South West of England Regional Development Agency

Wave Hub
Appendix J to the Environmental Statement

June 2006

Halcrow

South West *of* England
Regional Development Agency

WAVE HUB DEVELOPMENT EIA

COMMERCIAL FISHERIES STUDY

FINAL REPORT

May 2006

Prepared for EMU Ltd by

Martin Esseen,
19, St. Patrick's Road,
Wicklow Town,
Co. Wicklow,
Ireland.

Tel / Fax +353 404 62713

Email: martinfish@eircom.net

Wave Hub Development EIA: Commercial Fisheries Study

Final Report
May 2006

Report No. 05/J/1/06/0782/0539

Client:
Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Emu Ltd
Head Office
1, Mill Court
The Sawmills
Durley
Southampton
Hampshire SO32 2EJ
Tel : 01489 860050
Fax : 01489 860051
www.emulimited.com
email : mail@emulimited.com

ACRONYMS AND ABBREVIATIONS USED IN THIS DOCUMENT

CEFAS	Centre for Environment, Fisheries and Aquaculture Science
CFP	Common Fisheries Policy of the European Union
CSFD	Cornwall Sea Fisheries District
DEFRA	Department for Environment, Food and Rural Affairs (ex MAFF)
EA	Environment Agency
EIA	Environmental Impact Assessment
ES	Environmental Statement
EU	European Union
ICES	International Council for the Exploration of the Sea
MCA	Maritime and Coastguard Agency
mt	Metric tonne
TAC	Total Allowable Catch

ACKNOWLEDGEMENTS

Sincere thanks are due to everybody who gave freely of their time and knowledge to assist in this study and in the production of this document.

The use of the word “fisherman” in this document does not denote a gender bias but reflects common usage throughout the industry.

CONTENTS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

EXECUTIVE SUMMARY

Introduction

An area off the north Cornwall coast has been identified as the preferred location for the development of the Wave Hub. The Wave Hub is intended to provide Wave Energy Converter (WEC) developers with a facility where WEC devices can be tested and improved over a number of years. WEC developers would be encouraged to connect their devices to the Wave Hub for a limited duration and then remove them from the site to enable other devices to be connected. The required time duration is not known at this stage but should become clearer during the development process and from discussions within the industry. The design life for the Wave Hub is planned for 25 years.

The Wave Hub proposal itself is for one termination and distribution unit (TDU) and for up to four power connection units (PCUs) to be located on the sea bed in approximately 50 metres of water, to which WECs, or interconnected arrays of WECs, will be connected. The TDU, PCUs, WECs, WEC moorings and anchors, and all inter-connecting cables will be spread across the sea bed within a 4km x 2km Deployment Area.

Electricity generated at the site will be transmitted from the termination and distribution unit via a 28km long sub-sea high voltage cable to land and via onshore underground cable to a proposed onshore substation adjacent to the existing Hayle substation. The onshore substation will in turn be connected by underground cable to the 33kv bulk electricity system of Western Power Distribution (WPD).

All WECs would be floating or semi-submersible, connected to the Wave Hub by cable and moored on the seabed. The main types of device will be oscillating water column devices (partially submerged), buoyant moored devices (floating on or just below the surface of the sea), or hinged contour devices (floating on the surface of the sea).

WEC units may take a number of forms, with varying outputs, operating ranges, numbers in an array and spacing. Different device developers will each be able to connect either large scale devices or arrays of devices to a PCU (a PCU Array) at any one time. Developers would be able to build up the number of WECs in a PCU array and to replace WECs with larger scale devices. The Wave Hub will have a maximum output of 20MW. Given that there will be four PCUs, the maximum output per WEC developer will be 5MW.

Assuming that construction of the Wave Hub begins in 2007, it is expected that the first connection phase for three devices developers will be in 2008, with further connection phases by other device developers, either additional to or in substitution for, earlier devices in subsequent years.

In summary, the Wave Hub development comprises the following main components:

- A maximum generating capacity of 5MW per PCU array.
- Up to four PCUs.
- The associated interconnecting cable array.
- A termination and distribution unit (TDU) of maximum capacity of 20MW, with four connection points.
- The undersea cable to shore.
- The onshore cables.
- The onshore electricity substation, car park and access road together with associated works.

A number of consents are required in order to construct the proposed Wave Hub, and an Environmental Statement will accompany the various consent applications.

Need for Commercial Fisheries Study

This study has been prepared in support of the Environmental Impact Assessment (EIA) process being undertaken for the proposed Wave Hub Development. The Environmental Scoping Report (Halcrow, 2004) that was prepared as part of the EIA process identified the fact that commercial fishing activity takes place throughout the study area all year round. The proposed development has the potential to result in a number of impacts on this activity; in particular, there is a legal requirement for the establishment of 'safety zones' of up to 500m around the WECs within which fishing and other activities are likely to be prohibited. In addition, the deployment area will be designated as an Area to be Avoided (ATBA). As a consequence, a negative impact is predicted on those fishermen whose current fishing grounds exist in the area that will be affected by the safety zones and ATBA.

In order to assist the EIA process, Emu Ltd was commissioned by Halcrow Group Ltd to undertake a commercial fisheries study to provide a detailed understanding of commercial fisheries within the study area.

Information on commercial fishing activity in the study area was collated from a number of different sources, comprising the following sources:

- DEFRA fisheries surveillance data;
- Consultations with the local fishing industry;
- Site visits;
- Analysis of DEFRA landings data;
- Academic studies, previous fisheries reports, EIAs and other sources were studied;
- The internet.

In summary, the objective of this study is defined as follows:

"To carry out a study of commercial fishing activity within the defined study area that will enable an assessment of potential impacts of the proposed development on commercial fisheries to be carried out as part of the EIA"

Conclusions from DEFRA Surveillance Data

Fisheries surveillance data was obtained for the relevant sub-square of the relevant ICES rectangle (29E4 – Sub-Square 1) for the period 2000-2005 (although 2004 is the last complete year for which data is available). From these data, the following key observations were made.

- There is no significant trend in activity over the past 5 years;
- Fishing activity is highest in February and March during the sole fishery and lowest in November and December;
- U.K. vessels (47%) and French vessels (43%) account for the majority of sightings of active vessels;
- The great majority of French vessels are otter trawlers. Almost all of these fish outside the 12 mile limit;
- All the Belgian vessels are beam trawlers. Most sightings of these are outside the 12 mile limit;

- U.K. vessels use a number of different fishing methods in the area, including beam and otter trawling, potting and gill netting. Activity is spread across the whole of ICES rectangle 29E4, Sub-Square 1;
- Beam trawling activity is highest in February and March;
- Otter trawling activity is highest in January and February;
- Potting activity is highest in August and September;
- Gill netting activity is highest from June to October;
- Most of the otter trawling takes place outside of the 12 mile limit and will not be affected by the deployment area or any wider safety zones;
- Much of the beam trawling takes place outside of the 12 mile limit and will not be affected by the deployment area or any wider safety zones. However, some vessels are allowed to work inside the 12 mile limit and will be affected;
- Much of the potting takes place close to the deployment area and any wider safety zones and may be directly affected by the proposed development; and
- Gill netting will be little affected by the deployment area or any wider safety zones but will be impacted on by the construction of the site to shore cable.

Conclusions from Consultation with the Local Fishing Industry

Consultations were held with the fishing industry in and around Hayle and Newlyn during August 2005. The aim was to gain more site-specific and detailed information than could be gleaned from official data sources and to canvass opinion on potential problems that the industry might have with the proposed scheme and the possible mitigations of these problems.

It should be noted that this consultation with local fishermen took place in August 2005, when many details of the proposed scheme were not fully known by many fishermen.

Persons consulted included DEFRA officials, members of the Cornwall Sea Fisheries Committee, Cornwall Fish Producers Association, vessel owners and skippers of some of the vessels likely to be affected.

Based on this consultation exercise, the following key observations were made:

- Key species targeted in the wider study area include spider crab, edible (brown) crab, lobster, mackerel and sole;
- Other species of some seasonal importance include monkfish, bass, pollack, rays, plaice, cod, john dory, squid, turbot, herring and sprat;
- The fishery can be broadly divided into three main areas; (1) the inshore grounds, (2) the middle grounds and (3) the offshore fishery;
- A few larger beam trawlers target the sole fishery in the offshore grounds between February and April each year;
- Potting for brown crab begins in earnest in May with the season lasting through until November. Some local vessels fish a lot of their gear in and around the proposed Wave Hub site;
- The summer spider crab fishery is a key component of the local fishery; this species is targeted in the inshore and middle grounds by pots and nets;
- Lobster is also targeted by many vessels working the middle and offshore grounds;
- The other key fishery in this area is the summer mackerel hand-line fishery which has achieved Marine Stewardship Council accreditation as a sustainable fishery.

Structure of the Local Fishing Fleet

Hayle: There are approximately 40 registered vessels of which around 10 are considered to be full time boats. Of these around four are full time fishing for mackerel, one fishes using an otter trawl and the remainder mostly deploy pots. Many vessels will switch between different fisheries at different times of the year.

St. Ives: It is reported that two vessels are potting full time from St. Ives and between 30 and 40 vessels handline for mackerel during the season. Some of the mackerel boats are reported to be based in Newlyn for the winter fishery.

Portreath: One large full time potter is reported to fish from Portreath alongside a number of smaller, mostly part-time boats.

Newlyn: Newlyn is a large port with a fleet of hundreds of vessels. It is not possible to state how many of these vessels fish within the study area at some time of the year, although it is likely that many fish in this area at least once each year. However, only a small number of vessels are reported to have any degree of dependence on this area. Most of the beam trawlers are too large to legally fish inside the study area, while many of the larger netters and trawlers will travel to deeper water and richer fishing grounds.

Based on discussions with local fishermen, it is estimated that there are approximately 85 inshore fishermen who fish in the immediate study area. This is a rough estimate and the actual number of fishermen who fish in the study area may vary widely throughout the year. Numbers working on larger, non-local vessels offshore cannot be estimated. It is also a generally accepted figure that each job at sea supports five jobs ashore in ancillary industries such as boat building, fish marketing and processing, engine repair, gear manufacture etc.

Review of DEFRA Landing Statistics

Landings data from 29E4 for the period 2000 to 2004 was assessed in detail to identify the key trends in commercial fishing activity in the wider study area. The following key observations were made:

- Landings from 29E4 peaked in February /March. The peaks in February and March are mostly due to high earnings from the beam trawl fishery, mainly landing sole;
- Over 50% of fish caught in 29E4 were landed at Newlyn with the next most important ports being Brixham, Plymouth and Milford Haven;
- Beam trawling accounts for over 50% of the value of landings made from 29E4 over the reporting period. Potting was the second most important gear type in terms of landings, representing 17% of all landings;
- U.K. registered vessels of >10m in length were responsible for 75% of landings from 29E4;
- Unknown quantities of fish are landed by <10m vessels which are not recorded and do not show up in this data. Additionally, foreign vessels landing into non-U.K. ports make landings declarations to the country in which they land, irrespective of the fact that some of their fish may have been caught in U.K. waters. Belgian, French and Irish vessels all have access rights and quotas for some species in this area and some landings will be made into these countries;
- The most valuable species in terms of landings were sole, edible crabs, monkfish, mackerel, lemon sole and lobsters;

Table i summarises information on the key commercial species landed from 29E4.

Rank	Species	% of total value of landings from 29E4	Main months of fishery	Landings since 2000	Main gear type and vessel	Main port of landing
1	Dover Sole	27%	Feb-March	Increase from 2000 to a peak in 2002 of just over £1 million and then a decline to 2004.	>95% landed by beam trawlers.	Newlyn
2	Edible Crab	9%	May-Oct	Marked decline from landings of nearly £0.5 million in 2000 to around a third of this value by 2003, followed by a slight rise in 2004.	>97% by pots.	Newlyn
3	Monkfish	8%	Feb-March	Peak landings of this species in 2001 and 2002, declining to a low in 2004.	83% landed by beam trawlers.	Newlyn
4	Mackerel	8%	May-Sept with a peak in Nov	Dramatic decline from a peak in 2000 to a tenth of that value in 2003.	94% by handline.	Newlyn and St. Ives
5	Lemon Sole	6%	Feb-March	Quite steady, slight dip in 2004.	90% by beam trawlers.	Newlyn
6	Lobster	5%	Apr-Sept	Steady apart from a poor year in 2003.	87% by pots.	Newlyn

Table i Summary of main commercial species landed from 29E4, 2000 to 2004

The Hayle Fishery

- The value of recorded landings into Hayle from rectangle 29E4 has peaked in 2001 and declined to around one third of that value by 2004;
- The great majority of landings (over 70%) are made between May and September;
- Pots account for over half of the value of landings whilst over a quarter are taken by otter trawls;
- Vessels of >10m take around 55% of the value of landings in Hayle while the remainder is taken by the <10m sector. No records of landings by foreign vessels are seen;
- The fishery from Hayle broadly divides into two sectors; >10m vessels using pots and <10m vessels trawling. This distinction is not absolute;
- Trawling takes place all year round, but the main potting season is during the summer months;
- Crustaceans (lobsters, edible crabs and spider crabs) form the bulk (65%) of the value of landings into Hayle from 29E4.

The St. Ives Fishery

Although St Ives would not be directly impacted by the construction of the proposed Wave Hub and associated cables and onshore works, it is in fact closer to the offshore exclusion zone than is Hayle. Consequently, the pattern of fisheries from St. Ives has also been analysed.

- Annual landings from 29E4 into St. Ives have shown a decline from a peak of nearly £350,000 in 2000 to landings of around 5% of this value by 2003. A slight recovery is seen in 2004;
- In terms of seasonality, there is a clear peak of landings into St. Ives from June to September inclusive. This reflects the summer mackerel hand-line fishery that exists in this area during these months;
- The fishery is dominated over recent years by hand-lining, with potting as a secondary activity. Vessel analysis indicates that over 85% of landings into St. Ives from 29E4 are also made by the <10m sector. No foreign vessels were recorded as landing at St Ives;
- Analysis by species shows a clear dominance of mackerel, accounting for over 80% of the value of landings. Crustacean species account for nearly all of the remainder, apart from a small catch of pollack in the early part of the year.

Detailed analysis of the St. Ives and Hayle fisheries has been undertaken as vessels from these ports are the ones most likely to be most significantly affected by any restrictions on fishing activity from the Wave Hub development. Whilst vessels from others ports, such as Newlyn, will also be affected, the area of sea in question will represent a much smaller proportion of their fishing grounds compared to vessels from these two local ports.

Perceived effects on commercial fisheries from the proposed Wave Hub development

From the review of all the available data on commercial fisheries and consultation with the local industry it is clear that the area within which the study area is located supports a productive, well-established and diverse commercial fishery. The proposed Wave Hub project has the potential to result in adverse effects on the fisheries in this area. In order to try and assess any potential effects in more detail, all the representatives of the fishing industry consulted in August 2005 were questioned about what they felt would be the main source of disruption to commercial fishing activity should the development proceed.

While the general opinion was that such a scheme is desirable in theory, concern was expressed about the potential losses to fishing as a result of the scheme, and the possibility that, if successful, similar schemes could be proposed elsewhere along the north Cornwall coast.

The elements of the proposed scheme over which concern was expressed divide into four key categories:

1. Construction of the Wave Hub;
2. Cable laying operations;
3. Exclusion of fishing from the Wave Hub deployment area;
4. Future problems with the site to shore cable (operational phase) (e.g. interference with fishing gear).

It should be noted that the *perceived* effects discussed below were those highlighted through consultation with local fishermen in August 2005, when some details of the proposed scheme were not fully developed and/or have been subject to change, and could not be explained to the fishermen. Following the description of each of the perceived effects raised by local fishermen, this report provides a description of the predicted *actual* effects, based upon the findings of the EIA process.

Perceived effects from construction of the Wave Hub

Construction phase of the Wave Hub may involve an increase in the amount of marine traffic in the area that may cause problems for both trawlers (having to avoid other vessels, particularly if barges are being towed) and to static gear vessels (loss of buoys and ropes, interference during hauling).

Additionally, other through traffic, notably large car transporters and container ships en route from the Scilly Island Traffic Separation Scheme heading northeast for the Bristol Channel, often pass through this area; these will have to divert around the zone and may cause safety problems for fishing vessels.

Likely actual effects from construction of the Wave Hub

The construction works for the Wave Hub will involve a number of activities which will increase vessel movements. For the Wave Hub's offshore infrastructure, the TDU, PCUs, inter-connectors and the sub-sea cable will be manufactured off site and transported to the deployment area and be installed from a cable laying vessel. There will be no need to build a landing stage or any temporary structure fixed to or mounted on the seabed. Similarly, the WEC devices and their anchors and moorings will be manufactured off site and transported to the deployment area. Prior to the deployment of the WEC devices, work vessels will be required to install anchors to which to which mooring chains will be attached. Additional vessels will transport the WEC devices to the deployment area. The WECs will then be attached to their moorings.

The overall duration of the offshore works (discussed in Section 7.5) is predicted to last for a period of 55 days, although work at sea would not be continuous during this period and discrete items of works would take a much shorter duration of time. For example, installation of the Wave Hub's TDU, PCU, inter-connectors and cable, including inspection, will take 20 days, with the potential for an additional 7 days of downtime due to adverse weather and sea conditions. In addition, there will be installation of the WEC devices, which will increase the number of days when vessels will be working at sea. Consequently, there will be an increase in the amount of marine traffic during construction works. The working arrangements will be notified via Notices to Mariners.

The area of the offshore construction works will be denoted as an 'Area to Be Avoided' (ATBA) for the duration of the construction works for safety reasons, and this will be notified through a Notice to Mariners. Consequently, there will be a need to avoid the area of the construction works for a limited period of time, with this area being clearly defined and notified as described above.

In addition, construction vessels will have to be avoided when travelling to and from the construction site, although only a very limited number of vessels will be needed for the construction works. This will also be notified via the Notice to Mariners.

It is anticipated that the deployment area will be denoted as an area to be avoided (ATBA), however, it is not known whether this recommendatory routeing measure to aid safe navigation will be in place in time for construction works. Accordingly, for the purposes of this assessment, it is assumed that the ATBA will not be in place.

In addition, the potential for the proposed Wave Hub to impact on the path of other commercial vessels has been dealt with through the repositioning of the proposed deployment area from commercial shipping lanes. As a consequence, commercial vessels will not have to deviate paths when approaching the Bristol Channel and, therefore, the proposed scheme will not give rise to an increased risk of conflict between fishing vessels and commercial shipping.

A similar scale of activity is likely to occur when Wave Hub is decommissioned. At this time there will be works to remove the offshore infrastructure, cables, WEC devices, moorings, anchors, etc.

Perceived effects from the cable laying operation

Cable laying operations will cause disruption to fishing activities along the entire route of the cable from the offshore Wave Hub to the point where the cable comes ashore at Hayle. For the most part, this disruption will be minor, but disruption may increase the closer to shore it gets.

If it were to coincide with the peak of the spider crab fishery in May and June, there could be particular disruption to inshore fisheries. In contrast, there would be little impact on this fishery if the cable were laid after the end of September.

Likely actual effects from the cable laying operations

The cable laying will take a short duration of time, expected to be 20 days (including inspection and repositioning, if necessary), depending on weather and sea conditions which could add 7 days to the duration of the construction period in May to September, or add 15 days in October to April. Fishing activity will not be prevented in the vicinity of the cable route, but a Notice to Mariners will be issued in order that users of the inshore waters are aware of the works. Once the cable is laid on the sea bed, the entire cable route will be inspected and repositioned in localised areas if the cable is found to be suspended in the water between high points on the sea bed in order to ensure that 'bridging' of the cable between high points is kept to the absolute minimum.

The proposed works are likely to take place in late spring and early summer given that this period is likely to represent the best weather works for undertaking marine construction works. This timing could coincide with the peak of the spider crab fishery in May and June.

A similar scale of activity is likely to occur when Wave Hub is decommissioned. At this time there will be works to recover the cable from the seabed.

Perceived effects of exclusion from the Wave Hub deployment area

Fishermen's perceptions were that an area of approximately 8 km^2 may become a permanent exclusion zone for fishing vessels during the operational phase. The need for such a large area was questioned, and fears were raised as to the possibility that additional areas may be sought later if the current scheme is successful.

Displacement of vessels from the Wave Hub deployment area to other nearby areas may occur, increasing the fishing pressure on these grounds. If the closed area off Trevose Head is enforced again in 2006, then increased congestion may occur in the spring sole fishery.

Additionally, some parts of the proposed deployment area are effectively refuges, where static gear fishermen, particularly offshore potters, have established and defended their areas and can fish with little fear of having their gear damaged or destroyed by trawlers towing through it. If these grounds are lost it will prove impossible for these operations to establish elsewhere in heavily trawled areas.

In terms of more local (Hayle) fisheries, static gear operations (specifically pots and, to a lesser degree, tangle nets) will lose grounds and find it difficult or impossible to re-establish in the area.

Potting boats fishing the middle grounds (*i.e.* between the offshore deployment area and St. Ives Bay) have expressed fears that the offshore potters will be forced to work closer inshore and will compete for their grounds. Beam trawlers, being relatively maneuverable, will be able to work around the edges of the exclusion box, but will still lose large areas of traditional ground. Otter trawlers, who are often more constrained in their direction of towing due to the strong tides in the area, may have to take a wide sweep to avoid the area and may consequently lose a larger part of their fishing area.

Adjacent trawling grounds may become more heavily fished, and it may become increasingly difficult for static gear boats to find an area to fish. Other shipping may be forced to avoid the deployment area and may, therefore, have more of an impact on fishing operations.

Likely actual effects of exclusion from the Wave Hub deployment area

During the construction and operational stage of this development, it is anticipated that an area to be avoided (ATBA; i.e. a recommendatory routeing measure to aid safe navigation) will be declared for the deployment area. In addition, it is anticipated that navigation rights will be extinguished around the WEC devices and that safety zones will be declared up to a maximum of 500m around individual WECs and/or arrays of WECs including their lateral movement. Therefore, although no formal "fisheries exclusion zone" will be established, for the purposes of this assessment, a worst case scenario is assumed to comprise the combined effects of the ABTA, extinguished navigation rights and a maximum potential area of safety zones over the entire period of the Wave Hub's operation (25 years). Under the worst case scenario, it is assumed that the effect of the ABTA, even though it is a non-statutory measure, will be to prevent fishing from taking place in the deployment area (i.e. a sea area of 4km x 2km). The effect of the extinguished navigation rights should not extend beyond the deployment area since it relates directly to the WECs (and potentially their lateral movement), which will be positioned within the deployment area. However, it is possible that the safety zones could extend beyond the deployment area, adding to the total sea area effectively excluded from fishing.

The worst case scenario would be an additional 500m extension all around the deployment area, effectively creating a 3km by 5km (i.e. 15km^2) combined safety zone. However, this is unlikely to represent a realistic worst case scenario because of the technical requirements influencing the layout and performance of the WEC devices (e.g. maximum energy generation, wave shadow effects, timing of WEC device deployments, and mooring arrangements). More realistic scenarios can be calculated based on the areas required to accommodate the maximum extent of safety zones (i.e. 500m) around the example layouts of the WEC devices that form part of the consent application for the Wave Hub. These areas add up to a maximum of 1.4km^2 of safety zones outside the deployment area giving a total area of 9.4km^2. Nevertheless, for this assessment, the worst case scenario for an exclusion area preventing fishing activity is assumed to be 15km^2.

In summary, it is likely that the following effects may occur.

- A small number of vessels that fish static gear (specifically pots and, to a lesser degree, tangle nets) will potentially lose grounds and find it difficult to re-establish in the wider area (trawling activity outside 12nm and other established static gear fisheries within the 12nm limit).
- Larger potting vessels that are forced away from the deployment zone may move onto the middle grounds and compete for space with smaller boats that are already established in this area.
- Beam trawlers who regularly fish in this area in the period January to March, being relatively maneuverable, will be able to work around the edges of the deployment area, but may still lose areas of traditional ground in and around the proposed deployment area.
- Certain otter trawlers who regularly fish in this area in the period January to March and are often more constrained in their direction of towing due to the strong tides in the area may have to take a wide sweep to avoid the area and may consequently lose a larger part of their fishing area.
- Adjacent trawling grounds may become more heavily fished, and it will become increasingly difficult for static gear boats to find an area to fish.
- The reduced fishing pressure within the deployment area may produce a beneficial effect on local fish resources which may, in turn, lead to benefits to commercial fishing vessels in the wider area.

Decommissioning of the Wave Hub will include removal of the offshore infrastructure, cables, WEC devices, moorings, anchors, etc. In addition, the ABTA, extinguished navigation rights and safety zones will cease to operate so fishing should no longer be prevented by the operation of the Wave Hub.

Perceived effects of the site to shore cable (operational phase)

Problems may be caused by the cable running ashore from the Wave Hub to join with the National Grid at Hayle. For the most part this cable will be laid across a seabed that is mostly rock; consequently it will be difficult or impossible to bury them.

Serious concerns were expressed, particularly among the trawling and potting sectors, that the cable and an adjacent, parallel area would become an exclusion zone. This would probably be more of a loss to the industry than the Wave Hub deployment zone.

If the cable and an adjacent band of seabed were to become an exclusion area it would, in theory, alter the pattern of fishing in the study area as (a) trawlers would no longer be allowed to tow their gear across the line of the cable (in practice, as any exclusion to fishing would be difficult to enforce, it is likely that many of the otter trawlers would merely shorten their towing warps, increase engine speed and "fly" their gear over the cable. Beam trawlers may just tow over it regardless, if they perceive it as offering little or no threat to their gear), and (b) potters and tangle netters in theory would be excluded from shooting strings of pots or fleets of nets across the cable. Again, as they will often work their gear in the same direction as the tide, this would cause disruption to their fishing operations. As above, they may ignore the exclusion zone unless it is adequately policed.

An exposed cable would, apart from being at risk themselves to damage from fishing gear, might be responsible for the following problems:

- Snagging of trawl gear, particularly if the cable is suspended between two high points as is deemed likely in the draft project report (Halcrow, 2004); the trawl doors in particular would be liable to being trapped under the cable. Such snagging, particularly for beam trawlers, could lead to a serious risk of capsize;
- Pots would get snagged during hauling. With the strong tides in the area it is inevitable that the gear is sometimes dragged when being hauled; while this may lead only to the loss of one or a few pots, these are expensive pieces of equipment. There is also the additional risk of capsize or foundering particularly if a small vessel becomes fouled in poor weather;

Some concern was expressed about the as yet unknown effects that the electric currents carried by the cables might have on the behaviour or migration of fish. Some types of fish, particularly elasmobranchs, are known to be extremely sensitive to some types of electrical fields.

Likely actual effects from the site to shore cable (operational phase)

A 25km sub-sea cable will run between the Wave Hub's offshore and onshore infrastructure. The cable will indeed be laid on the seabed where rock is exposed at the surface or insufficient sediment is present to allow burial. This means that the cable will be laid on the seabed for most of its length offshore of St Ives Bay. The cable will be armoured by an outer layer/sheath of steel. It will not be armoured using rock. Inshore, in St Ives Bay where the sediments are predominantly sand, the cable will be buried up to 3m below the seabed.

Once installed, the cable will be subject to an underwater inspection to ensure that any spans between two high points are kept to an absolute minimum. If inspection identifies a span, the cable will be re-positioned to minimise or avoid spanning.

With regard to a potential exclusion zone, **the cable route will not become an exclusion zone of any form** except for where it lies within the boundaries of the proposed ABTA for the deployment area and safety zones around the WECs, which may extend approximately 500m along the seaward end of the cable. Therefore, fishing will be permitted over the majority of the length of the cable route. In areas where the cable is exposed on the seabed, many of the otter trawlers would merely shorten their towing warps, increase engine speed and "fly" their gear over the cable. Beam trawlers may just tow over it regardless, if they perceive it as offering little or no threat to their gear. If fishermen consider that the presence of the cable on the surface of the seabed represents a threat to their gear, then trawling is likely to be avoided over the cable route. The position of the cable will be clearly identified on charts and made known to fishermen and so it will be possible to avoid the cable. Nevertheless, this would represent an adverse effect on trawling activity, although it is noted that due to the rocky seabed in this area trawling is not a significant means of fishing.

The electro-magnetic effects of the cable will be assessed in detail as part of the EIA process and be reported in the Environmental Statement

Decommissioning of the Wave Hub will include removal of the cable and a return to the pre-existing conditions in terms of risk and damage to fishing gear.

Suggested mitigation during construction (based on consultation with fishing industry)

- Work on the offshore Wave Hub area should be avoided between January and April to avoid potential conflict with the sole fishery in the area at that time;
- Work close inshore, especially to bring the cable ashore at Hayle, should not coincide with the peak months of the inshore spider crab fishery (May, June, July and August);
- A wide ranging fisheries liaison system should be established;
- Wherever possible the cable should be buried. Where this is not possible it is vital that enough slack is left in the cable so that it closely follows the contour of the seabed and does not end up suspended between two high points; and
- A detailed post-construction survey (diver / ROV) is requested, and any parts of the cable that may cause hazards to fishing operations should be clearly identified and their locations made known to the industry.

Assessment of actual impacts following mitigation

It is predicted that work on the Wave Hub deployment area will indeed be avoided between January and April, mainly due to weather conditions at this time of year. This will result in an indirect mitigation measure to the sole fishery in this area. However, it is unlikely that work on the site to shore cable will be able to avoid the period May to August, therefore, a degree of disruption to commercial fishing activity will occur during the installation of this cable. This disruption will be minor though as it expected that the cable laying will only take up to 5 days, and at any one time, only a small part of the route will be unavailable for fishing (the area in which the cable laying barge is working).

Actual effects upon local commercial fishing activity will also be minimised through setting up a dedicated fisheries liaison post for the construction phase of the scheme. The role of this fisheries liaison officer (FLO) will be to disseminate information to the local fishing industry about any planned construction and to be at sea during the construction process in order to provide a link between the contractor and local fishermen. The exact scope and role of the FLO post should be developed through consultation with local fishermen and the developer. If the FLO role is carried out efficiently, then adverse effects upon local fishermen will be minimised.

Undertaking a detailed post-construction survey of the site to shore cable, using either diver of ROV, will also reduce any adverse effects on local fishing vessels. Following this survey, a report should be issued to local fishermen, via the FLO, so that all local skippers are made aware of any areas of the cable route that may represent a higher risk to certain fishing gears, than other parts.

In summary, if well thought out mitigation measures are implemented during the construction phase of the scheme, then any adverse effects upon local commercial fishing vessels are likely to be of a minor and temporary nature.

Conclusions

The area in which the Wave Hub development is proposed supports a diverse and well-established fishery. The actual Wave Hub location is in an area specifically fished by large beam trawlers in February –March, primarily targeting dover sole but also landing important by-catch species including monkfish and lemon sole.

The area in and around the Wave Hub site also supports a number of potting vessels, with at least one vessel fishing up to 90% of their gear in and around the proposed deployment area (*Source*: consultation with local fishermen, August 2005).

Further inshore, along the route of the proposed site to shore cable, an even more diverse fishery exists, comprised of large numbers of <10m vessels from Hayle and St. Ives. The summer spider crab fishery is a key part of the local fishery as is the mackerel handline fishery which has MSC accreditation as a sustainable fishery.

