AERIAL SURVEYS OF BIRDS IN PROPOSED STRATEGIC AREAS FOR OFFSHORE WINDFARM DEVELOPMENT, ROUND 2: PRELIMINARY REPORT, THAMES WINTER 2002/03

WWT Research Report

Authors

Colette Hall, Lucy Smith & Peter Cranswick

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The Wildfowl & Wetlands Trust
Slimbridge
Gloucestershire
GL2 7BT

Tel 01453 890333
Fax 01453 890827
Email research@wwt.org.uk

Reg. charity no. 1030884

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SUMMARY

To assist with the environmental assessment of the UK's offshore windfarm development, aerial surveys of the round 2 proposed strategic areas were undertaken to collect data on bird numbers and distribution. Surveys of the Thames Strategic area were undertaken on behalf of several energy companies in January and February 2003.

A series of transects were flown at 2 km intervals over the strategic area, and observers recorded the numbers of birds encountered. Combined with data from a Global Positioning System, used to record the flight path of the plane, their location could be calculated to a high degree of accuracy.

A series of maps shows the distribution of the key bird species or species groups in 4 x 4 km cells, calculated as the number of birds encountered corrected for survey effort (i.e. the length of transect flown).

Large numbers of divers, the vast majority believed to be Red-throated Divers, were recorded in both months. Numbers and distribution, however, varied markedly between January and February. Grebes and seaducks were located primarily in the western most areas. Kittiwakes and auks showed more pelagic distributions, concentrated in the central or eastern parts of the strategic area and with different distributions in the two months. Gulls, considered as a group, were widely distributed over the strategic area in both months.

Provisional estimates of total numbers of Red-throated Divers suggest that the number recorded in January in the Thames exceeds the current estimate for the whole of Great Britain. Further surveys, ideally linked with survey of the Suffolk coastline, are required to establish total numbers and the extent to which this area represents an ecological site for this species. This information is required to ensure correct contextual setting for assessment of windfarm development proposals both in the Thames and nationally.

The findings in this report are based on just two surveys in one winter. Bird distribution will vary with and between winters, and surveys in early and late winter, and in other years, are required to provide an appropriate assessment of the winter distribution of birds in the Thames round 2 area. This is particularly relevant given that the key species in the Thames appear to be highly mobile.

1 INTRODUCTION

The UK has made a commitment that 10% of electricity in the UK should be generated from renewable sources by 2010. Offshore windfarms have the potential to make a significant contribution to this target (DTI 1999) and the UK Government's announcement of the first major round of UK offshore windfarm development in December 2000 resulted in eighteen companies pre-qualifying for site development.

To ensure that a long term view is taken that adheres to the principle of sustainability, contributes to UK Government targets for renewable energy, complies with European Directives, (including the forthcoming Strategic Environmental Assessment Directive (SEA)), the DTI launched a consultation paper 'Future Offshore'. This proposed a strategic planning framework as a basis for expansion of the offshore wind industry and set out the DTI's commitment to undertake an SEA for the second round of licences in three strategic areas: the North West, the Greater Wash, and the Thames Estuary.

Assessing the environmental impacts of these major developments is, in many cases, complicated by the relative paucity of suitable environmental data in marine areas. For example, few data are available on the numbers and distribution of birds at sea in sufficient detail for appropriate assessment to be made. Data are required at a number of levels: to enable assessment of the individual development, to provide context to the relative importance of individual sites, to enable the cumulative impact of multiple developments in a region to be assessed and to allow a strategic overview of the environmental impacts of a round of developments to aid the decision making process.

To provide contextual information for the proposed strategic areas for the second round of offshore windfarm development, a programme of bird surveys was funded by DTI and developed by the Royal Society for the Protection of Birds (RSPB) in conjunction with The Wildfowl & Wetlands Trust (WWT) and the Joint Nature Conservation Committee (JNCC). A programme of work was agreed in early 2003, to include aerial surveys of the three strategic areas in winter 2002/03 and surveys of tern foraging areas in summer 2003 (Allcorn *et al.* 2003, Cranswick *et al.* 2003). This report provides preliminary results from aerial surveys in the Thames strategic area in early 2003, undertaken by WWT for energy companies exploring development opportunities in that area.

2 METHODS

2.1 Aerial survey

Aerial surveys have been used for several decades to count birds at sea, particularly in the Baltic and southern North Sea. A small plane with two observers is used, flying at low altitude: each observer counts birds on or flying just above the water's surface to one side of the plane. Historically, surveys used either a 'total count' method, aiming to count all birds within a predefined area, or to cover larger areas using 'transect counts', whereby observers counted birds in a strip of water that extended a set distance to either side of the flight path of the plane; the total number of birds in the study area was then calculated based on the proportion of the total area represented by the surveyed strips.

Aerial surveys used for this report were undertaken using a methodology recently developed in Denmark by the National Environment Research Institute (NERI) (Kahlert *et al.* 2000). This involved a 'distance sampling' approach (see Buckland *et al.* 2001), whereby the distance to each bird/flock of birds was recorded. Because birds further from the observer will be more difficult to detect, recording of distance allows the number of missed birds to be estimated. This approach allows statistical analyses of the data (e.g. 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).

Aerial surveys were undertaken by WWT using experienced observers who have undertaken aerial survey around Wales and for many of the round 1 windfarm sites in the UK in 2001/02 and 2002/03, ensuring consistency of information collected for windfarm EIAs (see also WWT Wetlands Advisory Service 2003). A Partenavia PN68 aircraft was used, flying at an altitude of 250 ft and at a speed of approximately 185 kmh^{-1}. Using a clinometer, birds were located in one of four distance bands covering an area from 44 m to 1000 m either the side of the plane; birds beyond 1000 m from the flight path of the plane were not recorded. A series of transects spaced 2 km apart was designed to cover the strategic areas. Transects were orientated perpendicular to major environmental gradients (primarily sea depth) and, where possible, to run north-south to reduce the effect of glare at the time of the survey (surveys were undertaken centred around midday). Two experienced aerial survey observers were used to count birds, and a navigator guided the pilot along transect lines with the aid of a GPS. For each bird or flock of birds, the species (or species-group where specific identification was not possible), number, its behaviour, distance band and the time at which it was perpendicular to the flight path of the plane were recorded using a Dictaphone. The location of the plane, recorded using a GPS, was downloaded onto a laptop computer every five seconds. Surveys were undertaken in good weather conditions, generally with winds of 15 knots or less.

2.2 Coverage

Survey in the Thames was undertaken on behalf of local energy companies exploring opportunities for windfarm development within the Thames. Coverage was, therefore, not undertaken of the whole strategic area, but concentrated on western and central areas, though covering most sea area of less than 20 m depth within the strategic area except for nearshore waters in the north of the area. Survey was undertaken on 18th and 19 January and 15th and 16 February. In both months, just over 1200 km of transect was flown, though with two additional short transects at the western end in January (Figs 1 & 2). Because of restrictions on minimum flying altitude over land, transects perpendicular to the coast ended approximately 1 km from the shore.

