11 Commercial Fisheries & Mariculture

11.1 Introduction

Commercial fishing is an important industry in the REA study area, generating approx 3.5 million pounds worth of first sale landings in 2008 (table 11.2.1). Key species of commercial importance in the REA study area include Lobster, Edible Crab, Spider Crab, Scallop, European seabass, Pollack, Ray, Brill , Turbot, Sole, Red mullet ,Black bream. and Sandeels. Section 11.2 describes the current situation with regards to Commercial fishing activities taking into account available information on the landings and value of key commercial species, structure of the commercial fleet, intensity of fishing across the study area, the location of key fishing grounds and main fishing seasons.

Fig 11.1.1: Under ten metre commercial fishing boats at the Boue Blondel 2006. These size boats typify the Bailiwick fleet.

Mariculture in the form of designated fishery areas are also situated in sub-tidal Areas, focused exclusively on the production of Pacific Oysters (*Crassostrea gigas*) and Mussels (*Mytilus edulis*). These operations are discussed in more detail in sub section 11.2.11.

Fig 11.1.2: Oysters being layed onto trestle tables, Rocquaine Bay 2008. This type of operation is practiced at various locations around the shoreline of Guernsey.

11.2 Baseline Environment

11.2.1 Landings and Value

The Sea Fisheries Section maintains a database of fish and shellfish landings from all licenced fishing vessels. Due to the data collection methodology it is not possible to accurately determine quantities of fish caught within the REA study area. Many Bailiwick fishing vessels operate outside the study area and annual grossings may be made up from fishing activities in a variety of fishing grounds. For the local fleet this is typically from the shore out to 12 miles, with some angling and potting activities taking place beyond 12 miles. Given this wide distribution of fishing effort it is also beyond the scope of this document to attribute monetary values to specific regions of the REA study area.

Table 11.2.1 : Landings of principal commercial species 2004-2008. *(*Commerce and employment Seafisheries section Statistical report 2009)

Species	Landings 2008 (tonnes)	Landings 2007 (tonnes	Landings 2006 (tonnes)	Landings 2005 (tonnes)	Landings 2004 (tonnes)	Landings 2003 (tonnes)	Average value per tonne (£000,s)
Anglerfish [3]	3.3	2	1.6	2.3	0.9	1.9	3
Bass	123.2	142	162.4	173.0	127.8	49.2	5.5
Black Bream	55	212.5	161.7	158.8	49.9	131.3	1.1
Brill	10.3	8.7	12.7	13.8	9.8	9.4	6
Cod	2.2	1.9	0.9	0.5	1.0	3.0	2
Conger [1]	38.6	38.2	108	58.5	22.4	23.2	1.1
Crayfish	0.7	0.4	0.3	0.3	1.2	1.3	25
Cuttlefish	2	0.7	0.3	2.5	4.5	5	1
Dogfish [1]	16	10.4	20.4	20.6	12.9	45	0.5
Edible Crab	802	933	751	810	899	885	1.2
Grey mullet	1.8	1.2	1.9	1.1	1	1.1	1
John Dory	0.4	0.3	0.4	0.4	0.5	1.1	7

Species	Landings 2008 (tonnes)	Landings 2007 (tonnes	Landings 2006 (tonnes)	Landings 2005 (tonnes)	Landings 2004 (tonnes)	Landings 2003 (tonnes)	Average value per tonne (£000,s)
Lobster	67.2	71.5	58.9	59.8	60.5	49	10
Ling	1.6	4.1	3.6	1.8	1.1	No data	1.5
Mackerel	6.5	6.5	6.8	7.1	5.2	No data	0.5
Plaice	1.6	1.5	2	2.9	2.7	1.7	3
Pollack	52 (5)	47.9	42	44.4	35.9	21.4	1.5
Ray	149.8	72.8	117.1	144.6	117.4	163	2.5(3)
Red mullet	8.3	8.2	8.1	12.1	10.1	10.3	5
Sand Sole	1.5	1	0.9	2.0	1.1	1	3
Sandeel (2)	46	60	39.2	45	43.2	37.9	- (4)
King Scallop	102	108	123.4	101.3	107.6	89.2	3.5
Smoothound	19.8	23.1	16.8	18.8	11.3	No data	2
Sole	6.0	3.6	3.5	5.4	6.0	4.8	7
Spider	86.3	59	65	73.3	99	146	1
Squid	0.5	0.5	0.1	0.3	0.4	0.9	5
Turbot	2.5	3.2	5.9	8.1	7.0	4.3	8
Tope	16.2	24.7	10	38.0	26	No data	2
Wrasse (1)	5	4	7.1	4.7	5.5	No data	0.5
Total	**1636**	**1851**	**1728**	**1819**	**1671**	**1688**	
Total	**3534**	**3877**	**3825**	**4033**	**3641**	**3159**	

11.2.2 Species of Commercial importance In the REA study Area.

From the value and landings shown in table 11.2.1 above it is possible to identify key species of commercial importance targeted in the REA study area.

Crustaceans

Potting for edible crab, spider crab and lobster (to a lesser extent crayfish) is the most important Bailiwick fishery in terms of tonnage and value. The main crustacean species are present on almost all soft and hard grounds within the REA study area. Peak landings for edible crab and lobster are during the summer months and for Spider crab during the annual spring migration between April and June.

Red Mullet (*Mullus surmulletus*)

Red mullet are mainly caught by set nets between August and March over sandy ground in many inshore areas including the main bays around the Island. The opening of the bays to netting on October 1st each year coincides with the increased abundance of Red Mullet on inshore grounds.

European Seabass (*Dicentrarchus labrax*)

Seabass are a significant component of the annual income of many GU Registered wetfish vessels. Present all year round within the REA study area the fishery can be split into two main components. There is an overwintering spawning stock present to the west of Guernsey and a spring and summer fishery present around reefs and sandbanks where bass feed on sandeels and other small fish together with crabs.

Ray (*Raja sp.*)

The main species of Ray taken in commercial catches is the Blonde Ray accounting for around 75% of total Ray Landings. The majority of Ray landed are taken in Trawl, line and net fisheries.

Scallop (*Pectin maximus*)

Scallops are taken by dredging and diving all year round with the main commercially significant aggregations coinciding with the diving and dredging chart shown in fig. 11.2.8.

Brill / Turbot (*Scopthalmus rhombus/Psetta maxima*)

Brill are mainly taken in trawls on the grounds shown in fig. 11.2.2. Brill and Turbot may be caught all year round on soft or gravelly substrate within the SEA study area being particularly prolific during the spring and early summer months.

Pollack (*Pollachius pollachius*)

Pollack are mainly caught by lining and angling around most rocky inshore areas of the SEA study area from March to October.

11.2.3 Migration paths

There are no documented well defined migration paths of commercial species that take place wholly within the REA study area. The presence of certain commercially important species is generally seasonal or area specific but their arrival to and from the REA study area is likely to occur along a broad front rather than in defined corridors of movement. Three species of commercial importance that exhibit these broad scale migratory patterns between the REA study area and the wider Channel and beyond have been studied in more detail by various researchers -

Spider crab **(***Maja Squinado***)**

Spider crab are an important commercial catch, being taken in greatest number during the spring inshore migration from April-June. The first spider crabs begin to reach Guernsey waters within the REA study area in late March. Overwintering areas have been identified as the deeper waters to the South of Guernsey outside the REA study area (Pawson 1995). Although this data is now over twenty years old Spider crab are still known to inhabit these same overwintering areas as French vessels continue to target these grounds with nets during the winter months.

Bass **(***Dicentrarchus labrax***)**

In the winter of 2006 and 2007 500 bass were tagged at the Boue Blondel by staff of the Guernsey Sea Fisheries Section. The pattern of tag returns suggested that this fishery was composed of adults that spent the spring and summer months in the Eastern Channel and southern North Sea returning to the western channel in late autumn and winter to spawn. There is a likely important spawning / pre- spawning ground for European Seabass centered around the Boue Blondel and associated reefs off the West coast between November and March. It is not known if the fish actually spawn there or use the area for feeding prior to spawning. (Brown and Pawson 2007, unpublished data).This ground is shown in fig. 11.2.9 and there is currently a netting and trawling exclusion zone of 0.5nm around this reef.

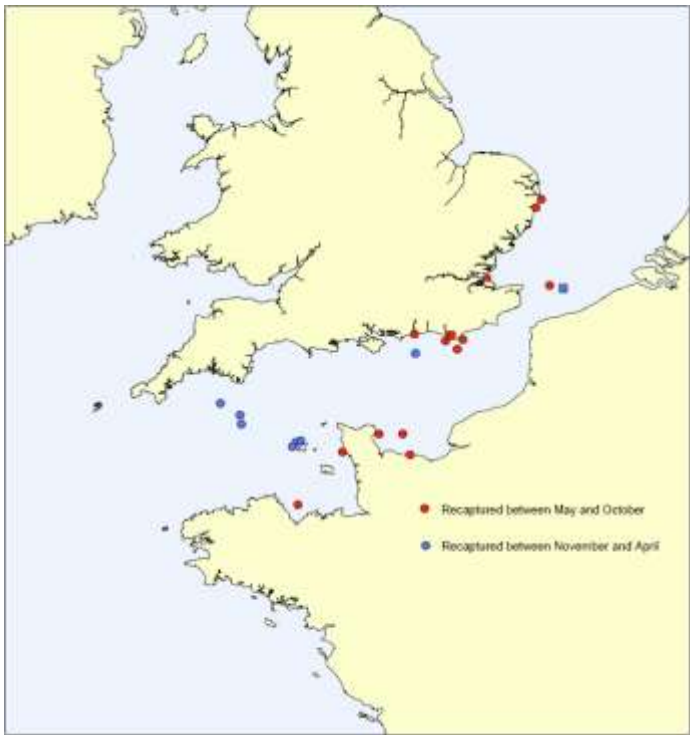

Fig 11.2.1. The movements of bass tagged at the Boue Blondel .Pawson & Taylor 2007.

Black Bream (*Spondyliosoma cantharus*)

Parts of the REA study area appear to be an important overwintering ground for Black Bream (Fig 11.2.2).