The main issues identified by local fishermen that may arise as a result of this development include temporary disruption during construction of the Wave Hub, temporary disruption during the cable laying operations, permanent disruption due to exclusion from the Wave Hub site and future problems with unburied cables. However, many of the issues raised in August 2005 were *perceived* effects and were raised without details of the proposed scheme being fully developed, in particular construction duration, methods and the process of implementing an ATBA and safety zones around future wave energy devices.

With increased knowledge of the exact scheme and proposed construction methodology, and with a commitment to implement certain mitigation measures, it is predicted that the proposed Wave Hub development will not result in any significant adverse impacts upon commercial fishermen during the construction phase and will only result in some displacement of fishing activity for a small number of fishing vessels that regularly fish within the area that will be covered by the Wave Hub deployment area and eventual WEC arrays. All potential impacts associated with the proposed scheme are fully described and assessed in the Environmental Statement.

Key to the successful development of this project will be continued dialogue and consultation with the local fishing industry **at all stages**. A good working relationship has now been established with some of the key individuals in the area through this study and the parallel fish ecology surveys currently being undertaken. It is essential that these relationships are developed further so that any future issues can be identified at an early stage and dealt with appropriately.

1.0 INTRODUCTION

1.1 Overview of Project

An area off the north Cornwall coast has been identified as the preferred location for the development of the Wave Hub. The Wave Hub is intended to provide Wave Energy Converters (WEC) developers with a facility where WECs can be tested and improved over a number of years. WECs would be encouraged to remain connected to the Wave Hub for a limited duration and then be removed from the site to enable other devices to be connected. The required time duration is not known at this stage but should become clearer during the development process and from discussions within the industry. The design life for the Wave Hub is planned for 25 years.

The Wave Hub proposal itself is for up to four power connection units (PCUs) to be located on the sea bed in approximately 50 metres of water, to which WECs, or interconnected arrays of WECs, will be connected. The PCUs will be spread across the sea bed within a 4km x 2km Deployment Area and each connected back to a termination and distribution unit.

Electricity generated at the site will be transmitted from the termination and distribution unit via a c.25km long sub-sea high voltage cable to land and via onshore underground cable to a proposed onshore substation adjacent to the existing Hayle substation. The onshore substation will in turn be connected by underground cable to the 33kv bulk electricity system of Western Power Distribution (WPD).

All WECs would be floating or semi-submersible, connected to the Wave Hub by cable and moored on the seabed. All WECs, their lateral movements, and their moorings will be within the 4km x 2km Deployment Area. The main types of device will be oscillating water columns (partially submerged), buoyant moored devices (floating on or just below the surface of the sea), or hinged contour devices (floating on the surface of the sea).

WEC units may take a number of forms, with varying outputs, operating ranges, numbers in an array, and spacing. Different device developers will each be able to connect either large scale devices or arrays of devices to a PCU at any one time. Developers would be able to build up the number of WECs in an array and to replace WECs with larger scale devices. The Wave Hub will have a maximum output of 20MW.

Assuming the Wave Hub becomes operational in 2008 it is expected that the first connection phase for three devices developers will be in 2008, with further connection phases by other device developers, either additional to or in substitution for, earlier devices in subsequent years.

A number of consents are required in order to construct the proposed Wave Hub, and the Environmental Statement accompanies the various consent applications. In summary, the Wave Hub development comprises the following main components:

- A maximum generating capacity of 5MW per PCU array.
- Up to four PCUs.
- The associated interconnecting cable array.
- A termination and distribution unit (TDU) of maximum capacity of 20MW, with four connection points.
- The undersea cable to shore.
- The onshore cables.
- The onshore electricity substation, car park and access road together with associated works.

The proposed Wave Hub site and site to shore cable route are shown in Figure 1.

1.2 Need for Site Specific Fisheries Activity Study

This study has been prepared in support of the Environmental Impact Assessment (EIA) for the proposed Wave Hub development. The Environmental Scoping Report (Halcrow, 2004) that was prepared as part of the EIA process identified the fact that commercial fishing activity takes place throughout the study area all year round. The proposed development has the potential to result in a number of impacts on this activity; in particular, there are proposals to establish an area to be avoided (ABTA) around the Deployment Area to aid safe navigation, to extinguish navigation rights around the WECs, and to establish 'safety zones' of up to 500m around the WECs; which could prevent fishing from taking place within a defined sea area. As a consequence, a negative impact is predicted on those fishermen whose current fishing grounds exist in the area that will be affected by measures to aid navigation and protect the Wave Hub and WECs.

Emu Ltd was commissioned by Halcrow Group Ltd to undertake a specific commercial fisheries study that would provide the detailed understanding of commercial fisheries in this area required for the project. This will allow an accurate prediction of the potential impacts on the commercial fishing industry to be made as part of the EIA. To assist with this study Emu Ltd sub-contracted Martin Esseen, an independent fisheries consultant, who has undertaken numerous such studies for Emu and who is himself an ex-commercial fishermen.

1.3 Overall Objective

The overall objective of this commercial fisheries study is:

"To carry out a study of commercial fishing activity within the defined study area that will enable an assessment of potential impacts of the proposed development on commercial fisheries to be carried out as part of the EIA"

1.4 Study Area

With respect to commercial fisheries, the study area is defined as follows:

"*The area in which the proposed Wave Hub infrastructure (PCU, TDU, interconnections and WEC's) are located along with the St Ives Bay area though which the proposed site to shore cable will be located"*

The study area is within ICES statistical rectangle 29E4 in sea area VIIf. For a further explanation of the ICES statistical rectangle system, see Appendix 1. The study area is situated within the U.K. 200 mile fishery limit, and is inside of the U.K. 12 mile limit. Consequently the area is open to fishing by vessels that have access rights to U.K. waters inside of 12 miles, and quota for the targeted species in area VIIf.

1.5 Deployment and Potential Safety Zones

Before assessing the distribution of commercial fishing activity in and around the study area, it is important to clarify the situation with regard to the establishment of an ABTA, extinguished navigation rights and safety zones in and around the Wave Hub's offshore Deployment Area. This understanding is vital to any subsequent assessment of potential disruption to commercial fishing activity. For example, the geographical position and area of the fixed 4km x 2km Deployment Area may not coincide with the geographical position and area of the safety zones around the WECs, which would mean that the total sea area effectively preventing fishing would be greater than 4km x 2km (i.e. 8km^2).

There is no intention to establish an ABTA, extinguish navigation rights, establish a safety zone nor establish any form of exclusion zone along the cable route.

Government information about safety zones with regard to the Energy Act 2004 is summarised in Appendix 6.

2.0 METHODOLOGY

2.1 Overview

Information on commercial fishing activity in the study area was collated from a range of sources, including official data produced by DEFRA and individual meetings with local fishermen at Hayle. The following sections provide a summary of the key data sources used in this study.

2.2 Analysis of DEFRA fisheries surveillance data

As part of their routine duties, DEFRA Sea Fisheries Inspectorate (SFI) collects sighting information of fishing activity from patrol aircraft flying over the area and from Royal Navy fisheries protection vessels. The data-set collected by this surveillance activity includes the following information for each vessel sighted:

- Nationality
- Type of fishing vessel (*i.e.* method of fishing)
- Date
- Time
- Latitude
- Longitude
- ICES Rectangle
- Sub-square (four per ICES rectangle)
- Activity (fishing, steaming, anchored etc.).

At best, these data can be considered to be a series of "snapshots" and can be used to suggest trends, to identify the nationalities of vessels involved in the area and to give an approximation of the levels of activity in and around the study area. However, there are well-documented limitations on the use of these data.

In particular, these data do not provide a complete picture as over flight data is intermittent and only occurs during the day, therefore night fishing is not recorded. Also, the route taken by the plane will also influence sightings of vessels. These data are also likely to under-represent under-10m vessels, as many do not have the required Port Letters and Numbers on their wheelhouse roofs for aerial recognition (indeed, many do not even have wheelhouses).

Therefore, over-flight data only provides a high level overview of commercial fishing activity within certain areas and does not fully represent the intensity and coverage of commercial fishing activity within an area. In particular, these data do not accurately reflect fishing activity in inshore waters, due to the large number of often part-time vessels, which are active close to the shore.

2.3 Consultations with the industry

Consultations were held with the fishing industry in August 2005. A survey, consisting of a series of port observations, meetings and interviews was carried out in order to collect data and assess the fisheries activity in and around the study area. The range of the study encompassed appropriate contacts along the coast in Hayle, St. Ives and Newlyn. Parties interviewed included the relevant offices of DEFRA, the Cornwall Sea Fisheries District (CSFD), fishermen's associations, vessel owners and individual skippers. A full list of persons consulted is given in Appendix 2.

2.4 Analysis of DEFRA landings data

Under the terms of the Common Fisheries Policy (CFP), commercial fishing vessels greater then 10m in length have to record data on their landings which can be viewed by anyone. Relevant landings data for the study area was acquired from DEFRA covering the ICES statistical block 29E4 and the five years from 2000 to 2004. These data give the value (and in most cases the weight) of fish and shellfish landed by port, gear type and species on a monthly basis. The relevance of the data is limited, particularly for assigning an economic value to the PES, for the following reasons:

- The data covers an area much larger than the primary study area of this project. Each ICES rectangle covers an area of 30 x 30 nautical miles (approximately 3,930 km^2), though in this case part of the square is land; the catch may have been taken from any part of the sea within this rectangle. The area of the deployment zone is approximately 8 km^2, or around 0.23% of the total area of 29E4;
- Vessels will often move in and out of different rectangles during the course of fishing operations; usually, the position where the gear is hauled is recorded in the logbook to signify the area where catches were taken;
- Full reporting of catches is not required for species for which there is no Total Allowable Catch (TAC);
- Vessels of less than 10m in registered length are not required to fill in logbooks or declare landings; and,
- An unknown quantity of fish caught in this area is not declared and never enters the official statistics. This may change in the future as, from 2005, there are new EU regulations regarding buying of fish.

However, the data is useful for showing seasonal variations in fishing patterns and to indicate longer term trends in the fishery. The methodology for the collection of DEFRA data is given in Appendix 3.

2.5 Other sources of information

Other sources of information and data, such as academic studies, previous fisheries reports, EIAs and other sources were studied. The internet was searched extensively for relevant information.

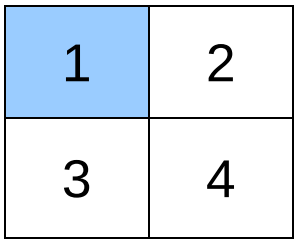
2.6 Coverage and accuracy

Given that many boats from different EU countries and from many ports around the U.K. operate at sometime inside the study area, it was not possible to conduct a totally comprehensive survey. The accuracy of the study can only be equal to that of the data supplied. It is assumed that all information that was given is accurate.

3.0 ANALYSIS OF SURVEILLANCE DATA

3.1 General

This analysis is based on surveillance data supplied by DEFRA and originates from both air patrol sightings and sightings by fisheries protection vessels in ICES statistical rectangle 29E4. For DEFRA surveillance activities, each ICES rectangle is divided into 4 sub-squares; the deployment zone and any potential safety zones are located in sub-square 1 (SS1).



The dataset for area 29E4 was filtered to remove sightings from the other three sub-squares, then filtered again to remove sightings of vessels not actively fishing (*i.e.* laid to or steaming through the area). The data for sub-square 1 were collected between 04/09/2000 and 21/08/2005. During this period 333 sightings of active fishing vessels were made. All sightings were made between 0741 and 2016, consequently, any vessels fishing during the hours of darkness will, inevitably, go unreported.

3.2 Data analysis

3.2.1 Annual distribution

The following numbers of sightings of active fishing vessels were made in each year during the study period.

Year	No. of sightings
2000 (Sept 4th onwards)	12
2001	49
2002	90
2003	70
2004	49
2005 (to Aug 21)	63

Table 1 Numbers of sightings of actively fishing vessels in 29E4 (SS1) (2000 to 2005)

No significant trend can be seen in this annual data.

3.2.2 Monthly distribution

In order to assess any seasonal trends in fishing activity within SS1, the aggregated sightings for each month between 2000 and 2005 are displayed below in Table 2. However, in order to remove any bias produced from variable patrol frequencies in each month, the sightings per patrol ratio are plotted graphically (Figure 2).

	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
Sightings	26	57	68	19	27	30	20	32	26	17	7	4
No. of Patrols	47	75	84	62	53	54	51	54	57	47	46	28
Sightings per patrol[1]	0.55	0.76	0.81	0.31	0.51	0.56	0.39	0.59	0.46	0.36	0.15	0.14

Table 2 Number of sightings of actively fishing vessels in 29E4 (SS1) made during each month (2000 to 2005).

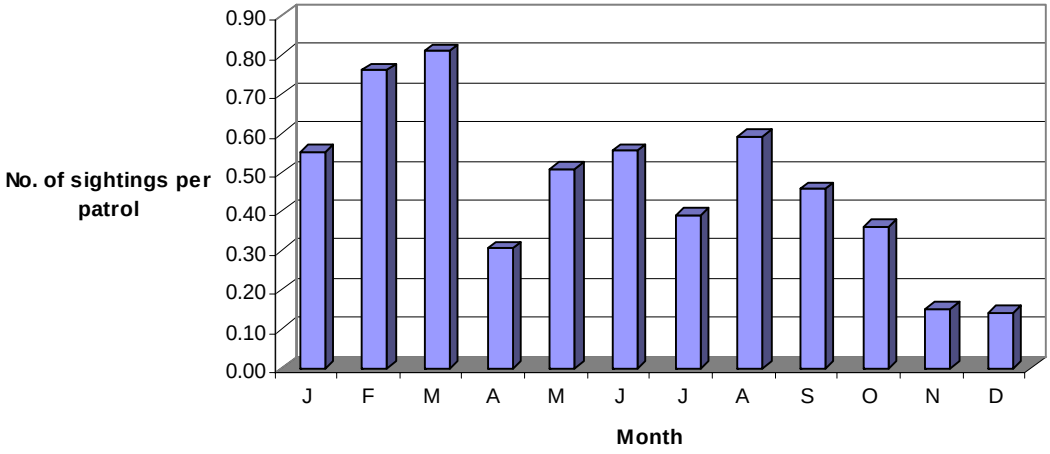


Figure 2 Active fishing sightings (per patrol) in 29E4 (SS1) per month, 2000 to 2005

Plotted graphically, the data show a peak of fishing activity in February and March, which is the season for the main sole fishery in the area. Activity drops away sharply in April and then rises again in the period May to August.

3.2.3 Distribution by nationality

From Table 3 it is clear to note that U.K. and French vessels make up the large majority of sightings in the area.

Nationality	No.	%
UK	155	47
France	142	43
Belgium	31	9
Unknown	2	1

Table 3 Nationalities of active vessels sighted in 29E4 (SS1) during the five year study period

[1] In order to remove the bias produced by more patrols taking place in certain months, the figure shows the number of sightings per patrol for each month.

3.2.4 Distribution by fishing method and nationality

Otter trawling is the most widely used method, and the large majority of fishing by this method is carried out by French vessels (Table 4). A small number of U.K. vessels are reported as otter trawling. Beam trawling is the second most widely used method, and here it is U.K. vessels which are the most often sighted, and Belgian vessels to a lesser extent. Potting is carried out mainly by U.K. vessels, with a few French potters having been sighted, while all gill netters sighted have been U.K. vessels (see Appendix 4 for details on various fishing methods used in this area).

Gear Type/ Nationality	Belgium	France	U.K.	Unknown	Total
Otter trawler	-	133	13	-	146
Beam trawler	31	1	72	2	106
Potter	-	8	53	-	61
Gill netter	-	-	17	-	17

Table 4 Fishing method[2] being used by active vessels of each nationality when sighted in 29E4 (SS1), 2000-2005

3.2.5 Seasonality of gear types

Table 5 indicates that beam trawling shows a clear peak of activity in February and March, which is the main season for the sole fishery in this area. Activity for the remainder of the year is very low.

Month	Beam trawl	Gill net	Pots	Otter trawl
January	4	-	1	21
February	31	3	-	23
March	54	2	1	11
April	5	-	5	9
May	3	-	8	16
June	3	2	4	18
July	2	2	6	10
August	2	3	14	13
September	1	2	12	11
October	-	2	8	7
November	1	-	1	5
December	-	1	1	2
Grand Total	**106**	**17**	**61**	**146**

Table 5 Total number of sightings by gear type and month for 29E4 (SS1), 2000-2005

The activity of otter trawlers is highest in January and February then remains at slightly lower levels through to the end of September; after this there is much less activity in the last 3 months of the year.

[2] For brief explanations of the major fishing methods mentioned in the text see Appendix 3.

Potting activity in 29E4 (SS1) shows a clear peak in August and September, coinciding with peak landings of lobster and brown crab from the area. It is only in the summer months that smaller boats can move their gear to offshore grounds and tend it regularly. June to October appears to be the period when the highest number of gill netters are working in 29E4 (SS1), though some winter activity is also seen.

3.2.6 Spatial distribution of all fishing activity

Figure 3 shows the distribution of all fishing activity (UK and foreign) observed during the 5 years of surveillance over area 29E4, in relation to the proposed deployment zone and potential safety zones plus the proposed site to shore cable route, which are also shown.

From this figure it is possible to note that fishing was recorded throughout the majority of 29E4 although there appeared to be a slightly greater frequency of sightings further offshore, beyond the Wave Hub deployment zone. This is likely to be due to the fact that both UK and non-UK vessels will fish offshore whilst only UK vessels are permitted to fish inshore.

3.2.7 Activity of U.K. vessels

The data-set was further screened to just display UK vessel fishing activity in 29E4 between 2000 and 2005. The output of this analysis is shown in Figure 4. This figure indicates a relatively high level of activity just to the south of the proposed deployment zone, including an area through which the proposed site to shore cable route is planned.

Although it appears from this figure that there is no fishing activity along certain parts of the proposed cable route, the limitations associated with these data make it likely that fishing does take place in these area but that it has not been recorded by the surveillance flights.

3.2.8 Activity of French vessels

Figure 5 illustrates sightings of French vessels actively fishing between 2000 and 2005. This figure indicates that the vast majority of French vessels fish outside of the 12 mile limit and will not, therefore, be affected by the development of the Wave Hub. However, some French vessels were recorded as actively fishing within the proposed deployment zone site and there also appeared to be a particularly high number of sightings due west (but outside) of this area.

3.2.9 Activity of Belgian vessels

All sightings of Belgian vessels actively fishing are shown on Figure 6. As with French activity, it appears that the majority of the activity of Belgian fishing vessels is outside of the 12 mile limit and well away from the proposed deployment zone, although some Belgian activity was noted within this area over the reporting period. The level of Belgian activity was also lower than French activity.

3.2.10 Distribution of trawling by nationality

Figures 7, 8 and 9 show trawling activity within 29E4 by UK, French and Belgian vessels respectively. With respect to trawling sightings, it should be remembered that while the trawler is moving for most of the time and may cover as much as 100km in a day of fishing, the aerial surveillance is a snapshot of position and activity; consequently, although there may be few records of trawling in the vicinity of the proposed deployment zone, this does not mean that it does not occur.

In terms of UK trawling activity, this is widespread throughout 29E4 although more sightings were recorded in offshore areas. There was also limited trawling (by larger >10m vessels) in inshore areas. This is probably due to the fact that inshore areas are fished extensively by smaller boats with static gear (pots and nets) and informal agreements may exist that keep large trawlers away from these areas.

French and Belgian trawling activity is concentrated in offshore areas, as would be expected. There is a noticeable concentration of sightings of French trawlers to the west of the proposed deployment zone. It is currently unknown why this concentration of effort occurs in this area.

3.2.11 Distribution of potting by nationality

The distribution of UK potting activity and French potting activity inside 29E4 are shown in Figures 10 and 11. These figures show that potting by UK vessels is far more prevalent than potting by French vessels and is generally concentrated closer inshore away from the areas subject to high trawling activity. This distribution of potting vessels is due to the low level of trawling activity inside of the 12 mile limit which reduces the risk of having expensive gear towed away by trawlers. Additionally, many of the potting vessels are relatively small and operate from local ports and as such will not be able to travel long distances to the fishing grounds.

With respect to UK potting around the proposed deployment zone and potential safety zones, there appears to be a concentration of potting just to the south of the site but none (by >10m vessels at least) in the northern part of the deployment zone.

3.2.12 Distribution of netting

Figure 12 shows the distribution of sightings of UK netting activity in 29E4 between 2000 and 2005. This shows that netting takes place to the immediate south east of the Wave Hub deployment zone and along the proposed site to shore cable route. No netting was recorded as taking place within the actual deployment zone.

3.3 Conclusions

Although the surveillance data gives snapshot of the true level of activity, it can be useful for determining the relative importance of different areas.

The following points can be deduced from the surveillance data for SS1 of rectangle 29E4:

- There is no significant trend in activity over the past 5 years.
- Fishing activity is highest in February and March during the sole fishery and lowest in November and December.
- U.K. vessels (47%) and French vessels (43%) account for the majority of sightings of active vessels.
- The great majority of French vessels are otter trawlers. Almost all of these fish outside the 12 mile limit.
- All the Belgian vessels are beam trawlers. Most sightings of these are outside the 12 mile limit.
- U.K. vessels use a number of different fishing methods in the area, including beam and otter trawling, potting and gill netting. Activity is spread across the whole of SS1.
- Beam trawling activity is highest in February and March.
- Otter trawling activity is highest in January and February.
- Potting activity is highest in August and September.
- Gill netting activity is highest from June to October.
- Most of the otter trawling takes place outside of the 12 mile limit and will not be affected by the proposed deployment and safety zones.
- Much of the beam trawling takes place outside of the 12 mile limit and will not be affected by the proposed deployment and safety zones. However, some vessels are allowed to work inside the 12 mile limit and may be affected.
- Much of the potting takes place close to the proposed deployment and safety zones, with some vessels regularly fishing within this area. These vessels may be directly affected by any restrictions on fishing implemented as part of this development.
- Gill netting will be little affected by the proposed deployment and safety zones but may be impacted on by the site to shore cable route construction.

4.0 CONSULTATIONS WITH THE INDUSTRY

4.1 Introduction

Consultations were held with the fishing industry in and around Hayle and Newlyn during August 2005. The aim was to gain more site-specific and detailed information than could be gleaned from official data sources and to canvass opinion on potential problems that the industry might have with the proposed scheme and the possible mitigations of these problems.

It should be noted that this consultation with local fishermen took place in August 2005, when many details of the proposed scheme were not fully known by many fishermen.

Persons consulted included DEFRA officials, members of the Cornwall Sea Fisheries Committee, Cornwall Fish Producers Association, vessel owners and, most importantly, skippers of some of the vessels likely to be affected. Given that many boats from different EU countries and other nations and from many ports around the U.K. operate at sometime inside the Wave Hub deployment zone, it was not possible to conduct a totally comprehensive survey. Some people were not available for consultation; some were contacted by telephone, while the information held by others is almost certainly covered by consultations already undertaken.

For the purposes of this part of the investigation, the study area is defined as those fishing grounds that may be affected directly or indirectly by the proposed development of the Wave Hub and the associated cable running ashore.

Information received from the industry is presented under the following headings:

- Main target species
- Seasonality of the fishery
- Main areas fished by different methods
- Approximate numbers of vessels by port
- Approximate numbers of fishermen by port
- Perceived disruption and losses from the Wave Hub project
- Suggested alternatives and mitigations
- Other information

4.2 Main target species

The main target species fished by vessels in the study area are reported as (not necessarily in order of importance):

- Spider crab
- Brown or Edible Crab
- Lobster
- Mackerel
- Sole

Other species of some seasonal importance include:

- Monkfish
- Bass
- Pollack
- Rays
- Plaice
- Cod
- John Dory
- Squid
- Turbot
- Herring
- Sprat

Official figures for landed value can be found in the section on analysis of official data, but, due to the incompleteness of the statistical regime, often bear little relation to figures of value or volume quoted during discussions with the industry.

4.3 Spatial distribution and seasonality of fisheries

The study area is divided into 3 main areas. These three areas are shown in Figure 13.

Inshore Grounds	Within St Ives Bay - the site to shore cable will pass through this area.
Middle Grounds	Outside of St Ives Bay as far as the southern-most edge of the proposed deployment area. The site to shore cable will pass through this area.
Offshore Grounds	The sea area including the proposed deployment area and any additional safety zones.

Table 6 describes the main fisheries and important species in each of the three areas described above by month as described during consultations with the industry; it is not exhaustive but highlights the major enterprises operating throughout the study area during the course of a year. The importance rating is as perceived by the author from discussions – it may be that for some individuals a particular activity is vital whereas the overall importance to the industry is lower; it is the lower figure that is quoted. Some details may appear to be in contradiction of the official DEFRA statistics; however, it must be remembered that the information presented here pertains to a very small area relative to the statistical rectangle used for the DEFRA purposes.

Those activities listed as 4 or 5 (High or Very High Importance) are listed in **bold**.

Month	Area	Fishery or species	Importance 1 = low 5 = v. high
January	Inshore	Otter trawlers targeting sole, plaice and ray. Some potting for lobster and brown crab. Mackerel handlining in some years	3 2 2
	Middle	Beam trawling mainly for sole by U.K. and Belgian boats working from Newlyn, Brixham, Padstow, Plymouth, Milford Haven and other ports. Mostly work on soft ground. French otter trawlers working on rough ground targeting a wide range of prime fish. Some potting for lobster and brown crab.	2 2 2
	Offshore	Beam trawling mainly for sole by U.K. and Belgian boats working from Newlyn, Brixham, Padstow, Plymouth, Milford Haven and other ports. French otter trawlers working on rough ground targeting a wide range of prime fish. Potting for brown crab and lobster.	3 2 2
February	Inshore	Some potting for lobster and brown crab. Mackerel handlining in some years	2 2
	Middle	Beam trawling mainly for sole by U.K. and Belgian boats working from Newlyn, Brixham, Padstow, Plymouth, Milford Haven and other ports. Mostly work on soft ground. French otter trawlers working on rough ground targeting a wide range of prime fish. Some potting for lobster and brown crab. Tangle netting for spider crab.	3 2 2 2
	Offshore	**Beam trawling mainly for sole by UK and Belgian boats working from Newlyn, Brixham, Padstow, Plymouth, Milford Haven and other ports. Mostly work on soft ground.** French otter trawlers working on rough ground targeting a wide range of prime fish. Some potting for lobster and brown crab.	**4** 2 3

Table 6 Key fisheries and important species in each area by month

Month	Area	Fishery or species	Importance 1 = low 5 = v. high
March	Inshore	Some potting for lobster and brown crab. Mackerel handlining in some years	3 2
	Middle	Beam trawling mainly for sole by U.K. and Belgian boats working from Newlyn, Brixham, Padstow, Plymouth, Milford Haven and other ports. Mostly work on soft ground. French otter trawlers working on rough ground targeting a wide range of prime fish. Some potting for lobster and brown crab. Tangle netting for spider crab.	3 2 3 3
	Offshore	**Beam trawling mainly for sole by U.K. and Belgian boats working from Newlyn, Brixham, Padstow, Plymouth, Milford Haven and other ports.** French otter trawlers working on rough ground targeting a wide range of prime fish. Potting for brown crab and lobster.	**4** 2 3
April	Inshore	Potting for lobster, spider crab and brown crab. Otter trawling for plaice, ray and sole. Some netting for sole. Tangle netting for spider crab.	3 3 1 3
	Middle	Beam trawling mainly for sole by U.K. and Belgian boats working from Newlyn, Brixham, Padstow, Plymouth, Milford Haven and other ports. Mostly work on soft ground. French otter trawlers working on rough ground targeting a wide range of prime fish. Potting for lobster and brown crab increases. Tangle netting for spider crab.	3 3 3 2
	Offshore	Beam trawling mainly for sole by U.K. and Belgian boats working from Newlyn, Brixham, Padstow, Plymouth, Milford Haven and other ports. French otter trawlers working on rough ground targeting a wide range of prime fish. Potting for brown crab and lobster	3 2 3

Table 6 (Cont'd)

Month	Area	Fishery or species	Importance 1 = low 5 = v. high
May	Inshore	**Potting for spider crab, lobster and brown crab.** **Tangle netting for spider crab**. Otter trawling for plaice, ray and sole. Mackerel handlining Some netting for sole.	**4** **4** 3 3 1
	Middle	**Potting for spider crab, lobster and brown crab.** **Tangle netting for spider crab.** French otter trawlers working on rough ground targeting a wide range of prime fish. Some mackerel handlining.	**4** **4** 3 2
	Offshore	French otter trawlers working on rough ground targeting a wide range of prime fish. **Potting for brown crab and lobster.** Some tangle netting by U.K. vessels	2 **4** 1
June	Inshore	Potting for spider crab, lobster and brown crab. Tangle netting for spider crab. Otter trawling for plaice and sole. Mackerel handlining	**5** **4** 2 5
	Middle	French otter trawlers working on rough ground targeting a wide range of prime fish. **Potting for brown crab and lobster.** Some mackerel handlining.	2 **4** 1
	Offshore	**Potting for brown crab and lobster.** French otter trawlers working on rough ground targeting a wide range of prime fish. Some tangle netting by U.K. vessels.	**5** 3 1

Table 6 (Cont'd)

Month	Area	Fishery or species	Importance 1 = low 5 = v. high
July	Inshore	**Potting for spider crab, lobster and brown crab.** Tangle netting for spider crab. Otter trawling for plaice and sole. Mackerel handlining	**5** 2 2 5
	Middle	French otter trawlers working on rough ground targeting a wide range of prime fish. **Potting for brown crab and lobster.** Local inshore boat otter trawling. Some mackerel handlining.	2 **5** 3 1
	Offshore	**Potting for brown crab and lobster.** French otter trawlers working on rough ground targeting a wide range of prime fish. Some tangle netting by U.K. vessels	**5** 3 1
August	Inshore	**Potting for spider crab, lobster and brown crab.** **Mackerel handlining.** Other small inshore fisheries	**5** **5** 2
	Middle	French otter trawlers working on rough ground targeting a wide range of prime fish. **Potting for brown crab and lobster.** Local inshore boat otter trawling. Some mackerel handlining.	2 **5** 3 1
	Offshore	**Potting for brown crab and lobster.** French otter trawlers working on rough ground targeting a wide range of prime fish. Some tangle netting by U.K. vessels.	**5** 3 1

Table 6 (Cont'd)

Month	Area	Fishery or species	Importance 1 = low 5 = v. high
September	Inshore	Otter trawling mainly for soles **Potting for spider crab, lobster and brown crab.** Mackerel handlining. Other small inshore fisheries	3 4 3 2
	Middle	French otter trawlers working on rough ground targeting a wide range of prime fish. Potting for brown crab and lobster.	2 3
	Offshore	French otter trawlers working on rough ground targeting a wide range of prime fish. Potting for brown crab and lobster. Some tangle netting by U.K. vessels.	3 3 1
October	Inshore	Potting for brown crab and lobster. Mackerel handlining. Otter trawling, mainly for soles.	3 2 3
	Middle	French otter trawlers working on rough ground targeting a wide range of prime fish. Potting for brown crab and lobster.	2 3
	Offshore	French otter trawlers working on rough ground targeting a wide range of prime fish. Potting for brown crab and lobster. Some tangle netting by U.K. vessels.	3 2 1

Table 6 (Cont'd)

Month	Area	Fishery or species	Importance 1 = low 5 = v. high
November	Inshore	Otter trawling mainly for soles Potting for brown crab and lobster. Netting for bass	3 2 1
	Middle	French otter trawlers working on rough ground targeting a wide range of prime fish. Potting for brown crab and lobster.	2 2
	Offshore	French otter trawlers working on rough ground targeting a wide range of prime fish. Potting for brown crab and lobster.	3 1
December	Inshore	Otter trawling mainly for soles Potting for brown crab and lobster. Netting for bass	3 1 1
	Middle	French otter trawlers working on rough ground targeting a wide range of prime fish.	1
	Offshore	French otter trawlers working on rough ground targeting a wide range of prime fish.	2

Table 6 (Cont'd)

Other minor fisheries reported during consultations include:

- Handlining for pollack on offshore wrecks and rough ground mostly from May to August;
- Small boat midwater trawling for herring and sprat in St Ives Bay from December to February;
- Bass handlining on inshore grounds;
- Bass netting in St. Ives Bay during winter months;
- Ring netting for pilchards;
- A fishery for black bream off St. Ives Head in September and October;
- Some cod landings between October and March;
- Velvet crabs caught as a bycatch from other potting operations;
- Gill net fishery for golden grey mullet.

