

**COWRIE ASURV-02-09**

# Aerial Surveys of Round 3, Zone 5 for Waterbirds - Final Report

WWT Consulting  
Wildfowl & Wetlands Trust

20th May 2009

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## Executive Summary

Data on the numbers and distribution of waterbirds are required for the Strategic Environmental Assessments of Offshore Wind Farms (OWF). From February to April 2009, aerial surveys of waterbirds and seabirds were conducted off the Norfolk coast, UK, within the proposed boundary for Zone 5 of the Round 3 Development areas (Crown Estate 2008).

The Zone 5 area was divided into seven roughly equal-sized survey blocks to allow maximum coverage within each survey day. Where possible adjacent blocks were surveyed synchronously, minimizing the likelihood of double-counting due to local movements of birds between survey days.

Surveys used a standard methodology that allows collection of data suitable for distance analysis, as well as accurate plotting of locations of individual observations.

This report identifies that the area covered by the seven survey blocks supports a diverse range of waterbirds, including high numbers of Red-throated Divers. The combined area was shown to support over 3% of Britain's wintering Red-throated Diver population (see O'Brien *et al.* 2008), and within this a relatively small area corresponding to two survey blocks to the east of Lowestoft, Norfolk, supports over 2%.

Caution should be used when comparing data collected during the April surveys with data from earlier dates due to migration of wintering birds away from UK waters, resulting in reduction in numbers from late March onwards, and the influx of summer breeding species such as terns.

## **Glossary**

### **Acronyms**

**OWF – Offshore Wind Farm**

**SPA – Special Protection Area**

**COWRIE – Collaborative Offshore Wind Research into the Environment**

**WWT – Wildfowl and Wetlands Trust**

**NERI – National Environment Research Council**

**GMT – Greenwich Mean Time**

**GPS – Global Positioning System**

### **Units**

**Kilometres per hour ( $\text{kmh}^{-1}$ )**

**Knots**

**Metres (m)**

**Kilometres (km)**

**Beaufort scale**

**Octads**



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# 1. Introduction

Data on the numbers and distribution of waterbirds and seabirds in UK inshore waters are required for a variety of purposes, including for monitoring waterbird numbers and distribution and identification of Special Protection Areas (SPAs). It is also required for Environmental Statements for Round 1 Offshore Wind Farm (OWF) proposals and Strategic Environmental Assessments for Round 2 and 3 OWF development.

Aerial surveys represent an important means of obtaining distribution data on waterbirds in inshore waters. Consequently COWRIE (Collaborative Offshore Wind Research into the Environment) commissioned WWT Consulting to carry out aerial surveys of waterbirds and seabirds in an area of OWF development in the North Sea, off-shore from East Anglia. These data will allow the use of specific analytical techniques which can indicate areas used by nationally and internationally important bird species, and areas supporting large concentrations of waterbirds or seabirds.

## 1.1 Objective

The objective of this project was to undertake seven aerial surveys of waterbirds in an area of the North Sea off-shore from East Anglia, the data from which will be used in the Strategic Environmental Assessment for potential offshore wind-farm development in Zone 5 areas. The seven surveys were to be completed during late winter between 25<sup>th</sup> February and 27<sup>th</sup> March 2008.

# 2. Methods

## 2.1 Aerial surveys technique

The aerial surveys were undertaken using a methodology developed in Denmark by the National Environment Research Institute (NERI) (Kahlert *et al.* 2000; see also Camphuysen *et al.* 2004). This method involved a 'distance sampling' approach (see Buckland *et al.* 2001), whereby the distance from the observer to each bird/flock of birds was recorded. As birds further from the observer are more difficult to detect than closer birds, recording of distance allows the number of missed birds to be estimated. This approach allows statistical analyses of the data (eg confidence limits to be calculated for estimates of numbers) that are not possible with data collected using previous aerial survey methods. Further, using a combination of the time at which birds were encountered and the track flown by the plane (recorded using a Global Positioning System (GPS)), the locations of observed birds can be calculated with considerable accuracy (in most cases, to within a few hundred metres).

