Annex G

Ornithology

CONTENTS

G1 BIRD SPECIES OF NOTE

Table G1.1 Bird Species of Note (Known to occur in the study area from published data or surveys)

Bird Species	Annex I (1)	Schedule 1 (2)	Red List (3)
Red-throated diver	✓	✓	
Great Northern diver	✓	✓	
Leach's Petrel	✓	✓	
Bewick's Swan	✓	✓	
Scaup		✓	
Common Scoter		✓	✓
Black-tailed Godwit		✓	
Bar-tailed Godwit			✓
Little Gull		✓	
Sandwich Tern	✓		
CommonTern	✓		
Arctic Tern	✓		
Little Tern	✓	✓	

Details of seabird or waterfowl species that are known to occur in nationally or internationally important numbers are provided in the following sections.

(1) Particularly vulnerable species to special conservation measures (*EC Wild Birds Directive 79/409/EEC*).
(2) Species subject to additional protection under the *Wildlife and Countryside Act 1981* and amendment because of their scarcity in Britain.
(3) Species whose population or range is rapidly declining, recently or historically and those of global conservation concern (RSPB et al, 1996)

G2 *WETLAND BIRD SURVEY*

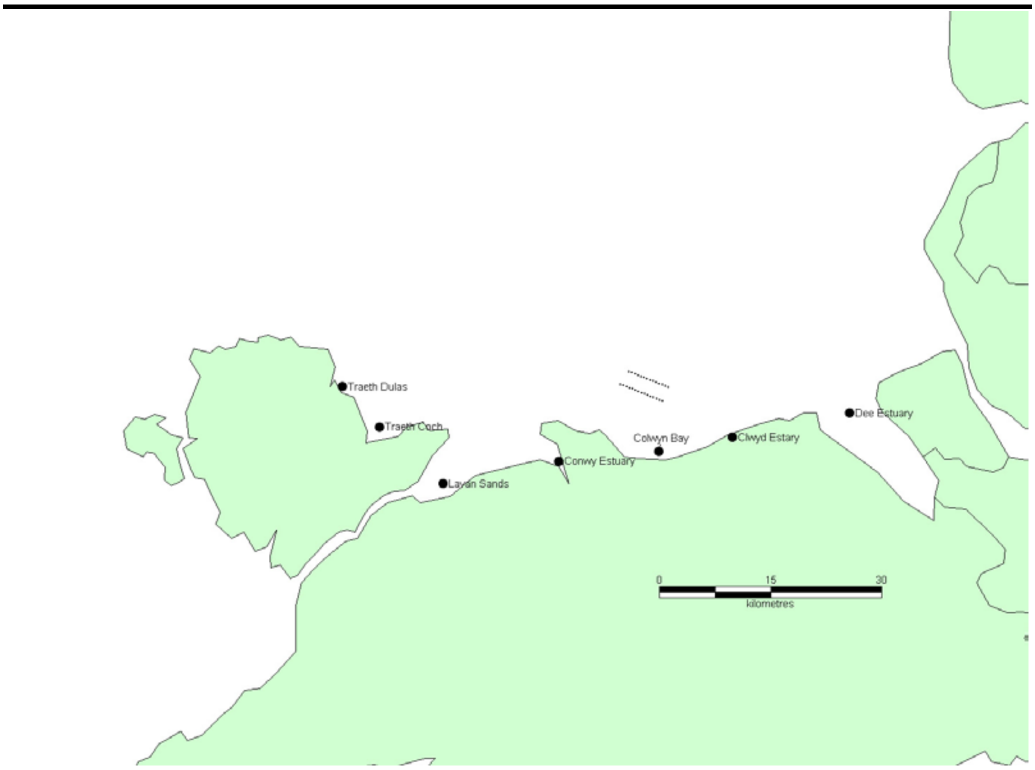
G2.1 *INTRODUCTION*

The Wetland Bird Survey (WeBS) (1) provides the main data set that covers the wintering and passage waterfowl populations throughout the study area. All important sites are counted on a monthly basis and the data are administered by the WeBS secretariat at the Wildfowl and Wetlands Trust (WWT). All counts are carried out from land. The main WeBS sites within the study area are:

- Dee Estuary
- Clwyd Estuary
- Colwyn Bay
- Conwy Estuary
- Lavan Sands (Traeth Lavan)
- Traeth Coch (Red Wharf Bay)
- Traeth Dulas (Dulas Sands)

Their locations are shown on *Figure G2.1*. The WeBS data from these sites were obtained for the more recent 15 years for which data were available, 1985/86 – 1999/2000. In addition, data from the sub-sectors within Colwyn Bay were obtained, to give a finer spatial resolution for this site, as it is the one closest to the development.

Figure G2.1 Wetland Bird Survey (WeBS) Sites in the Study Area



(1) Joint scheme of British Trust for Ornithology (BTO) and Wildfowl and Wetlands Trust (WWT) to monitor non-breeding waterbirds in the UK. Comprises synchronised monthly counts along pre-defined sectors of coastline.

G2.2 *METHODS*

The current status of the waterfowl populations and their conservation importance was determined using the standard WeBS assessment techniques (Musgrove *et al.* 2001). The mean of the peak counts in each of the most recent five years for which data were available (1985/86 – 1999/2000) was calculated for each species at each site. This value was then used to determine the conservation importance of each population at each site, using the standard assessment criteria adopted by CCW (JNCC 1995). A species was classed as internationally important if the mean peak count exceeded 1% of the appropriate flyway population, nationally important if it exceeded 1% of the GB population.

As the impacts of the wind farm could be of potentially greater magnitude in population terms for species in decline, further analysis of the population trends of the key species (nationally/internationally important) was carried out, using data for the last 15 years. A species was deemed to be increasing if its 15-year trend was positive and statistically significant (correlation analysis, $p<0.05$), and declining if its 15-year trend was negative and statistically significant ($p<0.05$). Species with trends that were not statistically significant (correlation analysis, $p>0.05$) were deemed to be stable.

Data on the key marine species (i.e. those two occurring on the WeBS counts in nationally/ internationally important numbers (cormorant and common scoter), that could potentially forage or roost within the wind farm site, were explored further. As the WeBS counts are made from land, the information on these marine species is inevitably limited. In particular, the numbers recorded are highly dependent on weather conditions and on the location of the birds in relation to the shore. The WeBS counts do, however, enable an indication to be obtained on the seasonal pattern of occurrence of these species in sight of land, and provide some information on how the populations have changed through time.

G2.3 *RESULTS*

G2.3.1 *Dee History*

The Dee Estuary is much the most important waterfowl site within the study area. It supports the seventh largest number of waterfowl in the UK (five-year mean peak of 130,231 individuals), including 10 species in internationally important numbers and a further 7 in nationally important numbers. Full details of the 5-year mean peak counts for each species and the thresholds for national and international importance are given in *Table G2.1*.

Table G2.1 Dee Estuary Waterfowl Populations. Mean annual peak over the five winters 1995/96 -1999/2000

Species	Five-year mean peak count	Threshold for GB importance	Threshold for International importance	Importance

Species	Five-year mean peak count	Threshold for GB importance	Threshold for International importance	Importance
Great Crested Grebe	94	100	>100	Regional
Cormorant	**448**	**130**	**1200**	**National**
Mute Swan	98	260	2400	Regional
Bewick's Swan	**72**	**70**	**170**	**National**
Shelduck	**7740**	**750**	**3000**	**International**
Wigeon	**3458**	**2800**	**12500**	**National**
Teal	**5479**	**1400**	**4000**	**International**
Mallard	1515	5000	20000	Regional
Pintail	**4900**	**280**	**600**	**International**
Shoveler	89	100	400	Regional
Scaup	33	110	3100	Regional
Common Scoter	27	275	16000	-
Goldeneye	50	170	3000	Regional
Red-breasted Merganser	61	100	1250	Regional
Oystercatcher	**24707**	**3600**	**9000**	**International**
Ringed Plover	**374**	**290**	**500**	**National**
Grey Plover	**1624**	**430**	**1500**	**International**
Lapwing	8488	20000	20000	Regional
Knot	**15581**	**2900**	**3500**	**International**
Sanderling	**446**	**230**	**1000**	**National**
Purple Sandpiper	42	210	500	Regional
Dunlin	**27938**	**5300**	**14000**	**National**
Black-tailed Godwit	**1970**	**70**	**700**	**International**
Bar-tailed Godwit	**1149**	**530**	**1000**	**National**
Curlew	**4815**	**1200**	**3500**	**International**
Redshank	**8483**	**1100**	**1500**	**International**
Turnstone	**941**	**640**	**700**	**International**

Of the nationally/internationally important species, five had statistically significant increasing trends; cormorant, shelduck, Bewick's swan, black-tailed godwit and dunlin. Three were declining; pintail, oystercatcher and ringed plover. The other nine (teal, wigeon, bar-tailed godwit, curlew, grey plover, knot, redshank, sanderling and turnstone) did not show a statistically significant trend.

G2.3.2 Clywd Estuary

The Clwyd Estuary supports a range of wildfowl and wader species, but none occurred in internationally important numbers and only two, cormorant and common scoter, occurred in nationally important numbers. Full details of the 5-year mean peak counts for each species and the thresholds for national and international importance are given in *Table G2.2*.

Table G2.2 Clwyd Estuary Waterfowl Populations. Mean annual peak over the five winters 1995/96 -1999/2000

Species	Five-year mean peak count	Threshold for GB importance	Threshold for International importance	Importance
Cormorant	**132**	**130**	**1200**	**National**
Shelduck	104	750	3000	Regional
Wigeon	368	2800	12500	Regional
Mallard	294	5000	20000	Regional

Species	Five-year mean peak count	Threshold for GB importance	Threshold for International importance	Importance
Scaup	54	110	3100	Regional
Common Scoter	**1401**	**275**	**16000**	**National**
Red-breasted Merganser	15	100	1250	Regional
Oystercatcher	330	3600	9000	Regional
Ringed Plover	55	290	500	Regional
Lapwing	1576	20000	20000	Regional
Sanderling	37	230	1000	Regional
Curlew	235	1200	3500	Regional
Redshank	219	1100	1500	Regional

Neither of the two nationally important species at the site (cormorant and common scoter) showed a statistically significant trend in numbers through time.

G2.3.3 Colwyn Bay

Colwyn Bay generally supports only small numbers of waterfowl. The key exception to this is common scoter, which occurs at the site in nationally important numbers. Full details of the 5-year mean peak counts for each species and the thresholds for national and international importance are given in *Table G2.3*.

Table G2.3 Colwyn Bay Waterfowl Populations. Mean annual peak over the five winters 1995/96 -1999/2000

Species	Five-year mean peak count	Threshold for GB importance	Threshold for International importance	Importance
Cormorant	32	130	1200	Regional
Common Scoter	**1395**	**275**	**16000**	**National**
Oystercatcher	628	3600	9000	Regional
Lapwing	22	20000	20000	Regional
Redshank	114	1100	1500	Regional
Turnstone	132	640	700	Regional

There was no significant trend in the Colwyn Bay common scoter population through time.

G2.3.4 Conway Estuary

The Conwy Estuary supports a range of wildfowl and wader species, but none occurred in internationally or nationally important numbers. Full details of the 5-year mean peak counts for each species and the thresholds for national and international importance are given in *Table G2.4*.

Table G2.4 ***Conwy Estuary Waterfowl Populations. Mean annual peak over the five winters 1995/96 -1999/2000***

Species	Five-year mean peak count	Threshold for GB importance	Threshold for International importance	Importance
Shelduck	336	750	3000	Regional
Wigeon	274	2800	12500	Regional
Teal	281	1400	4000	Regional
Mallard	298	5000	20000	Regional
Red-breasted Merganser	21	100	1250	Regional
Ringed Plover	27	290	500	Regional
Lapwing	398	20000	20000	Regional
Dunlin	206	5300	14000	Regional
Curlew	781	1200	3500	Regional
Redshank	508	1100	1500	Regional

G2.3.5 Lavan Sands (Traeth Lavan)

Lavan Sands supports a small number of wildfowl populations and a range of waders. It is particularly important for the nationally important numbers of great crested grebe, oystercatcher and curlew that it supports. Full details of the 5-year mean peak counts for each species and the thresholds for national and international importance are given in *Table G2.5*.

