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Pentland Firth Orkney Waters Marine Spatial Plan: Value Added in the Fish Supply Chain in Orkney and Northern Highlands

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Foreword

This report is the one of a suite of evidence documents that will support Stage 2 of the development of a pilot Pentland Firth and Orkney Waters Marine Spatial Plan. Stage 2 consists of a number of research projects carried out to fill the knowledge gaps identified in Stage 1 - the development of a Marine Spatial Planning Framework and Regional Locational Guidance. The information collected during this stage, including this report, will be used to inform Stage 3, which is the on-going drafting of the Marine Spatial Plan itself.

It is intended that the Marine Spatial Plan will be submitted for consultation in 2015.

Executive Summary

Introduction: Orkney crab is a high value product sold throughout the UK and is sourced from seas adjacent to Orkney, the Northern Highlands and crabbing grounds further afield. The sea bed is also of high commercial interest for marine renewables, therefore future development needs to be balanced with current users to adequately support local businesses and communities. This report is the one of a suite of evidence documents to support the development of a pilot Pentland Firth and Orkney Waters Marine Spatial Plan. It is intended that this plan will be submitted for consultation in 2015. This report estimates the value of marine species caught in the Pentland Firth and Orkney Water (PFOW) region and specifically in the Pentland Firth and Orkney Water Strategic Area (PFOW-SA to onshore processing in both Orkney and the North Highlands.

Aims: The aims of this research are to: 1) quantify the value of species landed into the Pentland Firth and Orkney Waters (PFOW) region to the catching sector; 2) quantify the proportion coming from inside the strategic area (PFOW-SA) going into the processing sector; 3) conduct input-output (IO) analysis to examine the economic linkages and benefits from Orkney/Northern Highland based processing; 4) produce scenario based analysis to quantify the wider economic impacts from reduced fishing opportunity and; 5) to contextualise potential community impacts from reduced fish landings.

Results: Landings into Orkney and the Northern Highlands are dominated by crustaceans and demersal species. In 2011, £42.4 million (21,559 tonnes) of marine species were landing into PFOW, £36.8 million from the over 15m fleet and £6.1 million from the under 15m fleet. Crustaceans are the key species from the under 15m vessels whilst demersal species are the target group for over 15m vessels. Overall 17% of the value and 16% of volume landed into the region comes from inside PFOW-SA with 5.6% of the value to over 15m vessels and 90% of the value to under 15m vessels. This indicates little impact would be felt by the over 15m fleet, but that under 15m vessels are more dependent on PFOW-SA waters.

Spatially, Scrabster received the bulk of landings (£29.5 million) followed by Kirkwall (£3.8) and Stromness (£3.2). Almost all Orkney ports with the exception of Stromness receive around 50% of their landings from the under 15m vessels landing crustaceans from inside PFOW-SA. Northern Highland ports received almost all of the demersal landings and a large volume of crustaceans from over 15m vessels. Mollusc landings are spread throughout the region. Sales data from the Register of Buyers and Sellers shows receipts from processors and merchants in the Northern Highlands of £1.3m and £4.8m (total £6.1m) respectively of crustaceans and demersal species, whilst processors and merchants from Orkney purchased £4.8m, £26,000 and £446,000 (total £5.3m) of crustaceans, demersal and mollusc species respectively. This equates to 26.5% of landings into the region

being utilised by Orkney and Highland based merchants/processors. Using these and the landings data, it is estimated that 35% of crustaceans and 3% of demersal landings purchased by Orkney and Northern Highland businesses come from inside PFOW-SA, equating to £2.5m of the raw product entering onshore fish business.

Using IO analysis it is estimated that the initial £2.5m of raw material from PFOW-SA contributes, directly and indirectly, to £10.4m in output at the local level and £18.4m at the Scottish level. This output supports £2.9m in income and 159 FTE jobs at the local level. At the Scottish level output supports £5.7m in income and 244 FTE jobs. This analysis is an estimate and it is important to be aware of the assumptions and limitations which underpin such IO analysis. These assumptions and limitations are discussed further in section 3.

Qualitative data from key informant interviews highlighted the importance of inshore fisheries to onshore processors in Orkney. Orkney has developed a business model, managed by local fishermen who supply the Orkney factories. Whilst larger crabbers also land into these facilities to ensure consistency of supply, the companies are keen to stress that their unique market brand is dependent on inshore fishing. The Northern Highland processors do not show any preference to inshore vessels, but do stress the importance of having produce landed locally to help keep down costs.

Geographically, facilities in this region are perfectly situated for proximity to raw material, but a fundamental business challenge is remoteness. Local markets are small in comparison to the available product, therefore focus is on the UK food retailers. Crab has a short shelf life and low profit margins, so processing and transportation needs to be short and the direct delivery of the raw produce to the factories facilitates this. In the Northern Highlands transportation over land is easier but expensive, so to remain competitive businesses have to counter this which they say is achievable because of the quality of produce sourced from regional fishing grounds. Should inshore access decrease some interviewees felt that larger vessels could not supply the short fall due to the need for capital investment. Small scale creeling vessels cost around £50,000 whereas large crabbers are in the realms of £1 million which is just not available to local fishermen.

Regarding pay and opportunity, people working in processing in Orkney are earning less than the national average, however Orkney Fishermen's Society (OFS) is the largest private sector employer in Orkney and is a modern BRC Global Standards A accredited food processing facility. Within this facility there are a high diversity of workers where low skilled workers can access full time permanent employment and develop with the company as well as graduates and post graduate workers due to the technical requirements of the UK retail contracts that the OFS supply.

Discussion: Owing to the patterns of landings, onshore activity in Orkney and Northern Highlands has evolved to handle crustaceans in Orkney and whitefish in the Northern Highlands. However diversification does seem to be taking place in the Northern Highlands. Scrabster is the busiest port by value with the majority of species being landed there. Orkney however has a wide geographical spread of ports receiving landings with both Kirkwall and Stromness receiving significant volumes. Orkney ports are more dependent on inshore fishing grounds than the Northern Highlands with just under half of their landings coming from these waters, which increases to 90% for crustaceans across all Orkney ports.

In the Northern Highlands there would appear to be limited impact to onshore activity from a reduction in fishing opportunity as almost all landings into the area come from outside PFOW-SA. For merchants on Orkney there is potentially a higher impact as whilst Orkney processors have larger vessels who can fish further afield, merchants trading from the small ports are sourcing from inshore vessels, the boat most likely to be effected by reduced access. However Orkney processors also argued that that their business viability is also directly linked to this proximity to local fishing grounds and due the low profit margins on crab, importing raw material for processing from other area is not feasible for business viability. Equally at least one of the processors is tied to inshore/small-scale fishing and there is a question on whether a reduction in inshore activity would negativity impact on market demand and jeopardise this business model.

Introduction

Orkney brown crab (*Cancer pagurus*) is a high value product sold throughout the UK in supermarkets such as Waitrose, M&S, Sainsburys, Tesco, Asda and Lidl. Much like Scottish lobster and langoustine, Orkney crab is marketed under a premium brand, but unlike lobster and langoustine, which is exported to the continent, a large proportion of brown crab is consumed in the UK. Orkney brown crab is sourced in seas adjacent to Orkney and further afield from a range of Scottish vessels, which include large crabbers as well as small creel vessels (~60) who also target lobster (*Homarus gammarus*) and velvet swimming crab (*Necora puber).*

Within these crabbing waters is an area defined as the Pentland Firth and Orkney Waters Strategic Area (PFOW-SA) (Figure 1), as defined by the Crown Estate, which holds some of the best marine energy resources in Scotland and is of high commercial interest for wave and tidal development. These waters are also an important factor in the Orkney, Caithness and Sutherland economy for established businesses and for the well-being of the people that live in these areas (and others throughout Scotland). To assess these interests the pilot Pentland Firth and Orkney Waters (PFOW) Marine Spatial Plan (MSP) is being produced to balance future opportunities with the needs of existing users whilst protecting the marine environment.

The draft pilot PFOW-MSP is due for consultation in early 2015. This plan will be accompanied by a suite of evidence documents, including a Strategic Environmental Assessment (SEA), a Habitat Regulations Appraisal (HRA) and a Socio-Economic Assessment. The latter of these will consist of a range of information, including the estimated impact of the MSP upon current users and uses of the surrounding seas. This work will contribute to the Socio-Economic Assessment by providing a detailed analysis of the value that marine species caught within PFOW-SA provide to onshore processing in Orkney and also the Northern Highlands through the port of Scrabster. This report looks at crustaceans (mainly brown crab) which supports Orkney-based onshore processors and demersal white fish, which are landed in Scrabster.

Aims and Objectives

The aims of this research are to investigate the value of inshore fisheries to onshore activities in Orkney and Northern Highlands and the socio-economic links to local auxiliary businesses and local communities.

The project objectives are to;

1) Quantify the value of species landed into PFOW to the catching sector using ScotMap, Vessel Monitoring System (VMS) and the official landings data.

2) Quantify the proportion of species from inside PFOW-SA going into the processing sector in Orkney and the Northern Highlands.
3) Analyse, via an Input-Output (IO) framework, the economic benefits to Orkney and the Northern Highlands from the processing industry.
4) Use the IO framework to provide scenario based outputs (10%) to quantify the wider economic impacts from reduced fishing activity in PFOW-SA.
5) Qualitatively measure the potential community impacts from a reduction in fish landings coming from the PFOW-SA.

