Scottish Government
Riaghaltas na h-Alba
gov.scot

Monitoring the Socio-economic Impacts of Marine Protected Areas: 2019 Report

AGRICULTURE, ENVIRONMENT AND MARINE

social research

Contents

Executive Summary

This report provides an assessment of evidence on the socio-economic impacts of Scotland's Marine Protected Areas (MPA) since management measures were introduced in 2016.

In 2019 Marine Scotland began gathering evidence for the second review of socio-economic impacts of Marine Protected Areas on a range of sectors, stakeholders and communities. These included the fishing sector, seafood processing, aquaculture and tourism. A combination of quantitative (analysis of fishing activity and employment data) and qualitative (in-depth stakeholder interviews) methods were used to identify changes in marine industries and communities, to understand the causes of these changes, and to determine whether these changes could be attributed to MPA management measures. Four case studies were conducted, based around five MPAs (South Arran MPA, Loch Sunart to the Sound of Jura MPA, Wester Ross MPA, Wyre and Rousay Sounds MPA and Sanday SAC) to illustrate the impact of MPAs in specific geographic areas.

This review found that there had been localised positive and negative impacts on coastal communities and industries, associated with MPA management measures. Where impacts were felt, this was often due to a combination of factors, one of which was MPAs.

Socio-economic impacts on the fishing industry

The new measures adopted since 2016 as part of Scotland's MPA process affect fishing activity in a number of MPA sites and could have knock on effects for wider seafood industries as well as other marine users. The commercial fisheries sector is most likely to be directly impacted by MPA management measures, as a number of restrictions are placed on the type of vessel and gear that can be deployed within an MPA boundary.

Landings data showed that, in some areas, there were changes in landings after MPA management measures were introduced. Impacts were more apparent at the local level, and both positive and negative impacts were felt in different parts of the fishing industry. ICES rectangle analysis indicated decreases in trawled *Nephrops* landings and dredged scallops in some rectangles containing MPAs, while increases in creeled *Nephrops* and hand-dived scallops were also evident.

Analysis of landings from trawl vessels which fished within MPA boundaries before management measures were introduced, suggested catch reductions of 25-35% from rectangles containing MPAs, with vessels found to compensate for this by fishing more heavily in other rectangles, without MPA designations. Total landings for these vessels remained the same, or higher, apart from those which had been particularly heavy users of the fishing grounds within MPAs, whose total landings reduced by approximately 12% on average. The same analysis for dredge vessels found that landings within MPAs rectangles, and in non-MPA rectangles declined from 2013-2018, with a steeper decline post 2016. This suggests that other factors are affecting dredged scallop landings on the west coast, but that MPAs may be a contributing factor.

These vessels accounted for 1-12% of the total number of vessels registered in port districts near MPAs, depending on how heavily they used the MPA, so were a relatively small proportion of all fishers operating in the area.

Analysis of employment data for port districts near MPAs showed a slight increase in total employment on static gear vessels, and a decrease on trawl and dredge vessels on the west coast of Scotland. This trend was clearest and most pronounced in a few areas, where the magnitude of the change was greater. Some areas showed no trends that could be identified as consistent with MPA management measures. These changes could reflect a shift from mobile to static gear in some areas due to MPA management measures which restrict the use of mobile gear.

Interview data supported the findings of the landings while employment data provided further explanation of the results. Just over a quarter of fishers interviewed reported reduced landings, as did two thirds of seafood processors. This was attributed to reduced access to the sheltered fishing grounds within MPA boundaries. In response, fishers reported changing their practices in several ways to adapt to the MPA measures. Many were fishing in other grounds, some had bought bigger boats to enable them to travel further and withstand harsher weather, some had diversified to creel fishing and a few had downgraded to smaller boats or sold up. Through their adaptations, most fishers have managed to tolerate the challenges and continued to operate viable businesses, although it should be noted that this may have been at some personal cost and inconvenience.

Static gear fishers reported having greater access to the grounds within MPAs, and felt they were more secure fishing there without the risk of gear conflict. Some had expanded their businesses and taken on more crew.

Socio-economic impacts on other key industries

Potential impacts of MPA management measures on other marine industries, namely seafood processing, aquaculture and tourism were also explored. Seafood processors tended to be affected in similar ways to fishers and were found to have adapted in similar ways. Those who had been affected were particularly concerned about their ability to retain staff.

The main impacts described by those from aquaculture were associated with the increased complexity of planning applications, which were said to be more costly and time consuming. Respondents also described delays in receiving responses on the outcome of their planning applications, which were said to delay developments and result in financial losses.

In relation to tourism, respondents felt that the MPAs had had a positive impact, as they provide an additional tourist attraction for areas nearby. Some businesses reported using the MPA designations as part of their unique selling point (USP) or their promotional material. Respondents also highlighted the importance of the natural environment for marine tourism in general. They felt that the added environmental protection afforded by MPA measures would enhance marine tourism opportunities in the future, regardless of whether those businesses used the MPA directly. An example of this is recreational fishing, which respondents hoped would expand as habitats and stocks recovered. Several respondents felt that more effort

could have been made to promote and celebrate the MPAs among the general public. They acknowledged that there was still a lack of awareness about MPAs in some areas.

Wider Economic and Social Impacts on local areas

Several organisations and community groups have developed or galvanised around the MPAs. These groups were found to have organised a large array of activities and events, raising awareness and educating the public about marine conservation and the rich diversity of their local inshore waters. Some indicated that they had also made links with relevant research institutions and collaborated on numerous research projects to gather data and improve understanding of the environmental impacts of MPAs. Some of these research projects also involved citizen science, further engaging the public with marine issues.

Respondents observed improvements in the marine environment, which they attributed to MPAs. Many stated that this was the most important positive impact of the MPAs and described feelings of hope and inspiration at the thought of the improvements that were possible and what that could mean for their local area.

According to the Social Attitudes Survey[1], and the short structured interviews, the general public tended to be in support of MPAs, though were often unsure what they were.

Wider Context

Although this research focused on the socio-economic impacts of MPA management measures, it was common for respondents to discuss other related topics which helped to explain, highlight or contextualise the more direct impacts. Some of the areas where impacts were visible were particularly rural and remote, increasing the vulnerability of the communities and industries that operate there. Many fishers described the shortage of crew as being a key challenge and in some cases this was the biggest challenge they faced. In addition, rural areas can suffer from depopulation, which some respondents linked to the shortage of crew.

Respondents from fishing and related industries highlighted that MPA management measures were not the only thing affecting their ability to maintain their businesses. Other challenges were also highlighted, such as practical difficulties in getting access to markets, the limitations caused by the quota system, fluctuating seafood and fuel prices, the cumulative impacts from other industries, and climate change. The impacts of these issues interact and, in some cases, may compound the impacts of MPA management measures.

Insights from the Case Studies

The case studies focused on MPA impacts in four specific areas and helped to illustrate how the MPA management measures, and their effect on marine industries and communities, can combine with other factors, leading to significant impacts.

[1] Marine Scotland, *Marine Social Attitudes: Survey*, by The Scottish Government (The Scottish Government, 2020).

While the findings of this study are heavily influenced through the local context, they provide useful insight for other locations and MPAs.

Respondents from communities near the South Arran MPA (Campbeltown, Tarbert, and Carradale) described the difficulties of running a business in a rural and remote area. Depopulation in this area has exacerbated the struggle to find crew, high transport costs make supplies more expensive and industries linked to fishing were described as highly interdependent and vulnerable as a result. Additional stresses, such as restricted access to fishing grounds as a result of the MPA measures can compound existing pressures.

On the other hand, respondents from communities near the Wyre and Rousay Sounds MPA and Sanday SAC in Orkney (Kirkwall and Stromness) did not describe significant impacts due to the MPAs. There are several industries operating in the waters around Orkney and the challenge here is navigating the impacts these might have on each other. While these industries provide employment, and so reduce the reliance on fishing, there are also concerns that some of them are taking potential crew members away from commercial fishing. These issues were of greater concern among respondents than the impacts of the MPAs.

Conclusion

This research has drawn on a wide range of sources of quantitative and qualitative evidence. Perhaps most importantly the project has included detailed input from interviews with individuals from a range of impacted industries in different localities. It is challenging to draw clear conclusions on the extent of impacts that MPAs have had; however, using a combination of methods and data sources enables us to have confidence in our findings. There is certainly evidence that MPAs have made fishing more challenging in some areas with additional knock on impacts on associated industries. Some businesses have had to adapt to survive. There is also evidence of positive environmental and community impacts, particularly with regard to public environmental awareness, research and education. The clearest message from the research, however, is that MPAs are one of the many challenges that face marine industries and their communities at this time. Where impacts were felt, this was often due to a combination of factors, one of which was MPAs. Whilst in some cases MPAs may have a minimal direct impact, when evaluated in combination with other existing challenges, they can exert a greater, cumulative strain than might be immediately apparent.

These findings highlight the importance of taking a holistic approach, which takes account of the wider context when carrying out socio-economic impact monitoring.

It is important to note that this research was carried out in 2019, before the Covid-19 pandemic. There have been serious consequences for coastal communities and industries as a result of the pandemic. These are likely to have exacerbated many of the struggles described in this report.

We recommend continued monitoring of the impacts of MPA management measures, as the marine environment and the industries that depend upon it continue to change and develop.

The inclusion of qualitative techniques in monitoring and impact assessment, as well as continued engagement with stakeholders are also recommended.

Section 1. Introduction and Background

This report provides an assessment of evidence of the socio-economic impacts of Scotland's Nature Conservation Marine Protected Areas (NCMPA[2]) since management measures were introduced in 2016.

The first round of Marine Protected Areas (MPAs) were designated on the 7th August 2014 to protect nationally important species, habitats and geology across Scotland's seas. Management measures were introduced for some inshore MPAs on 8 February and 23 March 2016, respectively, following a period of public consultation[3,4].

The management measures are thought to potentially impact a wide range of marine sectors and users, with most significant impacts predicted to affect fishing activity in several MPA sites and with knock on effects for wider seafood industries as well as other marine users. Scottish Ministers have, therefore, committed to monitor and report on the socio-economic impact of management measures to ensure that appropriate actions might be taken to mitigate any severe impacts on marine users and support emergent sectors and opportunities.

In 2016 research on the emerging evidence on the social impacts of Scotland's MPAs was carried out[5]. The work did not find any evidence, at a national level, of significant positive or negative socio-economic impacts linked to MPA management measures that were introduced in February and March of that year. Nonetheless, issues and concerns were identified in the report and it was recommended that further monitoring should be carried out in two to three years. It was noted that at the time of the research (2016), the MPA management measures had only been in place for a short period and it was felt that both positive and negative impacts may develop over time.

This assessment aims to provide Scottish Ministers with evidence of the observed positive and negative socio-economic impacts of MPA management measures, across sites in Scotland, three years post implementation. The project objectives are to:

- Further develop the methodology used in the first MPA socio-economic monitoring report with second phase analysis,
- Gather, update and analyse new evidence on the positive and negative socio-economic impacts of MPA management measures three years post-implementation,
- Provide Scottish Ministers with the existing evidence of the positive and negative socio-economic impacts of MPAs.

[2] Hereafter referred to as MPAs
[3] Inshore MPAs/SACs Consultation: 2014
[4] 2014 Consultation on the management of inshore Special Areas of Conservation and Marine Protected Areas - Consultation analysis report
[5] Marine Scotland, *Scottish Marine Protected Areas: Socio-Economic Monitoring*, by The Scottish Government (The Scottish Government, 2017).

Background

The purpose of Nature Conservation MPAs is to protect rare, representative and productive species, habitats and geology across Scotland's marine environment so that the rich diversity of life in the waters around Scotland and the benefits they bring can be enjoyed both now and in the future.

Scotland's seas provide nurseries and feeding grounds for species that are critical to the marine ecosystem and dependent maritime industries, including commercial fish species. Kelp, seagrass forests and offshore reefs help reduce the effects of storms by acting as a physical buffer. Healthy seas are more resilient to the impacts of climate change, as well as contributing to climate change mitigation through carbon sequestration.

Protecting rare, threatened, declining, or nationally representative species and habitats is important for their own sake, but also for the wide range of benefits they provide. These benefits are not only important for Scotland and the UK, but also for the world. There are, therefore, a number of legal frameworks and agreements that coordinate and govern the protection of seas at a national and international level.

Marine Scotland has duties and commitments to designate an ecologically coherent network under the following Acts and international agreements:

- the Marine (Scotland) Act 2010.
- the Marine and Coastal Access Act 2009.
- the OSPAR Convention.
- the European Marine Strategy Framework Directive (MSFD).
- the Convention on Biological Diversity.
- the World Summit on Sustainable Development.

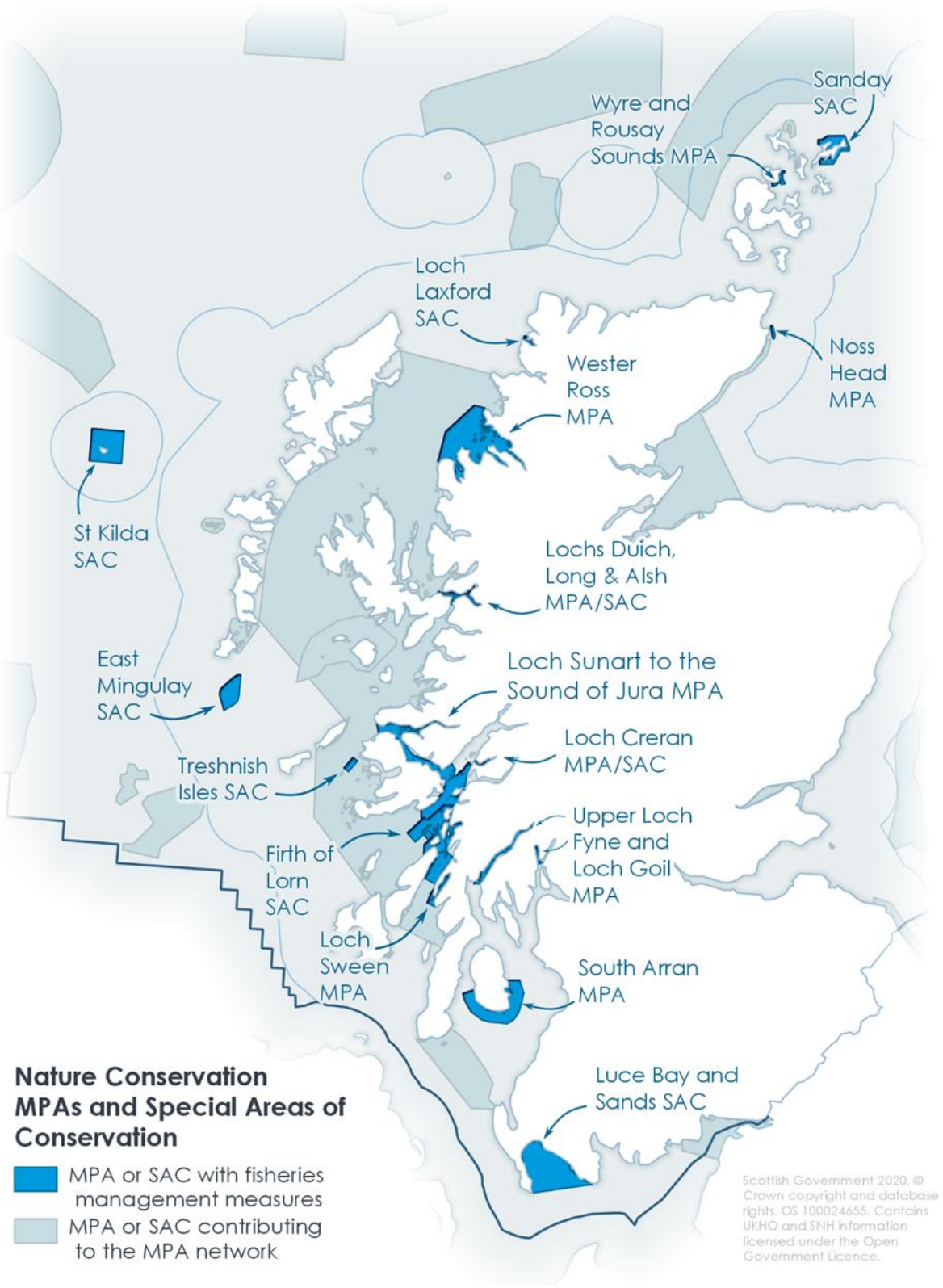
The 2009 and 2010 Acts require Marine Scotland, in designating a network, to have regard to a number of issues set out in the legislation, including the extent to which designation in Scotland would contribute to a UK network. The MPA network in Scotland's seas is designed to conserve a selection of marine biodiversity (species and habitats) and geodiversity (the variety of landforms and natural processes that underpin the marine landscapes). Marine Scotland has various powers to protect these special habitats and species, also known as protected features.

Thirty NCMPAs were designated in August 2014 following two public consultation exercises in 2013 and 2014. Following this, management measures were proposed for 10 inshore NC MPAs, and 9 inshore Special Areas of Conservation (SACs)[6], which were subject to public consultation over the following year (Figure 1.1). Management measures were introduced for some inshore MPAs on 8 February and 23 March 2016. These new management measures particularly affect fishing activity

[6] It should be noted that some of these overlap, and some were protected by existing designations.

in a number of MPA sites, while other marine users were already affected since MPAs were designated in August 2014, due to the protective provisions of the Marine (Scotland) Act 2010. For SACs, the provisions of Article 6 of the EU Habitats Directive have applied to other marine activities since designation. This means that the MPAs are considered during the licensing process when potential impacts on protected areas are assessed and where necessary mitigated, before the regulator gives consent. It is also possible that onshore industries, such as processing or vessel maintenance, may be indirectly affected by these designations and their associated management measures.

Figure 1.1 Spatial distribution of Marine Protected Areas in Scotland



Structure of report

Following the introduction and background section (0), the second section (Section 2) of the report summarises the methodological approach used to assess socio-economic impacts of MPAs in Scotland.

This is then followed by four sections describing the research findings:

Section 3. Socio-economic impacts on the Fishing Industry

This section considers the direct impact of the management measures on the fishing industry. This section forms a major part of the report and is divided into two subsections. The first sub-section is an analysis of relevant quantitative data to capture any impacts on fishing activity as a result of the MPA management measures. The second section presents qualitative data covering views and experiences of key informants and stakeholders on how MPAs have impacted on fishing businesses and communities in areas local to the MPAs.

Section 4. Socio-economic impacts on other key industries

Section 4 covers the socio-economic impacts on other important marine industries situated in coastal communities in areas affected by MPAs. These are seafood processing, aquaculture and marine tourism. These industries may experience socio-economic impacts due to the introduction of MPAs either as the result of the designation or as a consequence of changes in fishing activity, landings or employment.

Section 5. Wider social impacts on local areas

Section 5 presents the perspectives of local businesses and communities and considers some of the wider socio-economic impacts of the MPAs being introduced. These include perspectives that could be associated with the more immediate changes in the marine environment and marine industries. This section also presents data on public attitudes and awareness of MPAs.

Section 6: Wider Context

Section 6 summarises the cumulative impacts of marine developments in areas near MPAs, in order to illustrate the complexity in which marine industries and their communities operate. It also sets out wider challenges that marine industries face such as those seen on the global level. The introduction of MPAs is just one of a wider set of challenges facing marine stakeholders. In some cases, MPAs may have a minimal direct impact but if evaluated in combination with other existing challenges, they can exert a greater, cumulative strain than might be immediately apparent.

The final sections of the report are:

Section 7: Case Studies

Section 7 presents brief summaries of the four case study areas which are used to illustrate the impact of MPAs in a specific geographic area.

Section 8: Compliance

The compliance section sets out some data to demonstrate how effectively the restrictions and MPA measures are being complied with.

Section 9: Conclusion

The report ends with a brief conclusion summarising the key issues identified throughout the report.

Section 2. Methodological approach

2.1 Rationale for methodological approach

This study focuses on potential impacts of MPAs for the fishing industry, seafood processing, aquaculture and tourism, as these are the main marine industries that might be affected by MPAs and associated management measures on the west coast of Scotland. Wider impacts on coastal communities are explored through discussions with local authorities and community groups, as well as stakeholders from the groups described above.

A mixed methodological approach was used for this study to bring together both quantitative and qualitative data to comprehensively explore the socio-economic impacts of MPA measures in Scotland. This included analysis of:

- Existing quantitative fishing activity data that is held by Marine Scotland (collected for other purposes).
- Existing quantitative data on fisheries employment and compliance held by Marine Scotland (collected for other purposes).
- Qualitative data collected through interviews with key informants and stakeholders in communities affected by MPAs during a period of fieldwork in September 2019.
- Short, structured interviews carried out with members of the general public and local businesses in four case study areas during the fieldwork period.
- Findings from relevant questions in the Marine Social Attitudes survey conducted in 2018.

The marine environment and the industries and communities that depend on it are complex and influenced by a number of factors. For this reason, it can be difficult to identify changes in marine industries and communities, to understand the causes of these changes and to confidently attribute them to new interventions, such as MPA management measures.

The methodological approach, therefore, sought to address each of these issues in the following ways:

Identify changes

Analysis of quantitative data, such as fish landings and employment, was used to identify trends that might be related to MPAs. Quantitative data for other industries, was not available at the spatial scale required.

Qualitative evidence from in-depth, semi-structured interviews and short, structured interviews with key informants and stakeholders was used to identify changes that may not be captured in existing quantitative data.

Understand changes

Interviews gave us a more in depth understanding of the observed changes. Through this analysis we could determine why and how behaviours are changing in

relation to MPA management measures, and whether there are other factors underpinning some of the changes observed.

Attribute changes to MPAs

Attributing changes to interventions is difficult, especially in complex social systems. In this review, three methods were used to increase confidence in the links made between observed changes and MPA management measures. These are:

1. The control group

To determine which of the observed changes are due to MPAs, ideally communities near MPAs would be compared with a similar community, far from MPAs. The inshore Nature Conservation MPAs that are the focus of this research are distributed across the west coast of Scotland. There are no MPAs in inshore waters on the east coast of Scotland, and so this area could be used as a control. Another method, often used, is to look at a population before and after an intervention and explore any changes identified. Many of the characteristics of the population in question, and the factors that affect it, should be the same allowing the effect of the intervention to be assessed.

Neither of these methods can be entirely accurate, however. Fishing practices on the east coast are different to those used in the west coast and so drawing accurate comparisons is difficult. A 'before and after' comparison may include the impacts of changes in other factors affecting the fishing industry, such as biological trends, changing consumer preferences or changes in weather patterns, and so may also lead to inaccuracies in clearly assessing the impact of the MPA management measures. In this research, these two approaches are combined to build up a clearer picture of changes associated with MPA management measures enabling greater confidence to be drawn from the conclusions.

2. Triangulation

Using a mixed method approach enables the same issues to be explored using different datasets and analyses as well as allowing us to compare results to see if they match. For example, changes in landings reported in the interviews can be compared with analysis of existing landings datasets held by Marine Scotland.

3. Corroboration

New stakeholders were contacted and interviewed until saturation was reached i.e. the same names were being suggested repeatedly by respondents. This gives us confidence in the sample. Themes were coded and reported based on the frequency with which they were raised by stakeholders and stakeholder groups. The same issues being raised by multiple respondents can give us confidence in the importance of that issue – especially when it is raised by respondents from a range of locations of stakeholder groups.

Data availability

Most of the quantitative data analysed in this study related to the fisheries sector and not to other sectors. This is because Marine Scotland holds datasets relating to fishing activity at a fine enough scale and over a time frame long enough to link to MPA management measures. Quantitative data was not available for other sectors, at a spatial scale or time frame appropriate for exploring the impacts of MPAs.

For other sectors it was necessary to depend more heavily on primary data collected through interviews.

The Marine Social Attitudes survey explored the views of the Scottish public with regard to the marine environment, including MPAs. It included postcode data, enabling finer scale analysis.

2.2 Quantitative Data

A wide range of datasets were included within the analyses, including:

Fishing activity data

Dataset description

Marine Scotland collects data on the tonnage and target species of vessel landings, as well as information about the main gear type used, the vessel length and the voyage start and end times. Vessels over 12 metres in length are also fitted with a Vessel Monitoring System (VMS), which sends out a signal indicating the vessel location every 2 hours. Vessels under 10 metres in length are required to fill in Fish1[7] forms, indicating the location where most of their fishing activity took place.

Only the VMS data has been analysed for this project as the Fish1 forms do not provide data for the entirety of the period of interest, having only been used since 2017. The under 10 metre vessels are most likely to use static gear (either creel or hand-diving) as their main gear type, and so, for the most part, are unlikely to be directly affected by MPA management measures, as these fishing practices are subject to fewer restrictions.

Analysis

Landings data was analysed to show trends over time at the level of ICES rectangle and at port district level. This data includes landings from over, and under 10 m vessels and all gear types.

The ICES rectangles are the smallest geographic areas for which fishing activity data can be disaggregated. ICES rectangles are areas of the sea defined by ICES that are approximately 30 nautical miles by 30 nautical miles. They have codes based on a grid reference e.g. ‘41E7’.

[7] Owners/masters of vessels with an overall length of 10 metres and under are required to complete a FISH1 form, as they are not fitted with VMS. This includes information about the date and duration of each fishing voyage, the gear used, weight and species landed, port of departure and landing, and the co-ordinates where most of the fishing took place.

This review has examined fishing activity in ICES rectangles containing MPAs, to explore trends in landings for the main fish species targeted by gears that are most affected by MPA management measures. These are *Nephrops,* either trawled or creeled, and scallops, either dredged or hand-dived. Landings from rectangles containing MPAs have been analysed for changes relative to a 2013-2015 baseline (i.e. pre implementation of MPA management measures). These changes were presented with reference to MPA management measures to see if the patterns were consistent.

At the port district level, landings were also analysed for changes relative to a 2013-2015 baseline. Port districts near MPAs (west coast) were compared to those that are not near MPAs (east coast). In this way we can begin to see whether observed changes are unique to MPA areas.

VMS data was used to determine which vessels fished in or near MPAs, in 2014 and 2015, before management measures were introduced. This enabled our analysis to focus on vessels which fished inside the MPA and would be expected to be most affected by management measures. The amount of time that these vessels spent at fishing speeds within MPA boundaries was determined and averaged for the two-year period. With this information it was possible to categorise vessels based on the extent to which they could be said to depend on the fishing grounds within the MPAs. Landings data for these vessels was then analysed for the 2013-2018 period to establish any changes since the introduction of MPAs in 2016. This analysis should indicate whether vessels which fished in MPAs were impacted by management measures.

Compliance data

Marine Scotland's Compliance Division collect data on the number of reports of suspected incursions into MPAs, and the number and type of enforcement outcomes. Compliance also has information about the level of monitoring carried out by the different types of Marine Protection Vessel. This data is presented to indicate the extent to which the management measures of MPAs have been complied with and thus the degree to which results of this research are related to management measures.

Social Attitudes Survey data

Marine Scotland commissioned research to improve understanding of how Scottish residents interact with the marine environment (sea and coastal areas), their perceptions of how it should be managed and their environmental concerns, amongst other issues. Data was collected using an online questionnaire administered to a representative sample of Scottish residents. Two of the survey questions covered the subject of MPAs, and the results are presented in this report.

2.3 Qualitative Data

Qualitative data was collected through key informant interviews, stakeholder interviews, and short structured interviews with business owners and members of the public. A review of ethics and data protection considerations was carried out, to ensure that the research adhered to the robust ethical standards and duties

expected of Scottish Government social research, and in order to comply with legal obligations.

The main issues that needed to be considered related to GDPR, privacy and the need to obtain informed consent for recording the interviews.

Key informant interviews

Marine Scotland conducted in-depth interviews with key informants from the following sectors:

- industry representatives of the commercial fishing sector,
- representatives of the seafood processing sector,
- local authorities,
- tourism and community groups.

Compliance officers for each area near an MPA were also interviewed to get an overview of their perspectives on changes experienced since the implementation of the MPA management measures.

Key informants were selected from a list of individuals and organisations who represented groups who may have been impacted by MPAs, or who had engaged with processes to designate MPA sites and to develop the MPA management measures. The list of key informants was checked and added to by the Research Advisory Group. A list of the main stakeholder organisations represented is provided at Annex 2. The interviews were semi-structured and conducted largely face to face with some done by telephone. See Annex 3 for the list of interview questions.

Twenty-eight key informant interviews were carried out in total, each lasting approximately 30-90 minutes.

The aim of the key informant interviews was to get an overview of observed positive or negative socio-economic changes following the introduction of MPA management measures. They were also used to provide information to assist with the selection of case study areas.

The interviews provided in-depth qualitative information from representative members of the industries and groups which may have been impacted by MPAs. Such information sheds light on the context and motivations behind the results generated through the analysis of quantitative data described in other sections

Case studies

Four case study MPAs were selected to enable an area specific analysis of the impacts of individual MPAs on the businesses and communities closest to them.

The case study areas were chosen using a set of criteria to ensure that a good range of types of issues relating to MPAs were covered. The criteria were developed using

information from the key informant interviews as well as preliminary analysis of fishing data and were agreed by the Research Advisory Group.

The criteria identified were:

- Perceptions or evidence of compliance issues in an area,
- Controversial designation of the site or concerns expressed during the consultation,
- Type of activity prohibited in the area (to get a range),
- Any evidence of changes in fishing fleet composition and/or activity,
- Any changes in port registration or landings near the MPA,
- Other marine developments nearby,
- Potential for, or existence of, tourism in the area,
- Existence of active community groups in the area.

At the end of this process the following sites were chosen:

- **South Arran MPA** – chosen because it covers a large area, where a lot of fishing takes place, and so there was potential for impacts on the fishing industry. Static gear fishing is prohibited in some zones. There is also an active community group associated with the MPA. The site is considered to be controversial.
- **Wester Ross MPA** – chosen because the site was controversial to begin with, but now less so. There is value in exploring reasons for this change. There are active community groups in the area. There are also aquaculture sites, so cumulative impacts can be explored.
- **Loch Sunart to the Sound of Jura MPA** – chosen because it covers a large area where a lot of fishing took place, and so there was potential for impacts to the fishing industry. Marine tourism is well established in the area and so there were potential implications for tourism associated with the MPA.
- **Orkney (Sanday SAC and Wyre and Rousay Sound MPA) –** chosen because it was not controversial and impacts on fishing were not expected. However, a range of marine industries use the inshore waters around Orkney and there was potential for cumulative impacts.

