Rhyl Flats Offshore Wind Farm

Baseline Report

Fish & Fisheries

prepared for

Stephen J Lockwood

Coastal Fisheries Conservation & Management

Colwyn Bay

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prepared for
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Executive Summary

The Rhyl Flats wind farm is situated at the eastern end of the Constable Bank, an area dominated by sand and sandy-gravel sedimentary deposits. The fish and shellfish fauna of Constable Bank are characteristic of inshore, shallow-water sandy areas around the coast of England and Wales; none is rare.

The principal commercial species' spawning grounds off the North Wales coast are those for plaice and Dover sole. There is a nursery area for both species landward of Constable Bank between Colwyn Bay and Rhyl. There may also be a spawning–nursery area for rays on rougher ground towards Rhyl–Prestatyn and both the Conwy and Dee Estuaries are designated statutory bass nursery areas. All of the local rivers, support salmon and sea trout runs although sea trout are noticeably more abundant relative to salmon in the River Clwyd than either the Dee or Conwy.

With the exception of plaice and herring, ICES assessments of principal commercial fish stocks in the Irish Sea, i.e. cod, sole, whiting, found them to be exploited above levels for long-term sustainability. At present, however, there are no regular assessments of rays or bass, both of which are targeted over Constable Bank or its vicinity.

The commercially important stocks of nephrops and scallops are concentrated in the central to northern parts of the eastern Irish Sea, well away from Rhyl Flats and Constable Bank. Similarly, there are no commercially important stocks of mussels, cockles or shrimps closer than the Dee, Conwy or eastern Menai Strait. There are commercially exploited populations of crabs and lobsters around the Great Ormes Head and whelks in the vicinity of, if not on Constable Bank.

Several species of national and, or international nature conservation interest have been recorded in and around Liverpool Bay but, with the exception of smelt in the River Conwy, none appears to have a locally-based population.

All fishing is subject to regulations of the EU common fisheries policy and inside 6 miles from baselines, which includes the Constable Bank, byelaws of the North Western & North Wales Sea Fisheries Committee. The area is characterised by very low levels of fishing activity with virtually none in the winter. Tangle-netting for rays occurs on Constable Bank each spring and late summer but trawling activity is sporadic and rare. Potting for whelks occurs in the vicinity but probably not on the Constable Bank itself.

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Contents

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1 Introduction

1.1 Project Background

The UK government is committed to generating 10% of UK electricity demand from renewable resources by 2010 and 15% by 2015. To this end, the Department of Trade and Industry has supported two rounds of offshore wind-farm developments in three strategic areas off the coasts of England and Wales, one of which is the eastern Irish Sea.

The most recent Round 2 developments have been for large (~200 turbine) sites, including the proposed Gwynt y Môr site off the coast of North Wales. Previous Round 1 proposals were developed for smaller (30 turbine) sites including six locations around Liverpool Bay. Three sites have been consolidated into one off Fleetwood and have yet to receive final approval; the Burbo Bank wind farm is under construction off the Wirral; North Hoyle wind farm was completed in early 2004 and is fully operational; and the Rhyl Flats site received approval to proceed in 2002 but work has yet to commence.

Originally, the plans and environmental statement for Rhyl Flats wind farm were developed by Celtic Offshore Wind Ltd (ERM, 2002) but the site was purchase by npower renewables Ltd (npr) in December 2002. As part of its construction licence obligations, npr has continued to collect data on the species of birds and marine wildlife that inhabit the area, in particular the over-wintering sea birds – common scoter and red throated diver. This monitoring will establish current populations, and will continue during construction and operation of the wind farm. npr intends to commence construction work on turbine

foundations in the second half of 2007 and to complete construction and turbine installation during 2008.

1.2 Site Location

Rhyl Flats itself is an area of shallow water (<5 m CD) directly offshore from Rhyl; the actual location of the wind farm is further offshore and to the west of Rhyl Flats, on the eastern end of Constable Bank (5–10 m CD) between Abergele and Rhos-on-Sea (Fig. 1). The area of the wind farm is approximately 3.9 square miles (*c*. 10 square kilometres). The closest point to shore is Rhos Point, which is 5 miles (*c*. 8 kilometres) from the nearest turbine.

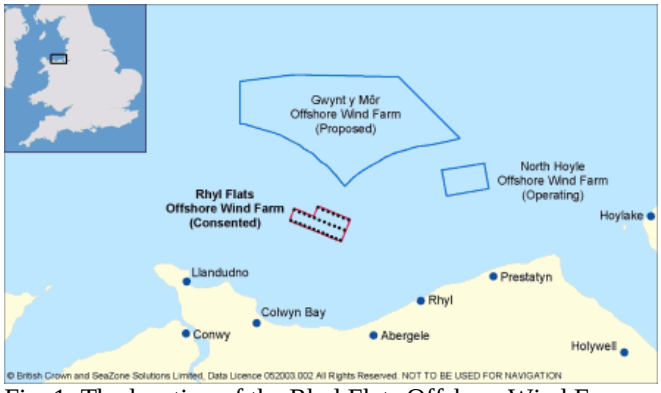

Fig. 1: The location of the Rhyl Flats Offshore Wind Farm including the consented turbine locations (npr Rhyl Flats website).

A 74 m high meteorological mast has been in place at the site since 2002 collecting wind data, and this will remain in position during the operation of the wind farm. The wind farm has consent for 30 wind turbines of up to 5 megawatts (MW) in size but it is anticipated that smaller turbines than this will be installed. The size range is likely to be between 2.3MW and 3.6MW. The consented hub height (the height to the top of the tower) is up to 100 metres (m) and the consented maximum height to the tip of an upright blade is 152m. In practice it is likely that the actual hub height will be around 80m, and the maximum height to blade tip around 134m.

1.3 Fish and Fishery Baseline

The species of fish, fish stocks and fisheries on and adjacent to the Rhyl Flats wind farm site were described in the environmental statement prepared by COWL (ERM, 2002). A complementary study was carried out in preparation of the environmental statement for the North Hoyle wind farm, a study that also embraced Rhyl Flats and the Constable Bank (Innogy, 2002). A more extensive analysis of the fish, fish stocks and fisheries of Liverpool Bay, including Rhyl Flats and the Constable Bank, was undertaken in preparation of the environmental statement for the proposed Gwynt y Môr wind farm (npr, 2005).

The report presented here draws heavily from these earlier reports but where it is deemed necessary or prudent, the earlier data has been augmented by additional data, not least from the ongoing monitoring surveys (CMACS, 2006). In general, however, it is sufficient to reinterpret the existing data sets with respect to the Rhyl Flats site. As with previous fish and fishery assessments prepared on behalf of npr, the fishermen, fishermen's representatives and fishery regulators with the most immediate and relevant knowledge and experience of the Rhyl Flats site have been consulted as part of the data assessment and interpretation validation process.

2 Fish and Shellfish Stocks of Liverpool Bay, including Rhyl Flats

2.1 Overview

The Rhyl Flats wind farm site is located at the eastern end of the Constable Bank, a seabed feature in the south-west corner of Liverpool Bay. It is an area characterised by mixed sedimentary deposits ranging from fine sand through gravely sand to gravels less than 15 m below chart datum. The area is frequented by a wide variety of fishes, commercial and non-commercial, demersal, pelagic and migratory, that are characteristic of almost any shallow water, inshore sandy environment around the coast of England and Wales. With the exception of the migratory species and some of the small, non-commercial species, all the fish found on the Constable Bank and in Liverpool Bay are components of larger populations or stocks that are found throughout the eastern Irish Sea, if not the Irish Sea as a whole and even beyond.

With the possible exception of some species of conservation importance, there are no local, national or international programmes aimed specifically at monitoring the abundance and distribution of non-commercial fish species. Some information is gathered, however, on their relative abundance in the course of fishing surveys undertaken to monitor commercial fish stocks. The abundance of the principal commercial fish stocks year-on-year is subject to international assessment by the International Council for the Exploration of the Sea (ICES), the scientific organisation that provides scientific advice to the international fishery commissions, including the Fisheries Directorate of the European Commission.

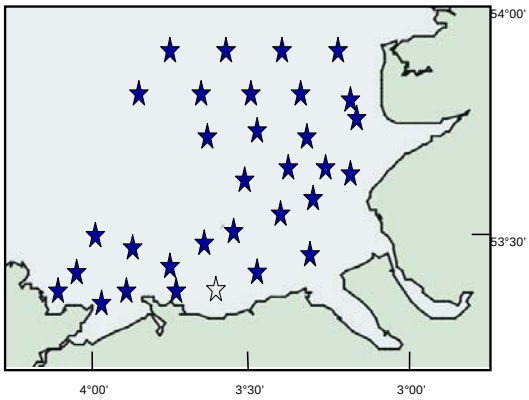

Fig.2: Approximate positions of CEFAS beam-trawl survey stations across Liverpool Bay. The open star indicates the station closest to the Rhyl Flats wind farm site.

