14 COMMERCIAL FISHERIES

14.1 The table below provides a list of all the supporting studies which relate to the commercial fisheries impact assessment. All supporting studies are provided on the accompanying CD.

Details of study	Location on supporting studies CD
Benthic survey for Phase 1 of the MeyGen tidal stream energy project, Inner Sound, Pentland Firth (ASML, 2011)	OFFSHORE\Seabed interactions
Navigation Risk Assessment (NRA) MeyGen Inner Sound (Anatec, 2012)	OFFSHORE\Navigational Risk Assessment

14.1 Introduction

14.2 This section assesses the effects of the Project on commercial fisheries. The assessment has been undertaken by Xodus.

14.3 To gain a better overall understanding of the baseline and potential impacts associated with commercial fisheries; consideration should also be given to the following Environmental Statement (ES) sections:

- Benthic habitats and ecology (Section 10);
- Fish ecology (Section 13);
- Navigation (Section 15); and
- Socio-economics (Section 21).

14.2 Assessment Parameters

14.2.1 Rochdale Envelope

14.4 In line with the Rochdale Envelope approach, this assessment considers the maximum ('worst case') project parameters. Identification of the worst case scenario for each receptor (i.e. Environmental Impact Assessment (EIA) topic) ensures that impacts of greater adverse significance would not arise should any other development scenario be taken forward in the final scheme design. Table 14.1 describes the detail of the project parameters that have been used in this assessment and explains why these are considered to be worst case. The potential alternative Project parameters have been considered in Section 14.9.

Project Parameter relevant to the assessment		'Maximum' Project parameter for impact assessment	Explanation of maximum Project parameter
Turbines	Maximum deployment area	Maximum area of seabed is 1.1km^2	The maximum potential area that fisherman will be unable to work due to deployment of turbines. This will be 1.1km^2.
	Decommissioning	All turbines removed at decommissioning	From a decommissioning perspective it is assumed that all turbines will be fully removed at decommissioning.
Turbine Support Structure	Decommissioning	All Turbine Support Structures (TSSs) removed at decommissioning	From a decommissioning perspective it is assumed that piled TSSs will be cut at the seabed. The piles below the seabed will remain in-situ.
Cable connection to shore	Maximum cable footprint on seabed	86, 120mm unbundled cables each 1,300m in length with split pipe armouring	The maximum physical area of the seabed occupied by the cables has been calculated as 0.027km^2. Based on a maximum 1.3km of cable from Horizontally Directionally Drilled (HDD) bore exit to turbine, and a cable diameter of 120mm (x2 to account for split pipe armouring) for 86 turbines. This assumes that the cables will emerge from the bores 700m from the shore.
	Decommissioning	86, 120mm unbundled cables, each 1,300m in length	All cables laid on the seabed will be fully removed at decommissioning.
Vessels	Safety zone for Dynamic Positioning (DP) vessel during installation and maintenance activities	500m radius area around vessel	A maximum safety zone of 500m is considered for the assessment. A 500m safety zone is industry standard. The size of the safety zone during construction will influence navigation and commercial fishing activities in the area.
	Installation vessel physical presence	1 DP vessel for the duration of the installation for year 1 and 2 2 DP vessels for year 3 installation	Installation activities will be carried out by a single DP vessel during year 1 and 2, all installation activities to be undertaken using a single DP vessel. If other smaller vessels used to undertake some of the work of the DP vessel, no concurrent multiple vessel activities will take place, i.e. no more than one vessel on site at any one time. Year 3 installation will require a maximum 2 DP vessels for TSS installation. These two vessels may be present on site at the same time during year 3.
	Maintenance vessel physical presence	1 DP vessel present every 2.8 days	Based on a maximum 86 turbine array, 1 DP vessel will be present a maximum of 130 times (i.e. single slack tide operation) per year i.e. the DP vessel will be present on site every 2.8 days.
Onshore Project components	-	N/A	Onshore Project parameters do not influence the commercial fisheries impact assessment.

Table 14.1: Rochdale Envelope parameters for the commercial fisheries assessment

14.2.2 Area of assessment

14.5 It is also important to define the geographical extent of the assessment area. The focus of the impact assessment is potential impacts on the commercial fisheries using the Project area and adjacent waters.

14.3 Legislative Framework and Regulatory Context

14.6 The EIA Regulations are the only legislation directly relevant to this assessment. The legislation and guidance relevant to the resources and habitats on which commercial fish species depend is summarised in Benthic Habitats and Ecology (Section 10) and Fish Ecology (Section 13).

14.4 Assessment Methodology

14.4.1 Scoping and consultation

14.7 Since the commencement of the Project, consultation on commercial fisheries issues has been ongoing. Table 14.2 summarises all consultation relevant to commercial fisheries. In addition, relevant comments from the EIA Scoping Opinion are summarised in Table 14.3, together with responses to the comments and reference to the ES sections relevant to the specific comment.

Date	Stakeholder	Consultation	Topic / specific issue
8th and 9th of March 2011	Local fisheries interests The Crown Estate Marine Energy Developers	The Crown Estate's Pentland Firth and Orkney Waters Fisheries Meetings	Fisheries issues and concerns discussed at a meeting chaired by The Crown Estate's Fisheries Liaison Officer.
7th April 2011	Marine Scotland and Scottish	Pre-Scoping meeting	EIA surveys and studies required and the data

Date	Stakeholder	Consultation	Topic / specific issue
	Natural Heritage (SNH)		needs for each EIA study.
6th May 2011	Local fishermen	Local fisherman's visit to view the Atlantis turbine at Invergordon	Turbine technology and discussions with fishermen regarding their concerns.
27th May 2011	Marine Scotland, statutory consultees and non statutory consultees	Submission of EIA Scoping Report	Request for EIA Scoping Opinion from Marine Scotland and statutory consultees and request for comment from non statutory consultees.
30th June – 2nd July 2011	Local stakeholders	Public Event - EIA Scoping	Public event to collate information/opinions on proposed EIA scope.
7th July 2011	Maritime and Coastguard Agency (MCA)	Meeting	The scope of work for the NRA was discussed with the MCA including the various data sources planned to be used to characterise baseline traffic levels.
24th August 2011	Five local fishing skippers (3 John o' Groats & 2 Scrabster)	Meeting	Discussion on local fishing activity and vessels that fish in the Project area. Target species, gear used and effort spent within the Project area.
22nd September 2011	Scottish Fishermen's Federation (SFF), Marine Scotland Compliance, Local fishermen and sailing representatives, Wick RNLI, Scrabster Harbour, Gill's Harbour, Pentland Ferries, John o' Groats Ferries	Hazard Review workshop	Project overview and baseline data review.
31st September 2011	Marine Scotland, The Highland Council, statutory consultees and non statutory consultees	Receipt of EIA Scoping Opinion	Receipt of response to EIA Scoping Report and other comments from non statutory consultees.
3rd October 2011	Marine Scotland	Project update meeting	Report on EIA progress and presentation of key findings of the impact assessment.
12th October 2011	Maritime and Coastguard Agency (MCA)	Meeting	The draft findings of the NRA were presented to the MCA. Specific comments were made which have been incorporated into the final NRA.
6th – 7th December 2011	Local stakeholders	Public Event – pre application consultation	Public event to communicate the findings of the EIA to local stakeholders.
9th March 2012	Caithness District Salmon Fisheries Board	Meeting	Consultation with salmon fisheries board to discuss potential issues and approach to impact assessment.

Table 14.2: Consultation undertaken in relation to commercial fisheries

Name of organisation	Key concerns	Response	ES section within which the specific issue is addressed
SNH	SNH recommend consultation with relevant Inshore Fisheries Groups (IFGs) in addition to other Fisheries associations. IFGs endeavour to comprise representation from all vessels fishing in the inshore area, including small independent fishers that may not be part of a major association. Vessels that are not based locally (i.e. east coast vessels that also operate on the west coast, and *vice versa*), should also be included.	No IFG has been set up in this area as yet; the North Coast Fisheries Group, in addition to Orkney Fisheries Association, has been consulted. Adequate consultation has been undertaken as confirmed by Marine Scotland (McLeod, pers.com. Marine Scotland, Marine Planning and Policy Officer, 2011). Relevant fisheries organisations were contacted as part of the consultation process, to establish the importance of fishery resources in the inshore area.	Refer to Section 14.4.1 Scoping and Consultation
SNH	It is noted that geo-referenced data regarding inshore fishing activity and catch is very limited because; (a) shellfish fisheries are largely unregulated and require very little catch reporting; and, (b) many of the vessels in the inshore area are less than 15m long and are not required to have satellite vessel monitoring systems (VMS). Consultation with the IFGs is likely to be helpful in establishing the importance of fishery resources within an area and the likely extent of displacement of fishing activity.	In the absence of IFGs in the area, consultation has been undertaken with the appropriate organisations in the area; including locally known fishermen and the Orkney Fisheries Association; to establish the importance of fishery resources in the inshore area and to assess the likely effect of displacement.	Refer to Section 14.4.1 Scoping and Consultation
SNH	Marine Scotland science and CEFAS should advise on appropriate data sources relating to spawning and nursery grounds, and whether any additional surveys are required. They should also be contacted to discuss mitigation measures and if there is overlap between the development site and the location of nursery / spawning grounds.	Marine Scotland has been consulted with and Centre for Environment Fisheries and Aquaculture Science (CEFAS) generated data used in regards to this matter.	Refer to the Fish Ecology, Section 13, for further consideration of spawning habitats.
SNH	Consideration should be given to benthic habitats or substrate types; particular sectors of the Scottish fishing industry are associated with particular substrate types, as well as species in different stages of their life-history.	Substrate type and benthic habitats are discussed further in the benthic habitats and ecology section.	Refer to the Benthic Habitats and Ecology; Section 10.
SNH	Consideration should be given to potential impacts of noise / vibration and EMF to shellfish species.	Impacts on shellfish are considered in the benthic ecology section, as they will be vulnerable to a similar range of impacts.	Refer to the Benthic Habitats and Ecology, Section 10.
SNH	The environmental effects of displacing (and potentially concentrating) fishing effort to other areas should be assessed by the applicant. Also to be considered is the potential of the development area to provide a refuge for particular species, potentially increasing biomass, with potential benefits to adjacent fishing grounds.	Displacement effects and potentially beneficial effects to adjacent fishing grounds are considered.	Refer to Sections 14.6.2 Impact 14.2: Displacement of fishing effort targeting new or alternative fishing grounds, 14.7.1 Impact 14.5: Displacement of fishing effort and 14.7.2 Impact 14.6: Change in abundance and distribution of target species.
Marine Scotland	In addition to the Scottish Fisherman's Federation and major fishing associations, the relevant Inshore Fisheries Group (IFG)	No IFG has been set up in this area as yet; the North Coast Fisheries Group, in addition to Orkney Fisheries Association, has been consulted. Adequate	Refer to Section 14.4.1 Scoping and Consultation

Name of organisation	Key concerns	Response	ES section within which the specific issue is addressed
	should also be consulted.	consultation has been undertaken as confirmed by Marine Scotland (McLeod, pers.com. Marine Scotland, Marine Planning and Policy Officer, 2011).	
Marine Scotland	To ensure liaison with the fishing industry is focussed and that key species with potential to be impacted by the development are identified, habitat associations for fish/shellfish and particular fishing types should be highlighted.	Benthic habitats within the footprint of the proposed development have been identified (refer to Section 10) and associated fishing industry types confirmed.	Refer to the Benthic Habitats and Ecology, Section 10 and Section 14.5.3 for details regarding benthic habitats and commercially valuable species occurring within the Project area.
Marine Scotland	The applicant should assess the effects of displacing fishing effort to other areas; the potential for the development area to provide a refuge for particular species, potentially increasing biomass with potential benefits to adjacent fishing grounds should also be considered.	Potential impacts of displacement of fishing effort and changes in abundance and distribution of target species have been considered.	Refer to Sections 14.6.2 Impact 14.2: Displacement of fishing effort targeting new or alternative fishing grounds, 14.7.1 Impact 14.5: Displacement of fishing effort and 14.7.2 Impact 14.6: Change in abundance and distribution of target species
Marine Scotland	Consideration should be given to the cumulative effects of displaced fishermen and fishing activity of any proposed exclusion zone; in or around the site.	Consideration of cumulative impacts includes displacement of fishermen from other proposed marine developments.	Refer to 14.10 Cumulative Impacts.
The Crown Estate's Pentland Firth and Orkney Waters Fisheries Meetings 08/03//2011	The inner sound is a route used by all small fishing vessels transiting that area. During winter it is not normally possible to transit to the north of Stroma. Concerns over the navigation of the Inner Sound included: The clearance depth above the turbines. The effects of the turbines on the water.	Impacts on navigation, including to commercial fishing vessels, are considered in the Navigation Section 15.	Refer to Navigation, Section 15.
The Crown Estate's Pentland Firth and Orkney Waters Fisheries Meetings	At a scoping meeting, fishermen raised concerns that adding another turbulence factor to the wave and tide environment could cause impassable conditions.	Coastal process modelling shows there will be insignificant changes to wave and tidal conditions in the vicinity of the Project.	Refer to the Physical Environment and Sediment Dynamics Section 9.