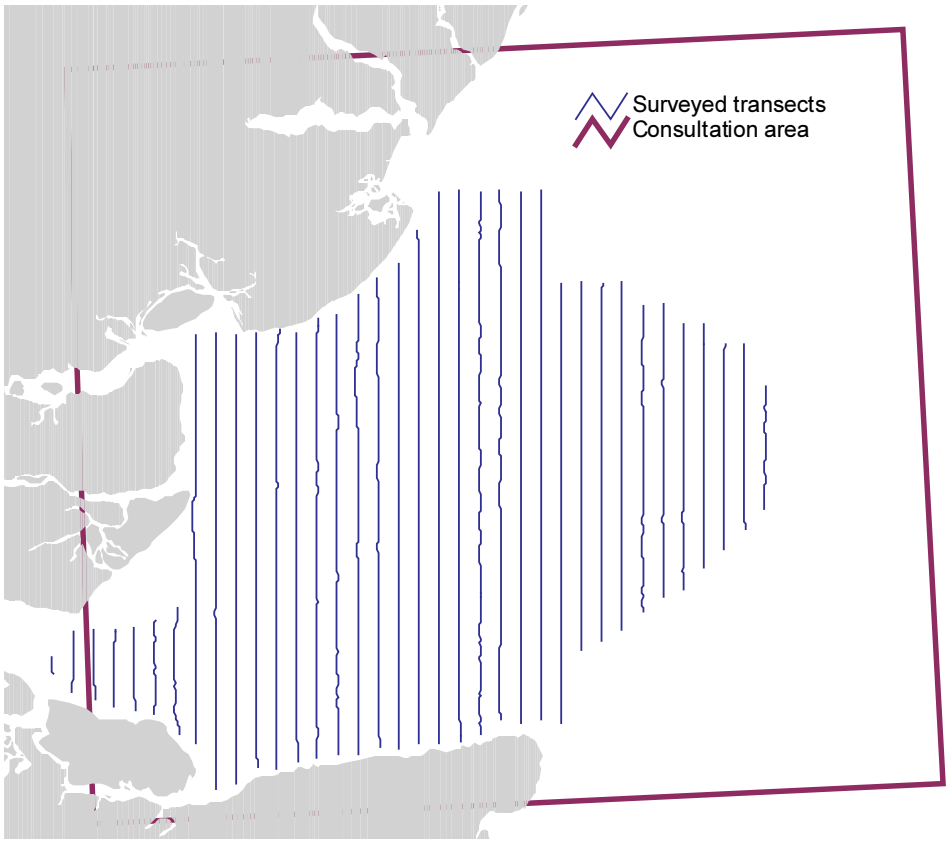

Figure 1. Aerial survey tracks flown in the Thames strategic area during January 2003.

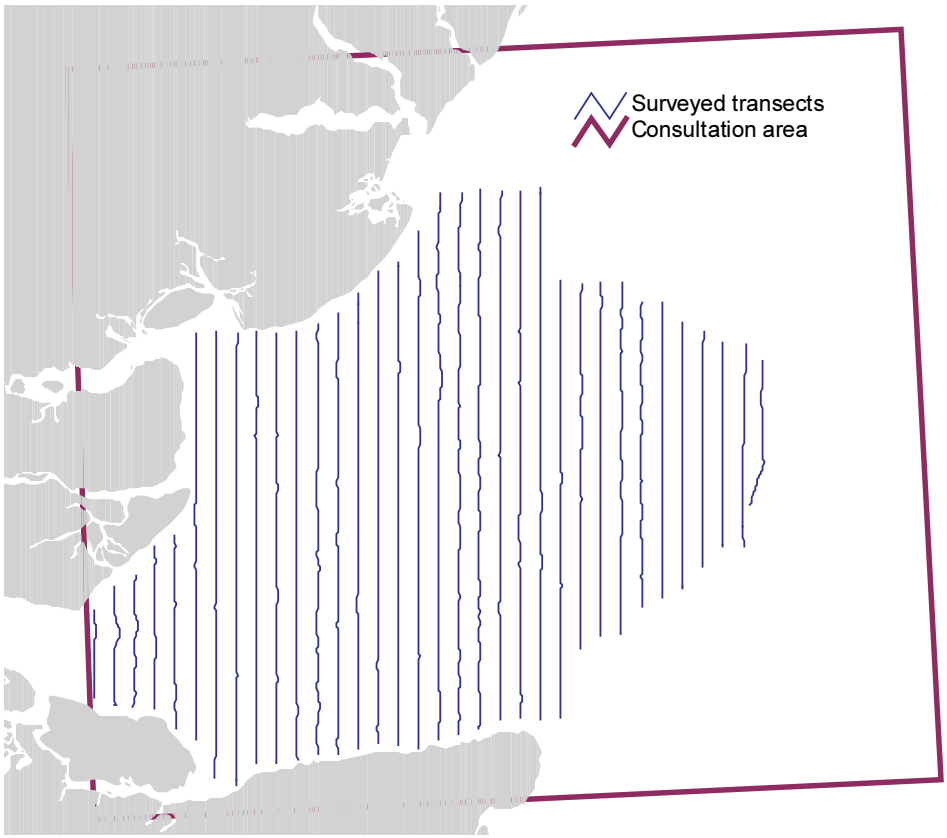

Figure 2. Aerial survey tracks flown in the Thames strategic area during February 2003.

2.3 Analysis and map production

The precise location of each bird or flock of birds was calculated by linking the time (to the nearest second) at which they were recorded and the location of the plane, recorded from the GPS every five seconds. Interpolation of the GPS data enabled each position to be located along the flight path. In Figures 3 and 4, the locations of any birds detected are shown as dots along the transect lines, displaced at different distances either side of the flight path according to side of the plane and the distance band in which they recorded. The location of most observations is considered to be accurate to within 2-300 m.

The distribution of the more numerous species (or species groups) in the strategic area is shown using encounter rate, i.e. the numbers of birds counted per unit length of transect flown. Data are summarised by 4 x 4 km grid squares, corrected for survey effort in each cell. The density scales used in the maps were selected to illustrate the distribution patterns of encounter rates. They are consistent between surveys but are not comparable between species due to the different detectability of different species.