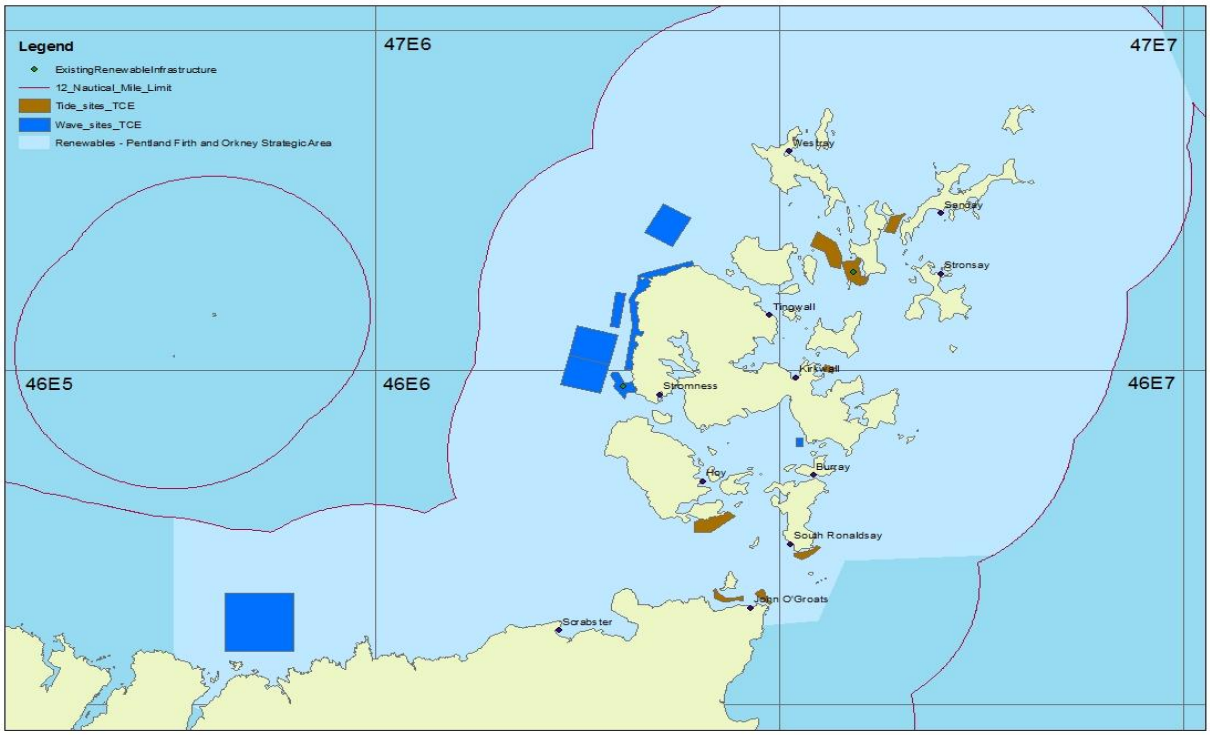


Figure 1: Map of PFOW showing the Crown Estate Strategic Area and the wave and tidal Agreement for Lease areas.

Section 1: Overview of Fishing Activity

Species landed from PFOW Strategic Area and surrounding waters

Throughout this report PFOW refers to the region in general and includes all activities that take place in all waters in the area that potentially impacts on Orkney and the Northern Highlands. PFOW-SA refers specifically to the Strategic Area which for the propose of this study is used as a proxy for the area in the pilot marine plan (base on Annex 1 - yet to be finalised). For this report PFOW-SA is depicted as the pale blue area with extends out to the 12nm line in Figure 1 and spans 5 ICES rectangles[1]. Since this analysis, this area has been redefined and the area used by the pilot MSP is based on the Scottish Marine Regions of Orkney and North Coast (see Annex 1). Whilst these boundaries are yet to be confirmed, this

[1] 47E6, 47E7, 46E5, 46E6, 46E7

analysis does not include fishing activity on the Orkney Skerries or the west of the Northern Highlands, therefore this analysis could be underestimating the impact to the region.

To quantify the links between fishing activity and associated onshore activity three data sets were combined to accurately map where marine species were caught and landed into Orkney and the Northern Highlands. The first data set maps activity of over 15m vessels through a Vessel Monitoring System (VMS). The second data set maps under 15m vessel activity through ScotMap (a mapping programme) and both are linked to the third data set, the Fisheries Information Network (FIN), the official government database used to extract volume and values of UK fisheries (see Annex 2 - Methods for further details). To reduce the complexity of the picture this analysis focuses on the top 11 ports (Fig. 2), from a total of 19 active ports in the region - this accounted for 99.8% of landings into the two districts and all analysis is on these 11 ports only.

Figure 2: Eleven Key Port in Orkney and Northern Highaland

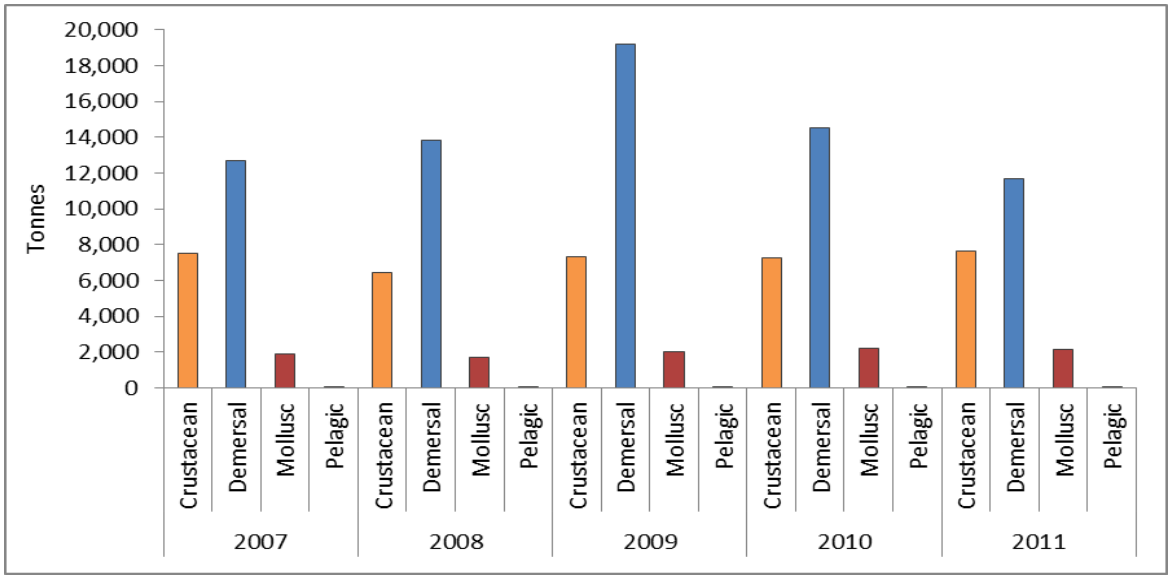


Figure 3: Total volume of landing into 11 key ports from PFOW and surrounding waters

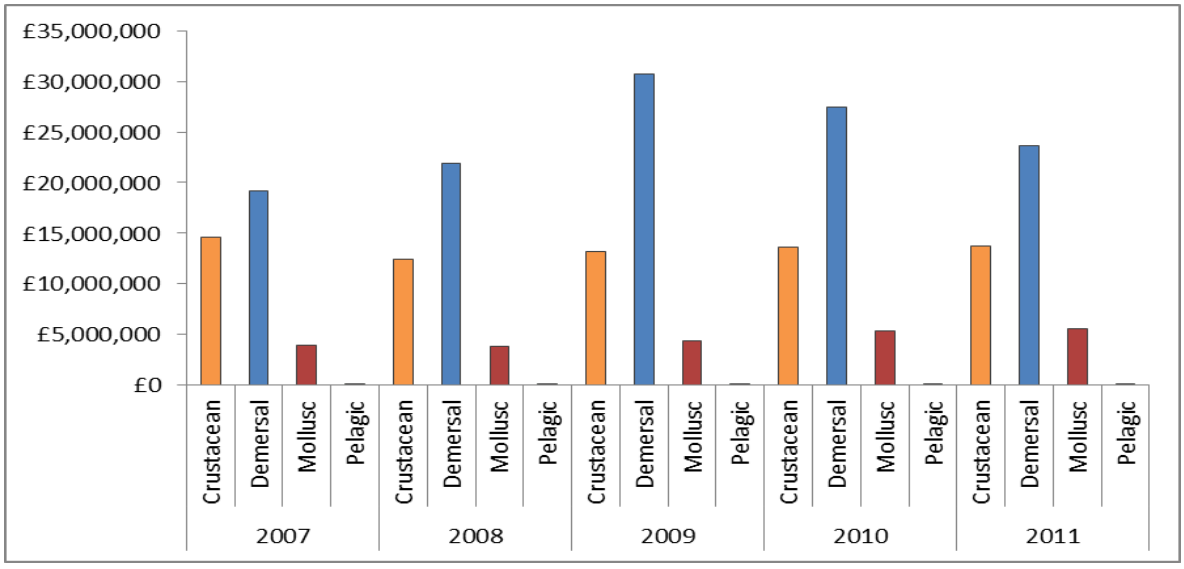


Figure 4: Total value of landings (2011 prices) into 11 key ports from PFOW and surrounding waters

Landings into Orkney and the Northern Highlands are dominated by demersal and crustacean species. By volume demersal species make up the bulk and ranged from 11,706 to 19,215 tonnes between 2007 and 2011 (Fig. 3). Crustaceans follow, having remained steady and range from 6,419 to 7,660 tonnes and molluscs are also constant over the period at around 2,000 tonnes per year. By value demersal are the highest value group, however crustaceans gain a little in value due to the relativity high price per kg (Fig. 4).

To conduct a detailed study on fish landings and their links to onshore activity the rest of this report focuses on 2011 fishing activity[2] to profile the fleet composition and vessels contributing to regional landings. Using VMS and ScotMap, spatial activity was mapped and quantities estimated for vessels over and under 15 metres in length. Table 1 presents total landings of £42.9 million in 2011 - £36.8 million (18,878 tonnes) came from the over 15m fleet and £6.1 million (2,681 tonnes) from the under 15m fleet. For the over 15m vessels this was dominated by demersal landings followed by crustaceans and for the under 15m vessels this was dominated by crustaceans with a small amount from molluscs.