As part of its contribution to international fishery stock assessments, the Centre for Environment, Fisheries and Aquaculture Science (CEFAS), Lowestoft, undertakes an annual trawl survey in Liverpool Bay. Over a period of almost 20 years to 1991 these surveys were limited to an area along the North Wales coast and were

carried out by locally-based inshore trawlers using a modified commercial otter trawl (Innogy, 2002). Since 1992, however, the surveys been carried out by research vessel across the eastern Irish Sea using a 4 m beam trawl (Parker-Humphries, 2004; npr, 2005). These beam-trawl surveys are most effective at sampling small demersal and flatfish species and least effective at sampling large roundfish, e.g. cod, and pelagic fish, e.g. herring and mackerel. Nevertheless, over the whole survey period, the trawl survey data have shown a high degree of stability in species composition and relative abundance. These CEFAS survey data are also complemented by npr's inshore Rhyl Flats monitoring programme (CMACS, 2006), a survey that tends to catch small fish species and juveniles of larger fishes.

Table 1: An alphabetic list by common name of all fish recorded in the CEFAS 4 m beam-trawl surveys of Liverpool Bay 1992–2004. Species recorded at CEFAS Prime Station 36, a position just off Constable Bank, are shown in bold (CEFAS data from npr, 2005).

Common Name	Scientific Name	Common Name	Scientific Name
Bib or pout whiting	*Trisopterus luscus*	Pipefish, greater	*Syngnathus acus*
Brill	*Scophthalmus rhombus*	Pipefish, Nilsson's	*Syngnathus rostellatus*
Bull rout	*Myoxocephalus scorpius*	**Plaice**	*Pleuronectes platessa*
Butterfish	*Pholis gunnellus*	**Pogge or Hooknose**	*Agonus cataphractus*
Butterfly blenny	*Blennius ocellaris*	Ray, blonde	*Raja brachyura*
Clingfish, two-spot	*Diplecogaster bimaculata*	Ray, cuckoo	*Raja naevus*
Cod, Atlantic	*Gadus morhua*	**Ray, spotted**	***Raja montagui***
Cod, poor	*Trisopterus minutus*	**Ray, thornback or roker**	*Raja clavata*
Conger eel	*Conger conger*	Rockling, five-bearded	*Ciliata mustela*
Dab	*Limanda limanda*	Rockling, four-bearded	*Rhinonemus cimbrius*
Dogfish, nurse hound or bull huss	*Scyliorhinus stellaris*	Sandeel, greater	*Hyperoplus lanceolatus*
Dogfish, starry	*Mustelus asterias*	**Sandeel**	*Ammodytes tobianus*
Dogfish, starry smooth hound	*Mustellus mustellus*	Scad or horse mackerel	*Trachurus trachurus*
Dogfish, lesser spotted	*Scyliorhinus canicula*	**Scaldfish**	*Arnoglossus laterna*
Dragonet, common	*Callionymus lyra*	**Sea scorpion**	*Taurulus bubalis*
Dragonet, reticulated	*Callionymus reticulata*	Sea bass	*Dicentrarchus labrax*
Dragonet, spotted	*Callionymus maculatus*	**Sole, Dover**	*Solea solea*
Flounder	*Platichthys flesus*	**Sole, lemon**	*Microstomus kitt*
Garfish	*Belone belone*	Sole, thickback	*Microchirus variegatus*
Goby, sand	*Pomatoschistus minutus*	**Solenette**	*Buglossidium luteum*
Gurnard, grey	*Eutrigla gurnardus*	Sprat	*Sprattus sprattus*
Gurnard, red	*Aspitrigla cuculus*	Squid	*Alloteuthis subulata*
Gurnard, tub	*Trigla lucerna*	Squid	*Loligo vulgaris*
Haddock	*Melanogrammus aeglefinus*	Tope	*Galeorhinus galeus*
Hake	*Merluccius merluccius*	Topknot, Imperial	*Phrynorhombus regius*
John Dory	*Zeus faber*	Topknot, Norwegian	*Phrynorhombus norvegicus*
Ling	*Molva molva*	Triggerfish	*Balistes carolinensis*
Lumpfish	*Cyclopterus lumpus*	Turbot	*Psetta maxima*
Mackerel, Atlantic	*Scomber scombrus*	**Weever, lesser**	*Echiichthys vipera*
Monk or anglerfish	*Lophius piscatorius*	**Whiting**	*Merlangius merlangus*
Mullet, red	*Mullus surmuletus*	Whiting, blue	*Micromesistius poutassou*
Octopus, northern	*Eledone cirrhosa*	Witch	*Glyptocephalus cynoglossus*
		Wrasse, goldsinney	*Ctenolabus rupestris*

Over sixty species of fish have been recorded from the beam-trawl survey across Liverpool Bay and 24 of these species were recorded at the station just off Constable Bank (Table 1). All are characteristic of inshore, relatively shallow-water environments around the coast of England and Wales (see also CMACS, 2006) although some, e.g. wrasse and octopus, are more frequently associated with rocky areas or rock outcrops than predominantly sedimentary deposits. None of the species listed is 'rare' or subject to nature conservation protection measures although varying degrees of conservation concern are expressed for some of the exploited commercial species (see below).

2.2 Spawning and Nursery Areas

The vast majority of fish and shellfish spawn between late winter and early summer and release pelagic, i.e. free-floating, eggs. Exceptions include the herring (*Clupea harengus*), sandeels (Ammodytidae), rays (Raiidae) and dogfish (Scylliorhinidae), and several of the non-commercial species, e.g. pogge (*Agonus cataphractus*), gobies (Gobiidae) and blennies (Blenniidae), all of which deposit their eggs on the seabed where they remain until the larvae hatch. The small, non-commercial demersal species are widespread and relatively abundant in the area of Rhyl Flats and Constable Bank and almost certainly spawn in the area. Similarly, sandeels are relatively widespread and will spawn locally but there are no known spawning areas of significance for either commercial fisheries or seabird colonies.

Some commercial species spawn more or less ubiquitously throughout the eastern Irish Sea, including Liverpool Bay; e.g. dab and whiting which spawn April–May, but other spawning is relatively more restricted. Plaice spawn February–April in the area between the Great Orme and the Isle of Man, and Dover sole spawn April–May further to the east within Liverpool Bay itself. Cod spawning is limited primarily to the northern half of the eastern Irish Sea, well away from Liverpool Bay and herring spawning is virtually limited to the east coast of the Isle of Man in August and September (Hillis & Grainger, 1990; Coull *et al*, 1998; Figure 3).

From the plaice and sole spawning grounds, offshore from the Rhyl Flats wind-farm site, the planktonic eggs and larvae of both drift towards the coast and settle in shallow-water nursery areas inshore of the Constable Bank. Not only have juvenile sole and plaice been found in this area during the site assessment and monitoring surveys (Innogy, 2002; npr,

2005) albeit sometimes in small numbers (CMACS, 2006), but they have also been subject to extensive scientific studies (Rogers, 1993, 1994; Symonds & Rogers, 1995). Indeed, Riley *et al*. (1986) found the area inshore of the Constable Bank supported the largest juvenile sole population in the Irish Sea (Fig 4).

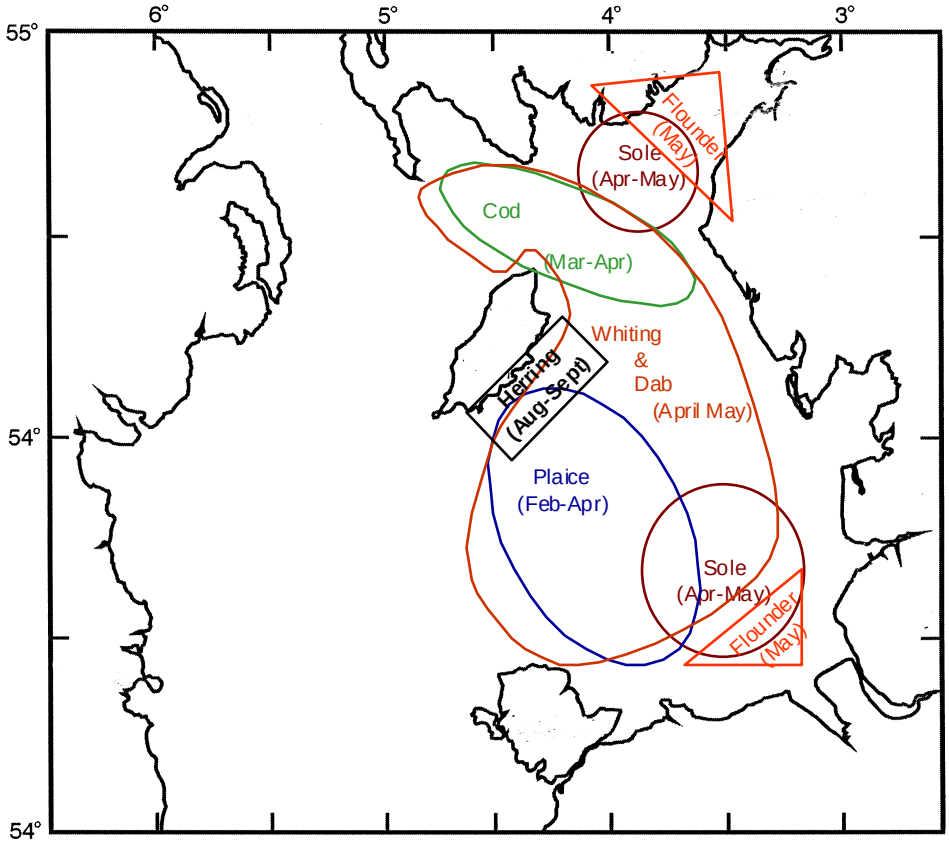

Fig. 3: An indication of the spawning distribution of some fish species within Liverpool Bay and the eastern Irish Sea (based on data from Fox *et al*, 1997; from npr, 2005).