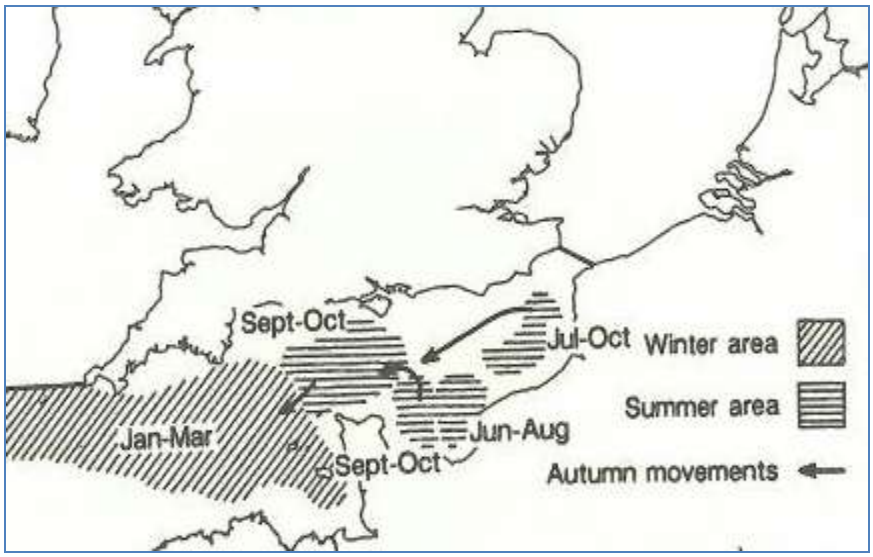

Fig 11.2.2. Black Bream migration patterns and Overwintering areas (Pawson 1995).

This continuing presence of commercial aggregations of Black Bream within the REA study area is evidenced by the relatively high bream landings shown in table 11.2.1 (2008 landings were lower

due to reduced trawling effort rather than any decline in Bream abundance). These landings were primarily from winter pelagic trawling and netting operations targeting the overwintering bream in deeper water to the east and south of Sark and off the north and west coast of Guernsey, both inside and outside the REA study area.

Other migrations of note

Cuttlefish move between the central English Channel and the REA study area although they are not a commercially significant fishery locally.

11.2.4 The Bailiwick Fleet

The Bailiwick commercial fishing fleet is currently dominated by fishing vessels of 10 m or under in length (Table 11.2.2). The number of under ten metre licenced vessels in the Bailiwick fleet has increased from 158 to 175 since 2004, with a fall in over ten metre vessels from 16 to 11. The fall in larger vessels represents a trend for operators to move into the under ten metre sector where there are comparatively fewer restrictions on landing and also reduced operating costs. The 57 UK vessels currently holding a Guernsey license do so under a reciprocal licencing agreement with the UK. Very few of these UK vessels fish in the REA study area and those that do are often angling vessels that visit during appropriate tides in the summer months.

Table 11.2.2: Structure of the commercial GU licensed fleet 2004 -2009

Vessel Category	Number of vessels December 2004	Number of vessels August 2006	Number of vessels July 2007	Number of vessels August 2008	Number of vessels August 2009
GU registered <10m (32'9")	158	164	175[2]	175[2]	175
GU registered >10m	16[1]	13[1]	13[1]	12[1,2]	11([1])
Jersey registered >10m	9	9	9	9	9
Jersey Registered <10m	1	2	2	2	2
UK registered (all vessels)	84	86	89	64	57
Total	268	274	288	262	254

11.2.5 Fisheries Regulation

1. All power driven vessels that fish for profit within the REA study area require a licence issued by the Sea Fisheries section of the Commerce and employment department. There is a vessel size restriction of 17m and 500hp within the Bailiwicks 3 mile limit. The key piece of fisheries legislation governing fishing activities in the REA study area is *The Fishing ordinance 1997.*

2. Between the 1st May and THE 30TH September each year set nets and longlines may not be used and trawling is forbidden inside the lines show on fig. 11.2.3. Outside of this season nets and trots may be encountered in many of these bays especially during the autumn when red mullet, sole and other prime demersal species become more abundant on these nearshore grounds.

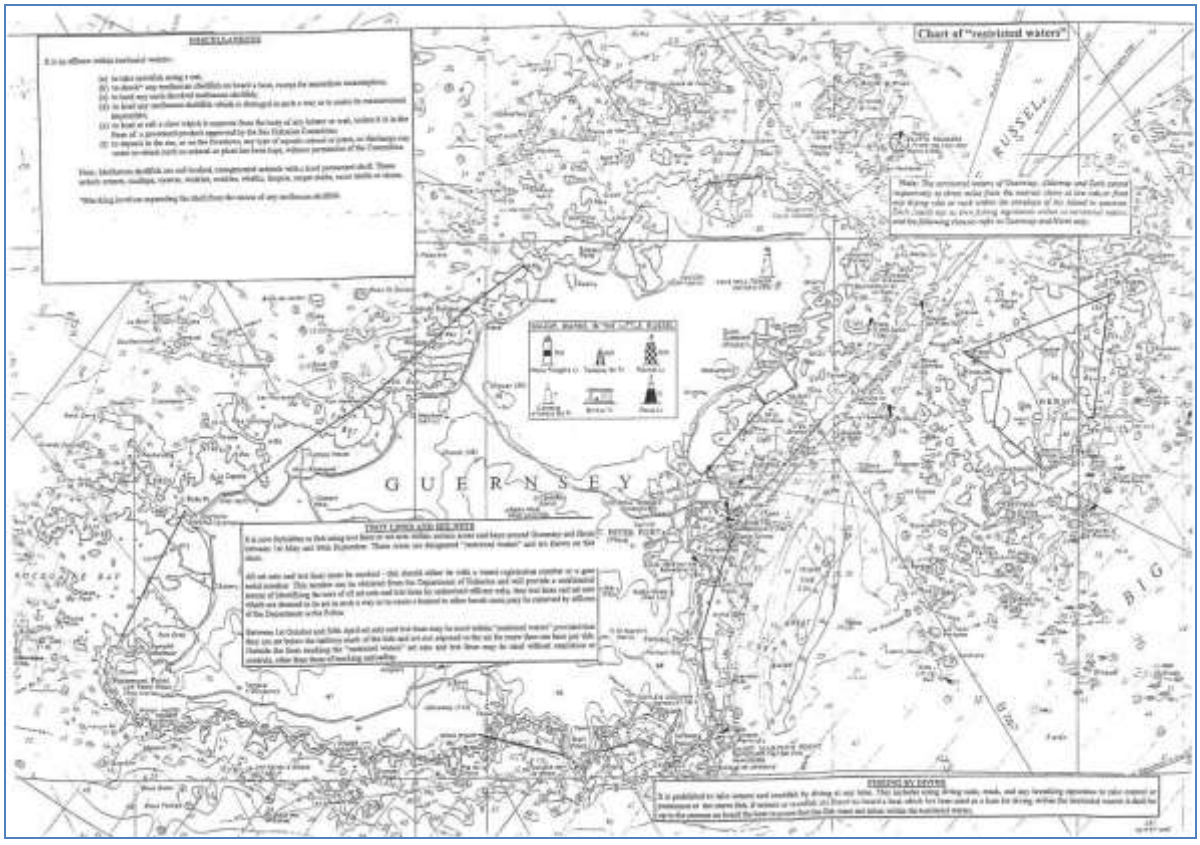

Fig 11.2.3. Restricted waters where longlining, set netting and trawling is prohibited between the 1st May and the 30th September each year.

11.2.6 Fishing Methods and Fishing grounds

A brief description of the main commercial fishing methods used in the REA study area is given below. The number of GU registered vessels recorded as having used each method in 2008 is also provided. For each of the fishing methods a chart showing the main areas where the activity currently takes place is presented. While many fishing methods have discreet definable areas where they are practiced in some cases there is significant overlap of methods. Potting areas are generally attributable to individual fishermen where gentlemen's agreements developed over many years define who fishes in which areas. The fishermen working these patches of ground may change over time as vessels leave and join the fishery. These types of gentleman's agreements also define the interaction between static methods such as potting, netting and longlining with active methods such as trawling and dredging. If a trawlerman intends to fish an area known to be worked by potters he will in most cases discuss it with the fisherman involved to reduce the risks of conflict between the two. The following charts should therefore be considered as a guide to current fishing patterns rather than a definitive guide to fishing grounds and locations of methods used in the REA study area. In some cases it has not been possible to publish precise fishery areas due to the commercial sensitivity of the information involved**.**

Potting

Practiced by 72 GU registered vessels in 2008 (41% of the fleet) potting is the most common fishing method in the REA study area. The fishery takes place in all months of the year with activity increasing during the summer months April to September. The fishery takes place during daylight hours with the pots remaining on the ground throughout (pots are not taken back to port at the end of the days fishing.

Potting involves the setting of strings of pots, the number of pots used on one string dependent on the size of the vessel and its operating arrangement. Pots are hauled, cleared of catch, rebaited and shot back to the seabed. Many pots used in the REA study areas are parlour pots which as the name suggests contain a chamber from which crabs and lobsters cannot escape. This ensures that the fishermen do not lose catch when they cannot tend to the pots, such as during times of bad weather. Almost all inshore rocky areas are used for potting where lobster may be the main target species, with most open areas of ground tending to be fished for edible crab. Grounds to the south and west of Guernsey and areas of the Big Russel are the most intensely fished areas with some under ten metre vessels using up to 1000 pots. There is a seasonal spider fishery that runs from March to July targeting inshore migratory spiders as they find shallower water for mating (see section 11.2.3).

Potting is not permitted in Sark territorial waters (0-3nm) from October to March and pots are generally removed from these waters during that period.