Table 1: Total value and volume into 11 key ports by species type for over and under 15m vessels and percentage which come from inside PFOW-SA

	PFOW-SA and Surrounding waters		PFOW-SA only		% from inside PFOW-SA	
	Value	Volume (ton)	Value	Volume (ton)	Value	Volume
Over 15m vessels						
Crustaceans	£8,570,715	5,365.8	£234,824	128.2	2.7	2.4
Demersal	£23,577,239	11,689.0	£1,174,971	732.9	5.0	6.3
Molluscs	£4,655,205	1,809.8	£391,311	189.6	8.4	10.5
Pelagic	£11,995	13.3	£365	0.2	3.0	1.5
All species	**£36,815,154**	**18,877.9**	**£1,801,470**	**1,051.1**	**4.9**	**5.6**
Under 15m vessels						
Crustaceans	£5,114,626	2,283.2	£4,620,035	2,064.4	90.3	90.4
Demersal	£51,027	16.9	£1,724	1.2	3.4	7.2
Molluscs	£942,313	361.0	£917,087	350.7	97.3	97.1
Pelagic	£9,501	9.4	£9,039	8.9	95.1	95.4
All species*	**£6,117,467**	**2,681.4**	**£5,597,141**	**2,450**	**91.5**	**91.4**
Total all species	**£42,932,621**	**21,559.3**	**£7,398,611**	**3,501.1**	**17.2**	**16.2**

* figure does not match total of species for the under 15m vessels as some landings are excluded

Overall 17% of the value of landings into the region came from PFOW-SA and 16% of volume. However the proportion of catch by vessel length differs significantly with 5.6% of volume (4.9% of value) coming from inside PFOW-SA for the over 15m fleet, but over 90% of landings for the under 15m excluding demersal species which is substantially lower (table 1). This indicates little impact would be felt by the over 15m fleet from reduced fishing opportunity in the PFOW-SA, but the under 15m vessels are more dependent on these waters through the landings of crustaceans (Fig. 5).

[2] To achieve consistency between data sets analysis was conducted on 2011 data as the most recent year used in ScotMap.

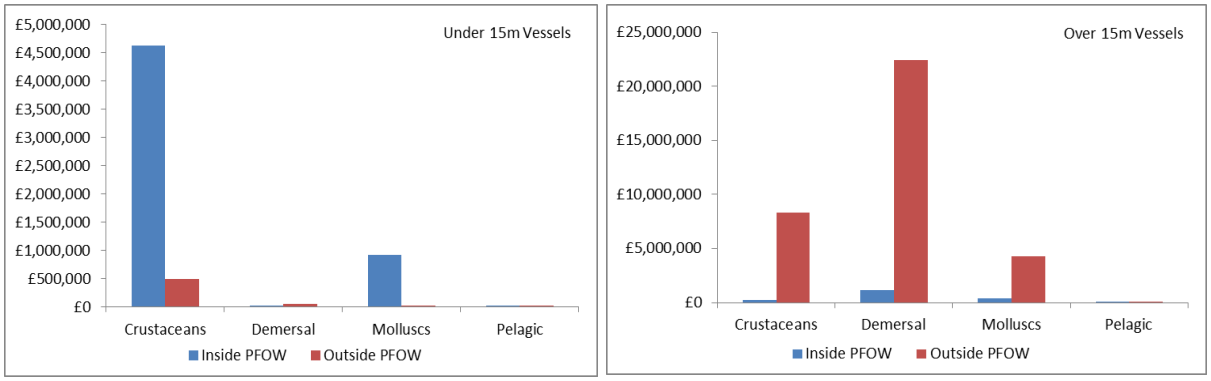


Figure 5: Value of species type landed into 11 key ports from under 15m (left) and over 15m (right) vessels from inside PFOW-SA (blue) and outside PFOW-SA (red).

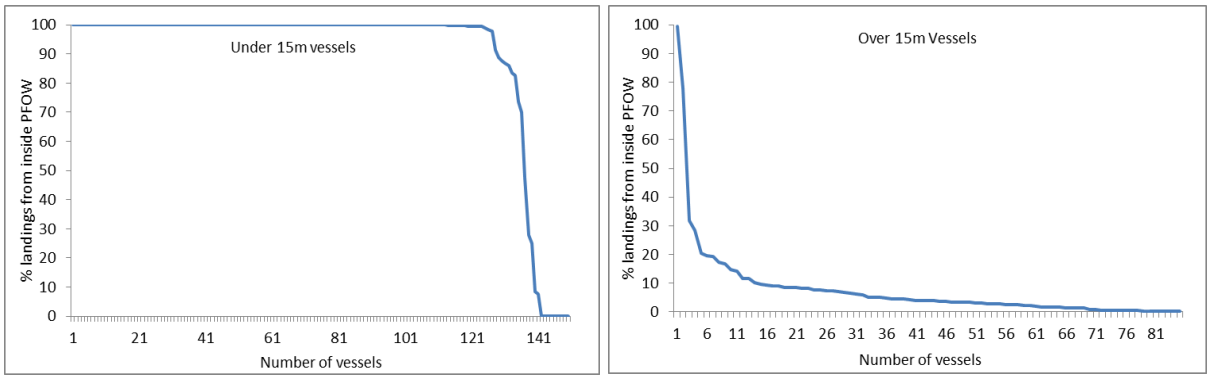


Figure 6: Number of vessels by proportion (%) of landings coming from inside PFOW by under (left) and over 15m (right) vessels. Data for under 15m vessels' mean value from 2006- 2011, for over 15m vessels data from 2011 landings.

This is further supported by plotting the proportion of landings coming from inside PFOW-SA for both fleets which demonstrates that 124 vessels in the under 15m fleet catch over 99% of their landings from inside PFOW-SA, whilst only 1 over 15m vessel catches over 99% from inside PFOW-SA (Fig. 6). It is worth noting that of the registered 141 under 15m vessels, not all are working full time and include hobby fishing and partially active vessels.

Spatial activity of PFOW-SA vessels

To understand the islands and isolated regions dependence on landings and the links to onshore fish processing activities the geographical spread of landings from inside and outside PFOW-SA were plotted for over 15m and under 15m vessels in 11 key ports (Fig. 7). This illustration shows that the majority of landings in 2011 came into Scrabster, Stromness and Kirkwall and the bulk of landings into the first two ports come from outside PFOW by over 15m vessels (Fig. 7). For Kirkwall just over half of the value is from over 15m vessels. Landings caught from inside PFOW-SA by the over 15m fleet came into Sanday and Scrabster (see Fig. 7) probably due to the strategic location of these ports or proximity to good crustacean grounds from Sanday (Fig. 9) and mollusc grounds for Scrabster (Fig. 10).

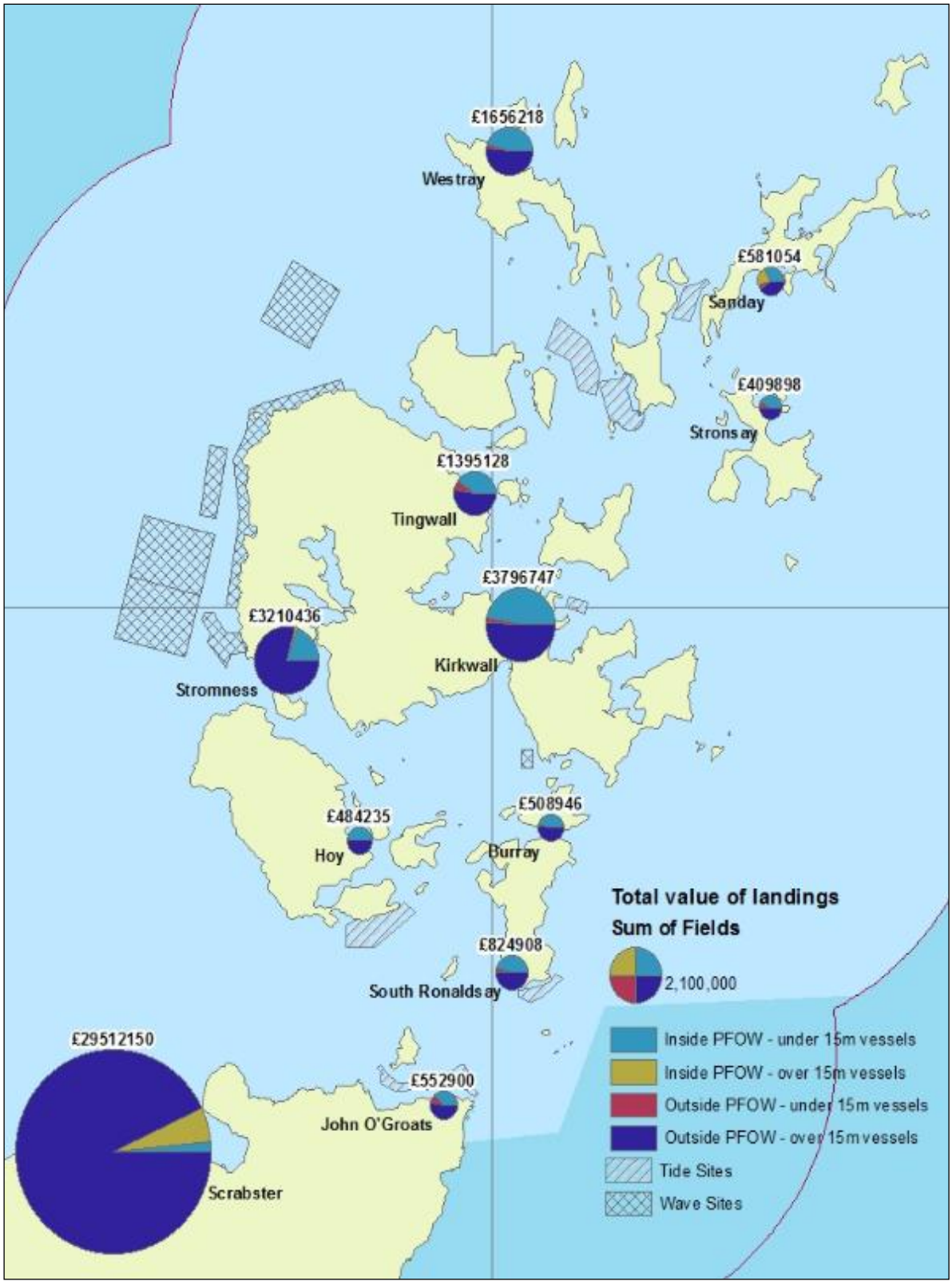


Figure 7: Value of landings broken down by under and over 15m vessels from inside and outside PFOW-SA.

