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AERIAL SURVEYS OF WATERBIRDS IN STRATEGIC WIND FARM AREAS:

2004/05 Final Report

MAY 2006

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- Centrica Renewable Energy Limited
- Countryside Council for Wales
- Department for Environment, Food and Rural Affairs
- Department of Trade and Industry
- DONG Walney (UK) Limited
- Dudgeon Offshore Wind Limited
- English Nature
- GE Gunfleet Limited
- Greater Gabbard Offshore Winds Limited
- Kentish Flats Limited
- London Array Limited
- Npower Renewables Limited
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- Scira Offshore Energy Limited
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- The Joint Nature Conservation Committee
- Wildfowl & Wetlands Trust Consulting

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Contents

Figures

Tables

Introduction

1.1 The Round 2 wind farm Strategic Environmental Assessment (SEA)[1] identified a significant baseline data gap for Round 2 wind farm areas on the distribution and main flight paths of waterbirds including migratory, feeding/roosting patterns and their behavioural response to wind farms. Following a review of the data collected it was clear that there were gaps in the understanding of the distribution of waterbirds within each of the three strategic offshore wind farm areas: Thames, East Irish Sea and Greater Wash. The data is required by developers in order for them undertake a valid Environmental Impact Assessment and are also required in order to identify boundaries for potential Special Protection Areas (SPA) under the Birds Directive (79/409/EEC).

1.2 In order to rectify the data gap it was decided to fulfil these inter-related needs as a single coherent aerial survey project with support from the offshore wind farm industry, Joint Nature Conservation Committee (JNCC), English Nature (EN), Countryside Council for Wales (CCW), Department for Environment, Food and Rural Affairs and Department of Trade and Industry.

1.3 In July 2004 a panel of experts from JNCC, EN, CCW, DEFRA and DTI met to identify the areas of priority and to draw up an aerial bird survey programme for 2004 and 2005 that covered the three strategic areas, plus adjoining areas identified as potentially important for birds. The conclusions reached at the meeting were circulated to industry and it was agreed to proceed with a joint approach.

[1] Offshore Wind Energy Generation: Phase 1 Proposals and Environmental Report for consideration by the Department of Trade and Industry April 2003

1.4 A programme of aerial surveys have been undertaken by the Wildfowl & Wetlands Trust's (WWT) Wetlands Advisory Service (WAS) from winter 2004/05 through to summer 2005. This has provided large-scale survey data covering the nearshore waters in Northwest England (from Anglesey to the Solway Firth), in the Greater Wash and in the Thames (from Flamborough Head, Yorkshire, to Sandwich Bay, Kent). These data will inform the environmental impact assessments of offshore wind farms (OWF) and aid potential marine Special Protected Area (SPA) identification (Johnstone *et al* 2002).

Objective of the Report

1.5 This report provides final results from aerial surveys undertaken between October 2004 and September 2005. Numbers of birds encountered are provided, and estimates of total numbers calculated 'distance analysis' are provided for the more numerous species of conservation importance. Maps are provided showing the large-scale distribution in each of the three strategic wind farm areas. Brief comparisons are made with the results of previous surveys.

Methods

Aerial survey

2.1 Aerial surveys used for this report 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 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 would not be possible with data collected using previous aerial survey methods. Furthermore, 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).

2.2 Aerial surveys were undertaken by WAS using experienced observers who have undertaken aerial surveys previously for many of the OWF sites and to identify sites for potential classification as SPAs in the UK in 2001/02, 2002/03 and 2003/04. A number of Partenavia PN68 aircraft were used, flying at an altitude of 250 ft and at a speed of approximately 200 kmh^{-1}. The location of the plane was recorded every five seconds using a GPS.

2.3 A series of transects spaced 2 km apart were designed to cover nearshore waters. Ideal survey design is for transects to be orientated perpendicular to major environmental gradients (primarily sea depth). Transects that run north-south reduce the effect of glare during the survey and aid the detectability and identification of birds. Any transects used in previous large-scale or regional surveys were retained to enable comparison of data with previous results. Consequently, transects in areas covered for the first time during this project were created by extension of those already in use in Liverpool Bay, in the Thames and off the north Norfolk coast. North-south transects were used throughout the strategic areas and, for ease of navigation, followed northings of the GB Ordnance Survey grid.

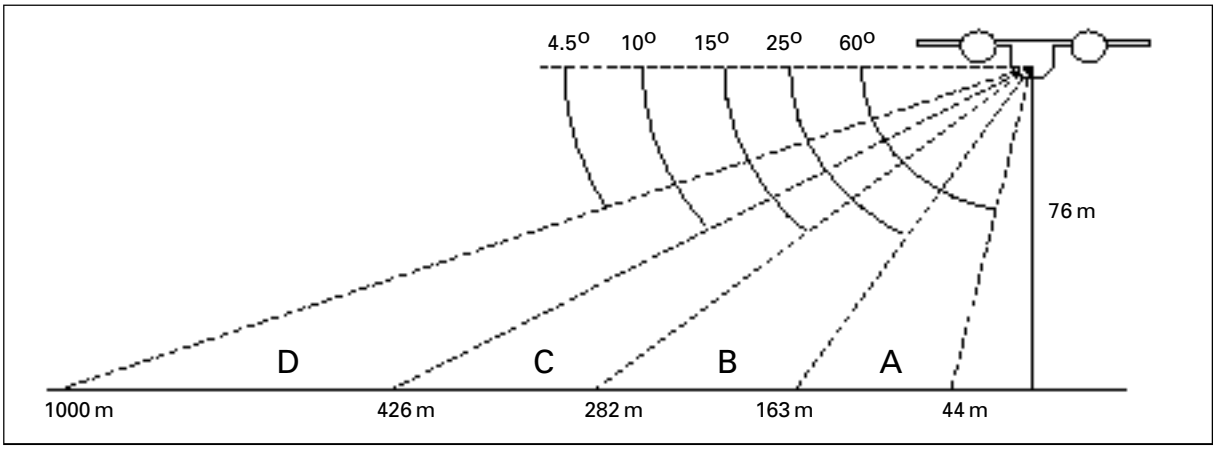
2.4 For each bird or flock of birds, the species, number, behaviour, distance band and the time at which it was perpendicular to the flight path of the plane were recorded using a dictaphone. Using a clinometer, birds were located in one of four distance bands covering an area from 44 m to 1,000 m either the side of the plane (Figure i); 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 were detected, and effort was concentrated on this band. Inevitably, birds further from the plane in other bands are missed owing to their distance from the plane and the need for the observers to concentrate observation on the area of sea nearest the flight line.

2.5 Surveys were generally made during a four-hour period centred on midday GMT to minimise the effects of glare on counts. Surveys were undertaken in good weather conditions, generally with winds of 15 knots or less.

2.6 Survey was suspended during the turns between the end of one transect and the start of the next, though significant observations, e.g. cetaceans or large flocks of birds, were sometimes recorded on an *ad hoc* basis.

2.7 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 being in a species group, e.g. diver (*Gavia* spp.), '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 *Larus minutus* or Kittiwake *Rissa tridactyla*) or gull (*Larus* spp. or Kittiwake). Many divers and gulls can be identified to species, but auks are very difficult to distinguish except by using binoculars.

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



2.8 Scoters at large distances are not easily identifiable as Common Scoter *Melanitta nigra*, as they are indistinguishable from Velvet Scoter *Melanitta fusca* at that range, particularly within mixed flocks. The vast majority of birds in Bands A and B can, however, be identified to species – and any Velvet Scoter in flight in band C would be readily distinguished. As only very small numbers of Velvet Scoters were recorded during aerial surveys, it has been assumed that the vast majority of scoters present were Common Scoters.

2.9 The vast majority of diver species (*Gavia* spp.) recorded are considered to be Red-throated Divers *Gavia stellata*. Considerable caution is exercised given the possibility of confusion with Black-throated Diver *Gavia arctica* and the inexperience of the observers with observations of this species from the air; however, only very small numbers have been recorded on aerial survey, even among those birds close to the plane. Great Northern Divers *Gavia immer* 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.'.

Survey area

2.10 The survey area was divided into a series of survey blocks that could be covered by a single plane in one day. The survey area was designed to cover all Round 2 OWF sites being investigated, plus a buffer zone and any control areas, and to cover areas known or thought to be important for waterbirds and seabirds. The boundaries of the survey blocks were placed to avoid cutting any possible OWF footprints and any areas already known to be important for flocks of birds, particularly Common Scoter.

2.11 Five survey blocks were identified for the North West strategic area, six for the Greater Wash and five for the Thames (Figure ii).

Coverage

2.12 The distribution of many waterbirds wintering in the UK changes during the course of the winter, for example, because many breed outside the UK and migrate here at different times of year, and because of changes in food resources or weather. Changes during summer months will relate particularly to breeding and fledging of young. Seven survey periods were identified to record changes in abundance and distribution during the course of the year (Table 1). An additional survey was made at GW4 (Fig ii) in September 2005, to assess its importance for moulting scoter.

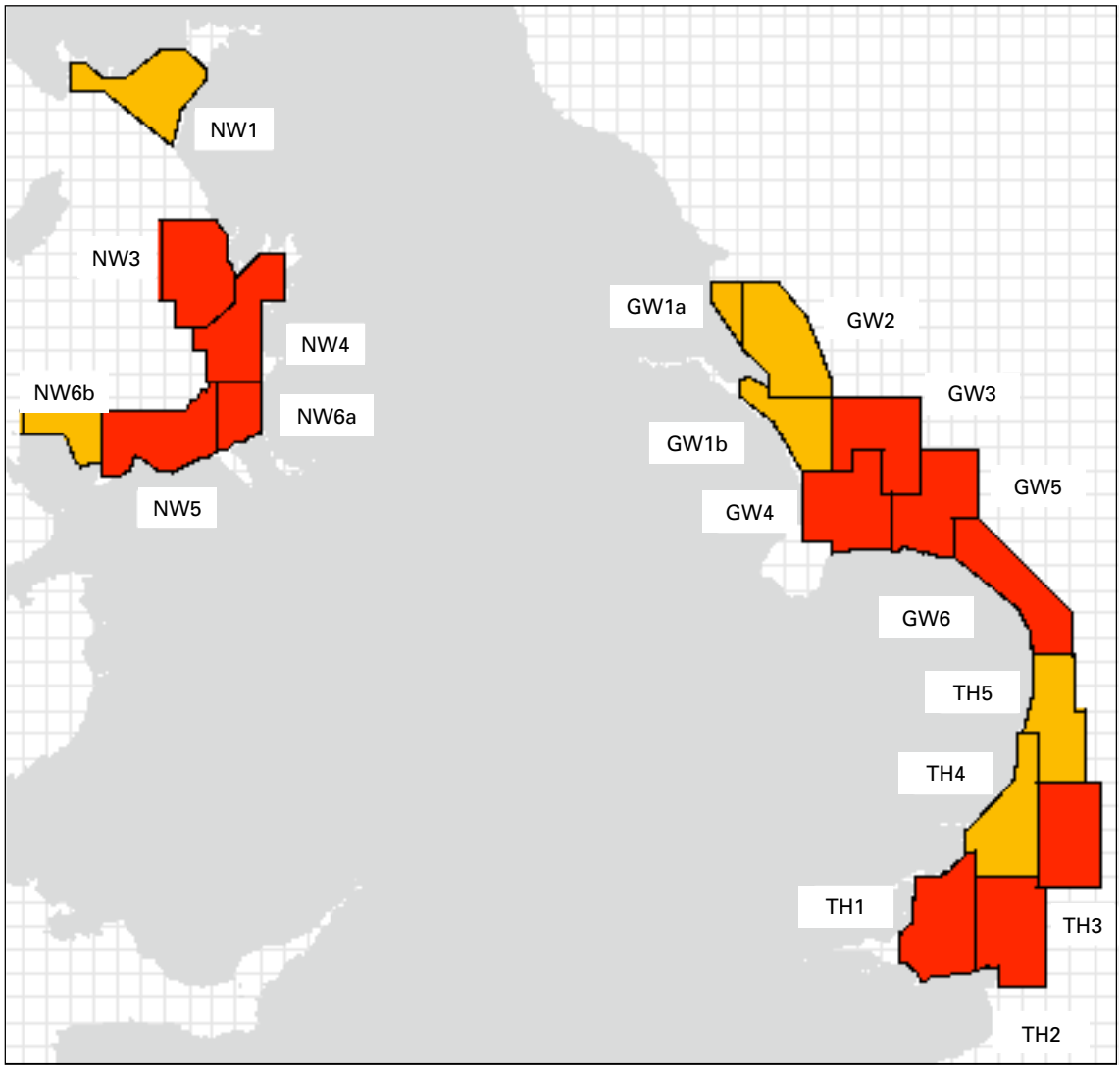
Table 1 - Survey periods used for aerial surveys in 2004/05

Survey Period	Description	Dates
1	Early winter	23 October – 21 November
2	Mid winter (1)	22 November – 31 December
3	Mid winter (2)	1 January – 9 February
4	Late winter	10 February – 11 March
5	Breeding: incubation	9 May – 5 June
6	Breeding: chick rearing	6 June – 10 July
7	Post fledging/moult	11 July – 21 August

2.13 The dates of flights in each survey block are given in Tables 2-4. Some small parts of some survey blocks could not be flown, for example, because of 2-km flying exclusion zones around nuclear power stations (at Wylfa, Anglesey, Heysham, Lancashire, and Sizewell, Suffolk). In some survey blocks on some dates, survey was also curtailed by military activity in danger zones (notably, the northwest corner of NW3 (Fig ii), or because of heavy boat traffic (e.g. in the mouth of the Humber) but these generally affected only small areas at the periphery of certain survey blocks.

2.14 Due to complications with obtaining Civil Aviation Authority (CAA) approval, it was not possible to fly through and therefore survey within the footprint of constructed wind farms. At these sites, the plane flew at a higher altitude (preventing survey using the prescribed methods), to pass safely over the top of the wind farm before descending to the survey altitude as soon as possible afterwards (survey was not possible 1-2 km along the transect path either side of the constructed wind farm) or flew around the wind farm, departing from the intended transect route by approximately 1 km. This affected coverage of North Hoyle OWF in NW5 and Scroby Sands in GW6 (Fig ii).

Figure ii – Survey blocks (colours represent winter survey priorities)



Analysis and map production

2.15 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 to the location of the plane, recorded by the GPS (generally, every five seconds). Interpolation of the GPS data enabled the position of the plane to be located along the flight path at each second. The locations of birds detected were displaced either side of the flight path at a distance roughly in the middle of the distance band in which they were recorded. The location of most observations is consequently considered to be accurate to within 200-300 m.

2.16 The distribution of the more numerous species (or species groups) in each Strategic Area is shown using encounter rate, i.e. the numbers of birds counted per unit length of transect flown. Data are summarised by 2x2 km grid squares, corrected for survey effort (distance flown over which observers were actively looking for birds) in each cell. Casual observations of 'out of transect birds' (e.g. those recorded while the plane was turning between transects) were omitted from this analysis.

2.17 The density scales used in the maps were selected to illustrate the distribution patterns of encounter rates. They are broadly consistent between surveys but small variations will occur owing to the different conditions of visibility during and between surveys, and the different abilities of observers. Densities are not, however, comparable between species due to the different detectability of different species. Note that the range of relative density values may vary markedly between species, and reference should be made to the key in each figure to interpret apparent high concentrations of birds appropriately.

Analytical methods for population assessment

2.18 The density and population abundance of Common Scoter and of all diver species combined were estimated using *Distance 5.0* software (Thomas *et al.*, 2005). Line transect methods were employed for the diver analyses and strip transect methods for the Common Scoter (due to complications arising from the tendency for scoter to move away from the flight path in response to the plane). No significant differences between observers were found and it was thus unnecessary to include observer as a covariate. Data for Common Scoter has been post-stratified by flock size to improve precision, and 95% confidence intervals were obtained by bootstrap simulation. Observations were combined by geographic region (east and west) within each of the seven survey periods, and density and abundance estimates are thus presented as regional totals for each survey period (unless insufficient observations were collected to permit analysis).

Results

Overall numbers and distribution

3.1 Maps showing the distribution of bird observations of all species in winter (Periods 1-4) and summer (Periods 5-7) for the North West, Greater Wash and Thames are shown in Figures 1-6. Relative densities of all birds encountered in winter and summer for each of the OWF Strategic Areas are shown in Figures 7-12. These maps show total numbers of birds counted per 2x2 km grid cell (summing the numbers of birds recorded in flocks), corrected for survey effort (distance flown in each cell).

3.2 Total numbers of birds encountered during aerial surveys of the North West, Greater Wash and Thames OWF Strategic area are given in Tables 5-7. The numbers recorded in each survey block are given in Tables 13-34. Note these are not absolute numbers of birds in the survey area, which need to be calculated using 'distance', to allow for the numbers of birds that are missed with increasing distance from the transect line.