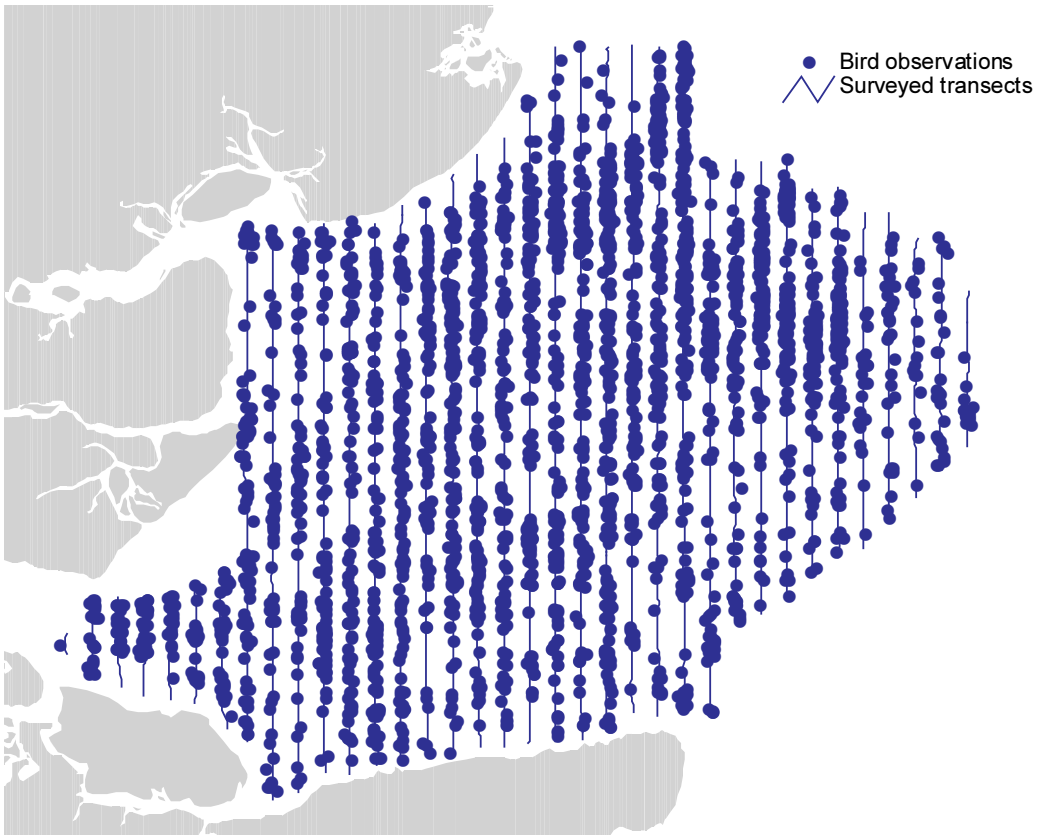

Figure 3. Locations of all bird observations in the Thames strategic area, January 2003.

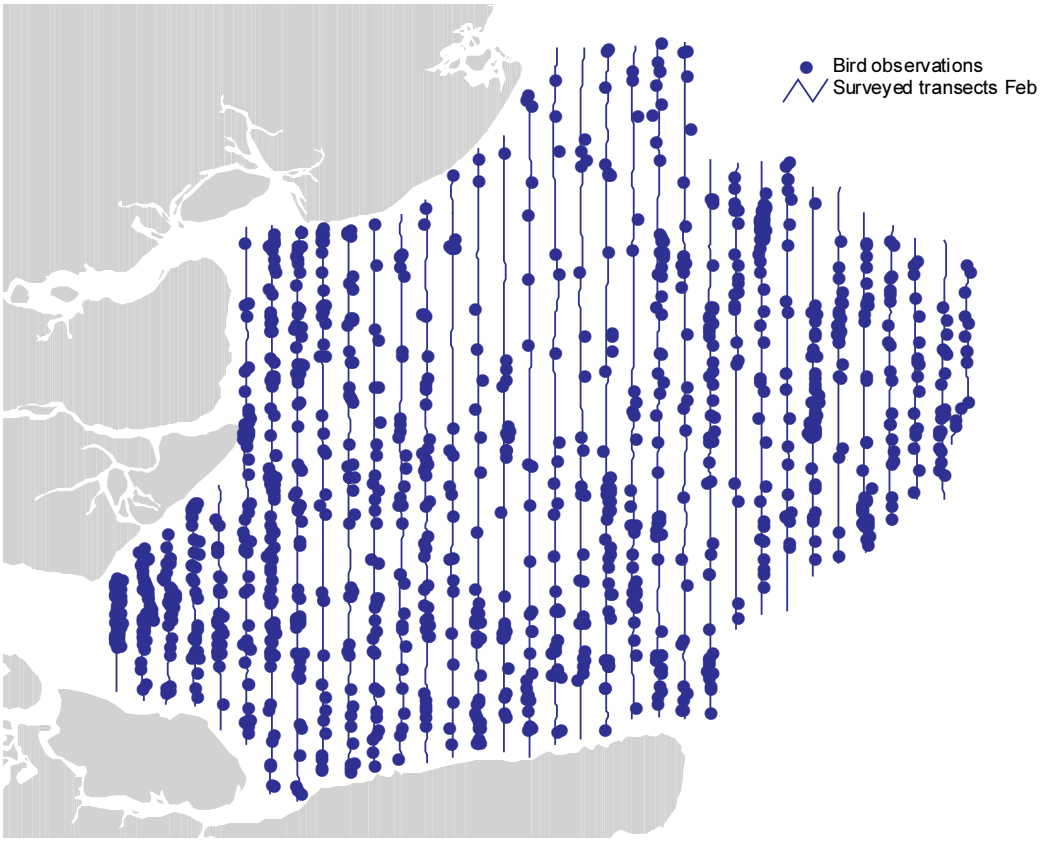

Figure 4. Locations of all bird observations in the Thames strategic area, January 2003.

3 RESULTS

3.1 Counted numbers of birds

Total numbers of birds encountered during the surveys of the Thames strategic area are presented in Table 1. Note that these are not the absolute numbers present in the survey area but the number detected; birds further from the plane will have been overlooked, and a band 88 m wide directly below the plane cannot be viewed.

A cautionary approach is taken with regard to species identification, such that only those individuals which are observed clearly are identified to species level. The vast majority of divers in the area are considered to have been Red-throated Divers *Gavia stellata*, and most of the species given as gulls in the table are likely to have been *Larus* spp.

Table 1. Numbers of birds counted during aerial survey of the Thames strategic area, winter 2002/03.