Almost all Orkney ports with the exception of Stromness received around 50% of their landings from the under 15m fleet from inside PFOW-SA. A small proportion of the under 15m vessels land catch from outside PFOW-SA which are landed into the northern ports (Westray, Sanday, Stronsay, Tingwall and Kirkwall) and two southern ports (John O'Groats and South Ronaldsay).

The following maps (Fig. 8-10) show the distribution and value of landings by species, excluding pelagic due to low landings into the area. All demersal landings went to Scrabster (~£23 million) with the exception of Stromness where over 15m vessels landed around £81,000 and under 15m a modest £1,400 (Fig. 8). This shows that Orkney has no direct dependency on demersal species, but this species type is very important to the Northern Highlands.

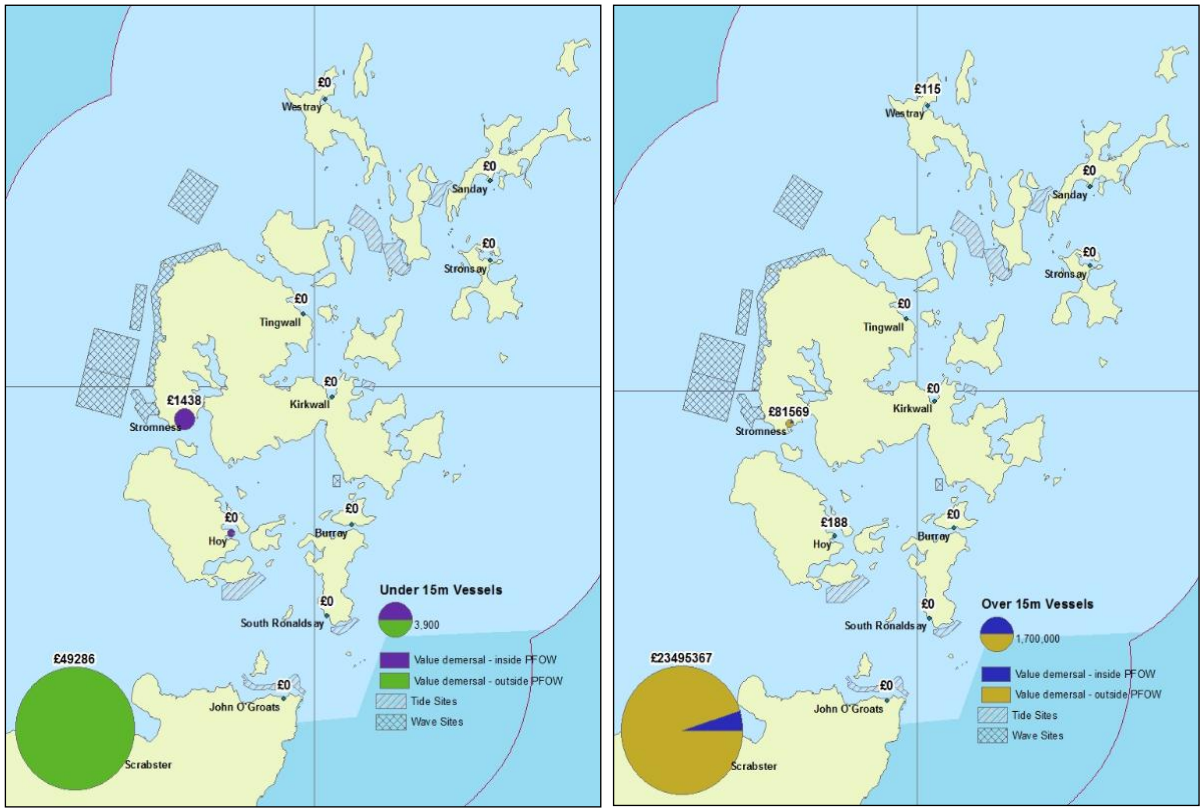


Figure 8: Value of demersal landings by under (left) and over 15m (right) vessels into PFOW-SA key 11 ports. Size of pie charts represent variations in the value of landings

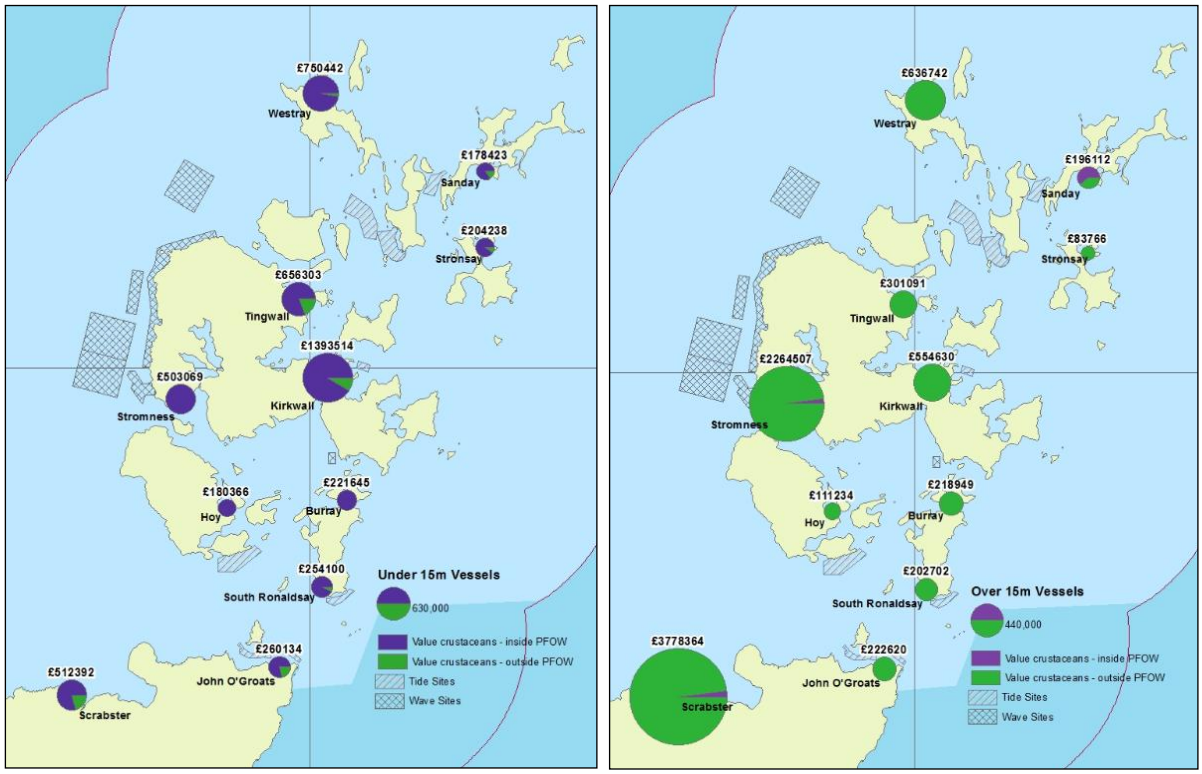


Figure 9: Value of crustaceans landings by under (left) and over 15m (right) vessels into PFOW-SA key 11 ports. Size of pie charts represent variations in the value of landings

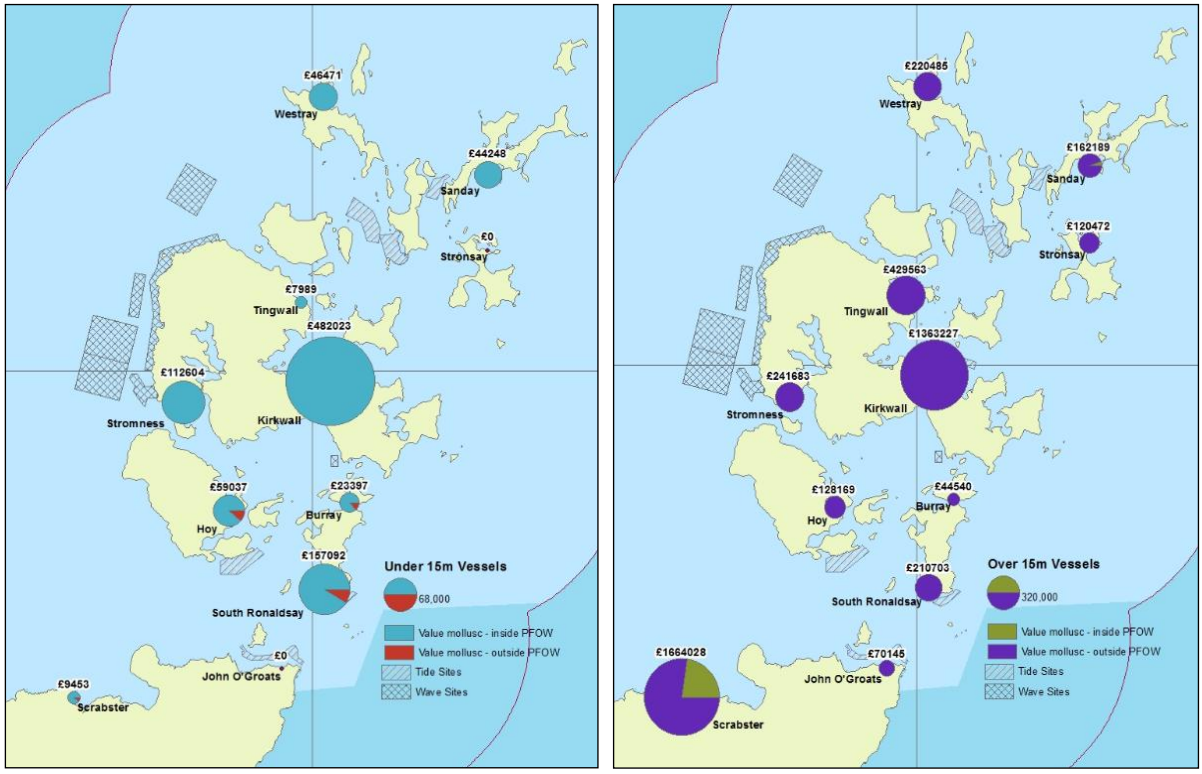


Figure 10: Value of mollusc landings by under (left) and over 15m (right) vessels into PFOW-SA key 11 ports. Size of pie charts represent variations in the value of landings

Crustacean landings are spread throughout the PFOW region with the higher landed values going into Scrabster (£3.8 million), Stromness (£2.3 million), Westray and Kirkwall (around £600,000) by the over 15m vessels. For the under 15m vessels the bulk is landed into Kirkwall (£1.4 million) and then spread throughout the west coast of Orkney with Westray and Tingwall landing around £700,000 and Stromness and Scrabster about £600,000. Of these landings the majority comes from inside PFOW-SA.