3.3 Coverage of survey blocks NW1, NW6b, GW1a, GW1b, GW2, GW6 and TH2 was not required during the summer (Periods 5-7). Survey blocks TH3 and TH4 were flown once during the summer period (resulting in apparently low numbers of observations in these blocks when combined for all three periods).

3.4 Highest numbers of observations (one bird, and one flock of birds, are both treated as single observations) were recorded in the winter, with lower numbers in the summer, especially in the Thames.

3.5 The highest densities of birds occurred closest to shore, particularly in Liverpool Bay and close to the Suffolk and Essex shores, where flocks of scoters and gulls were encountered. Although relatively high numbers of observations were made in some offshore areas, many related to individual or small groups of birds, hence these maps show relatively lower densities of numbers of birds in the offshore part of most survey blocks.

3.6 High numbers of encounters close to shore in some areas are a result of flocks of waders and gulls feeding or loafing on mudflats or sandbanks exposed at low tide, notably in northeast Morecambe Bay, Cumbria (NW4), off the Dengie and southwest from Foulness, Essex (TH1), and off Skegness, Lincolnshire (GW4).

3.7 In the North West during winter the highest numbers of observations were recorded near to shore, notably off Blackpool and in the bays along the north Wales coast (primarily due to the presence of scoter flocks). Although relatively high numbers of observations were made in offshore areas in NW3 these were primarily single auks, resulting in a low relative density of birds.

3.8 In summer the highest concentrations of observations in the North West were recorded near shore in Morecambe Bay and along the North Wales coast (primarily gull species), and off the Dee Estuary (primarily terns and gulls).

3.9 Note that coverage of the western part of NW1 was not required for the project. The small number of observations in Wigtown Bay relates to a single flight of eight short transects in January.

3.10 The observations in the Greater Wash during the winter were relatively evenly distributed, though there were fewer observations in GW1b and GW6. The relative density of birds was similar throughout the survey area, with small areas of high concentration near to shore, due to dense, discrete scoter flocks, and loafing gulls.

3.11 In the summer there were high numbers of observations off the North Norfolk coast, primarily of terns inshore and in the west, and of Kittiwakes in offshore areas. Low numbers of observations were made in western areas of GW4.

3.12 In the Thames, during winter, the highest numbers of observations and relative densities of birds were off the Suffolk and Essex coasts, primarily due to gulls, and in the easternmost transects of TH2. In the summer, numbers of observations were generally low in the Thames, especially in the north of TH1 and in TH3.

Species numbers and distribution

Common Scoter

3.13 Total numbers of scoters counted in each survey block during Periods 1-7 are given in Table 8. Estimates of scoters calculated using Distance 5.0 for the East coast (Greater Wash and Thames) and West coast (North West) are given in Table 9 for each Period in which significant numbers were recorded. Relative densities of scoter during Periods 1-7 in the

North West are shown in Figures 13-19, during Periods 1-4 in the Greater Wash in Figures 20-23 and during winter (Periods 1-4 summed) for the Thames in Figure 24.

3.14 The North West held by far the largest numbers of scoters in all periods, with a late winter peak of almost 20,000 birds counted. The highest concentrations were over Shell Flat and along the North Wales coast. The Greater Wash held relatively high numbers of scoters, mainly in a few discrete flocks just off the mouth of the Wash. The Thames held small numbers of scoters, with no obvious pattern to the distribution of small flocks.

3.15 Large numbers of scoters were present throughout the winter in the North West. Discrete areas of high concentration during winter were notable over much of Shell Flat, spreading south and closer to shore near the mouth of the Ribble, directly offshore from Formby Point, and throughout much of Colwyn Bay. Smaller numbers were found in Conwy Bay and Red Wharf Bay, and in the northern part of the Outer Solway Firth. One relatively large flock was encountered to the north of Walney Island, but only in one period. At many of these sites, a sizeable proportion of birds were located some distance from shore.

3.16 There appeared to be a westwards shift in distribution as the winter progressed, with peaks in NW4 and NW6a in early winter, then dropping as numbers increased in western survey areas NW5 and NW6b in Periods 3 and 4 (Table 8).

3.17 Scoter concentrations over Shell Flat appeared to move further offshore as the winter progressed (Periods 1 to 4), with high encounter rates recorded along the length of the sandbank in Period 4. Numbers in Colwyn Bay increased dramatically in Period 4.

3.18 Few scoters were encountered in the North West during the summer, although some birds were present over Shell Flat in all periods. By Period 7 numbers had increased, as birds started to return from the breeding grounds.

3.19 Nearly all scoters in the Greater Wash were located within GW4. On most occasions, birds were located in a few discrete flocks, usually at predictable locations off Skegness, near Titchwell and Holkham Bay. Most were found very close to shore, normally within 1-2 km, but on several occasions, birds were encountered some distance north of the coast, over the large area of shallow water extending north from the western part of the North Norfolk Coast.

3.20 Although few flocks were encountered, observations suggest that, as in North Wales, scoters appeared to move offshore as the winter progressed.

3.21 The Thames held the smallest and most variable numbers of scoters of the three Strategic Areas. Most were recorded east of Foulness, with small numbers in TH4 and occasional birds elsewhere (Table 8).

3.22 Very few scoters were recorded in the Greater Wash or Thames Strategic Area during the summer.

3.23 No significant numbers of scoters were found during the additional survey of GW4 in September 2005.

3.24 Numbers of Common Scoters, calculated using *Distance 5.0*, gave estimates between two and three times greater than actual counts. The large confidence intervals are partially a result of the clumped distribution of scoters and partially due to the tendency of scoter to flush in front of the plane, moving away from the transect line.

3.25 The West coast held significantly larger numbers of Common Scoter than the East. Distribution was particularly clumped, with a large proportion of all birds in each area often occurring in just one or two survey blocks.

3.26 The North West OWF Strategic Area held numbers exceeding the international 1% threshold (16,000 individuals) during all winter periods. This number was exceeded in NW4 alone, also in all winter periods. NW5 held more than 16,000 scoters in Period 4.

Divers

3.27 Total numbers of divers (Red-throated, Black-throated, Great Northern and those not identified to species) counted in each survey block during Periods 1-7 are given in Table 10. Estimates of divers calculated using *Distance 5.0* for the East coast (Greater Wash and Thames) and West coast (North West) are given in Table 11 for each Period in which significant numbers were recorded. Observations of divers in Periods 1-4 in the North West are shown in Figs 25-28, in the Greater Wash in Figures 29-32 and in Thames in Figures 33-36.

3.28 Total numbers were relatively constant between winter periods in Strategic Areas, except for the Thames where numbers rose sharply in Period 2 and then remained constant for the remainder of the winter.

3.29 Divers were found widely distributed throughout most of the survey area. Although some concentrations appeared to be found close to shore and around the mouths of estuaries in some survey blocks, birds were consistently encountered a long way from shore in all Strategic Areas, and over 40 km from shore in both the Greater Wash and Thames, even if only in low densities.

3.30 Divers were present in large numbers from Period 2 onwards in the Thames, with consistently around 1,000 birds (combining all species and unidentified birds) (Table 7). The vast majority are believed to have been Red-throated Divers. The number of divers increased in the inner part of the survey area (TH1 and TH2) and decreased in the outer survey area (TH4 and TH5) through Periods 2-4.

3.31 The highest densities were in mid channel in the outer part of the Thames Estuary, and off the Suffolk coast. These two areas were characterised by the presence of sizeable flocks, often comprising groups of tens of birds, and appeared to show clumped patterns associated with the channels and sand banks in the waters between Kent and Essex.

3.32 Divers were present in the North West throughout the winter with counted totals varying from 128 to 213. The peak winter count occurred in Period 4 (Table 10), consistent with results from previous years. The majority of divers identified to species were Red-throated Divers and it is thought that the vast majority of unidentified divers were of this species.

3.33 The distribution of divers within the North West varied through the winter with no survey block consistently holding highest numbers, probably due to movements of their mobile prey. All of the survey blocks held 40-60 divers in at least one period, with the exception of NW6b. Areas with seemingly higher densities included the mouth of the Ribble Estuary, Formby Point and the mouth of the Dee Estuary. Distribution was generally clumped, becoming slightly more widespread and perhaps moving further offshore in Period 4.

3.34 Moderate numbers of divers were recorded throughout the winter in the Greater Wash. As with birds in the North West and Thames, the vast majority are believed to have been Red-throated Divers although only a proportion was identified as such. The peak in Period 4 of 227 birds (all species combined) (Table 6) perhaps indicates passage of birds along the east coast of England. Divers were recorded in all survey blocks, with consistently low counts in GW2 and the highest numbers in GW4 in all periods (Table 10).

3.35 In the Greater Wash divers were mainly located fairly close inshore in early and mid winter (Periods 1-2) with most birds between Cromer and the Humber. In Periods 3 and 4 numbers were greatest off the Lincolnshire coast.

3.36 Estimated numbers of divers, calculated using *Distance 5.0*, were significantly higher off the East coast than the West. Numbers in the East exceeded 3,000 birds during Periods 2-4. No single survey block held in excess of 3,000 birds. The confidence limits were much smaller than those for scoter as a result of the more uniform distribution of divers.

Little Gull

3.37 Total numbers of Little Gulls counted in Periods 1-7 in each survey block are given in Table 12. Observations of Little Gulls in the winter (Periods 1-4) in the North West and Greater Wash are shown in Figures 37-38.

3.38 Large numbers of Little Gulls were encountered in Period 1, and moderate numbers remained in Period 2 (Table 12). The majority were encountered well offshore in GW3 (Table 12).

3.39 Large numbers of Little Gulls were encountered during the winter in the Greater Wash (mainly Periods 1 and 2). The majority were recorded in the central area of the Strategic Area with the highest densities occurring well offshore. It is thought that a high proportion of birds not identified to species, but noted simply as 'small gull' in offshore areas during these Periods, will also have been Little Gulls.

3.40 In the North West small numbers of Little Gulls were encountered in early winter, when sizeable numbers are known to gather in Liverpool Bay and other parts of the Irish Sea. The main concentrations were encountered in offshore areas west of Blackpool. Numbers were highest during early to mid winter.

3.41 In both the North West and the Greater Wash Little Gulls appear to occur in a relatively discrete area, within which distribution is almost contiguous.

Eider

3.42 Large numbers of Eiders *Somateria mollissima* were present during the winter in the North West OWF Strategic Area (Figure 39). Almost all of the Eiders encountered in winter were in Morecambe Bay and around Walney Island. Small numbers were found in Wigtown Bay, the Solway, Conwy Bay and off Blackpool. Most Eiders were encountered near mouths of rivers or estuaries.

3.43 Nearly all birds were consistently found in Morecambe Bay (NW4). The low count during Period 3 is probably a result of birds moving locally out of the survey area (e.g. beyond the limit of surveyed transects) due to tidal movement rather than a true reduction in numbers.

3.44 Much smaller numbers of Eider were recorded during summer though again mainly in Morecambe Bay. It is likely that, as in winter, birds had moved only locally but beyond the limit of the surveyed area.

Manx Shearwater

3.45 Moderate numbers of Manx Shearwaters *Puffinus puffinus* were present during the summer in the North West OWF Strategic Area. Manx Shearwaters were widespread throughout offshore areas, at the outer limit of the survey area; distribution will have extended well beyond the survey area. The highest concentrations were off Barrow (NW3) and in the northwest corner of NW5 (Figure 40).

Gannet

3.46 Moderate numbers of Gannets *Morus bassanus* were present during the summer, with occasional sightings throughout winter. Most birds were encountered in the North West OWF Strategic Area. Gannets were patchily distributed with an obvious concentration off Wirral and the mouth of the Dee (Figure 41).

Cormorant and Shag

3.47 Moderate numbers of Cormorants *Phalacrocorax carbo* and Shags *Phalacrocorax aristotelis* (and those not identified to species) were found throughout the year in the North West OWF Strategic Area, with the highest numbers in early to mid winter. Cormorants and Shags were present from Anglesey to the mouth of the Ribble Estuary, mainly in inshore areas (Figures 42-43). The area off the North Wales coast held the largest numbers in most periods. All survey blocks here held moderate numbers in at least one period, with the exception of NW6b.

3.48 During the summer, distribution was more restricted, with most birds in Colwyn and Conwy Bays (Figure 43). Occasional observations were made in offshore areas during the summer.

Gulls

3.49 Six species of gull – Black-headed Gull, Common Gull, Lesser Black-backed Gull, Herring Gull, Greater Black-backed Gull and Kittiwake – were commonly recorded throughout the surveys (Figures 44-64). The first five are found in large numbers at coastal and inland sites; Kittiwakes are generally pelagic and separate maps are therefore presented for this species.

3.50 Large numbers of gulls were recorded in most areas throughout the year in the North West, with the increase in numbers in late winter likely to represent birds returning to breeding areas (large numbers in NW4 are likely to be associated with the colony on Walney Island on the border of NW3 and NW4) (Tables 13-19).

3.51 Gulls were encountered widely throughout the North West, generally relatively evenly distributed up to the offshore limit of the surveys. Highest densities often occur immediately adjacent to the coast, e.g. in Morecambe Bay, off Blackpool and the North Wales coast (Figures 44-50). In many cases this may be due to survey coinciding with low tide when large numbers of gulls loaf on exposed inter-tidal areas. Isolated high densities of gulls offshore may represent marked concentrations around active fishing vessels.

3.52 Gulls were again widespread during summer periods in the North West. High densities were found in Morecambe Bay during Periods 5 and 6, close to major breeding colonies but perhaps also representing aggregations of non-breeders and birds loafing on exposed substrates at low tide.

3.53 Large numbers of gulls were encountered in the Greater Wash, with numbers decreasing gradually as the year progressed. Highest concentrations were found in GW1b and GW4.

3.54 In the Greater Wash, gulls were encountered widely throughout the survey area, with consistently higher numbers in the north and west. In Periods 1 and 2 marked concentrations occurred adjacent to and extending from the mouth of the Wash (Figure 51). In Periods 2-4 there was a general movement northwards and westwards, with high concentrations in GW1a and GW2 in Period 4 (Figures 52-54). High densities of birds in areas adjacent to the coast and in the mouth of the Humber Estuary are likely to be a result of loafing gulls on exposed inter-tidal areas at low tide.

3.55 In the Greater Wash, there is an obvious offshore aggregation of gulls in early summer (Period 5), possibly related to large multi-species feeding association or fishing activity (Figure 55). Many of these birds were Kittiwakes (see below). Few gulls were encountered in mid to late summer (Figures 56-57).

3.56 Large numbers of gulls were recorded in the Thames OWF Strategic Area. Large numbers recorded in TH1 and TH2 were due to high concentrations of gulls loafing on sandbanks at low tide. Peak numbers occurred during the mid winter survey periods (Tables 27-33).

3.57 Gull species were encountered widely throughout the Thames during winter, with the exception of Period 4 when few birds were recorded in offshore areas (Figures 58-64). This pattern then continued during summer periods, when birds were much more sporadically encountered in the Thames.

Kittiwake

3.58 Kittiwakes were encountered further offshore than other species of gull, although distribution differed between winter and summer in all the OWF Strategic Areas (Figures 65-70).

3.59 In the North West, winter distribution was spread throughout Liverpool Bay with greatest concentrations in the north (Figure 65). In the summer, distribution had moved south and further inshore (Figure 66). NW5 held the highest concentrations.

3.60 Kittiwakes were widespread but thinly distributed throughout the Greater Wash in winter, with low numbers in the southeast in particular (Figure 67). In the summer there was an obvious aggregation in GW3 during Period 5 (Figure 68). This represented some of the highest densities of Kittiwakes during 2004/05. Very few kittiwakes were, however, seen in other areas in the summer.

3.61 In winter, Kittiwakes were widespread in the Thames, with high densities recorded sporadically throughout. Only inshore areas held few birds (Figure 69). Very few Kittiwakes were encountered during the summer, with most birds in TH5 (Figure 70).

Terns

3.62 Terns were recorded patchily in all three OWF Strategic Areas. A large proportion of individuals could not be identified to species, though most were believed to be Sandwich Terns *Sterna sandvicensis* and Common Terns *Sterna hirundo*, the predominant species breeding in these areas.

3.63 Only small numbers of terns were encountered in the North West OWF Strategic Area despite sizeable breeding colonies in Liverpool Bay. The highest concentrations were inshore around the breeding colonies in the Dee Estuary (NW5 & NW6a), and off Walney and Barrow (NW3 & NW4) with densities generally decreasing with increasing distance from colonies (Figure 71).