Species or species group	January 2003	February 2003
diver sp.	1487	745
Red-throated Diver	344	104
grebe sp.	118	60
Fulmar	0	15
Gannet	3	6
Cormorant	24	10
Shag	6	12
Cormorant/Shag	1	12
Brent Goose	4	0
Shelduck	0	4
Wigeon	241	0
Eider	696	52
Common Scoter	222	465
Velvet Scoter	10	0
Red-breasted Merganser	14	0
Oystercatcher	4300	2350
Curlew	0	10
wader sp.	180	1630
Great Skua	1	0
Black-headed Gull	400	41
Common Gull	227	10
Lesser black-backed Gull	15	18
Herring Gull	59	54
Great Black-backed Gull	85	13
Kittiwake	556	109
grey gull sp. (Herring or Common)	413	353
black-backed gull sp.	143	81
large gull sp.	15	39
gull sp.	2411	1751
auk sp.	2006	61
Total transect length flown (km)	c 1200	c 1200

3.2 Bird distributions

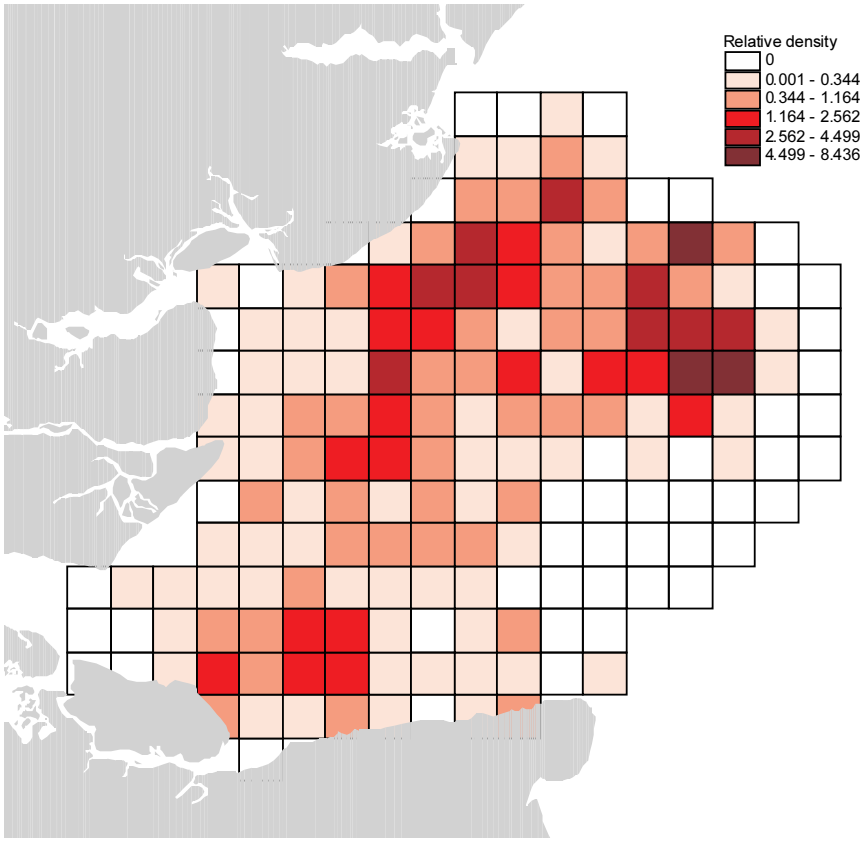

Figure 5. Relative encounter rate for all observations of divers (*Gavia* spp.) using a 4 x 4 km grid in the Thames strategic area, January 2003.

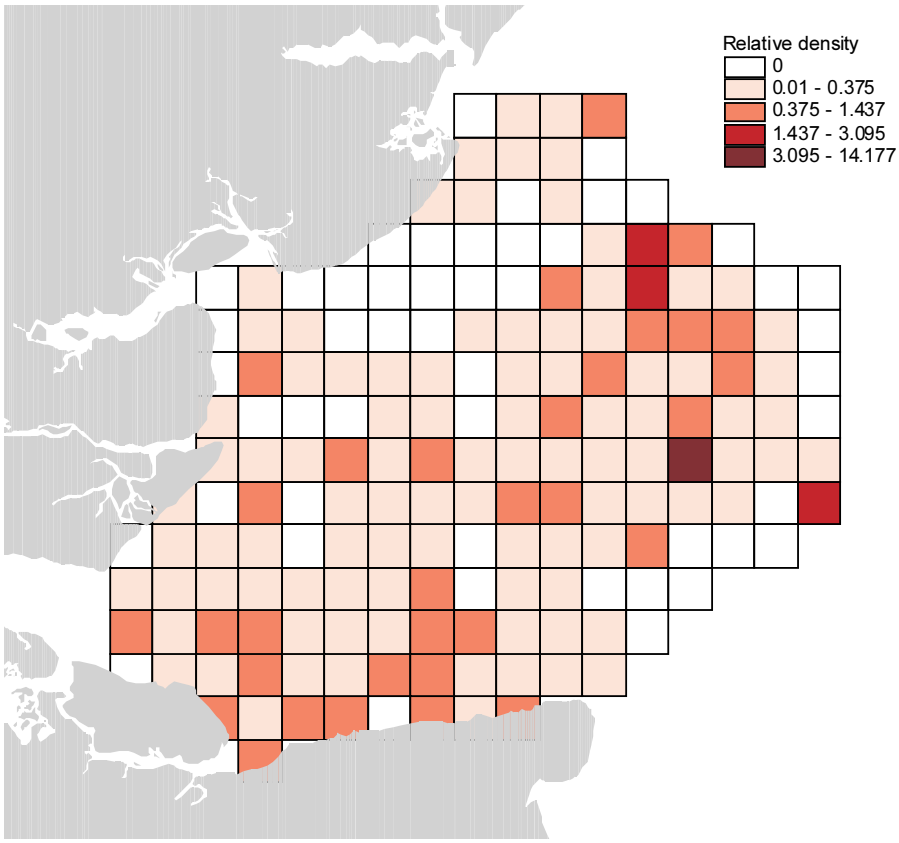

Figure 6. Relative encounter rate for all observations of divers (*Gavia* spp.) using a 4 x 4 km grid in the Thames strategic area, February 2003.