Table 14.3: Scoping comments relevant to commercial fisheries

14.4.2 Desk based study

14.8 To inform this section, information was collected from numerous sources including relevant data sets as listed below:

- Annual landings for vessels over 10m in length detailing species, species type, live weight, value, from the International Council for the Exploration of the Sea (ICES) Statistical Rectangle 46/E6 for the period 2006 to 2010; and
- Vessel Monitoring System (VMS) data for vessels over 15m within the Inner Sound and surrounding area including details of direction, gear type, activity and date for the period 2006 to 2009.

14.9 In addition to datasets, reports were consulted to provide information on the background and baseline commercial fishing conditions in the Inner Sound, including:

- Scottish Marine Renewables Strategic Environmental Assessment, Commercial Fisheries and Mariculture – Section 10 (Scottish Executive, 2007);
- 2009 Economic Survey of the UK Fishing Fleet (Curtis, H. and Brodie, C., 2011);
- The Economic Impact of Game and Coarse Fishing in Scotland for SEERAD (Radford and Riddington, 2004);
- Economic Impact of Recreational Sea angling in Scotland, prepared for the Scottish Government (Radford, A., Riddington, G. and Gibson, H., 2009);
- Strategic Research Assessment for Wet Renewables (Davies 2008); and
- Coull, K.A., Johnson, R. & Rodgers, S.I. (1998). Fisheries sensitivity Maps in British Waters. Published Distribution by UKOOA Ltd (updated by CEFAS 2011).

14.4.3 Field survey

14.10 Fieldwork undertaken as part of the benthic ecology assessment is relevant to commercial fisheries and where appropriate, has been referenced throughout this section. Fieldwork specific to commercial fisheries was not undertaken as part of the baseline.

14.4.4 Significance criteria

14.11 The EIA process and methodology are described in detail in Section 8. Each assessment section is, however, required to develop its own criteria for the 'sensitivity of receptor' and 'magnitude of impact' aspects since the definition of these will vary between different topics. For commercial fisheries, the significance criteria used in this section is based on the methodology described in Section 8 but the sensitivity of the receptor and magnitude of impact are defined in Table 14.4 and Table 14.5 respectively.

14.12 The consequences of impacts are then considered by reference to the relevant criteria in the EIA Regulations. The significance of impacts in relation to the EIA Regulations is defined in Section 8, Table 8.2.

Sensitivity of receptor	Definition
Very High	▪ Fishing activity is located only within the study area. ▪ Fishing activity is of very high intensity in the study area. ▪ Fishing activity relies on the resources in the study area.
High	▪ Fishing activity is located mostly within the study area, some fishing activity occurs outside the Project area. ▪ Fishing activity is of high intensity in the study area. ▪ Fishing activity relies mostly on the resources in the study area, some resources are exploited elsewhere.

Sensitivity of receptor	Definition
Medium	▪ Fishing activity is located within the study area 50% of the time with the remaining effort being expended outside the Project area. ▪ Fishing activity is of medium intensity in the study area. ▪ Fishing activity relies on resources in the study area for 50% of the time and from resources outside the study area for the remainder of the time.
Low	▪ Some fishing activity is located within the study area but most effort is expended outside the Project area. ▪ Fishing activity is of low intensity in the study area. ▪ Fishing activity relies on resources from outside the study area most of the time.
Negligible	▪ Fisheries are not sensitive to change.

Table 14.4: Definitions for sensitivity of commercial fisheries

Magnitude of impact	Definition
Severe	▪ Widespread total loss or very major alteration to the baseline conditions of commercial fisheries. ▪ Little or no recovery anticipated. ▪ Impact highly likely to occur.
Major	▪ Widespread change to the baseline conditions of commercial fisheries, leading to medium term effects. ▪ Recovery to baseline conditions anticipated after several years following decommissioning. ▪ Impact likely to occur
Moderate	▪ Change to commercial fisheries in a localised area (confined to Project footprint and immediate locality) for Project duration, but no lasting change to baseline conditions. ▪ Good recovery potential following decommissioning (approximately 2 years). ▪ Impact will possibly occur.
Minor	▪ Change from baseline conditions measurable but within scale of natural variability, and confined to project footprint. ▪ Temporary alteration or effects on commercial fisheries confined to a small percentage of locally available fishing grounds, with rapid recovery likely. ▪ Impact unlikely to occur.
Negligible	▪ No change or an imperceptible change to the baseline condition of commercial fisheries. ▪ Impact extremely unlikely to occur.
Positive	▪ An enhancement of ecosystem or population parameter. ▪ An enhancement in the availability or quality of a resource to the extent of potentially benefiting the well being of the persons utilising that resource benefiting from it in some way.

Table 14.5: Definitions for magnitude of impact in relation to commercial fisheries

14.4.5 Data gaps and uncertainties

14.13 Fish and shellfish landings are reported by ICES rectangles which are 30 minutes latitude and 1° longitude in size, approximately 30 nautical miles square. The Project falls within the ICES statistical rectangle 46E6, within the wider ICES statistical area of IVa (Figure 14.1). Therefore reporting landings from a small area, such as that covered by the offshore Project area, is not possible.

14.14 Analysis of Vessel Monitoring System (VMS) data provides information on the locations and intensity of fishing effort. However VMS data can also provide a misleading picture for a number of reasons; it is not a legal requirement for vessels under 15m to carry VMS equipment (notably all vessels known to fish in the vicinity of the Project are less than 15m). Additionally, VMS data is generally filtered to indicate when the vessel is fishing. In areas of unfavourable conditions such as the strong tidal currents experienced in the Inner Sound, transiting vessels can be travelling very slowly and therefore be misinterpreted as fishing. Marine Scotland is no longer able to provide VMS as raw data which limits the way that data can be manipulated and interpreted. As a result, consultation with local fishermen (Sea View Hotel, John o' Groats in August 2011) has been undertaken, to establish which vessels fish in the Inner Sound and which fish species are targeted.

14.5 Baseline Description

14.15 The MeyGen Inner Sound Agreement to Lease (AfL) area lies within ICES statistical rectangle 46E6; baseline establishment and impact assessment utilising landings data has focused on this rectangle. Refer to Figure 14.1 for further details regarding the location of the offshore Project area within ICES statistical rectangle 46E6.

14.16 The study area for this assessment encompasses the area where fishing activity may take place within the Inner Sound and includes the offshore aspects of the Project; from the shoreline down to a water depth of 48.6m below the lowest astronomical tide (LAT) (iX Survey, 2009). The turbine deployment area is located in the main Inner Sound channel, where the greatest depths are present; with an average depth of between 34 and 38m (LAT). The turbine deployment area is largely comprised of exposed bedrock; the majority of sediments have been transported away due to high currents. The cable corridor is comprised of exposed bedrock and areas of kelp. Further detailed information on hydrodynamic regime, bathymetry and seabed habitats is presented in Section 9 (Physical Environment and Sediment Dynamics) and Section 10 (Benthic habitats and ecology) respectively.

14.5.1 Fisheries management overview

14.17 Within Scotland, the National responsibility for fisheries management lies with the Sea Fisheries Division of Marine Scotland and is enforced by Marine Scotland Compliance (formerly the Scottish Fisheries Protection Agency). EU countries manage their fisheries in collaboration through the common fisheries policy (CFP). The policy utilises a range of measures with the aim of achieving a thriving and sustainable European fishing industry; as part of this the EU Fisheries Commission makes recommendations and proposals which are used to formulate management plans and decisions for specific species.

14.18 In 2011 the Commission set out proposals for a 2013 reform of the CFP. Aims of the reform include taking action against over fishing in favour of sustainable management of stocks, production of multi-annual plans governed by ecosystem approach, a ban on discards and measures beneficial to small scale fisheries.

14.19 Total Allowable Catches (TACs) are catch limits set for the most commercially significant fish stocks. TACs are proposed by the Fisheries Commission based on scientific advice from ICES, the Scientific Technical and Economic Committee for Fisheries (STECF) and are decided by the council of fisheries ministers. TACs are currently one of the principle management tools used by the EU, however the CFP is currently under review and management is focusing more on effort and technical conservation measures (TCM), such as equipment restrictions.