Table G2.5 ***Lavan Sands Waterfowl Populations. Mean annual peak over the five winters 1995/96 -1999/2000***

Species	Five-year mean peak count	Threshold for GB importance	Threshold for International importance	Importance
Great Crested Grebe	**288**	**100**	**[not defined]**	**National**
Shelduck	307	750	3000	Regional
Wigeon	731	2800	12500	Regional
Teal	167	1400	4000	Regional
Mallard	417	5000	20000	Regional
Pintail	20	280	600	Regional
Common Scoter	41	275	16000	Regional
Oystercatcher	**4081**	**3600**	**9000**	**National**
Ringed Plover	83	290	500	Regional
Dunlin	2533	5300	14000	Regional
Curlew	**1461**	**1200**	**3500**	**National**
Redshank	522	1100	1500	Regional
Turnstone	28	640	700	Regional
Redshank	508	1100	1500	Regional

No statistically significant trends were found in any of the three nationally important populations at the site over the last 15 years.

G2.3.6 Traeth Coch (Red Wharf Bay)

This site supports small numbers of wildfowl and waders but is particularly notable for nationally important numbers of common scoter. No other species reaches national importance. Full details of the 5-year mean peak counts for each species and the thresholds for national and international importance are given in *Table G2.6*.

Table G2.6 ***Traeth Coch Waterfowl Populations. Mean annual peak over the five winters 1995/96 -1999/2000***

Species	Five-year mean peak count	Threshold for GB importance	Threshold for International importance	Importance
Cormorant	28	130	1200	Regional
Shelduck	108	750	3000	Regional
Wigeon	193	2800	12500	Regional
Common Scoter	**293**	**275**	**16000**	**National**
Red-breasted Merganser	10	100	1250	Regional
Oystercatcher	712	3600	9000	Regional
Ringed Plover	44	290	500	Regional
Curlew	386	1200	3500	Regional
Redshank	105	1100	1500	Regional

There was no significant trend in the Traeth Coch common scoter population through time.

G2.3.7 Traeth Dulas

This site supports only very small numbers of waterfowl. It was discontinued as a WeBS count site in 1996. Full details of the 5-year mean peak counts for each species and the thresholds for national and international importance are given in *Table G2.7*.

Table G2.7 ***Traeth Dulas Waterfowl Populations. Mean annual peak over the five winters 1991/92 -1995/1996 (most recent for which data were available).***

Species	Five-year mean peak count	Threshold for GB importance	Threshold for International importance	Importance
Ringed Plover	13	290	500	Regional
Curlew	481	1200	3500	Regional

G2.4 SUMMARY OF WEBS DATA AVAILABLE ON MARINE SPECIES

The WeBS scheme does not provide comprehensive coverage of marine waterfowl species, but does give some additional background information about the distribution and abundance of this group. As discussed above, the accuracy of the WeBS counts is very much dependent on the weather conditions during each count, and as a result numbers counted tend to be more variable than terrestrial species. The WeBS counts do provide an indication of at least the minimum numbers present, of the distribution along the coast and on the seasonal pattern of occurrence (at least in the waters visible from land).

The two marine species counted by the WeBS scheme along the north Wales coast that occur in nationally important numbers are cormorant and common scoter. Both of these are species that could potentially occur foraging or roosting within wind farm site. The annual peak counts for each are shown in *Figures G2.1* and *G2.3* respectively.

Figure G2.1 Common Scoter Study Area Annual Peak Count (WeBS Data)

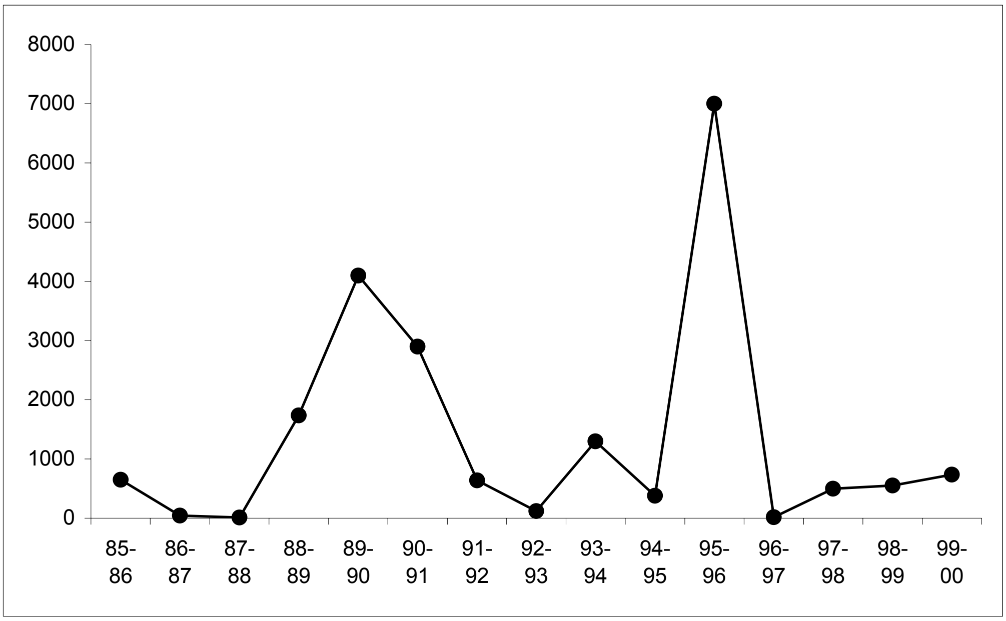
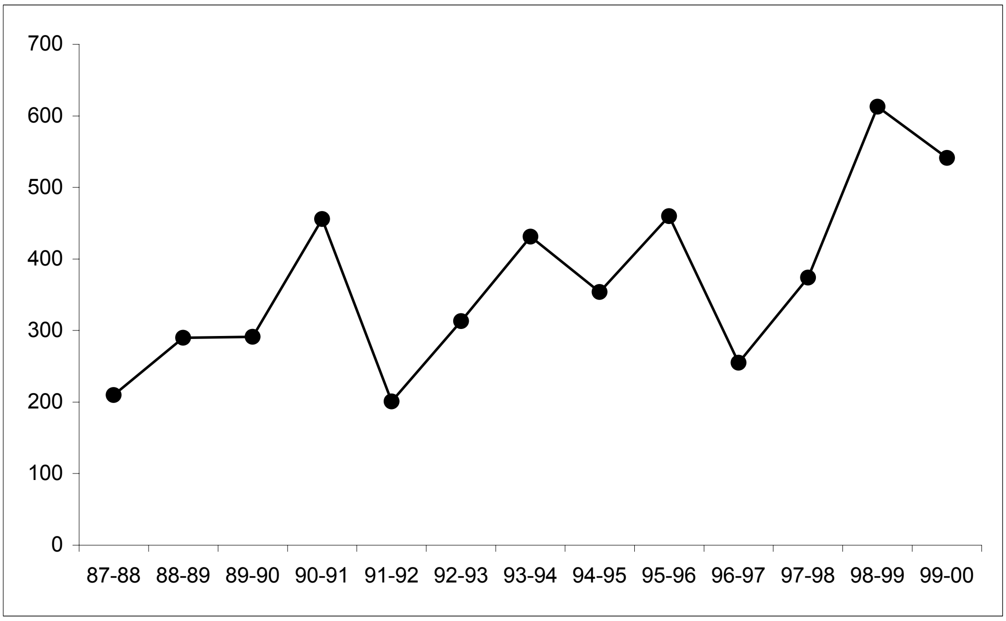


Figure G2.2 Cormorant Study Area Annual Peak Count (WeBS Data)



Common scoter do not shown any trend in peak numbers over time (correlation analysis; $p>0.05$) but the annual peak has varied greatly between years. It is highly likely that this reflects the distribution of the birds at the time of the counts in relation to the shore rather than actual population changes. Peak counts most likely just coincided with good counting conditions and the birds being located close inshore. However, these counts do illustrate that substantial numbers of scoters do occur in the inshore waters of the study area.

Cormorant peak numbers within the study area have increased significantly (correlation analysis; $p<0.05$) over time, from about 2-300 in the 1980s up to a current peak of 5-600. This increase reflects the changes that have occurred nationally (Musgrove *et al,* 2001).

The distribution of common scoters and cormorants along the north Wales coast as recorded by the WeBS counts is shown in *Figures G2.3* and *G2.4* for the two species respectively. As counts of these species are not particularly reliable, the peak count recorded at each site over the past 15 years is shown. Data are presented for each WeBS site, apart from Colwyn Bay, which has been sub-divided into its component sectors, to give a better spatial resolution as it is the site lying closest to the proposed wind farm.

Figure G2.3 Common Scoter Distribution From WeBS Counts

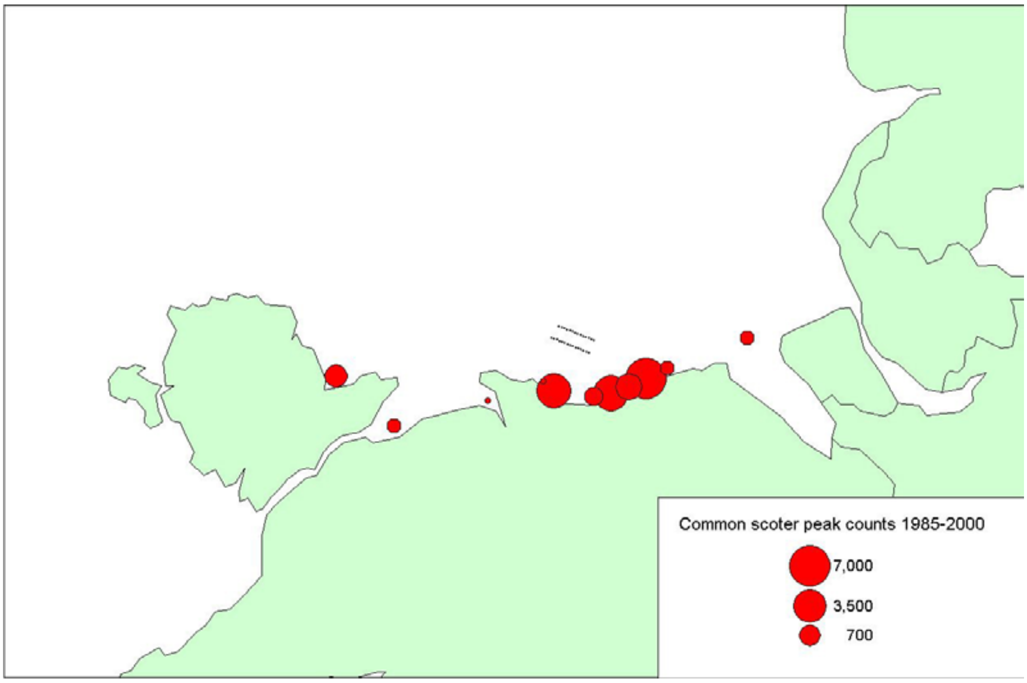
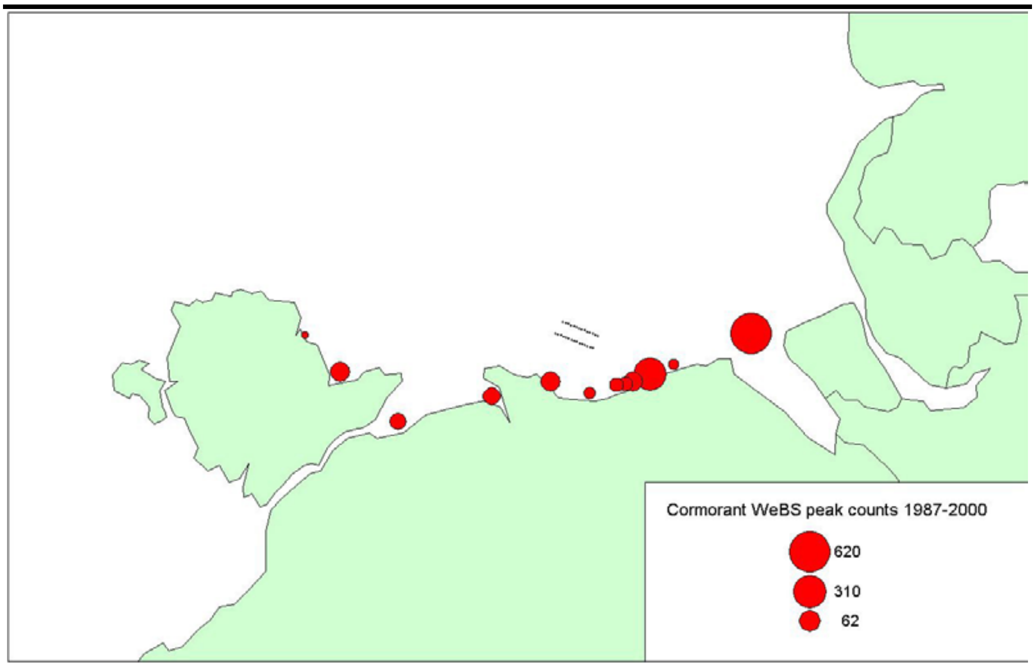


Figure G2.4 Cormorant Distribution From WeBS Counts



Common scoter was recorded by the WeBS scheme along the north Wales coast throughout the study area, but the main concentration was found in Colwyn Bay. Cormorant was more evenly distributed along the coast, with the greatest concentration in the Dee Estuary.