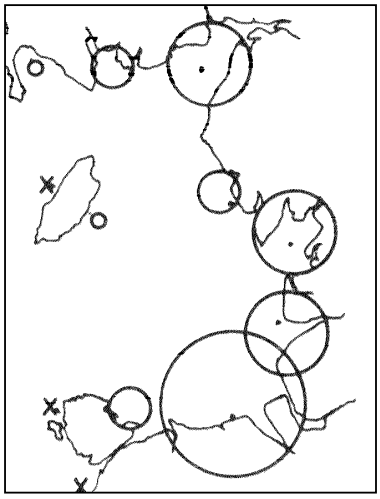

Fig. 4: Distribution and relative abundance of 0-group Dover sole in the principal nursery areas in the eastern Irish Sea (from Riley *et al*, 1986).

A variety of rays and dogfish (elasmobranches), are found throughout Liverpool Bay including Rhyl Flats and Constable Bank (Ellis & Parker-Humphreys, 2005). They differ

from the finfish in that they have internal fertilisation and lay a small number of eggs, each protected within its own horny egg-case – commonly known as a mermaid's purse. Gravid females move inshore to spawn spring-early summer when they deposit their eggs in shallow areas of rough ground such as is found to the east of Rhyl Flats, towards the Dee Estuary; the juveniles tend to remain in these areas.

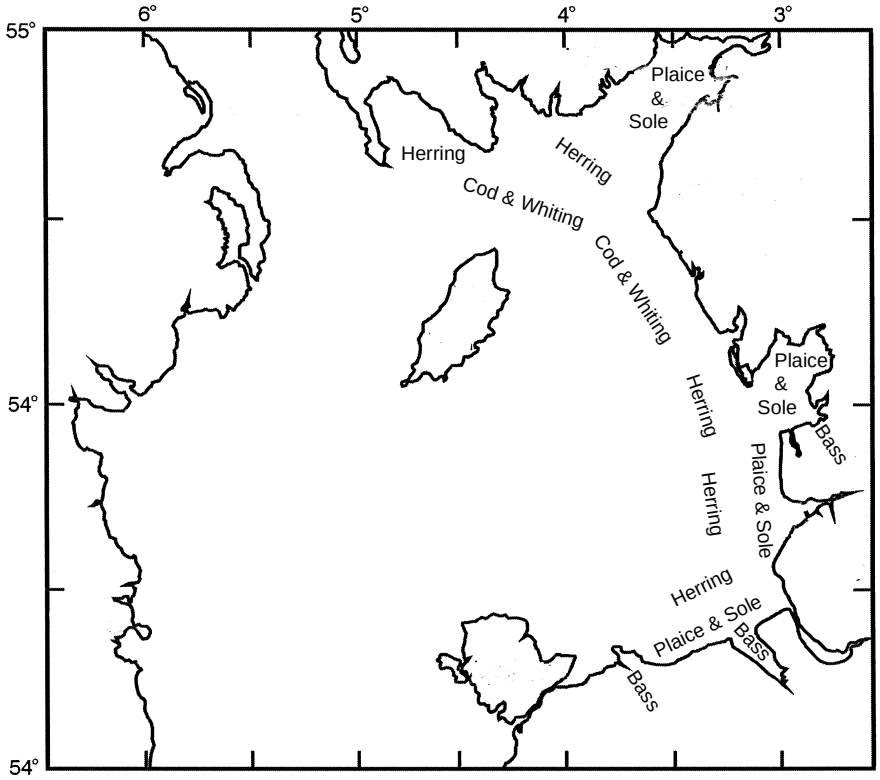

Fig. 5: The distribution of juvenile fish and nursery areas around the eastern Irish Sea (After Hillis & Grainger, 1990 and Coull *et al*, 1998: npr, 2005).

The principal, known, spawning grounds for bass are in the English Channel (Picket & Pawson, 1994) but there is probably some spawning offshore in the Irish Sea. This conclusion is inferred from the abundance of juvenile bass found in the Conwy and Dee Estuaries (Fig. 5), both of which are designated statutory bass nursery areas (MAFF, 1990; DEFRA, 1999). Although bass of various sizes are caught inshore between the Great Ormes Head and Dee Estuary, including Rhyl Flats and Constable Bank, there is no evidence for a critical linkage between the area and the species' life history.

2.3 Exploited Demersal Fish Stocks

Commercially exploited fish stocks are subject to annual assessment by the European Commission (which takes scientific advice from ICES) following which the EU Council

of Ministers agrees management measures for the following year. These measures are implemented through the regulations of the Common Fisheries Policy (CFP), including total allowable catches (TAC) set for principal stocks of fish. Some stocks and TACs are specific to the Irish Sea, e.g. cod, plaice, sole, but other stocks cover a wider area that includes the Irish Sea, e.g. angler fish and haddock.

Table 2: Irish Sea (and associated areas) total allowable catches (TAC) and UK quotas for the principal commercial demersal fish species caught in the area. Landing of many other species, e.g. dabs, turbot, brill, rays and dogfish, is not restricted (data from EU website). Reported landings from the Irish Sea for 2004–05 are given in parentheses (MFA website).

	TAC				UK Quota			
	2004	**2005**	**2006**	**2007**	**2004**	**2005**	**2006**	**2007**
Species								
Demersal								
Angler*	20 902	25 802	26 456	28 080	3759 (250)	4510 (161)	4757	5050
Cod	2150	2150	1828	1462	620 (660)	619 (599)	527	421
Plaice	1340	1608	1608	1849	404 (372)	485 (423)	485	558
Sole	800	960	960	816	178 (107)	213 (105)	213	181
Whiting	514	514	437	371	199 (88)	199 (47)	169	144
Haddock*	6503	11 520	11 520	11 520	4897 (430)	1152 (352)	1152	1152
Ling*	None	set	None	set	5063 (85)	5063 (62)	5063	4050
Bass*	None	set	None	set	None (5)	Set (3)	None	set
Rays & dogfish*	None	set	None	set	None (1483)	Set (1145)	None	set

*Includes all areas south & west of UK

The most recent ICES assessments of Irish Sea fish stocks found that the cod spawning stock is at as low a level as it has ever been and is being fished unsustainably (ACFM, 2006, vol. V). In contrast, the haddock stock that supports the Irish Sea fishery has benefited from above average recruitment of juvenile fish to the exploited population in recent years and the spawning stock is showing signs of growth. Similarly, the Irish Sea plaice stock has full reproductive capacity and is being harvested at a sustainable level. The same has not been said for the sole stock where the spawning stock biomass continues to be at a low level. The annual TACs for the past four years for species exploited in the Irish Sea are summarised in Table 2.

It can be seen that the demersal species for which there are substantial TAC (i.e. >10 000 t) and UK quota (>1000 t) are all for stocks that cover an area extending beyond the Irish Sea; e.g. haddock west of Scotland and Ireland. Species with stocks restricted to the Irish Sea – cod, plaice, sole, whiting – all offer small TAC and correspondingly small, almost

trivial, UK quota (and 2004–5 catches). These small figures are a consequence of all the principal commercial fish stocks being in a depleted state through sustained high exploitation rates and, or environmental effects. As the inshore waters of southern Liverpool Bay, not least the Constable Bank, are on the extreme periphery of these stock distributions it is inevitable that the abundance of these commercial demersal fishes in the wind-farm area is very low.

Hitherto, there has been relatively little fishery research effort directed towards studies of elasmobranch species and their stocks although this is gradually changing. ICES has begun to provide some scientific advice to the fisheries commissions, including the EC, on elasmobranch stocks in the North Sea, whilst in the UK the Sea Fish Industry Authority is leading an initiative for ray species to be landed by species rather than as an unsorted group. At present, however, there are no data on the status of elasmobranch stocks in the Irish Sea; there is no TAC or UK quota and landings are unrestricted. Under this regime, the UK landings of elasmobranches from the Irish Sea comprise the largest category of fish landings shown in Table 2.