Three respondent groups were targeted in each case study area: individual stakeholders, local business owners and members of the general public.

Individual stakeholder interviews

In each case study area stakeholder interviews were undertaken with a selection of respondent groups who were identified as having the potential to be impacted in

some way by MPAs. In the same way as the key informant interviews, they provided an in-depth understanding of the issues discussed. They tended to be more personal, however, describing individual experiences and reflections, rather than providing insights about the community.

Key informants were asked to provide introductions to stakeholders in the relevant area. Subsequently, a form of snowball sampling was used to identify further stakeholders. This method involved asking each stakeholder to suggest further stakeholders who might be relevant. This process continued until saturation was reached i.e. the same names came up repeatedly, or time ran out.

We made numerous attempts to contact community councils and other local groups in each area, but were unsuccessful. It is often difficult to contact members of the public who are not part of an interest group.

Using advice from the Research Advisory Group, Key Informants and Compliance officers, who are all active within communities and sectors linked to MPAs, we aimed to engage with all those who might be affected by MPAs, including those who might not have been aware of, or engaged with the process.

Like the key informant interviews, stakeholder interviews were semi-structured and conducted by telephone or face-to-face. See Annex 4 for the questions used.

Short structured interviews with members of the public

It is important to understand how members of the public, including those living around MPAs, feel about them together with the other marine activities taking place in the area. It is also important to explore whether members of the public have been impacted by the introduction of MPAs and what they understand of the impacts felt by other groups.

To this end, in each case study area, members of the public were approached and asked to complete short, structured interviews. See Annex 5 for the questions asked. A convenience sampling approach was used i.e. people were approached on the high-street or in busy areas of the towns we visited. Although this approach does not ensure a representative sample, it enabled us to quickly gain some insight into the views of the general public.

Short structured interviews with local businesses

Although some industries may be directly impacted by MPAs, both positive and negative indirect impacts may be felt by other businesses located in areas close to MPAs. In each case study area, businesses on the local high street were approached and asked to complete a short structured interview. See Annex 6 for the questions asked. Each business on the high-street was approached, and those that agreed were interviewed. As above, this is a form of convenience sampling, and was considered an appropriate way to quickly gain some insight into the views of this group.

Both the general public and business short structured interview guides are available in Annex 5Annex 6. Note that in both, the questions were designed to align with

those asked in the Social Attitudes Survey, the findings of which are provided in section 5.4. Neither survey obtained a large enough sample to be considered robustly representative of each local area, but the results give an indication of the attitudes of people and business owners living near MPAs.

Interview Data analysis

The key informant and stakeholder interviews were transcribed and imported into NVIVO software[8]. This software allows respondents to be classified according to chosen characteristics e.g. sector, MPA of interest, and allows interview data to be coded according to themes such as “loss of sheltered grounds” or “environmental benefits”. In this way one can determine which themes were most common across different groups of respondents.

An emergent broad coding framework was produced by the researchers based on first impressions of the main themes that arose during fieldwork interviews. This was refined during the coding process and was reviewed at the end to ensure that the coding was consistent throughout.

Structured interview analysis

General public and business interview data was entered into an MS Excel spreadsheet. Both structured interviews explored respondents’ level of understanding, attitudes and perceptions of MPAs. These responses were grouped together and analysed so that they could be compared with the Social Attitudes Survey results.

The other responses to the questionnaire were imported into NVIVO so that they could be analysed by theme. The sample size was not large enough to be suitable for quantitative analysis.

[8] QSR International (1999) NVivo Qualitative Data Analysis Software [NVivo 11]. Available from Qualitative Data Analysis Software | NVivo (qsrinternational.com)

Section 3. Socio-economic impacts on the Fishing Industry

This section considers the direct socio-economic impacts of the management measures on the fishing industry. The fisheries management measures associated with Marine Protected Areas have applied restrictions to activities that are permitted to take place within the MPA boundary. These include restrictions on the size of vessel and type of fishing gear that can be deployed within the MPA. Whilst restrictions vary depending on the MPA, most commonly, mobile gear is restricted from these areas, while static gear is permitted. This has the effect of restricting the access of some fishers to certain fishing grounds, which may have consequences for fishing businesses and across the fishing industry.

The first section provides an analysis of relevant quantitative data on fishing activity (as described above). The second section presents the findings from targeted interviews covering views and experiences of key informants and stakeholders on how MPAs have impacted on businesses and communities in the local area. This is preceded by a brief overview of the fishing sector.

Summary of key findings

The evidence presented in this section suggests that MPA management measures have had localised impacts on landings and employment in areas near MPAs and that fishers have adapted to these in several ways.

Analysis of landings data show that landings to ports near MPAs have mostly declined from 2016-2018 and the same is true for landings from some ICES rectangles containing MPAs.

Further analysis of landings from trawl vessels which had fished within MPA boundaries before management measures were introduced, suggest that trawl vessels are now catching less from rectangles containing MPAs and are compensating for this by fishing more heavily in other rectangles, further from MPAs. Total landings for these vessels remained the same, or higher, apart from those which were particularly frequent users of the fishing grounds within MPAs. These fishers appear to have found it harder to compensate for lost landings from the MPA areas, showing a decline overall in total landings after MPA measures were introduced.

Landings from dredge vessels who had fished within MPA boundaries declined from 2013-2018 both from within rectangles containing MPAs, and those not containing MPAs. The decline was steeper after 2016, suggesting that MPAs may have been a contributing factor.

These results are borne out by the reports of respondents from the fishing industry, who stated that they were fishing more heavily in other areas since the MPAs were introduced.

- They expressed concern about the extra pressure on these grounds and the impact this might have on fish stocks
- Many respondents from the fishing industry said that it was sheltered, winter fishing grounds that they had lost access to and that, without these areas, they were less able to fish in the winter as they felt it was too dangerous.

To reach grounds where they could fish, respondents reported having to steam further, in some cases staying out on the boat for a few days at a time instead of coming home each night.

- This saves them the time and fuel required to make the journey each day.
- A few highlighted the impact this schedule can have on family life.

Approximately a quarter of the fishers interviewed described changes they had made to their business to adapt to the MPA management measures. These changes were often either:

- buying a bigger boat that would enable them to travel further and fish in worse weather conditions, or,
- buying static gear so that they could fish in the MPAs.

There were some concerns expressed by interviewees about the impact that an increase in larger vessels and increased numbers of creels might have on fish stocks.

It was common for static gear fishers to describe feeling much more secure in their fishing, due to the MPAs. They mentioned having access to more grounds and types of fishing than before the implementation of the MPA management measures.

About a fifth of respondents from the fishing industry described improvements in stocks in, or adjacent to, MPAs. They also described improvements to the marine environment more generally that they had noticed since the introduction of MPAs.

Analysis of employment data showed that employment on mobile gear vessels in port districts on the west coast of Scotland had decreased slightly while employment on static gear vessels had increased. This trend was particularly pronounced in some districts.

These trends corroborated reports from fishers:

- A number of mobile gear fishers described operating with a reduced number of crew, while some static gear fishers said that they had taken on more crew.
- A number of respondents linked to the fishing industry mentioned people selling their businesses due to MPAs. A relatively small portion of these related personal accounts of selling their business.
- People who left the fishing industry were commonly said to have found work in aquaculture or on service vessels.

Overview of the Scottish Commercial Sea Fisheries Sector

In order to understand the impacts described in the following sections, it is important to look at the contribution of fishing to the national and local economy and to define which part of the Scottish fishing industry is relevant for this research.

In 2017 fishing generated £316 million GVA: accounting for 0.24% of the overall Scottish economy and 6% of the marine economy GVA. The commercial fishing industry provided employment for 4,800 people (headcount), contributing 0.19% of the total Scottish employment and 6% of the marine economy employment.

Figure 3.1 shows the distribution of the value of demersal, pelagic and shellfish landings by the UK fleet, by ICES rectangle in 2016 over the inshore (inner line) and offshore waters (outer line). The inshore areas of the west coast of Scotland, are important areas for shellfish fisheries, while the east coast and offshore areas are more important for pelagic and demersal fisheries.

This report focuses on inshore fishing on the west coast of Scotland, as this is where the first round of MPAs are located. The relevant fishery for this research is, therefore, the west coast shellfish fishery, comprising mostly scallops and *Nephrops*, caught using static gear (creels or hand diving) and mobile gear (trawl and dredge).

In the following section evidence is presented which may suggest changes to the income and operating costs of vessels on the west coast of Scotland as a result of the MPAs. An understanding of typical values for these, for the relevant segments of the fleet, will help to put this evidence into context.

Figure 3.1 Value of demersal, pelagic and shellfish landings from UK vessels by ICES rectangle, 2016

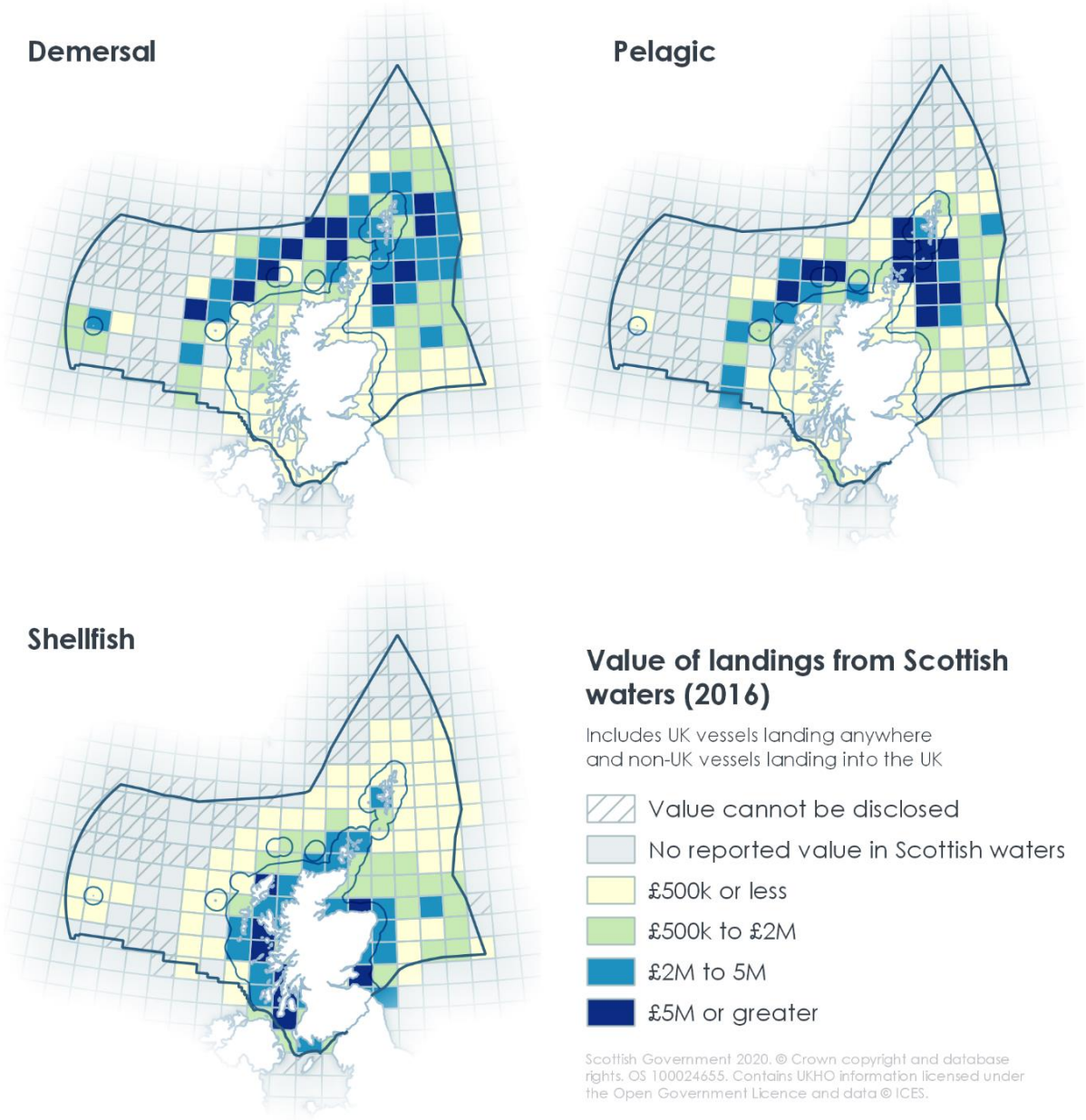


Table 3.1 shows the average income and operating costs for segments of the UK fishing fleet that are most relevant for this research. The 2017 data from Seafish indicated that the types of vessels described in this study may have an income of £59,000 - £494,000 depending on the size of vessel and gear used. Between 65-89% of this income may go towards operating costs (£44,676 - £413,171), approximately 11% of which is spent on fuel and 25-40% is spent on crew costs.

Table 3.1 Income and operating costs for relevant segments of the Scottish fishing fleet, 2017 data

Fleet segment	Average fishing income (£'000)	Average annual operating costs (£)	Operating costs as % of income	Average annual crew cost per vessel (£)	Average annual fuel costs per vessel (£)
West of Scotland *Nephrops* trawl over 250 kW	350	315,091	87	107,464	57,741
West of Scotland *Nephrops* trawl under 250 kW	175	142,077	80	53,302	25,468
UK Scallop dredge over 15 m	494	392,295	79	154,313	76,553
UK scallop dredge under 15 m	192	130,970	89	33,231	20,614
Under 10 m pots and traps	59	44,676	74	14,980	4,980
Pots and traps 10-12 m	144	103,038	65	46,330	9,487
Pots and traps over 12 m	491	413,171	75	171,943	51,302

Most of the operating costs of a fishing business are spent in the local community, giving an indication of the local economic contribution of a fishing vessel. In addition, the skipper and crew are likely to be using shops and other facilities in the community contributing further added value to the local economy.

Section 3 A Quantitative data analysis: Fishing Activity and Employment Data

Marine Scotland holds data on the number of vessels registered in Scotland, the amount of fish they land, which ports they land to, and the number of people they employ. In this section, this data is used to explore whether a change in these factors can be seen following the introduction of MPAs in 2016. This analysis is based on the assumption that if the MPA management measures are having an impact on fishing vessels, this would reduce activity and landings in the areas affected by management measures. Furthermore, if MPA management measures are displacing vessel activity because of restrictions on some of their traditional fishing grounds, it is expected that there would be increased activity and landings in areas not affected by MPA management measures.

3.1 Trends in overall fishing activity by Scottish vessels

Marine Scotland reports fishing activity statistics each year[9]. These national statistics indicate that total landings have remained relatively stable from the 2013-2015 average to 2018 suggesting the industry is, as a whole, not worse-off since the introduction of MPA management measures (see Table 3.2). It is, however, important to note other factors will have an impact on fishing activity and communities. This is examined further in other sections.

Table 3.2 Change in total landings and registered vessels, relative to 2013-2015 baseline

	2013-15 baseline	2018	% Change
Total Landings	429,255 (tonnes)	445,602 (tonnes)	3.80
No. Registered vessels	2,017	2,089	3.57

Since the MPA management measures are geographically focused on the west coast of Scotland and around the islands of Orkney, it is possible that the aggregate industry figures mask impacts across specific areas around the MPAs. It is, therefore, important to consider trends by geographic areas.

3.2 Activity of Scottish Registered Vessels by ICES[10] Rectangle

Scottish commercial fishing vessels are currently required by EU law to provide information about the fish they are landing into ports, including the gear that was used to catch it and the area of the sea in which it was caught. The finest scale at which this can be presented is the ICES rectangles (approximately 30x30 nautical miles).

[9] Scottish sea fisheries statistics 2018

[10] International Council for the Exploration of the Sea

Table 3.3 shows trends in landings from each ICES rectangle containing MPAs. The percentage change in landings each year from 2016 to 2018 is shown relative to a 2013-2015 average baseline. Only rectangles which exhibit clear and notable trends are shown here. A table with details of all rectangles containing MPAs can be seen in Annex 8. It should be noted that several ICES rectangles contain more than one MPA, and that for some rectangles the area of MPA comprises a very small proportion of the total rectangle area. Where the MPA area is a very small proportion of the ICES rectangle, this has been marked with an asterisk and care should be taken in interpreting these findings.

Key finding: The analysis below shows that, for some ICES rectangles containing MPAs, there have been changes in *Nephrop* and scallop landings following the introduction of MPA management measures. In some cases, these changes are consistent with the fishing restrictions associated with the management measures i.e. areas where deployment of mobile gear is prohibited but static gear is allowed. We are, therefore, seeing some changes in fishing activity associated with MPA management measures.

Table 3.3 Changes in *Nephrops* and scallop landings by gear type, 2016 to 2018 relative to a 2013 – 2015 baseline

ICES Rectangle	MPA	Year	*Nephrops*		Scallops	
			Traps	Trawls	Dredges	Hand-dived
38E5	Luce Bay and Sands	Average 2013-15 landings (t)	0.18	30.96	237.54	
		2016	-	-55%	34%	-
		2017	-	-52%	4%	-
		2018	-	-57%	-19%	-
39E4	South Arran	Average 2013-15 landings (t)	15.36	2,556.48	256.94	-
		2016	-16.85%	28.63%	15.85%	-
		2017	30.86%	4.17%	-61.53%	-
		2018	-18.14%	-22.12%	-38.05%	-
40E4	Loch Sween, South Arran, Upper Loch Fyne and Loch Goil	Average 2013-15 landings (t)	175.59	1,665.04	593.05	67.31
		2016	33.11%	-1.11%	-0.32%	3.13%
		2017	26.63%	-11.03%	-34.52%	-21.37%
		2018	29.74%	-26.08%	-46.20%	-36.12%
41E4	Loch Sunart to the Sound of Jura, Upper Loch Fyne and Loch Goil	Average 2013-15 landings (t)	10.89	235.72	21.05	1.25
		2016	4.82%	11.03%	-41.40%	81.20%
		2017	-3.22%	-33.32%	-19.56%	106.54%
		2018	-12.36%	-33.98%	-65.18%	91.67%
42E2	East Mingulay	Average 2013-15 landings (t)	6.21	216.75	23.32	0.75

		2016	-44.37%	43.87%	68.34%	-100.00%
		2017	-85.76%	85.30%	-5.02%	-92.32%
		2018	-93.77%	-21.10%	14.45%	-23.44%
42E3	Loch Sunart to the Sound of Jura, Treshnish Isles*	Average 2013-15 landings (t)	76.39	549.89	574.15	16.53
		2016	-4.40%	46.79%	11.93%	-68.71%
		2017	-38.13%	18.01%	-19.24%	-34.07%
		2018	-47.81%	-8.05%	-32.76%	-75.64%
42E4	Loch Sunart to the Sound of Jura, Loch Creran	Average 2013-15 landings (t)	25.50	79.64	66.90	32.17
		2016	55.21%	-8.96%	-5.86%	14.48%
		2017	139.35%	-24.79%	-40.67%	-1.35%
		2018	140.83%	-59.35%	-46.93%	-58.48%
45E6	Noss Head	Average 2013-15 landings (t)	0.06	0.03	211.42	
		2016	1431.67%	-100.00%	-44.58%	-
		2017	3074.00%	-100.00%	-59.18%	-
		2018	3535.83%	-100.00%	-79.79%	-
47E7	Sanday, Wyre & Rousay Sounds	Average 2013-15 landings (t)	1.46	1.04	93.90	170.23
		2016	-98.18%	245.59%	-75.66%	59.99%
		2017	-67.23%	176.37%	-20.67%	9.51%
		2018	-93.20%	84.39%	-36.03%	58.56%

>50% Increase	30-50% Increase	20-30% Increase	10-20% Increase	0-10% Increase	0-10% decline	10-20% decline	20-30% decline	30-50% decline	>50% decline

* These MPAs comprise a very small proportion of the total rectangle area

A decline in trawled *Nephrop* landings can be observed in ICES rectangle 38E5 (Luce Bay and Sands), 39E4 (South Arran MPA), 40E4 (Loch Sween, South Arran and Upper Loch Fyne and Loch Goil MPAs), 41E4 (Loch Sunart to the Sound of Jura MPA) 42E4 (Loch Sunart to the Sound of Jura and Loch Creran MPAs). The use of trawl gear is prohibited in large parts of these MPAs, meaning that trawlers do not have access to *Nephrops* fishing grounds in these areas. **This suggests that the MPA management measures could be responsible for the decline in *Nephrops* landings in these rectangles.** For some of these rectangles, such as 39E4 (South Arran MPA), trawling is prohibited in only a small proportion of the rectangle's sea area, and so observed changes in landings may not be attributable to the MPAs.

An increase in creeled *Nephrops* can be seen in 40E4 (Loch Sween, South Arran and Upper Loch Fyne and Loch Goil MPAs), 42E4 (Loch Sunart to the Sound of Jura and Loch Creran MPAs). Creeling is mostly permitted in these MPAs[11], while mobile gear is not, potentially allowing creel fishers greater access to *Nephrops* grounds in these areas. A steep decline in creeled *Nephrops* can be seen in 42E2 (East Mingulay). Creeling is prohibited in 50% of this site and so creel fishers have lost access to some of these fishing grounds. **This suggests that the MPA management measures may have resulted in increases in creeling activity in some areas, and decreases in others.**

In a number of the ICES rectangles there is also evidence of a decline in landings for dredged scallops. This can be seen in 38E5 (Luce Bay and Sands), 40E4 (Loch Sween, South Arran and Upper Loch Fyne and Loch Goil MPAs), 41E4 (Loch Sunart to the Sound of Jura and Upper Loch Fyne and Loch Goil MPAs), 42E3 (Loch Sunart to the Sound of Jura, Treshnish Isles) and 42E4 (Loch Sunart to the Sound of Jura, Loch Creran). **The use of dredge gear is prohibited in large parts of these MPAs, meaning that dredgers do not have access to the scallop grounds within the designated area.** Landings of dived scallops in 41E4 (Loch Sunart to the Sound of Jura and Upper Loch Fyne and Loch Goil MPAs) show a sharp increase, but from a low baseline. Hand-diving is allowed in these MPAs, while the use of mobile gear is not, potentially giving divers greater access to the scallops in these areas. **This suggests that MPA management measures may have led to a decline in dredged scallops and an increase in landings of hand dived scallops in some areas.**

In other rectangles there appears to be no clear pattern to the changes in landings, or alternatively, it is clear that observed trends cannot be related to MPA management measures. For example, declines in dredged scallop landings can be seen in 45E6 (Noss Head) and 47E7 (Sandy SAC and Wyre and Rousay Sounds). The Noss Head MPA was not heavily dredged before the MPA was introduced, while Wyre and Rousay Sands comprises a very small proportion of the rectangle in question. The Sanday SAC was set up in 2005 and is unlikely to still be affecting landings in the area.

It is important to note that the analysis above serves as an indication of possible trends but cannot be used to confirm or deny impacts of MPA management measures. In many areas the ICES rectangles represent large areas when compared with the areas covered by the MPAs. Many of the MPA management measures are also zonal and seasonal. This makes it difficult to explicitly attribute changes in ICES rectangle landings to the presence of MPAs even though, in some cases, a correlation between the introduction of MPA management measures and a change in landings is visible. It is also possible that a decline in fishing, and therefore landings, within MPA boundaries may be compensated for by an increase in fishing in other parts of the same rectangle.

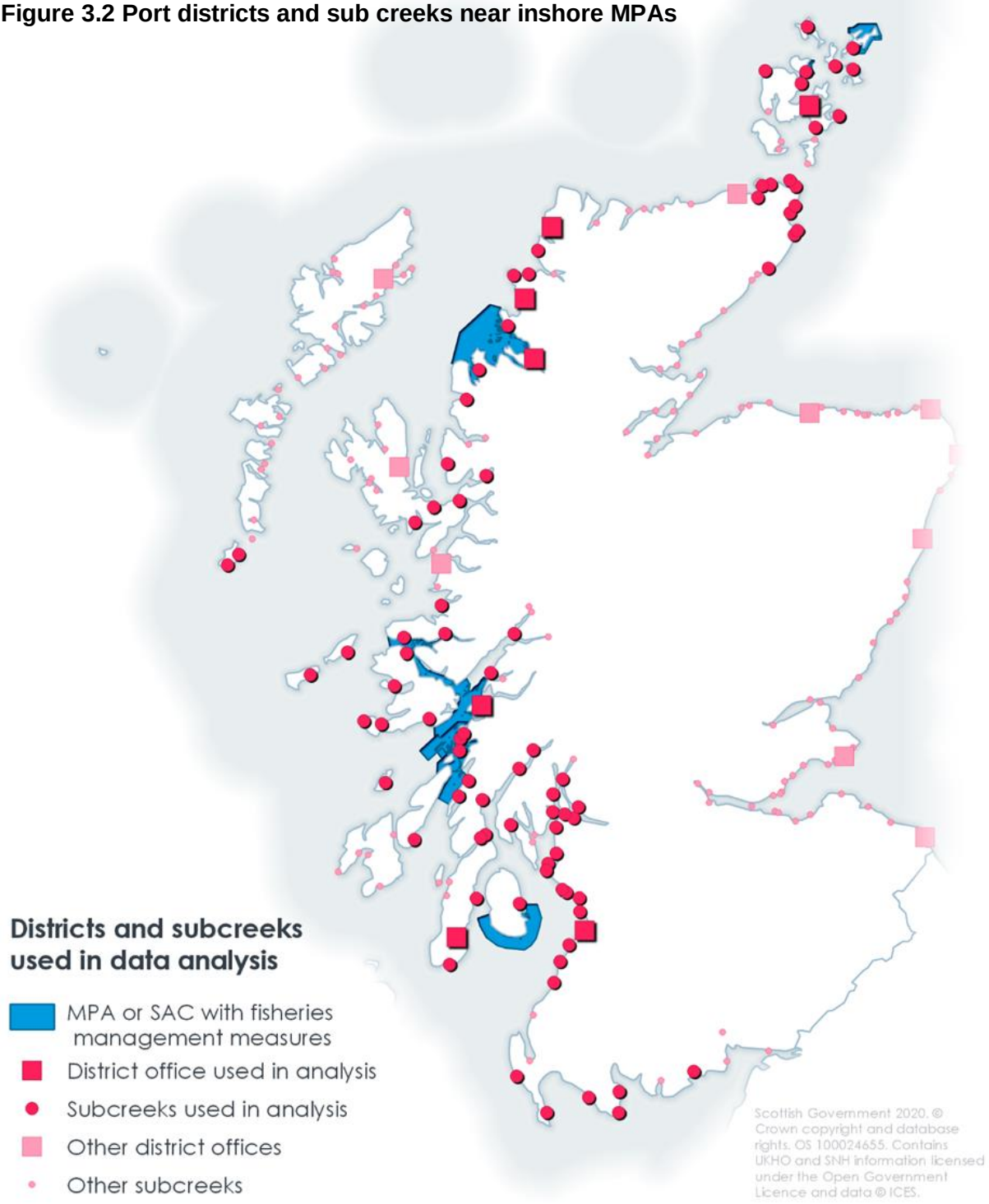
[11] Many of the MPAs have some zonal management, and so there may be small areas where creeling is prohibited

3.3 Port Analysis

Landings

Ports rely heavily on landings from fishing vessels and are important to the local economy in fishing communities. As well as looking at landings from ICES rectangles containing MPAs, as shown above, it is possible to look at landings to ports near

Figure 3.2 Port districts and sub creeks near inshore MPAs



MPAs (Figure 3.2). In this way we can start to see whether any changes in landings are having an impact on communities.

The cells in Table 3.4 and Table 3.5 are shaded to reflect the magnitude and direction of the change relative to the baseline. Blue indicates an increase, while red indicates a decrease. A darker shade reflects a greater change.

Key point: There has been a greater decline in landings in the ports near MPAs compared with other ports.

Table 3.4 Percentage change in total weight of landings (t), relative to 2013-2015 average, for each west coast port district

Port Districts	Average 2013 - 2015 (t)	% change 2016	% change 2017	% change 2018
Scrabster	825.02	-2.03	-1.03	-0.37
Orkney	1953.60	17.60	-3.81	-17.85
Stornoway	540.91	40.59	36.93	-16.11
Lochinver	503.57	-23.22	-38.10	-55.23
Kinlochbervie	381.73	-39.58	-21.98	-28.09
Ullapool	1118.89	22.59	-2.26	-15.79
Mallaig	124.46	10.21	4.72	-1.43
Oban	2459.87	-4.65	-16.13	-20.77
Campbeltown	2905.56	12.78	2.25	-19.72
Ayr	2284.22	6.74	3.81	2.43
Portree	537.80	8.89	-5.55	-26.46

Most west coast port districts have seen a reduction in landings in 2017 and 2018. Landings in Stornoway and Mallaig do not decrease until 2018, and in the case of Mallaig, the reduction is very slight. Ayr is the only port district to see an increase in all years, although the magnitude of the increase decreases from 2016-2018. The individual ports within each of these port districts show a greater variation in trends. The absolute landings and percentage change can be seen in Annex 9.

The trend in landings to port districts on the west coast contrasts with that seen on the east coast (Table 3.5), where most port districts see an increase in landings from 2016-2018.

Table 3.5 Percentage change in total weight of landings (t), relative to 2013-2015 average, for each east coast port district

Port district	Average 2013 - 2015 (t)	% change 2016	% change 2017	% change 2018
Aberdeen	1255.33	-12.29	0.45	-23.29
Anstruther	1275.67	16.64	36.01	32.79
Buckie	1194.00	45.48	64.07	37.19
Eyemouth	2079.67	8.33	42.33	43.77
Fraserburgh	24439.67	-6.02	11.66	14.53
Peterhead	150862.67	6.55	8.53	12.84
Shetland*	27092.00	18.99	13.81	-9.38

*Shetland average is based on 2014-2015, as landings to this port district decreased by 95% from 2013-2014 and so skewed the results

This review has focused on the west coast shellfish fishery as this is most likely to be affected by MPAs. Analysis comparing shellfish landings on the east and west coast, reveals the same pattern as total landings (Table 3.6 and Table 3.7).