The seasonal pattern of occurrence of the two species is summarised in *Figures G2.5* and G2.6. These Figures summarise the percentage of birds of each species recorded in each month.

Figure G2.5 Proportion of Common Scoter Recorded During WeBS Counts

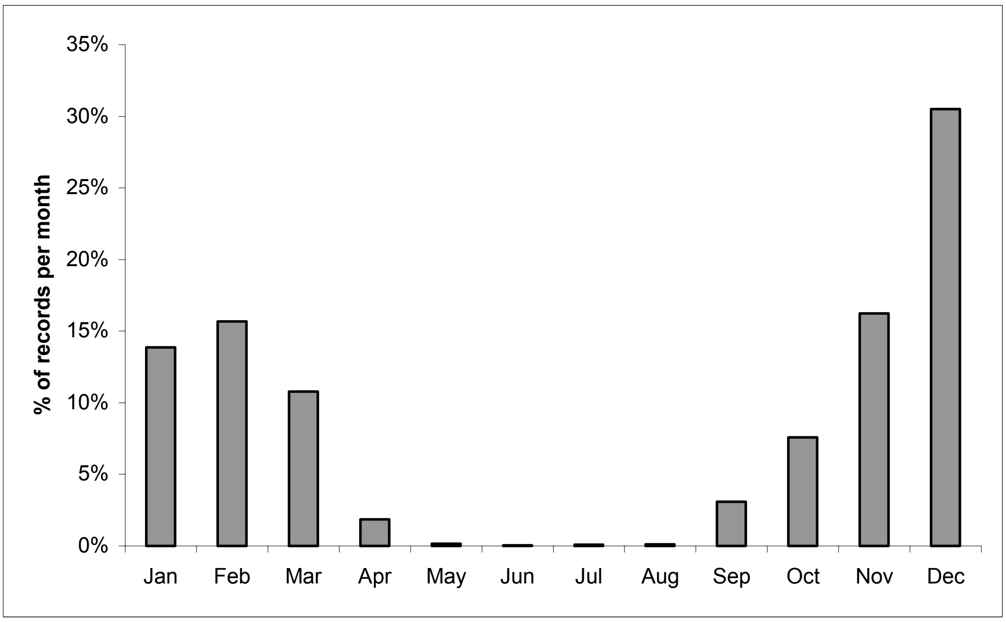
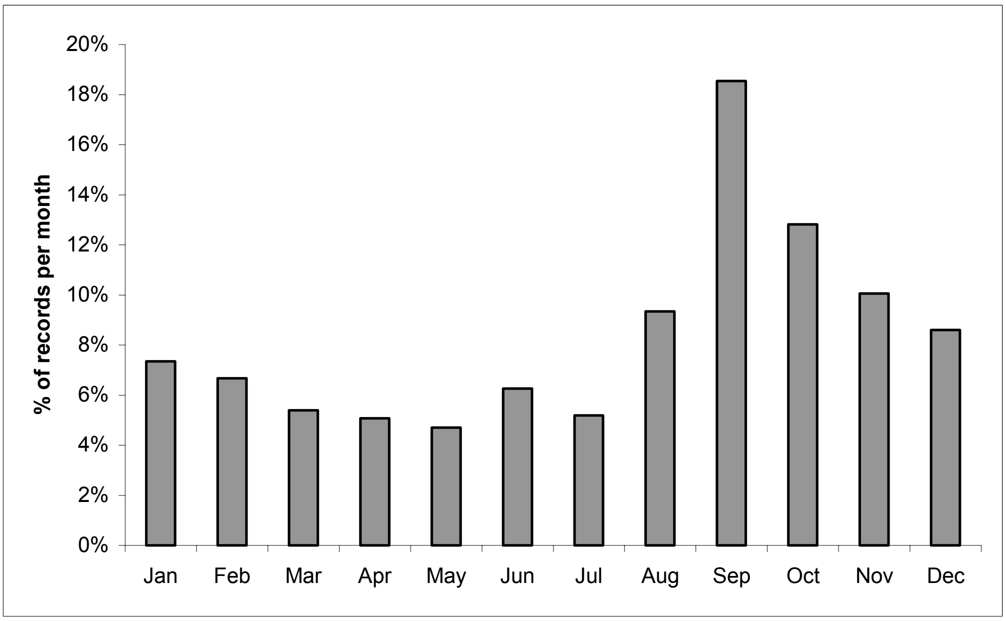


Figure G2.6 Proportion of Cormorants Recorded During WeBS Counts



The WeBS counts for common scoter suggest that this species is primarily a wintering one in the study area. Peak numbers generally occurred in December, with few birds recorded between April and September. However, care should be taken in the interpretation of these data in isolation. As they are terrestrial counts, part of the reason for the decline in spring may be that the birds move further offshore (and hence are less detectable by the WeBS counts).

Cormorant is present in the study area year-round, with peak numbers in autumn (possibly reflecting increases in the population through recruitment of young birds).

In addition, a range of other marine species have been recorded during the WeBS counts, including divers, great crested grebe, scaup and red-breasted merganser, but none approached national importance (other than great crested grebe at one site, Lavan Sands).

G3 SEABIRDS AT SEA DATA

Table G3.1 JNCC Seabirds at Sea Bird Densities, taken from Stone et al. 1995. All densities are numbers of birds per km². A blank cell indicates no data available for that species/period.

Species	Season	Grid Square: Wind farm	West	East	North-west	North	North-east
Divers	April-May	0	0	0.1-0.49		0	0
Divers	June-September	0	0	0	0	0	0
Divers	October-November	0	0	0	0	0	0
Divers	December-March	0.5-0.99	0.5-0.99	0.5-0.99	0	0	0.01-0.09
Red-throated diver	April-May			0		0	0
Red-throated diver	June-September	0.01-0.09	0	0.01-0.09	0	0	0
Red-throated diver	October-November	0	0	0	0	0	0
Red-throated diver	December-March	0	0	0	0	0	0
Fulmar	March-April	0.01-0.99	0.01-0.99	0	0.01-0.99	0.01-0.99	0.01-0.99
Fulmar	May-July	0.01-0.99	0.01-0.99	0	0.01-0.99	0.01-0.99	0.01-0.99
Fulmar	August-November	0.01-0.99	0.01-0.99	0	0.01-0.99	0.01-0.99	0.01-0.99
Fulmar	December-February	0	0	0	0	0.01-0.99	0
Manx shearwater	March-April	0	0	0	0	0	0
Manx shearwater	May-June	0	0	0	0	0	0
Manx shearwater	July-August	0	0.01-0.99	0	0.01-0.99	0	0
Manx shearwater	September-October	0	0.01-0.99	0.01-0.99	0	0	0
Manx shearwater	November-February	0	0	0	0	0	0
Leach's petrel	May-August	0	0	0	0	0	0
Leach's petrel	September-November	0	0	0	0	0.01-0.09	0
Leach's petrel	December-April	0	0	0	0	0	0
Gannet	March-April	0	0	0	0	0.01-0.99	0.01-0.99
Gannet	May-August	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99
Gannet	September-October	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99
Gannet	November-February	0.01-0.99	0	0	0.01-0.99	0	0
Cormorant	March-April	0		0	0	0	0
Cormorant	May-September	0.1-0.19	0.1-0.19	0.2-0.49	0	0	0.2-0.49
Cormorant	October-February	0	0		0	0	

Species	Season	Grid Square:					
Shag	March-April	0		0	0	0	0
Shag	May-August	0	0.01-0.49	0	0	0	0
Shag	September-October	0.01-0.49	0	0	0	0	0.01-0.49
Shag	November-February	0	0	0	0	0	0
Common Scoter	January-April	1-4.99	0		0	0	0.01-0.99
Common Scoter	May-June	0	0	0	0	0	0.01-0.99
Common Scoter	July-September	0	0	0.01-0.99	0	0	0
Common Scoter	October-December	0	0	0	0	0	1-4.99
Red-breasted merganser	May-October	0	0.01-0.49	0	0	0	0
Red-breasted merganser	November-April	0	0	0	0	0	0
Artic skua	April-June		0	0	0	0	0
Artic skua	July	0	0	0	0	0	0
Artic skua	August-October	0	0	0.01-0.09	0	0.01-0.09	0.01-0.09
Artic skua	November-March	0	0	0	0	0	0
Great skua	April-June		0	0	0	0	0
Great skua	July-August	0	0	0	0	0	0
Great skua	September-October	0	0	0	0	0.01-0.19	0.01-0.19
Little gull	March-May	0		0	0	0	0
Little gull	June-July	0	0	0	0	0	0
Little gull	August-November	0	0	0	0	0	0.1-0.19
Little gull	December-February		0	0	0	0	0
Black-headed gull	March-April	0		0	0	0	0
Black-headed gull	May-June		0		0	0	0.2-0.49
Black-headed gull	July-September	0	0.1-0.19	0	0	0	0.01-0.09
Black-headed gull	October-February	0	0		0	0	0.01-0.09
Common gull	March-April	0			0	0.01-0.19	0.5-0.99
Common gull	May-June		0	0	0	0	0.01-0.19
Common gull	July-September	0	0.01-0.19	0	0	0	0
Common gull	October-February	0	0	0	0	0.01-0.19	
Lesser black-backed gull	April-June		0	0.01-0.99	0	2-4.99	0.01-0.99
Lesser black-backed gull	July-August	0	0.01-0.99	0.01-0.99	0	0.01-0.99	0.01-0.99
Lesser black-backed gull	September-October	0.01-0.99	0.01-0.99	0.01-0.99	0	0.01-0.99	0.01-0.99
Lesser black-backed gull	November-March	0	0	2-4.99	0.01-0.99	1-1.99	0.01-0.99
Herring gull	March-April	0		1-1.99	0	0.01-0.99	0.01-0.99
Herring gull	May-June		0	1-1.99	0	0	0.01-0.99
Herring gull	July-October	0.01-0.99	0.01-0.99	0.01-0.99	0	0.01-0.99	0.01-0.99

Species	Season	Grid Square:					
Herring gull	November-February	0.01-0.99	0.01-0.99	2-4.99	0.01-0.99	0.01-0.99	1-1.99
Greater black-backed gull	March-April	0		0	0	0	0.01-0.99
Greater black-backed gull	May-July	0.01-0.99	0	0.01-0.99	0	0.01-0.99	0.01-0.99
Greater black-backed gull	August-October	0.01-0.99	0.01-0.99	0.01-0.99	0	0.01-0.99	0.01-0.99
Greater black-backed gull	November-February	0	0.01-0.99	1-1.99	0.01-0.99	1-1.99	0.01-0.99
Kittiwake	April-May	0.01-0.99	0.01-0.99	0.01-0.99	0	0.01-0.99	0.01-0.99
Kittiwake	June-July	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99
Kittiwake	August-October	0.01-0.99	0.01-0.99	0.01-0.99	1-1.99	0.01-0.99	0.01-0.99
Kittiwake	November-March	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99
Terns	March-April	0		0	0	0	0.01-0.19
Terns	May-July	0	0.2-0.49	0.5-0.99	0	0	0
Terns	August-September	0.01-0.19	0.01-0.19	0.5-0.99	0.2-0.49	0.01-0.19	0.01-0.19
Terns	October-February	0	0	0	0	0	0
Sandwich tern	March-April	0		0	0	0	0.01-0.09
Sandwich tern	May-August	0	0	0	0	0	0
Sandwich tern	September-October	0	0.01-0.09	0	0	0	0.01-0.09
Common/Arctic tern	April-June		0	0.5-0.99	0	0	0
Common/Arctic tern	July-September	0.01-0.09	0.01-0.09	0.5-0.99	0.1-0.49	0.01-0.09	0.1-0.49
Guillemot	March-April	1-1.99		0	0.01-0.99	0.01-0.99	0.01-0.99
Guillemot	May-June		0	0	0	0	0.01-0.99
Guillemot	July	0.01-0.99	2-4.99	0.01-0.99	2-4.99	0.01-0.99	0.01-0.99
Guillemot	August		0.01-0.99	0		0	0.01-0.99
Guillemot	September-October	0.01-0.99	1-1.99	2-4.99	2-4.99	0.01-0.99	1-1.99
Guillemot	November-February	0	1-1.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99
Razorbill	April-June		0	0	0	0.01-0.99	0.01-0.99
Razorbill	July	0	0.01-0.99	0	0.01-0.99	0	0
Razorbill	August-September	0	0.01-0.99	0	1-1.99	0	0
Razorbill	October-January	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99	0.01-0.99
Razorbill	February-March	0		0	0.01-0.99	0.01-0.99	0
Black guillemot	April-July	0	0.01-0.19	0	0	0	0
Black guillemot	August-September	0	0	0	0	0	0
Black guillemot	October-March	0	0	0	0	0	0
Puffin	April-May			0		0	0
Puffin	June-July	0	0.01-0.99	0	0.01-0.99	0.01-0.99	0
Puffin	August-September	0	0	0	0.01-0.99	0.01-0.99	0
Puffin	October-January	0	0	0	0	0	0

