



Rampion Offshore Wind Farm



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Rampion Offshore Wind Farm

Adult and Juvenile Fish and Epibenthic Characterisation Survey

31st October – 8th November 2011

**Undertaken by
Brown & May Marine Ltd**

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1.0 Summary

In order to establish the abundance and composition of adult and juvenile fish and epibenthic species within the area, an otter and scientific beam trawl survey was undertaken in and adjacent to the Rampion offshore wind farm between the 30th October and 8th November 2011. Six commercial target species were identified: cod (*Gadus morhua*), Dover sole (*Solea solea*), lemon sole (*Microstomus kitt*), plaice (*Pleuronectes platessa*), whiting (*Merlangius merlangus*) and black sea bream (*Spondyliosoma cantharus*).

1.1 Otter Trawl

A total of 32 species were caught in the otter trawl, with a greater species diversity observed in the wind farm catches (30 species) than in those from the reference stations (24 species). Long finned squid (*Loligo forbesi*) was the most abundant species caught in the wind farm, followed by lesser spotted dogfish (*Scyliorhinus canicula*) and then *M. merlangus*. *M. merlangus* was the most prevalent species caught at the reference stations, with a catch rate of 159.7 individuals per hour (/hr), followed by *S. canicula* and then horse mackerel (*Trachurus trachurus*). Overall, the total catch rate for all individuals caught in the otter trawl was greater at the reference stations than within the wind farm.

Catch rates for *S. cantharus* and *G. morhua* were greatest within the wind farm, whereas those for *P. platessa* and *M. kitt* were greatest at the reference stations. One *S. solea* and six undulate ray (*Raja undulata*) were recorded within the wind farm.

The majority of the *M. merlangus*, *P. platessa* and *G. morhua* found both within the wind farm and at the reference stations were above the minimum landing size (MLS). Most of the *T. trachurus* and the bass (*Dicentrarchus labrax*) found at the reference stations were above the MLS.

Overall for the target species, females were more prevalent than males both within the wind farm and at the reference stations.

A higher proportion of the *M. merlangus* and *S. cantharus* caught in both the wind farm and at the reference stations, and of the *P. platessa* found within the wind farm were female. The sex percentage of the *M. kitt* caught both within the wind farm and at the reference stations, the *G. morhua* caught within the wind farm, and of the *P. platessa* found at the reference stations was approximately equal. In addition to the target species, a greater proportion of *S. canicula* were females both within the wind farm and at the reference stations.

The greatest proportion of the *M. merlangus* caught at both the reference stations and within the wind farm was maturing and spent females. The highest proportion of the *S. cantharus* found at the reference stations, and of the *P. platessa* caught both within the wind farm and at the reference stations were maturing females. A greater percentage of the *S. cantharus* caught within the wind farm were immature. The greatest proportion of the *M. kitt* caught within the wind farm and at the reference stations, the *G. morhua* caught within the wind farm, and the one male *S. solea* found within the wind farm were spent individuals.

1.2 Beam Trawl

A total of 24 fish species and 91 invertebrate (80 motile and 11 sessile) taxa were caught. Sand goby (*Pomatoschistus minutus*) was the most prevalent fish species, followed by solenette (*Buglossidium luteum*) and then painted goby (*Pomatoschistus pictus*). Low numbers of *M. kitt*, *S. cantharus* and *P.*

platessa were found within the wind farm. One short-snouted seahorse (*Hippocampus hippocampus*), a species of conservation interest, was found within the wind farm. The total catch rate for fish caught in the beam trawl was greater at the reference stations than within the wind farm.

Overall, shrimp (*Crangon allmani*) was the most abundant motile invertebrate species caught, followed by brittlestar (*Ophiura albida*) and then brown shrimp (*Crangon crangon*). *O. albida* was the most prevalent species within the wind farm, whereas at reference stations *C. allmani* had the highest catch rate. The total catch rate for motile invertebrates caught in the beam trawl was greater within the wind farm than at the reference stations.

The phylum of Bryozoa was the most widely occurring and was found at all 24 sampling stations, followed by undetermined species of barnacle and then sea anemone (*Actiniaria sp.*).

2.0 Introduction

The following report details the findings of the adult and juvenile fish and epibenthic characterisation survey, undertaken in and adjacent to the Rampion offshore wind farm between the 30th October and 8th November 2011.

The survey methodology, vessel and sampling gear detailed were agreed in consultation with Cefas and the Marine Management Organisation (MMO). A dispensation from the MMO for the Provisions of Council Regulations 850/98 to catch and retain undersize fish for scientific research and 43/2009 specifically related to days at sea was obtained prior to commencement of the survey. A summary of the health and safety performance of the survey is provided in Appendix 1.

The aim of the survey was to establish the abundance and composition of fish and epibenthic species within the area. It should be noted that Cefas have defined cod (*Gadus morhua*), Dover sole (*Solea solea*), lemon sole (*Microstomus kitt*), plaice (*Pleuronectes platessa*), whiting (*Merlangius merlangus*) and black sea bream (*Spondyliosoma cantharus*) as the target species within the area. Cefas also highlighted the status of the undulate ray (*Raja undulata*) as a UK Biodiversity Action Plan (BAP) species.

3.0 Planned Scope of Work

The planned scope of works for the October/November 2011 adult and juvenile fish and epibenthic characterisation survey are detailed below, and illustrated overleaf in Figure 3.1.

- **Otter Trawl**
 - 18 tows of approximately 20 minutes duration within the Rampion site and six reference tows in adjacent areas.
- **Otter Trawl Sample Analysis**
 - Number of individuals and catch rate by species
 - Average length and length distribution by species
 - Finfish & sharks (except herring; *Clupea harengus* & sprat; *Sprattus sprattus*): individual lengths (nearest cm below)
 - *C. harengus* & *S. sprattus*: individual lengths (nearest ½cm below)
 - Rays: individual length and wing-width (nearest cm below)
 - Sex percentage of target species (see above) and elasmobranchs
 - Spawning condition of target species
 - Finfish species: Cefas Standard Maturity Key - Five Stage
- **Beam Trawls**
 - 18 tows of approximately 500m in length within the Rampion site and six reference tows in adjacent areas (at the same locations as the otter trawls)
- **Beam Trawl Sample Analysis**
 - Abundance, catch rate, average length and length distribution (mm) for fish species, scallops (king scallop; *Pecten maximus* & queen scallop; *Aequipecten opercularis*) and whelk (*Buccinum undatum*)
 - Abundance and catch rate for invertebrate species
 - Presence/absence for species where counts are unfeasible (i.e. encrusting/colonial species)

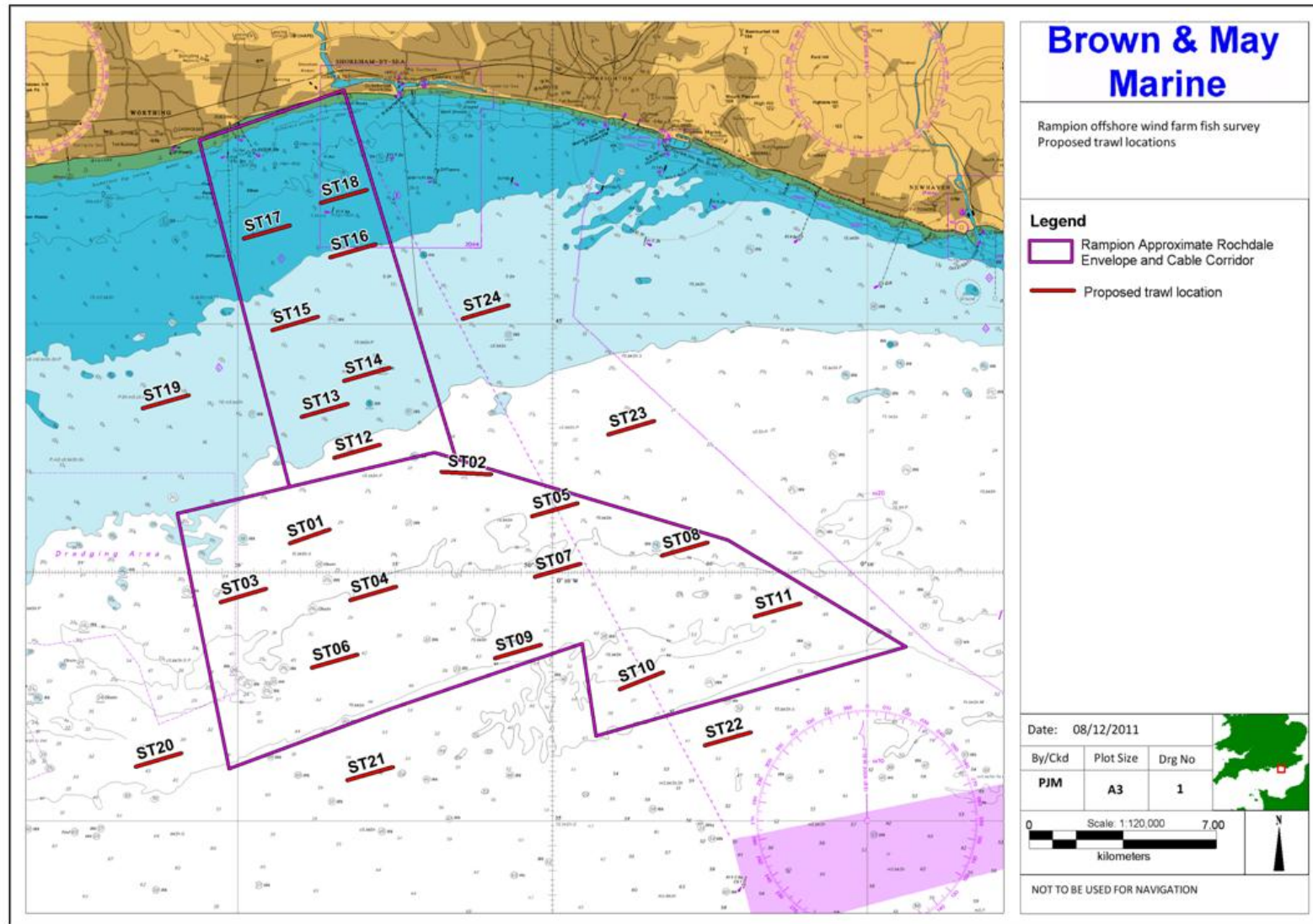


Figure 3.1 Proposed Trawl Locations

4.0 Methodology

4.1 Survey Vessel

The survey vessel, the “Lauren Anne” (Figure 4.1), is a Shoreham-based commercial trawler whose skipper has experience of fishing in the survey area. The specifications of the survey vessel are given in Table 4.1 below.



Figure 4.1 Survey Vessel “Lauren Anne”

Table 4.1 Survey Vessel Specifications

SURVEY VESSEL SPECIFICATIONS	
Length	13.3m
Beam	5.21m
Draft	2.7m
Main engine	Cummins engine NT855-M 221KW(300HP)
Gearbox	4.5:1
Propeller	4 bladed, 1350mm diameter, enclosed in nozzle
GPS	2 x Furuno GPS Navigator
Plotters	Olex Plotter with Electronic Charts
Sounder	Furuno

4.2 Sampling Gears

4.2.1 Commercial Otter Trawl

A commercial otter trawl with an 80mm mesh cod-end was used for sampling (Figure 4.2); the specifications for which are given in Table 4.2 below.



Figure 4.2 Otter Trawl Used

Table 4.2 Otter Trawl Specifications

OTTER TRAWL SPECIFICATIONS	
Towing Warp	18mm, 150 fathoms
Depth: Payout Ratio	4:1
Trawl Doors	Bison
Net	80mm mesh cod-end
Ground line length	14.6m (48 ft)
Footrope	14.5m with 6 inch bobbins
Est. Headline height	2.5m
Distance between doors (est.)	67.1m (220ft)

4.2.2 Scientific Beam Trawl

Epibenthic sampling was undertaken using a 2m scientific beam trawl (Figure 4.3); the specifications for which are given in Table 4.3 below.



Figure 4.3 Scientific Beam Trawl Used

Table 4.3 Beam Trawl Specifications

BEAM TRAWL SPECIFICATIONS	
Beam width	2m
Headline height	55cm
Shoe length	77cm
Shoe width	15cm
Cod-end liner	5mm

4.3 Positioning and Navigation

The vessel position was tracked at all times using a Garmin GPSMap 620 with an EGNOS differential connected to an external Garmin GA30 antenna. The trawl start times and positions were recorded when the winch stopped paying out the gear, similarly the trawl end times and positions were taken when hauling of the gear commenced.

The co-ordinates and tow tracks for each otter trawl and beam trawl are given in Section 4.5 and Section 4.6 respectively.

4.4 Sampling Operations

The survey was undertaken between the 31st October and 8th November 2011. A summarised log of events is given in Table 4.4 below.

Due to the mechanical configuration onboard the vessel, all otter trawls were completed prior to a full gear change to the scientific beam trawl. Otter trawl sampling was undertaken on 31st October to 1st November and 5th to 6th November 2011. The beam trawls were undertaken 7th to 8th November 2011.

It should be noted that otter trawls at stations OT14, OT15, OT19 and OT24 were relocated to reduce the risk of snagging or damaging the gear. The otter trawl at station OT06 was shortened as the net came fast and was hauled in order to become clear of the obstruction. The beam trawl at station BT08 was relocated to avoid known rough ground. Future surveys will replicate the positioning of the relocated trawls in order to avoid damaging the gear.

The beam trawl was damaged at stations BT05, BT16 and BT17, these trawl locations require further assessment as to whether they will be relocated to the nearest area that is clear of obstructions and are illustrated in Figure 4.5.

Table 4.4 Summarised Log of Events

Sunday 30th October 2011
Vessel inspection and audit
Safety briefing
Mobilise survey
Monday 31st October 2011
Otter Trawls: OT13, OT14, OT16 & OT24
OT14 relocated to known safe ground to avoid wreck
OT24 relocated to known safe ground
Return to Shoreham
Tuesday 1st November 2011
Otter Trawls: OT02, OT12, OT15, OT17, OT18, OT19 & OT23
OT15 relocated to known safe ground
OT19 relocated to known safe ground
Return to Shoreham
Wednesday 2nd November 2011
Weather day in port
Thursday 3rd November 2011
Weather day in port

Friday 4th November 2011
Weather day in port
Saturday 5th November 2011
Otter Trawls: OT01, OT03, OT04, OT06, OT09, OT10, OT11, OT20, OT21 & OT22
OT06 relocated to avoid wreck and shortened due to net becoming fast
Return to Shoreham
Sunday 6th November 2011
Otter Trawls: OT05, OT07 & OT08
Return to Shoreham
Monday 7th November 2011
Beam Trawls: BT01, BT02, BT03, BT04, BT05, BT07, BT12, BT13, BT14, BT15, BT16, BT17, BT18, BT19 BT23 & BT24
Net damaged at BT05 due to large boulder
Net damaged at BT16
Net damaged at BT17
Return to Shoreham
Tuesday 8th November 2011
Beam Trawls: BT06, BT08, BT09, BT10, BT11, BT20, BT21 & BT22
BT08 relocated to known safe ground
Return to Shoreham
Demobilise survey

4.5 Otter Trawl Sampling

The total catch was boxed, labelled and photographed. All target species (*G. morhua*, *S. solea*, *M. kitt*, *P. platessa*, *M. merlangus* and *S. cantharus*) were retained. Subsampling was undertaken when large homogenous samples were obtained.

The following sample analysis was undertaken aboard the vessel before returning all non-target individuals to the sea:

- Length: (nearest cm below)
 - Total length for all non-target fish species/species of conservation interest (e.g. *R. undulata*)
 - Mantle length for all cephalopods
 - Shell height for all *B. undatum*
 - Shell diameter for all *P. maximus* and *A. opercularis*
- Sex: All elasmobranchs

The target species were boxed, labelled, photographed, iced and stored at +2°C before transportation to Cefas (Lowestoft) for length, sex and maturity analysis mid way through, and at the end of the survey, in line with the agreed scope of works. The Cefas standard five-stage maturity key used is given in Table 4.5 overleaf.

The start and end times, co-ordinates and the duration of each otter trawl are given in Table 4.6; wind farm and reference tows are highlighted in red and green respectively. The otter trawl tow tracks are shown in Figure 4.4; also illustrated are the locations where the otter trawl was damaged, shortened or relocated.

For the purposes of data analysis, catch rates have been calculated to allow for quantitative comparisons to be made between the numbers of individuals caught per hour at each station (see Table 5.1).

Table 4.5 Cefas Standard Five Stage Maturity Key

Maturity Stage	Male	Female
I Immature	Roundfish – testes very thin ribbon lying along an unbranched blood vessel. Flatfish – testes tight up against back of gut cavity and very small, not usually larger than 10mm x 2mm. No sign of development.	Roundfish – ovaries small, elongated, whitish, translucent. Flatfish – ovaries small, ovary wall thin and easily broken, internally yellowish-orange (although can be variable). No sign of development.
M Maturing	Colour is progressing towards creamy white and the testes are filling more and more of the body cavity. Roundfish – may be many lobed Flatfish – at latest phase the testes can become bulbous.	Eggs are beginning to develop. Roundfish – the ovaries are filling more and more of the body cavity. Flatfish – ovaries are extending down the side of the body of the fish. There are no signs of hyaline eggs.
H Hyaline	No equivalent stage.	Hyaline eggs present, one or many. Ovaries will not run, even under moderate pressure.
R Running	Will extrude sperm under light pressure to advanced stage of extruding sperm freely with some sperm still in the gonad. Flatfish – sperm evident in ducts.	Will extrude under light pressure to advanced stage of extruding eggs freely with some eggs still in the gonad.
S Spent	Testes shrunken with little sperm in the gonads but often some in the gonoducts which can be extruded under light pressure. The gonad can shrink back to very small size. Flatfish gonad becomes knobbly.	Ovaries shrunken with few residual eggs and slime. Ovaries become tighter, no sign of egg development.