3.64 Terns were widespread through the surveyed areas in the Greater Wash with the exception of the westernmost transects. Highest concentrations were around the breeding colonies, although in contrast to the North West OWF Strategic Area high densities were also found throughout the survey area, up to 65 km north of breeding colonies on the North Norfolk coast (Figure 72).

3.65 Terns were distributed patchily through the Thames, with no obvious aggregations (Figure 73). The majority of birds were recorded in Period 7 and are unlikely to have been associated with any breeding colonies.

Auks

3.66 The majority of auks encountered are believed to have been Guillemots *Uria aalge* with smaller numbers of Razorbills *Alca torda*. No Little Auks *Alle alle* or Puffins *Fratecula arctica* were specifically identified, although a very small number of observations were thought to have been of these species.

3.67 Large numbers of auks were observed in the North West at the start of the winter period, but declined steadily during the winter and into summer when birds were nesting (Table 5). Numbers increased again at the end of summer (Period 7) as young fledged and adults and young moved away from the colonies. The areas holding the largest numbers were NW3 and NW5 (Table 13-19).

3.68 Auks were encountered widely throughout the North West during the year, with distributions and relative densities varying between periods. In winter the highest densities of auks were found in offshore areas of NW3 and NW4, and off North Wales, particularly Great Ormes Head to Anglesey (Figures 74-77). Either or both of these areas held high concentrations through the winter. In early summer, auks were found through most of the survey area, and with a more even distribution; inshore areas generally held few birds except around the breeding colonies at Great Ormes Head (Figure 78). Low densities in Period 6 centred around the Great Ormes Head and the western edge of NW4 (Figure 79). By the end of the summer the distribution was similar to that of the winter as fledged young and adults moved away from breeding colonies (Figure 80).

3.69 Although present throughout the Greater Wash, as with the North West, largest numbers of auks were recorded in early winter and generally decreased as the year progressed (Table 6) with an increase in Period 7. No particular area was favoured, possibly due to the mobile nature of their prey.

3.70 Auks were widespread through the Greater Wash, although their distribution varied considerably between periods. In Period 1 high densities were widespread through the survey area with only GW6 holding low concentrations (Figure 81). By Period 2 numbers had decreased and birds moved generally further offshore (Figure 82). In Periods 3 and 4 there was a general movement northwards with high concentrations in GW1a and GW2 in Period 4 (Figures 83-84), survey blocks that were not flown in Periods 5-7. In early to mid summer few auks were encountered. By the end of summer numbers had increased, with most birds in offshore areas (Figures 85-87).

3.71 Peak numbers of auks in the Thames were recorded in Period 2, with numbers falling subsequently through the summer but increasing in Period 7, as in the other Strategic Areas (Table 7). Distributions varied by period; with consistently low numbers in the innermost area (TH1) (Tables 27-33).

3.72 Auks were widespread through most of the Thames, with the exception of TH1. The highest densities occurred in different areas through the winter, though there was a general movement offshore from mid to late winter (Figures 88-91). At the end of the summer the main concentrations were in the north of the area (Figure 92). Relative density maps were not produced for Periods 5 and 6 due to very low numbers of auks recorded.

Discussion

Overall summary

4.1 The North West was characterised by large counts of Common Scoters, concentrated mostly in the bays along the north Wales coast and over Shell Flat, Blackpool. Waterbirds and seabirds were widely spread throughout much of the Thames, with divers in particular found over much of the survey area, and large numbers of waterbirds and gulls in nearshore areas, often associated with exposed intertidal areas. The Greater Wash generally held fewest numbers of birds of all three Strategic Areas. During winter, even once numbers of Common Scoter (which account for half or more of the total numbers in the North West) are removed, the North West and Thames held 10,000 or more waterbirds and seabirds; numbers (excluding Common Scoter) in the Greater Wash declined steadily from around 7,000 to just 3,000.

4.2 Total numbers of waterbirds and seabirds were reasonably consistent throughout the four winter periods in the North West and Greater Wash, but showed a midwinter peak in the Thames. Numbers in all Strategic Areas were low during the summer, though increased in Period 7.

Common Scoter

4.3 Numbers of Common Scoter counted in the North West surpassed the level for international importance (16,000; Wetlands International 2002) on two occasions in 2004/05. Numbers estimated using distance analysis exceeded this threshold during all winter periods and in all cases, the lower confidence interval also exceeded this number, giving considerable confidence regarding the regular presence of internationally important numbers of common scoter in Liverpool Bay throughout the winter.

4.4 Winter maxima for Common Scoter in Liverpool Bay during 2001/02 to 2004/05 were 27,800, 79,100, 42,900 and 47,600 (although this last figure will have included a relatively small number in the Solway Firth that were not included in totals for the previous winters) (Cranswick *et al.* 2004, Hall *et al.* 2005), demonstrating the regular and continued presence

of internationally important numbers. No marine SPA has yet been designated in Liverpool Bay, although the boundaries for a site are currently in preparation.

4.5 As in recent years (WWT Wetlands Advisory Service 2004, Cranswick *et al*. 2004), there was a late winter peak in scoter numbers in the North West in 2004/05, although this was not as pronounced as previously and a lower proportion of the total was found over Shell Flat in late winter. A shift in distribution in the North West in late winter was again noted (with Formby Point and Conwy Bay becoming more important at that time) though this was also less pronounced than in some previous years.

4.6 The movement of scoters further offshore during the course of the winter is believed to be a response to food depletion in inshore areas: being generally shallower, food in these areas represents more profitable foraging. Recent studies on the benthic communities in Liverpool Bay have found large scale (more than 50%) declines in the density of likely scoter prey during the winter (Kaiser *et al* in prep).

4.7 Sizeable numbers of Common Scoter were found off Norfolk and in the Thames. Large numbers have occurred in the latter site historically (off several sites along the Essex coast). The most consistently used site in recent years has been close to the area around Foulness, though the exact location and number of birds appears rather variable (Hall *et al*. 2003, WWT). Numbers off the Norfolk coast have been regularly observed at predictable locations close inshore in recent winters by land-based counts (e.g. Cranswick *et al*. 2005). Aerial surveys have confirmed the presence of these birds, but also their use, on occasion, of shallow waters some distance from shore that would not otherwise have been detected. Flocks in both of these Strategic Areas were generally discrete and much more limited in their distribution than in the North West.

4.8 Other important sites for wintering Common Scoter in the UK include Carmarthen Bay, designated as the UK's first marine SPA, based on its importance for Common Scoter, a site which regularly supports around 20,000 birds (Cranswick *et al*. 2005). Some 11,800 were estimated in Cardigan Bay in 2003/04 (Hall *et al*. 2005). The Moray and Dornoch Firths, Tay Estuary and Firth of Forth hold small numbers of scoter: aerial surveys conducted in winter 2003/04 counted a total of 3,267 Common Scoters in December, although estimates using distance analysis are not yet available (Dean *et al* 2004).

4.9 The current estimate of wintering Common Scoter numbers in Britain is 50,000 (Cranswick in press, Kershaw & Cranswick 2003). This estimate is based on data collected before the recent increase in aerial survey activity in Britain, however, and the results from those surveys suggest that the real figure is likely to be around 80-90,000.

4.10 The estimate for the population of Common Scoters, used to identify sites of international importance in Europe, is 1.6 million (Wetlands International 2003) with the majority of the European wintering population found in the Baltic and Kattegat. The eastern North Sea holds hundreds of thousands, with smaller numbers in France, Portugal and northern Africa. In cold winters numbers in the North Sea are thought to be higher, when more scoters cross Jutland than in mild winters (Skov *et al*. 1995).

4.11 It should be noted that where large numbers of scoters are encountered, it is likely that individuals or small flocks of other species may have been missed during aerial surveys.

Divers

4.12 Divers were encountered widely throughout all Strategic Areas. Although not all could be identified to species, it is believed that the vast majority were Red-throated Divers.

4.13 Numbers of divers in the Thames in 2004/05 were lower than in recent winters. Fewer divers were encountered in the mid Thames channel (survey blocks TH1 and TH2) than during previous surveys; the peak count in those two blocks alone has normally exceeded 1,500 in late winter (e.g. Hall *et al*. 2003), whereas total numbers in all six Thames survey blocks reached only about 1,000 in 2004/05.

4.14 Winter maxima for Red-throated Divers (assuming all diver observations to have been of this species) in the Thames during 2002/03 to 2004/05 were 11,100, 7,700 (JNCC unpublished) and 5,600. This last figure is, in fact, an estimate for the English east coast from Kent to Yorkshire, not just the Thames. It will have included only a relatively small number of Divers outside the Thames Strategic Area, with a large proportion recorded in northern parts of the Thames Strategic Area. Nevertheless, these figures demonstrate the regular and continued presence of large numbers of Red-throated Divers in the Thames.

4.15 Only a few sites in Northwest Europe hold comparable numbers to those in the Thames, e.g. 23,500 divers (a mixture of Red-throated and Black-throated) are found in the East German Bight (Skov *et al*. 1995), although these occurred over a much larger area (13,000 km^2) compared with those in the Thames (2,500 km^2 surveyed during 2002/03 and 2003/04).

4.16 Previous surveys noted marked changes in the number and distribution of divers in the Thames between months (Hall *et al*. 2003). In some winters, a large influx has been noted, whilst in others, a more gradual build up of numbers has occurred. Peak numbers usually occur in late winter, although the precise timing has varied. Large movements of birds have even been noted during the course of an individual survey.

4.17 Feeding largely on fish, a widespread and mobile distribution of divers may be expected due to the mobility of their prey; and it might be speculated that the numbers and timing of arrival of divers in the Thames is related to the seasonal occurrence of fish species, particularly if spawning. Lower numbers in 2004/05 may reflect differences in fish stocks within the main channel of the Thames, differing use of other nearby areas in UK waters, a smaller influx into UK waters from the near Continent, or other factors. Further survey is needed to establish the regularity of any patterns and reasons for variations in numbers and site use.

4.18 The Suffolk coast has been known to support large numbers of Red-throated Divers on occasion, e.g. 2,680 were recorded during land-based counts in January 2000 (Rafe 2000 in Cranswick *et al*. 2005). Aerial surveys undertaken in 2004/05 were the first to provide comprehensive, synchronised coverage of the area extending north from the Thames along the East Anglian coast using a consistent method.

4.19 Large numbers were present just to the north in TH4 at the same time as large counts in TH1 and TH2. This suggests that presence along the Suffolk coast is a regular occurrence. Further, the survey shows that an area of high diver density is continuous from the mid Thames channel to roughly the Suffolk/Norfolk border, and that this distribution extends a long way offshore. Surveys off the Belgian coastline suggest that distribution there extends to around the 20 m depth contour (Skov *et al*. 1995) and aerial survey further east in the Thames Strategic Area would be useful to ascertain the limit of their extent.

4.20 Large numbers of Red-throated Divers are occasionally recorded off the south Kent coast, e.g. Lade Sands, near Dungeness (e.g. Cranswick *et al*. 2005). In the absence of any aerial survey coverage in this area, it is not clear whether birds in this area represent an extension or satellite of the 'flock' using the Thames Strategic Area, or represents infrequent aggregations during passage. Consideration should thus be given to extension of the survey area along this part of the Kent coastline, for example, during times of peak occurrence in the Thames.

4.21 Given the strong possibility that the area of the Thames OWF Strategic Area is likely to represent a coherent 'site' for divers, future surveys should ensure synchronised coverage across this broad region to ascertain numbers in this area.

4.22 The estimate of approximately 1,000 Red-throated Divers in the North West Strategic Area in 2004/05 compares reasonably with maxima of approximately 1,600, 1,000 and 600 in 2001/02 to 2003/04 (Hall *et al*. 2005). No marine SPA has yet been designated in Liverpool Bay, although the boundaries for a site, to include areas of importance for Red-throated Diver, are currently in preparation.

4.23 Aerial surveys of divers in other parts of the UK during winter 2003/04 recorded large numbers of Red-throated Divers in the Tay (137) and the Moray (54), although estimates using distance analysis are not yet available. Shore-based counts of Aberdeen Bay recorded a peak of 225 Red-throated Divers in late March 2004 (Dean *et al*. 2004). Some 1,200 were estimated (using distance) for Cardigan Bay in March 2004 (Hall *et al*. 2005).

4.24 As for Common Scoter, the increased aerial survey activity in the UK has greatly changed our understanding of Red-throated Divers wintering in British waters: the British estimate (of just 4,850 birds, derived from boat-based surveys in the 1980s) is clearly a considerable underestimate, and the above results suggest it is likely to be at least 10,000 birds and perhaps considerably more in some winters.

4.25 Procedures for identifying marine SPAs are currently in preparation (McSorley et al. 2004, Webb *et al* in prep a, Webb *et al*. in prep b). Significantly for Red-throated Diver, occurring on Annex 1 of the EC Birds Directive, all nationally important sites for Red-throated Divers in the UK qualify for consideration for SPA classification (Stroud *et al* 2001).

4.26 The international population estimate of Red-throated Divers is between 100,000 and 1 million (Wetlands International 2002). The international threshold is thus currently set at 10,000 birds, but this is likely to be revised to 3,000 in the next edition of *Waterbird Population Estimates* (Wetlands International in prep).

4.27 Divers and scoters were absent from the mouths of some busier estuaries, notably the Mersey, Humber, and the Stour/Orwell. Both species are known to be susceptible to disturbance from boats, and their relative scarcity in these areas – and seemingly in some parts of the mid Thames channel – may in part reflect the volume of boat traffic in these areas.

Other species

4.28 Large numbers of Little Gulls were observed in Periods 1 and 2, particularly in the Greater Wash. Although Little Gulls are regularly encountered in this area during migration periods (e.g. during land-based counts and by birdwatchers along the North Norfolk Coast), large counts have only very rarely been made; notably, during land-based counts off Spurn, Yorkshire, in September 2000 and during boat-based surveys in the same area (effectively, GW1a and GW2) in September 2003 (Hartley 2004).

4.29 Hartley (2004) speculated that the eastern part of the North Sea formed an important staging area for Little Gulls, before onward passage to wintering grounds, which extend from Britain to the western

Mediterranean and off West Africa. Based on actual counts during aerial surveys in 2004, it is likely that true numbers easily exceeded 1,000 birds.

4.30 Aerial surveys also showed that these birds were spread over a large area well offshore in the North Sea, with small numbers around other parts of the East Anglian coast and even in Thames, confirming the importance of the east North Sea for Little Gulls at this time. Notably, these large numbers were recorded in Periods 1 and 2, much later than the peak off Yorkshire in recent years which has occurred in September, with few remaining by the end of October (Hartley 2004). Almost no birds were recorded northeast of the Humber Estuary, where Hartley had recorded large numbers during boat-based surveys.

4.31 Kittiwakes and auks regularly had similar distributions. Kittiwakes are known to form associations with auks, and small groups of auks were often observed to be accompanied by a Kittiwake. Distributions of auks varied greatly between months, presumably in relation to changing fish stocks and preferred prey during the course of the year, as well as the need for proximity to breeding colonies between late winter and summer. The similar distribution of Kittiwakes in many months to that of auks may reflect a similar food choice, and/or the association between these species.

4.32 Although largest numbers of Gannets were consistently recorded in the North West, sizeable counts were made on one occasion in the outer part of the Thames also. As with auks, varying distribution is likely to reflect broad-scale movements of fish stocks. Gannet distribution tended to be patchy, and large but localised aggregations are likely to represent association with large, discrete fish shoals.

Concluding remarks

4.33 The survey data collected during this study represents a major logistic achievement and the most thorough survey of waterbirds and seabirds conducted in the three Strategic Areas. Central organisation, planning and co-ordination enabled WWT to overcome periods of inclement weather, and ensured the successful completion of all surveys.

4.34 It is recommended that to ensure, as best as possible, that survey coverage is maximised and that effort is prioritised that co-ordination across the three Strategic Areas is co-ordinated centrally in future years. Not only does this provide costs savings in terms of economy of management effort, but it ensures greater flexibility and reaction of surveyors to changes in weather or other conditions.

4.35 Following aerial surveys in recent winters, in some parts of some Strategic Areas, those in 2004/05 appear to establish the regular presence of important concentrations of waterbirds and seabirds at some sites both within a winter, and between winters. Survey in 2004/05 was, however, the first aerial survey of many places, particularly between North Norfolk and the Thames. Regular survey will be needed over a number of years to establish importance of the area, particularly given the mobile nature of many species and their prey.

4.36 It should be noted that no aerial surveys were possible within the constructed wind farms during 2004/05 owing to health and safety issues. Such survey will be necessary to provide the data to assess the effects of their construction upon numbers and distribution of birds in and around their footprints.