Species	Season	Grid Square:				
Puffin	February-March	0	0	0	0	0

Figure G2.6 Aerial Survey Flight Transects Taken During Collection of JNCC Data (Source: Barton et al, 1994)

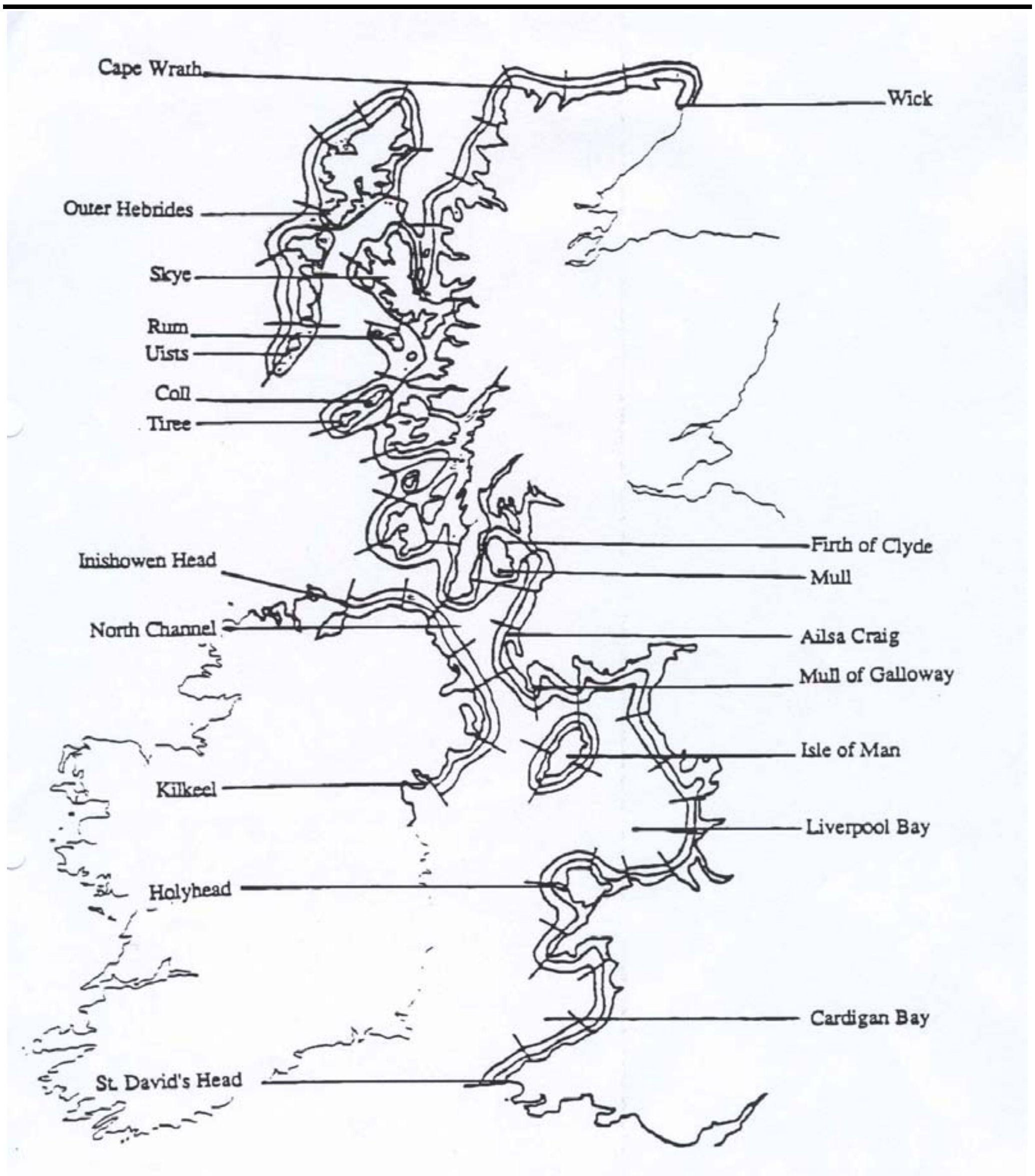


Table G3.2 North Wales Coast Study Area Breeding Seabird Colonies.

Site	Species	Breeding population (no. of pairs)	Year (most recent published data)	Importance
Puffin Island (Ynys Seiriol)	**Cormorant**	**400**	**1993**	**International**
[SSSI]	Lesser black-backed gull	54+	1991	Local
	Herring gull	171+	1991	Local
	Great black-backed gull	1-11	1991	
	Kittiwake	101-1000	1991	Regional
	Guillemot	101-1000	1991	Regional
	Razorbill	101-1000	1991	Regional
	Black guillemot	4	1991	Regional
	Puffin	11-100	1991	Regional
Little Orme Head (Creigiau Rhiwledyn)	**Cormorant**	**171**	**1999**	**National**
[SSSI]	Lesser black-backed gull	13-53	1991	Local
	Herring gull	60-170	1991	Local
	Shag	1-8	1991	Local
Gronant	**Little tern**	**86**	**1999**	**National**
[SSSI]	Black-headed gull	1-14	1991	
Dee Estuary (Shotton steelworks)	**Common tern**	**433**	**1999**	**National**
Great Ormes Head	Fulmar	c.1000	1991	Regional
[SSSI]	Kittiwake	c.3000	1991	Regional
	Guillemot	c.3000	1991	Regional
	Razorbill	30	1991	Regional
	Lesser black-backed gull	13-53	1991	Local
	Herring gull	60-170	1991	Local
	Great black-backed gull	3-10	1991	
Rhyl-Prestatyn	Lesser black-backed gull	13-53	1991	Local
	Herring gull	15-59	1991	Local

G4 COMPARISON OF THE PREFERENCE FOR THE WIND FARM SITE WITH OTHER PARTS OF THE STUDY AREA

Table G4.1 Comparison of the Preference for Use of the Wind Farm Site by Birds (Source: Fox & Petersen, 2002b)

Species	Wind park site			Wind park site + 2km			Wind park site + 4 km			
	M	D	P	M	D	P	M	D	P	N
Diver spp.	1,75	0,16	n.s.	4,39	-0,12	n.s.	12,28	0,03	n.s.	114
Shag/Cormorant	0,16	-0,78	*	0,64	-0,80	***	0,96	-0,86	***	626
Common Scoter	0,03	-0,96	***	0,76	-0,77	***	29,83	0,53	***	14943
Herring/Common Gull	0,65	-0,33	n.s.	3,27	-0,27	n.s.	7,84	-0,22	n.s.	153
Black-backed Gulls	0,00	-1,00	n.s.	0,90	-0,73	n.s.	3,60	-0,56	*	111
Kittiwake	1,29	0,01	n.s.	7,33	0,15	n.s.	26,72	0,47	***	232
Auk/Guillemot	0,45	-0,48	n.s.	3,78	-0,20	n.s.	7,87	-0,21	**	661
% of total transect covered	1,28			5,53				11,67		

Mean number of birds encountered per kilometre aerial transect surveyed (M) in the wind park area, wind park area plus 2 km and in the wind park area plus 4km. Also shown are the total numbers of birds for each category recorded throughout the three surveys (November and December 2001 and January 2002) from the total reference area. For each category and area, the Jacobs Index value (D) is given which varies between -1 (complete avoidance) and 1 (complete selection). The last column for each species category and area is the probability that these encounter rates differ from those of the entire area, based on one sample chi-squared tests. Values (P) are probabilities using standard statistical notation, n.s. represents P > 0.05, * P<0.05, ** P<0.01, *** P<0.001.

In summary, all birds showed either no difference between the reference area and wind farm site, or appeared to show significant avoidance of the wind farm site (as in the case of Cormorant/Shag and Common Scoter). The same pattern held for the wind farm site and the 2 km area around. Common Scoter and Kittiwake encounter rates were significantly higher in the wind farm site and an area 4 km about its periphery than in the reference area as a whole.

G5 *COLLISION RISK MODEL*

G5.1 *THE MODEL*

The collision risk model used in this assessment is the one developed by SNH and BWEA (Percival *et al,* 1999, Band, 2000). Details of the model are given in these two publications. The model runs as a two-stage process. Firstly the risk is calculated making the assumption that flight patterns are unaffected by the presence of the wind turbines, i.e. that no avoidance action is taken. This is essentially a mechanistic calculation, with the collision risk calculated as the product of (i) the probability of a bird flying through the rotor swept area, and (ii) the probability of a bird colliding if it does so. This probability is then multiplied by the estimated numbers of bird movements through the wind farm rotors at the risk height (i.e. the height of the rotating rotor blades) in order to estimate the theoretical numbers at risk of collision if they take no avoiding action.

The second stage then incorporates the probability that the birds, rather than flying blindly into the turbines, will actually take a degree of avoiding action (as has been shown to occur in all studies of birds at existing wind farms, with avoidance rates typically well in excess of 99%, Percival 2000). To determine the avoidance rate, a collision risk model is run for the parameters of the study wind farm, to estimate the number of collisions that would have occurred without avoidance. The collision rate is then calculated as the ratio of the actual number of collisions to the number predicted without avoidance, and the avoidance rate is simply the collision rate subtracted from one.

As such data are not available for any offshore wind farms, a worst-case approach has been taken, using the lowest avoidance rate reported for waterfowl species in any study. This has been taken as the collision rate reported at Blyth Harbour (Still *et al*. 1995, Painter *et al*. 1999), where an avoidance rate of 99.62% was estimated using the same standard collision risk model.

G5.2 *INPUT DATA*

G5.2.1 *Common Scoter*

Numbers at risk - There are two particular ways in which common scoter may be at risk of collision with the wind turbines, (a) during local movements for those using the area in proximity to wind turbines (this has been taken for the purposes of this assessment as the population in the wind farm area plus a 2km buffer), and (b) longer distance movements, which would be less frequent but there would be potentially larger numbers involved (for this assessment it has been assumed that the whole of the study area moves through the wind farm on arrival at the site and on departure from it, i.e. twice per year). The aerial surveys found no concentrations of scoters to the seaward side of the wind farm, so no regular large-scale movements through the wind farm would be likely (and none have been observed).

The numbers of scoters in each of these categories has been estimated from the aerial survey data. The maximum study area count was 6,127, but given that the survey is unlikely to have detected all of the birds, the actual population may be as high as 10,000 (1). This higher value has been used for the purposes of this assessment.

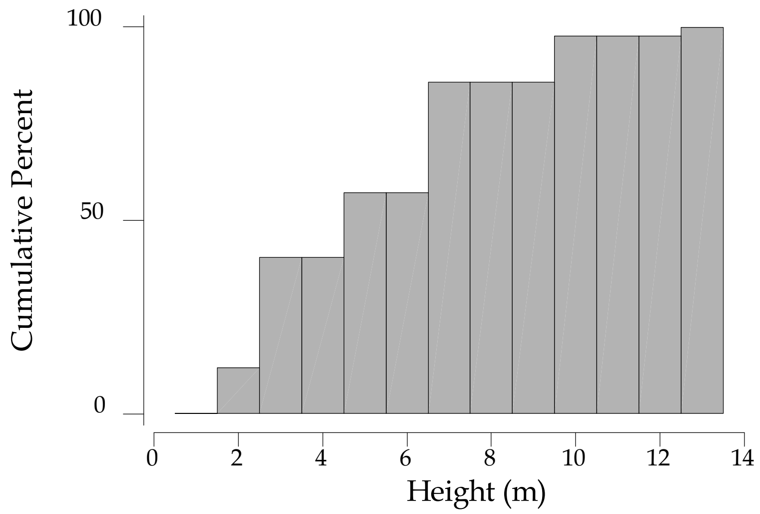
The proportion of this population that occurs in wind farm area (plus a 2km buffer) has been determined from the aerial surveys (Fox & Petersen, 2002b). Overall, 0.03% of the scoters were recorded within the wind farm area itself, 0.76% within that area and a 2km buffer, and 29.8% in that area and a 4km buffer. This would give population estimates of 3 in the wind farm, 76 in the wind farm plus 2km buffer and 2,980 in the wind farm plus 4km buffer.

