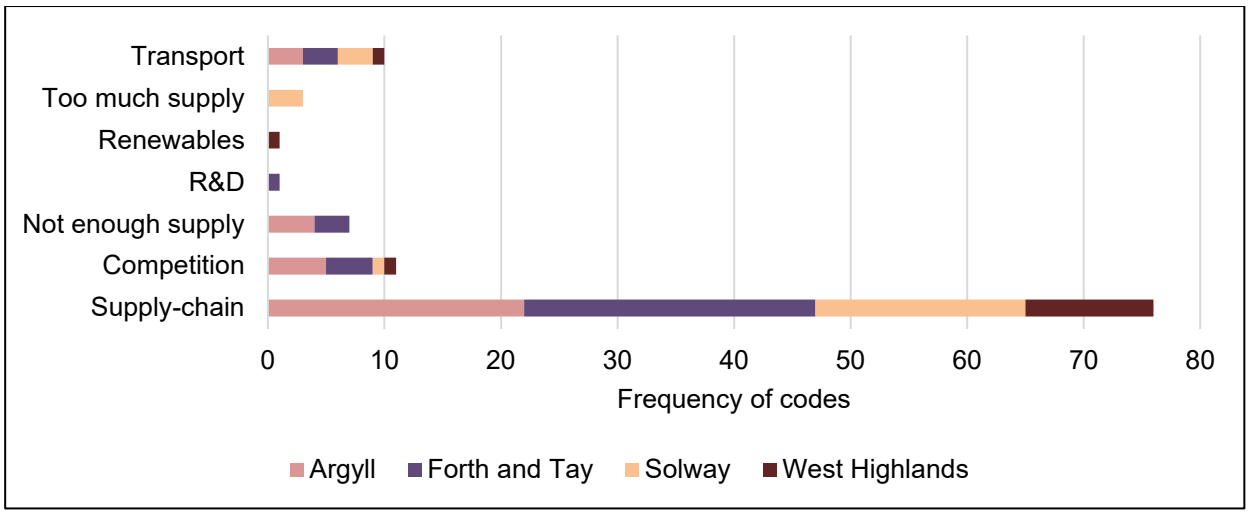

Figure 4.6. Stacked bar chart showing frequency of codes under the theme of supply chain according to interview region.

Transport of product featured significantly in the cost and value of fish, given its time-bound nature for freshness, including transporting of live catch. Transport considerations include special equipment for transporting shellfish, for example tubes to transport prawns, and ice equipment. Transport extends to Europe, particularly Spain. Vivier vans collect catch from the pier and take to processors and on-transport outside of the local area – they are the 'front end' of what is considered a lower value segment of the market (poorer prices), but there appears to be resistance to change by fishers because they will take available volumes in the context of general undersupply. Interviewees suggested that food miles and traceability have become more prominent for marketing and customer needs. Palletline and other logistics platforms are used but can be constrained by the remoteness of some destinations, and the time-dependency in fish delivery (scale and timing of transport is reflected in the move from large lorries to vans). Some interviewees noted that there can be a direct spatial / transport cost trade-off in selling decisions. Going further than a local buyer (either local restaurant, or a van ready to transport it) has time and travel costs. Equally, if a higher value product is sold to a restaurant that may be £1 extra, it may be at the cost of having a poorer quality average with the remainder which is being sold to a wholesaler. There is value in bundling better quality with poorer to attain an acceptable average. The RET (Road Equivalent Tariff) for ferries was cited as having improved the cost structure of exporting (from local area) of fish.

Renewables were viewed positively but with some caution that they may clash or need integrated into an already-complex inshore geography. This was noted in Solway but there was also uncertainty about what was likely to happen. There was an awareness that an alternative industry such as renewables was a good opportunity to diversify into a new manufacturing market, particularly with respect to boats; but that it does not always translate into local jobs. One interviewee cited turbine manufacturing in Germany as an example.

Competition posed by vivier vans was cited as the most prominent example of competition within the inshore fisheries supply chain. Some integrated models transporting live product are seeking to compete with the larger market but recognise they are smaller scale than the mass transit model. The industry is seen as more competitive with the advent of the internet, where prices for

fish and associated supplies can be compared more easily – mark-ups have been reduced. In a cooperative model, pooling of supplies of inputs, e.g. oil and general gear, with the application of a margin has driven efficiencies, with a dividend paid out to members (varying from year to year).

Too much supply / Not enough supply includes topics related to; input supply to fishers, supply-chain diversification, and downstream value chain.

Regarding input supply to fishers**,** interviewees discussed supply of boats and parts (including wheelhouses, rails, whalebacks), local grocery supplies, fuel oil, packaging, local hotel (food, beer), council landing charges, mooring and berthing charges, and equipment supply. Crates and creels were cited as being hand-made in the past by the fisher, or locally supplied. The move from wooden materials to plastics and metal, both for boats and equipment, has changed the nature of equipment supply and a change of supplier (often from local to external). Sources mentioned included a large equipment supplier in Inverness (Gaelforce Marine), an alternative supplier in Leeds, and Fraserburgh (via intermediaries in Bellshill and Dumfries). Other equipment can be supplied from Cornwall (hydraulics), Coventry (engine) and electronics from Ardrossan. Boat building and repair can now take place in other nearby regions (e.g. some Solway jobs delivered in Troon and Girvan). This wide spread of suppliers reflects the remaining economic linkages and cost base of inshore fishing. Conversely, some jobs that were previously outsourced and undertaken by specialists (experienced welders) are now done in-house by remaining local suppliers. The cost of inputs, particularly the boat (cited up to £1m) is seen as evidence that fishers are intent on sustainable fishing.

A reduction in the number of fishers has reduced the demand for supplies from local shops (cited: butchers, grocers, housing: similarly, services such as banking, though this is consistent with wider trends elsewhere). Equally, other services have been centralised, such as insurance (moving online) and vehicle repair contracts (fleet hire) – meaning that the business ecosystem relating to fish (and the diversity of jobs) has diminished. Estimated ratios between fishing and onshore jobs varied, e.g. ‘five-fold – for every man on the boat, five “on shore looking after him” to as high as 1:10. (This is higher than is supported in economic data but will vary from supply route to supply route.)

In the past, fishers encouraged their sons to learn a trade before returning to the boat. Now, the demographic trend includes the younger generation seeking non-fishing jobs. Those mentioned include Raytheon, a defence and technology company in Fife, ‘the rigs’ and the remaining local businesses of electrician, roofing, driving, consistent with the trend towards holiday homes and tourism rather than fishing as the primary business of a locality. Some towns have a seasonal change with tourism in summer and focus on fish and processing in winter (e.g. Kirkcudbright). Younger fishers may still be ready to leave the inshore fishing sector if they get the offer of a ‘better’ job. Some older fishers can cite four generations of involvement (from great-grandfather to self). It was regularly cited as ‘something to fall back on’ as a resilience measure, with one giving example of son and grandson learning fishing even though they lived away from the fishing area (in Paisley).

On-sale of fish products some fishers will take their catch and add value before on-sale, for example dressing crab and selling direct to local restaurants. This can add a large gross margin ranging from 1:2 and as high as 1:5 (e.g. a £20 basket can be sold for £100, which covers costs of preparation and transport). This can be marked up again, with the shell being sold for £5 to a

restaurant and sold to the customer for £10.95 (i.e. around 1:10 ratio from port-side value). Health and safety capacity, and lack of control over product, can be risks to the supply chain – in some cases high demand for product has led to poorly controlled operations, leading to a collapse in demand. Fishers therefore consider what long run strategies may be most reliable and factor that in along with transport and labour costs. Specialists may also be exporting small volumes in the rest of the UK (Wales is cited) as much as in Scotland, and beyond into Europe.

Larger processing operations can employ hundreds of people, e.g. Kirkcudbright, Ayr, Fraserburgh, Buckie – vans can sometimes be returning '¼ full' from the West Highlands to 17 processors on the East Coast. However, inshore fishing products are integrated with offshore fish processing – the interrelationship with other fishing (and, in particularly in the case of Shetland, fish transport logistics) provides strong synergies as well as competition. Inshore fishing is seen as more marginal in its activities – but interviewees recognise that the scale of fishing in the past was unsustainable.

The large global market has acted as a cushion for more locally focused suppliers – an excess supply for fishers or intermediaries can be sold abroad into a relatively unlimited market. Often the deepening integration of these global supply chains (starting with vivier vans at the harbour side) can provide a challenge for new entrants who are seeking to develop alternate supply chain models. Local restaurants will commonly pay a premium for lobsters, with example of between £1 and £5, in order to support local supply chains, though they recognise this will be a small part of the overall volume sold. Numerous destination markets were given in examples, e.g. stock going via Bellshill to Barcelona at a mark-up of 1:10 (€11 for fisher to €130 at destination); Skye langoustines can be marked-up from £55 per kilo to €160 in a Paris restaurant; stock destined for Portugal, France (high incidence) Manchester, Madrid, Antwerp. Spain (consistently cited) is seen as the largest market for inshore prawns.

4.1.8 Safety

The **safety** theme was dominated by issues associated with the environment and the general working conditions. The corresponding SLA category is twofold with elements of both human and natural capital. Figure 4.7 shows how many times the theme was mentioned over the 45 interviews. Issues surrounding *safety* were most prevalent in the Argyll region.

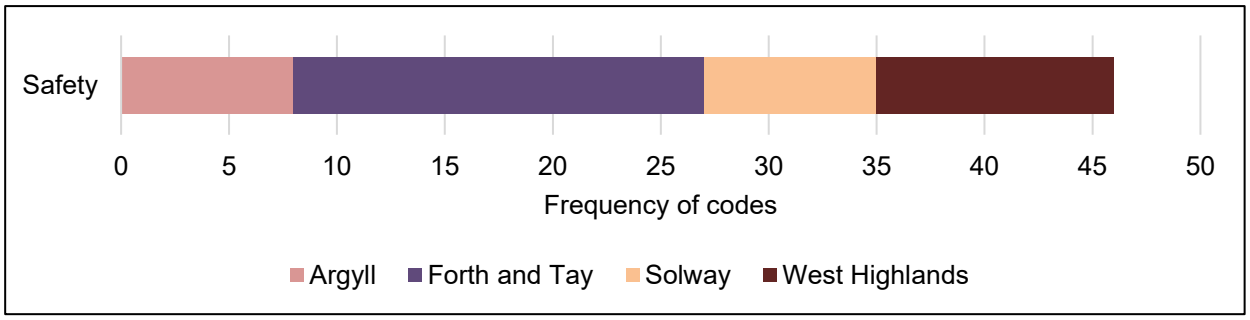

Figure 4.7. Stacked bar chart showing frequency of codes under the theme of safety according to interview region.

There was a general consensus among the interviewees that fishing was dangerous for a number of reasons including; weather (especially during winter months), gear and boat set-up, long working hours, and lone working. It was clear that the interviewees felt the danger of fishing and the associated respect that they have for the sea is a part of their individual and collective identities. Many stated that they had known people (family and friends) who had been lost at sea, and that the industry was not suited to everyone.

Interviewees stated that accidents can happen as a result of tiredness and fatigue as well as poor design and maintenance of boats. Interviewees acknowledge that working on their own is dangerous; however they have to assess the economic viability of having crew on board because of the associated costs. They do not think that young people are put off by these dangers. A few interviewees felt that stricter regulations were making boats safer such as Health & Safety measures and life jackets, and that these regulations should be stricter.

Interviewees described a sense of camaraderie in the in the inshore fishing community when at sea, even if there is some animosity between individuals. This is because they are reliant on each other when things go wrong at sea. Several interviewees said that they would call their mates or other fishers first if they were in danger before calling the RNLI (Royal National Lifeboat Institution).

4.1.9 Weather

The **weather** theme was dominated by issues associated with dependence and consequences of bad weather. The corresponding SLA category is mainly natural capital, with some human capital elements. Figure 4.8 shows how many times the theme was mentioned over the 45 interviews, with it being mentioned quite evenly throughout the four Marine Regions.

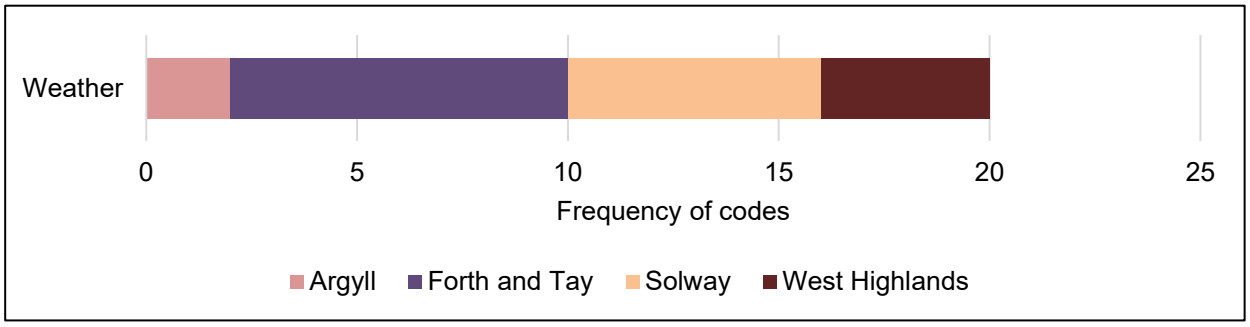

Figure 4.8. Stacked bar chart showing frequency of codes under the theme of weather according to interview region.

Weather is one of the biggest challenges that fishers face according to the interviewees. It determines when they can go out to sea, and how good their catch will be depending on the swell and wind direction at any one time. More importantly, it affects the earnings of the boats. In bad weather, fishers earn very little as they cannot get out to sea, but still have to pay their bills. Storms can result in additional losses for creel fishers as creels are often damaged or lost during these events. As a result of these challenges, fishers are sometimes forced into fishing all-year-round, often in poor weather conditions and for little return.

4.2 Survey

The survey was made available to all inshore fishers in Scotland who had internet access via either a phone, computer or tablet. A total of 133 fishers participated in the survey with representation from all 11 Marine Regions. The survey was split up into six categories, which reflected the emergent themes from the qualitative interviews. These categories were; background information, boats harbours and transport links, skills learning and career, jobs and income, community, relationships and culture, and marine and natural resources (resource management and catch). This section discusses the results of the survey under each of these categories, before discussing the results of the survey as a whole.

4.2.1 Background information

Questions one to eight of the survey helped to identify key demographic information about the inshore fishers in Scotland such as; age, nationality, home port, and time spent in the industry.

The majority of people that filled out the survey were fishers; approximately 90% were skippers with 3% indicated that they were crew members. Two of the fishermen were retired and two stated that they were part-time fishers, but still own their boats. Five of the respondents also stated that they had other roles in addition to skippering a boat, which included processing, buying catch, diving, and also crewing on other boats. The majority of the remaining 7% of respondents worked in local fisheries associations.

Of all respondents, 98.5% were male, with an average age of 51. The youngest fisherman was 14, and the oldest fisher was 81 years old. The majority of respondents identified as Scottish (88%), with 4.5% being English, and 3% identifying as being British. The remaining 4.5% included respondents from Northern Ireland, Republic of Ireland, or another European country. From the interviews that were conducted, it was clear that the age of fishers varied considerably which was confirmed by the survey results as shown in Figure 4.9. The largest age range was in the West Highlands region, with the smallest age difference in Solway.

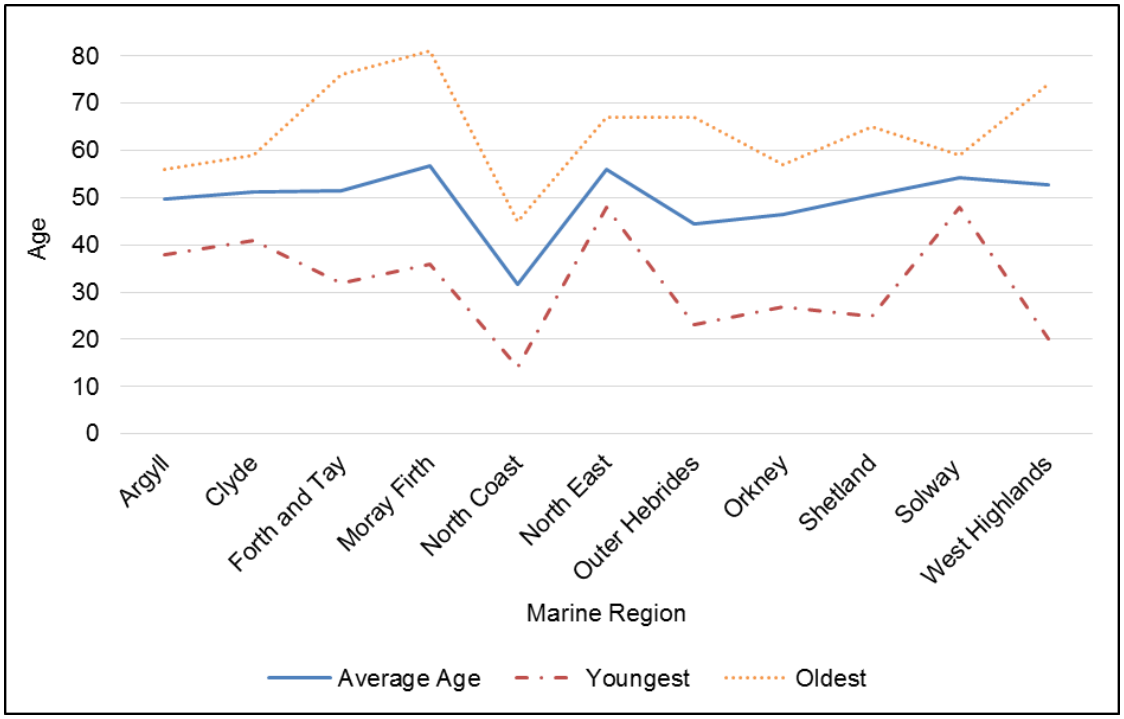

Figure 4.9. Age breakdown of fishers in all 11 Marine Regions that answered the online survey.

The home port of most respondents was within the Outer Hebrides Marine Region (almost 17%) as shown in Figure 4.10 below, followed by the Forth and Tay and Moray Firth Marine Regions. Only 2% of respondents were from the Clyde and North Coast Marine Regions.

The average amount of time that respondents have spent in the sector, either as fishers or working in another capacity within the sector is 29 years. One respondent indicated that they had only been in the industry for three years. However, some respondents indicated that the time spent in the industry was not always continuous, with some helping their father or grandfather before leaving the industry to do something else. This is supported by our interview findings where some fishers indicated that fishing is a skill and a job that one can always come back to, and it is a fall-back option for some people. On respondent indicated that they had been involved in the industry for 66 years. When asked if they were married, over 70% of respondents indicated that they were, with 4.5% opting not to answer the question.

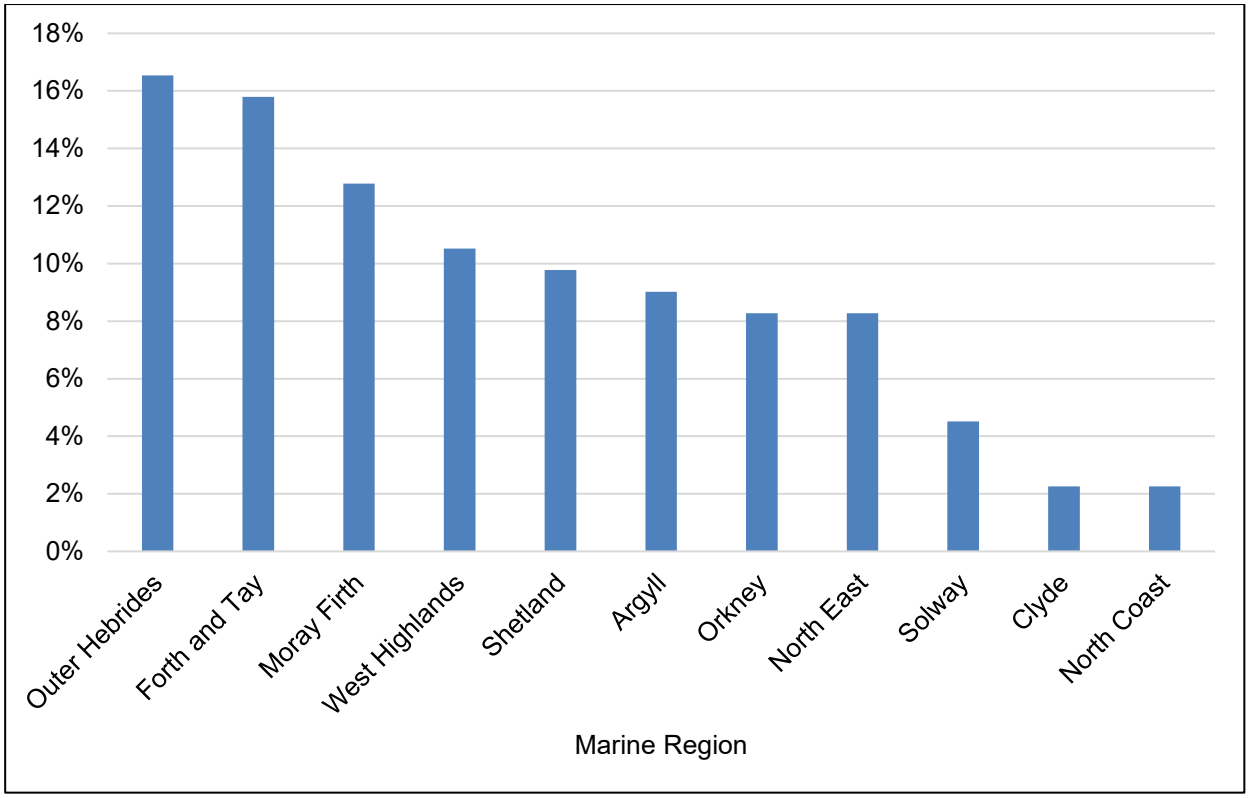

Figure 4.10. Location of respondent by Marine region, percentage.

4.2.2 Boats, Harbours and Transport Links

Following on from the demographic questions, respondents were also asked to indicate the number of boats they owned and the sizes of their boats. Most fishers owned one boat (73%), with only 10% owning two boats. There was only one fisher who owned more than 10 boats, and a few that owned more than three boats (~8%). They majority of boats owned by fishers in the inshore sector were between 6 - 11 m in length, with 36% falling into the 8 – 9 m range (Figure 4.11). Only 5% of boats were <5 m, with 20% over the 12 m limit as set by the definition of the inshore sector.

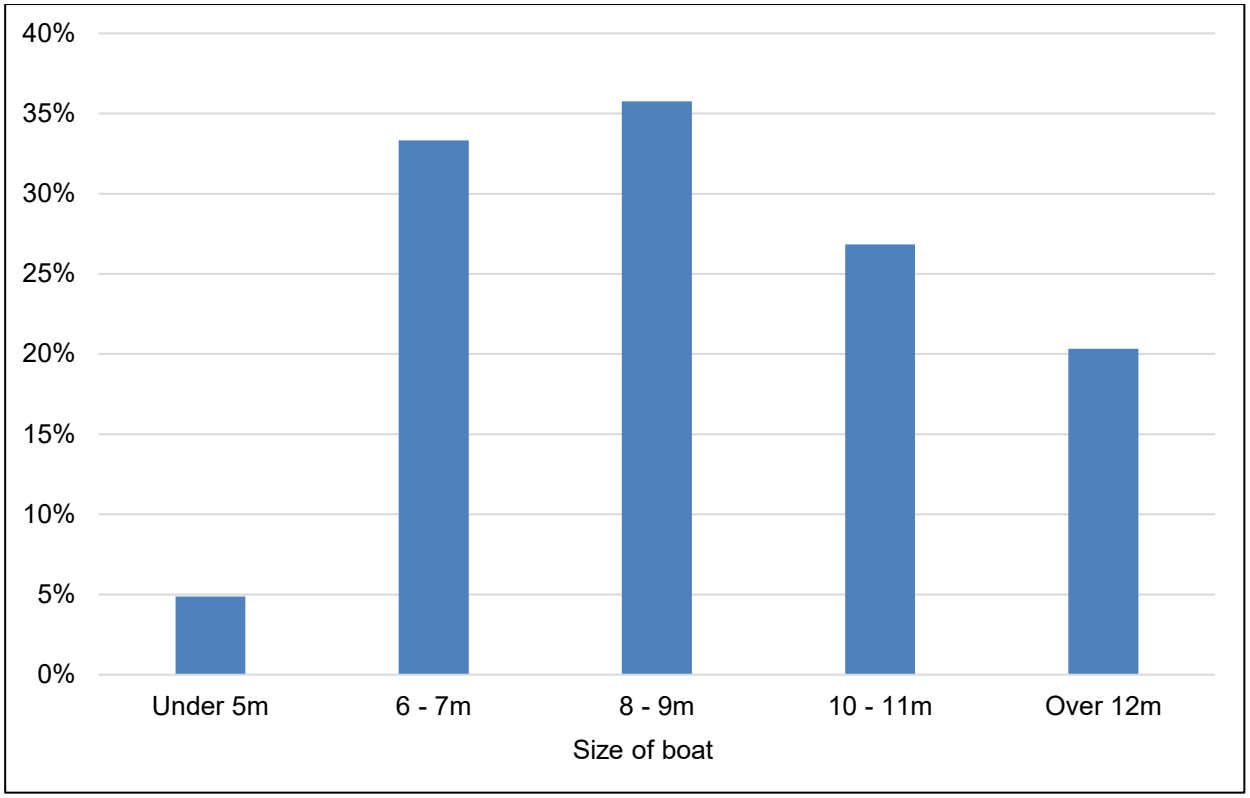

Figure 4.11. Size of boat(s) owned by respondent fishers, percentage.

There are some regional variations in the size of boats owned or worked on. The majority of fishers owned or worked on boats that are between 10 - 11 m, compared with 6 – 7 m in Forth and Tay. The most common size of boats owned in Solway are between 6 - 7 m and over 12 m. The most common sizes of boats in the West Highlands were between 8 - 9 m and 10 - 11 m.

Question 11 asked respondents to specify the type of fishing gear that they used, allowing respondents to pick multiple gear types. The most common gear type used by fishers was creels (69%) followed by trawls (25%) and dredges (12%). Creels were the most common types of gear used within all four regions. In addition, fishers also noted that they used other gear types (as shown Figure 4.12), including:

- Handlines and hooks
- Nets
- Hand diving
- Jigging, and
- A combination (e.g. creels and handlines).

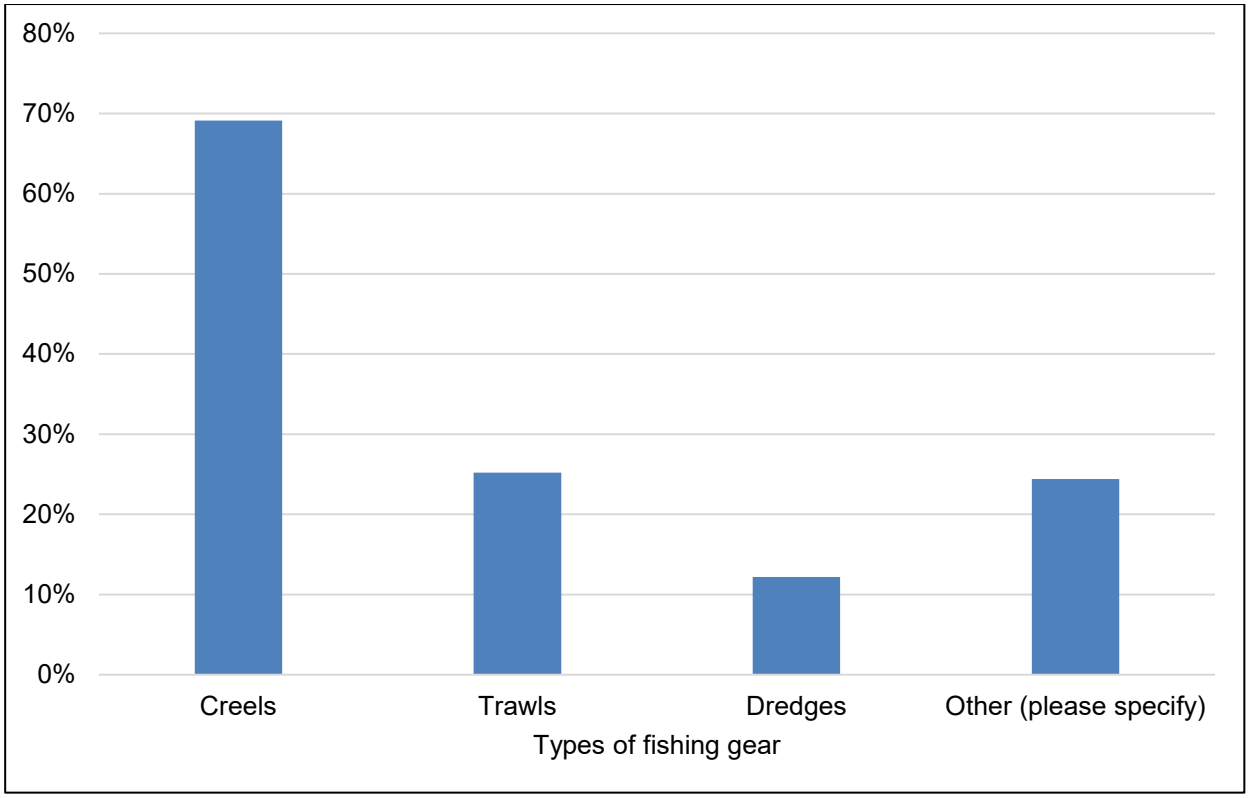

Figure 4.12. Types of fishing gear used by respondent fishers (multiple options), percentage.

Question 12 asked respondents to rate how important physical infrastructure was to their business, or the business that they worked for as shown in Figure 4.13. Most respondents indicated that these physical assets were very important to their business. Respondents were in agreement over the importance of harbours with 95% stating that they were somewhat and very important to their business. However, the opposite was seen for the importance of airports, with 36% stating that they were not at all important and only 18% suggesting that they are very important. Respondents' views on the importance of ferries were most likely related to their geographical location. While 36% of respondents indicated that they are important, 33% suggest that they are not at all important to their business. This was reflected in the interviews, where respondents in certain locations (such as the Argyll Marine Region) were much more reliant on ferries than those in the Solway Marine Region.

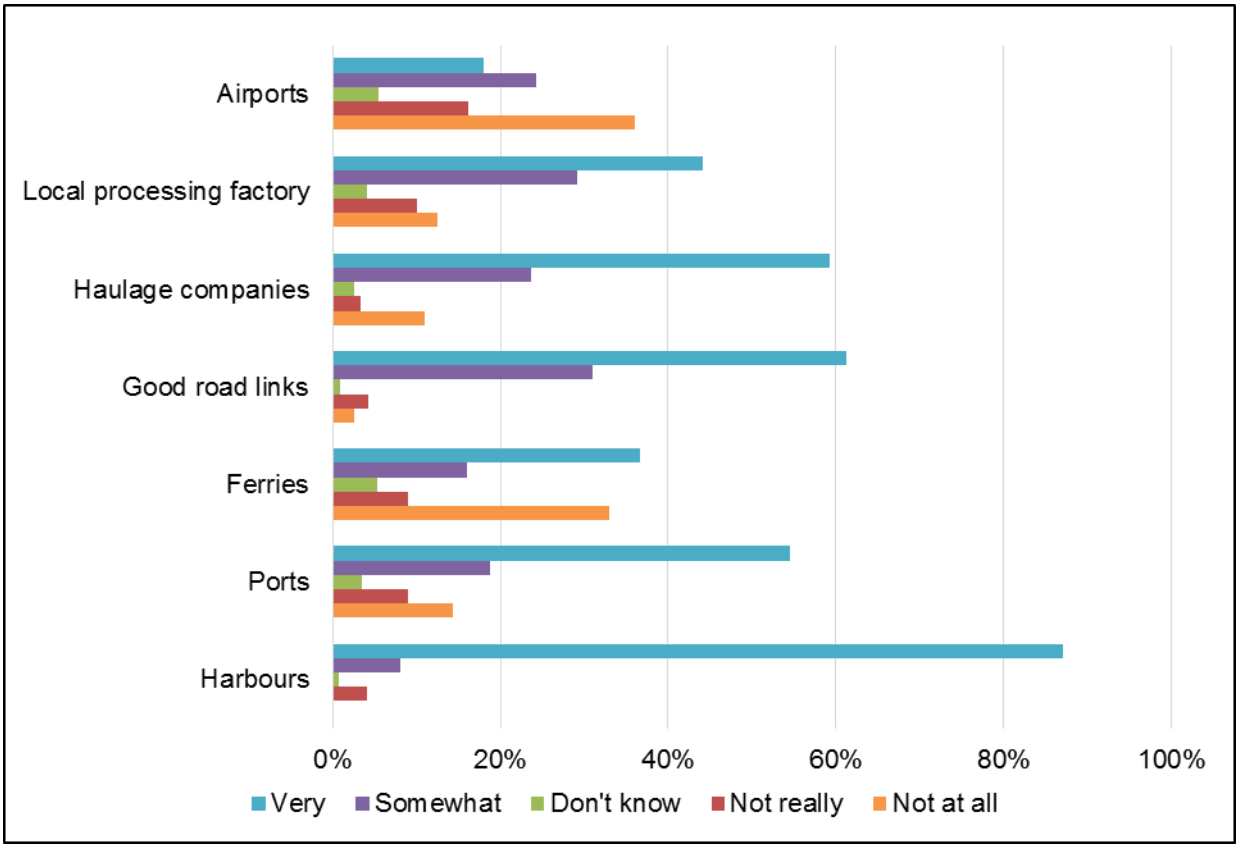

Figure 4.13. Percentage measure of importance of physical infrastructure to the inshore sectors.

Respondents were also asked to comment on other physical infrastructure which is important to their business. They indicated that although there were a lot of small piers, harbours and slipways in part of the country, they currently lack investment and maintenance which means that they are falling into disrepair with one respondent stating that: "*the lack of investment in maintenance and improving infrastructure [of] Council harbours is appalling*". In addition to maintenance, a few respondents mentioned that "*safe and secure berthing, with access to power and fuel*" was important.

Proximity to local and foreign markets and having a local buyer in place was mentioned by several respondents as being key to their fishing business, along with access to ice, better mobile phone coverage, and improved links to other parts of the country (i.e. East and West Coast linkages).

4.2.3 Skills Learning and Career

Question 13 asked respondents for their level of agreement with four statements relating to how the inshore fishing industry maintains crew, attracts new entrants, and passes down businesses (Figure 4.14). Most respondents thought that there were fewer young people to take over businesses now than there used to be, and that inshore fishing is passed down through family. Most respondents thought that there were not enough local people to find crew and equally that there were not enough young people coming into the industry.

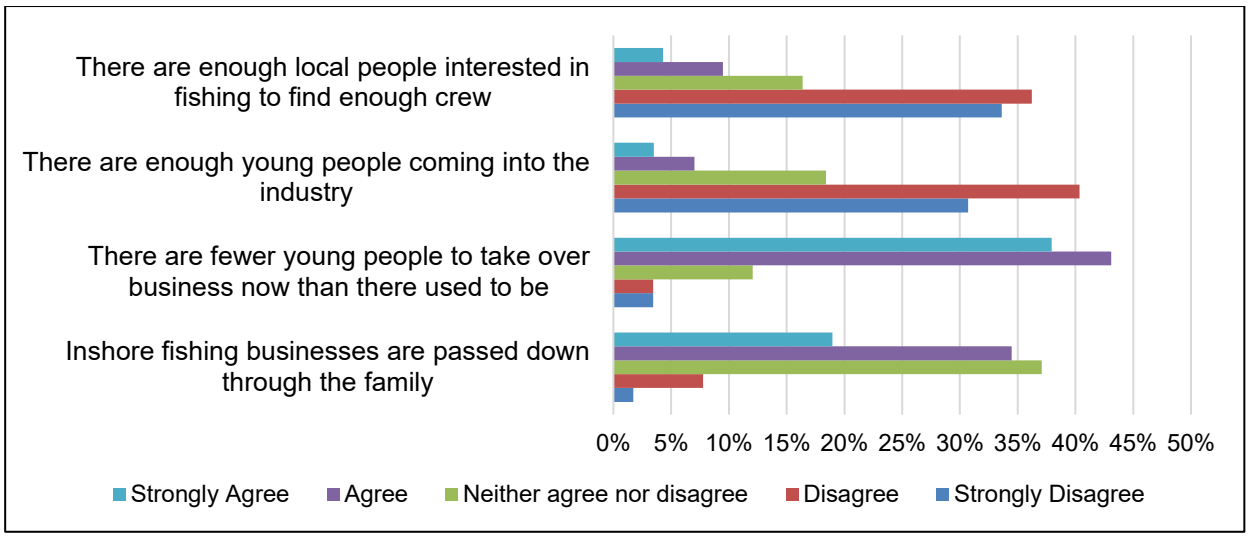

Figure 4.14. Weighted average of the level of agreement to statements on the future of the inshore fishing industry (1 = strongly disagree, 5 = strongly agree).

Question 14 asked respondents for their level of agreement with five statements on health and safety and training opportunities in the inshore fishing industry (Figure 4.15). Most respondents agreed with all of the statements, although, there was a higher level of disagreement with the statement that there were enough opportunities to learn the skill of fishing.

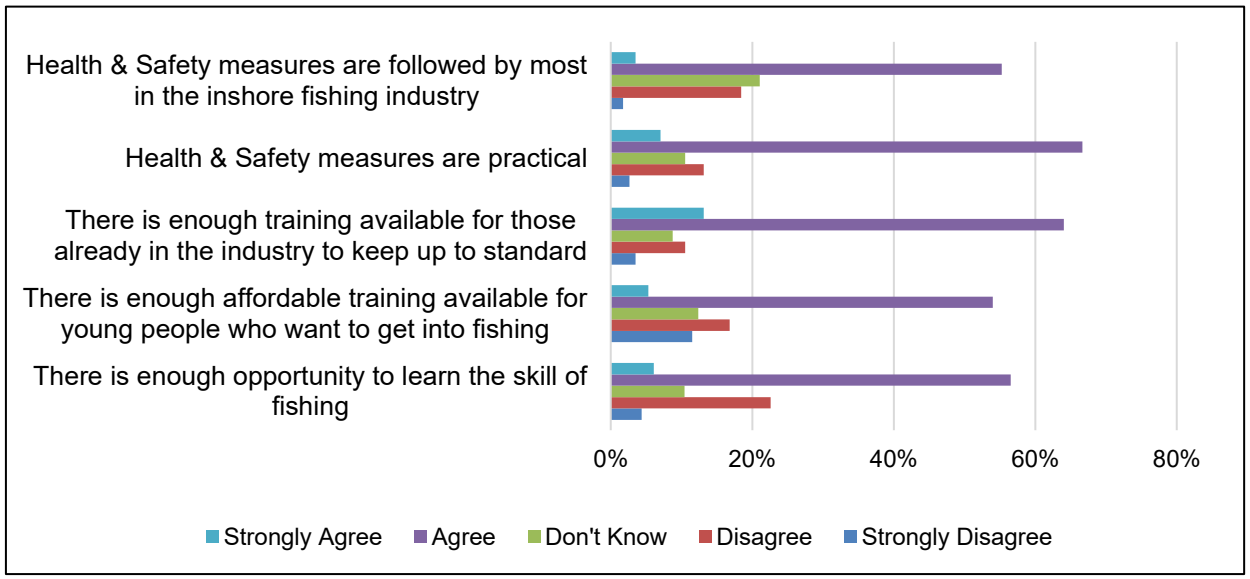

Figure 4.15. Percentage measure of level of agreement with five statements on health and safety.

Question 15 asked respondents for their level of agreement on types of work patterns (Figure 4.16). The majority of respondents agreed that their work patters have changed since they first started fishing, that they do day trips only and that they fish or crew all year round.

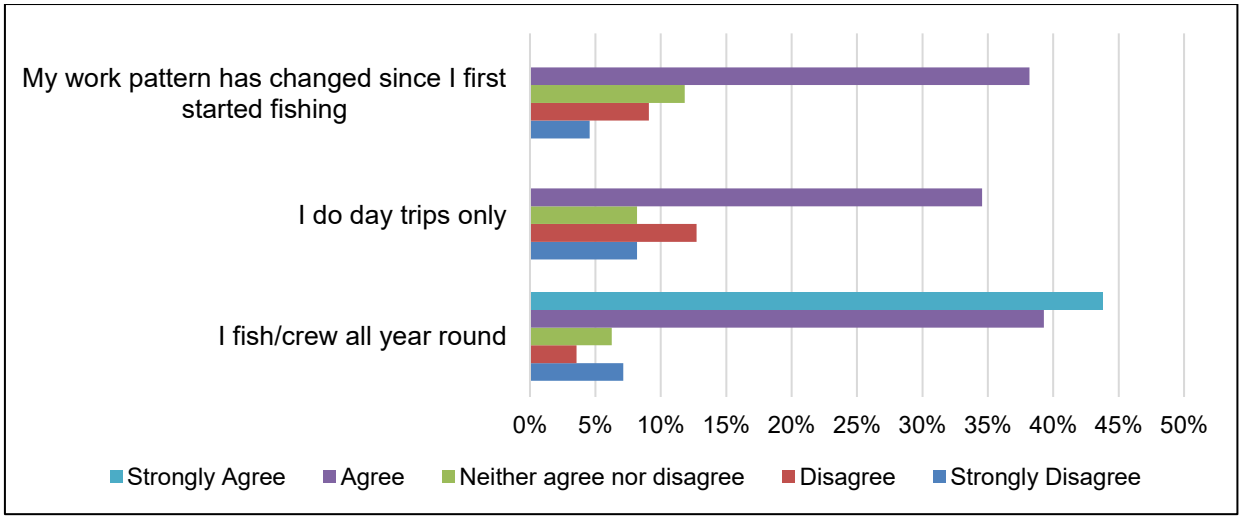

Figure 4.16. Percentage measure of level of agreement with statements on types of work patterns.

4.2.4 Jobs and Income

This section of the survey aimed to determine the extent to which the individuals and the community relied on fishing financially. Almost 77% of respondents felt that their community relied heavily on the fishing industry. They were then asked to list three industries (not in any order of importance) in their local area that rely on the fishing industry. Respondents gave a range of answers, but the most common was to do with maintenance or repairs of boats, including boat yards, boat repairs and building, fabricators and mechanics. Engineering was the next most commonly mentioned industry and included general and electrical engineering, but most respondents specifically mentioned marine engineering. Processing (including factories) and fishing gear suppliers (including manufacturers and chandleries) were the third and fourth most cited industries / sectors that respondents mentioned. Surprisingly, despite 77% of respondents believing that their community relied heavily on the fishing industry, a large percentage of them stated that there were no industries in their local areas that relied on fishing.

Respondents were also asked to estimate the percentage of their income received from fishing: ~64% of respondents relied heavily on fishing (81 – 100%) as shown in Figure 4.17. Where fishing was not their only income, respondents were asked in Question 19 to list other sources of income. Spousal income was the main additional source of income for fishers, followed by other paid work which varied from part time harbour work, to offshore oil industry work, to consultancy. Crofting was also an important source of income to fishers whether it is through the lease of their land or farming themselves. A number of fishers also rely on Bed and Breakfast or other types of property rentals as another income stream.

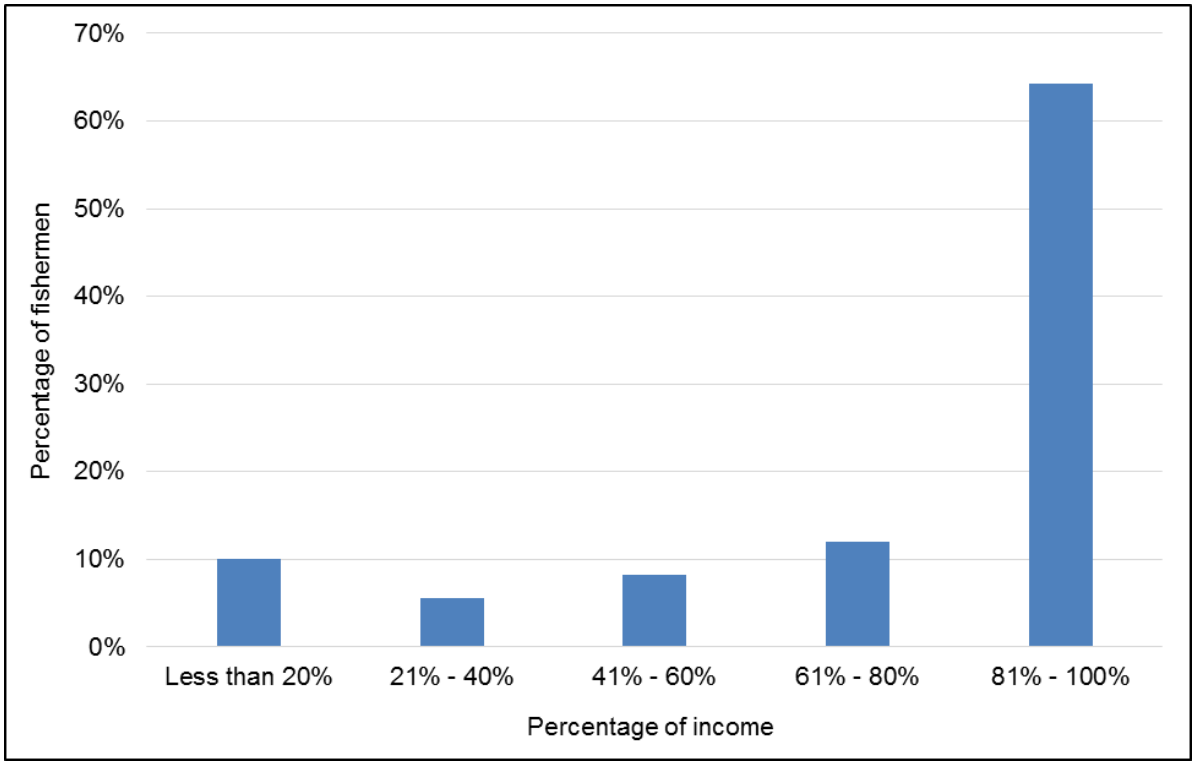

Figure 4.17. Estimated percentage of income from inshore fishing from respondents.

Respondents were asked if they would be able to estimate the running costs of the boats that they owned or worked on. Only 54% of respondents were willing to share these costs. Table 4.2 below shows the breakdown of the different costs that respondents were asked to estimate. Boat costs and skipper income is available through the Seafish fleet economic performance data (Seafish, 2017a) by administrative port and size of vessel. This information is not accessible by Marine Region in its current form (at the time of writing). Costs are also largely fixed, rather than variable across boats (i.e. an individual creel costs roughly the same per boat and region). (Further UK-wide analysis of boat costs have been collated by Seafish (2017a), though these have not been broken down by region.)

Table 4.2. Approximate running costs of the boat(s), £/year.

Costs	Average costs (£)	Minimum amount spent (£)	Maximum amount spent (£)
Fuel	21,179	200	200,000
Bait	4,663	0	27,500
Maintenance	14,171	5	200,000
Gear	13,575	100	300,000
Crew	60,712	0	550,000
Licences	17,816	0	220,000

Based on the information provided in the survey, paying for crew was the largest single running cost at an average per respondent of ~£61,000 per year. Fuel costs were around £21,000 per year, followed by licences. It is important to note that the information provided by respondents was patchy and varied significantly between respondents and suggests that some respondents did not provide accurate estimates. For example, one respondent indicated that they only spend £200 on fuel per year compared to several who spent £200,000 per year. Although this kind of variation can be down to the difference in the number of hours spent at sea (steaming and hauling) and the size of the boats in question, it is more likely that the £200 figure is a typographical error. The same discrepancies are seen in maintenance costs. However, for crew and bait, the minimum values are entirely plausible as some fishers; especially on creel boats often do not have crew, and some fish for their own bait whilst at sea. It is unlikely that fishers had no costs associated with licences as all fishers require a licence to fish. However, in some cases, licences are included in the cost of buying a boat.

Some respondents provided commentary on the approximate running costs, including that everything cost "*a fortune*" or that *"it's not cheap"*. Other responses showed that it was difficult to estimate some costs for a number of reasons:

- Gear costs "*Depends on storms could be £20k or £50*"
- Crew costs "*share of catch"*
- In terms of licences, some fishers offered a bit more information:
    - One indicated that they were "*not sure"* what their costs were
    - Several indicated that licences were a "*one-off payment*" or *"Currently included within boat purchase"*
    - No cost as they own the *"Full Shellfish entitlement"*
    - No cost as they own their licence.

Respondents were also asked to state any other estimated costs associated with the boats that they owned or worked on. Very little detail or monetary information was provided on these costs; transport, spare engines, harbour dues including mooring and landing fees, insurance, training,

and association fees. The authors postulate that this is because the participants in the survey did not wish to reveal these costs, had different terms for these costs or, did not differentiate between some of these costs within their expense reports. .