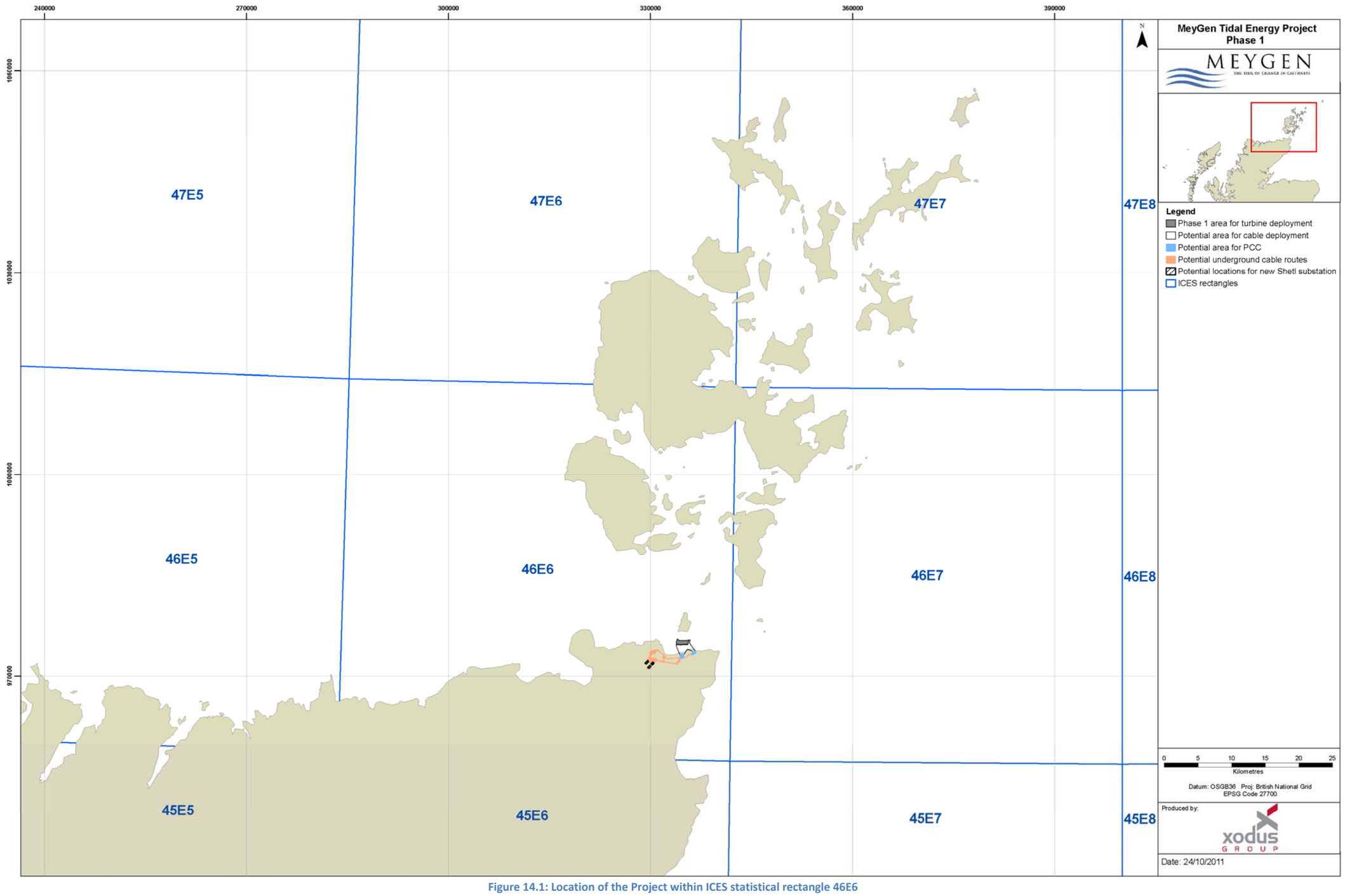

Figure 14.1: Location of the Project within ICES statistical rectangle 46E6

14.20 Notably, different quotas are applied to different species and are allocated on the basis of ICES division. The North Sea falls under the division of Subarea IV and the area is further divided into smaller divisions; the Project is located in the Division Iva (Fladen Ground). The ICES Advisory Committee (ACOM) provides annual advice which is updated throughout the year, on species important to specific subareas and divisions. This advice includes details on the current status of species, current management plans in place and recommendations for the future. For 2010, ICES published advice for Subarea IV regarding cod (*Gadus morhua*), haddock *(Malanogrammus aeglefinus*)), Norway pout (*Trisopterus esmarkii*), herring (*Clupea harengus*), Norway lobster (*Nephrops norvegicus)*, plaice (*Plueronectes platessa*), saithe (*Pollachius virens*), sand eels (*Ammodytes sp*.), sole (*Solea solea*), sprat (*Sprattus sprattus*) and whiting (*Merlangius marlangus*), in addition to advice specifically for Division IVa for Northern shrimp (*Pandalus borealis*). Updated advice for subarea IVa has been published for 2011 for herring and sand eels. However, through consultation it has been demonstrated that none of these species are targeted within the Inner Sound and the offshore Project area.

14.21 Certain species do not have quotas including lobster (Homarus gammarus), scallop (*Pecten sp*.), brown crab (*Cancer pagarus*) and velvetcrab (*Necora puber*); these are managed at local or national level through the Inshore Fishing (Scotland) Act 1984 (as amended 1994); giving Fisheries Division Managers the ability to control the activities of certain fishing gears and to open/close inshore areas. The Act is mainly exercised through the Inshore Fishing (Prohibition of Fishing and Fishing Methods (Scotland) Order 1989). Following consultation with the Scottish Inshore Fisheries and Advisory Group (SIFAG), the Deputy Minister for the Environment and Rural Development has announced that controls provided under the Act are to be reviewed.

14.22 Inshore Fisheries Groups (IFGs) in Scotland have been designed to allow fishing operators, stakeholders and other fishing interest groups to shape the management of local fisheries. Each IFG has an Executive Committee made up of commercial fishing interests and a spokesperson for non-affiliated fishermen. No IFG has been set up in the local area as yet; in the absence of a local IFG the North Coast Fisheries Group, the Orkney Fisheries Association and locally known fishermen have been consulted.

14.23 The Fisheries Committee is an advisory public body constituted under the Electricity Act 1989. It has a statutory remit to make recommendations to Scottish Ministers and people engaging in the generation of hydro-electric power; notably, tidal schemes are covered within the Committee's remit. The Committee provides advice on the effects of such schemes on fish, including making recommendations on how damage to fisheries or stocks of fish may be minimised or prevented.

14.5.2 Landings data

14.24 Landings data for the period 2006 – 2010 has been obtained from Marine Scotland. Table 14.6 details the value and liveweight tonnage for all species landed from ICES Statistical Rectangle 46E6 from 2006 – 2010. Notably, some of the data may be mis-reported such as the figures for monks & anglers (R. May pers comm., 2011). Mis-reporting of catches occur when a species is reported as being caught within a particular ICES rectangle (in this case 46E6), but the catches have actually been taken elsewhere (e.g. 46E7). Through consultation with local fishermen, it is known that shellfish comprise the main target species in the Inner Sound (lobster, brown crab, velvet crab).

Species	2006		2007		2008		2009		2010	
	Value (£)	Liveweight (Tonnes)	Value (£)	Liveweight (Tonnes)	Value (£)	Liveweight (Tonnes)	Value (£)	Liveweight (Tonnes)	Value (£)	Liveweight (Tonnes)
Blue ling	N/A	N/A	NA	NA	55	0.05	NA	NA	4	0.0
Bass	N/A	N/A	NA	NA	NA	NA	973	0.2	NA	NA
Catfish	N/A	N/A	27	0.1	100	0.05	34	0.0	NA	NA
Cockles	695	0.5	54	0.1	26	0.02	1,487	0.1	8,250	0.6
Cod	47,387	23.9	56,341	32.0	65,264	30.48	121,497	67.6	165,815	78.3
Conger eels	72	0.1	4	0.00	18	0.03	NA	NA	1	0.0
Common skate	N/A	N/A	NA	NA	NA	NA	304	0.4	NA	NA
Craw fish	N/A	N/A	29	0.00	NA	NA	2,739	0.1	20	0.0
Brown crabs	578,468	501.9	756,057	599.6	471,710	405.35	626,219	554.5	830,888	682.6
Velvet crabs	350,223	158.1	328,169	167.2	277,549	136.71	283,392	133.5	346,659	145.0
Green crab	21,312	39.2	21,367	35.8	21,612	39.86	20,374	36.8	23,701	40.5
Cuckoo Ray	NA	NA	NA	NA	NA	NA	NA	NA	59	0.2
Dabs	78	0.3	NA	NA	NA	NA	NA	NA	NA	NA
Greater Forked Beard	50	0.5	NA	NA	NA	NA	NA	NA	666	0.5
Gulper shark	NA	NA	NA	NA	0	0.01	NA	NA	NA	NA
Red gurnards	217	0.3	263	0.3	390	1.37	244	1.5	10	0.0
Haddock	28,188	24.5	25,226	22.7	48,715	47.40	183,407	191.7	177,738	164.4
Hake	743	0.5	3,991	2.8	2,117	0.99	1,214	2.0	493	0.3
Halibut	180	0.01	455	0.1	1,558	0.25	913	0.1	690	0.1
Herring	N/A	N/A	20,924	116.2	84,970	274.12	188,120	579.1	13,804	50.2
Horse mackerel	N/A	N/A	NA	NA	NA	NA	NA	NA	30,113	100.4
John Dory	4,850	1.5	1,570	0.4	2,813	0.33	1,395	0.4	2,179	0.4
Lemon sole	367	0.1	821	0.5	1,250	0.68	907	0.6	306	0.2
Ling	3,378	2.5	3,575	2.7	3,144	2.36	10,339	9.9	4,733	2.2
Lobster- squat	N/A	N/A	3,033	0.5	686	0.29	NA	NA	NA	NA
Lobsters	571,977	50.9	615,179	54.0	687,465	62.03	752,260	71.3	955,735	87.4
Long nosed skate	N/A	N/A	NA	NA	NA	NA	261	0.3	NA	NA
Mackerel	120	0.3	1,003	2.2	3,397	5.14	2,023	4.2	1,691	2.8
Megrim	115,062	40.9	76,323	34.1	29,784	11.78	17,284	7.9	33,153	12.8
Mixed clams	N/A	N/A	844	0.332	332	0.12	NA	NA	NA	NA
Monks and Anglers	857,719	309.1	744,636	310.3	780,949	283.65	568,755	182.6	374,212	110.8
Nephrops	51,159	11.8	66,358	15.9	70,616	24.81	19,665	4.0	17,111	4.7
Octopus	NA	NA	NA	NA	NA	NA	NA	NA	3	0.0
Other flatfish	230	0.1	18	0.0	141	0.08	59	0.1	35	0.0
Other or mixed demersal	199	0.2	150	0.1	251	0.15	492	0.3	628	0.3
Periwinkles	39,796	32.451	134,475	49.5	47,523	38.33	46,718	39.3	108,919	50.9
Plaice	8,056	9.4	506	0.7	744	1.10	749	1.3	434	0.6
Pollack	4,491	6.4	2,846		363	0.22	501	0.2	302	0.1
Portuguese Dogfish			1,163	1.7						
Queen Scallops	337	0.3	5,709	6.2	1,405	1.49	608	0.9	290	0.3
Rabbit fish	126	0.2	NA	NA						
Razor clam	3,829	1.4	NA	NA	793	0.24	108	0.0	816	0.3
Redfishes	N/A	N/A	NA	NA	NA	NA	NA	NA	4	0.0

Species	2006		2007		2008		2009		2010	
	Value (£)	Liveweight (Tonnes)	Value (£)	Liveweight (Tonnes)	Value (£)	Liveweight (Tonnes)	Value (£)	Liveweight (Tonnes)	Value (£)	Liveweight (Tonnes)
Red mullet	N/A	N/A	15	0.0	NA	NA	557	0.1	NA	NA
Roes	44	0.1	203	0.1	570	0.09	3	0.0	143	0.1
Saithe	2,801	3.0	7,529	16.4	5,039	9.56	9,353	14.8	23,557	27.5
Scallops	134,621	63.4	106,106	43.2	74,103	38.08	158,696	46.9	150,273	59.2
Skates and Rays	3,259	3.5	4620	4.1	2,599	3.96	1,574	1.9	1,761	1.7
Spotted Ray	N/A	N/A	NA	NA	NA	NA	NA	NA	68	0.1
Spurdog	7,104	7.4	7,231	9.6	8,324	5.68	21,800	19.1	708	0.9
Sole	N/A	N/A	NA	NA	NA	NA	10	0.0	NA	NA
Squid	9,611	3.6	3,487	1.2	5,865	2.21	12,644	5.6	23,670	9.3
Surf clams	258	0.3	NA	NA	NA	NA	NA	NA	NA	NA
Thornback Ray	N/A	N/A	NA	NA	NA	NA	196	0.2	5	0.0
Torsk	3,599	4.5	2,377	3.1	1,226	1.74	943	1.3	2,063	2.2
Turbot	204	0.1	691	0.1	681	0.09	135	0.0	628	0.1
Unidentified dogfish	N/A	N/A	NA	NA	8	1.66	40	0.0	12	0.0
Whelks	24,126	44.1	19,946	34.8	836	1.57	31,476	60.1	22,709	41.08
White skate	N/A	N/A	N/A	N/A	NA	NA	7	0.1	252	0.3
Whiting	2,433	2.4	4,755	4.1	7,439	6.85	21,039	17.7	21,970	21.3
Witch	95	0.1	503	0.6	NA	NA	221	0.2	136	0.1

Notes:
[1]Mis-reporting of catches occurs when a species is reported as being caught within a particular ICES rectangle (in this case 46E6) but the catches have actually been taken elsewhere (e.g. 46E7).

Table 14.6: Value and liveweight tonnage for all species landed from ICES statistical rectangle 46E6 2006 -2010 (Marine Scotland Statistics, 2011a). *Red text indicates key economic species*

14.5.3 Commercially important species occurring in the Project area

14.25 During the period from 2006 to 2010, the species of greatest commercial value in ICES Statistical Rectangle 46E6 were (in order of descending economic value) brown crab, lobster, velvet crab and scallops. Refer to Table 14.6 and Figure 14.2 and Figure 14.3 (below) for further details.

14.26 Between 2006 and 2010 the overall value for landings from ICES Statistical Rectangle 46E6 steadily increased, a slight decrease was recorded in 2008. This decrease is possibly (in part) due to a reduction in the landings for the most valuable species in 2008 (detailed in Figure 14.5 and Table 14.6). The overall annual live weight tonnage and annual economic value has shown an overall increase compared to those seen in 2006, as illustrated in Figure 14.4, Figure 14.5 and Table 14.7. However, despite an increase in total tonnage of landings in 2008 (in comparison to 2006), the economic value in this year showed a decrease in value of just under 6% (Table 14.7). This could be due to a significant decrease in the price recorded for one of the most regularly landed species (i.e. brown crabs or lobster).