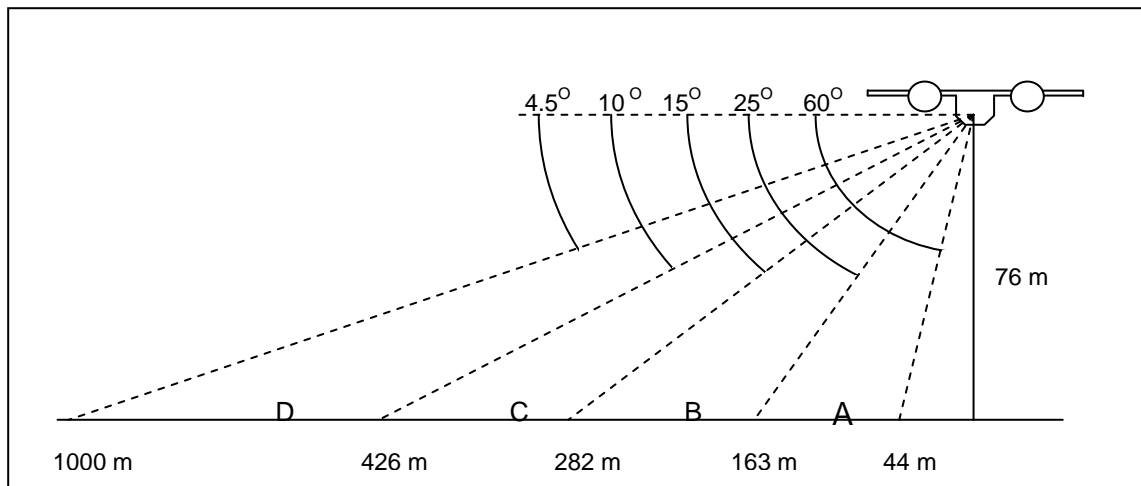
Partenavia PN68 aircraft were used for the surveys, flying at an altitude of 76m and at a speed of approximately 200kmh<sup>-1</sup>. The location of the aircraft was recorded every five seconds using a GPS.

A series of transects spaced 2km apart was designed to cover the required area. The transects were aligned north-south along grid lines of the Ordnance Survey of Great Britain to reduce the effect of glare during the survey and aid the detection and identification of birds. Surveys were generally conducted around a period centred on midday GMT, again to minimise the effects of glare from the sun on detection.

Surveys were only undertaken in good weather and sea state conditions, generally with wind speeds of 15 knots or less to minimise the effect of sea state on the detectability and identification of birds. Observers kept a record of sea state, based on the Beaufort Scale, and cloud cover (in octads), as well as giving a subjective assessment of detection conditions, at the start of each transect and whenever conditions changed significantly.

The aerial surveys were undertaken by experienced observers at WWT Consulting. For each bird or flock of birds, the species, number, behaviour, distance band and the time at which it was perpendicular to the flight path of the plane were recorded using a dictaphone. Using a clinometer, birds were located in one of four distance bands covering an area from 44m to 1,000m either side of the plane (Figure 1); birds beyond 1,000 m from the flight path of the plane were not recorded. The survey method assumes that all birds in distance Band A are detected, and effort was therefore concentrated on this band. Inevitably, some birds further from the plane in other bands may be missed due to their distance from the plane and the need for the observers to concentrate observation on the area of sea nearest the flight line.

**Figure 1 – Distance bands used for aerial survey (not to scale)**



Survey was suspended during the turns between the end of one transect and the start of the next, though significant observations, such as priority bird species, cetaceans or large flocks of birds, were recorded on an *ad hoc* basis.

A cautionary approach was taken with regard to species identification, such that only those individuals that were observed clearly were identified to species level; otherwise, birds were identified as belonging to a species group.

Divers *Gavia* spp. not identified to species level were recorded as 'diver spp'. Caution was exercised given the possibility of confusion between Red-throated Divers *Gavia stellata* and Black-throated Divers *Gavia arctica*. Great Northern Divers *Gavia immer* are more readily separated from both Red-throated and Black-throated Divers during aerial survey.

Gulls not identified to species level were identified as being in one of the following species groups: 'grey gull' (Common Gull *Larus canus* or Herring Gull *Larus argentatus*), 'black-backed gull' (Lesser Black-backed Gull *Larus fuscus* or Great Black-backed Gull *Larus marinus*), 'large gull' (Herring Gull, Lesser Black-backed Gull or Great Black-backed Gull), 'small gull' (Black-headed Gull *Larus ribidundus*, Common Gull, Little Gull *Hydrocoloeus minutus* or Kittiwake *Rissa tridactyla*) or gull (*Larus* spp., Little Gull or Kittiwake).