4.2.5 Community Relationships and Culture

Question 22 asked respondents to rate the business impact of five factors relating to use of marine space and seasonality (Figure 4.18). There was very limited negative impact associated with recreational users of the sea, including tourism activities such as diving and wildlife watching. Gear conflict did have perceived negative impacts, although the extent of which varies with gear type. Gear conflict with trawlers/ dredgers had more 'no negative impact' responses than gear conflict with creels. However, it also had more 'extreme negative impact' responses whereas conflict with creels had more 'slight negative' and 'significant negative' responses. Seasonality had similar levels of 'slight negative', 'significant negative' and 'no negative' responses.

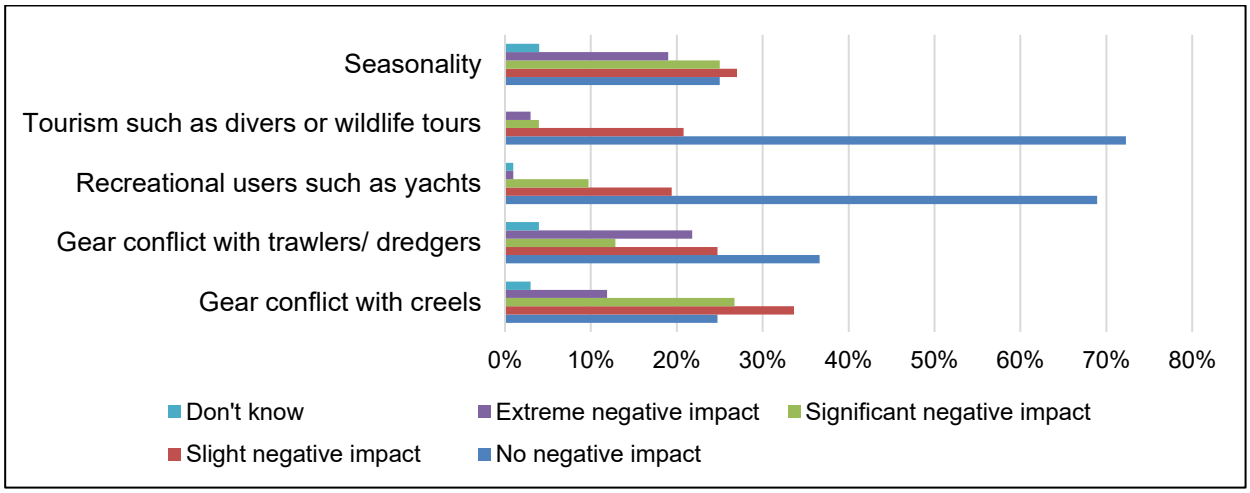

Figure 4.18. Percentage measure of level of agreement with five statements on seasonality and use of marine space.

Question 23 asked respondents to rate their level of agreement with six statements about local community and family (Figure 4.19). Most respondents agreed that fishing was part of their local community. There was a mix of responses to the statements about family being involved in the fishing industry. A larger percentage strongly disagreed with the statement that 'none of my family are involved in the fishing industry' than those who agreed with the statement. However, the difference between the two is not dramatic. Most respondents disagreed or strongly disagreed with the statement that pelagic commercial fishing is in their family history. Most strongly agreed that commercial inshore fishing was part of their family history.

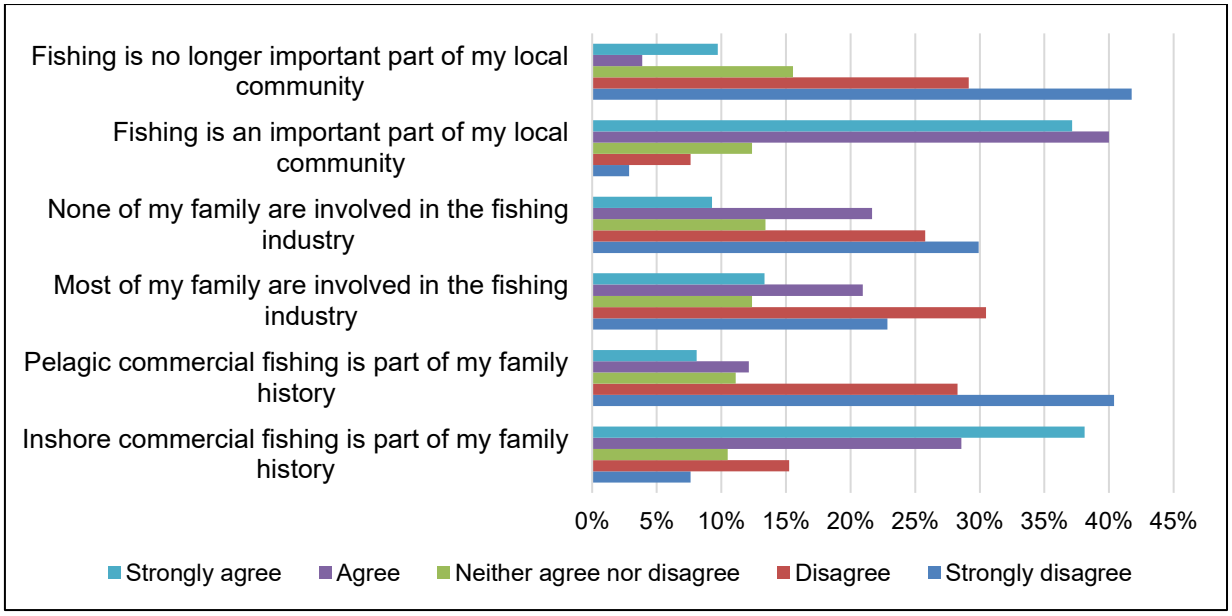

Figure 4.19. Percentage level of agreement with statements on the inshore fishing community and culture.

Question 24 asked respondents to rate their level of agreement with seven statements about inshore fishing culture (Figure 4.20). Most of the respondents agree that there is a difference between local and non-local boats, that fishing provided a job when they otherwise would not have had one, that 'fisher have to be able to cope with dangerous situations' and that 'you have to be hardy to be a fisher'. Most respondents disagreed that you have to know people in the fishing industry to get into it. There was ambivalence towards the statement that 'fishing is a business rather than a way of life'. Interestingly, there was strong agreement with the statement that 'fishing is a way of life rather than a job'.

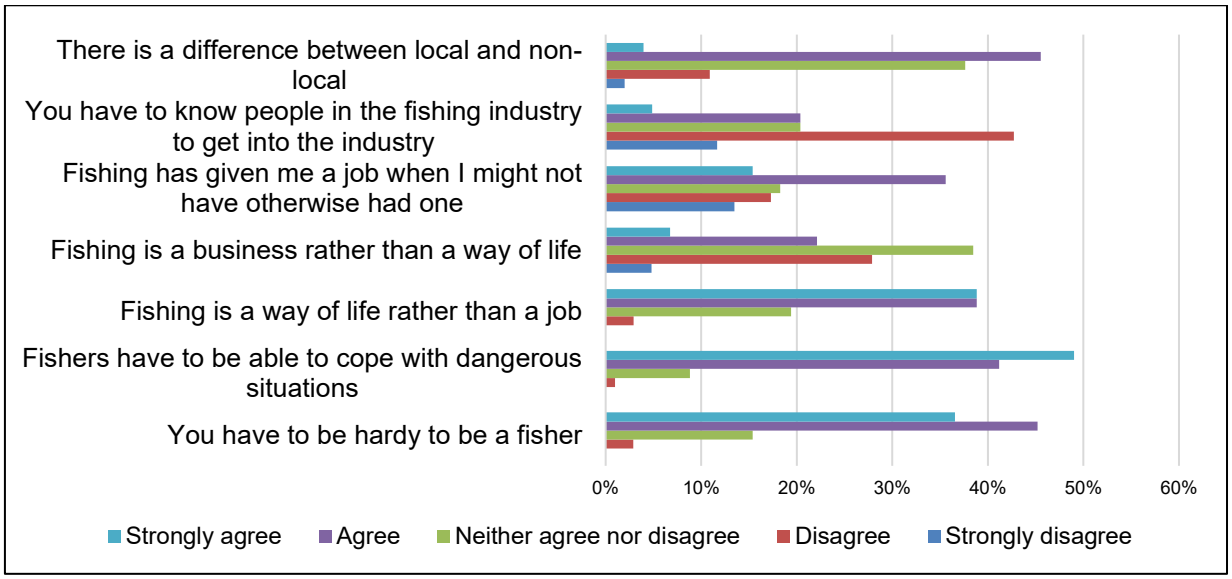

Figure 4.20. Percentage level of agreement with statements on inshore fishing culture.

Question 25 asked respondents to rate their level of agreement with four statements on relationships within the inshore fishing community (Figure 4.21). Respondents with mostly either agreed or strongly agreed with all of the statements.

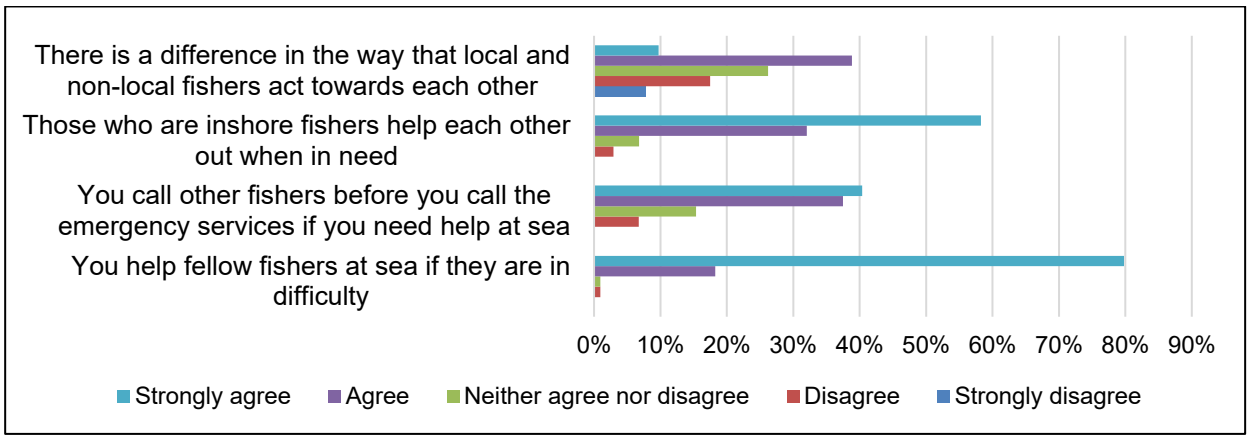

Figure 4.21. Percentage level of agreement with statements on relationships within the inshore fishing community.

Question 26 asked respondents about their level of agreement with three statements on how inshore fishers are represented (Figure 4.22). Most of the respondents either disagreed or strongly disagreed with the statement that they did not feel the need to have anyone represent them. Most respondents also agreed that they were well represented by their regional inshore fisheries group. Unsurprisingly, most felt neutral about the statement on Marine Scotland.

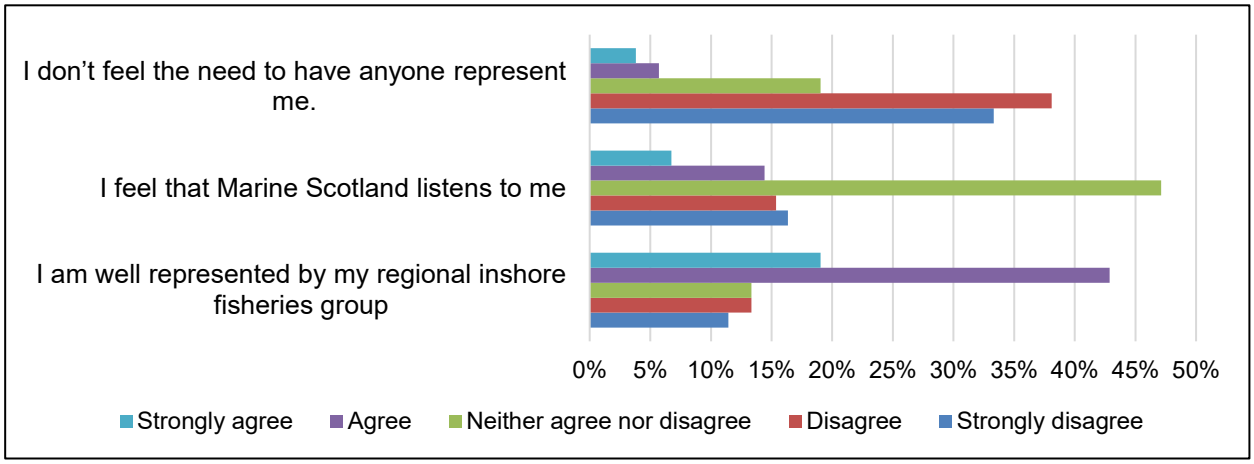

Figure 4.22. Percentage level of agreement with statements on how inshore fishers are represented.

4.2.6 Marine and Natural Resources

Question 27 asked respondents to list up to five target species (Figure 4.23). Lobster, *Nephrops*, velvet crab and brown crab were the most common and salmon and sea trout were the least common. The target species were not listed in order of preference, as was evident by extra comments such as '*scallops in the winter'* and '*mackerel in the summer*'. There were 98 responses listed under target species one, 79 for target species two, 62 for target species three, 45 for target species four, reducing to 19 for target species five. It is important to note that these results cover all of Scotland and all gear types.

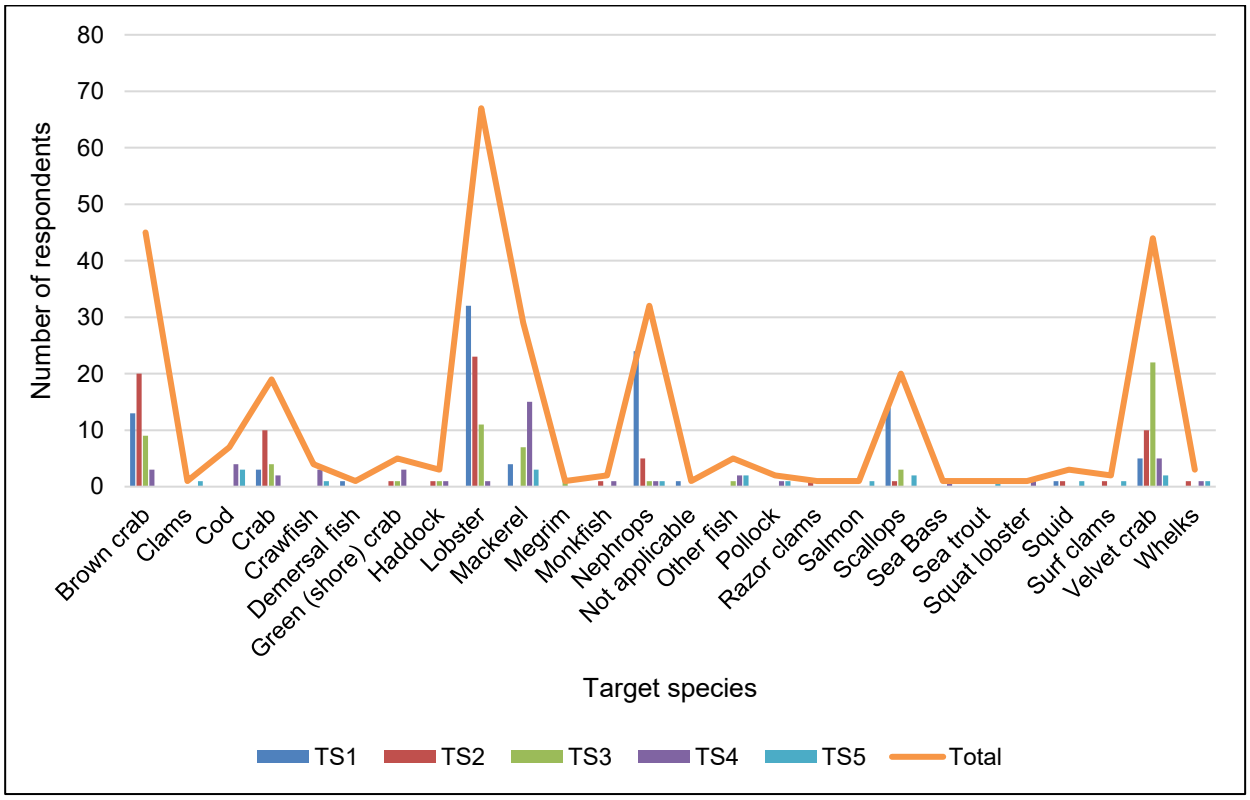

Figure 4.23. Number of respondents plotted against target species (up to 5).

Question 28 asked respondents to rank five factors from one (most important) to five (less important) in terms of their negative impact on inshore fishing. The factor that was ranked as the most important by the most respondents was 'weather', followed by 'limited stocks/ catch' and 'not enough space to fish'. 'Limited stocks / catch', 'not enough space to fish' and 'seasonality' had similar percentages of respondents ranking them as second, third, fourth and fifth. Those who chose 'other' were asked to specify the factor. Responses included specific reasons such as *'tidal harbour'*, *'too many creels'* and *'MPAs'* (Figure 4.24).

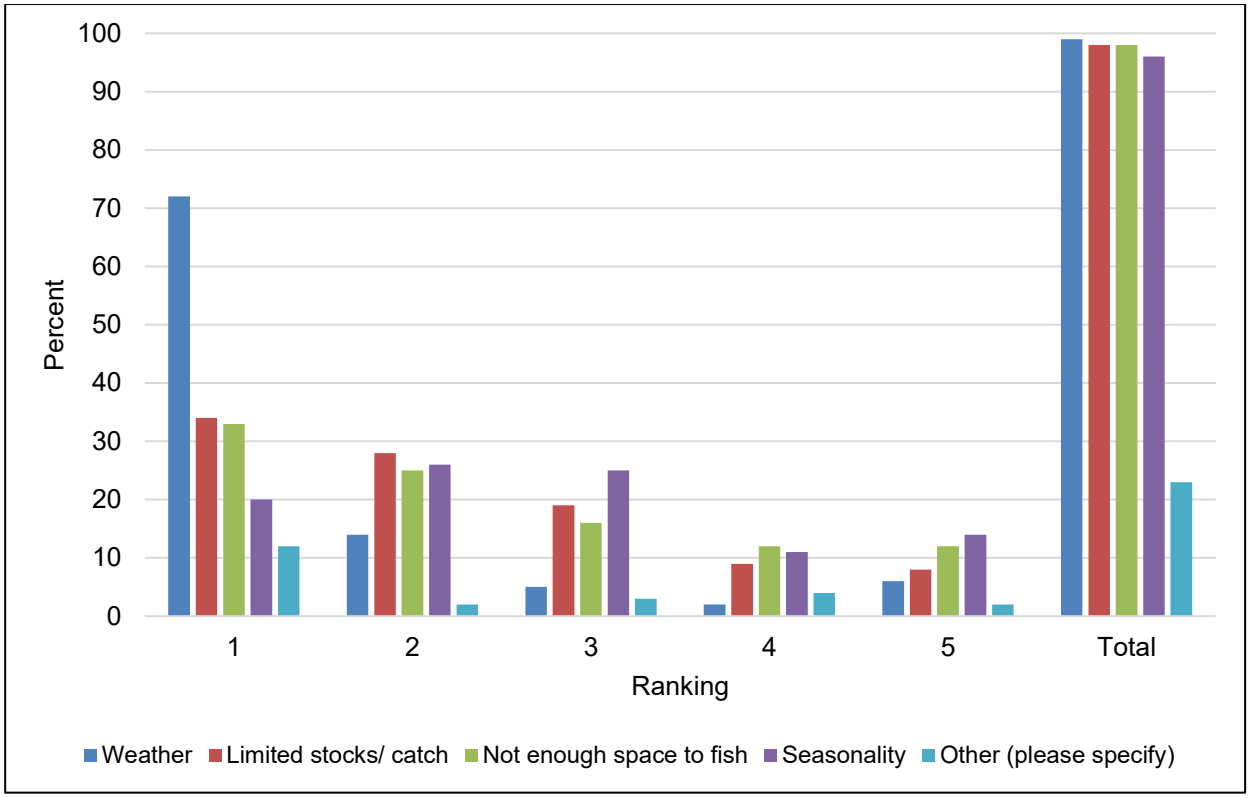

Figure 4.24. Percentage ranking of five factors which could negatively impact inshore fishing (1= most important, 5= less important).

Question 29 asked respondents to describe the changes that they had seen to the marine environment over their careers in inshore fishing. The change that was cited the most referred to the number of creel boats and the amount of gear in the water. One respondent summed it up as; '*Now resembles a golf course in the summer season'*. Another stated that there is '*too much gear on the ground'*. There were quite a few references to a reduction in catch, the damage that scallop dredges cause to the seabed and an increasing abundance of seals. Respondents also noted the changing weather and temperature of the seas and how this affected their fishing. For example, '*warmer waters [are] shifting where stocks are found'*, and '*we don't get flat calm summer seas often… sea is more unpredictable'*.

Question 30 asked respondents to qualify the changes to the sea that they have seen over their fishing careers (Figure 4.25). Most respondents felt like the sea had change either 'somewhat' or 'a lot'. Only 26% thought that the sea had not really or not at all changed.

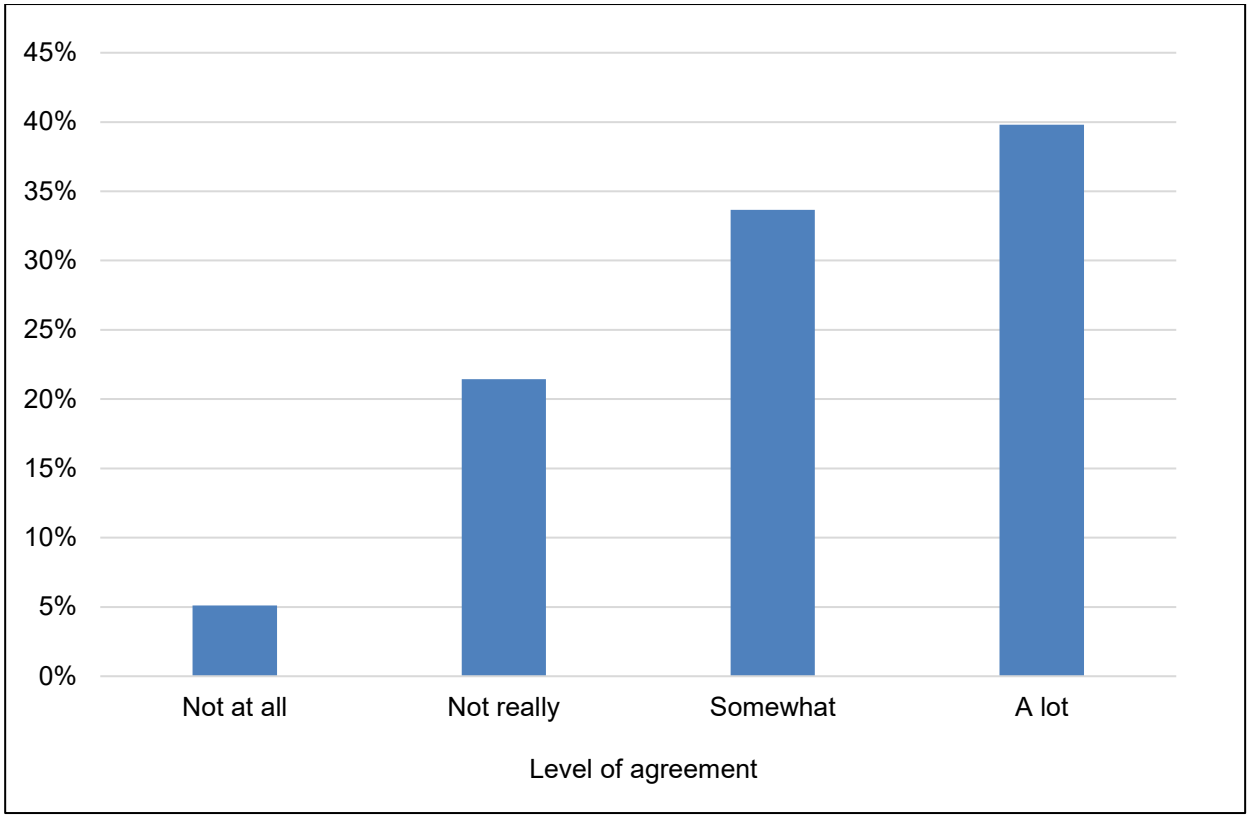

Figure 4.25. Percentage level of agreement to the question; 'To what extent has the sea changed over your fishing career?'

Question 31 asked respondents for their agreement level with six statements about how inshore fisheries are managed (Figure 4.26). There was a strong agreement level with the statements that fishers manage their own fishing effort, that the future of fishing depends on good management by fishers and to a slightly lesser extent that fishers take responsibility for managing their local fishing areas. Interestingly, there was agreement that the future of fishing also depends on good management by Marine Scotland but not that Marine Scotland should be responsible for managing individual fishing effort or grounds.

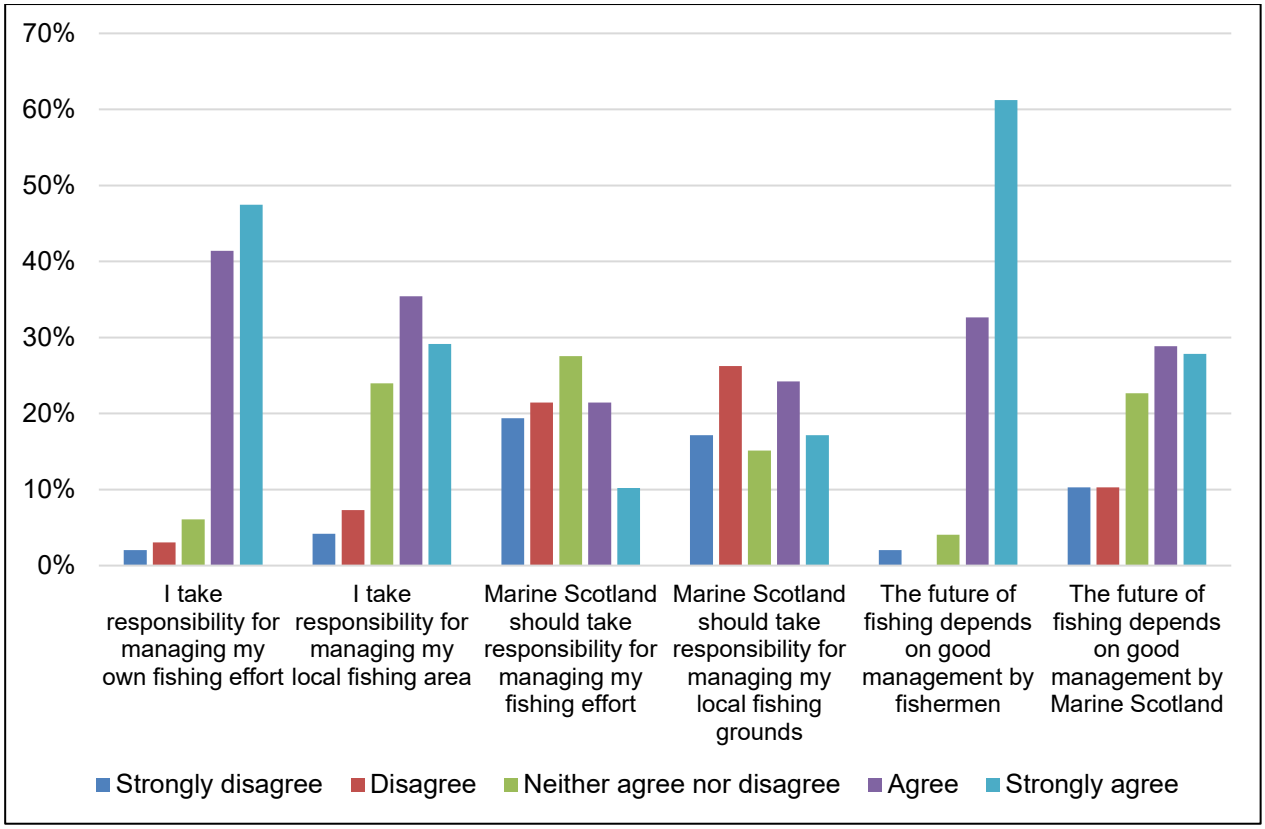

Figure 4.26. Percentage level of agreement to statements on how inshore fisheries should be managed.

Question 32 asked respondents to comment on how the management of the inshore fishing sector could be improved in their area (Figure 4.27). There were 70 responses out of a potential 133. Of the responses, most related to the need for creel limitation (28%) and included comments such as; '*Limiting creel numbers, especially on the big boats' and 'unfished creels should be removed, total ban on creels fished by unlicensed boats*.' The second largest category of responses was about the need for regulating agencies (Marine Scotland) to listen to fishers (15%) and included comments such as; '*By really listening to fishermen as we actually know what we are doing and why. Just now it feels like fake listening and offers to consult that we can't use. By not having a one size fits all solution and thinking more locally.*'

Under the theme of 'other' there were several diverse comments, from one relating to the need for better data on '*destructive fishing practices*' to another which asks for '*more protection from Marine Scotland*' for areas which border English-controlled waters as there is confusion around where the different regulations start and end. 'Limits on dredging/trawling' mostly pertained to the reinstatement of the three-mile limit and the banning of both activities in inshore waters. 'More visibility and policing' documented requests for '*fisheries officers making the odd appearance around the harbours' and 'monitoring of catch from specific areas'*. Respondents advised that management should be area specific and involve local fishers under the theme of 'Local control'. 'MPA management' related to '*governing and spatial management between the static and mobile sectors'*. 'Quotas / Total Allowable Catches (TACs)' were requested for larger white-fish quota

for inshore fleets and flexible quota management schemes. Only three respondents thought that the current system was fine under the theme ‘Leave it be’.

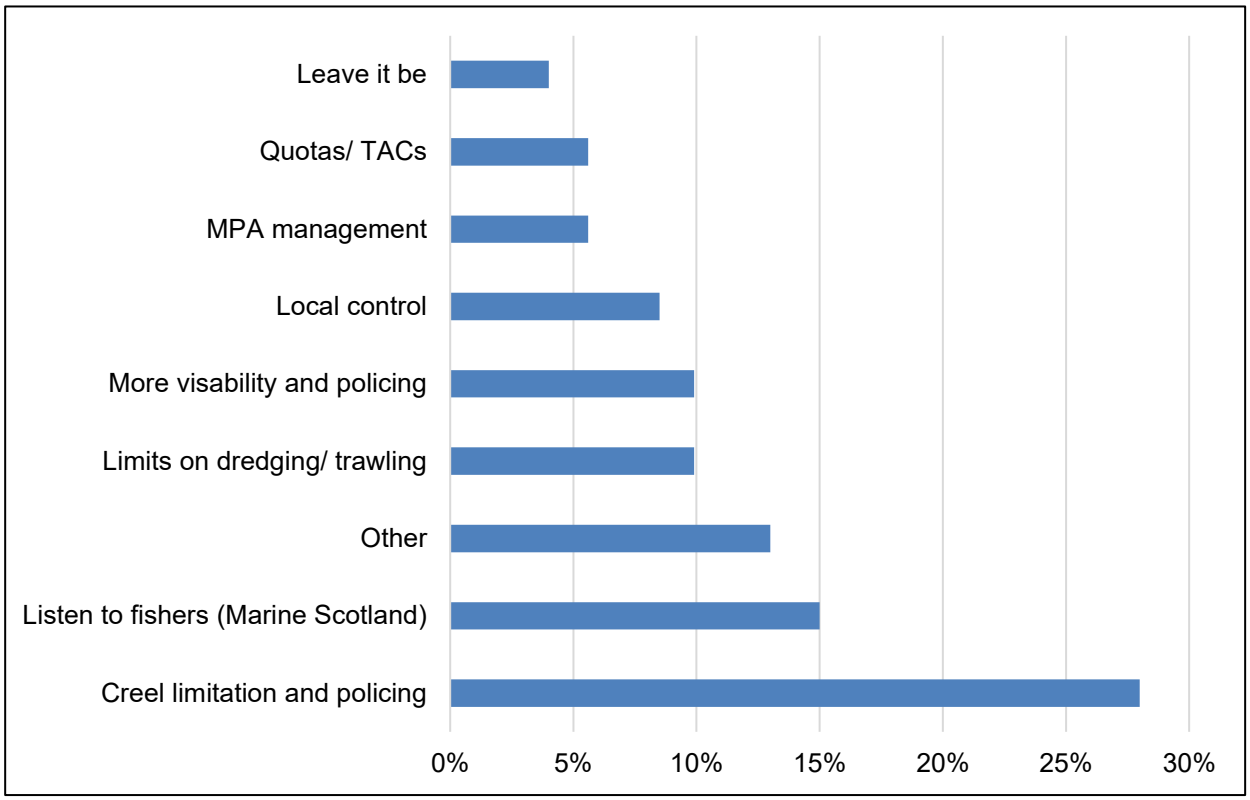

Figure 4.27. Percentage of comments relating to the nine themes identified in them.

4.2.7 Survey Conclusions/Discussions

The findings of the survey back up those of the interviews, and because of the participation from all Marine Regions, shows that many of the characteristics of inshore fisheries are found in all regions (e.g. gear conflict, differences between localities and the subsequent desire for more local management). Although the majority of fishers are in the industry continuously, there are a few that choose to leave the industry before returning at the later date. In some cases, they started working on boats as children with their fathers and grandfathers, before pursuing education and other economic opportunities. They then either choose to come back or fell back into it for love or in some cases, out of necessity. It has been noted in a couple of cases that fishing is sometimes an ‘employer of last resort’, taking on people who struggle to work in other positions, but it is also seen as a fall-back option for many fishers because it is a skill that allows them to always go back to it.

Although some aspects of physical infrastructure are seen as being crucial to fishers (such as harbours and good road links), several stated in interviews that some were falling into decline, which was confirmed by visits to these sites. The reduction in fishing effort has seen the decline of some fishing villages throughout Scotland, such as Drummore in Solway, and St. Monans in

Forth and Tay. As these harbours are used less by fishing vessels, they begin to fall into disrepair and the councils are less likely to put more money into maintaining them. In the case of Drummore, the decline of the harbour has seen several shops close in the village and boats (fishing and leisure vessels) are no longer able to get in and out of the harbours. This is in stark contrast to other areas along the Solway coast such as Kirkcudbright which is still a working harbour and Portpatrick which has become more of a tourist town. The same can be seen in the Forth and Tay region where St. Monans harbour and village is fairly quiet and dilapidated, compared with Pittenweem which appeared to be a bustling fishing town and Anstruther which has transformed into a tourist (heritage) town, with very few fishing vessels in the harbour, and a marina full of pleasure / leisure boats (Figure 4.28). The contrast is stark and highlights the importance that a thriving fishing industry has on an area, rather than its importance to fishers.

Figure 4.28. St Monans Harbour (left) home to a small but active inshore fishing fleet. Oban Harbour (right) host to a small inshore fishing fleet and a larger number of larger fishing vessels. (Pictures: Imani Enterprise Ltd. 2017).

The results from the survey suggest that the inshore fishing industry in Forth and Tay is sometimes unaware of the importance it has to local areas. This is supported by some respondents stating that no industries in the local area are reliant on the fishing industry for their commercial viability. However, there are several examples around Scotland which show how important fishing is, especially once it leaves an area e.g. St. Monans and Drummore as discussed above. There are cases where incorporating tourism into the offering has prevented the decline of an area, such as Anstruther (Figure 4.29). Respondents in Argyll, the West Highlands and Solway Marine Regions indicated that the communities rely (somewhat and a lot) on inshore fishing. The researchers postulate that in small, remote and rural communities, inshore fishing might still be a notable industry and where it is not, it is still considered culturally important. However, in larger communities with other bigger maritime and coastal industries, the prominence of inshore fishing is diminishing.

Figure 4.29. St Andrews Harbour (left) home to a small but active inshore fishing fleet. Anstruther Harbour (right) host to a small inshore fishing fleet and a larger number of recreational vessels. (Pictures: S-L Billing 2017).

Although the majority of fishers get between 81 – 100% of their income from fishing, many look at other ways of supporting this through spousal income, or additional jobs. These can include but are not limited to harbour master, pub work, office-based work, crofting and offshore work. Other jobs and income are crucial to fishers, especially during periods of bad weather and when grounds are closed (in some areas).

In terms of running costs of boats, this varied considerable across respondents and does not give a complete picture. However, it is clear that these costs are substantial, especially crew and fuel costs. The cost of having crew explains why many inshore fishers (especially creelers) opt to fish on their own, despite the safety issues that they are faced with. Not enough information has been captured in the survey to draw out any detail on fuel costs. For example, information on the boat and engine size, in addition to hours steaming and hauling, and total catch value would be needed to draw out any nuances in fuel costs versus effort and reward.

Change was a key theme throughout the survey and was also prominent in the interviews. Many of the topics touch on changes which have happened over careers, such a reduction in young people entering the industry and the shift from seasonal fishing to all year round. However, it is apparent that there are some changes which have an impact on the culture of inshore fishing and that these differ between regions.

It was clear that the survey respondents thought that there were fewer young people entering the industry than there used to be and that there were not enough local people interested in crewing. This view was reflected in the average age of the respondents being 51 years old and the median 50. Interestingly this is despite most agreeing that there were enough learning and training opportunities and that health and safety measures were practical. In the interviews, this reduction in young people entering the industry was attributed to the work patterns required and the difficulty of the work in comparison to other jobs, such as the trades.

Interestingly, respondents mostly agreed that work patterns had changed since they first started their careers and also that they now fish year round. The interviews backed this up, with most interviewees stating that they used to fish seasonally but have changed to fishing year-round. This change was due to several reasons including; the need to go out more to make the same amount of catch; being able to purchase rather than hand-make gear; and the need to protect/ maintain their areas for creeling.

The statements about protection of fishing areas might correspond with the results from Question 22, showing that gear conflict with creels was perceived to have a negative impact on respondents' fishing businesses. Although Questions 29 and 32 were not directly related to creeling, respondents stated that some creeling areas were crowded and that there were too many creels overall. It might be that competition for space has a role to play in the changes in work patterns, in addition to the other pressures mentioned previously.

Despite the view that there were not many young people coming into the industry and limited local people who wanted to crew, respondents still thought that inshore fishing was important to their communities as discussed above.

Historically, inshore fishing in Scotland was seen as a *'family business'*. This was also the case in the survey (Question 23) where most respondents stated that they have inshore fishing within the family history. The survey also reflects the interviews where most of the respondents answered that they did not have pelagic fishing as part their family history, but a small number did. This could be due to geographical differences between regions, where on the East Coast there might be more opportunities to move between the two industries whilst on the West Coast the main fishing industry is inshore.

The inshore fishing industry is still largely seen as a way of life rather than a job. However, there were still a large number of respondents who saw the industry as a business rather than a way of life. This could be down to a difference in definitions (i.e. the job of fishing is a way of life, but the flow of money and goods is first and foremost a business), or it could be a change in the attitudes that inshore fishers are having towards their industry. In the interviews, several people mentioned that there are two sides of the inshore fishing culture. The first is where fishers see it as a business, and the second is where fishers see it as a way of life. Interviewees associated the first type of inshore fisher with an attitude of short-term gains, limited stewardship of marine resources, and non-local vessels. The second type of inshore fisher was seen as in it for the long haul and therefore more interested and active in stewardship and building relationships with other vessels. This last point corresponds with the results of Question 25, where respondents agree that there is a culture of helping each other out, but also that there is a difference in the way that local and non-local fishers act towards each other. The interviews suggested that non-local vessels were more reliant on emergency services because they do not have connections with local vessels that can help them when in difficulty.

When asked about representation of the inshore fishing industry, the quantitative answers in Question 26 were in line with the qualitative statements made at the end of the survey in Question 32. 15% of the statements related to the need for Marine Scotland to listen to fishers and 27% of respondents either disagreed or strongly disagreed with the statement that Marine Scotland listens to inshore fishers. Within the interviews the term 'listening' was unpacked by interviewees as a process where the entity tasked with listening was required to respond with understanding,

and to act on what was being said. This might be why the regional inshore fisheries groups were seen as providing good representation to survey respondents as they are more local, have experience in fishing, and work as a go-to between Marine Scotland and individual inshore fishers. In some cases, the size of the rIFG was criticised as being too large. In such cases, more granular representation and management was desired.

This desire for local management and representation was also found in Question 30, where a large majority of respondents felt responsible for managing their own fishing effort and fishing grounds. They also took responsibility for the future of fishing by agreeing that it depends on management by fishers, rather than Marine Scotland. The dichotomy between the two types of fishers (business vs way of life and local vs nomadic) might explain why there are different agreement levels with the statements on the responsibility for management of grounds relying on Marine Scotland, with almost a 50 / 50 split between agreeing and disagreeing. As the interviewees advised some vessels are nomadic and are looking for short-term gains before moving on, so it makes sense for them that Marine Scotland should manage grounds. But for those who are long-term and local, they see Marine Scotland as an entity which makes decisions based on broad figures/ statistics rather than local contexts. That being said, there was a desire for more local visibility and enforcement by Marine Scotland, which might reduce the feeling that Marine Scotland is not present on a local basis.

From both the survey and the interviews it was clear that participants wanted a mix of management, where policing and enforcement are carried out by Marine Scotland, but the parameters of the rules/ polices are set on a local scale and have at their core, the knowledge of the fishers who work each area. The main policy that the survey respondents were calling for was limitation on the number of creels per vessel and the number of days they can be left out and enforcement of these limitations by Marine Scotland.

4.3 Value Chain

4.3.1 Summary

The different supply routes to market determine the degree of value capture Scotland / UK derives from the inshore fishing sector. Some local supply methods – ‘from boat to plate, locally’, can generate local value addition of ten times or more, but this is a small proportion of the market: while others (direct transport out of region) can have very low additional local impact, though there may be significant further national benefits across Scotland (and UK) where different types of processing services take place – often in areas with greater social deprivation.

The regional impact of inshore fishing cannot be fully determined by relying on national multipliers: each town, local economy and supply route will differ. When identifying ‘fish jobs’ in a region, they may not be linked to local inshore fishing, or indeed even local offshore fishing, i.e. a regional processor may be buying fish from across the country. Each route to market will be different and should be considered through route-specific value chain analysis. Similarly, species that cross boat size, distance from shore, and fishing methods (e.g. *Nephrops*) mean that specific methods of catch and processing vary substantially.

Running costs and inputs (often sourced via cooperative or chandlery) are relevant but not a key driver of activity, with the possible exception of fuel: national surveys provide detail (substantiated with interview data under this study in WP4). Seafish provide cost summaries from surveys by boat size at a UK level. Cooperatives and some processors can add value through intermediary services for wholesale (transport, sorting, grading, dressing crabs, live storage, and chandlery). Asset costs were a key driver of economic outcomes - boat and licence financing (and administrative hurdles to securing these) are potentially crucial for determining rest of value chain model. Both processors and cooperatives have partial but not sufficient funding models to ensure succession (particularly from crew to owner). The Western Isles have a collaborative model that could improve succession and new entry to the sector.

Mark-up (through value addition activities with cost, not just considering net profit) can be attained at a local level: three to 25 times value mark-up in brown crab from boat to plate. Some local sales (e.g. wholesale to public) transfer benefits to consumer through direct sale but miss further transactions: e.g. selling a kilo of langoustines to the public at £11 instead of £7.50, i.e. at a premium, is good for the fisher and buyer but the processor could have sold it for £25. This demonstrates high variation in value capture across supply routes, but it cannot be assumed that any value addition could be applied across the whole catch in Scotland. This is discussed and is rooted in social and economic factors (and Brexit).

Vivier vans can end local and national value at harbourside and realise value overseas (but provide very large demand). Scottish vivier intermediaries are competing to gain more intermediary services (sorting, grading, processing). European market prices determine all the value back through the VC – cooperative and close links with processors can cushion cost divergence over a year (but not always week to week). European market dominance is now being challenged by demand from other global markets, which is in turn increasing prices achievable from Europe too. Transport and supply routes can vary significantly, from vivier to cooperative-owned transport to processors, to sleeper trains. Supply routes are fairly directly connected to price through provenance considerations, and often to broader regional reputation.

4.3.2 Value Chain Matrix

Table 4.3 below shows a breakdown of the value chain matrix.

Table 4.3. The Value Chain Matrix. All figures within the table are from 2017.

Direct Income to inshore fishers (Scotland)	£63.66m
Direct Employment (Marine Scotland, 2018)	2,374 fishers
GVA of inshore fishing activity	£36.92m
Non-fishing income to Scotland generated through inshore fishing (Type II impacts additional to fishing including indirect and induced effects)	£38.20m
Employment across the value chain	3,086 (an additional 712 jobs beyond fishers)
Total value to Scottish Economy (including direct, indirect and induced impacts)	Income: £101.85m (an additional £38.20m to other sectors) Employment: 3,324 jobs (an additional 950 jobs in other sectors) GVA: £59.08m (an additional £22.15m to other sectors)
Strategic impacts	***Scotland Food and Drink:*** Scottish food provenance is of increasing value to the national economic strategy ***Tourism:*** inshore fishing is seen to present a positive image in coastal tourism. ***Trade-off with other marine sectors***: fishing must compete with other sectors for marine space – some activities are compatible while some are not, including other fishing methods.
Global value of Scottish inshore fishing* *Associated gross value of final use based on the fish product plus other inputs	£250-600m (likely between 5 and 10 times landing value achievable depending on supply route, but average ratios are unknown)
Impacts on local economies	Can be limited beyond the landing values unless local processing is undertaken. Often the wider economic impacts are significant but take place elsewhere. This is important for policymakers – jobs in Bellshill, Larkhall and Glasgow depend on inshore fishing – arguably, support for growth in processing could focus on more deprived areas than the fishing ports, though provenance is still a key selling point.
Risk / resilience	There is strong evidence of the economic de-risking of individual fishers through their activity – it is scalable. However, there is less evidence of significant de-risking of particular local economies.

The quantitative values reflecting wider economic impacts beyond the fishers themselves are based on standard causal chains (using input-output models) that reflect a demand-driven

multiplier from fishing activity. They do not venture a supply-driven multiplier impact where increased supply of inshore product drives increased value in processing and other services, though this is demonstrated qualitatively and diagrammatically in the value chain analysis in Section 4.5. The multiplier impacts on suppliers to the sector, and the induced (general) multiplier in the economy, are generalised across fishing activity in Scotland – they do not accurately show the high impact of specific supply chain models, and the relatively low impact of others; nor do they adequately differentiate by species. Interviews noted where there are compatibility issues with other marine sectors (including other fishing activities) and each case can be very location-specific. These figures are not, therefore, sufficiently reliable for policy decision-making if used alone, and local impact assessments, with reference to specific upstream and downstream linkages, are advised.

Understanding the value chain (or, the accumulation of value across different supply chain models) and the different constraints in different market segments is an area where more research beyond the landings data could bear fruit in determining the best economic strategies in fisheries (and indeed the wider marine and food sectors).

4.3.3 The Market System: The Value Chain in Context

The market system for inshore fishing can comprise multiple and overlapping policy frameworks. Some industry associations such as the Fishermen's Mutual Association in Fife have tangible assets, contracts and office functions, while more widely the rIFG function as forums to channel policy and industry needs, though these have limited lobbying power in a complex multi-stakeholder environment, and varying degrees of support and engagement. Trust and engagement with Marine Scotland was considered to be quite low, with visibility of what functions it can and should play in the Scottish and wider British Isles (including Isle of Man, UK, Irish and European historic rights agreements) is unclear. It is possible that Marine Scotland is seen as the body that should ultimately field all these conflicting interests, though it cannot definitively shape the outcomes of many of them. Some of the regions are more socially and economically coherent than others: for example, Orkney Islands region operates as a strong council region as well as for inshore fishing specifically, while Forth and Tay does not. In Solway the logistical and economic differences between, say, Stranraer and Annan, are significant due to geography, connectivity and alternative employment even though they are in the same region.

In terms of service providers, well-functioning finance models for succession and growth, both at boat level and across the value chain, seem to be lacking. This is a policy area which could be addressed more intensively through: cross-sectoral organisations such as Scotland Food and Drink, Scottish Enterprise and Seafood Scotland, all of which have increasing interest in how seafood can support the wider Scottish food and drink offer; and engagement with banks, or through wider collaborations as in the Western Isles, where a processor, bank, council and fisher associations can develop a coherent package for loans. Equipment supply, logistics and access to processors did not appear to be a barrier, though recent improvements (the emergence of 'courier' services to processors) could be an efficient fusion of vivier vans and deepening the realisable processing value in Scotland. Some processors see reactive and attentive collection as a key offer to fishers.

A degree of secrecy was evident in supply routes – some fishers were unwilling to disclose who they sold to, e.g. ‘a buyer in the Glasgow area’ but not wishing to name them.