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Figures

Figure 1 - Observations of birds in the North West OWF Strategic Area during aerial surveys, winter 2004/05. A single record of birds (whether an individual or flock) is treated as one observation. All observations are shown for Periods 1-4 inclusive. The approximate boundary of the survey blocks is shown in green. The grid is the 10-km national OS grid. Note, a higher proportion of birds is detected close the plane, hence the apparent distribution is of lines of birds running north-south along the path of the transects

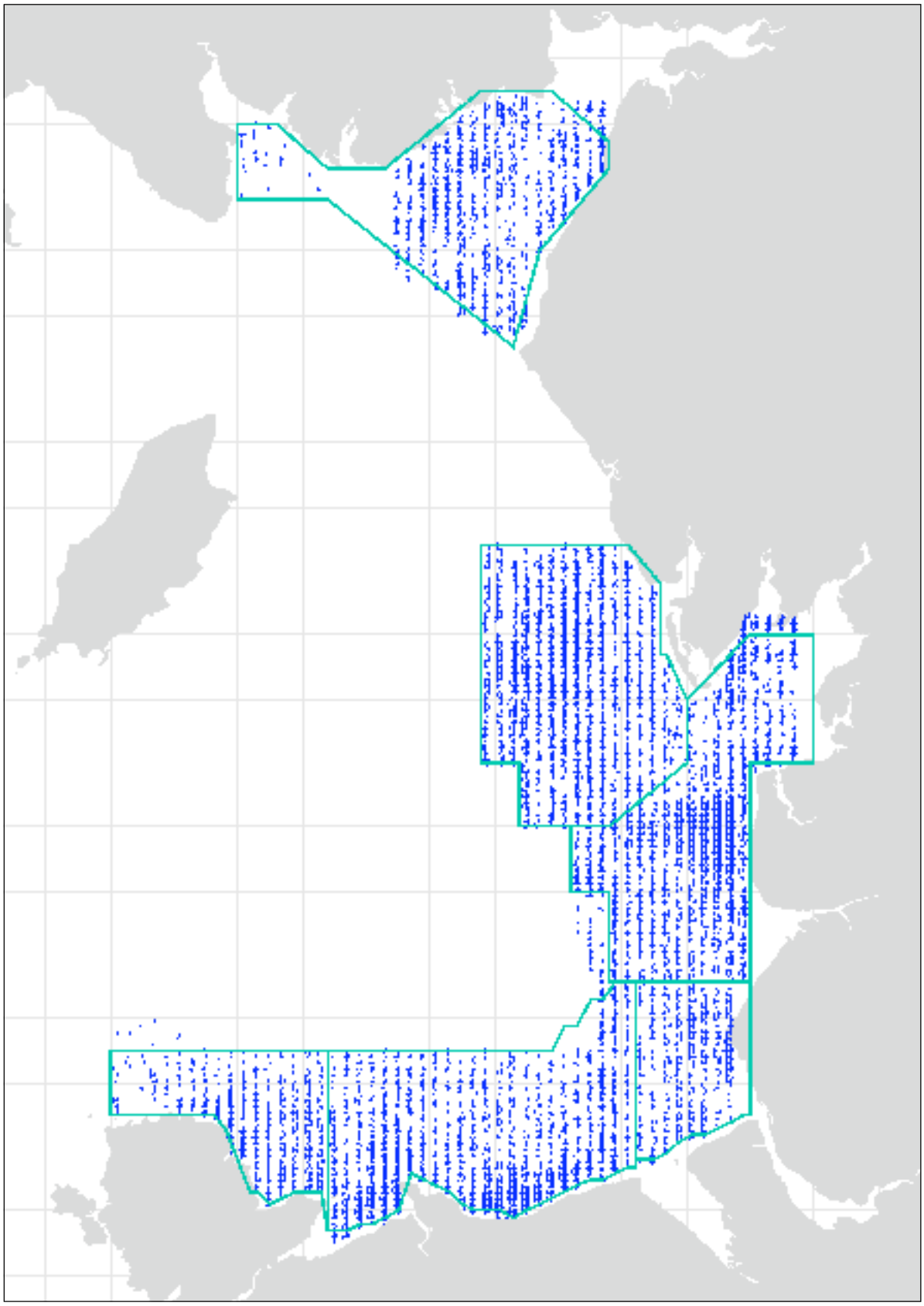


Figure 2 - Observations of birds in the North West OWF Strategic Area during aerial surveys, summer 2005. A single record of birds (whether an individual or flock) is treated as one observation. Note some survey blocks were not surveyed. All observations are shown for Periods 5-7 inclusive (see also notes in legend for Figure 1)

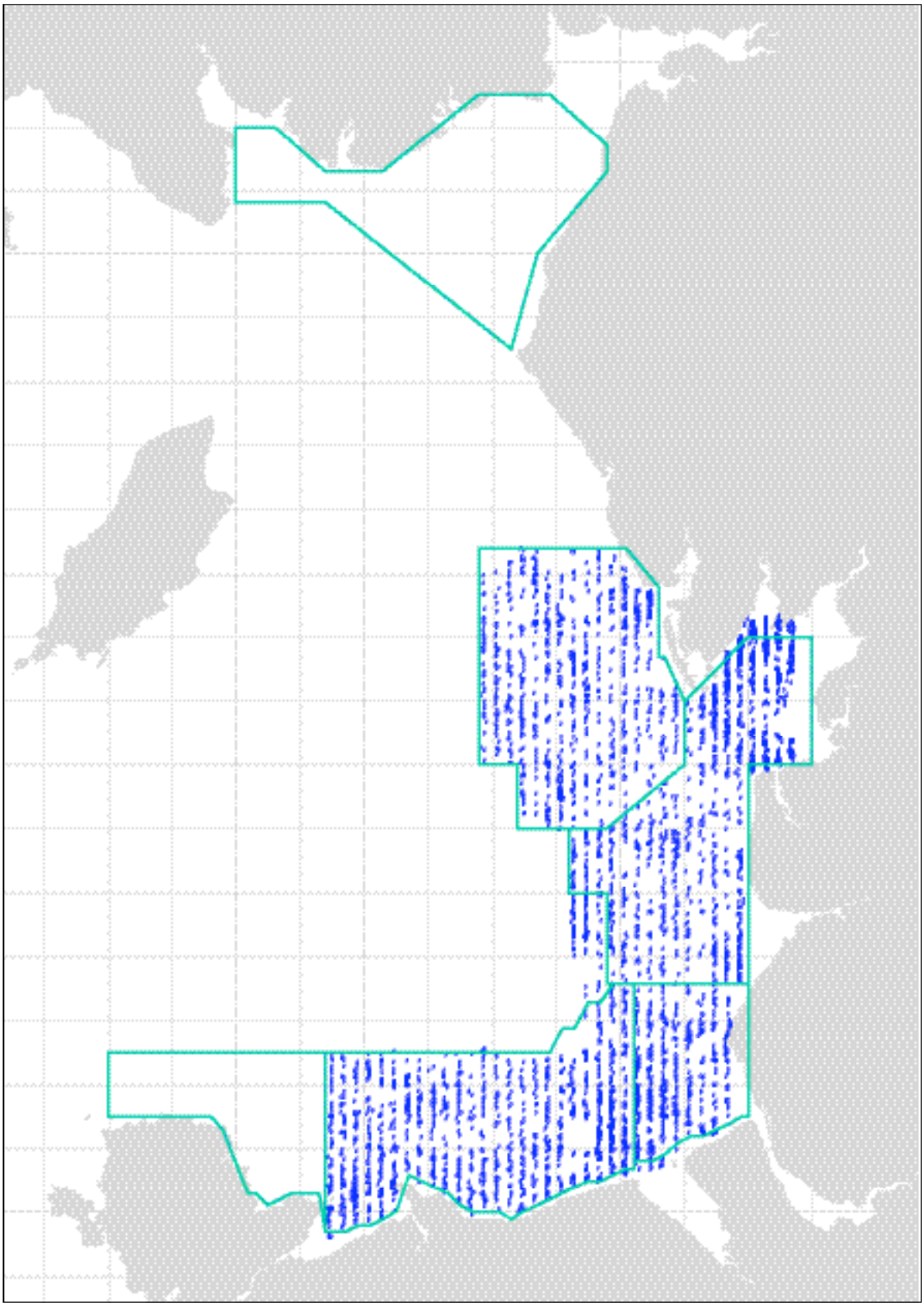


Figure 3 - Observations of birds in the Greater Wash OWF Strategic Area during aerial surveys, winter 2004/05. A single record of birds (whether an individual or flock) is treated as one observation. All observations are shown for Periods 1-4 inclusive (see also notes in legend for Figure 1)

Figure 4 - Observations of birds in the Greater Wash OWF Strategic Area during aerial surveys, summer 2005. A single record of birds (whether an individual or flock) is treated as one observation. Note some survey blocks were not surveyed. All observations are shown for Periods 5-7 inclusive (see also notes in legend for Figure 1)

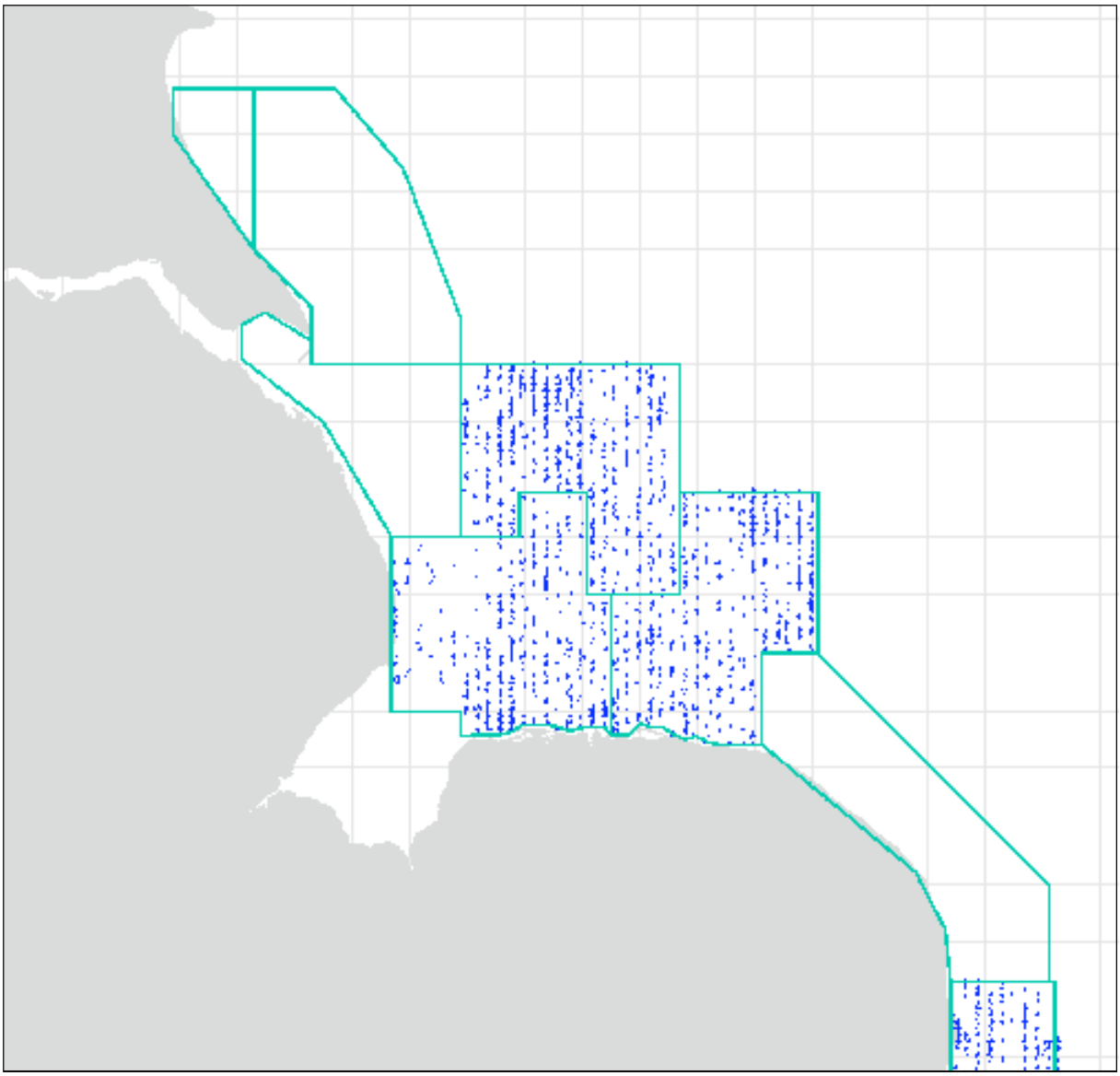


Figure 5 - Observations of birds in the Thames OWF Strategic Area during aerial surveys, winter 2004/05. A single record of birds (whether an individual or flock) is treated as one observation. All observations are shown for Periods 1-4 inclusive (see also notes in legend for Figure1)

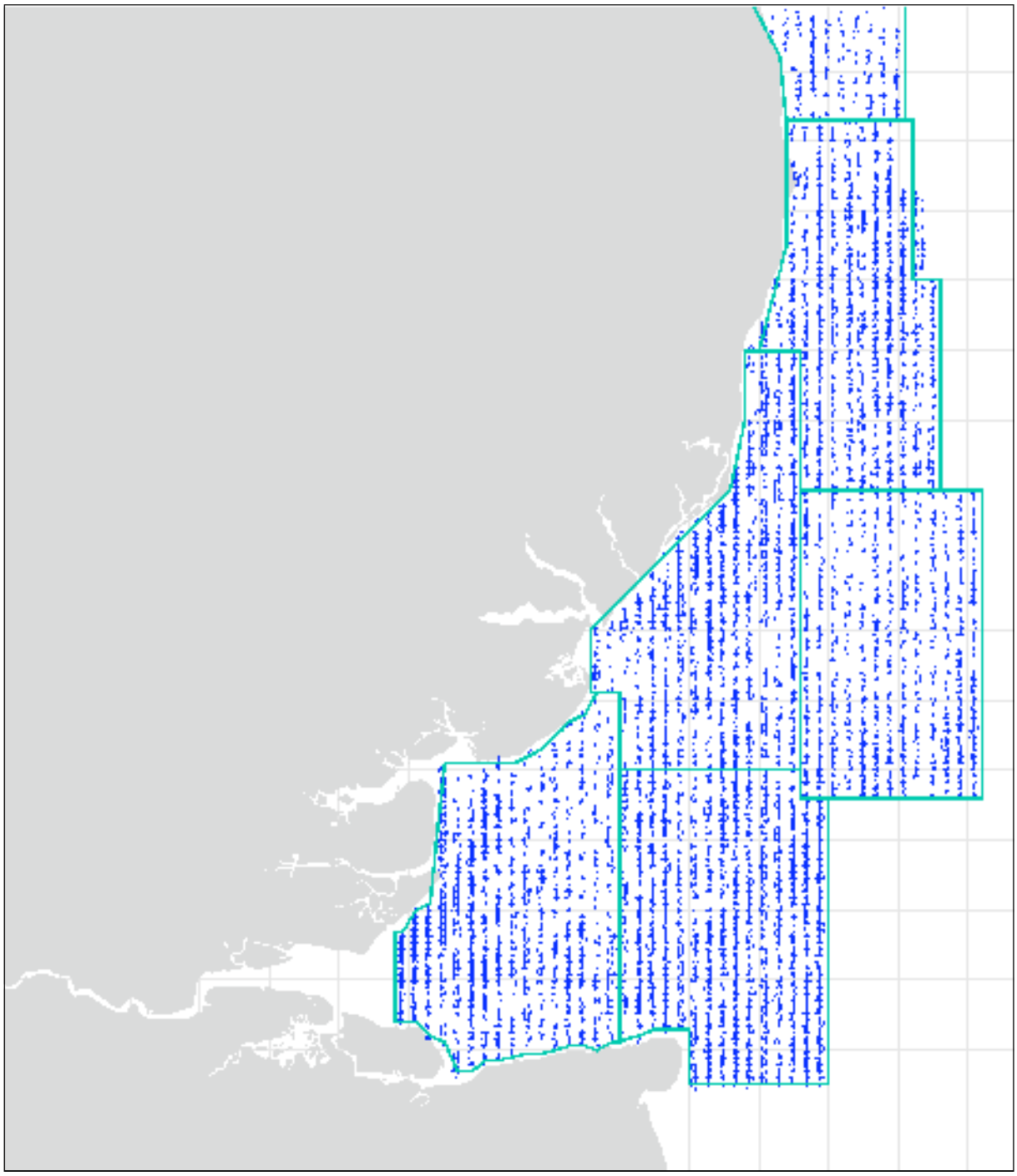


Figure 6 - Observations of birds in the Thames OWF Strategic Area during aerial surveys, summer 2005. A single record of birds (whether an individual or flock) is treated as one observation. Note some survey blocks were not surveyed. All observations are shown for Periods 5-7 inclusive (see also notes in legend for Figure 1)