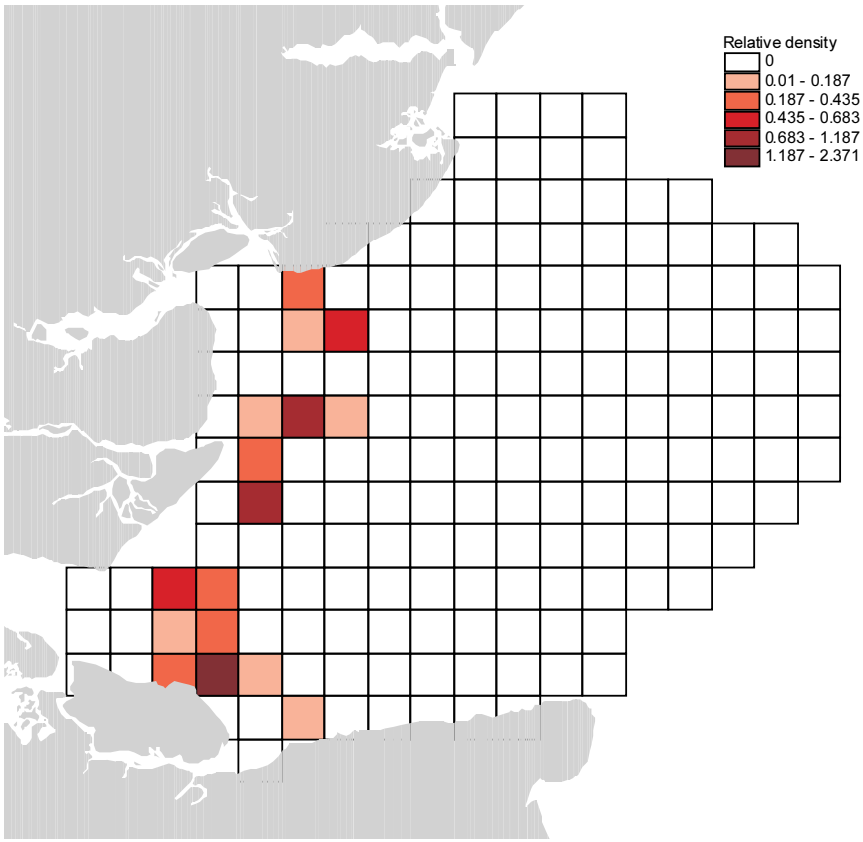

Figure 7. Relative encounter rate for all observations of grebes (*Podiceps* spp.) using a 4 x 4 km grid in the Thames strategic area, January 2003.

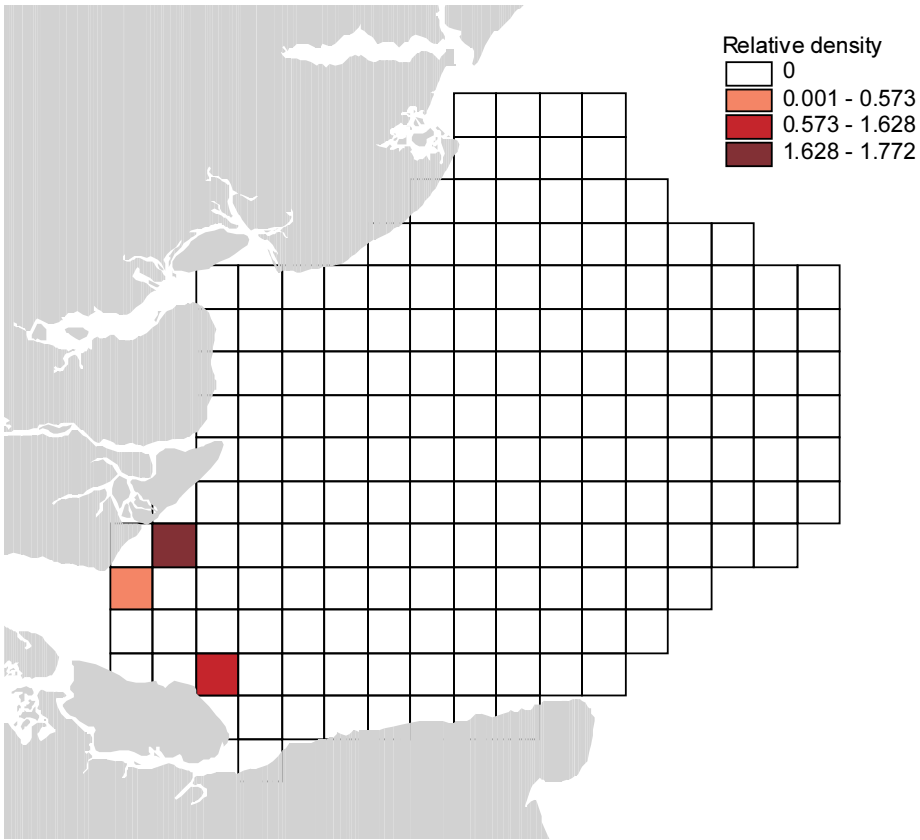

Figure 8. Relative encounter rate for all observations of grebes (*Podiceps* spp.) using a 4 x 4 km grid in the Thames strategic area, February 2003.

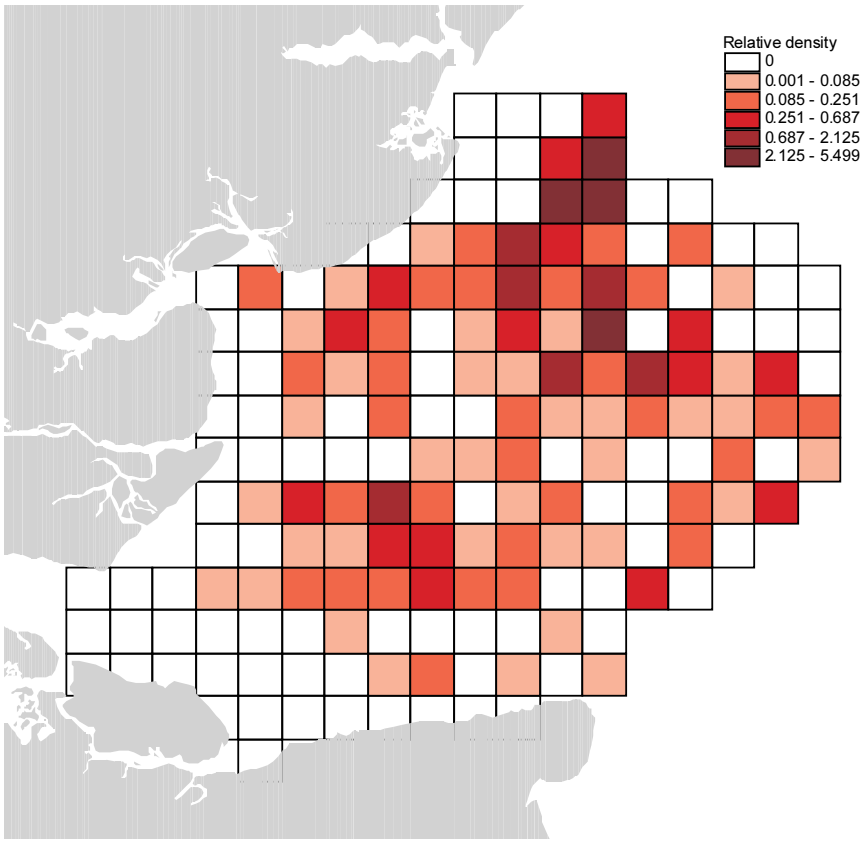

Figure 9. Relative encounter rate for all observations of Kittiwake (*Rissa tridactyla*) using a 4 x 4 km grid in the Thames strategic area, January 2003.