Table 3.6 Percentage change in total weight of shellfish landings (t), relative to 2013-2015 average, for each west coast port district

Port district	Average 2013 – 2015 (t)	% change 2016	% change 2017	% change 2018
Scrabster	763.14	4.60	-3.74	-4.13
Orkney	1932.71	17.54	-4.40	-18.60
Stornoway	453.03	43.57	32.02	-11.65
Lochinver	481.27	-23.21	-38.79	-54.47
Kinlochbervie	83.08	-6.19	-58.49	-44.88
Ullapool	1053.73	14.78	-0.68	-22.21
Mallaig	123.73	9.05	2.06	-6.76
Oban	2443.89	-4.75	-16.49	-21.60
Campbeltown	2871.47	13.36	3.25	-19.04
Ayr	2278.76	6.89	4.01	2.52
Portree	535.32	7.70	-6.09	-26.72

Table 3.7 Percentage change in total weight of shellfish landings (t), relative to 2013-2015 average, for each east coast port district

Port district	Average 2013 – 2015 (t)	% change 2016	% change 2017	% change 2018
Aberdeen	1184.00	-8.87	4.65	-19.59
Anstruther	1232.33	18.47	37.46	35.52
Buckie	1096.33	41.93	53.33	23.32
Eyemouth	1904.67	13.14	50.42	55.51
Fraserburgh	5397.00	1.09	25.63	12.60
Peterhead	2891.67	43.65	49.22	-4.41
Shetland	1998.67	54.65	17.03	17.08

The reduction in landings to ports near MPAs from 2016-2018 could be linked to MPA management measures. If vessels are not able to fish as they used to, they may be catching less, and landing less to nearby ports. The same trend is not reflected in ports that are not close to MPAs, which could support this theory. It is important to note, however, that the type of fishing on the east coast, where fishing for finfish in offshore waters is more common, is very different to that on the west coast and means it is difficult to draw any strong conclusions from this data in isolation.

3.4 Activity of vessels fishing in MPAs before management measures

To explore some of the points highlighted in the previous sections in more detail, it is necessary to look more specifically at vessels which habitually fished within MPA boundaries before management measures were introduced in 2016**.**

Using VMS data, it is possible to identify vessels that fished within the boundary of an MPA before that area was designated, and to determine how much time was spent fishing within that boundary.

This list of vessels was filtered so that only those which spent more than 10 hours fishing[12] in an MPA between 2014-2015[13] were included in the analysis. Vessels were grouped into different time categories ranging from 10+ hours to 200+ hours, so that the amount of time spent in the MPA could be used to indicate how dependent these vessels were on the grounds within the MPA boundary. Information about these vessels can then be analysed for trends over the 2013-2018 period. In this way any changes that occurred after MPA management measures were introduced can be observed.

Table 3.8 shows the number of vessels that were included in this analysis, for different gear groups and time categories, and indicated the proportion of the west coast fleet who may have been affected by MPA management measures. The total is less than the sum of trawl and dredge vessels, as some vessels use both gear types.

Table 3.8 Number of vessels who fished within MPA boundaries for different time categories

Time Category	Gear Group	Number of vessels in each year					
		2013	**2014**	**2015**	**2016**	**2017**	**2018**
10 + hrs	Trawl	109	114	110	107	103	93
	Dredge	44	42	45	42	40	37
	Total	**141**	**149**	**147**	**139**	**135**	**124**
25 + hrs	Trawl	77	83	82	78	75	68
	Dredge	36	34	36	33	31	29
	Total	**105**	**110**	**111**	**103**	**100**	**92**
50 + hrs	Trawl	61	65	63	62	58	51
	Dredge	27	27	28	26	25	23

[12] This is defined as spending more than 2 hours at fishing speeds

[13] Before MPA management measures were introduced, and when VMS was widely adopted

	Total	**81**	**85**	**85**	**80**	**77**	**69**
100+ hrs	Trawl	40	43	40	40	38	33
	Dredge	21	19	21	19	18	16
	Total	**54**	**55**	**55**	**51**	**50**	**44**
200 + hrs	Trawl	24	26	25	26	24	20
	Dredge	12	10	12	11	11	10
	Total	**32**	**33**	**33**	**31**	**32**	**26**

Between 2013 and 2018 there were 1186 - 1143 vessels registered in port districts on the west coast of Scotland. The port districts vary in size, with each having between approximately 20-200 registered vessels (see Annex 10). The number of vessels included in this subset account for approximately 1-12% (depending on the time category) of the total number of vessels operating in west coast port districts suggesting that the impacts of MPAs are felt by a relatively small proportion of the total west coast fleet.

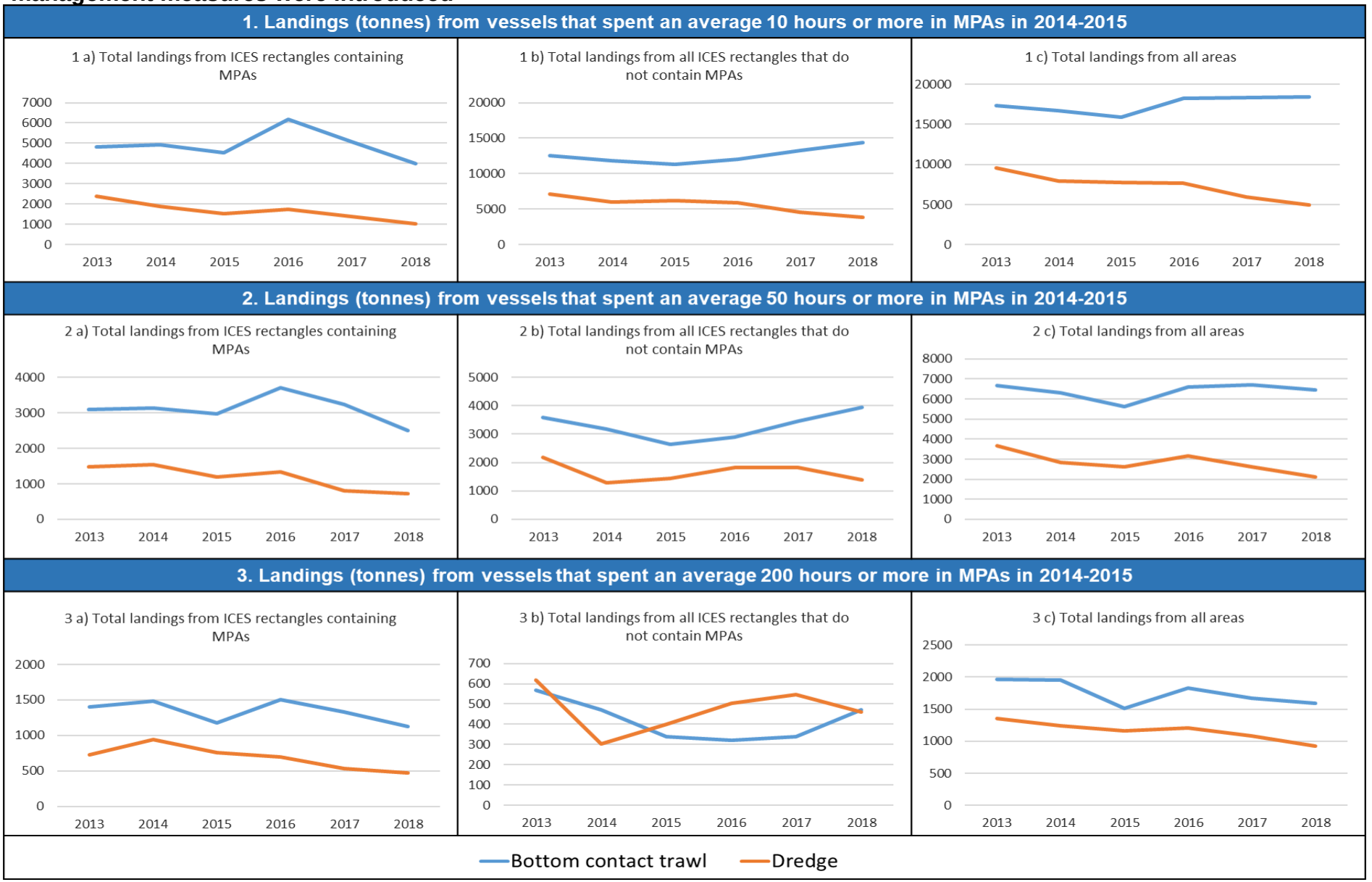
This analysis does not include any vessels entering the fleet after 2014, therefore any changes in ownership, home port registration, gear type or inward migration of vessels to this area are not included. Only those vessels that had remained operating as a Scottish vessel through the entire 2013-2018 period were included in the sample to allow for accurate before and after comparisons.

Vessel Landings data

Landings data for the vessels identified in the previous section was analysed to identify any changes between before and after the MPA management measures were introduced. This analysis can be used to indicate a correlation between MPA management measures and observed changes in landings. It is important to note this analysis cannot confirm a causal link between any observed correlation because it is not possible to control for other factors that might have influenced landings.

Figure 3.3 shows the trends in landings for vessels which spent differing amounts of time fishing in MPAs in 2014-2015. For each time category, there are 3 graphs indicating the total landings for that group of vessels, and the portion of those landings that were fished from ICES rectangles containing MPAs (MPA rectangles), and the portion fished from ICES rectangles that do not contain MPAs (non-MPA rectangles). Presenting the landings in this way, allows us to see whether displacement of fishing activity has occurred.

Figure 3.3 Change in landings over time, for vessels which fished in MPAs for different amounts of time, before management measures were introduced



Trawled landings

For vessels that fished in MPAs for 10 hours or more (graphs 1a, 1b, and 1c) trawled landings from MPA rectangles decrease after 2016, whilst landings from non-MPA rectangles increase from 2015 onwards. Total landings from all rectangles increase overall, relative to 2013. **This indicates that these vessels were able to compensate for lost landings inside MPA rectangles by fishing more heavily in other areas outside MPA rectangles**.

A similar trend is evident for trawled landings from vessels that spent over 50 hours and over 200 hours fishing in MPAs (graphs 2 and 3). Landings from MPA rectangles decrease from 2016 onwards, while landings from non-MPA rectangles increase after 2016. Total landings for vessels that fished in MPAs for 50+ hours remained near 2013 levels. For vessels which spent 200 + hours (graph 3 c) fishing in MPAs, total landings decreased relative to 2013 levels. **This could indicate that vessels that spent more time fishing in MPAs (i.e. over 200 hours) found it harder to compensate for the loss in landings by fishing elsewhere.**

All graphs show a decline in trawled landings from 2013-2015, followed by an increase between 2015-2016 (before MPA measures were introduced). This suggests that there are also other factors affecting trawled vessels fishing in these areas, other than MPAs. This corroborates findings from the qualitative part of this research. See Section 3 and Section 6.

Dredged landings

Landings from MPA rectangles for dredge vessels decline between 2013-2018 for all time thresholds (graphs 1, 2, 3 a). Although the decline starts in 2013, there is a slightly steeper decline post 2016. Total dredged landings (from all rectangles) show a similar trend. Dredged landings from non-MPA rectangles show a general decline from 2013-2018, but with a lot of fluctuation. The decline starting in 2013 indicates there are other factors affecting dredged landings but the 2016 dip in total landings suggests that the MPA management measures may have had some negative impact on dredge vessels

Average change in landings by weight per vessel

The average change in landings by weight (tonnes) for each vessel can give us an indication of the impact of reduced landings on vessel skippers and crew. Table 3.9 shows the average change in landings before and after MPAs were introduced per vessel for groups of vessels which fished in MPAs for different amounts of time.

This shows that trawl vessels that were most heavily dependent on MPAs (i.e. those that had fished in them for 200 hours or more) have been most affected by MPAs. Their landings decreased by nearly 12 tonnes (> 10%) on average per vessel between the baseline period and 2018. This suggests these vessels have not been able to recoup their landings from other grounds.

Trawl vessels which were less reliant on these grounds appear to be largely unaffected and have even increased average landings since 2013-2015.

Average dredge-caught landings decrease in every time category (varying between 25 and 40% depending on the time category), but the average reduction per vessel decreases in higher time categories. This appears to indicate that those who spent less time fishing in an MPA experienced greater reduction in landings. It may be that other, more important factors, were affecting dredge-caught landings at this time.

Table 3.9 Change in 2018 average landings (tonnes) per vessels relative to 2013-2015 baseline

	Trawl-caught landings (t)		
Time spent (hrs)	2013- 2015 Average Baseline	2018 Average	Average change (baseline-2018)
10 +	188.44	216.72	28.28
25 +	118.34	126.34	8.00
50 +	123.95	134.67	10.72
100 +	95.88	96.61	0.73
200 +	100.63	88.71	-11.92

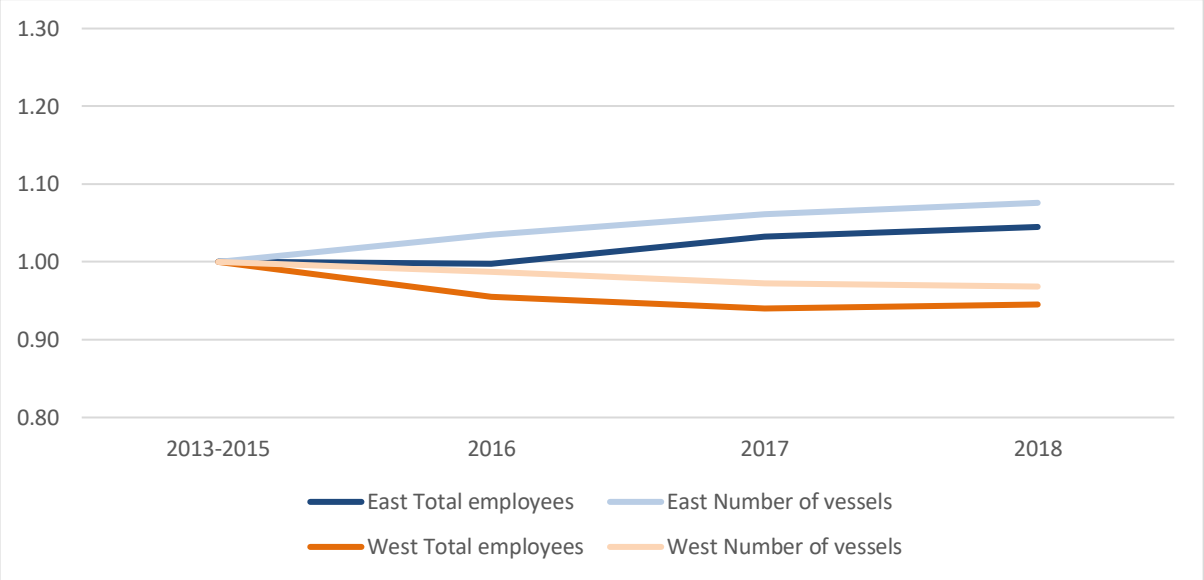
	Dredge-caught landings (t)		
Time spent (hrs)	2013-2015 Average Baseline	2018 Average	Average change (baseline-2018)
10 +	250.09	144.87	-105.22
25 +	194.62	141.76	-52.86
50 +	149.61	100.53	-49.07
100 +	127.54	95.06	-32.48
200 +	135.37	92.89	-42.48

3.5 Employment data

Each year, each fishery office in Scotland supplies Marine Scotland with an estimate of the number of vessels in their respective port district, some details about those vessels and the number of people employed on each vessel. This data can be used to give an indication of employment trends for this part of the fishing industry.

In Figure 3.4 employment numbers are split so that trends on the east and west coast can be compared. The numbers are presented as an index, where 1 is the total number of employees in the baseline period, and changes in employment in subsequent years are shown as a fraction of the baseline. Most of the MPAs are located on the west coast, while there are very few on the east coast. Comparing trends on each coast can be used as a proxy for 'region with MPAs' and 'region without MPAs'.

Figure 3.4 Change in employment and number of vessels on the east and west coast of Scotland, 2013-2015 index

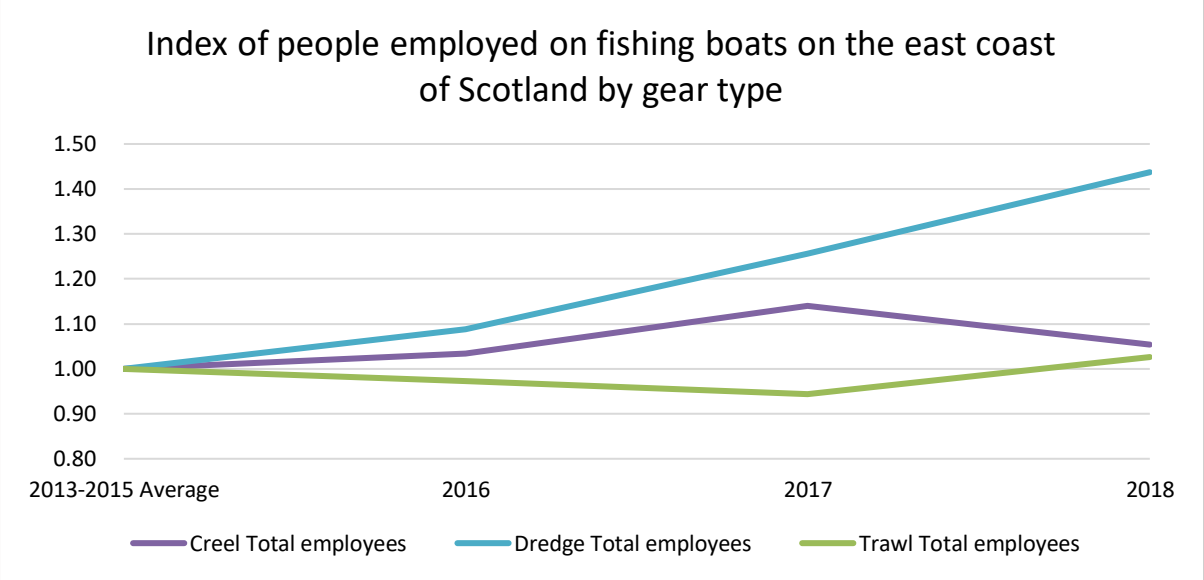


There has been an increase in the total number of employees on vessels on the east coast between the 2013-15 baseline and 2018, while the total number of employees on the west coast shows a gradual decrease over the same period. This reflects the ongoing trends in vessel numbers in each region: a steady increase on the east coast versus a steady but very slight decline on the west coast. Given that these are longer term trends that predate the introduction of MPAs, employment patterns overall, at the regional level, cannot be clearly linked to, and therefore do not appear to have been directly affected by, the introduction of MPA management measures in 2016.

The management measures in MPAs allow or exclude different methods of fishing. Employment on vessels using different gear types may, therefore, be affected differently. Comparing employment numbers on the east and west coast for the three main gear types allows us to explore this issue further.

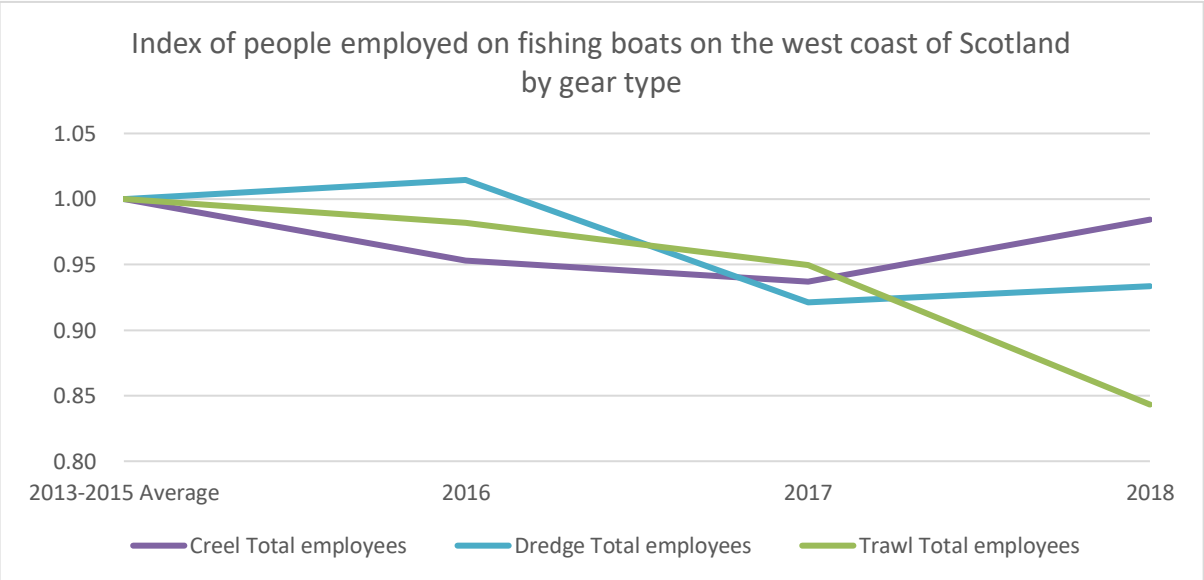
On the east coast (Figure 3.5) total employment on creel and trawl vessels has remained fairly stable, with some fluctuations between the baseline average and 2018. Total dredge employment is on a steady rise. Employment numbers for all gear types are at least greater than the 2013-2015 average.

Figure 3.5 Number of people employed on fishing boats on the east coast of Scotland by gear type



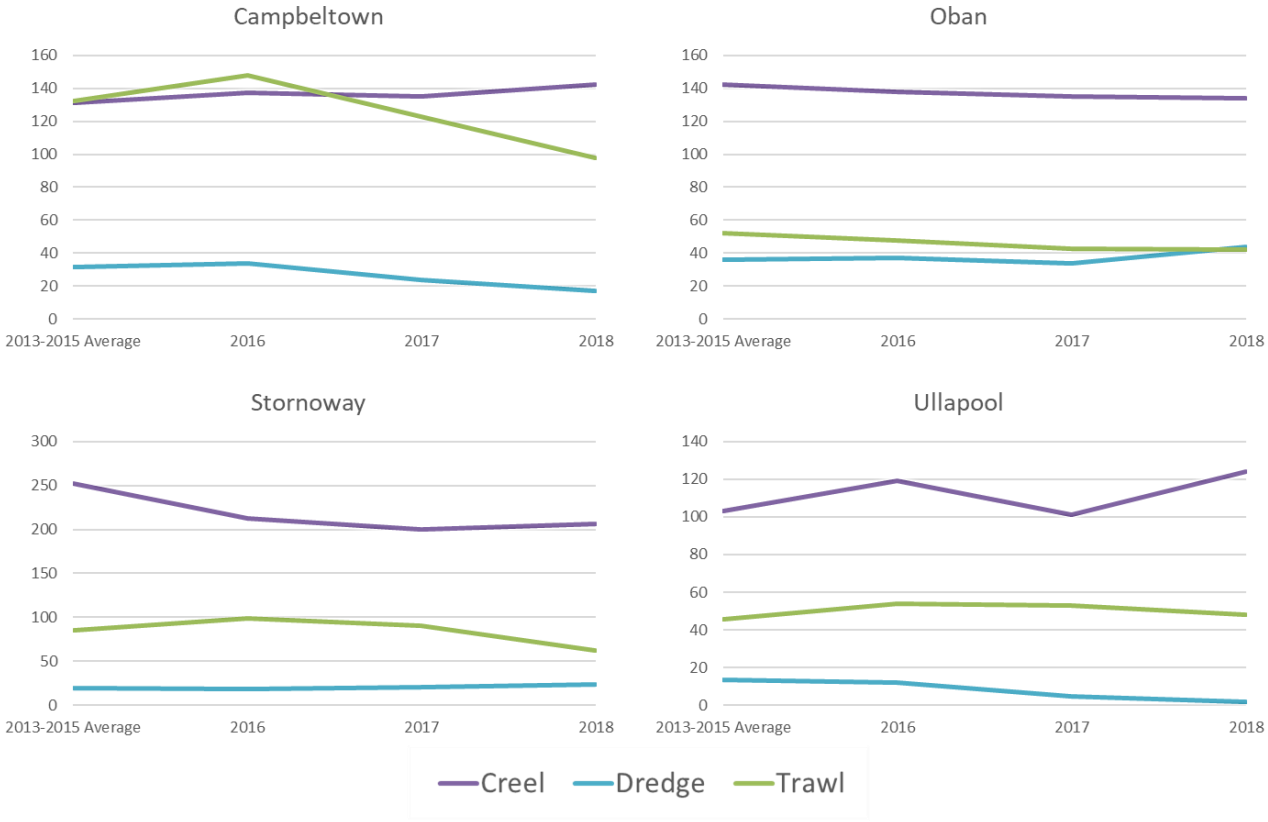
On the west coast (Figure 3.6) employment for all gear types shows a decrease over time. Employment on trawl vessels declines the most overall, and falls more sharply after 2017, while creel and dredge vessel employment increases slightly at this point.

Figure 3.6 Number of people employed on fishing boats on the west coast of Scotland by gear type



MPA management measures may have had clearer impacts at a local level. Figure 3.7 contains a selection of charts showing the total number of people employed on vessels, by gear type, for four districts close to MPAs on the west coast of Scotland. These areas were chosen because they showed the clearest trends. The data for other districts can be seen in Annex 11.

Figure 3.7 Total number of people employed on vessels in four port districts on the west coast of Scotland, grouped by gear type



Total employment on creel vessels increased overall in Campbeltown, Oban and Ullapool between 2013 and 2018, albeit with some fluctuations during this period. In Stornoway, employment decreased from 260 to 206 (a decline of 21%). These trends do not seem to have been impacted by the introduction of MPAs in 2016.

Employment on trawl vessels in Campbeltown and Stornoway declined after 2016, from 148 to 98 employees (a decline of 34%) in Campbeltown and from 99 to 62 (a decline of 37%) in Stornoway, which could be a consequence of the MPA measures. In Oban and Ullapool decreases in employment on trawl vessels are also visible overall, but these appear to be part of a longer-term trend.

For dredge vessels, employment increased from 19 to 24 in Stornoway (26%) and from 36 to 44 in Oban (22%) over the period. This contrasts with Campbeltown and Ullapool, where employment decreased after 2016 from 34 to 17 employees (a decline of 50%) and from 10 to 2 employees (a decline of 80%) respectively. This suggests that employment on dredge vessels may have been impacted by MPAs in Campbeltown and Ullapool.

In summary, employment on trawl, dredge and creel vessels on the west coast as a whole has declined slightly in recent years, but these trends mostly appear to predate the introduction of the MPAs in 2016. This suggests that the decline may be part of a longer trend and is influenced by other factors.

Employment on creel vessels remains relatively stable in all areas described above, apart from Stornoway, where employment numbers decline fairly steeply from 252 to 206 (18%) over the period. The start of this decline predates MPA management measures indicating that there are other factors affecting employment in this area.

In some port districts near MPAs on the west coast, changes in employment for some gear types appear to correlate with the introduction of MPA management measures in 2016. **A reduction in trawl employment in Campbeltown and Stornoway is evident from 2016 onwards, while dredge employment shows a similar but less steep decline in Campbeltown and Ullapool.** While a correlation is visible, it is important to note that we cannot be sure of a causal link between these declines and MPA management measures. These trends do, however, corroborate the information gained from the interviews, giving more confidence that they are linked to the presence of MPAs on the west coast.

Section 3 B Qualitative analysis: Views and perspectives of key informants and stakeholders on the impact of MPAs

This section reports on the main issues that were identified by key informants and stakeholders, representing a range of sectors, in the semi-structured interviews that were conducted in four locations across Scotland.

The analysis is based on the information supplied by the interview respondents and reflects perspectives and experiences of individuals. The views reported are as expressed by respondents, and no cross-check was done with regards to any position or argument presented (for example in relation to landings or profits) in order to respect confidentiality and anonymity of respondents. Some caveats apply, therefore, in the sense that this section presents the perspectives of respondents, and personal accounts of their experiences. Information provided in this way is, by its nature, subjective. That said, the frequency with which impacts are mentioned by respondents in general, or respondents from particular stakeholder groups, can be used to indicate their significance (in this context).

Twenty-eight key informants and 73 stakeholders were interviewed in total. Respondents were from a number of different marine user groups or sectors (see Table 3.10 and Table 3.11).

Table 3.10 Number of respondents interviewed from each marine user group.

Sector	Number of respondents interviewed
Compliance	7
Fishing industry	48
Fishers' representatives	8
Fishers – Total	40
Fishers - creel	*16*
Fishers - trawl	*6*
Fishers - dredge	*9*
Fishers – mixed mobile	*4*
Fishers – mixed mobile/static	*3*
Fishers – hand-dive	*2*
Fishing related business	4
Seafood processing	9
Fin fish Aquaculture	2
Harbour authority	5
Community group/eNGO	13
Tourism	6
Local Authority	7
Total	**101**

Table 3.11 Number of respondents interviewed and their MPA of primary interest*

MPA of primary interest	Number of respondents interviewed
South Arran	26
Loch Sunart to the Sound of Jura	20
Wester Ross	23
Orkney – Sanday & Wyre and Rousay Sound	13
East Mingulay	2
Loch Laxford	1
Lochs Duich, Long and Alsh	3
Upper Loch Fyne and Loch Goil	1
Loch Creran	1
Luce Bay and Sands	2
Entire MPA network	9
Total	**101**

**Respondents were often affected by, or had an interest in, more than one MPA*

South Arran, Loch Sunart to the Sound of Jura, Wester Ross and Orkney (Sanday and Wyre and Rousay Sound) were the MPAs of interest for the largest number of respondents, because these are the case study areas for this project.

3.6 Access to fishing grounds

A key issue identified through the interviews was the loss of access to fishing grounds, and particularly the loss of sheltered fishing grounds, due to the MPA management measures.

Thirty-six respondents, mostly from fishing or related industries, discussed the issue of lost access to fishing grounds as a result of MPA management measures. Many highlighted that it was sheltered fishing grounds in particular that they had lost, and which had the biggest impact on their business.

Twenty of these respondents were mobile fishers, with dredgers appearing to have been most often affected in this way (eight out of nine dredgers interviewed said they had lost sheltered fishing grounds). A further 12 mobile and mixed-mobile gear fishers had also lost sheltered fishing grounds. One creel fisher said that he lost ground due to the East Mingulay MPA, which prohibits the use of static gear (i.e. creels, pots and traps).

Few of those interviewed felt able to accurately quantify the proportion of their fishing grounds that they had lost, but those who did quoted a loss of between 30-60%. For many there were specific areas they would fish in winter months and, as a result of

the MPA management measures, they needed to find other areas to fish for a large part of the year.

Respondents from other groups were also aware of the issue of lost fishing grounds. Fishers' representatives and compliance officers often said that they were relating what they had heard from fishers in their communities, while some respondents, such as processors and an engineer, felt that the loss of fishing grounds had consequences for their businesses.

The loss of sheltered fishing grounds appeared to be an issue of great to concern to respondents in South Arran, Wester Ross and Loch Sunart to the Sound of Jura. Many fishers described how the Isle of Arran provided shelter no matter what direction the wind was blowing, enabling them to fish almost all year round. Similar things were said about Loch Ewe and Loch Broom, in the Wester Ross MPA, and most of the area inside the Loch Sunart to the Sound of Jura MPA.