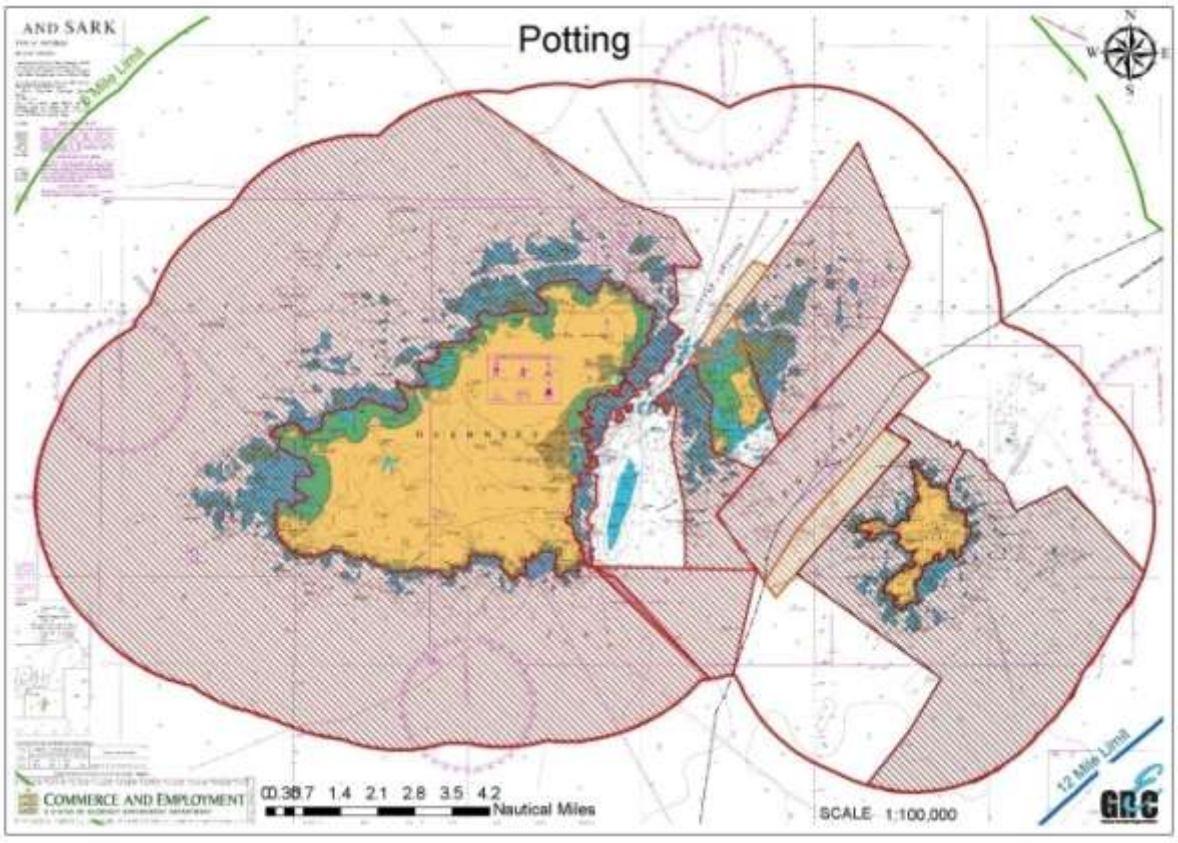

Fig 11.2.4: Main Potting grounds in the REA study area.

Demersal Trawling

Trawling is the operation of towing a net to catch fish. The net can be held open with either a beam, or trawl doors. Floats are attached to the upper edge of the net and weight is applied to the bottom edge of the net (in the form of a footrope) to form the mouth of the net. Demersal trawling can take place over most grounds except those very rough areas or where there are seabed obstructions such as wrecks. There are 4 over ten metre trawlers and 4 under ten metre trawlers based in Guernsey. Trawl grounds are well defined and the most intensely fished areas are the Banc au Nord and the Godine bank (see fig 11.2.5). Under ten metre trawlers tend to fish on smaller localised banks, and during the winter months the sandy bays of Guernsey are open to trawling.

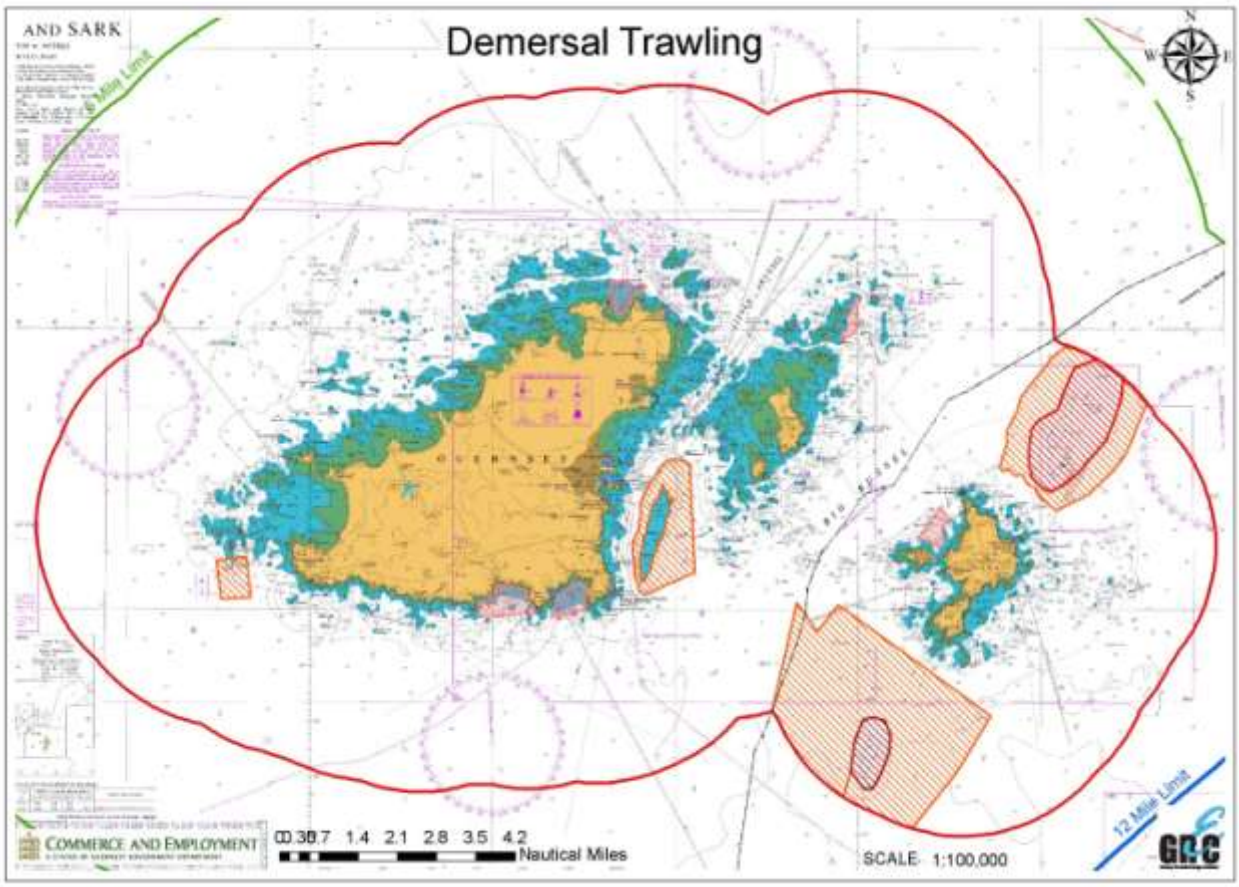

Fig 11.2.5: Main Demersal trawling grounds in the REA study area.

Pelagic trawling

Pelagic trawling is similar to demersal trawling except that the trawl and trawl doors do not make contact with the seabed. The method is currently practiced by one vessel on a seasonal basis targeting bass and black bream, principally in the deeper waters off the west coast of Guernsey and the east and south of Sark (See Fig. 11.2.6). Pelagic pair trawling is prohibited by means of a licence condition in the REA study area.

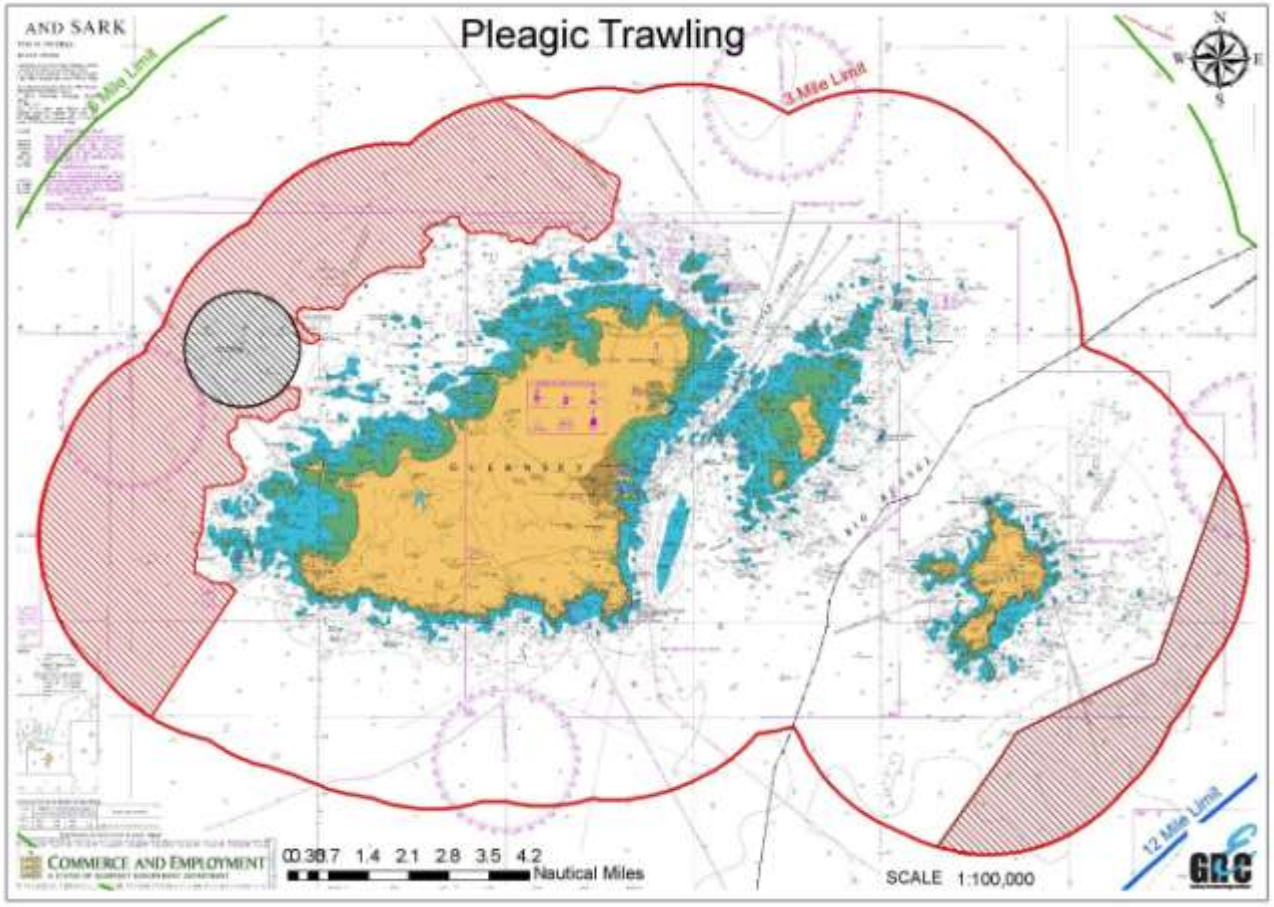

Fig 11.2.6: Main Pelagic trawling grounds in the REA study area.