For molluscs, landings are also spread throughout the region with the bulk of the landings from the under 15m vessels coming from inside PFOW-SA and for the over 15m vessels coming from outside. The southern ports have some landings by the under 15m fleet from outside PFOW-SA, where only Scrabster has over 15m vessels landing from inside PFOW-SA. Of these ports Scrabster (£1.7 million) and Kirkwall (£1.4 million) receive most of the catch from over 15m vessels and Kirkwall receives most of the catch for the under 15m vessels (£480,000).

Section 2: Buyer and Sellers in Orkney and Northern Highlands

A separate database was used to gather data on what species are supporting onshore fish businesses in the PFOW region and what is leaving the area. Data from the Registration of Buyers and Sellers Scheme[3] was used, which was introduced in 2005 and requires all buyers of seafood products to be registered and submit sales receipts. Data was classified by processors who buy fish and add value by conducting primary[4] or secondary[5] processing and merchants who buy and resell marine products without conducting any processing. Processors and merchants in the Northern Highlands bought £1.3m and £4.8m respectively of crustaceans and demersal species, whilst processors and merchants from Orkney purchased £4.8m, £26,000, and £446,000 of crustaceans, demersal and molluscs respectively (Table 2). All other purchases were from outside the PFOW region with £10.9m going to other areas in Scotland, £2.5m to England and £6.9m are unknown.

Of the products purchased in the region, processors bought the majority - £4.2m in the Northern Highlands and £3.2m in Orkney - whilst merchants traded around £2m each in the Northern Highlands and Orkney (table 2). This equates to 26.5% of landings into the PFOW region being utilised by Orkney and Highland based businesses.

[3] The legislation requires that all buyers and sellers of first sale fish are registered and that all auction sites of first sale fish and shellfish are designated. Registration and designation is free.
[4] The processing that occurs after harvesting or slaughter to make food ready for consumption or use in other food products.
[5] Turns primary processed food into other food products.

Please note, data presented in Table 2 totals £31.7m worth of sales notes in 2011. £42.9m (Table 1) was landed in the region in 2011 resulting in £11.2m unaccounted for, this we believe is due to direct sales for export which do not need to be registered under the current system.

Table 2: Value and volume of landing purchased by different buyers in 2011.

Purchases by group in 2011	Species	Value of sales	Volume of sales (ton)
Processors - Highlands	Crustacean	£280,719	93.7
	Demersal	£3,925,757	1987.8
	Total	**£4,206,780**	**2081.8**
Processors - Orkney	Crustacean	£3,159,371	2227.0
	Demersal	£24,464	12.1
	Mollusc	£13,859	6.0
	Total	**£3,198,067**	**2245.4**
Buyers/merchants - Highland	Crustacean	£1,054,885	758.0
	Demersal	£905,560	516.5
	Total	**£1,960,445**	**1274.5**
Buyers/merchants - Orkney	Crustacean	£1,649,559	823.0
	Demersal	£1,555	4.5
	Mollusc	£432,280	149.1
	Total	**£2,083,619**	**976.6**
Buyers outside PFOW -	Crustacean	£2,003,018	774.1
	Demersal	£7,952,527	3731.2
	Mollusc	£941,726	442.7
	Total	**£10,898,262**	**4949.2**
Buyers - England	Crustacean	£1,564,419	1114.9
	Demersal	£967,342	265.7
	Mollusc	£10,657	7.1
	Total	**£2,542,417**	**1387.6**
Unknown	Crustacean	£438,079	130.2
	Demersal	£6,439,961	2429.9
	Mollusc	£3,996	1.6
	Total	**£6,882,035**	**2562.4**
	Grand Total	**£31,771,625**	**15,477.6**

Note: £11.2 million worth of landings is unaccounted for due to direct sales overseas where no sales note is required.

Table 3 presents aggregated figures from Table 2 and details input (raw material) into onshore processors and merchants in Orkney and the Northern Highlands by species type which totals £6.1m for crustaceans, £4.9m for demersal and over £440,000 for molluscs. If we assume the proportions detailed in Table 1, where we estimate 35% of crustaceans, 5% of demersal species and 23.4% of molluscs purchased by Orkney and Northern Highland businesses come from PFOW-SA, then we estimate £2.5m of species entering onshore fish business comes from the PFOW-SA (Table 3).

Table 3: Purchases by PFOW processors and merchants by species and proportion from inside PFOW

	From PFOW-SA and Surrounding waters			PFOW-SA only		
	Crustacean	Demersal	Molluscs	Crustaceans	Demersal	Molluscs
Processors + merchants in Northern Highlands	£1,335,604	£4,831,317	£0	£473,803	£240,601	£0
Processors + merchants in Orkney	£4,808,930	£26,019	£446,139	£1,705,962	£1,296	£104,283
Totals by species	**£6,144,534**	**£4,857,336**	**£446,139**	**£2,179,766**	**£241,897**	**£104,283**
Total all species		**£11,448,009**			**£2,525,946**	
Proportion from inside PFOW				35%	5%	23.4%

Lastly, to conclude this section of the analysis, Table 4 details the geographical spread of purchases throughout the region, which shows that the majority of purchases are direct i.e. by privately registered buyers, but that Scrabster sells a significant volume - £16m through the fish market - whilst Stromness sells a small proportion - £71,000 through their fish market.

Figure 11: Fish at fish market

Table 4: Value and volume of landings purchased from PFOW's 11 key ports

Port	Type of buyer	Species	Value of sales	Volume of sales (tonnes)
Hoy	Private	Crustacean	£155,260	71.8
		Demersal	£150	0.1
		Mollusc	£59,302	29.8
		Total Hoy	**£214,712**	**101.7**
John	Private	Crustacean	£295,402	131.8
		Total John	**£295,402**	**131.8**
Kirkwall	Private	Crustacean	£1,472,481	571.7
		Demersal	£1,066	0.3
		Mollusc	£453,422	164.3
		Total Kirkwall	**£1,927,203**	**736.4**
S Ronaldsay & Burray	Private	Crustacean	£340,901	109.9
		Mollusc	£124,956	31.4
		Total S Ron & Burray	**£466,210**	**141.4**
Sanday	Private	Crustacean	£298,097	122.2
		Mollusc	£45,442	13.6
		Total Sanday	**£343,539**	**135.8**
Scrabster	Private	Unknown	£19,921	6.2
		Crustacean	£3,438,490	2256.0
		Demersal	£3,824,150	1975.7
		Mollusc	£558,601	295.9
		Total	**£7,841,456**	**4534.7**
	Fish	Unknown	£840,163	233
		Crustacean	£16,836	3
		Demersal	£15,430,015	7,697
		Total	**£16,288,015**	**7,935**
		Total Scrabster	**£24,129,472**	**12469.6**
Stromness	Private	Unknown	£1,965	0.5
		Crustacean	£2,428,010	1742.1
		Demersal	£28,061	23.3
		Mollusc	£104,382	30.4
		Total	**£2,562,418**	**1796.3**
	Fish	Unknown	£3,265	0.8
		Demersal	£67,669	44.9
		Total	**£70,934**	**45.7**
		Total Stromness	**£2,633,351**	**1842.0**
Stronsay	Private	Crustacean	£183,083	53.9
		Total Stronsay	**£183,083**	**53.9**
Tingwall	Private	Crustacean	£706,898	325.3
		Mollusc	£5,812	1.7
		Total Tingwall	**£712,710**	**327.1**
Westray	Private	Crustacean	£811,227	532.5
		Demersal	£379	0.2
		Mollusc	£47,266	33.7
		Total Westray	**£859,243**	**566.7**
		Grand Total	**£31,764,925**	**15506.3**

Note: £11.2 million worth of landings is unaccounted for due to direct sales overseas where no sales note is required.

Section 3: Estimates of the Contribution of PFOW Landings to the Local Economy

To understand the contribution these landings are making to the PFOW region, we commissioned an Input-Output (IO) analysis by an external consultant. This was undertaken by Erinshore Economics Limited and the below is a summary of their findings.

Input-Output (IO) analysis attempts to model a given economy (local or national) by describing the explicit linkages between buyers (consumers) and sellers (producers). Such linkages allow for inferences to be made about the economy of interest, for example, the dependency of a local economy on locally-sourced inputs. IO analysis provides a snapshot of an economy at a given point in time. Such a snapshot is useful in providing context to inform policy. However the rigidity of IO analysis means that it must be combined with logical reasoning for it to add value to the decision-making process. It is also important that the assumptions and limitations of IO analysis are understood (see below). The IO analysis adopted here focuses on processors and merchants operating in the PFOW region and attempts to quantify the linkages these businesses have within and outside of the study area.