Greater security for static fishers

It was common for static gear fishers to describe feeling much more secure in their fishing, due to the MPAs. This was mentioned by 8 out of the 16 creel fishers who were interviewed. They said that, where MPA management measures forbid the deployment of mobile gear, creel fishers no longer risk their gear being towed away by mobile fishers, an issue they had faced when fishing in shared grounds. They mentioned having access to more grounds and types of fishing than before. A few (4 out of the 16) stated that without the MPAs they would not have been able to sustain or expand their business indicating a clear positive impact of the MPA management measures in their area.

3.7 Displacement

In response to losing fishing grounds, many respondents said that they had transferred their activity to other areas – this response to management interventions, including those associated with MPAs is known as "displacement". In total, 44 respondents (out of 101) discussed this topic, indicating that it is an important issue for these fishing communities.

Displacement was mentioned by nearly all (18 out of 22) of the mobile and mixed-gear fishers interviewed. Many of these respondents described feeling that they were running out of options for places to fish and that they would have to transfer effort to areas that were already being fished. They felt that this would increase the fishing effort in that area (i.e. an area outside the MPA designations), and potentially lead to an increase in conflict or tension in those areas. One interviewee described feeling as though he was "poaching" someone else's ground.

Seven creel fishers mentioned displacement of fishing activity. In one case a creel fisher had been displaced by the East Mingulay MPA. In other cases, they described how mobile boats had been displaced, or how the increase in creel fishers in some areas had forced them to fish elsewhere. Some also described changing their fishing patterns in order to fish exclusively in the MPA as this afforded them a greater degree of security.

A few fishers stated that, although they were not directly affected by the MPAs, as they did not fish in those areas historically, they were aware of the increased competition in the remaining open grounds due to displacement of fishing activity. This explains, perhaps, why more respondents mentioned displacement than lost grounds.

Some fishers mentioned that they were considering upgrading to a bigger boat so that they could travel further afield to fish and perhaps withstand some of the harsh winter weather. There was some apprehension from a few fishers, however, that a change to bigger boats might lead to greater pressure on stocks, as fishers might need to land more fish in order to justify, and pay for, a larger boat with more crew.

It was also clear from the interviews that there were different degrees of displacement being experienced. For some fishing effort was transferred to the area just outside, or on the edges of the MPA. For others, particularly the bigger boats, they had started to fish further afield, spending more time on the east coast or in English waters. Respondents highlighted that this shift in fishing location could have knock on effects for ancillary businesses (such as processors, engineers, ice and fuel supplies) in the local area.

Six out of the nine seafood processors that were interviewed also mentioned the issue of displacement. In most cases, they were discussing what they had heard from their own boats, or boats that land with them. In a few cases, processors said that vessels which had been displaced from their usual fishing grounds, but which still landed to other processors, were now fishing in 'their' waters. This was said to be having a knock-on effect on stocks and the viability of their factories.

3.8 Diversifying

In the interviews, respondents often mentioned that they had noticed a change in the composition of the fleet in their local area, either due to people diversifying to creel fishing, or there being an increase in creel fishers moving into the area.

Approximately a quarter of the fishers interviewed (11 out of 40) described changes they had made since the MPA management measures were introduced; either diversifying to creels, expanding or upgrading their vessels. The majority of these were from the mobile fleet (dredgers, trawlers and mixed mobile fishers), while a couple of creel fishers described expanding their business.

One of those who had diversified to creels commented that although he had bought the gear, he had not been able to fish with it yet because he did not feel there was room in the area for him to fish. Fishers and fishers' representatives often stated that changing gear type was not as easy as some might think. They commented that such a change involved, not only the grant application and capital outlay, but also learning where and how to fish, who to sell to, and how best to manage the process. These are skills they had spent a career learning, and now needed to re-learn for another fishery.

One trawl fisher, who had diversified, had developed a method of trawling for prawns which allowed him to sell to the live market. In this way he could earn more, due to the higher value product, but fish less, thus having a lower environmental impact.

Thirty-six respondents described an increase in static gear fishing which some felt was due to the MPAs, with more creel fishers in particular operating in MPA areas. Although many felt that there had been an increase in the number of creels and creel fishers, there was some variety in the explanation and context that respondents offered.

For some there was concern that the influx in creels was due to an increasing number of industrial creel boats. Others reported that more people were creel fishing as a hobby, and were leaving their gear out for longer periods and not showing the same care for the stock as “true” fishers. It was also often mentioned that the rapid rise in creels was not entirely due to the MPAs but had started with a booming market for shellfish, especially crab.

It was often said by fishing industry respondents that these issues were compounded by the unregulated nature of the static gear fishery. Many respondents called for tighter regulation of static gear fishing.

3.9 Effort

Fishing effort, defined in this case as the amount of time spent at sea, was mentioned by 20 respondents in total (out of 101), 13 of which were fishers (approximately a third of those interviewed), with the remaining 7 respondents all linked to the fishing industry.

In terms of fishing effort, respondents’ comments tended to focus on two contrasting themes – reduced effort due to lost days at sea, or, an increase in effort to maintain catch and income. Some described losing more days at sea since the MPA management measures were introduced due to the loss of sheltered grounds. They said that in bad weather it was too dangerous to go out to fish in new areas outside the MPA restrictions and so they would be forced to stay in. Some estimated losing between 10-30 days of fishing per year. The majority of those who reduced their effort for this reason were based in the South Arran area.

Conversely, others described increasing their effort in order to maintain the level of income they earned before the MPAs were brought in. A few respondents mentioned working an extra 2-4 hours each day, while others described having to steam for an extra 2-4 hours to reach ground where they could legally fish. As a result, some said that they had altered their fishing patterns to spend the night on the boat, when the weather was good, so that they could improve the ratio of travel to fishing time. It was mentioned by some that this fishing pattern is a lot harder in terms of general welfare and family life due to being away from home and out on the boat for longer periods.

It was clear, through the interviews, that there was some variation in the impacts of management measures. Some creel fishers in the Clyde area, for example, mentioned that they were now able to spread their effort over the week, rather than focusing most of their effort at the weekends when the mobile fishers in the area are not active. It is likely that this can be linked to the weekend closure for mobile gear in the Clyde.

3.10 Stocks and landings

Pressure on stocks

Many respondents (29 out of 101) expressed concern that, with the displacement of effort to non-MPA grounds, the pressure on those areas would increase, to the detriment of those stocks. This topic was discussed particularly by fishers (approximately half of those interviewed) and their representative organisations, but also by seafood processors. This issue was raised by all of the dredgers who were interviewed, suggesting that this is of particular concern to this group.

Fishers frequently described having no choice but to continue to fish in the same areas, despite being aware that stocks were low, because there were fewer areas available to them due to the MPA management measures. They said that they still had overheads, salaries and bills to pay and so had to continue fishing in order to make a living.

In addition, the fishers often described how traditionally they would fish in a cycle; fishing in one area, and then moving on from it and leaving it to recover for a period. They felt it was not possible to do that anymore as there was nowhere else to go. One fisher mentioned that because of the cyclical nature of fishing, closing off one area with an MPA, for example, would have consequences for fishers in other, non-MPA areas, as fishers try to find alternative places to fish.

There was some talk of having to “hammer” an area instead of “fish” it. Respondents mentioned having to put in more effort to catch the same volume of fish, even though they recognised that this is unsustainable. Many said they were not happy about fishing in this way, and would prefer to fish for different species, but this was not an option due to the current quota system (Section 6.4)

A few creelers were concerned that industrial crabbers, fishing offshore, were catching the crab before they made it to the inshore waters, and that this was depleting stocks. They also highlighted that these industrial boats are able to fish 24/7 and could haul a large number of creels. This issue was mentioned particularly by respondents in the Wester Ross area, and in the Orkney area.

Reduced landings

Approximately a fifth of respondents (21 out of 101) felt that landings had reduced over the last few years, a concern that was voiced by fishers (13) and seafood processers (6) in particular. Seven out of the nine dredgers interviewed discussed this topic, suggesting that it is of particular importance to them.

A few respondents tried to quantify their loss of landings. For example, it was estimated by some that they had previously landed approximately 25 bags of scallops when they had fished in now designated grounds, but this was down to approximately 15 bags (-40%). As mentioned in the previous section, many fishers fish in a cyclical pattern, targeting different areas and species depending on the season. The observed reduction in landings refers only to the portion of the fishing cycle that would have been spent in waters now within the MPA boundaries. These estimates can, therefore, best be compared to the ‘landings from MPA rectangles’ presented in panels 1, 2 and 3 a) in Figure 3.3, which shows a reduction in dredge landings of approximately 33-45% from 2016-2018. It should be noted, however, that

the trend of declining dredge landings is visible from 2013 onwards, and so predates the introduction of MPA management measures.

Fishers indicated that the reduction in landings had been offset by the high price of the produce in recent years, and that without this they might have gone out of business. Some expressed concerns for the future if prices decreased.

The reduction in landings was attributed to the increased pressure on stocks described previously and the loss of days at sea. Respondents also highlighted that the MPAs were not entirely responsible for the change in landings but that various other factors had affected their landings, including the weather, Brexit and climate change as discussed in Section 6.

Finally, it was mentioned by a few respondents that the MPAs had closed off areas where larger, better quality prawns could be caught. As a result, they said that they were now catching smaller prawns and having to sell to a different, lower value, market. A lower value necessitates a greater volume of prawns to make the same return and support the fishery.

Stock improvements and increased landings in MPAs

Sixteen respondents described improvements in stock or landings in, or adjacent to, MPAs. This was noted by different respondent groups including fishers (mostly static and mixed gear fishers), as well as respondents from eNGOs and a local councillor.

Respondents described improvements in the abundance and quality of shellfish and a few mentioned getting a higher price for their product. Additionally, five respondents described a greater sense of security upon seeing stocks improving.

A few respondents mentioned that improvements in scallop stocks might be visible sooner as they recover more quickly, but that improvements in other fisheries might be slower. That said, a few respondents mentioned improvements in the quality and abundance of prawns, suggesting that these changes were also evident.

Environmental improvements

Eighteen respondents described improvements in the marine environment that they had noticed since the introduction of MPAs. This was highlighted by members of eNGOs, in particular, as well as some fishers and a local councillor. Respondents described seeing the return of various indicator species including kelp, anemone and porpoise, and noted improved water clarity. It was felt that these improvements indicated a recovering ecosystem and that other benefits would follow.

3.11 Financial impact

Negative economic impacts

Twenty-two respondents mentioned negative economic impacts associated with the MPA management measures. All but one of these were either fishers (12) or linked to the fishing industry in some way e.g. representative, engineers, processors.

Seventeen of these mentioned that they had experienced a loss in earnings either due to reduced landings or reduced days at sea. Nine mentioned the cost of buying

new equipment in order to diversify or make other changes to their business, while six reported increased fuel costs due to travelling further to access fishing grounds.

Other respondents mentioned the overheads associated with a fishing business and how these can be affected by changes in fishing patterns. It was highlighted by respondents that some overheads do not change much, even when the vessel does not go out or the landings are reduced.

A few respondents said that they had had to take out loans to buy vessels or new equipment, and explained that it can be hard to get loans if the future of fishing is uncertain. Having loans to repay can also increase the pressure to catch enough fish to keep up with repayments. In addition, one person described the costs of retraining in order to enter a new industry.

Economic Benefits

Seventeen respondents noted economic benefits associated with the MPA management measures. Approximately half of these were fishers and the other half were from eNGOs.

The fishers who reported benefits were all from the static gear sector (creelers or hand-divers). Benefits were due to a reduction in gear conflict. Creel fishers mentioned that in the past they had regular costs estimated at £1000 - 20,000 due to replacing gear that had been towed by mobile fishers. This risk to gear was not a concern within MPA boundaries. Economic benefits also stemmed from having greater freedom to fish in more areas and at all times. Before the MPAs were introduced they would have to fish in areas or at times when mobile gear vessels were not present, or risk losing their gear.

Environmental NGOs described further economic benefits associated with the growth in tourism, which they linked to MPAs, and the increased opportunities for attracting funding for community group activities. Such funding can lead to the employment of staff who move to an area, spend money and contribute to the community.

3.12 Changes in Employment

Fifteen respondents, from a range of groups, said that there had been a reduction in people employed in fishing or related industries which they felt was a consequence of the economic impacts caused by the introduction MPAs. Some described changes to their own business, whilst others reported changes they had heard about from others.

In some cases, members of staff were not replaced when they left, or businesses were down-sized so that fewer people were needed. Fishers often chose to operate without crew or with fewer crew, which would often involve changing to a smaller boat. Respondents frequently cited not making enough money to pay wages as the reason for downsizing and this was partly attributed to the introduction of MPA management measures. It was, however, often stated that the MPAs were only part of the problem, with environmental changes, the quota system and shortage of crew highlighted as other factors (see Section 6). Respondents expressed concern and

sadness at having to employ fewer staff, highlighting the paucity of jobs in rural areas.

In contrast a smaller number of respondents (4) mentioned that they had taken on more staff or crew and that this had been in relation to MPAs. Three of these were in the static gear sector (2 creelers and 1 hand diver) while another was from the eNGO/community group sector. Static gear fishers described being able to expand their businesses as they felt more secure regarding stocks and their ability to fish without gear conflict.

Selling up businesses

Thirty respondents raised the issue of people selling their businesses or leaving the fishing industry. All but one of these worked in the fishing industry (21) or fishing related businesses (8). Although frequently reported by respondents, only eight of these 30 respondents gave personal accounts of leaving the industry. This group comprised 7 fishers (4 dredgers) and 1 engineer.

Of those who had had to sell up or leave the sector, most cited feeling that their business was no longer viable as the main reason for leaving the industry or selling up. Other reasons given were that there was too much uncertainty and stress. The MPAs were described as an important contributing factor but it was often acknowledged that they were not the only issue (see Section 6). For example, a couple of people who sold up were of retirement age and would have been likely to have stopped fishing at that time regardless of the MPAs.

For those who were not of retirement age, the skipper and crew were mostly thought to have taken jobs in aquaculture or on personnel boats. Some crew were thought to now be unemployed, although this was not reported with certainty.

Conclusions

In this section the findings from analysis of fishing activity data and employment data are presented, combined with analysis of interviews.

Fishing activity data showed that, in some areas, there were changes in landings after MPA management measures were introduced. Impacts were more apparent at the local level while both positive and negative impacts were spread among different parts of the fishing industry. At the level of ICES rectangles, one could see decreases in trawled *Nephrops* landings and dredged scallops in some rectangles containing MPAs, while increases in creeled *Nephrops* and hand-dived scallops were also visible. In some ICES rectangles containing MPAs, no change was visible, further indicating that impacts are quite localised.

Analysis of landings from trawl vessels which fished within MPA boundaries before management measures were introduced, suggested that they were catching approximately 25-35% less from rectangles containing MPAs, and were compensating for this by fishing more heavily in other rectangles, further from MPAs. Total landings for these vessels remained the same, or higher, apart from those which had been particularly heavy users of the fishing grounds within MPAs, whose landings reduced by approximately 12% on average. The same analysis for dredge vessels found that landings within MPA rectangles, and in non-MPA rectangles

declined from 2013-2018, with a steeper decline post 2016. This suggests that other factors are affecting dredged scallop landings on the west coast, but that MPAs may be a contributing factor.

Interview data supported the analysis of the landings and employment data, and offered more of an explanation of the results. Just over a quarter of fishers interviewed reported reduced landings, as did two thirds of processors. Those who attempted to quantify these reductions cited losses of approximately 40% in landings typical for that season, and from those specific areas. These estimates align quite closely with the reductions in landings from MPA rectangles, described in the previous paragraph.

Many respondents, predominantly from the mobile fishing industry, highlighted that the loss of sheltered, winter fishing grounds has had an especially significant impact on them and their capacity to fish and maintain previous levels of income. In response, a large portion from this group described moving their fishing effort to other grounds where possible. In these cases, some described feeling that alternative areas were already at capacity, and expressed concern about the extra pressure on those fishing grounds. Some also described missing days fishing, if the weather was bad, as they no longer had access to sheltered fishing grounds. Related to this, respondents mentioned having to travel further to reach areas where they could legally fish, in some cases staying out on the boat for a few nights to reduce the proportion of time spent travelling. They highlighted the impact this could have on family life.

Respondents outlined several responses to the aforementioned impacts. Some diversified to creel fishing, some downsized, selling a vessel or reducing the number of crew on their boats, while others upgraded to bigger vessels that could travel further and withstand harsher weather conditions. A few chose to sell their business and leave the industry. Those who left fishing, were often said to have taken jobs in aquaculture or service vessels for other marine industries. In cases where people sold their business, some stated the MPA was one of many factors influencing their decision, but there were a few who cited the MPA as the primary reason.

For some respondents, however, the MPAs have been beneficial. Static gear fishers described being able to fish with greater security, without risk of gear conflict. This was said to save them a fairly large amount of money each year, as they did not have to replace their gear. There were also reports of improved stocks in and adjacent to MPAs, and respondents described seeing the habitat recovering, and rare species returning. In some of these cases, skippers were expanding their business and taking on more crew.

Analysis of employment data for port districts near MPAs supported the accounts of respondents, showing a slight increase in total employment on static gear vessels, and a decrease on trawl and dredge vessels on the west coast of Scotland. This trend was clearest in a few areas, where the magnitude of the change was greater, while other areas showed no trends that could be considered as consistent with MPA management measures.

The evidence from this section suggests that there have been localised positive and negative impacts of MPA management measures for the fishing industry.

We recommend continued monitoring of the impacts of MPA management measures, as the marine environment and the industries that depend upon it continue to change and develop.
The inclusion of qualitative techniques in monitoring and impact assessment, as well as continued engagement with stakeholders are also recommended.

Section 4. Socio-economic impacts on other key industries

This section covers the socio-economic impacts experienced by other key marine industries, located on the west coast of Scotland, which are impacted by the MPA measures in different ways. A range of positive and negative impacts are identified which relate directly to changes in the marine environment, as well as the indirect effects of changes in fishing activity and legislative changes associated with MPA management measures.

The following section will explore the positive and negative impacts experienced by three marine industries:

- Seafood processing
- Aquaculture
- Marine tourism

Most of the evidence described in the section comes from the interviews carried out during fieldwork. Where relevant, analysis of other data sources is also presented.

Summary of findings

Seafood processing

Many seafood processors echoed the views of fishers. This is unsurprising given the close link between the industries.

- A third of the processors interviewed stated that the volume of produce landed to them had reduced, and that this meant a reduction in their profits.
- One of these attributed this decline to the MPAs, while others said that they were only a contributing factor.

Processors described responding to the changes caused by MPA management measures in several ways including:

- Some said they had invested in new vessels as a means of guaranteeing supplies to their factory, but others were avoiding making such investments as they considered it too risky.
- A few processors described changing the produce they process or the markets to which they sell to reduce their reliance on areas containing MPAs, as well as increase their profits.

A large number of respondents from seafood processing discussed issues around staffing, which they directly related to reductions in landings. Some were making efforts to retain staff, as they considered themselves to be an important source of employment in the local area. In some instances, however, respondents described having to lay people off, reduce working hours or pay people less.

Aquaculture

The main direct impact highlighted by respondents from aquaculture was that the designation of an MPA near an existing or potential development increases the complexity of planning applications, the time and effort needed to prepare them and the time required for local authorities to process them.

Applications may require more extensive surveys which, in turn, are more costly and time consuming. Respondents described delays in obtaining responses from local authorities. These delays can have financial implications for aquaculture companies as developments have a long lead in time, requiring early preparation and investment. Potential employment opportunities may also be delayed at a cost to the local community.

Marine Tourism

The importance of MPAs for marine tourism was an important theme in interviews. Respondents highlighted:

- the importance of a pristine and healthy environment for tourism in Scotland, and marine tourism, in particular,
- the value of wildlife tourism for rural and remote areas in Scotland, such as those near MPAs.

A fairly large number of respondents from the tourist industry described the MPAs as a tourist attraction with some stating that their businesses had started or improved as a result of MPAs, while others now cite them as part of their unique selling point (USP). A wide range of businesses were described including Bed & Breakfast, kayak tours, boat trips, recreational angling and seafood vendors.

A large number of respondents felt that MPAs were not sufficiently publicised and that more should be done to promote them. In addition to those who used the MPAs as part of their business, there was a large number who knew little of the MPAs but expressed a desire to know more.

In addition to the benefits of tourism for rural areas, respondents also highlighted that employment in this industry is often seasonal, part-time and poorly paid. They felt it was important for tourism to be one part of a diverse and resilient local economy.

Recreational angling was mentioned as an important industry which may recover as a result of MPAs.

4.1 Seafood Processing

Seafood processing in Scotland is largely based in the North East, the Highlands and Islands and on the west coast, and makes a significant contribution to the local economies in these areas. In the north east, the industry works mainly with sea caught fish and shellfish. In the Highlands and on the west coast, it is most often focused on processing Atlantic salmon and other farmed fish and shellfish. In this study we focus on shellfish or mixed processors, predominantly located on the west coast of Scotland, as these are most likely to be affected by MPA management measures.

Seafood processors depend on a constant supply of produce to keep their businesses going. A reduction in landings can have knock on effects for seafood processors.

In 2017, seafood processing in Scotland generated £392 million GVA, accounting for 0.29% of the overall Scottish economy and 8% of the marine economy GVA. Seafood processing provided employment for 7,700 people (headcount), contributing 0.3% to total Scottish employment and 10% to marine economy employment.

In 2018, Scotland had 139 seafood processing sites (i.e. individual factories or facilities for processing fish), approximately 39% of the UK total. Seafish regional data at NUTS (Nomenclature of Territorial Units for Statistics) Level 3 provides information about sites on the west coast of Scotland in Table 4.1.

Table 4.1 Average employment, income and costs for seafood processing sites in regions near MPAs, according to Seafish regional data

Region	No. Sites	Average employment per site	Average income per site (£'M)	Average operating costs per site (£'M)	Regional GVA (£'M)
Caithness and Sutherland and Ross and Cromarty	9	40	5.6	5	11
Eilean Siar (Western Isles)	9	28	12.8	10.5	35
Lochaber, Skye and Lochalsh, Arran and Cumbrae, Argyll and Bute	17	24	6.5	5.6	29

Seafood processing: Interview findings

Nine seafood processors were interviewed. Four of these were most impacted by the South Arran MPA, while the Loch Sunart to the Sound of Jura and Wester Ross MPAs were each of primary concern to a further two processors. One processer was based in Orkney and so was impacted by the MPAs in that area.

A large portion of what the processors said echoed the accounts of the fishers. They described a shrinking of fishing grounds and the loss of sheltered fishing grounds, in particular, displacement of vessels into smaller areas, and concern over increased pressure on fishing grounds. These factors were all felt to be linked to a decrease in landings to the processing factory.

The key issues that were raised by seafood processors are discussed below.

Lost profits

Three processors said that their earnings had decreased in the last few years. Two of these quoted figures, which were in the region of £400,000 - £500,000. These losses were attributed to a reduction in the volume of shellfish landed to the factory, due to the reasons described above and in previous sections.

Two processors highlighted that the MPAs were only a contributing factor and not the sole reason for the reduced landings and loss of profits; however, another felt that their experience of loss of profits was entirely due to the MPA management measures.

Change in investment and business decisions

Six processors mentioned that they were changing their investment plans or shifting the focus of their business in order to adapt to the situation regarding MPAs.

Two of these had made the decision to buy their own vessel to guarantee supply to the factory, with one detailing a cost of £2.8 million for the vessel, £900,000 of which came from a loan. Despite their purchase, they described some reluctance in buying boats due to the additional responsibilities and time needed to manage them as well as the risk associated with the significant capital outlay.

Conversely, another processor had decided not to invest in a more modern vessel, as the future of the fishing industry felt too uncertain. They expressed concerns that more MPAs would be introduced, resulting in further potential impacts on landings.

Three processors described changing their business focus in the time since management measures were introduced. For example, one processor decided to focus on the brown crab market in China due to the difficulty in sourcing local scallops. This took around three years of work and was said to cost somewhere in the order of a six-figure sum.

Further evidence of this came from another processor who chose to focus on smoked mussels and to stop exporting scallops. They continue to supply scallop to the local market when they have produce, but this can no longer be sourced locally.

In addition, a shellfish processor mentioned having difficulty sourcing larger prawns as they said that they had traditionally acquired these from inside the MPAs. They have, therefore, chosen to focus on the scampi market, which is a lower value product and requires a greater volume of *Nephrops*.

Changes in staffing

Three of those who had changed their investment or business plans, mentioned doing so in order to avoid laying off staff.

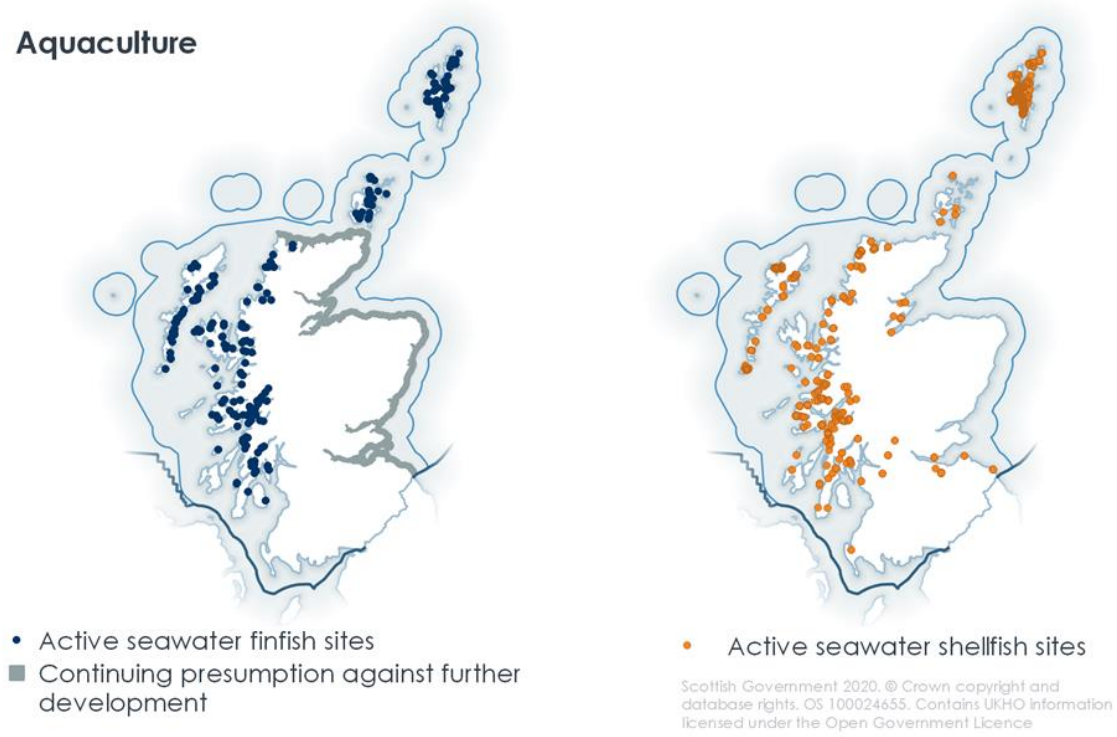
A further four also mentioned having to make changes to their staffing, since management measures were introduced. One of these said that staff were paid in relation to the amount of produce processed and so were paid less in the last few years due to a reduction in landed produce, while another described how their staff were having to leave work early as there was no processing for them to do. Further examples of similar impacts were provided by one processor who said that he had reduced the head count from nine to four members of staff, while another said that staff who leave were not being replaced.

4.2 Aquaculture

MPA designations can increase the number of impact assessments required, and the rigour required for planning consent. The cost of such assessments is incurred by the developer and the process takes time, potentially leading to delays.

Marine aquaculture in Scotland is concentrated on the west coast mainland, and in the Western Isles, Orkney and Shetland Islands (see Figure 4.1). Installations are normally positioned in sea lochs, voes and inlets (Scotland's Aquaculture, 2015). While a number of marine finfish species are farmed in Scotland (including rainbow trout, halibut and Arctic charr), the industry is dominated by Atlantic salmon production (95% of finfish production in 2017). Mussels are the main shellfish species produced (95% of shellfish production volume in 2018).

Figure 4.1 Location of finfish and shellfish aquaculture sites in Scotland



In this report the focus is on impacts to salmon producers as they comprise the vast majority of aquaculture in Scotland.

In 2017 aquaculture generated £436 million GVA: accounting for 0.33% of the overall Scottish economy and 8% of the marine economy GVA. The aquaculture industry provided employment for 2,200 people (headcount), contributing 0.09% of the total Scottish employment and 3% of the marine economy employment. According to figures from the Scottish Salmon Producers Organisation, in 2016 the eight largest salmon producers in Scotland spent on average £74 million each on suppliers and services and £8 million on capital investments.

Aquaculture: Interview findings

Two representatives were interviewed from each of two aquaculture companies operating in Scotland. As they all had very similar views, the main themes from these interviews are summarised in the following section.

Consent for development

Both respondents mentioned the increased time and effort required to gain consent for a new aquaculture development or to make changes to an existing site. With each new site, applications must be submitted for a marine licence from Marine Scotland, a CAR (Controlled Activities Regulations) licence from the Scottish Environment Protection Agency (SEPA) and planning permission from the local authority. These applications take account of the impact a development will have on the marine and coastal environment, and as such will consider any designations that the development might interact with. As the number of MPAs and other similar designations (e.g. SPAs, SACs) increases, so does the complexity of the applications for aquaculture developments, and the cost of producing them.

More complex applications require more detailed assessments and surveys and are often more resource intensive to produce. Respondents said they would often ask regulators for advice before submitting applications. They said they would like more information and guidance about how to produce successful applications and felt that there was a lack of clarity or certainty in the advice they currently receive.

All four aquaculture respondents also reported that in the last few years it has taken up to three times as long for regulatory bodies to respond to their planning applications. They believed that this was due to a lack of resource in the relevant regulatory organisations to deal with more complex applications. Their perception was that, where regulators felt uncertain about an application, they would take a precautionary approach, asking for more surveys and more information. Respondents felt that the level of detail requested was not always necessary.

Respondents also mentioned that the data or evidence available on protected features such as their distribution, habitat requirements, feeding and breeding habits, was sometimes minimal. In these instances, fairly extensive surveys were required in order to rule out the presence of a feature or habitat. These can be costly and time consuming.

