Centre for Marine and Coastal Studies

Rhyl Flats Offshore Wind Farm Beam Trawl Survey Report

A report to

npower renewables Ltd

October 2005

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1. Introduction

Rhyl Flats Offshore Wind Farm is located approximately 4 miles off the North Wales coastline within the Liverpool Bay between Towyn and Rhôs-on-Sea. Construction of the 30 2MW wind turbine array is scheduled to begin during late summer 2006 and continue through to the following year. The development should enter its post-construction phase in 2008.

A beam trawl survey was undertaken during September 2005 by the Centre for Marine and Coastal Studies (CMACS Ltd), during the pre-construction phase of the project, to provide information concerning the benthic populations in and around the development area as part of the 2005 baseline program (see Fig. 1 for site locations). Survey sites were located within the planned turbine array, in the near-field area adjacent and to the south east. Several sites were also chosen to the west, south west, south and along the planned cable route. These surveys will be repeated annually as part of the proposed monitoring required to comply with the conditions of the Food and Environmental Protection Act (FEPA) 1985: Part II (as amended) issued to 'npower renewables offshore Ltd' for the Rhyl Flats Offshore Wind Farm and dated the 5th February 2004. As wind farm construction is scheduled over the summer months, future monitoring will commence in September to coincide with the completion of construction.

This survey report details the preliminary results obtained during the September 2005 beam trawl survey and identifies the main faunal populations in and around the wind farm array in terms of species identification and the number of demersal fish and epibenthic invertebrates present. Further analytical interpretation and discussion of these results will be presented within the forthcoming monitoring report.

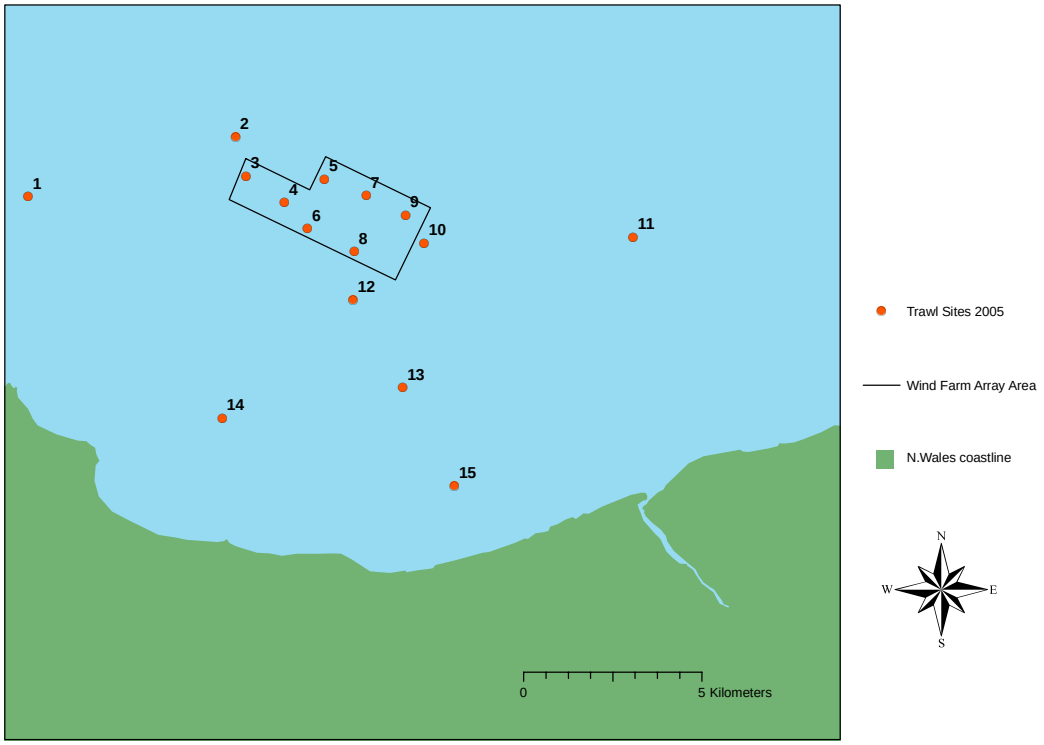


Fig. 1 Beam Trawl Site Locations surveyed in 2005 in relation to the Rhyl Flats Wind Farm.

2. Methodology

The survey was conducted between 5th and 7th September 2005 using the survey vessel RV 'Sandkat' operating out of Conwy marina and returning to the berth on a daily basis (see Fig. 2A). Surveys were carried out using a standard CEFAS 2m beam trawl with a 4mm square mesh cod-end and chain matrix between the beam and foot-rope (see Fig. 2B). 2m beam trawls were used to sample the benthic taxa, as they are practical for surveying amongst the array structures and cause relatively limited damage to the seabed. However, this gear is not ideal for surveying the presence of large demersal fish, many of which frequently avoid capture and consequently only qualitative data on large demersal fish can be interpreted.

Fig. 2A RV Sandkat Survey Vessel

Trawling was undertaken into the prevailing current with a speed of approximately 2 knots over the ground. A rope length attached to the beam trawl was paid out to a length approximately 3 times the depth of water. Once this length of rope was achieved trawling followed for a period of 5-10 minutes over a distance of 300m. Once fished, the trawl was retrieved and the sample landed on board into fish boxes.

A digital photograph of each sample was taken before any sorting or identification of organisms took place (refer to Appendix 3). All commercial fish species were taxonomically identified and lengths measured and recorded. The discovery of any elasmobranch or rare species was also recorded, these individuals were also measured and where possible sexed. The numbers and taxonomic identification of all remaining fish species were also recorded. Epibenthic invertebrates were counted and identified to species level with colonies of hydroids, soft corals and bryozoans being assessed according to their presence or absence or recorded weight (g). If any species were unable to be identified in the field a sample specimen was retained and preserved for future taxonomic identification. Sub-sampling was also necessary where very large hauls or large numbers of individual species were obtained. On such occasions the haul was sorted initially to remove all fish species and any conspicuous/large epifauna, after which the remaining sample was divided up into an appropriate fraction, all organisms identified and counted, and then multiplied up by the necessary scaling factor.

Fig. 2B 2m Beam Trawl

3 Results

3.1 Fish

Full data concerning fish abundance from the 2005 beam trawl survey at the Rhyl Flats Offshore Wind Farm are provided in Table 1 (Appendix 1), with the length data in Table 2 (Appendix 2). In total 1014 fish from 15 species were recorded, with the largest number of individuals recorded along the proposed cable route (sites 12, 13 and 15). Relatively high numbers of individuals were also observed at sites to the south of the array (site14), in the near-field area directly east of the development area (site 10) and within the south east corner of the site designated for turbine construction (site 8). Trawl sites within the turbine area (sites 3-7 and site 9) had comparable numbers to sites directly west (site 1) and north west (site 2) of the planned array (see Fig. 3 and 4).

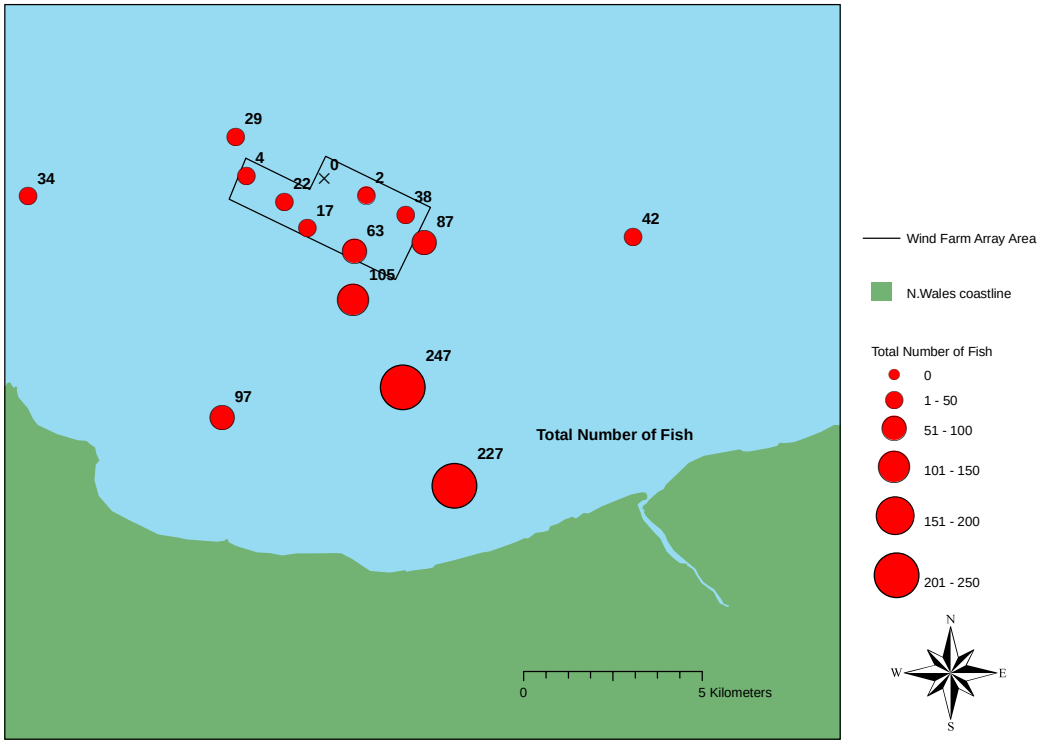


Fig. 3 Total Number of Fish individuals (refer to Fig. 1 for site numbers).