Table 4.6 Start and End Times (GMT), Durations and Co-ordinates of each Otter Trawl

Station	Date	Start				End				Duration (mm:ss)
		Time (GMT)	UTM30N		Depth (m)	Time (GMT)	UTM30N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
OT01	05/11/2011	07:19:23	5,617,627.9	691,086.2	31.5	07:39:28	5,616,756.9	689,263.4	31.7	20:05
OT02	01/11/2011	15:40:42	5,620,161.5	696,789.8	27.4	16:00:22	5,620,123.6	698,585.1	29.5	19:40
OT03	05/11/2011	08:04:51	5,615,164.9	688,267.4	29.1	08:24:33	5,615,759.8	689,869.7	32.2	19:42
OT04		09:03:40	5,615,525.6	693,516.0	40.7	09:20:48	5,615,927.0	694,768.4	42.3	17:08
OT05	06/11/2011	07:27:25	5,619,007.7	699,233.8	31.3	07:47:21	5,619,308.0	701,166.6	30.2	19:56
OT06	05/11/2011	09:47:49	5,613,950.2	694,172.2	43.8	09:59:57	5,613,391.6	693,155.4	44.3	12:08
OT07	06/11/2011	08:45:06	5,616,450.6	699,735.5	44.2	09:04:40	5,616,944.5	701,174.3	45.4	19:34
OT08		09:51:47	5,617,668.5	704,969.2	31.1	10:11:59	5,617,980.1	706,630.1	30.5	20:12
OT09	05/11/2011	12:53:04	5,613,551.1	698,974.1	47.3	13:12:57	5,614,146.8	700,851.5	48.7	19:53
OT10		13:45:22	5,612,482.8	703,360.2	43.7	14:05:15	5,613,262.8	705,137.2	47.4	19:53
OT11		15:43:14	5,615,389.7	708,445.5	48.5	16:02:53	5,616,113.3	710,322.8	40.4	19:39
OT12	01/11/2011	14:47:07	5,620,677.1	692,240.5	27.1	15:06:25	5,621,203.9	693,873.6	26.6	19:18
OT13	31/10/2011	07:22:52	5,621,978.0	692,047.8	20.0	07:42:50	5,621,619.1	690,112.7	19.1	19:58
OT14		09:06:30	5,625,215.3	695,323.8	17.4	09:26:53	5,624,109.1	694,206.7	19.9	20:23
OT15	01/11/2011	12:44:21	5,626,851.5	688,799.0	13.9	13:04:02	5,626,626.1	686,974.6	13.8	19:41
OT16	31/10/2011	11:38:31	5,628,786.5	692,801.0	13.7	11:58:24	5,628,434.2	690,994.6	12.9	19:53
OT17	01/11/2011	11:48:56	5,629,032.4	689,571.3	11.3	12:08:29	5,628,452.7	687,980.7	11.0	19:33
OT18		10:59:46	5,630,308.9	692,529.1	10.2	11:19:43	5,630,094.4	690,895.4	10.1	19:57
OT19		13:43:34	5,623,171.2	688,309.3	21.1	13:54:42	5,622,763.6	687,332.8	20.9	11:08
OT20	05/11/2011	10:48:03	5,609,129.7	686,152.1	44.5	11:07:50	5,609,676.1	687,443.7	44.6	19:47
OT21		11:50:31	5,608,794.7	693,199.2	57.0	12:10:25	5,609,455.6	694,718.8	55.9	19:54
OT22		14:40:51	5,610,590.7	706,752.8	60.4	15:00:34	5,611,175.9	708,666.1	51.9	19:43
OT23	01/11/2011	16:31:36	5,621,890.9	702,236.2	26.0	16:51:31	5,622,453.0	703,991.8	25.5	19:55
OT24	31/10/2011	10:19:54	5,626,910.1	699,195.7	18.3	10:40:15	5,626,267.9	697,883.9	18.6	20:21

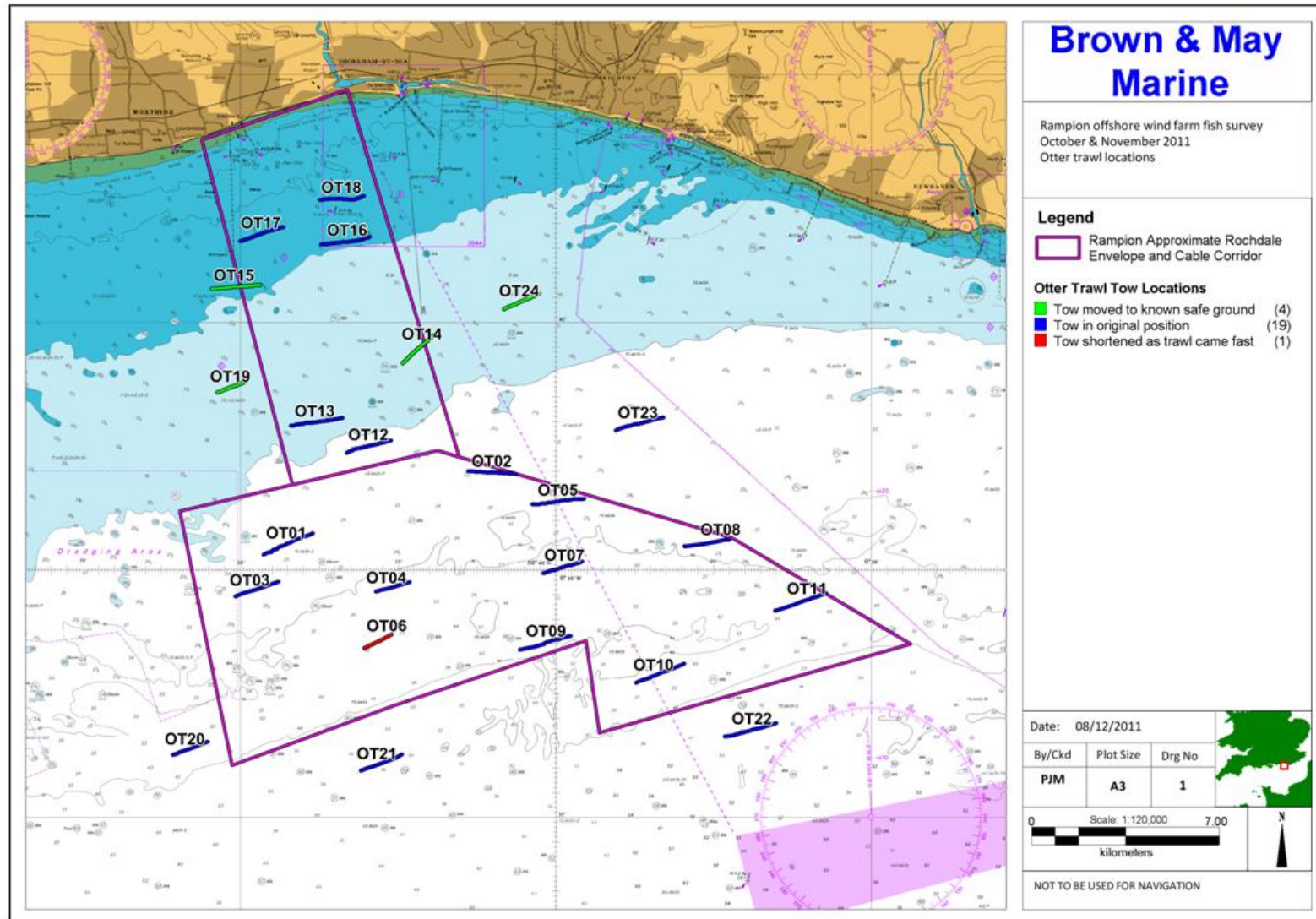


Figure 4.4 Otter Trawl Tow Tracks

4.6 Scientific Beam Trawl Sampling

All individuals caught in the beam trawl were retained, placed in plastic pots, labelled and photographed. Large fish that could not be retained within the sample pots were identified, measured and returned to the sea. Sub-sampling was applied when large (> 4 litres) homogenous samples were obtained. Samples were fixed at the end of every day using a 4% seawater buffered formalin solution.

The start and end times, co-ordinates and the duration of each beam trawl are given in Table 4.7 (reference and wind farm tows highlighted in green and red respectively). The beam trawl tow tracks are illustrated in Figure 4.5 overleaf also shown are the locations where the beam trawls were damaged shortened or relocated.

For the purposes of data analysis, catch rates have been calculated to allow for quantitative comparisons to be made between the numbers of individuals caught per hour at each station for fish and motile invertebrates (see Section 6.0).

Table 4.7 Start and End Times (GMT), Durations and Co-ordinates of each Beam Trawl

Station	Date	Start				End				Duration (mm:ss)
		Time (GMT)	UTM30N		Depth (m)	Time (GMT)	UTM30N		Depth (m)	
			Latitude	Longitude			Latitude	Longitude		
BT01	07/11/2011	08:15:51	5,617,565.9	690,733.1	36.1	08:25:49	5,617,348.8	690,270.1	33.3	09:58
BT02		11:17:17	5,620,289.7	698,111.8	28.7	11:27:17	5,620,092.2	697,651.5	29.0	10:00
BT03		08:39:52	5,615,675.7	689,379.9	31.3	08:49:37	5,615,493.2	688,900.9	29.9	09:45
BT04		09:21:56	5,615,654.8	693,817.3	42.2	09:32:30	5,615,836.2	694,284.1	43.1	10:34
BT05		10:39:53	5,619,208.9	700,810.7	29.0	10:51:31	5,618,953.8	700,148.4	29.1	11:38
BT06	08/11/2011	09:12:58	5,613,089.3	692,750.2	48.4	09:24:04	5,613,376.0	693,165.6	46.2	11:06
BT07	07/11/2011	10:09:23	5,616,703.0	700,104.6	43.5	10:20:16	5,616,877.1	700,583.2	42.5	10:53
BT08	08/11/2011	12:57:50	5,617,258.1	706,919.3	30.4	13:07:02	5,617,243.8	706,418.7	30.2	09:12
BT09		10:37:49	5,613,630.2	699,507.3	50.1	10:48:24	5,613,830.2	699,970.5	48.1	10:35
BT10		11:13:18	5,612,569.4	703,442.9	48.3	11:24:27	5,612,770.3	703,909.5	49.0	11:09
BT11		12:29:25	5,615,537.8	708,880.6	49.5	12:40:06	5,615,787.3	709,316.8	46.7	10:41
BT12	07/11/2011	07:42:52	5,620,944.4	692,826.9	25.2	07:53:34	5,620,757.5	692,348.8	26.4	10:42
BT13		13:33:39	5,621,815.2	691,735.0	20.7	13:43:29	5,621,674.1	691,244.9	21.0	09:50
BT14		13:05:38	5,624,957.9	695,172.7	18.7	13:14:43	5,624,660.9	694,771.3	19.1	09:05
BT15		14:34:28	5,626,697.5	687,826.9	11.6	14:44:20	5,626,798.9	688,321.8	11.4	09:52
BT16		15:22:28	5,628,559.6	691,278.8	10.9	15:33:25	5,628,592.7	691,815.7	11.3	10:57
BT17		14:56:57	5,628,683.4	688,641.7	9.2	15:06:54	5,628,884.3	689,101.2	9.2	09:57
BT18		15:44:41	5,630,035.2	691,957.4	9.7	15:55:01	5,630,226.6	692,421.5	9.6	10:20
BT19		14:02:47	5,622,999.3	688,046.6	18.0	14:13:41	5,623,203.9	688,499.6	18.2	10:54
BT20	08/11/2011	08:28:53	5,609,325.2	686,610.1	46.9	08:39:17	5,609,523.8	687,088.5	45.6	10:24
BT21		09:52:06	5,609,230.3	694,094.7	58.7	10:01:58	5,609,442.0	694,543.9	59.0	09:52
BT22		11:49:39	5,610,787.9	707,064.4	61.4	12:00:14	5,610,978.9	707,533.1	62.2	10:35
BT23	07/11/2011	11:59:50	5,622,104.9	702,409.4	24.5	12:10:28	5,622,260.2	702,884.9	24.4	10:38
BT24		12:39:52	5,626,774.8	698,743.2	17.7	12:49:31	5,626,652.2	698,255.2	17.8	09:39

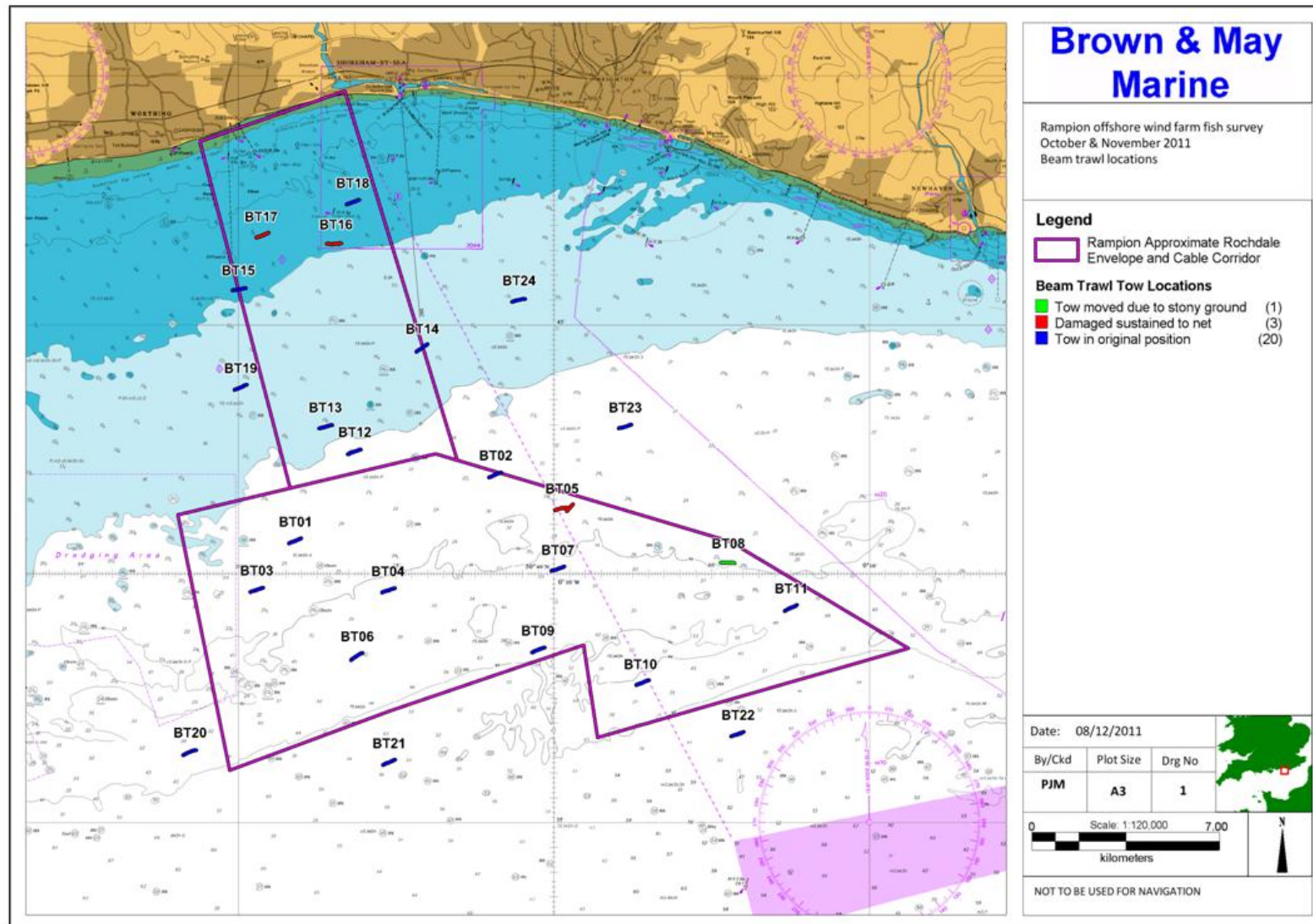


Figure 4.5 Beam Trawl Tow Tracks

5.0 Otter Trawl Results

5.1 Total Abundance and Catch Rates

The total number of individuals caught and the catch rate (number of individuals caught per hour) by species and site are given in Table 5.1 overleaf and illustrated by Figure 5.1. The catch rate by species and station is shown in Figure 5.3 (green and red boxes denote reference and wind farm stations).

A total of 32 species were caught; 30 within the wind farm and 24 at the reference stations. Overall, *M. merlangus* was the most abundant species caught, followed by long-finned squid (*Loligo forbesi*) and then lesser spotted dogfish (*Scyliorhinus canicula*).

M. merlangus were the most prevalent species caught at the reference stations (295 individuals), with a catch rate of 159.7 individuals per hour (/hr), followed by *S. canicula* (88; 47.7/hr) and then horse mackerel (*Trachurus trachurus*; 80; 43.3/hr). *L. forbesi* was the most abundant species found in the wind farm (361, 62.5/hr), followed by *S. canicula* (235; 40.7/hr) and then *M. merlangus* (202; 35.0/hr).

S. cantharus were found in both sampling areas, with a greater catch rate within the wind farm (20.6/hr). The highest catch rate of *S. cantharus* was found at station OT05 within the wind farm (120.4/hr). The catch rate for *P. platessa* was found to be higher at the reference stations (28.2/hr) and the greatest catch rate by station was found at reference station OT24 (141.5/hr).

M. kitt were found in greater numbers at the reference stations (8.7/hr), with the highest catch rate by station recorded at OT23 (30.1/hr). *G. morhua* were found in higher numbers within the wind farm (3.3/hr) and were most abundant at station OT05 (51.2/hr). One *S. solea* was found at station OT16 within the wind farm (0.2/hr), with a catch rate by station of 3.0/hr.

A total of six *R. undulata* were recorded, at four stations within the wind farm (OT09, OT13, OT15 and OT17).

Overall, the total catch rate for all species caught in the otter trawl was greater at the reference stations (376.4/hr) than within the wind farm (230.1/hr).