Social licence to operate (i.e. support for the sector’s activities) was evident, both at the processing level and at the fishing level where people welcomed small scale fishing and processing as part of a coastal society. Larger scale fishing and processing is seen as providing jobs to the community, though the connection with inshore fishing becomes quickly broken as large scale processing is likely to be non-local except in some towns like Kirkcudbright or Eyemouth, and those large scale processors will in turn be drawing non-local and non-inshore fish.

4.3.4 The Core Value Chain: Overview

The social, economic and cultural factors relating to inshore fishing are often rooted in activities very close to the landing port, and activities at sea. However, in a modern economy the benefits of input and output values often lie outside of the port area, and region. Often the number of activities in the port area can be very limited, and it is therefore important to examine how inshore fishing products are transported, processed, marketed and sold – this has important regional policy implications since the benefits of inshore fishing may accrue in urban regeneration areas as much as coastal communities.

The inputs of inshore fishing (equipment, boats, bait) are often sourced from outside the immediate port area, with the exception of labour, meaning that some value may be externalised or have low local impact. However, the majority is likely to be localised through labour costs. This data is available from the SIFIDS survey work which gives a breakdown of spending for each boat operator and is available at UK level through Seafish (Seafish, 2017a).

The inshore fishing supply chain is relatively simple in structure, as seen in Figure 4.30. However, there are some notable linkages which determine future potential – namely, the large pink arrow represents the flow of landed product from fishers to buyers who transport direct to Europe without further processing through vivier vans. This comprises the majority of the market for the inshore *Nephrops* catch. The large aqua-blue arrow represents the flow of brown crab to China where local processors are experiencing increased demand over the past five years, and which could be a significant new market opportunity.

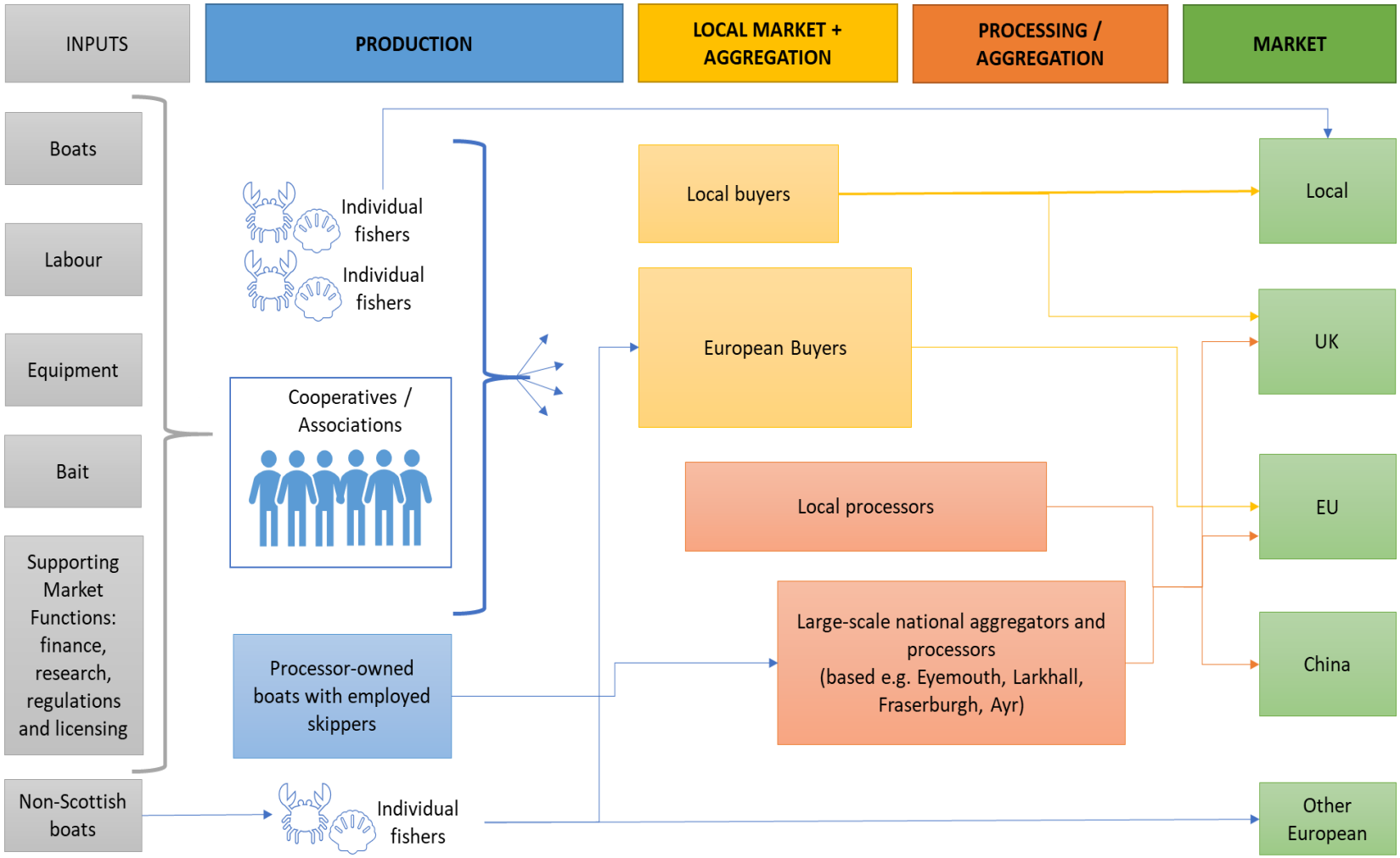

Figure 4.30. Inshore Fishing Value Chain Source: Imani Development Ltd. 2018

The number of jobs created in the value chain (indirect), and the jobs created through additional revenue circulating in the economy (induced) can be calculated using government multipliers for the sector – however, these suggest a very low number of jobs in the value chain (712 indirect jobs in the value chain, 950 if jobs in the wider economy are included) for the 2,374 inshore fisher jobs. This does not reflect the depth of impacts recorded in more local studies but could be explained by the degree to which vivier vans are used to transport directly overseas.

Similarly, these are the jobs recorded for Scotland, while there will be a higher multiplier in UK jobs (e.g. airfreighting of Scottish product out of Heathrow will provide jobs locally there and across the UK). A Seafish report (undertaken by University of Strathclyde) proposed that the output multiplier for shellfish is 3.54, almost double their Scottish value of 1.90, though additional employment was more marginal (Fraser of Allander Institute, 2002). These are higher than the most recent multipliers from the Scottish Government (2018b), though since 2002 there is likely to have been an increase in live transport out of Scotland with less downstream processing input.

4.4 Inshore Fishing Production Income

Inshore fishing income derives almost entirely from landings values, though this may be supplemented at the household level with other income sources (crofting, tourism, processing), and occasionally boat hire. The value of landings by Scottish based vessels in is equivalent to less than 1% of Scotland's GDP (Scottish Government, 2017b), but its wider economic impact can be considered beyond that, and also its strategic value in supporting Scottish tourism and as part of the offer across the Scottish food and drink sector, both of which are increasingly pivotal to Scottish growth. This is elaborated in a Solway report on the linkages between these sectors.

While the total nominal value to the Scottish economy is proportionately small, the inshore fishing industry makes an important contribution to Scotland's rural economy (Symes and Ridgway, 2003), landing up to £51m on average each year (2010 – 2015), which helps to sustain employment in coastal communities (Marine Scotland, 2016a). The precise value and volume of inshore fisheries depends on the definition of inshore fishing, with numbers changing significantly on whether it is defined by vessel size below 10 m or 12 m in length, and the distance to the coast that defines the inshore. Table 4.3 and Table 4.4 below shows the total volume and value of inshore fisheries respectively, by vessel size. This highlights the importance of developing a consistent definition from inshore fisheries which is used by all stakeholders – for example, the total shellfish landings value in 2015 was more than double the under 12 m value, at £113.56m, including *Nephrops*, brown crab and scallops which are captured through different gear types and distances from shore. Interviews suggest that this is more in line with general perceptions about the inshore sector's value.

In 2017, vessels under 12 m in length landed a total of 19,299 live weight tonnes as shown in Table 4.4. In terms of value, vessels under 12 m a total of £63.6m as shown in Table 4.5 (Marine Scotland, 2017), and increase of over 30% in 3 years.

Table 4.4. Total value of the Scottish inshore fishing sector by volume (t) from 2010 – 2017.

Vessels	2010	2011	2012	2013	2014	2015	2016	2017
<10 m	11,595	11,405	12,115	11,866	11,656	10,665	13,105	13,597
10 - 12m	5,782	5,176	5,134	4,908	5,209	4,585	5,696	5,702
<12 m (total)	**17,376**	**16,582**	**17,250**	**16,775**	**16,865**	**15,250**	**18,801**	**19,299**

Notes: Information from Marine Scotland (2018a) for vessels <10 m in length, vessels 10 – 12 m, and all vessels <12 m

Volume is recorded for live weight tonnes and rounded to the nearest whole number

Table 4.5. Total value of the Scottish inshore fishing sector by value (£m) from 2010 – 2017.

Vessels	2010	2011	2012	2013	2014	2015	2016	2017
<10 m	36.49	37.33	37.30	34.63	36.09	33.70	44.24	46.18
10 – 12 m	16.02	15.11	14.67	14.44	15.52	14.90	16.65	17.48
<12 m (total)	**52.52**	**52.45**	**51.97**	**49.06**	**51.61**	**48.61**	**60.89**	**63.66**

Notes: Information from Marine Scotland (2018a) for vessels <10 m in length, vessels 10 – 12 m, and all vessels <12 m

Total value (£m) is rounded to the nearest million for the value

At national level, until 2015 the total landings volume and value of inshore fisheries had been declining to £48.61m, as shown in Figure 4.31 below. However, 2016 saw a significant rebound to £60.89m in landings, and 2017 continued this trend.

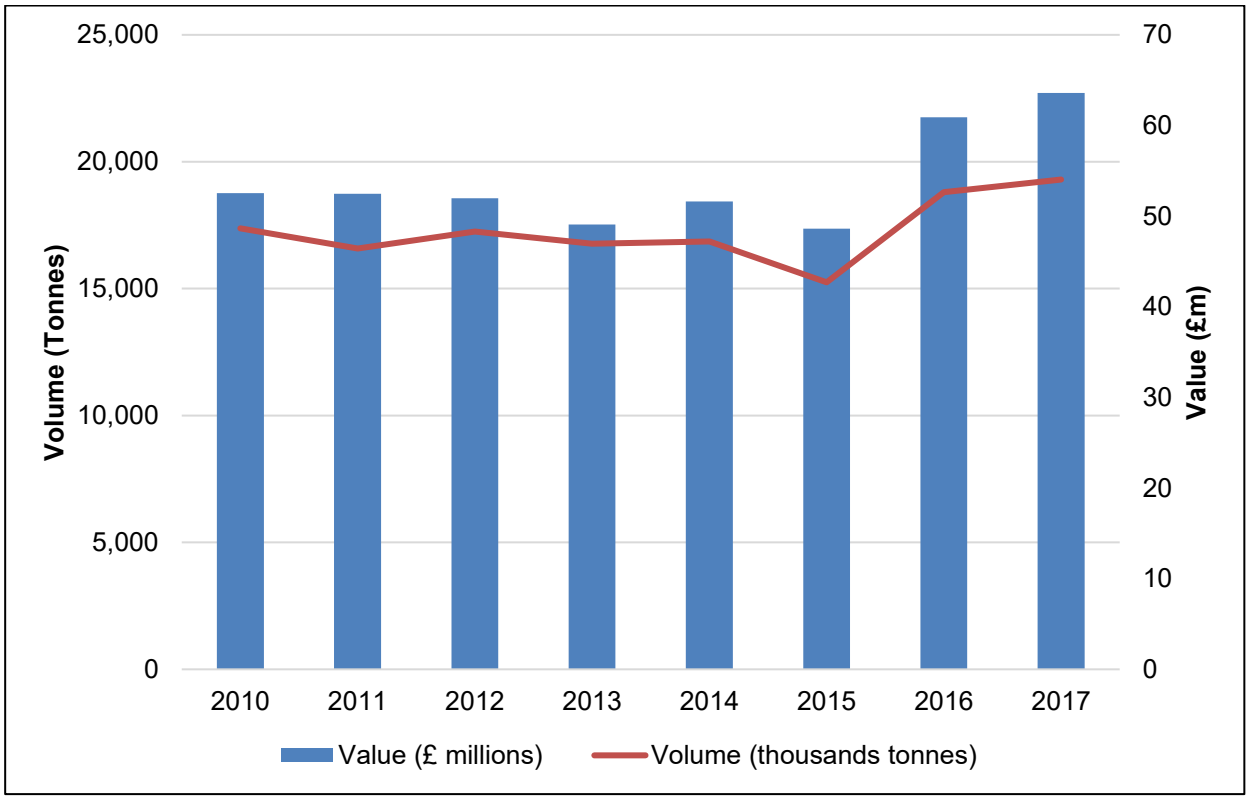

Figure 4.31: Total value of the inshore fishing sector by volume (t) and value (£m) from 2010 – 2017 (Marine Scotland, 2018a)

Employment has remained almost unchanged between 2,387 in 2014 and 2,374 in 2017, suggesting that the volume changes are down to stock and effort rather than number of fishers. This is consistent with the interview data.

There were 2,030 active fishing vessels registered in Scotland at the end of 2014 and in Scottish Government (2015c) recorded that 4,800 people are employed as fishermen either regularly or irregularly (excludes processing sectors): inshore fishing comprises around a half of those jobs. This fleet is dominated by vessels of 10 m or less, and accounting for 71% of the total fleet. In the UK overall, it was reported in 2013 that vessels under 10 m represent 75% of the fishing fleet, while they have access to 4% of the fishing quota (INTERREG, 2013). Scotland's fishing industry accounts for approximately 60% of the total UK catch and around 7.5% of the EU total volume (2014).

4.4.1 Species

At a Scottish national level, in 2017 the landings value of vessels <12 m (aggregating under 10 m and 10 - 12 m) by species is shown in Table 4.6 below. At the inshore level, *Nephrops* are on a par with European Lobster, followed by brown crab.

Table 4.6. Landings value by main species for vessels <12 m in Scotland.

Species	**Value (£m)**
Nephrops (Norway Lobster)	£16,961,680
Lobster (European)	£16,142,058
Brown crab	£11,903,670
Velvet crab	£4,933,195
Razor clams	£3,634,309
Whelks	£1,632,919
TOTAL	£55,207,831
OTHER SPECIES	£8,451,774
TOTAL INSHORE VALUE	£63,659,605

Source: Marine Scotland (2018a)

The volume and price per tonne of different inshore species shows considerable variation in scale to value, but also can mask the differences between gear types (e.g. trawled vs. creeled). Table 4.7 shows the approximate price per tonne for the main species caught.

Table 4.7. Price per tonne (£) of species (including inshore-caught).

Species	2015			2016		
	Tonnes landed (000's)	Value (£m)	Price (£) per tonne	Tonnes landed (000's)	Value (£m)	Price (£) per tonne
Edible crabs	10	12	1,248	11	15	1,371
Lobsters	1	11	10,559	1	14	12,010
Nephrops (Norway Lobster)	17	61	3,696	21	79	3,766
Queen scallops	9	5	559	8	6	767
Scallops	16	33	2,062	15	37	2,416
Squid	1	4	3,150	2	7	3,837
Velvet crabs	1	4	2,534	2	4	2,788
Other shellfish	2	4	1,581	3	6	1,758

Source: Scottish Government (2018a)

Lobsters are high value per tonne compared to other species, though in much lower volumes than other core species such as *Nephrops* and crabs. Since lobster is usually sold in the live market, different value addition is possible for lobster compared to crab which may be boiled and dressed. This has an impact on the full realisable value of the product in Scotland.

Prices for creeled products will tend to be higher than trawled – the total value for creeled *Nephrops* remaining relatively stable around £14m (Marine Analytical Unit, 2017), around a fifth of the total catch, see Figure 4.12. Evaluation of trade-off of these two models within the same species is contested. Brown crab prices have held or been increasing, which has been noted in interviews – this will have an impact on markets and processing strategies. Around two-thirds of brown crab volumes are caught inshore (Marine Analytical Unit, 2017).

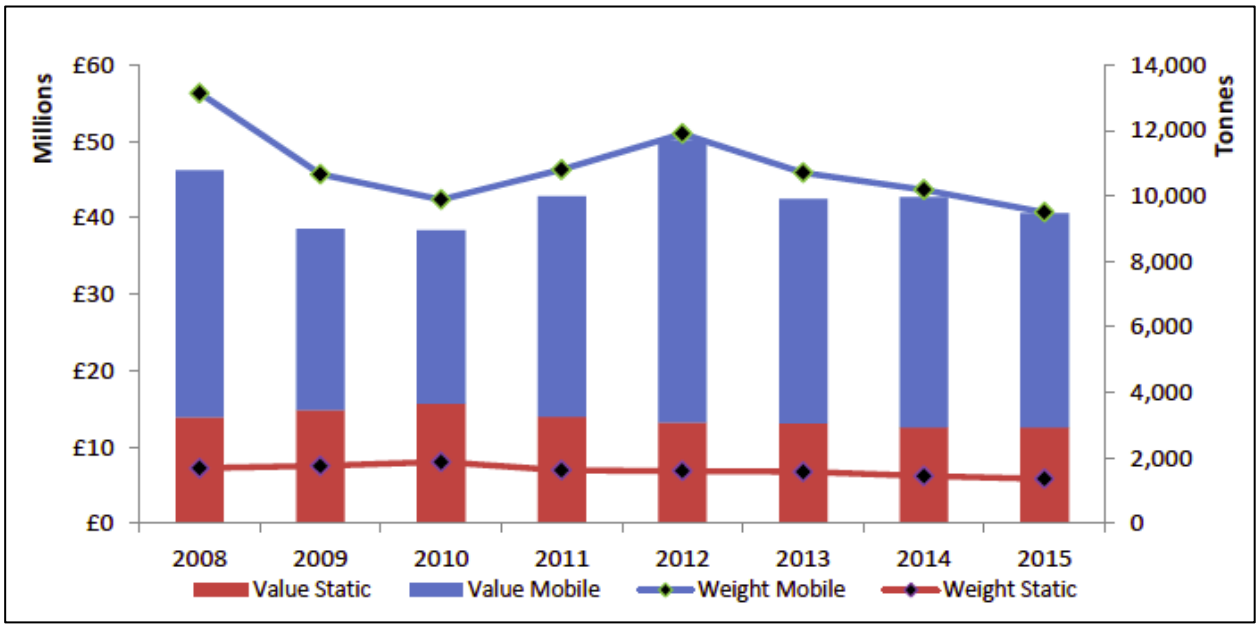

Figure 4.12: Volume and value of *Nephrops* (*Nephrops norvegicus*) landings from the west coast by all UK vessels into Scotland from 2008 - 2015 broken down by creel (static) and trawled (mobile) gear (Marine Scotland, 2017).

From a data perspective, *Nephrops* volume and value are the most likely to complicate the valuation of inshore fisheries due to the differing capture methods. *Nephrops* comprise the largest value of shellfish, and in discussions this value was occasionally conflated with the inshore fishing value. This also applies to other species to a lesser degree such as brown crab (as a significant contributor to the sub-sector), and scallops. This has implications for how people regard the inshore sector comparative to other sectors (and species).

4.4.2 Non-Fish Inputs

Equipment and running costs of inshore fishing are well documented and understood by fishers and recorded annually in a survey by Seafish. However, the capital investment for the boat itself can vary considerably, and the financial investment relative to crew earnings appear to pose a risk to succession in the industry.

While some boats are sourced in Scotland, such as through MacDuff shipyard, most second-hand boats are sourced on the open market, and sometimes fitted out to specification by the individual fisher. Catamaran hulls are increasingly popular for creelers. A professional creel boat may be available for £80,000, rising to £500,000 for a large boat with extensive specification, according to the interviews.

Equipment can be sourced, such as creels (approx. £40-£75 per creel as indicated by the interviews – shown in Figure 4.33), from manufacturers such as Gaelforce Marine in Inverness or Caithness Creels in Wick. The value of equipment will vary from vessel to vessel, but total

running costs / funding of boat equipment is considered to be a standard 10% of total annual revenue, excluding:

- Fuel (locally purchased but remotely supplied)
- Commission (local value capture in the case of a cooperative system)
- Landing dues (local value capture paid to harbour management, e.g. local council)
- Box charge (locally supplied).

Figure 4.33. Example of creels or lobster pots used by Scottish inshore fishers. (Pictures: Imani Enterprise Ltd., 2018.)

Seafish data based on wider surveys across the whole fisheries sector (disaggregating by species and vessel length) show the breakdown of costs showing relatively good margins, with net profit (remaining after costs) of 25-30%. Gross Value Added (GVA, i.e. the value added by fishers after taking into account intermediate costs such as fuel and equipment) is over 50%. This reflects the relatively high proportion of labour and owner profit as a proportion of total income, see Table 4.8.

Table 4.8. Income for UK Inshore Fishers, Pots and Traps. Data for two vessel types are shown, those <10 m, and those between 10 - 12 m (Seafish, 2017a).

	Variable	Under 10 m, 2016	10 - 12 m, 2016
Income, costs and profit (Average per vessel)	Fishing Income (£'000)	63.0	143.4
	Non Fishing Income (£'000)	3.6	5.3
	Total Income (£'000)	**66.6**	**148.6**
	Fuel (£'000)	6.0	8.3
	Crew share (£'000)	18.0	35.8
	Other Fishing Costs (£'000)	9.7	32.3
	Total Fishing Costs (£'000)	33.6	76.4
	Total Vessel Costs (£'000)	12.2	22.8
	Total Costs (£'000)	45.8	99.2
	Gross Value Added (£'000)	**38.8**	**85.2**
	Operating Profit (£'000)	**20.8**	**49.4**
	Depreciation (£'000)	2.2	3.6
	Interest (£'000)	0.6	1.5
	Other Finance Costs (£'000)	0.4	1.0
	Net Profit (£'000)	**17.6**	**43.2**
	GVA as % of income	58%	57%
	Costs as % of income	69%	67%
	NP as % of income	26%	29%

The GVA as percentage of income is higher than in many other comparable industries, such as aquaculture, as is net profit. Combined with interview examples it appears an attractive commercial opportunity. The social and cultural factors provide a strong counterbalance to what appears to be a positive financial picture – long working days, dangerous and rough outdoor work were seen as significant deterrents to new entrants to the industry. Interviews also suggested that partners / wives of fishers undertake work that is unlikely to be fully costed (or at all costed). The uncertainty about when a need to go fishing arises (weather dependent combined with limits to how long a creel can remain unchecked) means that partners can be limited in taking on other jobs, and socially can be limited in planning holidays / leisure. These can be significant disincentives, if not for those who have already chosen fishing as a career and way of life, then for new entrants to the sector.

Poor distribution of profit was also cited as risks to the sustainability of the industry, crew on a relatively low salary compared to the boat owner may not be able to accumulate the means to take on the boat when the owner retires. Some buyers with close relationships to boats (usually informal rather than contractual) note this as a risk to their supply they have attempted to mitigate by financing boats.

4.4.3 Individual fisher

An individual fisher with a relatively small boat setup can still gain a profitable income through inshore fishing as demonstrated in the example in Table 4.9.

Table 4.9. Example of a small scale inshore fisher's total earnings (as derived from value chain interviews – region has been kept anonymous to avoid disclosing individual fishers).

Total earnings, small creeling business with a two-person boat (skipper + 1 crew)	**£125,000**
10% standard expenses (including oil, repairs, nets, creels)	12,500
Box charges and commission of 5%	6,250
Landing dues to Council at 2.6%	3,250
Fuel at £300 per week	15,000
Wheelhouse costs	2,000
Crew member pay	22,500

Total remaining revenue for inshore fisher: £63,500

A bigger boat with three crew including a paid skipper, with £250,000 landing value, would result in approximately £190,000 of costs (before crew pay at £30,000), leaving:

Total remaining revenue for boat owner: £100,000

The apparently high incomes from inshore fishing in some areas seem to be encouraging, in that the nascent value should spur the industry to grow. However, interviewees stated that once the long hours, high physical and safety risks, and uncertainties about when fishing is feasible are taken into account (which can hinder a partner's ability to earn), succession in the sector is not assured. Nevertheless, in some areas net returns can be more than double the average Scottish salary.

From the survey, most fishers received 81 – 100% of their income from fishing (see Figure 4.17). Despite positive average figures, some interviewees considered inshore fishing inadequate in providing sufficient income, forcing them to do it part time and to work other jobs. However, many noted that there will always be those who are attracted to the challenge of drawing income from 'the elements', though schools might still project it as 'a career of last resort'. Income from fishing was the main proportion of fisher income, though spousal income and other part time or main earning activities were cited, including oil and gas and aquaculture.

4.4.3.1 Data Quality

Data on fisher costs is relatively good at a national level based on survey data collated by Seafish's Fleet Economic Performance Data (Seafish, 2017a) though this does not track value accumulation through processing (Seafish, 2017a) and export.

While the data is relatively comprehensive in terms of financial information, it is not split by marine region. It is possible to request data by administrative port through a separate request to Seafish, but the search criteria for ports does not cover regions evenly (for example there is not an option in the Solway Firth). The general Seafish GVA ratios from the fisher survey (which was compared and consistent with the limited financial data given in interviews) was applied to the MMO / Marine Scotland region-specific and species-specific landings data which was available under a separate data query from Marine Scotland. This provided region-level figures. For future port studies it may be beneficial to request specific port data from Seafish, though this has a constraint that the number of vessels in the search must be sufficiently large that the number is non-disclosive.

Nevertheless, it is important to note that the direct return for fishers which comprises the largest part of the fisher-level GVA is only part of the socio-economic picture, since it is access to financing capital such as the boat and licence that pose the biggest challenge (and influence succession), and the danger and disruption of family life associated with fishing: once these are overcome the profitability of inshore fishing is considered very positive.

There is also some scepticism from fishers and apex bodies about landing figures, and classification by engine size, boat length and fishing method. However, for many purposes this may not be an issue. The UK figures should be representative of Scottish figures given the scale of the Scottish fleet as a proportion of the total, but for specific regional studies it may be advisable to use survey data (as with this study).

Analysis of fisher income and spend can be captured through:

- Seafish's Fleet Economic Performance Data (Seafish, 2017a)
- Existing case study / research – e.g. Fraserburgh paper (DG Mare, 2016) on income and costs

- Local, direct survey work focusing on specific subsets of vessel type.

Looking at the full value chain (which suggests a multiple of as much as 10 to 25 of the primary landing price) there is sufficient downstream value to suggest that someone (not necessarily a local boat) will seek to continue inshore fishing activities, as discussed in Section 4.5.

4.4.3.2 Cooperative Model

A cooperative model is not widespread but continues to be successful in some cases and attracts strong membership. A cooperative operates a platform of common services for its member fishers. It runs a warehouse and lorry to deliver its products – the lorry is seen as a cost-effective way of ensuring product is transported to customer (de-risking as well as adding value). An example is a Cooperative which has around 70 working members, 5 - 6 retired members, and only 9 - 10 non-members in the port. Last year was their highest revenue to date, at £3.9m, with £4.4m over the 2017 calendar year. Table 4.10 shows this revenue by breakdown of species and other incomes from services.

Cooperative services can be varied, and include:

- Chandlery supplies, clothing and other inputs from their shop, and combine this with tourism revenue at approximately a 50 / 50 split, generating a total revenue of £275,000
- Pricing and market access, providing transport to processors outside the region and (occasionally) to a local supplier
- The dividend to members, can be in the £1000s per fisher
- Provide boxes for handling and transport
- Potential for use of property for tourism rentals.

Table 4.10. Association revenue in 2017 by species and other incomes (pers. comms.).

Association Revenue:	**Approx. £4-4.5m**	**% (by main species)**
Of which:		
Prawn (*Nephrops*)	£2.5m	64%
Crab	£600,000	15%
Lobster	£800,000	21%
Other Income (e.g. clams, chandlery relating to fishing)	£300,000+	-

Approximately £1.4-1.5m (over a third) is creel value. Beyond the main species, surf clams are popular and seen as small market but cost-effective. There have been problems with illegal razor clam fishing, and efforts are being made to give derogation to four boats to formalise the activity

and deter illegal operations. However, it is understood to be profitable with a boat able to land £5,000 of razor clams per week.

4.4.3.3 Other Organisational Models

The cooperative model shows how common interests can be scalable to achieve efficiencies in inputs and marketing – however, more common is the use of the buyer (or 'off-taker') of products to provide services in order to maintain a more reliable commercial relationship. Evidence in interviews cited boat finance, transport (the easier, the better, from the fisher point of view), supply of boxes and packaging, and efforts to mitigate price variations. The role of buyers (processors or otherwise) is considered below.

4.5 Value Addition Models

Local value addition scenarios can be categorised largely by the type of activity undertaken to add value to the product (though this will include many other secondary products and costs, including labour) and speed (in process terms) of exit from the local area.

This section will set out how the value of inshore catch will have an impact on downstream actors in the value chain. This takes a supply-driven approach to dependencies between catch volume and value derived from processors and others. However, in the case of inshore fishing, this has validity, since a tonne of inshore product will translate into greater volume (up to a tonne) and value for downstream processors

The speed of exit or dispersion from the local area determines a range of factors, including input funding from a buyer / off-taker, demand, price and degree of local and national economic impact. There remains a diverse number of off-taker routes to market, but increasingly they are concentrated in models that result in relatively low local value. This is not automatically a 'bad result' if it maintains a large and rapid route to market and there is no immediate alternative. There are positive and negative industry trends that may change these models in the coming years. Local value addition can be created beyond the harbour in the following ways:

1. Full local value capture: direct sale from fisher to restaurant or consumer.

It is possible for some products to be sold directly to the end consumer or a local restaurant. This is commonly viewed as the 'ideal' value chain because multiples of value of a catch can be realised within close proximity of landing. However, under the current norms of consumption, it is not considered to be a large market – in Solway, for example, an estimated 95% or higher of lobsters are thought to be sold on to intermediaries outside of the region (usually in Ayrshire and Glasgow). While there is arguably potential to increase local consumption of inshore fishing products, just because it has high value addition, does not mean that 100% of the market can be sold through this model. Further, some representatives are concerned that direct sale can circumvent standards such as on size and avoiding spawning seasons.

2. Direct retail sales

Direct sales to retail customers (holidaymakers, local buyers) at the quayside can provide a higher value at first sale than selling on to processors or restaurants at wholesale price, though the volumes for such purchases are considered negligible. In such a scenario, the consumer would 'gain' the value addition by obtaining the product at a relatively low price and using their own labour to prepare it.

3. Direct processing by fisher

The fisher can gain more in this full value capture scenario by doing primary processing. Particularly with crab, there is potential to add significant value before selling on as seen in Figure 4.34. This can be done by the fisher on a small-scale (i.e. solo, in time spent on shore), or on a larger scale with a boiler on a boat or at the harbour side (relevant permissions permitting). This allows on-selling to local restaurants or, in larger volumes, a higher value export to e.g. Chinese markets which are showing high demand.

The options for value addition for crabs can be illustrated below – note that the mark-ups in the diagram reflect *value addition*, not *net profit*, i.e. costs of processing further will be incurred, but these will translate into output, jobs and GVA (including net profit for the value chain participant adding value).

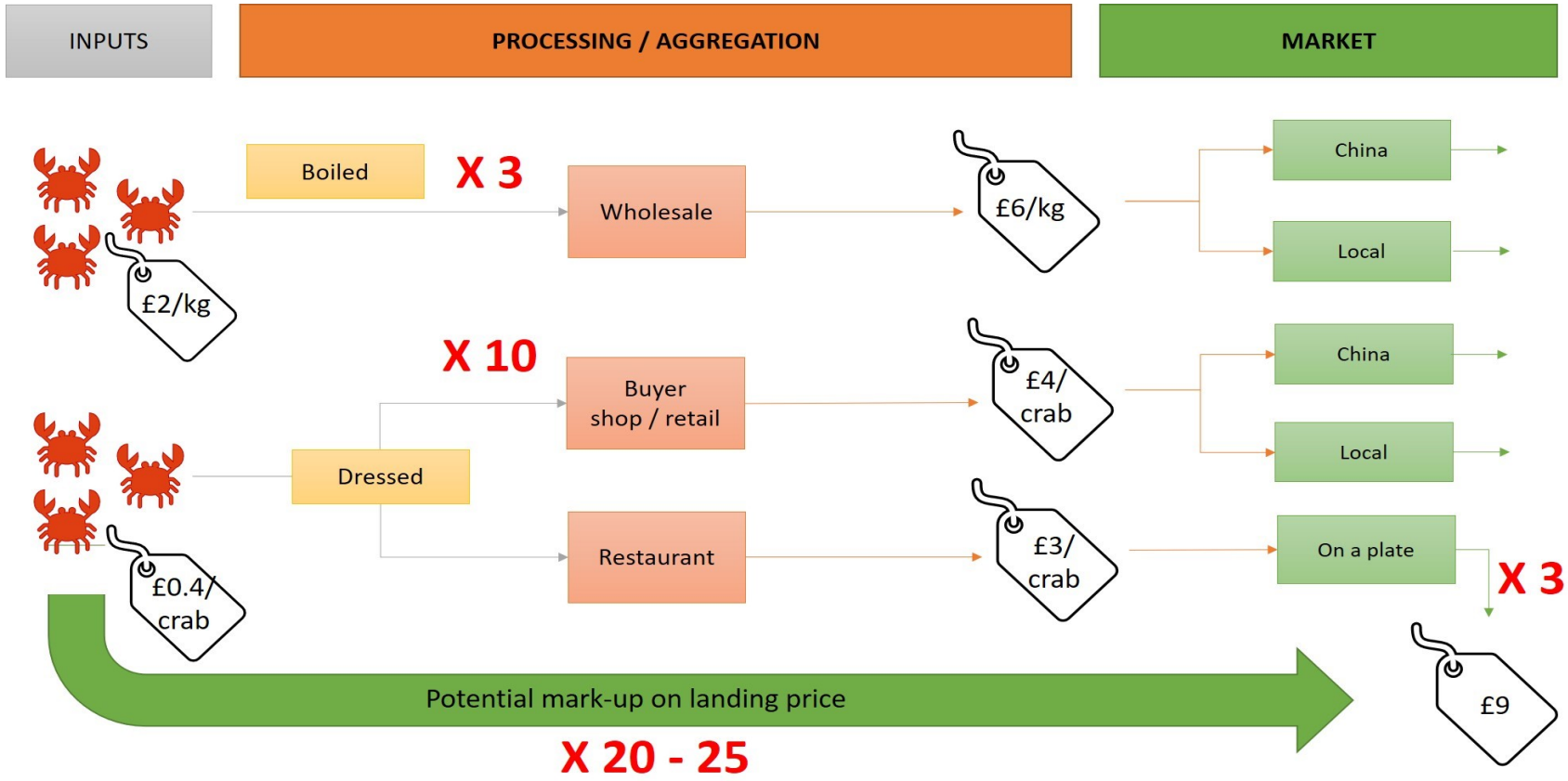

Figure 4.34. Value Addition opportunities for Brown Crab. Source: Interviews 2017.

As above (Figure 4.34), the processing value through boiling the crab is a threefold increase at £6. Dressing the crab provides a tenfold mark-up on the landed price. To sell a dressed crab in a restaurant, the price per crab may be £9, a 20 - 25-fold increase in value. This multiple of value is *not* net profit, i.e. that value capture comes with requisite costs, such as rent, labour, transport, accompanying food and services. Nevertheless, the value derived in employment and income from such activities will be a meaningful contribution to GVA that is dependent on fish volumes, i.e. it is accumulated based on the original fish product in proportion to its substitutability in the catering or hospitality offer.

This differential between price at first sale (40p) and plate (over 20 times higher) leads to a number of challenges to the current market logic of selling primary product to international markets, where there is abundant price pressure and limited economic value addition locally. One respondent summarising it as needing to 'put up a wall' around the region in order to capture more value from the catch. This is also manifested in related policy debates whereby the inshore fishing sector argue that creel-caught *Nephrops* can attain higher value than trawl *Nephrops* (recent NEF[10], SCFF (2017) and SFF[11] reports investigate this). Whether further value may be attained through the value addition will depend on the price sensitivity, and product substitutability, of inshore products. There may be a segment of the market that values and will pay for a higher value product, but that will be smaller than the total market and therefore to extrapolate that segment's value realisation across the total catch would not reflect a full segmentation of demand.

Nevertheless, it should not be assumed that the market is realising its full value addition potential at present, and attitudes to provenance, along with the deeper integration of food, drink and tourism sectors, are moving towards more focus on local production.

The Creel Fishing Effort Study (Marine Analytical Unit, 2017) finds that in 2015 the total value of brown crab caught and landed in Scotland was around £14m as seen in Figure 4.35.

[10] NEF Working paper on Scottish *Nephrops* fishery - https://neweconomics.org/uploads/files/Griffin-Nephrops-latest.pdf

[11] Analysis of *Nephrops* industry in Scotland - https://www.sff.co.uk/wp-content/uploads/2017/10/AS-nephrops-FINAL-report-171017-ISSUED.pdf

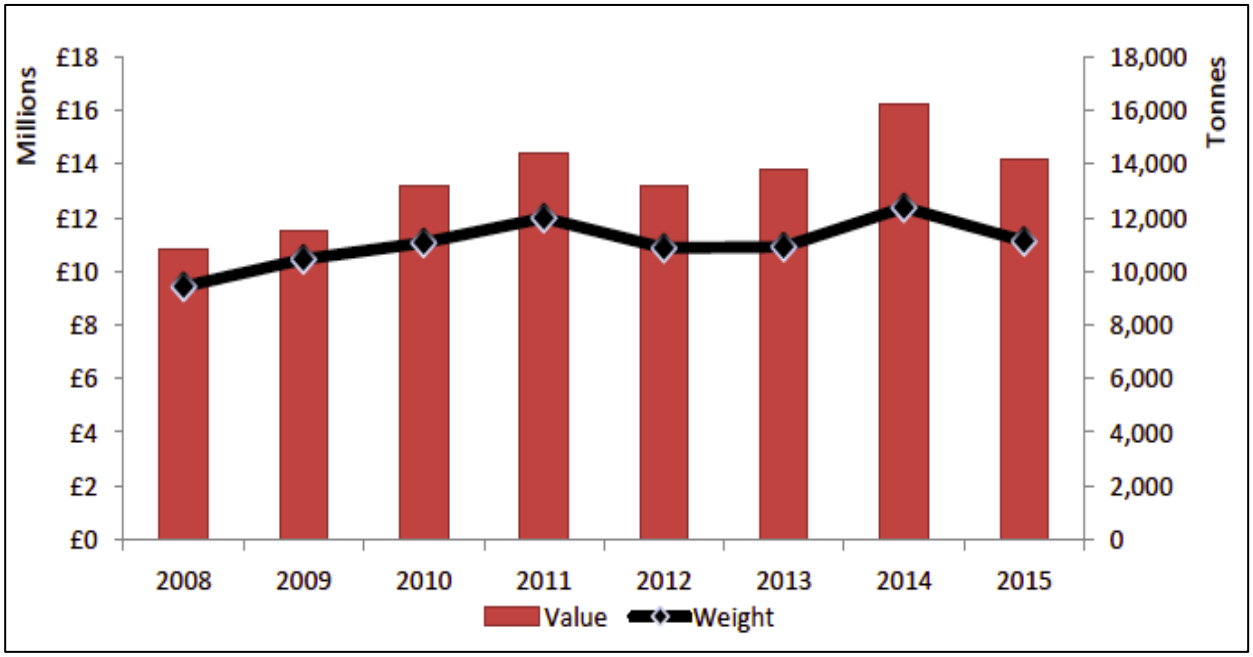

Figure 4.35. Volume and value of brown crab (Cancer pagurus) landings from all UK vessels into Scotland from 2008-2015. Source: Marine Analytical Unit (2017).

It is worth noting that this figure is likely to increase in value as demand grows and drives prices higher. The total attributable to inshore fishing is around two thirds of the total (Marine Analytical Unit, 2017), while a third is offshore. This is an example where inshore fishing interests and other gear types are very closely related and, in most analysis, examining market prospects it would be appropriate to take the total volume rather than inshore volume.

4. Significant local value capture before 'export' from region

Closely related to fisher-processed value addition is the processor who seeks to source from direct relationships with defined boats. Using agreements ranging from the informal / social, to financing arrangements, to full formal contracts to ownership of boats, integration between boats and processors can provide local value addition before on-sale.

At this level, if the full volume of crab was boiled in Scotland it would represent a total value of nearly £50 m and dressed for sale it would exceed £100 m. While this seems high, much of this value is in fact contributing to the turnover of Scottish fish processors. However, the degree to which growth in demand for crab can translate into additional value capture will depend on market preferences and requirements (especially for long haul export). In Orkney, for example, the high global prices being offered for wholesale brown crab are now posing a challenge for local processors who supply processed / dressed product for the UK market. If they can adapt and offer prices to reflect increases, this should be manageable, but their contractual relationship with retailers would need to reflect this, otherwise processing value will be lost.

At the supply side, competition for access to boats delivering catch remains intense in some areas with long term relationships hard to maintain when in the short term higher prices can be found through the vivier van system. Some competing Scottish firms seek to maintain ties with boats through ownership or contracts in order to secure supply. This can be like retaining chess pieces so that the larger value addition processing can be protected.

5. Locally integrated model

Crab processing involves purchasing the crab at the landing price of £1 - 2 per kilogram. If the process ends there, the crab can be shipped out to other Scottish processors or sent overseas.

A small processor can buy crabs and gain a margin through dressing the crab then selling on in low-volume batches (as per above diagram). Approximately 50% of crab catch in some regions is now believed to be sold to China, ranging from larger national, to small local, intermediaries: one buyer purchasing, processing and on-selling five tonnes per year. This is likely to grow by proportion as export demand increases.

At a larger scale, West Coast Sea Products in Kirkcudbright have a turnover of £12m per annum processing scallops. In the Firth of Clyde, Scotprime have links with local boats to source lobsters and other products for processing and export.

This processing is local on the basis that it has direct and relevant linkages with fishers, through financing or formal or informal purchasing agreements, so that an adequate supply of product is available. This is distinct from some processing activities that are relatively delinked geographically from the fisher, and indeed could be based anywhere. Rationalisation of the industry in the wider fisheries sector is taking place with the 2018 proposal of Pinney's of Annan being amalgamated into other Young's operations in Grimsby (as owner). In the inshore sector concentration of processing capacity is underway with Keltic Seafare joining D R Collin of Eyemouth. Management, financing, logistics, and physical processing of fish may follow this trend more generally due to the uncertainty around succession planning in the current small business model.

A small, local processor sources from 10 to 15 boats regularly with a close supply relationship, for the most part through informal agreement based on: loyalty (of the fisher), rewarded by convenience, regular contact and some cushioning of price volatility; and for the owner-processor a more secure supply chain in the short term along with a responsibility for supporting succession in the industry in the long term.

The concern about the future succession in the industry is consistent with general survey results and interviews. A boat can cost up to £250,000, plus a licence, and bank finance can be limited if there is no other collateral. In such cases, the opportunity for progression from 'young crew member' (though often this can be between 30 - 40 years old) to skipper / owner can be prohibitive. The crew member may have experience and know-how, but on a relatively low income working 05.30 to 18:00. In an effort to overcome these risk-reward payoffs, the processor has supported a lease-buy effort to transition from one generation to another, but they believe that this is a piecemeal solution to a far wider problem.

This relationship allows for weekly port-side collections and daily pick-ups on demand ensure rapid aggregation and transport of live, packed product, mostly to the French and Spanish market, with a small amount of local supply and to London. Supply routes are via Glasgow Airport and Larkhall (a different company is now investing in storage and processing capacity for live inshore shellfish exports, echoing the large-scale salmon exports going through DFDS in Larkhall for the aquaculture sector)[12].

Supplier boats can cover a catchment of around 100 miles of coastline. Setting up a local processing unit was considered a risk of smell and noise (including air and water being pumped overnight), but there was not a single issue raised by neighbours – the belief being that people would tolerate it if it is a local business and is sufficiently considerate in its operations. This is in line with emerging research on the concept of 'social licence to operate'.

6. National value capture in other regions

The value of processing may be captured in other regions of Scotland / UK through a number of routes – examples of hubs are in Fraserburgh, Eyemouth, Ayr and (away from the coast) Lanarkshire. Larger processors are more likely to be contracted with retailers, and in order to secure supply are increasingly owning vessels and employing skippers.

These processors and aggregators have varying levels of value addition – some may grade and sort into suitable batches or use packaging for live transport. Live tanks can mediate peaks and dips in supply of product. Boiling, cold storage etc. can be used in the non-live market. Beyond these, full processing through to packed retail meals can be undertaken. Many fishers do not recognise the transport and packing of product as value addition in the same way as they might do other processing activities like cooking and preparation for retail (secondary processing). However, all these services may be demanded by the market and are 'adding value', albeit by varying degree. A fuller understanding of these routes may be important in determining which supply routes add most value – if processors cannot compete with international wholesale prices; they may be unable to add multiples of value beyond the landing price.

Transport: a fisher may drive his catch to a market away from the port to deliver to a buyer – the product may be processed in Scotland / UK, but the location will be more remote. For a fisher delivering his catch, it means that price can be negotiated directly. However, it is often seen as time-ineffective and not obviously better than selling it direct at the harbourside. Often this can be done to protect knowledge of the supply route to market – a fisher may wish to keep this confidential.

There can, therefore, be a direct spatial / transport cost trade-off in selling decisions. Going further than a local buyer (either local restaurant, or a van ready to transport it) has time and travel costs. Equally, if a higher value product is sold to a restaurant that may be £1 extra, it may be at the cost of having a poorer quality average with the remainder which is being sold to a wholesaler. There is value in bundling better quality with poorer to attain an acceptable average.

[12] https://www.scottishseafoodassociation.com/member/dfds/

Other routes include ‘courier’ services (depending on rural reach), and transport arranged by the processor / buyer, though this is less common with a national processor than a local one.

Industry integration: as the industry undergoes rationalisation, smaller processors merge with larger ones to gain economies of scale. Seafish cite this as a trend – there is overcapacity in the processing sector, and low overall levels of vertical integration are beginning to change (Seafish, 2017b).

A cooperative or local transporter can buy product and transport to larger processors (usually) outside of region – for example, the Pittenweem FMA stocks are transported (in their own transport, giving a mark-up) to the North East for processing, with only small volumes being purchased for local processing. Keltic Seafare of Dingwall, with a turnover of £4 - 4.5m, is a company focusing on high quality product for top-end sales (supplying small volume batches of lobsters to London): they have now consolidated operations under D R Collin (turnover of £43.9m in 2017, up from around £20m in 2016). This type of end-to-end service can capture high value, but is not bound by the 5 km coastal geography other than through human capital factors (i.e. know-how).

The high values of processed product suggests that the national multiplier on fishing, when applied to inshore fishing, seems low, and certainly low compared to value chain models that involve national processors. However, the requirements of live transport and current markets may make constrain options to do otherwise.

Increasingly, retailers and standards certification are driving industry integration, with larger processors and retailers working back from the supermarket to the boat to demonstrate traceability and good governance. This increasingly entails greater control over boats, from tracking and documentation, to ownership and formal employment in turn driving bodies (for example, fishermen’s associations) to formalise further, including improving of access to finance and direct ownership. It is likely that price-setting will be more vertically integrated and driven less by the open market, evidence in interviews suggested that the spot market had been functioning poorly, and the rush for greater traceability (and new markets such as China) may indirectly improve price performance across the market system.

7. Vivier Transport

Some businesses have sought to buy from fishers to maintain live transport and sell on to high value local or continental markets, but have externalised operations to a maximal extent, i.e. buying straight off the boat, loading into 3.5T lorries with water tanks, and driving directly to the continent. Estimates range from between 75 - 90% of product shipped this way will be exported, with the remainder going to restaurants or intermediaries in Glasgow. A maximum of 5 - 10% of product were believed to remain for local consumption.

Visibility and understanding of the vivier transport was poor from the viewpoint of competitors, and largely negative on the basis they threatened loyalty within the supply chain and could outcompete them in the short term on prices, which they claimed damaged long term benefit to fishers.

The downstream economic impact of such a model seem very limited, though the counterfactual (a much larger segment of local / national processing) seems to be unrealised, and there was sufficient evidence of lack of capacity and cost pressures to suggest that a coordinated approach to a number of factors (succession, financing, labour competitiveness, transport, national demand for high quality products) would be required to significantly change the opportunity. It is possible that a change in policy to favour creel over trawled prawns would alter the value chain structure, but this would not be assured.