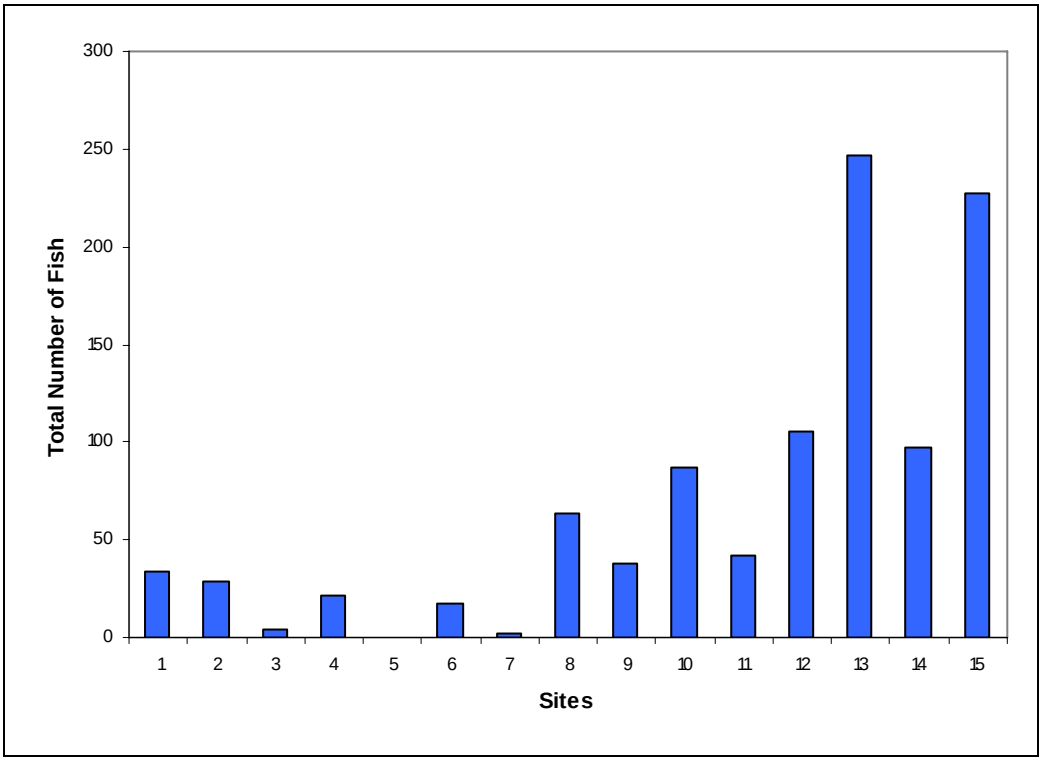


Fig. 4 Total Number of Fish by Site from the 2005 beam trawl survey.

The most common fish species recorded was Sand Goby (*Pomatoschistus minutus*) with a total of 457 individuals recorded from 12 of the 15 survey sites (see Fig. 5 and 6). The highest numbers of this species were recorded at site 15 inshore of the Rhyl Flats development area on the designated cable route. Large numbers of Solenette were also observed (209 individuals) from 13 of the 15 sites surveyed and were most abundant at site 13, located on the cable route equidistant between the coast and the planned development area. The most common commercial species was Dab (*Limanda limanda*). A total of 46 Dab (Lim*anda limanda*) were obtained from 9 of the 15 trawl sites, with the exception of most sites within the turbine array. The highest number of Dab (*Limanda limanda*) was obtained from site 13 directly south east of the array on the planned cable route. The distributions of the commonest and important commercial fish are displayed in Fig. 7 and 8.

Of the 15 sites surveyed, site 14 south of the turbine array was the most speciose (11 fish species) (see Fig. 5 and 6). The highest numbers were recorded at this site for Sand Goby (*Pomatoschistus minutus*) (31 individuals) and Solenette (*Buglossidium luteum*) (30 individuals). The most common commercial fish species were Dab (*Limanda limanda*) and Plaice (*Pleuronectes platessa*). Trawl sites within the wind farm array had relatively lower numbers of species, especially toward the northern corner of the planned development area (site 5 and 7: 0 and 2 fish species respectively).

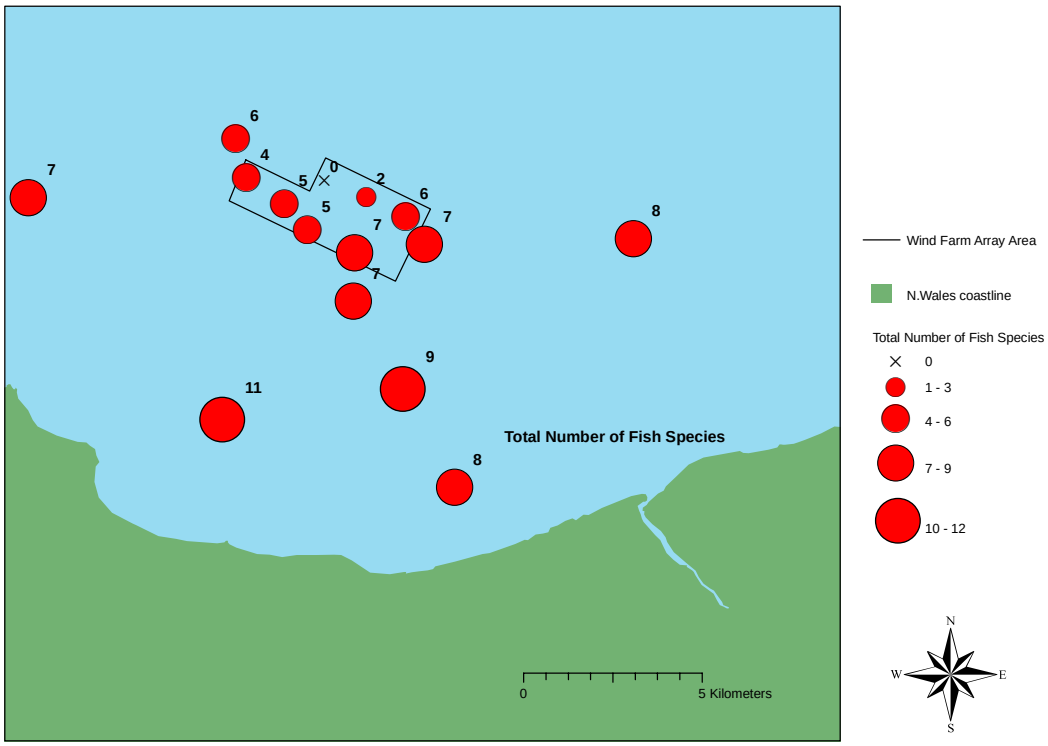


Fig. 5 Total Number of Fish Species (refer to Fig. 1 for site numbers).