Table 5.1 Number of Individuals Caught and Catch Rate by Species and Sampling Area

Species		Number of Individuals Caught			Catch Rate (Number of Individuals Caught per Hour)	
Common Name	Scientific Name	Reference	Wind Farm	Total	Reference	Wind Farm
Whiting	<i>Merlangius merlangus</i>	295	202	497	159.7	35.0
Long Finned Squid	<i>Loligo forbesi</i>	67	361	428	36.3	62.5
Lesser Spotted Dogfish	<i>Scyliorhinus canicula</i>	88	235	323	47.7	40.7
Horse Mackerel	<i>Trachurus trachurus</i>	80	118	198	43.3	20.4
Black Sea Bream	<i>Spondyliosoma cantharus</i>	12	119	131	6.5	20.6
Plaice	<i>Pleuronectes platessa</i>	52	63	115	28.2	10.9
Bib	<i>Trisopterus luscus</i>	11	71	82	6.0	12.3
Dab	<i>Limanda limanda</i>	19	10	29	10.3	1.7
Lemon Sole	<i>Microstomus kitt</i>	16	9	25	8.7	1.6
Bass	<i>Dicentrarchus labrax</i>	5	18	23	2.7	3.1
Queen Scallop	<i>Aequipecten opercularis</i>	8	13	21	4.3	2.3
Cod	<i>Gadus morhua</i>	1	19	20	0.5	3.3
Poor Cod	<i>Trisopterus minutus</i>	10	9	19	5.4	1.6
Spotted Ray	<i>Raja montagui</i>	5	12	17	2.7	2.1
Blonde Ray	<i>Raja brachyura</i>	2	11	13	1.1	1.9
Starry Smoothhound	<i>Mustelus asterias</i>	2	10	12	1.1	1.7
Red Gurnard	<i>Aspitrigla cuculus</i>	0	8	8	0.0	1.4
Tub Gurnard	<i>Trigla lucerna</i>	4	4	8	2.2	0.7
Brill	<i>Scophthalmus rhombus</i>	4	3	7	2.2	0.5
Red Mullet	<i>Mullus surmuletus</i>	5	2	7	2.7	0.3
Thornback Ray	<i>Raja clavata</i>	2	5	7	1.1	0.9
Undulate Ray	<i>Raja undulata</i>	0	6	6	0.0	1.0
Whelk	<i>Buccinum undatum</i>	0	6	6	0.0	1.0
Common Dragonet	<i>Callionymus lyra</i>	2	3	5	1.1	0.5
Common Cuttlefish	<i>Sepia officinalis</i>	0	4	4	0.0	0.7
Tope	<i>Galeorhinus galeus</i>	1	2	3	0.5	0.3
Cuckoo Ray	<i>Raja naevus</i>	2	0	2	1.1	0.0
Edible Crab	<i>Cancer pagurus</i>	0	2	2	0.0	0.3
John Dory	<i>Zeus faber</i>	2	0	2	1.1	0.0
King Scallop	<i>Pecten maximus</i>	0	2	2	0.0	0.3
Allis Shad	<i>Alosa alosa</i>	0	1	1	0.0	0.2
Dover Sole	<i>Solea solea</i>	0	1	1	0.0	0.2
Total Number of Individuals		695	1,329	2,024		
Catch Rate (No. Individuals Caught per Hour)		376.4	230.1	265.5		
Total Number of Species		24	30	32		

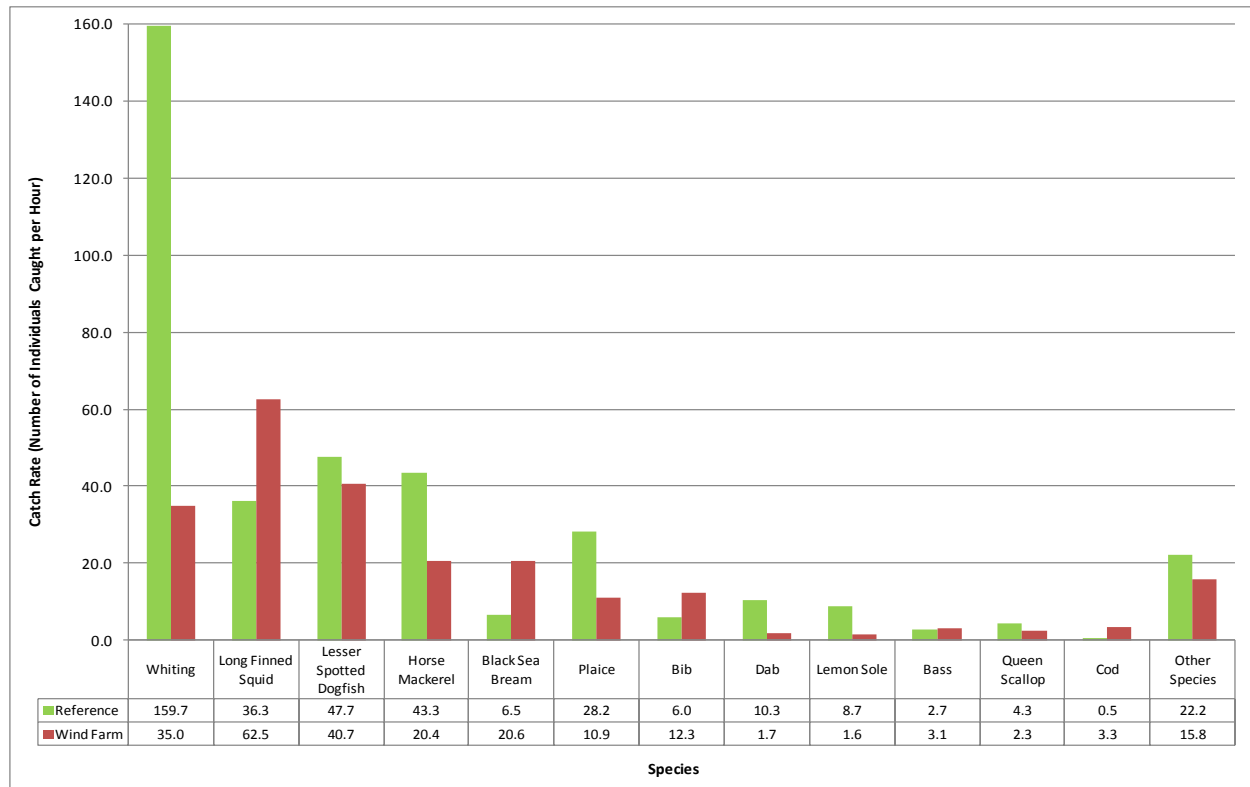


Figure 5.1 Catch Rate by Species and Sampling Area

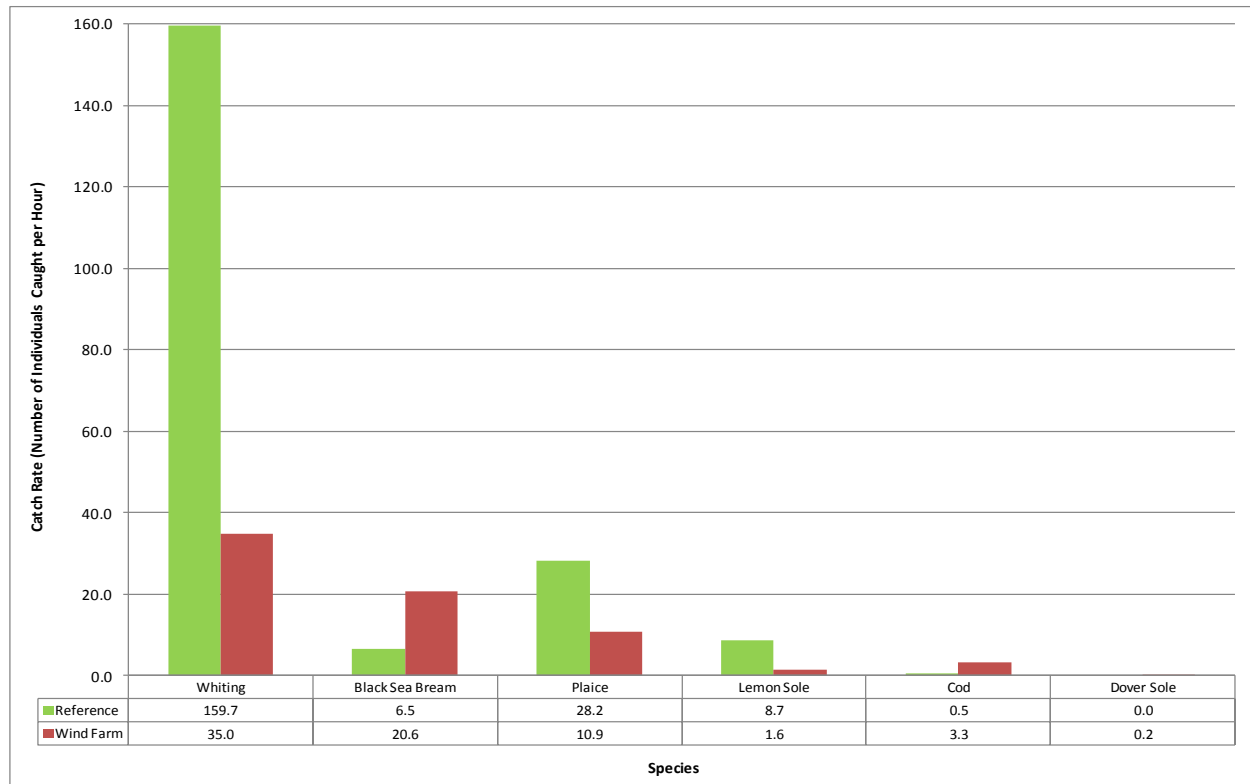


Figure 5.2 Catch Rate of Target Species by Sampling Area

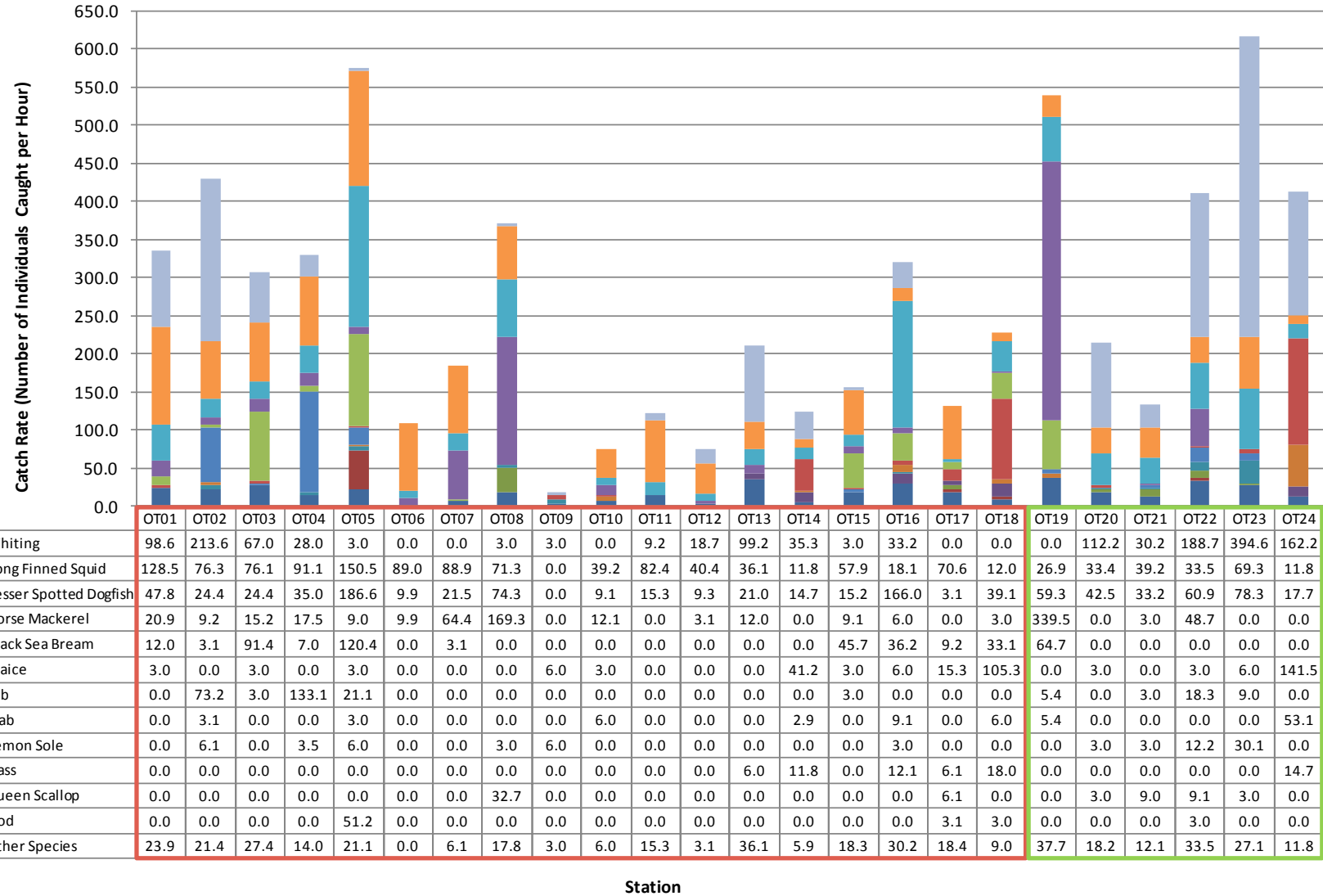


Figure 5.3 Catch Rate by Species and Station

5.2 Length Distribution

The average length (cm) by sampling area (reference and wind farm), and length range by species, and the length/wing width range for all species of ray caught are given in Table 5.2 and Table 5.3 respectively.

The length distributions for the most abundant species caught (>100 individuals), expressed as the catch rate (number of individuals caught per hour) by length (cm) and sampling area are shown in Figure 5.4 to Figure 5.9. In addition, the length distributions for *M. kitt*, *G. morhua*, and *R. undulata* are given in Figure 5.10 to Figure 5.12. The wing width distribution of *R. undulata* is shown Figure 5.13. The length distribution for *S. solea* has been excluded as only one individual was caught and the length is detailed below in Table 5.2.

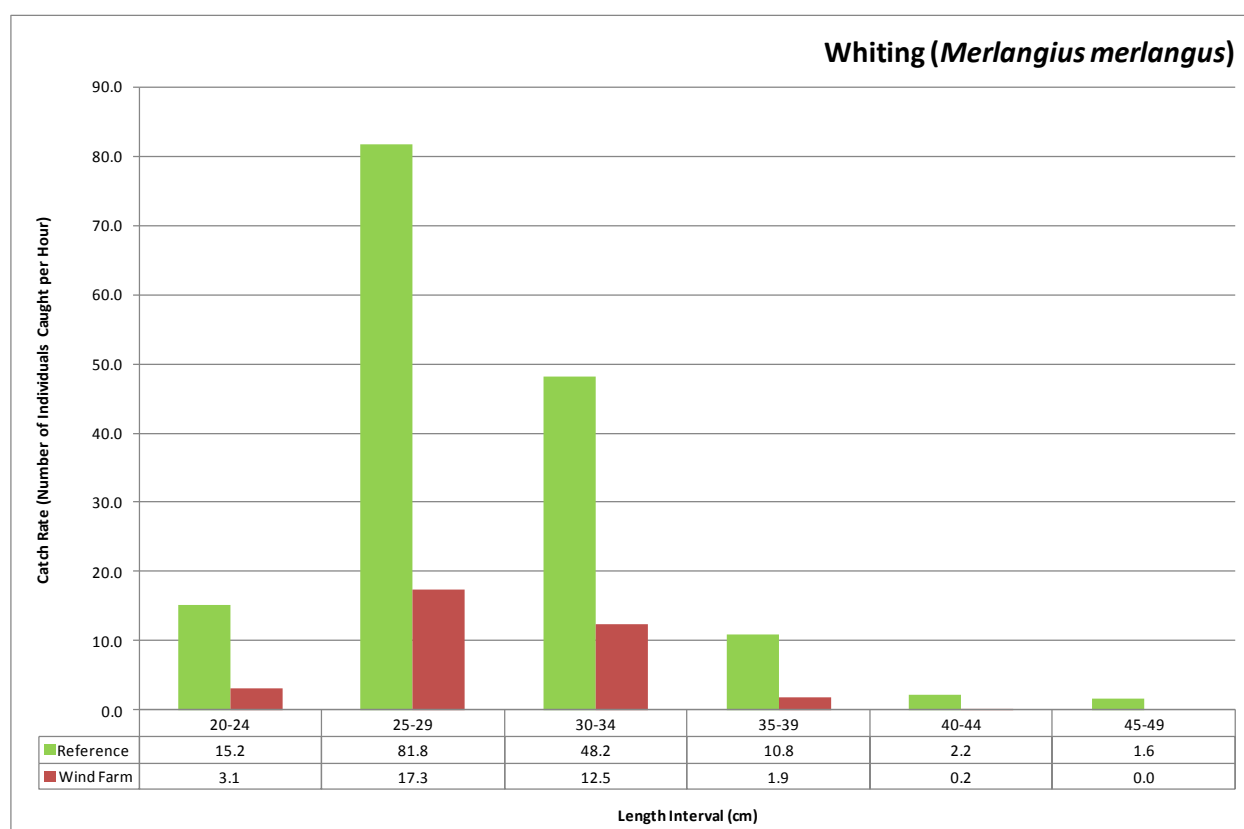
Table 5.2 Average Length and Length* Range by Species and Sampling Area