Sandeel trawling

One over ten metre vessel and one under ten metre vessel target sandeels within the REA study area. These demersal trawlers use fine meshed nets and generally tow durations are short <30 minutes. Sandeels caught within the REA study area may not be exported. Sandeels are a vital prey species in the marine ecosystem, being sold for use as bait in commercial longlining and angling operations as well a for uses by the leisure angling sector. The main fishing grounds are shown in 11.2.7.

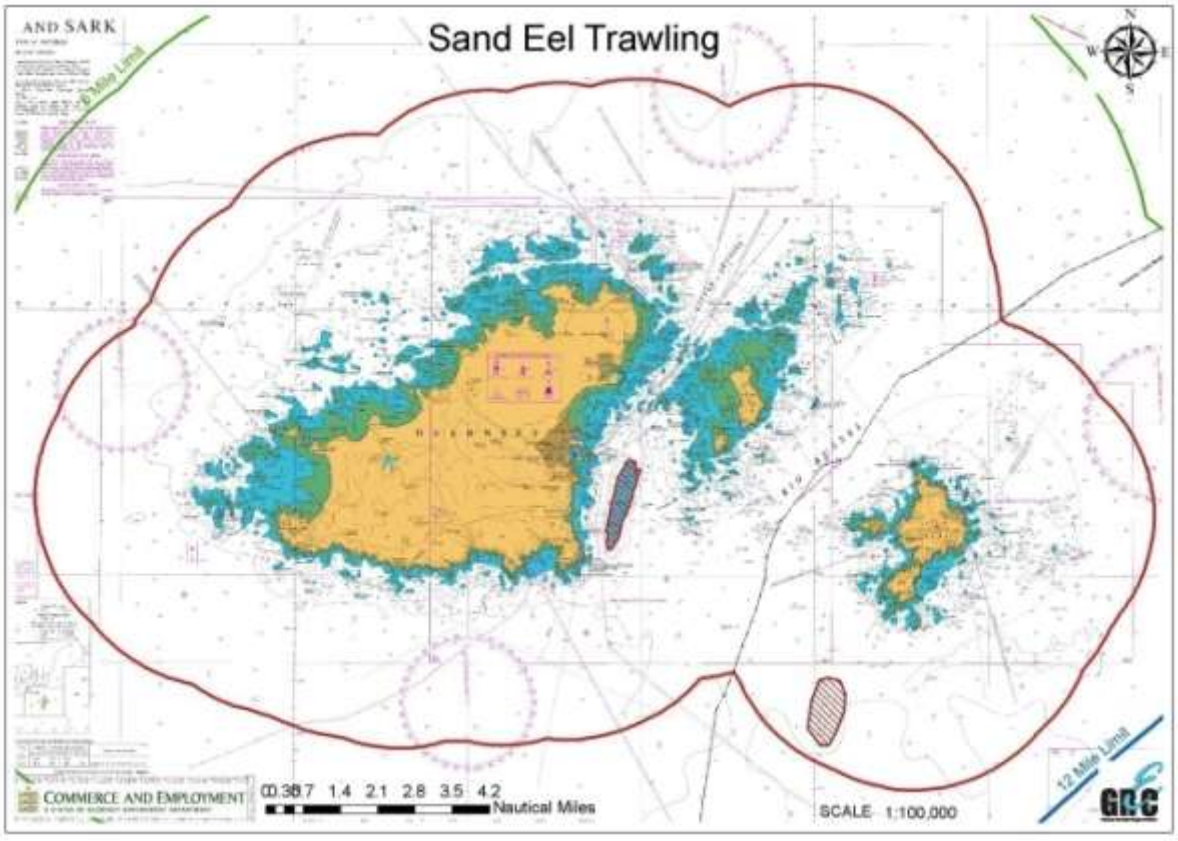

Fig 11.2.7: Main Sandeel trawling grounds in the REA study area.

Scallop dredging

A Scallop dredge is a steel frame with a front mounted tooth bar which is connected to a steel bag. This steel bag is is constructed of steel rings, known as belly rings. As the dredge is towed across the bottom the teeth dig up the scallops, depositing them in the dredge belly. Stones and other debris together with small scallops fall through the belly rings. There are two Guernsey based scallopers that work in the REA study area, the main grounds being well defined (Fig 11.2.8). These vessels tow either 4 dredges from the stern or 3 dredges per side.

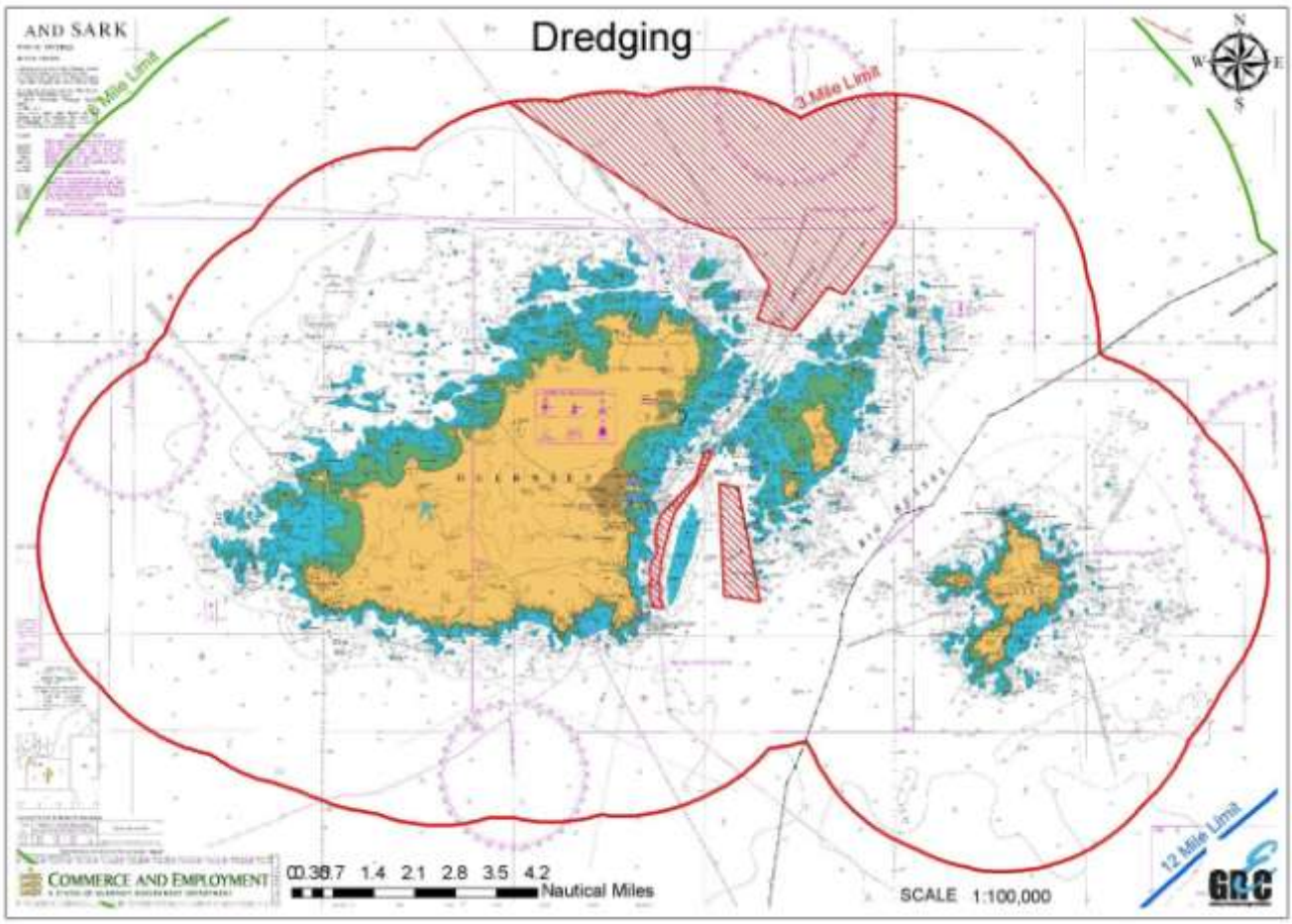

Fig 11.2.8: Main Scallop Dredging grounds in the REA study area.

Set netting

Bottom set gill nets are constructed to stand upright off the seabed forming a wall in the water column to intercept fish. Lead weights are attached to a rope at the bottom of the net and floats are attached to the top to hold the net upright. Trammel nets are similar but are constructed of three layers of net - a small mesh inner net is sandwiched between two larger-mesh nets, large fish are pocketed by the inner mesh. Tangle nets may be constructed using nylon or monofilament and are usually of larger mesh designed to catch species such as spider crab or Ray left in the water. Nets are constructed of mesh of varying size depending on the fish that is targeted. The main target species locally are bass, ray, red mullet, black bream and Pollack, with bycatches of lower value species such as wrasse dogfish and pout tending to be landed for use as crab pot bait. Some inshore netting operations are carried out specifically to catch lower value fish for bait. The main netting season in the REA study area is from August to April with a wide range of grounds used, mainly within 1.5 miles of the shoreline. 26 GU registered vessels used set nets in 2008.