The main periods for the major species are summarised in Table 7 below.

	Sole	Edible Crab	Spider Crab	Lobster	Mackerel
Jan					
Feb					
Mar					
Apr					
May					
Jun					
Jul					
Aug					
Sep					
Oct					
Nov					
Dec					

	Major importance
	Lesser importance

Table 7 Main fishing periods for key commercial species in study area

4.4 Main fisheries of the area

The following section provides more details on the key fisheries in the three main fishing areas outlined above; the inshore grounds, the middle grounds and the offshore grounds.

4.4.1 Inshore

The inshore grounds are defined as St. Ives Bay, inshore of a line from St. Ives Head to Godrevy Point. Although this is a relatively small area, it is important for a large number of small inshore boats. The area is sheltered from SW winds though long ground swells can cause problems on the bar at Hayle.

Cornwall Sea Fisheries District regulations restrict the size of vessels that can fish within this area and other regulations apply (see section on regulations in Appendix 5).

Mackerel

The majority of vessels fishing in this area spend much of their time handlining for mackerel. Approximately 30 – 40 small boats work from St. Ives during summer months with around a further 10 vessels from Hayle. It is difficult to put precise numbers on these vessels as many of them are working part time and many will go to other ports (e.g. Newlyn) at other times of the year. Some boats will work other types of fishing gear as and when resources become available (pots, tangle nets, gill nets). Most vessels are < 7m in length.

This is predominantly a summer mackerel fishery in St. Ives Bay, and is considered to be a different and discreet fishery to that between St. Ives Head and Gurnard's Head (SW along the coast) (Ghey, 2005) and to that based in Newlyn during the winter. In recent years good quantities of mackerel have been found in St. Ives Bay during the winter months and the fishery has extended into this period. The peak mackerel season is from June to September inclusive.

Mackerel boats from St. Ives tend to work over the high water, often working two tides per day. Catches may average around 120- 200 kg per boat per day at the peak of the season. The Hayle boats, of which around 4 or 5 are full time on mackerel and 4 or 5 part time, will tend to fish either over one high tide (leaving port on the flood tide and returning after high water) or will leave port on the last of the ebb and fish over low water, returning to port when there is enough water to cross the bar at Hayle. Landings from full time boats at Hayle are reported to be as high as 2 tonnes per boat per week at the height of the season, and most boats will fish around 5 days per week.

It was reported that in 2004 approximately 130 tonnes of mackerel was landed in Hayle for the human consumption market and a further 40 tonnes (of mainly small grades) were sold as bait to the potting fleet. Prices vary widely across the year, ranging from an average of around £0.50 per kilo in summer to as high as £2.50 in winter.

Official DEFRA statistics show landings of £5,547 into Hayle in 2004. If average prices in that year were say £1 per kilo and 170 tonnes in total was landed, this would produce a landed value of £170,000. This shows a considerable extent of non-reported fish, due either to it being reported as landed at Newlyn (as much is sold on the market at this port) or to it bypassing the reporting system altogether.

Potting

The majority of potting activity in the inshore zone is for lobster (*Homarus gammarus*) and spider crab (*Maia squinado*), with brown or edible crab (*Cancer pagurus*) being of lesser importance. Potting for lobsters occurs mostly in the summer months, with May to August being the prime months, while the fishery for spider crabs tends to peak earlier. There are approximately 10 potters based in Hayle, though not all are full time. Two vessels are reported as fishing full time out of St. Ives and one full time potter from Portreath sometimes fishes inside St. Ives Bay.

The spider crab fishery at Hayle is at times very much an inshore fishery, with catches being taken in shallow water right off the beaches. Hayle is one of the most important ports for spider crab in the U.K., with landings of up to 60 tonnes per week reported from April to August (though much of the crab is taken further offshore by tangle nets, particularly early on in the season). Most is exported in vivier trucks to France and Spain.

It is difficult to define the exact value of crustaceans landed from the potting fleet working the inshore grounds. Official DEFRA landing figures for the main crustacean species landed at Hayle over the five years from 2000 to 2004 are shown below in Table 8. However, these values are likely to be under-reported by a considerable factor because much of the landings will be made by <10m vessels that are not required to declare their landings.

	2000	2001	2002	2003	2004
Lobsters	£22,124	£43,453	£46,459	£28,880	£19,213
Edible crabs	£17,899	£35,983	£32,301	£32,602	£10,570
Spider crabs	£32,132	£14,528	£17,424	£14,608	£26,095

Table 8 DEFRA landings data for key crustacean species landed into Hayle, 2000-2004

Tangle netting

Tangle netting for spider crabs takes place mostly early in the year (February to April) in grounds further offshore, though some netting will take place in the inshore region. The nets are generally constructed of 0.1mm monofilament with a 12" (300 mm) mesh size and boats will fish up to 4000 yards (3,600 m) of net at any time.

CSFD regulations require nets in St. Ives Bay to be set in areas so there is at least 3 m of water over the headrope of the net at any stage of the tide. Additionally, the net fishery can be closed for 21 days with one working day's notice if the capture of seabirds in nets exceeds a predetermined level. This may be one reason why the pot fishery for spider crab is predominant in St. Ives Bay and more netting goes on outside of the bay.

Other species caught by tangle net will include ray, monkfish, edible crab and lobster.

Trawling

Only one otter trawler is reported to work frequently inside St. Ives Bay, working areas of sand and smooth ground in amongst the rough rocky areas. This boat will also work areas in the middle grounds at times and on patches of smoother ground to the south west of St. Ives Head.

Main target species are soles, plaice and ray, though most inshore commercial species will be taken at times. The large number of soft (*i.e.* recently moulted) spider crabs within the bay during July and August means that tows outside of the bay are more common during these months.

Charter angling

A few charter boats work out of St. Ives and one is reported to operate from Hayle though could not be contacted during the study. It is highly unlikely that they would suffer any serious impact from this development.

Minor fisheries

The following minor fisheries in the inshore grounds were reported during consultations:

- Small boat midwater trawling for herring and sprat in St Ives Bay from December to February;
- Bass handlining on inshore grounds;
- Ring netting for pilchards;
- A fishery for black bream off St. Ives Head in September and October;
- Velvet crabs caught as a bycatch from other potting operations;
- Gill net fishery for golden grey mullet.

Gill net fisheries (particularly for bass) are reported to have declined over recent years, possibly as a response to CSFD regulations on the use of nets and bycatches of seabirds.

4.4.2 Middle ground

For the purposes of this study the middle ground is defined as the area outside of St. Ives Bay seaward to the southernmost edge of the proposed deployment area, approximately 9 miles offshore. It is across this area that the greatest length of the cable from the wave hub will be laid. The seabed is predominantly hard rocky ground apart from a small patch of softer ground immediately to the south of the proposed site. Water depths increase from approximately 20m seaward to around 50m.

The U.K. 6 mile fishery limit runs through this area, precluding non-U.K. boats from fishing inside of it. U.K. registered beam trawlers with engines of less than 221 kw and with "historical rights" can fish inside the 6 mile limit up to the 3 mile limit. There are reported to be two such boats based in Newlyn. Outside of the 6 mile limit certain non–U.K. boats that have "historical rights" and sufficient quota are allowed to fish between the 6 and 12 mile limits. These are reported to be mostly Belgian beam trawlers and French otter trawlers, though French netters and potters were also mentioned briefly during discussions. However, the surveillance data suggests that there is little activity from French and Belgian vessels inside the 12 mile limit.

Beam Trawling

This area is of great importance to the beam trawler fleet at certain times of the year who fish here predominantly from January to March outside of the 6 mile limit. The beam trawlers often work small patches of softer ground between the rocky areas. They are much more maneuverable than otter trawlers and can, therefore, fish in tight areas. The main target species is sole, though significant quantities of other prime fish such as monkfish and lemon soles are also taken. Apart from the sole fishery at the start of the year, little beam trawling activity is reported from this area.

Belgian vessels predominate in this area, with between 20 and 30 vessels reported at any one time, although recent reports suggest that this number has declined significantly during 2005. Two vessels from Newlyn and 3 from Plymouth are reported to fish in the area, and the total number of U.K beamers that are of small enough engine capacity to work inside the 12 mile limit has reduced to around 20. Smaller Belgian beamers land in Padstow, while larger vessels steam to Milford Haven. The landings from these vessels will show up in DEFRA statistics as landings into U.K ports from foreign vessels. It is reported that some vessels will steam back to Belgium to land on some trips. Catches from these vessels will not be reported in U.K. statistics.

This area of middle ground has been of even greater importance recently due to the closure of grounds to the west of Trevose Head and some Irish Sea grounds as part of the "cod recovery plan", aimed at reducing fishing pressure on spawning cod. Two ICES statistical rectangles (30E4 and 30E5) were closed to all beam trawling for 3 months from February to April in early 2004, except for a one month derogation for Belgian trawlers in March. This caused a displacement of vessels onto grounds further south, *i.e.* onto the middle and offshore grounds of the study area. Following the December 2005 meeting of the EU Fisheries Council it was agreed that this closed area would remain in place in 2006 and in future years, but for only two months not three. Additionally, the spiraling cost of fuel means that grounds adjacent to Cornish ports (e.g. Newlyn, Padstow) have become increasingly important to local boats for making a profitable trip.

Otter trawling

A fleet of between 30 and 40 French otter trawlers are reported to fish areas of the middle ground throughout the year. They target high value species such as john dory in summer, and ray and cod at other times. These trawlers are reported to use light gear and to be able to skim their nets over the hard ground; thus much of the rocky area of the middle ground is accessible to them. Some larger U.K. registered otter trawlers mainly from Newlyn and Padstow are also reported to fish here.

French vessels land predominantly into ports along the coast of Brittany (Lorient, Roscoff, Concarneau) and consequently their catches will not be recorded in U.K. statistics. The seasonality of their catches cannot be determined from the DEFRA records, but it is likely that their landings follow similar patters to those of >10m U.K. vessels. Landings show a marked increase for the months of August to November inclusive. Squid, gurnard, john dory, ray and cod are the most valuable species that are seen in the U.K. landing statistics.

Potting

The middle ground is of primary importance for potters working out of Hayle, St. Ives and (to a lesser extent) Newlyn and occasionally to large migratory potters from other ports around the U.K. Approximately 8 potters from Hayle, 2 from St. Ives, 1 based in Newlyn and 1 from Portreath are reported to work regularly in the area, targeting primarily brown crab and lobster, though catches of spider crab are significant at some times of the year. Some vessels are reported to rarely fish outside of the 6 mile limit, thereby reducing the chances of losing gear to trawlers. Those who do work outside of the 6 mile limit are reported to have good relationships with trawlers, though gear losses sometimes occur. Much of the gear is moved ashore or to other areas before the start of the winter sole fishery.

October to December is reported to be the peak season for brown crab for potters from Hayle, though the Newlyn based vessel reports that gear is moved out of the area in September and brought back at the beginning of the year. This probably reflects a richer crab fishery in the English Channel which larger boats can exploit, but the smaller “local” boats cannot reach. Official statistics show May to November being peak months for landings into Hayle, with brown crab peaking from June to August and lobsters peaking from May to August. The main months for landings of spider crabs are May and June; many of these will be caught by potters working the middle grounds.

Landings into Hayle from potters shown in the official statistics suggest that around 90% of landings come from vessels of greater than 10m registered length. During the survey, it appeared that no potters of greater than 10m registered length were landing in Hayle; it is not clear where this discrepancy arises.

Tangle netting

Tangle netting, predominantly for spider crab, takes place across the middle grounds from around February to April, after which much of the crab has moved further inshore or is being caught in pots. The middle grounds are reported to be valuable as the crabs caught early in the season fetch high prices.

Mackerel

Whilst much of the mackerel from this area is caught inside St. Ives Bay, significant quantities are reported from the middle grounds, out to about 3 miles offshore. Fish have been caught out here during winter and spring months in recent years and are a valuable addition to the fishery.

Other minor fisheries
Handlining for pollack takes place on wrecks and rough ground in the area, with landings predominantly between May and August.

A small amount of netting for sole takes place on patches of soft ground.

4.4.3 Offshore grounds

For the purposes of this study the offshore grounds are defined as the area in which the proposed deployment area is located. This is an area between 9 and 11 nm offshore, to the east and north of the Bann shoal. Water depth is around 50 m and the seabed is predominantly a mixture of coarse sand, broken shell, gravel and rock.

Beam trawling
The area is fished by Belgian and U.K. beam trawlers (with engine power of less than 221 kw) early in the year, with the main target species being sole (see 3.2.1 above). The size and position of the proposed deployment area caused concern among beam trawler skippers consulted, and examination of their electronic chart systems (track plotters) showed that they commonly fish across this area.

Otter trawling
The (mostly) French and U.K. otter trawlers mentioned above in point 3.2.2 also fish the area where the wave hub is proposed all year round. These vessels tend to tow in a north-east or south west direction (i.e. up and down the tide) and will consequently experience considerable difficulties in maneuvering around the site.

Potting
The offshore area is used extensively by crab potting vessels, working from St. Ives, Newlyn and other ports around the coast. One vessel is reported to be currently working 900 pots (over 50% of its gear) in and around both the old and newly proposed Wave Hub deployment areas, while another is reported to be working 500 pots (25%). Crabbing goes on year round here, though during the early year there is less gear on the grounds due, presumably to the increase in beam trawler activity.

Tangle netting
Some activity by U.K. netters is reported in this area.

4.5 Approximate numbers of vessels by port

The preceding sections of the report summarise the key fishing areas within the wider study area. The following section provides specific details on the profile of the fishing fleets in the study area.

Port	Summary
Hayle	There are approximately 40 registered vessels of which around 10 are considered to be full time boats. Of these around four are full time on mackerel, one is trawling and the remainder are mostly potting. Many vessels will switch between different fisheries at different times of the year.
St. Ives	It is reported that two vessels are potting full time from St. Ives and between 30 and 40 vessels handline for mackerel during the season. Some of the mackerel boats are reported to be based in Newlyn for the winter fishery.
Portreath	One large full time potter is reported to fish from Portreath alongside a number of smaller, mostly part-time boats.
Newlyn	Newlyn is a large port with a fleet of hundreds of vessels. Of these many will fish inside the study area at some time of the year though only a small number are reported to have any degree of dependence. Most of the beam trawlers are too large to legally fish inside the study area, while many of the larger netters and trawlers will travel to deeper water and richer fishing grounds.

Table 9 Approximate numbers of vessels reported as fishing in the study area from local ports

4.6 Approximate numbers of fishermen by port

Based on the above number of boats it is possible to estimate the number of inshore fishermen working in the study area.

Type of vessel	Approx. no of boats	Average crew	Total
Mackerel boats	50	1	50
Small potters	12	1.5	18
Large potters	5	3	15
Trawler	1	2	2
Total	**68**		**85**

Table 10 Estimated numbers of inshore fishermen working in the study area

It must be emphasised that this is a rough estimate and the actual number of fishermen who work in the study area may vary widely throughout the year. Numbers working on larger, non-local vessels offshore cannot be estimated. It is a generally accepted figure that each job at sea supports five jobs ashore in ancillary industries such as boat building, fish marketing and processing, engine repair, gear manufacture etc.

Table 11 gives an overall picture of the number of fishermen in Cornwall in 1996 and 1999.

Port	1996	1999
Newlyn	444	438
Looe	113	108
Padstow	72	59
Falmouth	23	23
Cornwall total	1,221	1,148

Notes: This data includes those that fish part-time or on a seasonal basis but relates to commercial fisherman only.

Table 11 Number of Cornish fishermen, 1996 v 1999 (source Cornwall Sea Fisheries Committee)

5.0 ANALYSIS OF DEFRA LANDING STATISTICS

5.1 Introduction

In addition to a review of DEFRA fisheries surveillance data and interviews and consultation with representatives of the local fishing industry, landings data for the study area from the period 2000 to 2005 was also obtained and analysed in detail. These data enable a general picture of fishing in this area (29E4) to be built up and is useful to use as a cross-reference tool against comments made by local fishermen. The following data is available from this data-set.

- Year
- Month
- Category (<10m, >10m, Foreign)
- Species
- ICES rectangle where catch was made
- Gear type
- Port of Landing
- Live weight
- Value in £

Information is recorded by DEFRA on the following vessels:

- All U.K. registered vessels of >10m in registered length fishing in the ICES rectangle and landing into U.K. ports;
- All U.K. registered vessels of >10m in registered length fishing in the ICES rectangle and landing into non-U.K. ports;
- All non-U.K. vessels fishing in the ICES rectangle and landing into U.K. ports.

Data on non-U.K. vessels landing into non-U.K. ports is not collected by DEFRA even if the catch is taken within U.K. territorial waters; vessels of other nationalities which have the rights to fish in these waters will deliver relevant data to their own national authorities.

It must be emphasised that the data analysed here is not the full picture and that a proportion of the actual catch will go unreported, particularly from the <10 m sector. However, these data can be used to illustrate trends in landings, though it should be remembered that if trends in the <10m sector are significantly different to those in the >10m sector then these may not show up in the analysis. For the purposes of this study it is assumed the official data reflects what is happening in the fishery but may underestimate its total value. The collection system for all vessels >10m attempts a complete coverage of all main fishing activity. Assessments based on local knowledge are used to estimate uptake of some fishing activity by vessels <10 metres and for some shellfishing.

The methodology used by DEFRA to collect the statistics is given in Appendix 4.

The analysis will use the value of the catch as opposed to the weight. Value is often a more useful index of what is driving the fishery; as prices can vary widely across time, the volume landed often bears little relationship to the value. As it is financial returns which will determine which particular species or fishery is targeted by the fishermen, then prices are as likely to determine target species as is abundance, availability or regulation.

The data is used here first to give an overview of fisheries in rectangle 29E4; later in this section the landings into the ports of Hayle and St. Ives will be studied in greater depth to provide information on the fisheries closer to the study area.

5.2 Overview of fisheries in rectangle 29E4

5.2.1 Total annual landings

Table 12 shows the value of all fish caught in 29E4 over the period 2000 to 2004.

Year	Value (£)
2000	3,354,450
2001	3,640,004
2002	3,567,994
2003	2,604,594
2004	2,586,765

Table 12 Total landed value of fish caught in 29E4 (2000-2004)

No clear trend can be seen; value peaked in 2001 at just over £3.5 million and has declined to around £2.5 million in 2003 and 2004. Average annual value over the five year period is approximately £3.15 million.

5.2.2 Monthly landings

The aggregated value per month for the period 2000-2004 is shown below in Figure 14.

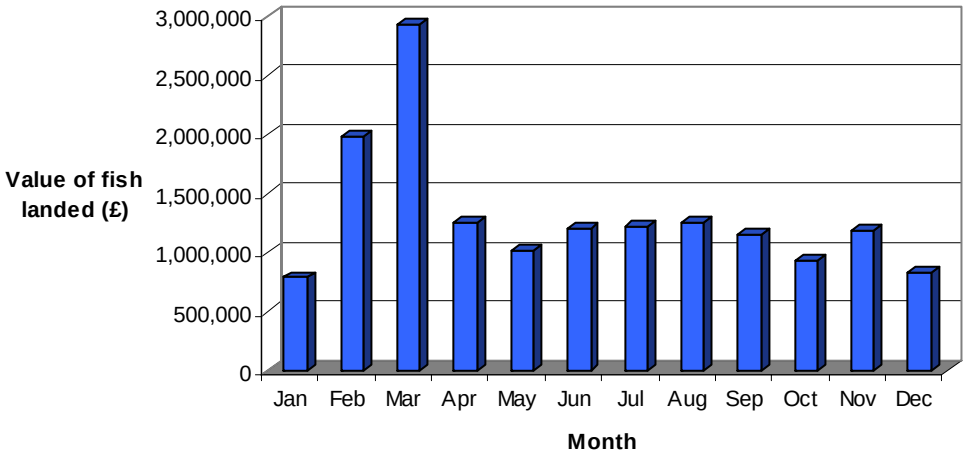


Figure 14 Aggregated monthly value of fish landed from 29E4 (2000-2004)

These data indicate that, between 2000 and 2004, there was a clear peak in value of landings in the February/March period. All other months are around the same value though December and January show the lowest values. The peaks in February and March are mostly due to high earnings from the beam trawl fishery, mainly landing sole (see later section).

5.2.3 Landings by port

Landings into 38 different ports are shown in the official data, including some into French and Dutch ports. The most significant ports over the period 2000 to 2004 are listed below in Table 13.

Port	Value (£)	%
Newlyn	8,285,072	52.59
Brixham	1,496,865	9.50
Plymouth	1,414,230	8.98
Milford Haven	1,096,344	6.96
Hayle	681,518	4.33
St Ives	594,822	3.78
Padstow	548,377	3.48
Newquay	421,713	2.68
Roscoff	244,505	1.55
Penzance	187,231	1.19
Falmouth	182,434	1.16
Portreath	156,876	1.00
Swansea	155,161	0.98

Table 13 Landings into key ports from 29E4 (2000-2004)

Table 13 indicates that over 50% of fish caught in 29E4 are landed at Newlyn with the next most important ports being Brixham, Plymouth and Milford Haven.

5.2.4 Landings by gear type and port

Thirteen different fishing gears are recorded in the statistics as landing fish within 29E4 during the period 2000 to 2005 (some are combined here for the sake of clarity, *e.g.* twin trawls have been included along with single trawls under the heading of otter trawls). The value of landings by gear type is shown below in Table 14 and Figure 15.

Gear Type	Value (£)	%
Beam trawl	8,369,142	53.1
Pots	2,637,003	16.7
Gill net	1,386,569	8.8
Handlines	1,210,742	7.7
Otter trawl	1,021,934	6.5
Tangle net	510,406	3.2
Dredge	423,281	2.7
Ring net	154,427	1.0
Purse seine	18,360	0.1
Longlines	16,363	0.1
Pair trawl	5,056	0.0
Midwater trawl	474	0.0
Drift net	49	0.0

Table 14 Proportion of landings by different gear types, 29E4 (2000-2004)

Table 14 indicates that beam trawling accounts for over 50% of the value of landings made from 29E4 over the reporting period, with potting making the second highest contribution to value of landings.

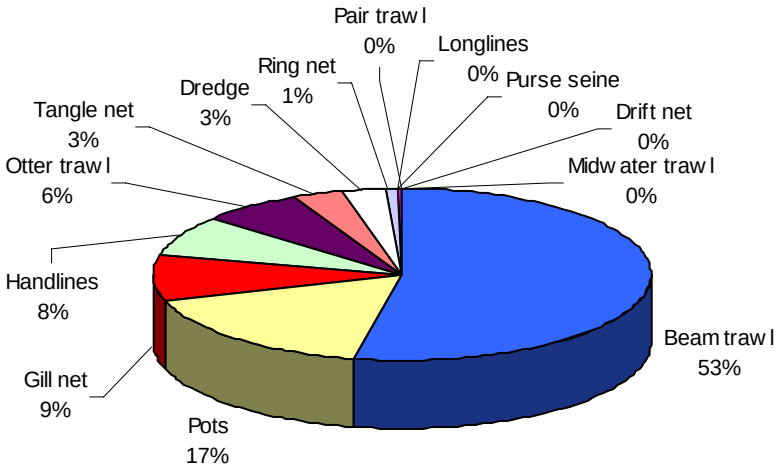


Figure 15 Proportion of total value of fish caught in 29E4 by different gear types

With respect to landings by different gear types into various ports, Table 15 (below) shows the official landings data for the reporting period.

Port of Landing	Beam trawl	Dredge	Gill net	Handlines	Otter trawl	Pots	Tangle net	Total
Newlyn	£3,698,376	£164,026	£1,131,947	£669,211	£674,999	£1,421,653	£340,129	£8,285,072
Brixham	£1,425,692	£67,538	-	-	£3,634	-	-	£1,496,865
Plymouth	£1,379,034	£23,789	-	-	£11,407	-	-	£1,414,230
Milford Haven	£1,034,635	-	-	-	£61,709	-	-	£1,096,344
Hayle	-	-	£57,291	£28,596	£190,478	£349,251	£52,279	£681,518
St Ives	-	-	£18,838	£486,558		£78,020	£11,355	£594,822
Padstow	£406,101	£646	£53,361		£54,060	£1,051	£33,159	£548,377
Newquay	-	-	£101,142	£2,444	-	£298,816	£19,311	£421,713
Roscoff	-	-	-	-	-	£244,505	-	£244,505
Penzance	£187,231	-	-	-	-	-	-	£187,231
Falmouth	£6,175	£166,910	£131	£1,838	£2,636	£3,857	£835	£182,434
Portreath	-	-	-	£170		£124,004	£32,702	£156,876
Swansea	£155,161	-	-	-	-	-	-	£155,161
Grand total	**£8,292,407**	**£422,908**	**£1,362,709**	**£1,188,816**	**£998,923**	**£2,521,158**	**£489,770**	**£15,465,148**

Table 15 Landings into each of the major ports from each of the major gear types (all landings in 29E4, 2000 to 2004)

Table 15 indicates that for Brixham, Plymouth and Milford Haven, over 95% of the landed value of fish from 29E4 is from beam trawlers, most likely targeting sole in the area during the traditional February-March fishery. These are large boats that travel long distances to exploit seasonal fisheries around the U.K. coast. Less than half of the value of landings into Newlyn is from beam trawlers – this is due to its proximity to the area, allowing a wide range of different fishing methods from both large and small vessels to be used. Nearly 75% of fish landed at Padstow is from beam trawlers, while all the fish landed into Penzance (adjacent to Newlyn) is from beam trawlers.

5.2.5 Landings by vessel category

Category	Value (£)	%
10m and Under vessels	2,571,546	16
Foreign vessels	1,375,428	9
Over 10m vessels	11,806,833	75

Table 16 Landings from different categories of vessels from 29E4 (2000-2004)

Table 16 shows very clearly that U.K. registered vessels of >10m in length were responsible for 75% of landings from 29E4 over the period 2000-2004. However, it must be remembered that unknown quantities of fish are landed by <10m vessels which are not recorded and do not show up in this data. Additionally, foreign vessels landing into non-U.K. ports make landings declarations to the country in which they land, irrespective of the fact that some of their fish may have been caught in U.K. waters. Belgian, French and Irish vessels all have access rights and quotas for some species in this area, and some landings will be made into these countries.

5.2.6 Landings by species

Area 29E4 shows a wide diversity of commercial fish species being caught, with over 70 species showing in the official data. The Top 20 ranked fish, in terms of the value of landings made over the 5 year period are shown below in Table 17.

Ranking	Species	Value (£)	%
1	Sole	4,192,392	26.61
2	Edible Crabs	1,411,403	8.96
3	Monkfish	1,263,252	8.02
4	Mackerel	1,193,639	7.58
5	Lemon Sole	891,993	5.66
6	Lobsters	835,971	5.31
7	Pollack	608,594	3.86
8	Scallops	551,068	3.50
9	Turbot	476,841	3.03
10	Megrim	471,667	2.99
11	Spider Crabs	440,721	2.80
12	Brill	403,806	2.56
13	Skates and Rays	357,752	2.27
14	Cod	329,434	2.09
15	Plaice	273,998	1.74
16	Bass	244,025	1.55
17	Crawfish	228,247	1.45
18	Squid	204,809	1.30
19	John Dory	168,689	1.07
20	Gurnard	160,007	1.02

Table 17 Landings (£) by species from 29E4, 2000-2004 – Top 20 species

Sole is clearly the most important commercial species, comprising over 25% of the value of declared landings from rectangle 29E4 between 2000 and 2004. Catches of the six major commercial species from the above list are analysed in more detail below:

5.2.6.1 Dover Sole

The Dover Sole (*Solea solea*) is a high-value flatfish that is found on soft sand and mud down to depths of around 130m (Wheeler, 1969). Spawning is from February to June, with a peak in April and May (Pawson, 1995) and takes place inshore near estuary mouths (CEFAS, 2001). As the fish spend much of the time buried in soft sediments, they are mainly caught by beam trawls which can dig deep into these sediments.

The fisheries for sole in the Celtic Sea and Bristol Channel involve vessels from Belgium as well as from countries bordering the area, with Belgium taking approximately 65%, the U.K. 23%, France 8% and Ireland 4% of the total landings of sole from ICES Divisions VIIf and g. Landings have declined steadily since the mid 1980s (CEFAS, 2001).

The annual landings of sole from rectangle 29E4 over the five year study period are shown below in Table 18 and Figure 16.

Year	2000	2001	2002	2003	2004
Value of Landings (£)	586,156	864,585	1,064,293	904,998	772,360

Table 18 Value of *Solea solea* landings from 29E4 (2000-2004)

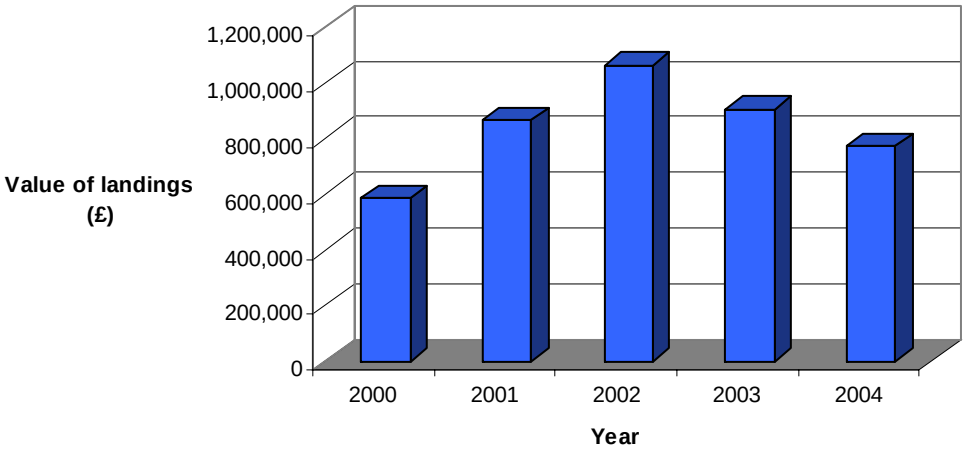


Figure 16 Value of *Solea solea* landings from 29E4 (2000-2004)

These data show that there was a rise from 2000 to a peak in 2002 of just over £1 million and then a decline to 2004. The total EU quotas for Area VIIf and g (2001-2004) are shown below in Table 19.