4.5.1 Prices

Processors who export, even with value addition locally, will be price-takers on the continental markets – some suggest that there is collusion amongst the small number of buyers to keep prices low. Some local processors with supply relationships may try to even out prices for fishers – if they make a large mark-up on price one week, they may seek to offer a favourable price when they are lower in the following week, even making a loss. This reduces volatility but also helps incentivise loyalty across good and bad weeks. There is also an uncertainty around the weekly continental price – on a Thursday or Friday a processor doesn't know the market prices in Spain and so will be 'buying blind', notwithstanding any market intelligence available through the week. Prices can vary from Monday, when prices are lower, to nearer the end of the week (Wednesday, Thursday) when they are higher to meet the weekend demand in France. Prices cited as £10 - 11 for prawns. Direct supply to Spain can be seen as missing middlemen links, and with greater pricing knowledge some fishers believe more money can be retained locally. Nevertheless, buyers from Spain, France and Italy are considered price-setters. On an extra-large (XL) prawn, they may make between £7 - 8 mark-up after deduction for transport, £5 - 6 on a Large (L), £4 on a Medium (M) or Small (S). Below £5 on a large prawn or £3 on a small is considered loss-making, reflecting the cost per unit to process and ship. Scale and quality categorisation can be problematic, since Mull prawns vary from elsewhere (this cited as an issue in Solway lobsters, too, which vary compared to elsewhere in the West Coast).

The dominance of the European markets is now being challenged, with global buyers becoming more apparent (especially China). This is helping not only achieve high prices elsewhere but is increasing prices in Europe. There is some hope, too, that Europe will be relatively price inelastic,

i.e. they will continue to demand inshore products even at a higher price (this will likely be tested in upcoming Brexit scenarios).

Sexism in price negotiations was cited in some examples – for example a supply quote requested from a woman would be higher than for a man.

Traceability and provenance are seen as key competitive advantages for many niche suppliers and wholesalers. However, perhaps conversely, some fishers look to keep their buyers confidential to avoid being undercut by competitor suppliers. The price of brown crab has increased with Chinese buyers entering the market, but some of the mark-up is lost to fishers due to convenience of other supply routes to buyers. This demonstrates that some markets may not be local but may yet be more profitable to primary fishers than some intermediary routes – however, the lack of uptake suggests that time (personal labour cost) and logistics / variable volumes may prevent switching.

4.5.2 Provenance

Tourism, local food and drink provenance, and the historical image of fishing (particularly creel fishing) have been repeatedly cited as synergistic in interviews, and this was echoed by examples from the processors in the value chain. One processor was recently contacted by a groom looking for '500 Oban Prawns' for his wedding in Perth, having first tried them in Oban, and was contacting a local processor to source them. This was considered a small order in the wider business activity (or an oddity) but it reflected the relevance and romance of local provenance in UK demand (Keltic Seafare notes their use of the Caledonian Sleeper train to deliver overnight to restaurants in London, Figure 4.36). Similarly, the expectation that a fishing village still has active fishing activity is a strong point for attracting tourists for an authentic experience – it is 'part and parcel of tourism'.

Figure 4.36. Caledonian Sleeper at Euston Station. Source: Randwick (2007).

It is important to note that there is a converse incentive in France and Spain – rather than market the Scottish provenance of their seafood, they benefit from an assumption that it is sourced locally to the restaurant, and not imported. This feeds into the assumption by UK holidaymakers that the shellfish they eat in Spain is not Scottish, when in fact it is very possible that it is.

4.5.2.1 Data Quality

Seafish publish the Seafood Industry Processing Report (Seafish, 2017b) which gives extensive data on processing costs, employment, total value and profitability nationally across the UK and by home nation, with some regional breakdown. However, inshore fisheries products are not disaggregated – assumptions need to be made using other evidence to identify where figures and trends apply to that sub-sector.

The data quality obtainable for an individual supply chain is therefore limited, given that some inshore fishing volumes are aggregated with non-inshore, and processing company data is highly likely to combine inshore and non-inshore figures. Company data is available (but variable) at Companies House, which can give turnover and profit values for such processors. However, again a company's scale and productivity will often depend on a portfolio of products and therefore attribution of value to inshore fishing products will be contested. For example, a processor may need a steady supply of farmed mussels alongside lobster or crab supply, or a restaurateur may appreciate access to local seafood but have substitute products to put on the menu in their absence.

4.5.3 Regional and National Value

Beyond local value addition, processors and transporters can draw across the regions of Scotland, aggregating product and finding economies of scale. Smaller processors are being consolidated with larger operations, and this is seen as de-risking the industry and finding a sustainable future, particularly in light of Brexit risks. Large processors in the North East of Scotland will process inshore products, and pelagic and white fish. Others e.g. D R Collin in Eyemouth, or Scotprime in Ayr, act as Scottish hubs to process and transport fish from across different regions and export into the Continent. The continental (Europe) markets are seen as the price-leaders, from which local markets are benchmarked and should be used in assessing sustainability and should be used for economic projections for Scottish value.

A Scotland-wide strategy for value capture (e.g. Scotland Food and Drink) should take the approach that if products can be competitively processed and developed in Scotland prior to export, this may be advantageous in total economic benefit. However, this may be a smaller market than the very large European market, and therefore one should be cautious in interpreting full value capture as the goal to maximise impact: very large wholesale markets are highly valuable in the absence of stronger local demand.

Ironically, there is the mixed effect when a consumer buys directly from the boat or port side. In one port, the value is £7.50 per kilo or langoustine landed for wholesale but sold at slightly higher cost to the public at £11.00. This means that greater value is captured locally, but the margin that

could have been attained in a processor in e.g. Peterhead or Eyemouth is lost (perhaps £25 - 30 per kilo sale), and instead that value is transferred in avoided cost to the consumer. That the consumer's labour or willingness to pay for a final product cannot be determined, but final sale could be as high as £50 - 70 per kilo.

4.5.4 Discussion

Analysis of the value chain shows that the economic impacts of each supply chain model vary considerably by geography. Below is a representation of the full realisable value of a product (crab, lobster, prawn): dark green represents local impact, light green value captured nationally but not within the fishing community, blue is where Scottish value chain actors might feasibly make gains, and red represents value realised external to the country and unlikely to ever be realised. A local boat-to-restaurant-plate model in a fishing village can yield a 1000% return (in terms of turnover that includes salaries and other costs, not just profit) on landed resource into the local economy. A vivier model can return a more modest total of the landed price (spent in turn on wages, chandlery supplies, boat maintenance, engineering, groceries) plus local vivier van costs (fuel, food, ancillary travel costs).

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The European market which has acted as a price-setter to date (possibly to change radically in 2019) has been a significant determinant of the market system for inshore fishing products. Often, while high value has been derived through the market system through to the plate, the specific supply routes have not been particularly dominant since there has been a large spot market in the system. Increasingly, the individual supply routes through local and national processors, through to retailers and/or international buyers seeking to secure their supplies, are likely to become increasingly dominant. This can provide an avenue to avoid the price-setting power of the European markets to date; however, it is not certain that it will in fact provide fishers with more bargaining power unless they have the means to acquire assets such as boats and licences. Weak and unstructured succession planning may drive the ownership of fishing assets towards processors-buyers. This would echo the pattern of rationalisation of the aquaculture sector where large operators acquired smaller firms.

The total proportions of each market supply chain model in Figure 4.37 below are based on interviews – on the basis that at least 70 - 80% of the live market is using a direct export vivier van model, with over 90% (most interviewees stated 90 - 95% are exported) using either a vivier van buyer or a processor that may be local or national but will be exporting most of their product.

The fresh and frozen market will have different value addition opportunities, though these will not always lend themselves to local processing.

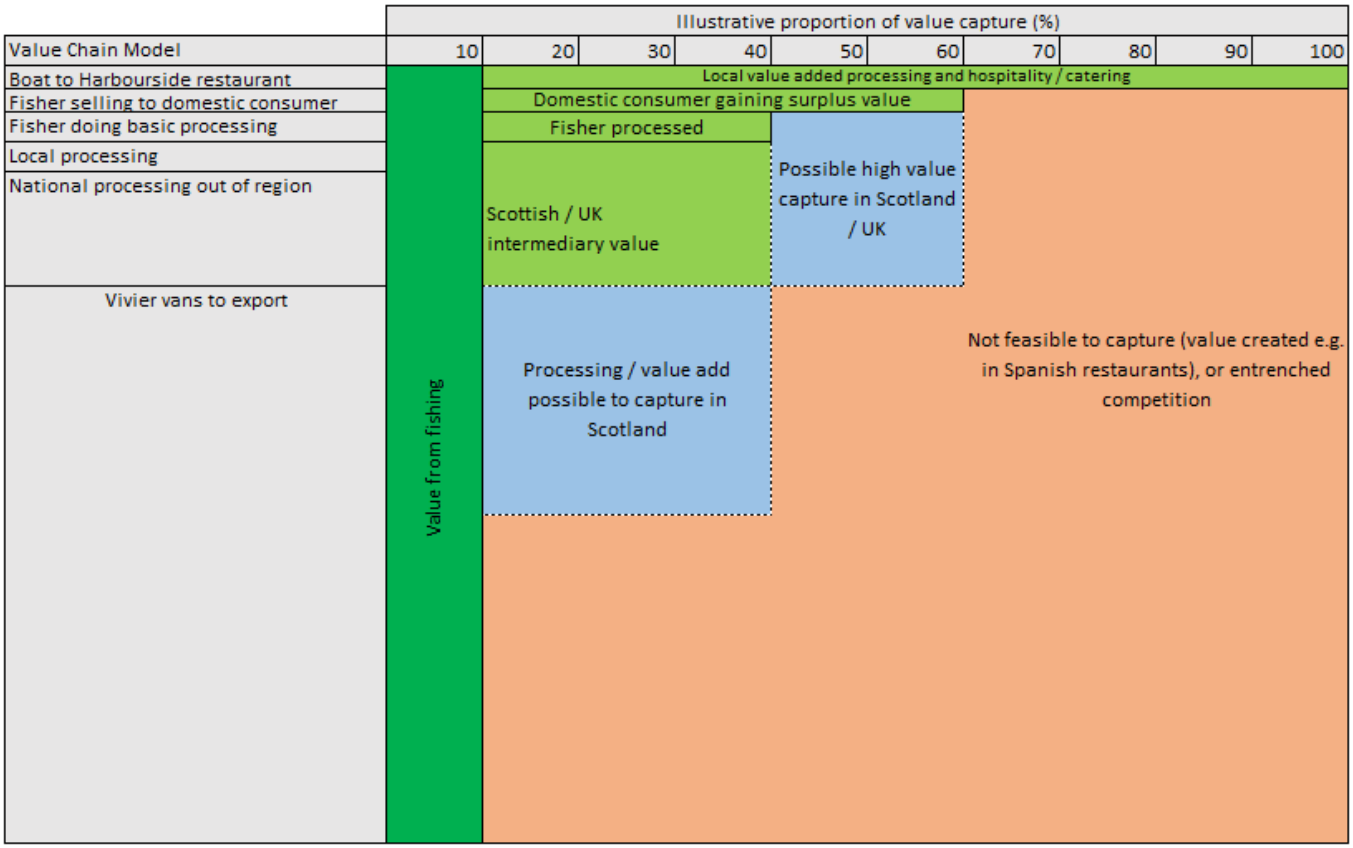

Figure 4.37. Value capture in different supply chain models.

An evaluation of the full capture through the inshore sector could be partially achieved by disaggregating volumes and values across registered buyers, by species and vessel size, more extensive company-level analysis, and a survey of market uses, since the coordination of this data into logical value chain data is currently very weak, both for analysts and for fishing representatives who are relatively dislocated in industry discussions and from processors and buyers. This may change as retailers and standards bodies drive greater control on traceability, leading to a more vertically integrated model with fewer buyers.

Currently, feedback from processors and fishers regarding the externalising of processing and value addition from the region, and often from Scotland, seems consistent with a relatively low national multiplier on value and jobs for fisheries. For example, a processor with a turnover of £50m may have a cost of sales of 80%, which may include processing employment (part of Scottish GVA) as well as inshore fishing purchases (an intermediate input), and less than 10% core employment earnings. Therefore, while impacts will vary by particular supply routes or regions, they require more comprehensive attribution with the primary product to fully evaluate downstream linkages and dependencies, especially where is unlikely that a national processor

would be able to substitute Scottish product for imports. Responses may also undervalue the degree to which time-bound logistics, sorting, grading, packing and general managing of stock is an invaluable intermediary service, even if it is not progressing the product fully through to secondary processing of e.g. products ready for supermarket retail.

Based on 2016 fisheries figures, if the first (dark green) tranche of landed value of inshore fishing is £63.6 m with direct GVA of £36.9 m, indirect and induced impacts (Type II multiplier) add an additional £22.2 m in GVA within the supply chain and wider economy. Beyond these supply chain impacts, there will be downstream GVA that is realised by processors (light green), whereby an extra tonne of fish available at the landings level will translate into further processing value (GVA within processing value addition). The total global value created by the 'raw material' of Scottish inshore fishing product is likely to be up to £600 m including retail / catering through to final consumption. What proportion of that can be captured in value to Scotland may be calculated by in-depth processor, retail and hospitality interviews and surveys, though it must be identifiable and specific to inshore fishing to be relevant to inshore fishing catch. Such information is currently unavailable, though tracing of linkages is improving. Note that such an endpoint in final value includes other services and food additions with associated costs, and does not fully depend on Scottish stock. For example, restaurants have a degree of substitution available (though it may be limited from a market system perspective). If the total value of inshore fished *Nephrops* (in boats under 12 m) landed in Scotland comes to around £14 m (Marine Analytical Unit, 2017), the total value chain capture at final restaurant sale may be many multiples of that figure. The majority of which will be realised outside of the local and national economies, but ultimately derived from the inshore fishing activity. Only a very small proportion (interviewees confidently estimate less than 5%) will be fully realised locally through sale to a local restaurant.

For brown crab, the increasing market demand from China may push prices higher for the fishers and encourage the growth of basic processing (boiling, freezing) relative to deeper value capture through processing to UK retail level.

Between these two ends of the spectrum, there are two main factors:

1). What proportions of the total market can be realised through different supply channels?

The blue areas (extending the value of current processing downstream and creating new local buyers and processing value) are where policies or initiatives may positively increase impact in Scotland (or across the UK).

There is not necessarily 'missed opportunity' to add value if there is no realisable local market for inshore products. If there is, then there is a case for improving competitiveness and performance of local supply chains for fisher- and high value local-processing when possible. This could be done by supporting promotional initiatives on the consumption side (consumers being aware of and having access to seafood and valuing it more in Scotland) and the supply side, for example by encouraging careers in Scotland's seafood sector (this is arguably underway through Scotland Food and Drink initiatives). At a market system level, addressing some of the financing limitations in the industry (demonstrated in interviews in this study) would assist in having a more active and integrated sector. If such steps were taken, there could be value gains in the blue areas of the diagram.

The scope for capturing the full value through to restaurant plate or retail will likely remain small relative to the international market, even if significant changes occurred in the Scottish or even UK-wide populations and supply chains. It could increasingly be under pressure from growing global demand, though with higher achievable landing prices this may swing the economic benefit to fishers even as processors struggle to pay higher prices to compete.

The evidence of poorly functioning financing and succession in the sector exacerbates the challenge to change attitudes to fish consumption in Scotland, and fisheries policies have tended to favour realising the known, export-oriented international market rather than foster a hyper-local approach that could fail to achieve its desired aims in the absence of sufficient local and national demand.

2). Will the market proportions (Scottish / UK to overseas) realistically change?

Potentially radical changes could occur through Brexit, if there are any new time constraints introduced in the logistics. A 24-hour period to deliver to Barcelona and French markets is seen as an advantage, but there are doubts whether more distant non-European markets can be delivered to reliably in a manner that retains freshness. This could imply a move to more adaptation (new or secure logistics models e.g. more frozen goods), or a collapse in the market, at least for those less capable of reaching such markets from more remote regions (i.e. it could affect Orkney more than Forth and Tay). The most positive scenario is increased global exports with basic processing of fresh / frozen product, and better developed intermediary handling of live product, with EU markets being sufficiently tolerant of higher prices to maintain interest. The alternative is a greater focus on fish consumption in the UK from the demand side, whereby a change in attitudes to UK-sourced goods allows for an increase in sales in the UK. Examples from other non-EU countries should be considered, such as Iceland and the Faroes with policy options ranging from focused regional development grants / concessions, to allocating quota to inshore fishing boats. Community quota schemes have been tried in Shetland and Orkney in the past but have been ruled as illegal under EU rules (Nautilus Consultants, 2004).

To a very large extent, the inshore fishing sector is shaped by its policies. However, disruption of the scale of Brexit will, inevitably, pose risks and could reduce the scale of local ownership of assets rather than increase it.

The likelihood of more processing in the UK will be affected by changes posed by Brexit, as overseas workers are common in fish processing. The contribution of EU immigrants to processing capacity, and social life and maintaining populations in more remote Highland and Island regions (against significant downward trends), was noted in interviews.

4.5.5 Future Scenarios

The following scenarios are set out to consider for policy development – while some are largely positive, others are negative. Many will have mixed impacts:

a. Better financing and succession planning in the sector may ensure profitable owner-operator activities.

b. Increased local processor integration with fishers may occur, with deeper control over pricing, supply and ultimately return for fishers, though this not assured.
c. General increase in overseas demand is likely to improve Scottish inshore fishing price realisation through increased demand but also breaking the price-setting power of current markets. However, this may make processing for the UK market harder to expand.
d. Increased integration from retailers to ensure traceability. This may reduce the level of fisher ownership of the fleet as supply chains are more tightly integrated, though it is not a given. Equally, processing remaining local is not assured as rationalisation of operations may occur over time (as with the salmon aquaculture sector.
e. In the absence of greater negotiating power in gear conflict negotiations, there may be a reduction in market access and inshore fishing ownership as it gets crowded out by other sectors (including trawler fishing) or overseas buyer-operators.

The sustainable development of the inshore sector depends on factors such as the integration of adequate financing models, pricing strategies, and markets resulting in the scenarios above (or similar). However, in consultation there seemed to be limited visibility for fishers of the requirements of processors, and (to a lesser extent) vice versa. More collaborative engagement along the value chain would improve outcomes and should be supported by policy makers.

An example of these emerging trends (ultimately driven by changing markets) can be seen below in one set of company accounts where they note that *'[t]here has been an emerging trend in recent years of big companies buying up scallop and crab vessels as they attempt to secure supplies and control the natural resource […] It may be prudent in the future for [us] to look to vessel ownership as a means of securing supplies*' (Orkney Fishermen's Society Accounts, 2017). Integration between buyer and boats is increasing, from Orkney to Argyll, reflecting tighter vertical and horizontal integration of the supply chain. If processors cannot remain competitive, through labour challenges or prices, the integration will likely shift to overseas buyers who will have different processing requirements in Scotland (possibly less value addition nationally). Increased interest in traceability for major retailers may provide a strong impetus to integrate the value chain, though this does not imply that value will be added locally or in Scotland.

Consultation with processors and fishers suggest that the most likely solution is consolidation of processors (horizontal integration) and their ownership of boats (vertical integration), with salaried skippers becoming prevalent at the larger scale of boat.

At the smaller end (particularly below 10 m), there may continue to be independent owners, but they will likely face increasing pressure as their negotiating power will be relatively less strong as the consolidation and integration trend continues.

A hybrid model may be seen in the mutual and cooperatives, whereby economies of scale could drive a mix of owners and salaried skippers, but with ownership by fishers moving downstream into processing and on-sale operations. This could create a commercial environment where fishers still have a choice between better financed ownership or more secure / constrained salaried skipper roles.

Fully independent owner-operators are not automatically more desirable unless succession planning is better organised and financed: though the numbers of fishers is relatively stable, it is not clear whether it will remain the case at inshore level.

4.5.6 Related Studies and Scope of Estimating Impacts

The above figures capture inshore fishing's direct impacts, but not the dependencies between it and other upstream (supply) and downstream (processing, hospitality, retail) sectors.

The economic impact of inshore fishing comprises the direct impact of employment and income for fishers and their staff (on-board and on land); the indirect employment and income through the supply chain, considering suppliers and businesses dependent on the supply of products; and the induced impact, which includes the additional employment and income deriving from an increase in income across the economy (for example, increased demand in a grocery due to increased fishing income).

Some studies have covered economic impacts of fishing in different ways:

- The Marine Maritime Organisation (MMO) prepared a report covering the 'Social Impacts and Interactions between Marine Sectors' (MMO, 2014) using a similar 'capitals' approach to this SIFIDS study (see section on social impacts)
- The Geography of Inshore Fishing and Sustainability (GIFS) Project (2012-14)[13], in addition to social and cultural factors, developed non-market valuations and the direct economic impacts of inshore fishing in the English Channel and the Southern North Sea
- The Mull Aquaculture and Fisheries Socio-Economic Study and Development Plan (Nautilus Consultants, 2014) estimates the impact of the fishery sector by species / method and compares it with other local industries (including aquaculture which is discussed as a fishery activity). Downstream impacts are estimated along with socio-economic factors showing a breakdown of relative financial and employment ratios.

The Mull study discusses the relevance of the geographic area assessed and draws links across the value chain in a holistic manner, estimating the impact on jobs in manufacturing, and other supply and downstream activities. This is valuable in drawing out the conceptual linkages between economic activities, even though it poses challenges in like-for-like comparisons and causality / attribution issues.

From a data perspective, the value of mixing specific and relevant vessel size, species, sector and other criteria is more important for policy making beyond landings data. However, at a Scotland (and UK) level, different industry system actors (policy makers, fishers, associations, processors) will continually take different data according to need, this means that views of inshore fishing economic value can vary considerably depending on whether the individual has 'shellfish',

[13] http://www.gifsproject.eu/en

‘inshore fishing’, ‘regional fishing’ or ‘fishing supply chain [including externally sourced fish, white fish, pelagic, etc.]’ in mind.

Comparing different fishing sectors and non-fishing sectors, The Grid Economics ‘Management of The Scottish Inshore Fisheries; Assessing the Options for Change’ (2014) for Marine Scotland, considers the economic benefits of limiting trawling for (Riddington *et al.,* 2014):

- Other Commercial Fishers (including creel fishers)
- Recreational Users
- Informal Coastal Visitors
- Non-Users / General Public.

The degree to which these impacts can be quantitatively assessed is complicated by the absence of agreed causal chains between competing interests between sectors, though agreed principles may be identified to some extent through further interview and survey work.

4.5.7 Other Upstream and Downstream Linkages

The impact of inshore fishing activity on the upstream activities (including supplier goods and services, and the requisite employment, social, cultural and associated impacts), and downstream activities (logistics, processing, retail, hospitality and export, including their requisite impact factors) must be considered, as they tend to be lacking in many assessments on the sector’s direct economic value. The challenge is that the impact in associated industries must be *attributable* (i.e. the benefit to an engineering firm must be apportioned, since they may be supplying farm businesses, offshore fishing and other sectors too) and *non-substitutable*, i.e. if a retailer can substitute Scottish product for non-Scottish product, then it is not *dependent* on Scottish inshore fishing. In many cases this dependency is difficult to estimate without a counterfactual, or to judge the degree to which a Scottish premium may exist, or why.

The Mull study (Nautilus Consultants, 2014) includes for upstream supply chain:

- Marine Services
- Aquaculture related transport
- Seafood Transport and Processing
- Engineering
- Construction

The downstream impacts on processing, hospitality and retail (given the links for Scotland Food & Drink / provenance agendas), and explicitly exporters within the transport sector, should be examined with caution, but must be assessed, since the value of inshore fishing may be higher downstream than the landing value of inshore fishing itself.

A Fraserburgh case study (DG Mare, 2016) as part of a Europe-wide assessment of the economic contribution of the provision of ancillary services to the fishing and aquaculture sectors covers, inter alia: sales agents, harbour services, boat painters, boat electricians, wheelhouse electronics suppliers, chandlery, ice and fish box supplies, and fuel.

Landside regional structures and urban social geography are fundamental to marine strategy. Some marine regions (e.g. Outer Hebrides) are sparsely populated, while others (e.g. Forth and Tay) comprise a number of significant human and economic settlements. Human settlement and geography play a significant role in connecting inshore fishing nodes to the economy, and the depth to which value chains penetrate the land or move beyond the vicinity of inshore fishing will vary widely from region to region.

Inshore fishing will combine impact with other industries too, for example: food processing – in alignment with the Scotland Food and Drink strategy, tourism – especially tourism that is marine-related, retail and hospitality, offshore fishing landings, and to some extent, aquaculture. Again, this complicates inland demarcation for data coding: while a 5 km radius has been suggested in previous literature, and is supported by interview evidence, this is not sufficient to capture wider value chain impacts, and these cannot be excluded from analysis

It is also the case that some employment will be transferable between some sectors and not others. For example, transferability might occur in aquaculture, transport, offshore fishing, and tourism, but not necessarily in manufacturing, renewable energy, or research.

5 REGIONAL RESULTS AND DISCUSSION

5.1 Argyll Marine Region

Summary

- The Argyll Marine Region is characterised by its many mountains, lochs and islands, which make both sea and road connectivity a significant challenge between its urban nodes and rural settlements
- Populations across the region have been steadily declining and ageing, and are expected to continue to do so
- Comparatively more extreme weather conditions experienced in Argyll and isolated settlements in the islands affect service delivery and community fragility
- The inshore fishing sector has been slowly contracting over the past 7 years, although live weight landings and values in 2016 were an increase on previous years
- Inshore employment in the region has declined since 2016, and accounts for 1.5% of the Marine Regions total employment.

5.1.1 Key Features

The Argyll Marine Region is situated between the Clyde and West Highlands Marine Regions and borders the Outer Hebrides Marine Region (Figure 5.1). The total coastline of Argyll is of significant length given its many lochs and islands, which presents challenges for marine planning in the region. Mountainous terrain and peripheral communities can pose challenges for road access and digital connectivity.

The Argyll Marine Region does not neatly intersect with Argyll & Bute Council area. Some wards within this council fall within the Clyde Marine Region. This means that when trying to do any analysis using landside data, the Argyll and Bute council information would need to be split between these two regions. As such, for the purposes of this study, the landward limit of the Argyll Marine Region will extend 5 km inland of the coastline as shown below (Figure 5.1). This map shows only the coastal data zones within 5 km of the marine region coastline which have been coded to show the levels of deprivation in each data zone.

The Argyll and Bute Council (a statutory agency involved in Marine Planning), recently drafted the Local Coastal Development Plan which supports upgrading of infrastructure relating to marine industries such as piers, harbours, landing facilities. It also recognises the need to support the inshore fishing fleet and the aquaculture and renewable energy industries with onshore working and storage space for equipment, maintenance and staffing facilities close to berthing facilities (Argyll & Bute Council, 2016).

5.1.2 Regional Economy

Argyll County has a population of 28,703 people, which is the smallest population of the 4 regions in this study (0.53% of total Scottish population[14]). Unemployment rates are seasonal and vary according to one of its largest sectors, tourism. In 2015, the Argyll and Bute region's key sectors were agriculture, forestry and fishing (21%; Scotland 10%), accommodation and food services (12%; Scotland 8%), retail (11%; Scotland 8%), and professional, scientific and technical activities (10%; Scotland 19%) (HIE, 2016). In terms of employment the key sectors are health, accommodation and food services, public administration, and retail sectors (HIE, 2016).

The region has a range of opportunities where it possesses competitive advantage in relation to its assets including; renewable energy, forestry, food and drink, leisure, recreation and tourism, and shipping. Transport infrastructure is also a crucial to island connectivity and industry (Argyll & Bute CPP, 2013). Argyll's inshore waters provide key navigational routes to the many island ferries (Argyll & Bute Council, 2016) which are important to the populations and economies on these islands.

The Argyll and Bute Economic Development Action Plan identified tourism, maritime, and food and drink as key long-term growth sectors (Argyll and Bute Council, 2017). It has prioritised growth in established industries of renewables and marine sciences in its 10-year Community Plan and Single Outcome Agreement (Argyll & Bute Planning Service, 2014). Culture and Heritage is also believed to be an area of significant economic growth potential (Argyll & Bute CPP, 2013).

[14] Mid-year population estimates for Scotland in 2017 was 5,424,800 (National Records of Scotland, 2018)

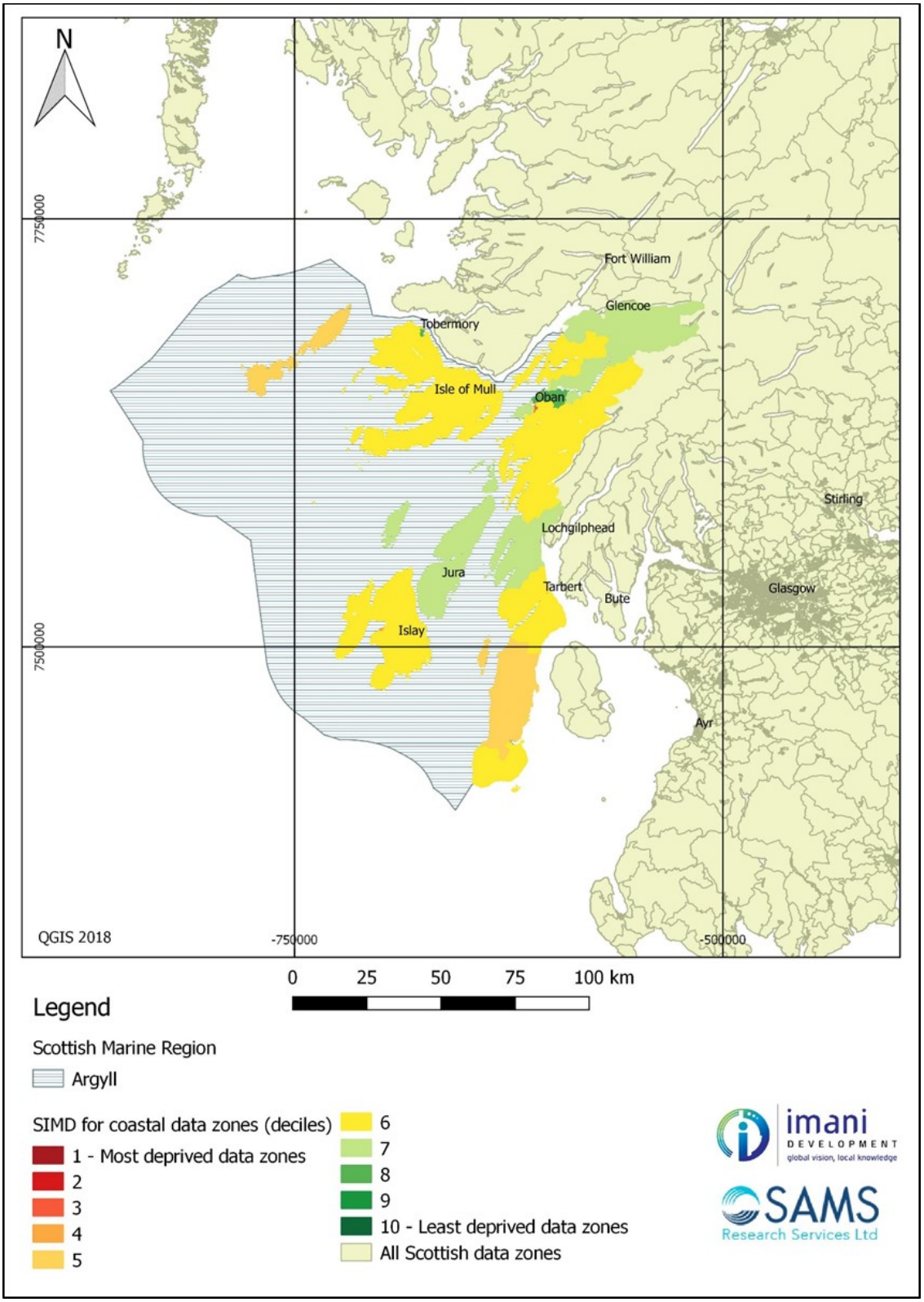

Figure 5.1. Location and extents of the Argyll Marine Region, showing the levels of deprivation for data zones within 5 km of the coastline. Source: Adapted by Imani Enterprise Ltd. from Scottish Government (2018a) data.

Amongst initiatives in food and drink, Argyll and Bute Council has plans to further develop upstream and downstream activities that improve value addition along supply chains. This includes work done by the Marine Planning Unit, with plans to further develop the aquaculture sector to increase sustainability of fishing industries and related business (Argyll and Bute Council, 2017). Despite the focus being on aquaculture, there are opportunities for the inshore fishing sector to link up with aquaculture, especially in provenance and traceability discussions.

The main fishing harbours in the region are Oban on the mainland and Tobermory and Loch Scridain on the Isle of Mull. Inshore fishing has historically been important to the region and inshore fishing is still seen as an important sector to communities in the region. Despite this, there has been a decline in inshore fishing which has been replaced by tourism, aquaculture, and as a result of an influx of retirees, has a lot more focus on service provision.

The Argyll marine region supports significant marine biodiversity and a range of coastal industries and activities. In 2013, the Scottish Government added six MPAs to its existing designated sites (Argyll & Bute Planning Service, 2014) within the Argyll Marine Region. In addition, there are a number of RAMSAR Sites, Special Protection Areas (SPAs), and Special Areas of Conservation (SACs). More information on these is available through the Marine Scotland Maps National Marine Plan Interactive (NMPi) portal (Marine Scotland, 2018b).

5.1.3 GIS Analysis / SIMD Analysis

The Argyll Marine Region is not considered to be deprived based on the analysis undertaken. However, it is important to note that just because an area does not register as ‘deprived’ does not mean that it has no deprivation. With the exception of a few of data zones, most zones in this region are in the top 40% of least deprived zones (as indicated by the yellow and green colours in Figure 5.1 and Figure 5.2). This region also does not have a high percentage of data zones in the top 10% of most deprived areas.

The two areas of interest within this region are Oban as shown in Figure 5.2 and Tobermory, both of which are prominent fishing towns. Tobermory is in the top 40% of least deprived data zones (with some in the top 10%) which supports the findings in Jones (2013) that fishing communities were suffering less severe deprivation than other areas, but that this could be down to of improvements in non-fishing areas such as increased tourism to the area, or aquaculture. Oban has seen a reduction in inshore fishing vessels (pers. comms) over recent years, yet large fishing vessels, recreational vessels, and ferries still operate out of the harbour. In addition, areas with low levels of deprivation are found in and around Oban, however, it also has the most deprived areas in the region which is characteristic of bigger towns.

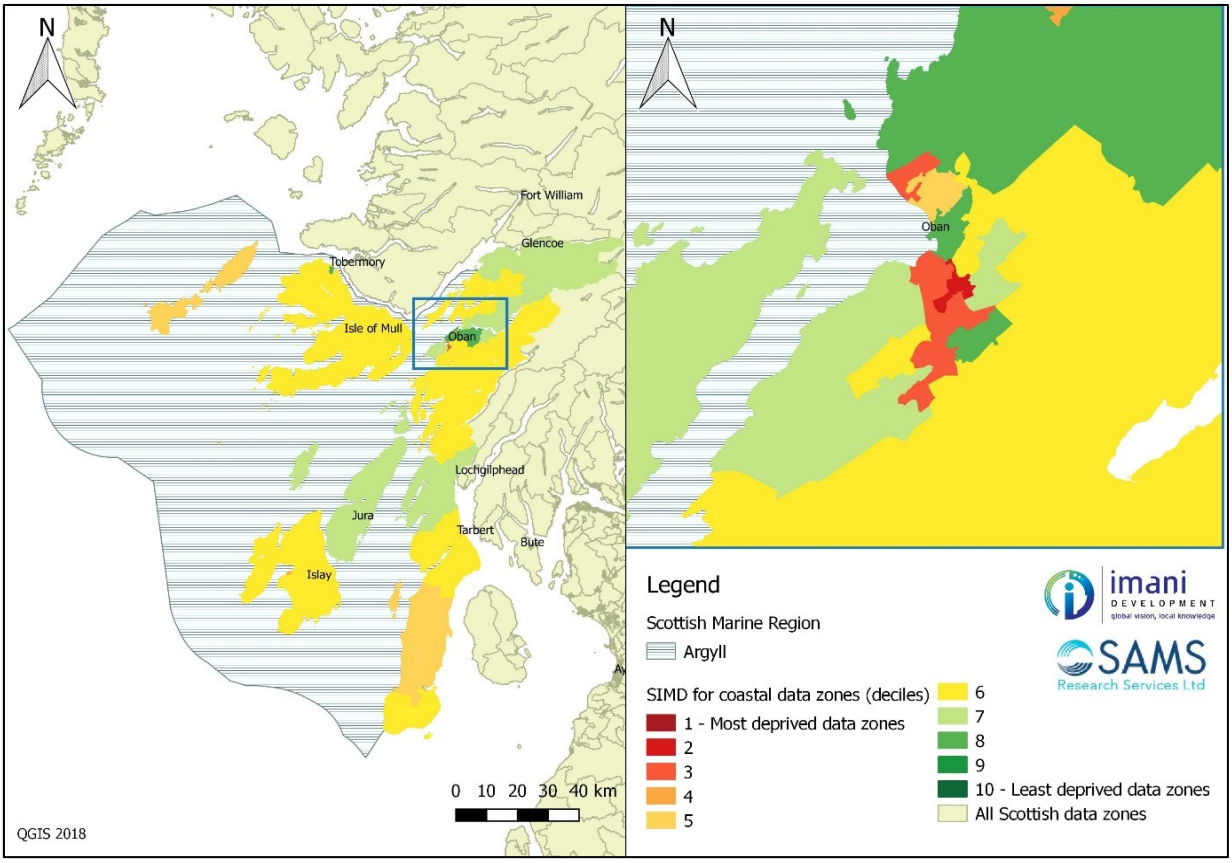

Figure 5.2. SIMD Analysis within the Argyll Marine Region, with a focus on Oban. Source: Adapted by Imani Enterprise Ltd. from Scottish Government (2018a) data.

5.1.4 Infrastructure and Linkages

Transport provision in this region is a continual challenge due to geography. This is exacerbated by the declining and changing population profile. Many communities are isolated and risk collapsing due to an ageing demographic - especially so in peri-urban and urban fringe areas. This feeds into increasing inequality in Argyll Marine Region, with different patterns of deprivation affecting different areas (Argyll & Bute CPP, 2013).

5.1.4.1 Supply Chain

Specific to the fishing industry, space available for handling and processing fish and shellfish has decreased. Argyll and Bute Council plans to develop onshore refrigeration units to help alleviate these bottlenecks and increase efficiency and sustainability of the sector (Argyll & Bute Council, 2016). Much of the inshore fishing product is acquired by vivier vans, with small scale processors struggling to compete, though this can be done through offering harbourside collection services and mitigating price fluctuations emanating from the European market.

The diverse marine activity in Oban and Mull means that there is a business opportunity for marine services, such as boat engineering and transport. Equally, fishers find that there is

competition for harbour space and infrastructure which increasingly supports the growing tourism sector.

5.1.4.2 Connectivity

The comparative difficulty of connecting the islands with the mainland (including cancellation of ferry routes as a result of weather, maintenance etc.), has made service delivery more costly and challenging. The Argyll and Bute council has committed to a long-term strategic infrastructure planning partnership with the Scottish Government and the private sector to help remedy the situation. Interventions are planned in road, rail, ferry, air and wider transportation infrastructure.

Regarding enabling infrastructure, the long-term strategic infrastructure planning partnership has earmarked development of the electrical transmission and distribution grid, water utility infrastructure, digital and mobile infrastructure, housing and community facilities, and town and built environment regeneration initiatives as areas for improvement (Argyll & Bute CPP, 2013).

5.1.5 Inshore Fishing Sector

Inshore fishers in this region have an average age of ~50 years old and have been fishing for between 20 and 40 years. The average number of boats owned is between one and 10 and the size between 10 - 11m. The survey of fishers in the Argyll Marine region indicated that creels, trawls, and dredges were all used, with creels being the most popular gear type.

Declining stocks have contributed to a steady decline in inshore fishing effort. Despite a clear downward trend in inshore fishery landings and volumes since 2010, Argyll remains an important marine regional player in the Scottish inshore fishing sector, by value (third highest), but not by volume (sixth largest). The inshore fishing sector in this region primarily targets crab, lobster and *Nephrops*.

5.1.5.1 Inshore Fishing Landings - Volumes and Values

The volume and value of inshore fishing activity in Argyll from 2010 to 2017 is outlined in Table 5.1 and Table 5.2 below by vessels <10 m and vessels between 10 - 12 m. The total volume of fish landed and reported by vessels <12 m in 2017 was ~1,915 tonnes. The majority of landings were from the under 10 m vessels which accounted for 70% of all landings in Argyll in 2017 (Table 5.1 and Figure 5.3).

Table 5.1. Total live weight landings by volume (tonnes) from vessels ,<10 m, and between 10 - 12 m for the Argyll Marine Region, from 2010 – 2017.

Volume (t)	2010	2011	2012	2013	2014	2015	2016	2017
<10 m	1,550	1,340	1,567	1,165	1,309	1,050	1,364	1,331
10 – 12 m	1,213	847	827	719	814	594	671	584
<12 m (total)	**2,763**	**2,187**	**2,394**	**1,883**	**2,122**	**1,644**	**2,035**	**1,915**

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number

Since 2010, the majority of landings are from the <10 m vessels and there has been a general decline landed by the 10 – 12 m inshore fleet from 44% in 2010, to 30% in 2017. Both fleets have experienced a drop in landed volumes over the time period, but there have been fluctuations in landings each year as shown in Figure 5.3. Unlike the other Marine Regions in this study, there has been a general decline in landings from Argyll since a high of 2,763 tonnes in 2010.

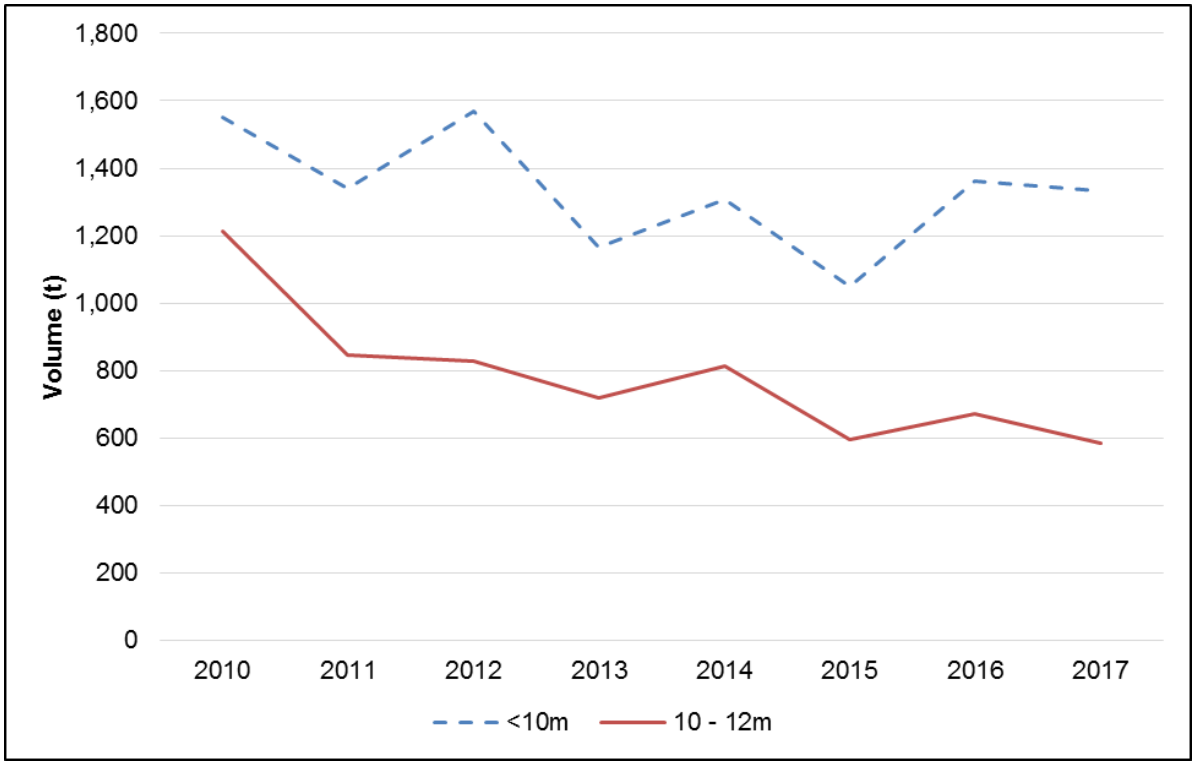

Figure 5.3. Total live weight landings by volume (tonnes) from vessels <10 m, and between 10 - 12 m for the Argyll Marine Region, from 2010 – 2017. Source: Marine Scotland, 2018a.

The value of landings has followed a similar trend for both the <10 m and the 10 – 12 m fleet, with a larger increase between 2015 and 2016 as shown in Table 5.2 and Figure 5.4 below. However, the total value of landings in 2017 dropped to under £7m. The value landed by the <10

m fleet accounts for the majority of the landings (67% in 2017). The value of landings for 10 – 12 m vessels has dropped from ~36% in 2010, to 33% in 2017.

Table 5.2. Total live weight landings by value (£m) from vessels <10 m, and between 10 – 12 m for the Argyll Marine Region, from 2010 – 2017.

Value (£m)	2010	2011	2012	2013	2014	2015	2016	2017
<10 m	5.08	4.41	4.63	3.67	4.11	3.80	5.01	4.54
10 – 12 m	2.80	2.21	2.19	2.26	2.52	2.37	2.65	2.24
<12 m (total)	7.89	6.63	6.81	5.92	6.63	6.16	7.66	6.78

Source: Marine Scotland, 2018a
Total value (£m) is rounded to the nearest million for the value

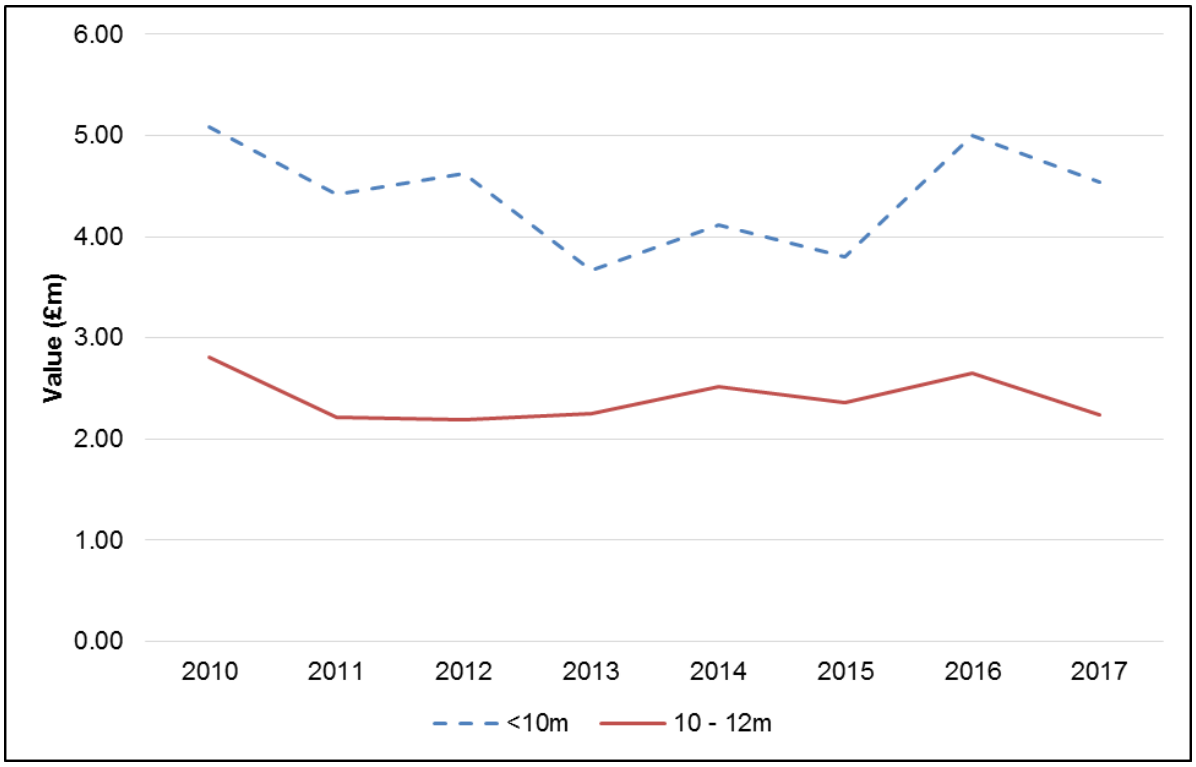

Figure 5.4. Total live weight landings by value (£m) from vessels <10 m, and between 10 - 12 m for the Argyll Marine Region, from 2010 – 2017. Source: Marine Scotland, 2018a.

Interestingly, the value of inshore landings in Argyll has fallen relatively less sharply than volume. Between 2010 and 2017 live weight landings fell around 40% from 2,763 tonnes to 1,644 tonnes, while value of landings fell around 22% from £7.89m to £6.16m. In 2016, however, volumes of inshore landings increased by around 25% to exceed 2,000 tonnes, with the value of inshore landings exceeding £7m for the first time since 2010.

The main species landed in the Argyll Marine Region by value (£m) over the last three years are *Nephrops*, crabs, lobsters, and as shown in Table 5.3 for boats under 10m. The volume landed of each species changes year on year and in previous years includes other species such as whelks, shrimps, whitefish, and periwinkles.