2.4 Exploited Pelagic Fish Stocks

As with the demersal species, some Irish Sea pelagic species' stocks cover an area extending far beyond the Irish Sea (Table 3). Also in common with the demersal stocks, it is these far-ranging stocks – mackerel and horse mackerel – that support substantial TAC (< 100 000 t) and quota (>> 10 000 t). Irish Sea catches of these species are trivial.

Table 3: Irish Sea (and associated areas) total allowable catches (TAC) and UK quotas for the principal commercial pelagic fish species caught in the area (data from EU website). Reported landings from the Irish Sea for 2004–05 are given in parentheses (MFA website).

	TAC				UK Quota			
Species	**2004**	**2005**	**2006**	**2007**	**2004**	**2005**	**2006**	**2007**
Herring	4800	4800	4800	4800	3550 (2472)	3550 (3522)	3550	3550
Mackerel*	545 500	420 000	415 824	422 551	17384 (1)	126913 (174)	131713	149519
Horse Mackerel*	137000	137000	137000	137000	12935 (10)	13067 (35)	13226	13292

*TAC & quota covers Irish Sea, west of Ireland and Celtic Sea

The only pelagic fish with a locally restricted stock is the Manx herring which spawns, and is fished, off the south-east coast of the Isle of Man in August–September (Fig. 3). ICES has assessed the stock to be relatively stable and able to support the level of catches

made in recent years (ACFM, 2006). Although there are anecdotal historic reports of herring spawning along the North Wales coast, probably including Constable Bank, there is no evidence or records of spawning in this during the past 50 years or more.

2.5 Exploited Shellfish Stocks

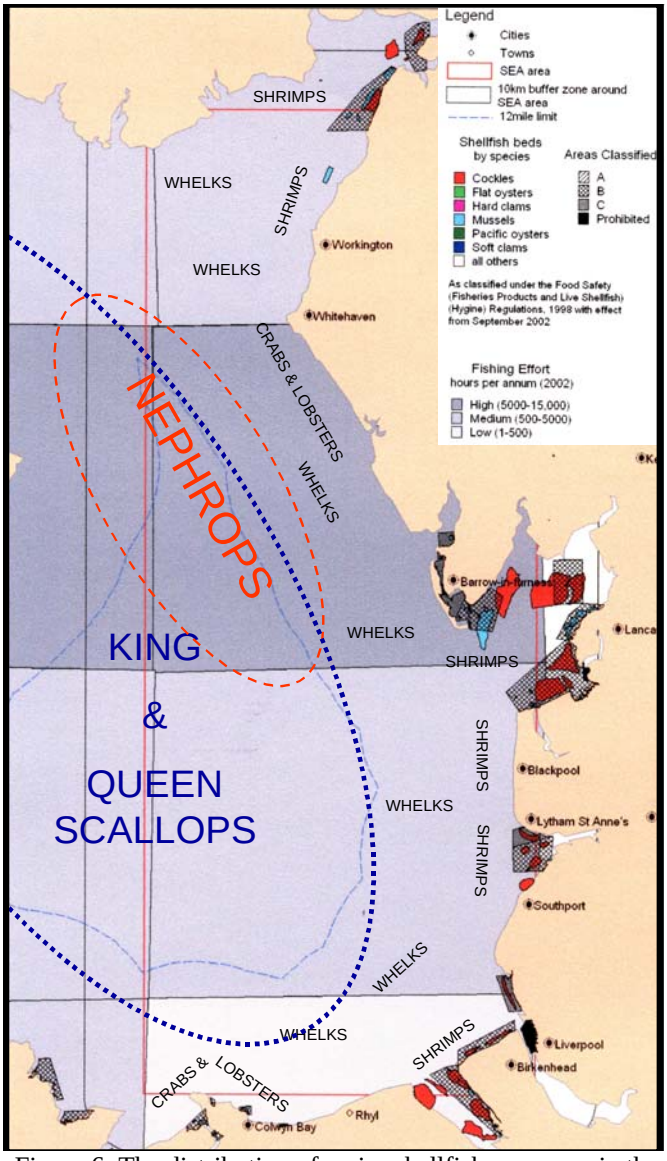

Figure 6: The distribution of major shellfish resources in the eastern Irish Sea (modified from CORDAH,, 2003).

Commercially exploited shellfish species are divided into the crustaceans, e.g. crab, lobster, nephrops, and molluscs, e.g. scallops, whelks, mussels. Their stocks and associated fisheries are widely distributed throughout the eastern Irish Sea and Liverpool Bay (Figure 6). The only species for which there is an annual stock assessment and allocation of TAC and quota is nephrops (ACFM, 2006) although inshore stocks of cockles and mussels are subject to assessment and management control by the North Western and North Wales Sea Fisheries Committee (NWNW SFC – all areas excluding the Dee) and the Environment Agency (Dee Estuary only).

2.5.1 Commercially exploited crustaceans

There are no exploited nephrops populations within Liverpool Bay; the principal exploited population in the eastern Irish Sea is found between the Isle of Man and the coast of Cumbria (Fig. 6). Crabs and lobsters are only found on the extreme western

fringes of Liverpool Bay around the Great Ormes Head and the Isle of Anglesey (UK total Irish Sea catch 2005: 487 t crab; 24 t lobster). Neither species is subject to stock assessment or catch limitation other than the enforcement of minimum landing sizes. Similarly, there are minimum landing sizes for shrimps but neither catch limitations (2005: 70 t) not stock assessments. The fisheries are well away from the Rhyl Flats wind-farm site in the Dee and Ribble Estuaries and in Morecambe Bay (Fig. 6).

2.5.2 Commercially exploited molluscs

Within Liverpool Bay, the principal exploited molluscs stocks are cockles and mussels [UK Irish Sea landings: cockles 68 t; (wild-stock) mussels 129 t]. There is a somewhat volatile but potentially large cockle stock within the Dee Estuary (Fig. 6) that is monitored by the Environment Agency and open to exploitation when they consider it suitable. Cockle stocks in the Ribble Estuary and west of Liverpool Bay in the Menai Strait are assessed and managed by the NWNW SFC. All are well beyond the influence of the Rhyl Flats wind-farm site but some mussels stocks are much closer. There are small sub-tidal populations just off Llandulas and Rhos Point, both inshore from the Constable Bank. Neither is subject to routine assessment but the NWNW SFC assesses them in response to the occasional request from locally-based mussel growers to dredge seed (juvenile) mussels for relaying in the Menai Strait.

There is an extensive whelk stock across Liverpool Bay, including the Constable Bank (Fig. 6) that is subject to exploitation (3521 t in 2005). It is not subject to assessment but there is a minimum landing size. In common with most exploited whelk populations, their abundance appears to be cyclical; they appear to support relatively short periods of relatively intense fishing effort followed by periods with low or no exploitation.

The most valuable mollusc fishery in the eastern Irish Sea is that for scallops, particularly the king scallop, *Pecten maximus*, (1956 t in 2005) but queen scallops, *Aequipecten opercularis*, (3952 t) are also widespread. The principal stock of king scallop is found around the Isle of Man although it does extend south east towards Liverpool Bay but not within *c*. 10 miles of Constable Bank. Queen scallops are more widespread and do reach into Liverpool Bay but probably not within *c*. 5 miles of Constable Bank in commercial quantities.

Queen scallop populations are not subject to assessment and the king scallop populations are only subject to regular assessment around the Isle of Man by the Manx government who also exercise management authority and controls. There is also a general Irish Sea-wide closed season for king scallop fishing in summer months.

2.6 Migratory Species: salmon, sea trout & eels

The *Salmon & Freshwater Fisheries Act* 1975, defines migratory species as salmon (*Salmo salar*), sea trout (*Salmo trutta*), and European eel (*Anguilla anguilla*); all three species are found in virtually all the rivers draining into Liverpool Bay (Russell, 1989; Apprahamian & Robson, 1999; Fig. 7).

2.6.1 Salmon

Atlantic salmon spend a year (grilse) or more (multi-sea-winter fish) at sea feeding before returning to their natal river to spawn between November and January. Once hatched, the young fish (parr) spend 2–4 years in the river system before developing into smolts that swim downstream and migrate to sea between late April and early June. The smolts leave the estuaries in cohorts but whether they remain in shoals or migrate individually to their feeding areas is not known. Similarly, it is unclear whether they remain close to the shoreline, as the immigrant adults do, or move across the open water of Liverpool Bay, possibly including Constable Bank, but it is known that they remain relatively close to the surface.