Costs to aquaculture companies

As mentioned above, extra surveys increase the cost of an application. One respondent quoted a figure of £80,000 for carrying out the Habitats Regulation Appraisal for two sites. This figure covered the cost of hiring expert consultants to

carry out surveys and assessments. Both respondents mentioned having to hire more staff to deal with the application process.

In addition to the upfront cost of the surveys, respondents mentioned the cost (resources and time) to the company of developments being delayed. Aquaculture developments have a long lead in time (often two years) as salmon spawns are grown from eggs and specialist equipment needs to be ordered. The equipment is expensive and so is not ordered until planning is approved. Respondents mentioned the practical and financial difficulties of dealing with such a delay. One quoted start-up costs of ~£3.5 million, explaining that after making such an investment, a development could be delayed for two years. They also mentioned that expected profits, from the development would be lost as a result of the delay and that this could equate to ~£7.5 million for the two years.

Costs to communities

Respondents mentioned that the extra staff hired to work on the planning process are often based nearer the central belt of Scotland and so are not necessarily creating jobs in the coastal communities near developments or the MPAs. It was also noted that job creation could also be impacted by a delayed project, with the potential to delay up to six jobs in a coastal community, which could have significant implications for these relatively small coastal areas.

Consultation process

Aquaculture respondents expressed frustration at the consultation process. They explained that often multiple MPAs are consulted on at the same time and that the information can be quite vague. There was a feeling that during consultation there is often a message that existing activities should not be affected by the MPA, but that the reality is often more complex. Respondents felt there was not enough information provided about the potential impacts on future activities during the consultation process.

They all mentioned that once an MPA is proposed, before it is officially designated, it is given policy protection. In addition, there were concerns expressed that MPA management measures and restrictions may change over time in light of new information and highlighted that in general, regulations tended to get stricter, rather than more lenient. This uncertainty around how strict MPA regulations might be in the future, gave rise to some concern about the development of new sites, and it was felt that this uncertainty could affect investment decisions.

Public perception

Aquaculture respondents mentioned a disconnect between the public perception of MPAs and associated regulations, and their own understanding of MPA regulations. The public often think that no activities are allowed inside an MPA, whereas industries, such as aquaculture, are often told that activities are allowed providing they do not negatively impact upon protected features. This disconnect between public perception and the legal reality can negatively affect a company's public image, if they are perceived to be contravening MPA regulations.

4.3 Tourism and recreational activities

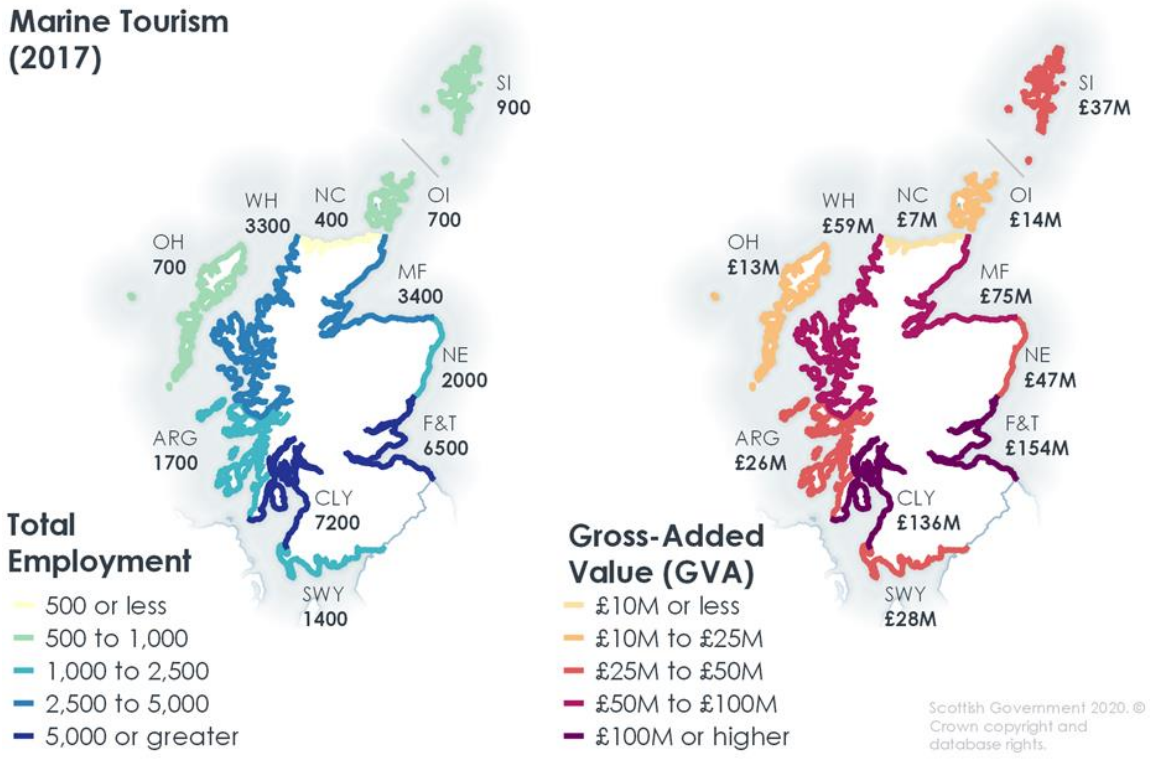
In addition to fishing and aquaculture, tourism and recreation industries may also be impacted by MPAs and their management measures. Wildlife tourism often depends on an environment perceived as pristine, and recognition of special features as an attraction. As a result, MPAs may provide a draw for tourists who are interested in seeing wildlife, boosting existing businesses and encouraging the establishment of others.

Scottish tourism as a whole was estimated to be worth £4.1 billion in GVA in 2017. In 2017 marine tourism generated £594 million GVA, accounting for 0.45% of the overall Scottish economy and 11% of the marine economy GVA. Marine tourism is estimated to account for around 14% of all Scottish tourism. Furthermore, the industry provided employment for 28,300 people (headcount), contributing 1.14% of the total Scottish employment. It is the biggest marine economy employer, accounting for 38% of the marine economy employment in Scotland. These figures are headcounts so while marine tourism and recreation dominate marine economy employment figures, the full-time equivalent employment level is significantly smaller. This is due to the often-seasonal nature of tourism and recreation together with the part time nature of the employment.

Figure 4.2 shows employment and GVA for each Scottish Marine Region in 2017. Tourism is particularly important for the Clyde and West Highland Regions with both areas containing a number of MPAs.

Marine tourism covers such a wide range of businesses from attractions, to accommodation and shops, that it is not possible to give an indication of operating costs and incomes for a typical business.

Figure 4.2 Marine tourism employment and GVA by Scottish Marine Region, 2017



Tourism: Interview findings

The effects of MPAs on tourism in surrounding areas was mentioned by a fairly large number of respondents (36 out of 101), from across various sectors. As a different number of respondents were interviewed in each sector, and this topic was discussed by such a broad range of respondent groups, the total respondents from each group are presented in Table 4.2 along with the number discussing tourism. It is important to note that a number of respondents who were classed as a different stakeholder group such as 'fishing industry' or 'eNGO' also had tourism interests e.g. B&B or boat tours. For the interview analysis, they were classed according to their primary occupation.

Table 4.2 Number of respondents discussing tourism in each stakeholder group compared to total

Stakeholder group	Total number interviewed	Number of respondents discussing tourism
Fishing industry	40	8
eNGO/community group	13	9
Tourism	6	6
Local Authority	7	6
Harbour management	5	4
Compliance	7	3

Importance of MPAs as a tourist attraction

Twenty-one respondents described MPAs as a tourist or recreation attraction and 11 mentioned businesses (sometimes their own, sometimes those of others) that either started because of MPAs, had improved because of them, or were using MPAs as part of their USP. Businesses linked to MPAs included kayak and snorkel tours, boat tours, recreational fishing, seafood vendors and Bed & Breakfast establishments. The Community of Arran Seabed Trust (COAST) have set up a visitor's centre to raise awareness of the MPA, to support marine conservation and to provide a base for their activities, which attracted 11,000 visitors in 2018. A few respondents gave financial information about these tourism businesses with estimates of turnover ranging from £60,000-£600,000.

A strong theme that emerged from the interviews was the importance of the natural environment for tourism in Scotland. Respondents felt that wildlife and the pristine nature of the habitats were significant attractions for both local and international tourists, and that this was particularly the case in Scotland's coastal areas.

A few respondents highlighted that some of the MPAs, particularly South Arran, are close to populated urban areas. There was a feeling that these MPAs provide an incredible resource with clear waters and rare species present, and so easily accessible to the more urban centres of the Central Belt (e.g. Glasgow and Edinburgh). This point is expanded on further in Section 5.1, with relation to community engagement and education opportunities.

These points were often supported by the recognition that tourism is an important industry for remote rural areas. There was a feeling among respondents that Scotland's tourism economy was growing and may continue to do so, with more people staying in the UK for holidays due to the weakness of the pound[14] and a growing desire amongst some to lower their carbon footprint by reducing air travel. A few respondents felt that environmental sustainability was of increasing importance when people make holiday decisions, and that the MPAs and associated seafood and recreational activities could capitalise on this.

Despite the recognition of potential benefits as a result of MPAs, it was common for some respondents to lament that not enough was made of the MPAs and that they needed to be promoted more. A few commented that terrestrial national parks are signposted and have interpretation boards, and felt that MPAs should be treated in the same way, with signs to draw people's attention to the sea and the wildlife that can be seen there.

Seven respondents with links to tourism were not aware of the MPAs or did not make the connection between MPAs and tourism opportunities. On the other hand, nine respondents with links to tourism made the connection and highlighted MPAs as part of their activities or used the MPAs in their promotional material.

Five respondents highlighted that although tourism is important for rural economies in Scotland, it is a seasonal industry and cannot sustain these communities alone. Often people need another job to ensure they have an income in the winter, or alternatively they move away in those months.

Recreational fishing

Fourteen respondents mentioned recreational fishing or sea angling with most of these lamenting the decline of this industry. Many described businesses related to recreational fishing that had been lucrative and important to communities in the past. Angling competitions were described as having been big attractions, drawing great numbers of international visitors to rural coastal communities in previous years. Respondents attributed the decline of this industry to reductions in fish stocks. There was hope that MPAs would improve fish stocks and allow this industry to return. Some reported that this regeneration of recreational fishing was already happening, with new businesses starting up and species such as haddock starting to appear at angling events.

[14] ONS Dashboard: Sterling effective exchange rate

Conclusions

Positive and negative impacts have been reported by industries that are not directly affected by MPA management measures. In the case of seafood processors this was often related to impacts experienced by the fishing industry. Respondents from seafood processing described struggling to get produce, reductions in business profits, and needing to change their business to adapt. Large processors are likely to be able to source produce from a wider range of vessels and fishing grounds and so may not be affected. For smaller processors who depend on a local fleet, changes in access to fishing grounds may be more important.

Respondents from aquaculture described the increased complexity involved with preparing planning applications for new developments or extensions and the business costs associated with this. They felt that there was not enough information about protected features and that local authorities lacked the resources to process them in good time. Delayed applications were said to be costly for aquaculture companies. Respondents also highlighted that delaying a project would also delay the jobs associated with a new site, a portion of which are in coastal communities.

In relation to tourism, respondents felt that the MPAs have had a positive impact, as they provide an additional tourist attraction for areas nearby. Some businesses reported using the MPAs as part of their USP or their promotional material. Aside from such direct links between tourism and MPAs, respondents also highlighted the importance of the natural environment for marine tourism in general. They felt that environmental protection afforded by the MPAs would enhance marine tourism and recreation opportunities in the future, regardless of whether those businesses used the MPA directly. An example of this is recreational fishing, which respondents hoped would expand as habitats and stocks recovered. A number of respondents felt that more effort could have been made to promote and celebrate the MPAs and their benefits for the environment and coastal communities, and acknowledged that there was still a lack of awareness about MPAs in some areas.

Section 5. Wider Social Impacts on Local Areas

This section sets out the wider social, economic and environmental impacts of MPAs. As well as impacts felt by industries operating in the marine environment, stakeholders in coastal areas can also experience impacts as communities become more or less prosperous due to the changes in the industries that support them. As well as these wider economic impacts, the activities surrounding the MPAs and the environmental changes they produce can affect how people engage with each other and their environment. Some of these changes are a consequence of the more direct impacts on marine industries (e.g. sea-fisheries, processing, aquaculture and tourism) that were discussed in the previous section, while others stem from the groups and activities that have sprung up in response to the MPA designations.

This section presents an overview of the analysis of qualitative perspectives from local businesses and communities on the positive and negative impacts of MPAs, considering economic, social and environmental consequences. In addition to understanding local stakeholders' perspectives, it is important to gauge the level of public understanding and support for MPAs, as they were created in the public interest. This section therefore also presents data from the Social Attitudes Survey regarding attitudes towards, and awareness of, MPAs.

Summary of findings

A fairly large number of respondents described how community groups associated with MPAs had organised events and activities in order to raise awareness and educate both locals and visitors about the marine environment. Respondents from eNGOS and community groups mentioned research projects, data collection campaigns and collaborations with research institutions, all aimed at improving the evidence base for MPAs. They highlighted that these events and activities provided opportunities for people to gain skills and experiences that might normally be too expensive or hard to reach. In some cases, MPAs are located near urban centres, and give people access to marine wildlife that they may not have had previously.

Many respondents described environmental improvements that they had seen since the implementation of the MPA management measures, and feelings of hope and inspiration at the thought of the future conservation benefits of MPAs.

There is evidence that community groups and organisations had developed or galvanised around the MPAs. These were said to bring like-minded people together, while a number of respondents described how local communities had taken a keen interest in the MPAs, their management and the activities associated with them. On the other hand, it was also very common for respondents to describe divisions between those who supported or opposed the MPAs.

Many respondents, from a range of groups, commented on the relationship between marine stakeholders and Marine Scotland. Respondents felt that there was a lack of a clear strategy for the marine environment, as well as the industries that depend on it, and that decisions appeared to be based on political need rather than evidence. It was acknowledged that relations had improved in recent years, however.

Respondents from the fishing industry often said that they were in favour of conservation and regulation, so long as it was fair, effective and enforced. Many were aware that the marine environment and fish stocks were in decline and felt that intervention was needed. They said that they would not mind losing access to grounds or stocks, if everyone was losing out in the same way, and they could be sure of the environmental benefits. Some felt that there was a need for more local management and more monitoring.

In terms of individual perceptions of MPAs, most respondents understood MPAs to be concerned with protected features or marine conservation. Others understood their aim to be fisheries management, stock improvement, or a complete ban on commercial activity. Analysis of the social attitude survey, and short structured interviews showed that many respondents were not sure what MPAs were, but the majority of respondents were in support of them, nonetheless.

5.1 Engagement with the marine environment

Many of the reported benefits of MPAs were linked to encouraging or facilitating engagement with the marine environment. It was felt that MPAs could draw people's attention to local marine biodiversity, while eNGOS and community groups have used the designation as a starting point for raising awareness about conservation issues and educating people about the marine environment.

Awareness and education

Twenty respondents, mostly from community groups, eNGOs, or local authorities, said that they had put on events and activities to raise awareness and educate local communities and visitors about the marine environment and the MPAs, whilst other respondents said that they had become more aware of marine issues due to such activities. These events are not necessarily focused solely on the MPA but used as a catalyst for achieving wider educational and awareness aims.

Many of the community groups said that they were heavily involved in marine education, outreach and raising awareness about conservation issues. They described a range of events, activities and programmes aimed at a variety of groups, and attracting large numbers of attendees. Awareness raising activities included:

- Evening talks given by visiting speakers e.g. photographers, academics, people from other environmental organisations
- Working with local natural history groups
- Giving presentations at larger conferences both nationally and internationally
- Shore scrambles with children and families where volunteers take groups for walks and teach them about what is there
- Stalls and activities at community events such as gala days and highland games
- Marine festivals showcasing sustainable sea produce
- Snorkel taster sessions where visitors are taken snorkelling in the MPA to see what is there and "snorkel trails" showing the best places to see marine life and marine features
- Involving communities and children with native oyster re-introduction
- Photography and film making in the MPAs

It is also worth noting that one MPA has achieved recognition as the first Mission Blue Hope Spot in Scotland and mainland UK (See Box 1).

Educational activities included:

- Visiting school groups to give talks (covering nursery, primary, secondary and university groups).

- Working with schools as part of a residential course. Sometimes this is linked to the local outdoor education centre and the John Muir conservation awards. Children from the surrounding area visit as part of the scheme
- Linking to High Schools' wider achievement modules with pupils invited to work on a project with the community group
- Arranging High School groups to do beach cleans, where volunteers teach them about conservation
- Research placements with universities at Edinburgh, Glasgow, York, Strathclyde
- Linking activities and placements with Duke of Edinburgh awards
- Marine ID courses and shoreline guided walks
- Training in how to conduct marine surveys.

Similarly, the campaigns run by many of the community groups extend beyond the MPA to wider marine issues such as marine plastic pollution. For example, an all-female yachting crew has been raising awareness of Lamlash Bay, in the South Arran MPA, and set up Think About Plastic Arran. Through that campaign they achieved plastic-free accreditation for the Arran community.

Box 1: Argyll Hope Spot
Mission Blue is an organisation founded by the oceanographer, Sylvia Earle. The idea is that anyone can nominate a place that is special to them and which has certain characteristics such as a great diversity of species, rare species, the potential for restoration, or is important for particular processes such as migration or spawning. Four community groups in the Argyll area came together, supported by many local people, to nominate the seas in the Argyll area as a hope spot. The area includes a number of MPAs.

A few respondents highlighted that it was important to make these activities, and the opportunity to engage with the marine environment, as accessible as possible. Some of these groups offer a chance for people to take part in activities, to learn and to see things, which might normally be prohibitively expensive, or considered too far away or too complicated to engage with. Assisting with marine surveys, for example, can allow young people to use equipment and learn techniques which may give them valuable experience for future work and study.

Research

Another issue that was raised in local areas was the importance of research and monitoring within the MPAs. This was highlighted by 19 (out of 101) respondents, mostly from members of community groups or eNGOS but also respondents from a range of other respondent groups. Some were involved in doing research themselves, whilst others were aware of research that was being done. Some discussed research that they thought should be done.

A number of the community groups carry out regular monitoring of the MPAs, with the help of volunteers, Seasearch divers and academics. Many cited the desire to ensure that baseline data was collected so that the success of management

measures could be assessed, as well as a need to learn more about the Priority Marine Features that the designation was based on. There was also the view that a better understanding was needed about what activities would or would not damage designated features.

The potential to increase the contribution of Citizen Science was also mentioned by respondents. It was suggested that by offering training in survey techniques and putting on events where groups can collect data together, these activities could help to raise awareness about marine issues, as described in the previous section.

As mentioned previously, some of the community groups have links to research institutes and so have students and academics visiting the area in order to collect data and carry out research projects. Some of the outputs from these projects have been published. In addition, a few respondents highlighted areas of research that they feel need to be addressed. These included the carbon or climate benefits of MPAs, the potential benefits of MPAs for nearby fisheries, sustainable levels of marine economic activities.

Sense of optimism about the local environment

Twenty respondents, from a range of groups including the fishing industry and members of community groups and eNGOS, described environmental improvements that they have seen as a result of MPAs, and feelings of hope and inspiration at the thought of the future conservation benefits of MPAs.

Respondents described the improvements they could see on the seabed and the excitement of seeing some species returning. There was also a sense of hope that parts of the sea may be able to recover in the coming years.

A few respondents highlighted that real, significant benefits would not be visible for a few years, as these ecosystems can take time to recover. They also noted that the main aim of the MPAs is marine conservation, and not socio-economic benefits, and that it was important not to lose sight of that.

5.2 Community relations

Eleven respondents, mostly from community groups/eNGOS, discussed ways in which the MPAs had encouraged collaboration and brought people in communities together.

Respondents often highlighted how the MPA, and the groups that had developed around it, provided a way of bringing people with similar interests together. The Coastal Communities Network (CCN) provides a way for community groups across Scotland, who are focused on conservation initiatives, to share experiences and lessons learned, and to collaborate on projects. For example, four community groups came together, with the help of CCN, to apply for the Argyll Hope Spot accreditation, described in Box 1.

It was also highlighted that communities near MPAs expressed a keen interest in the activities relating to their local MPA, such as results of research carried out, management decisions, and campaigns. This was attributed by respondents to the events and activities organised by these groups.

A few respondents mentioned instances where environmental groups and fishers had worked together. They highlighted how both fishers and environmental groups want healthy and resilient seas, supporting diverse and sustainable fisheries. Examples of working together included a trawl vessel skipper inviting school children from the local conservation group to see his boat and how this form of fishing works, as well as a scheme training creel fishers in how to disentangle marine mammals from ropes.

On the other hand, *c*onflict or tension relating to MPAs was mentioned by a fairly large number of respondents (27 out of 101). Most respondents who discussed this issue were from the fishing industry and from eNGO/community groups. A lot of the conflict related to some people supporting the introduction of MPAs, and others opposing them.

Mobile fishers tended to feel frustrated at suggestions that they were fishing in MPAs illegally. They acknowledged that a few fishers did break the rules, and this meant that they were then all “tarred with the same brush”. They felt that that their livelihood was at risk, but that other members of the community did not think that this mattered. Some respondents also suggested that the MPAs may have exacerbated tensions between the mobile and static fishers, given that some are allowed to fish in MPAs whereas others are not.

Some of those who supported or campaigned for MPAs described receiving threatening or aggressive messages and in some cases have had to change their behaviour/lifestyle in order to avoid such messages and feel safer. This was particularly concerning when families were affected.

Some respondents described these conflicts from personal experiences, others reported what they had heard anecdotally. A lot of conflict seemed to play out on social media, which was still felt to be unpleasant to deal with.

5.3 Trust

Forty-five respondents (out of 101) discussed their relationship, or the relationship of marine stakeholders, with Marine Scotland and the wider Scottish Government and highlighted the perceived lack of trust that exists in that relationship. This could have implications for future MPAs, including social acceptability, compliance and engagement with ongoing consultation for MPA management measures.

Twenty-nine of these were from fishing or related industries, while the remaining 16 respondents came from a range of stakeholder groups including eNGOs/Community groups, Tourism and Local Authorities.

The main theme that emerged consistently across all groups was the belief that the decisions that were made regarding MPA management measures and boundaries appeared to be influenced by politics rather than evidence. Respondents felt that there was not a clear long-term strategy for the inshore waters and that management could, therefore, change depending on political stances. This sentiment was shared by stakeholders with a conservation imperative and those with a fishing imperative.

Respondents from the fishing industry, in particular, questioned the value of the consultation process, as they felt they were generally not listened to properly, and believed that decisions were often made before the consultation began. A few respondents highlighted that loss of trust in this way can prevent fishers and other stakeholders from engaging with consultation processes and other government projects. On the other hand, a few respondents added that, although trust had been lost, the relationship between the fishing industry and Marine Scotland had improved in recent years and continues to do so.

Many respondents from the fishing industry said that they were in favour of conservation and regulation, providing it was fair, effective and enforced. They highlighted that the mobile sector is regulated, while the static sector is not subject to as many controls. Some also raised the issue of non-compliance with management measures. A few respondents described a situation in which they might leave an area unexploited, so that it could recover or be conserved, only for it to be exploited by someone else. They said that they would not mind losing access to grounds or stocks, if everyone was losing out in the same way, and they could be sure of the environmental benefits. These points are important to further understand the complexity of the relationship between industries and decision makers, and to ensure transparent and trusting relationships are built for the future.

Finally, respondents from a range of stakeholder groups felt that there was not enough local management of MPAs and insufficient monitoring of social and environmental impacts after management measures were introduced. In some instances, this contributed to the lack of trust described above as the approach to management was not thought to be transparent.

5.4 Understanding of Marine Protected Areas

It is important to gauge the level of public understanding and support for MPAs, as these policies are fundamentally created in the public interest. In each interview, respondents were asked what they understood of the objectives and workings of MPAs. This question was also asked of members of the public during short structured interviews that were carried out in each case study area, as well a question about their degree of support/opposition to MPAs. These questions were designed to follow the wording and structure of the questions asked in the 2018 Social Attitudes Survey.

Social Attitudes Survey

In 2018 Marine Scotland commissioned research to improve understanding of how Scottish residents interact with the marine environment (sea and coastal areas), their perceptions of how it should be managed and their environmental concerns, amongst other issues. A survey with the public was carried out asking their perspectives on the marine environment. A small portion of the questions in this survey related to MPAs, and the results of these are presented here, in Table 5.1 and Table 5.2.

Table 5.1 Social Attitude Survey response regarding familiarity with MPAs, showing total responses, and responses from those living on the west coast of Scotland

How familiar are you with Marine Protected Areas (MPAs)?							
		Not previously heard of MPAs	Heard of, but know nothing about	Not very familiar	Quite familiar	Very familiar	Total
National	%	35.8%	16.5%	33.3%	12.5%	2.0%	100%
	N	786	362	733	274	43	2198
West Coast	%	28.7%	12.5%	37.0%	19.0%	2.8%	100%
	N	83	36	107	55	8	289

When asked how familiar they were with Marine Protected Areas, a majority of respondents said that they were either not very familiar with them or had not heard of them before (33.3% and 35.8% respectively). The survey sample was representative by gender, social status and region, so the majority of respondents are unlikely to live near MPAs.

The survey included postcodes and so it was possible to look at those living within 10 km of the west coast of Scotland (a sample of 289 respondents from the total 2,189). The responses are consistent with the national sample, however, and show that the majority of respondents are either not very familiar with MPAs or had not heard of them before (37.0% and 28.7% respectively). The portion of those who were quite familiar with MPAs was higher for those living on the west coast with 19.0% responding in this way, as opposed to 12.5%.

Table 5.2 Social Attitude Survey response regarding support for or opposition to MPAs, showing all responses and responses from those living on the west coast of Scotland

To what extent do you support or oppose the creation of MPAs in Scotland?								
		Strongly oppose	Tend to oppose	Don't know	Neither support or oppose	Tend to support	Strongly support	Total
National	%	0.3%	0.9%	8.1%	10.2%	37.8%	42.7%	100.00%
	N	7	19	178	225	830	939	2198
West Coast	%	0.3%	0.3%	6.2%	9.7%	39.1%	44.3%	100.00%
	N	1	1	18	28	113	128	289

When asked to what extent they supported or opposed MPAs, the vast majority, at a national level, said that they tended to support or strongly support the creation of MPAs (37.8% and 42.7% respectively). The response to this question, given by those on the west coast of Scotland, is consistent with the national trend, with 39.1% and 44.3% responding that they tended to support or strongly supported the creation of MPAs.

In summary, although there is low awareness of MPAs among the public, analysis of the survey results suggests that people are supportive of them. This is true at the national level and in west coast areas.

Case study short interviews

Several towns were visited for each case study, and in each one short structured interviews were carried out with members of the public and local businesses. Part of the interview used questions from the Social Attitudes Survey, so that results could be compared. The total number of respondents from each area is given in Table 5.3.

Table 5.3 Number of short interview respondents in each area

MPA	Number of respondents
Loch Sunart to the Sound of Jura	12
Orkney	6
South Arran	11
Wester Ross	8
Grand Total	**37**

The sample size was small and not statistically representative, but the results are described here to give an indication of the local feeling towards MPAs.

When asked how familiar they were with MPAs, 23 out of 37 respondents said that they were not very familiar. Among those who said they were 'Not very familiar' 11 respondents speculated that the measures were to do with conservation of the marine environment.

When asked to what extent they supported or opposed MPAs, the majority in all case study sites said that they supported the creation of MPAs. It was common for those who were 'Not sure' to say that they felt some balance needed to be struck between conservation and economic activities. This was also said by some of those who supported MPAs. Eighteen respondents emphasised the need to care for the marine environment.

Stakeholder Interviews

During interviews it was common for respondents to discuss what they understood of MPAs and their objectives. It is important to know how people understand MPAs as this influences how they perceive the validity of the management measures, and the success of the policy. This topic was discussed by 72 out of 101 interviewees.

The majority of interviewees who discussed this topic, either understood that the MPAs were set up to protect special features, or that they had general marine conservation aims. Within these groups there was a spectrum from those who had detailed knowledge of MPA regulations (mostly in aquaculture, compliance and local authorities), through to those with much less detailed knowledge. Even those who mentioned protected features were not always familiar with what the feature was or why it was protected.

Ten respondents described MPAs as a fisheries management tool while 8 thought that their aim was to improve stocks. There was a perception from some that they were designed to reduce the size of the mobile fishing fleet, or specifically to reduce pressure on certain fish species.

Nine respondents mentioned that MPAs were perceived as ‘nature parks’ in which no commercial activity could take place. This was mentioned by some as their personal view, and by others as an assessment of how others view MPAs.

Conclusions

As well as wider economic impacts, the MPAs were thought to have wider social impacts. At the centre of many of these social impacts were a number of very active community groups. These groups organised a large array of activities and events with the aim of raising awareness and educating the public about marine conservation and promoting the rich diversity of their local inshore waters. They had made links with research institutions and collaborated on numerous research projects in order to gather data and improve understanding of the environmental impacts of MPAs. Some of these research projects involved citizen science, further engaging with the public around marine issues.

Respondents mentioned seeing improvements in the marine environment, which they attributed to MPAs. Many stated that this was the most important positive impact of MPAs and described feelings of hope and inspiration at the thought of the improvements that were possible and what that could mean for their local area.

Respondents from community groups described how the MPAs, and the activities associated with them, had brought together like-minded people around a common goal. They also felt that, in some cases, communities had taken ownership of the MPAs and were keen to hear how they were progressing.

On the other hand, it was common for respondents to describe instances of conflict or tension within communities, often between those who supported and those who opposed MPAs.

Generally, respondents understood that MPAs were intended to protect certain features. Others were aware of general marine conservation aims. Some respondents had the impression that MPAs were a form of fisheries management, a way to improve stocks, or an area where no commercial fishing activity was permitted. Some felt that confusions in understanding of MPAs could exacerbate conflicts and tensions and might lead to disillusionment.

Finally, according to the Social Attitudes Survey, and the short structured interviews the general public tended to be in support of MPAs but were often unsure what they were.