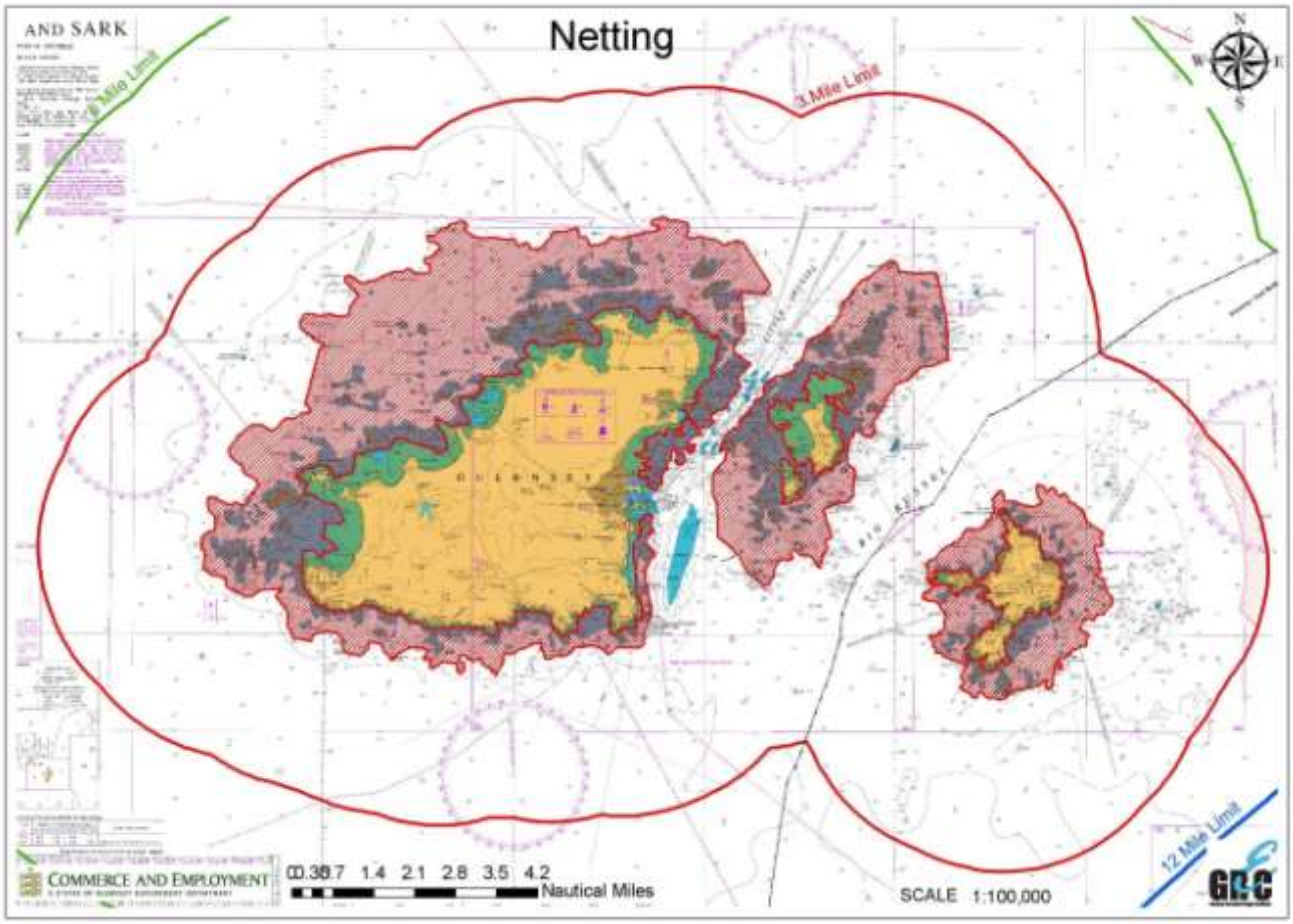

Fig 11.2.9: Netting grounds in the REA study area.

Long lining

Longlining is known locally as trotting or monotrotting. This method involves the use of lines of baited hooks that are usually set and retrieved on the same day or may be set and retrieved the next day. These lines are anchored in position on the seabed. The main target species are Bass, Ray, Pollack, Brill, Turbot, Tope, Smoothound and Conger Eel. Areas fished are extensive and dependent on species targeted and are mainly within the 50 metre depth contour as suggested in fig 11.2.10. 25 GU registered vessels used longlines in 2008, although 3 of these vessels were Alderney based and did not fish in the REA study area. The main longlining season tends to be from April through to October. As with netting the main grounds tend to be within 1.5 miles of the shoreline and around outlying reefs and banks although occasionally fisheries that target Tope Conger and Smoothound may also use deeper and more open areas within the REA study area.

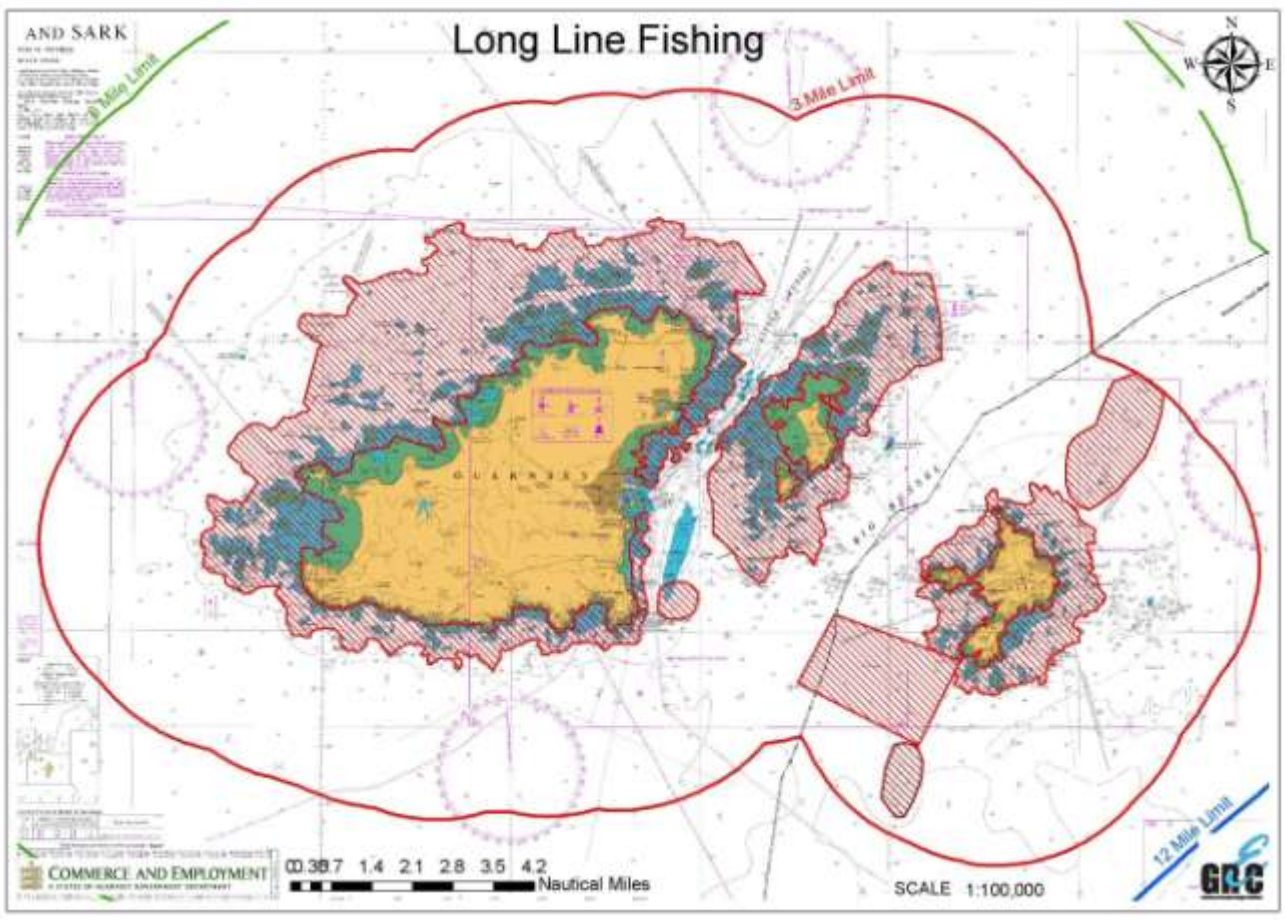

Fig 11.2.10.: Longlining grounds in the REA study area.

Diving

The main target species for local divers is the Great Atlantic scallop. The main fishing grounds are in the Little Russel and to the north east of the Island of Sark as shown in Fig 11.2.11. Diving is usually conducted by a two man team working from a drifting boat where one person acts as boatmen while the other is on the bottom. Bottom time may vary but is generally 20-30 minutes per dive with each diver conducting two dives or using two diving cylinders per day. Additional commercial diving activities target the high value flatfish species Brill, Turbot, and Sole using a small spear carried in the hand. These areas are less well defined but are generally in sandy inshore areas (less than 40m deep) to the south and west of Guernsey and to the east of the Island of Herm. There is currently two under ten metre vessels working the Little Russel scallop grounds on a fulltime basis with 2-3 Sark based vessels working the Sark grounds. 12 GU registered vessels were recorded as being used as a base for diving during 2008.