Year	Total quota	Belgium	France	Ireland	U.K.
2001	1112	686	78	30	318
2002	1070	648	67	35	319
2003	1240	729	78	39	350
2004	N/a	N/a	N/a	N/a	N/a

(Source, U.K. Fisheries Statistics, 2000, 2001, 2002, 2003. DEFRA website)

Table 19 EU quotas for ICES areas VIIf and g (combined)

This indicates that the peak catches do not coincide with the year of highest quota; however, the above quota covers an area much larger than rectangle 29E4 and catches can be taken anywhere within that area.

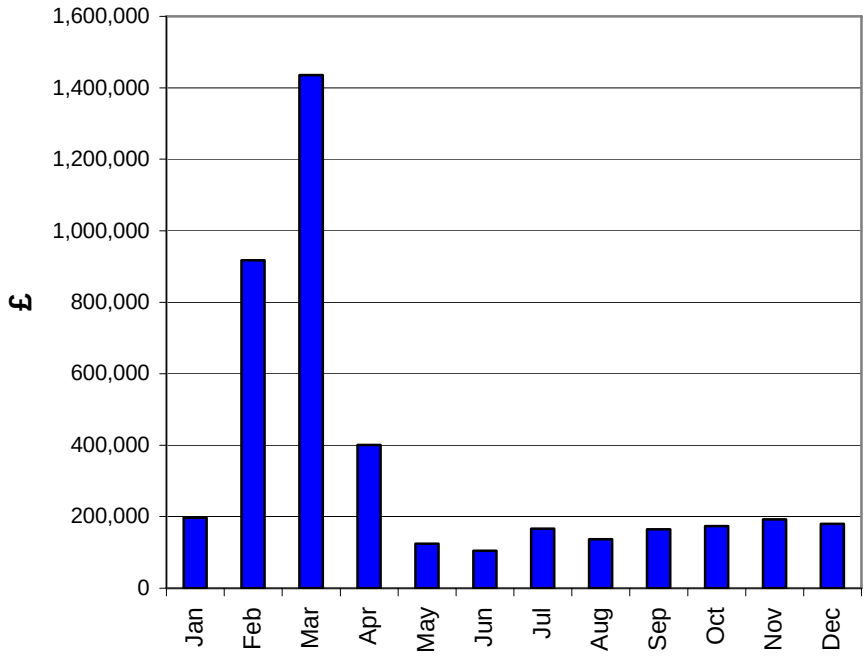


Figure 17 Aggregated monthly *Solea solea* catches (2000-2004)

Figure 17 indicates that there was a very clear peak of landings in the February/March period, with landings throughout the remainder of the year relatively low. This peak reflects the overall picture of landings of all species from this rectangle, showing the primary position occupied by sole fisheries. The peak of landings probably coincides with an inshore spawning migration from deeper waters. Rectangle 29E4 is known to lie within part of a spawning ground extending along the north Cornish coast (Pawson, 1995).

Gear	Value (£)	%
Beam trawl	4,051,704	96.64
Otter trawl	66,432	1.58
Gill net	29,345	0.70
Pots	20,370	0.49
Dredge	14,770	0.35
Tangle net	9,708	0.23

Table 20 Landings of *Solea solea* by different gear types from 29E4 (2000-2004)

Table 20 clearly shows that beam trawlers took almost 100% of the sole from 29E4 between 2000 and 2004. Further analysis by vessel category (<10m, >10m and foreign) indicates that the large majority (80%) of these landings were made by U.K. registered vessels of >10m. However it must be remembered that some catches by <10m vessels and from non-U.K. vessels landing into foreign ports will be unrecorded.

Analysis of the ports where most sole is landed indicated that 54% of all sole landings from this area were made into Newlyn (29%) and Brixham (25%), with the next largest proportion of landings made into Plymouth and Milford Haven. Although around 18% of sole landings into U.K. ports are taken by foreign vessels (mostly Belgian beam trawlers) no data is available to this study for landings from the area by foreign vessels landing into non-U.K. ports. It is likely that most Belgian vessels will land into U.K. ports most of the time as the distance to land in their home ports is too great. Both French and Irish vessels have quota for sole in ICES areas VII f and g; it is likely that this fish will be landed into ports in their respective countries.

5.2.6.2 Edible (Brown) Crabs

The Edible crab (*Cancer pagurus*) is a large decapod crustacean usually found on rocky ground or gravel banks. Adult crabs are generally found offshore (Pawson, 1995) and may make extensive migrations; juveniles are generally found in shallower waters.

With declared landings of around £1.4 million over the 2000-2004 study period, the edible crab is second only to the sole in declared value of landings from this statistical rectangle.

Annual value of landings for the period 2000 – 2004 is shown below in Table 21 and Figure 18.

Year	2000	2001	2002	2003	2004
Value of Landings (£)	461,297	410,985	187,504	147,705	203,913

Table 21 Value of *Cancer pagarus* landings from 29E4 (2000-2004)

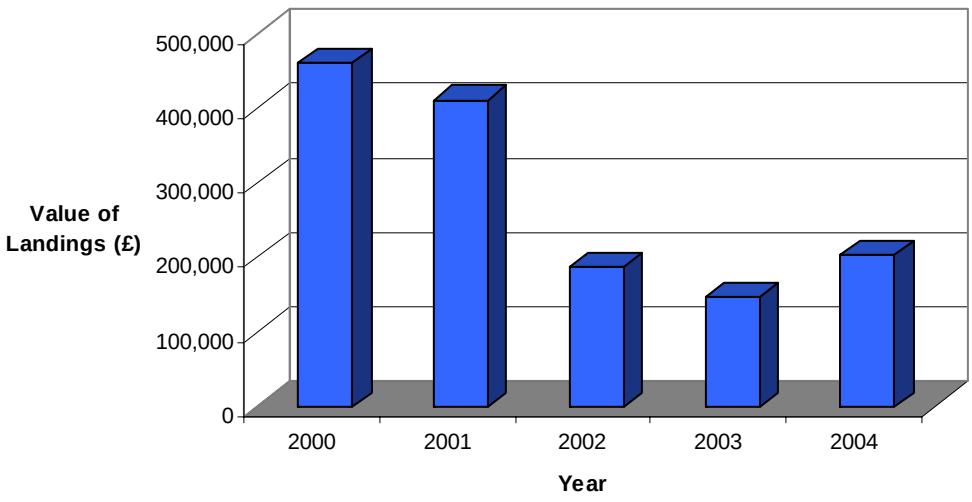


Figure 18 Value of *Cancer pagarus* landings from 29E4 (2000-2004)

Figure 18 shows a marked decline from landings of nearly £0.5 million in 2000 to around a third of this value by 2003, followed by a slight rise in the following year. Actual landings may be greater than this due to the unrecorded catches of the <10m fleet, many of which will fish for crab.

The seasonality of landings is shown in Figure 19 below.

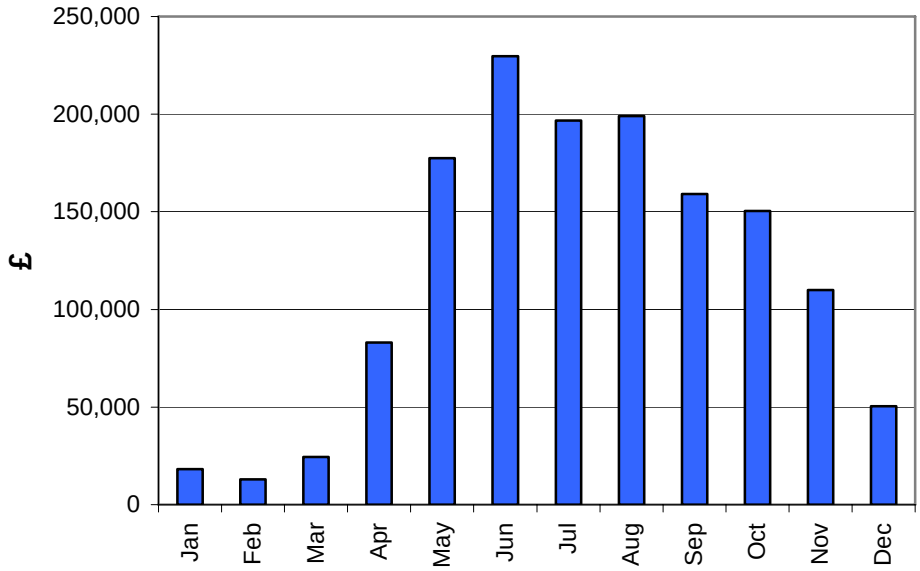


Figure19 Aggregated monthly *Cancer pagarus* catches (2000-2004)

Figure 19 shows that in the first part of the year landings are relatively low and then there is a sudden increase from April onwards rising to a peak of landings in June. Moderately high landings are maintained through to October followed by a decline to low levels in December. This may reflect either a decrease in the availability of crabs due to offshore migration or low water temperatures) or a decrease in fishing activity due to poor weather in the winter.

With respect to the main gear types, Table 22 (below) indicates that almost 100% of the catches were taken by baited pots, with a small proportion also taken in nets. Vessel category data indicates that over 90% of *Cancer pagarus* landings are taken by the >10m sector and virtually none by foreign vessels.

Gear	Value	%
Pots	1,373,253	97.30
Gill net	20,521	1.45
Tangle net	11,612	0.82
Beam trawl	5,715	0.40

Table 22 Landings of *Cancer pagarus* by different gear types from 29E4 (2000-2004)

As with other species, it is probable that landings from the <10m sector are under-reported. Also, as crabs are a non-quota species there are fewer reporting requirements for the over 10m sector (see Appendix 4 for the methodology of the collection of DEFRA landing statistics.)

Analysis by port of landing indicates that Newlyn is by far the dominant port for landings of crabs from rectangle 29E4 over the 5 year study period, with 63% of all landings (by value) recorded here. Only 9% of the value of landings was recorded from Hayle over the 2000-2004 period but in reality, this proportion may be greater due to the large number of <10m vessels operating out of Hayle which do not have to record catches.

5.2.6.3 Monkfish

The Monkfish (*Lophius piscatorius*, otherwise known as the Anglerfish) is a highly prized demersal species generally found in depths between 20 and 150 m on sandy or muddy bottoms or on gravel and rock (Wheeler, 1969).

Annual landings from 29E4 from 2000 – 2004 are shown below in Table 23 and Figure 20.

Year	2000	2001	2002	2003	2004
Value of Landings (£)	205,278	316,329	316,144	246,073	179,428

Table 23 Value of *Lophius piscatorius* landings from 29E4 (2000-2004)

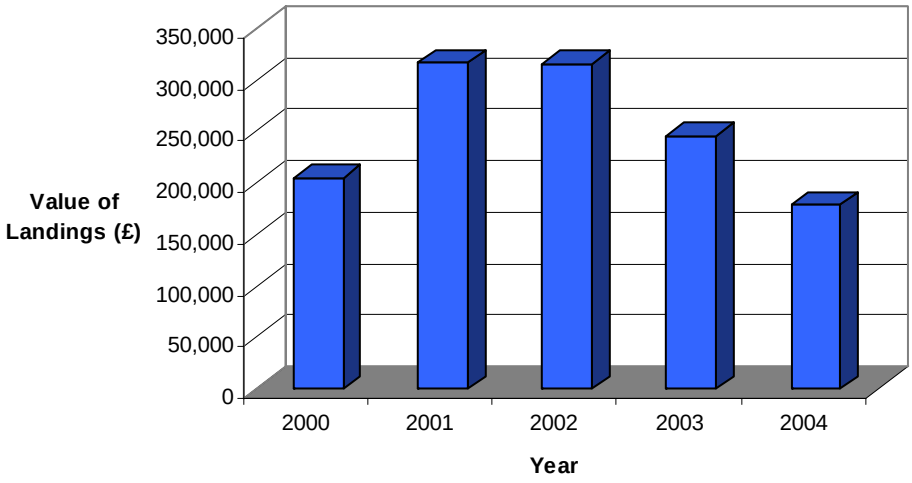


Figure 20 Value of *Lophius piscatorius* landings from 29E4 (2000-2004)

These data indicate that peak landings of this species were made in 2001 and 2002, declining to a low in 2004. This pattern mirrors that of sole landings (see above).

Monthly distribution of landings shows a peak in March, though this is not so pronounced as the peak in landings of sole. However, it is likely that the majority of landings in February, March and April are by beam trawlers targeting the sole fishery in this area.

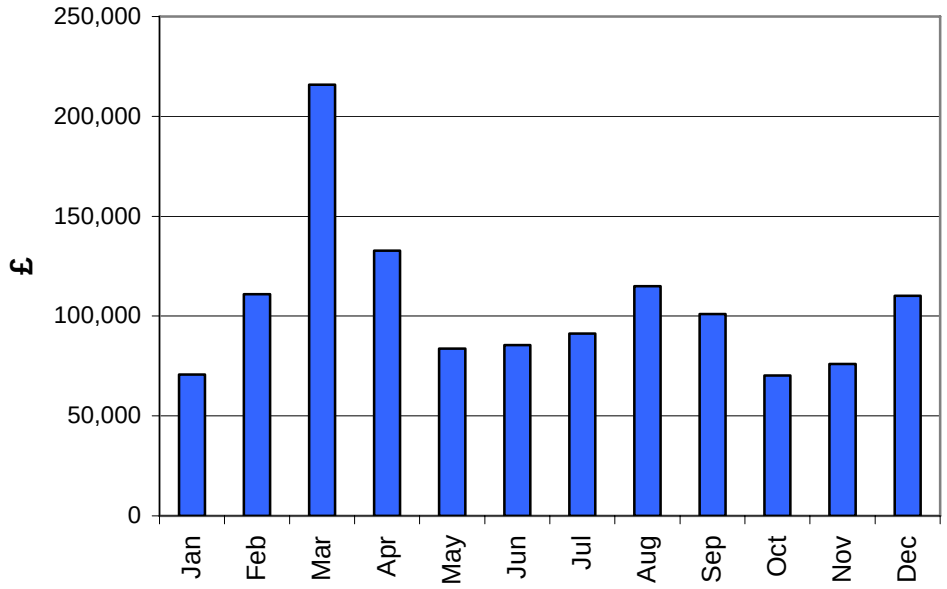


Figure 21 Aggregated monthly *Lophius piscatorius* catches (2000-2004)

Table 24 (below) indicates that beam trawlers account for a large proportion of monkfish landings (83%), while gill and tangle nets together take over 10% of the value of landings. Vessel analysis indicates that the great majority of monkfish are landed by U.K. registered vessels in the >10m category.

Gear	Value (£)	%
Beam trawl	1,051,281	83.2
Gill net	78,635	6.2
Otter trawl	55,958	4.4
Tangle net	54,740	4.3
Pots	15,026	1.2
Dredge	7,317	0.6

Table 24 Landings of *Lophius piscatorius* by different gear types from 29E4 (2000-2004)

In terms of the ports at which this species is landed, almost 70% of the value of landings from 29E4 were landed into Newlyn during the reporting period, with Plymouth being the next most important port.

5.2.6.4 Mackerel

The Mackerel (*Scomber scombrus*) is a pelagic species that is usually found in large shoals. It is distributed widely across North Atlantic waters, usually in depths of less than 200m. They undergo extensive spawning migrations (Pawson, 1995).

Annual landings for the period from 2000 – 2004 are shown below in Table 25.

Year	2000	2001	2002	2003	2004
Value of Landings (£)	597,583	342,344	87,635	61,129	104,948

Table 25 Value of *Scomber scombrus* landings from 29E4 (2000-2004)

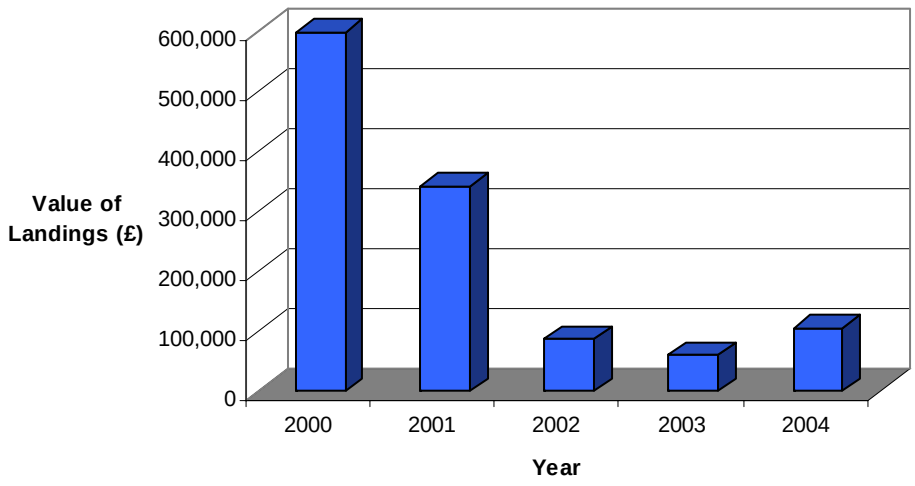


Figure 22 Value of *Scomber scombrus* landings from 29E4 (2000-2004)

Figure 22 shows a dramatic decline from a peak of around £0.6 million in 2000 to a tenth of that value in 2003. With respect to the seasonality of the fishery, monthly distribution of landings from 2000 – 2004 is shown below in Figure 23.

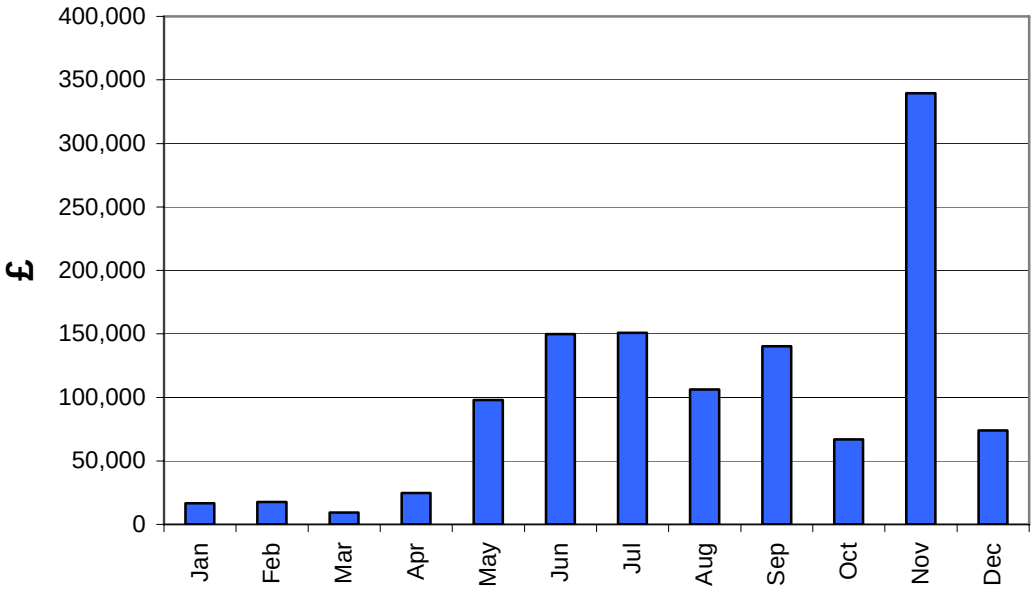


Figure 23 Aggregated monthly *Scomber scombrus* landings (2000-2004)

Figure 23 shows very low landings throughout the first four months of the year, increasing during the summer months and then tailing away by October, only to reach a very high peak in November. This is probably related to the migratory movements of the shoals. Over 94% of the landings made over this period were by hand-lining vessels. The Cornish mackerel hand-line fishery in this area is a specialised small boat fishery in Cornish waters and is in contrast to most other areas of Europe where the majority of mackerel is taken by very large pelagic trawlers or purse seiners. An area of some 67,000 km^2 has been designated as the "Mackerel Box", where no pelagic trawlers or purse seiners are allowed to target mackerel. However, significant quantities of mackerel are caught as a bycatch by these vessels when targeting other species.

The reported landings from pots and tangle nets may be a case of mistaken reporting as it is unlikely that significant quantities of mackerel will be caught by these methods.

The small boat nature of the mackerel fishery is borne out by the distribution of landings by vessel category, indicating that a very large percentage of the catch (91%) is taken by vessels from the <10m sector:

Almost 100% of the mackerel landings from 29E4 are landed into either Newlyn or St. Ives, with a small proportion (<3%) landed at Hayle. There is a specialised market for the line caught fish as it is generally of higher quality than those caught by other methods.

5.2.6.5 Lemon Sole

The Lemon Sole (*Microstomus kitt*) is a highly prized flatfish, and is found across the north east Atlantic from Iceland to the Bay of Biscay, mainly on areas of gravel and shell gravel (Wheeler, 1969). Spawning is from May to September, and it appears that the fish rarely come inshore or make extensive migrations (Pawson, 1995).

Value of annual landings over the five years from 2000 – 2004 are shown below in Table 26 and Figure 23.

Year	2000	2001	2002	2003	2004
Value of Landings (£)	181,460	177,164	259,892	172,062	101,415

Table 26 Value of *Microstomus kitt* landings from 29E4, 2000-2004

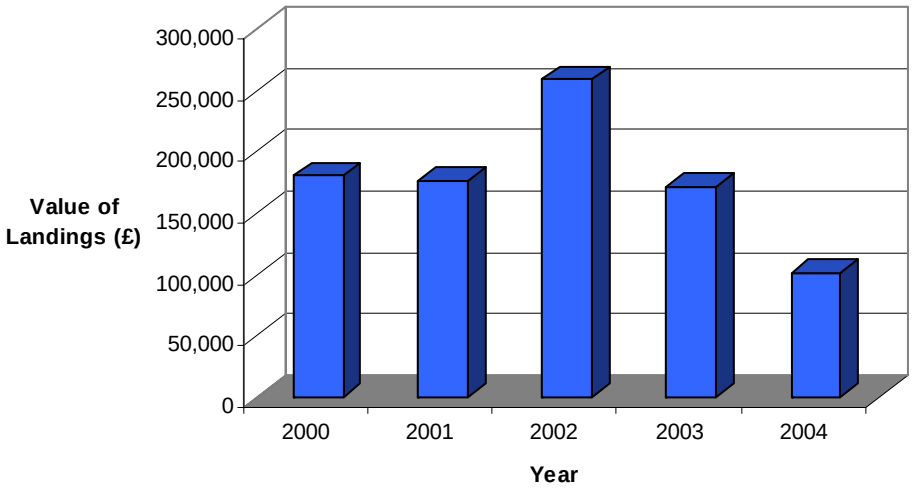


Figure 24 Value of *Microstomus kitt* landings from 29E4 (2000-2004)

The aggregated monthly landings for the study period are shown below in Figure 25.

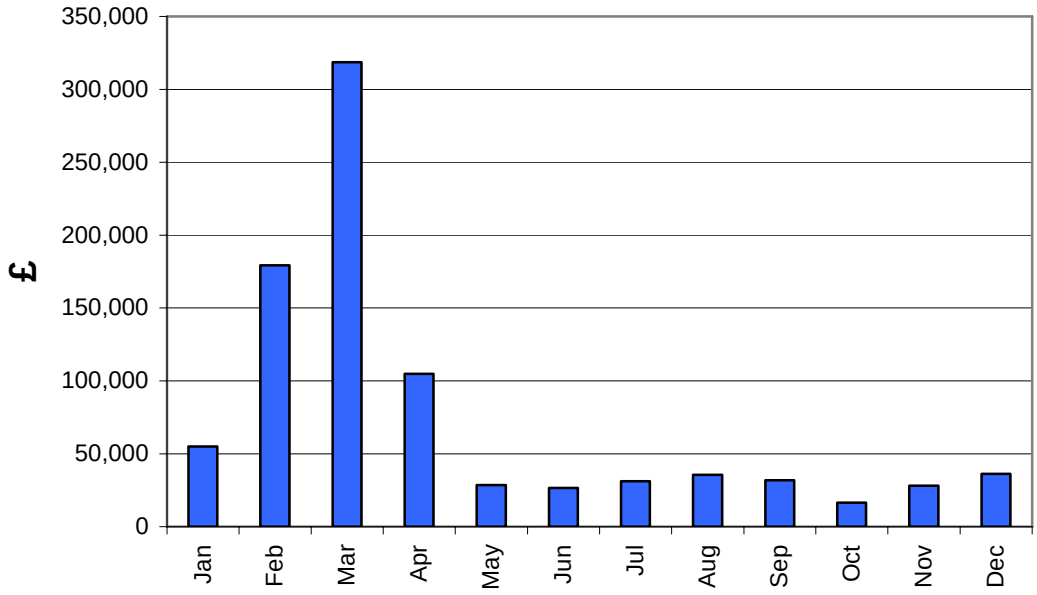


Figure 25 Aggregated monthly *Microstomus kitt* landings (2000-2004)

Figure 25 shows a strong peak of lemon sole landings in March, with high landings also in February. This is a similar pattern to both sole and monkfish landings (both monthly and annually) and it is suggested that the beam trawl fishery in the early part of the year, although targeting mainly sole, also takes significant quantities of monkfish and lemon soles as well. While these latter two species may not be what actually stimulates the fishery to take place, they are an important component of the overall picture.

Gear	Value (£)	%
Beam trawl	810,457	90.86
Otter trawl	77,094	8.64
Gill net	2,883	0.32
Pots	817	0.09
Dredge	479	0.05
Pair trawl	200	0.02
Tangle net	63	0.01

Table 27 Landings of *Microstmus kitt* by different gear types from 29E4 (2000-2004)

Table 27 shows that around 90% of recorded landings of lemon sole from 29E4 are taken by beam trawlers. Of other methods, only the otter trawl has any significant landings. Vessel analysis shows that over 80% of all landings of this species from 29E4 were made by U.K. vessels of >10m in registered length.

47% of landings of this species from 29E4 over this period were made at Newlyn, with a further 40% landed at Plymouth, Milford Haven and Brixham.

5.2.6.6 Lobster

The lobster (*Homarus gammarus*) is a high value decapod crustacean. It is widely distributed from Norway to North Africa and found generally in depths of less than 100m.

The value of annual landings from rectangle 29E4 is shown below in Table 28 and Figure 26.

Year	2000	2001	2002	2003	2004
Value of Landings (£)	208,636	206,760	193,770	79,004	147,801

Table 28 Value of *Homarus gammarus* landings from 29E4 (2000-2004)

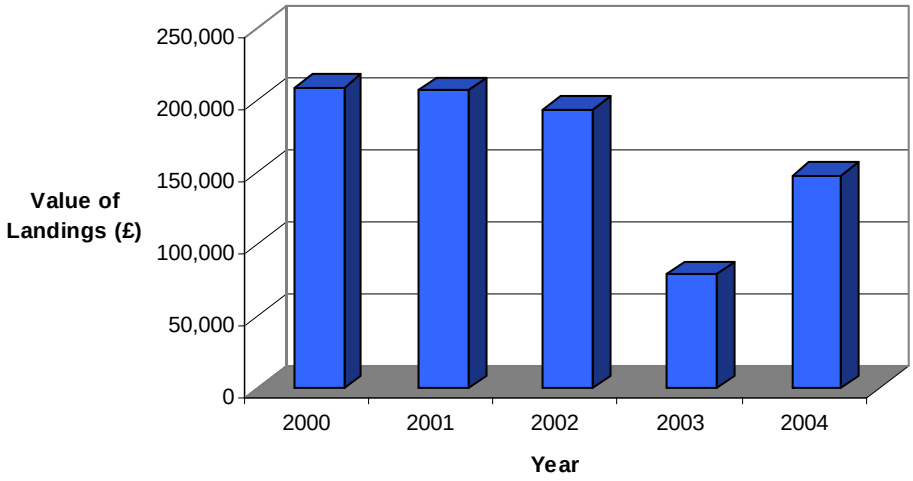


Figure 26 Value of *Homarus gammarus* landings from 29E4 (2000-2004)

Landings were fairly steady from 2000 – 2002, but dropped significantly in 2003. A slight recovery is seen for 2004. Monthly landings over this five year period are shown below in Figure 27.

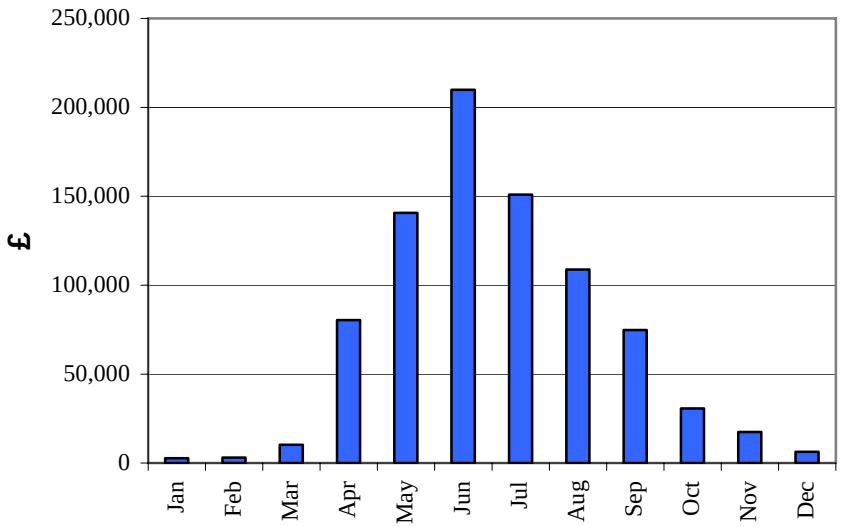


Figure 27 Aggregated monthly *Homarus gammarus* landings (2000-2004)

Figure 27 shows a clear summer fishery, with catches starting to pick up in April, peaking in June and declining rapidly by October. This is due to a number of factors, including increased feeding activity in summer and a larger number of boats targeting lobsters during the summer months.

Analysis of gear types shows the large majority of lobster (almost 87%) being caught in pots. Among other gear types, tangle nets and gill nets show some significant level of catches. Vessel analysis indicates that the clear majority of lobsters were caught by the U.K. registered >10m sector. However, landings from the <10m sector are likely to be under-reported as a significant number of part-time boats operate in the summer months.

Landings by port for lobster show Newlyn to land nearly 50% of the lobster catches from 29E4 with approximately 20% of all landings made at Hayle.

5.3 The fisheries of Hayle

The preceding sections have outlined the key fisheries from 29E4. However, the local port where the proposed wave hub development may have a particular impact is Hayle. Therefore, the pattern and extent of fishing out of Hayle is studied in more depth in the following sections.

5.3.1 Accuracy of DEFRA landings data

Although official statistics suggest that 45% of the fish landed into Hayle from rectangle 29E4 is caught by vessels of <10m registered length, the true figure may be somewhat higher. The majority of landings are of crustacean shellfish (lobster, edible crab and spider crab), landed by both >10m and <10m sectors. Neither is required to declare their landings under DEFRA rules.