Some limited data of scoter flight movements through the wind farm area are available from a boat survey carried out in January 2002. During six hours' observations within the wind farm, only one flock of 15 scoters and one additional single bird were noted. However this information was insufficient to reliably estimate movement rates. Instead the numbers flying through were estimated from the numbers in the area. It was assumed that birds found within the wind farm area and 2km buffer flew through the wind farm twice per day, and additionally that the whole study area population flew through twice per season (see above).

Flight heights – An important component of the collision risk is the height above the sea at which the birds fly. The turbines will be on towers with a hub height of 85m and will have a rotor diameter of up to 120m, so the blades will be rotating between 25m and 145m above the sea. Thus in order for the birds to collide with these, they would need to be flying at this height. The scoter flight heights recorded during the January 2002 boat surveys are summarised in *Figure G5.1*. The maximum flight height recorded was 13m, with just over half of the flights below 5m. No flights at all were recorded at rotor height. This would indicate that the collision risk for scoters would actually be very low indeed. However, in the worst case analysis carried out for the assessment modelling, it was assumed that all the birds were flying at rotor height.

(1) Use of distance sampling techniques to estimate numbers indicated a minimum population of approximately 8,000 birds.

Figure G5.1 Common scoter flight heights, from boat survey Jan 2002 (n=42 flocks). Data have been presented as cumulative percentage of flocks observed flying. Note: maximum height recorded was 13m.



Other input data - The other input data for the scoter collision risk modelling were taken from the published literature. Body size was obtained from Cramp (1998), using an average body length of 0.49m and an average wingspan of 0.85m. Flight speeds for scoter were not available, so instead the value for eider duck in Campbell & Lack (1985) was used, 21 $m.s^{-1}$.

Divers

Numbers at risk – Unlike the common scoters, there were no major concentrations of divers found within the study area during the aerial surveys. Therefore the main collision risk would be during local movements for those using the area in proximity to wind turbines (this has been taken for the purposes of this assessment as the population in the wind farm area plus a 2km buffer).

The numbers of divers that might be affected has been estimated from the aerial survey data. The maximum study area count was 60, but given that the survey is unlikely to have detected all of the birds, the actual population may be as high as 200. This higher value has been used for the purposes of this assessment.

It was not possible to separate all of the divers seen during the aerial surveys into species, so for the purposes of this assessment they have all been taken together. The large majority of the birds were almost certainly red-throated divers (*pers comm* Peter Cranswick, 2002), and 28 of the 29 divers seen during the January boat surveys were also this species (the other one being a great northern diver).

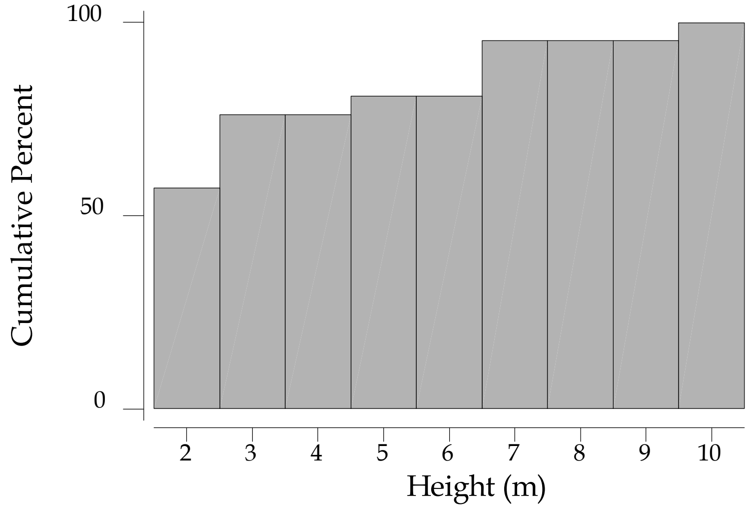
The proportion of this population that occurs in wind farm area and its surrounds has been determined from the aerial surveys (ref. NERI report). Overall, 1.73% of the divers were recorded within the wind farm area itself, 4.39% within that area and a 2km buffer, and 12.28% in that area and a 4km buffer. This would give population estimates of 3, 9 and 24 in the wind farm, wind farm plus 2km buffer and wind farm plus 4km buffer respectively.

Some limited data on diver flight movements through the wind farm area are available from a boat survey carried out in January 2002. During six hours' observations within the wind farm, 9 over-flying birds were noted. However this information was insufficient to reliably estimate movement rates. Instead the numbers flying through were estimated from the numbers in the area. It was assumed that birds found within the wind farm area and 2km buffer (9) flew through the wind farm twice per day.

Flight heights – As discussed in the scoter section above, height above the sea at which the birds fly is an important component of the collision risk. The turbines will be on towers with a hub height of 85m and will have a rotor diameter of up to 120m, so the blades will be rotating between 25m and 145m above the sea. Thus in order for the birds to collide with these, they would need to be flying at this height. The diver flight heights recorded during the January 2002 boat surveys are summarised in *FigureG5.2*. The maximum flight height recorded was 10m, with just over half of the flights below 2m. No flights at all were recorded at rotor height. This would indicate that the collision risk for scoters would actually be very low indeed. However, in the worst case analysis carried out for the assessment modelling, it was assumed that all the birds were flying at rotor height.

Other input data - The other input data for the diver collision risk modelling were taken from the published literature. Body size was obtained from Cramp (1998), using an average body length of 0.61m and an average wingspan of 1.11m. Flight speed was taken from Campbell & Lack (1985); 17 $m.s^{-1}$.

Figure G5.2 Red-throated diver flight heights, from boat survey Jan 2002 (n=21 flocks). Data have been presented as cumulative percentage of flocks observed flying. Note: maximum height recorded was 10m.



Migrant waterfowl

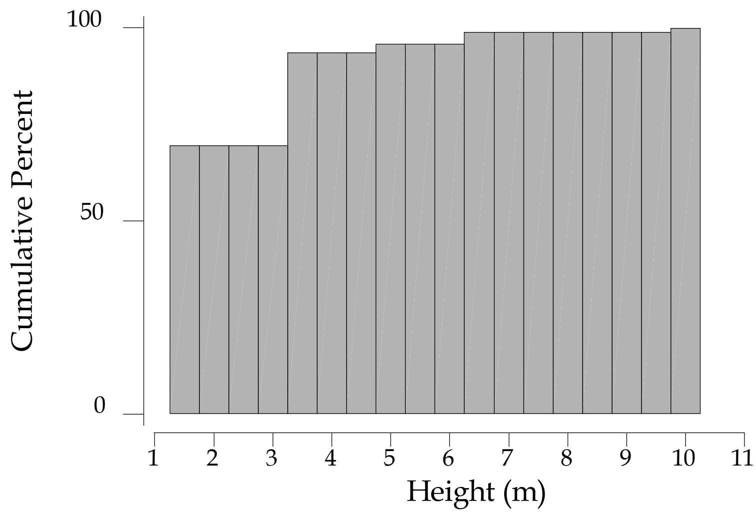
Consultees raised migrant waterfowl as another group of birds that could be a possible collision issue. Their main concern was possible collision mortality affecting the internationally important estuarine populations wintering in the study area (notably the Dee Estuary and Lavan Sands Special Protection Areas). Flocks from these important sites may potentially fly through the wind farm area whilst moving between wintering areas, and between wintering and breeding areas.

Studies of bird flight behaviour have shown that bird species such as those for which the SPAs are important generally fly in close proximity (within 1km) of the coast during such movements (Dirksen *et al,* 1998). Generally collision problems with such species are only likely to occur when a wind farm lies on a flight route that is used frequently by large numbers of birds, e.g. between a feeding and a roosting area (Percival, 2001). As no data were available on the actual movements of such species through the site, a worst case collision risk analysis was carried out, assuming that all of the wintering waterfowl populations within the study area flew through the wind farm twice per year. In the absence of any flight height data on these species, it was also assumed that all flew at rotor height (again extremely unlikely given general information on these species' flight behaviour, (*eg* Dirksen *et al,* 1998).

Other Species

There are two further groups of birds that might over-fly the proposed wind farm and hence be at risk of collision, other seabird species, and landbird migrants. Of the other seabird species, those most likely to occur in sufficient numbers to be at risk of collision impacts are cormorant, gulls and auks. Cormorants have been shown to have very high avoidance rates of wind turbines. For example at Blyth Harbour about 50-100 birds were flying through the wind farm on a daily basis and only a single collision was reported in a study lasting over 6 years (Painter *et al,* 1999). Gulls have been reported as collision victims at many coastal wind farms (Percival, 2000), but this is generally a result of their high abundance at such sites, and there is no evidence that they are particularly susceptible to collisions. There is no such information for auks, as they have not been studies at any existing wind farms. Collision rates would however, be likely to be negligible given their flight behaviour (flying close to the sea surface and well below rotor height, see *Figure G5.3*).

Figure G5.3 ***Auk (guillemot and razorbill) flight heights, from boat survey Jan 2002 (n=95 flocks). Data have been presented as cumulative percentage of flocks observed flying. Note: maximum height recorded was 10m.***



Landbird migrants fly over the sea during long-distance migration, and it is likely that the Rhyl Flats site will be over-flown by at least some of these birds. Studies at onshore coastal wind farms (Winkelman 1992a and 1992b) have reported collision rates of 0.01-0.02% of birds passing through the wind farm, equivalent to 1 in 5-10,000 individuals. Collisions would therefore only result in a significant adverse effect if many tens of thousands of birds were regularly passing through the wind farm. Such an occurrence at Rhyl Flats would be very unlikely indeed: migration over the sea occurs over broad front (Alerstam, 1990), and there are no topographical features to concentrate birds through the wind farm. The only possible problems might occur if these birds were attracted to the wind farm, *eg* by bright continuous lighting. In order to ensure that this does not occur as a result of the navigational lighting on the wind turbines, use of such lighting should be minimised, and flashing lights of as low intensity as possible should be used (Percival, 2001).

Flashing/strobe white lights are generally thought to be less of an attractant than continuous or red light, or rotating beams (Ogden, 1996).

G6 SIGNIFICANCE CRITERIA

The following tables (*Tables G6.1 – 6.3*) have been taken from the draft methodology for assessing the effects of wind farms on ornithological interests being developed by the British Wind Energy Association and Scottish Natural Heritage (Percival *et al*, 1999; Band, 2000).