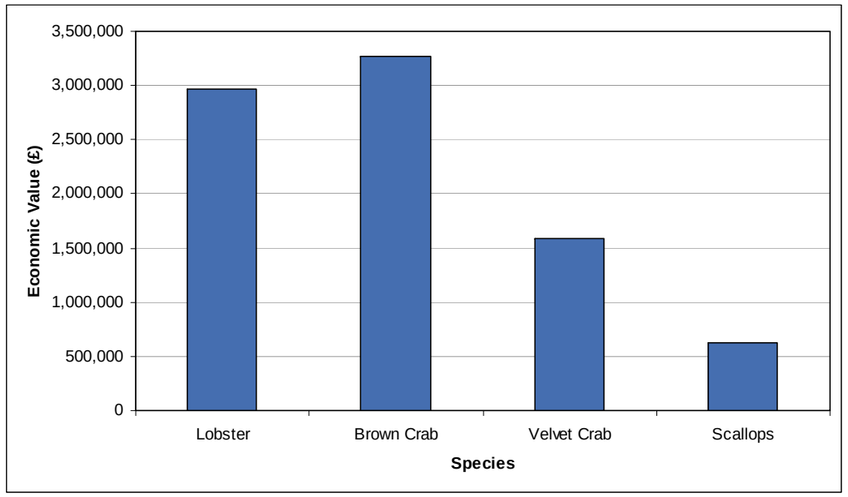

Figure 14.2: Total economic value for landings into ICES Statistical Rectangle 46E6, for the most valuable species (2006 – 2010), (Marine Scotland Statistics, 2011a)

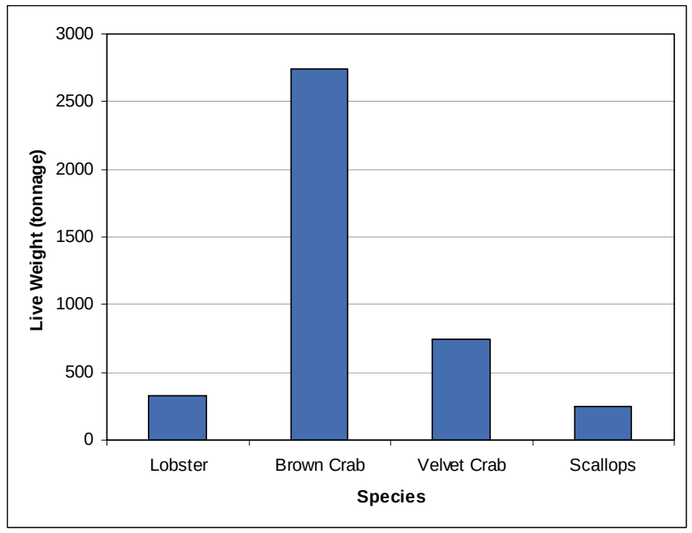

Figure 14.3: Total liveweight tonnage for landings into ICES Statistical Rectangle 46E6, for the most valuable species (2006 – 2010), (Marine Scotland Statistics, 2011a)

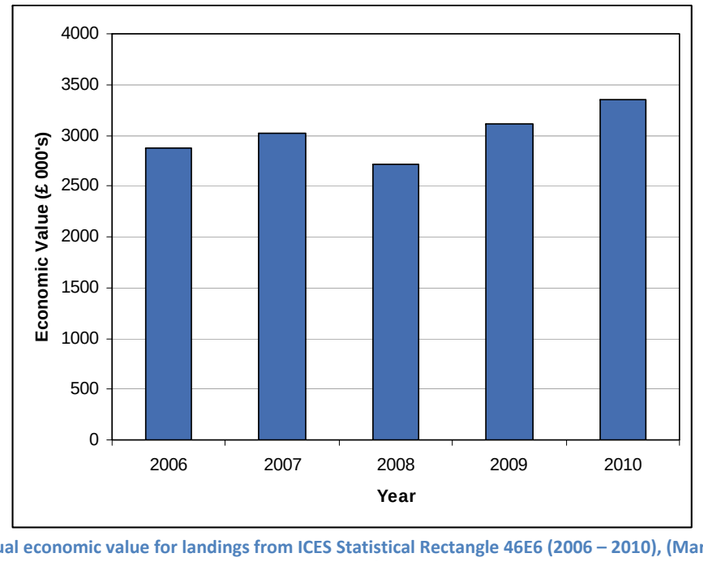

Figure 14.4: Total annual economic value for landings from ICES Statistical Rectangle 46E6 (2006 – 2010), (Marine Scotland Statistics, 2011a)

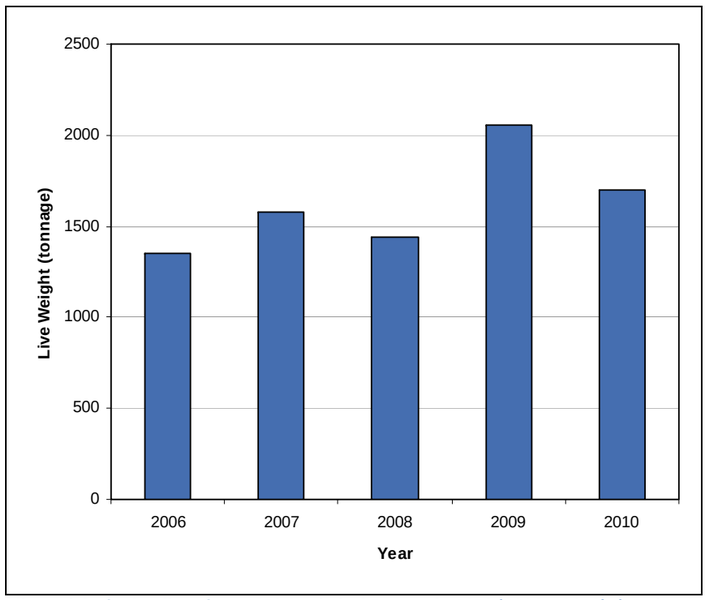

Figure 14.5: Total annual liveweight for landings from ICES Statistical Rectangle 46E6 (2006 – 2010), (Marine Scotland Statistics, 2011a)

Year	% Increase over in tonnage compared to 2006	% increase in value compared to 2006
2007	16.70%	4.99%
2008	6.75%	-5.74%
2009	52.53%	8.14%
2010	26.00%	16.33%

Table 14.7: Percent Change in landings in tonnes and value compared to 2006 (Marine Scotland Statistics, 2011a)

14.5.4 Spawning and nursery grounds

14.27 The Pentland Firth, including the offshore Project area, comprises spawning grounds for a number of commercial fish species; including sand eel, lemon sole and herring. This is detailed further in Section 13. None of the aforementioned species have significant landings or economic value for the ICES Statistical Rectangle 46E6, but are considered to be commercially important species in other areas (Coull *et al.*, 1998).

14.28 In addition to providing spawning grounds, the Pentland Firth (including the offshore Project area) provides a nursery area for a number of commercial fish species as detailed further in Section 13. Habitats within the Pentland Firth provide an important nursery area for blue whiting and anglerfish; in addition to comprising part of large nursery grounds for hake, mackerel, ling, sandeel, saithe, herring, haddock, lemon sole, whiting and cod. In terms of commercial fisheries, cod and haddock are known to have significant landings and economic value for Statistical Rectangle 46E6. However, consultation with local fishermen indicates that these species are not targeted within the offshore Project area.

14.5.5 Key commercial fish species

Lobster

14.29 Between 2006 and 2010, lobster accounted for 4.0% of the total liveweight tonnage for the ICES Statistical Rectangle 46E6. However due to the high economic value of lobster, landings accounted for 24% of the economic value for the period 2006 – 2010, making it the most valuable species for this time period with an economic value of £3,582,616. Both liveweight landings and economic value have increased each year between 2006 and 2010 (see Table 14.6).

14.30 Landings data for Scrabster shows that the most significant landings of lobster occur from August to October as presented in Table 14.8. Annual landings of lobster into Scrabster have fluctuated within a range of approximately 9 tonnes (42% of the 2006 value) in between 2006 and 2010, with a peak shown in 2009 (Table 14.9).

14.31 The preferred habitat of lobster is rocky substrata, with holes and excavated tunnels. Lobsters are found from the lower shore to depths of approximately 60m (Wilson, 2008). During the benthic survey carried out in the Project area between 25th and 27th July 2011, no lobsters were recorded (AMSL, 2011).

14.32 Lobsters are targeted by vessels using static gear (creels or pots). Given the strong tidal conditions in the vicinity of the offshore Project area, the offshore Project area is not considered important for lobster.

14.33 Consultation with local fishermen has confirmed that the turbine deployment area is targeted for lobster during the spring and summer months by at least one local fisherman, concentrating his efforts on the western area of the turbine deployment area. Fishing is limited in the turbine deployment area as it requires a combination of neap tides and good weather, due to the time it takes to deploy and haul creels between tides. The cable corridor to shore is fished more regularly.

Brown crab

14.34 Brown crabs, also known as edible crab, accounted for 33.8% of the total liveweight tonnage for the ICES statistical rectangle 46E6 between 2006 and 2010. With a total economic value of £3,263,342 brown crabs accounted for 22.0% of total landings value for the ICES statistical rectangle between 2006 and 2010; making brown crabs are the second most important species in terms of economic value. Both liveweight landings and economic value have shown a general increase between 2006 and 2010 for ICES statistical rectangle 46E6, with 2009 showing a peak for brown crab landings and 2007 showing a peak for economic value (see Table 14.9).

14.35 Landings data for Scrabster shows that the latter half of the year (from July onwards) shows the most significant landings for brown crab with a peak in landings in October (Table 14.8). Annual landings for brown crabs into Scrabster have fluctuated between 2006 and 2010 with peak landings shown in 2009 (Table 14.9).

14.36 Brown crabs have a preferred habitat of bedrock including under boulders, mixed coarse grounds and offshore in muddy sand. Brown crab is also found in the lower shore, shallow sublittoral and offshore to about 100m (Wilson, 2008). During the benthic survey carried out by ASML, brown crab were recorded on a number of occasions (ASML, 2011).

14.37 Brown crabs are targeted using static gears such as pots and creels. Consultation with local fishermen has confirmed that the turbine deployment area is sometimes targeted for brown crabs by a small number of vessels. Fishing is limited in the turbine deployment area as it requires a combination of neap tides and good weather, due to the time it takes to deploy and haul creels between tides. The cable corridor to shore is fished more regularly.

Velvet crab

14.38 Velvet crab accounted for 1% of the total liveweight tonnage for the ICES statistical rectangle 46E6 between 2006 and 2010. However due to the high economic value relative to weight, with a value of £1,585,992, velvet crab accounted for 10.5% of the total economic value for the ICES statistical rectangle 46E6 (between 2006 and 2010). Between 2006 and 2009, landings and value for velvet crab in the Statistical Rectangle 46E6 showed a gradual decline; between 2009 and 2010 this trend was reversed with an increase in both landings and value (Table 14.9).

14.39 Landings data for Scrabster shows that peak landings for velvet crab occur in August and December (Table 14.8). Between 2006 and 2009, landings of velvet crab into Scrabster showed a gradual decrease, a slight increase was recorded between 2009 and 2010. However, landings in 2010 still represent less than a third of the landings total for 2006 (Table 14.9).

14.40 Velvet crabs are found on stony and rocky substrata intertidally and in shallow water down to depths of 25m. They are most abundant on moderately sheltered shores (Wilson, 2008). During the benthic survey carried out in the Project area by AMSL, velvet crab was recorded (AMSL, 2011).

14.41 Velvet crabs are targeted using static gears such as creels or pots. Consultation with local fishermen has confirmed the cable corridor to shore is fished for velvet crabs.

Scallops

14.42 Between 2006 and 2010, scallops accounted for 3.1% of the total landings from ICES statistical rectangle 46E6. With a value of £623,799, scallops accounted for 4.1% of the total value for the ICES statistical rectangle 46E6, making them the fourth most commercially important species for this rectangle. Landings and value for scallops in the ICES statistical rectangle 46E6 have both fluctuated between 2006 and 2010. Both a peak in landings and value was seen in 2009 (Table 14.9).

14.43 Landings data for Scrabster shows that landings for scallop fluctuate throughout the year, with the most significant landings recorded in May and June and a smaller peak recorded in September – November (Table 14.8). Between 2006 and 2008, annual landings into Scrabster showed a gradual increase. Between 2008 and 2009 landings almost doubled, then between 2009 and 2010 landings more than halved to levels lower than landings recorded in 2006 (Table 14.9).