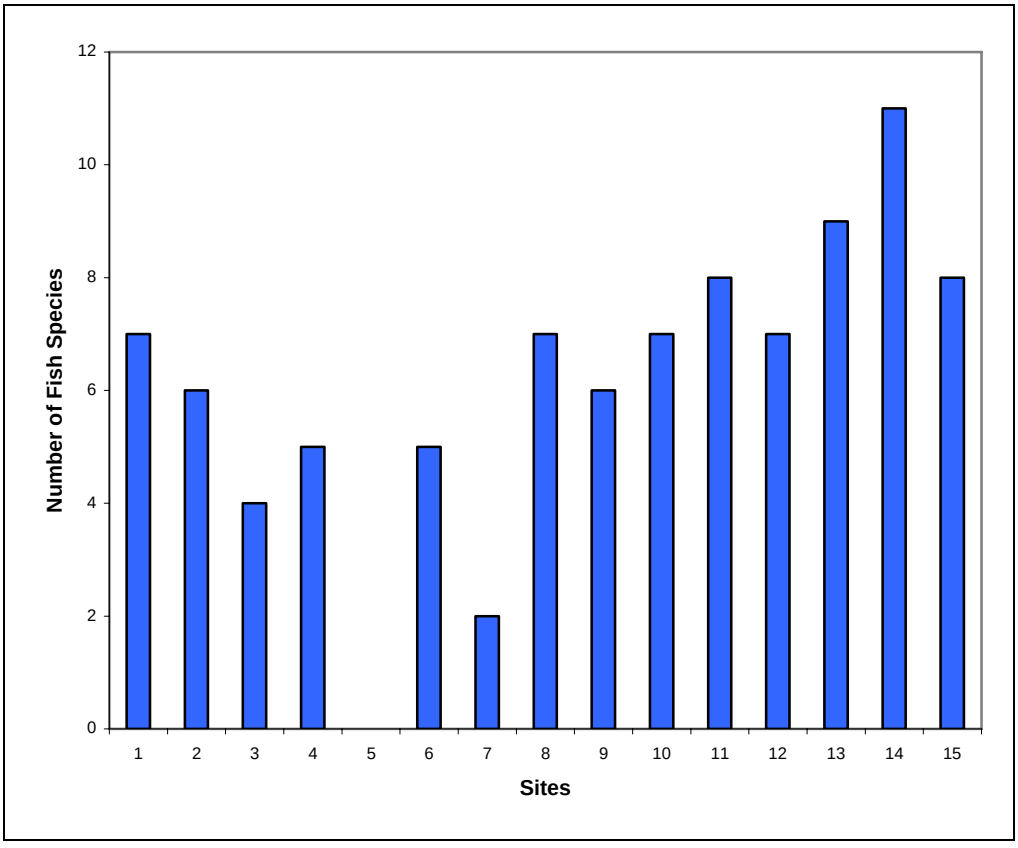
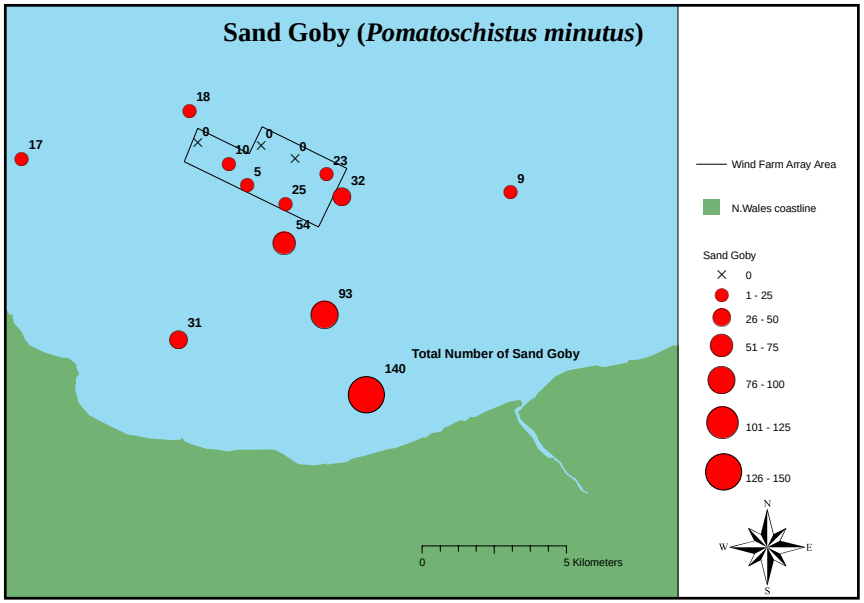
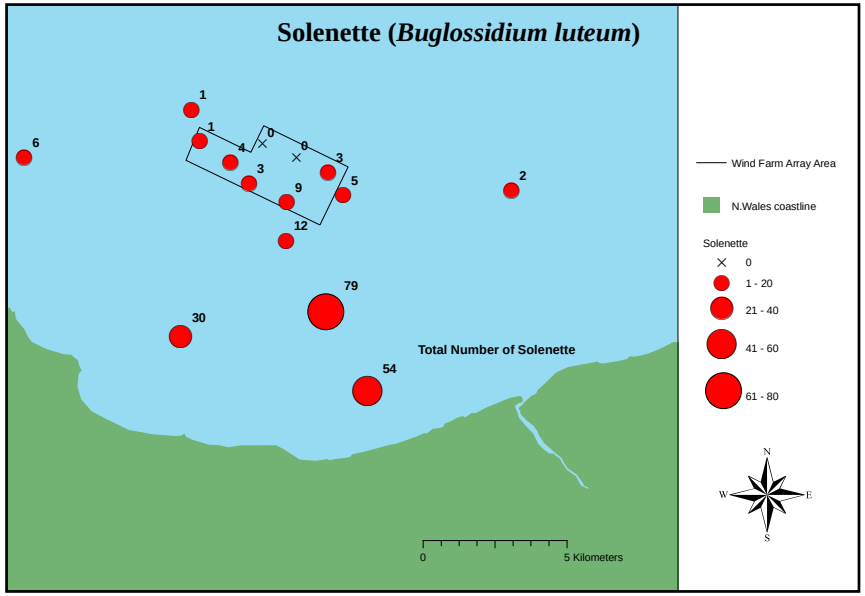


Fig. 6 Total Number of Fish Species by Site from the 2005 beam trawl survey.

No elasmobranch species were recorded from this survey, however a single John Dory (*Zeus faber*) was retrieved from the trawl at site 8 in the south east corner of the Rhyl Flats development area and is photographed in Appendix 4 (see Photo. 1). Although the distribution of this species is known to extend around all British and Irish coasts, this fish is only occasionally caught off the coast of Wales and was an interesting find in the 2005 survey. No other rare or unusual fish species were recorded during the survey. However, the Sand Goby is protected and legislated for under Appendix III (Protected Fauna Species) of the Bern Convention owed to its trophic position and importance. The Sand Goby is regarded as an abundant species in UK waters. It is also important to note that a UK British Diversity Action Plan has been described for commercial marine fish, which although are found over broad geographical areas, are at risk locally from excessive exploitation and stock collapse and are protected under the legislation and regulations underpinning the Common Fisheries Policy.


Sand Goby (*Pomatoschistus minutus*)
18
17
0
10
0
0
23
5
32
25
9
54
93
31
140
Total Number of Sand Goby
0
5 Kilometers
Wind Farm Array Area
N.Wales coastline
Sand Goby
0
1 - 25
26 - 50
51 - 75
76 - 100
101 - 125
126 - 150
N
W
E
S


Solenette (*Buglossidium luteum*)
1
6
1
4
0
0
3
3
5
9
12
2
79
30
54
Total Number of Solenette
0
5 Kilometers
Wind Farm Array Area
N.Wales coastline
Solenette
0
1 - 20
21 - 40
41 - 60
61 - 80
N
W
E
S