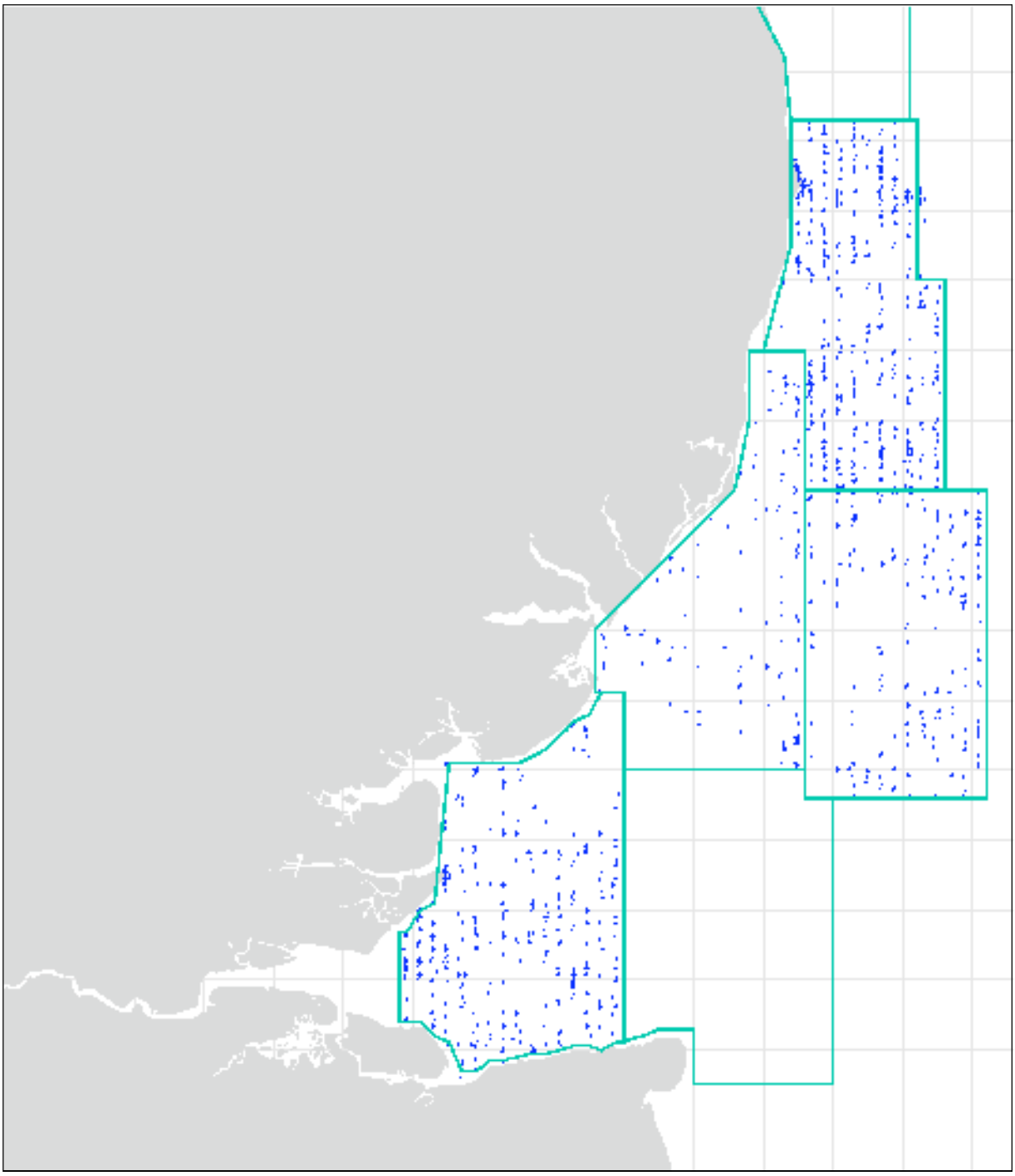


Figure 7 - Relative density of birds recorded in North West OWF Strategic Area during aerial surveys, winter 2004/05. Numbers of all species are summed by 2x2 km grid squares, corrected for survey effort. All observations are shown for Periods 1-4 inclusive

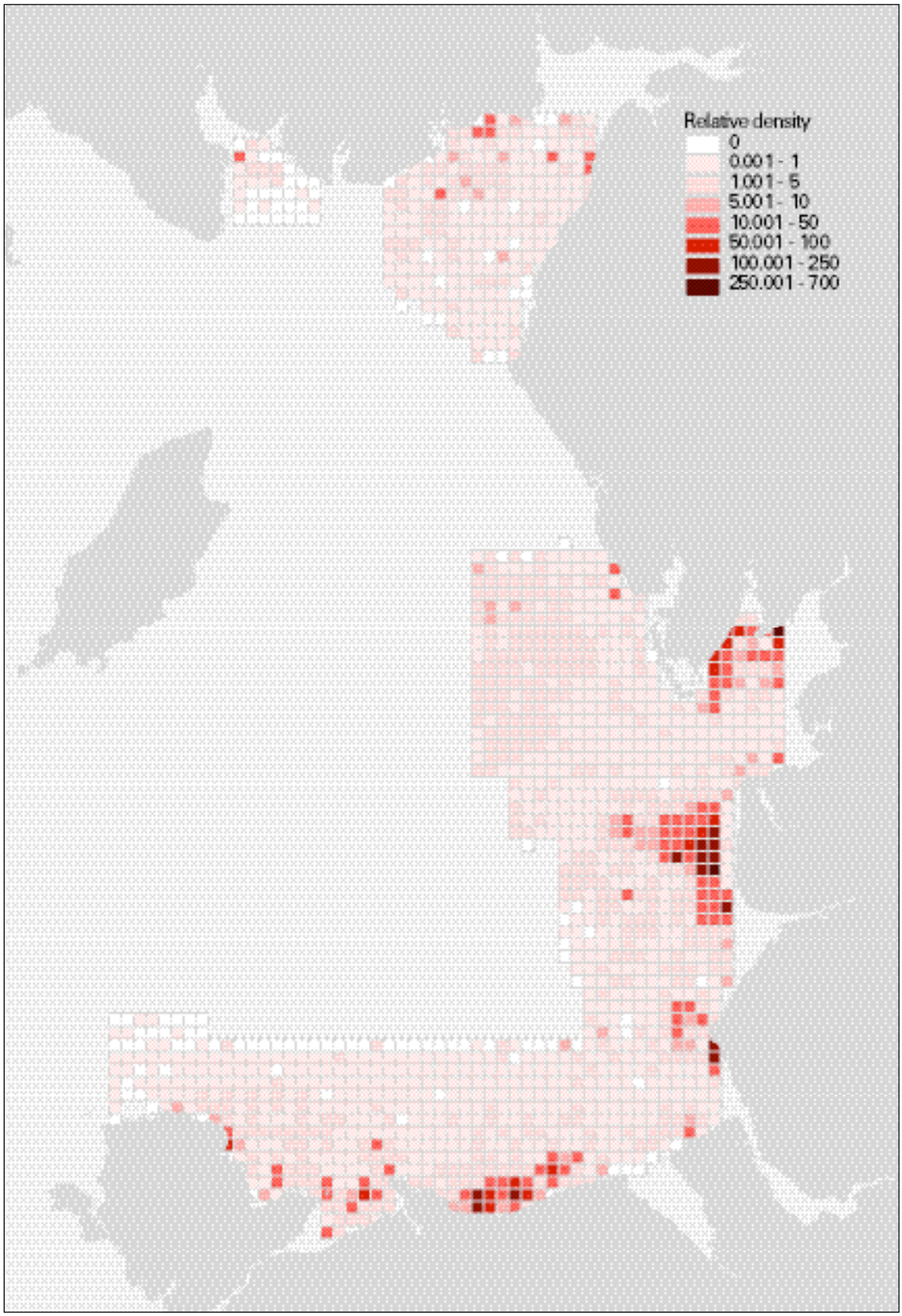


Figure 8 - Relative density of birds recorded in North West OWF Strategic Area during aerial surveys, summer 2005. Numbers of all species are summed by 2x2 km grid squares, corrected for survey effort. All observations are shown for Periods 5-7 inclusive

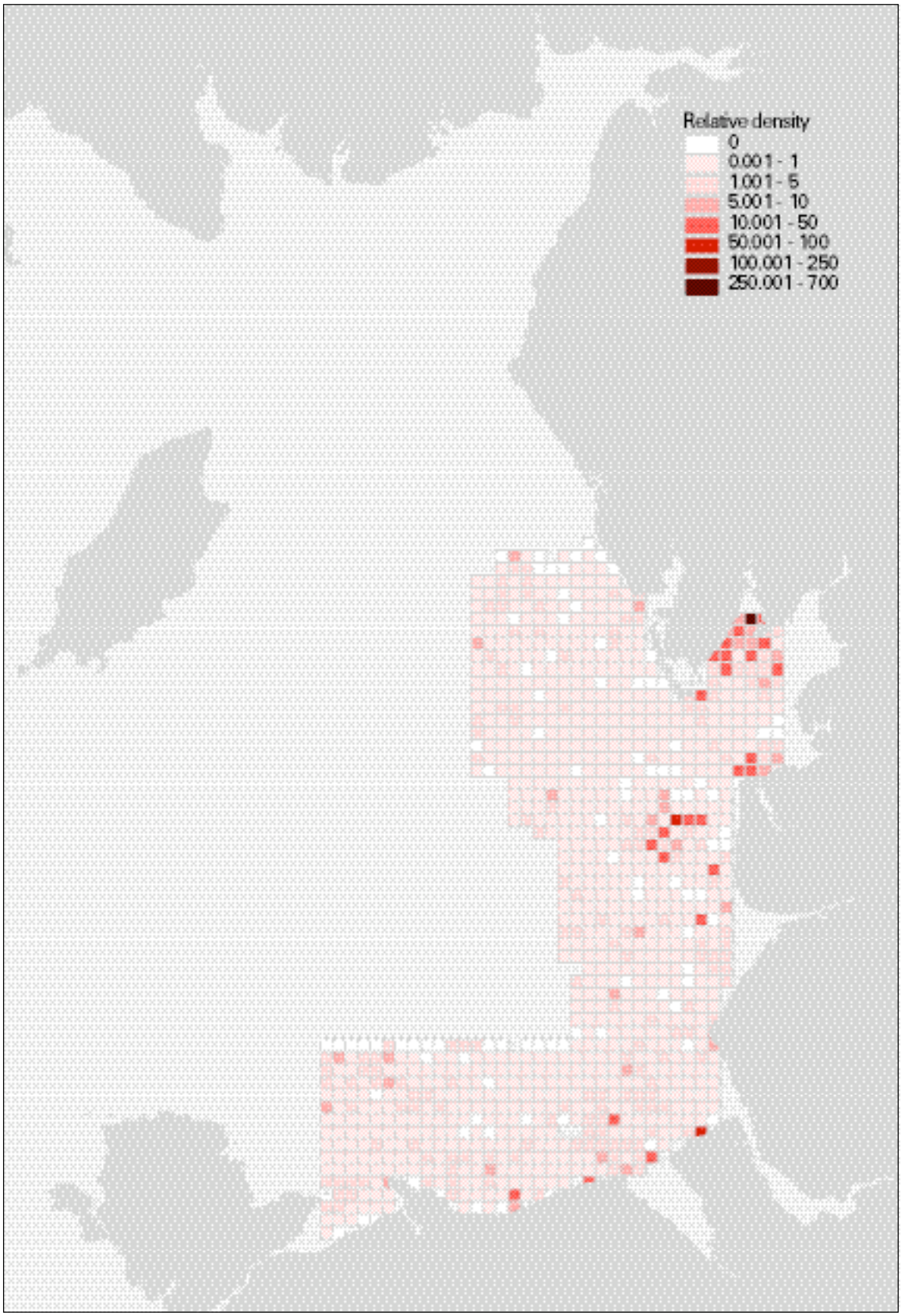


Figure 9 - Relative density of birds recorded in Greater Wash OWF Strategic Area during aerial surveys, winter 2004/05. Numbers of all species are summed by 2x2 km grid squares, corrected for survey effort. All observations are shown for Periods 1-4 inclusive

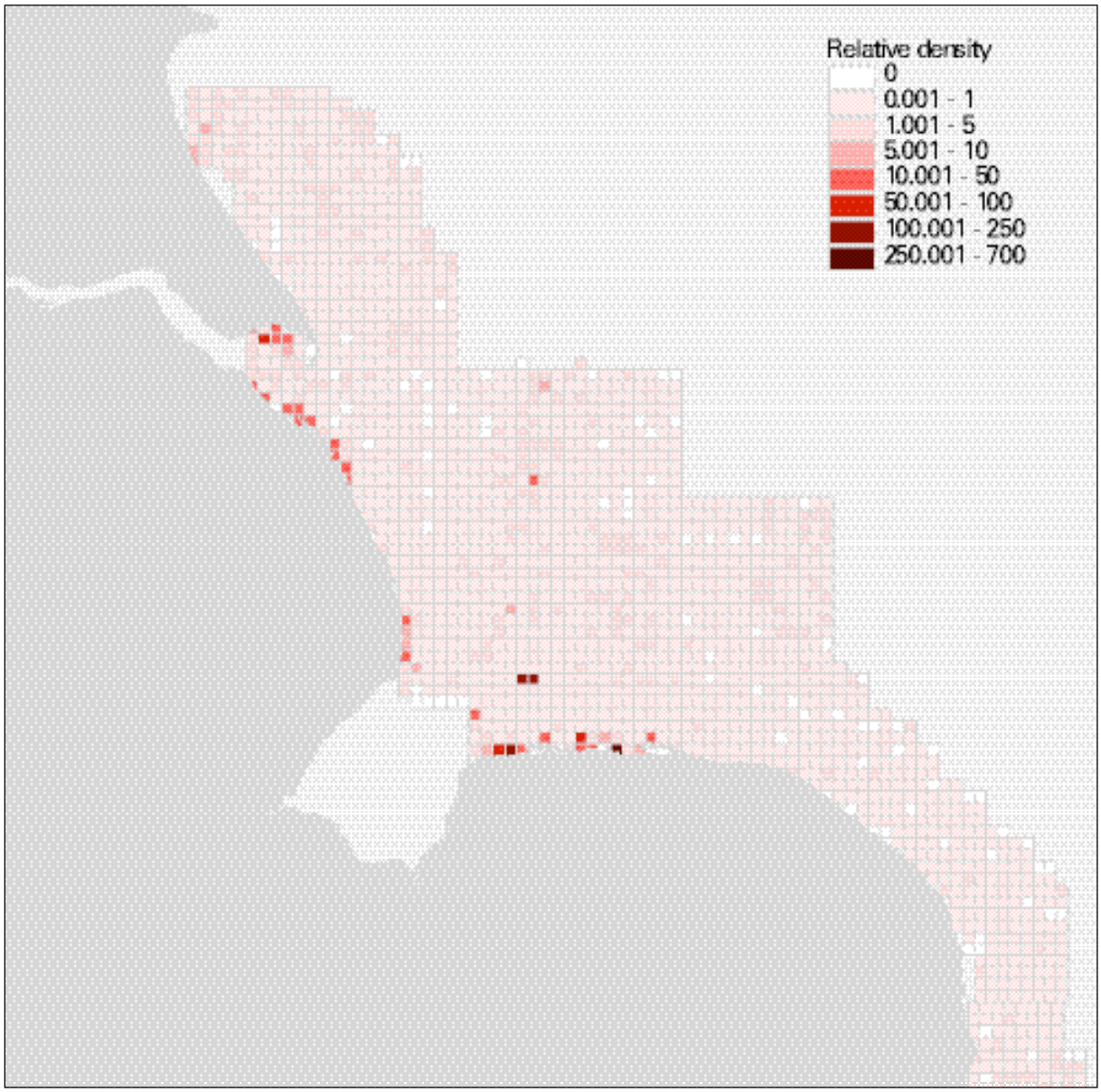


Figure 10 - Relative density of birds recorded in Greater Wash OWF Strategic Area during aerial surveys, summer 2005. Numbers of all species are summed by 2x2 km grid squares, corrected for survey effort. All observations are shown for Periods 5-7 inclusive