Auks (including Guillemot *Uria aalge*, Razorbill *Alca torda* and Puffin *Fratercula arctica*) are not readily identified to species during aerial survey and most observations in this survey were recorded as 'auk spp'.

Terns *Sterna* spp. not identified to species level were recorded as 'tern spp'. Common Terns *Sterna hirundo* and Arctic Terns *Sterna paradisaea*, are not easily separated, and the majority of observations of these species are recorded as Arctic/Common ('commic') Tern. Little Terns *Sterna albifrons* and Sandwich Terns *Sterna sandvicensis* are distinguishable from 'commic terns' although usually only birds seen in Band A are readily identifiable to species.

### 2.1.1 Coverage

The area to be flown was divided into seven survey blocks, identified as NS1, NS2, NS3, NS4, NS5, NS6 and NS7 (Figure 2). Due to conditions on the day NS7 was flown, only half the survey was completed, the remainder was flown at a later date when conditions allowed. These flights are referred to as NS7A and NS7B respectively.

Dates of survey flights in each of the NS survey blocks are shown in Table 1.

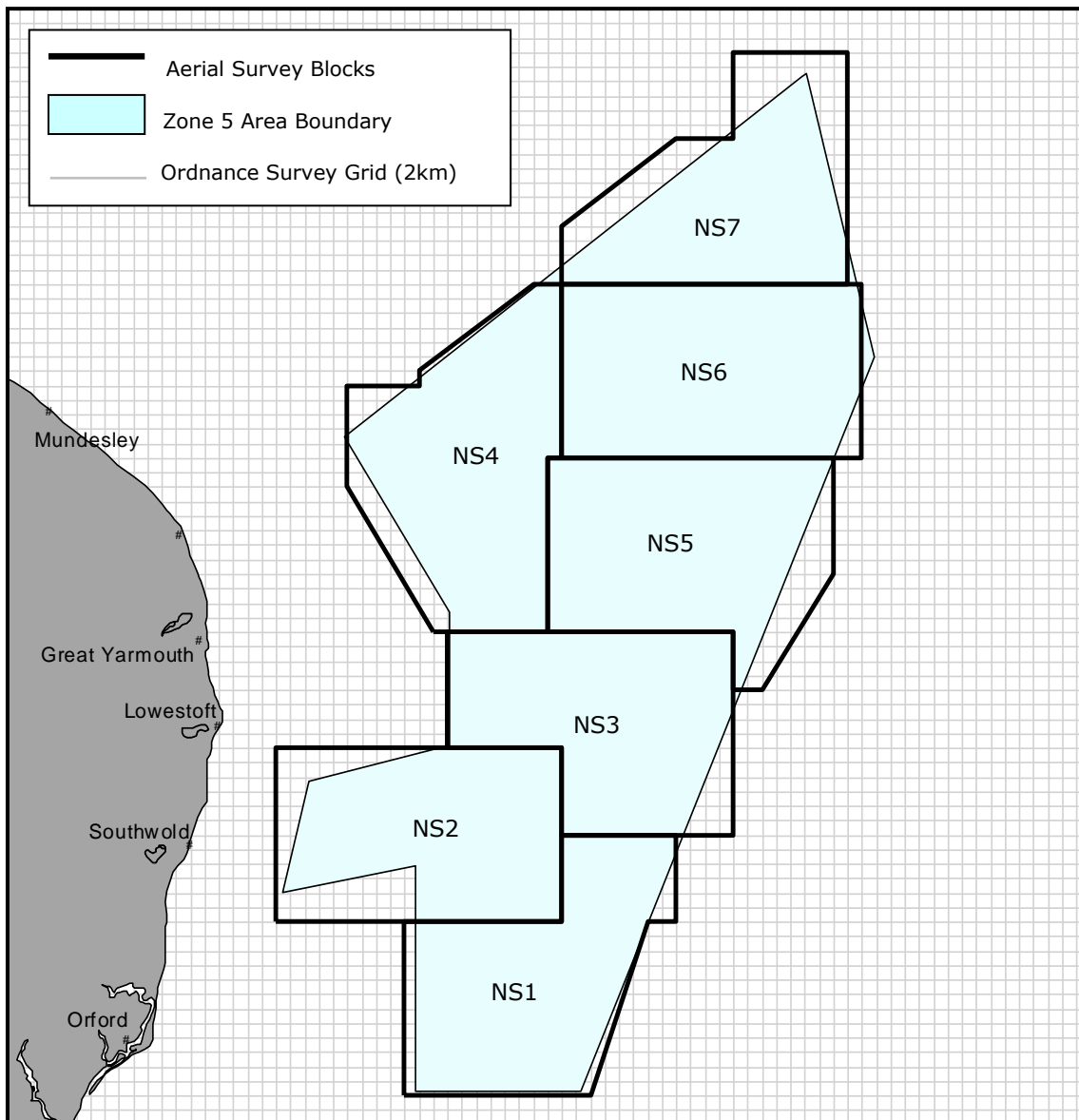
**Table 1 – Dates of survey flights**

Survey	NS1	NS2	NS3	NS4	NS5	NS6	NS7A	NS7B
Date	20 <sup>th</sup> March	5 <sup>th</sup> March	5 <sup>th</sup> March	18 <sup>th</sup> March	20 <sup>th</sup> April	18 <sup>th</sup> March	31 <sup>st</sup> March	20 <sup>th</sup> April

Wherever possible, when two flights were undertaken in the same day, adjacent blocks were flown. This enables us to report with confidence that all birds seen within the two survey blocks were separate individuals and were not double counted. Circumstances allowed NS2 and NS3 to have synchronous coverage on the 5<sup>th</sup> March, and NS4 and NS6 on the 18<sup>th</sup> March.

The first flight was flown on the 5<sup>th</sup> March. Foggy conditions prevailed through much of February and March, and by the end of the late winter period (27<sup>th</sup> March) only four flights had been completed. An extension to the contract allowed the remaining flights to be completed on the 20<sup>th</sup> April. Survey of NS7 on the 31<sup>st</sup> March had to be aborted half way through because of poor visibility which was not forecast. This survey block was completed on the 20<sup>th</sup> April. The two halves are referred to as NS7A and NS7B.