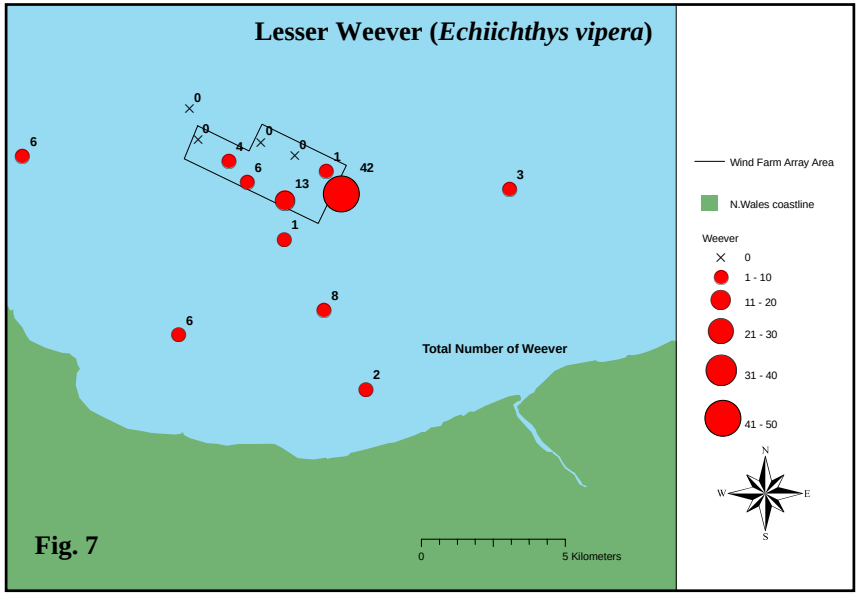
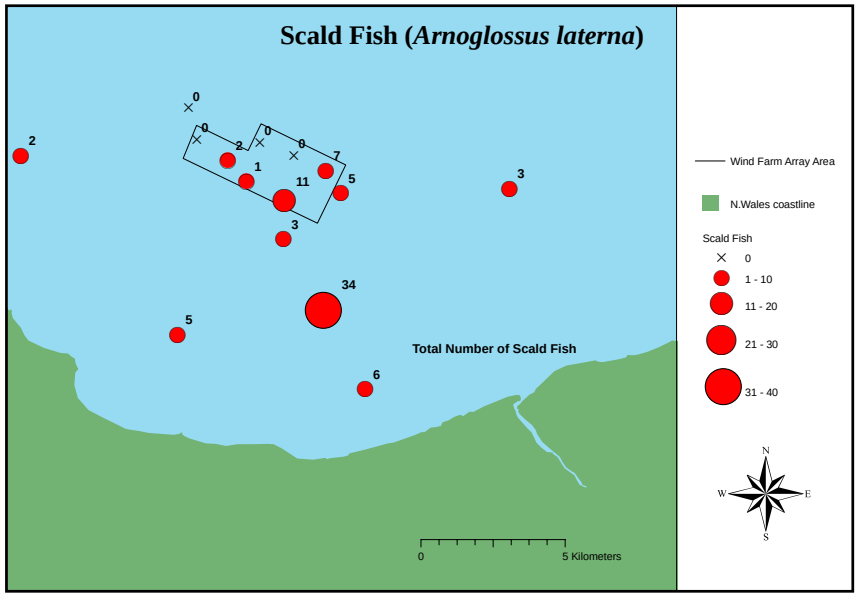
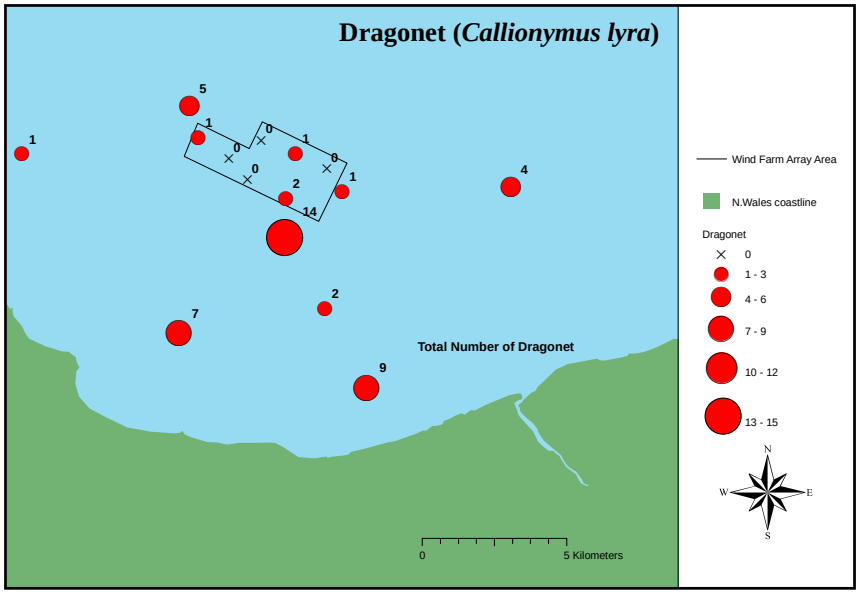

Lesser Weever (*Echiichthys vipera*)
0
6
0
0
4
0
0
1
6
42
13
3
1
8
6
Total Number of Weever
2
0
5 Kilometers
Wind Farm Array Area
N.Wales coastline
Weever
0
1 - 10
11 - 20
21 - 30
31 - 40
41 - 50
N
W
E
S

Fig. 7


Scald Fish (*Arnoglossus laterna*)
0
2
0
0
2
0
0
7
1
11
5
3
3
34
5
Total Number of Scald Fish
6
0
5 Kilometers
Wind Farm Array Area
N.Wales coastline
Scald Fish
0
1 - 10
11 - 20
21 - 30
31 - 40
N
W
E
S



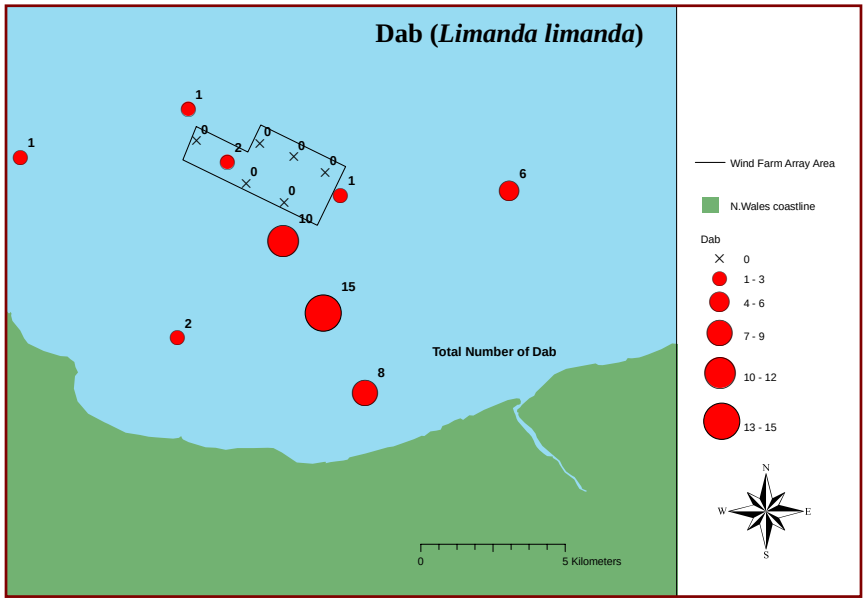
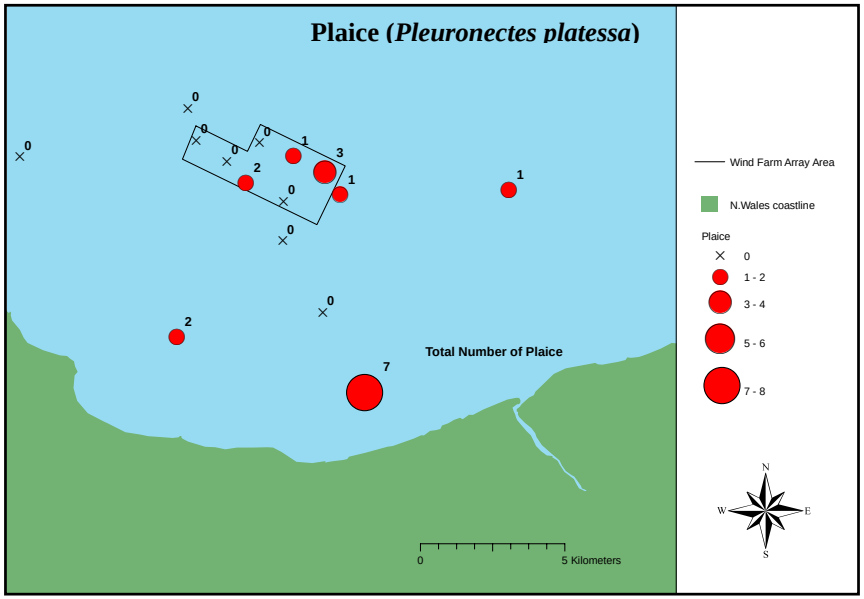
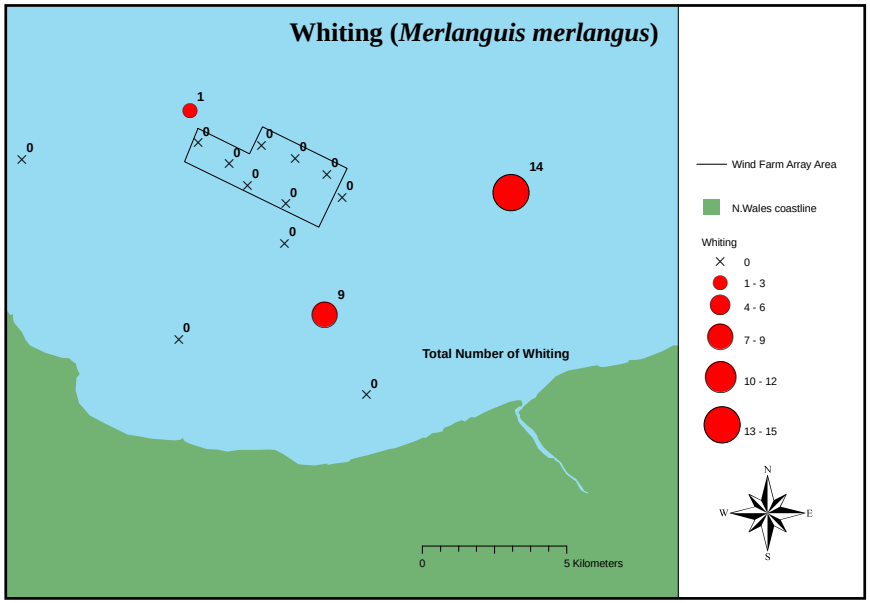


Fig. 7 contd Distribution of most common Fish (refer to Fig. 1 for site numbers). Please note the different scales used for each species.