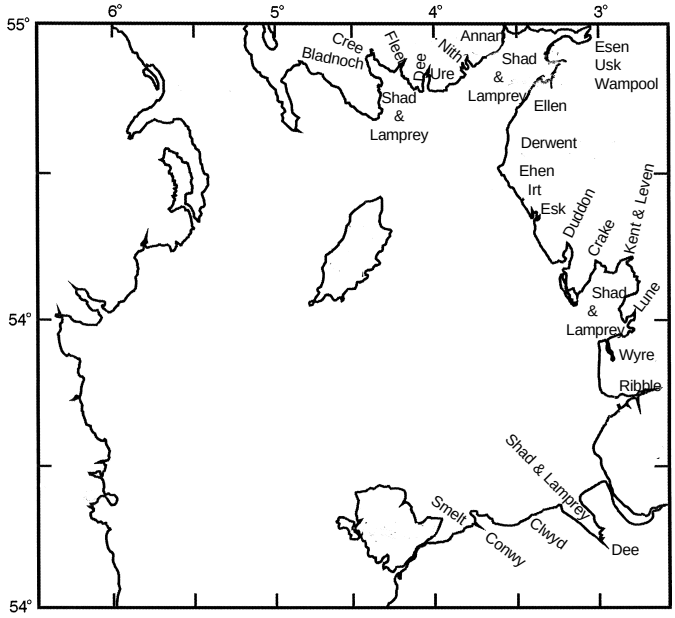

Figure 7: The named rivers known to have spawning salmon and or sea trout runs and estuaries in which shad, lampreys and smelt (species of nature conservation interest) have been recorded (information from JNCC, 1999).

Multi-sea-winter fish tend to arrive in coastal waters in the late winter and seek their natal river by moving too and fro close to shore, often swimming along the inter-tidal zone, before entering the natal river system during the spring. The single-sea-winter grilse

follow the older fish from late May onwards. The total catches of salmon recorded from the North Wales rivers closest to the Rhyl Flats wind-farm site are summarised in Table 3.

Table 4: The number of salmon recorded by the Environment Agency Wales 1995–2005, for North Wales rivers draining to Liverpool Bay and Menai Strait (Environment Agency, *Fishery Statistics 2005*).

River		**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**	**2006***
Ogwen	Net	136	92	70	109	85	0	0	0	0	0	
	Rod	59	85	110	54	101	122	68	43	114	125	
	Total	*195*	*177*	*180*	*163*	*186*	*122*	*68*	*43*	*114*	*125*	*50*
Conwy	Net	45	38	26	14	30	17	0	0	28	46	
	Rod	215	118	134	89	199	220	110	147	264	162	
	Total	*260*	*156*	*160*	*103*	*229*	*237*	*110*	*147*	*264*	*162*	*150*
Clwyd	Net	224	140	0	0	0	0	0	0	0	0	
	Rod	42	24	110	71	60	74	49	35	77	18	
	Total	*266*	*164*	*110*	*71*	*60*	*74*	*49*	*35*	*77*	*18*	
Dee	Net	1052	1167	1164	1020	543	750	950	724	745	810	
	Rod	433	433	627	390	359	616	493	421	1080	812	
	Total	*1485*	*1600*	*1791*	*1410*	*902*	*1366*	*1043*	*1145*	*1825*	*1622*	*574*

* Provisional (CEFAS/EA, 2007)

Of the four rivers summarised, the catches from the River Clwyd (the river closest to the Rhyl Flats wind farm site) appear to show the greatest variability, possibly showing an ongoing decline since the estuary's net fisheries were bought out in 1997. The other rivers indicate relatively stable total catches over the past decade and, by inference, stable salmon populations. The River Clwyd is also the only one of these four rivers that has so far failed to meet the Environment Agency conservation management targets (EA, 2007).

2.6.2 Sea trout

The life cycle of the migratory sea trout is almost identical to that of salmon but with two significant differences. In contrast to the salmon, the majority of sea trout survive spawning and will return to their natal spawning river on numerous occasions during their life time; secondly, they do not appear to undertake the same sea migration but remain in coastal waters, probably close to their natal river. The early life history and emigration of sea trout smolts is the same as for salmon smolts.

In contrast to the recorded salmon catches, it is not apparent that there is any more inter-annual variability in the River Clwyd sea trout catches than for the other rivers (Table 5). No less of a contrast is the fact that sea trout catches in the Clwyd are significantly greater

(factor of ten or more) than the salmon catches. In the Ogwen and Conwy the sea trout catches are only of the order x2 greater than salmon catches and in the River Dee sea trout catches are consistently less than half, if not less than a quarter of the salmon catches. This suggests that there is nothing inherently wrong with any of the rivers or their approaches with respect to migratory salmonids but there is some inherent characteristic that appears to favour one species over the other. In particular, the River Clwyd has something that appears to favour sea trout strongly in preference to salmon.

Table 5: The number of sea trout recorded by the Environment Agency Wales 1995–2005, for North Wales rivers draining to Liverpool Bay and Menai Strait (Environment Agency, *Fishery statistics 2005*).

River		**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**	**2005**
Ogwen	Net	46	50	30	30	17	0	0	0	0	0
	Rod	99	129	182	88	104	112	193	148	130	177
	Total	*145*	*179*	*212*	*121*	*121*	*112*	*193*	*148*	*130*	*177*
Conwy	Net	3	9	10	4	6	3	0	8	10	11
	Rod	304	232	514	351	391	583	630	572	464	489
	Total	*307*	*241*	*524*	*351*	*397*	*586*	*630*	*580*	*474*	*500*
Clwyd	Net	134	581	262	0	0	0	0	0	0	0
	Rod	528	717	1730	765	708	1319	868	982	1085	782
	Total	*662*	*1298*	*1992*	*765*	*708*	*1319*	*868*	*982*	*1085*	*782*
Dee	Net	103	81	34	29	27	26	106	50	67	46
	Rod	150	148	265	159	177	283	414	249	265	303
	Total	*253*	*229*	*299*	*188*	*204*	*309*	*520*	*299*	*332*	*349*

2.6.3 European eels

Eels spawn in an area of the west-central Atlantic, east of the Caribbean, known as the Sargasso Sea. The eggs and larvae – leptocephali – drift with the North Atlantic Drift and arrive in European coastal waters 2–4 years after spawning. Once in coastal waters, the leptocephali undergo metamorphosis to become elvers or ‘glass’ eels and these young fish enter the estuaries of most UK rivers. The main elver run occurs each spring and although the numbers may never be as great as are found in the Severn Estuary, it is reasonable to assume that elvers run up all the rivers entering Liverpool Bay.

Following immigration, eels spend many years in upper estuaries or freshwater where they feed and grow as ‘yellow eels’. When they are ready to return to the spawning grounds they move downstream and on re-entering an estuary in late summer to early autumn they undergo a process of pigment change to become ‘silver eels’ ready for the

return sea migration. Once the eels are at sea it is assumed that they leave coastal waters relatively rapidly.

There are no individual local or national assessments of eel populations but there has been an order of magnitude decline in the number of elvers entering the Severn Estuary over the past 30 years. Across Europe as a whole the decline has been nearer two orders of magnitude (EA, 2004).

2.7 Electro-sensitive Species

It is probable that all fish are sensitive to electro-magnetic fields to some extent but certain groups are known to utilise them on a day-to-day basis, foremost among these are the elasmobranches – sharks, dogfish, skates and rays, none of which are subject to routine monitoring or stock assessment. All of these fish are, or have been, present in Liverpool Bay from basking sharks (*Cetorhinus maximus*), the second largest of all fish, through a variety of rays [although the common skate (*Dipturus batis*) is no longer present], to the smallest of the dogfish – the common or lesser spotted dogfish (*Scyliorhinus canicula*). It is the bottom-dwelling rays and dogfish for which electro-magnetic fields are particularly important as they utilise low-level electro-magnetic activity and perturbations to locate buried prey.

Although there are no assessments of the actual abundance of lesser spotted dogfish, they are abundant and ubiquitous throughout the shallow-water sandy habitats of the eastern Irish Sea, including all of Liverpool Bay, the Constable Bank and Rhyl Flats (Fig. 8). Even when all actual and proposed offshore wind farms, and their export cable routes, across Liverpool Bay are taken into consideration, the area these wind farms could occupy is a small percentage of the total habitat available to this species and it seems highly improbable that they could suffer a discernible adverse effect. Other dogfish (see Table 1), including tope, are less abundant and if there is any local pattern to their distribution, the angling charter-boat skippers are inclined to describe it as being more towards the Dee Estuary than around the Constable Bank.

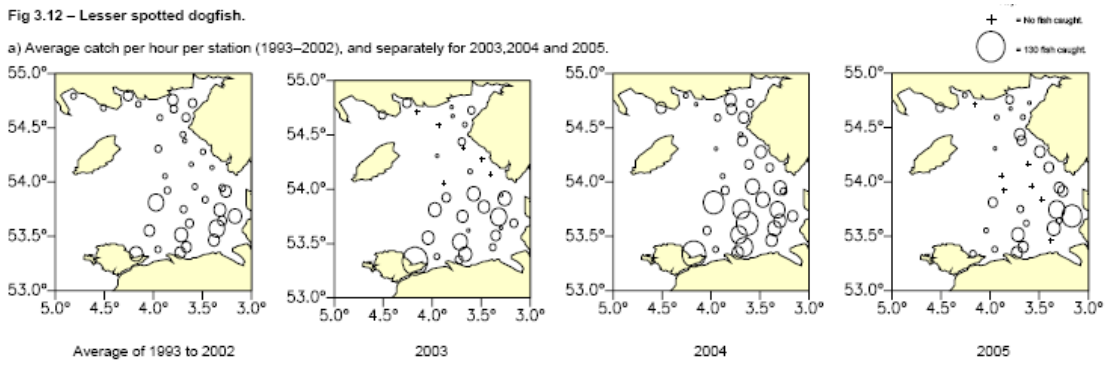

Figure 8: The distribution and relative abundance of lesser spotted dogfish in the eastern Irish Sea, as estimated from CEFAS trawl-survey data (from Ellis & Parker-Humphries, 2005).