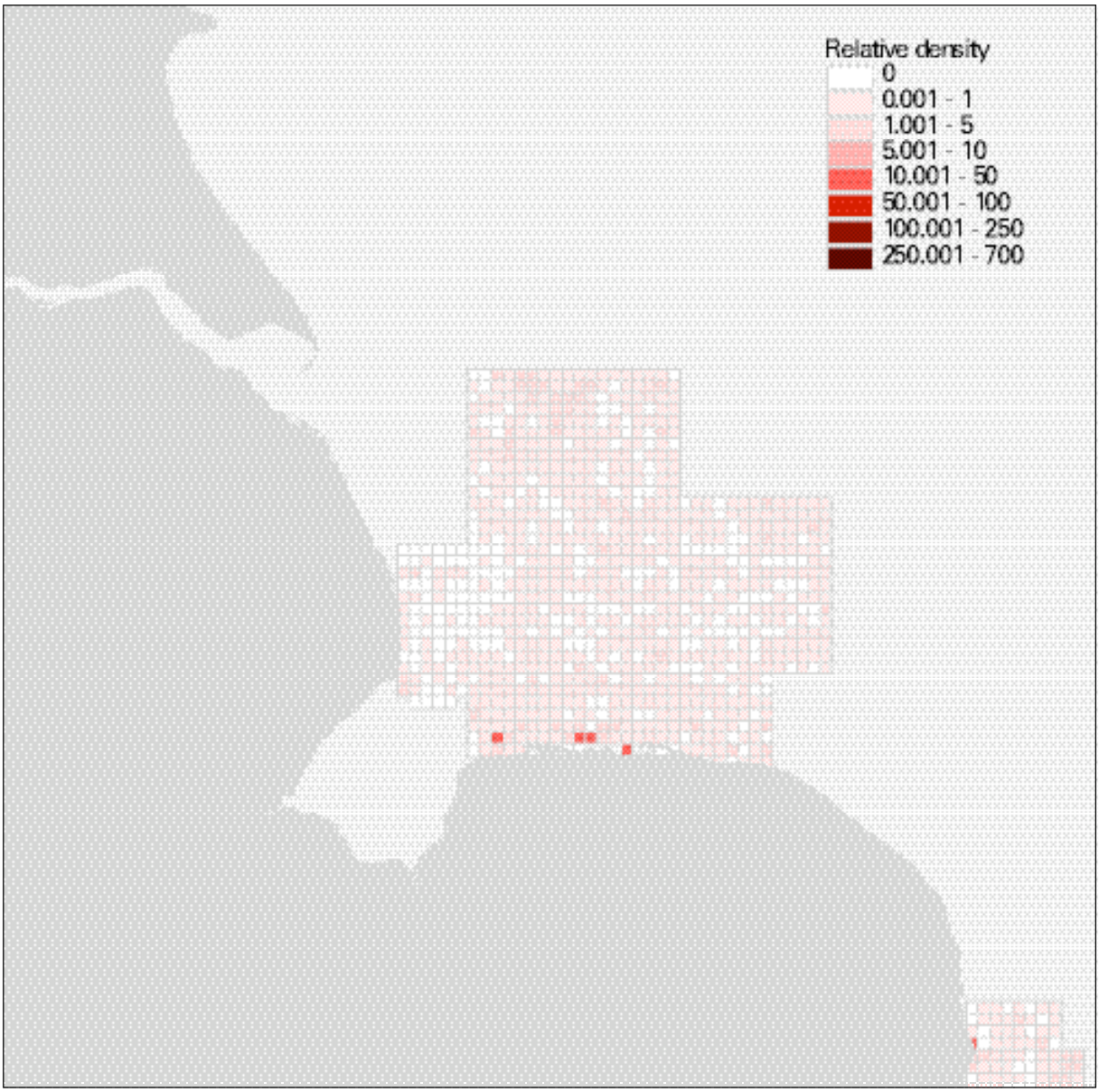


Figure 11 - Relative density of birds recorded in Thames OWF Strategic Area during aerial surveys, winter 2004/05. Numbers of all species are summed by 2x2 km grid squares, corrected for survey effort. All observations are shown for Periods 1-4 inclusive

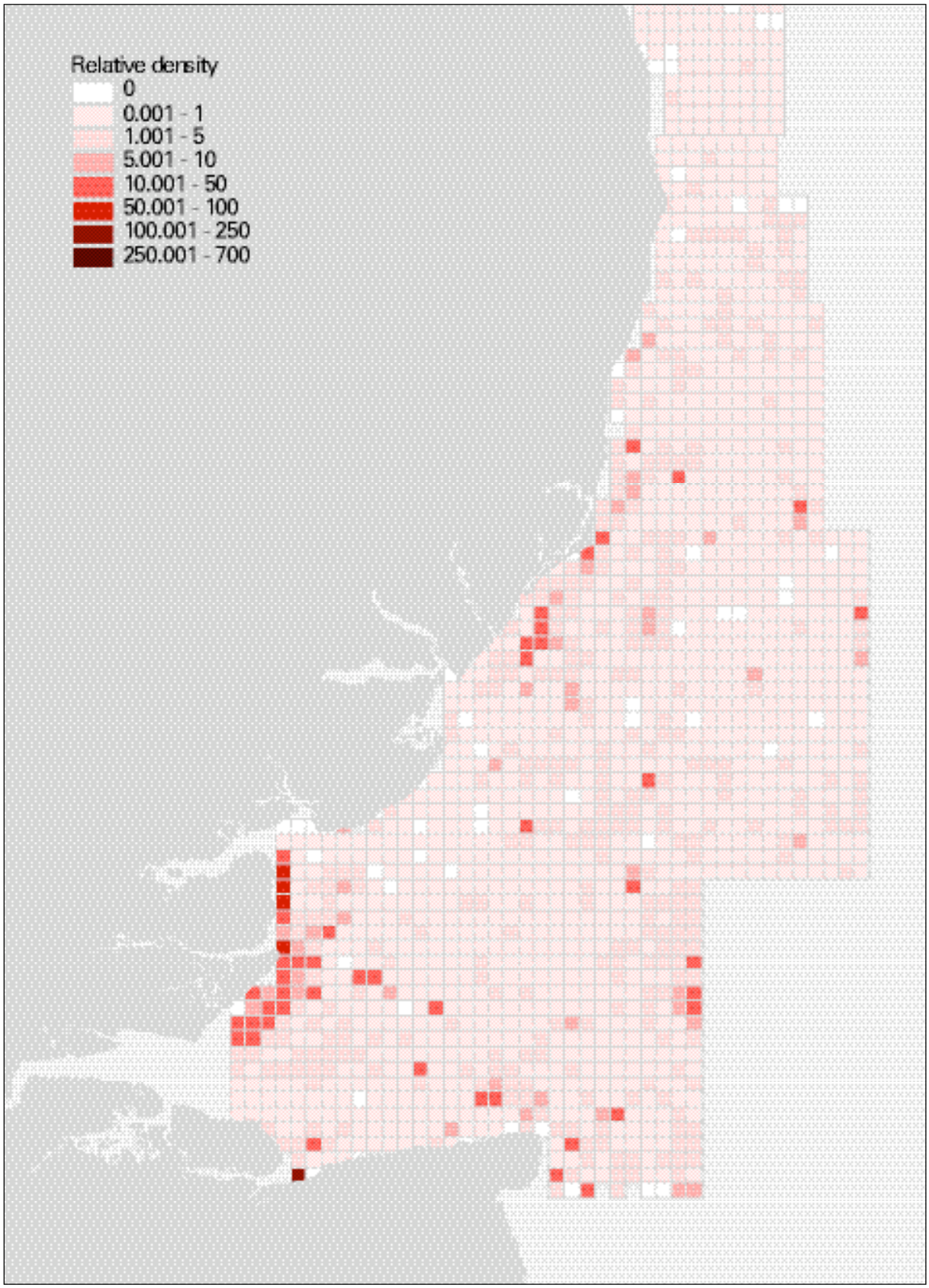


Figure 12 - Relative density of birds recorded in Thames OWF Strategic Area during aerial surveys, summer 2005. Numbers of all species are summed by 2x2 km grid squares, corrected for survey effort. All observations are shown for Periods 5-7 inclusive

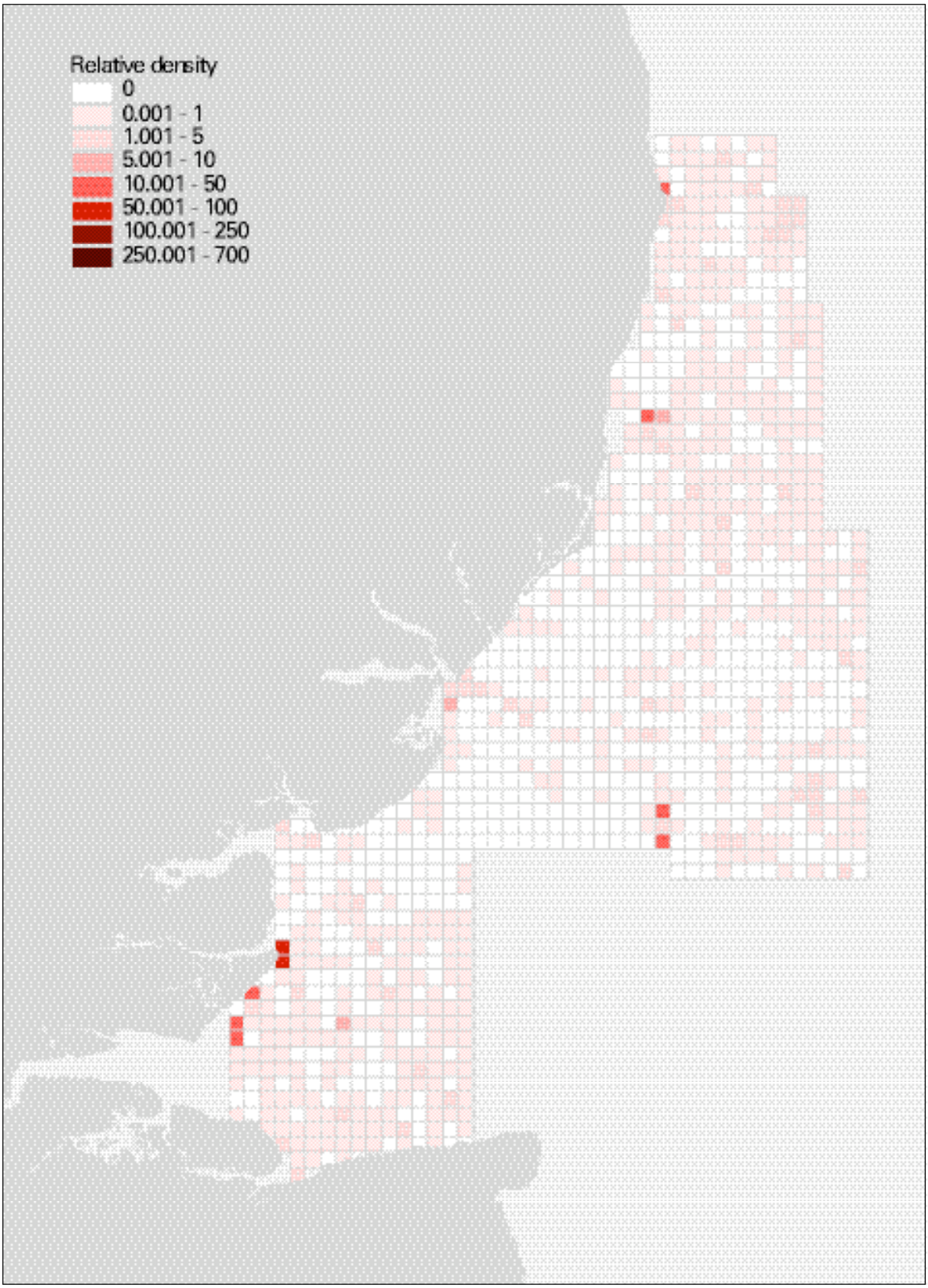


Figure 13 - Relative density of Common Scoters *Melanitta nigra* recorded in North West OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

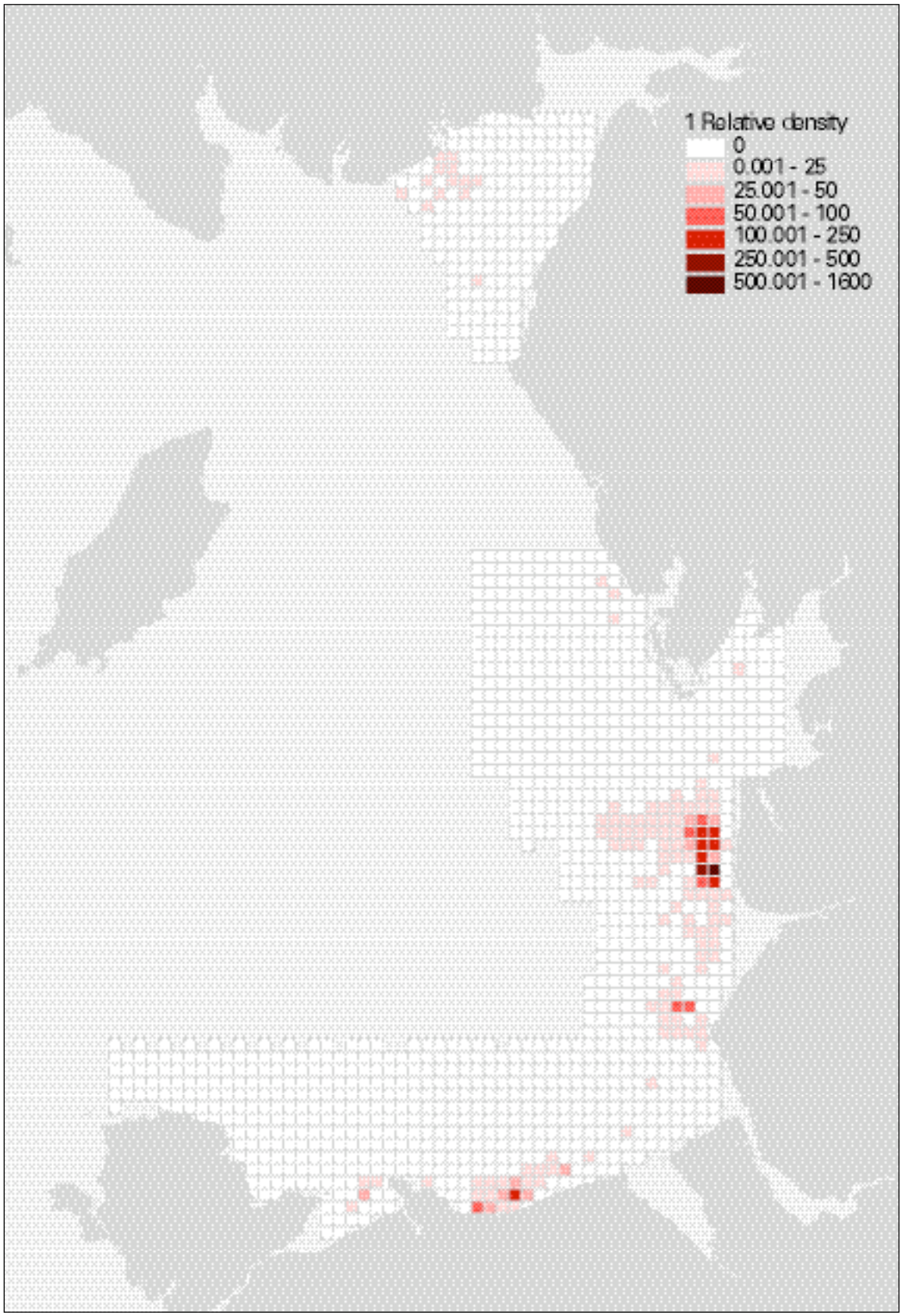


Figure 14 - Relative density of Common Scoters *Melanitta nigra* recorded in North West OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