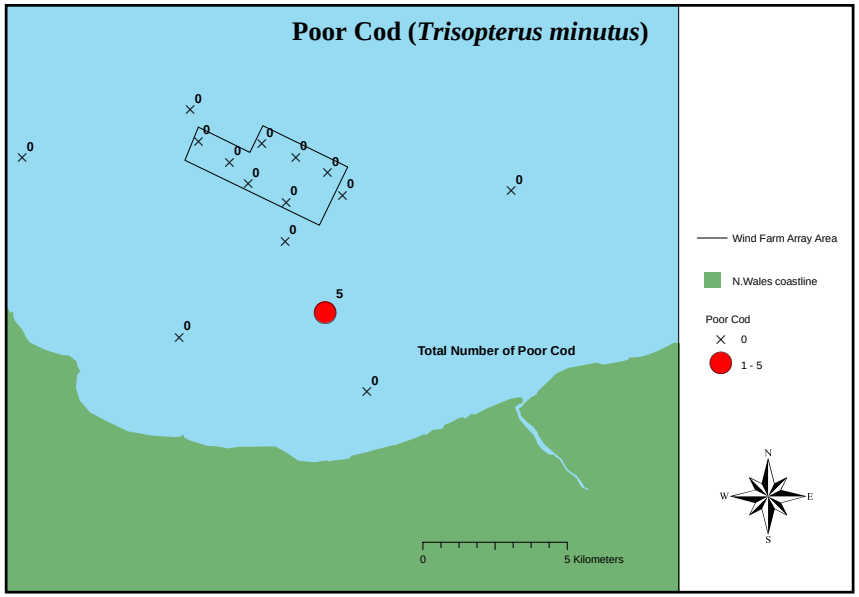


Fig. 8 Distribution of other important commercial fish (refer to Fig. 1 for site numbers). Please note the different scales used for different species.

3.2 Epifauna

Full data for benthic species recorded during the trawl survey are provided in Appendix 1. In total 4373 epibenthic invertebrates were recorded from 31 species from the groups Cnidaria, Mollusca, Crustacea and Echinodermata in the 2005 survey (see Fig. 9 and 10). The presence/absence or recorded weight of colonies of hydroids, soft corals and bryozoans was also noted at 10 of the 15 sites surveyed. The site with the largest number of invertebrate individuals was located in the near-field area directly north of the proposed turbine array (site 2). Comparatively large numbers of epifauna were recorded south west of the survey site. The sites aligned along the proposed cable route also obtained relatively large invertebrate numbers, which was replicated in the number fish recorded in the same area.

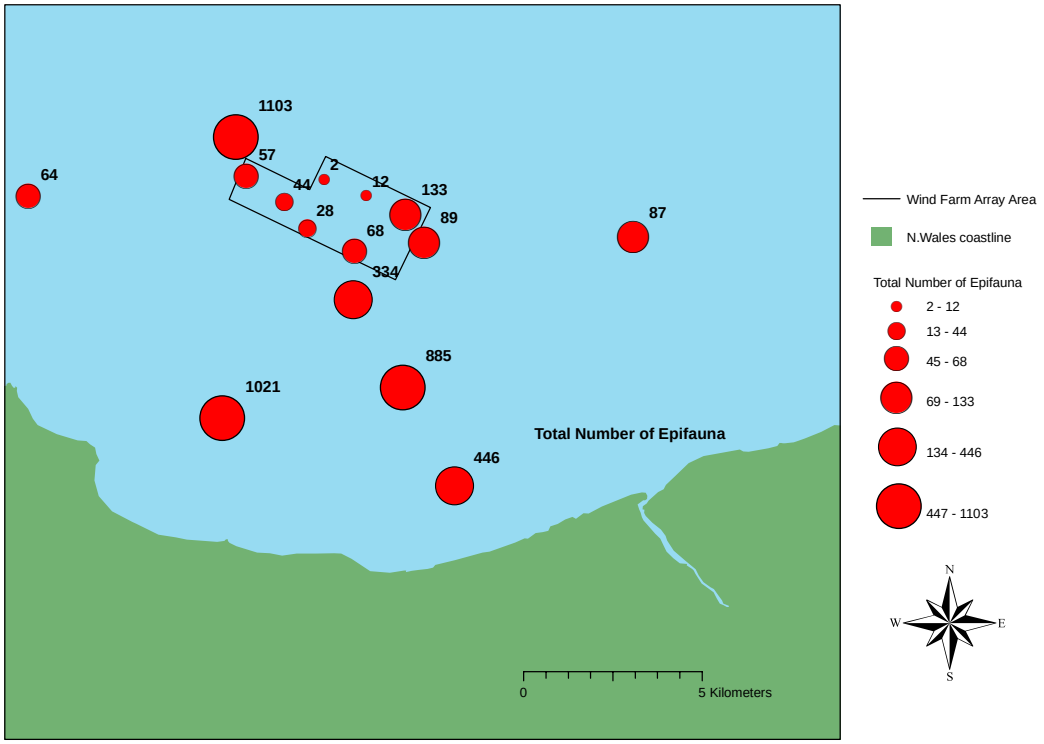


Fig. 9 Total Number of Epifaunal Invertebrates (refer to Fig. 1 for site numbers).

The most abundant invertebrate species was the brittle star *Ophiura ophiura* attaining 2068 individuals from 14 of the 15 sites trawled. The highest numbers of the brittle star were recorded at sites 14 (916 individuals) and 13 (562 individuals) south of the Rhyl Flats development area and on the cable route respectively. Large numbers of the common starfish *Asterias rubens* were also observed (933) and this echinoderm was present at all sites. Numbers of this species were highest at two sites along the planned cable route (site 13: 265 individuals and site 15: 212 individuals). The Long Clawed Porcelain Crab (*Pisidia longicornis*) and Plumose anemone (*Metridium senile*) were both common directly north of the array (site 2) to a total of 729 and 229 individuals respectively, but found in smaller numbers elsewhere. Both species were associated with the presence of Hornwrack (*Flustra folicea*), a bryozoan commonly attached to hard substratum on sandy/gravel ground. The Long-legged Spider Crab (*Macropodia rostrata*) was the fifth most abundant species retrieved and was most

commonly recorded in the near-field area directly south of the turbine development area (site 12). Overall the sites along the cable route and the areas north-west and south-west of the array accounted for most of the epifaunal individuals recorded. Comparatively lower numbers were noted within the Rhyl Flats development area and those sites directly east and west of the development area, with the lowest number of individuals recorded at site 5 within the planned array only totalling two lone *A. rubens*. The distributions of the commonest epifaunal invertebrates displayed in Figure 13.

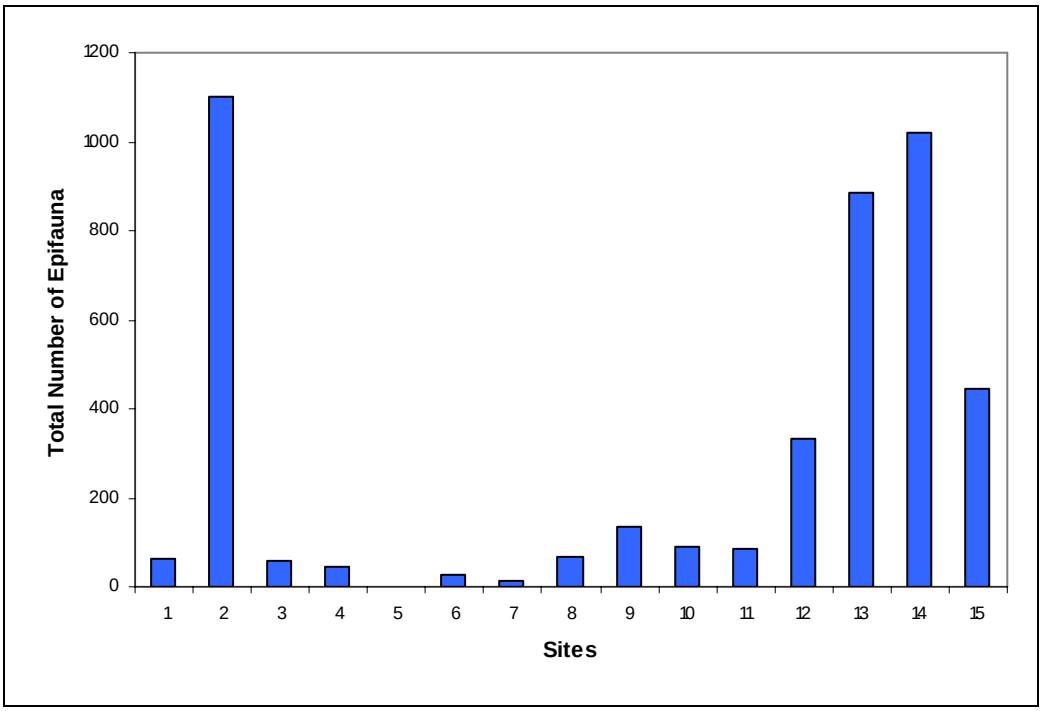


Fig. 10 Total Number of Epifaunal Invertebrates by Site from the 2005 beam trawl survey.