Over £42 million of marine species were landed into PFOW ports in 2011 (Table 1) and of that £11.4 million were purchased by Orkney and North Highland processors and merchants. However of this only £2.5m came from inside PFOW-SA (Table 3) and the remaining is caught from outside the area. The figures inputted into the IO analysis represent the value accrued from inside PFOW-SA only, as this is the upper boundary of value that could potentially be impacted from lost fishing opportunity. This analysis therefore quantifies the total loss of £2.5m rather than the full £11.4m purchased by PFOW processors and merchants. For this report this analysis was broken down into four separate groups - processors and merchants from;

1) Orkney handling non-crustacean species
2) Orkney handling crustacean species
3) Northern Highland handling non-crustacean species
4) Northern Highland handling crustacean species

The IO analysis implies that £2.5m of initial raw material input (i.e. crustaceans and non-crustaceans) from the PFOW-SA (Orkney and Northern Highlands) contributes to £10.4m in output (sales), £2.9m in income (wages), and 159 full-time equivalent (FTE) jobs within the PFOW-SA locality (Table 5). These numbers represent the direct and indirect upstream effect (type 1) of economic activity within the region. That is to say these 159 jobs include jobs in the processing sector (direct) within the PFOW-SA and also suppliers to the processing sector (indirect) within the PFOW-SA (e.g. the fish-catching sector). Results are also

presented for the direct, indirect and induced upstream effect (type II). The induced effect is the change in economy-wide household income resulting from the direct and indirect effects. For example the income accruing to these 159 (direct and indirect) jobs generates spending in the wider economy which itself contributes to output, income and jobs (Table 6).

Table 5: Direct and Indirect effect (Type I) at the regional level (Orkney and North Highland) from fish caught inside PFOW-SA. Values represent total in £ millions

Direct and Indirect Effect, Type I	Processors and Merchants: Orkney Non-Crustaceans	Processors and Merchants: Orkney Crustaceans	Processors and Merchants: North Highland Non-Crustaceans	Processors and Merchants: North Highland Crustaceans	Total
Output (£m)	£0.39	£7.12	£0.90	£1.99	£10.4
Income (£m)	£0.10	£2.04	£0.20	£0.57	£2.9
Employment (FTE Jobs)	6	112	10	31	159

Table 6: Direct Indirect and Induced effect (Type II) at the regional level (Orkney and North Highland) from fish caught inside PFOW-SA. Values represent total in £ millions

Direct, Indirect and Induced Effect, Type II	Processors and Merchants: Orkney Non-Crustaceans	Processors and Merchants: Orkney Crustaceans	Processors and Merchants: North Highland Non-Crustaceans	Processors and Merchants: North Highland Crustaceans	Total
Output (£m)	£0.67	£12.74	£1.44	£3.55	£18.4
Income (£m)	£0.20	£3.99	£0.39	£1.11	£5.7
Employment (FTE Jobs)	9	171	16	48	244

At the national (Scotland) level the IO analysis implies that £2.5m of initial raw material input from the PFOW-SA contributes to £11.7m in output (sales), £3.4m in income (wages), and 172 FTE jobs (Table 7). As expected the total impact at the national level is larger than the local level since, by definition, more interdependencies exists at a national level compared to a local level. For example processors within the PFOW-SA who import certain goods and services (e.g. IT services) from the rest of Scotland are not supporting output, income and jobs at the PFOW-SA level but clearly are supporting output, income and jobs at the Scotland level. This data however does not offer any analysis on the severity of these impacts as local losses can be severe at the local level due to job opportunities in the wider Scottish economy mitigating national losses.

Table 7: Direct and Indirect effect (Type I) at the Scottish level from fish caught inside PFOW-SA. Values represent total in £ millions

Direct and Indirect Effect, Type I	Processors and Merchants: Orkney Non-Crustaceans	Processors and Merchants: Orkney Crustaceans	Processors and Merchants: North Highland Non-Crustaceans	Processors and Merchants: North Highland Crustaceans	Total
Output (£m)	£0.44	£7.98	£1.01	£2.24	£11.7
Income (£m)	£0.12	£2.34	£0.24	£0.65	£3.4
Employment (FTE Jobs)	6	121	11	34	172

IO analysis allows for the simulation of 'shocks' to the examined economy. Traditionally such shocks are examined in terms of final demand. For example, say, a foreign country has a sudden increase in demand for more fish produce from the PFOW-SA. This increase in demand expands output (more processed fish are sold) which in turn increases the demand for inputs (more fish are caught). This ripple effect on output feeds into income and jobs providing an overview of how the economy of interest, as a whole, responds to the final demand shift. Clearly such a shock can be negative (i.e. final demand decreases) and the IO framework is equally capable of examining such a scenario. The policy context relating to the PFOW-SA is focussed around possible restrictions to fishing activity resulting from proposed marine developments e.g. marine renewables. Given this context the traditional IO demand-driven analysis described above does not seem overly appropriate as there is no reason to suggest that final demand for PFOW-SA produce will fall as a result of renewable developments. Therefore a more appropriate use of this IO analysis is in understanding the extent to which there is a reliance on catch sourced in the PFOW-SA. This is what will be impacted should renewable or other restrictive development go ahead - it is the relevant information to inform policy.

The IO analysis implies that a 10% reduction in landings from the PFOW-SA will result in the loss of £1m in output (sales), £0.3m in income (wages), and 16 FTE jobs within the PFOW-SA (Table 8). At the Scotland level a 10% reduction in landings from the PFOW-SA implies that £1.2m in output (sales), £0.3m in income (wages), and 17 FTE jobs will be lost.

Table 8: Losses arising to the local Economy from a 10% reduction in landings for fish and shellfish from PFOW-SA

Direct and Indirect Effect, Type I, **(£m)**	Processors and Merchants: Orkney Non-Crustaceans	Processors and Merchants: Orkney Crustaceans	Processors and Merchants: North Highland Non-Crustaceans	Processors and Merchants: North Highland Crustaceans	Total
Total Output	£0.04	£0.7	£0.09	£0.19	£1.0
Total Income	£0.01	£0.2	£0.02	£0.06	£0.3
Total Employment	0.6	11	1	3	16

It is important to be aware of the assumptions which caveat such estimates. The results presented above could be both over or under-estimates. From this analysis no indication can be gleaned regarding the downstream impact beyond processors and merchants (e.g. the extent to which hotels and restaurants are dependent on locally-sourced inputs). If such businesses are dependent (e.g. no substitutes exist) on inputs from within the PFOW-SA the impact presented here could be an underestimate.

The above analysis also makes certain assumptions regarding possible adjustment mechanisms. No account is taken of the fact that price increases and/or input substitution from elsewhere could offset any losses from the PFOW-SA. For example, if the price of PFOW- SA produce rises because of supply restrictions and consumers are still willing to buy at this higher price the supply-chain impact will be offset to some degree e.g. fishermen receive more revenue per tonne of PFOW-SA landed catch. If final consumers are willing to accept a substitute product the impact will also be offset e.g. instead of producing less output there is a shift towards different output. Any assessment of the above analysis must be combined with a reasonable narrative as to the likelihood of: 1) to what extent will spatial restrictions impact on the availability of fishing opportunities within the PFOW-SA?; 2) how substitutable is PFOW-SA sourced catch? and; 3) How sensitive is the demand for PFOW-SA produce relative to price/quality? Some of these questions will now be explored in section 4 using data from key informant interviews.

The full independent report is available at
http://www.scotland.gov.uk/Topics/marine/science/mau/Relpub/PFOWProcEcon

Section 4: Understanding what the Spatial and Economic Data means to PFOW

To contextualise and enrich the spatial and economic analysis presented above, interviews were conducted with four process mangers operating in PFOW region and three other key informants associated with fishing and/or regional development. A summary of this interviews is presented below.

Background to Processing in Orkney: Pre 1970 whitefish dominated landings throughout the region as infrastructure was poorly developed to benefit from inshore crustaceans. A subsequent decline in whitefish vessels coming into Orkney, resulted in the islands shifting its focus to crustaceans whilst the Northern Highlands ports continued to service the remaining whitefish vessels, with Scrabster becoming the key northern port. Whilst initially small, crustacean fishing started to expand in the late 1950s after successful exports of lobster to northern France. To develop this market, Orkney fishermen decided to set up a cooperative that supported the catching capacity of local fishermen and the mission behind the cooperative was, and remains so today, - “every Orkney fishermen can land anything caught, every day of the year and there would be the capacity to process and get the product to market”. To deliver on this mission, an

innovative scheme was designed to raise money to get a number of processing facilities established throughout Orkney.

Business Model: Orkney Fishermen Society (OFS) and Westray Processors Ltd are two of the only remaining companies that started at this time (Stronsay and Ronaldsay closed mid 1970s), and still operate under a cooperative model, which buys raw material landed by Orkney fishermen. Currently the cooperatives offer bonuses to contracted fishermen and dividends on company profits to shareholders on an annual basis. In this cooperative model the shares were a £1, they do not change in value and fishermen are the majority shareholders. Due to the amount of time the scheme has been running shares are now held by non-fishermen also (handed down to family etc.), which are no-vote accumulative shares, which realise a 5% return but do not allow the shareholder a vote in the general meetings. Only active or retired fishermen are allowed to vote. Of these fishermen, those who land more than £25,000 of shellfish to the society each year has two votes in the general meeting and fishermen who land less than this amount, or retired fishermen, have one vote. Because of the inevitable shift of shares to non- fishermen, the voting system is such that it allows the control of the company's future and direction to rest with active fishermen.

OFS is an unusual company and due to the unique business model has successfully linked the Orkney crab fishing fleet with UK supermarkets and UK household consumers. OFS has an annual turnover of around £8 million of which about 80% of the sales is from brown crab. Of this, 65% goes to the UK retail market, 10% to the other UK markets (food services, catering) and the remaining 25% is exported to Europe, China and South-East Asia. OFS is the principle supplier of crab products to UK supermarkets. OFS trades under a number of brand names, the most prestigious is 'Orkney Crab' which has assurances that only material sourced from Orkney owned and Orkney landed boats is used. Other produce is sold under other brand names such as 'Scottish Crab' or 'Shetland Crab' depending on where it was sourced. As shown in Table 1, a large quantity of the raw material coming into the processing facilities is from outside of the PFOW-SA, however it is argued that a significantly higher proportion of the value added to the processing output is heavily associated with the business model above which depends on inshore fishing.