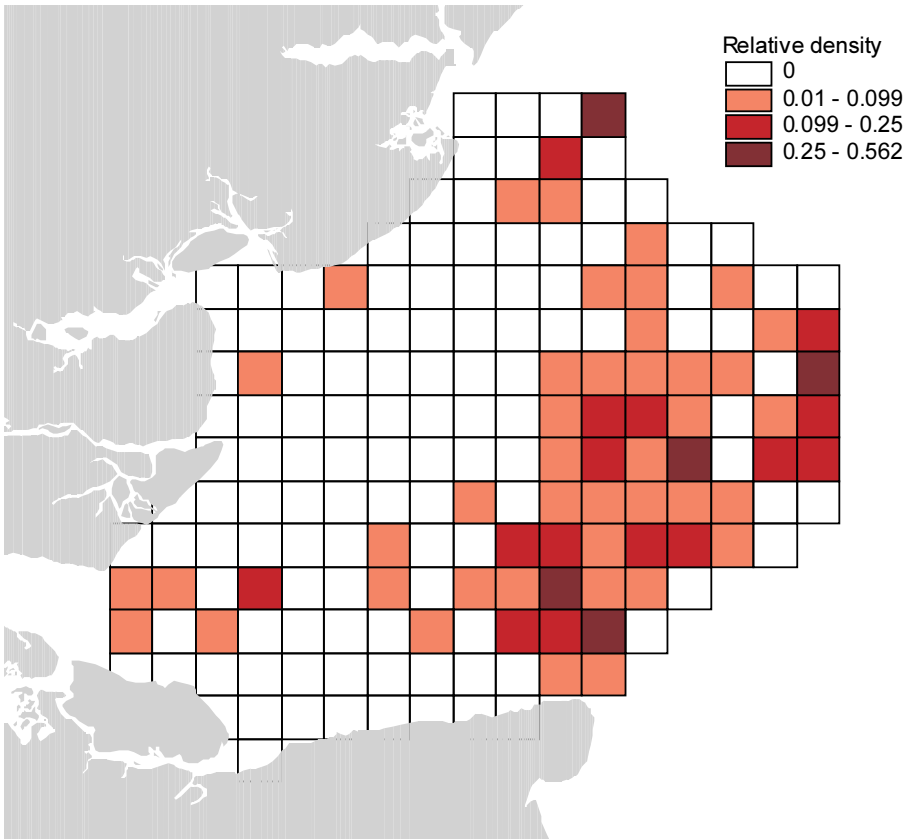

Figure 10. Relative encounter rate for all observations of Kittiwake (*Rissa tridactyla*) using a 4 x 4 km grid in the Thames strategic area, February 2003.

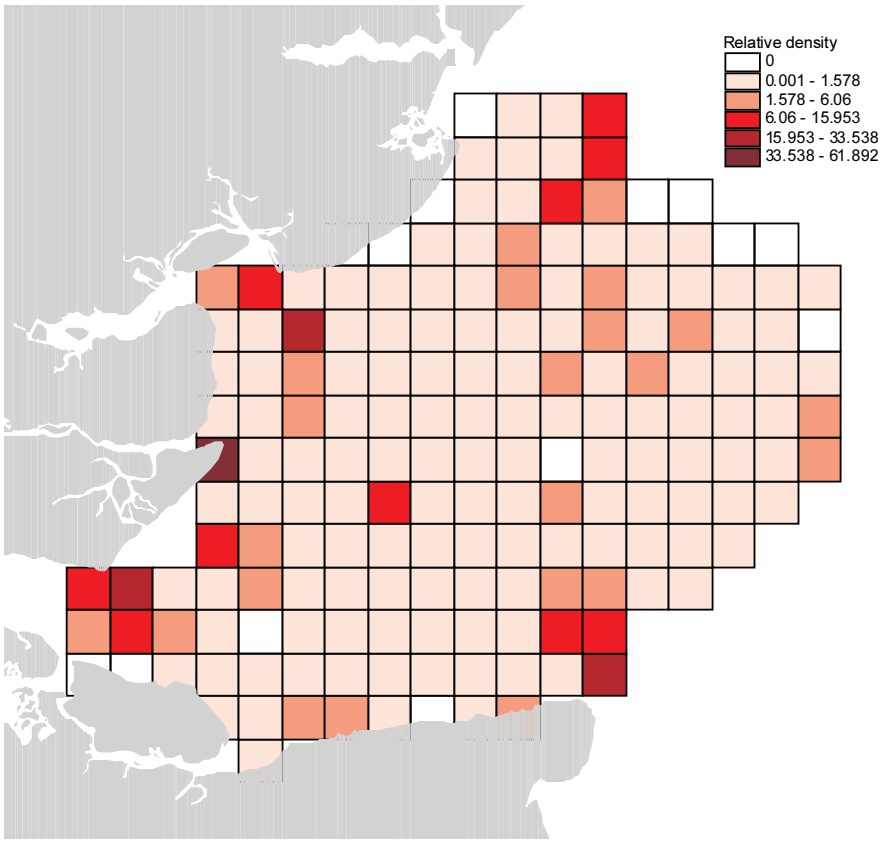

Figure 11. Relative encounter rate for all observations of gulls (*Larus/Rissa* spp.) using a 4 x 4 km grid in the Thames strategic area, January 2003.

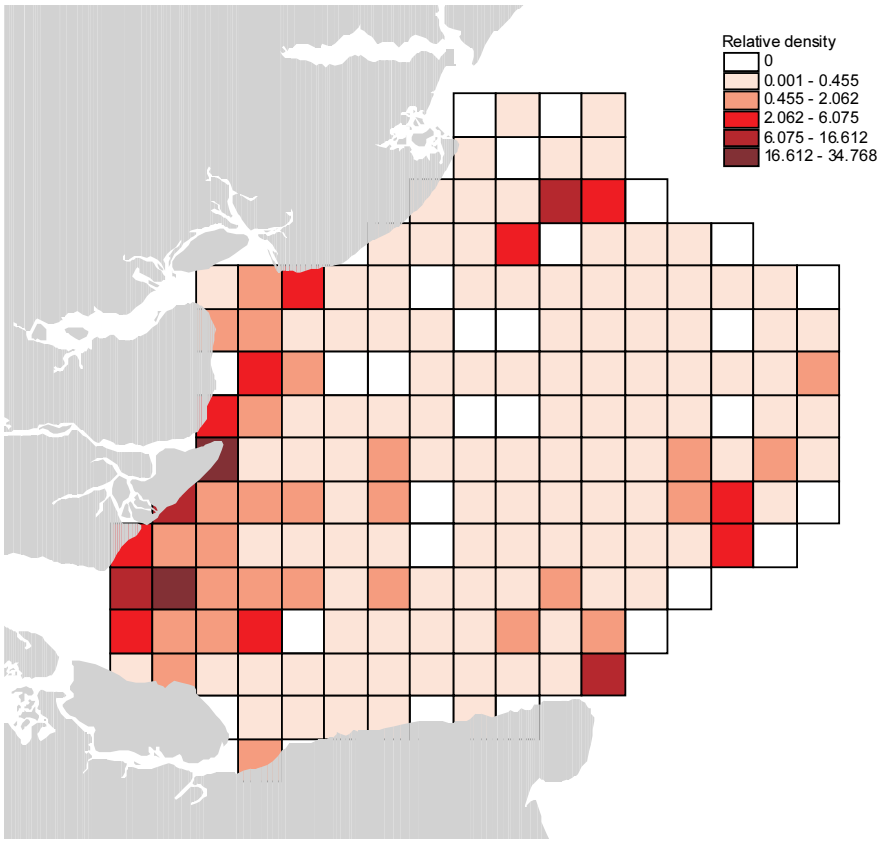

Figure 12. Relative encounter rate for all observations of gulls (*Larus/Rissa* spp.) using a 4 x 4 km grid in the Thames strategic area, February 2003.