14.44 Scallops are usually found in shallow depressions in the seabed with a preference for mixed areas of clean firm sand and fine or sandy gravel and occasionally are found on muddy sand. Scallop distribution can therefore be described as patchy. During the benthic survey carried out by AMSL, scallops were not recorded (AMSL, 2011).

14.45 Given the type of seabed sediment found within the offshore Project area and the known preferred seabed habitat of scallops, it is unlikely that scallops will be encountered with any regularity in the vicinity of the Project area. Additionally, given the strong and rapidly changeable tidal conditions, scallop dredges are not a realistic option for this area. Consultation with local fishermen has confirmed that the offshore Project area is not used to target scallops and that the nearest site important for scallops is located considerably further east.

Month	Lobster		Brown crabs		Velvet crabs		Scallops	
	Live weight (Tonnage)	Economic value (£)	Live weight (Tonnage)	Economic value (£)	Live weight (Tonnage)	Economic value (£)	Live weight (Tonnage)	Economic value (£)
Jan	1.2	18,894	160.2	229,716	1.2	2,340	4.5	10,282
Feb	1.3	21,206	159.5	228,131	0.8	1,612	3.6	6,150
Mar	1.6	26,231	167.1	279,819	0.57	1,260.8	8.0	12,076
April	1.9	25,395	179.9	252,671	1.1	2,200	6.0	9,731
May	2.1	22,608	165.8	209,997	1.5	2,883	19.6	39,979
June	1.8	16,972	154.2	239,236	1.1	1,993	21.0	84,324
July	2.9	27,956	228.3	239,236	1.5	2,744	6.4	11,319
Aug	4.4	40,851	244.0	258,960	2.7	4,779	3.7	6,587
Sept	4.1	41,433	249.6	268,957	1.3	2,963	12.1	19,901
Oct	3.0	41,434	281.8	309,379	1.2	2,069	16.8	22,492
Nov	1.5	18,366	275.3	302,615	0.7	1,176	12.7	24,426
Dec	1.4	22,742	238.9	374,440	2.09	4,496	8.9	17,352

Table 14.8: Average monthly variation for landings of top economic species for ICES Statistical Rectangle 46E6 into Scrabster 2006 – 2010 (Marine Scotland Statistics, 2011).

Year	Lobster		Brown crabs		Velvet crabs		Scallops	
	Live weight (Tonnage)	Economic value (£)	Live weight (Tonnage)	Economic value (£)	Live weight (Tonnage)	Economic value (£)	Live weight (Tonnage)	Economic value (£)
2006	22.0	249,773	2,662	3,409,204	30.0	54,188	81.8	137,340
2007	29.8	369,457	2,769	3,763,944	19.6	41,577	83.9	152,332
2008	25.2	299,426	2,162	2,710,321	10.8	20,010	93.4	210,249
2009	31.2	347,788	2,870	3,319,613	9.4	17,680	170.2	485,768
2010	28.0	312,948	2,338	2,965,122	9.7	19,166	70.0	111,098

Table 14.9: Annual variations for landings of top economic species for ICES Statistical Rectangle 46E6 into Scrabster (2006 – 2010). (Marine Scotland Statistics, 2011)

14.5.6 Commercial Fisheries within the Project Area

Gear type

14.46 The local conditions and tidal currents in the area mean that it is largely unsuitable for mobile gear types such as dredging and trawling. The main gear types used for fishing in the area are static and predominantly take the form of creeling or pots targeting shellfish species. In 2008, 2009 and 2010, pots accounted for over 80 % of the fishing effort in terms of fishing days (Scottish Government, pers. Comm., 2011).

Vessel presence in the Inner Sound

14.47 Automatic Identification System (AIS) data collected as part of the Navigation Risk Assessment (Anatec, 2011) and presented in the Navigation section (Section 15). These data indicate that only a very small number of fishing vessels transit the Inner Sound; notably all recorded fishing vessels were steaming on passage through the Inner Sound and no fishing vessels were recorded in the Project area. These vessels predominantly use the south of the offshore Project area and show little change in transit numbers and routes from the summer to the winter.

Origin of fishing vessels

14.48 All of the vessels that landed from the ICES statistical rectangle 46E6 in the period between 2006 and 2010 were registered within the UK. Given the predominant gear type in the study area (pots and creels) this explains landings being from UK vessels; pots and creels are generally not left for a period of longer than 40 hours, making this method of fishing generally viable for local vessels only. Consultation with local fishermen indicates that all of the boats encountered and actively fishing in the vicinity of the offshore Project area are likely to originate from John o' Groats.

The local fishing fleet

14.49 Scrabster is the nearest major commercial fishing port, located to the west of the Project, reporting landings of 13,900 tonnes (live weight) in 2009, with employment of 170 fishermen through Scrabster Harbour (Marine Management Organisation (MMO), 2009). There are 107 vessels less than 10m in length currently listed as having their administrative port as Scrabster; nine of which have their home port in Wick, 10 have their home ports in John o' Groats and 58 have their home port in Scrabster. There are 18 vessels over 10m in length which list Scrabster as their administrative port; three of which have their home port in Wick, two in John o' Groats and two in Scrabster (DEFRA, 2011).

14.50 Consultation with local fishermen indicates that there are three John o' Groats based fishermen who regularly fish in the vicinity of and occasionally within the boundaries of the turbine deployment area. However, it should be noted that four vessels are operated by these fishermen:

- Abbyjack;
- Azur;
- Little Seal; and
- Kingfisher.

14.51 These vessels are all used to deploy creels. Generally a couple of strings will be deployed at a time each with approximately 30 pots on each string.

14.52 The area is used throughout the year and the chance of encountering these vessels in the area is not determined by season; tidal and weather conditions dictate when vessels will use the area, although the time of year may dictate which species will be targeted and where they will be fished for. Brown crab and velvet crab may be targeted in the Project area in the winter months but not at other times of the year. The strong and rapidly changeable tidal conditions in the turbine deployment area mean there are tight weather and tide windows for deploying and hauling creels. It is therefore not intensively fished since fishermen are reluctant to use static gear in such conditions.

Vessel Monitoring System (VMS) data

14.53 The Vessel Monitoring System (VMS) is a form of satellite tracking using transmitters onboard fishing vessels. The system is a legal requirement under EC Regulation 2244/2003 and Scottish SI 392/2004. The VMS unit automatically sends the following data on a pre determined timescale:

- Vessel identification;
- Geographical location;
- Date and time of fixing position; and
- Course and speed.

14.54 All EU, Faroese and Norwegian vessels which exceed 15m in length must be fitted with VMS units. Fisheries Monitoring Centres have been established to monitor VMS data.

14.55 VMS data obtained from Marine Scotland Statistics for the period 2006 – 2009 indicates that annually less than 26 fishing vessels of over 15m length were recorded in the vicinity of the Inner Sound. Consultation has indicated that fishing by these vessels does not take place in the offshore Project area. A more significant number of vessels were recorded to the west (Figure 14.6).

Aquaculture

14.56 There are no historic or active aquaculture sites located within the vicinity of the offshore Project area or surrounding environment. The closest aquaculture development is located off the Orkney island of Hoy at West Fara, approximately 14km northwest (Magic, 2011; Scottish Government, 2010). The site is operated by Northern Isles Salmon, which has a licenced maximum biomass of 900 tonnes (Pers. Comm., Northern Isles Salmon, 2011). Due to the distance from the Project this site will not be impacted. Due to the strong tidal conditions within the Inner Sound, it is considered highly unlikely that the area will ever be looked upon favourably for the development of aquaculture sites.

14.5.7 Socio-economics of commercial fisheries

14.57 The 2009 Economic Survey of the UK Fishing Fleet provides a detailed insight into the financial and operational performance of the fleet during 2009. Table 14.10 details the average daily and annual incomes for vessels using pots and traps. Consultation with local fishermen indicates that vessels most frequently found in the vicinity of the offshore Project area are less than 10m in length.

	Vessel less than 10m	Vessel 10 – 12m	Vessel over 12m
Average annual income per vessel (£)	44,280	93,707	248,017
Average daily income per vessel (£)	474	602	1,790

Table 14.10: Daily and annual incomes vessels from the UK fishing fleet using pots and traps (Curtis and Brodie, 2011)

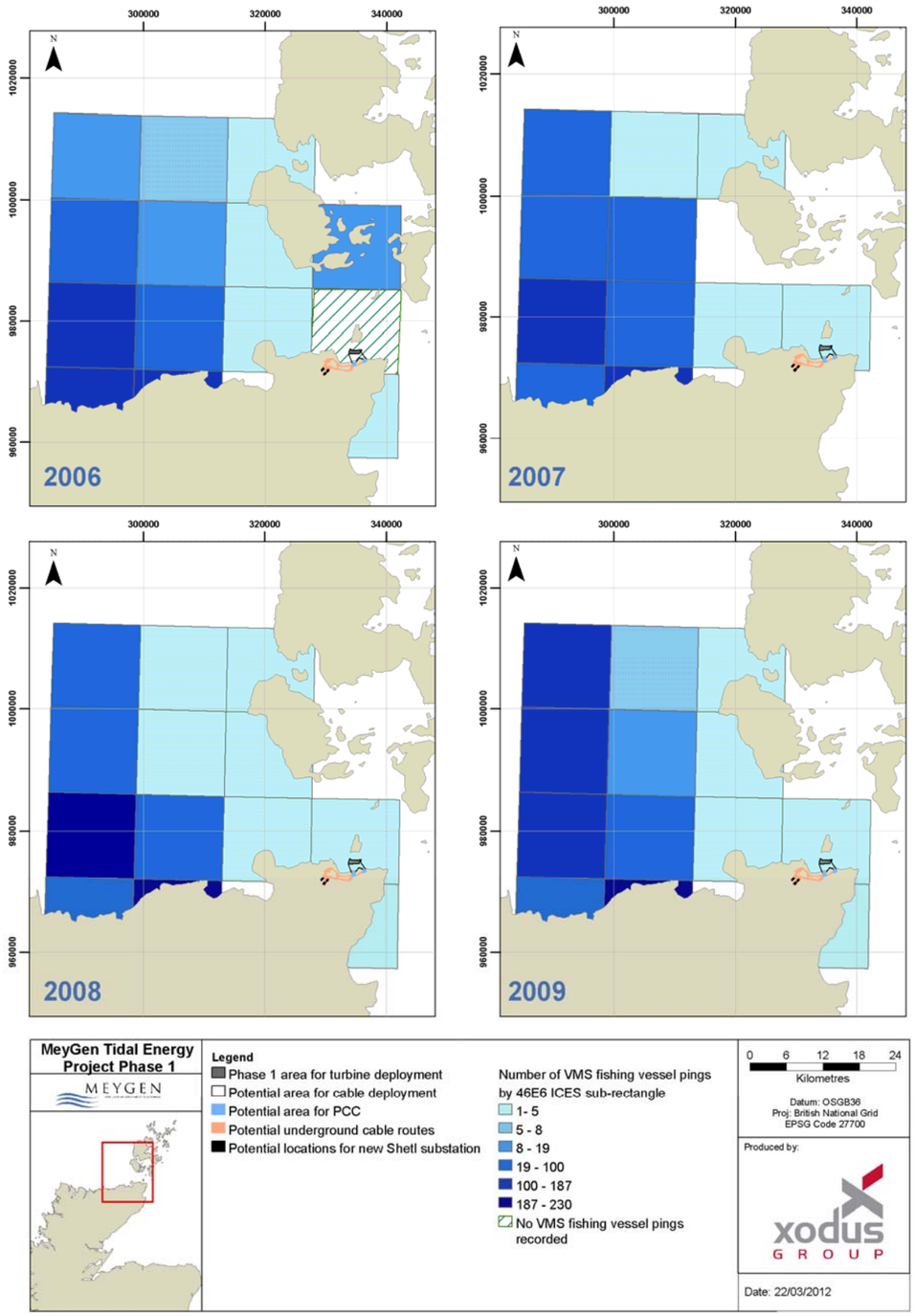

Figure 14.6: VMS data for Inner Sound and wider area 2006 – 2009 (Marine Scotland Statistics, 2011) Aquaculture

14.5.8 Recreational Fishing

Game fishing

14.58 A study into the economic impact of game and coarse fishing in Scotland estimated a total of 1.4 million angler days (annually) in Scotland; with the three most important regions being the Highlands, the Northeast and Central Scotland. Angling for brown trout in the Highlands is very popular, particularly amongst people from the Central Belt. Salmon fishing is also very popular and contributes approximately £35.4 million to the Highland economy, of which the vast majority comes from outside Scotland.