5.3.2 Annual landings

The total landings into Hayle for each year from 2000 – 2004 from rectangle 29E4 are shown below in Table 29 and Figure 28.

Year	2000	2001	2002	2003	2004
Value of Landings (£)	157,064	197,995	171,266	79,254	75,939

Table 29 Value of landings into Hayle from 29E4, 2000-2004

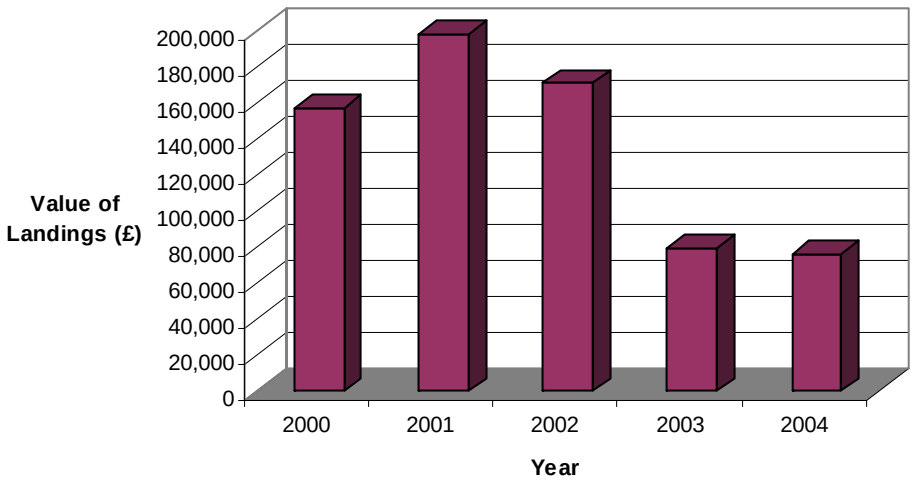


Figure 28 Annual landings into Hayle from 29E4 (2000-2004)

This shows landings peaking in 2001 and declining substantially thereafter to less than half of peak values. The reasons for this are not clear from the data but the following possibilities are suggested:

- A decrease in actual catches or in value of catches;
- A shift in catches from species which must be declared to those which may be landed undeclared;
- A higher number of <10m vessels in the fleet from which landings data is not required;
- An increase in volume of fish taken overland to other ports (particularly Newlyn) and recorded as having been landed there; and/or
- A greater proportion of fishing activity from Hayle being in statistical rectangles other than 29E4 (unlikely with the small boat nature of the fishery).

5.3.3 Seasonality of landings

The aggregated monthly landings into Hayle from 29E4 for 2000 – 2004 are shown below in Figure 29.

This figure shows very low activity for the first four months of the year followed by five months (May – September inclusive) where the bulk of catches are taken. The last three months show declining activity. The high earnings correspond with the peak of the shellfish season. Although there is a well-established sole fishery present within 29E4 in the February/March period, these landings are not shown in the Hayle data as they are landed at larger ports, in particular Newlyn.

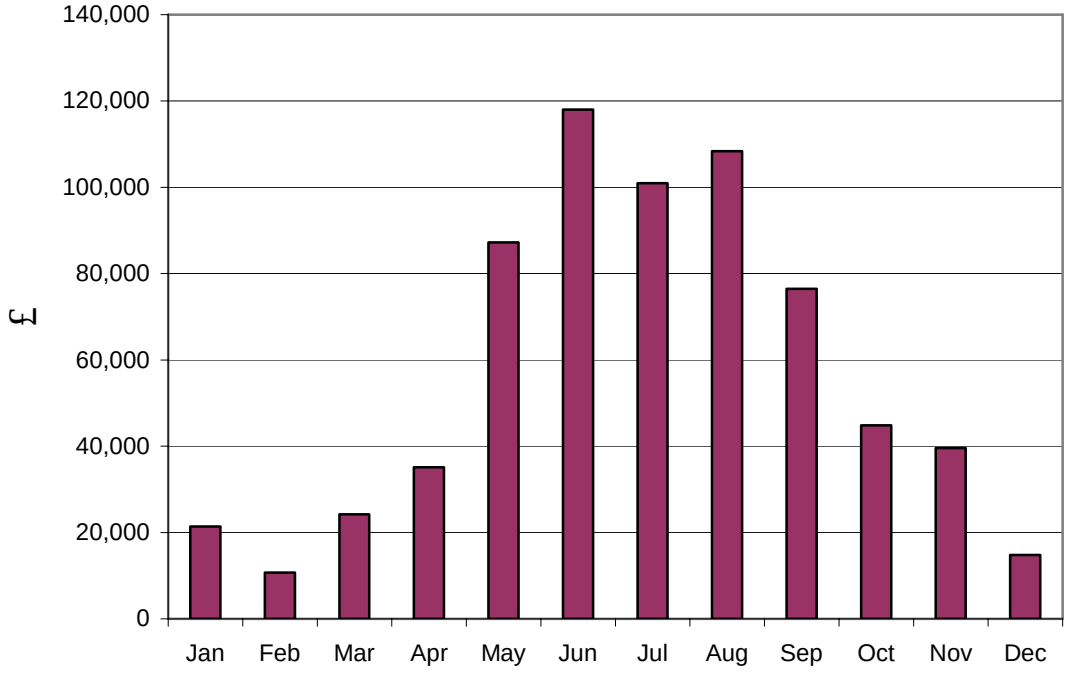


Figure 29 Aggregated monthly landings into Hayle from 29E4 (2000-2004)

5.3.4 Landings by gear type

The value of landings by different gear types over the five year period are given below in Table 30.

Gear	Value (£)	%
Pots	349,251	51.25
Otter trawl	190,478	27.95
Gill net	57,291	8.41
Tangle net	52,279	7.67
Handlines	28,596	4.20
Ring net	2,973	0.44
Longlines	650	0.10

Table 30 Proportion of landings into Hayle by different gear types - 29E4, 2000-2004

This shows that of all the landings from 29E4 made into Hayle, over 50% was landed by pots, with otter trawling contributing a further 28%. No beam trawlers land into Hayle as the port is too small, is strongly tidal and has insufficient infrastructure.

5.3.5 Landings by category

Landings from 29E4 into Hayle for the five year period are apportioned 45% to the <10m sector and 55% to the >10m sector. What degree of landings (by either sector) are unreported remains unclear. No foreign vessels are reported as landing in Hayle.

5.3.6 Landings by category and gear type

Gear	<10m	>10m	Total
Pots	£30,279	£318,973	£349,251
Otter trawl	£176,249	£14,229	£190,478
Gill net	£48,645	£8,645	£57,291
Tangle net	£16,828	£35,451	£52,279
Handlines	£27,653	£943	£28,596
Ring net	£2,973	-	£2,973
Longlines	£650	-	£650

Table 31 Landings from 29E4 into Hayle, 2000-2004, by category and gear type

Table 31 suggests that the fishery from Hayle broadly divides into two main components:

1. A pot fishery pursued mostly by >10m vessels; and
2. A trawl fishery by mostly <10m vessels.

However, when Hayle was visited there were few if any vessels of >10m in port. Pots, gill nets, handlines and tangle nets form a lesser but significant part of the <10m earnings, whilst tangle netting and trawling are important for a small portion of the >10m sector.

5.3.7 Seasonality of fishing methods

Gear	Gill net	Handlines	Otter trawl	Pots	Tangle net
Jan	£3,819	-	£15,913	£1,619	-
Feb	£2,930	-	£6,669	£796	£313
Mar	£1,713	-	£14,186	£672	£7,604
Apr	£1,387	£564	£10,124	£14,442	£8,622
May	£3,949	£1,258	£13,856	£53,117	£14,908
Jun	£5,446	£6,454	£11,216	£82,284	£12,019
Jul	£16,307	£7,797	£14,449	£58,822	£2,847
Aug	£15,946	£5,651	£23,700	£56,724	£4,674
Sep	£4,047	£3,910	£28,215	£38,507	£1,292
Oct	£334	£2,245	£20,140	£22,124	-
Nov	£989	£717	£22,074	£15,761	-
Dec	£422	-	£9,936	£4,384	-

Table 32 Aggregate landings into Hayle for 2000-2004 by gear type and month

Table 32 indicates the following points:

- The gill net fishery peaks in July and August and tails off to virtually nothing by the end of September. Pollack and spider crab are the main target species, and a dedicated net fishery (tangle nets and gill nets) for spider crab exists from Hayle;
- The main hand-lining season is from June to August, with September and October also showing medium landings. The prime target species is mackerel, though some pollack are also taken;
- Trawling takes place all year round, but best landings are seen between August and November. A wide range of species are taken, though rays are important;
- The bulk of landings from pots are taken between May and August, with landings tailing off by the end of November. Little potting takes place during the winter as most fishermen take their gear out of the water for fear of losses through bad weather. Major target species are lobster, edible crab and spider crab, though a bycatch of fish is also taken; and
- The peak season for tangle netting is May and June with the key target species being spider crab.

5.3.8 Landings by species

Some 40 species are recorded as being landed into Hayle over the five year study period. The top 9, with landed value for this period are shown below in Table 33.

Ranking	Species	Value (£)
1	Lobsters	160,128
2	Edible Crabs	129,354
3	Spider Crabs	104,787
4	Rays	66,993
5	Pollack	34,858
6	Cod	32,331
7	Sole	31,856
8	Mackerel	31,000
9	Plaice	29,925

Table 33 Landings (£) by species into Hayle from 29E4 (2000-2004): Top 9 species

From this table it is clear that landings of crustaceans are of prime importance in Hayle. However, as noted earlier, most potting vessels (*i.e.* those likeliest to catch the major species) are >10m in registered length. Consequently this may produce a bias in reporting of species landed by these vessels and the catches from the <10m trawling fleet remain relatively unreported.

5.3.8.1 Annual trends in landings by species

Table 34 (below) shows annual trends in landings from 29E4 by species.

Species	2000	2001	2002	2003	2004
Lobsters	£22,124	£43,453	£46,459	£28,880	£19,213
Edible crabs	£17,899	£35,983	£32,301	£32,602	£10,570
Spider crabs	£32,132	£14,528	£17,424	£14,608	£26,095
Rays	£12,584	£27,363	£22,275	£376	£4,395
Pollack	£7,946	£21,563	£1,768	£275	£3,306
Cod	£11,552	£10,510	£9,395	-	£874
Sole	£12,298	£6,365	£12,304	-	£889
Mackerel	£13,461	£5,431	£4,679	£1,882	£5,547
Plaice	£7,522	£12,243	£9,480	-	£680

Table 34 Annual landings into Hayle of the main species landed from 29E4 (2000-2004)

From Table 34 the following points can be noted:

- Lobster catches peaked in 2002 and declined significantly by 2004;
- Catches of edible crabs showed a plateau for 3 years from 2001 to 2003 and declined to less than a third of these values in 2004;
- Highest value landings of spider crab occurred in 2000; landings were then less than half of this level for 3 years but rose substantially in 2004;
- Rays showed a substantial decline in 2003 and a slight recovery in 2004;
- Landings of pollack peaked in 2001 and have never since been significant;
- Cod landings were fairly constant for the period 2000 – 2002 but then fell away to little or nothing;
- Sole landings show a similar pattern to cod, as do landings of plaice; and
- Mackerel landings were high in 2000 and have been at much lower levels since.

The reasons for the above changes are not clear from the data and could be due to a large number of factors:

- Declines in the actual abundance of some species on the local grounds;
- Fishing taking place in other ICES rectangles and not in 29E4;
- Lower fishing effort i.e. some boats being sold, others fishing less on some species;
- Lower fish prices;
- A shift to more vessels of less than 10m in the fleet, with consequent loss of reporting obligations; and/or
- More fish being sold in other ports (e.g. Newlyn)

All that can really be deduced from the above figures is that the value of fish landed into Hayle from area 29E4 during this period peaked in 2002 and has declined substantially since then.

5.3.8.2 Monthly trends in landings by species

Species	Lobsters	Edible crabs	Spider crabs	Rays	Pollack	Cod	Sole	Mackerel	Plaice
Jan	-	£1,545	£13	£5,998	£3,725	£3,154	£1,695	-	£2,658
Feb	£96	£561	£627	£2,034	£1,689	£2,298	£1,983	-	£491
Mar	£133	£25	£7,989	£3,668	£626	£5,962	£2,244	-	£960
Apr	£3,873	£2,762	£15,228	£4,147	£1,462	£497	£1,067	£1	£1,330
May	£29,086	£12,773	£22,170	£6,834	£4,890	£357	£2,137	£746	£3,271
Jun	£43,646	£24,950	£20,225	£4,486	£6,970	£744	£3,215	£7,547	£2,420
Jul	£30,087	£19,150	£15,870	£8,435	£6,838	£266	£3,432	£8,645	£2,247
Aug	£27,464	£22,202	£13,338	£13,727	£5,292	£399	£5,056	£7,457	£3,186
Sep	£16,874	£15,020	£6,722	£11,194	£1,879	£673	£6,168	£4,972	£6,599
Oct	£4,271	£17,023	£543	£1,498	£447	£7,250	£2,331	£1,093	£2,641
Nov	£3,539	£10,945	£1,220	£3,103	£750	£7,628	£1,160	£538	£3,080
Dec	£1,059	£32,399	£842	£1,868	£290	£3,103	£1,369	-	£1,041

Table 35 Monthly landings of the main commercial species landed at Hayle from 29E4, 2000-2004

From data presented in Table 35, the following conclusions can be noted:

- Lobsters show a peak of landings from May to the end of August. This corresponds with higher feeding activity due to warmer water and an increase in fishing effort over this period;
- Edible crabs have a slightly longer main season than lobsters, with good catch levels being maintained through to November;
- The season for spider crabs starts earlier in April and is more or less over by the end of September;
- August and September are the peak months for catches of rays, with a fairly steady level of landings being maintained for the remainder of the year;
- Most pollack is caught in May, June, July and August, though high landings are also seen in January;
- Cod shows a strong seasonality, with the large majority of landings being made between October and the following March;
- Sole catches peak in August and September, and show fairly consistent values for the remainder of the year;
- June to August accounts for the great majority of mackerel catches; and
- Plaice landings show a clear peak in September with no clear trend for the rest of the year.

5.3.8.3 Landings by species and gear type

Species	Gill net	Handlines	Otter trawl	Pots	Tangle net
Lobsters	£2,881	-	-	£152,621	£4,626
Edible crabs	£1,059	£20	-	£126,085	£2,190
Spider crabs	£11,690	£15	-	£56,435	£36,648
Rays	£1,571	£75	£62,528	£739	£2,079
Pollack	£27,683	£3,468	£160	£2,685	£862
Cod	£1,776	£58	£30,366	£92	£39
Sole	£3,889	-	£24,217	£2,645	£1,106
Mackerel	£1,774	£23,824	-	£2,558	£2,518
Plaice	£974	-	£27,880	£720	£351

Table 36 Landings of the major commercial species into Hayle from 29E4 by each of the main gear types, 2000-2004

The following can be deduced from the data presented in Table 36.

- Pots are the method of capture for the great majority of the prime crustacean species (lobster, edible crab and spider crab);
- Gill and tangle nets take around 40% of the value of spider crab landed into Hayle, while gill nets alone takes most of the pollack that is landed. The latter was mostly caught in 2001 and was probably taken from netting on wrecks in the area;
- Handlines take the around 90% of mackerel and around 10% of Pollack; and
- Otter trawling takes the majority of the demersal species such as cod, sole, plaice and rays.

5.3.9 Conclusions of the fishery at Hayle (based on DEFRA data)

- The value of recorded landings into Hayle from rectangle 29E4 has peaked in 2001 and declined to around one third of that value by 2004;
- May to September are thee months when the great majority of landings are made;
- Pots account for over half of the value of landings whilst over a quarter are taken by otter trawls;
- Vessels of >10m take around 55% of the value of landings in Hayle while the remainder is taken by the <10m sector. No records of landings by foreign vessels are seen;
- The fishery from Hayle broadly divides into two sectors - >10m vessels using pots and under 10m vessels trawling. This distinction is not absolute;
- Trawling takes place all year round, but the main potting season is during the summer months;
- Crustaceans (lobsters, edible crabs and spider crabs) form the bulk of the value of landings into Hayle from 29E4; and
- Reported landings of most important species have shown fluctuations or decline over recent years.

5.4 The fisheries of St Ives

Although St Ives would not be directly impacted by the construction of the proposed Wave Hub and associated cables and onshore works, it is in fact closer to the proposed deployment zone than is Hayle. Consequently it is worth looking at the pattern of fisheries from St Ives.

5.4.1 Annual landings

The total landings into St Ives for each year from 2000 – 2004 from rectangle 29E4 are shown below in Table 37 and Figure 30.

Year	2000	2001	2002	2003	2004
Value of Landings (£)	343,019	155,692	25,481	17,869	52,761

Table 37 Value of landings into St. Ives from 29E4, 2000-2004

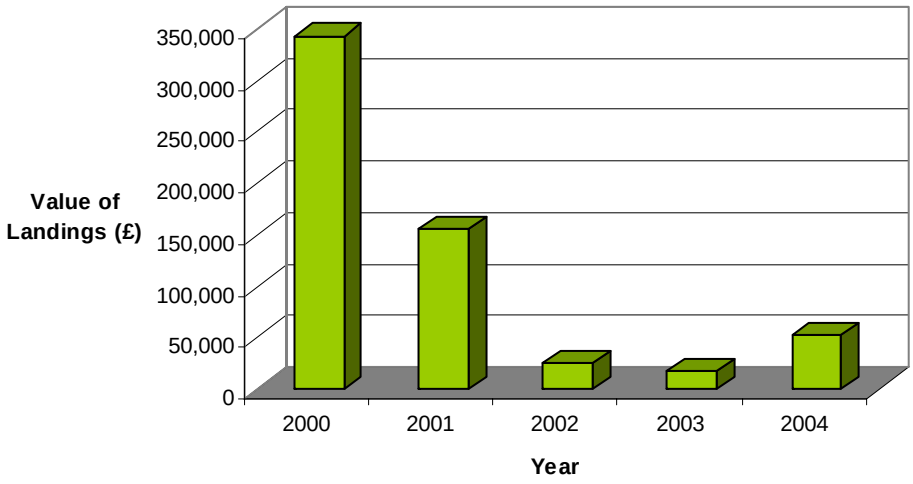


Figure 30 Annual landings into St. Ives from 29E4, 2000-2004

This shows a dramatic decline from a peak of nearly £350,000 in 2000 to landings of around 5% of this value by 2003. A slight recovery is seen in 2004.

5.4.2 Seasonality of landings

The aggregated monthly landings into St Ives from 29E4 for 2000 – 2004 are shown below in Figure 31.

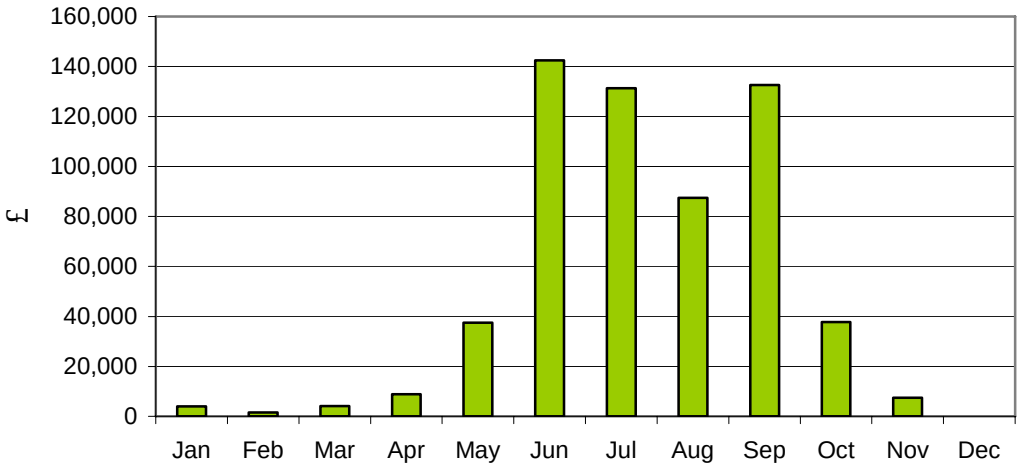


Figure 31 Aggregated monthly landings into St. Ives from 29E4 (2000-2004)

This shows a clear peak of landings into St. Ives from June to September inclusive. This reflects the summer mackerel hand-line fishery that exists in this area during these months.

5.4.3 Analysis by gear type

Table 38 shows landings over the five year study period by gear type:

Gear	Value (£)	%
Handlines	486,558	81.8
Pots	78,020	13.1
Gill net	18,838	3.2
Tangle net	11,355	1.9
Longlines	50	0.0

Table 38 Proportion of landings into St. Ives by different gear types - 29E4, 2000-2004

It is clear that this is a fishery dominated over recent years by hand-lining, with potting as a secondary activity. Vessel analysis indicates that over 85% of landings into St. Ives from 29E4 are also made by the <10m sector. No foreign vessels were recorded as landing at St Ives.

5.4.4 Analysis of landings by species

Analysis by species (Table 39) shows a clear dominance of mackerel, accounting for over 80% of the value of landings. Crustacean species account for nearly all of the remainder, apart from a small catch of pollack in the early part of the year.

Ranking	Species	Value (£)	%
1	Mackerel	490,797	82.5
2	Lobsters	37,100	6.2
3	Edible crabs	34,447	5.8
4	Spider crabs	12,417	2.1
5	Pollack	7,702	1.3

Table 39 Landings (£) by species into St. Ives from 29E4, 2000-2004: Top 5 species

What is clearly seen in St Ives over recent years is predominantly a summer fishery for mackerel from <10m boats with a small amount of potting for lobsters, edible crabs and spider crabs.

One other point to note is that in 2004, landings by >10m vessels into St. Ives were limited to one landing of lobster and crab with a value of £560 in June of that year. The remaining 99% of landings were by vessels of <10m. In 2004, mackerel comprised 98% of the value of the catch.

In conclusion, in 2004, St Ives realised very low landings of which the vast majority was of mackerel from <10m vessels. Therefore, according to official data there is no longer a significant fishery from this port targeting resources in rectangle 29E4.

6.0 ESTIMATE OF THE VALUE OF THE PROPOSED DEPLOYMENT AREA TO THE FISHING INDUSTRY

6.1 General

For the purpose of impact assessment, it is often useful to describe an area to be developed in terms of its financial value to the commercial fishing industry. Such a value can be obtained by reviewing landings data and speaking to local fishermen.

For the purposes of this study, only the first sale value of the fish and shellfish caught in the area will be considered. However it is worth noting that the additional value generated through onward sale of fish and through ancillary industries such as boat building and repair, gear manufacture, fuel supply, transport *etc.* is highly significant.

It is virtually impossible to assign an accurate and meaningful value to the area covered by the proposed deployment area in terms of fish catches. Site specific economic information is not available and the inherent natural variability of the marine ecosystem makes this process difficult. Additionally, the size of the fleet operating in the area and the value of catches taken from it varies substantially from year to year, introducing a high degree of variability into the assessment.

However, the proposed deployment area does have a value to the fishing industry, both in the U.K. and in other countries who have a right to fish there. At a local level it is likely that a small number of vessels will be affected, particularly smaller potting vessels.

6.2 Usefulness of landing statistics

Generally the official data agrees with the findings of the survey in regards to the most important fisheries in the study area and their seasonality. With regards to giving an overall value to fisheries in the area, official statistics are useful as a starting point.

It is widely accepted by both the fishing industry and regulatory bodies that official figures fall short of the truth, but to what extent this is the case is not clear for this fishery. Earlier studies for the south east of England (Nicholson & Mounce, 1989) suggest that actual landings are often about twice that recorded. The offshore location of the Wave Hub deployment area means that the majority of vessels using the area will be >10m in registered length and will therefore have to make declarations of the amount of fish caught. Therefore official data should give a reasonable guide to the value of fish taken from the statistical rectangle. The main area where information is lacking is for non-U.K. vessels fishing in the area and landing in ports in other countries, for which no data is available. An adjustment can be made for this based on the frequency of sightings of vessels of different nationalities, but this is not considered likely to be accurate.

6.3 Value by relative area

Given that there is no site-specific data on earnings by boats fishing within the proposed deployment area, and that very little fishing takes place there, then it will be necessary to use a simple relative area approach to estimate earnings from the area.

6.3.1 Methodology

This method will look at the average value of fish landed from ICES rectangle 29E4 over the period 2000–2004 inclusive. It will then compare the overall areas of the rectangle and of the proposed deployment area and will apportion the landings according to relative areas.

Area of 29E4	3931 km^2
Area of proposed deployment area	8 km^2
Proportion of 29E4 occupied by proposed deployment area	0.203 %
Average declared value of landings into 29E4 (2000 – 2004)	£3,150,761
Proportion allocated to proposed deployment area	£6,396 per year

Surveillance data indicates that around half of the activity in the area is of French otter trawlers who land directly into French ports and whose landings are therefore not included in U.K. data. If it is assumed that all vessels operating in the region are of similar size and profitability (which is highly speculative) then the above figures might be doubled to arrive at an estimate of the total value of the area to the fishing industry as a whole.

The degree of under-reporting of catches from this area cannot be estimated and therefore, cannot be included in any analysis. However, it is likely that a substantial value of fish is caught from the area that is not included in official statistics, either due to there being no requirement for it to be declared (due to it being caught by <10m vessels) or due to it being illegally not recorded.

7.0 POTENTIAL IMPACTS ASSOCIATED WITH THE PROPOSED DEVELOPMENT

7.1 Introduction

From the review of all the available data on commercial fisheries and consultation with the local industry undertaken in August 2005, it is clear that the study area supports a productive, well-established and diverse commercial fishery. Based on a relatively crude analysis of landings data, the actual area of proposed deployment appears to be of a fairly low value to the commercial fishing industry (approximately £6396 per annum). However, this broad nature of this analysis will fail to identify individual boats that may generate a much higher value per annum from this particular area of sea, therefore any financial value assigned to this area should be treated carefully. In addition, as noted in Section 6.3.1, foreign vessels are not included in the estimation of the value of the proposed deployment area to commercial fishing.

The following section provides further details of the consultation carried out in August 2005 and provides an overview of the *perceived* effects highlighted through these discussions with local fishermen. However, it should be noted that when this initial consultation was carried out in August 2005, many details of the proposed scheme were not fully known by many fishermen. Now that more details exist with respect to the proposed development and construction methodologies, a prediction of potential impacts can be made. In order to provide a form of "audit trail" and to demonstrate the nature of the predicted impacts in the context of the initial perceived effect, comments from local skippers and representatives of the fishing industry are presented below, followed by a commentary on the predicted impacts as assessed through the EIA process.

7.2 August 2005 Consultation

Consultation with representatives of the local fishing industry was undertaken in August 2005 by Mr Martin Esseen, an independent fisheries consultant employed by Emu Ltd to assist with this study. Mr Esseen is an ex commercial fisherman who has undertaken numerous such studies as part of EIA's for marine developments.

In total, 17 individuals were consulted, either via face-to-face meetings or phone conversations. The full list of those consulted is provided in Appendix I. These 17 persons comprised:

- 10 local skippers (based in Hayle and Newlyn – all <10m vessels);
- 2 members of Cornwall Sea Fisheries Committee;
- 2 members of DEFRA (now Marine Fisheries Agency);
- 3 representatives of the fishing industry (trawler owner who has 2 vessels that target the sole fishery off Hayle each year and members of local Fish Producer Organisations).

Each meeting involved Mr Esseen outlining what was known about the planned development at that stage and then running through a series of standard questions designed to build up a detailed understanding of commercial fisheries in this area. During discussions with individual skippers, information on the distribution of fishing activity within the study area was also obtained, where skippers were willing to disclose it.

7.3 Overview of perceived effects

The proposed Wave Hub project has the potential to give rise to adverse effects on the fisheries within the study area. In order to assess any potential effects in more detail, all the representatives of the fishing industry consulted in August 2005 were questioned about what they felt would be the main source of disruption to commercial fishing activity should the development proceed.

In general, considerable concern was expressed among some sectors of the fishing industry about the potential disruption to normal fishing activity and the subsequent financial loss that may be experienced by individual vessels. While the general opinion was that such a scheme is desirable in theory, concern was expressed about the potential losses to fishing as a result of the scheme.

Concern was also raised by some fishermen about the possibility that, if successful, similar schemes could be proposed elsewhere along the north Cornwall coast. It is beyond the remit of this report (and indeed the EIA process) to comment on the potential for future renewable energy developments in this region; however, any such project will require its own consents and permissions, with the associated requirement for EIA at which point the potential for cumulative impact will be a consideration.

The elements about which concern was expressed divide into four key categories:

1. Construction of the Wave Hub;
2. Cable laying operations;
3. Exclusion of fishing from the Wave Hub deployment area;
4. Future problems with the site to shore cable (operational phase) (e.g. interference with fishing gear).

7.4 Perceived v actual effects from construction of the wave hub

Perceived effects from construction of the Wave Hub

The construction phase of the Wave Hub may involve an increase in the amount of marine traffic in the area[3] that may cause problems for both trawlers (having to avoid other vessels, particularly if barges are being towed) and to static gear vessels (loss of buoys and ropes, interference during hauling).

Additionally, other through traffic, notably large car transporters and container ships en route from the Scilly Island Traffic Separation Scheme heading northeast for the Bristol Channel, often pass through this area; these will have to divert around the zone and may cause safety problems for fishing vessels.

Likely actual effects from construction of the Wave Hub

The construction works for the Wave Hub will involve a number of activities which will increase vessel movements. For the Wave Hub's offshore infrastructure, the TDU, PCUs, inter-connectors and the sub-sea cable will be manufactured off site and transported to the deployment area and be installed from a cable laying vessel. There will be no need to build a landing stage or any temporary structure fixed to or mounted on the seabed. Similarly, the WEC devices and their anchors and moorings will be manufactured off site and transported to the deployment area.

[3] A separate navigation risk assessment to investigate potential navigation impacts is being undertaken as part of the EIA process. This will assess potential navigation risks to commercial fishing vessels.

Prior to the deployment of the WEC devices, work vessels will be required to install anchors to which to which mooring chains will be attached. Additional vessels will transport the WEC devices to the deployment area. The WECs will then be attached to their moorings.

The overall duration of the offshore works (discussed in Section 7.5) is predicted to last for a period of 55 days, although work at sea would not be continuous during this period and discrete items of works would take a much shorter duration of time. For example, installation of the Wave Hub's TDU, PCU, inter-connectors and cable, including inspection, will take 20 days, with the potential for an additional 7 days of downtime due to adverse weather and sea conditions. In addition, there will be installation of the WEC devices, which will increase the number of days when vessels will be working at sea. Consequently, there will be an increase in the amount of marine traffic during construction works. The working arrangements will be notified via Notices to Mariners.

In addition, construction vessels will have to be avoided when travelling to and from the construction site, although only a very limited number of vessels will be needed for the construction works. This will also be notified via the Notice to Mariners.

It is anticipated that the deployment area will be denoted as an area to be avoided (ATBA), however, it is not known whether this recommendatory routeing measure to aid safe navigation will be in place in time for construction works. Accordingly, for the purposes of this assessment, it is assumed that the ATBA will not be in place.