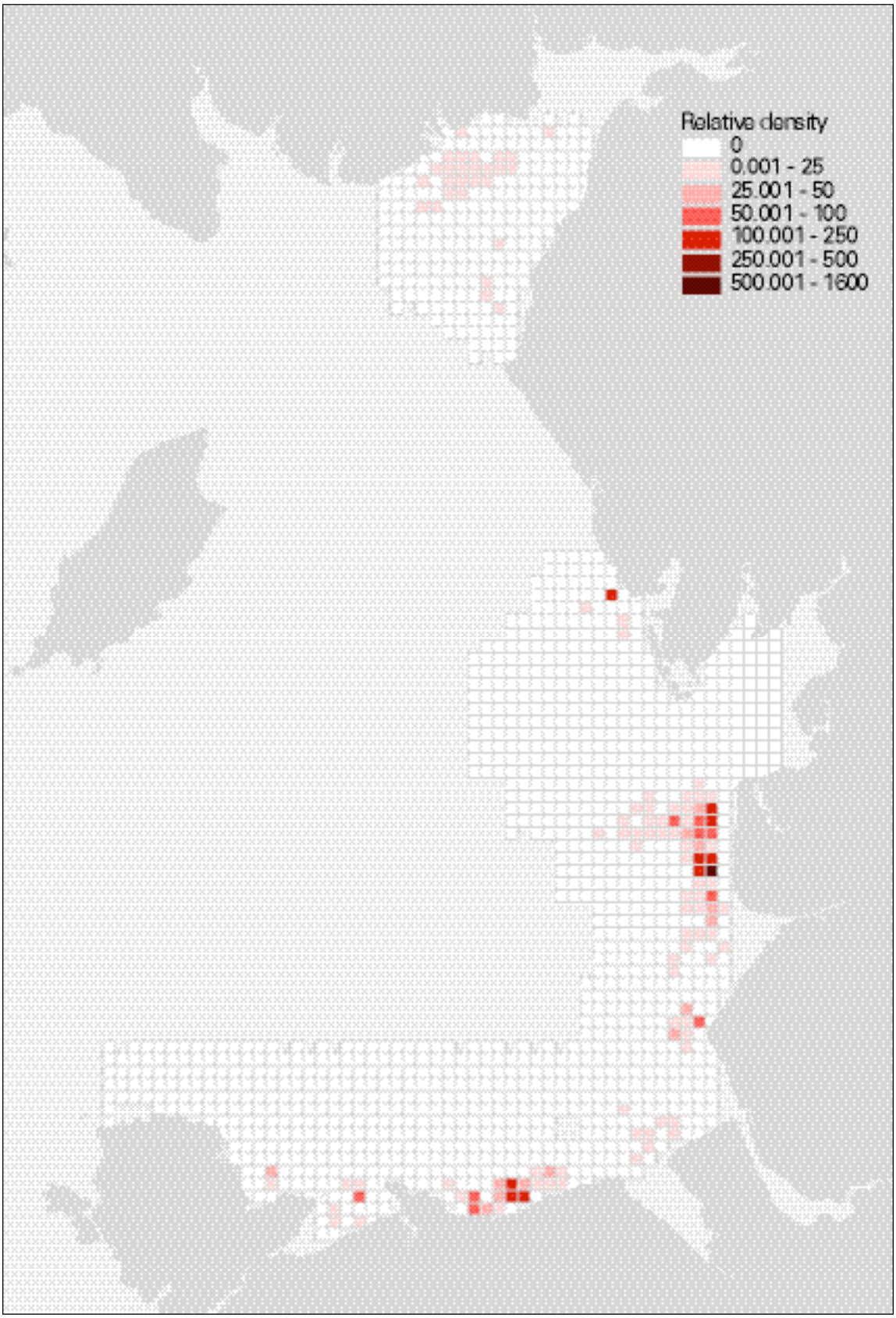


Figure 15 - Relative density of Common Scoters *Melanitta nigra* recorded in North West OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

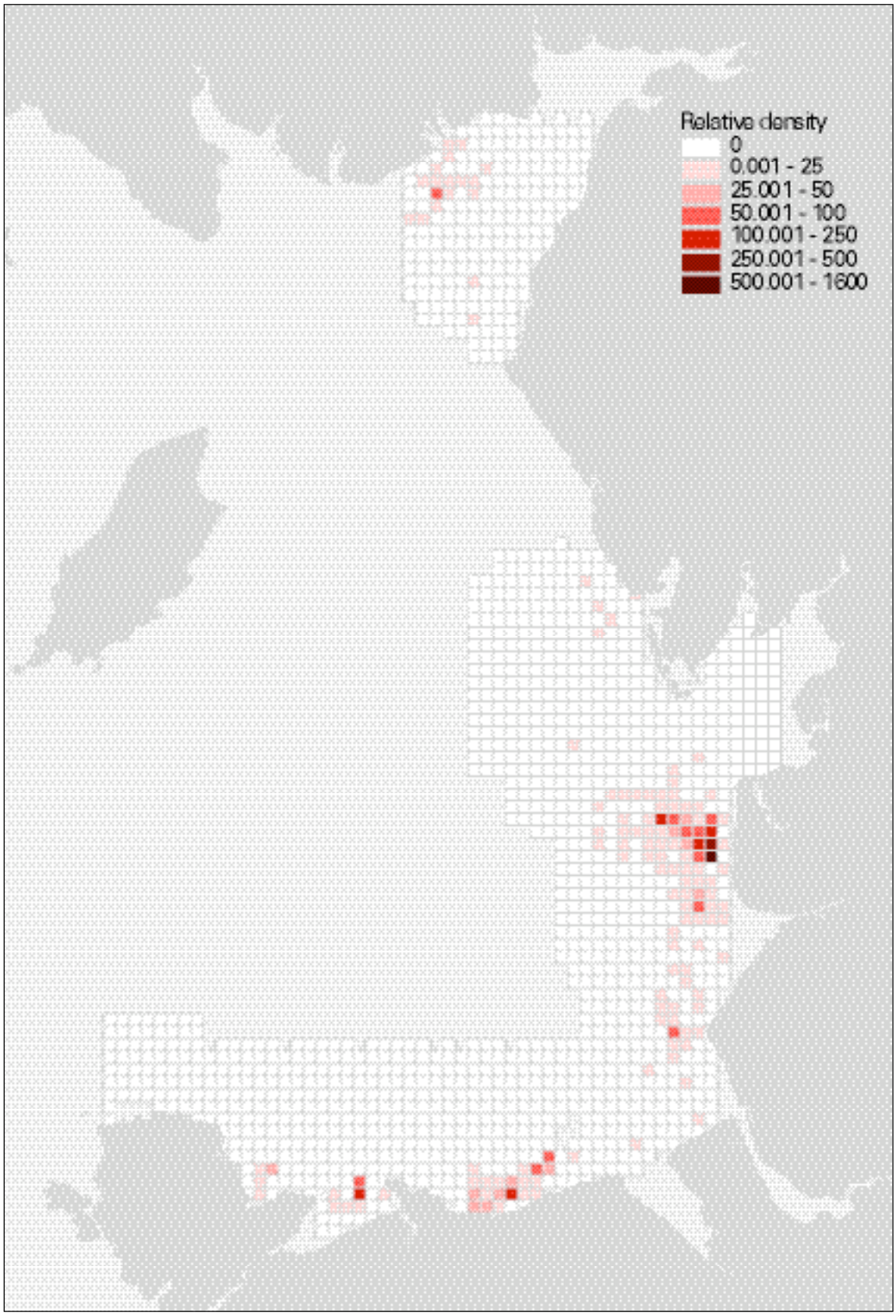


Figure 16 - Relative density of Common Scoters *Melanitta nigra* recorded in North West OWF Strategic Area during aerial surveys, Period 4. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

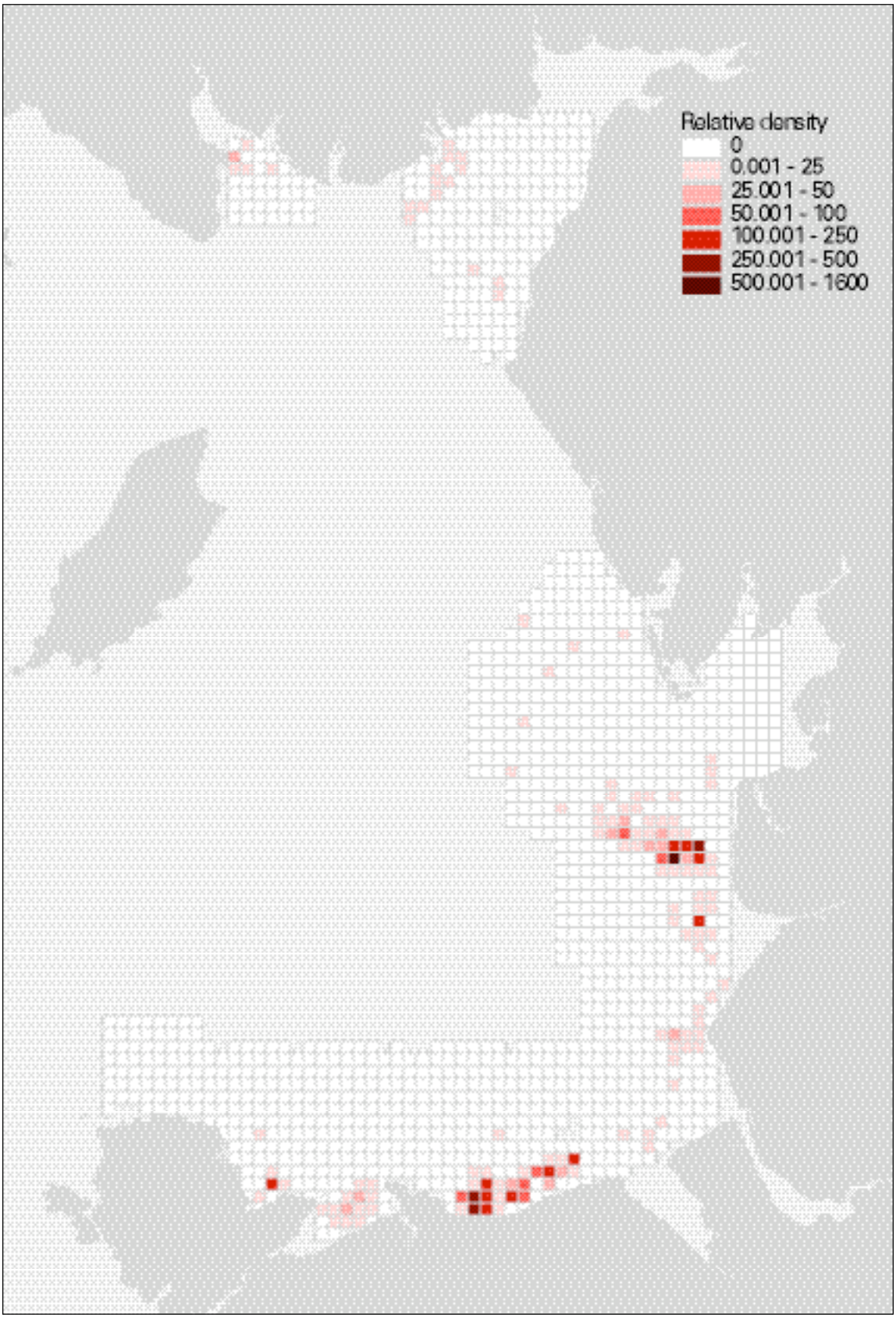


Figure 17 - Relative density of Common Scoters *Melanitta nigra* recorded in North West OWF Strategic Area during aerial surveys, Period 5. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

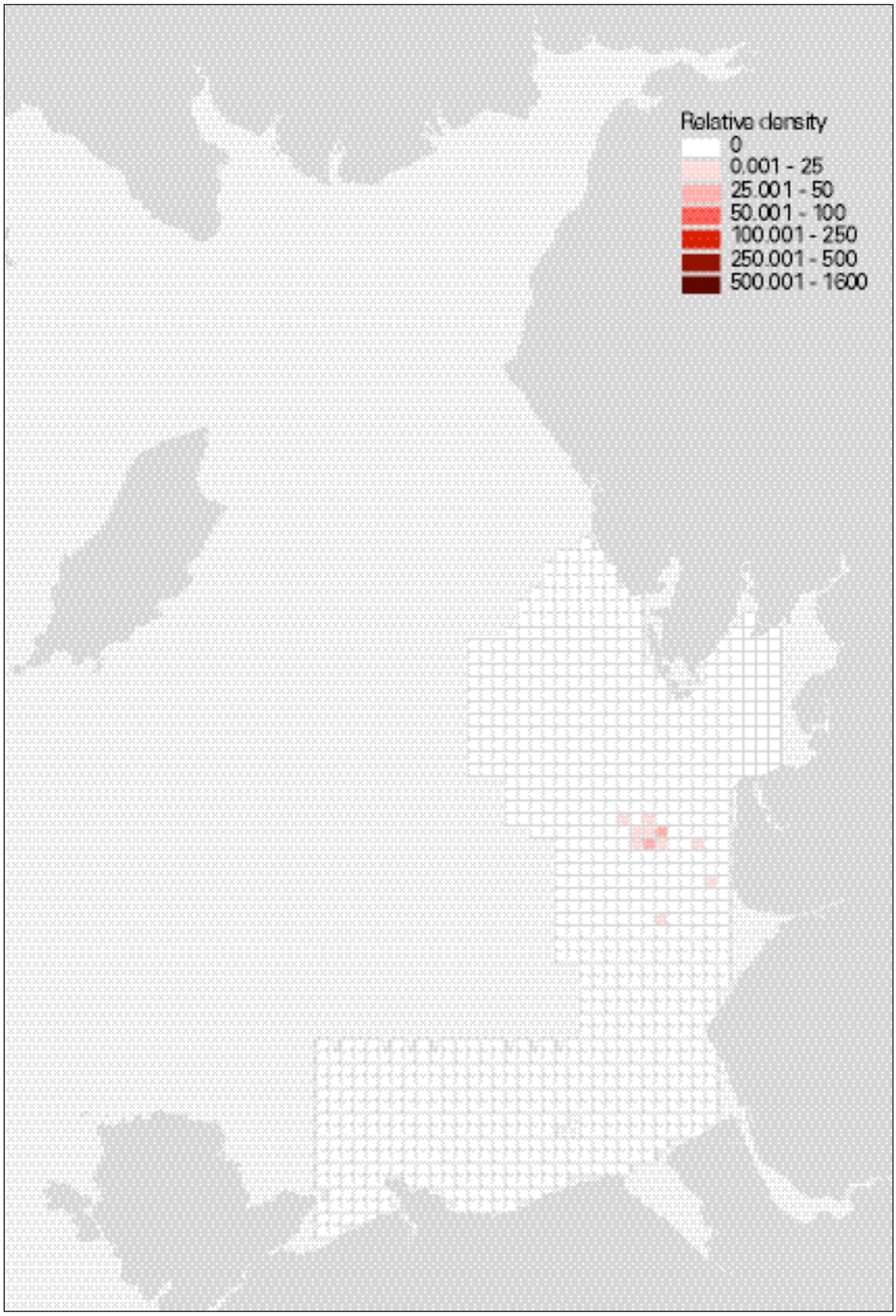


Figure 18 - Relative density of Common Scoters *Melanitta nigra* recorded in North West OWF Strategic Area during aerial surveys, Period 6. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

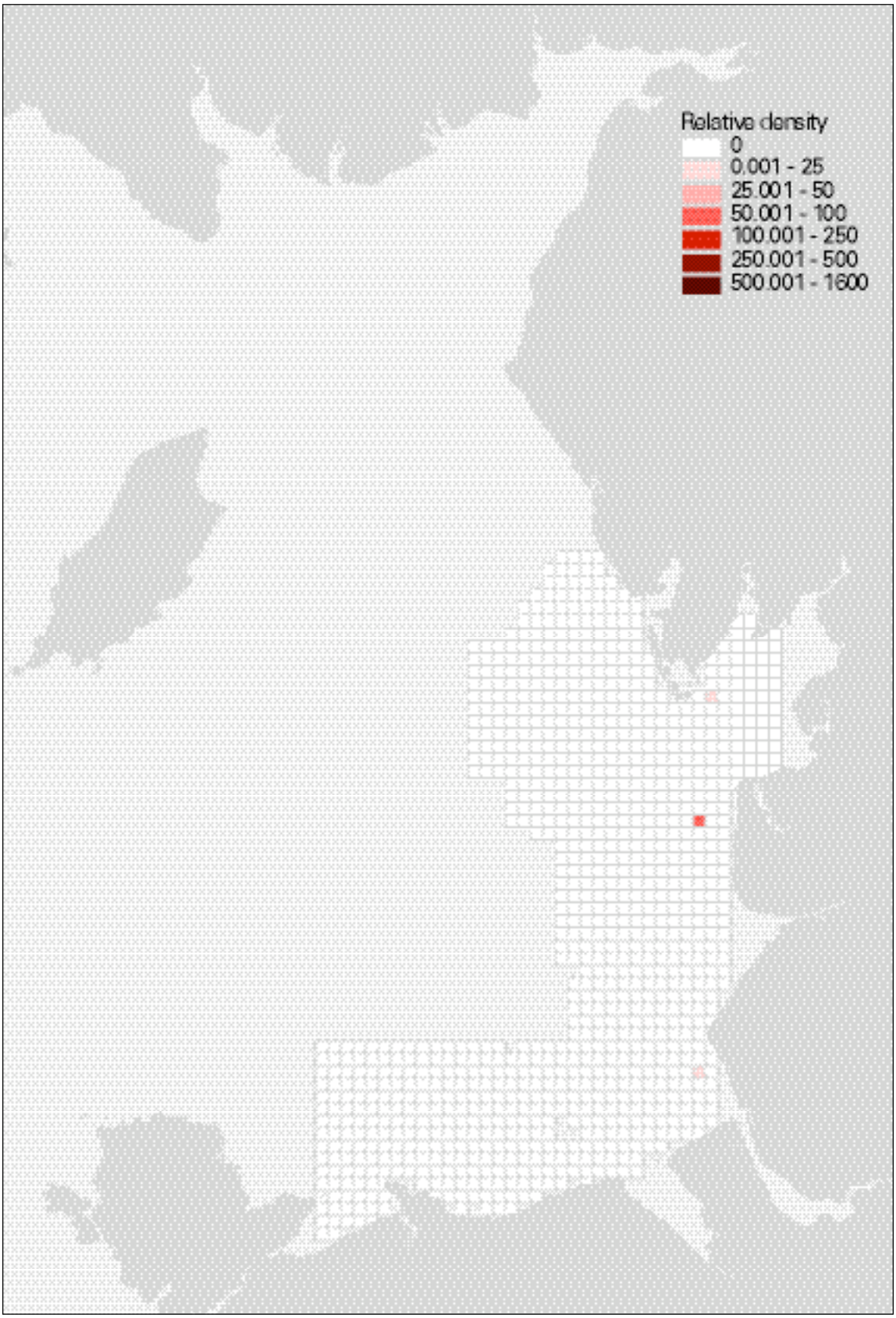


Figure 19 - Relative density of Common Scoters *Melanitta nigra* recorded in North West OWF Strategic Area during aerial surveys, Period 7. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