Table G6.1 Magnitude

VERY HIGH	Total loss or very major alteration to key elements/ features of the baseline conditions such that the post development character/ composition/ attributes will be fundamentally changed and may be lost from the site altogether. *Guide: < 20% of population / habitat remains*
HIGH	Major loss or major alteration to key elements/ features of the baseline (pre-development) conditions such that post development character/ composition/ attributes will be fundamentally changed. *Guide: 20-80% of population/ habitat lost*
MEDIUM	Loss or alteration to one or more key elements/features of the baseline conditions such that post development character/composition/attributes of baseline will be partially changed. *Guide: 5-20% of population/ habitat lost*
LOW	Minor shift away from baseline conditions. Change arising from the loss/alteration will be discernible but underlying character/composition/attributes of baseline condition will be similar to pre-development circumstances/patterns. *Guide: 1-5% of population/ habitat lost*
NEGLIGIBLE	Very slight change from baseline condition. Change barely distinguishable, approximating to the "no change" situation. *Guide: < 1% population/ habitat lost*

Table G6.2 Sensitivity

SENSITIVITY	**DETERMINING FACTOR**
VERY HIGH	Species which form the cited interest of SPAs and SSSIs. Cited means mentioned in the citation text for the site as a species (or as part of an assemblage of species) for which the site is designated (SPAs) or notified (SSSIs).
HIGH	Species which contribute to the integrity of an SPA or SSSI but which are not cited as species (or as part of an assemblage of species) for which the site is designated (SPAs) or notified (SSSIs) Ecologically sensitive species such as rare birds and contain birds of prey (see above list) Species present in nationally important numbers (>1% UK population)
MEDIUM	Species on Annex 1 of the EC Birds Directive Species present in regionally important numbers (>1% regional population) Species occurring within SPAs and SSSIs but not crucial to integrity of site Species listed as priority species in UK Biodiversity Action Plan subject

	to special conservation measures Species in Schedule 1 of the Wildlife & Countryside Act 1981 (applies to disturbance impacts only)
LOW	Any other species of conservation interest, eg species listed in Birds of Conservation Concern (see UK Biodiversity Action Plan) not covered above

Table G6.3 *Significance Matrix: Combining Magnitude and Sensitivity to Assess Significance*

SIGNIFICANCE		**G8 SENSITIVITY**			
		Very high	***High***	***Medium***	***Low***
Magnitude	VERY HIGH	Very high	Very high	High	Medium
	.1.1 High	Very high	Very high	Medium	Low
	Medium	Very high	High	Low	Very low
	Low	Medium	Low	Low	Very low
	Negligible	Low	Very low	Very low	Very low

Interpretation of the significance ratings should be as follows:

- **Very low** and **low** are not normally of concern, though normal design care should be exercised to minimise impacts.
- **Very high** and **high** represent a highly significant impact on bird populations and would warrant refusal of a planning proposal.
- **Medium** represents a potentially significant impact that requires careful individual assessment. Such an impact could warrant planning refusal, but it may be of a scale that can be resolved by revised design or appropriate mitigation.

G7.1 Ornithological Boat Survey Results: Constable Bank / Rhyl Flats 10/01/02

Date	**Wind**	**Cloud (scale 1-8)**	**Rain (scale 1-6)**	**Observers**	**Boat**
10/01/2002	**2 – 3 SE**	**4**	**0**	**J Clark P Brown**	**Coastal Guardian**

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
Start 09.30	T15	N53 º22.550 W003 º 36.350	1	Guillemot	- 300 yds	F	180º	5ft
09.36	T15		1	Razorbill	- 300yds	S		
09.38	T15		1	Guillemot	- 300yds	F	80º	5ft
09.43	T15		1	Guillemot	- 300yds	F	20º	10ft
09.54	T15		1	Red Throated Diver	+ 300yds	F	100º	5ft
09.55	T15		1	Razorbill	- 300yds	F	40º	5ft
09.57	T15		1	Guillemot	- 300yds	S		
09.58	T15		1	Guillemot	+ 300yds	F	180º	5ft
10.00	T15 – T11	start transect						
10.02	T15 – T11		1	Guillemot	+ 300yds	*F*	160º	5ft
10.04	T15 – T11		3	Guillemot	+ 300yds	F	40º	10ft
10.08	T11	N53º 23.162 W003º 38.398	3	Guillemot	+ 300yds	F	100º	5ft
10.15	T11		1	Guillemot	- 300yds	F	20º	10ft
10.16	T11		1	Guillemot	- 300yds	F	160º	10ft
10.25	T11		1	Guillemot	+ 300yds	S		
10.26	T11		3	Guillemot	+ 300yds	F	40º	5ft

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
10.36	T11 – T07	start transect						
10.42	T07	N53º 23.370 W003º 39.562	1	Red Throated Diver	+ 300yds	F	40º	5ft
10.50	T07		1	Guillemot	+ 300yds	F	50º	5ft
10.52	T07		1	Common Scoter	+ 300yds	F	50º	5ft
10.56	T07		1	Guillemot	- 300yds	F	260º	5ft
10.59	T07		3	Guillemot	+ 300yds	F	260º	10ft
11.04	T07		1	Kittiwake	+ 300yds	S	10º	
11.05	T07		1	Guillemot	+ 300yds	F	60º	5ft
11.07	T07		1	Guillemot	+ 300yds	F	40º	10ft
11.12	T07		1	Guillemot	- 300yds	F	230º	15ft
11.12	T07 – T04	start transect						
11.14	T07 – T04		8	Guillemot	+ 300yds	F	70º	5ft
11.14	T07 – T04		1	Guillemot	+ 300yds	F	80º	5ft
11.15	T07 – T04		5	Guillemot	+ 300yds	F	70º	5ft
11.16	T07 – T04		2	Guillemot	+ 300yds	F	100º	5ft
11.18	T04	N53º 23.484 W003º 41.242	1	Guillemot	+ 300yds	F	10º	5ft
11.18	T04		1	Red Throated Diver	+ 300yds	F	340º	10ft
11.19	T04		1	Guillemot	- 300yds	F	320º	5ft
11.21	T04		4	Guillemot	+ 300yds	F	100º	5ft
11.24	T04		2	Guillemot	- 300yds	F	350º	5ft
11.24	T04		3	Guillemot	- 300yds	F	290º	30ft
11.25	T04		1	Guillemot	+ 300yds	F	0º	5ft
11.26	T04		2	Razorbill	- 300yds	F	280º	5ft
11.28	T04		1	Guillemot	+ 300yds	F	40º	5ft
11.29	T04		7	Guillemot	+ 300yds	F	100º	5ft

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
11.29	T04		2	Razorbill	+ 300yds	F	100º	5ft
11.30	T04		1	Guillemot	+ 300yds	F	340º	10ft
11.31	T04		1	Guillemot	+ 300yds	F	120º	5ft
11.33	T04		1	Razorbill	+ 300yds	S	350º	
11.34	T04		1	Razorbill	- 300yds	F	260º	5ft
11.38	T04		5	Guillemot	+ 300yds	F	40º	10ft
11.42	T04		1	Guillemot	+ 300yds	F	350º	5ft
11.46	T04		1	Guillemot	- 300yds	F	260º	5ft
11.47	T04 – T01	start transect						
11.48	T04 – T01		1	Guillemot	- 300yds	S		
11.48	T04 – T01		1	Guillemot	+ 300yds	F	130º	10ft
11.49	T04 – T01		1	Guillemot	- 300yds	S		
11.50	T04 – T01		1	Red Throated Diver	+ 300yds	F	200º	10ft
11.50	T04 – T01		7	Guillemot	+ 300yds	F	20º	10ft
11.51	T01	N53º 24.071 W003º 41.530						
11.52	T01		1	Razorbill	- 300yds	F	70º	5ft
11.54	T01		1	Atlantic Grey Seal	- 300yds		20º	
11.54	T01		1	Guillemot	+ 300yds	F	140º	5ft
11.55	T01		1	Great Northern Diver	+ 300yds	F	50º	5ft
11.57	T01		1	Guillemot	+ 300yds	F	10º	10ft
11.59	T01		1	Guillemot	+ 300yds	F	50º	10ft

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
12.01	T01		2	Guillemot	+ 300yds	F	280º	10ft
12.01	T01		4	Guillemot	+ 300yds	F	160º	5ft
12.02	T01		2	Guillemot	- 300yds	F	130º	5ft
12.05	T01		1	Guillemot	+ 300yds	F	340º	5ft
12.08	T01		1	Red Throated Diver	+ 300yds	F	50º	5ft
12.10	T01		1	Fulmar	+ 300yds	F	50º	20ft
12.10	T01		1	Guillemot	- 300yds	F	50º	5ft
12.12	T01		2	Red Throated Diver	- 300yds	F	50º	20ft
12.14	T01		1	Razorbill	- 300yds	F	260º	5ft
12.16	T01		1	Guillemot	- 300yds	F	50º	5ft
12.17	T01		2	Guillemot	+ 300yds	F	100º	5ft
12.19	T01		1	Guillemot	+ 300yds	F	250º	10ft
12.21	T01		1	Guillemot	+ 300yds	F	250º	10ft
12.23	T01		1	Guillemot	+ 300yds	F	50º	10ft
12.23	T01		1	Razorbill	- 300yds	F	310º	5ft
12.26	T01		3	Razorbill	- 300yds	F	120º	5ft
12.28	T01		1	Fulmar	- 300yds	F	310º	5ft
12.30	T01-T16	start transect						
12.32	T01– T16		1	Guillemot	+ 300yds	F	160º	5ft
12.33	T01– T16		1	Guillemot	- 300yds	F	160º	5ft
12.34	T01– T16		1	Guillemot	- 300yds	S		
12.34	T01– T16		1	Guillemot	- 300yds	F	40º	5ft
12.35	T01– T16		1	Guillemot	- 300yds	F	50º	10ft

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
12.38	T16	N53º 23.167 W003º 42.354						
12.39	T16		4	Guillemot	- 300yds	S	275º	
12.41	T16		7	Guillemot	+ 300yds	F	80º	15ft
12.41	T16		1	Guillemot	+ 300yds	F	120º	5ft
12.43	T16		16	Guillemot	+ 300yds	F	180º	5ft
12.44	T16		1	Guillemot	+ 300yds	F	120º	10ft
12.47	T16		1	Guillemot	+ 300yds	F	120º	5ft
12.51	T16		4	Guillemot	+ 300yds	F	150º	5ft
12.53	T16		1	Fulmar	+ 300yds	F	340º	5ft
12.54	T16		4	Guillemot	+ 300yds	F	60º	10ft
12.55	T16		1	Razorbill	- 300yds	F	270º	5ft
12.58	T16		1	Guillemot	- 300yds	F	110º	5ft
12.59	T16		3	Razorbill	+ 300yds	F	58º	20ft
13.05	T16		15	Common Scoter	+ 300yds	F	359º	20ft
13.05	T16		5	Guillemot	- 300yds	F	180º	5ft
13.07	T16-T20	start transect						
13.09	T16-T20		1	Razorbill	- 300yds	S		
13.10	T16-T20		8	Guillemot	+ 300yds	F	50º	20ft
13.14	T16-T20		4	Guillemot	+ 300yds	F	240º	5ft
13.15	T20	N53º 22.384 W003º41.554						
13.15	T20		4	Guillemot	- 300yds	F	200º	5ft
13.17	T20		1	Cormorant	+ 300yds	F	190º	10ft
13.18	T20		3	Razorbill	+ 300yds	F	30º	5ft
13.20	T20		1	Guillemot	- 300yds	F	100º	5ft
13.24	T20		1	Guillemot	- 300yds	F	50º	5ft
13.25	T20		1	Guillemot	+ 300yds	F	50º	5ft

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
13.31	T20		1	Guillemot	+ 300yds	F	260^{o}	5ft
13.37	T20		3	Guillemot	- 300yds	F	30^{o}	5ft
13.42	T20		1	Guillemot	+ 300yds	F	325^{o}	20ft
13.47	T20-T24	start transect						
13.48	T20-T24		1	Guillemot	+ 300yds	S		
13.51	T20-T24		3	Guillemot	- 300yds	S		
13.51	T20-T24		1	Razorbill	- 300yds	S		
13.55	T20-T24		3	Razorbill	+ 300yds	S		
13.57	T24	N53^{o} 22.199 W003^{o} 39 368	1	Red Throated Diver	+ 300yds	S	90^{o}	
13.57	T24		1	Red Throated Diver	+ 300yds	F	90^{o}	20ft
14.08	T24		1	Razorbill	- 300yds	F	160^{o}	5ft
14.08	T24		1	Guillemot	- 300yds	F	160^{o}	5ft
14.08	T24		1	Razorbill	+ 300yds	F	310^{o}	5ft
14.11	T24		1	Guillemot	- 300yds	F	140^{o}	5ft
14.26	T24		2	Guillemot	+ 300yds	S	90^{o}	
14.27	T24-T27	start transect						
14.32	T24-T27		1	Red Throated Diver	- 300yds	F	70^{o}	30ft
14.33	T24-T27		1	Guillemot	S			
14.34	T27	N53^{o} 22. 598 W003^{o} 38.243						
14.38	T27		1	Guillemot	+ 300yds	S	120^{o}	
14.39	T27		1	Razorbill	+ 300yds	F	50^{o}	10ft
14.41	T27		1	Guillemot	+ 300yds	S	50^{o}	
14.57	T27		1	Cormorant	+ 300yds	F	05^{o}	5ft