In 2017 inshore fishers on boats <10 m landed 209 t of *Nephrops* which accounted for the largest value for the region at £1.18m. By value in 2017, velvet crabs were the next most valuable species for the under 10 m vessels at £0.9m (292 tonnes) followed by lobsters at £0.98m. As in the other Marine Regions, lobsters fetch the highest price per tonne at £13,931/t followed by *Nephrops* at £5,637/t.

Table 5.3. Total live weight landings by volume (tonnes) and value (£m) for species landed by vessels <10 m, for the Argyll Marine Region, from 2015 – 2017.

Species landed by vessels <10 m	2015			2016			2017		
	Tonnes landed (t)	Value (£m)	Price per tonne (£/t)	Tonnes landed (t)	Value (£m)	Price per tonne (£/t)	Tonnes landed (t)	Value (£m)	Price per tonne (£/t)
Nephrops (Norway Lobster)	172	1.37	7,992	181	1.59	8,757	209	1.18	5,637
Crabs - Velvet (Swim)	234	0.60	2,546	315	0.83	2,643	292	0.90	3,093
Lobsters	53	0.54	10,253	65	0.77	11,957	64	0.89	13,931
Crabs (C.P.Mixed Sexes)	328	0.39	1,184	463	0.60	1,301	520	0.86	1,663
Scallops	229	0.58	2,519	269	0.76	2,837	193	0.52	2,682

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number
Total value (£m) is rounded to the nearest million for the value

For vessels between 10 - 12 m, the most common landed species were lobsters, crabs, scallops, *Nephrops*, and razor clams as shown in Table 5.4 below. *Nephrops* accounted for the second highest landings by volume in the region for these vessels but the highest by value (£0.97m). Note that this figure does not include larger *Nephrops* vessels. Crabs were the highest landed species by volume but were a fraction of the price of *Nephrops* (£1,688/t for crabs compared to £6,210/t for *Nephrops*) which is consistent across all four regions. Lobsters from the region were selling for £13,770/t which is only slightly lower than the price for vessels <10 m. This is however,

higher than the price per tonne of lobsters in Solway and lower than prices in the Forth and Tay Marine Region.

Table 5.4. Total live weight landings by volume (tonnes) and value (£m) for species landed by vessels between 10 - 12 m, for the Argyll Marine Region, from 2015 – 2017.

Species landed by vessels 10 m – 12 m	2015			2016			2017		
	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne
Nephrops (Norway Lobster)	183	1.41	7,706	174	1.37	7,859	156	0.97	6,210
Crabs (C.P.Mixed Sexes)	252	0.27	1,089	286	0.35	1,237	253	0.43	1,688
Lobsters	21	0.22	10,737	25	0.30	12,092	19	0.26	13,770
Crabs - Velvet (Swim)	27	0.08	2,997	28	0.09	3,215	18	0.06	3,550
Razor Clam	2	0.01	4,079	1	0.00	5,490	27	0.14	5,390
Scallops	109	0.37	3,349	156	0.52	3,358	111	0.38	3,395

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number
Total value (£m) is rounded to the nearest million for the value

5.1.5.2 Inshore Fishing Employment

Inshore fishing accounts for 1.5% of the total working age population in Argyll (17,384) Marine Region according to the latest SIMD (Scottish Government, 2018a) figures. This indicates that it is not a significant contributor to the overall regional economy. Employment in Argyll's inshore fishing sector has decreased slightly over the period, despite growth of employment on vessels <10 m in 2015, and accounts for ~77% of fishers in the region, as shown in Figure 5.5 below.

Based on Scottish averages, inshore fishing activity in Argyll will contribute a total of £6.2m in GVA, £10.85m in output, and support an additional 11 jobs beyond direct fisher employment, though these may take place across Scotland and not necessarily regionally in Argyll.

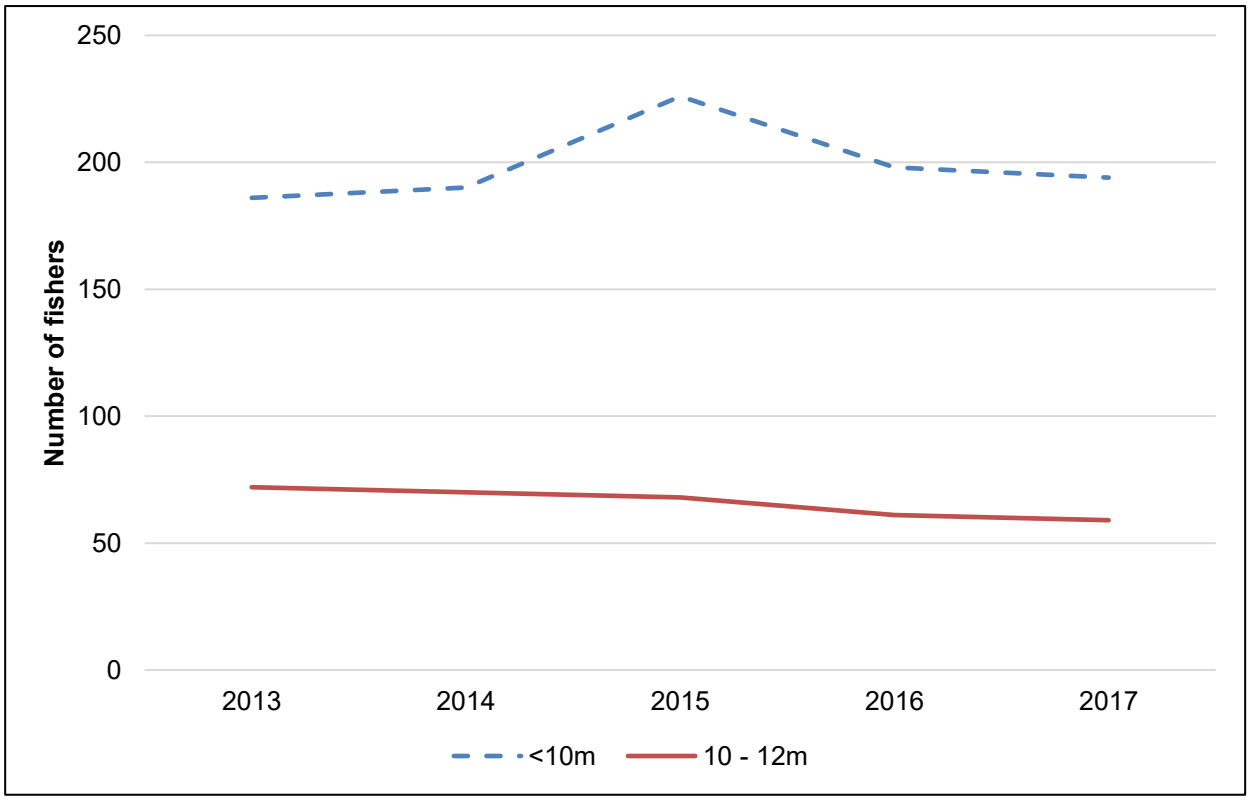

Figure 5.5. Total employment for vessels <10 m, and between 10 - 12 m for the Argyll Marine Region, from 2013 – 2017. Source: Marine Scotland, 2018a.

5.1.6 SLA Discussion

5.1.6.1 Human Capital

The ageing and declining population (with the exception being Oban) is an important issue for the Argyll marine region. The impact on the inshore fishing sector is that young people move out of the area to the cities, which affects succession planning in the industry. One interview respondent remarked that once a boat was gone, it was gone forever, i.e. when an elderly fisher has retired with no one in line to take over business, business simply shuts down.

The finding that there are limited numbers of young people coming into the industry is exacerbated by a lack of local people available to work as crew (from survey and interviews). The rise in foreign workers in the area – working both as crew and in processing factories is likely to be impacted by Brexit, though the exact impact will only become clear with time. Another factor in lack of crew was that the upturn in the oil and gas sector has attracted some people to change industry, while economic opportunities in other sectors such as Aquaculture also affects the availability of labour.

5.1.6.2 Social and Cultural Capital

The social and cultural characteristics of inshore fishing in the Argyll Marine Region appears, through the interviews and survey, to still be important to fishing communities. The image of a fisher being able to withstand the tough conditions and danger, pulling together in crisis, and seeing it as a way of life, is still strongly resonant with these fishers. However, there are some indications where this is no longer the case.

In terms of its place in society, 90% of interviewees say that inshore fishing is still important to their communities, but it is clear from the fieldwork undertaken that this is only true for some locations. Locations such as Oban have clearly moved on from inshore fishing, with the harbour now dominated by ferries and tourist boats. The island of Mull has changed demographically and now supports a much larger population of incoming retirees – contrasting strongly to its traditional working community, dependent on the inshore fishing industry. There are, however, still several key fishing harbours on the island such as Tobermory and Loch Scridain.

The inshore fishing sector is still seen as a job-creator – both directly and indirectly. Interviewees stated that fishing creates jobs both on land and in the local communities through the presence of processors, fabricators, and local shops.

It did appear the concept of the region being a community of fishers was waning. Although fishers identified that businesses were passed down through the family, in a few instances it was clear that this would no longer happen. The main reasons provided were that children had pursued other economic opportunities or were not interested in taking over from their fathers – reflected in the national interview analysis – “last of the fishing families”.

In addition, there are significantly higher barriers to enter the industry now than for previous generations – mainly due to the costs of boats, but also the cost of training, and the difficulties of complying with health and safety regulations.

Even though things appear to be changing, the cultural value of coming from a generation of fishers is still seen as important, or something to be proud of. Inshore fishing is seen by many as an integral part of their family history, and although some of these family links are now gone, or diminishing, there is still a strong feeling that fishing is an important part of community life in the Argyll Marine Region.

5.1.6.3 Financial Capital

Fishers in the survey indicated that over 80% of their income still came from fishing. It is still seen as a viable option for employment despite accounting for 1.5% of the Argyll Marine Region's population (Scottish Government, 2018a).

There are significant financial costs to owning a boat which was reflected throughout the four Marine Regions chosen for this study. The costs of buying a boat are prohibitive, especially to the young, but the costs associated with running the boat are also high. Seafish UK averages support the view that profitability is good, though this is not translating into a strong trend of new entrants, often (as stated in other chapters) due to the implications on lifestyle (unpredictable hours and days required, etc.).

5.1.6.4 Natural Capital

Seasonality is seen as the biggest factor that could negatively impact fishing activities by interviewees and survey respondents. However, for the management of the region, a clear challenge will be balancing the different sectors making a claim on the natural resources i.e. conflicts that may arise in shared marine space, most notably, aquaculture and tourism. It should be noted that there are clear synergies between both of these sectors, and the inshore fishing sector through Scotland Food and Drink, and Tourism strategies (e.g. provenance and traceability). New aquaculture developments have the potential to restrict access to existing fishing grounds which creates potential for conflict. However, lack of space more to do with mobile gear fishing which are not limited to single localities (Argyll & Bute Council, 2016).

Environmental designations such as MPAs have the potential to limit fishing grounds in Argyll, or at the very least impose restrictions on fishing activity which decreases the space available for the activity (Scottish Government, 2018b, for more detail on this).

5.1.6.5 Physical Capital

Argyll and Bute Council are investing in upgrading the physical infrastructure relating to marine industries. Fishers saw physical infrastructure such as ports, but also ferries and good road links as being very important to their businesses. Transport services and physical infrastructure upgrading is likely to improve inshore fishing and processing prospects. Investment in boats as assets remains a key factor in ensuring succession. One respondent noted that crew were unable to take over from skippers.

5.1.6.6 Vulnerability and Resilience

The Argyll Marine Region is resilient as there are alternative employment options such as aquaculture and tourism, though there is a risk that over-reliance on tourism and the demand for property creates negative feedback loops for the inshore fishing sector. Equally, some fishers in Mull have combined fishing and tourism and fishing and aquaculture.

The more transferrable skills and qualifications that inshore fishers have enables them to move between marine industries.

The supply chain is not vulnerable to the inshore fishing industry anymore. In the past, some fabricators and other industries would have relied on the inshore fishing industry, but now it no longer forms a major part of their business – as they can now focus on recreational vessels. The benefits of having a wider business services system will likely support continuity in the sector, though competing for space is a key risk.

Processors in the Argyll Marine Region tend to be smaller, and more niche and are therefore more reliant on the inshore industry.

5.2 Forth and Tay Marine Region

Summary

- The Marine Region is characterised by a number of large cities and the Firths of Forth and Tay.
- Inshore fishing in the region takes place in predominantly rural areas, mainly targeting *Nephrops*, scallops, crabs and lobsters.
- Forth and Tay benefits from a large influx of fish for processing (e.g. in Eyemouth) but much of its inshore fishing volume is processed out of region (Fraserburgh). Economic impacts of inshore fishing are therefore of mixed causality.
- This region recorded an increase in landing for 2017 and remains the largest Marine Region in terms of catch volume (tonnes) and value (£m).

5.2.1 Key Features

The Forth and Tay Marine Region is situated along Scotland's south eastern coast and stretches for around 760 km from the Scottish / England border near Eyemouth in the South, to the town of Montrose further north where it is bordered by the North East Marine Region. From the landward side, this region is bordered by 11 local authorities[15]. Figure 5.6 shows the coastal data zones within 5 km of the marine region coastline which have been coded to show the levels of deprivation in each data zone. The Forth and Tay Marine Region borders the North East of England which has a different management authority and inshore management model.

The Forth and Tay has a diverse marine ecosystem with sandbanks and mudflats and a number of islands (Stojanovic, *et al.*, 2016). A number of submarine sandbanks (including Marr Bank and the Wee Bankie) provide important breeding and feeding grounds for marine species. The inshore areas are mainly home to crab and lobster (Stojanovic, *et al.*, 2016). While intertidal habitats and subtidal rock in the region are in good condition, considerable pressure from inshore and offshore fishing activity has negatively affected the condition of subtidal sediments (SEIFG, 2012).

[15] Angus, Dundee, Perth and Kinross, Fife, Clackmannanshire, Stirling, Falkirk, West Lothian, Edinburgh, East Lothian and Scottish Borders

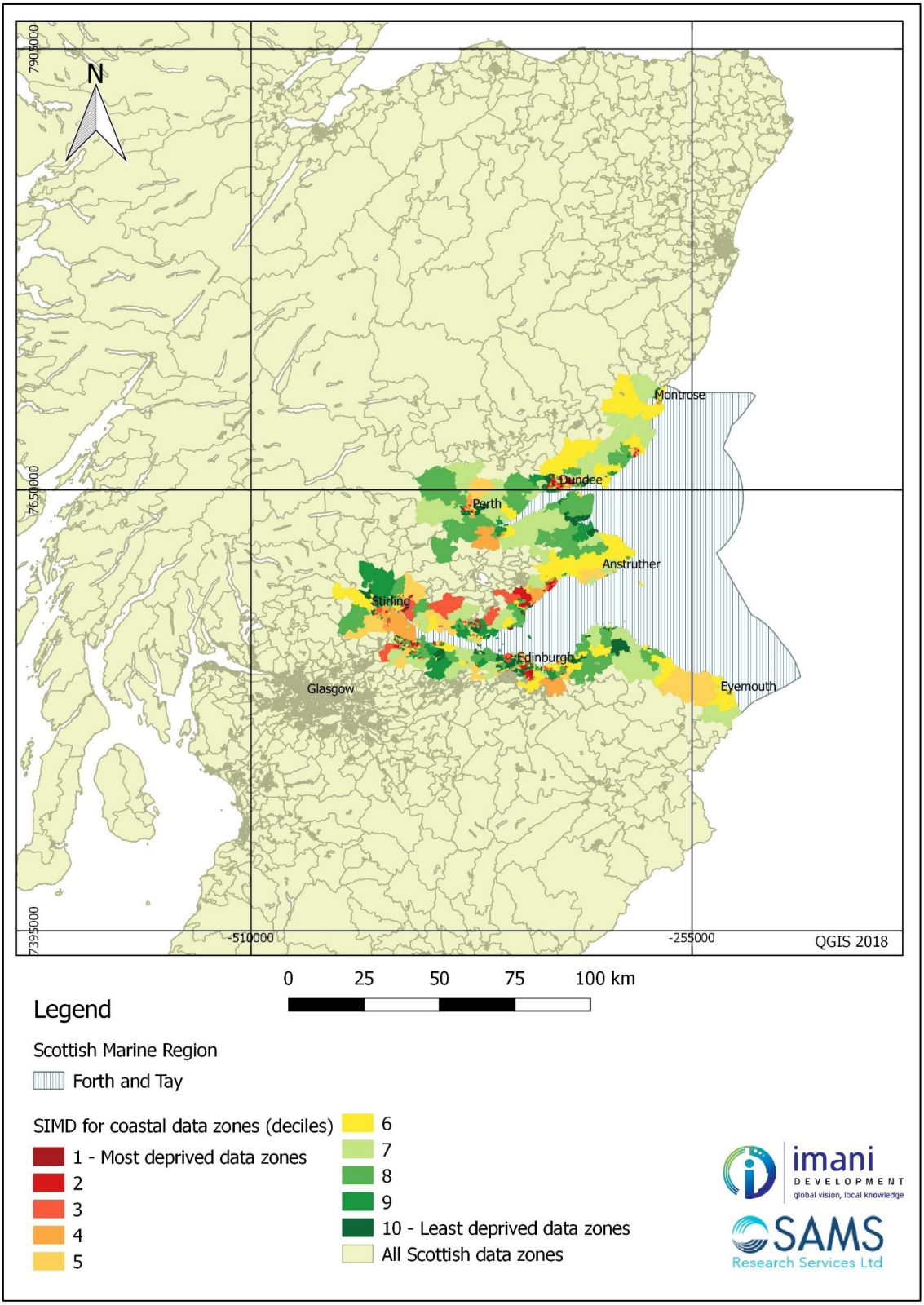

Figure 5.6. Location and extents of the Forth and Tay Marine Region, showing the levels of deprivation for data zones within 5 km of the coastline. Source: Adapted by Imani Enterprise Ltd. from Scottish Government (2018a) data.

5.2.2 Regional Economy

The Forth and Tay Marine Region has the largest population of the four Marine Regions chosen for this study at 1.25 million (adapted from Scottish Government, 2018a) which accounts for 23% of the total Scottish population (National Records Scotland, 2018)[16].

The Forth and Tay region is general a service-based economy (Fife Council, 2017) The major sectors include creative industries, food and drink, manufacturing, higher education, low carbon and energy, tourism, business services, construction and real estate (Skills Development Scotland, 2014; Bennett, 2017 and Fife Council, 2017). Economic growth in the Tayside economies is led by the expanding sectors of education, health and social care (Tay Cities, 2017), while growth in finance and tertiary research is observed in the larger urban areas (particularly Edinburgh) (Fife Council, 2017).

The region holds a number of important ports, including; Rosyth, Braefoot Bay, Burntisland, Grangemouth, Hound Point, Kirkcaldy, and Leith and Methil handling 27 million tonnes of freight traffic in 2016, 85% of which were exports. This comprised around 41% of Scotland's total freight traffic in 2016, and 48% of Scotland's outward freight traffic (Transport Scotland, 2017).

The Forth and Tay land-side economy can be assessed through two broad economic planning bodies: The Fife Economy Partnership covering activity along the Firth of Forth, and Tay Cities which encompasses the Tayside economic nodes of Angus, Dundee, Perth and Kinross and North East Fife.

5.2.2.1 Related Industry / Economic Activity

There is considerable resource to support growth in the offshore wind energy sector. Anticipated growth in seabed cabling and other development and operational phases of the renewable energy industry is likely to create additional demand for smaller coastal ports in the region (SEIFG, 2012). Growth in these marine industries could contribute towards increasing pressures and conflicts relating to the shared marine resource, particularly within the 12 nm boundary. In addition to commercial activity, inshore areas host significant recreational activity, including sailing, bathing beaches, diving and wildlife tourism – driven primarily by the proximity to the large population centres of Edinburgh, Stirling, Perth and Dundee (SEIFG, 2012).

The area is an important for offshore oil and gas, with the only oil refinery (as of 2012) in Scotland based at Grangemouth in the Firth of Forth (SEIFG, 2012). Seabed pipelines connect activities to the coast through inshore waters: the quality of inshore waters have been affected by localised contaminations from oil and gas activity. Other contaminants can be traced to dumping of dredge spoil from harbour maintenance, and seabed abrasion as a result of trawling (SEIFG, 2012).

There are numerous environmental designations in the region. These include but are not limited to RSPB reserves, extensive RAMSAR Sites and Coastal reserves, Sites of Special Scientific Interest (SSSIs), SPAs, and SACs. More information on these is available through the Marine

[16] Mid-year population estimates for Scotland in 2017 was 5,424,800

Scotland Maps NMPi portal (Scottish Government, 2018b). Some of these designations have implications for fishers, as they close off areas to fishing activity. While no MPAs sit within the Forth and Tay Marine Region, there are three large designations just beyond the inshore boundary, with a minor overlap off the coast of Montrose (Scottish Government, 2018b). These spatial limits can cause conflicts between inshore fishers and other marine users.

5.2.3 SIMD / GIS Analysis / Seaward vs. Landward Data

When considering deprivation, the Forth and Tay Marine region has extremes of deprivation and wealth. This region has some of the highest ranking data zones in the country but it also has the lowest (i.e. most deprived) data zones for income and employment, which means it has the largest range in deprivation across the four Marine Regions.

Overall, the Forth and Tay Marine Region is not considered to be deprived as it has an overall rank of six meaning that all the domains combine to give a value that is in the top 40% of least deprivation, despite having pockets of severe deprivation. The areas of least deprivation tend to be suburban areas, with more concentrated areas of deprivation within urban areas.

Looking at comparisons between fishing villages and non-fishing villages and towns, there seems to be very little difference in which areas have higher levels of deprivation. The coast from St. Andrews up to Tayport has no data zones that are considered to be deprived (indicated by the green and yellow colouring in Figure 5.7). Along the southern and northern extents of the Forth of Tay the only areas of deprivation (in the bottom 20%) are in the larger cities and towns such as Dundee and Perth as shown by the red areas below. This is characteristic of urban areas (due to high populations, poor housing conditions, higher levels of crime, and so on). The suburban areas and more rural areas tend to be less deprived.

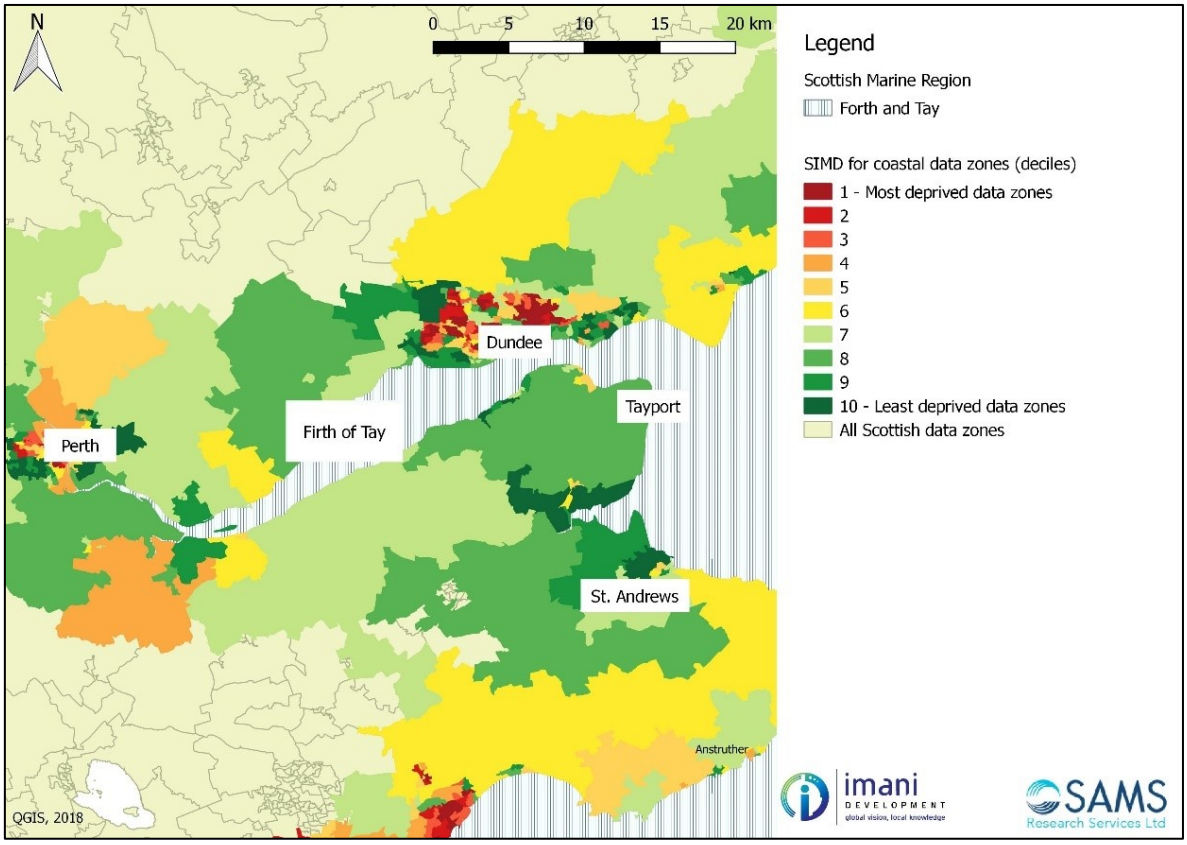

Figure 5.7. SIMD analysis for the Firth of Tay in the Forth and Tay Marine Region. Source: Adapted by Imani Enterprise Ltd. from Scottish Government (2018a) data.

Deprivation in the southern part of the Forth and Tay Marine region, around the Firth of Forth, had a wide range of data zones that are deprived and those that are not (Figure 5.8). It follows a similar pattern to the Firth of Tay where cities such as Stirling, Falkirk and Edinburgh show much higher levels of deprivation compared to the suburban and more rural areas (especially down towards Eyemouth in the south). Deprivation is not limited to the villages and towns that still have active fishing harbours. Pittenweem (near Anstruther) and North Berwick (near Edinburgh) have no data zones in the top 40% of deprived areas yet have a strong inshore presence. Whereas St. Monans, despite not being deprived, has larger number of deprived data zones than Pittenweem and North Berwick.

Moving down the northern edge of the Firth of Forth, Leven and Kirkcaldy, both of which still have active ports, experience very high levels of deprivation. Falkirk and Stirling have very high levels of deprivation but do not have inshore fishing activity. This shows that inshore fishing activity does not determine whether an area is deprived or not. There are other factors, such as historical reliance on heavy industry and large demersal and pelagic fishing fleets, and newer industries such as tourism and higher education are likely to play a large role in variability of deprivation in the region.

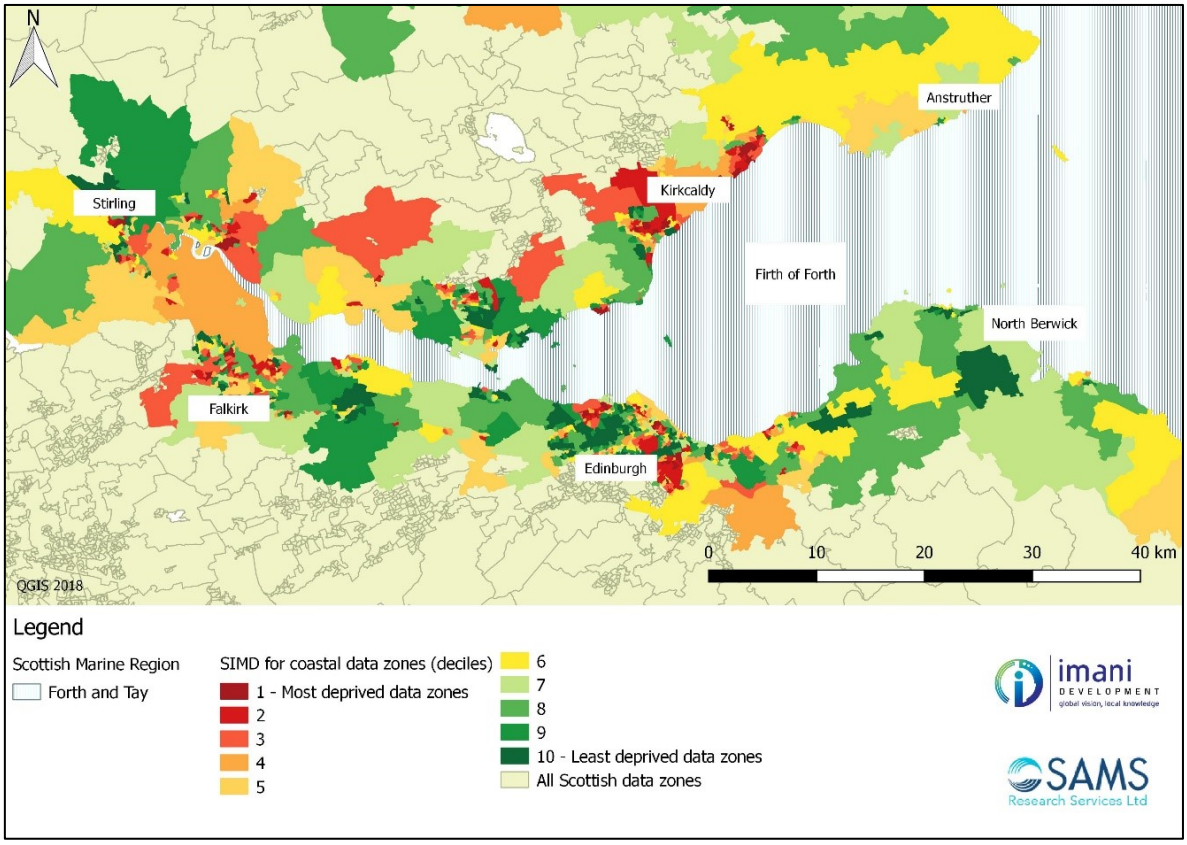

Figure 5.8. SIMD analysis for the Firth of Forth in the Forth and Tay Marine Region. Source: Adapted by Imani Enterprise Ltd. from Scottish Government (2018a) data.

5.2.4 Infrastructure and Linkages

5.2.4.1 Supply Chain

The Forth and Tay has supply chains that are integrated with other regions. Aside from harbour side employment and transport through cooperatives and third-party suppliers, the majority of processing jobs from Forth and Tay inshore fish will be in other regions, e.g. in Fraserburgh where much of the Fife inshore stocks are processed. Equally, Forth and Tay benefits from processing inshore fish from other regions of Scotland, most notably through D R Collin in Eyemouth, which had a turnover of £43.9m in 2017, up from £19.3m in 2016. Such growth would likely include the evident improvement in landing volumes but also through acquisitions, consolidating output from other Scottish processing capacity.

There are emerging opportunities for new business models in the supply chain – for example the growth in demand for crabs landed in St. Abbs was seen as encouraging, and it may be possible to add value (e.g. through boiling and then refrigeration) as a basic process at the harbour. Complying with fish processing regulations have been seen as a deterrent, but on-boat operations are common and could provide an innovative solution.

5.2.4.2 Connectivity

Forth and Tay is one of the best connected of Scotland's Marine Regions, with excellent road, sea and air infrastructure along long sections of its coastline. Northwards of the Firth of Forth, population centres at Dundee, Perth, St Andrews, Carnoustie, Arbroath, and Montrose are well spaced, ensuring a varied coastline of mixed rural and urban areas (Tay Estuary Forum, 2012). The most sparsely populated section of coastline spans the stretch from Dunbar to the Scottish-English border along its southernmost extents.

In Forth and Tay, physical infrastructure such as harbours and good road links are seen as being key to inshore fishers. Fishers in the region also felt that the proximity of processing factories to their operations was important to their business. This contrasts with other regions – particularly where connectivity issues are prevalent and inshore fishers felt that ferries and airports were the most significant physical infrastructures to business.

5.2.5 Inshore Fishing Sector

Inshore fishers in this region are on average ~52 years old and have been in the fishing industry for an average of 22 years but with ages ranging from three to 60 years among respondents. The average number of boats owned by fishers is one boat between six and seven meters in length. The survey indicated that creels were the most common gear type used by respondents, with some using trawls and dredges.

From the fieldwork undertaken and literature, the main inshore fishing port in the region is Pittenweem, followed by Dunbar and Eyemouth. The remaining landings are captured at a number of smaller ports, such as Crail, Methil and Leven, Anstruther, St. Andrews and West Wemyss. In 2012 the reported value from fisheries landings in these smaller ports was upwards of 95% of their total value recorded annually – indicating the importance of the inshore industry to these coastal populations (EMU, 2012). However, based on interviews and surveys undertaken, inshore fishing did not appear to be significant in all cases. For example, Anstruther is more reliant on tourism with more yachts in the harbour (marina) than fishing boats. St. Andrews has a small working harbour, but the focus of the town is now on higher education and recreational tourism, most notably golf. St. Monans however, is still predominantly a fishing harbour with little tourism evident, yet it is not thriving despite the presence of the inshore fishing industry.

5.2.5.1 Inshore Fishing Landings - Volumes and Values

The volume and value of inshore fishing in the Forth and Tay from 2010 to 2017 is shown in Table 5.5 and Table 5.6 by vessels <10 m and vessels between 10 - 12m. The total volume reported landings by vessels <12 m in 2017 was 3,046 tonnes, which has increased since 2010. The majority of landings were from the <10 m vessels which accounted for 66% of all landings in the Forth and Tay in 2017 (Table 5.5 and Figure 5.9). Since 2010, over 60% of annual reported landings have been by vessels <10 m. Both of the <10 m and 10 – 12 m vessels have followed a similar trend with 2015 being a bad year with the lowest volumes landed since 2010 (from the

data examined, reasons why 2015 were a bad year cannot be ascertained). However, 2016 and 2017 show a significant increase in volume landed. Forth and Tay accounts for ~21% of Scottish value (£) and the highest volume (~16%) in 2016 and is therefore a significant regional player in the Scottish inshore fishing sector.

Table 5.5. Total live weight landings by volume (tonnes) from vessels <10 m, and between 10 - 12 m for the Forth and Tay Marine Region, from 2010 – 2017.

Volume	2010	2011	2012	2013	2014	2015	2016	2017
<10 m	1,535	1,639	1,736	1,519	1,524	1,375	1,847	2,018
10 – 12 m	887	894	841	880	972	768	998	1,028
<12 m (total)	**2,422**	**2,532**	**2,577**	**2,398**	**2,496**	**2,143**	**2,845**	**3,046**

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number

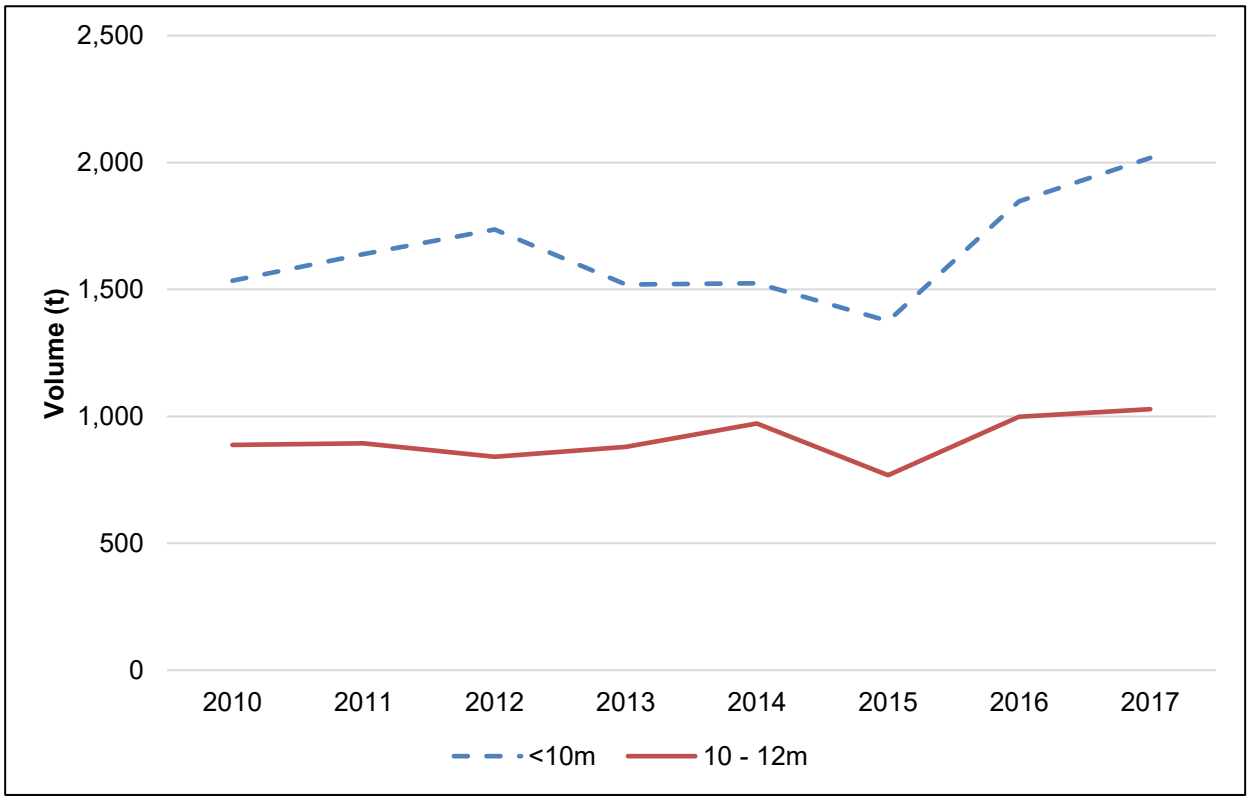

Figure 5.9. Total live weight landings by volume (tonnes) from vessels <10m, and between 10 - 12m for the Forth and Tay Marine Region, from 2010 – 2017. Source: Marine Scotland, 2018a.

The <10 m vessels land considerably more in terms of value than the 10 - 12 m vessels (Table 5.6 below). The value landed by both fleets is not proportional to the volumes landed. Under 10 m accounted for 66% of landings by volume, but this is 76% of landings by value indicating that the catch of <10 m vessels is more valuable than the catch landed by the 10 - 12 m vessels.

Table 5.6. Total live weight landings by value (£m) from vessels <10 m, and between 10 - 12 m for the Forth and Tay Marine Region, from 2010 – 2017.

Value (£m)	2010	2011	2012	2013	2014	2015	2016	2017
<10 m	5.52	7.16	7.17	6.18	6.83	5.92	7.79	10.39
10 – 12 m	2.03	2.49	2.33	2.47	2.80	2.34	2.79	3.25
<12 m (total)	**7.55**	**9.65**	**9.50**	**8.65**	**9.63**	**8.27**	**10.58**	**13.64**

Source: Marine Scotland, 2018a
Total value (£m) is rounded to the nearest million for the value

Despite a few years where the value of the total catch has declined, there has been a general upward trend in values from the region since 2010. In 2016 and 2017, the value rose significantly (Figure 5.10) which is in line with increases in volume, but also reflects an increased price per tonne of catch.

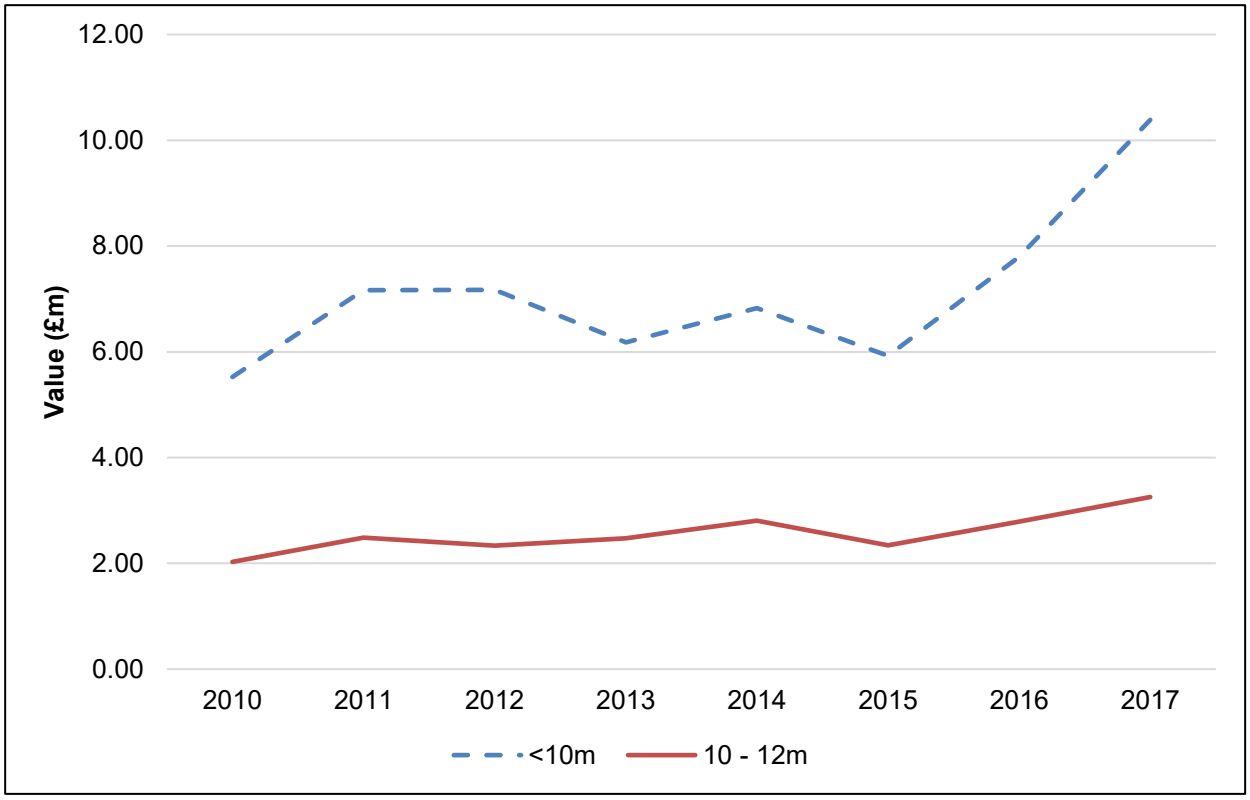

Figure 5.10. Total live weight landings by value (£m) from vessels <10 m, and between 10 - 12 m for the Forth and Tay Marine Region, from 2010 – 2017. Source: Marine Scotland, 2018a.

The inshore fishing sector in the Forth and Tay Marine Region accounted for 21.4% of all Scottish inshore landings by value, and 15.8% in terms of volume in 2017. These are the highest percentages in Scotland, across all Marine Regions, which shows that the Forth and Tay is a key region for the inshore industry (Marine Scotland, 2018a).

For vessels <10 m, the main species landed in the Forth and Tay Marine Region by value (£m) over the last three years are lobsters, *Nephrops*, and crabs as shown in Table 5.7. The volume landed of each species changes each year and has previously included other species such as squid, mackerel, whitefish (including cod, haddock, sole), and scallops.

Table 5.7. Total live weight landings by volume (tonnes) and value (£m) for species landed by vessels <10 m, for the Forth and Tay Marine Region, from 2015 – 2017.

Species landed by vessels <10 m	2015			2016			2017		
	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne
Lobsters	348	3.71	10,644	393	4.72	12,017	449	6.38	14,200
Nephrops (Norway Lobster)	374	1.37	3,656	476	1.68	3,528	341	1.44	4,226
Crabs (C.P.Mixed Sexes)	345	0.40	1,158	439	0.53	1,217	579	0.97	1,679
Crabs - Velvet (Swim)	101	0.21	2,070	130	0.31	2,352	194	0.59	3,066
Squid	1	0.00	2,142	1	0.00	2,241	46	0.04	946
Mackerel	148	0.11	755	118	0.11	944	97	0.12	1,249
Razor clams	10	0.04	4,087	20	0.06	3,158	75	0.45	5,991
Whelks	11	0.01	725	227	0.21	915	195	0.21	1,075

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number
Total value (£m) is rounded to the nearest million for the value

By value, lobsters were the main species landed by inshore fishers on vessels <10 m worth ~£6.4m in 2017, followed by *Nephrops* (£1.4m) and crabs (£0.97m). Lobsters sold at ~£14,200/t which was higher than prices for Solway (£13,765/t) and Argyll (£13,931/t).

For vessels between 10 - 12 m, the most common landed species over the three years were *Nephrops*, lobsters, and crabs as shown in Table 5.8 below, but some also landed whelks, scallops, whitefish, and clams. The smaller inshore boats tended to land a wider variety of species than the 10 - 12 m vessels. In 2017, £1.67m of lobsters were landed in this Marine Region followed by *Nephrops* at £0.96m. However, in 2015 and 2016 *Nephrops* accounted for the greatest value and volume of species landed, followed by lobster.

Table 5.8. Total live weight landings by volume (tonnes) and value (£m) for species landed by vessels between 10 -12 m, for the Forth and Tay Marine Region, from 2015 – 2017.

Species landed by vessels 10 m – 12 m	2015			2016			2017		
	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne
Nephrops (Norway Lobster)	414	1.19	2,867	510	1.45	2,850	563	1.67	2,969
Lobsters	77	0.80	10,364	69	0.80	11,629	67	0.96	14,321
Crabs (C.P.Mixed Sexes)	185	0.22	1,178	281	0.37	1,318	249	0.42	1,674
Crabs (Velvet)	17	0.03	1,782	11	0.02	1,911	14	0.04	3,067

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number
Total value (£m) is rounded to the nearest million for the value

5.2.5.2 Inshore fishing employment

Employment in the inshore fishing sector in the Forth and Tay Marine Region has remained fairly static since 2010 as shown in Figure 5.11 below. Both the <10 m and 10 - 12 m fleets have seen a reduction in the numbers of people employed since 2016 (13 less jobs in 2017). Vessels <10 m account for the majority of inshore fishing jobs at ~85%.

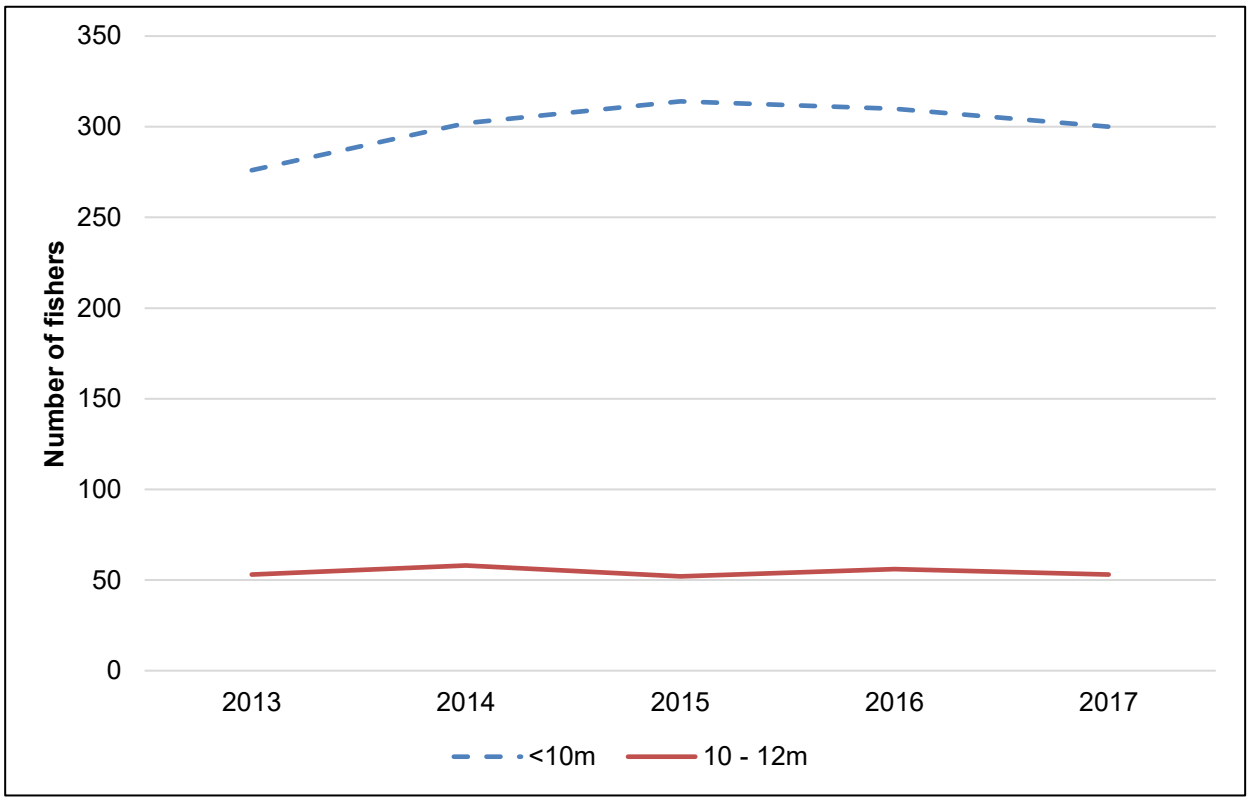

Figure 5.11. Total employment for vessels under 10 m, and between 10 m and 12 m for the Forth and Tay Marine Region, from 2013 – 2017. Source: Marine Scotland, 2018a.