14.59 Out of all the regions in Scotland, the Highland region has the greatest angler expenditure per day at £140.04; this takes into accounts things such as transport, accommodation and food.

14.60 There are a number of largely unexploited hill lochs in the Highlands. Caithness and Sutherland are unusual in having successfully marketed angling in such lochs (Radford and Riddington, 2004). Salmon fishing takes place in a number of rivers across Scotland with the closest to the Project area being the Thurso River, 21km to the west. Catches of Scottish salmon between 2003 and 2007 accounted for 60% and 12% of the UK and European nominal catch (fish killed and retained), respectively (Malcolm *et al*., 2010). As demonstrated in Section 13, migrating salmon potentially pass through the Project area during their migrations to feeding grounds off the coast of Greenland and the Faroe Islands and on their return back to their home rivers.

Sea angling

14.61 In 2009 a study was carried out into the economic impact of recreational sea angling in Scotland. It estimated that a total of 144,346 annual sea angler days occur in the North of Scotland every year. Out of the seven areas considered, this was the fifth lowest total. It is estimated that a total of 299 full time jobs are currently supported by sea angling in the North of Scotland; this figure is made up from full time positions, part time positions and seasonal positions.

14.62 The nearest location to the Project which was identified as important local centre for sea angling is Thurso, which ranked in the top 26 most popular launch sites. The mean annual expenditure by an adult sea angler was reported to be £1,516. The survey identified that there is a belief among many sea anglers that there are fewer sea anglers now than there was 20 and 10 years ago and that this trend is likely to continue, with the main reason cited as a decline in fish stocks. The study concludes with the opinion that there is significant potential for growth in Scottish Sea angling (Radford *et al*., 2009). Consultation with local fishermen indicates that the area in the vicinity of the offshore Project area is used occasionally by recreational anglers, but is not considered to be a significantly important sea angling area.

14.6 Impacts during Construction and Installation

14.6.1 Impact 14.1: Temporary exclusion from fishing grounds

14.63 Commercial fisheries occurring in the offshore Project area are comprised of small vessels (less than 15m in length) using pots to target lobster, brown crab and velvet crab. One fisherman targeting lobster concentrates fishing effort to the western end of the Project area; local waters occurring within the offshore Project area are also occasionally fished during winter months for brown and velvet crabs. Notably, it is anticipated that marine works will take place in the spring, summer and autumn months when weather conditions are most favourable.

14.64 Satellite data within the NRA (Anatec, 2011) recorded 16 vessels within the offshore Project area; all but 1 vessel was travelling at greater than 5 knots, so recorded vessels were likely to be in transit through the Inner Sound and not fishing, suggesting that the offshore Project area is not a locally important area for trawling activities and other large vessels. However, consultation does suggest some creeling activity occurs within the offshore Project area, although the intensity of fishing is generally low and these grounds are not the only ones exploited by fishermen identified during consultation.

14.65 It is likely, that during the construction phase, fishermen will be unable to access waters in the immediate vicinity of the offshore Project area; due to the presence of construction vessels undertaking construction

works and related safety considerations. To reduce the risk of interactions between fishing vessels and construction works, a safety zone may be put in place around the area of construction; the size of the safety zone has yet to be confirmed. If enforced, the safety zone may extend to a maximum radius of 500m (0.79km^2) although a smaller radius is anticipated (Section 15). This may have implications for the lobster fisherman utilising waters in the area during the spring / summer months when construction works are most likely to take place. It is recognised that fishermen may not wish to fish in the offshore Project area or immediate surrounding waters to reduce the risk of causing accidental damage to fishing gear.

14.66 The sensitivity of the fishing activity in the area is assessed as low due to the Project area not being a regular or intensely fished area and the area being of low importance. However, there will be a change to the ability to fish in the area and as a result the magnitude of the impact is considered moderate.

Impact significance

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Low	Moderate	Minor	Not Significant

MITIGATION IN RELATION TO IMPACT 14.1

- Although no significant impact has been identified, mitigation measures have been provided on a precautionary approach to ensure this remains the case.
- Ensure consultation with fishermen, which may involve the appointment of a Fisheries Liaison Officer to ensure fishermen are informed in advance of installation plans and to promptly answer any queries from fishermen.
- Details of the Project will be included in updated Kingfisher fishermen's awareness charts and FishSAFE.
- *Additional mitigation measures for all shipping and navigation have been identified in Section 15.*

14.6.2 Impact 14.2: Displacement of fishing effort targeting new or alternative fishing grounds

14.67 Fishing effort local to the Project is very low, comprising four vessels with the majority of fishing activity taking place in shallower waters outwith the turbine deployment area. Nevertheless, local fishing activity has the potential to occur all year-round. Alternative fishing areas (where pots may be used to target lobster and crab species) are located to the east and west of the offshore Project area and in waters close to the coast and these are already exploited to a greater degree by the vessels operating in the proposed Project area. It may be possible that fishermen can target the aforementioned species in peripheral waters surrounding the turbine deployment area; however, as discussed in Section 14.6.1, it is possible that for safety reasons, restrictions will be in place throughout the construction phase. The local fishing fleet may be able to temporarily modify commercial fishing activities throughout the construction phase; avoiding the offshore Project area to prevent interactions with installed marine infrastructure and collisions with construction vessels.

14.68 The sensitivity of the fishing activity in the area is assessed as low due to the Project area not being a regular or intensely fished area and the area being of low importance. However, there will be little change as fishermen already fish many areas outside the Project are and there displacement from the Project area is unlikely to change fishing effort in these areas. Therefore, the magnitude of the impact is considered minor.

Impact significance

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Low	Minor	Minor	Not Significant

MITIGATION IN RELATION TO IMPACT 14.2

- Although no significant impact has been identified, mitigation measures have been provided on a precautionary approach to ensure this remains the case.
- Ensure consultation with fishermen, which may involve the appointment of a Fisheries Liaison Officer to ensure fishermen are informed in advance of installation plans, and to promptly answer any queries from fishermen.
- Details of the Project will be included in updated Kingfisher fishermen's awareness charts and FishSAFE.
- *Additional mitigation measures for all shipping and navigation have been identified in Section 15.*

14.6.3 Impact 14.3: Change in abundance and distribution of target species

14.69 It is acknowledged that the main fish species targeted within the offshore Project area and surrounding waters are predominantly benthic crustaceans (lobster, brown crab and velvet crab). Direct disturbance from installation activities may affect the local distribution and abundance of these species; both within the turbine deployment area and in immediate surrounding habitats. Impacts on benthic species, including disturbance, are discussed further in Section 10. Loss of benthic habitat will be limited to the footprint of the tidal turbine devices and cables and in total will impact upon a relatively small area of benthic habitat within the Inner Sound. Changes in tidal conditions may also result in changes to benthic habitats; the results of coastal process modelling has indicated that such changes will not be significant. Minor changes in benthic habitats will not likely affect the abundance and distribution of target species, with negligible impacts only (Section 10 and Section 9).

14.70 Velvet crabs, usually inhabit intertidal or shallow waters; therefore this species will not likely be present in the deeper waters within the offshore Project area where turbine deployment will take place, although velvet crabs will likely be present for a portion of the length of the cable corridor. Notably, the maximum estimated area of seabed likely to be directly affected by the cable corridor is 0.027km^{2,} a relatively small percentage of the total available seabed in the Inner Sound. Therefore, the total area that will be affected (i.e. where cables will be laid) is only 1.09% of the total cable corridor area for the Ness of Huna cable corridor and only 1.10% of the Ness of Quoys corridor. In deeper waters where tidal turbines will be placed at a depth of approximately 31 to 38m, lobster may be more likely to be present. Recent studies (Neal & Wilson, 2008 and Jackson *et al*. 2008) suggest that lobster and crab species have low sensitivity to habitat loss and effects of smothering; therefore, target species occurring within the offshore Project area are considered to have a low sensitivity to disturbance impacts from installation operations. Changes in the abundance and distribution of target species within the offshore Project area and immediate surrounding waters will therefore likely be minor.

14.71 The sensitivity of the fishing activity in the area is assessed as low due to the Project area not being a regular or intensely fished area and the area being of low importance. Due to the low sensitivity of the target species to disturbance there are unlikely to be changes to the available population of crabs and lobsters. Therefore, the magnitude of the impact is assessed as minor.

Impact significance

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Low	Minor	Minor	Not Significant

MITIGATION IN RELATION TO IMPACT 14.3

- No mitigation measures proposed as no significant impact predicted.

14.6.4 Impacts 14.4: Risk of contamination (accidental spillage from vessels)

14.72 The discussion around this impact focuses on the potential impacts associated with the release of a large inventory of fuel oil from a vessel. This is considered to be the worst case potential accidental pollution impact. Other smaller inventories of polluting substances may potentially be released during the course of the Project. These impacts and their potential consequences are discussed further in accidental events (Section 24).

14.73 The total oil inventory for the large DP installation vessels is likely to be in the region of 6,000,000 to 8,000,000 litres of marine diesel stored in a number of separate tanks. The worse case spill from a single tank rupture is likely to be in the region of 600,000 litres of marine diesel released into the marine environment.

14.74 Oil spills can have a number of environmental impacts. Actual effects will vary depending on a wide range of factors including the volume and type of oil spilt and the sea and weather conditions at the time of the spill. Effects will also be dependent on the presence of environmental sensitivities in the path of the spill, but could include commercially important species present in the area i.e. lobster and crab.

14.75 An accidental event resulting in contamination to target species has the potential to result in cessation of fishing activities occurring in the offshore Project area and immediate surrounding environment. Should such an accidental event occur, only a small number of fishing vessels could be affected (a maximum of 4) and therefore the magnitude of impact is considered minor. Sensitivity of receptor is also considered low.

14.76 The potential for a loss of a large fuel oil inventory from a vessel is defined as extremely remote (see Impact 24.1, Section 24).

Impact significance (see Section 24 for impact ranking methodology)

Sensitivity of receptor	Magnitude of impact	Consequence	Likelihood *(See section 24)*	Impact significance *(See section 24)*	Significance (EIA Regs) *(See section 24)*
Low	Minor	Minor	Extremely remote	Negligible	Not Significant

MITIGATION IN RELATION TO IMPACT 14.4

- Although no significant impact has been identified, mitigation measures have been provided on a precautionary approach to ensure this remains the case.
- All vessels associated with Project operations will comply with IMO/MCA codes for prevention of oil pollution and any vessels over 400 GT will have onboard SOPEPs.
- All vessels associated with Project operations will carry onboard oil and chemical spill mop up kits.
- Where possible vessels with a proven track record for operating in similar conditions will be used.
- Vessel activities associated with installation, operation, routine maintenance and decommissioning will occur in suitable conditions to reduce the chance of an oil spill resulting from the influence of unfavourable weather conditions.

14.7 Impacts during Operations and Maintenance

14.7.1 Impact 14.5: Displacement of fishing effort

14.77 It is anticipated that the Project lifespan will be a minimum of 25 years, during this time, exclusion of fishing grounds would occur in the turbine deployment area and may occur infrequently and intermittently within the offshore Project area during essential maintenance operations (for safety reasons).

14.78 During operation, fishing is unlikely to take place in the vicinity of the tidal turbines for safety reasons. However, as stated earlier, the area is not fished regularly due to the difficult conditions and therefore there will be no large displacement of fishing effort from the turbine deployment area.

14.79 Maintenance operations are likely to involve enforcement of a 500m safety exclusion area surrounding the maintenance activities.

14.80 It is noted that only a small number of vessels (four boats in total) currently utilise waters within the offshore Project area, therefore potential changes in commercial fisheries are likely to be small in scale and occur intermittently over a long-term period (i.e. the lifespan of the Project).

14.81 Due to the low fishing effort within the Project area and the small number of vessels that fish the sensitivity of the fishing activity in the area is assessed as low. However, there will be a change to the baseline as fishermen will no longer be able to fish in the Project area. Therefore, the magnitude of the impact is considered moderate.