Background to Processing in Scrabster: Scrabster is home to a number of smaller to medium size businesses which handle and conduct primary processing of fish, crustaceans and molluscs. Scrabster has traditionally functioned as a landing port and fish market but processing has taken place since the late 1960s. However, the decommissioning of white fish vessels has impacted on the area and processors have diversified into other markets.

Businesses: One white fish processor remains who conducts primary processing but also acts as a merchant. Some merchants in the area have developed small scale processing facilities as well as local outlets in Thurso and seafood vans which travel throughout the area. Unlike Orkney most businesses rely on exports which are transported through Glasgow airport to Scandinavia or Asia or on vivier trucks to the continent. One of these businesses stated that they were more dependent on larger vessels as they offer a wider selection of product (e.g. crab with no appendages missing, which is critical for the Asian market) throughout the year. This is different to the Orkney model who can take any broken or damaged crab. Having a range of demands in the region was felt to add resilience, as boats have a range of processors who are willing to buy different quality catch.

Location and Remoteness of PFOW: Geographically, facilities in this region are perfectly situated because of the proximity to raw material. The regional fishing grounds are highly productive and perfectly suited for crustaceans, therefore high quality, fresh, local produce can be delivered with relative ease to factories. The fundamental weakness and long term business challenge has been the remoteness of the Orkney Islands and Northern Highlands. Whereas other crab processing areas in the UK have stronger local markets e.g. Newlyn in Cornwall and Cromer in Norfolk, who sell locally and to the tourist sector, these markets in PFOW are too small in comparison to the available product. Therefore OFS is focused specifically on the UK food retailers which requires volume and a steady supply, which they get from the full range of vessels in the area. Westray Processors Ltd is a sister company which supplies Orkney based businesses with crab products for the local and tourist markets and the remaining is sold to the OFS. OFS has deliberately left this section of the local market to the Westray facility.

In the Northern Highlands transportation over land is easier but still expensive, so businesses have to counter this to remain competitive and profitable which they say is achievable because of the quality of produce in the regional fishing grounds. It was stated that business viability would be severely undermined if raw product needed to be imported into the PFOW region.

Crab has a short shelf life and generally low profit margins, which means the processing and transportation of the product needs to be as short as possible and direct delivery of the raw produce to the factory facilitates this. What has made the Orkney facilities so successful is the quality branding of ‘Orkney Crab’ which has been developed with, and is intimately linked to, an Orkney fishing fleet. Currently this fleet consists of 30-40 under 15m vessels who regularly land their catch (over £25,000) through this organisation and 5 vessels in Westray. There are also 2 large crabbing vessels which supply the OFS factory, which are Orkney owned and fish in distant fishing grounds. These vessels supply the bulk of the crabs, through all weathers which are required to guarantee landings to supply the volume for the retail market. However it has been stated that, should the volume

of landings be affected, which included the inshore fleet, for anything but the very short term, this business model would fail and what would replace it e.g. small primary processing, would be forced to service different markets, as the supermarkets have bought into the local aspect of the business.

Shifting inshore capture to offshore capture: When asked if larger vessels could supply the short fall from lost opportunity in inshore grounds, it was stated that not only is this against the business model in Orkney but there is an issue with capital investment. Small scale creeling vessels are an investment of about £50,000 each whereas large scale crabbing vessels are in the realms of £1 million. It was felt the capital would not be available to upgrade the fleet to exploit distant crabbing grounds, assuming such grounds exist. OFS stated that in the short term it could be possible to source material from elsewhere, however the business model and established markets is completely dependent on inshore fisheries and remaining competitive would be severely challenged.

Onshore processing in the Northern Highlands are less dependent on local small-scale vessels, due to the dominance of large vessels in the region for decades and the particular model of shellfish export which requires large volumes to select primary product.

Skilled employment: Whilst it has been stated in the IO analysis that people working in processing in Ornkey and the Highlands are earning less than the national average, OFS is the largest private sector employer in Orkney and is a modern BRC Global Standards A accredited food processing facility - BRC Global Standards being global leaders in food safety and supply chain management. Within this facility there are a high diversity of workers where low skilled workers can access full time permanent employment and develop with the company as well as graduates and post graduate workers due to the technical requirements of the UK retail contracts that the OFS supply. This skilled work force also support the Westray facility who benefits from this investment which allows the company to supply local markets with high quality seafood at a competitive price.

Due to the demands (long hours, physical work) in the OFS facility a large proposition of the workforce is now recruited from overseas. In Westray this is not the case as almost all employees are islanders and it is reported that whilst primary income comes from family farms, this facility offers employment for young people and secondary income into family households. This is also an important facility for supplying women with their own income and independence from the family business. In the Northern Highlands local people make up the majority of the work force because of the remoteness of the region. One company did express problems with finding a good reliable workforce when they expanded, but felt this was to do with the shift in management approach and staff morale.

They now have a very low staff turnover as the management system has been greatly improved.

Island Life: Island life requires flexibility. Many people have a number of jobs and all contribute to maintaining the flow of island life. Managing business in these environments also requires flexibility. One facility discussed staffing and the need to be understanding and adaptable. For example staff holidays were discussed as getting to and from the island can take 2 days off people's holiday before they even get to international airports, which maybe increased if poor weather and delays are experienced. Training of staff is also challenging as 2 to 3 days are required if people need to go to the mainland, which is a large amount of time out of the processing facility which requires careful management to balance the business and remain profitable. It was also felt that these businesses in remote regions have important social roles in people's lives, as in some cases this is an opportunity for young people to socialise outside of the family business.

Transportation: OFS have internal Orkney wide transport to pick up landings on the islands and a 3rd party haulage company which transports produce from Orkney. Orkney is a net importer and OFS products are one of the few exported products (a small amount of salmon, whisky and beer also contribute) being exported and is therefore an important contractor for Orkney haulage companies, of what would otherwise be one way haulage. OFS has trucks going 5 days a week with between 30-80 pallets a week. Westray also stress the importance of having businesses exporting from the island, as this not only services the businesses but also supports wider transport infrastructure, such as ferries, which benefits all islanders. Further this process facility supports the local fishing fleet by buying in and storing supplies (protective clothing, fishing equipment etc.) which improves the viability and efficiency of the Westray fleet. Imports of these products are expensive in remote islands, therefore having the facilities transporting infrastructure is important for supporting island life.

Business Expansion: All companies felt that they could expand their businesses. On the islands it was felt that suitable markets were not a limitation, but the availability of crab was, as it was felt stocks are near to full exploitation. This was also stated as the case in the Northern Highlands, as lucrative markets are increasingly available and demand increasing for Scottish products. There was however contradiction around this, as it was felt the high supply of crab was depressing the market and impacted on the price that the fishing fleet are receiving, which they stated has been static for many years.

Section 5: Discussion of Findings

Composition and spatial distribution of landings

A wide range of species are targeted in PFOW-SA and surrounding waters by both under and over 15m vessels and all species types (pelagic, demersal, crustaceans and mollusc) are present in landings from the area. Pelagic species are harvested from the region but landed into Shetland therefore were excluded from this study. When it comes to landings that input to onshore activity in Orkney and Northern Highlands, the species composition simplifies and splits with the bulk of crustaceans being landed into Orkney and the bulk of demersal species into Scrabster in the Northern Highlands. Due to this historic split businesses have evolved to handle crustaceans in Orkney and whitefish in the Northern Highlands, however diversification does seem to be taking place in the Northern Highlands due to new export markets for Scottish crab.

Scrabster is the busiest port by value with the majority of species being landed there. All other ports along the Northern Highlands are no longer receiving fish landings with the exception of John O'Groats which have small landings of crustaceans. Orkney however has a wide geographical spread of ports receiving landings with both Kirkwall and Stromness receiving significant volumes. All the other small ports had over £400,000 worth of landings in 2011 which are, potentially, significant given the size of the ports and island populations. These ports are receiving a mixture of crustaceans and molluscs.

Orkney ports are more dependent on inshore fishing grounds with just under half of their landings coming from these waters, but for crustaceans from the under 15m fleet this increased significantly to almost 90% across all Orkney ports. Equally for mollusc species this dependency is high for the under 15m vessels as almost all ports received 100% from vessels fishing inside PFOW-SA. With the exception of one boat in the over 15m fleet, the impacts from potential displacement and lost fishing opportunity will be experienced by the under 15m fleet.

Impact to onshore activity from reduced landings

In the Northern Highlands there would appear to be limited impact to onshore activity from a reduction in fishing opportunity as all landings come from outside PFOW-SA with the exception of mollusc species. For the Orkney Islands, the bulk of landings (crustaceans) go into the main island (Stromness, Tingwall and Kirkwall) where a good road network around the island allows the product to be transported to the main processing facility. The other bulk of landings (crustaceans) goes directly into a processing facility on Westray. The five other island ports do not have any processing facilities and their landings are handled by merchants. These businesses potentially face a significant impact from lost

fishing opportunity from crustacean species. When one considers the value of landings into these businesses, just over one third (35%) of crustaceans come from inside PFOW-SA. For merchants this impact could be potentially higher as the processing facilities have larger vessels supplying their needs to maintain continuity in product lines, therefore increasing their supply options, however merchants trading from the smaller ports are more likely to be directly dependent on inshore catches. Equally, catches from small-scale fishers are more likely to include lobster, a high value species which makes their businesses profitable rather than dealing purely in the 'bread and butter' species of crab.

Impact to dependent businesses from reduced landings

The IO analysis found that the raw material input (i.e. crustaceans and non-crustaceans) being handled and processed in the region, which comes from the PFOW-SA, contributes to £10.4m in output i.e. products to market, and £2.9m in income i.e. wages. This supports an estimated 159 jobs in the regional (Orkney and Northern Highlands) economy. Whilst this should not be used as a direct comparison, to put this in some form of context the economic output for Orkney region in 2011 was £430m with employment in the regions an estimated 6,000 jobs. For the Northern Highlands meaningful comparison is harder because data is primarily available at the Highland local authority level. Highland economic output was £4,690m in 2011 with employment in the region an estimated 75,600[6].