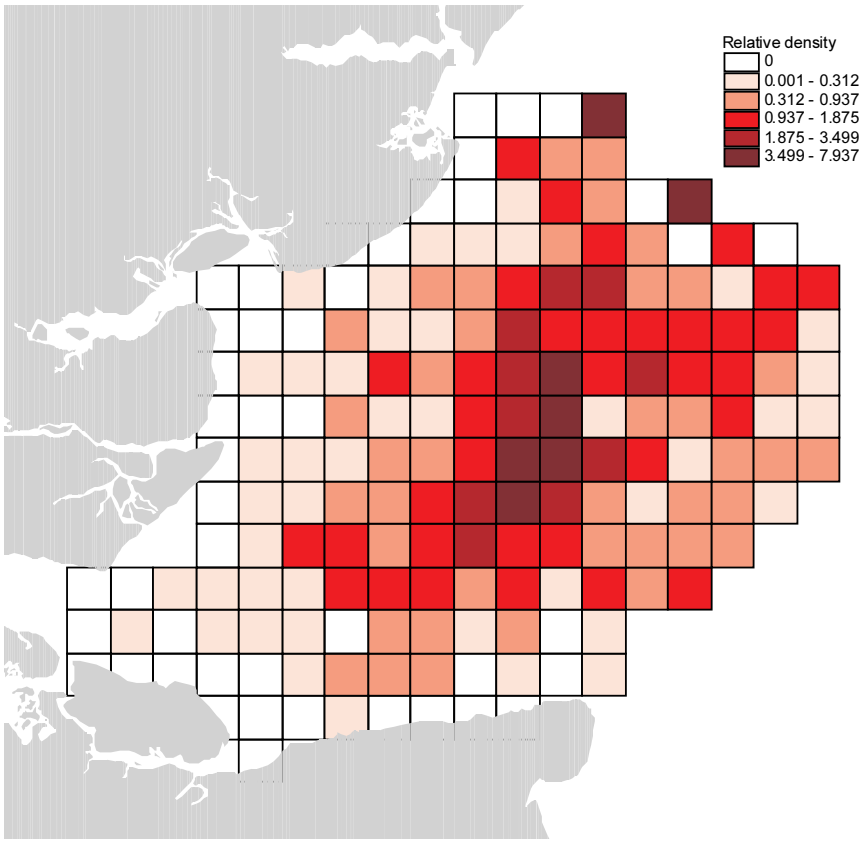

Figure 13. Relative encounter rate for all observations of auks (*Uria/Alca* spp.) using a 4 x 4 km grid in the Thames strategic area, January 2003.

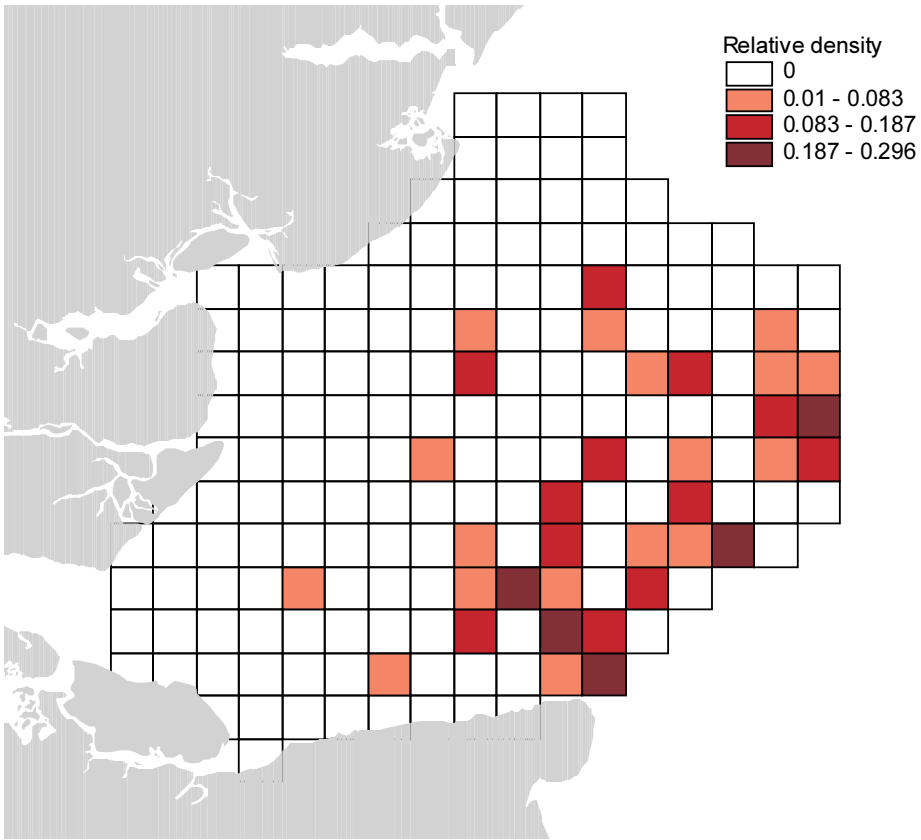

Figure 14. Relative encounter rate for all observations of auks (*Uria/Alca* spp.) using a 4 x 4 km grid in the Thames strategic area, February 2003.

4 DISCUSSION

4.1 Winter 2002/03

The distribution maps demonstrate the occurrence of birds throughout the Thames strategic area during January and February 2003. It would be premature to identify areas of importance based on the results of just two surveys in one winter, and further surveys are required, at different times of winter and in different winters, in order to assess the importance of particular areas within the Thames. This is particularly relevant given the large differences in numbers and distribution of several species in the two surveys undertaken, since these suggest that the birds may be highly mobile within the Thames.