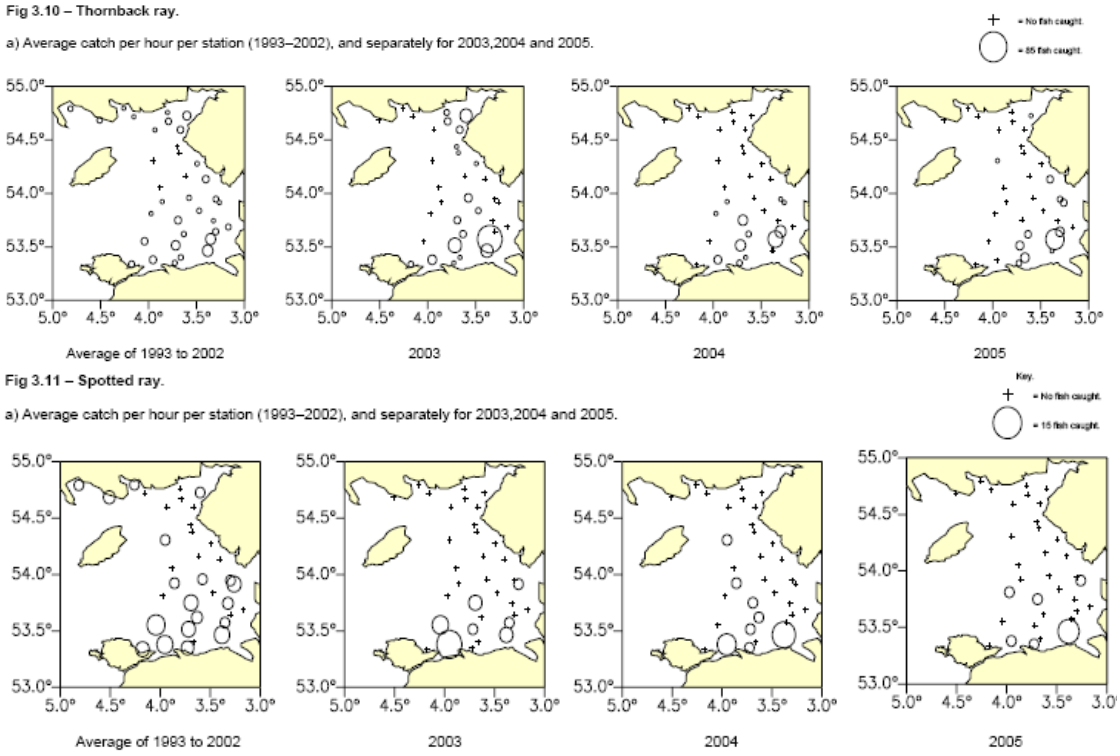

Figure 9: The distribution and relative abundance of thornback ray (a – upper) and spotted ray (b – lower) in the eastern Irish Sea, as estimated from CEFAS trawl-survey data (from Ellis & Parker-Humphries, 2005).

Rays are also less abundant than the lesser spotted dogfish but the group's distribution across Liverpool Bay is also widespread. The distribution and relative abundance of two of the more common ray species, thornback ray (*Raia clavata*) and spotted ray (*Raia montagui*) are shown in Figure 9. It appears that both are more abundant across Liverpool Bay than they are in the northern half of the eastern Irish Sea and that thornback rays may be more abundant off the Dee–Mersey Estuaries than elsewhere (Fig. 9a). While the spotted ray also appears to be relatively abundant in this location there appears to be a comparable locus of abundance off the eastern Menai Strait between the Great Ormes

Head and Anglesey (Figure 9b). Neither species appears to show a particular affinity with the Constable Bank or Rhyl Flats although locally-based tangle-netters report catching both species.

2.8 Non-commercial Fish Species & Fish of Nature Conservation Interest

There is a wide variety of small non-commercial fishes in Liverpool Bay (Table 1), the majority of which are ubiquitous, abundant and not subject to any immediate threat or conservation concern. However, there are some marine species recorded occasionally or regularly either within Liverpool Bay or the estuaries opening into the bay that are of nature conservation interest and are subject to national or international protection; these measures are summarised in Table 6. Species that have been recorded in Liverpool Bay or adjoining estuaries are listed in Table 7 and the distribution of some are shown in Figure 7.

Table 6: A summary of national and international legislation and treaties for the protection of fish of nature conservation interest (summarised from: Costello *et al*, 2002).

	Legislation	Purpose
1 –	*Wildlife and Countryside Act* 1981	Basic UK legislation underpinning nature conservation in the marine environment.
2 –	*Countryside & Rights of Way Act* 2000	UK legislation making stronger provision for nature conservation in the marine environment
3 –	Habitats Directive: *Council Directive 92/43/EEC on the conservation of natural habitats and of wild flora and fauna*	Requirement to establish special areas of conservation (SAC) to protect named species and habitats.
3a –	*Conservation (Natural Habitats &c.) Regulations* 1994	UK regulations providing the statutory basis for implementing the Habitats Directive.
4 –	Bern Convention: *Convention on the Conservation of European Wildlife and Natural Habitats*	Particularly for species and habitats which require co-operation between states.
5 –	Bonn Convention: *Convention on the Conservation of Migratory Species of Wild Animals*	Particularly for animals which migrate across national boundaries.
6 –	CITES: *Convention on the International Trade in Endangered Species*	Treaty to prevent the trade in endangered species
7 –	Rio Convention: *Convention on Biodiversity*	Protection of biodiversity at level of genetics, species and ecosystems.
7a –	*Biodiversity Action Plans* 1995	Non-statutory UK mechanism for pursuing convention's objectives.

2.8.1 Common goby & sand goby

Although the common and sand gobies are scheduled species (Bern Convention; Table 5 & 6) they are not subject to any specific UK conservation measures; they are ubiquitous

and abundant in shallow sandy habitats less than 2–5 m in depth around the British Isles. They are not seen to be at risk in UK waters.

2.6.2 Basking shark

The basking shark (*Cetorhinus maximus*) is the second largest fish in the world; it is a regular summer migrant to the coastal waters of the Isle of Man and the western Irish Sea but neither a numerous nor regular visitor to Liverpool Bay. It is a plankton filter-feeder that is most frequently associated with hydro-thermal fronts or other areas of high plankton production. As a plankton feeder, it is assumed to be less dependent on, or sensitive to localised electro-magnetic fields. Although there are UK-based migration studies of this species, there is no rigorous national or international stock monitoring or assessment programme. Directed fisheries and retention on board are prohibited under UK legislation (*Wildlife & Countryside Act* 1981) and the EU CFP.

Table 7: Species of fish recorded from the Irish Sea (Potts & Swaby, 1999) that are covered by one or more of the legislative measures listed in Table 3.

Scheduled Species		Conservation Legislation (see Table 5)
Common name	**Scientific Name**	
Marine Fish		
Commercially exploited fish species		7a
Common goby	*Pomatoschistus microps*	4
Sand goby	*Pomatoschistus minutus*	4
Basking shark	*Cetorhinus maximus*	1, 2, 6, 7
Diadromous Fish		
Allis shad	*Alosa alosa*	1, 2, 3, 7
Twaite shad	*Alosa fallax*	1, 2, 3, 7
Salmon (in freshwater)	*Salmo salar*	3
River lamprey	*Lampetra fluviatilis*	2, 3, 7
Sea lamprey	*Petromyzon marinus*	2, 3, 7
Smelt or sparling	*Osmerus eperlanus*	7

2.6.3 Allis & twaite shad

The allis shad (*Alosa alosa*) and twaite shad (*Alosa fallax*) shad are members of the herring family but they are similar to sea trout in that they spend most of their late juvenile and adult life in coastal waters (see, for example, Maitland & Campbell, 1992). In spring, the mature adults enter estuaries and move upstream to the lower reaches of freshwater where they lay their eggs before returning to sea (May–June). The young-of-

the-year reach the estuaries in autumn where they probably remain over winter. Neither species is abundant but there are irregular records of their capture in all of the major estuaries draining into the eastern Irish Sea (Potts & Swaby 1994; 1999; Figure 7). There is no regular monitoring or assessment of these species in the eastern Irish Sea.