Section 6. Wider context

The MPA designations and associated management measures form part of a range of factors that affect the marine environment and the people who depend on it. In themselves, MPAs may have minimal direct impact, but when examined in combination with other existing challenges, their impacts might be greater than initially thought. It is important to put the impacts resulting from the introduction of MPAs into this context to better understand them. This section summarises the cumulative impacts of issues affecting areas near MPAs to illustrate the complexity in which marine industries and their communities operate. It also sets out the wider challenges that marine industries face, some of which relate to global forces.

Summary of findings

Although the interviews focused on the issue of MPAs and the impacts they may have had on marine stakeholders, it was common for respondents to discuss other, related issues that interact with the MPAs. These issues serve to either explain, contextualise, or highlight some of the more direct impacts of MPA management measures.

A range of industries use the marine environment, all impacting on each other and placing restrictions on how the sea can be used. MPAs form a part of this context and, during interviews, were frequently discussed in relation to the cumulative impacts of other marine developments. For example:

- **Aquaculture** was often mentioned as having a wider impact on the marine environment by respondents from a range of groups. Fish farms use feed and chemicals to maintain their fish and it is thought that these impact on wild shellfish and adjacent habitats.
- **Offshore renewable developments** were mentioned less frequently and mostly in specific areas (e.g. Orkney). These developments take up space in the sea and can hinder safe passage through certain areas. They are currently not perceived to be a major concern in west coast waters.
- Respondents highlighted that not all marine areas are prime fishing grounds, but that where developments interact with these areas, it can have a disproportionate impact.

Many respondents from fishing and associated industries reported that **skippers were struggling to find crew** and that this was one of the biggest factors affecting their ability to fish. A few respondents described this as their most significant concern. The main causes of this were thought to be:

- Young people not choosing to join the industry as it is considered too risky and unstable. Young people were thought to be choosing to work in aquaculture instead, as this is perceived as offering a more stable income and benefits, such as pension, holidays and sick pay.
- Difficulties in accessing non-EU crew due to changes in legislation relating to migrant workers impacting overall recruitment into the sector.

Changes in prices for fish and shellfish can have a substantial impact on fishing and processing businesses and are known to fluctuate quite a lot, for a range of reasons. This was mentioned fairly frequently by respondents from the fishing industry as it can have such a big impact on vessel profits. Two main issues were highlighted:

- Concerns over access to markets for selling produce were frequently mentioned, as respondents were concerned about the potential impacts of Brexit. Fishers are able to get a higher price for their produce if they can sell it live to European markets. There were concerns that disruption to transport of goods to Europe might close this market avenue.
- On the other hand, Brexit uncertainty meant the British Pound was weak, creating a favourable exchange rate for exporting fish. Some said this was the main reason their businesses had been doing well, and expressed concern if the situation changed.

The licence or quota system was thought to hinder fishers' abilities to diversify and respond to changing markets, stocks and environmental conditions.

- Respondents described feeling constrained, having to continue fishing for the species they had quota for, even if stocks were depleted and profits reduced.
- The high price of licences or acquisition of quota were also thought to discourage young people from entering the fishing industry.

Rural and remote communities face a range of challenges including dwindling populations, lack of employment opportunities and difficulties accessing resources, making them vulnerable to external shocks. Even small changes to some industries can have significant consequences in rural communities. Respondents often described how the success of offshore and onshore businesses could be highly dependent on each other.

Respondents discussed how **wider environmental changes** can, and indeed are, having an impact on marine industries. Specifically, climate change was discussed as having the potential to increase the vulnerability of marine ecosystems, and so increase their need for protection.

6.1 Cumulative impacts

Several industries make use of the resources that Scottish seas provide e.g. offshore renewable energy and aquaculture. Where these developments occur, there will be restrictions on who can use that part of the sea and in what way depending on the nature of the development, and the area it occupies. MPA designations may occur in areas where there are other existing developments or industries, bringing with them another set of restrictions on marine activities. These restrictions can cover a fairly small area, but when combined with other nearby developments and the restrictions associated with them, they can have substantial impacts. This combination of impacts is termed 'cumulative impacts'.

Twenty-nine (out of 101) respondents raised the issue of cumulative impacts during interviews. Discussions focused on the impacts of aquaculture and renewable energy developments, although other marine users were also mentioned. Some respondents mentioned more than one type of cumulative impact.

Aquaculture

Twenty-three respondents discussed aquaculture developments and the individual and cumulative impacts they may have on the marine environment and other marine activities. This topic was discussed by approximately a quarter of fishers interviewed (11 out of 40), and half (6 out of 13) of the eNGO and community group members interviewed.

Most of these discussions were concerned with the environmental impact of aquaculture and whether this might affect fish stocks. Respondents discussed the effects of lice chemicals on crabs, and wider impacts on the sea-bed. This issue was raised mostly by fishers and eNGOs/community groups. As discussed in previous sections, there are already concerns regarding fish stocks, landings and environmental health, and the potential that aquaculture developments may add to this caused some disquiet.

Some fishers also mentioned that aquaculture may be exacerbating the difficulty in finding crew, as local men were choosing to work on fish farms instead, for the reasons outlined in Section 6.2. On the other hand, others said that they were grateful for the fish farms as they provided local employment, and felt that without the farms, some coastal communities might struggle.

Renewables

Potential cumulative impacts relating to offshore renewable developments were mentioned by 9 respondents, mostly from fishing or related industries, but also a couple from local authorities. Offshore renewable energy sites were mentioned most often in relation to reduced access to fishing grounds, if developments take place on fishing grounds, or impede safe passage to fishing grounds. For the most part, these developments were not thought of as an issue at present, but there were concerns about the area devoted to this type of development expanding in future. This could have an impact alongside MPA designations which also reduces the area available for fishing.

Ten respondents spoke of other impacts which they felt added to the difficulties of operating in the marine environment. Marine activities, which were mentioned in this

context, include military areas, ferry crossings, cruise liners and shipping lanes. A few respondents discussed how each development or requirement reduces their access to fishing grounds. Although each development may take up only a small area of the sea, when combined a greater total area is restricted. They also felt that planners positioning renewable energy installations failed to acknowledge that not all of the sea is prime fishing ground and that the weather, tides and currents have a big influence on which areas can be accessed. They said that when all these things are combined it can reduce options for fishing considerably.

6.2 Shortage of Crew

Skippers have been struggling to find crew to work on their boats for some time. This issue was raised by 28 respondents, all from fishing or related industries. A couple of respondents mentioned losing days at sea because of difficulty finding crew, with one citing 3 months lost in 2 years. Overall, crew recruitment was often cited as the biggest issue facing the fishing industry on the west coast.

The difficulty finding crew was thought to be for several reasons. Chief among these were:

- *Young, local people are not choosing to join the industry* –Young people were said to be working in aquaculture as this offered a steady income, regular working hours, and social benefits such as sick pay and holidays. According to some, although fishing often pays more than aquaculture, the wages may be irregular and are not sufficiently high to compensate for the uncertainty and difficult working conditions.
- *Difficulty getting non-EU crew* - The laws concerning employment of non-EU workers make it difficult for skippers to get visas for non-EU crew. Historically, crew from the Philippines or Ghana were able to come and work for a short period and then return to their home country. This is no longer possible due to a change in laws relating to foreign workers. Currently many boats rely on EU migrants, but there is some concern about what Brexit will mean for this source of crew.

6.3 Markets

Changes in prices for fish and shellfish can have a significant impact on fishing and processing businesses, something that was mentioned regularly during interviews. Twenty-two respondents discussed this topic, mostly from fishing and related industries.

Access to markets

It was common for respondents to mention Brexit and to express concern about their ability to sell their produce to Europe. For many, Europe is their main market and they do not know what they will do if they lose access to it, or if there are delays in moving live or fresh produce as a result of customs checks being introduced that would render it worthless.

A lot of respondents discussed the market for live brown crab in China. This market was said to be large and lucrative and potentially driving the rise in creel gear. A few respondents mentioned exploring that market in preparation for the impacts of Brexit.

Prices

It was also common for respondents to mention how fluctuating prices had a big impact on their income and economic stability. Many mentioned that the weak pound[15] had been good for them in recent years, as they were getting a better price for their produce. Many said that although their catch per unit effort was declining, the price had made up for that. It was also common for respondents to express concern about what would happen if the markets changed, and to recognise that markets can change quite quickly.

6.4 Licence or quota

The licence and quota systems affect which species can be fished and how much can be landed. Sixteen respondents raised this issue during the interviews, 13 of whom were from the fishing industry.

Depending on the target species, fishers either need to buy a license to fish, or quota that entitles them to a certain portion of the harvestable stock. Many respondents discussed how obtaining licence or quota was very difficult and expensive to buy, and that this had a number of consequences for those working in the industry.

Due to the price and availability, fishers described being limited to a small amount of quota for one species, or a license for one species. This meant that they were not able to diversify in response to changes in markets, stock, environmental conditions or new designations such as MPAs. Respondents described being forced to continue fishing for a particular species, despite being aware that stocks were low, because they did not have the option of moving on to something else. It was commented that this made the fishing industry and fishing communities less resilient to any political and environmental shocks that may be on the horizon.

Some also mentioned that the difficulty of obtaining licence or quota added to the challenge for young people seeking to enter the fishing industry, unless they were part of a family business. It was felt that this might further exacerbate the issues with finding crew.

6.5 Rural communities

Many of the communities near MPAs are small, rural and remote, and employment opportunities can be limited. Changes to a locally important industry can be keenly felt and can have significant consequences for the wider local economy and community.

Nineteen respondents, from a range of groups, mentioned the difficulties of living in rural and remote communities. Many described difficulties accessing resources and services, with the costs associated with transporting goods in or out of the area sometimes prohibitively high. This means that local businesses tend to rely on each

[15] ONS Dashboard: Sterling effective exchange rate

other. For example, the fishers, the harbour and the general population might rely on the local iron monger, while that business, in turn, is dependent on the local customer base. If one of those businesses or industries leaves or declines, there is a domino effect and the others suffer. Respondents mentioned struggling when the local chandlery, co-op or fuel tanker business closed. In some cases, it was mentioned that this can lead to an over-reliance on one business which provides a lot of local employment, and potentially infrastructure, thus increasing the overall vulnerability of the community.

Respondents also highlighted that remote and rural communities can suffer from depopulation and a lack of jobs. This can mean that each business is vitally important for providing employment, but also that each family or resident is important for using services and keeping them going. They highlighted that the situation can be particularly difficult for island communities.

For the reasons described above, rural, island and remote communities can be highly vulnerable and for coastal communities, where fishing can be an important industry, factors that affect fishing (e.g. MPAs) may have disproportionate impacts.

6.6 Environmental concerns

Wider environmental changes such as weather events and stock fluctuations can have an impact on marine industries. At the same time, climate change may increase the vulnerability of marine ecosystems, and so increase their need for protection.

Thirteen respondents, from a range of groups including the fishing industry, eNGOS or community groups, and processing, mentioned wider environmental concerns. All of these respondents mentioned concern for the marine environment, and highlighted a range of environmental issues including, climate change, micro plastics in the sea, ocean acidification, disruption of feeding patterns and disruption of the ecosystem as a whole. Over-fishing was also mentioned frequently. Many respondents commented that there were certain species that they had not seen for some time and expressed concern about what this might mean for the future of the wider ecosystem.

Several respondents said that the weather was the biggest risk factor for their business. Along with this, there was recognition from some respondents that weather patterns had become more erratic and storms more severe. Some linked this to climate change.

Conclusions

This section explored the links between MPA management measures and other local and global factors affecting marine stakeholders. The interviews focused on MPAs and their impacts, but it was very common for respondents to discuss other, related issues in order to better explain, highlight or contextualise their experiences.

It became clear that MPA management measures cannot be considered in isolation, as this is not how respondents experience their impacts. A common theme was that of cumulative impacts associated with other marine users. Respondents from the fishing industry, in particular, highlighted that MPA management measures were

introduced into inshore waters where certain areas are already inaccessible due to other marine developments such as those for aquaculture and renewable energy, as well as shipping lanes, ferry routes, cruise liners and military zones.

Many respondents commented on the environmental impacts of aquaculture sites. For those from the fishing industry, there were concerns that the chemicals and feed used in aquaculture may negatively affect shellfish, exacerbating the decline in these stocks and adding to the difficulties of landing enough to make a profit. Respondents from eNGOS and community groups also had concerns about pollution form aquaculture sites. They worried that these pollutants would add to existing pressures on the marine environment such as overfishing, climate change and marine plastics.

Respondents from fishing and related industries also highlighted that MPA management measures were not the only thing affecting their ability to maintain their businesses. Many respondents described the shortage of crew as the most important issue affecting them. This was thought to be due to a change in the law relating to non-EU migrant workers, as well as the lack of young people joining the industry. Respondents felt that young people did not choose to enter fishing as it was considered an unstable and difficult career. Young people in coastal areas, who might have been interesting in fishing, were said to be more likely to choose a career in aquaculture.

The price of fish and access to markets were also considered to be important factors for respondents from the fishing industry, as were environmental changes and the weather. These factors can be volatile and affected by global forces.

Interviews were carried out while Brexit negotiations were underway and this was of great concern to respondents from fishing and related industries, as it was seen to be impacting produce prices, and has the potential to affect markets. Recent years have also seen particularly erratic and extreme weather events.

Some factors, such as the quota system, reduced the ability of fishers to adapt to external shocks and changes, reducing their resilience. Respondents from the fishing industry described how the current quota and licence system limited their ability to target different fisheries in response to changes in markets, stocks, marine developments or weather events, amongst other things. As a result, the impact of developments such as MPA management measures can be accentuated, as fishers are less able to adapt to them.

In many cases the rural and remote nature of coastal industries and communities can make them vulnerable, compounding negative impacts from other factors. Rural and remote communities can suffer from dwindling populations, lack of employment opportunities and difficulties accessing resources. Even small changes to key industries can have relatively important consequences. Respondents often described how the success of offshore and onshore business could be highly dependent on each other.

Section 7. Case Studies

Four MPAs were chosen as case studies for this research. This approach enabled a more detailed exploration of specific issues and areas.

The case study areas were chosen using a set of criteria to ensure that a good range of types of issue were covered. The criteria were developed using information from the key informant interviews as well as preliminary analysis of fishing data and were agreed upon with the Research Advisory Group.

The case studies were as follows:

South Arran MPA – chosen because it covers a large area where a lot of fishing takes place and there is potential for impacts on the fishing industry. There is also a very active community group associated with the MPA. The site is controversial.

Wester Ross MPA – chosen because the site was controversial to begin with, but now less so. There is value in exploring reasons for this change. There are active community groups in the area. There are also aquaculture sites allowing cumulative impacts to be explored.

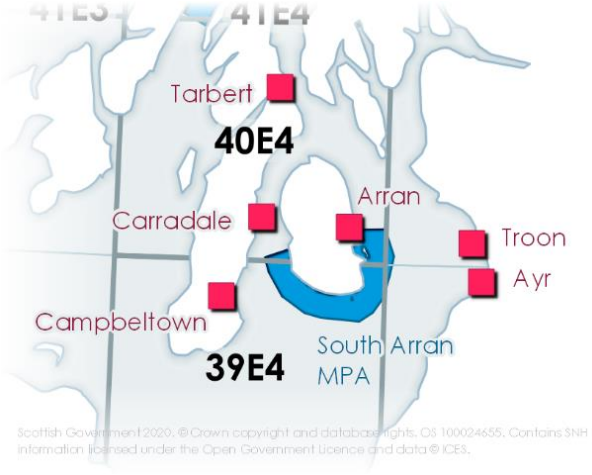
Loch Sunart to the Sound of Jura MPA – chosen because it covers a large area where a lot of fishing takes place and there is potential for impacts on the fishing industry. Marine tourism is well established in the area and there is potential for tourism activities associated with the MPA.

Orkney (Sanday SAC and Wyre and Rousay Sound MPA) – chosen because it is not controversial and impacts on fishing were not expected. However, a range of marine industries use the inshore waters around Orkney and there is potential for cumulative impacts

During August and September 2019, fieldwork was undertaken in the areas described above. Semi-structured interviews and short structured interviews were carried out with stakeholders and local businesses in communities near the case study MPAs. This, along with the key informant interviews, formed the basis of the qualitative evidence presented in previous sections of this report. The main findings of each case study are presented in the following pages, in order to place the impacts within their geographical context.

Case study: South Arran

Areas visited during fieldwork: Troon, Tarbert, Carradale, Campbeltown, Arran



	No. of respondents	
Stakeholder group	**In depth interview**	**Short interview**
Fishing industry	12	-
Seafood processing	4	-
eNGO/ Community group	4	-
Tourism	-	3
Food	-	-
Retail	-	1
Other (council, harbour)	6	-
Total	**26**	**4**

MPA context

Site description: The South Arran MPA is located around the southern half of the Isle of Arran in the Clyde. The outer boundary line is 3 nm from the coast and incorporates Holy Isle, Pladda Island and an existing No Take Zone in Lamlash Bay.

Features to be protected: Burrowed mud, kelp and seaweed communities, maerl beds, maerl or coarse shell gravel with burrowing sea cucumbers, seagrass beds, shallow tide-swept coarse sands with burrowing bivalves, ocean quahog aggregations.

Management measures - Whole Site: Beam trawl, dredge, demersal seine net, and demersal trawl by vessels greater than 120 gross tonnage.

Zonal management: Demersal trawl by vessels less than or equal to 120 gross tonnage. Creel fishing, set nets, and long lines.

Impacts of MPAs on the area

The most significant direct impact that the introduction of MPAs has reportedly had on fishing activity in the Arran area is the loss of access to important fishing grounds, requiring fishers to find new grounds as a result. This was mentioned by 17 respondents. In particular, the island of Arran was said to be important for providing shelter to fishing vessels during winter months, enabling vessels to fish no matter what direction the wind was blowing. Without these sheltered grounds, many described losing days at sea with one respondent estimating a loss of 10 days per year.

Nine respondents described reductions in landings. This was often attributed to the loss of sheltered fishing grounds. Ten respondents also mentioned having to fish

other areas more heavily, and expressed concern about the impact the extra fishing pressure might have on stocks.

In the South Arran area respondents also highlighted the many ongoing challenges facing fishing communities. These included:

The difficulties of living and working in a remote area:

- High transport costs can make it difficult and expensive to get supplies, small changes in employment can have a big impact, and depopulation is a concern.
- Respondents also described how many local businesses depended on each other and how declines in one could quickly have knock on effects for others.

The longer-term decline of fishing and the difficulties faced by port towns, as a result:

- Many cited Tarbert as an example of the interdependence between the onshore and offshore fishing related businesses, although similar trends were described in Campbeltown and Carradale.
- Businesses such as the chandlery, transport company and fishing office had sold up as the overheads were too high and profits too low. As a result, fishers have to organise their own transport, arrange delivery of hardware supplies and do their own accounts. This is more costly and time consuming.
- For some, these higher costs may make their business less viable, and they may choose to leave the industry. One respondent described it as being "punished for our postcode".
- Much of this decline was said to have started before MPAs were introduced, but the MPAs were seen as an additional burden and a contributing factor.

The difficulty finding crew for fishing boats:

- As well as the reasons described in Section 6.2 of this report, the remote location of these towns was seen as an extra factor.
- It was felt that crew from elsewhere in Scotland were not willing to travel so far for the work. One respondent said that they lost 3 weeks of fishing in 2018, as they could not find crew.

Eight respondents described social or personal impacts from management measures. Three of these described extra time needed to carry out other business related activities, such as accounts and ordering supplies, in addition to highlighting the impact of the increasing uncertainty of the profession on family life. Two young fishers left the industry to work in aquaculture for this reason, while another commented that he may leave fishing when he started a family. On the other hand, another respondent described how, after selling his fishing business to work in aquaculture, he was now away from his family for 3 weeks at a time. He felt it was hard on his wife and children and described finding it difficult to adjust.

Others discussed the effort associated with changing their career or fishing style. They said they had spent their careers acquiring the skills and knowledge required to

fish in their area, with their gear type, and that it was not easy to become competitive at a new style of fishing.

Stakeholders in the Arran area were also able to take advantage of the perceived opportunities associated with the MPA designation.

- Four respondents described the MPA as a tourist attraction, mentioning kayak tours businesses and B&Bs who used the MPA as part of their USP.
- The Community of Arran Seabed Trust (COAST) has set up a visitor's centre to raise awareness about the MPA, to support marine conservation and to provide a base for their activities. The centre attracted 11,000 visitors in 2018.

As well as using the MPA as a tourist attraction, local groups have used it to encourage and enhance engagement with the marine environment.

- Community groups in the area regularly organise a range of activities and events in collaboration with schools, universities and other relevant organisations, aimed at raising awareness of the MPA and wider marine issues, and educating both locals and visitors about the marine environment.
- They have developed collaborations with research institutes to carry out research and monitoring of the marine life in the area.
- A few respondents highlighted how the South Arran MPA is close to the central belt offering people from nearby urban areas a chance to see some exceptional marine wildlife. The research and activities that these groups organise also give people a chance to gain skills and experience that might normally be too expensive or far away to access.

Seven respondents reported environmental improvements in the area, saying they were seeing a greater abundance of some species and the return of others.

Thirteen respondents discussed the tensions that have arisen in the area since MPA management measures were introduced. Some groups are strongly in support of MPAs, while other are strongly against them. It is also clear that some have benefited from the designations, while others have not.

Local business perspectives

Four businesses took part in the short structured interviews. Three were linked to tourism, one supplied hardware to businesses and individuals. Two respondents considered their business to be linked to the marine environment.

From this group, little mention was made about how MPAs might have impacted on their businesses suggesting that MPAs are not the most pressing issue for them. Three respondents had not noticed any changes to their business in recent years and cited the weather as well as the local community as being the most important factors for the success of their business.

Only one respondent mentioned that fishing was declining and the community was not thriving. They did not attribute this to the MPA, but to overfishing. They also highlighted that they felt it was important for a community not to be dependent on tourism, as this can lead to a seasonal and unstable income.

Conclusion

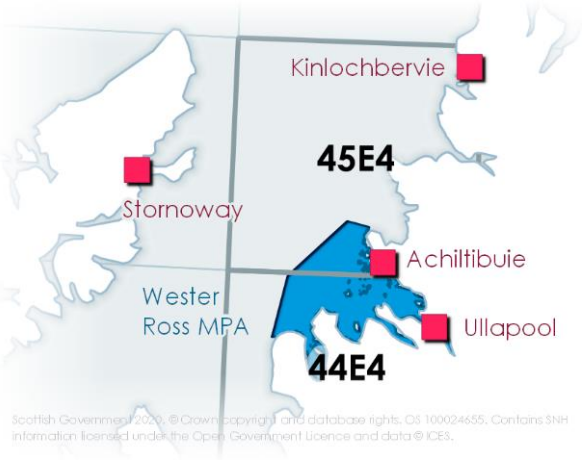
Fishers in the South Arran area reported losing access to sheltered fishing grounds, with consequences for their landings. This has had knock on effects for onshore businesses and communities. These were already suffering due to the trend of decline in fishing and the difficulties inherent with operating in a rural and remote community.

Local community groups have galvanised around the MPA, organising events and activities to raise awareness and educate people about the marine environment, and conducting research to assist with monitoring changes to the MPA. The MPA and associated opportunities are thought to provide a valuable resource for people in the wider area.

Case study: Wester Ross

Areas visited during fieldwork: Ullapool, Stornoway, Kinlochbervie, Achiltibuie

Stakeholder group	No. of respondents In depth interview	Short interview
Fishing industry	14	-
Seafood processing	2	-
eNGO/ Community group	2	-
Tourism	1	-
Food	-	3
Retail	-	-
Other (council, harbour)	4	-
Total	**23**	**3**



MPA context

Site description: The Wester Ross MPA stretches from the southern part of the Coigach peninsula to Loch Ewe, encompassing the Summer Isles and extending a little into the Minch.

Features: Burrowed mud, flame shell beds, kelp and seaweed communities, maerl beds, northern feather star aggregations, circalittoral muddy sand communities, maerl or coarse shell gravel with burrowing sea cucumbers as well as geodiversity features.

Management measures - Whole Site: Beam trawl, dredge, demersal seine net, and demersal trawl by vessels greater than 500 kW engine power.

Zonal management: Demersal trawl by vessels less than or equal to 500 kW engine power.

Impacts of MPAs on the area

A common theme in the Wester Ross MPA was the efforts that fishers had to make to adapt to MPA management measures.

- Twelve respondents discussed changing their fishing patterns; in some cases choosing to fish more on the east coast. This could have consequences for onshore businesses in the local area
- Nine respondents described how, as people were not able to fish inside the MPA, unrestricted fishing grounds had become more crowded, increasing pressure on these areas. One commented that everyone was looking for the same protection from the prevailing southerly wind, and so the same places were being targeted and stocks were declining

This was having knock on effects for local processors as their traditional grounds were being fished by vessels which landed their catches elsewhere. Processors highlighted that being based in remote areas can make it difficult to get produce as there is not such a wide range of resources available to them.

Changes in fish stocks were also mentioned by a fairly large number of respondents (14 in total), but with differing perspectives.

- Seven respondents discussed reported improvements to stocks and habitats within the MPA boundary. Scallop divers and anglers reported improvements in scallop stocks, as well as the return of fish species that has not been seen for a while, such as haddock, herring and skate. It was noted by respondents that scallop populations are often quick to recover and so would likely be the first fishery to show signs of recovery.
- As well as stock benefits within the MPA, eight respondents spoke of declines in stocks outside of the MPA. Several reasons were given for this. The decline in crab stocks was attributed to overfishing by industrial vivier crab boats, as well as a greater demand for crab in China. The decline in the *Nephrop* creel fishery was attributed to the high price of *Nephrops* and the lack of regulation in this sector.

A particularly notable theme within the Wester Ross MPA was the efforts made by local community groups in raising awareness, conducting research, and engaging across different stakeholder groups.

- Eight respondents reported an increased awareness of the marine environment in the local community, as well as research that had been carried out to monitor the MPA. Much of this work has been carried out by local eNGOs and community groups through a combination of citizen science and funded projects. The Ullapool Sea Savers were mentioned often in relation to the campaigns and projects they had been involved with.
- There were a few instances where environmental groups and fishers had worked together. For example, a trawl vessel had invited school children from the local conservation group to see his boat and how that form of fishing works. Additionally, a scheme was developed to train creel fishers in how to disentangle marine mammals from ropes.

Local business perspectives

Three businesses took part in the questionnaire, all of these were in the food sector and two considered themselves to be dependent on the marine environment. All respondents said they supported the introduction of MPAs.

One commented that since the Wester Ross MPA was established, community awareness of the marine environment and environmental issues had increased. They attributed this to local eNGOs and community groups. Another respondent noted the decline in the local fleet and the increase in tourism in the area.

Conclusion

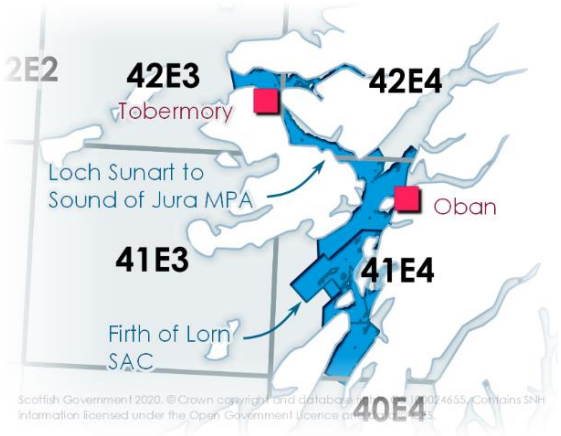
Fishers near the Wester Ross MPA have taken steps to adapt to the MPA management measures. This mostly involved changing their fishing patterns to target different areas. Unrestricted fishing grounds are becoming fairly crowded, and there were concerns about the impact the increased fishing pressure might have on these grounds.

Shellfish stocks in areas outside the MPA were already thought to be depleted as recent high prices for *Nephrops* and crabs had resulted in increased pressure on these species. On the other hand, respondents reported improvements to stocks and habitats within the MPA boundary.

Local community groups were praised for the work they had done raising awareness about the local marine environment.

Case Study: Loch Sunart to the Sound of Jura

(includes Firth of Lorn SAC, Loch Sunart SAC and Loch Sunart NCMPA)
Areas visited during fieldwork: Oban, Tobermory



Stakeholder group	No. of respondents In depth interview	Short interview
Fishing industry	9	-
Seafood processing	2	-
eNGO/ Community group	4	-
Tourism	2	4
Food (including seafood)	-	2
Retail	-	1
Other (council, harbour)	3	-
Total	**20**	**7**

MPA context

Site description: The Loch Sunart to the Sound of Jura MPA extends northwards from the Sound of Jura, covering the Firth of Lorn and the south-western part of Loch Linnhe. The site extends through the Sound of Mull and into Loch Sunart.

Features: Common skate as well as geodiversity features.

Management measures - Whole site: Beam trawl, suction dredge, demersal seine net, set nets, and long lines.

Zonal management: demersal trawl without use of tickler chains, and mechanical dredge.

Impacts of MPAs on the area

Common themes in Loch Sunart to the Sound of Jura area were displacement of fishing activity and the need to diversify. Nine respondents described being displaced from their traditional fishing grounds, while ten described taking steps to diversify or adapt their businesses. Six of these were personal accounts, four were reported.

- Many respondents from the fishing industry described having to travel further to find grounds in which to fish. One respondent said he now had to steam for 3.5 hours before he arrived at open fishing grounds.
- This might mean fishing in less sheltered waters or staying overnight on the vessel to avoid wasting time travelling each day.

- As a result, some respondents chose to buy a bigger vessel which could withstand worse sea conditions or sell up as a small boat was not viable.
- A few respondents were concerned that this would lead to a shift in the predominant style of fishing, with larger vessels becoming more common. Larger vessels tend to be more nomadic and need to catch more to make a profit. There were concerns that this could have consequences for stocks.
- Respondents also raised concerns about the increased pressure on areas outside MPAs. They said that grounds just beyond the MPA boundary were particularly heavily fished.
- Additionally, some respondents described fishing and landing their catch much further afield on the east coast and in English waters. This change in fishing behaviour could have consequences for processors that depend on local catch.

Another common theme was that of wildlife tourism and its importance for the local area. Ten respondents raised this topic.

- Respondents described how wildlife tourism had grown a lot in recent years, with some highlighting the contribution these businesses make to local harbours.
- It was estimated that there were 10 dive or wildlife boats operating in the area and that these would each take approximately 24 people at peak season. Visiting tourists stay in Bed & Breakfasts and eat in restaurants, further contributing to the local economy.
- While the growth of this industry was not attributed to the MPA, respondents did highlight that a healthy marine environment, with thriving populations of marine flora and fauna is vital for this type of tourism to succeed.