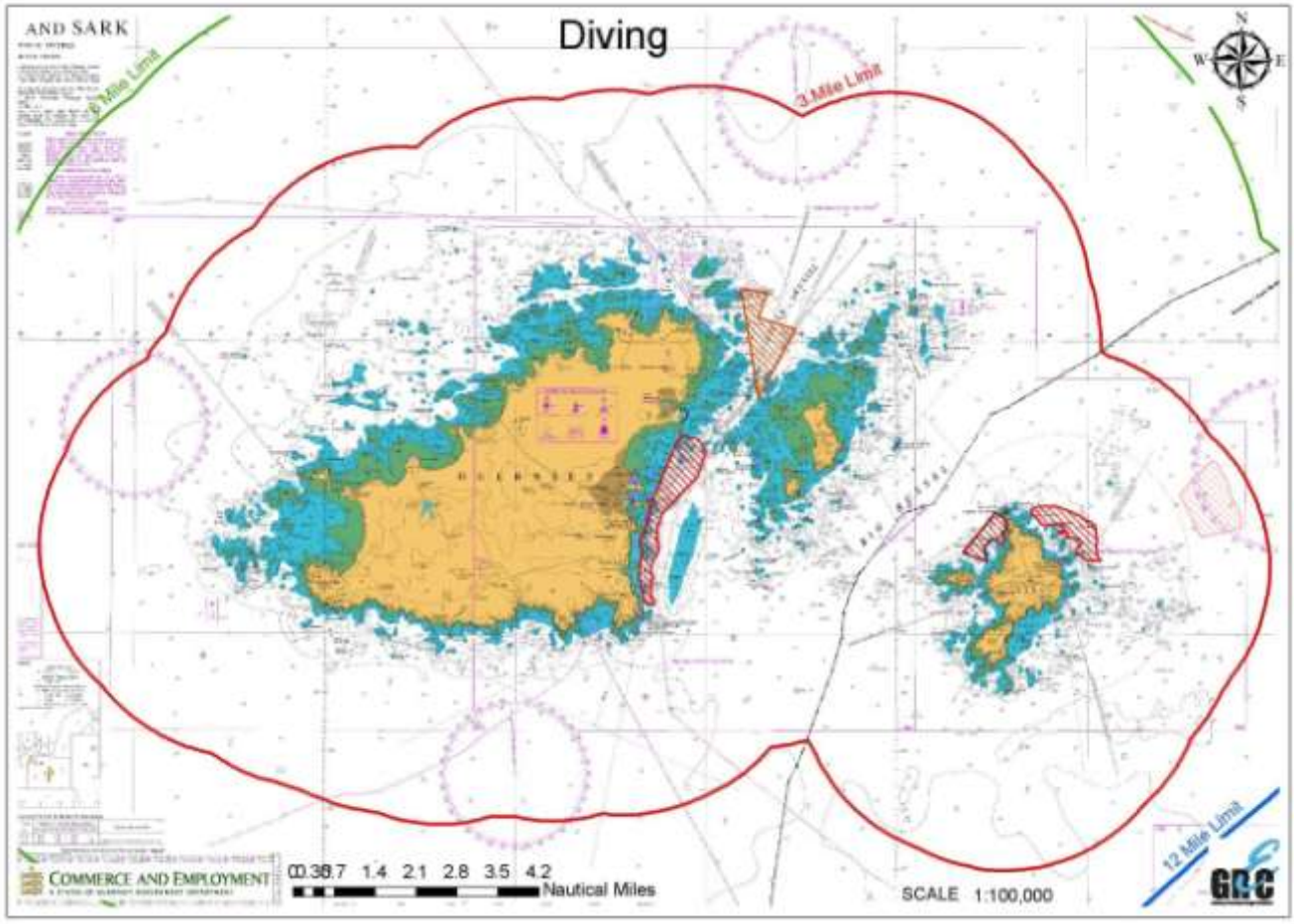

Fig 11.2.11: Main Commercial scallop diving grounds in the REA study area.

Angling (and handlining)

Angling and handlining is an extensively practiced method both by commercial and recreational operators in the REA study area. The main target species are Pollack, bass, turbot, brill mackerel and Bream. Angling is practiced over most inshore reefs and banks and those particularly intense areas of activity are shown on fig 11.2.12. The Boue Blondel fishery is a winter only fishery where bass are targeted with rod and line. 70 GU registered vessels (excluding Alderney based vessels) practiced angling during 2008.

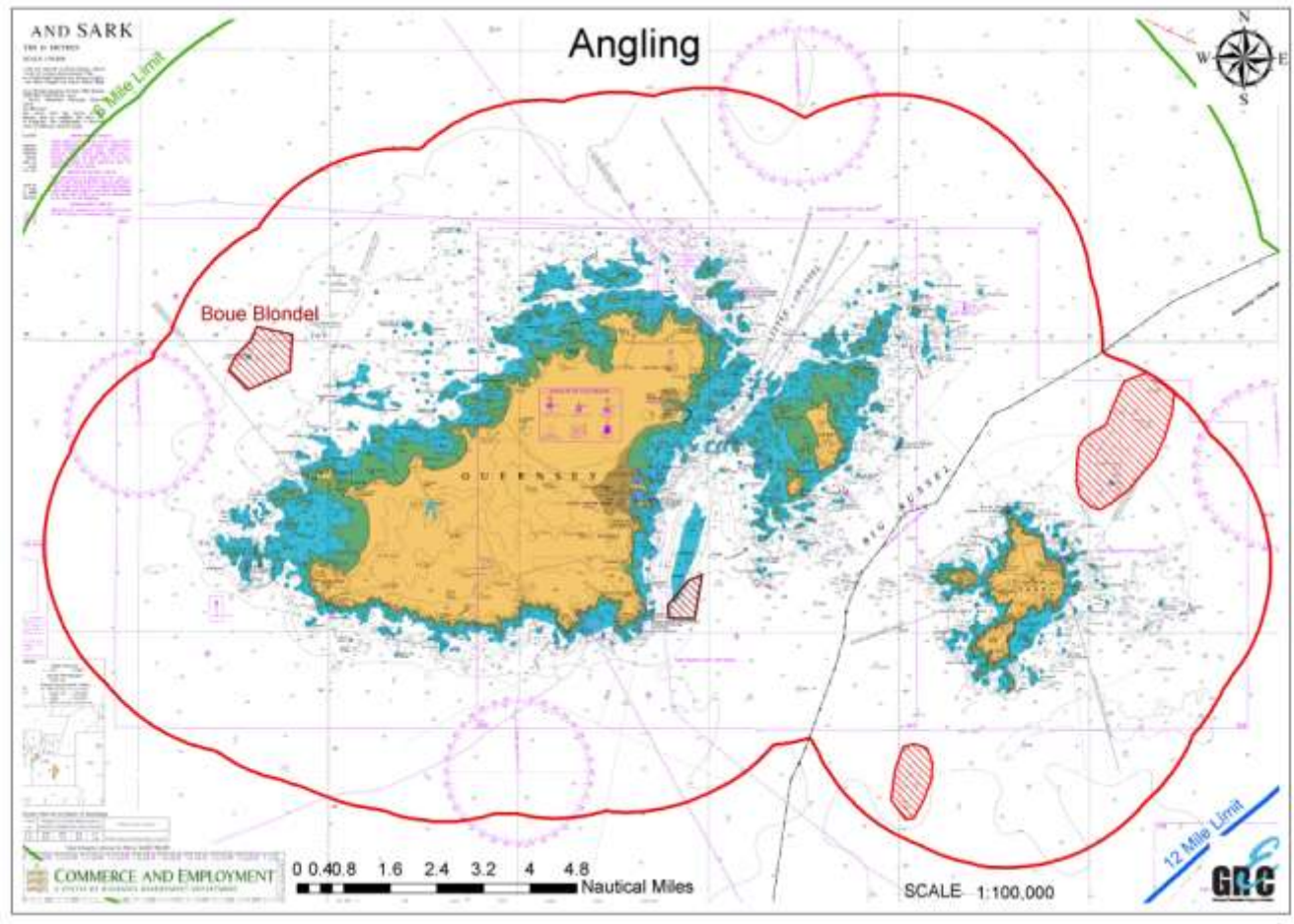

Fig 11.2.12: Main Commercial angling grounds in the REA study area.

11.2.7 Charter Angling

Charter angling is a branch of recreational fishing where a vessel carries a party of paying customers wholly for the purpose of pleasure fishing (*Any fish landed by the vessel cannot be sold)*. In Guernsey there are two licensed fishing vessels that also carry paying customers in the summer months. Some of these charter parties are locally based people engaging in club angling competitions. There are a number of visiting charter angling vessels from the UK from April to September although they mainly target areas outside the REA study area.

11.2.8 Other commercial fisheries

Seine netting

Seine netting for sandeels is practiced by a number of under ten metre vessels (data not available for the number of vessels using seine nets). The technique involves encircling a shoal of sandeels from a moving vessel then either hauling the net back to the vessel by hand or using a power block. This fishery provides bait for angling and lining operations. These fisheries may take place in many inshore locations, mainly over clean sandy ground. The main locations tend to be within bays and well defined marks in shallow water including to the east of Herm Island.

Beam trawling

Beam trawling is similar to demersal trawling except that a beam is used to keep the mouth of the net open rather than trawl doors. There are two common types of beam trawl, referred to as 'open gear' and 'chain mat gear'. Open gear is a lighter rig with several chains, called ticklers, towed on the seabed across the mouth of the net. These ticklers help to disturb the fish from the muddy seabed, causing them to rise and be caught by the net. This rig is used on clean soft ground (seabeds). The chain mat gear is used for the harder, rockier areas of seabed, more commonly used by the bigger class of beamers. Beam trawling is not permitted within the territorial waters of Sark and is mainly practiced outside the REA study area. There were three vessels that used beam trawls in 2008, using the open type gear arrangement.

11.2.9 Recreational Fishing

The main methods used by recreational fishermen in the REA study area are angling, potting, longlining, netting and diving. Recreational activity is of greatest intensity during the summer months (April – September). There is no data on the number of persons engaged in recreational fishing, frequency of the different activities or the amount of gear use. Recreational fishing is discussed in more detail in chapter 12.

11.2.10 Ormer fishery

The ormer or European abalone (*Haliotis tuberculata*) is a gastropod mollusc that inhabits the foreshore and sub littoral zone in rocky areas. The fishery is only open to shoregatherers and although ormers are gathered and sold commercially the fishery is generally a recreational pastime. Ormers are found in all rocky areas of the coastline within the REA study area. The gathering season is from January 1st to April 30th.

11.2.11 Mariculture In the REA study area

Mariculture in the REA study area is comprised exclusively of on bottom trestle culture of Pacific oysters (Crassostrea gigas) and the European mussel (Mytilus edulis). These operations are undertaken in 8 designated fishery areas, 7 on the Guernsey foreshore and 1 on the Herm foreshore (see fig 11.2.13). There are no mariculture operations on the foreshore of the Island Of Sark.