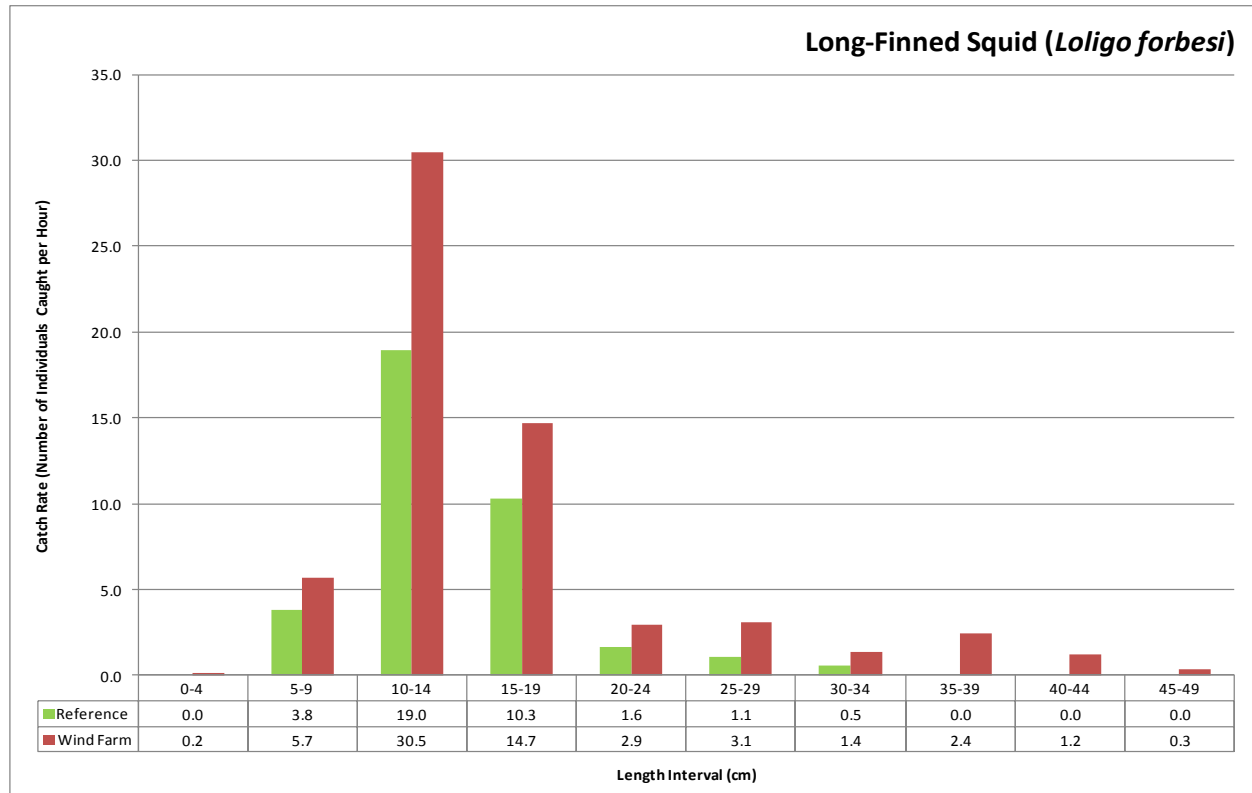
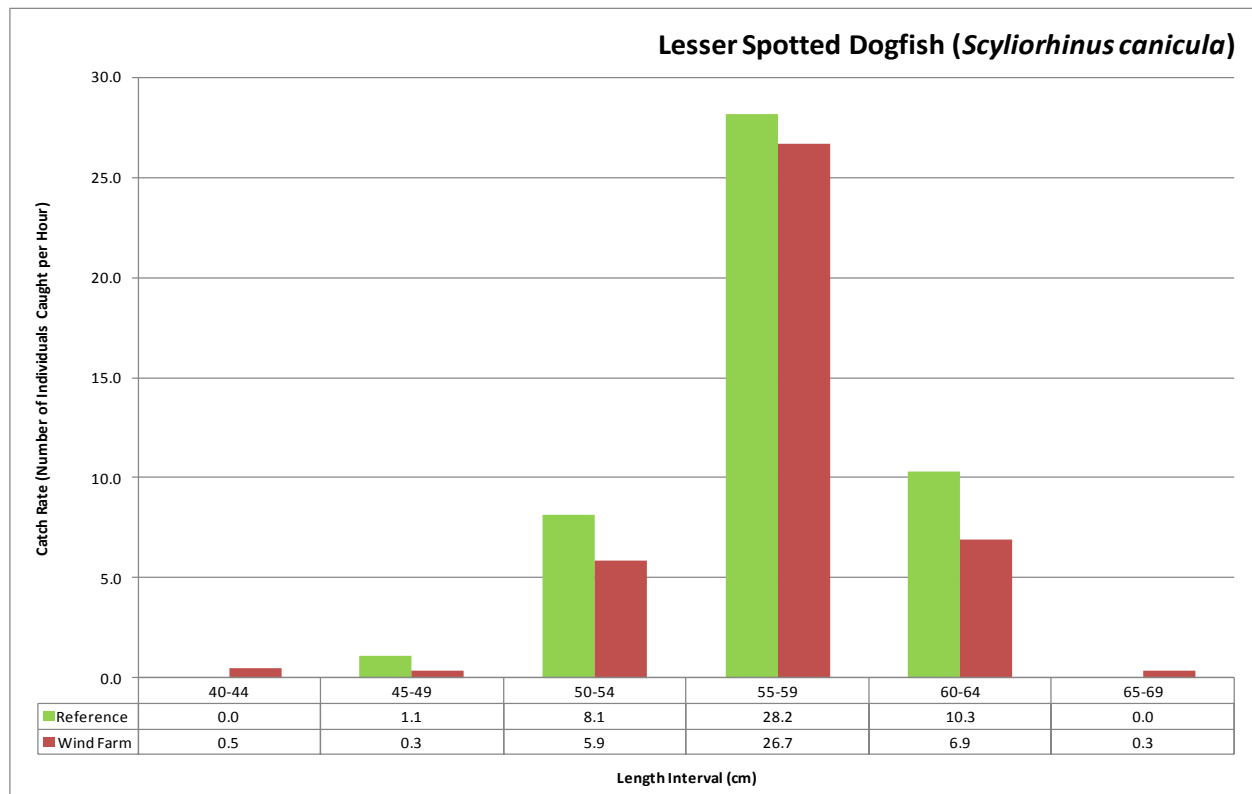
Species		Average Length (cm)		Length Range (cm)	
Common Name	Scientific Name	Reference	Wind Farm	Min.	Max.
Allis Shad	<i>Alosa alosa</i>	0.0	43.0	43.0	43.0
Bass	<i>Dicentrarchus labrax</i>	38.6	35.7	30.0	46.0
Bib	<i>Trisopterus luscus</i>	20.2	17.4	9.0	33.0
Black Sea Bream	<i>Spondyllosoma cantharus</i>	18.2	18.6	10.0	27.0
Brill	<i>Scophthalmus rhombus</i>	34.5	32.3	29.0	39.0
Cod	<i>Gadus morhua</i>	44.0	65.2	44.0	92.0
Common Cuttlefish (mantle length)	<i>Sepia officinalis</i>	0.0	17.8	16.0	19.0
Common Dragonet	<i>Callionymus lyra</i>	20.5	21.0	20.0	23.0
Dab	<i>Limanda limanda</i>	22.4	23.9	17.0	30.0
Dover Sole	<i>Solea solea</i>	0.0	30.0	30.0	30.0
Edible Crab (carapace width)	<i>Cancer pagurus</i>	0.0	16.8	16.1	17.4
Horse Mackerel	<i>Trachurus trachurus</i>	24.5	14.6	8.0	32.0
John Dory	<i>Zeus faber</i>	39.5	0.0	29.0	50.0
King Scallop (shell width)	<i>Pecten maximus</i>	0.0	11.5	10.0	13.0
Lemon Sole	<i>Microstomus kitt</i>	25.0	25.9	18.0	33.0
Lesser Spotted Dogfish	<i>Scyliorhinus canicula</i>	56.9	57.1	44.0	66.0
Long Finned Squid (mantle length)	<i>Loligo forbesi</i>	14.1	16.1	4.0	46.0
Plaice	<i>Pleuronectes platessa</i>	27.4	31.3	22.0	43.0
Poor Cod	<i>Trisopterus minutus</i>	27.7	12.7	11.0	33.0
Queen Scallop (shell width)	<i>Aequipecten opercularis</i>	5.4	5.2	4.0	6.2
Red Gurnard	<i>Aspitrigla cuculus</i>	0.0	33.0	25.0	36.0
Red Mullet	<i>Mullus surmuletus</i>	22.4	23.5	20.0	25.0
Starry Smoothhound	<i>Mustelus asterias</i>	84.5	81.0	61.0	112.0
Tope	<i>Galeorhinus galeus</i>	86.0	76.0	73.0	86.0
Tub Gurnard	<i>Trigla lucerna</i>	30.3	29.5	26.0	34.0
Whelk (shell height)	<i>Buccinum undatum</i>	0.0	6.4	4.7	8.1
Whiting	<i>Merlangius merlangus</i>	29.2	29.0	20.0	46.0

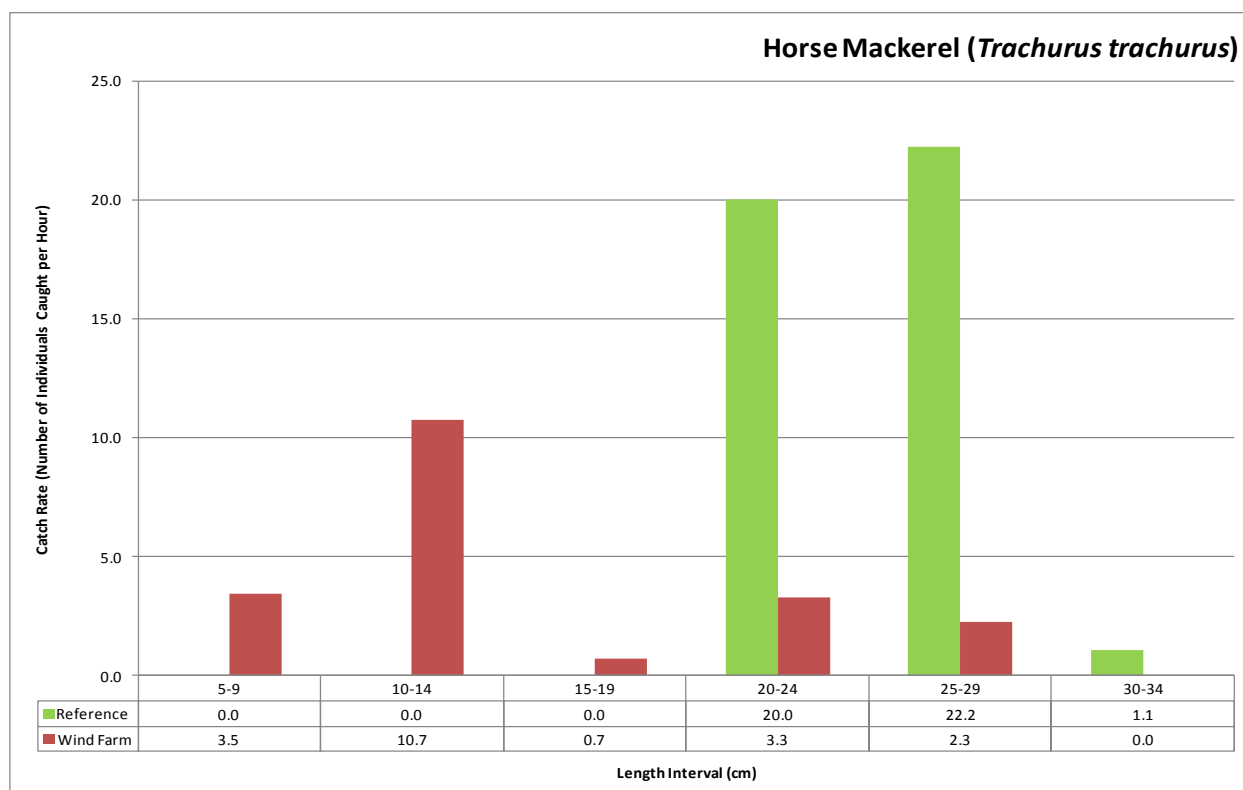
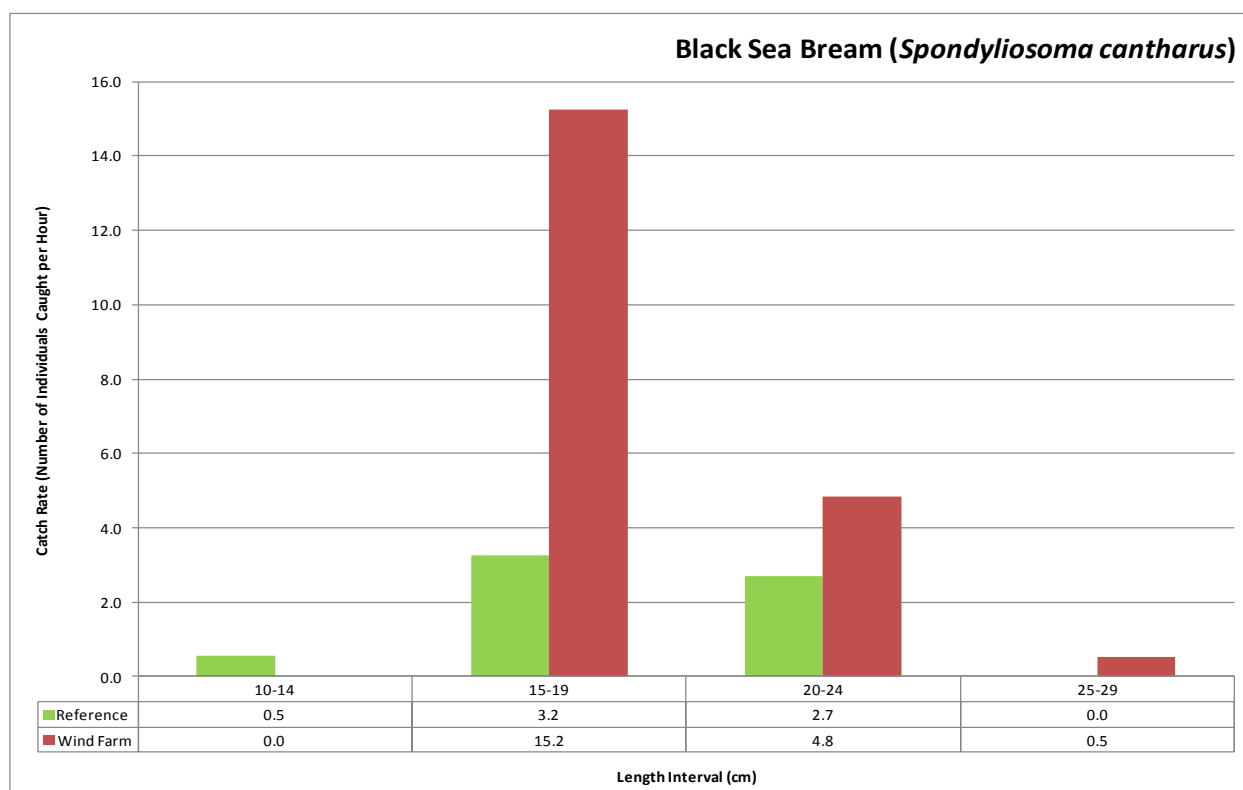
*An alternative measurement was taken for some species, and is detailed with the common name

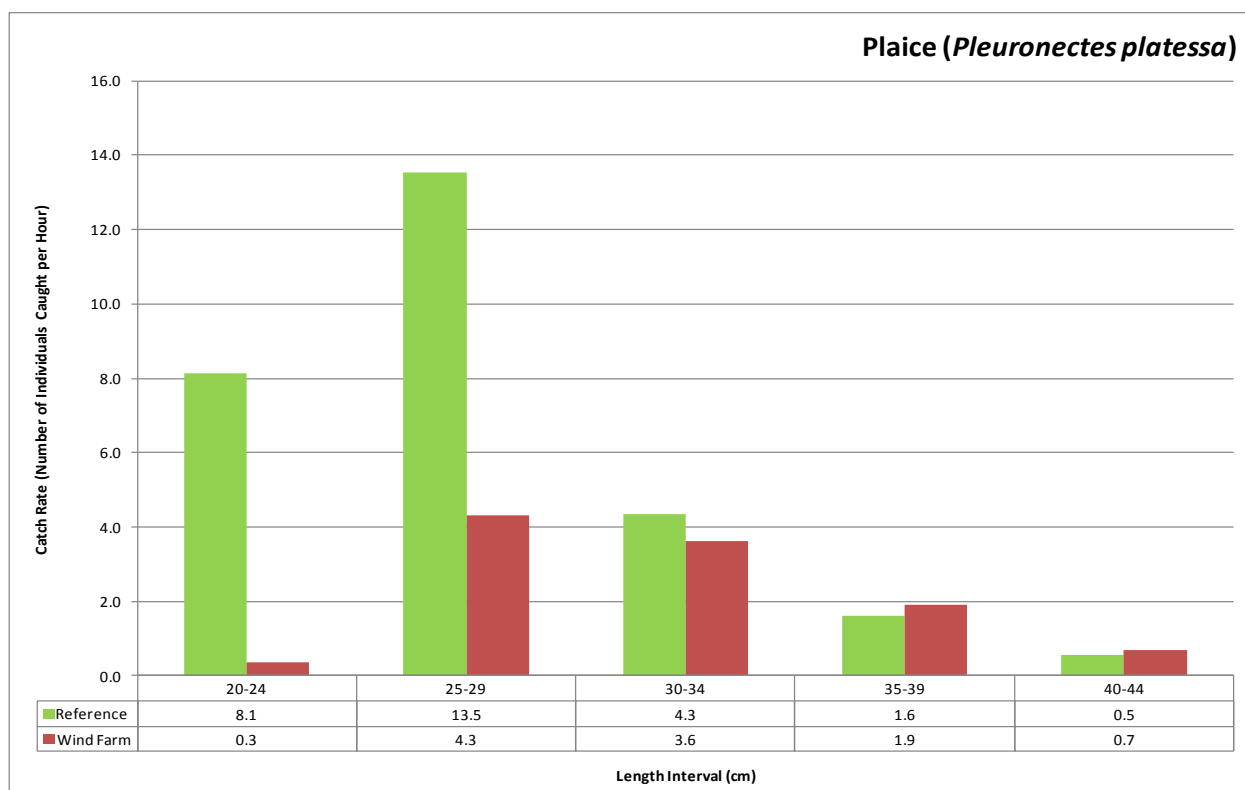
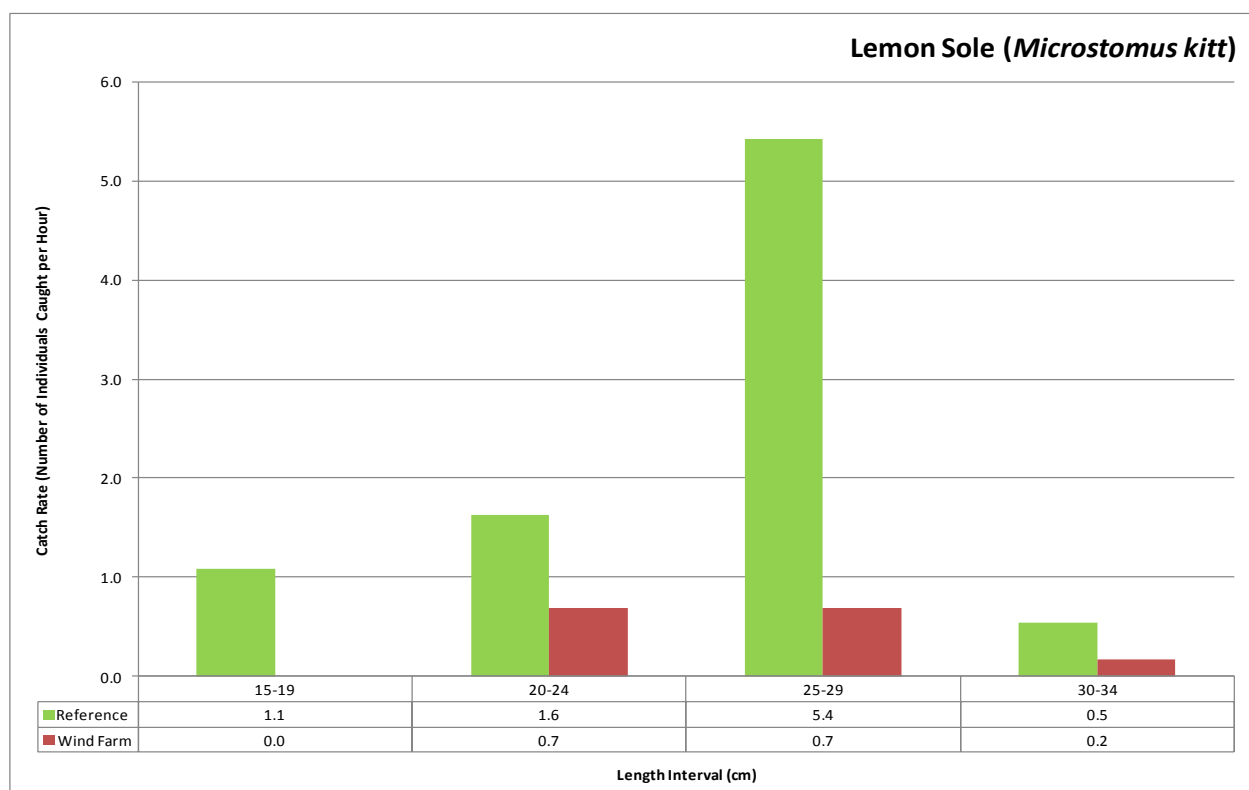
Table 5.3 Average Length, Length Range and Wing-Width Range for Ray Species and Sampling Area