Of the 15 sites surveyed, site 2 in the near-field area directly north of the development area was most speciose, obtaining a total of 19 different invertebrate species (including any hydroids, soft corals and bryozoans present) (see Fig. 11 and 12). The highest numbers at this site were attained for the Long Clawed Porcelain Crab (*Pisidia longicornis*) (729 individuals) and the Plumose Anemone (*Metridium senile*) (229 individuals). The majority of trawls at sites directly south (site 14), east (site 11) and along the planned cable route all obtained relatively high numbers of epibenthic species. This was also the case for the numbers of recorded fish species. Most of the trawls within the wind farm development area had comparable numbers of invertebrate species, which were relatively moderate (~5-7 species) compared to the aforementioned sites. However, similar to fish, the lowest number of different invertebrate species was recorded at site 5, in the northern corner of the Rhyl Flats development area.

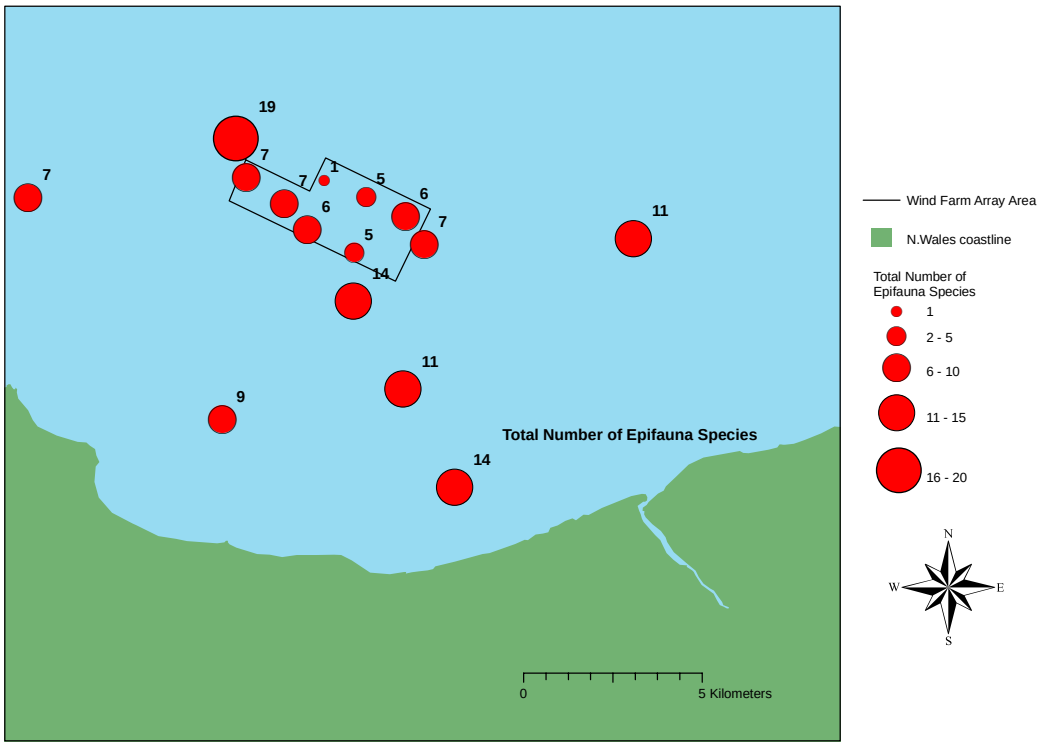


Fig. 11 Total Number of Epifaunal Invertebrate Species (refer to Fig. 1 for site numbers).

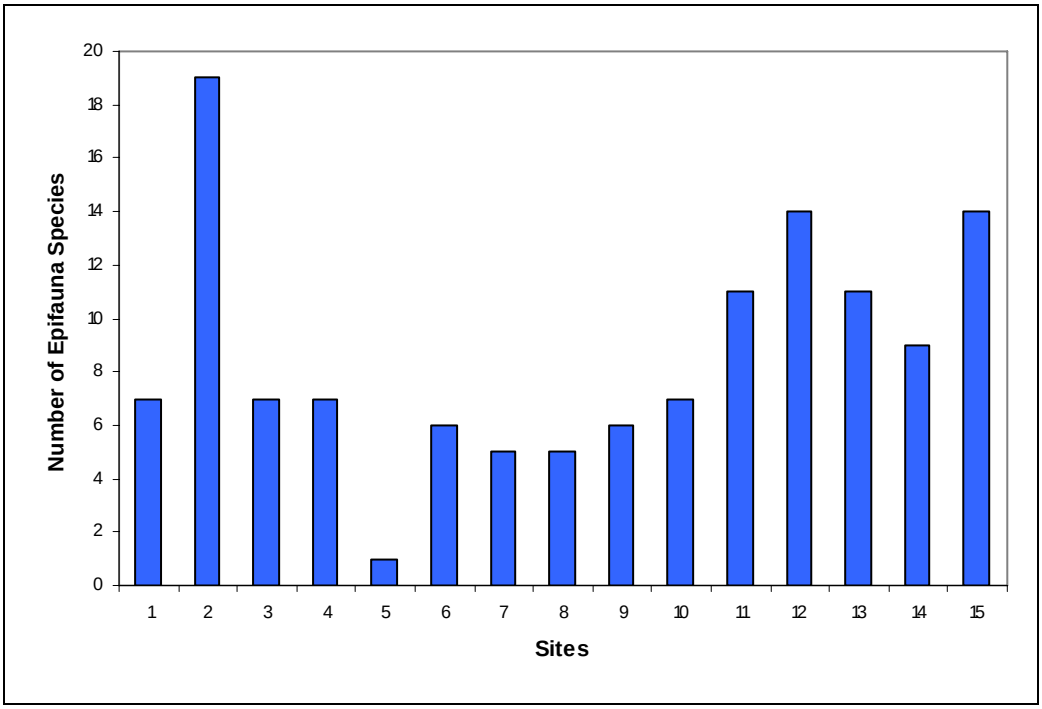
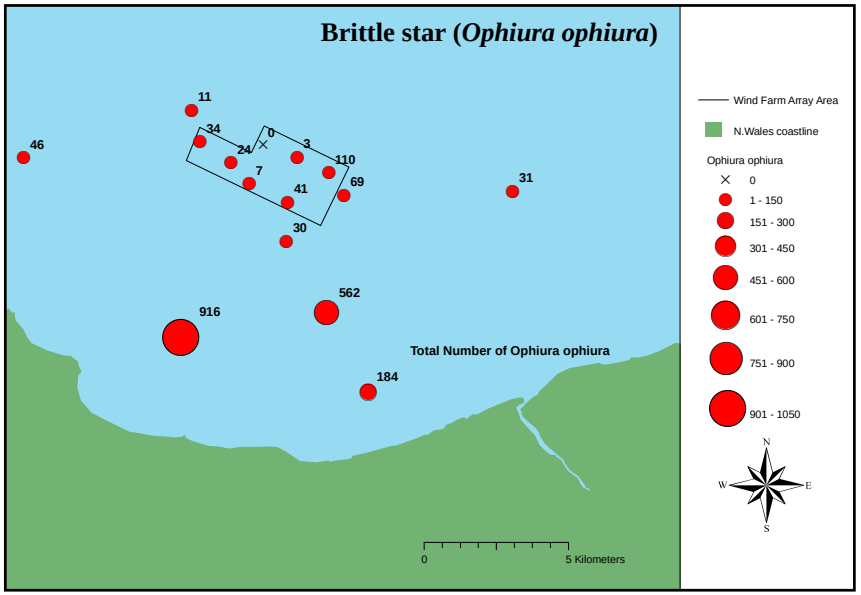
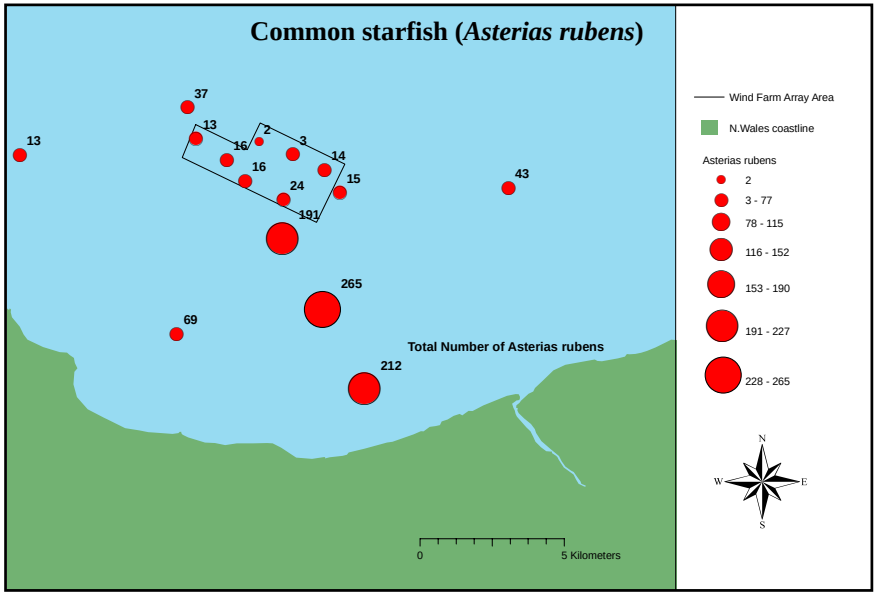


Fig. 12 Total Number of Epifaunal Invertebrate Species by Site from the 2005 beam trawl survey.