What however has been argued in the key informant interviews is that business viability is directly linked to the proximity of the fishing grounds and that due the low profit margins on crab, importing raw material for processing is not feasible for businesses facing other logistical limitations such as distance from market. Therefore fishing grounds in and around the PFOW region are important for the viability of the industry. What is less understood is whether the offshore fisheries could make up a potential reduction in landings coming from inshore, should fishing opportunity reduce.

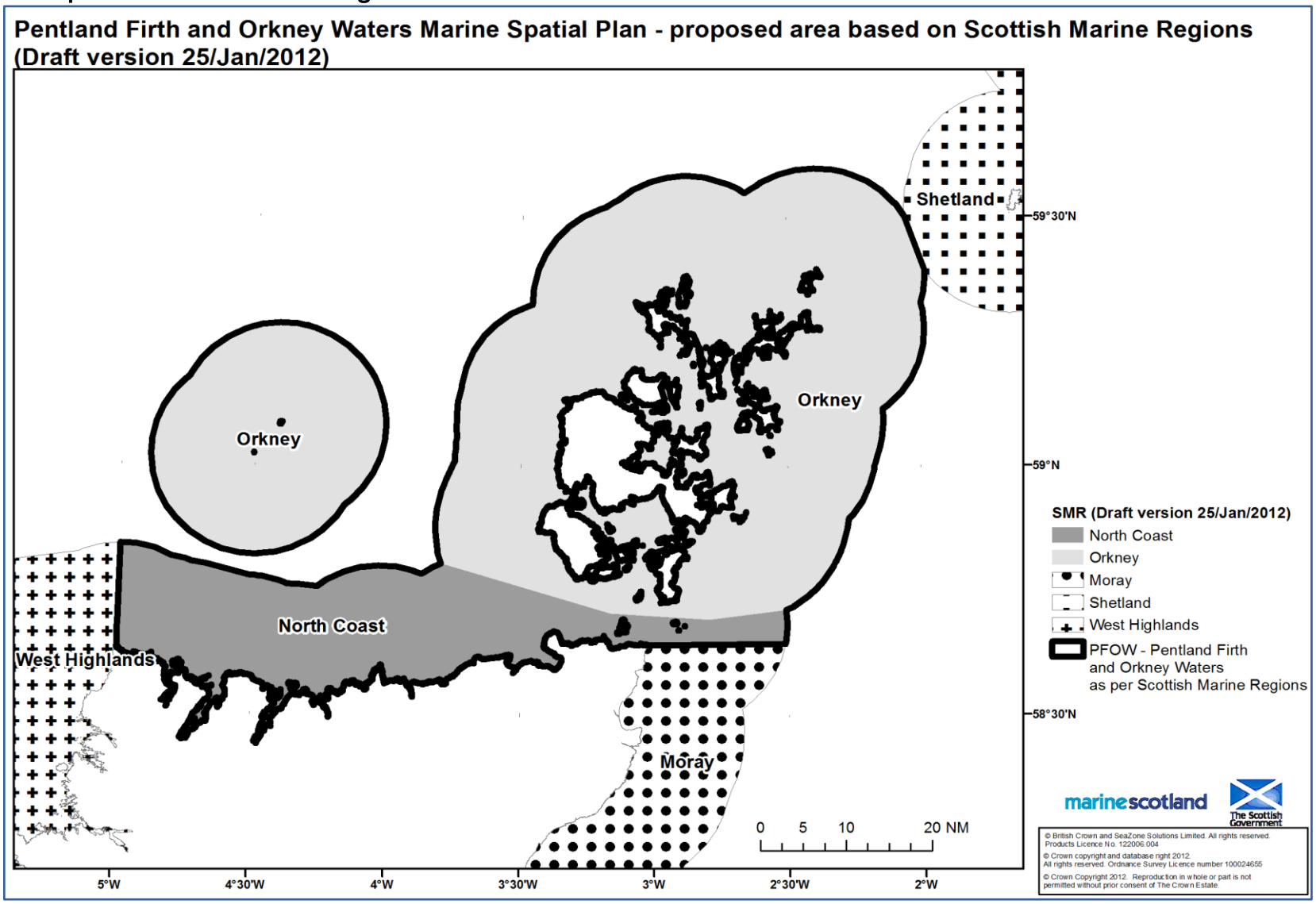
When looking at a more likely scenario such as a 10% decline in landings, which equates to around a £250,000 (2011 prices) reduction of purchases from PFOW-SA, £1m to the regional economy would be lost, £0.3m in income and 16 FTE jobs connected to onshore activity. How this will impact on the inshore fishing fleet is beyond the scope of this study, but given the level of activity inside the PFPW-SA by under 15m vessels, they are the most likely vessels to lose fishing opportunities. Whether this loss could be absorbed by the under 15m fleet and the vessels still remain viable is a remaining question. But as stated in the key informant interviews, the business model, at least for one of the facilities is tied to

[6] Regional economic data is from the Scottish Annual Business Statistics publication. This data excludes the financial sector, parts of agriculture and the public sector hence it is an underestimate of actual economic activity.

inshore/small-scale fishing and equally there is a question on whether a reduction in inshore activity would jeopardise this business model and negativity impact on the demand from current markets i.e. supermarkets would not be interested in a non-local/small scale brand.

Lastly, It would appear that wages in Orkney and Northern Highland processing and trading are generally lower than the national average which is a common trend in food processing and has resulted in many businesses having to source labour from overseas. It would appear this is the case with some of the factories in the study but certainly not all. For some of the remote island communities the presence of such businesses offers a range of benefits to the community such as supporting transport infrastructure, supplies a secondary income for households and gives women independence from the family businesses and young people the opportunity to work and socialise outside of family businesses.

Annex 1: Proposed Scottish Marine Regions



Annex 2: Methods

1) Mapping Fishing Activity with ScotMap and VMS

Methods of quantifying the value and volume of landings is normally conducted at ICES rectangles. The PFOW Strategic Area resides in 5 ICES rectangles, but spatially represent only 60% of this area therefore data from these rectangles would overestimate the activity within the PFOW-SA. We therefore used three sets of data to create estimates on fishing activity in the PFOW-SA, VMS data, ScotMap data and Fisheries Information Network (FIN).

Vessel Monitoring System (VMS) data for over 15m vessels plots the position of a vessel (much like a SatNav) every two hours. This data is then used to plots a vessel's trip which is linked to catch data taken from that vessel's log book contained in a database called Fisheries Information Network (FIN). This data can then be aggregated to accurately gather fishing activity in a geographical defined space such as PFOW-SA. This data can produce accurate landings over time and can estimate more accurately what was taken from inside PFOW-SA and from outside PFOW-SA by the over 15m fleet.

As VMS is not required on under 15m vessels, our ability to spatially plot vessels activity is much more limited. As this is a recognised weakness in fisheries management a project called ScotMap was commissioned to gather spatial activity of under 15m vessels throughout Scotland. This project was piloted in Orkney and 100% of the under 15m fleet took part. The project mapped each vessel's activity and asked fishers to estimate the average volume and value that they have taken from each over the last 5 years. Compiled, this data created map of fishing density and value of inshore fishing grounds to the under 15m fleet. We therefore used this data to estimate the proposition of catch coming from inside PFOW-SA for each vessels as well as 2011 FIN data for said vessel to estimate value and volume from inside and outside the PFOW-SA for all Orkney/Northern Highland based vessels.

To establish landings from inside PFOW-SA by species type into each port for the under 15m vessel, the top two landings port for each vessel were taken from FIN and then weighted to assign a proportion of landings to each port. For example, in Kirkwall, three vessels which land into Kirkwall as their main port have a mean landing of 89% of their catch from inside PFOW-SA. Four vessels who landed in Kirkwall as their second port had a mean landing of 65% as their second port. These proportions of landings were then weighted against the number of vessels and then averaged to get a weighted mean of landings from inside the PFOW-SA for that port. These proportions were used to divide total landings into the port from under 15m to ascertain value from inside and outside PFOW-SA.

2) Key Informant Interviews

Key informant interviews were arranged with individuals who were considered to have an overview of the onshore processing sector or inshore fishing activity. Since our key interest was in processing, the objective was speak to as many processors as possible to get a diverse range of views on its dependency and supply chain. Overall, eight interviews were conducted, five in Orkney, and three in the Northern Highlands. Interviews were conducted in an informal manner with 10 open questions based around four themes: 1) types of business/type of processing and raw product; 2) markets, associated industries and supply chain; 3) employee and job creation and; 4) potential changes from alternative marine uses. Interview durations ranged from 40 minutes to 2 hours, depending on the time interviewees had available.

3) Data Limitations

This research attempts to integrate a range of data sets from different sources and whilst we believe the data present in this report is an accurate reflection of onshore fish related activity there are some data limitations.

Integrating the data between ScotMap (under 15m) and VMS (over 15m) was challenging as ScotMap took estimates from fishers on where they fished and what volume and value they attributed to different spatial areas whereas VMS is the exact location of fishing activity which is then tied to log book data. Therefore over 15m is a more accurate representation whilst under 15m is an average estimate from between 2006 to 2011. Whilst we do not believe this has distorted the data to any great degree as they have been cross referenced with FIN landings data for the under 15m fleet (Log book data), proportions attributed to inside the PFOW-SA could have been slightly under or over estimated.

Using data from the Register of Buyers and Sellers has increased our confidence in the Input-Output (IO) estimates as we were able to cross reference figures between landings recorded in FIN and receipts from buyers. Previously we have relied on landings only which does not allow a breakdown of the data by buyers and therefore we did not know what is staying in or leaving the region. The register has therefore allowed more accurate figures to be input into the IO model, but as already stated we are missing receipts for £11.2m, which we believe is due to overseas sales.

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