**Figure 2 – Location of NS survey blocks in relation to Zone 5 area boundary (Crown Estate, 2008)**



### 3. Results

#### 3.1 Overall numbers and distribution

Table 2 gives total numbers of all bird species encountered during aerial surveys of the seven NS survey blocks.

Throughout the seven survey blocks, a total of 5,683 birds were recorded which were assigned to 24 species or species groups.

**Table 2 - Total numbers of all species recorded on aerial surveys of Zone 5 during February – April 2009**

Species/Species Group	NS1	NS2	NS3	NS4	NS5	NS6	NS7A	NS7B	Total
Arctic/Common Tern					6			7	13
auk spp.	396	239	897	95	88	552	171	17	2455
black-backed gull spp.	4	12	26	30	1	4	2		79
Black-headed Gull		2	5	1		16			24
Common Gull	1	20		1		3			25
Cormorant/Shag			2						2
diver spp.	71	121	121	41	1	17	23	8	403
Fulmar	28	28	31	20	25	22	4	2	160
Gannet	62	69	49	46	15	41	16	5	303
Great Black-backed Gull	3	5	2	2					12
Great Northern Diver						1			1
grey gull spp.	4	47		2	3	20	1		77
Guillemot	2		3						5
gull spp.	146	38	340	162	4	446	7		1143
Herring Gull	2	23	3	8					36
Kittiwake	76	39	48	68	6	179	105		521
large gull spp.	8	52	58	25		10	1		154
Lesser Black-backed Gull	8		3	4	1		1		17
Razorbill			1						1
Red-throated Diver	23	87	14	18		9	10		161
Sandwich Tern								1	1
skua spp.							1		1
small gull spp.	28	31	3	14	1	8	1	1	87
tern spp.					1			1	2
<b>Grand Total</b>	<b>862</b>	<b>813</b>	<b>1606</b>	<b>537</b>	<b>152</b>	<b>1328</b>	<b>343</b>	<b>42</b>	<b>5683</b>

### 3.1.1. Divers

Across the seven survey blocks, there were 403 records of diver spp., with 161 records of Red-throated Divers and one record of a Great Northern Diver. Divers occurred more in the southern and in-shore survey blocks (NS1, 2, 3 and 4) than they do in the northern and off-shore ones (NS5, 6 and 7). As no Black-throated Divers were identified to species level during these surveys, and Red-throated divers are known to winter in large numbers off the south east coast, it is safe to assume that all diver spp. records relate to Red-throated Divers.

Greatest numbers of divers were found in NS2 and NS3, which were surveyed synchronously. NS2 produced 121 diver spp. records and 87 Red-throated Diver records. In NS3, 121 diver spp. were observed in addition to 14 Red-throated Divers.