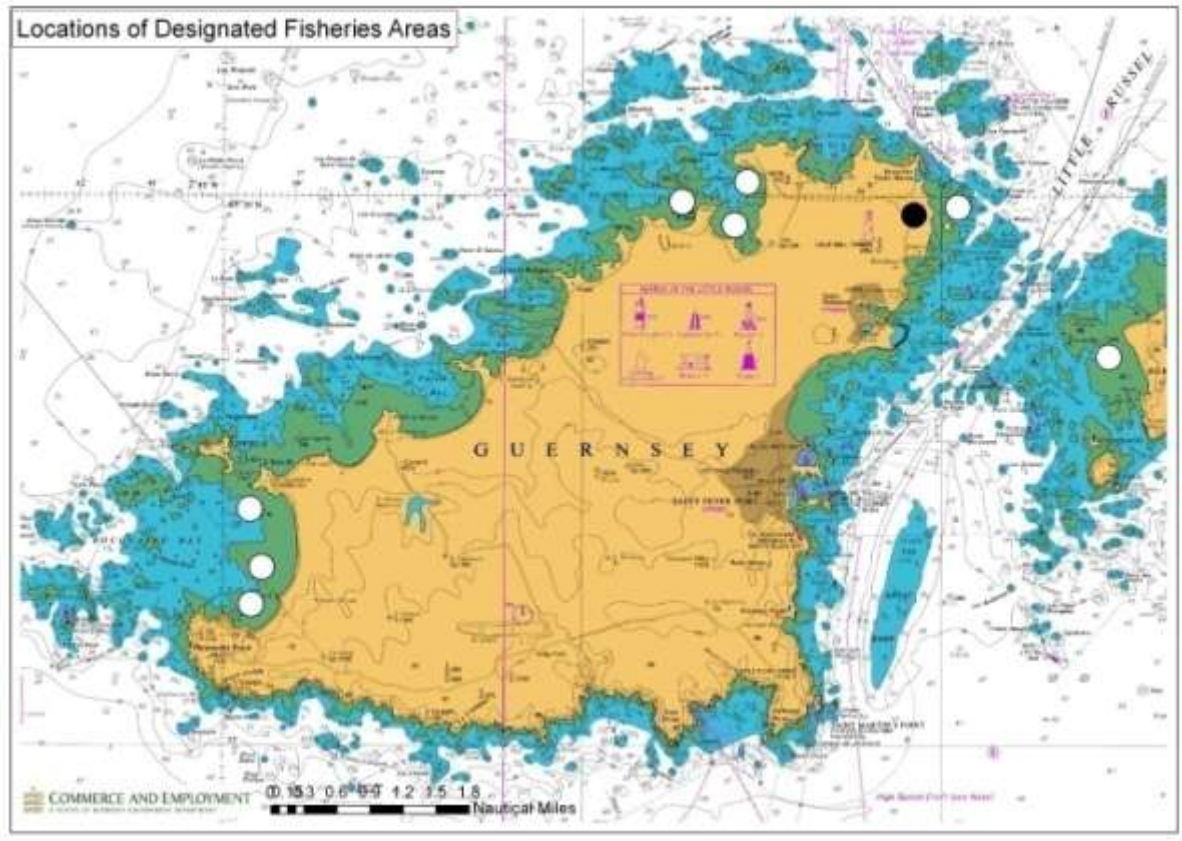

Fig 11.2.13: Locations (approximate) of the designated fishery areas where on bottom culture of Pacific oysters (Crassostrea gigas) and mussel (Mytilus edulis) takes place.

The States of Guernsey Commerce and Employment Sea Fisheries Section are responsible for the licensing off all shellfish farms within the REA study area. The Section issues shellfish farm licences under The Fishing (Licensing and Protection of Fisheries) Ordinance, 1987. The latitude and longitude positions of the 9 designated fishery areas are set out in the Fishing (designation of fisheries) Order 2009 (SEE APPENDIX H). The fishery areas bestow the exclusive right of the licensee to deposit shellfish. There is an oyster hatchery located at Hogue Noirmont Quarry on the NE coast of Guernsey (see black circle on fig 11.2.13). This facility is separated from the open sea by a controllable sluice gate.

11.3 Potential Key Effects

11.3.1 Commercial Fisheries

11.3.1.1 Reduced Productivity of Fishing Grounds (Ecological effects)

Noise

Noise associated with piling operations and/or cable laying may affect the distribution and movement habits of commercial species in the short term. It is known locally that noise generated from the presence of a large number of motor boats can reduce line caught catches of seabass, these aggregations known to disperse or move away to avoid the noise source (pers comm). That commercial fish exhibit a startle response to varying noise levels was demonstrated by Kastelein et al **(**2008,) although they noted that this response was very species specific and dependant on location, temperature, physiological state, age, body size, and school size. As such a device array of a currently estimated 1km^2 in one location is unlikely to inhibit the general movement of commercial fish and shellfish species between the REA study area and adjacent sea areas. For more information on Noise please see chapter 17.

Direct Mortality

The installation of devices and cables may lead to mortality of commercially important shellfish species depending on the type of construction methods employed. The risks of finfish mortality arising from collision with turbine blades has not been researched in an open water scenario. However recent research by conducted on the Mississippi suggest minimal risk to fish passing through a HGE hydrokinetic turbine. (Normandeau Associates 2009)

A more complete outline of ecological effects on fish and shellfish is discussed in the benthic ecology and pelagic ecology chapters (7 & 8)

Electromagnetic Fields

It is known that certain fish and shellfish species are sensitive to electromagnetic fields.

11.3.1.2 Temporary displacement from traditional fishing grounds

- Leading to potential gear conflicts
- lower economic returns

Construction, installation and decommissioning of renewable devices could result in fishing vessels being temporarily displaced onto different fishing grounds, effectively concentrating fishing effort into a smaller geographical area or onto other fishing grounds where economic returns are lower for a given unit of fishing effort. This temporary displacement may indirectly lead to gear conflict or force affected vessels to tie up for the duration of the installation. As shown in fig 11.2.4 above, the REA study area is heavily potted and there is little opportunity for established fishermen to move grounds. For such operators, tying up or reducing the number of pots worked may be the only option depending on the size and location of device arrays.

11.3.1.3 Collision / Entanglement

The main collision / entanglement risks with fishing gears in the SEA study area are –

- Mobile gear fishing too close to structures and/or over cables.
- Pots, nets, or longlines shot too close to structures.
- Divers colliding with structures.
- Potting vessels creeping[1] for lost gear with grapnels and snagging cables.

The risk of entanglement may be expected to increase if the size and/or abundance of commercially important species increase around the renewable devices. For example, if the number of lobsters increases near device structures one would expect potting operators to lay gear nearer to them.

A more complete analysis of the vessel collision risk is dealt with in the navigation chapter (15).

1. *Creeping is the activity of towing a grapnel hook from a vessel when the surface markers have been lost and the string of pots needs to be recovered)*

11.3.1.4 Permanent displacement from fishing grounds

- Leading to Increased pressure upon alternative fishing grounds
- Potential long term reduction in fishing fleets

Renewable energy developments in the REA study area may lead to permanent exclusion from areas of sea for all fishing methods. The extent of this displacement is dependant on the scale of development and the siting of device arrays. The presence or otherwise of exclusion zones to certain forms of fishing will also affect the level of displacement experienced. Given that the Bailiwick fleet is dominated by smaller under ten metre vessels, displacement may cause vessels having to fish further offshore or in unfamiliar areas. Constraining effort into smaller areas may lead to localised depletions in stocks, particularly shellfish. There may also be increased gear conflicts between static gear users and mobile gear users. Given that grounds outside the REA study area are also fished by vessels from the UK and Jersey (3-12 mile limit) and France (6-12 mile limit) options for displaced vessels are further limited at the present time. Permanent displacement may ultimately lead to a reduction in fishing opportunities to the extent that the commercial fleet may be permanently reduced.

11.3.2 Potential positive benefits

11.3.2.1 Increase in habitat and/or resources

An Increase in Benthic habitat (structure) leading to an increase in the commercial fishery resource base is a realistic alternative scenario resulting from wave and tidal power developments. Whether the renewable structures will increase resources or simply attract fish and shellfish from other areas is arguable. This attraction/ increase in resources effect is debated in the scientific literature with regard to the perceived benefits of artificial reefs. As has been anticipated from the theory behind no take zones, there may be an opportunity for a spillover effect from increasing breeding success within renewable energy developments. Experience from the Lundy Island no take zone (NTZ) has shown an increase in the abundance and size of lobsters there, and anecdotal evidence of increased lobster abundance outside the NTZ. Should it be found that renewable energy devices lead to positive benefits in terms of habitats and resources there may be an opportunity to leave structures in place post decommissioning. If so, it may be prudent to design any mounting structures such that they encourage commercially important shellfish and finfish species.

11.3.2.2 Servicing/ Maintenance

There may be an opportunity for the local fishing industry to utilise their vessels in the conveyance of persons and equipment during the installation phase of any development and in the maintenance of devices during their operational life.

11.3.3 Key effects On Mariculture Operations

None of the designated fishery areas are likely to directly compete for space with renewable energy development as all fishfarms are sited on the foreshore.

11.3.3.1 Cable Routing

The routing of any associated cables should not interfere with farm sites provided that they do not pass through designated fishery areas as shown in Fig 11.2.13 and detailed in latitude and longitude form in Appendix H.

11.3.3.2 Smothering

Pacific oysters and mussels held on tables are prone to smothering from excess sediment in the water column. Excess sediment produced during Installation and decommissioning may therefore impact on the production of the above species.

11.3.3.3 Pollution

Pollution from greases, oil leaks and antifoul paints pose a potential risk to shellfish operations including the hatchery facility shown in fig 11.2.13. Pollution incidents may cause a temporary restriction on harvesting and thus an n economic consequence to the shellfish operator.

11.4 Sensitivity of receptors

11.4.1 Commercial Fisheries

The sensitivity of commercial fishing activities varies depending on the type of fishery, and the extent of the fishing grounds. The extent of any development and the size and location of device arrays will determine the extent of any predicted effects.

11.4.1.1 Ecological effects

Finfish

As discussed in section 11.3.1.1, it is known that commercial finfish species are sensitive to noise and may avoid noise sources.

Shellfish
Commercial Shellfish may experience temporary disruption during installation of devices and cables.

11.4.1.2 Displacement potential depending on fishing method

Shellfisheries

The many inshore potting vessels operating within the REA study area are constrained in their ability to move by the traditional agreements that exist between operators. Given that potting occurs across a wide area of the REA study area sensitivity is considered to be the highest for potting in comparison with the other fishing methods taking place within the REA study area.

Diving

Commercial diving takes place in waters generally below 50m and in well defined areas of the little Russel and around the coast of Sark. There may exist a small risk of collision with seabed based devices but generally sensitivity is considered to be low.

Longlining / Netting

Most inshore longlining and netting operations generally take place within the 50m depth contour (other than those longline fisheries aimed at tope , conger and smoothound) so direct competition for space with renewable energy devices is lessened. Being passive fishery methods, interaction with buried cables will also be negligible.