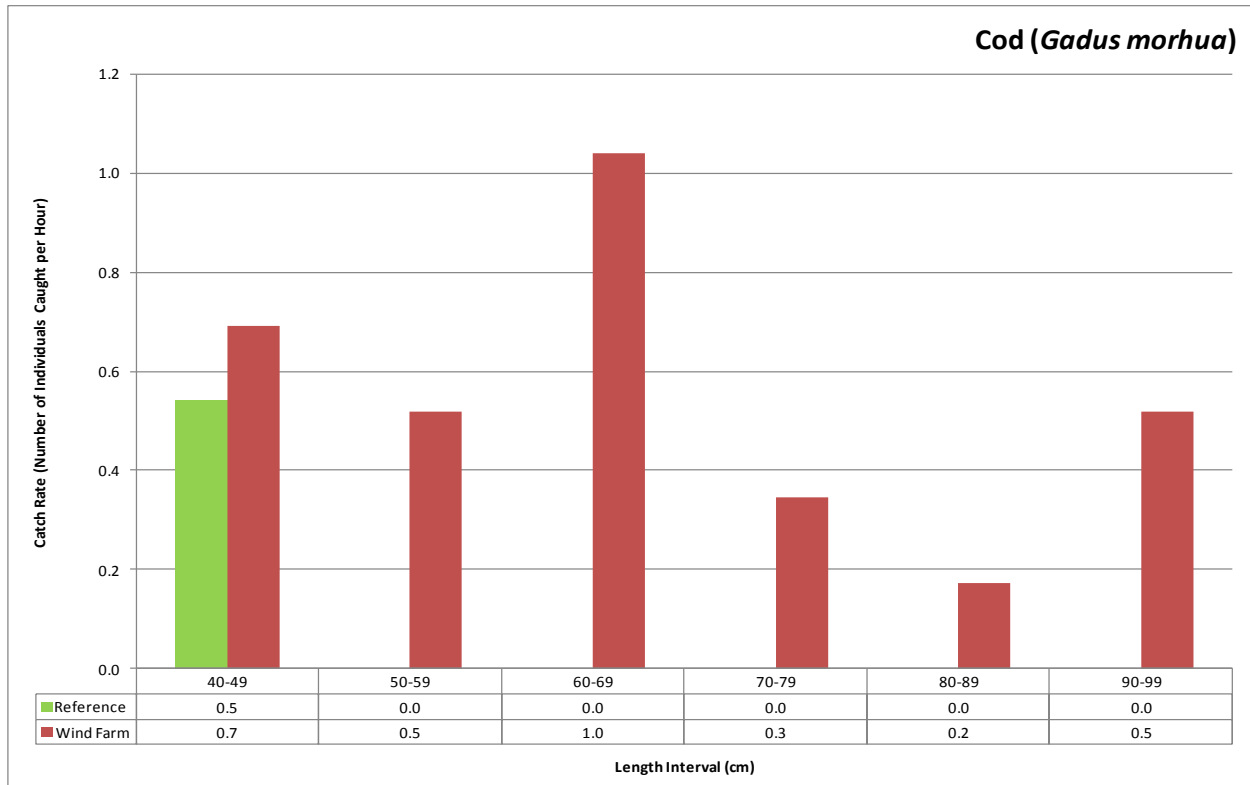
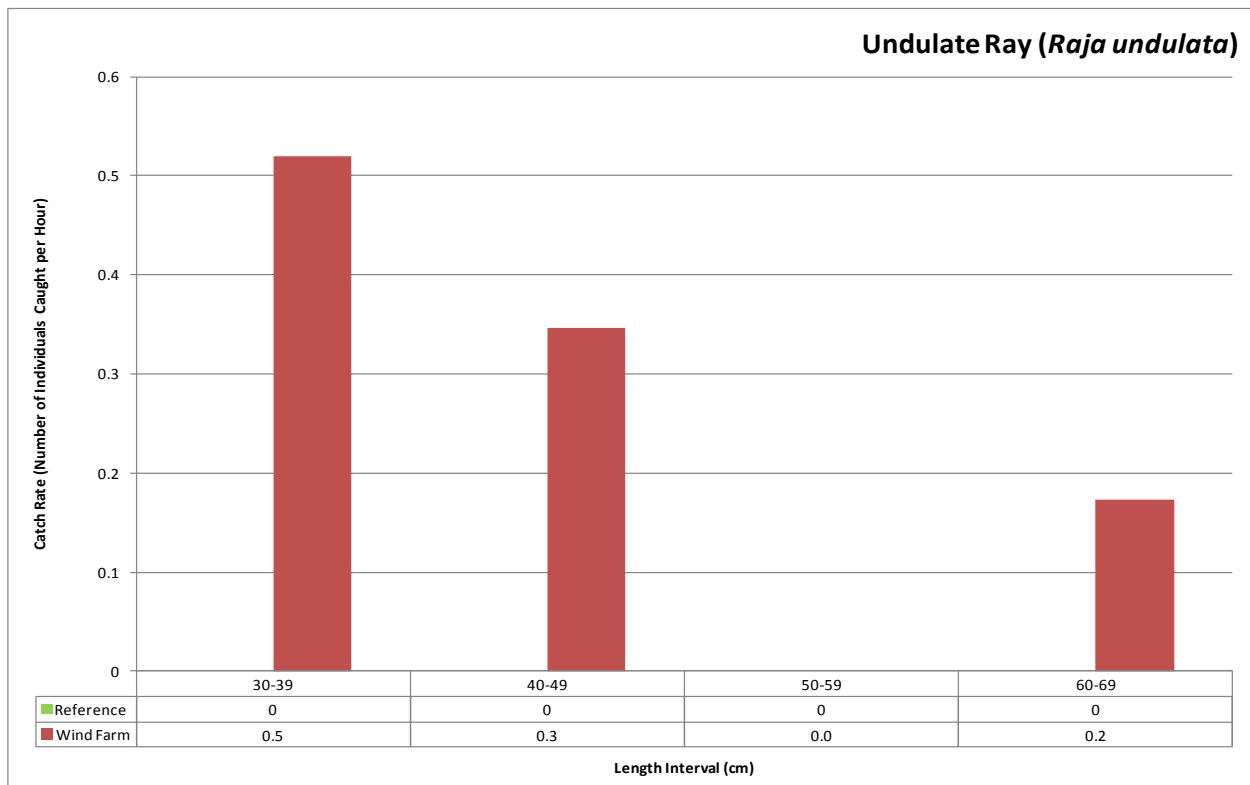
Species		Average Length (cm)		Length Range (cm)		Wing-Width Range (cm)	
Common Name	Scientific Name	Reference	Wind Farm	Min.	Max.	Min.	Max.
Blonde Ray	<i>Raja brachyura</i>	67.0	74.4	36.0	88.0	24.0	57.0
Cuckoo Ray	<i>Raja naevus</i>	30.5	0.0	30.0	31.0	21.0	21.0
Spotted Ray	<i>Raja montagui</i>	53.8	45.1	37.0	93.0	26.0	65.0
Thornback Ray	<i>Raja clavata</i>	77.0	44.6	30.0	83.0	25.0	54.0
Undulate Ray	<i>Raja undulata</i>	0.0	42.2	36.0	61.0	23.0	40.0

Figure 5.4 Whiting (*M. merlangus*) Length Distribution

Figure 5.5 Long Finned Squid (*L. forbesi*) Length DistributionFigure 5.6 Lesser Spotted Dogfish (*S. canicula*) Length Distribution

Figure 5.7 Horse Mackerel (*T.trachurus*) Length DistributionFigure 5.8 Black Sea Bream (*S.cantharus*) Length Distribution

Figure 5.9 Plaice (*P. platessa*) Length DistributionFigure 5.10 Lemon Sole (*M. kitt*) Length Distribution

Figure 5.11 Cod (*G. morhua*) Length DistributionFigure 5.12 Undulate Ray (*R. undulata*) Length Distribution

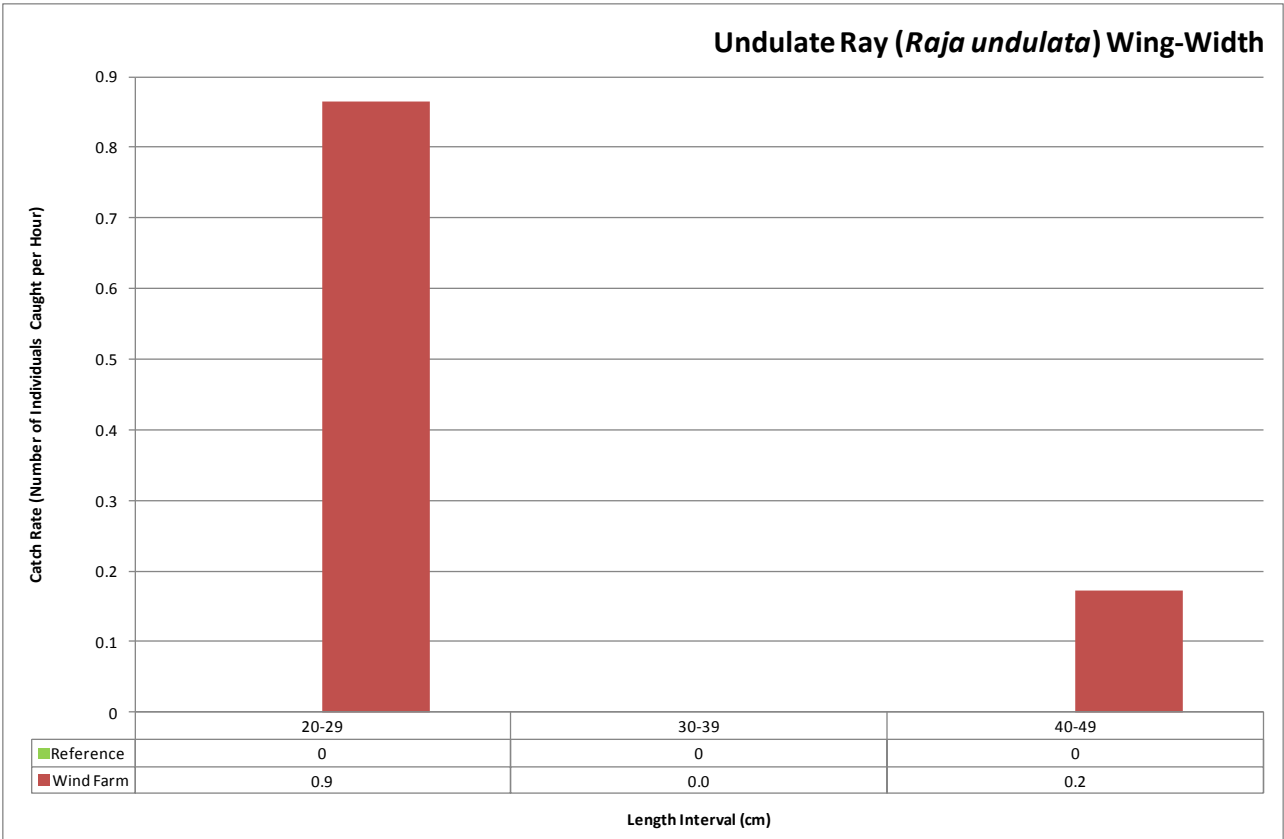


Figure 5.13 Undulate Ray (*R. undulata*) Wing-Width Distribution

5.3 Minimum Landing Sizes

Minimum landing sizes (MLS) for fish and shellfish species are set by the EC under Regulation No. 850/98 (Annex XII) and by the local Inshore Fisheries and Conservation Authorities in waters within their jurisdictions. The Rampion offshore wind farm site is located within the boundaries of the Sussex Inshore Fisheries and Conservation Authority (S-IFCA) and therefore the MLS's for fish and shellfish species set by this authority apply.

The ten species caught for which a MLS has been set are given in Table 5.4, along with their presence or absence within the wind farm and reference locations.

Table 5.4 Minimum Landing Sizes (MLS) by Species

Species		MLS (cm)	Presence	
Common Name	Scientific Name	S-IFCA	Reference	Wind Farm
Whiting	<i>Merlangius merlangus</i>	27	✓	✓
Cod	<i>Gadus morhua</i>	35	✓	✓
Horse Mackerel	<i>Trachurus trachurus</i>	15	✓	✓
Plaice	<i>Pleuronectes platessa</i>	27	✓	✓
Bass	<i>Dicentrarchus labrax</i>	36	✓	✓
Dover Sole	<i>Solea solea</i>	24		✓
Queen Scallop	<i>Aequipecten opercularis</i>	4 (shell width)	✓	✓
King Scallop	<i>Pecten maximus</i>	11 (shell width)		✓
Edible Crab	<i>Cancer pagurus</i>	14 (carapace width)		✓
Whelk	<i>Buccinum undatum</i>	4.5 (shell height)		✓

Figure 5.14 and Figure 5.15 illustrate the percentage of individuals by species caught above and below their set MLS at the reference stations and within the wind farm, respectively.

The majority of the *M. merlangus* caught both at the reference stations (77.3%) and within the wind farm (75.2%) were above the set MLS.

At the reference stations 100.0% of the *T. trachurus* found were above the set MLS, whereas within the wind farm 69.5% of the catch was below the MLS.

It was found that 50.0% of the *P. platessa* caught in the reference stations and most caught in the wind farm (90.5%) were above the MLS. All *G. morhua* caught at both locations were above the MLS.

The majority of the bass (*Dicentrarchus labrax*) caught at the reference stations were above the MLS (80.0%), whereas within the wind farm a greater proportion of the *D. labrax* was below the MLS (61.1%).

All other species were caught in relatively low numbers.

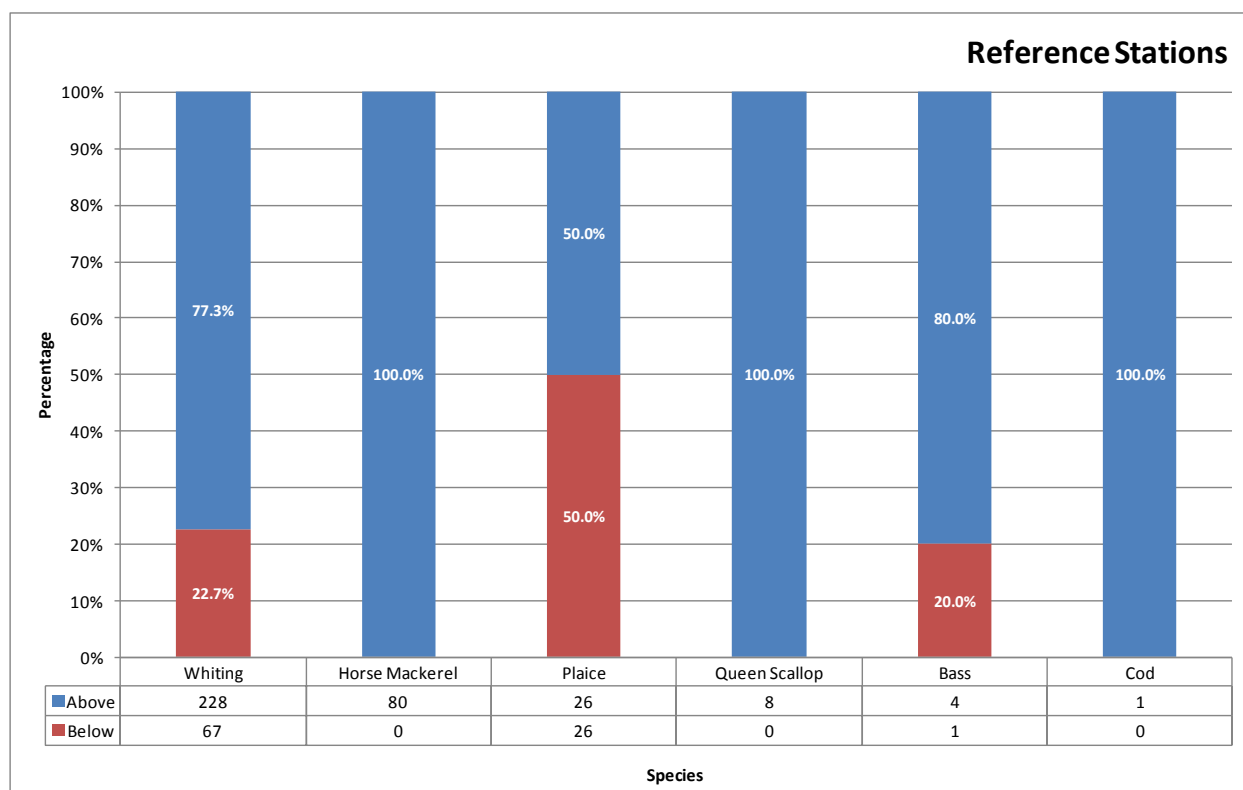


Figure 5.14 Percentage of Individuals Caught Below and Above their Set MLS by Species at Reference Stations

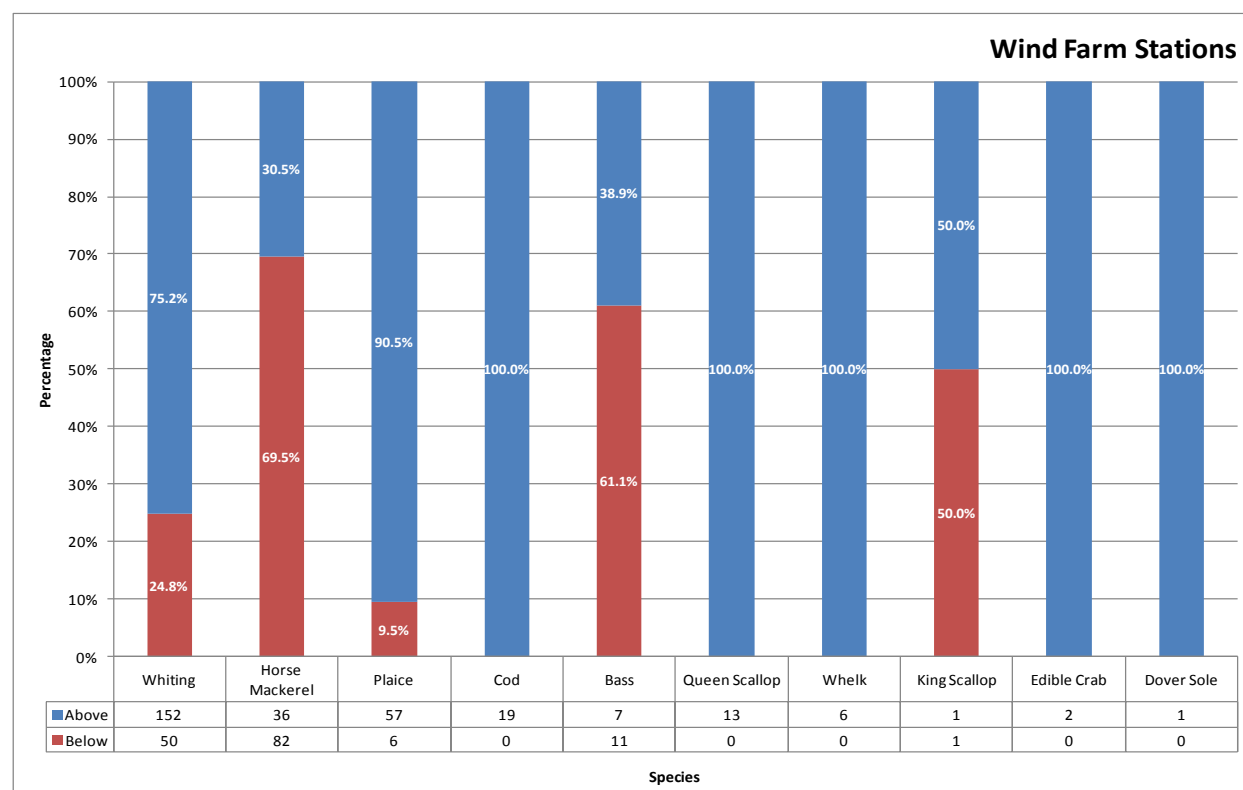


Figure 5.15 Percentage of Individuals Caught Below and Above their Set MLS by Species within the Wind Farm

5.4 Sex Percentage

The sex percentage for the six target species are illustrated in Figure 5.16 (reference) and Figure 5.17 (wind farm). It should be noted that Cefas were unable to confidently determine the sex of a number of individuals, and as such they have been categorised as 'unsexed'. While not one of the target species, *S. canicula* has been included in this analysis due to the high numbers caught during the survey.