According to the latest SIMD (2016) figures, inshore fishing is not a significant contributor to the overall regional economy, accounting for only 0.04% of the total working age population in this region. However, in the Scottish context, it accounts for 15% of all fishers on vessels <10 m and 14.3% of fishers on vessels of 10 - 12 m of total inshore fishers in Scotland.

Based on Scottish 2017 data averages, the Forth and Tay landing activity creates an additional 106 jobs in the supply chain, and a total of 141 (inclusive of the 106) across the Scottish economy, contributing £21.82 m of output and £12.66m m of GVA to Scotland.

5.2.6 SLA Discussion

5.2.6.1 Human Capital

The number of fishers (i.e. jobs on-board) has increased by 37 since 2013 to presently, though the average fisher age remains high. There was a small amount of evidence of supporting young entrants to the industry, but this was considered an exception to the rule.

There were mixed feelings about skills requirements and availability. Some fishers strongly agreed that there was enough opportunity to learn the skills of fishing (46%) and that there was enough training for young people (38%). However, 31% did not agree that there was enough opportunity to learn the skills and 38% did not agree that there was enough training for young people. Based on fisher interviews it is not clear what impact this will have.

The region provides a lot of additional economic (i.e. tourism, engineering especially in the renewables sector, and oil and gas) and educational opportunities that will impact the number of young people wanting to enter the sector – making the fishing industry an employer of last resort (60% state that fishing has given them a job when they might otherwise not have had one). However, inshore fishing still has a role to play in creating or supporting other industries such as fishmongers, fabricators, shellfish buyers (several fishers talked about the fish vans that come along to the harbours to buy fish straight from the boat), although many of these businesses have diversified so are no longer completely reliant on the inshore industry.

Being within the travel to work areas of Edinburgh, Dundee and re-industrialising areas of Fife has an impact on local fishing – succession seems not to be assured, with e.g. engineering jobs being cited as alternative career options. Given the profitability of inshore fishing for many, and links with tourism (i.e. linking in with the provenance and traceability discussions), there might be opportunities for innovative new models for inshore fishing.

5.2.6.2 Social Capital

Although many respondents still feel that the inshore fishing sector is important to the local communities, there were a large percentage of fishers who neither agreed nor disagreed that it is still important to these communities. Even so, it is clear that the history of fishing is important in these villages (i.e. fishing museums, fishing boats with flowers at junctions into the villages, and so on) and that the image of a fisher is still one of resilience (or toughness), that it is a dangerous job, and that it is a way of life.

Where inshore fishing has ceased to be the main industry, tourism has taken over – such as in Anstruther, where a fishing museum and marina have transformed the village, whereas this is not the case further down the coast in St. Monans. As with other regions (e.g. Stranraer's oyster festival) it is notable that seafood is a pillar of tourism as much as a standalone activity. Anstruther's tourism approach remains strongly associated with its fishing heritage. The cooperative model in this region seems to comprise the vast majority of fishers with only a few local fishers deciding not to be members.

In general, there is less dependence on inshore fishing than there once was, but it is still seen as integral to the image of a lot of the towns and villages in the region. This is supported by survey results where 38% said that their community did not really rely on fishing anymore and 46% said that they were somewhat to significantly reliant on the industry now.

60% say inshore fishing is still important to their communities (compared with 90% in the Argyll region), but again, this is dependent on location. However, this is countered by a large percentage of fishers that neither agree nor disagree that fishing is important to the local community (40%). There seems to be less of a family history of inshore fishing in this region – 50% stated that they agreed or strongly agreed with this statement. This may be somewhat surprising, given the concentration of fishing in the East Neuk area.

5.2.6.3 Financial Capital

Inshore fishing accounted for over 80% of income for 42% of fishers in the survey, with 33% indicating that it was less than 20%. Other sources of income include offshore work, spouse income and rental properties.

There are significant financial costs to owning a boat that was reflected throughout the four Marine Regions. The costs of buying a boat can be prohibitive, especially to the young, and the costs associated with running the boat are also high. Nevertheless, net profit margins seem strong in recent years. Information on boat profitability in Forth and Tay was limited in SIFIDS surveys and examples from interviews, but it was considered largely profitable once initial investment in the vessel and licence was secured: this is consistent with UK averages through Seafish survey work and interview examples which also suggest that access to financing the assets of a boat and licence are a more significant barrier than underlying profitability for most.

One cooperative in the regions is converting some harbour side property to holiday lets: this complemented their positive returns from fishing and sales through their chandlery, which gained income from fishers and tourists. In summary, there is increasing integration with tourism.

5.2.6.4 Natural Capital

Gear conflict is minimal, and the majority of fishers stated that there is no negative impact from recreational users (i.e. yachts) or tourism (i.e. divers and wildlife tours).

There are a number of environmental designations in the regions, which will likely have impacts on fishing activities, although not guaranteed. These designations can (in some cases) prevent fishers from fishing in the area, thus forcing them into closer proximity with other fishers and marine users. In the interviews, there was little reference to conflicts over shared marine space at present. However, it should be noted that there is concern that wind farm sites will interrupt prime inshore fishing grounds by preventing access, which should be monitored going forward.

5.2.6.5 Physical Capital

The physical infrastructure in the region is good, especially transport networks, though arguably the boom in housing demand through tourism and second homes has changed the fishing

villages of the East Neuk of Fife. Processing of Fife fish takes place in Fraserburgh, and D R Collin sources from across Scotland. This shows a degree of integration through available infrastructure, and it has played a role in shaping the inshore fishing sector.

Inshore fishing increasingly shares infrastructure with tourism, such as harbours, property and retail. Fishing villages are understood to be key to the heritage of villages – i.e. Anstruther fishing museum.

5.2.6.6 Vulnerability and Resilience

Based on the high level of economic opportunities available in the Forth and Tay region, and the good availability and access to transport infrastructure, this Marine Region is not strongly reliant on the inshore fishing industry for economic sustainability. As it employs only 0.04% of the total working population, the region is not vulnerable to shocks in the inshore fishing industry, though its impacts will be higher at the local port level. Nevertheless, this in turn will be port-specific, since some regions (such as the East Neuk) show stronger evidence of diversification of opportunities (manufacturing, tourism, commuting) than those which have more concentrated inshore activity. Further, while some towns are very concentrated in fishing benefits (e.g. Fraserburgh, Kirkcudbright) these benefits are often not dependent on local inshore fishing catch, but rather from a far wider region.

Fishers have a good set of transferrable skills which means that, should they no longer be able to fish, they could seek employment on renewable energy developments, and other offshore work – mainly because they have the safety certificates, and boat handling skills that these jobs require. They may benefit from the increase in value of property in coastal areas through tourism and demand for second homes, though it is equally likely that this will pose an affordability problem for those without property assets. Given findings that Scottish inshore fishers are more attached to their home localities than the offshore sector (and therefore less likely to move) (Pita *et al.,* 2010), caution is required when reporting the potential benefits of the rise of property values. While in Fife this has been pursued at a cooperative level (using property assets), the culture of Scottish fishers may make them reluctant to do this as a norm (noting the impacts that fishing has on lifestyles and predictability of free time).

The supply chain is seen as being resilient with evidence of businesses having diversified their incomes years ago (i.e. majority of their work is no longer inshore fishing related). However, there are some businesses such as fish vans that are reliant on landings.

Cooperatives and their members are directly reliant on inshore fishing but could provide an avenue for strengthening succession through guarantees, e.g. in the Western Isles where associations, councils and banks work together to support financing of boats for new entrants.

5.3 Solway Marine Region

Summary

- The majority of the Solway coastline is rural and not heavily developed, with a dependence on primary industries (fishing and farming) and processing.
- The region's population is spread across a number of small to medium towns, with Dumfries as a hub.
- Inshore landings are relatively small in comparison to other Marine Regions, with a value of approximately £2m in 2017.
- Scallops, crab and lobster are the main species.
- Direct employment in the inshore fishing sector is low at a total of 73 people but creates other jobs locally and in other regions of Scotland.
- Impact of the sector could increase significantly with growing demand for crab and formalisation of the razor clam fisheries.

5.3.1 Key Features

The Solway Marine Region is located in the south-west of Scotland. Its coastline covers the whole of the northern side of the Solway Firth, extending out to Wigtown Bay, Luce Bay, and the hammerhead structure to the west of Stranraer (Nautilus Consultants, 2013). The Dumfries and Galloway Council is the only council that borders this region. Figure 5.12 displays the coastal data zones coded to show the levels of deprivation within 5 km of the marine region coastline.

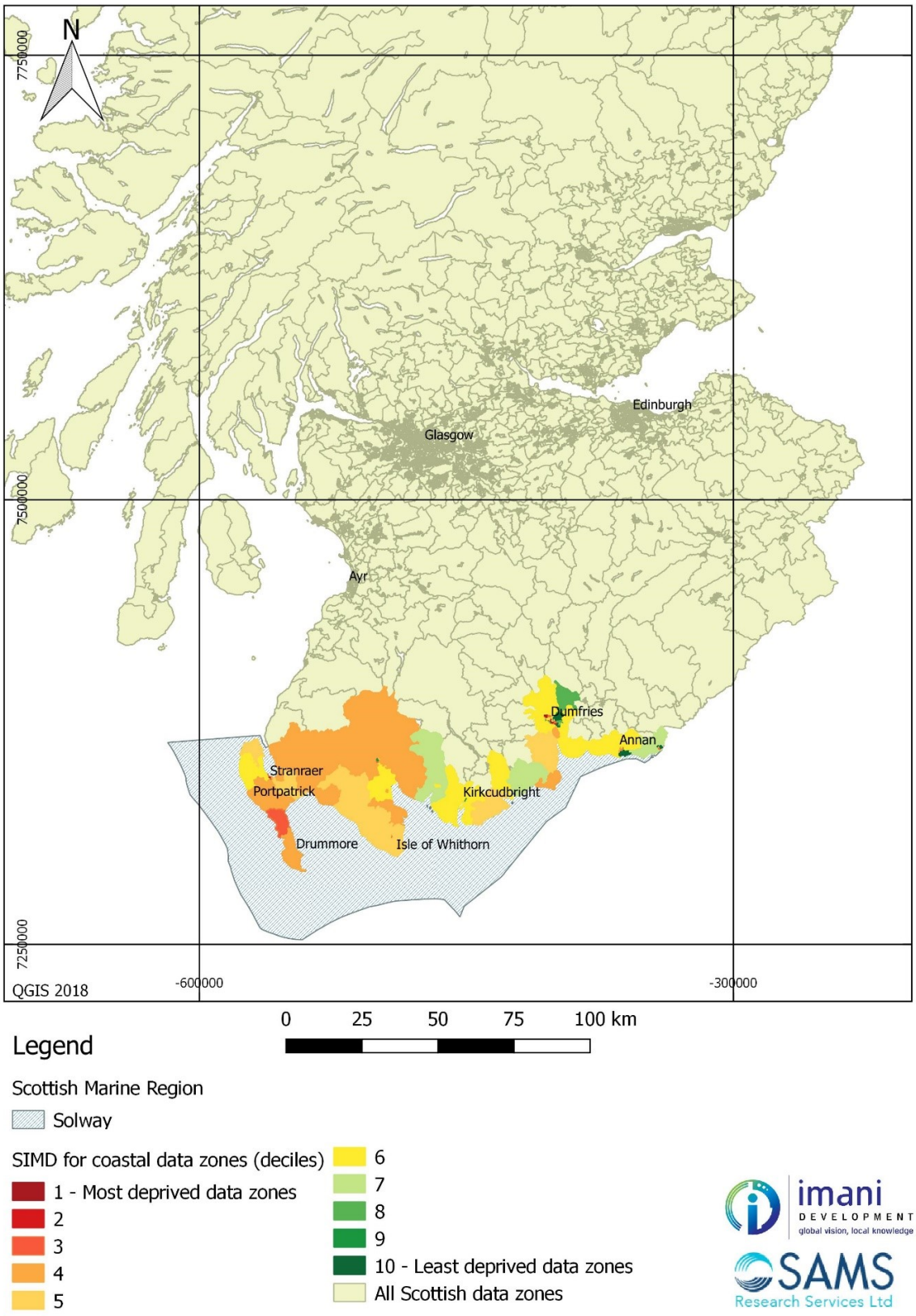

Figure 5.12. Location and extents of the Solway Marine Region, showing the levels of deprivation for data zones within 5km of the coastline. Source: Adapted by Imani Enterprise Ltd. from Scottish Government (2018a) data.

5.3.2 Regional economy

The Solway Marine Region has a population of 101,000 (adapted from Scottish Government, 2018a), which accounts for 1.9% of the total Scottish population (National Records Scotland, 2018)[17]. This is the second largest coastal population out of the four marine regions focussed on in this study, behind the Forth and Tay region (23%).

The wider Dumfries and Galloway area is primarily a rural economy with agriculture, forestry, tourism, and food processing as its most important sectors. Renewable energy generation is becoming increasingly important as a driver of economic growth over the last decade (Dumfries & Galloway Council, 2018). The East of the region is relatively well connected through the motorway network to the Central Belt and England, but the West is relatively remote.

The main fishing harbours within the region are Kirkcudbright (king and queen scallops, and processing), Isle of Whithorn (scallops, crab, and lobster), and Stranraer (oysters, occasional landings from visiting prawn and whitefish trawlers).

There are also a number of smaller inshore boats that use these ports and facilities at smaller harbours such as Garlieston, Port William, Drummore and Portpatrick, all of which contribute to the local rural economy (Nautilus Consultants, 2013). There is also considerable recreational and sport fishing activity, which is important as they bring money into the local economies by buying fuel, bait, groceries, and through harbor dues and other maintenance costs (i.e. induced economic impacts through expenditures on local goods and services).

Figure 5.13. Nomadic fishing boats at Stranraer Harbour. (Picture: Imani Enterprise Ltd., 2017.)

The management of the Solway Marine Region is distinctive as there are five different management authorities bordering the region: Isle of Man, Northern Ireland, England, Scotland (specifically the Clyde Marine Region) and Republic of Ireland. This presents a significant

[17] Mid-year population estimates for Scotland in 2017 was 5,424,800

challenge for local marine management, as each jurisdiction has its own marine management plan, and these are often not complimentary resulting in conflict between different boats, according to the interviews. Fishing boats from these administrations fish in Solway waters, in addition to European boats that have historical fishing rights. In order to prevent these conflicts, a Code of Conduct[18] for the region was developed, which has, according to fishers, reduced conflicts between local boats, but not necessarily visiting boats (i.e. from the Isle of Mann) due to the voluntary nature of the code.

This marine space and its associated polities is further complicated by the North Channel which is an important shipping route. Policy negotiations relating to the complexity of the Solway Marine Region This further constrains fishing activity in the region and adds to spatial conflicts. Within this, inshore fishers are perceived to be on the receiving end of policy negotiations which came through strongly in the regional interviews. This is not the case throughout Scotland and is seen as characteristic of this region.

However, it is important to note that Isle of Man (Manx) and Clyde scallop boats that fish in local waters make an important contribution to the local economy through refuelling, buying groceries, as well as landing catch which is processed in the local factories (mainly Kirkcudbright).

There are a number of environmental designations in place within this Marine Region. These include, but are not limited to RSPB Bird reserves, National nature reserves, RAMSAR Sites and Coastal reserves, SSSIs, SPAs, and SACs. More information on these is available through the Marine Scotland Maps NMPi portal (Scottish Government, 2018b). Some of these designations have implications for fishers, as they close off areas of the sea to fishing activity, thus reducing the area for fishing, which can, in some cases push fishers and other marine users into conflict. Military exercise and danger areas can also impact fishing activity as they are entirely restricted zones.

The Dumfries and Galloway Council sees sustainable development of coastal areas as an important contributor to economic growth in the region. The Council's second Local Development Plan (LDP2; currently in proposal stage) notes rising sea levels and increasingly extreme weather conditions associated to climate change as important considerations for coastal development planning, as well as understanding and managing inter-industry conflicts within the inshore (Dumfries & Galloway Council, 2018).

5.3.3 Related Industry / Economic Activity

According to figures in the Scottish Index of Multiple Deprivation (SIMD, 2016) the Solway Marine Region has a working age population of 60,512 (Scottish Government, 2018a). The main business sectors in Dumfries and Galloway[19] are Agriculture, Forestry and Fisheries (28%), Retail (10%), and Construction (9%). While sectoral business counts in Dumfries and Galloway

[18] Solway Code of Conduct. Available from: http://www.solwayfirthpartnership.co.uk/code-of-conduct

[19] According to the 2014 UK Business Counts

are largely proportional to those of Scotland overall, Agriculture, Forestry and Fisheries (at 28%) are more than three times larger than the national economy (at 9%) (Skills Development Scotland, 2014). In terms of employment by occupation, the most common employment categories are skilled trades occupations (17%), elementary occupations (14%), professional occupations (13.6%), and caring, leisure and other service occupations (11.1%).

Tourism is a key sector to the region, including marine and wildlife tourism, sport fishing, and yachting (Dumfries & Galloway Council, 2018), and creative industries such as painting are important to the region. Investment in regeneration of the Stranraer Waterfront, for example, is part of a plan to reposition Stranraer and Loch Ryan as a marine leisure destination and seaside economic hub town (Dumfries & Galloway Council, 2018).

In addition, the Stranraer Oyster Festival is part of the Stranraer Development Trust's plan to regenerate the town with a focus on seafood (mainly oysters) and provenance, plus the development of a marina. In its first year, it generated ~£0.5 m to the local economy (Scotland Food and Drink, 2017). Several interviewees also noted that fishing and tourism are linked and that tourists enjoy seeing a working harbour and watching the catch come in. As such, Kirkcudbright Harbour remains open to tourists, although this is subject to health and safety concerns (BBC, 2018).

Agriculture, mainly dairy farming, is seen as a major industry for Solway, although there is a declining workforce due to increased mechanisation. Farming is also seen as a complementary activity to inshore fishing, and under a similar narrative of managed decline in numbers participating in primary production. Processing of scallops is a large operation in Kirkcudbright by and is well-known in the town and provides substantial employment year-round. However, most of the processing is of scallops which are not caught by the inshore fleet (under 12 m). Forestry is also important, covering 28% of Dumfries and Galloway, attracting around 1.1 million and 413 thousand visitors per annum respectively (Dumfries & Galloway Council, 2018).

5.3.4 SIMD / GIS Analysis / Seaward vs. Landward Data

The Solway Marine Region has areas which are considered to be deprived, as well as those that are in the top 10% of least deprived areas as shown in Figure 5.13 and Figure 5.14. Most of the western side of the Solway Marine Region falls within the top 50% of most deprived data zones, while the eastern region tends to be less deprived, but also experiences more variation in deprivation levels.

There are a number of reasons why this could be the case, such as better connectivity and access to services and employment opportunities in the Eastern region compared to the remoteness of the Western side. Primary industries such as farming and fishing are more prominent in the west of the region, coupled with remoteness might make it difficult to attract and retain a workforce. In the smaller towns and villages there are fewer opportunities for young people who, as a consequence move away from the area. From fieldwork undertaken, the number of jobs in fishing and farming are declining in the region so no longer provide the jobs that are required.

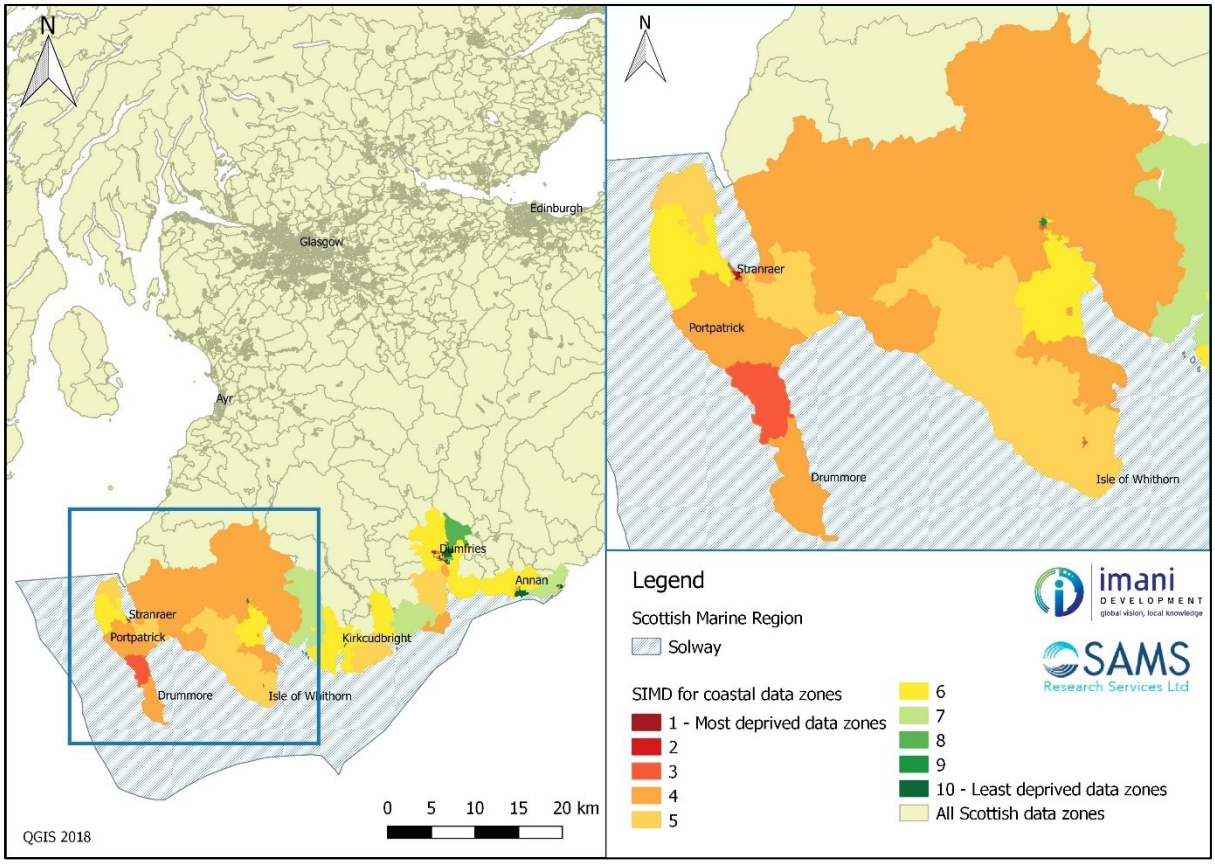

Figure 5.14. SIMD for the Western region of the Solway Marine Region. Source: Adapted by Imani Enterprise Ltd. from Scottish Government (2018a) data.

Overall, the Solway Marine Region would not be considered to be deprived with an overall decile rank of five (50%). There are areas of deprivation (bottom 20%), but also of wealth across the region. Parts of Annan, Stranraer and Dumfries have severe deprivation, but also areas of 'no' deprivation.

Looking at comparisons between fishing villages and non-fishing villages and towns, there seems to be very little difference in levels of deprivation. Perhaps the main thing to note is that there are less areas of deprivation where the place is not reliant on primary industry (e.g. farming and fishing). Where there is more diverse economic activity, there tends to be more pockets of less deprived areas as seen in Dumfries (education and other services), Annan and Kirkcudbright (processing).

The value chain analysis in Solway shows that some coastal processors and restaurants have direct employment linkages with inshore fishing activity. In Kirkcudbright, though scallop processing goes beyond inshore fishing definitions (boat length over 12 m); the impact of fishing is strong at a coastal town level (see below). However, most of the processing impacts of inshore fishing go beyond the scope of this SIMD mapping region.

The SIMD shows the most deprived areas are not confined to areas where inshore fishing exists, it exists in other areas within this region. However, the less well-connected West side of Solway faces the greatest socio-economic challenges, and it is notable that they are using seafood production (mainly aquaculture at present) and marketing as a base for local economic regeneration.' It is too early to determine the full socio-economic impact of using seafood in this way (i.e. the Stranraer Oyster festival), but it provides an opportunity for inshore fishers in this region feed into these strategies.

5.3.5 Infrastructure and Linkages (Connectivity)

Road linkages in Solway are mixed: it has motorway links to the Central Belt of Scotland – and there was evidence of the inshore sector supplying the Glasgow area, and the M74 also leads south into England, which is a key source of tourism demand. This also provides access for fish processors in the Dumfries and Galloway region, though these are often largely delinked from inshore fishing products. Annan (subject to possible closure) has been processing non-local, whitefish – demonstrating how 'fishing jobs' must be differentiated by type and activity if considering the impact of different sub-sectors.

Changes in the infrastructure and linkages can have significant effects – the move of the ferry terminal to Cairnryan has had a negative impact on accommodation and associated trade in Stranraer, spurring the town to diversify and look for other ways of regenerating the economy – a marina has been built, and the Stranraer Oyster Festival was launched.

Inshore fishers in Solway highlighted that ports were very important to their business, but unlike other regions, ports, ferries and airports were not at all important to their businesses. Good road links and haulage companies, plus processing facilities within the region seen as important. For example, pallet couriers were being used when possible to outsource small loads of product, though coverage in remote areas was still patchy.

5.3.5.1 Supply Chain

Input supply: while the survey work indicated that fuel companies, engineers, fabricators, fishmongers and chandlers were all somewhat reliant on the industry, in interviews it was evident that many of these were fairly diversified across other sectors. This indicates a challenge when evaluating linkages in the value chain – if we assume the total absence of inshore fishers in a particular area, the impact may be noted but unlikely to pose an existential threat to most local businesses, though many would lose a *proportion* of their customer base. This subtle process of attrition of dependence on inshore fishing may be one reason why local people assume fishing to be important to the economy, while in fact suppliers report that they have already had to diversify and not be wholly focused on one locality and sector – engineers, for example, are likely to have rationalised and supply farming and other marine sectors as well as fishers.

The impact would be more profound for the small number of local processors who directly *source* from fishers: but in general, the presence of strong processor linkages lies largely outside of the under 12m vessels, which had looser or smaller scale ties with buyers. Impacts may be more

pronounced in more concentrated economic regions such as Orkney, where crab fishing (both inshore and offshore) is better consolidated.

Nevertheless, the industry is one pillar of a local economy, and if it were to fail, communities are right to be wary that this would undermine the economic 'mix'. These two aspects of the argument are reconcilable because the relatively low number of inshore fishers was often confused with the relatively large number of offshore / scallop fishers whose presence and economic multiplier were indeed high. Some small scale processing and local restaurant consumption of local products was evident, and while in small volumes is likely to have a relatively good local impact ratio. These include seafood processing operations (smokehouses, retail, filleting and preparation), and some serving of local crab in cafes and restaurants.

There is a large scallop processor based in Kirkcudbright, providing direct employment to 300 people and indirect to 200. The scallops sector is supported by a fleet of fishing boats (over 12 m) that target offshore grounds during summer and inshore during winter. A fleet of larger vessels also support the sector, operating offshore through most weather conditions. Smaller scalloping vessels struggle to operate profitably under current effort allocations and sometimes head to other regions along the Scottish West Coast and Moray Firth to increase landings.

The Kirkcudbright processing, while operating with boats larger than 12 m, is a good example of very locally integrated fishing supply-chain impacts. Processing takes place very close to landing, and boat ownership and operations are tightly integrated into the management of processing supply, with a mix of processor-owned and fisher-owned vessels. It is unlikely this system could be applied in some species areas – for example in lobster creeling the individualism and 'territorial' arrangement of fishers would make it less likely, though this may change if succession routes cannot be found. More widespread use of such a model may intensify benefit for local communities, though it does not assure full value capture unless the processor is in turn integrating with local buyers (retailers, hospitality) too.

In general, the Solway inshore fishing value chain beyond the fisher appears to be more ad hoc and prone to exit the region. Some value addition can be undertaken by fishers, for example by dressing crab prior to on-sale to restaurants. Similarly, small intermediaries such as Galloway Smokehouse do this as a core part of their business. The gross margins for this are seen to be profitable, and an estimated 50% of crab is sold through a local avenue, the other half going to a growing Chinese market. Such increases in derivable value from any given inshore product are encouraging, and points to opportunities in the face of Brexit uncertainty.

Stranraer has some oyster operations and is now branding itself as an oyster festival destination – while the oyster value chain and fishing is relatively independent of inshore fishing, it is strongly indicative of the economic linkages through tourism and branding of food and drink for the region and Scotland. One interviewee has since described the oyster festival as a moment when "*Stranraer unquestionably re-engaged with the loch in a manner that had not been seen since the last ferry sailed out of the port six years previously"* (BBC, 2017).

5.3.6 Inshore Fishing Sector

Inshore fishers in this region are on average 54 years old, which is the oldest age in the four regions, and have been in the industry for an average of 35 years. The average number of boats owned per fisher is one, with 50% of boats between 6 – 7 m, and the remaining 50% over 12 m. There were no fishers with boats between 7 - 12m in the survey and while this is likely a statistical anomaly, it could reflect a real split between casual and commercial boats.

The main fishery in the Solway Marine Region is inshore creel fishing for lobster. Although there are whitefish in the region (mainly bass, cod, whiting, plaice, Dover sole), of commercial value, they cannot be caught by local boats as they gave up their entitlements and can no longer afford to buy them back (Nautilus Consultants, 2013). This was also reflected in a number of interviews.

5.3.6.1 Inshore Fishing Landings - Volumes and Values

The recorded volume and value of inshore fishing activity in Solway from 2010 to 2017 is outlined in Table 5.9 and Table 5.10 below by vessels <10 m and vessels between 10 -12 m. The total volume reported landings by vessels <12 m in 2017 was 555 tonnes. The majority of landings were from the 10 - 12 m vessels, which accounted for 55% of all landings in Solway in 2017 (Table 5.9 and Figure 5.15).

Table 5.9. Total live weight landings by volume (tonnes) from vessels <10 m, and between 10 - 12 m for the Solway Marine Region, from 2010 – 2017.

Volume (t)	2010	2011	2012	2013	2014	2015	2016	2017
<10 m	214	183	258	338	234	302	368	252
10 – 12 m	117	52	43	77	55	161	277	303
<12 m (total)	**331**	**235**	**301**	**415**	**289**	**463**	**645**	**555**

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number

Since 2010, the under 10 m vessels have landed the majority of landings for the region. However, since 2015, the difference in landings between both fleets has been reducing, with the 10 m – 12 m vessels accounting for the majority (55%) of landings in 2017. Both sets of vessels have followed similar trends (corresponding peaks and troughs in volume) up until 2017, as seen in Figure 5.15 below. However, since 2014 the total volume landed by vessels between 10 and 12m has increased dramatically accounting for 19% in 2014 and 55% in 2017.

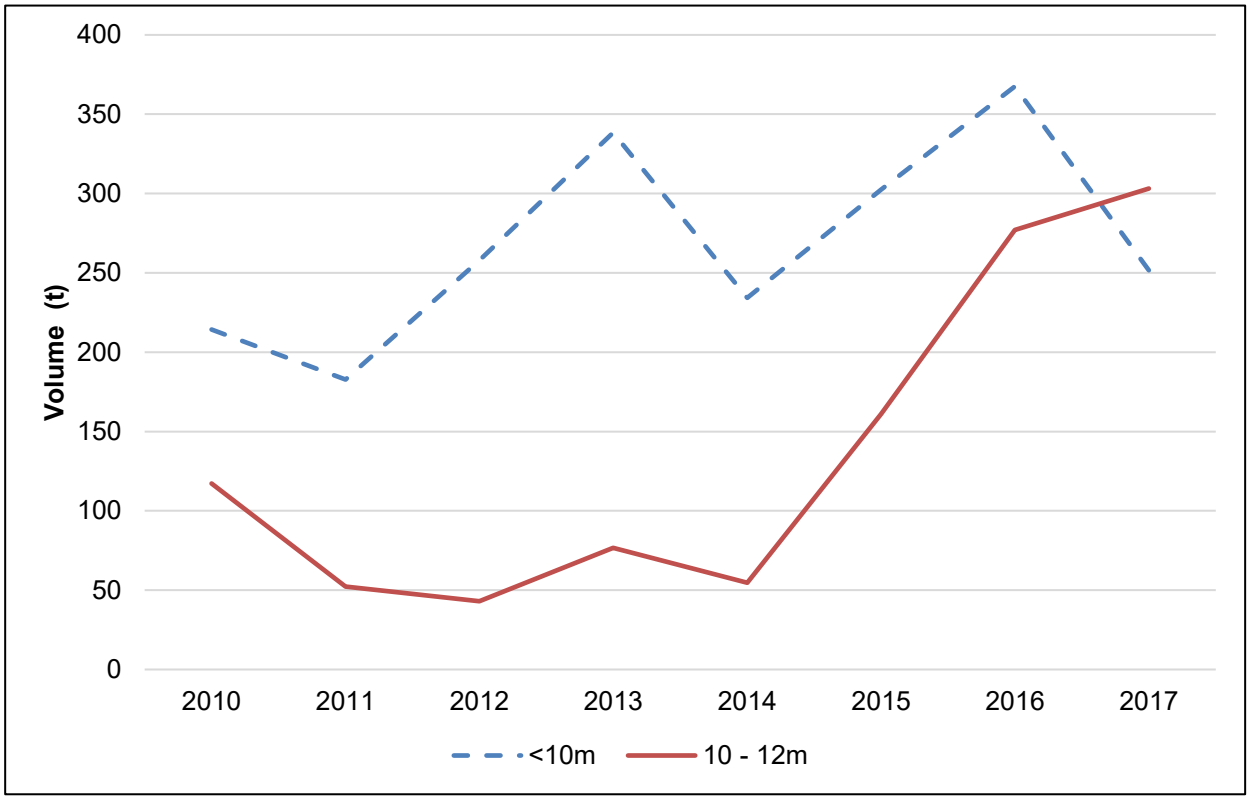

Figure 5.15. Total live weight landings by volume (tonnes) from vessels <10 m, and between 10 – 12 m for the Solway Marine Region, from 2010 – 2017. Source: Marine Scotland, 2018a.

The value of landings in Solway shows a similar pattern to volume with vessels <10m accounting for the majority of landings up until 2016 at 82% (£1.84m) as shown in Table 5.10 and Figure 5.16. The value of these landings closely follows the increase and decrease in the volume of these landings from 2010 – 2017, indicating that the price per tonne of catch has remained relatively stable. The value of landings for vessels between 10 - 12 m is much lower but has experienced a large increase in line with volumes since 2014 (£0.75m in 2017, compared to £0.12m in 2010). However, despite accounting for 55% of volume landed in 2017, the 10 - 12 m vessels only accounted for 38% of the total landed value.

Table 5.10: Total live weight landings by value (£m) from vessels <10 m, and between 10 – 12 m for the Solway Marine Region, from 2010 – 2017.

Value	2010	2011	2012	2013	2014	2015	2016	2017
<10 m	0.68	0.59	0.72	0.95	0.66	1.18	1.84	1.20
10 – 12 m	0.12	0.05	0.08	0.15	0.17	0.29	0.40	0.75
<12 m (total)	**0.80**	**0.63**	**0.80**	**1.09**	**0.83**	**1.48**	**2.25**	**1.94**

Source: Marine Scotland, 2018a
Total value (£m) is rounded to the nearest million for the value

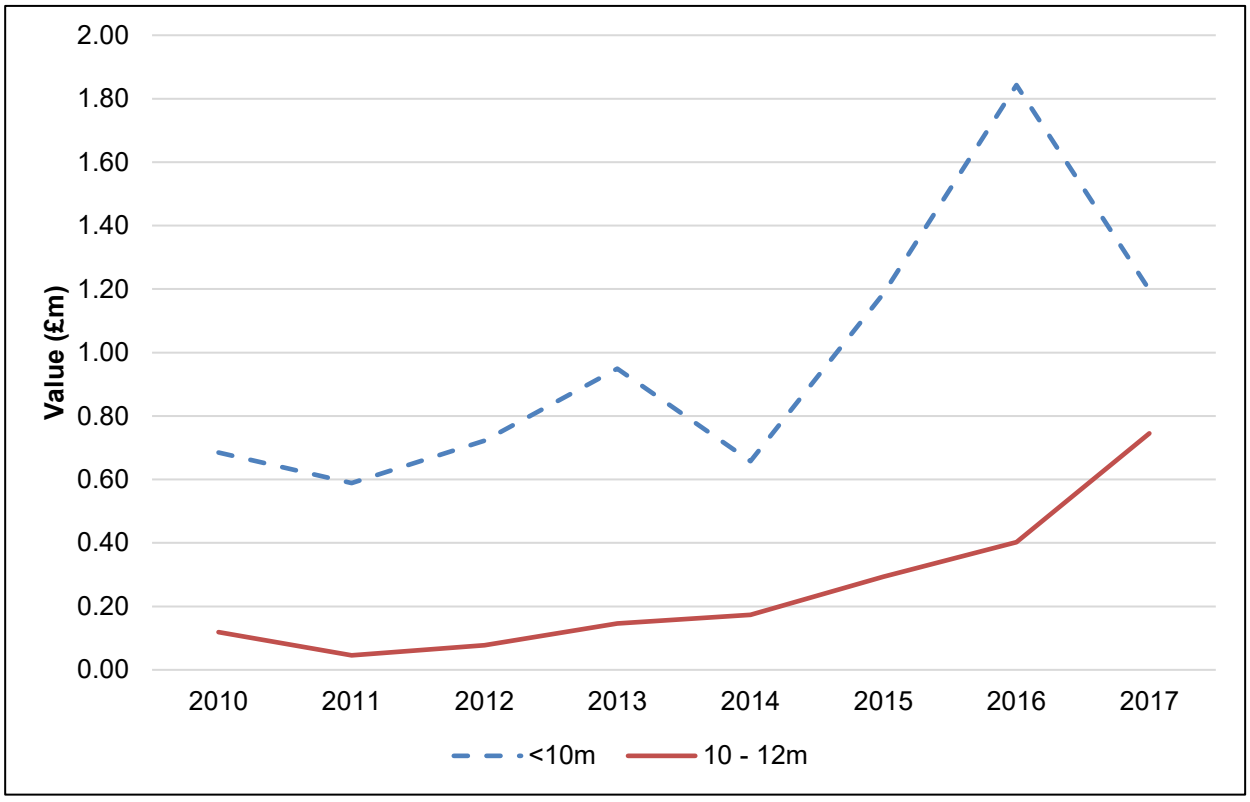

Figure 5.16: Total live weight landings by value (£m) from vessels <10 m, and between 10 - 12 m for the Solway Marine Region, from 2010 – 2017. Source: Marine Scotland, 2018a.

The main species landed in the Solway Marine Region by value (£m) over the last three years are razor clams, lobsters, scallops and whelks for boats <10 m (Table 5.11). The formalisation of razor clam operations could be a large area of growth, with reports of fishers being able to earn £800 per day according to interviews. The volume landed of each species changes year on year and in previous years includes other species such as skates and rays, bass and *Nephrops*.

In 2017 inshore fishers on boats <10 m landed 115 tonnes of razor clam which was worth £670,000 which is approximately £5,800/t. Lobsters only accounted for the third highest volume in the region but accounted for £390,000 with a price per tonne of ~£13,700/t, making it but far the most valuable species in the region.

Table 5.11. Total live weight landings by volume (tonnes) and value (£m) for species landed by vessels <10 m, for the Solway Marine Region, from 2015 – 2017.

Species landed by vessels <10 m	2015			2016			2017		
	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne
Lobsters	144	0.66	4,605	46	0.52	11,353	29	0.39	13,765
Whelks	97	0.08	869	57	0.06	1,060	95	0.10	1,092
Nephrops (Norwegian lobster)	5	0.01	2,371	9	0.02	2,433	6	0.01	2,245
Scallops	13	0.03	2,177	6	0.02	2,345	3	0.01	2,660
Razor Clam	144	0.66	4,605	247	1.22	4,942	115	0.67	5,826

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number
Total value (£m) is rounded to the nearest million for the value

For vessels between 10 - 12 m, the most common recorded landed species were lobsters, scallops, *Nephrops*, razor clams and whelks (Table 5.12). However, up until 2014, only two species were landed by these vessels and these differed each year. For example, in 2011 these boats landed only scallops (14t, £29,000) and Queen scallops (38t, £16,000). Several interviewees mentioned the closure of the cockle fishery in the region and despite several efforts the fisheries have not been reopened (mainly due to sustainability and management issues). The scallop fishery is subject to closure throughout some of the months, and scallops are mainly targeted by the larger vessels 12 m or over which could be why inshore boats (<12 m) do not register scallop landings in some years.

Table 5.12. Total live weight landings by volume (tonnes) and value (£m) for species landed by vessels between 10 - 12 m, for the Solway Marine Region, from 2015 – 2017.

Species landed by vessels 10 m – 12 m	2015			2016			2017		
	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne
Lobsters	6	0.07	10,773	10	0.12	12,064	9	0.12	13,190
Scallops	14	0.03	2,203	23	0.05	2,301	3	0.01	2,731
Nephrops (Norway Lobster)	-	-	-	0.3	0.00	5,768	0.3	0.00	5,464
Razor Clam	25	0.11	4,293	-	-	-	49	0.35	7,056
Whelks	116	0.09	765	243	0.23	934	240	0.26	1,093

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number
Total value (£m) is rounded to the nearest million for the value

Since 2010, whelks have accounted for the largest proportion of landings by 10 – 12 m vessels (240t in 2017), but only the second highest value (£260,000) behind razor clams (£350,000). Lobsters are the most valuable species for the 10 – 12 m boats but fetch a slightly lower price per tonne than the <10 m boats: £13,190/t compared to £13,765/t. More in-depth research into the differences in these figures for Solway is required to understand their origins.

In addition, historically, landings data from the Solway Marine Region have been captured by Marine Scotland in figures for Ayr (Clyde Marine Region) which does not adequately reflect Solway's contribution to the national inshore fishing sector. Reporting of landings value and volume by Marine Region (rather than admin port) will reflect the economic and social contribution that Solway makes to the industry.

5.3.6.2 Inshore fishing employment

Employment in Solway's inshore fishing sector (illustrated in Figure 5.17) has fallen between 2013 and 2016 despite the observed increase in landings volume and value over the same period. This was supported by interviews in the region and by the survey data, which indicated that there are not enough people getting into the industry. Vessels <10 m in length account for more jobs than vessels between 10 - 12 m, at over 80% of fishers employed in the region. However, in 2017, inshore employment increased by 13 individual jobs. All these jobs were in the <10 m vessels, with the total number on 10 – 12 m vessels remaining constant.

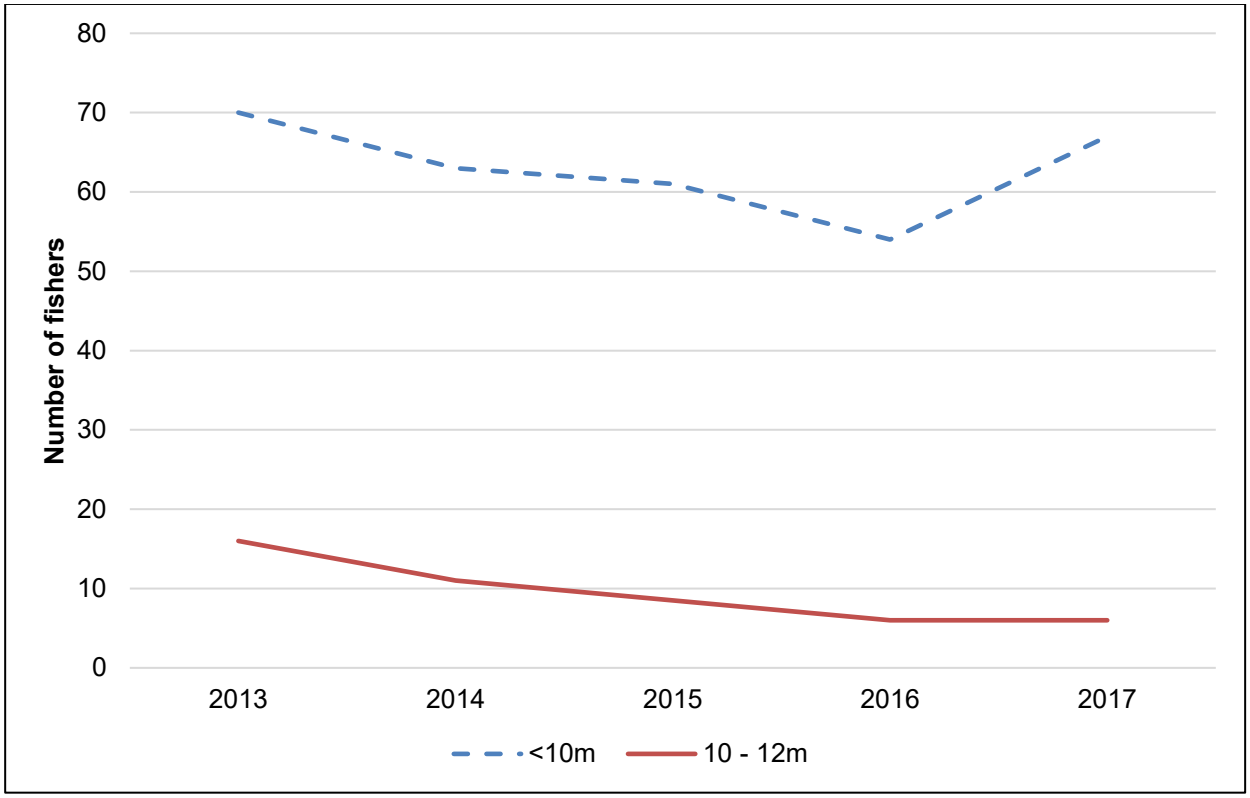

Figure 5.17. Total employment for vessels under 10 m, and between 10 m and 12 m for the Solway Marine Region, from 2013 – 2017. Source: Marine Scotland (2018a).

Inshore fishing accounts for 0.12% of the total working age population in the Solway Marine Region according to the latest SIMD figures, which indicates that it is not a significant contributor to the overall regional economy. Again, this does not capture other significant fishing operations such as scallop dredging, which is more evident in its impacts. The Solway Marine Region accounts for 3.3% of all fishers on vessels <10 m and 1.6% of fishers on vessels between 10 - 12m of total inshore fishers in Scotland.

Based on national averages, the total value of Solway landings should generate a total economic job (i.e. from 73 inshore fisher jobs comes another 29 in the supply chain and local economy), £3.11m turnover (a further £1.17m of economic activity beyond fishers themselves) and a GVA of £1.8m. However, these figures are not considered sufficiently reliable at a regional level because of the variation in supply routes. It is expected that since most inshore processing and input values are external to Solway, the multiplier will be below the Scottish average. This could be established with further analysis, and it is recommended that a wider scope of operations including scallop dredging and non-inshore linkages are considered.

5.3.7 SLA Discussion

5.3.7.1 Human Capital

The key challenge appears to be the succession planning of inshore fishing in Solway. As with other marine regions there is no clear cohort of young fishers moving into existing operations. The young people that are moving in tend to move into the larger operations such as scallop dredging on vessels over 12 m. In addition, the lack of young people is also affecting the ability of skippers to find and retain crew. The young people they do find have little to no interest in pursuing fishing as a career and view it as a job of last resort. They would rather earn less money working in supermarkets, than endure the harsh conditions of fishing. Fishers held the perception that this is further impacted by social media as young people do not want to miss out on time socialising with friends. Survey respondents indicated that affordable training and opportunities to learn the skill are not barriers for people entering the sector as the current level of provision is enough to meet these needs.

5.3.7.2 Social Capital

The social and cultural characteristics of inshore fishing in Solway is still seen as an important aspect in community life as fishers still feel that their communities are reliant, to some degree on the sector. Historically, fishing was passed down through the generations with sons taking over from fathers. However, this is changing and there is a strong sense in Solway that this is no longer the case, as few family members are still involved in the industry. The lack of a large inshore presence may make succession in Solway more vulnerable than other regions where there is a greater industry network.

The identity of fishers still remains intact, with fishing still seen as being a way of life rather than a job or a business by participants in the survey and interviews.

5.3.7.3 Financial Capital

The majority of fishers stated that 81 – 100% of their income came from the industry. Inshore fishing activity in Solway is not considered to be a major contributor to the total regional economy since it is, not expected to exceed £3m including the supply chain. (The scallop processing in Kirkcudbright is far larger). However, it can still be a profitable and valuable activity on an individual basis, and has downstream benefits to Ayrshire, Glasgow and Aberdeenshire processors as a volume within a much larger system. Running costs are once again, a significant cost to fishers. Some combined small-scale farming and value addition to their fishing activities.

5.3.7.4 Natural Capital

There is some tension over the shared marine space in this region, mainly between different gear types in the region although the Code of Conduct helps to minimise these. Fishers have reported that they experience some negative impacts on their businesses from recreational users and tourism (such as divers or wildlife tours).