Impact significance

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Low	Moderate	Minor	Not Significant

MITIGATION IN RELATION TO IMPACT 14.5

- No mitigation measures proposed as no significant impact predicted.

14.7.2 Impact 14.6: Change in abundance and distribution of target species

14.82 During Project operation, fishing is unlikely to place in the vicinity of the tidal turbines for safety reasons; it is therefore possible that turbine support structures may indirectly provide a refuge for brown crab and lobster, in addition to providing new substrate which rocky substrate species assemblages may find suitable to colonise. These 'refuge' areas may increase levels of general productivity, potentially increasing localised foraging resources for both lobster and brown crab. Increased foraging opportunities may enable lobster and brown crab populations to increase within the offshore Project area, particularly around the turbine support structures. Refer to Benthic Habitats and Ecology (Section 10).

14.83 The potential for increase in populations of target species may result in greater numbers of lobster and brown crab occurring in surrounding habitats outwith the turbine deployment area, which may increase the population available to local fisheries that target them. However, such effects are likely to be imperceptible to the local fishing fleet. Nevertheless, this long-term impact is considered positive, with potential for benefits to local benthic ecosystems and indirect benefits to the local fishing fleet.

14.84 In coastal areas adjacent to the offshore Project area, coastal process modelling has shown that there will be no discernable effect on coastal habitats (including subtidal and intertidal habitats); therefore impacts relating to changes in the abundance and distribution of the shallower water velvet crabs and velvet crab fisheries will likely be negligible.

14.85 Again due to the low fishing effort within the Project area and the small number of vessels that fish the sensitivity of the fishing activity in the area is assessed as low. Given that the Project has the potential to provide a benefit to the target populations of shellfish in the area, although potentially imperceptible, magnitude is assessed as a minor positive.

Impact significance

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Low	Minor Positive	Minor Positive	Positive

MITIGATION IN RELATION TO IMPACT 14.6

- No proposed mitigation due to potential for beneficial effects to benthic ecosystems and local commercial fisheries.

14.7.3 Impact 14.7: Loss of fishing gear due to entanglement

14.86 It is possible that entanglement leading to loss of fishing gear, predominantly pots or creels, may occur during the operational life of the Project. No trawling takes place in Inner Sound. Therefore the only risk is considered to be from the local creel vessels. Consultation with the fishermen has indicated they would avoid fishing within the turbine array due to the danger of snagging. The main risk is likely to be with snagging the cables to shore. It may be that a situation may arise where tangled gear have to be cut free.

14.87 The low effort expended within the Project area and the small number of vessels that fish there the sensitivity of fishing activity in the area is assessed as low. However, once turbines are operational it is unlikely that fishing will take place within the turbine deployment area and it is unlikely that entanglement of gear will occur. Fishermen will also avoid areas where cables are present for the same reasons. Therefore, the magnitude of the impact is considered minor.

Impact significance

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Low	Minor	Minor	Not Significant

MITIGATION IN RELATION TO IMPACT 14.7

- Although no significant impact has been identified, mitigation is still proposed to ensure this remains the case.
- Further consultation with the local fishing fleet to ensure the safe continuation of fishing effort in the cable deployment area once cables are installed.
- Consultation with the local fishing fleet, to ensure fishermen are aware of turbine locations.
- Provision of offshore Project area location data to local fishermen and Kingfisher Information Services (marine safety authority), to enable incorporation of offshore Project area location data into plotters.
- Project area will be depicted on charts. Turbines and cables will be depicted on appropriate scale charts.
- Cable route coordinates will be circulated to kingfisher and local skippers.
- Cables will be grouped (where feasible) to minimise overall footprint on the seabed.
- HDD bores will provide protection for at least part of the cable length from shore.
- Natural crevices will be used to avoid exposed cables being on the seabed surface as far as practicable.
- Additional material weighting will be used where necessary to ensure cable stability on the seabed.

14.7.4 Impact 14.8: Risk of Contamination

14.88 The vessels to be used during operations and maintenance will be the same size or smaller than those during construction and installation and will therefore have similar inventories of oil. The likelihood of spillage, mitigation measures and residual impacts are the same as those described for vessel spillage during construction and installation (Impact 14.4).

14.7.5 Impact 14.9: Indirect impacts to recreational fishing

14.89 In the vicinity of the Project there are fishing activities that take place that could potentially be impact by the operating turbines through their impact on fish species present in the Project area. These include both marine and migratory fish species. For sea anglers targeting fish within the Project area and the wider Pentland Furth the impact is unlikely to be of any significance due to the low importance of the area for recreational fishing. Section 13 assessed the overall impact to fish species as not significant. Therefore the target species of recreational sea anglers are unlikely to be affected by the Project and given the low effort expended in the Project area any effects of the Project are unlikely to be perceptible.

14.90 Salmon fishermen along the east and north coast of Scotland target salmon that have migrated through the Pentland Firth as smolts to their feeding grounds and have returned via the same route to their natal rivers to spawn. The Project therefore has the potential to impact the salmon population as it moves through the Pentland Firth and through the Inner Sound both as smolts and as adults, reducing the number of fish that return to the rivers and are available to be caught by fishermen targeting salmon. However Section 13 (Fish Ecology) assessed potential impacts to fish as a whole and to salmon as being not significant and that any impacts that do occur are likely to be imperceptible from changes in the population that occur naturally.

14.91 Salmon fishermen are considered to be receptors of high sensitivity due to fishery being highly sensitive to changes in salmon populations. However, the magnitude of the impact is considered to be negligible as changes to fish populations as a whole and to salmon populations were considered to be unlikely and imperceptible from natural variation in fish populations.

Impact significance

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
High	Negligible	Minor	Not Significant

MITIGATION IN RELATION TO IMPACT 14.9
▪ No mitigation measures proposed specifically for recreational fishing activity as no significant impact predicted. However, measures will be implemented to mitigate impacts to fish populations (please refer to Section 13).

14.8 Impacts during Decommissioning

14.8.1 Impact 14.10: Disturbance of fishing grounds

14.92 Decommissioning of the tidal array will likely involve the removal of tidal turbines, turbine support structures and related offshore infrastructure. Impacts will include physical disturbance of benthic habitats, increased underwater noise, water column disturbance and an increase in local vessel activity. These impacts may result in temporary (disturbance related) displacement effects of target species.

14.93 Decommissioning works may also result in the temporary exclusion of fishing activities in the offshore Project area, for the duration of the decommissioning phase (for safety reasons). This will likely affect the temporary use of the waters in the Inner Sound by the local fishing fleet. The sensitivity of the receptor is considered low as only a few vessels will be affected during decommissioning. As the majority of vessels will not be fishing in the Project area and those that are will only be affected temporarily the magnitude of impact is considered minor.

Impact significance

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Low	Minor	Minor	Not Significant

MITIGATION IN RELATION TO IMPACT 14.9
▪ Although no significant impact has been identified, mitigation has been proposed to ensure this remains the case. ▪ Ensure fishermen are aware of decommissioning activities and schedule. ▪ Details of the Project will be included in updated Kingfisher fishermen's awareness charts and FishSAFE.

14.8.2 Impact 14.11: Temporary changes in distribution and abundance of targeted species

14.94 As discussed in previous sections, target species occurring within the proposal footprint include lobster, brown crab and velvet crab. These species may be subject to disturbance impacts during the decommissioning stage; however, it is likely that disturbance impacts (if any) will be minor, localised and temporary. The tidal turbines will be removed from support structures to a recovery vessel and returned to shore. If piled foundations have been used the piles will be cut at the seabed and cables will be recovered to a vessel, with potential for disturbance impacts to benthic species (including target species), as the cables are moved over the seabed and the cable bores filled at the breakthrough location.

14.95 Disturbance and changes in the distribution and abundance of target species will likely occur in the same area that experienced impacts during construction and installation operations. Impacts will be of a similar or lesser magnitude as the impacts on target species described for the installation and operational phases and is therefore considered minor. The sensitivity to this impact will also remain low as it was for impacts during installation and operation.

Impact significance

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Low	Minor	Minor	Not Significant

MITIGATION IN RELATION TO IMPACT 14.11
▪ No mitigation measures proposed as no significant impact predicted.

14.8.3 Impact 14.12: Risk of contamination

14.96 The vessels to be used during operations and maintenance will be the same size or smaller than those during construction and installation and will therefore have similar inventories of oil. The likelihood of spillage, mitigation measures and residual impacts are the same as those described for vessel spillage during construction ad installation (Impact 14.4).

14.8.4 Impact 14.13: Resumption of fishing activities in traditional fishing grounds

14.97 Following completion of decommissioning activities, the local fishing fleet will be able to resume traditional fishing activities in the Inner Sound to pre-construction levels, fully accessing all local traditional fishing grounds, including areas which may have been temporarily excluded during the construction phase or with restricted access during maintenance operations. This may be considered as a beneficial impact on the local fishing fleet; with long term effects on the activities of local commercial fisheries occurring throughout the Project lifecycle only.

14.98 The sensitivity of the receptor is considered minor due to the four vessels operating within the Project area. Following decommissioning of the Project these vessels will be able to resume fishing in the area and as it only represents a small proportion of their current fishing grounds the impact magnitude is considered a minor positive.

Impact significance

Sensitivity of receptor	Magnitude of impact	Consequence	Significance
Low	Minor Positive	Minor Positive	Positive

MITIGATION IN RELATION TO IMPACT 14.13
▪ No proposed mitigation; impacts on the local fishing fleet will likely be positive, enabling resumption of fishing activities in traditional fishing grounds and a return of commercial fisheries activities to pre-Project conditions.

14.9 Potential Variances in Environmental Impacts

14.99 Consideration of the maximum potential impact has been undertaken throughout the commercial fisheries impact assessment. This has considered the entire footprint of offshore construction and installation activity including a maximum safety zone of 500m radius. It is likely that the safety zone will be reduced to allow navigation of the narrow channel still available to vessels transiting the area (see Shipping and Navigation, Section 15). This may increase the area available to fishing vessels, further reducing any impacts.

14.100 The area occupied by the turbines and cables during operation has also been considered in its entirety and as this is unlikely to change, the impacts assessed above are not considered to vary and the impacts as assessed above are considered to remain.

14.10 Cumulative Impacts

14.10.1 Introduction

14.101 MeyGen has in consultation with Marine Scotland and The Highland Council, identified a list of other projects (MeyGen, 2011) which together with the Project may result in potential cumulative impacts. The list of these projects including details of their status at the time of the EIA and a map showing their location is provided in Section 8; Table 8.3 and Figure 8.1 respectively.

14.102 Having considered the information presently available in the public domain on the projects for which there is a potential for cumulative impacts, Table 14.9 below indicates those with the potential to result in cumulative impacts from a commercial fisheries perspective. The consideration of which projects could result in potential cumulative impacts is based on the results of the project specific impact assessment together with the expert judgement of the specialist consultant.