The highest proportion of the *M. merlangus* (66.8% at both locations), *S. cantharus* (66.7% and 68.1%), and *S. canicula* (66.8% and 77.9%) caught in both sampling areas were female.

Female *P. platessa* were more prevalent within the wind farm (69.8%), whereas at the reference stations the sex percentage was approximately equal. In both sampling areas the sex percentage of the *M. kitt* caught was also approximately equal.

The sex percentage of the *G. morhua* caught within the wind farm was approximately equal, whereas only one male *G. morhua* was found at the reference stations. One male *S. solea* was recorded within the wind farm.

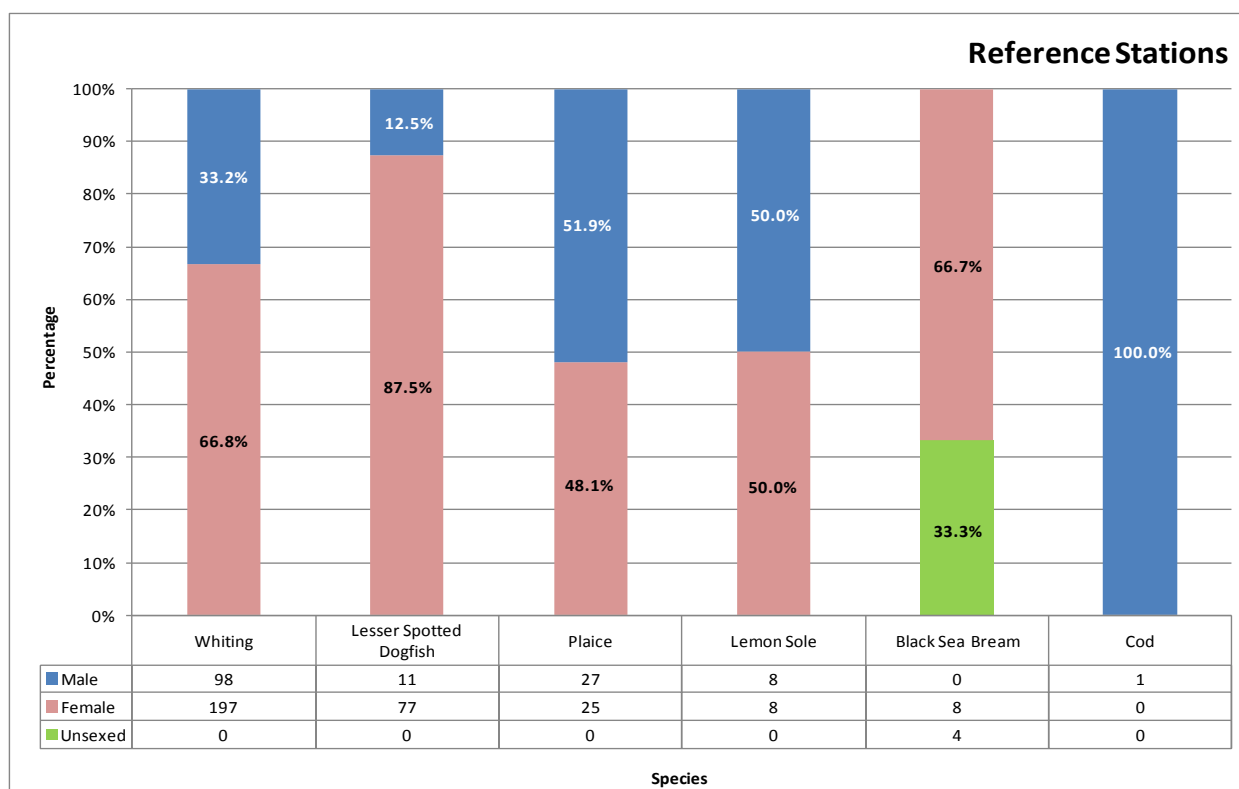


Figure 5.16 Sex Percentage by Species caught at Reference Stations

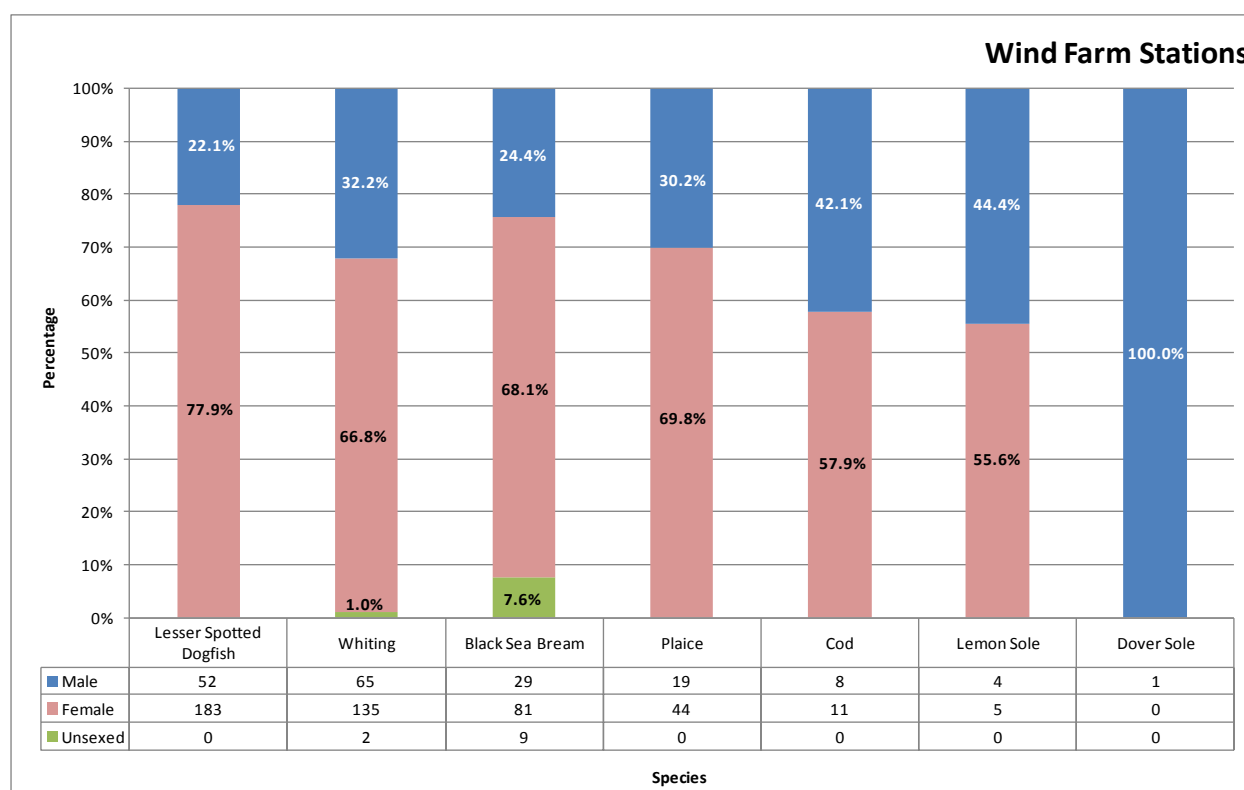


Figure 5.17 Sex Percentage by Species caught at Wind Farm Stations

5.5 Spawning Condition

The sex, spawning condition and length range of the six target species are given in Table 5.5 to Table 5.10. Where a stage of maturity was not identified it has not been included in the following tables.

The greatest proportion of the *M. merlangus* caught both at the reference stations and within the wind farm was represented by maturing (36.0%) and spent (28.8%) females.

The highest proportion of *S. cantharus* caught in the wind farm was immature fish (52.7%), whereas at the reference stations a greater percentage of the catch was maturing females (50.0%).

Most of the *P. platessa* caught in both sampling areas were maturing fish (96.5%), the highest proportion of which was female (56.5%).

The greatest proportion of the *M. kitt* (48.0%) caught at both sampling areas, the *G. morhua* (65.0%) caught within the wind farm, and the one male *S. solea* found within the wind farm were spent individuals. One immature male *G. morhua* was caught at the reference stations.

Table 5.5 Whiting (*M. merlangus*) Spawning Condition

Whiting							
Sex	Maturity	Site		Total	% of Total Catch	Length Range (cm)	
		Reference	Wind Farm			Min.	Max.
Female	Immature	4	6	10	2.0%	21	26
	Maturing	104	75	179	36.0%	20	40
	Spent	89	54	143	28.8%	24	46
Male	Immature	7	9	16	3.2%	22	29
	Maturing	41	23	64	12.9%	20	37
	Spent	50	33	83	16.7%	24	37

Table 5.6 Black Sea Bream (*S. cantharus*) Spawning Condition

Black Sea Bream							
Sex	Maturity	Site		Total	% of Total Catch	Length Range (cm)	
		Reference	Wind Farm			Min.	Max.
Female	Immature	1	41	42	32.1%	15	21
	Maturing	6	25	31	23.7%	16	25
	Spent	1	15	16	12.2%	21	27
Male	Immature	0	27	27	20.6%	15	19
	Maturing	0	1	1	0.8%	19	19
	Spent	0	1	1	0.8%	23	23

Table 5.7 Plaice (*P. platessa*) Spawning Condition

Plaice							
Sex	Maturity	Site		Total	% of Total Catch	Length Range (cm)	
		Reference	Wind Farm			Min.	Max.
Female	Maturing	23	42	65	56.5%	22	43
	Spent	2	2	4	3.5%	26	31
Male	Maturing	27	19	46	40.0%	22	37

Table 5.8 Lemon Sole (*M. kitt*) Spawning Condition

Lemon Sole							
Sex	Maturity	Site		Total	% of Total Catch	Length Range (cm)	
		Reference	Wind Farm			Min.	Max.
Female	Immature	0	1	1	4.0%	22	22
	Maturing	4	1	5	20.0%	23	27
	Spent	4	3	7	28.0%	24	33
Male	Immature	2	0	2	8.0%	19	22
	Maturing	2	3	5	20.0%	18	27
	Spent	4	1	5	20.0%	25	29

Table 5.9 Cod (*G. morhua*) Spawning Condition

Cod							
Sex	Maturity	Site		Total	% of Total Catch	Length Range (cm)	
		Reference	Wind Farm			Min.	Max.
Female	Immature	0	1	1	5.0%	47	47
	Maturing	0	2	2	10.0%	45	46
	Spent	0	8	8	40.0%	62	92
Male	Immature	1	2	3	15.0%	44	53
	Maturing	0	1	1	5.0%	90	90
	Spent	0	5	5	25.0%	58	64

Table 5.10 Dover sole (*S. solea*) Spawning Condition

Dover sole							
Sex	Maturity	Site		Total	% of Total Catch	Length Range (cm)	
		Reference	Wind Farm			Min.	Max.
Male	Spent	0	1	1	100.0%	30	30

6.0 Scientific 2-metre Beam Trawl Results

6.1 Abundance and Catch Rates

A total of 24 fish species and 91 invertebrate (80 motile and 11 sessile) taxa were caught. The numbers of individuals and catch rates by sampling area for fish and motile invertebrate species are given in Table 6.1 and Table 6.3 respectively. The catch rates by species and sampling area are illustrated by Figure 6.1, and Figure 6.2 shows the catch rates by species and station (where red and green boxes denote wind farm and reference stations respectively). The presence/absence or count by sampling area for sessile invertebrate species is given in Table 6.4.

6.1.1 Fish Species

A total of 24 species of fish were caught in the beam trawl; 20 within the wind farm and 14 at the reference stations. Sand goby (*Pomatoschistus minutus*) were the most prevalent species caught both within the wind farm (152.1/hr) and at the reference stations (208.9/hr), followed by solenette (*Buglossidium luteum*) and then painted goby (*Pomatoschistus pictus*).

Two *M. kitt*, one *S. cantharus* and one *P. platessa* were found within the wind farm, with catch rates of 0.6/hr, 0.3/hr and 0.3/hr respectively. One short-snouted seahorse (*Hippocampus hippocampus*), a species of conservation interest, was found within the wind farm at station BT05.

The highest catch rate was recorded at station BT24 (795.9/hr), followed by BT09 (640.6/hr), and then BT19 (478.9/hr). *P. minutus* represented the greatest proportion of the catch at the majority of the sampling stations, with the exception of BT07 and BT22 where lesser weever (*Echiichthys vipera*) and *P. pictus* were most prevalent, respectively.

Overall, the total catch rate for fish species caught in the beam trawl was greater at the reference stations (341.4/hr) than within the wind farm (196.2/hr).

Table 6.1 Abundance and Catch Rates of Fish Species by Station

Species		No. of Individuals Caught			Catch Rate (No. of Individuals Caught per Hour)	
Common Name	Scientific Name	Reference	Wind Farm	Total	Reference	Wind Farm
Sand Goby	<i>Pomatoschistus minutus</i>	216	472	688	208.9	152.1
Solenette	<i>Buglossidium luteum</i>	68	47	115	65.8	15.1
Painted Goby	<i>Pomatoschistus pictus</i>	31	22	53	30.0	7.1
Common Dragonet	<i>Callionymus lyra</i>	20	12	32	19.3	3.9
Lesser Weever	<i>Echiichthys vipera</i>	4	20	24	3.9	6.4
Black Goby	<i>Gobius niger</i>	1	10	11	1.0	3.2
Scaldfish	<i>Arnoglossus laterna</i>	2	6	8	1.9	1.9
Greater Sandeel	<i>Hyperoplus lanceolatus</i>	2	3	5	1.9	1.0
Pogge	<i>Agonus cataphractus</i>	1	3	4	1.0	1.0
Small Headed Clingfish	<i>Apletodon microcephalus</i>	2	1	3	1.9	0.3
Tub Gurnard	<i>Chelidonichthys lucerna</i>	3	0	3	2.9	0.0
Five-bearded Rockling	<i>Ciliata mustela</i>	0	2	2	0.0	0.6
Lemon Sole	<i>Microstomus kitt</i>	0	2	2	0.0	0.6

Species		No. of Individuals Caught			Catch Rate (No. of Individuals Caught per Hour)	
Common Name	Scientific Name	Reference	Wind Farm	Total	Reference	Wind Farm
Three-bearded Rockling	<i>Gaidropsarus vulgaris</i>	0	2	2	0.0	0.6
Black Sea Bream	<i>Spondyllosoma cantharus</i>	0	1	1	0.0	0.3
Greater Pipefish	<i>Syngnathus acus</i>	1	0	1	1.0	0.0
Horse Mackerel	<i>Trachurus trachurus</i>	0	1	1	0.0	0.3
John Dory	<i>Zeus faber</i>	0	1	1	0.0	0.3
Lesser Spotted Dogfish	<i>Scyliorhinus canicula</i>	0	1	1	0.0	0.3
Plaice	<i>Pleuronectes platessa</i>	0	1	1	0.0	0.3
Poor Cod	<i>Trisopterus minutus</i>	1	0	1	1.0	0.0
Rock Goby	<i>Gobius paganellus</i>	0	1	1	0.0	0.3
Short-snouted Seahorse	<i>Hippocampus hippocampus</i>	0	1	1	0.0	0.3
Thickback Sole	<i>Microchirus variegatus</i>	1	0	1	1.0	0.0
Total Number of Individuals		353	609	962		
Catch Rate (No. Individuals Caught per Hour)		341.4	196.2	232.5		
Total Number of Species		14	20	24		