Local Business perspectives

Seven businesses took part in the short structured interviews. Four of these were related to tourism, two were in the food industry and one was in retail. Six of them felt that their business was dependent on the marine environment.

The businesses in the food industry commented that they had found it difficult to source local seafood in recent years, and had noticed fewer boats in the harbour. The shortage of stock meant higher prices and, in some instances, hiring less staff. This was attributed in part to the MPA (i.e. management measures placed more pressure on a smaller area), but also to crew shortages and a decline that started long ago.

One respondent whose business was 50% tourism, and 50% service boat, mentioned that the revenue from the service boat was higher and more constant. They commented that tourism can be fickle and the running costs are fairly constant, irrespective of the number of customers.

Conclusion

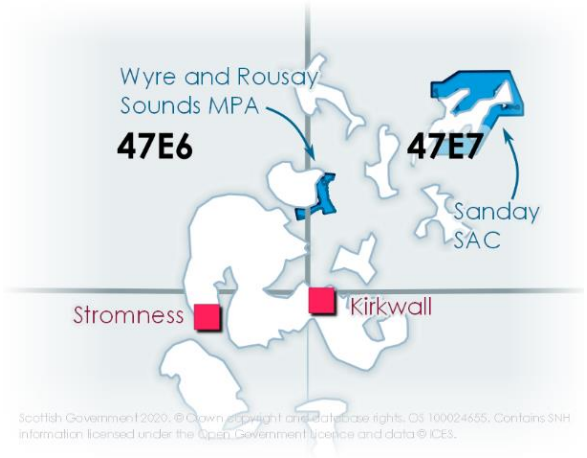
Displacement was an important impact for fishers near the Loch Sunart to the Sound of Jura MPA, with some fishers describing having to travel over three hours before reaching grounds in which they could fish. Some commented that they had adapted by changing their fishing patterns so that they would stay out on the boat and fish for three days before going home. Others upgraded to bigger vessels which could travel further, shifting to a more nomadic style of fishing.

Wildlife tourism was thought to be very important for the local area and is an industry that is growing. Respondents highlighted that this type of tourism depends on a healthy and diverse marine environment.

Case Study: Orkney

(Wyre and Rousay Sounds NCMPA and Sanday SAC)
Areas visited during fieldwork: Kirkwall, Stromness

	No. of respondents	
Stakeholder group	**In depth interview**	**Short interview**
Fishing industry	5	-
Seafood processing	-	-
eNGO/ Community group	-	-
Tourism	3	2
Food	-	1
Retail	-	2
Other (council, harbour)	5	-
Total	**13**	**5**



MPA context

Site description: The Wyre and Rousay MPA covers the sounds between the islands of Rousay, Wyre and Egilsay in Orkney, north Scotland. The area covers channels swept by the tides of the Atlantic and the North Sea supporting large beds of maerl and kelp and seaweed communities. Sanday SAC surrounds most of northeast Sanday Island, from Backaskaill Bay round to the Holms of Ire.

Features: Wyre and Rousay Sounds NCMPA: Kelp and seaweed communities on sublittoral sediment, maerl beds, as well as geodiversity features. Sanday SAC: harbour seals, reefs, subtidal sandbanks, intertidal mudflats and sandflats

Management measures - Whole site: Demersal trawl, demersal seine net, beam trawl, and dredge.

Other context: Most activity in the area is from under 15 m creel and dive vessels. Three finfish farms are located within the boundary of the MPA. The Fall of Warness (European Marine Energy Centre (EMEC), up to 4 MW capacity) tidal energy generation test site is within 5 km of the MPA boundary while the Westray South (SSE Renewables Developments (UK) Limited, 200 MW capacity) tidal energy generation development is in development.

Impacts of MPAs on the area

Cumulative impacts were particularly important issues for respondents near the Orkney MPAs, and were mentioned by 4 respondents.

- There are a number of industries using the marine environment in the area including fishing, aquaculture, renewable energy generation and tourism. This

was not considered to be an issue at present, but there were concerns for the future if more developments were planned

- Aquaculture was mentioned often as it was believed that the chemicals for treating lice were having a detrimental impact on shellfish stocks. It was also said that aquaculture offered a more obvious career path for young people as the industry was more prominent in the area.
- One respondent described how cumulative impacts may not necessarily involve the loss of fishing grounds, but that the location of developments could impede safe passage, making areas difficult to access.

Six respondents mentioned tourism, and, in particular, wildlife tourism, describing how the local landscapes and seascapes are an important part of tourism in Orkney.

- MPAs were not described as a part of that tourism, at present, and a few respondents were not aware of them.
- Two respondents described plans to develop sustainable tourism and felt that the MPAs could be a big part of this. They described a project that was in development with the North Isles Landscape Partnership to develop a virtual dive experience in the MPA. The partnership was set up to raise awareness of the landscape and environmental assets in the Northern Isles.

Local Business Perspectives

Five businesses completed the short structured interviews. Two of these were in the tourism sector and three were in retail. Of these only one business considered themselves to be dependent on the marine environment. When asked whether they had noticed any changes to their community or business, a few respondents commented that tourism had expanded a great deal and that there were many more cruise liners in recent years. This was not attributed to MPAs. One respondent also commented that the environment was very important in Orkney and that people were much more environmentally conscious than they had been in the past.

Conclusions

The seas around Orkney are exploited by a wide range of marine industries including fishing, aquaculture and renewable energy. Cumulative impacts were an important topic in the area, as each industry shares the area with the others. At present, the cumulative impact of marine developments in the inshore waters around Orkney were not considered to be a significant issue. There were some concerns about how this situation might change, if developments increase or expand.

Tourism is another important industry in the area and there is a project underway to develop a virtual dive project that will enable people to explore the MPA from the land.

Section 8. Compliance

This section explores the extent to which MPA management measures have been complied with since they were introduced in 2016 using some of the data that is collected by Marine Scotland Compliance and some of the evidence obtained in the key informant interviews.

On the whole MPA management measures are being complied with. Where incursions are reported this is usually for legitimate reasons. Data shows that it is, nonetheless, difficult to bring enforcement or prosecution due to the need to have robust evidence proving that illegal fishing activity has taken place.

Background

Marine Scotland compliance is responsible for enforcing compliance with MPA management measures and for monitoring activity across the MPA network. Compliance monitoring is carried out by boat, by air, from the shore, using the Vessel Monitoring System (VMS), or through reports from the public.

When a report of a possible incursion into an MPA is received, a preliminary assessment is first carried out to determine whether immediate action is possible. Reports are often made after the event and so the prospect of immediate action is limited.

Evidence is then gathered using information from the other monitoring methods e.g. VMS to assess the validity reports of breaches of management measures. If evidence is strong enough, a skipper of a vessel alleged to have offended may be interviewed. Where evidence indicates that serious breaches of management measures have occurred, the matter may be referred to the Procurator Fiscal who in turn may decide to pursue a prosecution.

However, more commonly, if a skipper is found to have broken the law, a Fixed Penalty Notice (FPN) is issued.

8.1 Data on MPA incursions and reports

Marine Scotland Compliance hold data on the number of reports, monitoring effort and prosecutions related to MPAs in Scotland. Table 8.1 shows the number of reports of suspected incursions each year for each MPA from August 2015-end December 2019. Most MPAs have had few reports of incursions in that time period, which suggests widespread compliance with management measures.

Despite this general trend, there are a few areas where reports are far more common such as the Loch Sunart to the Sound of Jura MPA and the South Arran MPA which have generated approximately 10-20 times more reports than the other MPAs. This is shown in table 8.1.

It was apparent from interviews with compliance staff that this high number is because in some areas some vessels are allowed in the MPA for certain activities such as transit or shelter. Some of the MPAs are associated with ports and fishing vessels pass through the area legitimately.

Table 8.1 Number of reported incursions each year, in each MPA, from 2015 -2019.

MPA or other closed area name	2015	2016	2017	2018	2019	Total
Clyde Sea Sill					1	1
East Mingulay		1	1	1	1	4
Loch Sunart to the Sound of Jura	1	12	9	6	9	37
Loch Creran		1	2			3
Loch Carron					3	3
Loch Sween		3	2			5
Luce Bay					1	1
South Arran	4	26	13	10	19	72
South Inner Sound Seasonal Closure		1	1	2		4
St. Kilda		1				1
Upper Loch Fyne and Loch Goil		7	3	1	4	15
Wester Ross	4	2		2	5	13
Total	9	54	31	22	43	159

Table 8.2 shows the enforcement outcomes of suspected incursions from August 2015- end December 2019. Only a small proportion of reports lead to some form of enforcement. The main reason for this, as suggested in the interviews with compliance staff, is that some of the reported incursions are legal and do not require enforcement. There is also difficulty in providing sufficient evidence for enforcement action to be taken. For example, the vessel ID, a description, and photograph including fixed reference point, and proof that the vessel had gear deployed in the MPA is needed. Suspected incursions are rarely reported 'in real time' and it is difficult to collect adequate evidence after the fact.

Table 8.2 Enforcement outcomes, August 2015 - end December 2019

Year	No Further Action	Advisory Letter	Warning Letter	Fixed Penalty Notice	Referred to COPFS
2016				1	
2017			1	1	
2018	1*		1	1	1**
2019				4	3 **/***

* No offence committed

** 1 case in 2018 and 1 case in 2019 referred to Crown Office and Procurator Fiscal Service (COPFS) following non Payment of Fixed Penalty Notice (FPN)

*** 1 Case in process of being submitted to COPFS

Following risk assessment and intelligence processes, it was agreed that as one of the busiest areas of inshore waters, the Firth of Clyde, which covers the South Arran and Upper Loch Fyne and Loch Goil Marine Protected Areas (MPAs), and No Take Zone, would be the best place to run a pilot Inshore Protection Programme.

The trial is being undertaken by a Rigid Hulled Inflatable Boat (RHIB) called 'Dignity' which will enable MS compliance to be onsite anywhere in the pilot area within an hour.

8.2 Interview results

The theme of 'compliance' was mentioned by 36 of the 99 respondents who were interviewed. The number of times this issue was mentioned was similar across different groups, as can be seen in Table 8.3.

Table 8.3 Number of times compliance was mentioned by different groups

	Fishing Representative	Static	Mobile	Compliance officer	eNGO	Other
Mentioned compliance	5	5	5	7	8	6

Incursions

Of these, 24 respondents said that they were aware of incursions happening in MPAs. Four respondents said that they were not aware of incursions in their area. Ten respondents recounted specific events while a further 10 spoke more generally of having heard of incursions in MPAs. On a few occasions the same event was mentioned by several respondents.

Stakeholders who mentioned incursions (9 and 12 respectively) did so mainly in relation to South Arran and Loch Sunart to the Sound of Jura MPA case study areas. These MPAs were also described as having the most reports of incursions by compliance officers who were interviewed.

Additional points on Compliance

In interviews Marine Scotland Compliance officers explained that they have visited community groups to provide training in how to spot illegal activities, how to report them and how to provide good quality evidence. These events were thought to be successful and officers remarked that the quality of reports had improved. Some community groups have produced information leaflets to help people report illegal activities in the MPAs.

Some respondents expressed some dissatisfaction with the level of monitoring and enforcement of MPA management measures arguing that they felt that there was insufficient resources available to Marine Scotland Compliance for the task of monitoring MPAs. This sentiment was expressed by eNGOs and fishers alike.

Fishers expressed frustration at the thought that some people could be getting away with fishing illegally in MPAs and exploiting a resource that they are aware is to be protected. There was also a feeling that people committing such actions give fishers in general a bad name and undermine the benefits that the MPA is supposed to offer.

Section 9. Overarching conclusions

The analysis of fishing activity and fish landings data, together with evidence from key informant interviews and case studies suggested that there had been both localised positive and negative impacts linked to MPA management measures.

Landings to ports near MPAs have mostly declined from 2016-2018 with the same trend reflected in landings from some ICES rectangles containing MPAs.

Trawl vessels which had fished within MPA boundaries before management measures were introduced are now catching less from ICES rectangles containing MPAs, and are compensating for this by fishing more heavily in other rectangles, further from MPAs. Total landings for these vessels were found to have remained the same, or were higher, apart from those which had been particularly heavy users of the fishing grounds within MPAs, whose landings reduced by approximately 12% on average. Landings from dredge vessels which had fished within MPA boundaries showed a decline from 2013-2018, with a steeper decline post 2016. This suggests that other factors are affecting dredged scallop landings on the west coast, but that MPAs may be a contributing factor.

There has been a slight increase in total employment on static gear vessels, and a decrease on trawl and dredge vessels on the west coast of Scotland. This trend is clearest and most pronounced in particular areas where the magnitude of the change was greater.

These findings were corroborated by the interview data, where respondents reported similar trends, but offered more of an explanation. Declines in landings were attributed to reduced access to sheltered fishing grounds as a result of MPA designations, and fishers reported changing their practices in response. Many were fishing in other grounds, some had bought bigger vessels to enable them to travel further and withstand harsher weather conditions, while others had diversified to creel fishing, and a few had either downgraded or sold up.

Static gear fishers reported having greater access to the grounds within MPAs, and felt more secure fishing these areas without the risk of gear conflict. Some had expanded their businesses and taken on more crew.

It was common for respondents to discuss other related topics which helped to explain, highlight or contextualise more direct impacts. Many fishers described the shortage of crew as being an important issue, in some cases the most important issue, facing them. Most of the communities in question are rural and remote and can suffer from depopulation, which some linked to the shortage of crew.

Other issues were raised through the study, such as access to markets, the quota system, fluctuating prices, cumulative impacts from other industries, and the changing environment. The impacts of these issues interact and, for some, may compound the impacts of MPA management measures.

Potential impacts of MPA management measures on other marine industries, namely seafood processing, aquaculture and tourism, were also explored. Seafood

processors tended to be affected in similar ways to fishers and responded in similar ways. Those who had been affected were particularly concerned about their ability to retain staff. It was harder to quantify impacts on other marine industries as data is not available at a fine enough spatial scale.

The main impacts described by those from aquaculture was the increased complexity of planning applications. These were said to be more costly and time consuming. Respondents described delays in receiving responses, which were said to delay developments, leading to financial losses.

With regards to tourism, respondents felt that the MPAs have had a positive impact, providing additional tourist attractions for areas nearby. Respondents felt that environmental protection would enhance marine tourism opportunities in the future, regardless of whether businesses used the MPA directly.

Community groups and other organisations have developed or galvanised around the MPAs. These groups have organised a large array of activities and events aimed at raising awareness and educating the public about marine conservation and promoting the rich diversity of their local inshore waters. They have collaborated on numerous research projects in order to gather data and improve understanding of the environmental impacts of MPAs.

Respondents mentioned seeing improvements in the marine environment, which they attributed to MPAs. Many stated that this was the most important positive impact of MPAs and described feelings of hope and inspiration at the thought of the improvements that were possible and what that could mean for their local area.

According to the Social Attitudes Survey, and the short structured interviews, the general public tended to be supportive of MPAs, although it should be noted that people were often unsure what they were.

The research presented in this report was carried out in August and September 2019, before the Covid-19 pandemic. There have been serious consequences for coastal communities and industries as a result of the pandemic. These are likely to have exacerbated many of the struggles described in this report.

Section 10. Annexes

Annex 1. Social Attitudes Survey Questions

Marine Scotland commissioned research to improve understanding of how Scottish residents interact with the marine environment (sea and coastal areas), their perceptions of how it should be managed and their environmental concerns, amongst other issues.

The research consisted of a nationally representative survey of adults aged 16 and over and a series of focus groups to investigate attitudes to the Scottish marine environment, carried out by YouGov. A survey of 2,198 adults in Scotland was carried out online using the YouGov panel. The sample was representative by gender, age, social grade and region. Alongside this, six face-to-face focus group sessions were conducted across coastal, rural and urban locations in Scotland. Each group consisted of between nine and ten respondents, taking place in Aberdeen, Peebles and Glasgow. Throughout the report, this is referred to as the qualitative phase.

MPAs were explored in both the survey and the focus groups, although only the survey responses are presented in this report.

The questions regarding MPAs are presented below:

How familiar are you with Marine Protected Areas (MPAs)? (Allows one selection)

- Very familiar
- Quite familiar
- Not very familiar
- Heard of, but know nothing about
- Not previously heard of MPAs

Marine Protected Areas (MPAs) are areas of sea that are designated to ensure protection of some of the most vulnerable marine animals and habitats (e.g. marine mammals, seabirds and seagrass beds) and important historic sites (e.g. shipwrecks). MPAs are protected under Scottish and UK legislation and are managed to reduce the impact of human activities on marine animals and/or habitats. This management can restrict some industries, such as fishing, shipping, renewable developments, oil and gas, which can have positive or negative economic impacts on different people and businesses.

To what extent do you support or oppose the creation of MPAs in Scotland? (Allows one selection)

- Strongly support
- Tend to support
- Neither support or oppose
- Tend to oppose
- Strongly oppose
- Don’t know

Annex 2. List of Stakeholder Organisations Represented in Key Informant Interview

Marine Scotland Compliance
Inshore Fisheries Groups
Local Authorities
Port and Harbour Authorities
Environmental NGOs
Seafood processors
Aquaculture

Annex 3. Key Informant Interview Guide

Introductory information

Interview name:

Organisation and role:

Date:

Fishing Industry

Could you tell me a bit more about your job? And your role in the fishing industry? (What region do you cover?)

What is your understanding of MPAs (in your area) and the management measures associated with them?

Have you observed any changes in the fishing industry in your area? i.e. fleet composition? What/how much is being caught?

Do you think any of these changes are due to MPAs?

Are you aware of any vessels/businesses who have had to change the way they operate as a result of the introduction of MPAs? Could you give details? E.g. area they fished in, gear type, target species?

Are you aware of any vessels and related staff who have left the fishing industry as a result of the introduction of MPAs? Could you give details?

Do you know of any vessels who have increased or decreased their fishing activity since the introduction of MPAs? Could you give details?

Are you aware of any efforts to measure or monitor the impacts of MPAs in your sector?

Seafood processing

Could you tell me a bit more about your job? And your role in the seafood processing industry?

(If processor) Could you tell me more about your business? What type of seafood processing? Size of business etc.

Where do you source your fish?

Are you aware/have you noticed any changes in fishing activity since the introduction of MPAs?

How much of this do you think is due to MPAs?

Do you have any information about specific businesses which have been affected by MPAs?

Are you aware of any seafood processors who have had to change the way they run their business since the introduction of MPAs? Could you give details?

Are you aware of any efforts to measure or monitor the impacts of MPAs in your sector?

Community Groups
Could you tell me a bit more about your role in the community group?

Could you tell me a bit more about the community group you are part of? How did it start? Who is involved? How did they get involved? What are the aims of the group?

Did the group start after the introduction of MPAs? Or did it exist beforehand?

What is the group doing in relation to MPAs?

How far has the groups progressed with its aims and initiatives?

With relation to the group's activities, what do you think the costs and benefits of these might be? To whom do you think these will accrue?

Do you know of any other community groups linked to MPAs? Could you tell me about them?

Are you aware of any businesses in the area related to MPAs? Could you tell me about them?

Are you aware of any efforts to measure or monitor the impacts of MPAs in your sector?

Tourism
Could you tell me a bit more about your job? What is your role in the tourism industry?

Are you aware of any tourism related businesses which are linked to MPAs?

Are you aware of any existing tourism related businesses whose fortunes improved due to the introduction of MPAs?

Are you aware of any tourism related businesses who suffered due to the introduction of MPAs?

Are you aware of any efforts to measure or monitor the impacts of MPAs in your sector?

If running own tourism business
Is your business related to MPAs?

In what way?

How and when did your business start?

Did you live in the area beforehand or move for the opportunity?

Compliance

Have there been infringements of MPA management measures?
How many? In which MPAs? What were the circumstances? Type of vessel (segments)?

How is compliance monitoring currently carried out? What methods are used? Has this changed over time? If so, why?

How much effort is put into monitoring? How is effort measured?

How, and with what frequency, are patrols carried out? Over what area? How much time is spent?

How is non-compliance investigated? What are the repercussions for non-compliance?

Questions for case study areas

We will be using South Arran, Loch Sunart to the Sound of Jura, Wester Ross and the Orkney MPAs as case studies.

Could you pass on contact details for people you think we should speak to?
We are interested in:

- Fishers who have been positively or negatively impacted
- People in tourism
- People with businesses associated with fishing
- Links to the general public i.e. community councils, other groups
- Community groups?

Which towns/villages would be best to visit in order to reach as many people as possible?

Are there any dates that would be particularly good or bad for reaching people?

Are there particular issues that you feel we should be focusing on?

Any advice regarding focus groups? What is the likelihood of getting fishers in the same room at the same time to do a focus group? Would you recommend in

What would be good venues or locations in which to hold interviews or focus groups? E.g. ports, public buildings.

Annex 4. Stakeholder Interview Guides

Interview guide: Fishers

Date:
Location:
Name of interviewer:
Name of interviewee:

Could you tell me a bit about you and your business?
How long have you been working as a fisher? Do you own the boat or work for someone else? How many people are employed on your boat? Is this your main job or do you have another income? Are you the main earner in your family? Is it a family business?

What factors do you think are the most import for the success of your business? Or have the most impact on your business?

What is your understand of marine protected areas? What do you think is their main objective?

Do you know of any MPAs in the surrounding area? If so, which ones?

Have you observed any changes in the fishing industry in your area? i.e. fleet composition? What/how much is being caught?

Have you noticed any changes to your own business?

Do you think any of these changes are due to MPAs?

Have you had to change the way your operate/run your business as a result in the introduction of MPAs? Could you give details?

Seafood processing
Could you tell me a bit more about your job? And your role in the seafood processing industry?

(If processor) Could you tell me more about your business? What type of seafood processing? Size of business etc.

What factors do you think are the most import for the success of your business? Or have the most impact on your business?

What is your understand of marine protected areas? What do you think is their main objective?

Where do you source your fish?

Are you aware/have you noticed any changes in fishing activity since the introduction of MPAs?

How much of this do you think is due to MPAs?

Do you have any information about specific businesses which have been affected by MPAs?

Are you aware of any seafood processors who have had to change the way they run their business since the introduction of MPAs? Could you give details?

Are you aware of any efforts to measure or monitor the impacts of MPAs in your sector?

Community Groups
Could you tell me a bit more about your role in the community?

Could you tell me a bit more about the community group you are part of? How did it start? Who is involved? How did they get involved? What are the aims of the group?

What is your understand of marine protected areas? What do you think is their main objective?

Did the group start after the introduction of MPAs? Or did it exist beforehand?

What is the group doing in relation to MPAs?

How far has the groups progressed with its aims and initiatives?

With relation to the group's activities, what do you think the costs and benefits of these might be? To whom do you think these will accrue?

Do you know of any other community groups linked to MPAs? Could you tell me about them?

Are you aware of any businesses in the area related to MPAs? Could you tell me about them?

Are you aware of any efforts to measure or monitor the impacts of MPAs in your sector?

Tourism
Could you tell me a bit more about your job? What is your role in the tourism industry?

What is your understand of marine protected areas? What do you think is their main objective?

Are you aware of any tourism related businesses which are linked to MPAs?

Are you aware of any existing tourism related businesses whose fortunes improved due to the introduction of MPAs?

Are you aware of any tourism related businesses who suffered due to the introduction of MPAs?

Are you aware of any efforts to measure or monitor the impacts of MPAs in your sector?

If running own tourism business
What factors do you think are the most import for the success of your business? Or have the most impact on your business?

What is your understand of marine protected areas? What do you think is their main objective?

Is your business related to MPAs?

In what way?

How and when did your business start?

Did you live in the area beforehand or move for the opportunity?

Annex 5. General Public Structured Interview Guide

Structured Interview Guide: General Public

Date:
Location:

Personal information
Gender: Males ☐ Female ☐
Age: 16- 24 ☐ 25 – 34 ☐ 35 – 44 ☐ 45 – 54 ☐ 55 – 65 ☐ 65+☐
Occupation

Do you live in the area? Yes ☐ No ☐

How long have you lived in the area?

If you've moved here, what brought you to the area?

If you're visiting, what brought you to the area?

For those living in the area – do you know anyone who works in the marine environment or associated industries?

Questions about MPAs

How familiar are you with Marine Protected Areas (MPAs)?
-Wait for response then read out following definition-

Marine Protected Areas (MPAs) are areas of sea that are designated to ensure protection of some of the most vulnerable marine animals and habitats (e.g. marine mammals, seabirds and seagrass beds) and important historic sites (e.g. ship wrecks).
MPAs are protected under Scottish and UK legislation and are managed to reduce the impact of human activities on marine animals and/or habitats. This management can restrict some industries, such as fishing, shipping, renewable developments, oil and gas, which can have both positive and negative economic impacts to different people and businesses.
To what extent do you support or oppose the creation of MPAs in Scotland?

Do you know of any MPAs in the surrounding area? If so, which ones?

Have you noticed any changes to the community in recent years? Could you give details?

Do you think any of these changes are due to MPAs?

Any further comments?

Annex 6. Business Structured Interview Guide

Structured Interview Guide: Businesses

Date:
Location:
Type of business:

Information about the business

How old is the business:

How long have you been involved with the business?

How many people are employed in the business? (Rough figure is fine)

What do you think are the most important factors affecting the success of the business?

Is the business linked/dependent on the marine environment?

Questions about MPAs

How familiar are you with Marine Protected Areas (MPAs)?
-Wait for response then read out following definition-

Marine Protected Areas (MPAs) are areas of sea that are designated to ensure protection of some of the most vulnerable marine animals and habitats (e.g. marine mammals, seabirds and seagrass beds) and important historic sites (e.g. ship wrecks).
MPAs are protected under Scottish and UK legislation and are managed to reduce the impact of human activities on marine animals and/or habitats. This management can restrict some industries, such as fishing, shipping, renewable developments, oil and gas, which can have both positive and negative economic impacts to different people and businesses.
To what extent do you support or oppose the creation of MPAs in Scotland?

Do you know of any MPAs in the surrounding area? If so, which ones?

Have there been any changes to this business in recent years? Could you give details?

Have you noticed any changes to the community in recent years? Could you give details?

Do you think any of these changes are due to MPAs?

Any further comments?

Annex 7. Management Measures

Fishing management measures in inshore Marine Protected Areas. Whole site refers to fishing gear which has been prohibited across the whole site. Zonal management refers to gear which is permitted in some areas and prohibited in others

Sites	Management measures
Loch Laxford SAC; Noss Head MPA; Wyre and Rousay Sounds MPA.	**Whole site**: Demersal trawl, demersal seine net, beam trawl, and dredge
Sanday SAC; St Kilda SAC; Treshnish Isles SAC	**Whole site:** Demersal trawl, demersal seine net, beam trawl, set nets, and dredge
East Mingulay SAC;	**Whole site**: Demersal trawl, demersal seine net, beam trawl, and dredge **Zonal management:** Creel fishing, set nets, and long lines (50% of site)
Lochs Duich, Long & Alsh MPA/SAC	**Whole site:** Beam trawl, demersal seine net, demersal trawl, and dredge
Luce Bay & Sands SAC	**Whole site:** Beam trawl, suction dredge, and demersal seine net, and demersal trawl. **Zonal management:** Mechanical dredge permitted in Jan, Feb, Nov, Dec each year
Loch Creran MPA/SAC	**Whole site:** Demersal trawl, demersal seine net, pelagic trawl, set nets, long line, beam trawl, and dredge. **Zonal management:** Creel fishing
Loch Sunart to the Sound of Jura MPA	**Whole site:** Beam trawl, suction dredge, demersal seine net, set nets, and long lines. **Zonal management:** demersal trawl without use of tickler chains, and mechanical dredge
Loch Sunart MPA/SAC	**Whole site:** Demersal trawl, demersal seine net, set nets, long line, beam trawl, and dredge.