2.6.4 River & sea lamprey

The distribution of lampreys around Liverpool Bay (Figure 7) and their life-history is not dissimilar to that of the shads (see, for example, Maitland & Campbell, 1992). Most of their life is spent in coastal waters and they enter estuaries to spawn in the spring. Sea lampreys (*Petromyzon marinus*) spawn in the lower reaches of rivers before returning to sea in early summer, followed by young-of-the-year in the autumn. River lampreys (*Lampetra fluviatilis*) migrate further upstream and the juveniles remain in the river until spring when they emigrate to the estuaries where they remain for 1–2 years. No data are available for assessing the status of Liverpool Bay lamprey populations or stocks. There is no regular monitoring or assessment of these species in the eastern Irish Sea.

2.6.5 Smelt

The European smelt (*Osmerus eperlanus*) is a member of the salmon family that, like shad and lamprey, spends most of its adult life in coastal waters but enters estuaries to spawn in the spring (see, for example, Maitland & Campbell, 1992). The adults return to sea once they have spawned; the post-larvae drift downstream and the young-of-the-year reach the lower estuary in autumn. There is no regular monitoring or assessment of this species in the eastern Irish Sea but a small spawning population does run into the River Conwy.

3 Commercial & Recreational Fisheries

3.1 Introduction

This report represents an up-dated summary of the information prepared for the environmental statement for the Gwynt y Môr offshore wind farm (npr, 2005). For the purposes of this assessment, Liverpool Bay is the area covered by ICES Statistical Rectangles 35E6 and 36E6 (Figure 10) but this report focuses on the coastal sub-rectangles of 35E6. The Rhyl Flats offshore wind farm is within the north-western quadrant of Rectangle 35E6, ie sub Rectangle 35E6(1).

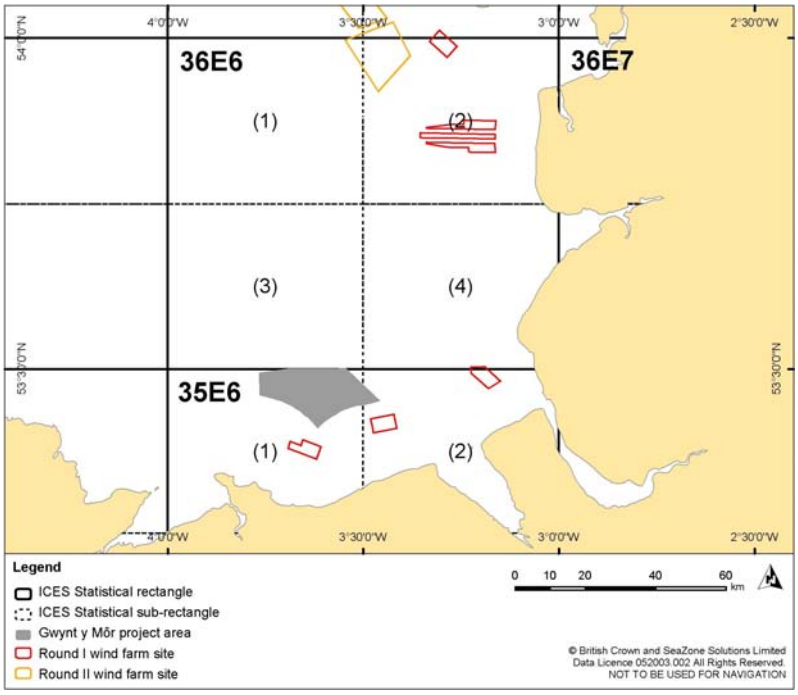

Figure 10: ICES Statistical Rectangles 35E6 (sub-rectangles 1 & 2) & 36E6 (sub rectangles 1 to 4) indicating the position of wind farm sites within Liverpool Bay (from npr, 2005).

The wind-farm site is also within the 6 mile inshore fishery limit within which only UK-registered fishing vessels may fish. It is also an area where all fishing activity is subject to the byelaws of the North Western and North Wales Sea Fisheries Committee (NWNW SFC). In particular, Byelaw 9 states:

> *No mechanically propelled vessel which exceeds 15 metres overall length shall be used in fishing for or taking sea fish within that part of the District to the east of a line drawn 000^0 (T) from The Old Lighthouse, Great Ormes Head (53^0 20.53'N, 03^0 52.13'W, WGS 84 datum).*

> *This byelaw shall not be enforceable for those vessels: used in fishing for mussels (*Mytilus edulis*) using dredges; or used in angling with rod and line.*

3.2 Registered Fishing Vessels

In addition to this statutory restriction on vessels that may fish on or adjacent to the Rhyl Flats site, there are many vessels based around Liverpool Bay that are too small to reach Rhyl Flats from the operational home. As of 1 May 2007, the number of registered fishing vessels, by length group, based in ports or harbours around Liverpool Bay were:

Length (m)	Fleetwood	Mersey	Dee	Rhyl to Connah's Quay	Conwy including Rhos-on-Sea	Beaumaris including Red Wharf Bay
<5	1	2		3		1
>5 <7.5	4	3	9	10	7	1
>7.5 <10	18	3	2	9	6	2
>10 <15	2	2				
> 15	8					

* Data from Defra/MFA website.

Of these 93 vessels, the eight >15 m boats are all based in Fleetwood. SFC byelaws prohibit them from fishing on Constable Bank; they spend the greater part of their time working otter trawls to the north rather than south of Fleetwood. At the opposite extreme, the seven under 5 m vessels are too small to fish more than extremely rarely in such an exposed location as Constable Bank and all bar one are based too far from the site for it to be a practical option. Most are engaged in local shellfisheries such as shrimp or cockle fishing in the Ribble or Dee estuaries.

The same is true for many of the 7.5–10 m vessels; many are engaged in local shellfisheries and only the larger, more robust vessels in this category would travel from beyond Rhyl or Conwy to fish Constable Bank. There is one such vessel based in Fleetwood that occasionally works along this coast. Similarly, there is a small number of boats based in Holyhead and Caernarfon that might venture eastward to the Constable Bank when prolonged periods of westerly or south-westerly storms make fishing on their normal westerly grounds, such as Caernarfon Bay, impractical. Such visitors are, however, rare. In contrast, it is reasonable to assume that all eight of the Conwy, Rhos-on-Sea and Beaumaris-based boats in this category work on or near Constable Bank at sometime

during the year, although the number that do so regularly is probably no more than four or five.

Of the four vessels in the 10–15 m group, one Fleetwood-based trawler may work off the North Wales coast in the autumn but the Mersey-based boats tend to work to the north and not west of the Douglas–Point of Ayr gas pipeline.

3.3 Commercial Fishing Gear and Fisheries

There are three forms of fishing gear used regularly on or adjacent to Constable Bank, two static gears and one towed. Throughout the summer a Conwy-based under 10 m boat works bottom-set tangle nets targeting rays between the coast (*c.* April) and the Douglas gas installations (*c.* July), and then works back towards the shore. This involves setting nets on and near Constable Bank twice each season. Until recently, the same pattern of fishing was followed by a Rhyl-based boat but the skipper is currently without a boat. A Dee-based boat that also works this type of net off this coast rarely works west of the gas pipeline. Surface-set gill nets set for bass tend to be worked very close inshore, principally east of the River Clwyd, and in Conwy Bay and Red Wharf Bay

The other static gear worked in the wind-farm area is whelk pots. Two, possibly three of the Conwy and Beaumaris boats work grounds from Red Wharf Bay to the eastern end of Constable Bank and even as far as Rhyl Flats. Occasionally, itinerant whelk-fishing boats, usually operating from Fleetwood or Holyhead, also work off the North Wales coast. The constraints of itinerant operations, however, dictate that they are more likely to be over 15 m in length and, therefore, unable to fish within 6 miles of baselines; i.e. they must operate well to seaward of Constable Bank.

Two Rhos-on-Sea based under 10 m boats fish with otter trawls all year, bar the depth of winter, but work mostly inside the Constable Bank between Colwyn Bay and Rhyl. When the weather is favourable, however, both also work on the Constable Bank but probably not outside the bank. Occasionally, they may be joined by one or two of the Conwy-based boats but primarily in Conwy Bay and Red Wharf Bay. Similarly, during prolonged periods of westerly or south-westerly storms boats from Holyhead and Caernarfon may seek sheltered conditions in the lee of the Great Ormes Head and fish Constable Bank.

Dee-based trawlers rarely work west of the Dee, preferring to stay in the mouth of the Dee Estuary or off the Wirral coast, i.e. on and near the Burbo Bank.