No rare or unusual invertebrates were recorded during the 2005 beam trawl survey. However, it should be noted that some of the invertebrate species recorded are considered to be of national importance in respect of their provision of habitat and food sources. This is true of the common starfish, *A. rubens*, which is the most common and familiar starfish in the north-east Atlantic, colonies of Dead-man's Fingers (*Alcyonium digitatum*) and the Plumose anemone (*Metridium senile*) (see www.marlin.co.uk). Similarly, where large assemblages of Hornwrack (*Flustra foliacea*) are common they provide a habitat for various species of sponges, hydroids, caprellid amphipods and the suspension feeding Long Clawed Porcelain Crab (*Pisidia longicornis*). This crab was commonly found in conjunction with Hornwrack assemblages in the 2005 survey especially at site 2, directly north east of the planned array. It should also be noted that the Thick Trough Shell (*Spisula solida*) recorded at site 6 within the proposed turbine array, is a potentially important commercial bivalve species and a minimum catch size limited to 2.5cm has been imposed by the European Union Council Regulation 850/Annex XII.


Brittle star (*Ophiura ophiura*)
11
34
24
0
3
110
69
7
41
46
31
30
562
916
184
Total Number of Ophiura ophiura
0
5 Kilometers
Wind Farm Array Area
N.Wales coastline
Ophiura ophiura
0
1 - 150
151 - 300
301 - 450
451 - 600
601 - 750
751 - 900
901 - 1050
N
W
E
S


Common starfish (*Asterias rubens*)
37
13
13
2
3
16
14
16
15
24
191
43
265
69
212
Total Number of Asterias rubens
0
5 Kilometers
Wind Farm Array Area
N.Wales coastline
Asterias rubens
2
3 - 77
78 - 115
116 - 152
153 - 190
191 - 227
228 - 265
N
W
E
S

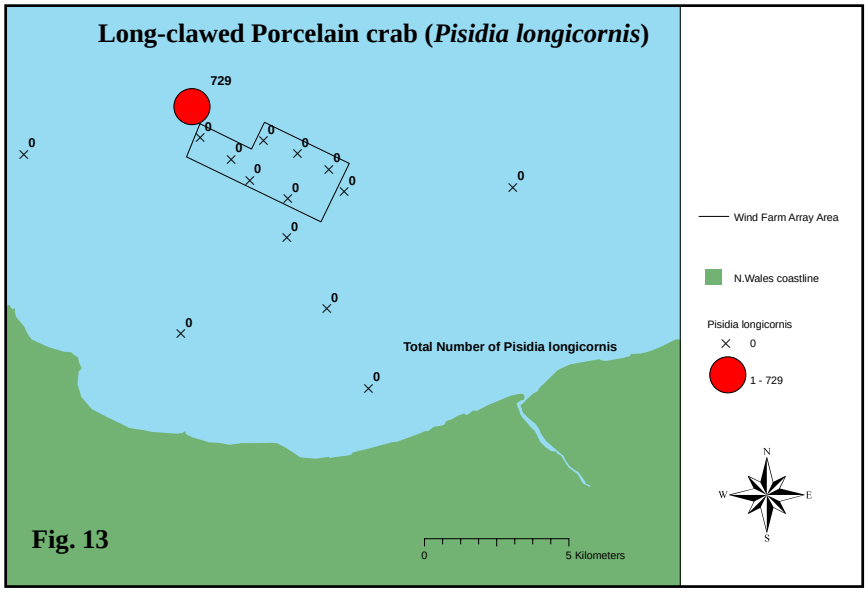
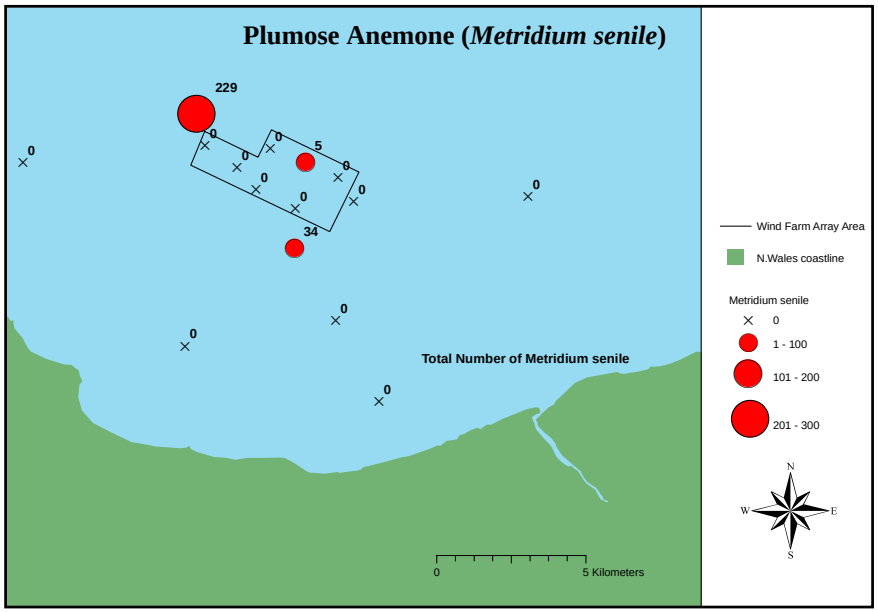

Long-clawed Porcelain crab (*Pisidia longicornis*)
729
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
0
Total Number of Pisidia longicornis
0
5 Kilometers
Wind Farm Array Area
N.Wales coastline
Pisidia longicornis
0
1 - 729
N
W
E
S

Fig. 13


Plumose Anemone (*Metridium senile*)
229
0
0
0
0
5
0
0
0
0
34
0
0
0
0
Total Number of Metridium senile
0
5 Kilometers
Wind Farm Array Area
N.Wales coastline
Metridium senile
0
1 - 100
101 - 200
201 - 300
N
W
E
S

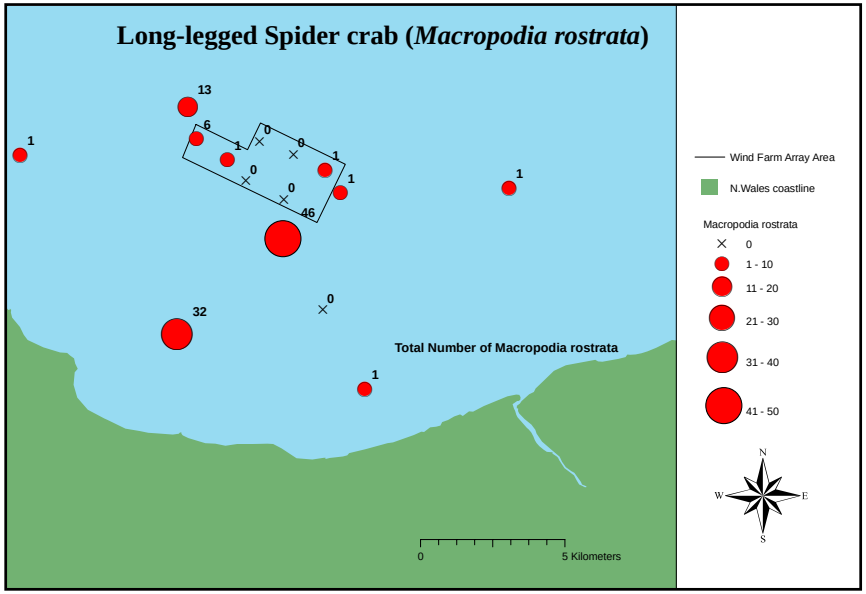


Fig. 13 contd Distribution of the most common Epifaunal Invertebrates (refer to Fig. 1 for site numbers). Please note the different scales used for each species.