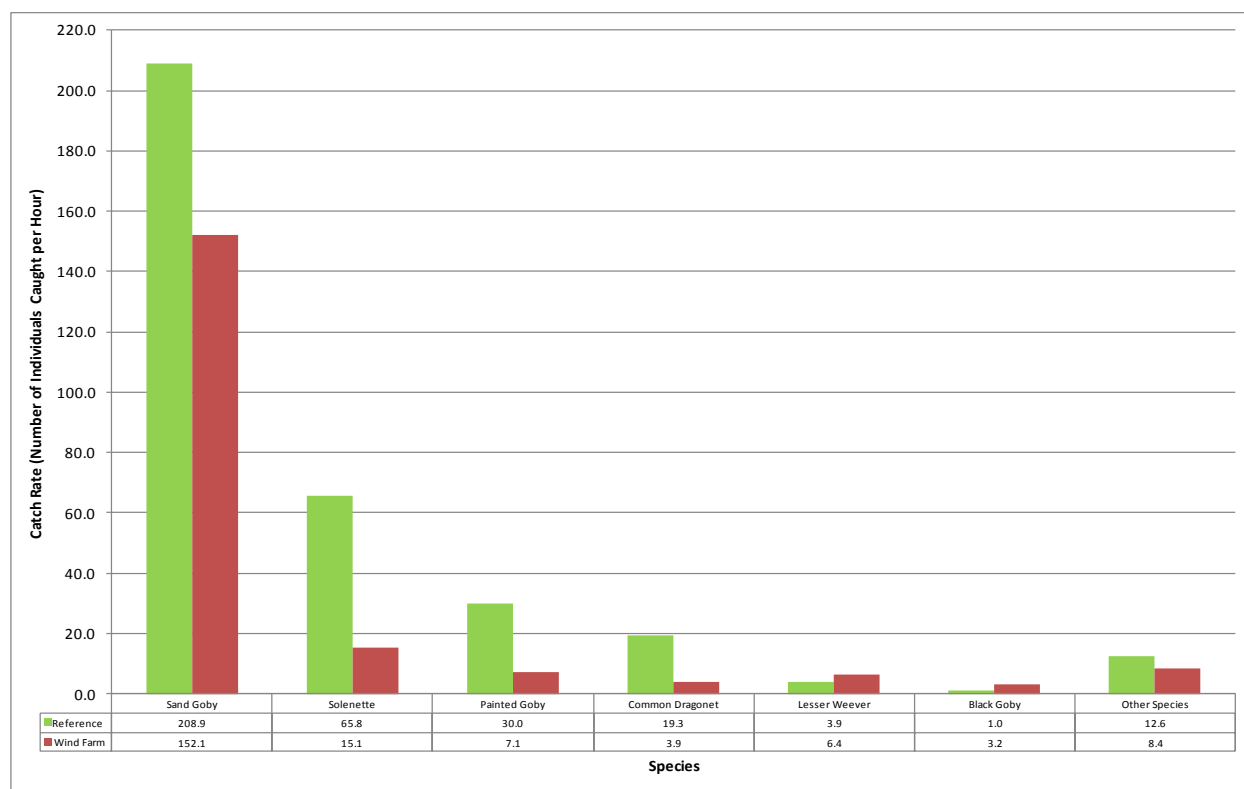


Figure 6.1 Catch Rate by Fish Species and Sampling Area

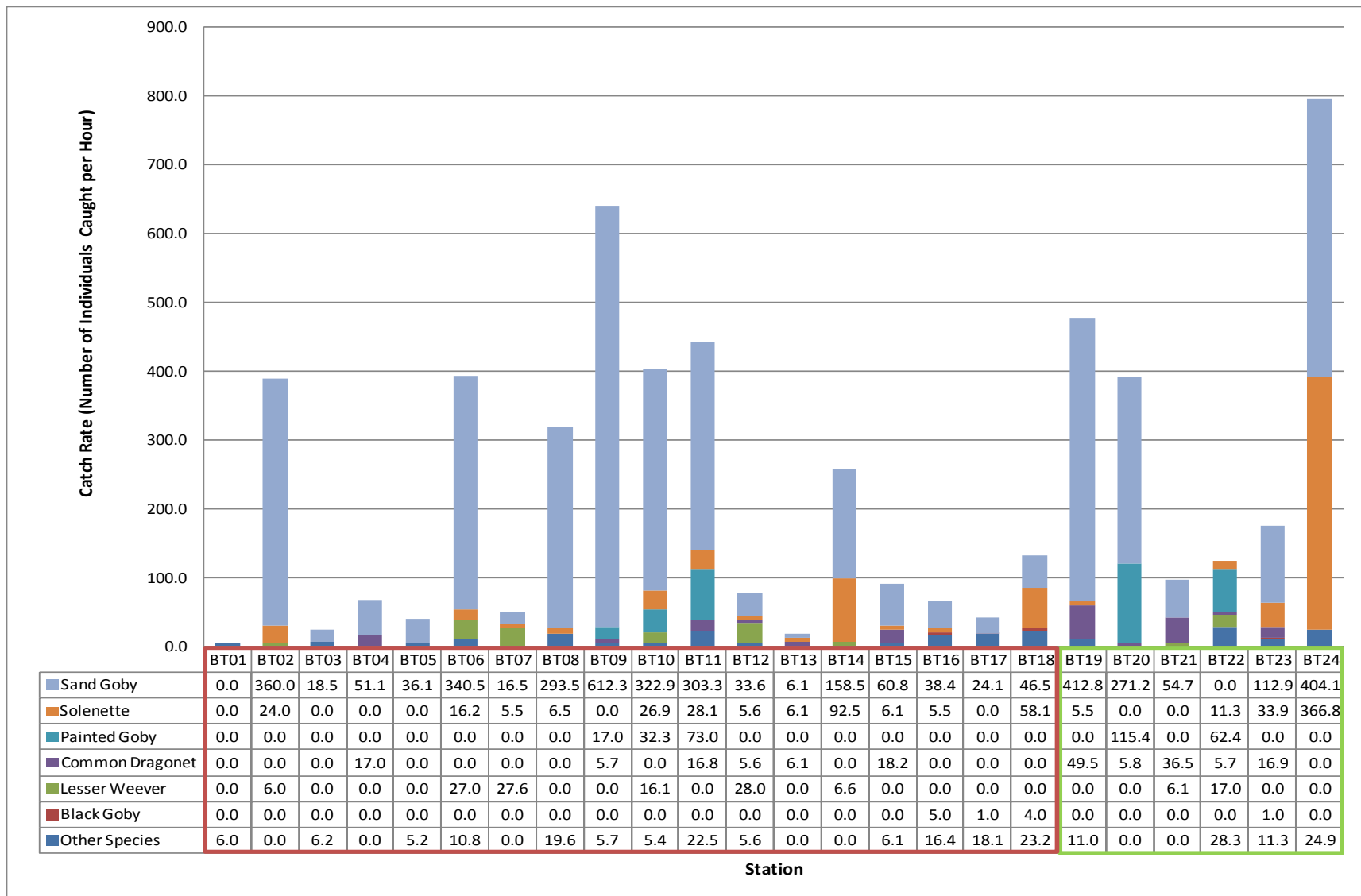


Figure 6.2 Catch Rate by Species and Station

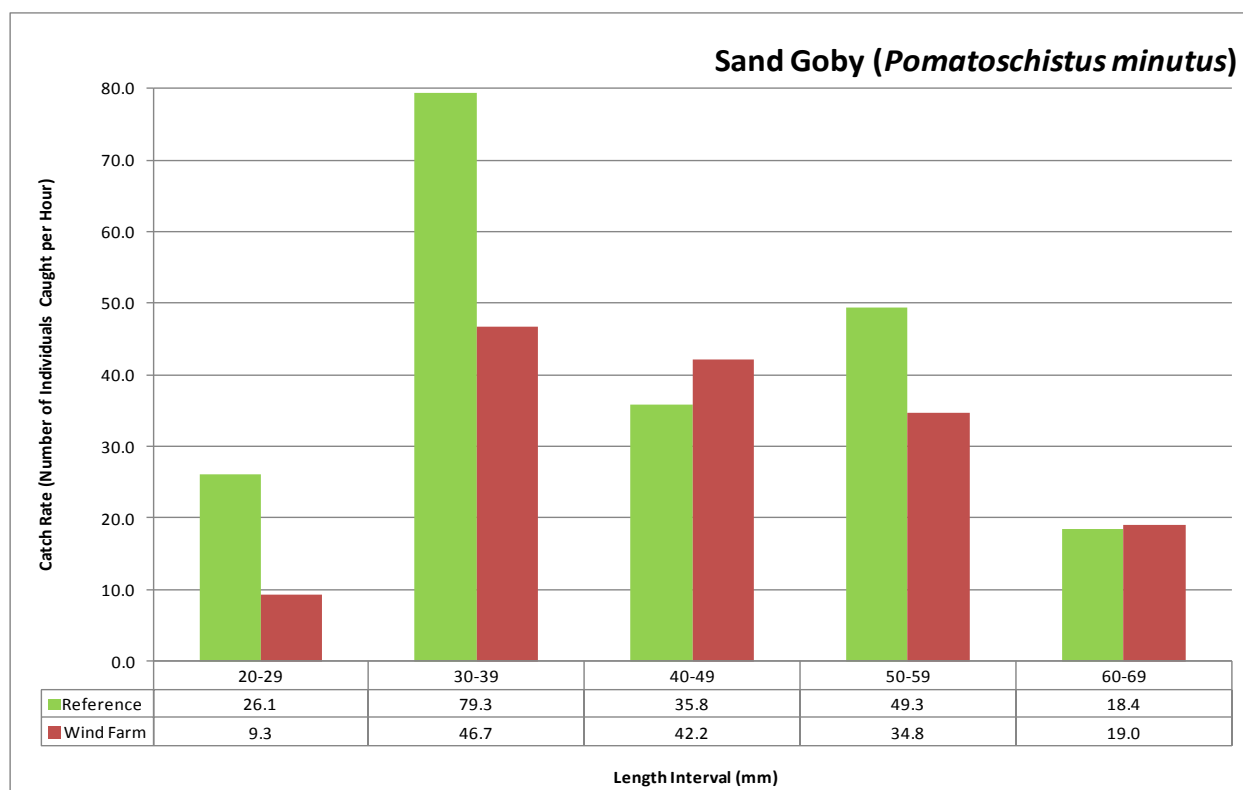
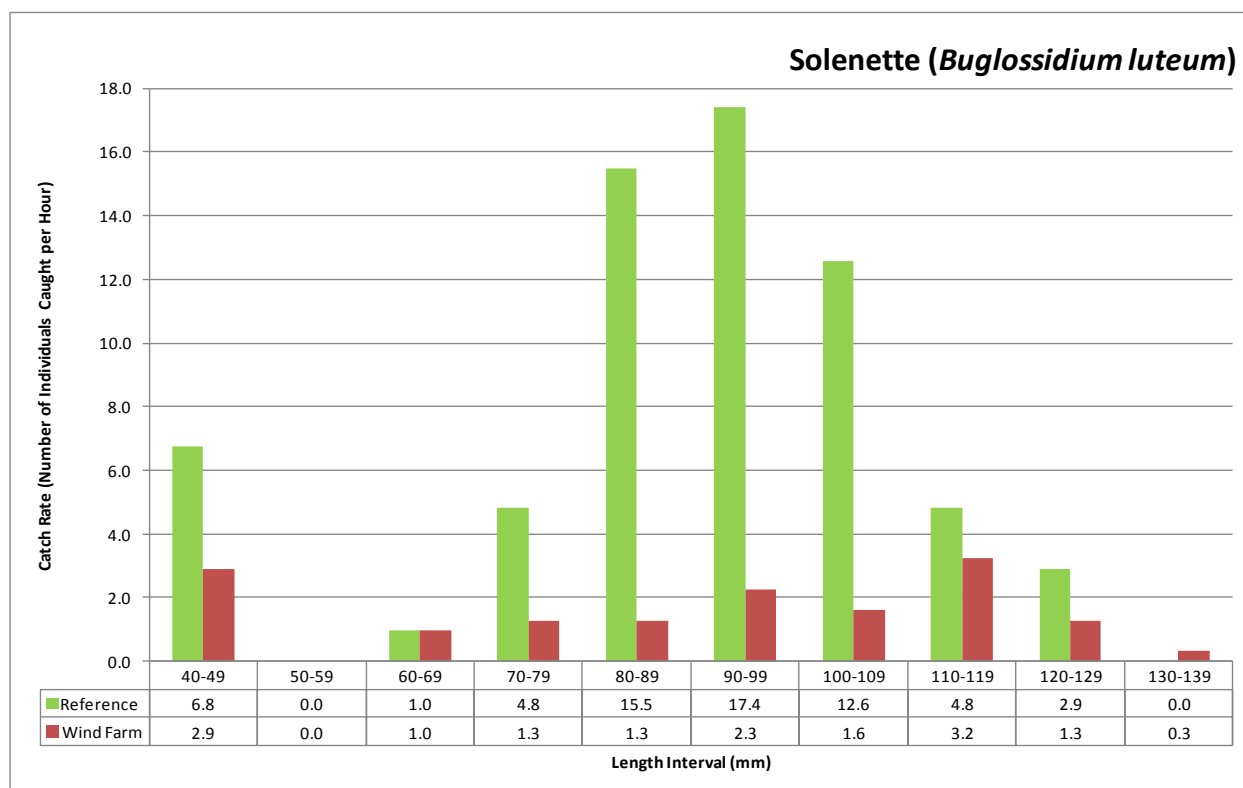
6.2 Length Distribution

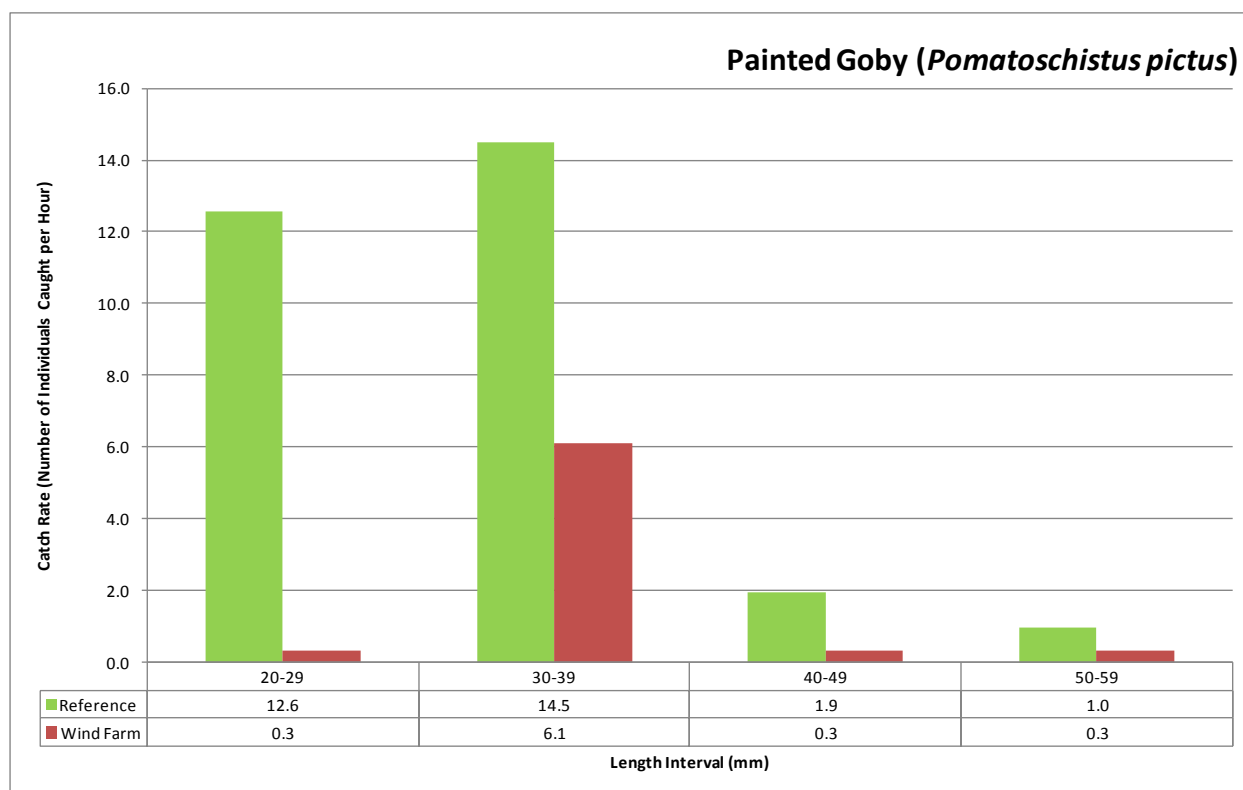
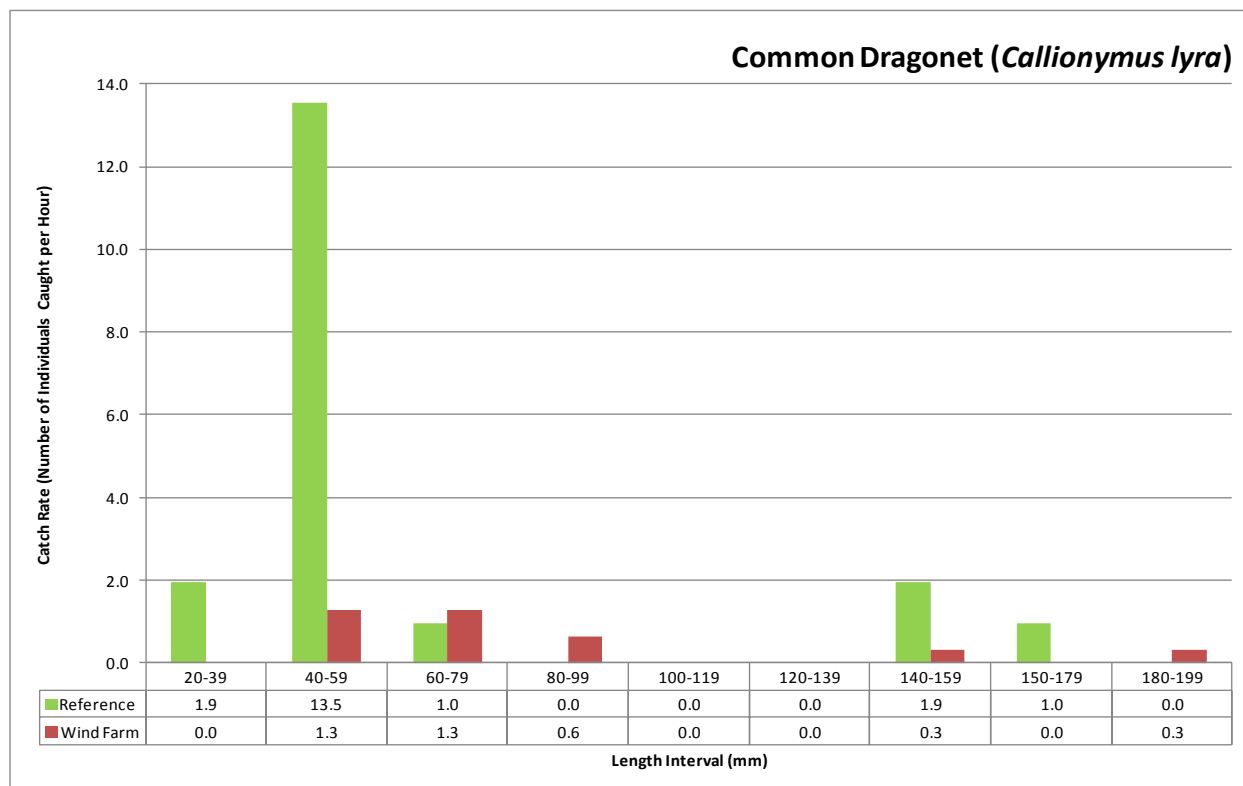
The average length (mm) and length range of species caught by sampling area (reference and wind farm), are given below in Table 6.2 respectively.