NS1, which was to the south of NS2 and NS3, produced 71 records of diver spp. and 23 records of Red-throated Divers. In NS4, 41 diver spp. were counted along with 18 Red-throated Divers.

Diver numbers fell in the remaining three off-shore and northern blocks, with 31 diver spp. and ten Red-throated Divers in NS7A and B and one diver spp. in NS5. In NS6, 17 diver spp. with nine Red-throated Divers and one Great Northern Diver were recorded.

### 3.1.2. Auks

Auk spp. was the most abundant species group recorded over the seven survey blocks, with 2,455 birds. One Razorbill and five Guillemots were identified to species level.

The highest numbers of auk spp. occurred in NS3, with 897 records, plus one Razorbill and three Guillemots. NS2, which had synchronous coverage, had 239 records of auk spp.

NS6 had the second highest numbers, producing 552 auk spp. records. NS4 was surveyed at the same time, and had 95 records of auk spp.

NS1, the southern most block, had 396 auk spp. records and two Guillemots. NS5 produced 88 auk spp. records and NS7A and B produced 188 auk spp. records.

### 3.1.3 Gulls

Gull spp. was the second most abundant species group with 1,143 records over the seven survey blocks. Of the gulls identified to species level, Kittiwakes were by far the most abundant species with 521 records over the whole project area.

Kittiwake records were highest in the two northern blocks NS6, with 179 records, and NS7A, with 105 records. In the remaining blocks Kittiwakes were fairly evenly distributed with numbers ranging from 39 (NS2) to 76 (NS1). NS5 and NS7B showed very low numbers and absence of Kittiwakes respectively, but this is more likely to be a result of the date they were surveyed than the unsuitability of these areas for this species.

Much smaller numbers of the other identified gull species were recorded.

### 3.1.4. Gannet

Over all the survey blocks there were 303 records of Gannets. Numbers were higher, and fairly even in the more southerly and in-shore blocks NS1, 2, 3 and 4, with numbers per block ranging from 46 to 69. Numbers were generally lower in the off-shore and northerly blocks NS5, 6, and 7, with numbers per block ranging from 5 to 41. Again, lower numbers in NS5 and NS7B are likely to be due to the relatively late survey date.

### 3.1.5. Other species

Smaller numbers of three other species were recorded.

#### **FULMAR**

Over the whole project area there were 160 Fulmar *Fulmarus glacialis* records, with birds very evenly distributed across all blocks apart from the most northerly, NS7A and B, which showed very low numbers.

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### Tern spp.

In the blocks which were surveyed late in April, (NS5 and NS7B) 13 Arctic/Common Terns were recorded with one Sandwich Tern. These birds are summer migrants to Britain, and the date NS5 and NS7B were surveyed is the likely reason that they occurred in these two blocks and not the others.

### Cormorant spp.

Two *Phalacrocorax spp.* were recorded in NS3.

## 4. Concluding remarks

The area covered by these aerial surveys supports a relatively diverse range of waterbirds, with high numbers of divers and moderate numbers of auks, gulls, Gannets and Fulmars.

The most up to date estimate of wintering numbers of Red-throated Divers in Britain is 17,000 (O'Brien *et al.* 2008), with the number of birds constituting national importance set at 170. Assuming all the diver spp. seen were Red-throated Divers, then even before distance analysis, 564 Red-throated Diver records across all the survey blocks relates to over 3% of the national wintering population.

Given the same assumption, and again before distance analysis, the area corresponding to NS2 and NS3 alone supported over 2% of Britain's wintering Red-throated Diver population.

Survey blocks NS5 and NS7B show fewer records of species such as auks and divers than would be expected from adjacent blocks, and within the same survey block, in the case of NS7. For example NS7A, surveyed on the 31<sup>st</sup> March had 171 auk spp. records and 23 diver spp. records. When the remaining half of the survey was completed on the 20<sup>th</sup> April only 17 auk spp. were recorded as well as 8 diver spp.. This is likely to be due to wintering auks and divers leaving the area within this period to return to breeding sites. If the survey had been able to be completed when it was first attempted, the number of auks and divers observed is likely to have been higher.

Similarly, although the numbers of divers does seem to decrease in the northern blocks, the very low count of one diver sp. recorded in NS5 is likely to be because of migration of divers from the area to breeding grounds further north. If the survey was completed earlier in the season a higher count could be expected.

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