Time	Turbine	Position	Quantity	Species	Distance	Sitting or Flying	Direction	Height
14.57	T27		1	Guillemot	+ 300yds	F	280^o	10ft
15.01	T27		1	Guillemot	- 300yds	F	100^o	5ft
15.02	T27-T30	start transect						
15.02	T27-T30		1	Gannet	- 300yds	F	280^o	30ft
15.05	T27-T30		2	Cormorant	+ 300yds	F	350^o	10ft
15.08	T27-T30		1	Guillemot	+ 300yds	F	75^o	10ft
15.09	T30	N53^o 21.724 W003^o 37.150						
15.10	T30		1	Cormorant	+ 300yds	S	3^o	
15.22	T30		1	Razorbill	+ 300yds	F	190^o	10ft
15.23	T30		1	Guillemot	- 300yds	F	350^o	5ft
15.40		SURVEY COMPLETED						

G7.2 *Ornithological Boat Survey Results: Constable Bank / Rhyl Flats 11/01/02*

Date	Wind	Cloud	Rain	Observers	Boat
11/01/02	**S 2/3 increasing**	**7/8**	**Nil**	**J. Clark P. Brown**	**Sea Quest 11 (Rhyl)**

Time	Turbine	Position	Quantity	Species	Distance	Sitting or Flying	Direction	Height
08.14	start A (east > west)	N53^o 21.825 Woo3^o 31.591						

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
08.19	A		2	Cormorant	+ 300yds	F	70º	10ft
08.21	A		5	Common Scoter	- 300yds	F	210º	10ft
08.21	A		5	Common Scoter	+ 300yds	F	200º	5ft
08.22	A		3	Red Breasted Merganser	- 300yds	S		
08.23	A		9	Common Scoter	+ 300yds	F	90º	20ft
08.23	A		7	Common Scoter	+ 300yds	F	circles	5ft
08.24	A		3	Guillemot	- 300yds	S		
08.25	A		2	Common Scoter	+ 300yds	S		
08.25	A		1	Common Scoter	- 300yds	S		
08.26	A		1	Guillemot	+ 300yds	F	250º	5ft
08.26	A		1	Cormorant	- 300yds	F	50º	20ft
08.27	A		20	Common Scoter	+ 300yds	S		
08.28	A		1	Cormorant	+ 300yds	S		
08.29	A		14	Common Scoter	+ 300yds	F	210º	10ft
08.29	A		1	Common Scoter	+ 300yds	F	310º	15ft
08.30	A		3	Common Scoter	+ 300yds	F	20º	20ft
08.30	A		4	Common Scoter	+ 300yds	F	220º	20ft
08.31	A		14	Common Scoter	- 300yds	F	220º	15ft
08.31	A		50	Common Scoter	+ 300yds	F	90º	20ft
08.32	A		20	Common Scoter	- 300yds	S		
08.33	A		25	Common Scoter	- 300yds	F	350º	20ft
08.33	A		4	Common Scoter	+ 300yds	F	circles	20ft

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
08.34	A		10	Common Scoter	- 300yds	S		
08.35	A		1	Red Breasted Merganser	- 300yds	F	170^o	10ft
08.36	A		4	Common Scoter	- 300yds	F	130^o	10ft
08.36	A		16	Common Scoter	+ 300yds	F	220^o	15ft
08.37	A		40	Common Scoter	+ 300yds	F	220^o	30ft
08.38	A		1	Common Scoter	- 300yds	F	205^o	30ft
08.39	A		4	Common Scoter	+ 300yds	F	205^o	5ft
08.39	A		19	Common Scoter	+ 300yds	F	circles	20ft
08.40	A		12	Common Scoter	- 300yds	F	180^o	15ft
08.41	A		13	Common Scoter	+ 300yds	F	190^o	10ft
08.41	A		30	Common Scoter	+ 300yds	F	130^o	15ft
08.42	A		20	Common Scoter	+ 300yds	F	260^o	30ft
08.43	A		50	Common Scoter	- 300yds	S		
08.43	A		20	Common Scoter	+ 300yds	F	260^o	20ft
08.44	A		8	Common Scoter	+ 300yds	S		
08.45	A		4	Common Scoter	+ 300yds	F	200^o	10ft
08.45	A		7	Common Scoter	+ 300yds	F	190^o	30ft
08.46	A		10	Common Scoter	+ 300yds	F	200^o	10ft
08.47	A		6	Common Scoter	+ 300yds	F	190^o	30ft
08.48	A	N53^o 21. 976 W003^o 39. 939	2300	Common Scoter	+/- 300yds	S		
08.48	A		1	Fulmar	- 300yds	F	70^o	5ft
08.52	A		1	Cormorant	- 300yds	F	80^o	5ft
08.55	A		1	Razorbill	- 300yds	F	300^o	5ft
08.57	end A	N53^o 20. 810 W003^o 38. 939						

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
08.57	start B (east>west)	N53º20. 810 W003º 38. 939						
09.03	B		1	Cormorant	- 300yds	F	80º	5ft
09.05	B		1	Razorbill	- 300yds	F	300º	5ft
09.05	**B**		1	Great Crested Grebe	+ 300yds	F	125º	5ft
09.09	**B**		1	Razorbill	-300yds	S		
09.10	**B**		1	Velvet Scoter	- 300yds	F	circles	10ft
09.13	**B**		1	Guillemot	- 300yds	F	70º	5ft
09.14	**B**		1	Razorbill	- 300yds	S		
09.17	**B**		1	Fulmar	- 300yds	F	120º	5ft
09.25	**B**		1	Guillemot	- 300yds	S		
09.30	**B**		3	Razorbill	+ 300yds	S		
09.30	**end B**	N53º 21. 000 W003º 40.100						
09.40	start C (west>east)	N53º 20. 500 W003º 40. 830						
09.40	C		80	Common Scoter	- 300yds	F	260º	20ft
09.41	C		50	Common Scoter	+ 300yds	F	260º	40ft
09.43	C		2	Razorbill	- 300yds	S		
09.43	C		2	Guillemot	- 300yds	S		
09.44	C		1	Razorbill	- 300yds	S		
09.44	C		4	Common Scoter	+ 300yds	F	20º	15ft
09.44	C		2	Common Scoter	+ 300yds	F	circles	20ft
09.45	C		7	Common Scoter	+ 300yds	F	260º	20ft
09.45	C		12	Common Scoter	+ 300yds	F	250º	10ft
09.46	C		2	Common Scoter	+ 300yds	F	120º	15ft
09.47	C		2	Common Scoter	+ 300yds	F	270º	10ft

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
09.50	C		1	Red Throated Diver	+ 300yds	F	220º	5ft
09.56	C		2	Red Breasted Merganser	+ 300yds	F	45º	5ft
09.59	C		1	Red Throated Diver	+ 300yds	F	230º	5ft
10.01	C		1	Red Throated Diver	+ 300yds	F	240º	5ft
10.05	C		1	Red Throated Diver	+ 300yds	F	230º	5ft
10.06	C		1	Razorbill	- 300yds	S		
10.07	C		1	Cormorant	+ 300yds	S		
10.10	end C	N53º 21. 00 W003º 31. 200						
10.16	start D (east>west)	N53º 20. 500 W003º 31. 250						
10.18	D		1	Red Throated Diver	+ 300yds	F	200º	15ft
10.27	D		18	Common Scoter	+ 300yds	F	210º	10ft
10.27	D		11	Common Scoter	- 300yds	F	circles	10ft
10.28	D		1	Common Scoter	+ 300yds	F	170º	10ft
10.29	D		3	Common Scoter	+ 300yds	F	265º	5ft
10.30	D		22	Common Scoter	+ 300yds	F	circles	10ft
10.33	D	N53º 20. 287 W003º 35. 424	700	Common Scoter	+ 300yds	S		
10.34	D		7	Common Scoter	+ 300yds	S		
10.34	D		7	Common Scoter	- 300yds	S		
10.35	D		1	Razorbill	- 300yds	S		

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
10.44	D	N53º 20. 220 W003º 38. 424	1600	Common Scoter	+ 300yds	S		
10.46	D		50	Common Scoter	+ 300yds	S		
10.54	end D	N53º 20. 200 W003º 40. 350						
11.04	start E to dock (west>east)	N53º19. 200 W003º 41.100						
11.04	E		1	Red Throated Diver	+ 300yds	F	30º	10ft
11.07	E		1	Fulmar	- 300yds	F	circles	15ft
11.10	E		1	Razorbill	- 300yds	S		
11.11	E		1	Cormorant	- 300yds	S		
11.12	E		2	Red Throated Diver	+ 300yds	F	210º	5ft
11.17	E	N53º 19. 287 W003º 38. 170	1200	Common Scoter	1 mile N	S		
11.18	E		1	Red Throated Diver	+ 300yds	F	350º	5ft
11.20	E		3	Red Throated Diver	+ 300yds	F	220º	10ft
11.21	E		25	Shag	- 300yds	S		
11.22	E		1	Red Throated Diver	- 300yds	F	320º	5ft
11.24	E		2	Red Throated Diver	- 300yds	F	250º	20ft

Time	*Turbine*	*Position*	*Quantity*	*Species*	*Distance*	*Sitting or Flying*	*Direction*	*Height*
11.26	E		1	Red Throated Diver	- 300yds	F	160º	5ft
11.27	E	N53º 19.700 W003º 35. 300	350	Common Scoter	1mile	S		
11.30	E		1	Red Throated Diver	+ 300yds	F	270º	5ft
11.31	E		1	Red Throated Diver	- 300yds	S		
11.31	end E	approx. N53º 19. 500 W003º 34. 000						

G7.3 Ornithological Boat Survey Results: Constable Bank / Rhyl Flats 03/03/02

Date	*Wind*	*Cloud (scale1-8)*	*RAIN (SCALE 1-6)*	*Observers*	*BOAT*
03/03/2002	***W 4+***	***4***	***0***	***J. Clark and P. Brown***	***Coastal Guardian***

Time	**Turbine**	**Position**	**Depth (m)**	**Quantity**	**Species**	**Distance (m)**	**Sitting or Flying**	**Direction**	**Height (m)**
10.00	**T15**	**N53° 22. 58 W003° 36. 35**	**12.6**						
10.08	**T15**			**1**	**Cormorant**	**+ 300**	**F**	**328°**	**3**

10.12	**T15**			**1**	**Guillemot**	**200**	**S**		
10.14	**T15**			**1**	**Guillemot**	**+ 300**	**F**	**320°**	**3**
10.15	**T15**			**1**	**Fulmar**	**-50**	**F**	**140°**	**2**
10.16	**T15**			**1**	**Kittiwake**	**-50**	**F**	**150°**	**2**
10.16	**T15**			**1**	**Fulmar**	**-50**	**F**	**306°**	**2**
10.20	**T15**			**1**	**Razorbill**	**+ 300**	**F**	**320°**	**2**
10.22	**T15**			**1**	**Gannet**	**200**	**F**	**292°**	**2**
10.24	**T15**			**3**	**Guillemot**	**250**	**S**		
10.25	**T15**			**1**	**Razorbill**	**200**	**S**		
10.26	**T15**			**1**	**Kittiwake**	**-50**	**F**	**350°**	**5**
10.27	**T15**			**1**	**Guillemot**	**250**	**F**	**292°**	**2**
10.28	T15			3	Guillemot	+ 300	F	300°	2
10.30	T15			1	Kittiwake	-50	F	310°	3
10.32	T15 – T11	start transect							
10.33	T15 –T11			1	Kittiwake	-50	F	310°	3
10.37	T15 – T11			1	Razorbill	-50	S		
10.40	T15 – T11			1	Cormorant	250	F	100°	2
10.40	T15 – T11			1	Razorbill	-50	S		
10.41	T15 –T11			1	Razorbill	-50	F	140°	2
10.42	T15 – T11			2	Razorbill	200	F	280°	2
10.43	T15 – T11			1	Guillemot	-50	F	360°	2
10.43	T15 – T11			2	Razorbill	-50	F	360°	2
10.46	T11	N53° 23. 18 W003° 37.	16.6						

		99							
10.49	T11			1	Guillemot	-50	F	320º	2
10.52	T11			1	Fulmar	+ 300	F	15º	6
10.56	T11			1	Razorbill	+ 300	S		
10.57	T11			1	Cormorant	+ 300	F	110º	6
10.58	T11			1	Red Throated Diver	+ 300	F	110º	10
10.58	T11			1	Red Throated Diver	+ 300	F	350º	5
10.59	T11			1	Razorbill	200	S		
10.59	T11			1	Kittiwake	-50	F	280º	3
11.04	T11			1	Guillemot	+ 300	F	100º	3
11.05	T11			1	Guillemot	+ 300	F	100º	6
11.13	T11			1	Guillemot	200	F	130º	2
11.17	T11			2	Razorbill	+ 300	F	312º	2
11.18	T11 – T7	start transect		6	Guillemot	200	F	120º	5
11.23	T11 – T7			1	Guillemot	150	S		
11.24	T11 – T7			2	Guillemot	+ 300	F	290º	3
11.32	T7	N53º 23. 52 W003º 39. 44	20.5						
11.33	T7			1	Shag	250	S		
11.34	T7			4	Gannets	+ 300	Diving		20
11.34	T7			1	Cormorant	+ 300	F	150º	2
11.36	T7			8	Guillemot	+ 300	F	140º	3
11.41	T7			1	Red Throated Diver	+ 300	F	320º	10