In addition, the potential for the proposed Wave Hub to impact on the path of other commercial vessels has been dealt with through the repositioning of the proposed deployment area from commercial shipping lanes. As a consequence, commercial vessels will not have to deviate paths when approaching the Bristol Channel and, therefore, the proposed scheme will not give rise to an increased risk of conflict between fishing vessels and commercial shipping.

A similar scale of activity is likely to occur when Wave Hub is decommissioned. At this time there will be works to remove the offshore infrastructure, cables, WEC devices, moorings, anchors, etc.

7.5 Perceived v actual effects from the cable laying operations

Perceived effects from the cable laying operations

Cable laying operations may cause disruption to fishing activities along the entire route of the cable from the offshore Wave Hub to the point where the cable comes ashore at Hayle. For the most part, this disruption will be minor, but disruption may increase the closer to shore it gets.

If it were to coincide with the peak of the spider crab fishery in May and June, there could be particular disruption to inshore fisheries. In contrast, there would be little impact on this fishery if the cable were laid after the end of September.

Likely actual effects from the cable laying operations

The cable laying will take a short duration of time, expected to be 20 days (including inspection and repositioning, if necessary), depending on weather and sea conditions which could add 7 days to the duration of the construction period in May to September, or add 15 days in October to April. Fishing activity will not be prevented in the vicinity of the cable route, but a Notice to Mariners will be issued in order that users of the inshore waters are aware of the works. Once the cable is laid on the sea bed, the entire cable route will be inspected and repositioned in localised areas if the cable is found to be suspended in the water between high points on the sea bed.

The proposed works are likely to take place in late spring and early summer given that this period is likely to represent the best weather works for undertaking marine construction works. This timing could coincide with the peak of the spider crab fishery in May and June.

A similar scale of activity is likely to occur when Wave Hub is decommissioned. At this time there will be works to recover the cable from the seabed.

7.6 Perceived v actual effects of exclusion from the Wave Hub area

Perceived effects of exclusion from the Wave Hub deployment area

Fishermen's perceptions were that an area of approximately 8 km^2 may become a permanent exclusion zone for fishing vessels during the operational phase. The need for such a large area was questioned, and fears were raised as to the possibility that additional areas may be sought later if the current scheme is successful.

Displacement of vessels from the Wave Hub deployment area to other nearby areas may occur, increasing the fishing pressure on these grounds. The closed area off Trevose Head has been enforced again in 2006 and is likely to be so in future years (Cornwall SFC, *Pers. Comm.*) so congestion will likely continue in the spring sole fishery.

Additionally, some parts of the proposed deployment area are effectively refuges, where static gear fishermen, particularly offshore potters, have established and defended their areas and can fish with little fear of having their gear damaged or destroyed by trawlers towing through it. If these grounds are lost it may prove impossible for these operations to establish elsewhere in heavily trawled areas.

In terms of more local (Hayle) fisheries, static gear operations (specifically pots and, to a lesser degree, tangle nets) may lose grounds and find it difficult or impossible to re-establish in the area.

Potting boats fishing the middle grounds (*i.e.* between the offshore deployment area and St. Ives Bay have expressed fears that the offshore potters may be forced to work closer inshore and will compete for their grounds.

Beam trawlers, being relatively maneuverable, will be able to work around the edges of the exclusion box, but will still lose large areas of traditional ground. Otter trawlers, who are often more constrained in their direction of towing due to the strong tides in the area, may have to take a wide sweep to avoid the area and will consequently lose a larger part of their fishing area;

Adjacent trawling grounds will become more heavily fished, and it will become increasingly difficult for static gear boats to find an area to fish.

Other shipping will be forced to avoid the deployment area and will therefore have more of an impact on fishing operations.

Likely actual effects of exclusion from the Wave Hub deployment area

During the construction and operational stage of this development, it is anticipated that an area to be avoided (ATBA; i.e. a recommendatory routeing measure to aid safe navigation) will be declared for the deployment area. In addition, it is anticipated that navigation rights will be extinguished around the WEC devices and that safety zones will be declared up to a maximum of 500m around individual WECs and/or arrays of WECs including their lateral movement. Therefore, although no formal "fisheries exclusion zone" will be established, for the purposes of this assessment, a worst case scenario is assumed to comprise the combined effects of the ABTA, extinguished navigation rights and a maximum potential area of safety zones over the entire period of the Wave Hub's operation (c.25 years).

Under the worst case scenario, it is assumed that the effect of the ABTA, even though it is a non-statutory measure, will be to prevent fishing from taking place in the deployment area (i.e. a sea area of 4km x 2km). The effect of the extinguished navigation rights should not extend beyond the deployment area since it relates directly to the WECs (and potentially their lateral movement), which will be positioned within the deployment area. However, it is possible that the safety zones could extend beyond the deployment area, adding to the total sea area effectively excluded from fishing. The worst case scenario would be an additional 500m extension all around the deployment area, effectively creating a 3km by 5km (i.e. 15km^2) combined safety zone.

However, this is unlikely to represent a realistic worst case scenario because of the technical requirements influencing the layout and performance of the WEC devices (e.g. maximum energy generation, wave shadow effects, timing of WEC device deployments, and mooring arrangements). More realistic scenarios can calculated based on the areas required to accommodate the maximum extent of safety zones (i.e. 500m) around the example layouts of the WEC devices that form part of the consent application for the Wave Hub. These areas add up to a maximum area of 1.4km^2 of safety zones outside the deployment area giving a total area of 9.4km^2. Nevertheless, for this assessment, the worst case scenario for an exclusion area preventing fishing activity is assumed to be 15km^2.

It has been argued (FSBI, 2001) that an area closed to fishing has little impact on a fishery which is regulated by quota; the quota will be taken elsewhere and the fleet will end up catching the same amount of fish. However, it is not just the amount of fish caught that is relevant here; the costs incurred in taking it are an important part of the profit equation. If boats are forced to steam further, to haul gear more often or to fish in deeper or more obstruction-ridden waters, then profitability will be reduced. Indeed, in a situation where the volume of fish is fixed by quota (and indeed often reduces year on year), where input costs are rising rapidly (particularly fuel costs, which have more than doubled between 2004 and 2005) and the price paid for fish remains more or less static or decreases, then to limit catching opportunities is a grave burden on an already heavily burdened industry. Indeed it is reported (Fishing News, 2005) that some Newlyn beam trawlers are now laid up because of fuel prices being so high that fishing has become unprofitable.

If this potential impact is assessed in more detail, it could be argued that even if fishing in the proposed deployment area (i.e. 8km^2) is prevented entirely, resulting in a 100% loss of value to the fishery from this area, a value of only £6,396 per annum would be lost. This represents just over 0.2% of the total value of landings from 29E4, which would be a negligible impact on the financial value of the wider fishery as a whole. On this basis, under the worst case scenario, if fishing is prevented over sea area of 15km^2, a value of £12,035 would be lost per annum, representing 0.382% of the total value of landings from 29E4. However, the financial analysis undertaken to data is crude and has not been done to a level of detail that permits impacts on individual vessels to be identified.

In reality, any disruption to fishing in this area may actually have a significant impact upon a few individual vessels that rely on this area for a large proportion of their landings, and subsequent profit. Further consultation with vessels identified as fishing in the proposed deployment area for a large proportion of the year will be required to explore this impact in more detail.

Displacement of vessels from the Wave Hub deployment area to other nearby areas will occur, increasing the fishing pressure on these grounds. As the closed area off Trevose Head has been enforced again in 2006, then congestion will likely occur in the spring sole fishery.

Additionally, some parts of the proposed exclusion zone are effectively refuges, where static gear fishermen, particularly offshore potters (approximately 2-3 vessels), have established and defended their areas and can fish with little fear of having their gear damaged or destroyed by those trawlers permitted to fish within the 12nm limit towing through it (although it is recognised that the majority of trawling activity is outside the 12nm limit, many beam and otter trawlers from ports such as Newlyn, fish in this area, particularly at certain times of year, such as Spring. Estimates based upon consultation and review of DEFRA data suggests that between 20-30 Belgian vessels traditionally fish in this area during the January to March period each year, although recent reports suggest that this number has declined significantly during 2005. In addition, 2 vessels from Newlyn and 3 from Plymouth are reported to regularly fish in the area. The total number of U.K beamers that are of small enough engine capacity to work inside the 12 mile limit has reduced to around 20).

If these grounds are lost, it may prove difficult for these operations to establish elsewhere in heavily trawled areas (outside the 12nm limit) or in areas where existing static gear fisheries are already established (inside the 12nm limit).

Specifically, the proposed deployment and potential safety zones will likely have the following impacts on local fisheries:

- A small number of vessels that fish static gear (specifically pots and, to a lesser degree, tangle nets) will potentially lose grounds and find it difficult to re-establish in the wider area (trawling activity outside 12nm and other established static gear fisheries within the 12nm limit).
- Larger potting vessels that are forced away from the deployment zone may move onto the middle grounds and compete for space with smaller boats that are already established in this area.
- Beam trawlers who regularly fish in this area in the period January to March, being relatively maneuverable, will be able to work around the edges of the deployment area, but may still lose areas of traditional ground in and around the proposed deployment area.
- Certain otter trawlers who regularly fish in this area in the period January to March and are often more constrained in their direction of towing due to the strong tides in the area may have to take a wide sweep to avoid the area and may consequently lose a larger part of their fishing area.
- Adjacent trawling grounds may become more heavily fished, and it will become increasingly difficult for static gear boats to find an area to fish.
- The reduced fishing pressure within the deployment area may produce a beneficial effect on local fish resources which may, in turn, lead to benefits to commercial fishing vessels in the wider area.

Decommissioning of the Wave Hub will include removal of the offshore infrastructure, cables, WEC devices, moorings, anchors, etc. In addition, the ABTA, extinguished navigation rights and safety zones will cease to operate so fishing should no longer be prevented by the operation of the Wave Hub.

7.7 Perceived v actual effects of the site to shore cable (operational phase)

Perceived effects of the site to shore cable (operational phase)

Problems may be caused by the cable running ashore from the Wave Hub to join with the National Grid at Hayle. For the most part these cables will be laid across a seabed that is mostly rock; consequently it will be difficult or impossible to bury them.

Serious concerns were expressed, particularly among the trawling and potting sectors, that the cable and an adjacent, parallel area could become an exclusion zone. This would probably be more of a loss to the industry than the Wave Hub deployment zone.

If the cable and an adjacent band of seabed were to become an exclusion area it would, in theory, radically alter the pattern of fishing in the study area as (a) trawlers would no longer be allowed to tow their gear across the line of the cable (in practice, as any exclusion to fishing would be difficult to enforce, it is likely that many of the otter trawlers would merely shorten their towing warps, increase engine speed and "fly" their gear over the cable. Beam trawlers may just tow over it regardless, if they perceive it as offering little or no threat to their gear), and (b) potters and tangle netters in theory would be excluded from shooting strings of pots or fleets of nets across the cable. Again, as they will often work their gear in the same direction as the tide, this would cause disruption to their fishing operations.

As above, they may ignore the exclusion zone unless it is adequately policed.

An exposed cable would, apart from being at risk themselves to damage from fishing gear, might also be responsible for the following problems:

- Snagging of trawl gear, particularly if the cable is suspended between two high points as is deemed likely in the draft project report (Halcrow, 2004); the trawl doors in particular would be liable to being trapped under the cable. Such snagging, particularly for beam trawlers, could lead to a serious risk of capsize;

- Pots would get snagged during hauling. With the strong tides in the area it is inevitable that the gear is sometimes dragged when being hauled; while this may lead only to the loss of one or a few pots, these are expensive pieces of equipment. There is also the additional risk of capsize or foundering particularly if a small vessel becomes fouled in poor weather;

- Some concern was expressed about the as yet unknown effects that the electric currents carried by the cables might have on the behaviour or migration of fish. Some types of fish, particularly elasmobranchs, are known to be extremely sensitive to some types of electrical fields.

Likely actual effects of the site to shore cable (operational phase)

A 25km sub-sea cable will run between the Wave Hub's offshore and onshore infrastructure. The cable will indeed be laid on the seabed where rock is exposed at the surface or insufficient sediment is present to allow burial. This means that the cable will be laid on the seabed for most of its length offshore of St Ives Bay. The cable will be armoured by an outer layer/sheath of steel. It will not be armoured using rock. Inshore, in St Ives Bay where the sediments are predominantly sand, the cable will be buried up to 3m below the seabed.

Once installed, the cable will be subject to an underwater inspection to ensure that spans between two high points are kept to the absolute minimum. If inspection identifies a span, the cable will be re-positioned to avoid or minimise the span.

With regard to a potential exclusion zone, **the cable route will not become an exclusion zone of any form** except for where it lies within the boundaries of the proposed ABTA for the deployment area and safety zones around the WECs, which may extend approximately 500m along the seaward end of the cable. Therefore, fishing will be permitted over the majority of the length of the cable route. In areas where the cable is exposed on the seabed, many of the otter trawlers would merely shorten their towing warps, increase engine speed and "fly" their gear over the cable. Beam trawlers may just tow over it regardless, if they perceive it as offering little or no threat to their gear. If fishermen consider that the presence of the cable on the surface of the seabed represents a threat to their gear, then trawling is likely to be avoided over the cable route. The position of the cable will be clearly identified on charts and made known to fishermen and so it will be possible to avoid the cable. Nevertheless, this would represent an adverse effect on trawling activity, although it is noted that due to the rocky seabed in this area trawling is not a significant means of fishing.

The electro-magnetic effects of the cable will be assessed in detail as part of the EIA process and be reported in the Environmental Statement.

Decommissioning of the Wave Hub will include removal of the cable and a return to the existing conditions in terms of risk and damage to fishing gear.

7.8 Suggested mitigation and/or alternatives

Fishermen from Hayle were consulted at an early stage in the development and an opportunity for others to have an input into the process was given through meetings and a questionnaire (Halcrow, 2004), but apparently very little feedback was received. In addition to formal consultation, since November 2004, Emu Ltd has been engaged in discussions with local commercial fishermen about fish ecology surveys. The first of these surveys was subsequently undertaken in July 2005. Through the course of these discussions and surveys, ideas about mitigation have been voiced by local fishermen and noted by Emu Ltd.

7.8.1 Mitigation during construction

The following points were raised during discussions as means whereby impacts on the fishing industry during the construction phase of the Wave Hub and its associated cables might be reduced:

- Work on the offshore deployment area should be avoided between January and April to avoid potential conflict with the sole fishery in the area at that time. (Due to weather and sea conditions at this time of year, it is unlikely that work on the offshore deployment area will take place in this period);
- Work close inshore, especially to bring the cable ashore at Hayle, should not coincide with the peak months of the inshore spider crab fishery -May, June, July and August (Due to preferable weather conditions, cable laying work is likely to take place over this period. However, it is only predicted to take 4-5 days to complete this activity);
- A wide ranging fisheries liaison system should be established, covering all fisheries and potential conflicts in the area;

- Wherever possible the cable should be buried. Where this is not possible it is vital that enough slack is left in the cable so that it closely follows the contour of the seabed to keep any spans to the absolute minimum (both these measures will be adopted); and
- A detailed post-construction survey (diver / ROV) is requested, and any parts of the cable that may cause hazards to fishing operations should be clearly identified and their locations made known to the industry (this will take place and will be stipulated as one of the conditions of the contract for the appointed construction contractor).

7.8.2 Assessment of actual impacts following mitigation

It is predicted that work on the Wave Hub deployment area will indeed be avoided between January and April, mainly due to weather conditions at this time of year. This will result in an indirect mitigation measure to the sole fishery in this area. However, it is unlikely that work on the site to shore cable will be able to avoid the period May to August, therefore, a degree of disruption to commercial fishing activity will occur during the installation of this cable. This disruption will be minor though as it expected that the cable laying will only take up to 5 days, and at any one time, only a small part of the route will be unavailable for fishing (the area in which the cable laying barge is working).

Actual effects upon local commercial fishing activity will also be minimised through setting up a dedicated fisheries liaison post for the construction phase of the scheme. The role of this fisheries liaison officer (FLO) will be to disseminate information to the local fishing industry about any planned construction and to be at sea during the construction process in order to provide a link between the contractor and local fishermen. The exact scope and role of the FLO post should be developed through consultation with local fishermen and the developer. If the FLO role is carried out efficiently, then adverse effects upon local fishermen will be minimised.

Undertaking a detailed post-construction survey of the site to shore cable, using either diver of ROV, will also reduce any adverse effects on local fishing vessels. Following this survey, a report should be issued to local fishermen, via the FLO, so that all local skippers are made aware of any areas of the cable route that may represent a higher risk to certain fishing gears than other parts.

In summary, if well thought-out mitigation measures are implemented during the construction phase of the scheme, then any adverse effects upon local commercial fishing vessels are likely to be of a minor and temporary nature.

7.8.3 Alternative sites

One beam trawler skipper from Newlyn suggested that there would be virtually no impact on the fishing industry if the wave hub were located west of the Bann Shoal on around the 6° West line, and at around 50° 16’ North. There is apparently an existing exposed cable here, controlled by a guard boat. This site is reported to be little used by the fishing industry and is clear of the major shipping lanes. Another site suggested is an area of hard ground at 50° 25’ N and 5° 19’ W.

Although noting the comments of local fishermen, it is important to recognise that many more constraints than those relating to the commercial fishing industry were taken into account to identify the proposed Wave Hub deployment site. The Wave Hub site was determined through a detailed site identification process including a screening of potential sites onshore, offshore and for the cable route by taking into account various constraints such as shipping lanes, MOD military exercise areas, designated sites of nature conservation interest, presence of cliffs at landfall and other issues (12nm limit).

Impacts will arise as a result of this development, not only commercial fisheries but on other parameters. However, in terms of impacts on the environment as a whole, the proposed development and construction options site represents the best-case scenario for this development**.**

8.0 CONCLUSIONS

The area in which the Wave Hub development is proposed supports a diverse and well-established fishery. The actual Wave Hub location is in an area specifically fished by large beam trawlers in February –March, primarily targeting dover sole but also landing important by-catch species including monkfish and lemon sole.

The area in and around the Wave Hub site also supports a number of potting vessels, with at least one vessel fishing up to 90% of their gear in this area (*Source*: consultation with local fishermen, August 2005).

Further inshore, along the route of the proposed site to shore cable, an even more diverse fishery exists, comprised of large numbers of <10m vessels from Hayle and St. Ives. The summer spider crab fishery is a key part of the local fishery as is the mackerel handline fishery which has MSC accreditation as a sustainable fishery.

The main issues identified by local fishermen that may arise as a result of this development include temporary disruption during construction of the Wave Hub, temporary disruption during the cable laying operations, permanent disruption due to exclusion from the Wave Hub site and future problems with unburied cables. However, many of the issues raised in August 2005 were *perceived* effects and were raised without details of the proposed scheme being fully developed, in particular construction duration, methods and the process of implementing safety zones around future wave energy devices.

With increased knowledge of the scheme and proposed construction methodology, and with a commitment to implement certain mitigation measures, it is predicted that the proposed Wave Hub development will not result in any significant adverse impacts upon commercial fishermen during the construction phase and will only result in some displacement of fishing activity for a small number of fishing vessels that regularly fish within the area that will be covered by the Wave Hub deployment area and eventual WEC arrays. All potential impacts associated with the proposed scheme are fully described and assessed in the Environmental Statement.

9.0 AUDIT TRAIL

Title: South West Wave Hub Commercial Fisheries Study (Final Draft)			
Report No:	05/J/01/06/0782/0539/Final Draft v03		
Job No:	J/1/06/0782		
Client Name:	Halcrow Group Ltd.		
Client Contact:	Steve Challinor		
		Initials	**Date**
Project Manager:	Jonny Lewis		
Data Analysis undertaken by:	Martin Esseen		
Report written by:	Martin Esseen / Jonny Lewis		
Report checked by:	Claire Espinasse		
Report Authorised by:	Simon Shaw		

10.0 DOCUMENTS CONSULTED

CEFAS, 2001. *Fisheries Information – cod, sole, plaice and whiting in the south west of the British Isles.* SAMFISH leaflet. Funded by EU Study Contract 99-009

Cornwall Sea Fisheries District Byelaws, 2003.

DEFRA, 2001, U.K. Sea Fisheries Statistics 1999 and 2000. London: The Stationery Office

DEFRA, 2002, U.K. Sea Fisheries Statistics 2001 London: The Stationery Office.

DEFRA, 2003, U.K. Sea Fisheries Statistics 2002 London: The Stationery Office.

DEFRA, 2004, U.K. Sea Fisheries Statistics 2003 London: The Stationery Office.

Fishing News, 2005. Beamers tie up in Newlyn. Fishing News, 26th August 2005, p.2

FSBI, 2001. *Marine protected areas in the North Sea.* Briefing Paper 1, Fisheries Society of the British Isles, Granta Information Systems, 82A High Street, Sawston, Cambridge CB2 4H, U.K.

Ghey, P., 2005. *An investigation of hand-line caught Mackerel* (*Scomber scombrus L.*) *on the north coast of Cornwall*. Unpublished paper, 2005. 47 Bodriggy Street, Hayle, Cornwall, U.K.

Halcrow, 2004. South West Wave Hub Feasibility Study. Task 4B: Environmental Scoping Report Draft. October 2004. Halcrow Group Limited.

Metoc (2004). Resources, constraints and development scenarios for wave and tidal stream power in the south west of England. Metoc plc for South West of England Regional Development Agency.

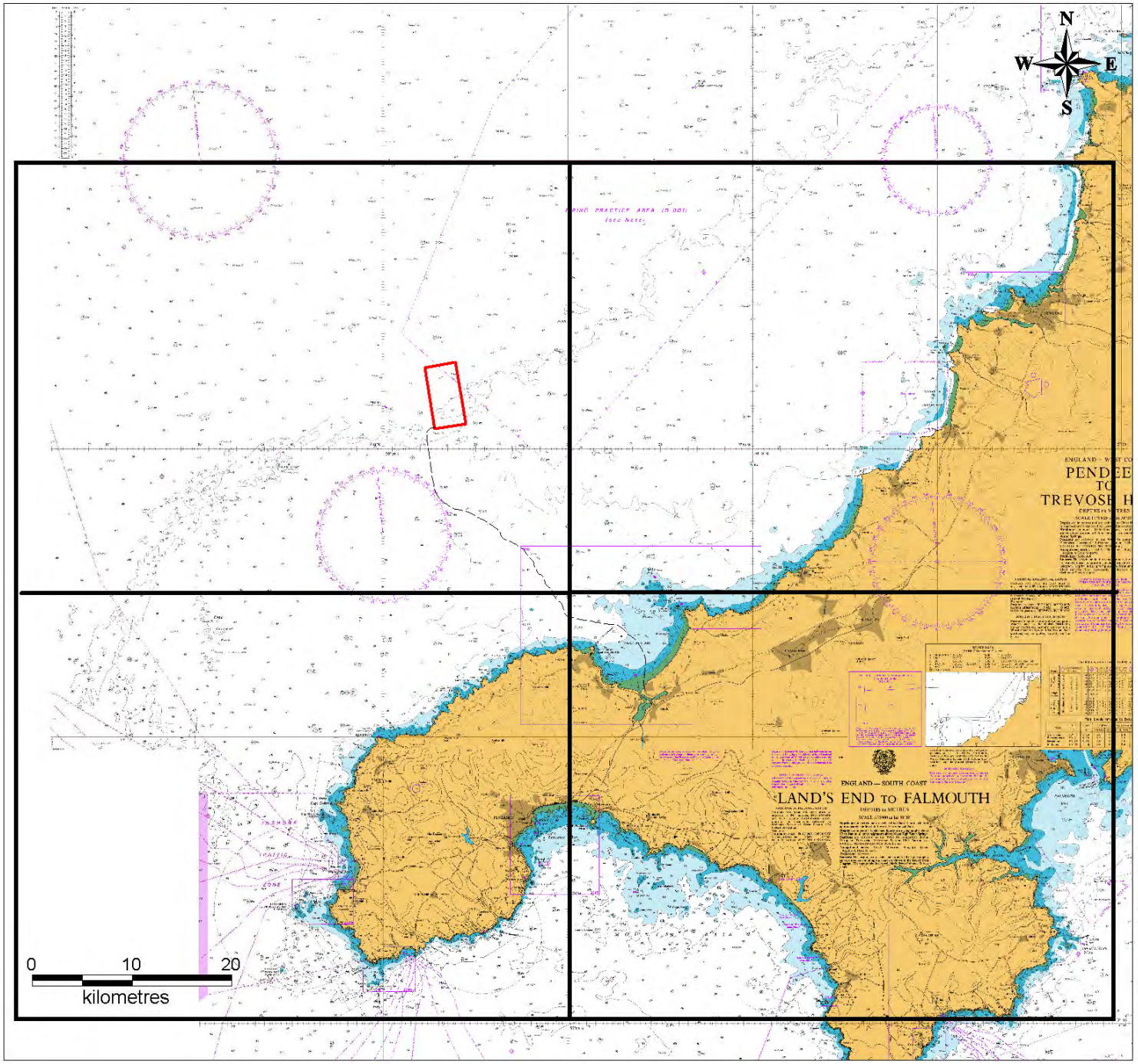
Nicholson & Mounce, 1989. *Study of the Fishing Industry in the South East of England.* SFIA Report 1394.

Pawson, 1995. *Biogeographical identification of English Channel fish and shellfish stocks.* Fisheries Research Technical Report No. 99. MAFF Direct. Fish. Res., Lowestoft: 72pp.

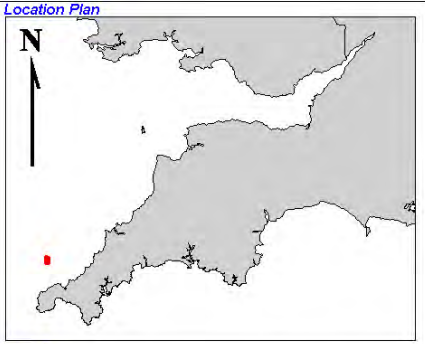
Sainsbury, J.C., 1996. *Commercial fishing methods – an introduction to vessels and methods. 3rd edition.* Fishing News Books, London. ISBN 0-85238-217-0

Wheeler, A., 1969. *The Fishes of the British Isles and North West Europe.* Macmillan and Co. Ltd., London. 613 pp.

FIGURES



Location Plan



Legend

- ICES Square Sub-section
- ICES Square
- Proposed Site to Shore Cable Route
- Proposed Wave Hub Site (New Deployment Area)

Notes

Coordinate System: WGS 84

Client

Halcrow

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

EMU

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

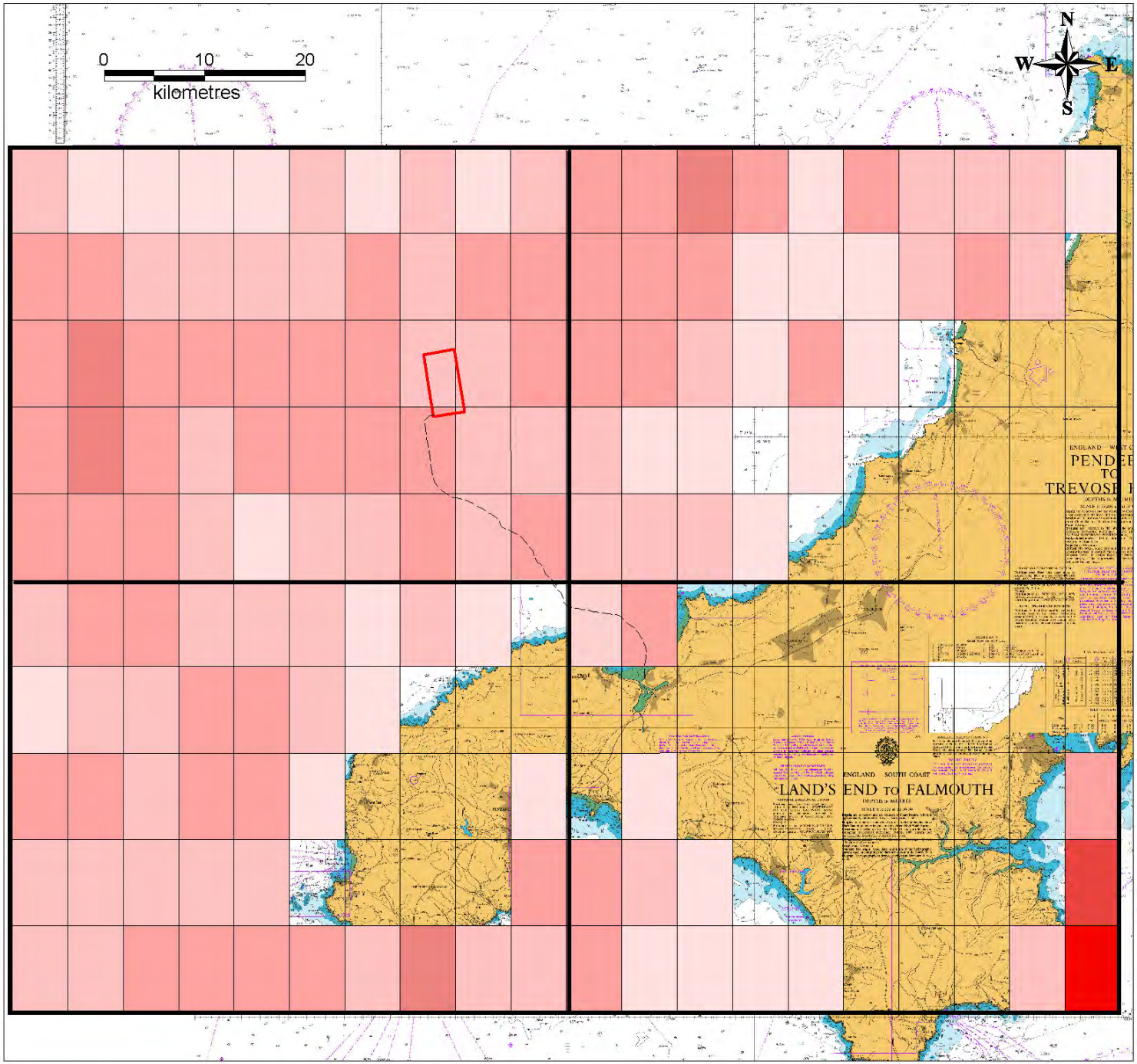
Project Title

Wave Hub Fisheries Surveys

Drawing Title

Location Map of ICES Squares with Sub-squares in Relation to the Exclusion Zone and Cable Route

Job No.	Date Issued	Figure 1		
J/1/06/0782	2/5/06			
Sheet Size	**Scale**	**Drawn by**	**Checked by**	**Revision No.**
A4	1: 0.350 km	RLC	JXL	



Legend

Proposed Site to Shore Cable Route

Proposed Wave Hub Site (New Deployment Area)

Sightings per 19 km sq Square

- 0
- 1 - 5
- 6 - 10
- 11 - 20
- 20 - 30
- 31 - 40
- 41 - 60
- 61 - 70

Notes

Coordinate System:

WGS 84

Client

Halcrow

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

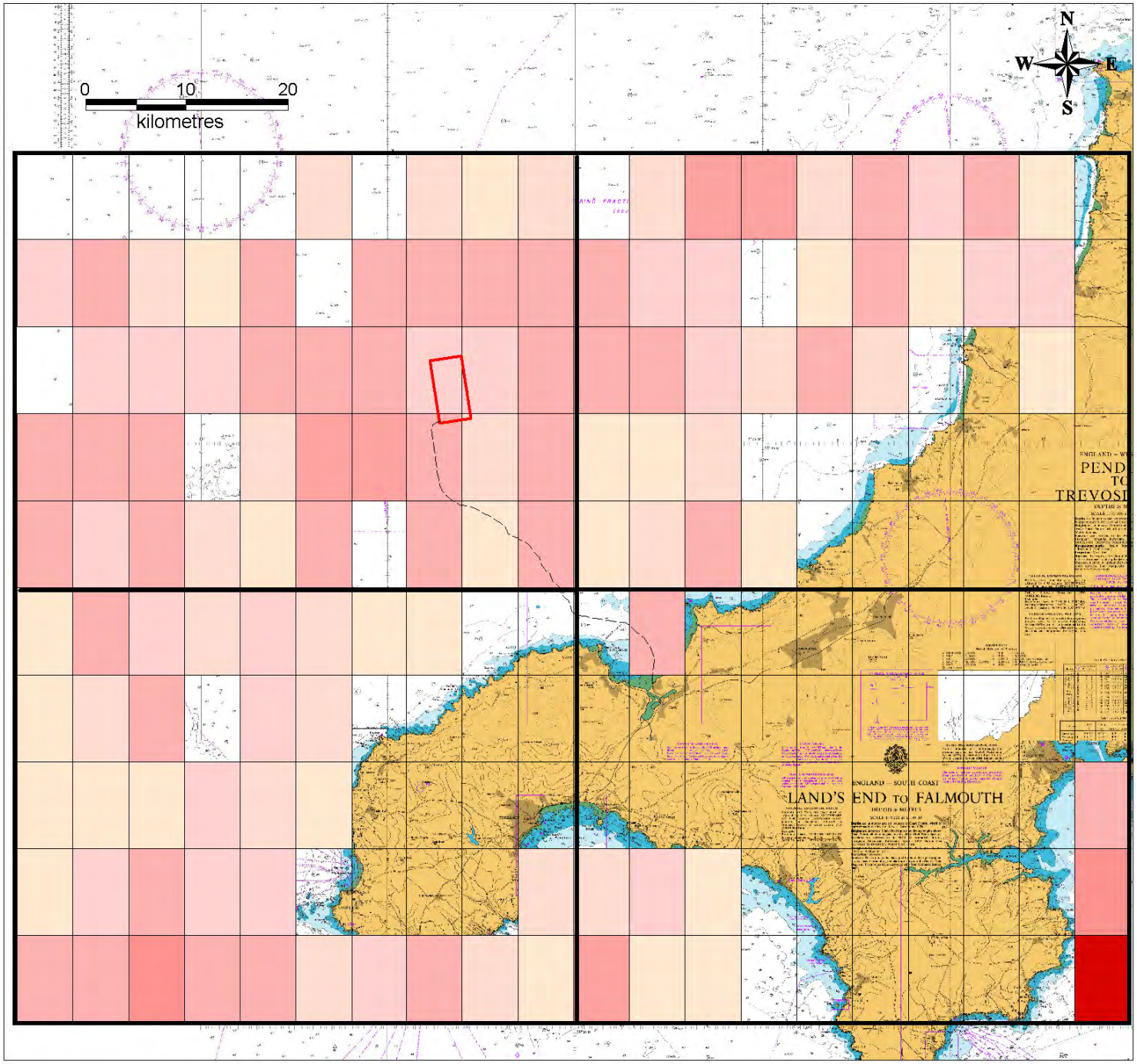
Project Title

Wave Hub Fisheries Surveys

Drawing Title

All Fishing Activity in 29E4 (2000-2005)

Job No.	Date Issued	Figure 3		
J/1/06/0782	2/5/06			
Sheet Size	**Scale**	**Drawn by**	**Checked by**	**Revision No.**
A4	1: 2.483 km	RLC	JXL	



Legend

Proposed Site to Shore Cable Route

Proposed Wave Hub Site (New Deployment Area)

Sightings per 19 km sq Square

- 0
- 1
- 2
- 3
- 4 - 7
- 8 - 10
- 11 - 20
- 51 - 60

Notes

Coordinate System:

WGS 84

Client

Halcrow

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

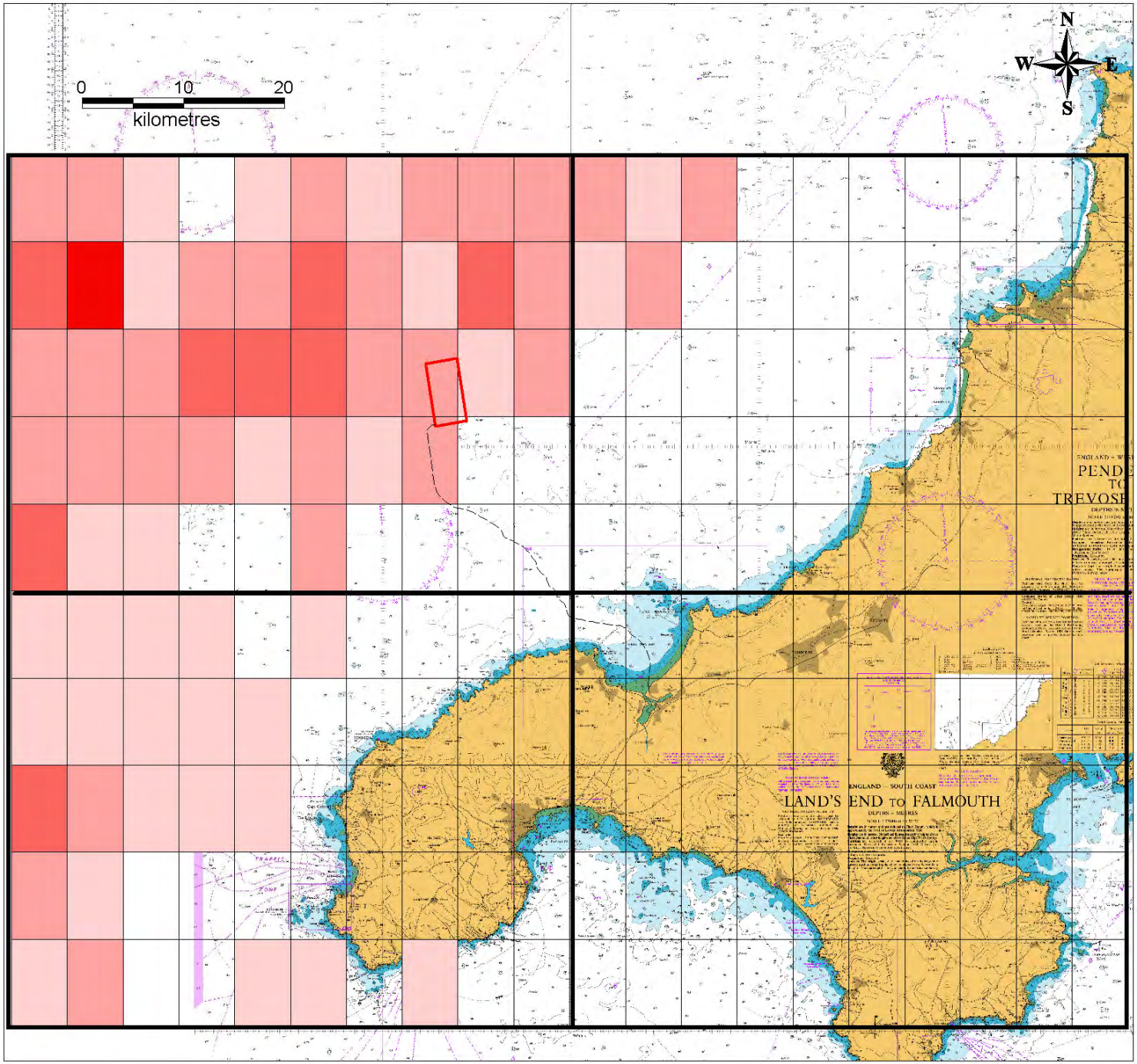
Project Title

Wave Hub Fisheries Surveys

Drawing Title

UK Fishing Activity in 29E4 (2000-2005)

Job No.	Date Issued	Figure 4		
J/1/06/0782	2/5/06			
Sheet Size	Scale	Drawn by	Checked by	Revision No.
A4	1: 3.460 km	RLC	JXL	



Legend

Proposed Site to Shore Cable Route

Proposed Wave Hub Site (New Deployment Area)

Sightings per 19 km sq Square

- 0
- 1 - 3
- 4 - 7
- 8 - 10
- 11 - 20

Notes

Coordinate System:

WGS 84

Client

Halcrow

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

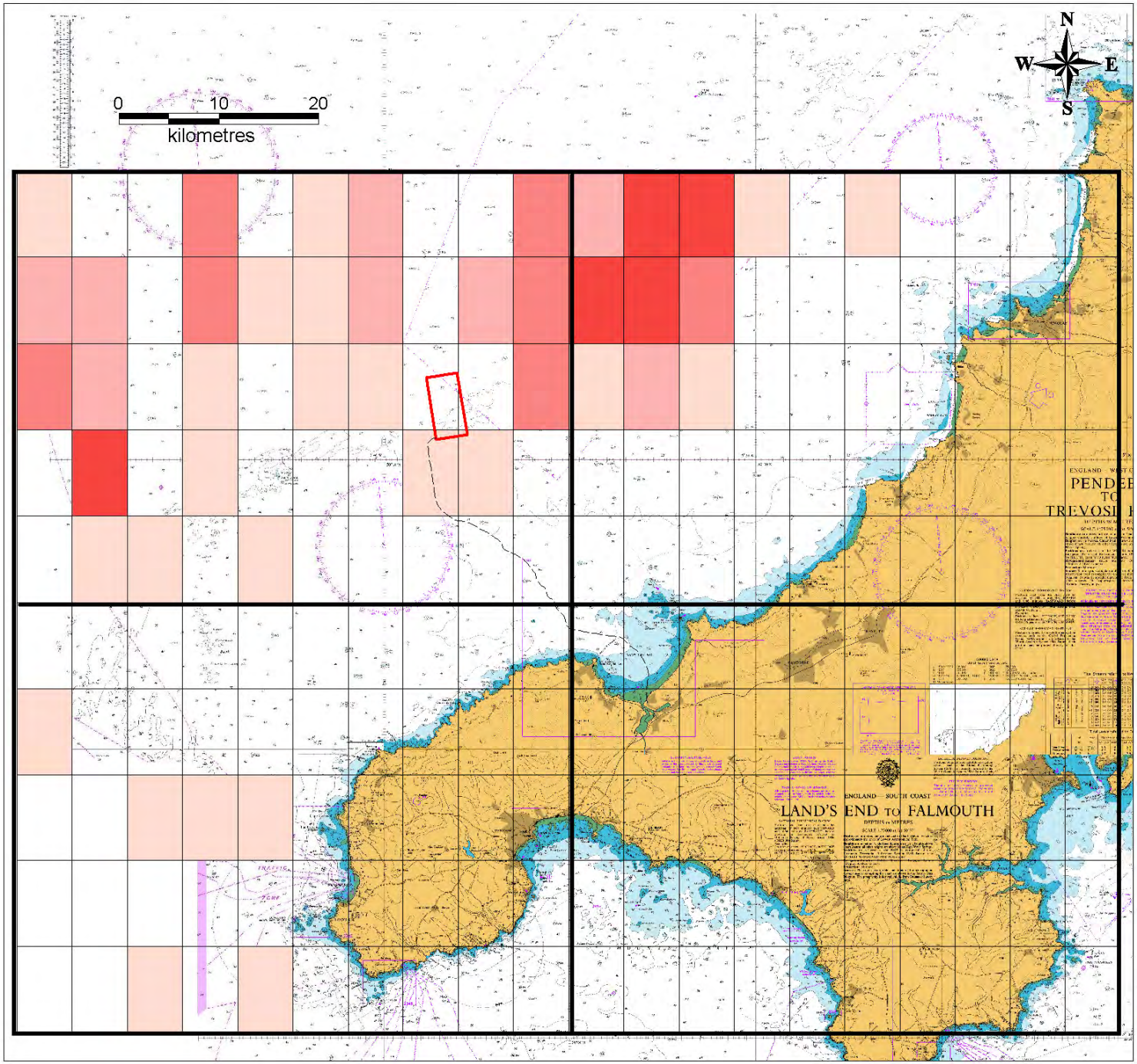
Project Title

Wave Hub Fisheries Surveys

Drawing Title

French Fishing Activity in 29E4 (2000-2005)

Job No.	Date Issued	Figure 5		
J/1/06/0782	2/5/06			
Sheet Size	**Scale**	**Drawn by**	**Checked by**	**Revision No.**
A4	1: 3,460 km	RLC	JXL	



Legend

Proposed Site to Shore Cable Route

Proposed Wave Hub Site (New deployment Area)

Sightings per 19 km sq Square

- 0
- 1 - 3
- 4 - 7
- 8 - 10

Notes

Coordinate System:

WGS 84

Client

Halcrow

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

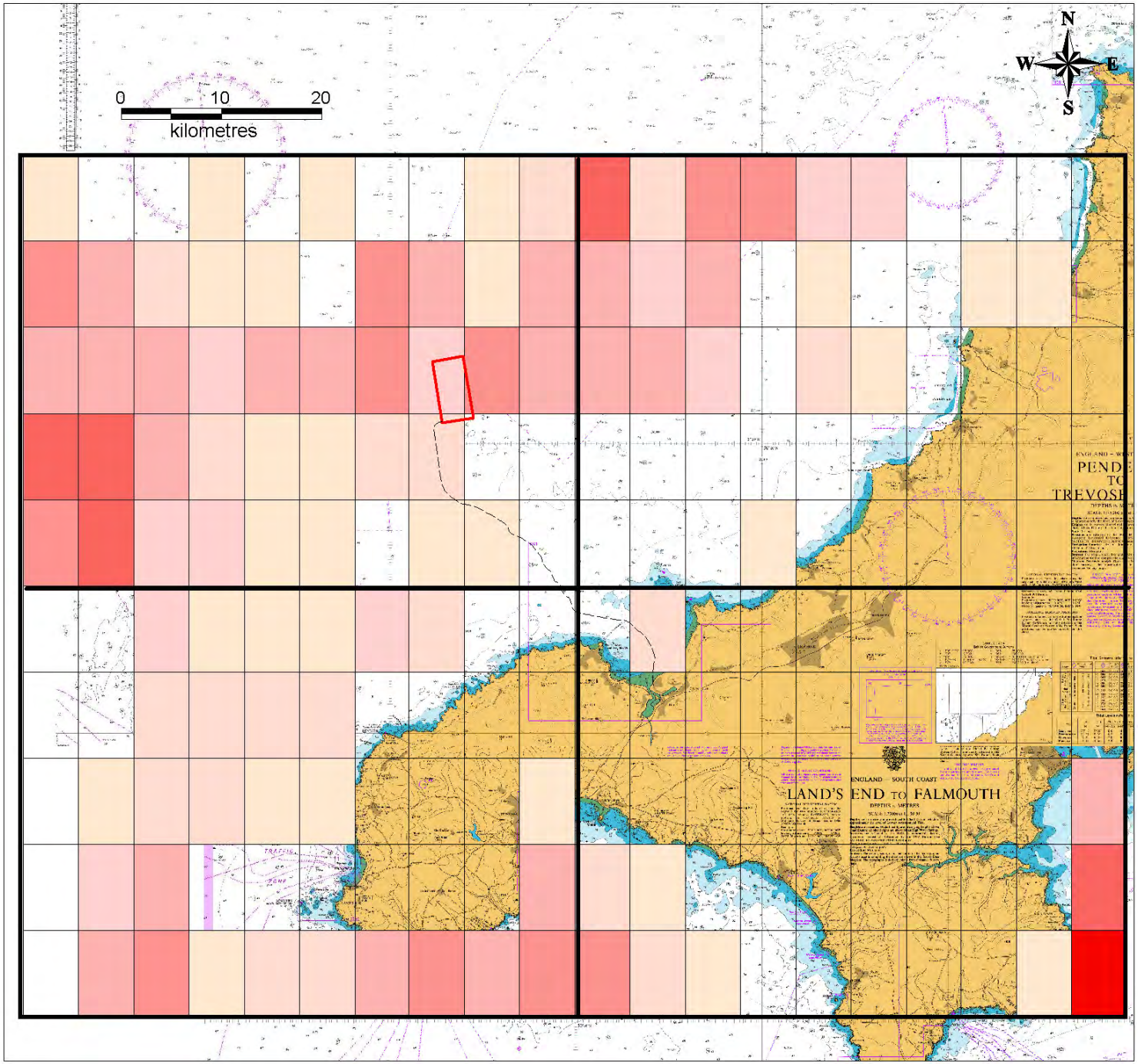
Project Title

Wave Hub Fisheries Surveys

Drawing Title

Belgian Fishing Activity in 29E4 (2000-2005)

Job No.	Date Issued			
J/1/06/0782	2/5/06	**Figure 6**		
Sheet Size	**Scale**	**Drawn by**	**Checked by**	**Revision No.**
A4	1: 3.500 km	RLC	JXL	



Legend

Proposed Site to Shore Cable Route

Proposed Wave Hub Site (New Deployment Area)

Sightings per 19 km sq Square

- 0
- 1
- 2
- 3
- 4 - 7
- 7 - 10
- 10 - 20
- 21 - 30
- 31 - 40

Notes

Coordinate System:

WGS 84

Client

Halcrow

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

Emu

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

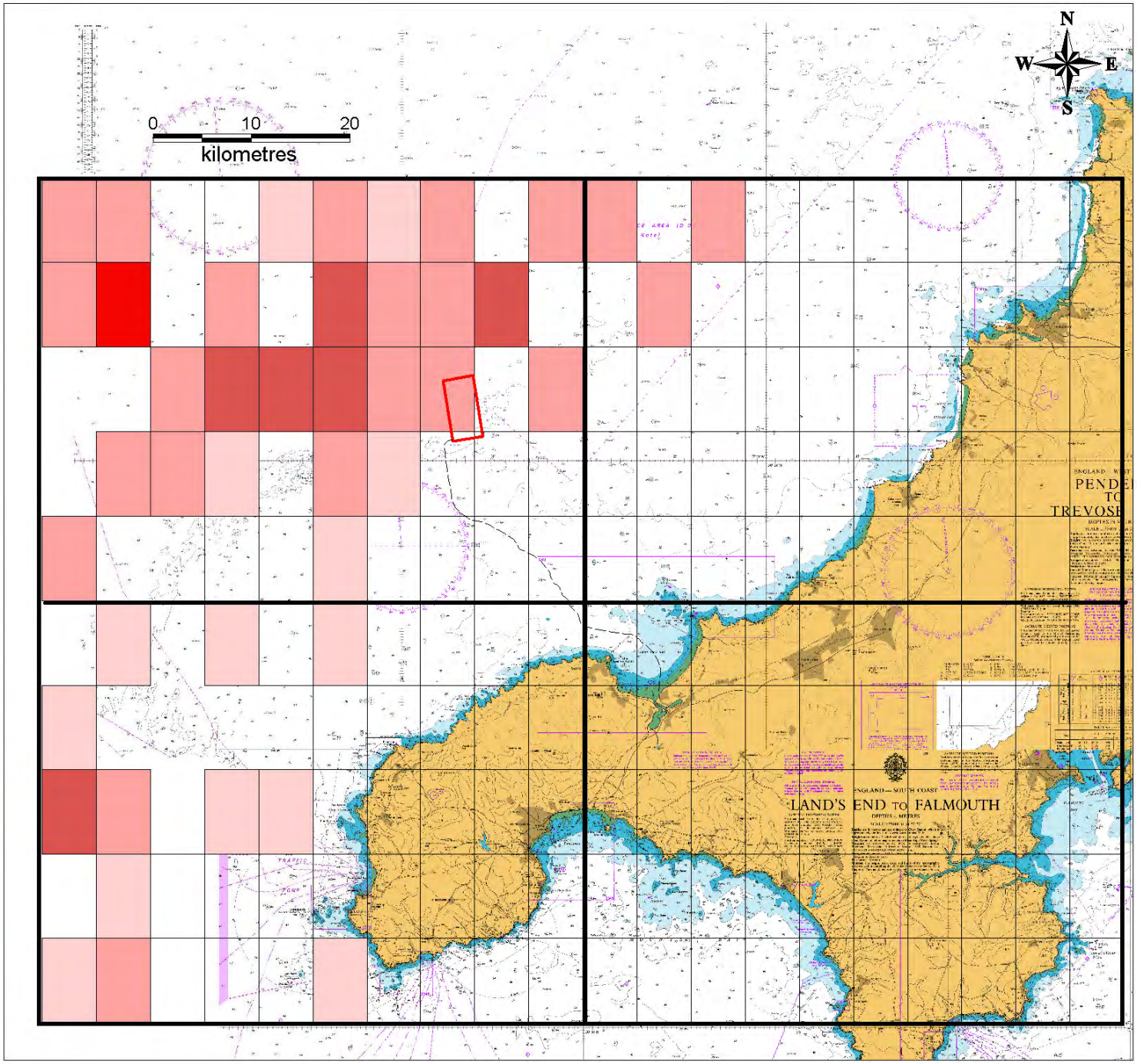
Project Title

Wave Hub Fisheries Surveys

Drawing Title

UK Trawling Activity in 29E4 (2000-2005)

Job No.	Date Issued	Figure 7		
J/1/06/0782	2/5/06			
Sheet Size	**Scale**	**Drawn by**	**Checked by**	**Revision No.**
A4	1: 3.5 km	RLC	JXL	



Legend

Proposed Site to Shore Cable Route

Proposed Wave Hub Site (New Deployment Area)

Sightings per 19 km sq Square

0
1 - 2
3 - 6
7 - 9
10 - 12
12 - 100

Notes

Coordinate System:

WGS 84

Client

Halcrow

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

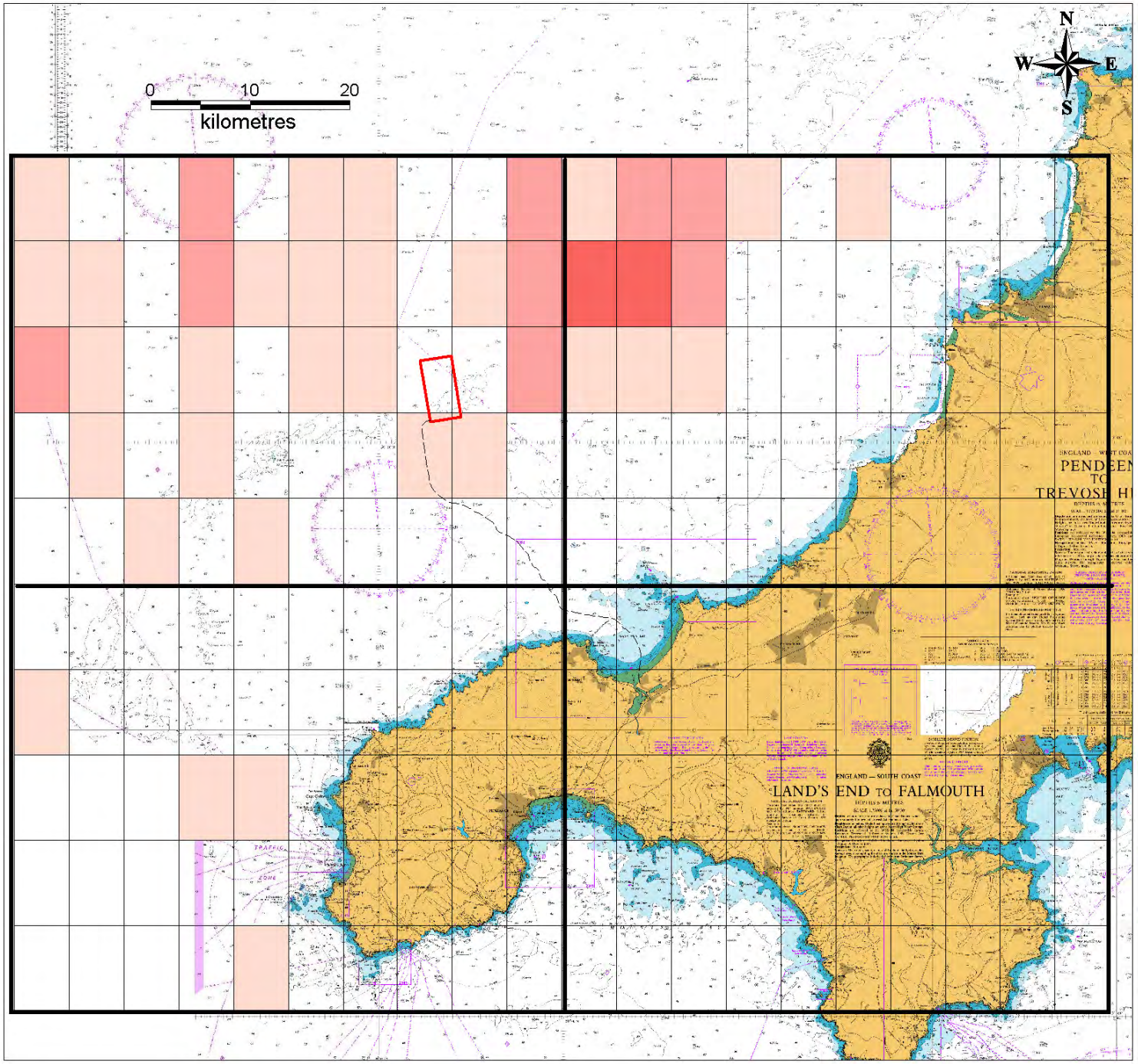
Project Title

Wave Hub Fisheries Surveys

Drawing Title

French Trawling Activity in 29E4 (2000-2005)

Job No.	Date Issued	Figure 8		
J/1/06/0782	2/5/06			
Sheet Size	**Scale**	**Drawn by**	**Checked by**	**Revision No.**
A4	1: 3.565 km	RLC	JXL	



Legend

Proposed Site to Shore Cable Route

Proposed Wave Hub Site (New Deployment Area)

Sightings per 19 km sq Square

- 0
- 1 - 3
- 4 - 7
- 8 - 10

Notes

Coordinate System:

WGS 84

Client

Halcrow

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

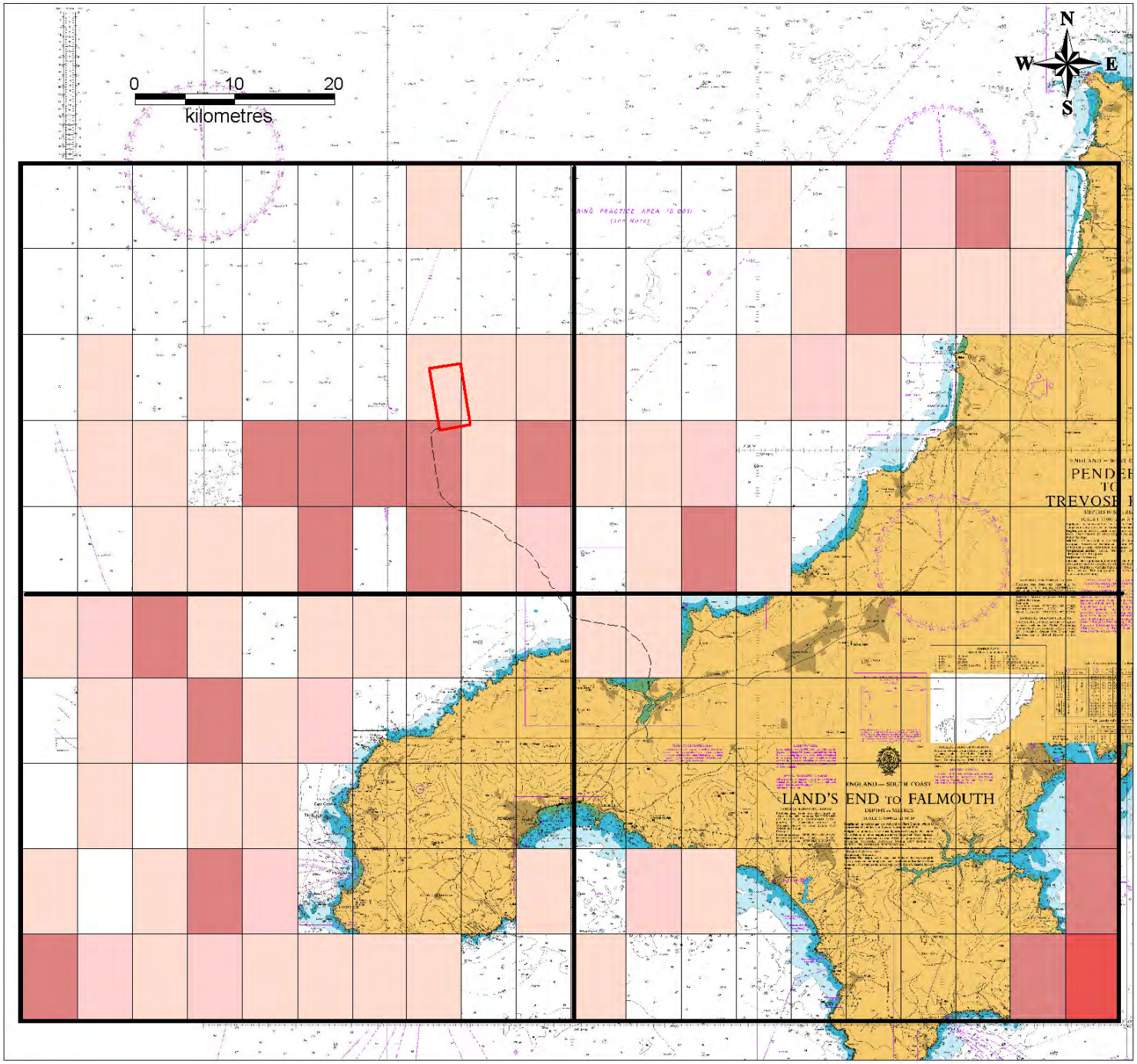
Project Title

Wave Hub Fisheries Surveys

Drawing Title

Belgian Trawling Activity in 29E4 (2000-2005)

Job No.	Date Issued	Figure 9		
J/1/06/0782	2/5/06			
Sheet Size	Scale	Drawn by	Checked by	Revision No.
A4	1: 3.5 km	RLC	JXL	



Legend

Proposed Site to Shore Cable Route

Proposed Wave Hub Site (New Deployment Area)

Sightings per 19 km sq Square

- 0
- 1 - 3
- 3 - 4
- 4 - 10
- 16 - 20

Notes

Coordinate System:

WGS 84

Client

Halcrow

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

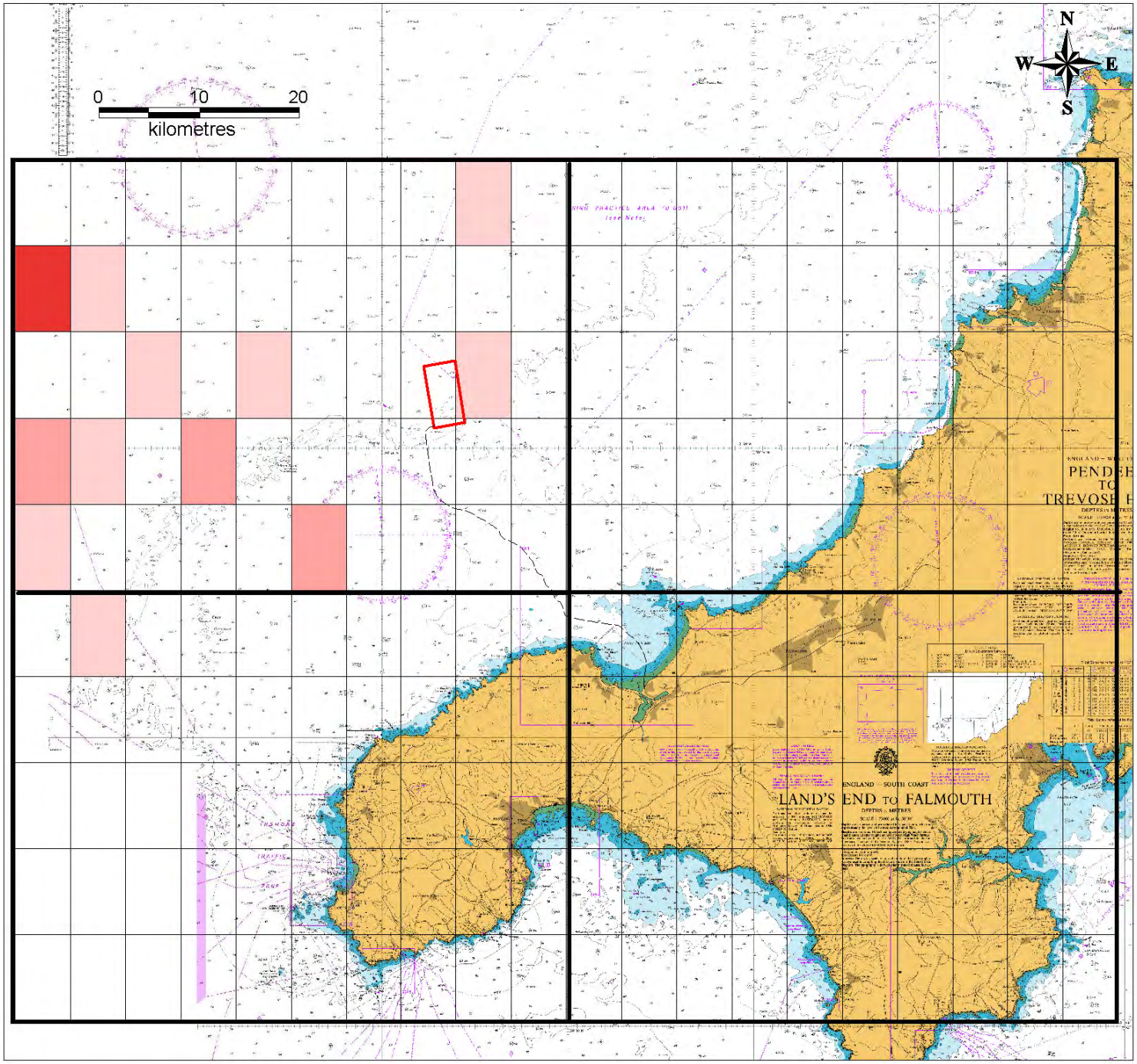
Project Title

Wave Hub Fisheries Surveys

Drawing Title

UK Potting Activity in 29E4 (2000-2005)

Job No.	Date Issued	Figure 10		
J/1/06/0782	2/5/06			
Sheet Size	Scale	Drawn by	Checked by	Revision No.
A4	1: 3.5 km	RLC	JXL	



Legend

Proposed Site to Shore Cable Route

Proposed Wave Hub Site (New Deployment Area)

Sightings per 19 km sq Sqaure

- 0
- 1
- 2
- 3

Notes

Coordinate System:

WGS 84

Client

Halcrow

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

Emu

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

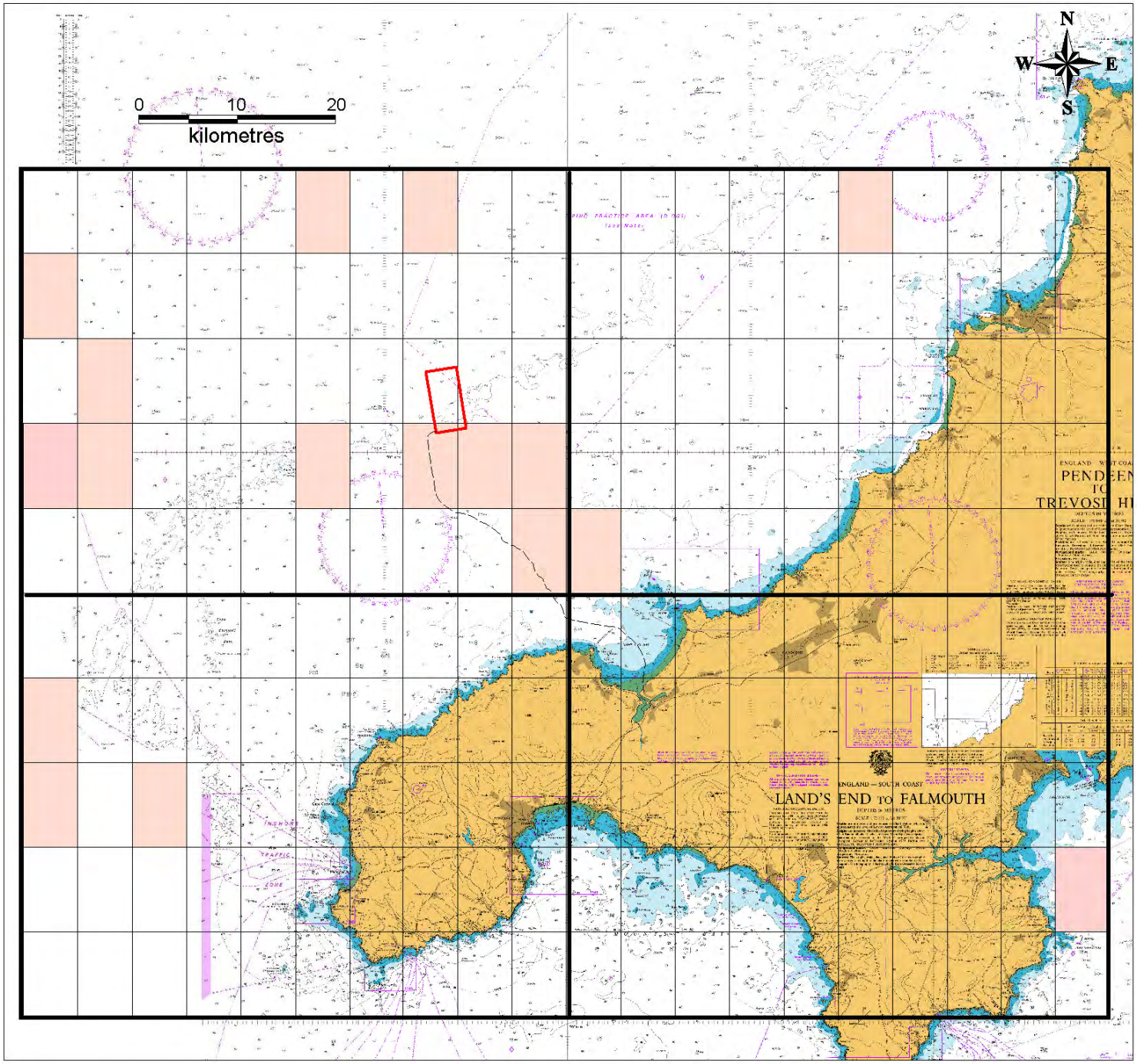
Project Title

Wave Hub Fisheries Surveys

Drawing Title

French Potting Activity in 29E4 (2000-2005)

Job No.	Date Issued	Figure 11		
J/1/06/0782	2/5/06			
Sheet Size	**Scale**	**Drawn by**	**Checked by**	**Revision No.**
A4	1: 3.5 km	RLC	JXL	



Legend

Proposed Site to Shore Cable Route

Proposed Wave Hub Site (New Deployment Area)

Sightings per 19 km sq Square

- 0
- 1-2
- 3-5
- >9

Notes

Coordinate System:

WGS 84

Client

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

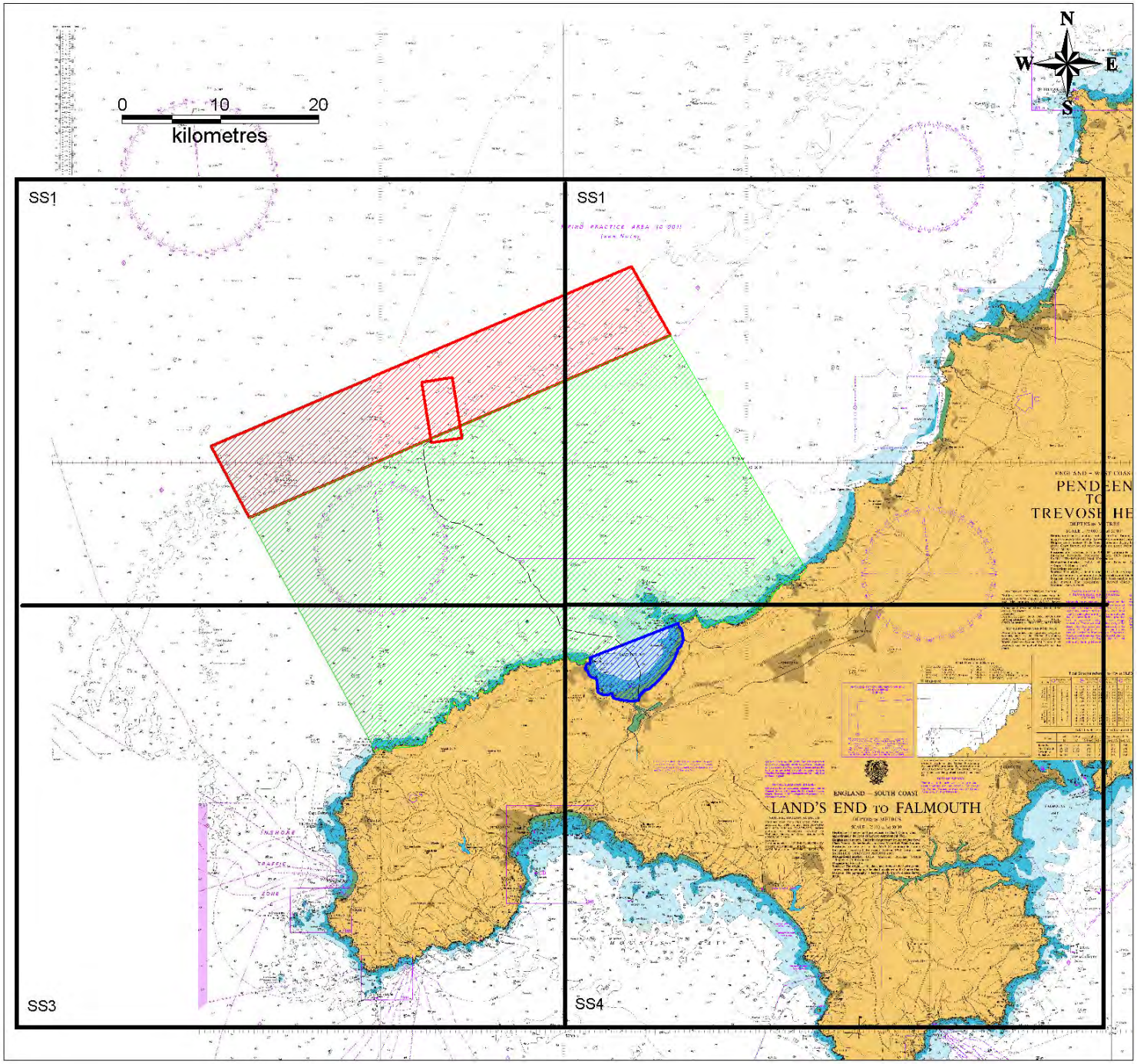
Project Title

Wave Hub Fisheries Surveys

Drawing Title

UK Netting Activity in 29E4 (2000-2005)

Job No.	Date Issued	Figure 12		
J/1/06/0782	2/5/06			
Sheet Size	**Scale**	**Drawn by**	**Checked by**	**Revision No.**
A4	1: 3.5 km	RLC	JXL	



Legend

- Inshore Ground
- Middle Ground
- Offshore Ground
- Proposed Site to Shore Cable Route
- Proposed Wave Hub Site (New Deployment Area)

Notes

Coordinate System:

WGS 84

Client

No Window

Halcrow Group Ltd
Ash House
Falcon Road
Sowton
Exeter
EX2 7LB

Consultant

No Window

EMU Ltd
1 Mill Court, The Sawmills
Durley, Southampton.
SO32 2EJ.
United Kingdom
Tel: +44 (0)1489 860050
Fax: +44(0)1489 860051

Project Title

Wave Hub Fisheries Surveys

Drawing Title

Key Fishing Grounds
Within Wave Hub Study Area

Job No.	Date Issued	Figure 13		
J/1/06/0782	2/5/06			
Sheet Size	**Scale**	**Drawn by**	**Checked by**	**Revision No.**
A4	1: 3.5 km	RLC	JXL	

APPENDICES

APPENDIX I

ICES STATISTICAL RECTANGLES

ICES statistical rectangles provide a grid covering the area between 36°N and 85°30'N and 44°W and 68°30'E. Latitudinal rows, with intervals of 30', are numbered (two-digits) from 01 at the southern boundary (latitude 36°00'N) and increasing northwards to 99. The northern boundary of the statistical rectangle system is, thus, latitude 85°30'N.

Longitudinal columns, with intervals of 1°, are coded according to an alphanumeric system, beginning with A0 at the western boundary (longitude 44°00'W), continuing A1, A2, A3 to longitude 40°W. East of 40°W, the coding continues B0, B1, B2, .., B9, C0, C1, C2, .., C9, *etc.*, using a different letter for each 10° block, to the eastern boundary of the area covered. Note that the letter I is omitted. Thus:

Longitudinal column of ICES rectangle	Coordinates
A	44°W-40°W
B	40°W-30°W
C	30°W-20°W
D	20°W-10°W
E	10°W-00°
F	00°-10°E
G	10°E-20°E
H	20°E-30°E
J	30°E-40°E
K	40°E-50°E
L	50°E-60°E
M	60°E-68°30'E(M8)

When designating an ICES rectangle, the northern coordinate is stated first. Thus, the rectangle of which the south-west corner is 54°00'N 03°00'E is designated 37F3.

Usually, it is necessary to specify an area with more precision than is possible with a statistical rectangle designation. Therefore, a sub-rectangle designation must be given (as a fifth character) by dividing a statistical rectangle into nine (10' latitude x 20' longitude) sub-divisions, as follows:

1	4	7
2	5	8
3	6	9

Example:
A location 58°12'N 10°33'E would, therefore, lie within ICES rectangle/sub-division:

4	5	G	0	5

APPENDIX 2

PERSONS CONSULTED

Name	Position
Dave Munday	Chief Fishery Officer, DEFRA, Newlyn
Callum Gough	Fishery Officer for Hayle and St Ives, DEFRA, Newlyn
Edwin Derriman	Chief Fishery Officer, Cornwall Sea Fisheries Committee.
Simon Cadman	Senior Fishery Officer, Cornwall Sea Fisheries Committee
Paul Trebilcock	Chief Executive, Cornwall Fish Producers Association
Chris Stevens	Skipper/Owner “Girl Linda” LO59
Michael Corin	Skipper, “Sapphire”, PZ66
Peter Ghey	Skipper/Owner “Sally Ann of Navax” PZ703
Keith Thresher	Skipper/Owner “Sarah Jane of Helford” FH273
Steve Knowles	Skipper/Owner “Nellie” PZ10
Elizabeth Stevenson	Director, Stevenson Trawlers, Newlyn (by phone)
Reg Easterbrook	Skipper/Owner “Chloe Estelle”
John Carter	Skipper/Owner “Swift”
Milky Veale	Skipper/Owner “Orca” SS707
P.J. Godfrey	Skipper “Midnight Express (by phone)
Bert Moss	Skipper “Pen Glas” (by phone)
Jim Portus	Chief Executive, South West FPO (by phone and email)

APPENDIX 3

U.K. FISHERIES STATISTICS: METHODOLOGY

Organisation of the national system of fishery statistics

Fisheries data are mostly collected by officers in the Sea Fisheries Inspectorates and processed by officials of the various U.K. Fisheries Departments, namely the Ministry of Agriculture, Fisheries and Food (for England and Wales), the Scottish Office Agriculture and Fisheries Department, the Department of Agriculture for Northern Ireland and Departments in Jersey, Guernsey and the Isle of Man. The main legislation used is: (i) the EU fisheries legislation on keeping and submitting logbooks and providing landing declarations. (ii) general powers under the Sea Fisheries (Conservation) Act 1967 under which Ministers granting a licence can require the master, owner or charterer of the vessel named in the licence to provide him with such statistical information as he may direct. These powers were widened in the Sea Fish (Conservation) Act 1992 to cover other types of information and the form in which it is to be supplied. MAFF collates the information compiled by U.K. Fisheries Departments for this publication.

Method of collecting, processing and compiling the data on catches, landings and average prices

Sources of data
The sources include logbooks, landing declarations, sales notes and personal contact with fishermen and merchants. Port harbour masters also provide details of individual vessels landing at main coastal locations. The method used for collecting data depends upon the size of vessel, species and location of landings. Legislation covers the supply of data on logsheets for all vessels over 17m overall length and vessels over 10m but not over 17m overall length which fish in more than one ICES area or are at sea for more than 24 hours and land TAC species. In addition vessels over 10m and not over 17m overall length fishing for less than 24 hours are required to supply landing declarations for quota species caught. Much information on the value of catches is provided by the industry. For vessels under 10 metres overall length, there is no statutory requirement under either EU or national legislation for fishermen to declare their catches. Information for this sector has been collected with the co-operation of the industry: it comprises log sheets and landing declarations voluntarily supplied by fishermen and assessments of landings derived from market sources and by correspondents located in the ports. Full documentation is not required for most fishing for non-TAC species, including shell fish, and summary records are compiled using information supplied voluntarily by the industry, from a variety of local sources and surveys run by local Sea Fisheries Committees.

Landings abroad
U.K. vessels which make landings at foreign ports are required under EU legislation to dispatch copies of log sheets and landing declarations covering their trips to the vessels' home ports within 48 hours of landing. When these data are received at the home port, they are entered on the systems used for U.K. landings.

Attribution of area of capture
Details of the areas fished are taken from the logbooks and codes for the ICES divisions and statistical rectangles are keyed into the port micro-computers. Where a statistical rectangle is split into different areas (*e.g.* part is in EU waters and part in the Norwegian waters) an additional code is used to indicate the zone fished. The detailed codes are available on the central computer records. Where a vessel fishes in more than one area in a single trip, the total amounts for the trip of each species, as given in the sales notes and landing declarations are allocated to the areas in

proportion to the estimated quantities of the species taken from each area, as recorded in the logbook. In areas where a logbook is not provided, *e.g.* on one-day trips by vessels of overall length 17m and under or non-quota species, the information on ground fished is based on interview or knowledge of the vessel's area of operation. For the few landings from distant waters, the coding of the areas is less detailed but sufficient to identify the quota stocks concerned.

Value of landings and average price data
Sales note information has been routinely provided for landings into Scotland. For landings into England, Wales and Northern Ireland much information is supplied by fishermen, though the amount of detail provided on grade and freshness is less complete. Average prices are derived using the presentation codes of the landings and the average values and quantities landed.

Data capture and processing
The Sea Fisheries Inspectorate at port offices carry out manual checks on the information provided. These include a check between logbook information and that given in the sales notes or observed as landed. Information from log sheets, landing declarations and other sources are then keyed into micro-computers connected to the main databases by government staff at port offices. In England and Wales new data entry facilities were introduced in late 1993 enabling details from the daily log sheet to be keyed though catch records may be summarised where these cover fishing over several days with the same gear and in the same rectangle. The catch data are used to apportion information from the landing declaration/sales note which is keyed separately. The fishing records are transmitted to the central computer systems where further checks are carried out on the data before they are reflected on the main landings databases. Catch and landings statistics for the U.K. are compiled from the systems run by MAFF and SOAFD. The former holds information on all landings into England, Wales and Northern Ireland by U.K. vessels and of landings abroad by vessels administered by MAFF and DANI whilst the latter provides figures for landings into Scotland by all U.K. vessels and landings abroad by SOAFD administered vessels.

Reliability and representativity of the data.

Representativity
The collection system for all vessels over 10m attempts a complete coverage of all main fishing activity. For the stocks subject to TACs and quotas and for vessels over 17m, there is a legal requirement to provide documentation, and unless the information supplied is amended as a result of being queried or is legally challenged and the challenge is sustained, this forms the basis for the statistics. Assessments based on local knowledge are used to estimate uptake of some fishing activity by vessels under 10 metres and for some shellfishing: proposals to move to a structured sampling system to estimate landings by the under 10 metre fleet are being considered. *Completeness* The reliability of the statistics is dependant upon the veracity of the documentation provided by fishermen. There are systems of surveillance using sightings by aircraft and by fisheries protection vessels and the resulting information is employed in checking the data.

APPENDIX 4

A SIMPLIFIED DESCRIPTION OF FISHING GEAR REFERRED TO IN THE TEXT

Otter Trawl

A trawl is essentially a cone-shaped net, closed at one end. The headrope has a number of floats attached to give vertical opening, while the footrope is generally heavily weighted with chain, rubber discs and steel rollers to give firm contact with the ground. Horizontal opening is achieved by a pair of flat metal (sometimes wooden) plates, known as trawl doors or otter boards (hence the name otter trawl) attached to the wings of the trawl by wire ropes known as bridles. The doors are rigged so as to exert an outwards shearing force when dragged through the water and hold the net open horizontally. The trawl is towed through the water on a pair of steel warps until winched back on board where the catch is released from the closed end of the net (the cod end).

All demersal (bottom living) fish can be taken in the bottom trawl. The principal target species in the study area are dover sole, monkfish and lemon sole.
A trawl can be rigged so as to fish in mid water (pelagic or midwater trawl), though this requires a different set up and different trawl doors. This method is used for catching pelagic (midwater) fish, such as mackerel, herring, sprats, horse mackerel and sandeels.

Beam trawl

With the beam trawl the horizontal opening of the net is achieved by the use of a steel beam; this is mounted on a set of metal skids to hold the headrope of the net off the seabed. The footrope is often comprised of a mat of chains designed to dig into the sediment and catch fish such as sole. Two beam trawls are generally towed per vessel, from booms protruding from either side of the boat. When fishing in U.K. waters the maximum aggregate length of the beams must not exceed 24m.

Lobster and crab pots

Nowadays most pots are made from a plastic coated steel frame covered with netting. One or more entrances allow access to the pot, but also act as “non-return valves”, helping to prevent the catch from escaping. Parlour pots have a second chamber inside, again with an entrance made of netting that prevents escape back into the main part of the pot; once inside this parlour the catch is secure.

Pots are generally fished in “strings”, a number of pots (depending on deck space on the boat and other factors) attached to a single back-line with anchors and marker floats at either end.
The pots are baited, usually with fish, and set over suitable ground (mostly rocky areas for lobsters and rocks or gravel banks for crab). Other species that may be caught include spider crabs, velvet swimming crabs and fish, especially conger eels.

Increased use of parlour pots over recent years has effectively allowed fishing effort to increase, as the gear, which previously had to be hauled and cleared every day to fish effectively, can now be left for a number of days and still catch. Consequently more gear can be fished on a 2 or 3 day rotation.

Fixed or Set nets

There are three main types of set nets used in the study area, gill nets, tangle nets (or ray nets as they are also known) and trammel nets. All are anchored on the seabed.

Gill nets

These are constructed from a single sheet of netting, attached to a weighted footrope along the bottom and a floating headline along the top. There is more weight than flotation, therefore the footrope maintains contact with the sea bed and the netting rises up vertically. The effective height of the net varies according to mesh size and number of meshes, but is usually between 1m and 5m. Mesh size and number vary according to target species, though regulations prohibit use of nets with mesh sizes between 65 and 90 mm. Fish swim into the nets and are caught by their gills (hence the name), though some fish too large to become gilled may become entangled and trapped by their fins or spines.

The nets are fished in fleets (a number of individual nets tied together) up to 1000 m in length. They are anchored at either end and are generally shot in the direction of the tidal flow. Fishing period is usually around 24 hours, though this can vary according to target species and amount of gear being fished.

The main problems with gill nets are losses through mobile fishing gear (trawls, dredges etc.), loss of marker buoys from other shipping activities, catching large amounts of seaweed, and spider crabs which often infest the nets and cause considerable damage.

Principal target species are sole, bass and plaice, though a wide range of finfish and crustaceans will be caught according to area and season.

Tangle nets

These are built and fished in a similar way to gill nets, but with much larger meshes (typically 200 – 350 mm); they are hung very loosely and tangle large fish such as turbot, brill and rays in the baggy meshes. They are widely used for spider crab in the study area

Trammel nets

A trammel net consists of three sheets of netting joined together at the headrope and footrope. The outer two are of a large mesh size (typically 250 mm) whilst the inner sheet is of a smaller size (typically around 100 mm). The two outer sheets are considerably lower in height than the inner sheet, thereby causing the inner sheet (sandwiched between the two large meshed outer sheets which take the upward force of the floats on the headrope) to remain loose and baggy. A fish will swim through one of the outer meshes, hit the middle sheet and carry a bag or pocket of this smaller mesh out through the other side. It can therefore catch fish that would be too large to get trapped in a gill net.

Trammel nets are highly efficient, though their design makes them more difficult to clear the fish and weed or other detritus. Principal target species are sole and bass, though all species of finfish and crustaceans are caught.

Drift nets

A drift net is built in a similar manner to a gill net, with a weighted footrope and a headrope with floats; the difference is in the relative effect of each of these ropes. Less weight on the footrope or more floats on the headrope allows the drift net to float at the surface, with a curtain of netting hanging vertically downward in the water.

Drift nets are not anchored but left to drift with the tide. Sometimes the net is left attached to the boat, and sometimes it is allowed to drift free; in the latter case a number of nets (each up to 1000m in length may be used).

Longlines

Longlines comprise a main back-line with a number of shorter lines (droppers or snoods) attached at intervals along the length. Each of these droppers has a hook attached. The gear is generally baited ashore and then shot away with an anchor and marker buoy at either end. Length varies according to target species and grounds, but up to 1000 hooks may be used on each line. All bottom feeding fish can be caught on longlines.

APPENDIX 5

BACKGROUND TO FISHERIES REGULATIONS IN THE AREA

European Union regulations

Close controls are needed on the volume and methods of fishing. In waters around Europe, these operate within the framework of Europe's Common Fisheries Policy (CFP). Each year the European Union (EU) sets a Total Allowable Catch (TAC) for each fish stock in Community waters. This is allocated to Member States on a fixed percentage basis as their annual quota. The U.K.'s quotas are apportioned between various groups within the U.K. fishing fleet. The size and structure of the U.K. fishing fleet is governed by a licensing system, and vessels work to an agreed quota of allowable catches, based on scientific assessment of fish stocks. Some allocations are managed by fishermen's organisations, known as Producer Organisations. However, overall responsibility for managing the U.K.'s quotas rests with DEFRA and the other U.K. Fisheries Departments (DEFRA, 2001)

EU regulations also cover technical issues such as mesh sizes, design of fishing gear, areas where fishing is regulated and a host of other issues.

UK regulations

Within the framework of the CFP, U.K. Fisheries Departments take responsibility for administering quotas, issuing and regulating fishing licences, national regulations on fishing gear and fishing activities, collection of statistical data and a wide range of other activities. Regulations produced by DEFRA are applicable to U.K. registered boats only.
The Environment Agency (EA) is responsible for the regulation of fishing for Salmon, Sea Trout and Eels out to 6 miles from baselines.

The Maritime and Coastguard Agency (MCA) is responsible for enforcing safety regulations.

All of the area which will be directly affected by the proposed development lies inside the U.K. 12 mile fisheries limit.

The following U.K. national fishery regulations apply between 6 miles and 12 miles from land in the study area:

- No beam trawlers allowed to fish with engine capacity of >221 kw;
- No foreign vessels without clear historical fishing rights and quota (in this area this includes mainly Belgian beam trawlers and French otter trawlers).
- The Mackerel Box – an area of approximately 67,000 km^2 where fishing for mackerel by certain methods is highly regulated. The study area is within this box.

Cornwall Sea Fisheries District (CSFD) regulations apply to waters from the coast out as far as the 6 mile limit; the following byelaws are relevant to this study (Source, CSFD Byelaws, 2003):

Shellfish fishing:

No vessels of greater than 16.46 m overall length may fish for shellfish, except that between 3 and 6 miles from land any shellfish vessel who had fished in this area prior to 6th August 1997 may (under registration with CSFD) may continue to do so.

Trawling:
No vessels of greater than 18.28 m overall length or with an engine power of > 221 kw can trawl inside 6 miles, except that between 3 and 6 miles from land, any trawler under this category who had fished in this area prior to 6th August 1997 may (under registration with CSFD) may continue to do so.

Additionally CSFD require all vessels fishing for shellfish within the district to hold a permit and to complete catch returns. However, data from this requirement could not be made available to this study for reasons of commercial confidentiality.

APPENDIX 6

SAFETY ZONES AND THE ENERGY ACT 2004

"The Energy Act 2004 introduces a new scheme to enable a safety zone (or zones) to be established around offshore renewable energy installations. (Note: in the case of Wave Hub a safety zone is likely to be established around each WEC or array of WECs connected to each (of up to four) PCU).

The purpose of the safety zone is to minimise the risk of collisions between vessels and offshore renewable energy installations by establishing a zone around or adjacent to an installation which it will be a criminal offence to enter. The notice which establishes the safety zone may give permission for certain vessels to enter into the safety zone and to undertake specified activities within it. Standard permissions to enter into any safety zones, for example for the purposes of rendering assistance to a vessel in distress or other emergency situation, will be set out in regulations.

A safety zone can be established to cover the main stages in the life of a renewable energy installation – the construction (and extension phase if appropriate) and decommissioning phases, as well as the longer operational phase. The safety zone cannot exceed a distance of 500 metres, measured from the outer edges of the installation around which it is to be established, unless permission is granted by the International Maritime Organisation on a case by case basis.

The power of the Secretary of State to declare a safety zone is discretionary and the applicant must make a case, based on safety grounds, for the establishment of the zone.

Any safety zone which is approved will be tailor-made for the circumstances of the particular installation in question. An application for a safety zone does not have to be made at the same time as development consent is being sought for the renewable energy installation around which it would be established. However, the Secretary of State must take any safety zone into account in deciding whether to grant consent for the installation and it would be useful therefore for applicants for the development consent to give the Secretary of State information about their intentions in regard to a safety zone, if a formal application for such a zone is not being made at the same time."