The length distributions for the five most abundant species caught (>10 individuals), expressed as the catch rate (number of individuals caught per hour) by length (cm) are shown in Figure 6.3 to Figure 6.7 and the length for each individual is given below in Table 6.2.

Table 6.2 Average Length and Length Range by Species and Sampling Area

Species		Average Length (mm)		Length Range (mm)	
Common Name	Scientific Name	Reference	Wind Farm	Min.	Max.
Black Goby	<i>Gobius niger</i>	95.0	81.1	60.0	100.0
Black Sea Bream	<i>Spondyliosoma cantharus</i>	0.0	60.0	60.0	60.0
Common Dragonet	<i>Callionymus lyra</i>	66.0	81.0	25.0	180.0
Five-Bearded Rockling	<i>Ciliata mustela</i>	0.0	95.0	85.0	105.0
Greater Pipefish	<i>Syngnathus acus</i>	80.0	0.0	80.0	80.0
Greater Sandeel	<i>Hyperoplus lanceolatus</i>	167.5	165.0	160.0	175.0
Horse Mackerel	<i>Trachurus trachurus</i>	0.0	80.0	80.0	80.0
John Dory	<i>Zeus faber</i>	0.0	85.0	85.0	85.0
Lemon Sole	<i>Microstomus kitt</i>	0.0	177.5	155.0	200.0
Lesser Spotted Dogfish	<i>Scyliorhinus canicula</i>	0.0	570.0	570.0	570.0
Painted Goby	<i>Pomatoschistus pictus</i>	31.4	35.0	20.0	50.0
Plaice	<i>Pleuronectes platessa</i>	0.0	290.0	290.0	290.0
Pogge	<i>Agonus cataphractus</i>	135.0	48.3	30.0	135.0
Poor Cod	<i>Trisopterus minutus</i>	90.0	0.0	90.0	90.0
Rock Goby	<i>Gobius paganellus</i>	0.0	70.0	70.0	70.0
Sand Goby	<i>Pomatoschistus minutus</i>	41.6	42.6	20.0	65.0
Scaldfish	<i>Arnoglossus laterna</i>	97.5	120.0	50.0	140.0
Short-Snouted Seahorse	<i>Hippocampus hippocampus</i>	0.0	35.0	35.0	35.0
Small Headed Clingfish	<i>Apletodon microcephalus</i>	25.0	35.0	15.0	35.0
Solenette	<i>Buglossidium luteum</i>	95.5	91.6	45.0	130.0
Thickback Sole	<i>Microchirus variegatus</i>	160.0	0.0	160.0	160.0
Three-Bearded Rockling	<i>Gaidropsarus vulgaris</i>	0.0	60.0	50.0	70.0
Tub Gurnard	<i>Trigla lucerna</i>	263.3	0.0	260.0	270.0

Figure 6.3 Sand Goby (*P. minutus*) Length DistributionFigure 6.4 Solenette (*B. luteum*) Length Distribution

Figure 6.5 Painted Goby (*P. pictus*) Length DistributionFigure 6.6 Common Dragonet (*C. lyra*) Length Distribution

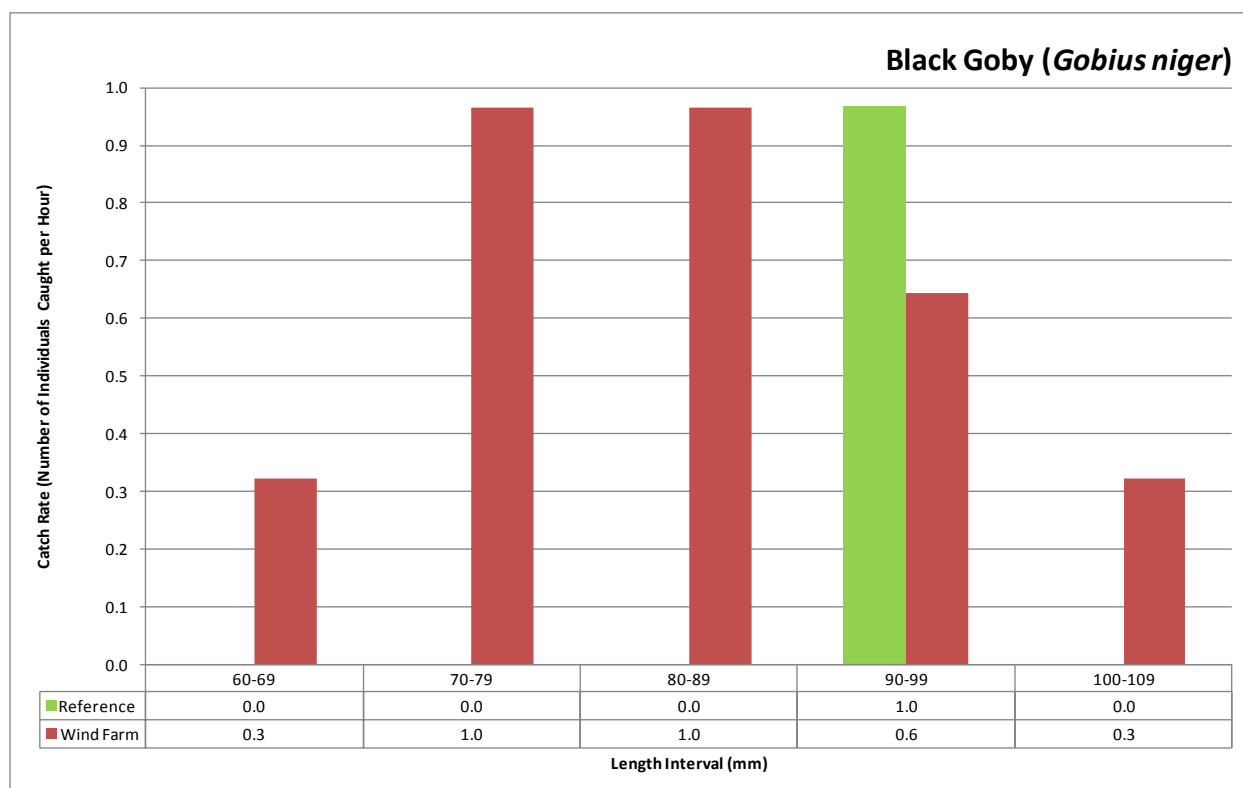


Figure 6.7 Black Goby (*G. niger*) Length Distribution

6.2.1 Motile Invertebrate Species

A total of 80 motile invertebrate taxa were found; 72 within the wind farm and 47 at the reference stations. Overall, shrimp (*Crangon allmani*) was the most abundant motile invertebrate species caught (1,265 individuals), followed by brittlestar (*Ophiura albida*; 1,116) and then brown shrimp (*Crangon crangon*; 295).

O. albida was the most prevalent species within the wind farm, with a catch rate of 325.1/hr, whereas at reference stations *C. allmani* had the highest catch rate (303.7/hr).

The greatest numbers of individuals (all species) were found at station BT05 (1,102); this is due to the high numbers of *O. albida* caught (663).

Overall, the catch rates for motile invertebrates caught in the beam trawl were greater within the wind farm (1,339.3/hr) than at the reference stations (1,005.9/hr).

Table 6.3 Abundance and Catch Rates of Motile Invertebrate Species by Station

Species				Number of Individuals			Catch Rate (Number of Individuals Caught per Hour)	
Phylum	Class	Common Name	Scientific Name	Reference	Wind Farm	Total	Reference	Wind Farm
Annelida	Polychaeta	Polychaeta	Serpulidae sp.	-	P	-	-	-
			Sabellariidae sp.	-	P	-	-	-
			Cirratulidae sp.	7	7	14	6.8	2.3
			Nereididae sp.	2	8	10	1.9	2.6
		Catworm	Nephtyidae sp.	0	6	6	0.0	1.9
		Polychaeta	<i>Flabelligera affinis</i>	1	5	6	1.0	1.6
			Phyllodocidae sp.	5	1	6	4.8	0.3
		Scaleworm	Polynoidae sp.	2	3	5	1.9	1.0
		Polychaeta	Syllidae sp.	0	4	4	0.0	1.3
			Opheliidae sp.	0	1	1	0.0	0.3
			Sphaerodoridae sp.	0	1	1	0.0	0.3
			Maldanidae sp.	P	-	-	-	-
Arthropoda	Malacostraca	Shrimp	<i>Crangon allmani</i>	314	951	1,265	303.7	306.4
		Brown Shrimp	<i>Crangon crangon</i>	83	212	295	80.3	68.3
		Amphipoda	Isaeidae sp.	21	263	284	20.3	84.7
		Hermit Crab	Paguridae sp.	70	201	271	67.7	64.8
		Shrimp	<i>Philocheras trispinosus</i>	74	122	196	71.6	39.3
		Amphipoda	Melitidae sp.	24	170	194	23.2	54.8
		Spider Crab	<i>Macropodia sp.</i>	18	101	119	17.4	32.5
		Hermit Crab	<i>Pagurus bernhardus</i>	13	50	63	12.6	16.1
		Amphipoda	Caprellidae sp.	9	39	48	8.7	12.6
		Shrimp	<i>Processa parva</i>	4	30	34	3.9	9.7
			<i>Pandalina brevisrostris</i>	9	24	33	8.7	7.7
			<i>Pontophilus bispinosus</i>	20	12	32	19.3	3.9
		Mysid Shrimp	Mysida sp.	8	19	27	7.7	6.1
		Long-clawed Porcelain Crab	<i>Pisidia longicornis</i>	1	18	19	1.0	5.8
		Flying Crab	<i>Liocarcinus holsatus</i>	2	2	4	1.9	0.6
		Hermit Crab	<i>Pagurus prideaux</i>	1	3	4	1.0	1.0
		Pink Shrimp	<i>Pandalus montagui</i>	1	3	4	1.0	1.0
		Shrimp	<i>Pontophilus sculptus</i>	0	4	4	0.0	1.3
		Squat Lobster	<i>Galathea intermedia</i>	0	4	4	0.0	1.3
		Mysid Shrimp	<i>Gastrosaccus spinifer</i>	1	3	4	1.0	1.0
		Bryer's Nut Crab	<i>Ebalia tumefacta</i>	0	3	3	0.0	1.0
		Dwarf Swimming Crab	<i>Liocarcinus pusillus</i>	1	2	3	1.0	0.6
		Marbled Swimming Crab	<i>Liocarcinus marmoreus</i>	3	0	3	2.9	0.0
		Amphipoda	Amphilochidae sp.	1	1	2	1.0	0.3
		Hairy Crab	<i>Pilumnus hirtellus</i>	0	2	2	0.0	0.6
		Shrimp	<i>Pontophilus brevisrostris</i>	0	2	2	0.0	0.6
		Swimming Crab	<i>Liocarcinus sp.</i>	1	1	2	1.0	0.3
		Amphipoda	Lysianassidae sp.	0	1	1	0.0	0.3
		Arch-fronted Swimming	<i>Liocarcinus navigator</i>	0	1	1	0.0	0.3
		Edible Crab	<i>Cancer pagurus</i>	0	1	1	0.0	0.3
		Isopoda	<i>Janira maculosa</i>	0	1	1	0.0	0.3
		Shrimp	<i>Caridea sp.</i>	0	1	1	0.0	0.3
			Crangonidae sp.	1	0	1	1.0	0.0
			<i>Hippolyte varians</i>	1	0	1	1.0	0.0
			<i>Hippolyte longirostris</i>	0	1	1	0.0	0.3
Ctenophora	Nuda	Sea Gooseberry	<i>Pleurobrachia pileus</i>	22	93	115	21.3	30.0
Echinoderm-ata	Asteroidea	Common Starfish	<i>Asterias rubens</i>	31	166	197	30.0	53.5
	Echinoidea	Green Sea Urchin	<i>Psammechinus miliaris</i>	26	139	165	25.1	44.8
		Sea Potato	<i>Echinocardium cordatum</i>	0	1	1	0.0	0.3

Species				Number of Individuals			Catch Rate (Number of Individuals Caught per Hour)	
Phylum	Class	Common Name	Scientific Name	Reference	Wind Farm	Total	Reference	Wind Farm
	Ophiuroidea	Brittlestar	<i>Ophiura albida</i>	107	1,009	1,116	103.5	325.1
			<i>Ophiura ophiura</i>	93	149	242	90.0	48.0
		Common Brittlestar	<i>Ophiothrix fragilis</i>	2	10	12	1.9	3.2
		Brittlestar	Ophiuridae sp.	0	2	2	0.0	0.6
			<i>Ophiothrix sp.</i>	0	2	2	0.0	0.6
			<i>Ophiacten affinis</i>	0	1	1	0.0	0.3
		Small Brittlestar	<i>Amphipholis squamata</i>	1	0	1	1.0	0.0
Mollusca	Bivalvia	Queen Scallop	<i>Aequipecten opercularis</i>	27	52	79	26.1	16.8
		Bivalve Mollusc	<i>Spisula elliptica</i>	2	8	10	1.9	2.6
			<i>Abra prismatica</i>	0	3	3	0.0	1.0
		Native Oyster	<i>Ostrea edulis</i>	2	0	2	1.9	0.0
		Razor Shell	<i>Phaxas pellucides</i>	0	2	2	0.0	0.6
		Scallop	Pectinidae sp.	0	2	2	0.0	0.6
		Banded Carpet-shell	<i>Tapes rhomboides</i>	0	1	1	0.0	0.3
		Bivalve Mollusc	<i>Laevicordium crassum</i>	1	0	1	1.0	0.0
		King Scallop	<i>Pecten maximus</i>	0	1	1	0.0	0.3
		Scallop	<i>Clamys varia</i>	0	1	1	0.0	0.3
		Bivalve Mollusc	<i>Tellina danacina</i>	0	1	1	0.0	0.3
	Cephalopoda	Little Cuttlefish	<i>Sepiola atlantica</i>	12	129	141	11.6	41.6
		Common Cuttlefish	<i>Sepia officinalis</i>	1	5	6	1.0	1.6
		Squid	Loliginidae sp.	0	1	1	0.0	0.3
	Gastropoda	Slipper Limpet	<i>Crepidula fornicata</i>	4	68	72	3.9	21.9
		Common whelk	<i>Buccinum undatum</i>	6	14	20	5.8	4.5
		Alder's Necklace Shell	<i>Polinices pulchellus</i>	4	7	11	3.9	2.3
		Painted Top Shell	<i>Calliostoma zizyphinum</i>	0	2	2	0.0	0.6
		Gastropoda	Gastropoda sp.	0	1	1	0.0	0.3
			<i>Lunatia catena</i>	1	0	1	1.0	0.0
		Nudibranch	<i>Adalaria loveni</i>	0	1	1	0.0	0.3
Nemertea	-	Ribbon Worm	Nemertea sp.	0	2	2	0.0	0.6

6.2.2 Sessile/Encrusting Invertebrate Species

It should be noted that species presence (P) is given where counts were not feasible, and therefore catch rates could not be calculated.

A total of 11 sessile invertebrate taxa were found; 11 within the wind farm and five at the reference stations.

The phylum Bryozoa was the most prevalent, and was found at all 24 sampling stations, followed by undetermined species of barnacle (14 stations) and then *Actiniaria sp.* (48 individuals at 12 stations).

Table 6.4 Presence/Number of Sessile/Encrusting Invertebrate Species by Station

Species				Site		Total No. of Individuals	No. of Stations where Present
Phylum	Class	Common Name	Scientific Name	Reference	Wind Farm		
Arthropoda	Maxillopoda	Barnacle	Barnacle indet.	P	P	-	14
		Goose Barnacle	Lepadidae sp.	-	P	-	1
Bryozoa	-	Bryozoan	Bryozoa sp.	P	P	-	24
Chordata	Ascidiacea	Sea Squirt	Ascidiacea sp.	-	2	2	3
Cnidaria	Anthozoa	Cloak Anemone	<i>Adamsia carciniopados</i>	P	1	1	3
		Sea Anemone	<i>Actiniaria sp.</i>	8	40	48	12
		Snakelocks Anemone	<i>Anemonia viridis</i>	-	3	3	1
	Hexacorallia	Cloak Anemone	<i>Adamsia carciniopados</i>	-	P	-	1
	Hydrozoa	Hydroid	Hydroid sp.	-	P	-	1
	Octocorallia	Dead Man's Fingers	<i>Alcyonidium digitatum</i>	P	P	-	3
Porifera	N/A	Sponge	Porifera sp.	-	P	-	1

7.0 Appendix

7.1 Appendix 1 - Health and Safety

7.1.1 Personnel

Brown and May Marine (BMM) staff protocol followed the standard health and safety protocol outlined in the BMM “Offshore Operational Procedures for Surveys using Commercial Fishing Vessels”.

All BMM staff have completed a Sea Survival course approved by the Maritime and Coastguard Agency, meeting the requirements laid down in: **STCW 95 Regulation VI/1 para 2.1.1 and STCW Code section A-VI/1** before boarding any vessel conducting works for the company. Employees are also required to have valid medical certificates (ENG1 or ML5) before participating in offshore works.

7.1.2 Vessel Induction

Before boarding the survey team were shown how to safely board and disembark the vessel. Prior to departure the skipper briefed the BMM staff on the whereabouts of the safety equipment, including the life raft, emergency flares and fire extinguishers, and also the location of the emergency muster point. The safe deck areas, man-overboard procedures and emergency alarms were also discussed. The survey team were warned about the possible hazards, such as slippery decks and obstructions whilst aboard. The BMM staff were briefed about trawling operations and the need to keep clear of all winch’s when operational. All hazards were assessed prior to the survey in the BMM health and safety risk assessment.

7.1.3 Daily Safety Checks

The condition of the life jackets, EPIRB’s, and life raft were inspected daily. Also checked were the survey team working areas, including the wheelhouse to ensure these areas were clear of hazards such as clutter and obstructions.

7.1.4 Post Trip Survey review

Upon completion of the survey a “Post Trip Survey Review” was filed, see Table 7.1 overleaf.

Table 7.1 Post Trip Survey Review

Project: Rampion Offshore Wind Farm	Vessel: Lauren Ann	
Surveyors: Jonathan Keer, Richard Preston	Skipper: Andrew Hill	
Survey Area: English Channel – Off the coast of Shoreham	Total Time at Sea: 6 Days	
Dates at Sea: 31/10/11 – 01/11/11 and 05/11/11 – 08/11/11		
	Comments	Actions
Did vessel comply with pre trip safety audits?	Yes – Audited on 30/10/2011	N/A
Skipper and crew attitude to safety?	Very Good	Crew wore lifejackets for entire survey
Vessel machinery failures?	None	N/A
Safety equipment failures?	None	N/A
Accidents?	None	N/A
Injuries?	None	N/A