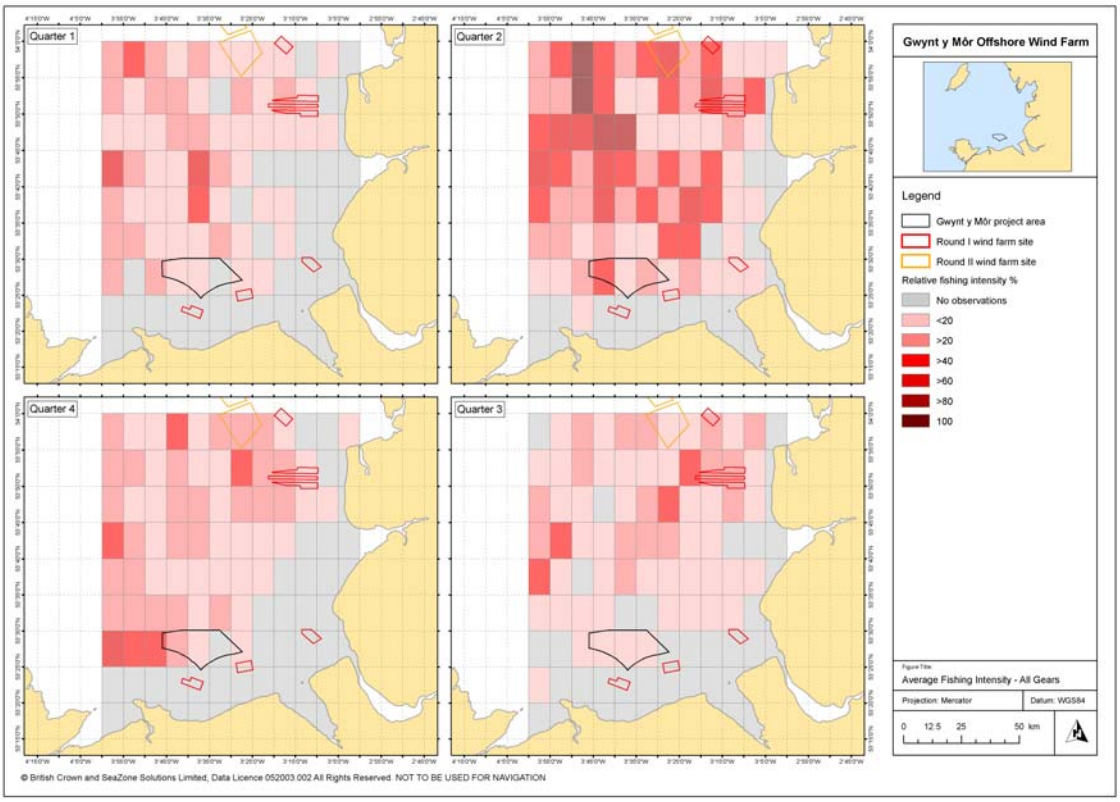

Figure 7: The average (1995-03) relative fishing intensity across Liverpool Bay, all gears combined, as recorded by Defra-MFA surveillance overflights: Q1 top left → Q2 top right → Q3 bottom right → Q4 bottom left → Q1. The absence of records indicates low rather than no fishing activity (Figure from npr, 2005).

In addition to these locally-based boats, one Fleetwood-based otter trawler occasionally works the North Wales coast in late autumn and a Fleetwood-based under 10 m beam trawler sometimes works along this coast, including Constable Bank, fishing for sole in the spring or early summer. Even less regularly, scallop-fishing boats from Caernarfon or further afield fish the area but as neither the king nor queen scallop beds extend inshore as far as the Constable Bank, theirs is not a significant activity.

In summary, the fishing pattern off the North Wales coast, particularly in the vicinity of Constable Bank continues to be as was found in the earlier assessments for Rhyl Flats (ERM, 2002), North Hoyle (Innogy, 2002) and Gwynt y Môr (npr, 2005); it is an area of very low fishing intensity with a very small number of vessels working the area in the course of a year and an even smaller number, probably no more than four or five, working

the area with any sort of regularity over the summer months only. Of this number, a set-netter works across Constable Bank twice each season and two small trawlers tow along the bank in fine weather. The distribution of whelk fishing relative to Constable Bank is highly dependent on catch rates and may be relatively intense one year and then less intense for a year or so as the species is not very mobile and stocks take time to recover.

3.4 Charter Boats and Recreational Fishing

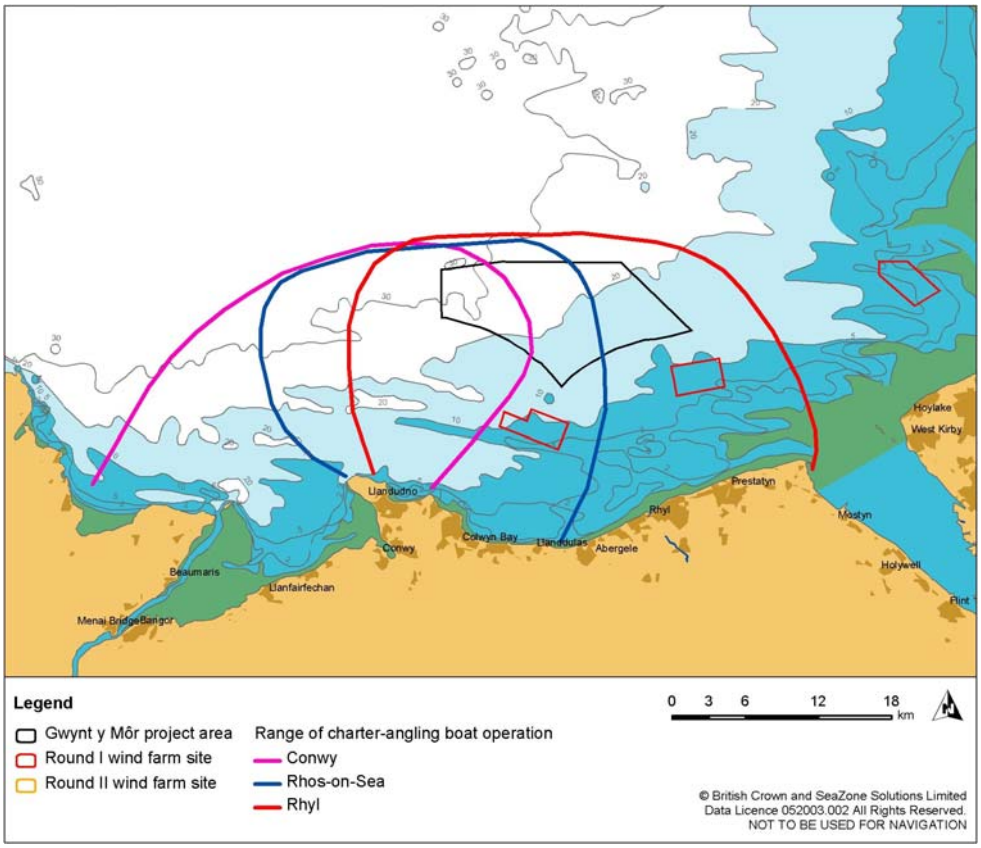

Figure 12: An indication of the range of operations of charter-angling boats operating from Conwy, Rhos-on-Sea and Foryd Harbour, Rhyl (figure from npr, 2005).

In contrast to all but the most locally-based commercial fishing boats, the Constable Bank is of fundamental importance to commercial charter-angling boats from Conwy–Beaumaris to Rhyl. In fine weather, these vessels may also be joined by some of the larger (or more foolhardy) trailer-towed privately owned angling vessels.

The commercial charter boats frequently fish 10–12 miles from their operational base. This puts the Rhyl Flats project area well within the normal operational range of boats based in

Conwy (4 charter boats), Rhos-on-Sea (3) and Foryd Harbour, Rhyl (10), but beyond the normal operational range of boats based in the Menai Strait, Dee, Mersey, Ribble or Fleetwood.

Boats operating from the Conwy Estuary fish primarily on 'marks' (ie wrecks or rock outcrops) between Puffin Island, Anglesey, and, occasionally, the western end of Constable Bank. In contrast, Constable Bank is at the centre of charter vessel activities operating from Rhos-on-Sea, although these boats will range from marks NW of the Great Orme, out to the Douglas gas installations and east to Rhyl. The Rhyl-based boats' operations also span the Constable Bank but also extend as far east as the Dee Estuary (Fig. 12).

3.5 Salmon and Sea Trout Fishing

There is no commercial salmon fishing anywhere in the eastern Irish Sea, including Liverpool Bay. Commercial fishing is limited to no more than 2 net licences issued by the Environment Agency for fishing within the Conwy Estuary and up to six in the Dee Estuary.

Recreational (riparian) fishing for salmon is also heavily regulated and licensed by the Environment Agency. The spring fishery for multi-sea-winter fish is based on catch and release whereas there is the option to retain grilse (single-sea-winter fish) caught later in the year. Although salmon have been reported from the Mersey in recent years, it is the only river system entering Liverpool Bay that does not support a salmon or sea trout run.

3.6 Commercial Eel Fishing

There are no targeted, commercial fisheries for migrating silver (mature) eels in Liverpool Bay, including Rhyl Flats and Constable Bank. There are commercial fisheries for yellow (feeding) eels in the estuaries and river catchments of rivers draining into Liverpool Bay. All such fisheries are licensed by the Environment Agency.

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