Seasonality and weather are considered to have the biggest negative impact on fishing activities in this region. Perhaps the most important aspect is the fact that there are 5 different jurisdictions bordering each other, and therefore 5 different sets of regulations. This presents a very challenging marine policy environment which is further impacted by environmental designations (MPAs, SPAs, SACs), plans of offshore wind and renewable energy, and military practice areas.

5.3.7.5 Physical Capital

Physical infrastructure plays an important role in this region. When the ferry terminal was moved from Stranraer, the town experienced rapid decline. Since then, the Stranraer development Trust has tried to regenerate the town with a focus on seafood (mainly oysters), and the development of a marina. Using the current infrastructure (train station, accommodation, etc.), Stranraer hosted an oyster festival in September 2017 in an attempt to boost the economy and the image of the town. It attracted over 10,000 people and generated ~£0.5m to the local economy (Scotland Food and Drink, 2017). Inshore fisheries can work with organisations like these to promote and develop a seafood offering with a focus on provenance.

Where physical capital assets are not maintained, this can have a negative impact on an area. The harbour at Drummore has fallen out of use (as a result of external circumstances) has resulted in fishing boats looking for harbours and slipways elsewhere to continue fishing. . Local shops have left, and the village is falling into disrepair. The advent of deeper rural reach in courier logistics could improve small-scale operations and cheaper access to markets.

5.3.7.6 Vulnerability and Resilience

Solway communities have proven to be socially resilient to change as was seen in Stranraer, but evidently vulnerable to large economic changes such as the ferry location. The inshore fishing industry directly employs fewer than 100 people and as such is likely to have very little economic impact on the local communities. Fishers have a good skill set which can easily be transferred to other industries such as oil & gas and aquaculture, neither of which are seen as alternative options in the region and would result in fishers having to move elsewhere and as such fishers might struggle to find alternative employment. Although they could help crew on other boats, this would not give them the freedom associated with their own boats, or return the same money as owning a boat.

Tourism and recreational fishing are significant industries in Solway and have the potential to grow through festivals and community action, as seen in Stranraer. Fishing villages are important to the area as many tourists like to see working harbours such as the Isle of Whithorn and Kirkcudbright (pers. comms). It is likely that this will provide strong resilience in the future, and inshore fishing should align where possible with this sector.

Supply chain is reliant in some respects, but in general reliance has declined over the years – fishers run their own produce up to places like Glasgow and Ayr because there is not enough produce from the area to warrant trucks and vans going down. There are a number of other processing operations such as white fish, cheese processing and dairy. Although the supply chain has diversified to other industries (i.e. fabricators are not only servicing fishing boats) and is not completely reliant on inshore, interviews noted that when the dairy plant closed, it resulted

in a significant number of redundancies in the local area. The recent closure of Pinney's fish processor in Annan has seen the loss of over 400 jobs – this could indirectly cause an impact on the inshore sector through changes in operations, or those with fish processing links turning their attention to inshore operations, but this is not clear.

5.4 West Highlands Marine Region

Summary

- The regional economy is significantly more dependent on agriculture, forestry and fishing industries than both the Highland Council area and Scottish economies overall.
- Traditional crofting and marine sectors remain the major employers in the region, although growth of the business base between 2010 and 2015 was driven by non-traditional industries – particularly those related to tourism.
- Although the Highland Council has invested in connectivity and other economic infrastructure, topography and road connectivity remain the most significant challenges to unlocking economic growth.
- Based on Scottish averages, the West Highlands inshore sector contributes a total of £14.15m to Scottish output, around 116 additional jobs beyond fishers, and £8.21m of GVA across the supply chain and wider economy.
- Despite a decline in of landings in 2017, it stills remains the 2nd largest Marine Region in terms of volume (tonnes) and value (£m).

5.4.1 Key Features

The West Highlands Marine Region is situated on mainland Scotland's west coast, to the north of the Argyll Marine Region, sharing a northern border with the North Coast Marine Region. The Outer Hebrides Marine Region borders the entire length of this region. The Highlands coast is dominated by sea lochs and as such, has the longest stretch of coastline. Economic and strategic planning in the West Highlands falls within the scope of The Highlands Council, based in Inverness on the East coast. Although there is some overlap with both the Council and adjacent Marine Region, the land-side populations of West Highlands fall within the wards of Lochaber, Skye and Wester Ross, and West Sutherland. The extents of the region for the purposes of this study are illustrated in Figure 5.18.

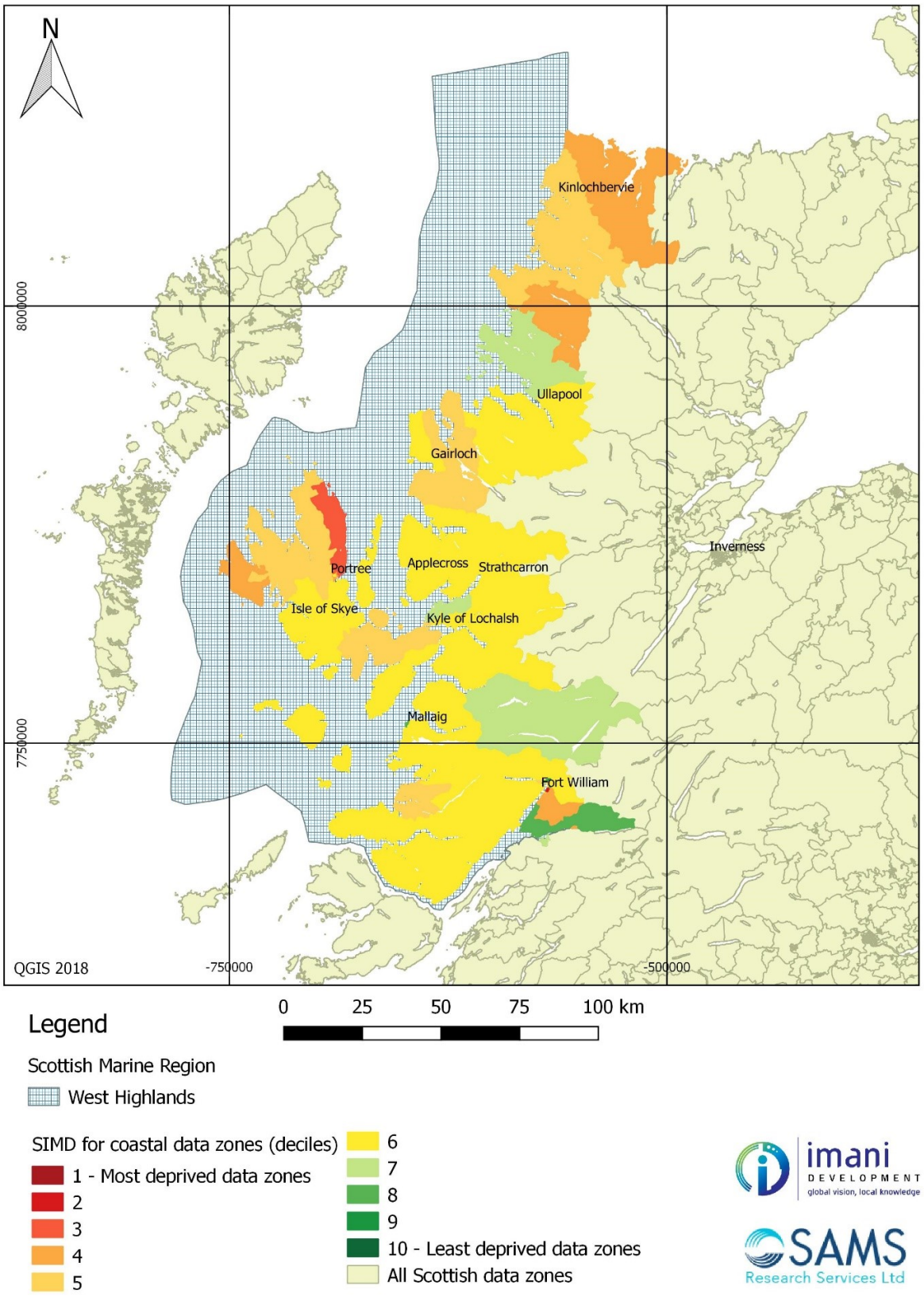

Figure 5.18. Location and extents of the West Highlands Marine Region, showing the levels of deprivation for data zones within 5 km of the coastline. Source: Adapted by Imani Enterprise Ltd. from Scottish Government (2018a) data.

5.4.2 Regional Economy

The West Highlands Marine Region has a population of ~37,734 (Scottish Government, 2018a), which accounts for 0.7% of the total Scottish population (National Records Scotland, 2018)[20]. This is the third largest coastal population out of the four Marine Regions focussed on in this study, behind the Forth and Tay (23%), and Solway (1.86%).

The wider West Highland region is primarily a rural economy with key sectors including tourism, fishing, agriculture and aquaculture. While many of the smaller coastal villages are traditional crofting communities, the larger settlements have harbour / port facilities (e.g. Gairloch and Kyle), local service provision and established tourism sectors. It has a number of important semi-urban hubs, including Fort William further south, Portree on the Isle of Skye, and Ullapool further north. Aside from Skye, West Highlands incorporates the Small Isles of Eigg, Muck, Rum and Canna, Raasay off the east coast of Skye and a number of other smaller islands.

The rural and wild nature of the coastline provides both advantage and challenges to regional economic development. Its vast number of sea lochs and headlands mean that while landmarks and settlements are often in close proximity of each other, mobility between these locations by land is difficult. The mountainous topography also inhibits connectivity, with substantial lengths of the coast remaining remote, unlinked by formal roads, and relatively uninhabited as a result (Highland Council, 2010). The west coast of the Highlands is one of the more visited coastal stretches of the region. As such the tourism sector is becoming increasingly more important to the local economy and its expansion includes maritime tourism and the food and drink sector.

The West Highlands regional economy can be divided into two regional wards. The Lochaber, Skye and Wester Ross region (from Fort William and Mallaig in the south to Lochalsh, slightly northwards of Ullapool) and West Sutherland, the coastline north of Wester Ross beyond Ullapool.

The Lochaber, Skye and Wester Ross economy is significantly more dependent on agriculture, forestry and fishing industries than that of the Highlands economy overall – or indeed that of the Scotland aggregated. In 2016, these sectors comprised the largest portion of the business base at 30% (compared to 20% in the Highlands and 10% in Scotland), followed by accommodation and food services at 13% (10% in the Highlands and 8% in Scotland) and construction at 12% (13% in the Highland and 11% in Scotland) (HIE, 2016).

The rural economy in the region is largely supported by small, local businesses reliant on quality coastlines and waters (Highland Council, 2010). Tourism in this region continues to be an important employer.

Fishing activities could also contribute indirectly to tourism as tourists enjoy visiting “working harbours”, and while tourists do not necessarily visit the region for fishing, it is an important part of their experience. ports and harbours provide vital infrastructure for other marine users such as wildlife tours, mooring points, fuel supplies and so on. While it could be argued that tourism helps to maintain these physical assets, it is hard to separate the impact that fishing has for tourism.

[20] Mid-year population estimates for Scotland in 2017 was 5,424,800

Lochinver harbour, which was upgraded in the 1990s, is a significant national landing port for both the EU and UK whitefish fishing fleet (Highland Council, 2018). The harbour is now a central part of the Lochinver economy and forms part of the proposed CaSPlan which aims to grow the commercial fishing and tourism sectors through promoting housing and business development on allocated sites associated with the harbour (CaSPlan, 2018).

Marine industries play a central role in the Kinlochbervie local economy with the natural harbour a focal point, connecting fishers with North and West Coast grounds – with sales of catch (alongside a number of other services) run by the Kinlochbervie Fish Selling Company (Highland Council, 2018). Fishing, aquaculture, tourism and the public sector are the main local employers, with topography and loch-related road patterns presenting the most significant barriers to expansion (CaSPlan, 2018).

There are a number of environmental designations in place within this Marine Region. These include but are not limited to a few Sites of Special Scientific Interest (SSSIs), Special and Special Areas of Conservation (SACs). The whole region is designated as a SAC as evidence for the development of Marine Protected Areas (MPAs). There are plans to designate further areas of this region as MPAs, a talking point for many of the interviewees. More information on these is available through the Marine Scotland Maps NMPi portal (Scottish Government, 2018b). There are also substantial military operations in the region which has closed off some areas of the coast completely.

The increasing number of designations and marine users i.e. creelers, trawlers, aquaculture, recreation, boat tours in the West Highlands has resulted in pressure and competition for the use of marine space. The reintroduction of the 3-mile limit was brought up by the majority of interviewees in the region, although this was barely mentioned in the other three regions which demonstrates how different these regions can be, even along the West Coast.

5.4.3 SIMD Analysis / GIS Analysis / Seaward vs. Landward

The West Highland Marine Region has the smallest range of deprivation across the four Marine Regions considered, yet would still not be considered to be deprived, placing in the middle of the ranking system at 50%. The West Highlands performs well with low crime levels in the region (decile of 8) and performs above 50% for income, employment, health, housing, and education (all rank 6). However, this region ranks in the bottom 20% in terms of access to services which is a condition of the geography of the region.

There is little variation in deprivation levels throughout the region (Figure 5.18), but there are some areas where there are a number of data zones in proximity to each other that have higher levels of deprivation. There are pockets in the region with lower levels of deprivation, mainly in the south near Mallaig and Fort William, and in Kyle which could be down to better access to services, and transport networks (i.e. trains) and more road networks.

The areas with higher levels of deprivation are on the northern parts of the Isle of Skye and the northern parts of the mainland as seen in Figure 5.18. Despite having lower levels of deprivation, these data zones are still not considered to be the most deprived zones (i.e. not in the top 20%). There does not appear to be any pattern between the location of ports / fishing villages and high levels of deprivation or non-fishing villages and higher levels of deprivation within the region.

5.4.4 Infrastructure and Linkages

5.4.4.1 Supply Chain

There is a variety of processing capacity in the West Highlands, including niche, high value processors. Some, however, are consolidating with processors in other regions to remain competitive through cost efficiencies, to safeguard long term sustainability, and to professionalise. Brexit risks were cited as threatening labour supply – while considered manageable to date, there is concern it is a significant threat for the future. This is a wider demographic challenge recognised by Highlands and Islands Enterprise (HIE) across different sectors including aquaculture (ekosgen and Imani Enterprise Ltd., 2018).

Road networks are a constraint – long distances on lower capacity roads is a factor, often exacerbated in during the summer tourism season.

Based on Scottish averages and 2017 figures, the West Highlands inshore sector based on Scottish averages, the West Highlands inshore sector contributes a total of £14.15 m to Scottish output, 116 additional jobs beyond fishers, and £8.21m of GVA across the supply chain and wider economy. However, because there is a large movement of West Highlands product to other regions for processing and export, these figures are not reliable at the regional level.

5.4.4.2 Connectivity

Transport and connectivity in the West Highlands falls within the strategic mandate of the HITRANS Regional Strategy for the Highlands and Islands (HITRANS, 2008).

Island connectivity remains a challenge for planning authorities. There has been significant investment in connecting the Isle of Skye, to the mainland. Portree is the largest population centre on Skye – some 217 miles from Glasgow. The Skye Bridge, constructed in 1995, along with the Armadale Ferry are the primary connection points between the island and the Central Belt. The HITRANS strategy earmarked development of Skye Airport in 2013 to further improve connectivity (HIE, 2016).

Mallaig in Lochaber is a particularly important arrival and departure point in the region via rail, ferry and / or port, and due to its strategic location is faced with high private housing demand that it is currently unable to be met. There are plans to expand Mallaig Harbour to serve the growing tourism and fishing sector, which is predicted to expand further post-Brexit (Highland Council, 2018).

5.4.5 Inshore Fishing Sector

5.4.5.1 Inshore Fishing Landings - Volumes and Values

The recorded volume and value of inshore fishing activity in the West Highlands from 2010 to 2017 is outlined in Table 5.13 and Table 5.14 below by vessels <10 m and vessels between 10 - 12 m. The total volume of catch landed and reported by vessels <12 m in 2017 was 2,217 tonnes. In the West Highlands, 66% of all recorded landings by volume were from 10 - 12 m vessels in 2017 (Table 5.13 and Figure 5.19).

Table 5.13. Total live weight landings by volume (tonnes) from vessels <10 m, and between 10 - 12 m for the West Highlands Marine Region, from 2010 – 2017.

Volume (t)	2010	2011	2012	2013	2014	2015	2016	2017
<10m	1,688	1,553	1,582	1,489	1,416	1,247	1,576	1,461
10 - 12m	813	832	855	898	978	767	967	757
<12m (total)	**2,502**	**2,385**	**2,437**	**2,387**	**2,393**	**2,014**	**2,543**	**2,217**

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number

Since 2010, the total landings to the West Highlands have continued to fall despite a brief increase in volume landed in 2016 for boats <10 m. However, volumes for the 10 - 12 m boats have experienced an increase until 2014. Since then, landings have continued to fall, despite a brief increase in 2016 as can be seen in Figure 5.19 below.

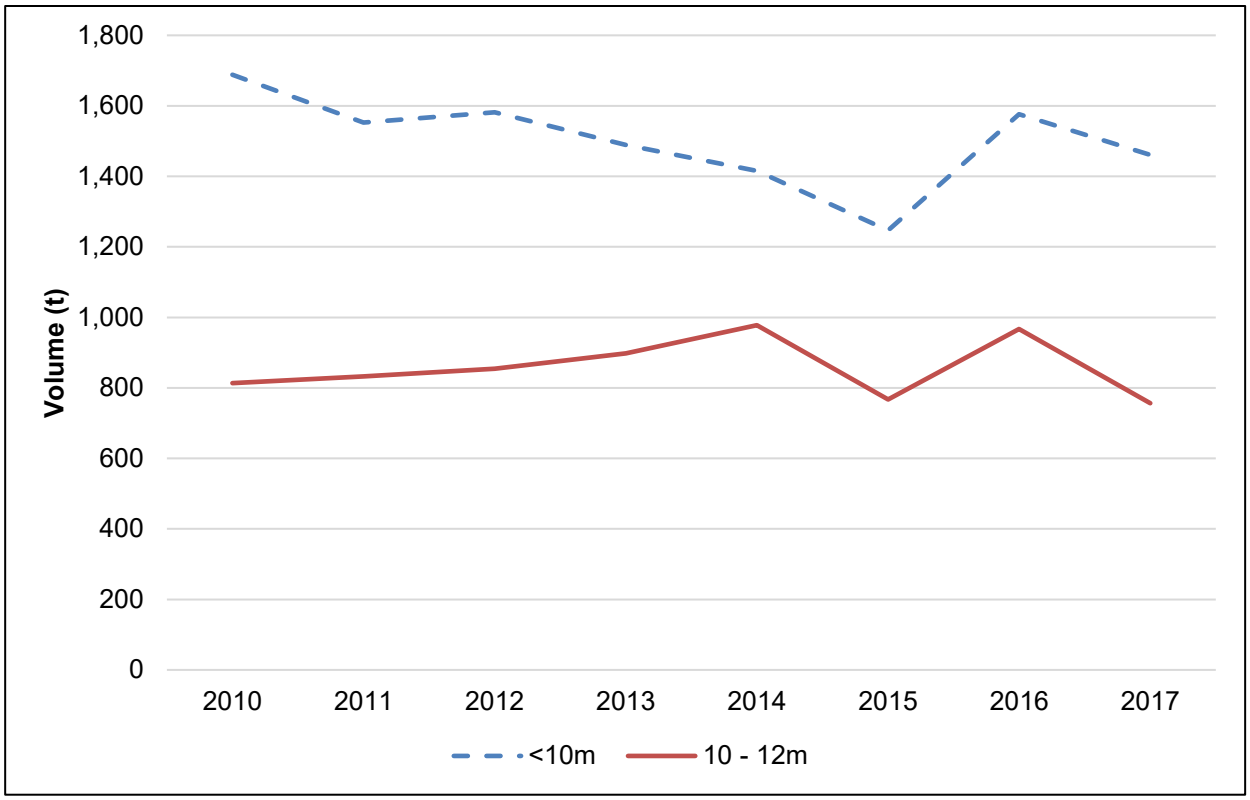

Figure 5.19. Total live weight landings by volume (tonnes) from vessels under 10 m, and between 10 m and 12 m for the West Highlands Marine Region, from 2010 – 2017. Source: Marine Scotland, 2018a.

Live weight landings by value in the West Highlands have declined since 2010 (Table 5.14 and Figure 5.20 below) for vessels <10 m. In 2016 the value of landings in this region increased from just over £6.2m to £8.2m in 2016. Despite this large increase, this was reversed in 2017 with the value of landings dropping below £6m. Landings by value for the 10 - 12 m vessels, although significantly lower, have remained fairly constant since 2010, with a slight increase up until 2015 / 2016 before decreasing in 2017 to below £3m.

Table 5.14. Total live weight landings by value (£m) from vessels <10 m, and between 10 - 12 m for the West Highlands Marine Region, from 2010 – 2017.

Value (£m)	2010	2011	2012	2013	2014	2015	2016	2017
<10 m	8.95	8.17	7.39	6.38	6.64	6.23	8.20	5.96
10 – 12 m	3.37	3.45	3.67	3.58	3.84	3.98	3.97	2.89
<12 m (total)	**12.32**	**11.62**	**11.06**	**9.96**	**10.47**	**10.22**	**12.16**	**8.84**

Source: Marine Scotland, 2018a
Total value (£m) is rounded to the nearest million for the value

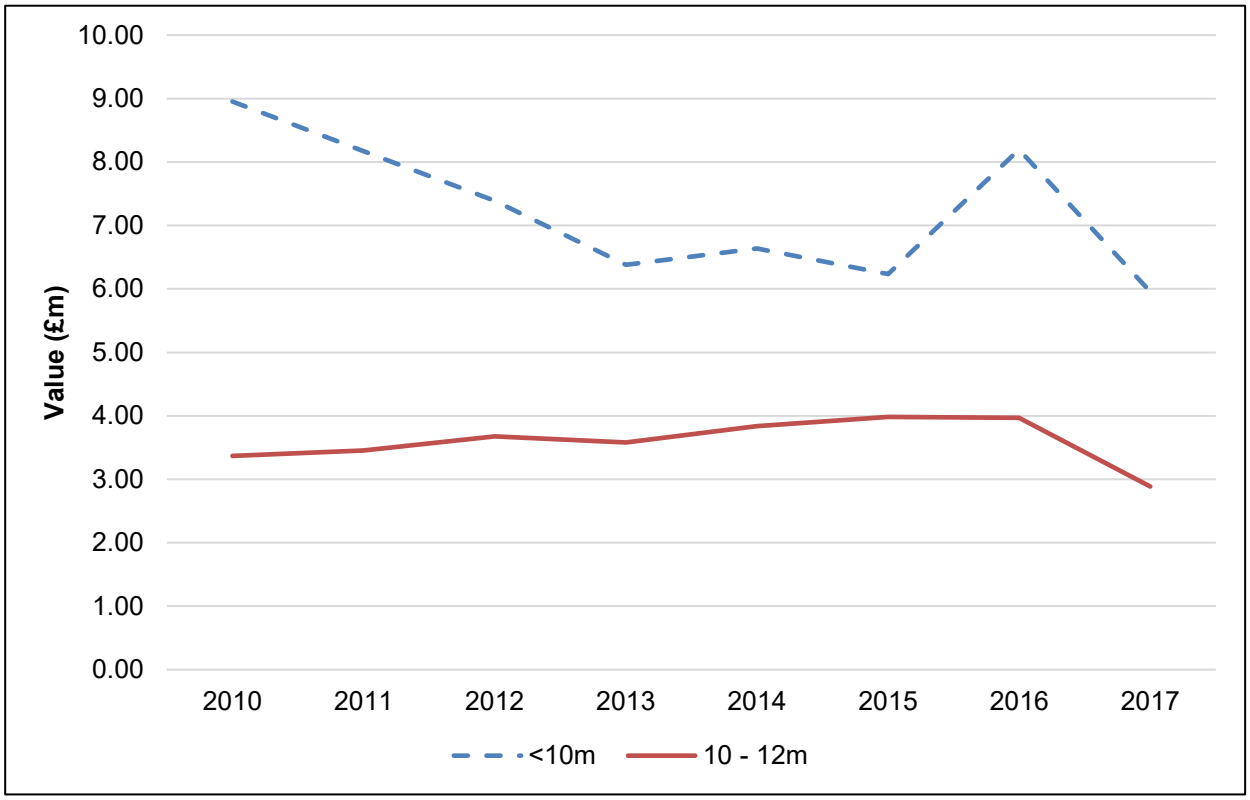

Figure 5.20. Total live weight landings by value (£m) from vessels <10 m, and between 10 - 12 m for the West Highlands Marine Region, from 2010 – 2017. Source: Marine Scotland, 2018a.

In terms of percentage of volume and value for the region, the vessels under 10 m accounted for 66% of the volume and 67% of the value. This is the only region where both value and volume account for similar proportions in catch landed (Argyll is the next closet region at 67% and 70% respectively). The trends in volume and value landed since 2010 for vessels <10 m has followed a similar pattern to each other, indicating that both the price and volume have increased at a similar rate. A similar trend can be seen for vessels between 10 - 12 m, except for 2015 where the value of catch remained on an upward curve but the volume dropped by ~200 tonnes.

Overall, the inshore sector in the West Highlands Marine Region accounted for 11.5% of total landings by volume and 19.9% by volume, both behind Forth and Tay, making it the second most valuable region in Scotland for vessels under 12 m in length.

The main species landed in the West Highlands Marine region by value (£m) over the last three years are *Nephrops*, wrasse, crabs, scallops and lobsters as shown in Table 5.15 for boats under 10 m. The volume and type of catch varies each year with other notable species including mackerel, clams, whelks, and whitefish (e.g. plaice, cod).

In 2017, inshore fishers on boats <10 m landed 594 tonnes of *Nephrops* worth £3.3m, by far the highest value in the region. Wrasse were not landed in the region until 2014 and have since increased in value for the region, to become the second most landed species by value, despite only 16t landed in 2017. Wrasse also fetched high prices at ~£26,000/t, which is significantly higher than lobsters (£13,777/t) and *Nephrops* (£5,572/t).

Table 5.15. Total live weight landings by volume (tonnes) and value (£m) for species landed by vessels <10 m, for the West Highlands Marine Region, from 2015 – 2017.

Species landed by vessels <10m	2015			2016			2017		
	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne
Nephrops (Norway Lobster)	538	4.31	8,014	710	5.08	7,153	594	3.31	5,572
Wrasse	17	0.52	30,494	23	1.50	65,006	16	0.42	26,375
Crabs (C.P.Mixed Sexes)	364	0.40	1,097	549	0.63	1,153	541	0.92	1,695
Scallops	168	0.48	2,883	105	0.32	3,073	132	0.45	3,423
Lobsters	28	0.30	10,508	26	0.32	12,519	37	0.50	13,777
Crabs - Velvet (Swim)	72	0.17	2,330	98	0.27	2,729	68	0.21	3,056

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number
Total value (£m) is rounded to the nearest million for the value

For vessels between 10 – 12 m, the most common landed species were *Nephrops*, crabs lobsters, and scallops as shown in Table 5.16. Other species that were caught in the region include clams, squid, monks or anglers, whelks and some whitefish.

As with the smaller vessels, *Nephrops* accounted for the highest value of landings in 2017 by value at £2.08m. Although less tonnes were landed in comparison to the smaller vessels, they also fetched a lower price per tonne (£4,777/t compared to £5,572/t).

Table 5.16. Total live weight landings by volume (tonnes) and value (£m) for species landed by vessels between 10 m and 12 m, for the West Highlands Marine Region, from 2015 – 2017.

Species landed by vessels 10 m – 12 m	2015			2016			2017		
	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne	Tonnes landed (t)	Value (£m)	Price per tonne
Nephrops (Norway Lobster)	512	3.43	6,693	553	3.15	5,699	434	2.08	4,777
Crabs (C.P.Mixed Sexes)	153	0.19	1,236	314	0.39	1,254	236	0.40	1,675
Lobsters	9	0.10	10,955	13	0.16	12,280	13	0.19	13,946
Scallops	83	0.25	2,963	78	0.24	3,057	64	0.19	2,964
Crabs - Velvet	6	0.01	2,324	8	0.02	2,566	8	0.03	3,260

Source: Marine Scotland, 2018a
Volume is recorded for live weight tonnes and rounded to the nearest whole number
Total value (£m) is rounded to the nearest million for the value

5.4.5.2 Inshore Fishing Employment

Employment in the West Highlands inshore fishing sector has fallen since 2014 for vessels <10 m. Employment on the 10 - 12 m vessels has fluctuated since 2013 (see Figure 5.21), and in 2017 was at the lowest level since 2013, with 60 people employed. Vessels <10 m continued to employ more people than the 10 - 12 m vessels, at 79% of the total number of jobs.

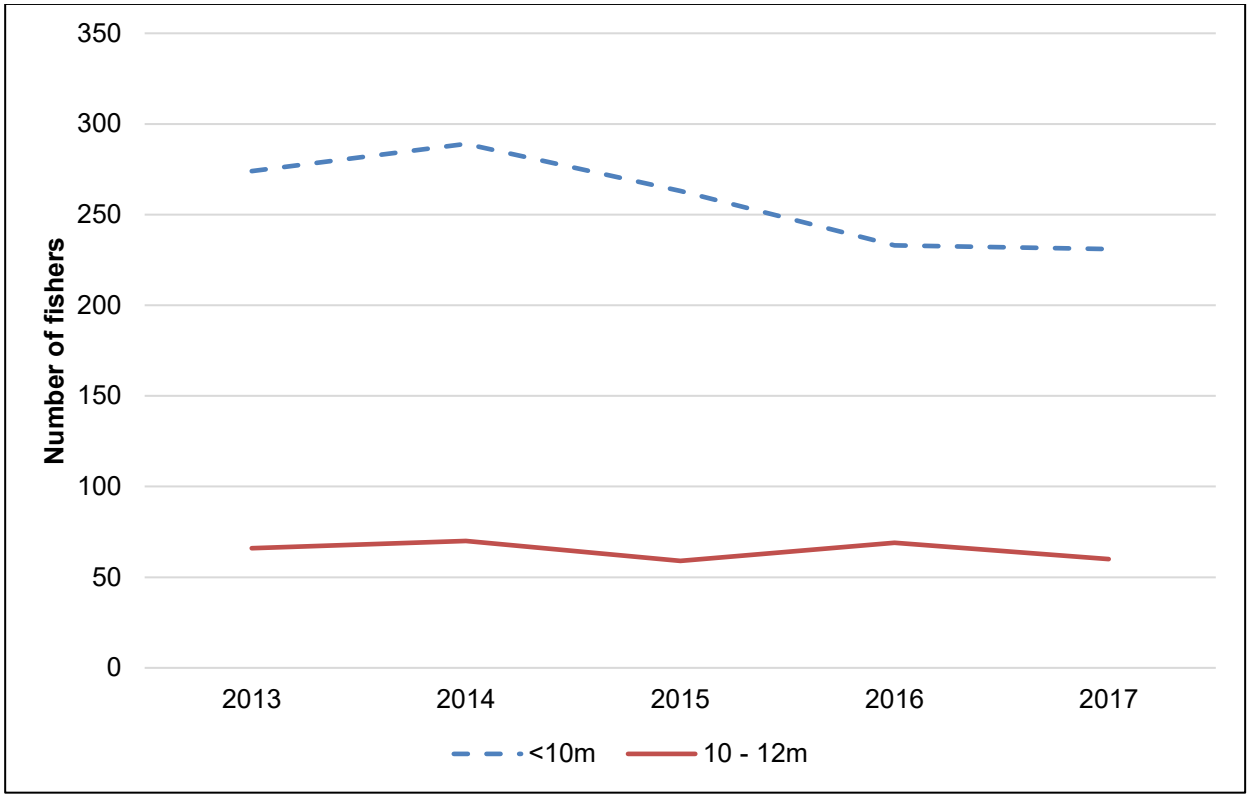

Figure 5.21. Total employment for vessels <10 m, and between 10 - 12 m for the Solway Marine Region, from 2013 – 2017. Source: Marine Scotland, 2018a.

5.4.6 SLA Discussion

Inshore fisheries in the West Highlands region have strong cultural, economic and historical significance. *Nephrops* fishing is particularly important, providing economic value and employment to some of the most remote West Coast communities. Decreasing fish stocks and increased competition for limited grounds and resources is affecting landings and livelihoods which was evident through the interviews undertaken in the region. The growth of aquaculture– especially within the sea lochs – has caused a rise in conflict between wild fisheries and fish farming stakeholders operating in inshore waters. There was also evidence of more traditional conflicts between mobile at static fisheries.

5.4.6.1 Human Capital

Inshore fishing accounts for ~290 direct jobs in the region, plus indirect jobs in a diverse set of marine businesses, accounting for 12% of all inshore fishers in Scotland (vessels <12 m only).

An ageing population in the Highlands is well documented which poses a number of challenges for the inshore fishing sector. Young people are moving out of the region to pursue economic opportunities elsewhere as there are limited options within the region. However, the evolution of tourism, growing aquaculture industry, and farming could change this trend if housing and connectivity improves.

This migration impacts succession planning. Interviewees noted that there are not enough young people coming into the industry due to several factors including; the difficulty of the job, better conditions in other industries (such as trade), barriers to entry such as the cost of gear and vessels. This shows that there has been a change in inshore fishing as it is no longer seen by the young as a viable career option.

This West Highlands is different to the other three regions as it was perceived that there is not enough opportunity for people to learn inshore fishing skills. This could be to do with the lack of desire to pass on skills, better opportunities elsewhere and / or the poor connectivity of the region resulting in lack of peer-to-peer learning and options for attending local courses.

Ageing populations are increasing pressure on the delivery of services across the region – especially in the more remote and rural areas – and are compounded by issues regarding the recruitment of skilled health and social care workers (COHI, 2017). The retention of young people in the region has become central to the region's strategic economic priorities, with the COHI formally commissioning the Highlands and Islands Talent Attraction Strategy and Action Plan. This strategy stretches beyond the West Highlands, incorporating the entire Highlands and Islands region.

In addition, the West Highlands is also an area predicted to be particularly affected by Brexit, due to its high reliance on the EU member states for skilled workers. This impact is likely to be felt highest in traditional and growth sectors such as agriculture, aquaculture, fishing, tourism and hospitality (COHI, 2017).

5.4.6.2 Social Capital

Despite changes relating to succession, fishing in this region is still regarded as being important to communities. The image of a fisher being able to withstand the tough conditions and danger, pulling together in crisis, and seeing it as a way of life and not a business still resonant. Although once an important part of family life, it no longer holds the same significance as less family members are involved, and there are fewer young people coming in to the sector. From the fieldwork conducted in this study it is clear that there is still a strong inshore fisheries presence in many of the villages visited and that it is still viewed as being important to local communities, even if they are no longer reliant on it.

There is tension in the communities between mobile (creelers) and static (trawlers) fishers and interviews indicated that this extends beyond the sea. Respondents talked about fighting in pubs, and there was open animosity towards each other. Despite this, respondents still work to the unwritten rules of being a fisher and will always help each other out in need or difficult circumstances rather than calling the emergency services. Unlike the other regions, there is a difference between the way local fishers view other local and non-local boats. The interviewees suggested that there was a 'them and us' mentality and that there would be a sustainable industry in the West Highlands if there were only local boats in the region.

5.4.6.3 Financial Capital

This region accounts for the second highest percentage of Scottish landings by value (£m, 21%), and the second highest volume (t, 13.2%), behind the Forth and Tay Marine Region. Most of the fishers surveyed indicated that they are reliant on the industry for their income, with a few indicating that they have other income streams.

5.4.6.4 Natural Capital

The distinctive coastline of the West Highlands makes management challenging as a result of the numerous lochs and islands. The number of different uses of the marine environment in conjunction with limited space has created conflict with local inshore fishers as interviewees stated that they are all competing for the same areas which continue to decrease as a result of environmental designations and military uses. They feel that some of the MPA designations are not based on good scientific evidence. The increasing restriction of marine space available for the sector has resulted in competition between inshore fishers, where it was not present to such an extent previously.

For static gear fishers, conflict is low within their own sector, and between themselves, tourism operations and recreational users (yachts). However, there is conflict with trawlers / dredgers within the region because both mobile and static gears are targeting the same species. This was identified as the most prominent risk by creelers in the survey and in interviews.

Inshore fishing opportunities in West Highlands are vulnerable to policies determining use of marine space and static gear inshore fishers appear to want the reinstatement of the 3-mile limit.

Other factors that are seen to have negative impacts on fishers are seasonality and availability of stocks, and weather.

5.4.6.5 Physical Capital

The cost of transport in the West Highlands affects inshore fisheries due to the geography and nature of the road infrastructure in the region. Large vans are not able to use many of the roads, and road closures due to snow and ice in winter are numerous. Good road links and harbours were the most important physical capital assets that fishers cited for their businesses. Airports were seen as being important, demonstrating that there is a wide range of different physical capital assets that fishers rely on.

Having processing factories nearby is key to the industry in this region as the value addition and jobs that are created benefits the local economy and means that there is less distance to transport fish on landing. Static gear fishers benefit from this as their catch is less likely to die on route to markets, as they do in other regions such as the Solway Marine Region.

Additional pressure especially in summer months as a result of tourism is evident from interviews with fishers as it puts additional strain on the roads and services (e.g. the North Coast 500).

5.4.6.6 Vulnerability and Resilience

There is a significant opportunity in aquaculture throughout West Highlands, with large investments in feed processing and wider operations; combined with tourism and relatively low levels of deprivation, the local economy has demonstrated financial resilience in communities traditionally reliant on fishing. However, significant supply chain risks such as access to markets and labour could change this in the coming years. Tourism is increasingly adding pressure to rural infrastructure and housing. These are risks that could undermine recent economic gains: at least one niche, high-value processor relies on quality and live catch for exports to Europe. They mainly source from the West Highlands but are looking to source from other areas to meet demand and to find ways of increasing efficiencies. Two areas within the region are facing more acute social deprivation.

6 OVERALL DISCUSSION

The assessments of the socio-economic and cultural aspects of Scottish inshore fisheries have been combined in this work package through the use of the Sustainable Livelihood Approach (SLA). The SLA provides a replicable, holistic and adaptive framework for identifying key characteristics and areas for improved or more integrated policy measures. In this WP, the focus was on socio-economics and culture of Scottish inshore fisheries, however these parameters can be combined with environmental data to provide a fully desegregated structure for management, should the need arise.

This discussion explores how the results of both the questionnaire and the survey work with the SLA, how each 'capital' helps to present a rounded assessment of the cultural and socio-economic aspects of the Scottish inshore fishery and their interactions. Further, it maps some of the connections and drivers between one aspect of fisheries and another – for example, financial capital influences investment in physical assets and infrastructure, and social capital (e.g. understanding and cultural factors in fisheries) can influence access to skills and other human capital. It looks in depth at the supply-chain of the industry, identifying connections which are key both upstream and downstream. This leads into the less – tangible aspects of the industry, where the lines of business, culture, personal identity and community are blurred. It also sets out the changes that are taking place and the risks and opportunities that they present to Scottish inshore fisheries as both an industry and as a community involved in a cultural heritage activity, which mimics the peaks and troughs of the marine environment it both relies on and impacts.

The importance of the interlinkages between the lives and assets of those in the Scottish inshore fishing sector is critically important, because policies are often directed at addressing the challenges of one 'capital', whereas the underlying driver may be in another area entirely. For example, addressing skills shortages in fishing may be important to fill clear gaps, but often the lack of human capital in certain areas is due to the younger generation pursuing other economic opportunities, either within fishing or in an entirely different sector. Equally, skills transfer into the sector from other industries can be barred by industry structures, social networks or policies, rather than a lack of training or education initiatives.

Assessment of the different assets of those living in the inshore fishing sector, across their social, financial, natural, human and physical capital, must be informed by two key cross-cutting themes; 1) risk and vulnerability to change and 2) the sector's distinct structure (its 'market system') within which decision-making and outcomes are determined.

Diverse risks and vulnerabilities are apparent in the interview responses, the survey and through the economic analysis. From the direct physical dangers inherent in fishing, which can shape the whole culture of communities, to succession planning, where it is unclear where the next generation of inshore fishers will come from, to the value-chain of the catch, which relies on buyer pricing. The wider sectoral political economy plays a significant role in determining livelihood strategies, and in turn, outcomes, for fishers. This includes the support networks and associations (e.g. the rIFGs), regulatory bodies and the economic drivers in the supply chain itself. Brexit is an example of where the sectoral drivers will be determined by factors beyond the control of inshore fishers.

6.1 Social and Cultural Capital

Although difficult to define within space and time, culture can be broadly described as the knowledge (ways of thinking), ideals, values, and social customs of a particular group of people or a society (Spencer-Oatey, 2008). Within the Scottish inshore fishing sector, there have been a few in-depth explorations or assessments of the culture of the people who make up the industry, which are detailed and paint a picture of change (Urquhart *et al.,* 2013; Msomphora 2015; Symes *et al*., 2015). The findings of this study reflect these works, by providing evidence of changing relationships, customs, values, identities and relationships. The importance of tracking shifts in culture and including cultural data in assessment for management purposes is revealed through evidence of differences in practices and behaviour according to gear type, location / geography, personal motivation, and business opportunities. This is set within the context of uncertainty around political decision-making for when the UK leaves the EU.

Representation and management of the inshore fisheries, relationships, gender, differences between the role of inshore fisheries within communities in the past and now (many communities are not solely reliant on it as other industries have come through such as aquaculture and tourism), were the key **social and cultural capital** themes.

Representation was related to both policy and management. The differences in opinion both within and between the gear types were stark, and pointed at inherent cultural variation, that filtered down to operational practice. For example, many of the creelers felt that they were stewards of their own ‘patches’ but that their stewardship was at jeopardy because of competition for space. A model of this was recorded in three of the case studies; Fisher A (often described as an ‘incomer’ by locals) bought a big boat (12 m) which was able to work at least twice as many creels as the other boats. The bigger boat took up more space in the fishing grounds at a single point in time than the other boats operating in the area. This therefore reduced the opportunity for Fishers B, C, D and E, to move their gear around, and take their gear up when they were not fishing. Consequently, Fishers B, C and D left their creels out longer to ensure that their ‘patch’ was not fished by other boats (i.e. protected) and Fisher E who had more financial means bought a bigger boat that could directly compete with Fisher A. The result: even less space for Fishers A, B, C, D and E to operate. This shift from stewardship and small-scale inshore creeling, to competition and larger scale inshore creeling was created by the difference in business practice, motivation, and culture of Fisher A, and the adaptation measures that Fishers B, C, D, and E had to take to ensure that their livelihoods were protected. The juxtaposition pointed out by the interviewees was that this model meant longer working hours and less catch per creel for all vessels, regardless of size. Nightingale (2013) also recorded this contrast of desire to be stewards versus operational practice. She related it to feminist theory, which shows that domination by a particular norm / practice, or a certain culture, can force the behaviour of the rest of the population work in ways that are not reflective of their actual motivations, values, or desired practices.

One of the suggestions for improving the local spatial dimensions of the inshore sector (both trawling and creeling) was more local management, which interviewees thought might improve representation (through practical co-ordination measures such as being able to set meetings at desirable times and locations, and more values-based measures such as choosing which areas of the local sector require improvement). However, fishers agreed that the key to developing

effective management regimes at any level was through bettering relations between Marine Scotland and fishers. This advice is not new. There have been records of these issues over the past 20 years, from Urquhart's (2013) review of the social and cultural impact of marine fisheries to Msomphora's (2015) recording of the attitudes to the original Inshore Fisheries Groups, through to Nobel's (2003) documentation of the failure of Shetland's Regulating Order for the local management of shellfish within the 6nm boundary of the islands. Symes et al. (2015) found that the sub optimal relationship between different inshore fishing types and between inshore fishers and managing agencies in Scotland is so embedded that it is now part of fishing culture.

The interviewees and survey respondents in this study suggested that an improvement could start with showing them where their data goes, and the policies that it informs. They would like visibility of how their contributions affects / influences management (by the data that they provide and the outcomes from rIFG meetings), which would be a step towards feeling that their knowledge, and time spent engaging, is valued and is being put to good use. Scientific knowledge co-creation and subsequent co-management could help this process.

Aside from relationships within the sector and between managing agencies and the sector, there is a change in fishing culture and practices that affects the way that fishers relate to and sit within coastal communities. Historically, inshore fishers were rooted in their communities as the main source of income and in some cases, food and transport. The whole family was involved to some extent. Fathers were fishers (including all aspects of boat and gear upkeep) sons were apprentice fishers and, processors. Daughters and wives were net / creel fixers, processors, bookkeepers, and homemakers. This connection created a sense of identity with fishing within communities – hence the terms, 'fishing community', or 'fishing village'. However, both the survey and the interviews showed the family aspect of inshore fishing is changing. Sons were encouraged by their families to choose or individually chose a different employment option (the trades were mentioned the most times). Daughters were encouraged to go to university. The reasoning behind these changes was revealed as fishers did not want their children to go into an industry which is 'inherently risky' from both a financial and safety perspective. The result is that Scottish inshore fishing community is moving towards self-selection – those involved actively choose it as a career, rather than being pulled into it through familial ties. As this is a phenomenon which seems to be recent and gradual, more research should be conducted to see how it changes the shape and culture of the industry and the communities that are connected with it.

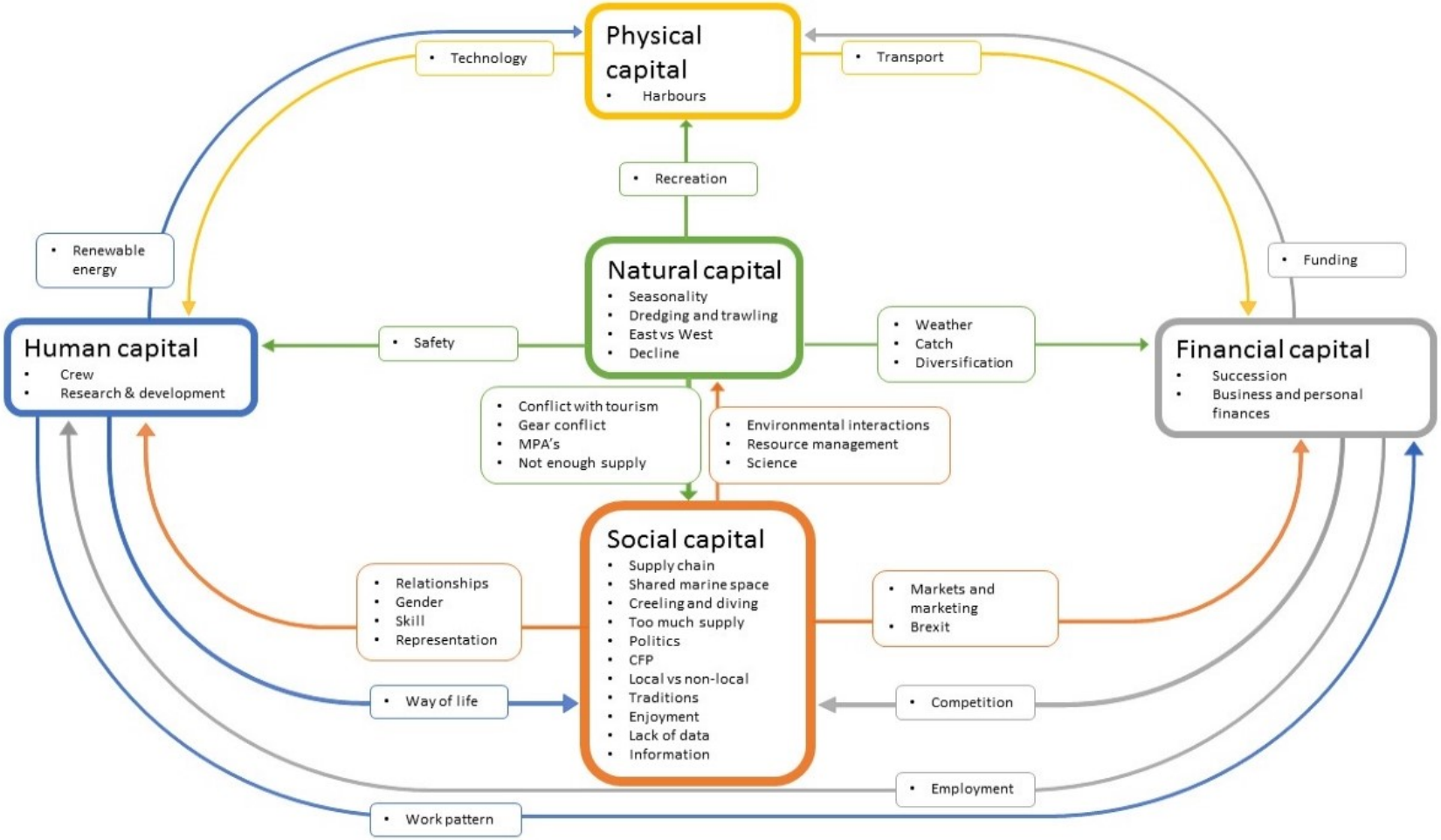

Figure 6.1. Representation of how the topics within the interviews are linked to the five types of capital. The arrows show where a topic is shared between the capitals, the colour and direction of travel showing where the topic originated according to our thematic analysis.