Particularly notable from these surveys are the concentrations and distribution of divers. Although less than one fifth of all divers were identified to species, it is considered that the vast majority, if not all, were Red-throated Divers. Considerable caution was exercised given the possibility of confusion with Black-throated Diver and the inexperience of the observers with observations of this species from the air. None, however, was seen, even among those birds close to the plane, and it is considered that recording many birds as unidentified divers was over cautious. Great Northern Divers are readily separated from both Red-throated and Black-throated Divers and very few if any will have been overlooked within those birds recorded as 'diver spp.'.

The UK Government identified a series of guidelines for the selection of Special Protection Areas (SPAs) that includes areas used regularly by 1% or more of the Great Britain population of a species listed in Annex 1 of the Birds Directive (79/409/EEC) (Stroud *et al.* 2001). If these guidelines, originally established for terrestrial sites, are used in the marine environment also (as has occurred for the classification of the UK's first marine SPA, for Common Scoter in Carmarthen Bay), all sites with 50 or more Red-throated Divers, an Annex 1 species, would qualify for SPA designation.

The majority of Red-throated Divers in January occurred in the northern and outer parts of the study area, seemingly associated with Gunfleet Sands and the outer parts of Long Sand, although an appropriate analysis, linking individual observations to bathymetric data, is required to determine the nature of any such relationship. In February, however, numbers and distribution had changed markedly, with only around half the January total present, and far fewer birds in the northern part, with some areas seemingly favoured in January supporting no birds at all in February. Boat-based surveys in the Thames recorded few divers before mid December 2002, after which there appeared to be a large influx (S Percival pers comm.) while aerial surveys in winter 2001/02 found a most divers in southern and inner parts of the Thames (A Webb pers. comm.).

Around 50% of divers were observed in Band A (44-162 m from the transect line). Whilst a statistically valid approach (e.g. 'distance' or kriging) is required to calculate total numbers present within the survey area accurately, it is possible to provide a provisional estimate if it is assumed that diver distribution is random within the survey area with respect to transect placement. Band A represents 12% of the survey area, suggesting approximately 7500 (Red-throated) divers in the surveyed area of Thames in January. This compares with an estimate of just 4850 for the whole of Britain during winter (Danielsen *et al.* 1993), based largely on boat-based surveys in the mid and early 1980s. The fact that the national estimate of wintering Red-throated Divers appears to be a substantial underestimate has considerable implications for environmental assessments for windfarm development, primarily with regard to the assessment of areas supporting nationally important numbers which potentially quality for SPA designation.

Large numbers of Red-throated Divers are known to occur off the Suffolk coastline, e.g. 2680 were recorded by land-based observers off Minsmere in January 2000 (Rafe 2000). Given the seemingly mobile nature of birds within the Thames over short time periods, and the possibility that birds at this site may be linked to those in Suffolk, it is important to ensure that further surveys are undertaken to identify the nature of use of the Thames, particularly to identify favoured areas, and to undertake co-ordinated survey of the sea area along the Essex and Suffolk coastline at the same time as the rest of the Thames to identify the true number and distribution of Red-throated Divers. This is necessary to identify the importance of the Thames as a whole and to ensure that assessments of individual windfarm proposals are placed in the correct context. Further analysis of these data is also required to identify the key factors determining diver distribution.

Distribution of grebes, like that of divers, was primarily sufficiently far from shore to have eluded land-based detection. Most seaducks were found in the western part of the study area, particularly over the Dengie Flats

with or just west of most grebes. Most terrestrial species, particularly the waders, were also seen in these areas, generally flushed from land-based roosts, particularly at Foulness, where the transect path passed close to land.

As with observations in the Greater Wash in early 2003 (Cranswick *et al.* 2003), the distribution of auks and Kittiwakes appeared to be closely linked, occurring widely throughout the central areas in January. Numbers of both dropped considerably in February (from 2000 to 60 auks and from 550 to 100 Kittiwakes), when distribution of both was then confined primarily to the southeast. The rapidly varying distribution of these species is likely to be linked to their fish prey, and the changes in distribution mirror to some extent that of the divers also. For all such species, frequent surveys during the periods of peak occurrence within individual winters and over a period of several winters will be necessary to determine the status and distribution of these species within the Thames with any degree of confidence.

Gulls were widely distributed throughout the survey area, although with concentrations of larger species (Herring Gull and the black-backed gulls) in the western most areas.

4.2 Future work

The surveys in the Thames were made in mid winter in one season. Surveys in early and late winter (between October and March or April) and in different winters are required to assess numbers at that time, and to assess the consistency of distribution patterns between years, in order to provide a full assessment of ornithological interest in the strategic area in winter and during passage periods.

Further analysis is required to determine the total numbers of birds in the survey area (i.e. allowing for those missed by the observers due to their greater distance from the plane), using 'distance' or other appropriate techniques.

The survey area should be extended to include all shallow water (<20 m deep) in the strategic area, particularly those areas in the north and south. Ideally, survey should extend along the Suffolk coastline beyond the strategic area to identify both the total numbers of Red-throated Divers within this broader area and whether this represents an ecological site for that species.

5 REFERENCES

Allcorn, R, MA Eaton, PA Cranswick, M Perrow, C Hall, L Smith, JB Reid, A Webb, KW Smith, RHW Langston & N Ratcliffe. 2003. *A pilot study of breeding tern foraging ranges in NW England and East Anglia in relation to potential development areas for offshore windfarms.* RSPB/WWT/JNCC report to DTI.

Buckland, ST, D Anderson, K Burnham, J Laake, D Borchers & L Thomas. 2001 *Introduction to distance sampling: estimating abundance of biological populations.* Oxford University Press, Oxford.

Cranswick, PA, C Hall & L Smith. 2003. *Aerial surveys of birds in proposed strategic areas for offshore windfarm development, Round 2: preliminary report, winter 2002/03*. WWT report to DTI, Slimbridge.

Danielsen, F, H Skov & J Durinck. 1993. Estimates of the wintering population of Red-throated Diver *Gavia stellata* and Black-throated Diver *Gavia arctica* in northwest Europe. *Proceedings of the 7th Nordic Congress of Ornithology, 1990*: 18-24.

Department of Trade and Industry 1999. *New & Renewable Energy: Prospects for the 21st Century*. DTI, London.

Kahlert, J, M Desholm, I Clausager & IK Petersen. 2000. *Environmental impact assessment of an offshore wind park at Rødsand*. Natural Environment Research Institute, Rønde.

Rafe, R. 2000. *The Harrier SOG Bulletin No. 121*. Suffolk Ornithologists' Group.

Stroud, DA, D Chambers, S Cook, N Buxton, B Fraser, P Clement, P Lewis, I McLean, H Baker & S Whitehead. 2001. *The UK SPA network: its scope and content.* JNCC, Peterborough.

WWT Wetlands Advisory Service. 2003. *All Wales Common Scoter Survey: report on 2001/02 work programme*. CCW Contract Science Report no. 568.

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