11.43	T7			1	Fulmar	200	F	300º	6
11.46	T7			2	Kittiwake	300	F	210º	3
11.54	T7			1	Fulmar	-50	S		
11.59	T7				Guillemot	300	F	210º	3
12.00	T7 – T4	start transect							
12.03	T7 – T4			1	Guillemot	300	F	105º	3
12.03	T7 – T4			3	Fulmar	-50	S		
12.04	T7 – T4			2	Guillemot	-50	S		
12.10	T7 – T4			1	Guillemot	150	S		
12.13	T7 – T4			1	Guillemot	100	S		
12.13	T4	N53º 23.79 W003º 40.52	24.0						
12.14	T4			1	Razorbill	+ 300	F	260º	3
12.16	T4			1	Red Throated Diver	+ 300	F	110º	3
12.16	T4			1	Kittiwake	-50	F	310º	2
12.17	T4			1	Guillemot	200	F	42º	3
12.19	T4			3	Guillemot	250	F	100º	2
12.20	T4			1	Guillemot	50	F	20º	5
12.21	T4			1	Fulmar	-50	F	310º	2
12.23	T4			2	Cormorant	150	F	150º	3
12.25	T4			1	Kittiwake	-50	S		
12.25	T4			1	Fulmar	-50	F	300º	2
12.40	T4 – T1	start							

		transect							
12.47	T1	N53° 24. 07 W003° 41. 65	25.00						
12.48	T1			1	Fulmar	150	F	300°	3
12.50	T1			3	Guillemot	-50	F	130°	3
12.50	T1			2	Razorbill	-50	F	130°	3
12.56	T1			1	Shag	200	S		
12.57	T1			2	Guillemot	200	F	80°	2
12.58	T1			1	Guillemot	100	F	270°	3
13.00	T1			3	Guillemot	+ 300	F	280°	2
13.02	T1			1	Guillemot	-50	F	250°	2
13.03	T1			1	Guillemot	+ 300	F	280°	2
13.06	T1			1	Fulmar	-50	F	50°	2
13.11	T1			1	Cormorant	250	S		
13.12	T1			20	Guillemot	200	F	90°	5
13.12	T1			1	Guillemot	300	F	280°	2
13.15	T1 – T16	start transect		1	Fulmar	100	F	10°	2
13.16	T1 –T16			1	Gannet	100	F	280°	2
13.16	T1 – T16			1	Guillemot	100	F	160°	2
13.17	T1 – T16			1	Fulmar	-50	F	70°	2
13.22	T1 – T16			1	Fulmar	250	F	358°	2
13.24	T1 – T16			1	Guillemot	250	S		
13.24	T1 – T16			1	Cormorant	300	F	80°	2

13.26	T1 – T16			2	Guillemot	-50	S		
13.26	T16	N53^o 23. 01 W003^o 42. 34	23.00	2	Guillemot	100	S		
13.26	T16			2	Guillemot	-50	S		
13.28	T16			1	Guillemot	-50	S		
13.30	T16			1	Guillemot	-50	S		
13.30	T16			2	Razorbill	200	S		
13.32	T16			1	Fulmar	300	F	330^o	3
13.34	T16			1	Fulmar	50	F	45^o	5
13.35	T16			2	Guillemot	200	F	85^o	8
13.35	T16			1	Fulmar	-50	F	340^o	2
13.36	T16			2	Guillemot	50	F	300^o	2
13.36	T16			2	Red Throated Diver	250	F	80^o	2
13.37	T16			1	Kittiwake	-50	F	300^o	6
13.38	T16			5	Guillemot	300	F	85^o	2
13.39	T16			1	Guillemot	250	F	90^o	2
13.41	T16			1	Guillemot	250	F	292^o	2
13.46	T16			1	Guillemot	-50	F	220^o	12
13.49	T16			1	Guillemot	+ 300	F	70^o	5
13.50	T16			2	Guillemot	200	F	70^o	5
13.51	T16			2	Guillemot	+300	F	80^o	3
13.54	T16			6	Guillemot	+ 300	F	90^o	3
13.54	T16			20	Common Scoter	+ 300	F	90^o	6

13.56	T16			12	Common Scoter	+ 300	F	90º	2
13.58	T16			2	Razorbill	250	S		
13.59	T16 – T20	start transect							
14.00	T16 – T20			4	Guillemot	150	F	280º	2
14.03	T16 – T20			1	Guillemot	50	F	230º	2
14.04	T16 – T20			1	Red Throated Diver	150	F	280º	2
14.05	T16 – T20			3	Red Throated Diver	250	F	280º	2
14.06	T20	N53º 22. 67 W003º 40. 86							
14.07	T20			1	Kittiwake	250	S		
14.10	T20			2	Guillemot	300	S		
14.11	T20			1	Fulmar	+ 300	F	170º	2
14.12	T20			1	Red Throated Diver	+ 300	F	180º	6
14.14	T20			1	Fulmar	-50	F	170º	3
14.15	T20			1	Fulmar	150	F	20º	2
14.17	T20			1	Cormorant	300	F	130º	3
14.21	T20			1	Kittiwake	-50	F	240º	15
14.22	T20			1	Razorbill	+ 300	F	130º	3
14.24	T20			1	Guillemot	200	F	230º	2
14.28	T20			1	Fulmar	-50	F	280º	2
14.28	T20			1	Kittiwake	-50	F	360º	3
14.29	T20			1	Cormorant	50	F	140º	6
14.32	T20			1	Razorbill	300	S		

14.33	T20			1	Guillemot	150	S		
14.35	T20			1	Fulmar	100	F	330º	3
14.35	T20 – T24	start transect							
14.38	T20 – T24			1	Common Scoter	+ 300	F	280º	2
14.39	T20 – T24			2	Guillemot	+ 300	F	280º	2
14.40	T20 – T24			40	Common Scoter	+ 300	F	280º	5
14.40	T20 – T24			1	Shag	150	S		
14.41	T20 – T24			1	Kittiwake	-50	F	140º	12
14.41	T20 – T24			2	Razorbill	100	F	270º	3
14.43	T20 – T24			2	Red Throated Diver	200	F	230º	2
14.44	T24	N53º 22.33 W003º 39.43	15.0	1	Fulmar	150	F	340º	12
14.44	T24			1	Guillemot	-50	S		
14.45	T24			1	Shag	-50	S		
14.45	T24			1	Cormorant	200	F	160º	3
14.45	T24			2	Guillemot	+ 300	F	145º	3
14.47	T24			1	Fulmar	300	F	345º	2
14.51	T24			1	Shag	-50	S		
14.51	T24			1	Shag	200	S		
14.53	T24			1	Kittiwake	-50	F	280º	10
14.55	T24			1	Red Throated Diver	+ 300	F	140º	12
14.57	T24			1	Guillemot	200	F	160º	2
14.58	T24			1	Cormorant	+ 300	F	270º	3

14.59	T24			3	Guillemot	250	F	160º	2
15.00	T24			1	Fulmar	-50	F	320º	2
15.01	T24			1	Fulmar	+ 300	F	310º	3
15.01	T24			1	Cormorant	+ 300	F	275º	2
15.03	T24			1	Guillemot	+ 300	F	280º	2
15.04	T24			4	Fulmar	50	F	350º	3
15.04	T24			3	Guillemot	+ 300	F	280º	2
15.07	T24			1	Guillemot	+ 300	F	180º	2
15.07	T24			1	Guillemot	200	F	350º	2
15.08	T24			3	Kittiwake	-50	F	310º	8
15.12	T24			4	Kittiwake	200	F	310º	3
15.13	T24 – T27	start transect		3	Kittiwake	-50	F	360º	5
15.13	T24 – T27			1	Cormorant	+ 300	F	90º	3
15.14	T24 – T27			1	Shag	+ 300	F	180º	2
15.15	T24 – T27			1	Cormorant	100	F	280º	2
15.17	T24 – T27			3	Cormorant	+ 300	F	275º	2
15.17	T24 – T27			1	Shag	200	S		
15.18	T24 – T27			2	Guillemot	150	S		
15.18	T24 – T27			3	Common Scoter	+ 300	F	275º	3
15.21	T27	N53º 22.08 W003º 38.30		1	Fulmar	200	F	280º	2
15.24	T27			6	Red Throated Diver	150	S		
15.25	T27			2	Guillemot	300	S		

15.25	T27			1	Atlantic seal	300			
15.28	T27			1	Cormorant	300	F	280º	2
15.28	T27			2	Razorbill	200	S		
15.30	T27			1	Shag	150	F	200º	2
15.31	T27			1	Guillemot	-50	F	210º	2
15.31	T27			1	Cormorant	+ 300	F	85º	2
15.31	T27			1	Shag	+ 300	F	275º	2
15.33	T27			1	Shag	300	F	230º	2
15.34	T27			1	Guillemot	150	F	260º	2
15.35	T27			3	Cormorant	+ 300	F	230º	2
15.37	T27			1	Guillemot	120	S		
15.38	T27			1	Razorbill	150	S		
15.39	T27			1	Shag	300	F	230º	2
15.40	T27			1	Great Crested Grebe	300	S		
15.42	T27			5	Cormorant	200	F	230º	2
15.44	T27			1	Cormorant	250	F	240º	2
15.45	T27			1	Cormorant	300	F	230º	2
15.46	T27			1	Guillemot	50	F	240º	2
15.47	T27			1	Guillemot	200	F	275º	2
15.49	T27			1	Guillemot	-50	F	270º	2
15.50	T27 – T30	start transect		8	Cormorant	+ 300	F	230º	2
15.53	T27 – T30			3	Guillemot	200	F	280º	2
15.53	T27 – T30			2	Cormorant	200	F	260º	2

15.54	T27 – T30			2	Razorbill	200	S		
15.55	T27 – T30			4	Cormorant	+ 300	F	150º	2
15.55	T27 –T 30			5	Cormorant	300	F	230º	2
15.56	T27 – T30			4	Cormorant	300	F	230º	2
15.57	T27 – T30			2	Cormorant	+ 300	F	240	2
15.58	T30	N53º 21. 82 W003º 37.18	10.5						
16.00	T30			1	Guillemot	200	F	250º	2
16.01	T30			1	Red Throated Diver	150	F	180º	3
16.01	T30			6	Cormorant	+ 300	F	230º	2
16.02	T30			3	Cormorant	+ 300	F	85º	2
16.03	T30			4	Common Scoter	+ 300	F	70º	3
16.03	T30			1	Fulmar	+ 300	F	260º	3
16.05	T30			1	Fulmar	50	F	360º	3
16.07	T30			4	Common Scoter	300	S		
16.07	T30			1	Red Throated Diver	200	F	290º	2
16.07	T30			11	Cormorant	+ 300	F	240º	2
16.08	T30			7	Cormorant	+ 300	F	260º	2
16.09	T30			1	Fulmar	50	F	280º	3
16.10	T30			3	Kittiwake	50	F	280º	5
16.11	T30			7	Guillemot	250	F	70º	2
16.11	T30			2	Guillemot	300	F	275º	2
16.12	T30			3	Cormorant	250	F	230º	2
16.13	T30			1	Shag	300	S		

16.14	T30			1	Cormorant	+ 300	F	260^{o}	2
16.15	T30			3	Shag	250	F	275^{o}	2
16.16	T30			1	Shag	-50	F	280^{o}	2
16.18	T30			3	Cormorant	200	F	130^{o}	2
16.20	T30			7	Cormorant	120	F	240^{o}	2
16.21	T30			1	Guillemot	100	S		
16.21	T30			1	Kittiwake	-50	S		
16.23	T30			1	Razorbill	-50	S		
16.23	T30			2	Guillemot	150	F	275^{o}	2
16.23	T30			1	Cormorant	+ 300	F	220^{o}	2
16.24	T30			2	Cormorant	+ 300	F	220^{o}	2
16.25	T30			1	Cormorant	250	F	220^{o}	2
16.26	T30			1	Cormorant	200	F	270^{o}	2
16.28	end of survey								