Scallop Dredging

The Dredging grounds are generally well defined and may directly interact with renewable energy devices in the areas shown in Fig 11.2.8. Any extensive development on these grounds would force the vessels to move outside three miles where competition with other vessels would be higher. There is also moderate displacement potential due to cable routing, depending on the extent of any exclusion zones around cables.

Trawling/ Pelagic trawling

Trawling grounds are also reasonably well defined (figs 11.2.5 to 11.2.7). Potential for displacement of demersal trawling operations is as described for scallop dredging. Pelagic trawling may exhibit a lower sensitivity to displacement given the relatively low effort in this sector and the mobility of pelagic fish stocks.

11.5. Potential Significance of Effects

11.5.1 Commercial Fisheries: Significance Level Determining Criteria

The Value of the overall fishery is considered to be 'International' as European vessels are allowed within 12 nm of Guernsey and Sark. Any impact on the study area could have secondary effects on the 12 mile fishery. Therefore, the following Significance criteria have been applied.

Major
Impact on existing commercial fishing activities in that it may cause; a long term (for the life of the device array) reduction in landings, or a permanent reduction of the fishing fleet (i.e. number of vessels) of the REA study area that could be directly attributed to marine renewable energy development.

Moderate
Impact on existing commercial fishing activities that may cause; fishing fleets to permanently modify their fishing activities (e.g. modification of methods or gear), or, long term (for the life of the device array) reduced access to traditional fishing grounds or greater transit times to grounds, or, temporary total loss of access to grounds. The total quantity of landings from the SEA study area or the number of vessels in the fishing fleet may be reduced.

Minor
Impact on existing commercial fishing activities in that it may cause; fishing fleets to
temporarily modify their fishing activities (e.g. modification of methods or gear), or temporarily reduced access to traditional fishing grounds.
The total quantity of landings from the SEA study area or the number of vessels in the fishing fleet would not be reduced.

None
Negligible/No impact No displacement of commercial fishing activities.

11.5.2 Mariculture: Significance Level Determining Criteria

Major

Long term (for the life of the device) reduction in marine fish farm area, or a long term effect on contamination and local hydrodynamic regime that results in a medium reduction in marine farm productivity.

Moderate

No loss of fish farm area. Long term effect on water contamination and local hydrodynamic regime that results in a small reduction in marine farm productivity.

Minor

No loss of fish farm area, short term or temporary effect on water contamination and water movement that results in a small reduction in marine farm productivity.

None
Negligible/No impact No loss of fish farm area, no effect on water quality or shellfish quality

Table 11.5.1: Significance of effects: Commercial Fisheries

Effect	Device Type	Development phase	Receptor	Duration	Significance of effects
Reduced productivity of fishing grounds	**All**	**Installation Operation Decommissioning**	**Commercial Finfish species Shellfisheries**	**Long term**	**Moderate**
Temporary displacement from fishing grounds during construction	**All**	**Installation, Decommissioning**	**All fishing methods**	**Temporary**	**Minor**
Long term displacement from fishing grounds	**All**	**Installation, Operation, Decommissioning**	**Potting Trawling Dredging Netting/ Longlining Diving**	**Long term**	**Major Moderate Moderate Minor negligible**
Collision/ entanglement	**All**	**Installation, Operation, Decommissioning**	**Potting Mobile gear Static gear**	**Long term**	**Moderate**

Table 11.5.2: Significance of effects : Mariculture

Effect	Development phase	Receptor	Duration	Significance of effects
Smothering	Installation/Decommissioning	Oysters/mussels	temporary	None
Pollution	Operation	Oysters /mussels	Long term	minor
Onshore routing of cables	Installation/Decommissioning	Licensee designated fishery area	Temporary	None

11.6. Likelihood of Occurrence

Due to the lack of research it is very difficult to assess the effect of wave and tide energy developments on commercial fish and shellfish species. Clearly the scale of any of the potential effects on disturbance of fishing grounds and commercial fish species are dependent on the type of devices and the size and number of device arrays. There will exist some overlap between tide and wave developments given that the REA study area is fished by a high proportion of the commercial fleet. Therefore one could reasonably expect the loss of some fishing grounds to all or some fishing methods within the REA study area.

11.7 Mitigation Measures

Where potential effects have been identified for a specific receptor, the following mitigation measures are appropriate for reducing/mitigating effects.

Table 11.7.1: Mitigation Measure: Commercial Fisheries

Potential effect	*Device type*	*Development phase*	*Receptor*	*Potential Significance of effects*	*Mitigation*
Reduced overall productivity of fishing grounds	**Wave and associated cables Tidal devices and cables**	**Installation Operation decommissioning**	**Commercial Finfish species** **Shellfisheries**	**Moderate** **Minor**	**Avoid key fishing grounds Avoid installation/ decommissioning during key fishing seasons Avoid piling in favour of gravity systems Monitor any changes in LPUE through data held by Seafisheries section Dialogue with fishing industry Lobster friendly foundations**
Temporary displacement from fishing grounds	**Wave and associated cables Tidal devices and cables**	**Installation decommissioning**	**All fishing methods**	**Moderate**	**Avoid intensely fished areas where possible Early dialogue with fishing industry. Offer affected vessels work associated with devices Compensation**
Long term displacement from fishing grounds	**Wave And associated cables Tidal devices and cables**	**Installation operation decommissioning**	**Potting Trawling Dredging Netting/ Longlining diving**	**major moderate moderate minor** **negligible**	**Compensation Allow static gear operations within exclusion zones Developers to open early dialogue with fishing industry. Offer affected vessels work associated with devices**
Collision/ entanglement	**Wave And associated cables Tidal devices and cables**	**Installation Operation decommissioning**	**All fishing methods**	**moderate**	**Developers to open early dialogue with fishing industry Exclusion zones VHF safety broadcasts Clear any debris**

Table 11.7.2: Mitigation Measure: Mariculture

Potential effect	Device type	Development phase	Receptor	Potential Significance of effects	Mitigation
Pollution	Tidal Wave	Installation Operation decommissioning	Oysters / Mussels	moderate	Specify permitted antifoul products Ensure risk assessments are adequate for leaks and spill incidents Ensure developer has Pollution plan in place
Onshore cable routing	Wave cables Tide cables	Installation	Licensee, designated fishery area	minor	Avoid designated fishery areas Open dialogue with shellfish farmers in conjunction with Seafisheries section.
Smothering	Wave cables Tide Tide cables	Installation Operation decommissioning	Oysters/mussels	minor	Avoid piling solutions in favour of gravity systems

11.8 Confidence and Knowledge Gaps

There is a lack of research on the effects of tide and wave energy developments on the marine environment and their interaction with the commercial fishing industry. Therefore the confidence of many of the predictions of possible effects and success of mitigation measures is low in most cases. In terms of the baseline data there is a lack of finer scale detail regarding precise quantities of gear in different parts of the REA study area and due to the sensitivity of financial information no assessment of the value of individual fishing businesses is available.

11.9 Residual Effects

Table 11.9.1 summarises the overall significance of the potential effects identified for commercial fisheries in the REA study area, and indicates how the residual effects might be reduced through the application of appropriate mitigation.

Table 11.9.1: Residual Significance Of Effects: Commercial Fisheries

Potential effect	Receptor	Potential significance of effects	Mitigation	Residual significance of effects
Reduced overall productivity of fishing grounds	Commercial Finfish species Shellfisheries	moderate minor	Exclusion zones Avoid key fishing grounds Clear debris Avoid installation/ decommissioning during key fishing seasons Avoid piling in favour of gravity systems	Minor None
Temporary displacement from fishing grounds	All fishing methods	moderate	Avoid intensely fished areas where possible Early dialogue with fishing industry. Offer affected vessels work associated with devices Compensation	Minor
Long term displacement from fishing grounds	Potting Trawling Dredging Netting/ Longlining diving	major moderate moderate minor None	Compensation Allow static gear operations within exclusion zones Developers to open early dialogue with fishing industry.	Moderate Minor Minor None None
Collision /entanglement	All fishing methods	moderate	Developers to open early dialogue with fishing industry Exclusion zones VHF safety broadcasts	Minor

Table 8: Residual Significance Of Effects: Mariculture

Potential Effect	Receptor	Potential significance of effects	Mitigation	Residual significance of effects
Pollution	Oysters/mussels	moderate	Specify permitted antifoul products Ensure risk assessments are adequate for leaks and spill incidents Ensure developer has Pollution plan in place	minor
Onshore cable routing	Licensee designated fishery area	minor	Avoid designated fishery areas Open dialogue with shellfish farmers in conjunction with Seafisheries section.	none
Smothering	Oysters/mussels	minor	Avoid piling solutions in favour of gravity systems	minor

11.10 Recommendations for Survey and Monitoring

Given the lack of data on possible effects on catches in the vicinity of renewable developments it would seem appropriate to monitor any such changes. Baseline data on landings per unit effort could be carried out by the Seafisheries section using existing logbook data. It should then be possible to monitor changes in catch levels during and post device installation to identify any significant trends both positive and negative in catch levels.

The need for developers to open early dialogue with the fishing industry has been identified in this report. There are various models of best practice for liaison with the fishing industry such as the FLOWW model (BERR, 1998). This should be undertaken by the developer as part of any site selection process to help determine the key areas of importance for commercial species and the spatial extent on a finer scale of fishing gear at the time of the development.

References

1. Normandeau Associates 2009. An estimation of survival and injury of fish passingthrough the hydro green energy hydrokinetic system, and a characterization of fish entrainment potential at the Mississippi Lock and dam no. 2 hydroelectric project (p-4306) Hastings, Minnesota
final report

2. Commerce and employment Seafisheries section Statistical report 2009

3. Kastelein[a], , van der Heul[a],. Verboom[b] Jennings[c], der Veen[d] and de Haan[e] 2008, Startle response of captive North Sea fish species to underwater tones between 0.1 and 64 kHz Marine env research Pages 369-37

4 .Brown & Pawson 2006, Bass tagging on the Boue Blondel, Guernsey: Progress report. Cefas, Lowestoft, England.

5.Pawson M.G. 1995 Biogeographic Identification Of English Channel Fish And Shellfish Stocks. Fisheries Research Technical Report no 99.

6. BERR Department for business enterprise and regulatory reform 2008 Fishing liaison with Offshore wind and wet renewable group (FLOWW) recommendations for fisheries liaison. Best practice guidance for offshore renewable developers.