4. Appendices

Appendix 1 Total Number of Fish and Epibenthic Invertebrate Species recorded from the 2005 Beam Trawl Survey.

Table. 1

Common Name	Species Name	Trawl number 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
Fish																	
Pogge	*Agonus cataphractus*	0	3	0	0	0	0	0	0	0	0	0	11	0	8	0	**22**
Lesser sand eel	*Ammodytes tobianus*	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	**1**
Scald Fish	*Arnoglossus laterna*	2	0	0	2	0	1	0	11	7	5	3	3	34	5	6	**79**
Solenette	*Buglossidium luteum*	6	1	1	4	0	3	0	9	3	5	2	12	79	30	54	**209**
Dragonet	*Callionymus lyra*	1	5	1	0	0	0	1	2	0	1	4	14	2	7	9	**47**
Lesser weever	*Echiichthys vipera*	6	0	0	4	0	6	0	13	1	42	3	1	8	6	2	**92**
Grey gurnard	*Eutrigla gurnardus*	1	0	1	0	0	0	0	2	0	0	0	0	2	3	1	**10**
Dab	*Limanda limanda*	1	1	0	2	0	0	0	0	0	1	6	10	15	2	8	**46**
Whiting	*Merlanguis merlangus*	0	1	0	0	0	0	0	0	0	0	14	0	9	0	0	**24**
Plaice	*Pleuronectes platessa*	0	0	0	0	0	2	1	0	3	1	1	0	0	2	7	**17**
Sand Goby	*Pomatoschistus minutus*	17	18	0	10	0	5	0	25	23	32	9	54	93	31	140	**457**
Greater pipe fish	*Syngnathus acus*	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	**1**
Lesser pipe fish	*Syngnathus rostellatus*	0	0	3	0	0	0	0	0	0	0	0	0	0	2	0	**5**
Poor cod	*Trisopterus minutus*	0	0	0	0	0	0	0	0	0	0	0	0	5	0	0	**5**
John Dory	*Zeus faber*	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	**1**
Crustaceans																	
Acorn barnacle	*Balanus crenatus*	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	**2**
Masked crab	*Corystes cassivelanus*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Brown shrimp	*Crangon crangon*	0	0	0	1	0	1	0	1	3	1	1	11	2	1	15	**37**
Prawn	*Eualus cranchii*	0	0	0	0	0	0	0	0	0	0	0	3	26	0	0	**29**
Scorpion spider crab	*Inachus dorsettensis*	0	6	0	0	0	0	0	0	0	0	0	2	0	0	0	**8**
Harbour crab	*Liocarcinus depurator*	1	0	0	0	0	0	0	0	0	0	2	0	0	0	0	**3**
Swimming crab	*Liocarcinus holsatus*	1	0	1	0	0	0	0	1	0	0	4	1	5	2	24	**39**

Table. 1 contd		Trawl number															Total
Common Name	**Species Name**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	
Spider crab juveniles	*Macropodia sp (damaged)*	0	0	0	0	0	0	0	0	0	0	2	0	1	0	0	**3**
Long-legged spider crab	*Macropodia rostrata*	1	13	6	1	0	0	0	0	1	1	1	46	0	32	1	**103**
Velvet swimming crab	*Necora puber*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Hermit crab	*Pagurus bernhardus*	0	2	2	0	0	1	0	0	0	0	0	8	9	1	3	**26**
Hermit crab juveniles	*Pagurus* juveniles	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	**1**
Pink shrimp	*Pandalus montagui*	0	20	0	0	0	0	0	0	0	0	2	0	0	0	0	**22**
Hairy crab	*Pilumnus hirtellus*	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	**4**
Long clawed porcelain crab	*Pisidia longicornis*	0	279	0	0	0	0	0	0	0	0	0	0	0	0	0	**279**
Amphipod	Unidentified	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	**1**
Molluscs																	
Nudibranch	*Aeolidia papillosa*	0	5	0	0	0	0	0	0	0	0	0	0	0	0	0	**5**
Queen scallop	*Aequipecten opercularis*	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	**1**
Common whelk	*Buccinun undatum*	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	**1**
Long-finned squid	*Loligo forbesii*	1	0	0	0	0	0	0	0	3	0	0	0	0	0	0	**4**
Little cuttlefish	*Sepiola atlantica*	1	1	0	1	0	0	1	0	2	3	1	1	0	0	0	**11**
Thick Trough Shell	*Spisula solida*	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	**1**
Nudibranch	*Tritonia hombergi*	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	**3**
Bivalve	Unidentified	0	0	0	0	0	2	0	0	0	0	0	0	0	0	0	**2**
Echinoderms																	
Common starfish	*Asterias rubens*	13	37	13	16	2	16	3	24	14	15	43	191	265	69	212	**933**
Sand star	*Astropecten irregularis*	0	0	1	1	0	0	0	1	0	0	0	6	14	0	3	**26**
Brittlestar	*Ophiothrix fragilis*	0	26	0	0	0	0	0	0	0	0	0	0	0	0	0	**26**
Brittlestar	*Ophiura ophiura*	46	11	34	24	0	7	3	41	110	69	31	30	562	916	184	**2068**
Others																	
Erect bryozoan	*Alcyonidium diaphranum*	A	A	A	A	A	A	A	A	A	A	A	P	P	A	86	**N/A**
Erect bryozoan	*Alcyonidium parasiticum*	A	A	A	A	A	A	A	A	A	A	A	A	A	A	P	**N/A**
Dead-man's Fingers (soft coral)	*Alcyonium digitatum*	A	A	A	A	A	A	A	A	A	A	235	A	A	<5	64	**N/A**
Hornwrack (bryozoan)	*Flustra foliacea*	A	3800	A	A	A	A	P	A	A	P	P	A	A	P	A	**N/A**
Hydroid	*Hydractinia echinata*	A	A	A	A	A	A	A	A	A	A	A	A	A	A	2	**N/A**

Table. 1 contd

Common Name	Species Name	Trawl number															Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	
Whiteweed (hydroid)	*Hydrallmainia falcata*	A	A	P	P	A	A	A	A	A	P	A	P	P	P	P	**N/A**
Plumose anemone	*Metridium senile*	0	229	0	0	0	0	5	0	0	0	0	0	34	0	0	**N/A**
Scale worm sp	Unidentified	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	**N/A**

*Please note that in **'Others'** 'P' and 'A' denote presence and absence data. Numbers represent weight in grammes (g).

Appendix 2 Length Measurements of Commercial Fish Species recorded by site from the 2005 beam trawl survey.

Site	Length (mm)					
	Plaice	Dab	Grey Gurnard	Whiting	Poor Cod	John Dory
1	-					
2	-	158	-	92	-	-
3	-					
4	-	252 72	-	-	-	-
5	-					
6	216 154	-	-	-	-	-
7	257	-	-	-	-	-
8	-	-	-	-	-	232
9	225 267 188	-	-	-	-	-
10	205	175	-	-	-	-
11	207	177 173 167 150 156 122	-	84 87 92 81 99 86 102 87 74 92 103 88 112 87	-	-
12	-	151 161 222 157 181 145 174 143 121 133	-	-	-	-
13	-	124 117 122 131 139 146 142 131 135 137 78 136 130 155 132	-	86 100 129 66 78 77 92 100 82	101 74 82 85 83	-
14	253 249	123 70	-	-	-	-

Site	Length (mm)					
	Plaice	Dab	Grey Gurnard	Whiting	Poor Cod	John Dory
15	105 133 118 125 127 125 109	79 79 47 81 47 82 71 84	95	-	-	-

Appendix 2 contd.

Appendix 3 Photographs of all trawls undertaken as part of the 2005 beam trawl survey.

Photo.1 Rhyl Flats Site 1.

Photo.2 Rhyl Flats Site 2.

Photo.3 Rhyl Flats Site 3.

Photo.4 Rhyl Flats Site 4.

Photo.5 Rhyl Flats Site 5.

Photo.6 Rhyl Flats Site 6.

Photo.7 Rhyl Flats Site 7.

Photo.8 Rhyl Flats Site 8.

Photo.9 Rhyl Flats Site 9.

Photo.10 Rhyl Flats Site 10.

Photo.11 Rhyl Flats Site 11.

Photo.12 Rhyl Flats Site 12.

Photo.13 Rhyl Flats Site 13.

Photo.14 Rhyl Flats Site 14.

Photo.15 Rhyl Flats Site 15.

Appendix 4 Digital Photographs of Interest

Photo. 1 John Dory retrieved in trawl at Site 8, in the south west corner of the planned turbine array.