Project title	Potential for cumulative impact	Project title	Potential for cumulative impact	Project title	Potential for cumulative impact
MeyGen Limited, MeyGen Tidal Energy Project, Phase 2	✓	SHETL, HVDC cable (onshore to an existing substation near Keith in Moray)	×	OPL, Ocean Power Technologies (OPT) wave power ocean trial	×
ScottishPower Renewables UK Limited, Ness of Duncansby Tidal Energy Project	✓	Brough Head Wave Farm Limited, Brough Head Wave Energy Project	×	MORL, Moray Offshore Renewables Ltd (MORL) offshore windfarm	×
Pelamis Wave Power, Farr Point Wave Energy Project	×	SSE Renewables Developments (UK) Limited, Costa Head Wave Energy Project	×	SSE and Talisman, Beatrice offshore Windfarm Demonstrator Project	×
Sea Generation (Brough Ness) Limited, Brough Ness Tidal Energy Project	×	EON Climate & Renewables UK Developments Limited, West Orkney North Wave Energy Project	×	BOWL, Beatrice Offshore Windfarm Ltd (BOWL) offshore windfarm	×
Cantick Head Tidal Development Limited, Cantick Head Tidal Energy Project	×	EON Climate & Renewables UK Developments Limited, West Orkney South Wave Energy Project	×	Northern Isles Salmon, Chalmers Hope salmon cage site	×
SSE, Caithness HVDC Connection - Converter station	×	ScottishPower Renewables UK Limited, Marwick Head Wave Energy Project	×	Northern Isles Salmon, Pegal Bay salmon cage site	×
SSE, Caithness HVDC Connection - Cable	×	SSE Renewables Developments (UK) Limited, Westray South Tidal Energy Project	×	Northern Isles Salmon, Lyrawa salmon cage site	×
RWE npower renewables, Stroupster Windfarm	×	EMEC, Wave Energy test site (Billia Croo, Orkney)	×	Scottish Sea Farms, Bring Head salmon cage site	×
SSE, Gills Bay 132 kV / 33 k V Substation Phase 1: substation and overhead cables (AC)	×	EMEC, Tidal energy test site (Fall of Warness, Orkney)	×	Northern Isles Salmon, Cava South salmon cage site	×
SSE, Gills Bay 132 kV / 33 k V Substation Phase 2: HVDC converter station and new DC buried cable	×	EMEC, Intermediate wave energy test site (St Mary's Bay, Orkney)	×	Scottish Sea Farms, Toyness salmon cage site	×
SHETL, HVDC cable (offshore Moray Firth)	×	EMEC, Intermediate tidal energy test site (Head of Holland, Orkney)	×	Northern Isles Salmon, West Fara salmon cage site	×

Table 14.9: Summary of potential cumulative impacts

14.103 The following sections summarise the nature of the potential cumulative impacts for each potential project phase:

- Construction and installation;
- Operations and maintenance; and
- Decommissioning.

14.10.2 Potential cumulative impacts during construction and installation

14.104 Despite specific project details not being available for MeyGen Phase 2 and the other projects listed in Table 14.9, it is possible to qualitatively assess potential cumulative impacts. Both Phase 2 of the MeyGen Tidal Energy Project (additional 312MW) and the Scottish Power Renewables UK Limited Ness of Duncansby Tidal Energy Project have potential to result in cumulative impacts on local commercial fisheries. Cumulative impacts include disturbance and displacement of the local fishing fleet to alternative fishing grounds by project specific enforcement of temporary safety zones; with potential for increase in contamination risk through a general increase in vessel activity and offshore construction activity. However, the likelihood of a non-routine accidental event is considered remote and appropriate mitigation will be put in place across all projects, ensuring potential for cumulative impact remains minor.

14.105 There is the potential for safety zones to be employed for the construction and installation phase of each project which could be up to a maximum radius of 500m (0.79km^2). Given the distance between the closest project (Ness of Duncansby Tidal Energy Project) and the MeyGen Phase 1 Project is 3km, it is unlikely that safety zones will occur in close proximity to each other and there will be large areas of sea available for fishing activity to take place outside the safety zones. As a result the cumulative impact of these projects is considered to be insignificant.

14.106 Marine vessel traffic will likely increase in the wider area during the construction stage of the aforementioned marine renewables projects, potentially resulting in navigational safety issues for sea users (including the local fishing fleet) across the region. This is discussed further in the Shipping and Navigation section (Section 15).

14.10.3 Potential cumulative impacts during operations and maintenance

14.107 Operation of Phase 2 of the MeyGen Tidal Energy Project in concurrence with Phase 1 will increase the offshore area of turbine deployment in the Inner Sound, further decreasing the area of fishable waters in the Inner Sound. The aforementioned tidal energy projects elsewhere in the region will also be operational throughout the lifecycle of the Project; therefore there will be a further small reduction in the area of fishable waters. This may result in localised displacement of fishing effort; however the potential for cumulative impact on commercial fisheries is considered minimal, due to the low number of vessels (four) known to use the Inner Sound and the availability of alternative fishing grounds in the surrounding environment.

14.108 In addition, during maintenance operations, which are ongoing operations, it is likely that safety zones will be enforced. There is also the potential that each project could undertake maintenance operations at the same time (although this would not happen all the time) and therefore employ safety zones in concurrence. The size of these safety zones could be up to a maximum radius of 500m (0.79km^2). Given the distance between the closest project (Ness of Duncansby Tidal Energy Project) and the MeyGen Phase 1 Project is 3km, it is unlikely that safety zones will occur in close proximity to each other and there will be large areas of sea available for fishing activity to take place outside the safety zones.

14.109 Potential for loss of fishing gear through entanglement and contamination risk may increase due to the occurrence of tidal energy projects across the region; however it is anticipated that fishing activities will not take place in close proximity to offshore project areas for safety reasons. Therefore, cumulative impacts including disturbance and displacement due to maintenance operations are considered insignificant.

14.110 Additionally, there is potential for a cumulative minor positive impact to commercial fisheries, through an increase in populations of target species within project turbine deployment areas. As discussed in Section 14.7.2, the creation of localised 'refuge' areas may result in greater numbers of lobster and brown crab occurring in surrounding habitats outwith tidal energy project turbine deployment areas, which may increase the target population available to local fisheries. It is likely that such an effect would be imperceptible to the local fishing fleet, nevertheless the long-term cumulative impact is considered positive, with potential for benefits to local benthic ecosystems and indirect benefits to the local fishing fleet.

14.10.4 Potential cumulative impacts during decommissioning

14.111 It is unlikely that project decommissioning will occur at the same time across the region, therefore potential for cumulative impact from decommissioning to commercial fisheries is considered limited. It is likely that Project decommissioning will take place in combination with other offshore project activities the region; however only a small number of fishing vessels will be affected by disturbance and displacement effects and there is an abundance of alternative fishing habitat elsewhere in the region, therefore this impact is considered minor.

14.112 Following completion of decommissioning activities, traditional fishing activities will be able to resume in the offshore project footprints, with fishing vessels being able to fully accessing all local traditional fishing grounds, including areas which may have been temporarily excluded during project construction, maintenance and decommissioning phases. This may be considered as a beneficial impact on the local fishing fleet; with long term effects on the activities of local commercial fisheries occurring throughout project lifecycles only.

14.10.5 Mitigation requirements for potential cumulative impacts

14.113 No mitigation is required over and above the Project specific mitigation.

14.11 Proposed Monitoring

14.114 No monitoring specific to commercial fisheries is proposed. However, consultation with local fishermen will be ongoing throughout the duration of the Project to aid assessment of any long term project impacts, in addition to helping inform the decommissioning phase, ensuring disruption to the local fishing fleet is minimised where possible.

14.115 Vessel traffic behaviour will be monitored, more details are provided in Section 15 (Shipping and Navigation).

14.12 Summary and Conclusions

14.116 Throughout the Project life-cycle there are likely to be some effects of temporary exclusion to the local fishing fleet, including displacement from fishing grounds and access restrictions during installation and maintenance operations. However, such displacement and restriction impacts will be of a temporary nature only and will likely affect only a small number of fishing vessels (4 small boats) which are known to utilise fishing grounds within the Project area, targeting lobster, brown crab and velvet crab. However, it should be noted that these fishing grounds are not the only areas targeted by these boats and they represent only a small portion of their overall fishing area.

14.117 Notably the NRA (Anatec Ltd, 2011) highlighted that the fishing vessels in the Inner Sound are predominantly active in shallow areas outwith the turbine deployment area and that during operation the cable corridor will still be available for fishing activity. Therefore disturbance and displacement impacts likely to occur throughout the duration of the Project have been assessed as not significant.

14.118 Recreational fishing activity within the Project area is low and impacts to the target species are not significant and it is therefore unlikely that recreational angling activity will be affected by the Project. Salmon fisheries have a greater potential to be affected by the Project due to the sensitivity of the species they target. However, Section 13 (Fish Ecology) predicts that impacts to salmon from EMF and potential encounters with the turbine array will not be significant. Therefore it is unlikely salmon fisheries will be affected by the Project and impacts will be insignificant.

14.119 To conclude, the Project will impact upon local fisheries during the construction, operation and decommissioning phases. Likely impact on commercial fisheries including displacement of fishing effort, change in abundance and distribution of target species and risk of contamination have been assessed as not significant. The impact assessment has enabled comprehensive and cautious consideration of likely Project impacts on commercial fisheries; no significant impacts have been identified, therefore the overall effect of the Project on commercial fisheries is deemed not significant.

14.13 References

Anatec Ltd (2011). Navigation Risk Assessment MeyGen Inner Sound Phase 1. Report for MeyGen Ltd.

ASML (2011). Benthic survey report for survey of the Inner Sound, Pentland Firth. Report for MeyGen Ltd.

Barne, J.H., Robson, C.F., Kaznowska, S.S., Doody, J.P. & Davidson, N.C. (1996). Coasts and seas of the United Kingdom Region 3 North-east Scotland: Cape Wrath to St. Cyrus. JNCC Coastal Directories Series, Peterborough.

Coull, K.A., Johnson, R. & Rodgers, S.I. (1998). Fisheries sensitivity Maps in British Waters. Published Distribution by UKOOA Ltd.

Curtis, H. and Brodie, C. (2011). 2009 Economic Survey of the UK Fishing Fleet. Seafish Economics, Seafish, Edinburgh.

DEFRA (2011). UK vessel lists 2011.

Ellis, J., Ungaro, N., Serena, F., Dulvy, N.K., Tinti, F., Bertozzi, M., Pasolini, P., Mancusi, C. & Notarbartolo di Sciara, G. (2008). *Leucoraja naevus*. In: IUCN 2010.

iX Survey (2009). Report on the Geophysical Site Survey Stroma JN3475. Prepared for Atlantis Resources Corporation.

Jackson, A., Marshall, C. & Wilding, C., (2009) *Palinurus elephas*. European spiny lobster. Marine Life Information Network; Biology and Sensitivity Key Information Sub-programme (online). Plymouth: Marine Biological

Association of the United Kingdom. Available at http://www.marlin.ac.uk/speciesbenchmarks.php?speciesID=4022 [Accessed 16/08/2011]

Marine Scotland (2011). MeyGen, Phase 1, Tidal Turbine Array, Inner Sound, Pentland Firth. Scoping Opinion. [Received on 30/09/2011]

Marine Scotland Statistics (2011a). Landings data for the period 2006 – 2010.

Marine Scotland Statistics (2011b). VMS data for the period 2006 – 2010.

MMO (2009). UK Sea Fisheries Statistics, 2009.

MeyGen (2011). Projects for consideration in the cumulative (and in combination) impact assessment.

MAGIC, (2011). Multi Agency Geographic Information for the Countryside (MAGIC) Available at http://magic.defra.gov.uk/default.htm [Accessed 16/06/2011]

Neal, K.J. & Wilson, E. (2008) *Cancer pagurus*. Edible crab. Marine Life information Network: Biology and Sensitivity Key Information Sub-programme (online). Plymouth: Marine Biological Association of the United Kingdom. Available at http://www.marlin.ac.uk/speciesfullreview.php?speciesID=2872 [Accessed 16/08/2011]

PMSS (2011). Pentland Firth Inner Sound Preliminary Hazard Analysis. Report for MeyGen Ltd.

Radford, A. & Riddington, G. (2004). The Economic Impact of Game and Coarse Fishing in Scotland. For SEERAD, November 2004.

Radford, A., Riddington, G. & Gibson, H. (2009). Economic Impact of Recreational Sea angling in Scotland, prepared for the Scottish Government.

Scottish Government (2010). Map of Aquaculture sites in Scotland. Available at http://www.scotland.gov.uk/Resource/Doc/295194/0109668.pdf [Accessed 16/06/2011].

Scottish Executive (2007). Scottish Marine Renewables SEA. Environmental Report. Prepared for the Scottish Executive by Faber Maunsell and Metoc plc.

SNH (2002). Natural Heritage Futures - Orkney and Northern Caithness.

Reeve (2008). *Lophius piscatorius*. Angler fish. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available at http://www.marlin.ac.uk/speciesfullreview.php?speciesID=3728 [Accessed 16/08/2011].

Wilson (2008). *Cancer pagarus*. Edible crab. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available at http://www.marlin.ac.uk/speciesinformation.php?speciesID=3519 [Accessed 16/08/2011].

Wilson (2008). *Homarus gammarus*. Common lobster. Marine Life Information Network: Biology and Sensitivity Key Information Sub-programme [on-line]. Plymouth: Marine Biological Association of the United Kingdom. Available at http://www.marlin.ac.uk/speciesinformation.php?speciesID=3519 [Accessed 16/08/2011].