Politics is another aspect of social and cultural capital in which the inshore fishing industry in Scotland is involved in, willingly or not. This paragraph discusses politics within Scotland and between the mobile and static gear sectors. Brexit and the Common Fisheries Policy are discussed together in Section 6.6. It was evident that there is a cultural difference between the static and mobile gear sectors within the inshore fishing industry, which is reiterated by the use of lobbying power from different groups. For example, the static gear sector perceived that they were less represented and less well financed than the mobile sector. This is reflected in the membership of the SFF, which represents the mobile sector of both inshore, demersal and pelagic vessels. Given these sectors are worth more than the static sector in catch volume and vessel earnings, it is understandable that SFF has more money and lobbying power than the Scottish Creel Fishermen's Federation (SCFF), which only represents static gear fishers. Interlinked with the politics between these two representation bodies is the regional Inshore Fisheries Groups (rIFGs). The interviews and the survey showed that most inshore fishers are cautious about having another representation body, which is currently only a consultee to Marine Scotland, rather than an agency with power. The original Inshore Fisheries Groups (IFG),which were set up as a pilots in 2009, were not viewed as wholly successful or beneficial by inshore fishers (Msomphora, 2015) because of the power dynamics between the sectors and because of their lack of power. It is likely that if the same model is used, the rIFG will suffer the same issues and their predecessor (Msomphora, 2016). Each failure of this type will erode fishers trust in the governing agencies responsible for setting up these schemes, and may threaten participation in future. This is an important point for the management and participation of static gear fisheries / fishers as the nature of their work and the personal characteristics that predispose them to the job (e.g. prefer solitude, to be outside, to run their own businesses) also act as a barrier to engaging with these types of consultation strategies. From the interviews, static gear fishers stated that if they are able to see their contributions or their views carried through into policy is likely to encourage wider involvement. Equally, the opposite is also true – if contributions are not seen to be carried through to policy, or are not communicated in a way that highlights how their time and expertise has helped to shape policy, it is likely that there will be a decline in participation.

6.2 Financial Capital

The full financial value of inshore fishing to Scotland is diffuse and often out of the immediate town and coastal region. Further, as in a previous study (Jones, 2013), there does not seem to be a strong link between direct levels of economic deprivation and inshore fishing. These two considerations confirm that a more holistic market system view of inshore fishing should be used in economic and social policy making. Considering balanced economic growth, for example in the case of Forth and Tay, areas like Kirkcaldy and Leven would deserve support for developing processing jobs before Anstruther or Pittenweem: i.e. if there were initiatives to improve local processing impact, the larger towns might be preferable for social objectives and economies of scale – this is evident in facilities based in Larkhall and Bellshill.

The diffusion of economic benefits also means that inshore fishers often 'don't care where the fish goes' once it is sold. There are rational and significant drivers behind this view, but in turn

there are strong consequences to where fish goes, and what happens *en route* which can feed back into the sustainability of the fishing itself. Changing global markets and the likely disruption of the European market through Brexit will have impacts on financial capital for inshore fishers, and those in downstream services.

The negotiating power of fishers seems weak – while supply and demand 'should' give them power in price-setting, in practice fishers seem to be price-takers on any given day unless they are in a more integrated relationship with a buyer. The volatility of prices, unpredictable supply, and the scale of the international market, mean that it has become the norm that fishers are not in control of price. Some processors in long term buying relationships with fishers will seek to offer a good price package overall (mitigating bad prices and relying on profitable weeks another time). The unintended consequence of consolidation and rationalisation in the processing of fish is that economic linkages are not locally evident, and this prevents more intense local supply integration. The trend towards larger processing facilities in other regions (e.g. Fraserburgh processing Fife fish, Troon processing Solway fish) should be par for the course and not prevent value addition in Scotland / UK, but there does seem to be a lack of coordination in the sector between fishers and processors, and this threatens the full possible value capture in the sector overall. The bargaining power for inshore fishers (and local processors in turn) may be strengthening with the rise in demand from China, and this can in turn force European buyers to offer better prices to compete.

The multiplier effects on financial capital in the economy are problematic to assess at the Scottish level, since input-output calculations amalgamate different types of fishing together which have different modes of operation: the current debate about *Nephrops* capture methods demonstrates that a general number will not be the final word in policy discussions. At a regional or town level, this methodological problem is strongly exacerbated, such that financial and employment impacts are better assessed through deep dive, quantitative (where possible) direct case studies where specific impacts are assessed. Further, the reliability of the standard (demand-driven) multiplier may be less appropriate than a supply-driven multiplier in the case of shellfish, because the driver for value addition is a relatively fixed supply rather than a change in demand. This is important for upcoming changes in Brexit because much rests on whether markets beyond the EU will continue to provide a demand base for fishing and fish processing activity. Evidence from interviews suggests this is the case, though at potentially significant cost in administrative and logistical barriers which may impact efficiency and returns to producers.

Future scenarios could be:

a. Better financing and succession planning in the sector to ensure profitable owner-operator activities;
b. Increased local processor integration with fishers, with deeper control over pricing, supply and ultimately return for fishers
c. General increase in overseas demand improves Scottish inshore fishing price realisation, but may make processing for the UK market harder to expand
d. Increased integration from overseas buyers, with less value capture in Scotland (though this may be desirable in order to keep inshore fishing operational and in the absence of more Scottish interest)
e. Reduction in market access, and inshore fishing as it gets crowded out by other sectors (including trawler fishing) or overseas buyers.

A more holistic approach to the financing and strategic development of inshore fishing is seen in regional strategies, and these should more overtly incorporate the impacts of other regions of Scotland and the UK when garnering support for initiatives.

6.3 Human Capital

Consultation with inshore fishers confirms that it is still a distinctive way of life, driven by personality and choice rather than lack of alternatives. Inshore fishing still captures some people's desire to drive a living 'up against the elements'. Although possibly less so by fishers themselves, it is also seen as a 'career of last resort', even among the towns and villages that laud the value of it for tradition and increasingly for tourism value. The inherent safety risks taken by fishers may unite these competing perspectives.

Fisher skills are relatively transferable across other growing marine sectors, and in fishing areas there was evidence of alternatives for upcoming generations to derive value from other sectors nearby. Many see the skills and career opportunities for their children as lying outside of fishing – this also extends to fish processing, although that is seen more as a 'normal' business, albeit with strongly time-dependent demands. Nevertheless, some fishers were teaching children and even urban grandchildren visiting the coast how to practice fisher skills.

The skills required for fishing often lie in the experience of the crew, and so the opportunity for crew retention and transition into ownership of boats is important for continuity and sustainable industry development. Unfortunately, on both counts there appear to be constraints. Young crew can quickly find they are unsuited to the work, while experienced crew may struggle to get finance to buy a boat from a retiring skipper. There are some financing models that may help retain this valuable human capital (i.e. know-how, knowledge of fishing grounds, informal local rules, legislation etc.) and they should be seen as safeguarding valuable human capital.

Demands on free time, and particularly the unpredictability of fishing demands, had a big impact on quality of life. Holidays and weekends for fishers and their families are dependent on weather (for example, if the weather has been poor, preventing access to creels, the first opportunity to get out again must be taken).

The self-image, culture and traditions of coastal communities remain bound up with fishing, and particularly inshore fishing. Rather than being nostalgic, it is seen as a basis on which to build new industries and skills, not least tourism. The linkages between inshore fishing and the large and increasing presence of tourism in coastal regions merits much deeper linkages to be developed.

6.4 Physical Capital

Physical capital assets of boats are a large determinant of succession and industry sustainability, and they are seen as strategic assets between fishers and competing processors. Vertical integration where processors either support a fisher to finance a boat, or processors own the boat

and hire skippers to run them, are important links, and are more likely to become the norm rather than an adaptive strategy in the absence of better financing mechanisms. In the case of processor-owned boats, the fisher will need to take the salary and landings prices stated. This is seen increasingly as an easier (though possibly less lucrative) route to becoming a skipper, and implies much less risk as an owner. However, it could remove the barriers in succession in operating boats. For older fisher's mitigation of financial risk was often to consider downsizing to a smaller boat, equating to a lower asset, lower income equilibrium.

The infrastructure used by fishers (harbours, road network, communications) mean that even remote areas can now be integrated into a wide, international network – this can extend to increasingly good courier services in remote areas. Some areas still face poor roads and poor connectivity – and in some cases, where a harbour or connectivity have been degraded, this has had impacts on fishers. Landside logistics (and in the case of islands, logistics that take product back onto the sea via ferries) remain relevant.

The relationship between tourism, travel to work areas, and inshore fishing are relevant to housing stock and affordability. Some areas such as Forth and Tay are strongly influenced by geography and other sectors. The 'sharing' of infrastructure such as harbours is a direct policy discussion – in some cases the mixing of tourists and boats can pose safety and access problems, though for reasons discussed in this study, there is a good motive for collaboration and accommodation of other sectors which build on fishing heritage.

Changing markets may stretch the capacity of some supply chains. To supply beyond Europe, centralised facilities, vivier systems and cold chains will need to be developed in new ways, requiring investment. Scottish Enterprise and other agencies have been supportive to some new businesses in developing this sectoral infrastructure, but Brexit risks may threaten this. Changing markets may shift demand and prices towards processing of fresh and frozen product over live transport, however, it is unclear what implications this has for value chain intermediaries in terms of infrastructure, and should be a focus for further analysis.

6.5 Natural Capital

Natural capital can be defined as biophysical ecosystems (water, land, weather, wildlife, natural habitats). Within this study, natural capital was mostly related to the perceptions that fishers had of changes in the biophysical ecosystems they fished, their fishing practices, and management of their fishing grounds. Prominent aspects in this topic which were relevant across all of the case studies and within the survey were MPAs, the differences between static and mobile gear types, and the rivalry for space within fishing grounds. However, it also covered topics relating to how the natural environment shapes inshore fisheries and the culture of inshore fishing communities as a whole through the variability of local environments, harshness of marine weather and its impacts on safety, work pattern and income. Due to the focus of this study – socio-economics and culture – there were very few mentions of interactions with wildlife that was not a target species. However, under social capital, the opportunity to be immersed within an environment where wildlife is regularly spotted and regularly enjoy experience of beautiful sunrises / sunsets,

glassy swell and the silence offered by being out on the sea was one of the many reasons inshore fishers enjoy their jobs and call it a 'lifestyle' instead of 'just a job'.

Space in the marine environment is a key feature in any fishers' livelihood. However, the industry finds itself in competition or having to work with increasing number of marine users. Aside from fishing, marine tourism, aquaculture, shipping and transport, oil and gas, pipelines and cabling, renewable energy, military defence, and designation of areas for conservation through either MPAs or fisheries management schemes all consume space within Scottish inshore waters. The nature of MPAs was one of the most frustrating features of the current marine management regime in Scotland for inshore fishers. Some fishers were for MPAs because they excluded the mobile sectors and some fishers were against MPAs because they were the ones being excluded or because they felt like the single goal (e.g. an MPA for a single type of habitat / species in a relatively small area) was not enough to properly manage sustainable use of Scottish waters. These views highlight the difficulty of balancing the aims of Scotland's National Marine Plan – where the overall aim is 'Clean, healthy, safe, productive and diverse seas; managed to meet the long term needs of nature and people.' It is understandable that in the view of different types of fishers, managing 'to meet the long-term needs of nature and people' could easily be juxtaposed with 'productive' seas (Scottish Government, 2015b).

Weather and the variability of local marine environment were the largest factors impacting the viability of an inshore fishing business (e.g. how many days / hours a vessel can fish). More interestingly however, were the comments that there is still a lack of scientific understanding around how and why certain types of weather impact catch rates and the locations of target species. Although this type of information is valuable for fisheries management and its value is duly acknowledged by fishers, the competitive nature of inshore fishing means that handing over this type experiential knowledge is a business risk.

Weather is also a defining feature of the culture of inshore fishers when at sea as well as fishing communities on land. An example of the culture at sea is that all conflicts and disagreements are left behind when a vessel gets into trouble; 98% of survey respondents said that they would help a fellow fisher out when at sea if they were in difficulty. Aside from legal obligations, the dangerous nature of the job, the small size of inshore fishing communities (e.g. most inshore fishers know all other vessels who operate in their area or out of their port) and the knowledge that the weather is indiscriminate in who it impacts, means that the culture of help is strong.

6.6 Stand-out / Cross Capital Characteristics

6.6.1 The Three Mile Limit

In 2017, the SCFF submitted a report to the Scottish Government which outlined their argument for re-introducing the three mile limit for the mobile fishing sector. The three mile limit refers to a ban of mobile gear use within three nautical miles of the shore which was introduced within Scottish inshore waters in the late 19th century, due to observations that the inshore fishery was being depleted. The ban was lifted in 1984 due to decline in demersal finfish landings and pressure from the mobile gear industry (Scottish Government, 2012).

The arguments of SCFF focussed on the market failure of the current management structure of the *Nephrops* fishery, which has led to a reduction in access to grounds for static gear fishers. It contends that although the mobile sector may catch more *Nephrops* by volume, the catch is worth less per kilo than the *Nephrops* caught by static gear. It provides an outlook on the socio-economic and environmental benefits that an increased static sector might have for the West Coast in particular (Scottish Creel Fishermen's Federation, 2017). In the West Highland case study, seven out of the 12 interviewees described their reasons for supporting the re-introduction of the three mile limit. These included; the environmental damage that the mobile sector has on inshore ecosystems; lack of space for static gear fishing; competition with the mobile gear sector, which results in over-fishing and static gear fishers losing out; lack of representation of static fishers in the decision to lift the ban in the first place and; bullying and threat of gear loss caused by mobile sectors; the unfair power relations between the larger offshore mobile sector and static inshore fishers. One interviewees summed the situation up by stating that *'any creeler that says they are sharing [inshore space] willingly is suffering from Stockholm syndrome'*.

Interestingly, although gear conflict and the cultural and practice differences between the static and mobile sectors was also highlighted in the Argyll and Solway case studies, neither made reference to the three mile limit. In Solway this might be because the Solway Code of Conduct facilitates a working relationship between the static and mobile sectors. In Argyll there seems to be a less formal code of conduct, where mobile fishers call static gear fishers if they are working an area where creels are normally found. Interviewees in Argyll stated that nomadic mobile vessels cause problems because they do not call the local static gear fishers. They just turn up, cut lines and then leave. The interviewees suggested that the nomadic mobile gear vessels feel less accountable for their actions because their business is not reliant on local grounds and their home lives are not integrated with local communities – when nomadic vessels have caught all they can from one area they just move on to the next. Equally, local fishing communities, both static and mobile cannot hold nomadic vessels to account via informal routes because of the lack of local presence (e.g. nomadic vessels do not use the local harbours, pubs, shops, or schools).

Although the West Highlands case study was the only one where the three mile limit was specifically mentioned, interviewees across all regions called for better representation for static gear fishers within the inshore fishing sector. One of the recurring suggestions from the survey was for more local management regimes, where fishers can directly feed into management strategies, and thus have the opportunity to see the effects that their participation and knowledge-sharing has on their local grounds. The SLA framework allows us to characterise how changes to one aspect of the current management regime will impact each capital within the sustainable livelihoods framework. In this instance any changes to the three mile limit will impact relationships, culture and resource management which all come under social capital, but also economics (financial capital), employment (human capital), and fishery stocks (natural capital). In turn, this means that any changes to management regimens should not only be made on the merits of evidence relating to fish stocks and economics, but also on the social and human aspects of employment, relationships, and culture. This study is not the first to identify that management of fisheries, especially those that are historically and / or culturally embedded within national and local identities, requires an understanding of the complexities around livelihoods and relationships rather than the activity of fishing in isolation (Symes *et al.*, 2015). However, it is the first in the UK to provide evidence of these interlinkages using the SLA framework. As is shown above, the SLA framework can provide a holistic approach to assessing and

understanding the consequences (both positive and negative) of different management decisions on inshore fishing communities.

6.6.2 Succession and Work Pattern

Succession and work patterns are a strong determinant of how the industry looks today, and will develop in future. The financing of a boat and licence is a considerable investment that is not universally well supported through the financing sector. Ad hoc and local solutions (processor-financed, processor-owned, cooperative-financed, collaborative financing across parties as in Western Isles) all offer ways forward. However, if crew cannot be supported in becoming skippers, or succession through new entrants or family links are not sufficiently strong, then the inshore fishing sector could either diminish, be crowded out by alternative gear methods, or be 'professionalised', possibly through non-Scottish ownership (which may be desirable particularly if local ownership was absent or uncompetitive). While this would not have significant direct regional impact, it would likely diminish strategic options that are increasingly seen as desirable, e.g. in tourism and food and drink.

The lifestyle of fishers is seen as a strong counterbalance to profitability in the sector – it deters new entrants as crew or owners, and has an impact on the livelihoods of families. Many regard it as 'worth it' for the benefits it brings in terms of individual satisfaction and, often, income, but the all-encompassing demands of fishing, and the safety risks involved, were evident.

These benefits and drawbacks were reflected in processing and intermediaries, too. Time-pressured market demands, volatile prices, and having to accommodate weekend and out-of-hours pick-ups from inshore fishers meant that the work pattern of those in the supply chain reflect similar problems. Even in profitable companies, there was some evidence that the next generation was keen to pursue other areas of work rather than continue in the fishing business while others still see the appeal of provenance and association with inshore fishing as an aspiration. Scottish Enterprise and other agencies have been supporting such new ventures, and it appears that this is consistent with other Scottish economic drivers, though the logistics of processing are as likely to bring jobs to urban areas as they are to coastal / rural areas. This is to be welcomed as a further positive economic impact since it can bring jobs to areas facing economic and social deprivation.

6.6.3 Brexit

Interviews with fishers and other industry and value chain stakeholders referred to the implications of Brexit on their businesses. Many of the interviewees were critical of the Common Fisheries Policy (CFP) (which is an EU level policy), but were also uncertain of whether their dislike for it was because of the EU, or the way that it is handled through the Scottish Government. Interestingly, many of the interviewees were aware that leaving the EU might have an impact on their businesses, but were willing to vote for Brexit. In most cases, the reasons given related to white fish stocks being taken by vessels from other countries, despite the vast majority of inshore fishing targeting shellfish. The authors postulate that this view is held because fishers believe that stocks within Scottish waters should be caught by Scottish vessels.

The post-Brexit settlement is currently uncertain and could affect how Marine Scotland and other agencies manage the inshore sector. In the future, regardless of Brexit outcomes, more integrated processor-fisher engagement is desirable. This study suggests that more investment in understanding these linkages would be beneficial and cost-effective, building on food and drink sector studies currently underway.

While the impact of Brexit was largely a part of the policy mix for inshore fishers, fish processors, particularly those dealing with live transport, saw any delays as a big operational risk. This was within the context of a rapidly changing market with Chinese demand for seafood, particularly brown crab, is changing the dynamics of the processing sector – the combination of Brexit and non-European demand could have significant implications for the structure of the industry.

6.6.4 Gender

Women's role in the fishing industry was mentioned across all regions, from familial relationships through to land-based industry work such as book-keeping, processing and administration. However, it was evident that fishing is still a male-dominated industry, with views that limit access to the industry for those who are female. For example, many male interviewees held the view that a woman's place was at home with the family and that the practicalities of life on board a vessel are not attractive to women. On the other hand a few interviewees described how their sisters, wives or female children (sometimes grown) 'helped out' on their vessels. In one case a woman was described as 'helping out' a fisher for a few months when they could not get crew. This shows that despite a general view from male interviewees (that women would not want to fish), there are women who indeed do desire to participate in this work. This is a cross-cutting area which requires attention. Technological advances are likely to decrease the physical nature of the industry, which means that the culture of inshore fisheries needs to and in very small steps, is already changing to become more inclusive of women working the waters.

The activity of fishing is not the only aspect of the inshore fishing industry in Scotland where historical social norms of gender roles influences how women are viewed within the sector. Policy and data collection measures on the value-chain of the industry should be updated to include voluntary or ancillary work conducted by women to improve the socio-economic characterisation of the industry, as is discussed further in section seven.

6.7 Integrating Socio-economic and Cultural Data in Inshore Fisheries Assessments

This section reflects on the data quality available for qualitative and quantitative assessments of the socio-economics and culture of Scottish inshore fisheries, areas for improvement, and the potential for this type of data to be integrated into management processes either through the SIFIDS Integrated Management System (WP6) or otherwise.

This WP was different to the other work packages within the SIFIDS project in that it was built on qualitative data, before moving on to collect quantitative data. The qualitative data provided a grounded approach (Glaser, 2002) (where quantitative assessments were based on an analysis

of the industry through qualitative interviews) to data collection and allowed for an expansion and exploration of the reasons behind official quantitative figures. This approach proved especially pertinent where official statistics were not necessarily reflective of activities on the ground (e.g. employment figures). The economic assessment benefitted from qualitative information as it proved an aid to understanding why the market system is the way it is, why there are discrepancies, and areas where these discrepancies have the potential to be reduced through adjustments in reporting and data collection strategies. Despite this study taking a different approach to other work packages, the methods from data collection right through to analysis under the SLA are transparent and replicable. The format of integration with the Integrated Data System (WP6) was difficult, given the very different nature of the subjects and types of data involved – inductive and constructivist philosophies (humanities and socio-economics) in the case of this work package, and deductive and positivist (natural sciences and information technology) in the case of the other data collection work packages. The current integration is through provision of currently available social and economic data, and methods for data collection (interview topic guide / structure and survey). As the data on the social and cultural characteristics of the Scottish inshore fishery is a reflection of reality at a single point in time, the results will shift according to the political environment, opinions, and social norms, the movement of people, and the biophysical environment. It is therefore recommended that these assessments are repeated on a regular basis – perhaps to reflect standard political and policy terms of five years.

National, regional, and local scales of data are required for a full assessment of the socio-economic and cultural characteristics of the Scottish inshore fishing sector. Cultural characteristics were captured on a local level, where they reveal themselves more keenly. However, assessing the economic linkages of the industry required all scales of data, where there were some models which worked on a local level, others which relied on regional associations, and those which were national scale.

The interviews from processors and fishers revealed that there are differences between the value-chain and GVA figures that are presented by Marine Scotland and what the industry estimates the figures to be. This could be because the Scottish inshore fishery is a subsector of Scottish fishing and as such, much of the current data collected as an assessment of the value chain is not disaggregated i.e. it is difficult to decipher whether the value is from the inshore fishing sector or not. This is a clear area where improvements in data collection on the processing side of the industry that could provide a more consistent understanding of the value of the sector to Scotland. For example, if processors collected and provided data on the providence of their stock (recorded whether it was from the inshore fishing sector) and where it was going to, a better measure of the value-chain of catch of the inshore fishing sector could be established. Currently, the value of catch and number of businesses with dependency inshore catch is currently likely to be underestimated. Recording of this type of data should be country-wide to better reveal the linkages between the inshore fishing sector and employment at a national scale. Between the development of Fish 1 data, MMO, Seafish and MS data, and buyer registrations, there is scope to address this.

In addition to this value-chain discrepancy, there are external and hidden costs associated with the inshore fishing sector that were revealed by the survey and interviews. For example, the interviews showed that there were women who did the books for their partners/ husbands, without classing themselves as employed in the inshore fishing sector, or its supply-chain. This type of

employment is subsequently not captured by official figures. A model of operation that was revealed along the West Coast, Highlands and Solway, was that the partners of fishers would support the fishing business through doing the books whilst also earning their own money by running a Bed and Breakfast, teaching, or nursing. From a cultural perspective, these findings suggest that there is a split between running a viable business and the reporting of inshore fishing activity. Although an individual often carries out the *activity* of inshore fishing, families carry out the *business* of inshore fishing. This suggests that the 'image' of an individual fisher in the often male-dominated culture of inshore fishing resonates within policies on collection of employment and income figures and perhaps the way that it is collected (e.g. one interviewee did not understand why we wanted to interview her as she was not 'the fisher' she was 'just doing the bookkeeping'). In order to improve these figures, policy should accommodate recording of all of the work needed to carry out a successful inshore fishing operation – including voluntary work conducted by women and other family members. It is likely that if these figures were recorded, it would show a higher number of people involved in the value-chain.

Ensuring that data is collected solely for the purposes of inshore fisheries management is also essential for assessing the viability of the industry into the future. For example, this study found that there are immediate succession issues. The average age of respondents to the survey was 51, this was consistent with Marine Scotland data where the mean age in 2015 for pots and traps fishers was 50. The mean age across the entire Scottish fishing fleet was 39.7 (Marine Scotland Science, 2016). When combined with perception that young people are not entering the industry because of issues related to; the cost of running and operation; space to fish; and the attractiveness of alternative employment options which have similar wages (e.g. the trades), succession should be a serious consideration for the management of the sector. This sentiment is perhaps not reflected through the whole of the Scottish fishing fleet.

A framework was developed in this study to collect and analyse inshore fisheries data, a summary of which can be found in Section 3 and Appendix 4. This framework sets out the philosophy, approaches and methods used to collect and analyse the cultural and socio-economic data for this study.

Other relevant factors for framing related studies:

- Separate inshore fishing from the rest of the fishing sector. There is variation in what figures stakeholders use based on the breakdown in terms of value (£), even though the figures quoted come from the same data source. The variation usually lies in the definition and breakdown of the values; for example shellfish from under 12m vessels is being compared to the total shellfish landed in Scotland by all vessels.
- The SIMD and value chain analysis highlighted that impact datasets do not neatly map from a policy makers perspective with the marine environment. The scope of analysis should take this into account, so that e.g. a fish processing job in Bellshill or in another non-coastal area is still accounted for in coast-focused analyses.
- The geographic footprint of the seaward side of the industry did not show itself as being hugely pivotal to the landside analysis despite the initial fishing activity taking place on the sea (and optimal catch is often rightly the focus of other studies). However, with the increasing importance of traceability these two sides might become linked to data from other WPs, with catch, effort, and vessel tracking data more tightly integrating with the

landside socio-economic data. This will see greater confluence of Marine Region Policies, buyer relationships, and the tracking and landings data all within the market system.

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APPENDIX 1: INTERVIEW TOPIC GUIDES

IMPACT OF FISHING: SOCIO-ECONOMIC AND CULTURAL FACTORS (WP4)

Interview topic guide; Fishing industry

Introduction

- Introduce self and project
- Explain;
  - Reasons for recording the interview – concentrate on what is being said
  - no right or wrong answer
  - length of interview – no more than 1.5 hours
  - voluntary nature of participation and right to withdraw at any time
- Confidentiality and how findings will be reported
- Any questions they have

Opening questions

1. What type of fishing do you do?
2. How did you first become involved in fishing?
   i. How did you learn the trade/art?
   ii. What was involved in your learning?
   iii. What roles did you hold before your current one?
3. What's your role in fishing at the moment?
   i. What do you enjoy?
   ii. What are the challenges?

Fishing and identity

4. What does fishing mean;
   i. To you?
   ii. To your family?
5. What does fishing mean to your community?
   iii. What are the positive aspects?
   iv. What are the negative aspects?

Fishing and change

6. In what ways has fishing changed over your lifetime?
   i. Clarification questions
7. What future do you see for fishing in your local area?
   ii. Clarification questions

Closing comments

8. Is there anything else that you would like to add?

Closing remarks

- Thank interviewee for their time and participation
- Ask if they have any further questions about the project or confidentiality

Interview topic guide; adjacent communities/ individuals

Introduction

- Introduce self and project
- Explain;
  - Reasons for recording the interview – concentrate on what is being said
  - no right or wrong answer
  - length of interview – no more than 1.5 hours
  - voluntary nature of participation and right to withdraw at any time
- Confidentiality and how findings will be reported
- Any questions they have

Opening questions

1. Can you introduce yourself and your profession?
2. What do you think of the marine activities in this area?
   i. What are the positive aspects?
   ii. What are the negative aspects?

Fishing and identity

3. What does fishing mean;
   i. To you?
   ii. To your family?
4. What does fishing mean to your community?
   iii. What are the positive aspects?
   iv. What are the negative aspects?

Fishing and change

5. In what ways has fishing changed over your lifetime?
   i. Clarification questions
6. What future do you see for fishing in your local area?
   ii. Clarification questions

Closing comments

7. Is there anything else that you would like to add?

Closing remarks

- Thank interviewee for their time and participation
- Ask if they have any further questions about the project or confidentiality

APPENDIX 2: SURVEY QUESTIONS

Final Survey Questions

APPENDIX 3: AVAILABILITY OF DATA

	Datasets / Type of data	National Level	Regional Level	Marine Region Level	Local Level	Vessel length	Other?	Geo-coded ?	Access?	Complementary / secondary data	Why not	Via	Links
	Seaward side data												
1	**Seafish Fleet economic performance data**	Average vessel data	No	No	Limited in current format	Yes, but limited breakdown for <12m	Gear type and activity level	No	Yes, available through Seafish	Other options available	Does not provide data by Scottish Marine Regions - not available in the current formatc Data derived from Marine Scotland data - stems from individual, port level information	Some data by breakdowns is available through this dataset, but requests need to be sent to Seafish to be published. Options do not appear to disect data by the breakdowns required for this study.	http://www.seafish.org/research-economics/industry-economics/seafish-fleet-economic-performance-data
	Length									Partial - survey			
	Landings (tonnes)									Yes - Marine Scotland			
	Fishing income (£'000)									Partial - survey			
	Days at sea									No			
	Landings per day at sea (tonnes)									No			
	Average price per tonne landed (£)									Yes - Marine Scotland			
2	**ScotMap**	No longer avaiable and advised not to use data collected through this project.											http://www.gov.scot/Topics/marine/science/MSInteractive/Themes/ScotMap
3	**Scottish Sea Fisheries Statistics**	Yes	Yes (districts)	No	Limited	Yes, but not in required breakdowns	Location, power, main fishing method	No	Yes, available through Marine Scotland	Yes - Other Marine Scotland data, Seafish data, MMO data	Although this provides useful information for this study, the breakdown by Marine Region and by <10m and 10m-12m boats is not possible in its current form	Some data by breakdowns is available through this dataset, but would need to request data by regions and boat length to Marine Scotland, which has already been down and provides provisional 2017 data.	http://www.gov.scot/Topics/Statistics/Browse/Agriculture-Fisheries/PubFisheries https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2016
	Employment												
	Vessels												
	Landings					No	Scottish vessel landings Species type breakdown District level						
	Other Marine Scotland datasets												
4	NMPi	Used for context and additional information for the regional contexts particularly for environmental purposes. However, Marine region GIS layers were downloaded from this site. Limited information on fishing activity be breakdowns that are required for this study. The ScotMap dataset is available on this site. All infromation is geocoded and available on the Marine Scotland website											http://www.gov.scot/Topics/marine/seamanagement/nmpihome
5	Requested fisheries landings and employment	Yes	Yes	Yes	Yes	Yes	Species data by vessel length	No	Yes, available through Marine Scotland	Supported and supplemented by interview findings	Main source of data for the soci-economic impacts	Data request to Marine Scotland	n/a
6	Seafood Processing Industry Statistics (Seafish)	Not split by inshore, but useful for shellfish ratios	For shellfish and selected processing areas	No	No	No	Useful for ratios and salaries that are applicable to inshore fishing products	No	Full report, data would require Seafish request	Supported by SIFIDS interviews including case study data, and analysis of company accounts available at Companies House	Gives processing regions such as Grampian but does not split data by inshore fishing. Shellfish data is useful but not disaggregated.	Report online, further data requests to Seafish	http://www.seafish.org/media/publications/2016_Seafood_Processing_Industry_Report.pdf
	Landward side data												
7	**Scottish Index of Multiple Deprivation**	Yes	Yes	Not in current format	Yes	n/a	n/a	Yes	Yes, available through Scottish Government	No	Used to determine the levels of deprivation in 4 Marine Regions, and to see if there was any correlation between fishing villages and other coastal villages / towns	Publicly available through Scottish Government	http://www.gov.scot/Topics/Statistics/SIMD
8	**Travel to Work Areas (TWWA)**	Not sure	Yes	No	Yes	n/a	n/a	Yes	Yes, available through Scottish Government	Interviews and survey work	Used to provide context for the four Marine Regions	Publicly available through UK Government (Office for National Statistics) / Marine Scotland	http://marine.gov.scot/information/employment-travel-work-areas-ttwa

APPENDIX 4: FRAMEWORKS AND APPROACHES USED FOR THIS STUDY

Frameworks, tools, indicators	Aim	Description	Data collection and approaches	Timelines	Analysis of data	Lessons learned	Gaps in evidence
Overarching Approach							
Sustainable Livelihoods Approach (SLA)	This is the overarching framework for this piece of work which informed our approach, way of thinking and the final report structure	The SLA seeks to understand scenarios in which people and communities can better maintain or enhance the assets on which their livelihoods depend, can cope with and recover from stress and shocks, and can provide for future generations.	The SLA relies on a participatory approach whereby consultation with community members can identify relevant views about fisheries and their impact local on natural, social and economic contexts. Qualitative interviews formed the basis of content which was then coded against the five types of capital to identify the drivers in social and economic factors for inshore fishers.	Each interview requires transcribing and then coding. 1 day per interview for both transcription and coding at an average interview length of 40mins.	Used the SLA as a framework and standard qualitative coding procedures for analysis of interview transcripts.	Provides a holistic way of thinking about the social, cultural and environmental aspects of inshore fishing whilst incorporating the economic aspects.	Cannot interview all Scottish inshore fishers, only those who are willing. This represents a data limitation.
Market Systems Approach	This framework compliments the SLA, helping to understand the linkages and feedback loops within the inshore fisheries sector.	The 'market system approach' has demonstrated how multiple players within a sector interact, illustrating to practitioners and non-practitioners how the inshore fisheries market operates, from government, rIFG, tourism industry, infrastructure, through to	The market system – i.e. the rules, industry functions, and the actors in the value chain, create positive and negative outcomes which affect the asset base and livelihoods of the individual or local economy in question. This has been the framework in which inshore fishing value has been considered, i.e. as part of a larger market system which is dependent	See above.	Following information during the initial interview stage, data gaps were identified. As such, further supply chain interviews were undertaken (approved by ethics committee).	The relative lack of dialogue between fisher organisations and processors was perhaps underestimated - more resource was required to undertake a wider processor and market consultation.	Financial data such as fisher income and boat costs are not readily available by vessel size and Marine Region, only at a UK level through Seafish.

Frameworks, tools, indicators	Aim	Description	Data collection and approaches	Timelines	Analysis of data	Lessons learned	Gaps in evidence
		skippers and crew members	on, and influences, inshore fishing outputs.				
Regional Case Studies	Four Marine Regions were considered in this study to maximise the amount learned from the study within the given time period. It allowed the study to delve deeper into the supply chain and relationships within the sector, providing a framework that can be expanded and	These regions were chosen in consultation with the other work packages in the SIFIDS project and Marine Scotland.	In depth interviews were conducted in each of these regions (45 across all four) as well as the additional supply chain interviews.	4 weeks of stakeholder engagement Additional research time to develop each case study including survey results, interview write-up, landing data (by vessel and catch), and the SIMD analysis	Data was analysed for the national discussions, with key information included in the write-up of each region. The SIMD analysis was carried out for each region as was an analysis of the landings value and employment for each region. This enabled us to estimate GVA for each region.	At present it is challenging to collect land data for Marine Regions as Local Council areas do not map onto the Marine Regions. Caution needs to be taken in trying to describe the coastal communities without visiting the regions.	High level analysis of Marine Regions that were not considered is possible but stakeholder consultation would require direct interview study. .

Frameworks, tools, indicators	Aim	Description	Data collection and approaches	Timelines	Analysis of data	Lessons learned	Gaps in evidence
	used through Scotland.						
Economic Theory							
Macroeconomic Industry Analysis	To provide an industry overview that demonstrates the industry's contribution to the economy, including GVA, employment and strategic linkages with other sectors.	During the analysis the team consulted with relevant stakeholders including data and regulatory bodies, fisheries groups and individuals to ensure its indicators were valid, desired and useable by the relevant institutions. Each data source has been recorded, noting what information is available at what level (e.g. national, regional, port, boat, individual), and has been combined with wider analysis and secondary publications on inshore fisheries to establish the significance to the Scottish economy.	Measuring the sector's economic performance from landings, through the operational value chain models within the sector and demonstrating final impact. Evaluation of inshore fisheries economic multiplier effect on the regional and national economy has been modelled but has clear qualifications regarding assumptions used in the process.	Duration of the project	Landings data has been collated for under 12m inshore vessels, and direct GVA derived using Scottish Government data. Descriptions of linkages with other sectors has been explained and modelled. Explanations of the degree of reliance of different areas on inshore fishing were given based on SIMD and other metrics, and the relative locations of different stages of the industry were cited.	The relative lack of dialogue between fisher organisations and processors was perhaps underestimated - more resource was required to undertake a wider processor and market consultation. There is a wariness of attributing downstream impacts in processing through a Ghoshian multiplier or similar, but in practice the causality is strong between fish and downstream products, and this should be developed further.	Economic and financial performance of the inshore fleet is available at UK level from Seafish (2017a) but not available publicly by Marine Region. Interview and survey data provided similar content, but duplication could be avoided if Seafish content was obtainable.

Frameworks, tools, indicators	Aim	Description	Data collection and approaches	Timelines	Analysis of data	Lessons learned	Gaps in evidence
Value Chain Analysis Methodology	Undertake interviews with actors in the supply chain as: a) Part of the initial interviews; b) As targeted interviews to confirm findings and fill in the gaps; and c) To get a better understanding of the full supply (and value) chain	Analysis of the value chain was based on data from the initial interview phase to determine the linkages between fishers and their (upstream) suppliers and (downstream) buyers.	A brief topic guide was developed for these interviews but was not used in all cases. The purpose of these interviews was to try and draw out more detail on the supply chain and fill in any gaps in our knowledge	March / April 2018. These were undertaken once the team had analysed and written up the initial interviews and developed a supply chain diagram which highlighted where gaps and uncertainties were.	Interviews were typed up and included in the supply chain write up and economic sections of the report. The supply chain diagram was finalised.	Important to factor in these interviews at the start of the project. Based on the methods chose, it was not possible to include these discussions in the initial interviews as the questions were deemed to be leading. However, they were useful to have after the main bulk of the data was collected	These interviews helped fill in gaps in the evidence. However, there are still gaps in terms of income and costs from interviewees as they do not want to share this information.
Landings and employment data	This data was required to estimate the GVA of inshore fishing and to understand the scale (volume and value) of the industry to Scotland.	Data on landings reported by fishers from Fish 1 forms and Fisheries Officers. This data is not currently available for each Marine Region. It was requested from Marine Scotland and aggregated from port level data to Marine Region level.	Data on landings was requested by: a) By vessels under 10m and vessels between 10 and 12m for each Marine Region b) By species, by vessel type (<10m; 10-12m) for each Marine Region Analysis of the 4 Marine Regions was undertaken to determine the volume and value; and GVA to each region and Nationally.	Throughout the project. Main analysis was in June 2018 (had to wait for the provisional data to be released).	Data was analysed and presented for each of the 4 Marine Regions. Analysis was done by vessel type (<10m and 10-12m) and by species. GVA for each Region and for Scotland was calculated using these figures.	Understanding of landings and employment data varied e.g. <12m shellfish revenue is smaller than the *total* shellfish revenue for Scotland, though some stakeholders have the larger figure in mind.	Data is not yet aggregated and publicly available by Marine Region. Fisher employment is only available from 2013.

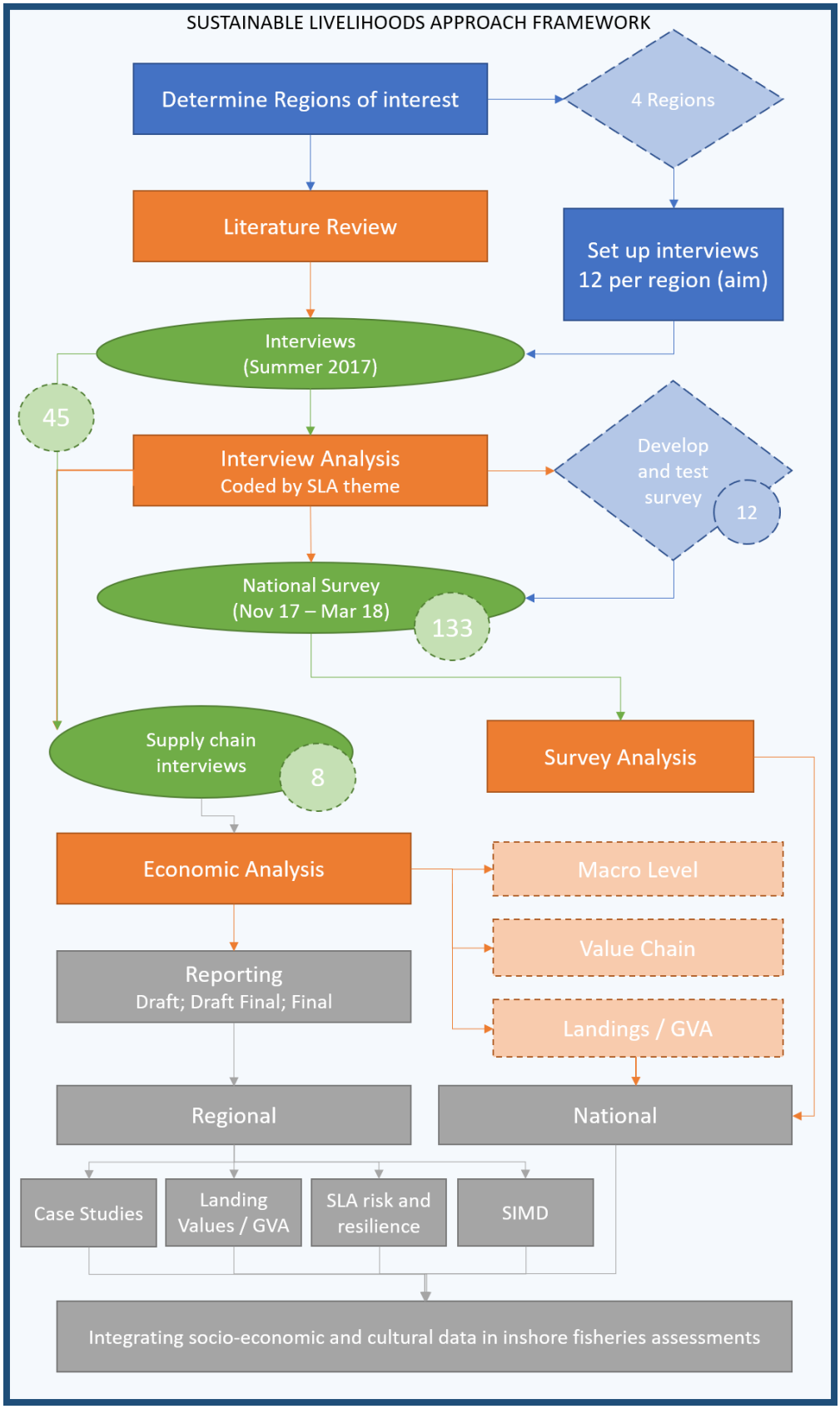
Frameworks, tools, indicators	Aim	Description	Data collection and approaches	Timelines	Analysis of data	Lessons learned	Gaps in evidence
Social Approach							
Interviews	Undertake interviews within each identified region.	'Funnel semi-structured' interviews, beginning with open ended and broad questions and ending with more specifically targeted questions.	45 interviews undertaken in 4 Marine Regions. Topic Guides were developed for both 'Fishers' and 'Associated Actors' which can be found in Appendix 1. The interviews covered economic, social and cultural content. Interviews were recorded by written notes. Interviews were set up with the help of facilitators before travelling to the region. They were contacted via telephone or email and given a breakdown of the project and the interview process. The bulk of interviews were set up before arrival (6 - 8 in each region) During the fieldwork additional interviewees were approached through snowball technique (i.e. referred to by other interviewees) and approaching people in the local area.	There were two researchers at all interviews, one taking notes and the other asking the questions and engaging with the interviewee. The interviews for each region were conducted within one week (one week per region), equalling four weeks of fieldwork in total.	All interviews were typed up in Microsoft word and thematically analysed through a qualitative coding approach using QSR Nvivo software. The themes were then further coded using the SLA Capitals and discussed qualitatively. There were 48 themes in total based on the coding exercise.	Although rich contextual data was provided by the interviews, there were some areas which required further research (i.e. supply chain). Additional interviews were undertaken to get more detailed information on the supply chain. Structured Supply chain interviews should be scheduled in at the start of the project.	The themes and the total number of themes will change with movements in policy and social and cultural contexts.

Frameworks, tools, indicators	Aim	Description	Data collection and approaches	Timelines	Analysis of data	Lessons learned	Gaps in evidence
Survey	Themes from the interviews were used to determine the questions asked in the national survey. The survey was structured using the capitals from the SLA.	The questionnaire combined dichotomous questions (yes / no) with Linkert scale questions (strongly agree, agree, disagree, strongly disagree), as well as standard demographic questions.	Distributed using the Survey Monkey online platform. The Survey can be found in Appendix 2. Follow-up emails and reminders for filling out the survey were sent out in January 2018.	A pilot survey was conducted with 12 respondents, including an expert in survey work, before the survey was sent out. The main survey was open for 5 months.	Analysis of the responses was both quantitative and qualitative, conducted in excel.	The Seafish UK-wide economic performance data should adequately cover the costs and income of fishers by region or by local port, though this is not currently publicly available at that level. A positive response to the survey work suggests that 'interesting' questions relating to family, culture and business are well received or valued.	These findings are a cross section of the opinions of individuals within a specific industry at one point in time. However, the methods are replicable at any point in time.
Integrating socio-economic and cultural data							
Scottish Index of Multiple Deprivation (SIMD)	Used to determine if there is a relationship between deprivation levels and fishing communities.	This study aligned the SIMD with Marine Regions to determine levels of deprivation in coastal communities with the aim of determining whether any meaningful results can be drawn from it in relation to inshore fisheries.	This study undertook the analysis based on The James Hutton Institutes' (undated) definition of coastal areas – areas within 5 km of the coast including estuary and river limits. This was done using Geographic Information Systems (GIS) software where all data zones that were within 5 km	Initial research and mapping took approx 1 week.	Four maps were produced for each Marine Region Case Study showing the SIMD within 5km of the coastline. A basic visual analysis was undertaken to determine links between	There are complexities between marine and terrestrial data in terms of boundaries and available data. The 5km coastal area provided the best available data for this basic analysis.	More analysis can be undertaken to determine if there is a link between deprivation and inshore fishing (i.e. a statistical analysis) but

Frameworks, tools, indicators	Aim	Description	Data collection and approaches	Timelines	Analysis of data	Lessons learned	Gaps in evidence
			of the coastline including estuary and river limits were included. If a data zone was whole or partially within 5 km of the coastline, that data zone was included in the study.		deprivation and fishing.	This study does attempt to link terrestrial socio-economic data with the marine environment. this is purely illustrative, and a more in depth study should be undertaken to address the landward limit of the Marine Regions before socio-economic outcomes can be addressed using purely land-based indicators.	this was not within the remit of the study.

Frameworks, tools, indicators	Aim	Description	Data collection and approaches	Timelines	Analysis of data	Lessons learned	Gaps in evidence
Terrestrial vs. Marine environment	Approach in this work package was to look at the land-side aspects of fishing rather than the fishing grounds themselves.	The varied impacts of inshore fishing on land-side, cultural, social and economic systems, are important factors determining fishing activity.	While many of these operations are based in coastal areas, they geographically disconnected from the coast where inshore fish is landed. Value chain analysis posed geographic challenges – a tightly defined study region provides limited insight when the economic value may quickly transfer (or 'leak',) to another region. The value chain approach identified the impacts – whether positive or negative – that were realised beyond the immediate vicinity of the economic activity.	Throughout the project.	Terrestrial and industry strategy is relatively under-analysed, yet succession, vertical integration and new markets will strongly impact the payoffs for inshore fishing.	More attention to processor linkages could inform key inshore fishing decisions	More in-depth analysis of downstream processing would be invaluable in understanding the full value of the sector, particularly as Brexit changes a number of factors affecting the industry.

The diagram below represents a flow chart of the framework and approaches used in this study.


SUSTAINABLE LIVELIHOODS APPROACH FRAMEWORK
Determine Regions of interest
4 Regions
Literature Review
Set up interviews
12 per region (aim)
Interviews
(Summer 2017)
45
Interview Analysis
Coded by SLA theme
Develop
and test
survey
12
National Survey
(Nov 17 – Mar 18)
133
Supply chain
interviews
8
Survey Analysis
Economic Analysis
Macro Level
Value Chain
Landings / GVA
Reporting
Draft; Draft Final; Final
Regional
National
Case Studies
Landing
Values / GVA
SLA risk and
resilience
SIMD
Integrating socio-economic and cultural data in inshore fisheries assessments

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