Loch Sween MPA	**Whole site:** Beam trawl, suction dredge, demersal seine net, demersal trawl and mechanical dredge by vessels greater than 75 gross tonnage. **Zonal management:** Hand gathering, demersal trawl and mechanical dredge by vessels less than or equal to 75 gross tonnage
South Arran MPA	**Whole Site:** Beam trawl, dredge, and demersal seine net, and demersal trawl by vessels greater than 120 gross tonnage. **Zonal management:** Demersal trawl by vessels less than or equal to 120 gross tonnage. Creel fishing, set nets, and long lines
Upper Loch Fyne & Loch Goil MPA	**Whole site:** Beam trawl, dredge, and demersal seine net, and demersal trawl by vessels greater than 75 gross tonnage. **Zonal management:** demersal trawl by vessels less than or equal to 75 gross tonnage. Creel fishing, set nets, and long line
Wester Ross MPA	**Whole Site:** Beam trawl, dredge, demersal seine net, and demersal trawl by vessels greater than 500 kw engine power. **Zonal management:** Demersal trawl by vessels less than or equal to 500 kw engine power

Annex 8. Full ICES rectangle data analysis

ICES Rectangle	MPA	Year	Nephrops		Scallops	
			Traps	Trawls	Dredges	Hand Dived
38E5	Luce Bay and Sands	Average 2013-15 landings (t)	0.18	30.96	237.54	
		2016	-	-55%	34%	-
		2017	-	-52%	4%	-
		2018	-	-57%	-19%	-
39E4	South Arran	Average 2013-15 landings (t)	15.36	2,556.48	256.94	-
		2016	-16.85%	28.63%	15.85%	
		2017	30.86%	4.17%	-61.53%	-
		2018	-18.14%	-22.12%	-38.05%	-
40E4	Loch Sween, South Arran, Upper Loch Fyne and Loch Goil	Average 2013-15 landings (t)	175.59	1,665.04	593.05	67.31
		2016	33.11%	-1.11%	-0.32%	3.13%
		2017	26.63%	-11.03%	-34.52%	-21.37%
		2018	29.74%	-26.08%	-46.20%	-36.12%
41E3	Treshnish Isles*	Average 2013-15 landings (t)	22.38	485.33	138.92	8.85
		2016	-26.22%	-5.61%	-3.22%	-45.15%
		2017	59.02%	-44.65%	-23.63%	210.66%
		2018	46.85%	-66.13%	-76.88%	166.57%
41E4	Loch Sunart to the Sound of Jura, Upper Loch Fyne and Loch Goil	Average 2013-15 landings (t)	10.89	235.72	21.05	1.25
		2016	4.82%	11.03%	-41.40%	81.20%
		2017	-3.22%	-33.32%	-19.56%	106.54%
		2018	-12.36%	-33.98%	-65.18%	91.67%
42E2	East Mingulay	Average 2013-15 landings (t)	6.21	216.75	23.32	0.75
		2016	-44.37%	43.87%	68.34%	-100.00%
		2017	-85.76%	85.30%	-5.02%	-92.32%
		2018	-93.77%	-21.10%	14.45%	-23.44%
42E3	Loch Sunart to the Sound of Jura, Treshnish Isles	Average 2013-15 landings (t)	76.39	549.89	574.15	16.53
		2016	-4.40%	46.79%	11.93%	-68.71%
		2017	-38.13%	18.01%	-19.24%	-34.07%
		2018	-47.81%	-8.05%	-32.76%	-75.64%

42E4	Loch Sunart to the Sound of Jura, Loch Creran	Average 2013-15 landings (t)	25.50	79.64	66.90	32.17
		2016	55.21%	-8.96%	-5.86%	14.48%
		2017	139.35%	-24.79%	-40.67%	-1.35%
		2018	140.83%	-59.35%	-46.93%	-58.48%
43E4	Lochs Duich, Long and Alsh	Average 2013-15 landings (t)	178.50	216.73	78.62	102.09
		2016	18.44%	97.14%	36.98%	-14.61%
		2017	14.83%	-1.82%	26.33%	-22.24%
		2018	15.36%	-38.69%	38.97%	-39.00%
44E4	Wester Ross	Average 2013-15 landings (t)	171.57	643.77	29.61	33.71
		2016	0.68%	35.16%	-52.58%	-35.92%
		2017	-13.74%	2.24%	53.67%	2.49%
		2018	-16.67%	-2.09%	-50.59%	22.44%
45E4	Loch Laxford, Wester Ross	Average 2013-15 landings (t)	84.17	706.63	21.62	10.03
		2016	-9.60%	82.42%	-22.91%	-47.85%
		2017	-31.42%	38.51%	-31.62%	9.35%
		2018	-17.78%	5.59%	2.22%	59.86%
45E6	Noss Head	Average 2013-15 landings (t)	0.06	0.03	211.42	
		2016	1431.67%	-100.00%	-44.58%	-
		2017	3074.00%	-100.00%	-59.18%	-
		2018	3535.83%	-100.00%	-79.79%	-
47E6	Wyre & Rousay Sounds*	Average 2013-15 landings (t)	0.36	14.87	54.73	6.61
		2016	-	56.39%	-53.27%	63.88%
		2017	-	-33.71%	-96.78%	-65.72%
		2018	-	-73.54%	-76.26%	-76.02%
47E7	Sanday, Wyre & Rousay Sounds	Average 2013-15 landings (t)	1.46	1.04	93.90	170.23
		2016	-98.18%	245.59%	-75.66%	59.99%
		2017	-67.23%	176.37%	-20.67%	9.51%
		2018	-93.20%	84.39%	-36.03%	58.56%

>50% Increase	30-50% Increase	20-30% Increase	10-20% Increase	0-10% Increase	0-10% decline	10-20% decline	20-30% decline	30-50% decline	>50% decline

Annex 9. Landings for ports within port districts near MPAs – Percentage change and absolute values

Percentage change in total weight of landings, relative to 2013-2015 average, for west coast port districts and subcreeks

	2013-2015 Average	2016	2017	2018
		%change	% change	% change
Scrabster	825.02	-2.03	-1.03	-0.37
Auckengill	0.40	-100.00	-100.00	-100.00
Castletown	0.72	159.99	547.50	269.86
John O'Groats	67.10	2.59	63.49	27.96
Keiss	1.39	107.88	569.14	426.24
Lybster	105.21	-11.27	-30.65	-37.15
Staxigoe	27.50	-100.00	-100.00	-100.00
Stroma				
Wick	632.62	1.37	-2.03	4.34
Orkney	1953.60	17.60	-3.81	-17.85
Birsay	4.62	37.60	74.48	-5.23
Eday	2.49	-73.22	43.89	-58.12
Kirkwall	829.28	36.14	20.58	-7.33
Rousay	7.31	-92.54	-54.40	-73.34
Sanday	61.16	-59.07	-56.86	-78.81
Stronsay	42.78	10.72	29.23	95.01
Tingwall	376.13	-11.09	-36.50	-34.10
Westray	632.27	19.27	-13.99	-23.32
Stornoway	540.91	40.59	36.93	-16.11
Barra	109.65	28.58	-78.41	-36.37
Castlebay	156.40	12.38	86.66	18.13
Northbay	274.86	61.43	54.65	-27.51
Lochinver	503.57	-23.22	-38.10	-55.23
Culkein/Drumbeg	0.98	443.76	1186.90	1065.00
Kylesku	48.71	-14.81	-3.41	-7.73
Lochinver	453.88	-25.14	-44.47	-62.74
Kinlochbervie	381.73	-39.58	-21.98	-28.09
Eriboll	1.87	-100.00	-100.00	-88.46
Kinlochbervie	367.27	-41.87	-21.05	-28.25
Scourie	12.58	36.15	-37.70	-14.64
Ullapool	1118.89	22.59	-2.26	-15.79
Achiltibuie	44.97	1.02	19.38	70.68
Aultbea	90.67	-3.95	-21.02	-31.49
Gairloch	369.25	15.59	2.70	-3.84

Little Loch Broom	23.58	10.12	-86.86	-92.12
Poolewe - Cove	0.30	-100.00	-100.00	-100.00
Ullapool	590.11	33.24	-0.70	-24.35
Mallaig	124.46	10.21	4.72	-1.43
Ardnamurchan	19.39	-68.95	-49.16	-55.90
Arisaig	3.09	231.89	246.33	499.91
Glenuig	19.90	35.55	111.55	119.09
Kilchoan	68.88	19.86	-30.62	-49.98
Salen	13.94	-18.69	42.48	25.62
Oban	2459.87	-4.65	-16.13	-20.77
Baile Mor (Iona)				
Balvicar	43.93	-16.39	24.67	10.32
Bunessan	50.05	-25.59	-11.57	-6.33
Coll	24.09	62.60	60.48	-0.88
Corran				
Cuan	80.25	-0.33	19.82	-24.06
Fionnphort	339.03	-34.03	-28.99	-27.11
Loch Buie (Mull)	0.64	-78.48	344.32	143.84
Luing	30.27	-5.69	-17.96	-13.17
Oban	1270.67	-4.47	-32.98	-34.67
Port Appin	14.68	75.06	54.29	25.79
Tiree	124.11	19.41	42.15	17.84
Tobermory (Mull)	359.57	10.02	8.48	-2.22
Toberonochy	2.63	-100.00	5.90	-100.00
Ulva Ferry	121.26	-5.96	-5.14	17.74
Campbeltown	2905.56	12.78	2.25	-19.72
Ardentinny				
Ardrishaig	8.61	126.15	54.23	24.72
Arran	0.89	-23.86	-20.84	5.09
Brodick	4.51	-83.54	-67.39	-100.00
Campbeltown	1191.37	19.20	2.21	-23.12
Carradale	266.86	9.33	-13.44	-27.08
Colonsay	3.34	-100.00	-100.00	471.42
Craighouse	2.91	100.47	-59.42	159.20
Crinan	144.93	-27.62	-40.22	-10.45
Dunoon	12.46	155.39	199.06	147.98
Furnace	4.94	-42.81	-96.92	191.31
Gareloch				
Inveraray	1.62	-100.00	-13.96	-98.54
Kyles Of Bute	5.11	10.35	20.66	-0.09
Portincaple	15.35	5.92	-0.10	3.58
Tarbert	928.95	2.12	-0.21	-31.64
Tayvallich	67.64	51.27	109.98	89.26

West Loch Tarbert	251.31	29.64	14.21	-10.67
Ayr	2284.22	6.74	3.81	2.43
Ardrossan	174.69	12.01	25.55	87.90
Ayr	60.74	**-98.99**	-99.83	-97.53
Cumbraes	0.64	**-20.49**	-100.00	-100.00
Drummore	103.34	**1.99**	-2.62	-39.53
Dunure	3.24	**305.07**	1190.68	366.30
Garlieston	44.45	**114.34**	205.19	44.12
Girvan	253.91	**13.14**	0.93	-17.55
Gourock	3.91	**-69.61**	-82.79	100.35
Greenock	67.65	**-3.60**	3.68	-12.15
Inverkip	0.18	**-100.00**	-100.00	-100.00
Irvine	23.75	**-99.66**	-93.86	-100.00
ISLE OF WHITHORN	99.78	**-52.47**	-26.25	-54.79
Maidens				
Port William	160.84	**36.82**	3.72	-15.77
Portpatrick	7.73	**-52.86**	-75.00	-91.61
Troon	1287.26	**8.84**	-99.77	-100.00
Troon & Saltcoats				
Wigtown	0.57	**6.15**	-100.00	-100.00
Portree	537.80	**8.89**	-5.55	-26.46
Applecross	44.20	**21.85**	-28.12	-14.70
Broadford	146.43	**4.67**	59.36	23.61
Carron	13.87	**44.30**	-100.00	-88.79
Kyle	254.85	**11.47**	-4.71	-31.24
Strathaird	78.44	**-5.17**	-100.00	-100.00

Absolute weight of landings, relative to 2013-2015 average, for west coast port districts and subcreeks

Port District	2013	2014	2015	2016	2017	2018
Scrabster	**904.77**	**800.90**	**769.38**	**808.26**	**816.54**	**822.00**
Auckengill	0.40					
Castletown			0.72	1.86	4.64	2.65
John O'Groats	69.47	72.88	58.94	68.84	109.70	85.86
Keiss	2.45	0.19	1.52	2.89	9.29	7.31
Lybster	109.33	115.53	90.76	93.35	72.96	66.12
Staxigoe	53.14	1.87				
Stroma					0.15	
Wick	669.98	610.43	617.44	641.31	619.79	660.05

Orkney	**1822.80**	**1951.21**	**2086.79**	**2297.46**	**1879.21**	**1604.91**
Birsay	0.48	8.20	5.17	6.35	8.05	4.37
Eday	0.15	2.51	4.81	0.67	3.58	1.04
Kirkwall	694.58	761.46	1031.82	1128.99	999.91	768.49
Rousay	13.20	1.42		0.55	3.33	1.95
Sanday	102.50	50.13	30.86	25.03	26.39	12.96
Stronsay	41.70	43.02	43.62	47.36	55.29	83.42
Tingwall	401.96	424.08	302.34	334.41	238.85	247.86
Westray	568.25	660.41	668.16	754.11	543.82	484.81
Stornoway	**454.93**	**559.46**	**608.33**	**760.46**	**740.68**	**453.77**
Barra	72.08	120.94	135.93	140.99	23.67	69.77
Castlebay	123.78	178.10	167.33	175.77	291.94	184.75
Northbay	259.07	260.43	305.08	443.70	425.07	199.24
Lochinver	**645.45**	**501.95**	**363.31**	**386.62**	**311.72**	**225.47**
Culkein/Drumbeg	0.45	1.06	1.43	5.33	12.62	11.42
Kylesku	51.53	55.77	38.85	41.50	47.05	44.95
Lochinver	593.48	445.12	323.03	339.79	252.05	169.10
Kinlochbervie	**237.81**	**409.60**	**497.76**	**230.62**	**297.82**	**274.49**
Eriboll	0.60	3.84	1.17			0.22
Kinlochbervie	219.69	393.74	488.39	213.49	289.98	263.53
Scourie	17.52	12.03	8.21	17.13	7.84	10.74
Ullapool	**1083.01**	**1212.80**	**1060.85**	**1371.59**	**1093.63**	**942.23**
Achiltibuie	44.17	51.47	39.28	45.43	53.69	76.75
Aultbea	111.54	91.57	68.91	87.10	71.62	62.12
Gairloch	333.67	431.84	342.26	426.83	379.22	355.06
Little Loch Broom	10.65	28.63	31.46	25.96	3.10	1.86
Poolewe - Cove	0.64	0.02	0.22			
Ullapool	582.35	609.27	578.72	786.27	586.01	446.44
Mallaig	**133.09**	**122.64**	**117.64**	**137.17**	**130.33**	**122.68**
Ardnamurchan	21.86	23.02	13.27	6.02	9.86	8.55
Arisaig	2.81		3.38	10.27	10.71	18.56
Glenuig	20.96	20.89	17.86	26.98	42.10	43.61
Kilchoan	77.18	59.06	70.41	82.57	47.79	34.45
Salen	9.44	19.67	12.72	11.34	19.87	17.52
Oban	**2455.33**	**2708.14**	**2216.14**	**2345.36**	**2063.12**	**1948.88**
Baile Mor (Iona)				2.57	2.22	4.51
Balvicar	51.60	35.89	44.31	36.73	54.77	48.47
Bunessan	53.60	53.86	42.69	37.24	44.26	46.88
Coll	15.45	31.27	25.56	39.17	38.66	23.88
Corran					0.09	
Cuan	50.43	99.73	90.58	79.98	96.15	60.94
Fionnphort	380.27	444.63	192.21	223.65	240.75	247.11
Loch Buie (Mull)		0.64		0.14	2.84	1.56
Luing	27.16	27.80	35.83	28.54	24.83	26.28
Oban	1376.15	1266.02	1169.84	1213.83	851.61	830.19

Port Appin	10.10	15.00	18.93	25.69	22.65	18.46
Tiree	107.81	139.48	125.05	148.20	176.43	146.25
Tobermory (Mull)	274.76	434.59	369.35	395.59	390.06	351.58
Toberonochy	3.96	1.29			2.78	
Ulva Ferry	104.04	157.95	101.79	114.02	115.03	142.77
Campbeltown	**2965.01**	**3009.37**	**2742.31**	**3277.00**	**2970.82**	**2332.54**
Ardentinny				0.18	0.24	0.03
Ardrishaig	6.08	8.70	11.05	19.48	13.28	10.74
Arran	0.00	1.41	1.26	0.68	0.70	0.94
Brodick	4.51			0.74	1.47	
Campbeltown	1183.47	1305.25	1085.37	1420.10	1217.69	915.93
Carradale	260.52	279.30	260.75	291.77	231.00	194.60
Colonsay	3.34					19.08
Craighouse	0.38	4.43	3.93	5.84	1.18	7.55
Crinan	169.71	176.04	89.04	104.90	86.64	129.79
Dunoon	14.23	14.75	8.41	31.83	37.27	30.91
Furnace	3.94	3.30	7.58	2.82	0.15	14.39
Gareloch					2.30	0.00
Inveraray	0.88	2.99	0.99		1.39	0.02
Kyles Of Bute	4.05	5.25	6.03	5.64	6.16	5.10
Portincaple	16.72	15.11	14.20	16.25	15.33	15.89
Tarbert	1006.08	910.06	870.73	948.64	926.96	635.07
Tayvallich	70.44	52.53	79.94	102.31	142.02	128.01
West Loch Tarbert	220.65	230.25	303.03	325.81	287.02	224.51
Ayr	**2497.36**	**2354.47**	**2000.83**	**2438.22**	**2371.31**	**2339.73**
Ardrossan	174.68	180.10	169.28	195.67	219.32	328.24
Ayr	3.31	174.86	4.05	0.62	0.11	1.50
Cumbraes	0.73	0.55		0.51		
Drummore	81.06	106.97	121.99	105.40	100.63	62.48
Dunure	2.34	1.19	6.17	13.10	41.75	15.09
Garlieston	30.26	25.43	77.65	95.27	135.65	64.06
Girvan	358.32	204.47	198.94	287.28	256.28	209.36
Gourock	3.66	3.79	4.28	1.19	0.67	7.83
Greenock	72.01	53.27	77.67	65.22	70.14	59.43
Inverkip	0.18					
Irvine	46.91		0.59	0.08	1.46	
ISLE OF WHITHORN	92.60	152.71	54.03	47.42	73.59	45.11
Maidens				1.16	7.87	39.35
Port William	166.90	146.06	169.57	220.07	166.82	135.48
Portpatrick	15.38	2.02	5.78	3.64	1.93	0.65
Troon	1449.02	1302.21	1110.54	1401.01	2.97	
Troon & Saltcoats					1292.10	1371.15
Wigtown		0.86	0.28	0.60		
Portree	**528.80**	**592.11**	**492.49**	**585.61**	**507.97**	**395.49**

Applecross	38.59	64.91	29.11	53.86	31.77	37.71
Broadford	168.08	169.35	101.85	153.26	233.35	181.00
Carron	3.75	24.55	13.33	20.02		1.56
Kyle	215.72	260.31	288.53	284.08	242.85	175.22
Strathaird	102.66	73.00	59.67	74.39		

Annex 10. Number of vessels registered in port districts near MPAs

Number of vessels registered in port districts near MPAs

	Number of vessels per year					
Port District	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Ayr	157	147	126	141	129	136
Campbeltown	144	137	144	148	152	142
Kinlochbervie	19	22	23	21	22	21
Lochinver	13	15	30	30	27	25
Mallaig	51	44	46	49	47	45
Oban	120	117	115	112	113	113
Orkney	138	131	132	131	128	128
Portree	127	129	123	107	105	101
Scrabster	92	90	93	93	100	105
Stornoway	218	214	210	209	206	213
Ullapool	107	112	105	110	113	114
Total	1186	1158	1147	1151	1142	1143

Annex 11. Employment data for all districts on the west coast of Scotland

Total employment on vessels in ports and port districts on the west coast of Scotland

	2013	2014	2015	2016	2017	2018
Ayr	**680**	**674**	**467**	**466**	**482**	**521**
			5			
Annan	31	35	49	40	42	44
Ayr	209	197	58	61	59	52
Ballantrae	18	18	18	19	19	21
Drummore	4	4	9	8	8	10
Dunure	14	12	11	9	11	11
Girvan	4	12	20	28	22	25
Kirkcudbright	195	198	176	176	175	176
Largs & Greenock	26	24	20	17	19	29
Maidens	1	1		1	2	4
Port William			4			
Portpatrick	5	5	1	2	5	3
Stranraer	25	20	20	25	21	14
Troon & Saltcoats	135	135	66	68	80	97
Whithorn	13	13	10	12	19	25
(blank)						10
Campbeltown	**304**	**300**	**320**	**332**	**303**	**277**
Ardrishaig	12	7	14	9	6	6
Arran	5	4	5	7	5	5
Bruichladdich	2	2	3	2	2	2
Bute	22	20	19	21	15	13
Campbeltown	66	72	73	86	94	83
Carradale	21	17	24	26	20	16
Colonsay	1		1	1		1
Crinan	9	6	3	6	5	6
Gigha	2	2	3	2	4	6
Islay	15	19	18	16	16	11
Jura	2	2	3	2	2	2
Port Askaig	4	4	4	3	3	7
Port Ellen	27	27	38	26	27	32
Rothesay		2				
Tarbert	87	88	83	92	74	63
Tayinloan	6	5	3	3	2	2
Tayvallich	13	12	13	14	13	8
West Loch Tarbert	10	11	13	16	15	14
Kinlochbervie	**40**	**46**	**46**	**40**	**43**	**45**
Eriboll	3	6	7	5	8	6
Kinlochbervie	29	30	31	29	29	33
Scourie	8	10	8	6	6	6

Lochinver	**23**	**25**	**263**	**247**	**267**	**249**
Culkein/Drumbeg	2	1	3	3	2	0
Lochinver	21	24	260	244	265	249
Mallaig	**108**	**98**	**105**	**95**	**98**	**100**
Ardnamurchan	2	4	6	5	5	5
Arisaig	5	4	6	4	4	5
Corpach		1	1	1		
Glenuig	2	2	2	2	2	4
Mallaig	97	86	88	81	83	83
Salen	2	1	2	2	4	3
Oban	**246**	**244**	**267**	**237**	**228**	**236**
Coll	6	7	3	6	4	4
Fort William	24	18	20	15	13	12
Loch Buie (Mull)	3	2	2	2	2	3
Loch Scridain (Mull)	24	31	29	24	29	23
Luing	26	27	25	23	22	26
Oban	120	117	139	119	112	125
Tiree	12	14	14	14	18	15
Tobermory (Mull)	31	28	35	34	28	28
Orkney	**442**	**297**	**303**	**292**	**286**	**291**
Hoy	18	10	10	10	10	9
Kirkwall	147	105	113	93	104	113
Rousay	1	1	1	1	1	1
S Ronaldsay	83	49	44	45	35	32
Sanday	8	6	6	6	5	5
Stromness	62	38	40	46	42	41
Stronsay	7	5	7	10	8	10
Tingwall	39	29	27	27	26	27
Westray	77	54	55	54	55	53
Portree	**205**	**209**	**182**	**155**	**169**	**157**
Bracadale	8	9	10	9	10	10
Broadford	25	26	24	13	15	24
Dunvegan	15	18	17	15	21	36
Kyle	41	45	43	31	33	33
Portree	61	57	43	36	41	18
Sleat	9	9	7	5	10	3
Snizort	7	10	6	3	3	8
Strathaird	11	11	13	19	18	11
Torridon	28	24	19	24	18	14
Stornoway	**371**	**371**	**360**	**336**	**316**	**298**
Barra	87	79	77	74	73	57
Benbecula	17	15	12	12	9	11
Bernera (Lewis)	14	17	16	16	13	16
Berneray (N Uist)	5	6	7	9	8	8
Grimsay	24	24	25	19	20	16
Lochs	20	23	19	11	14	7

North Harris	4	4	5	4	4	6
North Uist	40	33	35	31	34	30
Portnaguran & Ness	8	8	10	10	7	6
Scalpay	23	21	18	13	11	9
South Harris	26	22	22	19	13	15
South Uist & Eriskay	38	39	33	36	40	44
Stornoway	65	80	81	82	70	73
Ullapool	**191**	**200**	**179**	**209**	**179**	**209**
Achiltibuie	14	18	17	18	13	15
Aultbea	15	15	15	13	9	12
Avoch	9	16	13	11	10	10
Brora	16	12	10	10	10	11
Gairloch	20	24	25	31	25	31
Invergordon	11	10	4	17	16	18
Inverness	4	5	4	3	4	6
Portmahomack	24	26	24	20	21	23
Ullapool	78	74	67	86	71	83

Glossary

CAR	Controlled Activities Regulations
Citizen science	Citizen science (CS; also known as community science, crowd science, crowd-sourced science, civic science, volunteer monitoring, or online citizen science) is scientific research conducted, in whole or in part, by amateur (or nonprofessional) scientists.
Clam	Also known as a scallop
Creel	A "lobster pot" or type of trap used to fish for shellfish such as crab, lobster, and *Nephrops*
Demersal	On or near the seafloor
Demersal fishing	Pulling your net close to the seafloor.
Demersal fish	Fish that live on or near the sea floor (e.g. flounder or plaice)
Dredge	Dragging something over the seabed and stirring up the bottom to collect shellfish (typically scallops)
Electrofishing	Fishing for razor clams (aka 'spoots') by using a team of divers that drag an electrode across the seabed, stunning things in the sand. Divers pick up the razor clams as they pop up out of the seabed.
EU Habitats Directive	EU Habitats Directive aims to achieve favourable conservation status for a range of vulnerable habitats and species of European importance.
Fish 1 Form	Marine Scotland data collection system for under 10 m boats which records the landings, species, and location of fishing activity for each week
Fisheries Associations	Trade bodies representing fishers
Fishery	A fishery is an activity leading to harvesting of fish defined by the species caught, gear, sea area and species or group of species under a given management regime
Fishery Officer	Marine Scotland colleagues who check the landings and collect the data from fishing boats
Fishery Offices	Where fishery officers work (see fishery officer)

Fleet	Collection of boats arranged either by location (e.g. Scottish vs English fleet), size (e.g. the inshore fleet, the over 10 m fleet), or gear used (e.g. the creel fleet)
Fleet segment	A group of vessels with the same length, class and pre-dominant fishing gear during the year. Vessels may have different fishing activities during the reference period, but might be classified in only one fleet segment.
Gear	The type of equipment people use to fish (e.g. net or creel)
Haul	Pulling up gear to see what you have caught
Home port	The port a boat is registered at
ICES	The International Council for the Exploration of the Sea. They are in charge of stock assessments and quota distribution and Marine Scotland provide them with data that is used in assessments and landings statistics
ICES square	A standardised division of the sea for statistical analysis, just like a map on land is divided into OS squares
Inshore	Within 6 nm (nautical miles) of the coast
Inshore Fisheries Groups (IFGs)	Local management bodies for fisheries
Inshore fleet	Smaller boats (generally defined as under 10 m). They traditionally fish for shorter periods of time than the bigger boats.
Landing	When fishers come back to the harbour after fishing and take their catch ashore to sell/transport.
Landings	The amount of fish caught (can be measured by weight or value)
Langoustine	See *Nephrops*
Licences	Boats need a licence to fish certain species such as shellfish, cod etc.
Market	Where fish/the catch is sold (as well as being the wider economic market)
Mobile gear	Gear that moves/ is pulled along (e.g. net)
MPA	Marine Protected Area - There are three types of MPA in Scotland: 1) Demonstration and research to test novel approaches to marine management; 2) Historic to protect marine wrecks and artefacts; 3) Nature conservation to protect biodiversity. The term can also be used generically to describe any marine protected area.

MSFD	EU Marine Strategy Framework Directive (MSFD) aims to achieve Good Environmental Status by ensuring that adverse effects from human activities are avoided.
NCMPA	Nature Conservation MPAs: Conserve marine flora or fauna, habitats or geological or geomorphological interests and protection of these features can be used to complement other protection measures including SACs, SPAs and SSSIs.
Nephrops	The Latin name for the group of species known as Norway lobster, prawn or langoustine. A type of shellfish that can be caught by net or creel.
Network of conservation sites	A term used in the Marine and Coastal Access Act 2009 to describe sites designated to protect marine biodiversity - MPAs, Ramsar, SACs, SPAs, SSSIs
Non-sector	Boats that do not belong to a PO (the majority of under 10 m boats)
NTZ	No Take Zone. An area of sea and seabed from which no marine life can be removed by any method
NUTS	Nomenclature of Territorial Units for Statistics is a geocode standard for referencing the subdivisions of countries for statistical purposes.
Pelagic	Open water column (not near the bottom).
Pelagic fish and fishing	Fishing for fish living in the open water column (not near the bottom).
Ping	Location data that is transmitted from a boat through VMS every two hours.
Ponds	Holding facilities for shellfish where people keep them before selling them on.
Port Number	The numbers on the side of the boat that have two letters identifying its home port, and numbers identifying its vessel (e.g. OB123= Oban based vessel)
Prawn	See *Nephrops*
Producer Organisation (PO)	Organisations around Scotland that help boats buy/lease/sell their quota among other things
Quota	The weight of fish that fishing boats are allowed to catch. Only some fish are "quota species", and not all boats have quota. An individual fishing quota (IQ or IFQ) is an allocation to a nation, individual (a person or a legal entity (e.g., a company)) of a right [privilege] to harvest a certain amount of fish in a certain period of time. It is also often expressed as an individual share of an aggregate quota, or Total Allowable Catch (TAC). Quota changes from year to year, depending on stock assessments.

RSS Number	Registry of Shipping and Seaman Number. Like a licence plate for boats. Unique identifier
SAC	Special Areas of Conservation are protected areas for habitats and species listed in the EU Habitats Directive, such as reefs and bottlenose dolphin.
Scallop	Scallop is a common name that is primarily applied to any one of numerous species of saltwater clams or marine bivalve molluscs in the taxonomic family *Pectinidae*, the scallops. However, the common name "scallop" is also sometimes applied to species in other closely related families within the superfamily *Pectinoidea*.
Seasearch divers	Seasearch is a project for volunteer scuba divers and snorkelers who have an interest in the marine environment. They gather information on seabed habitats and associated marine wildlife in Britain and Ireland through the participation of volunteer recreational divers.
Seafish	A public body that produces economic and employment data for fisheries
Seasquare	A way to spatially divide the sea for statistical analysis- see 'ICES square'
SEPA	Scottish Environment Protection Agency
SPA	Special Protection Areas are protected areas for wild birds listed in the EU Wild Birds Directive, or for regularly occurring migratory species.
SSSI	Site of Special Scientific Interest (SSSIs) - protect nationally important habitats, species and geological features found above the mean low water mark.
Static gear	Gear that does not move on the seabed. It gets put down and stays in one place. Examples include creels, pots, and traps.
Stock	The amount of a particular species. It is calculated annually by scientists and is used to work out how much quota everyone gets so we can fish more sustainably.
TAC	The total allowable catch (TAC) is a catch limit set for a particular fishery, generally for a year or a fishing season. TACs are usually expressed in tonnes of live-weight equivalent, but are sometimes set in terms of numbers of fish.
The Marine (Scotland) Act 2010	The Act of the Scottish Parliament which gives the Scottish Ministers the power to designate MPAs in Territorial Waters.

The Marine Acts	A collective term used to describe the Marine (Scotland) Act 2010 and The Marine and Coastal Access Act 2009.
Trawl	A method of fishing that involves pulling a fishing net through the water behind one or more boats (a type of mobile fishing).
VMS	Vessel Monitoring System. Legally required to be on all boats over 12 m it records location every two hours ('pings').
Whitefish	E.g. cod, haddock.
Whitefish fleet / Pelagic or Demersal Fleet	Vessels that target whitefish, such as cod or haddock, and so fish the pelagic or demersal portions of the water column. They are typically larger boats that are over 10 m. Often fish for multiple days at a time.

How to access background or source data

The data collected for this <statistical bulletin / social research publication>:

☐ are available in more detail through Scottish Neighbourhood Statistics

☐ are available via an alternative route <specify or delete this text>

☒ may be made available on request, subject to consideration of legal and ethical factors. Please contact <Kathleen.Allen@gov.scot> for further information.

☐ cannot be made available by Scottish Government for further analysis as Scottish Government is not the data controller.

social research

The views expressed in this report are those of the researcher and do not necessarily represent those of the Scottish Government or Scottish Ministers.

This document is also available from our website at www.gov.scot.
ISBN: 978-1-80004-205-6

The Scottish Government
St Andrew's House
Edinburgh
EH1 3DG

Produced for
the Scottish Government
by APS Group Scotland
PPDAS771786 (11/20)
Published by
the Scottish Government,
November 2020

GSR
GOVERNMENT SOCIAL RESEARCH
Social Science in Government

Social Research series
ISSN 2045-6964
ISBN 978-1-80004-205-6

Web Publication
www.gov.scot/socialresearch

PPDAS771786 (11/20)