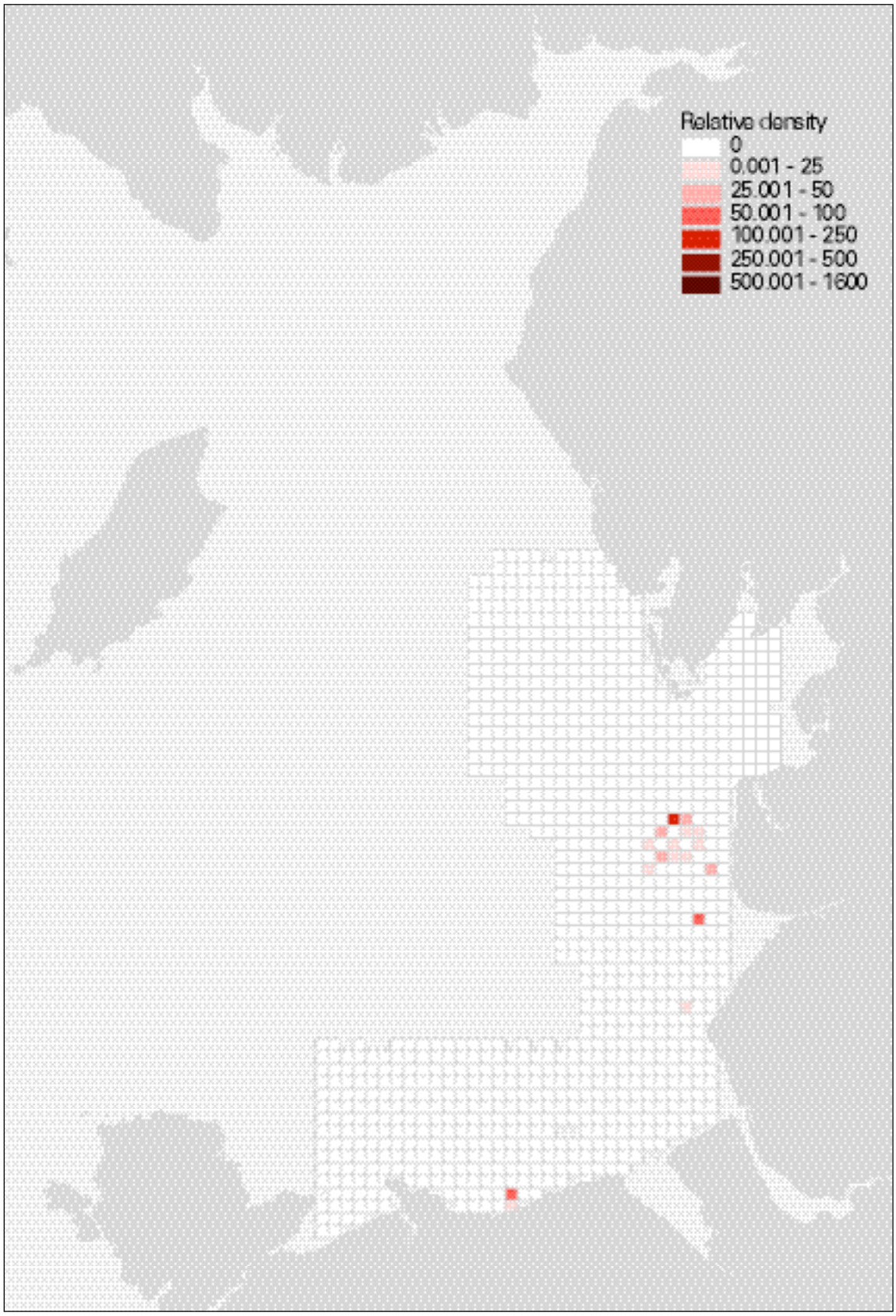


Figure 20 - Relative density of Common Scoters *Melanitta nigra* recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

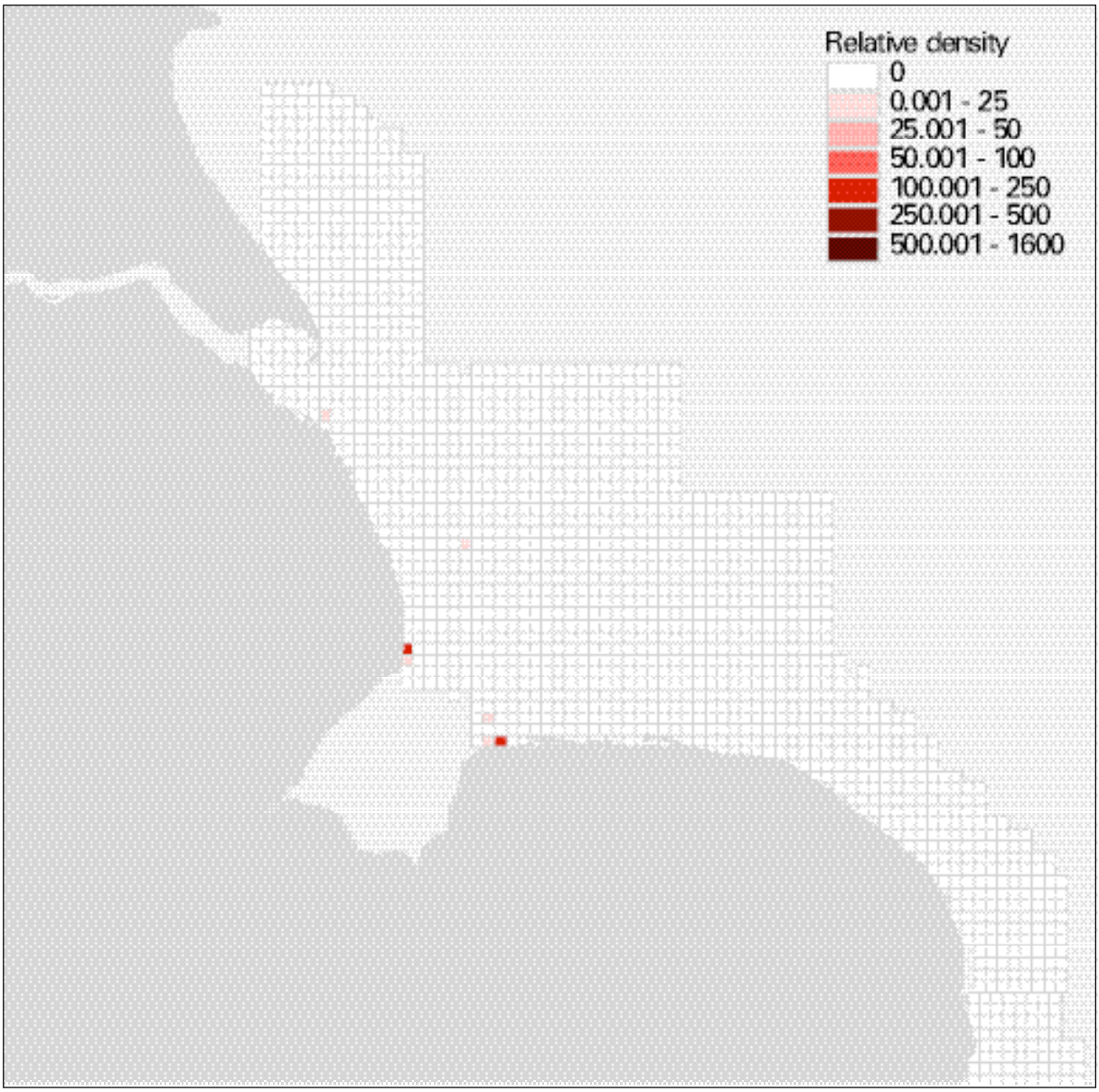


Figure 21 - Relative density of Common Scoters *Melanitta nigra* recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

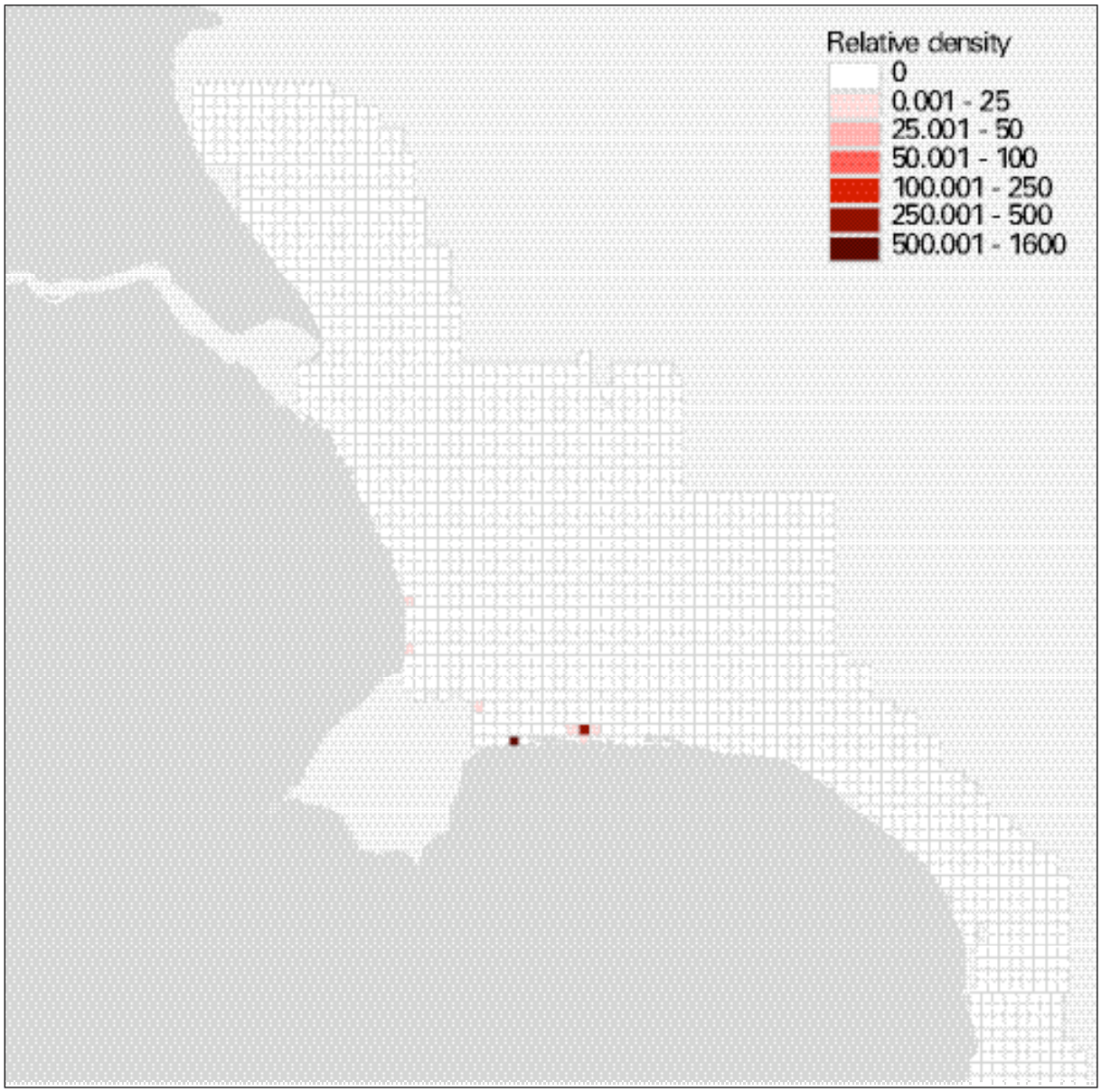


Figure 22 - Relative density of Common Scoters *Melanitta nigra* recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

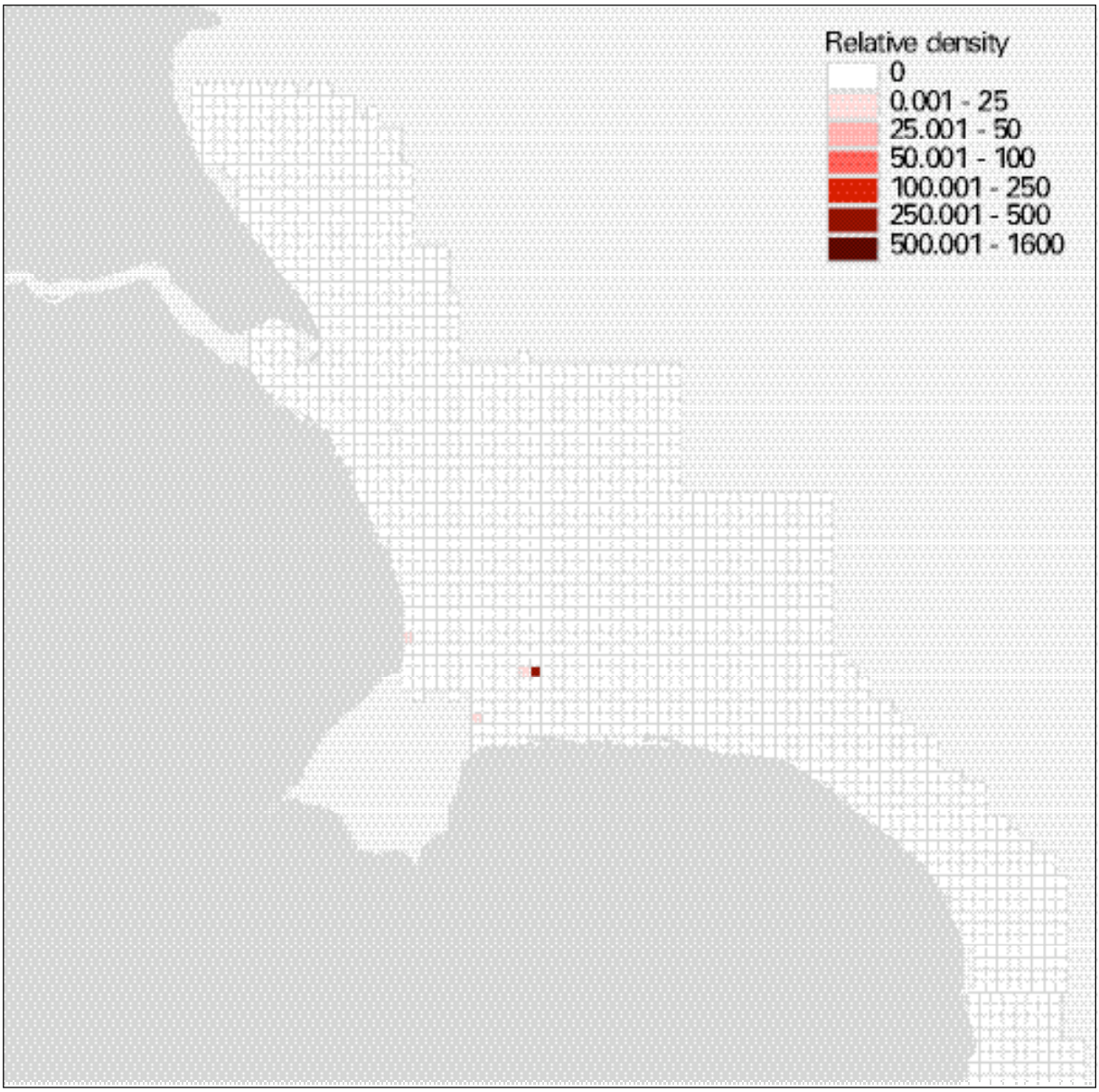


Figure 23 - Relative density of Common Scoters *Melanitta nigra* recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 4 Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

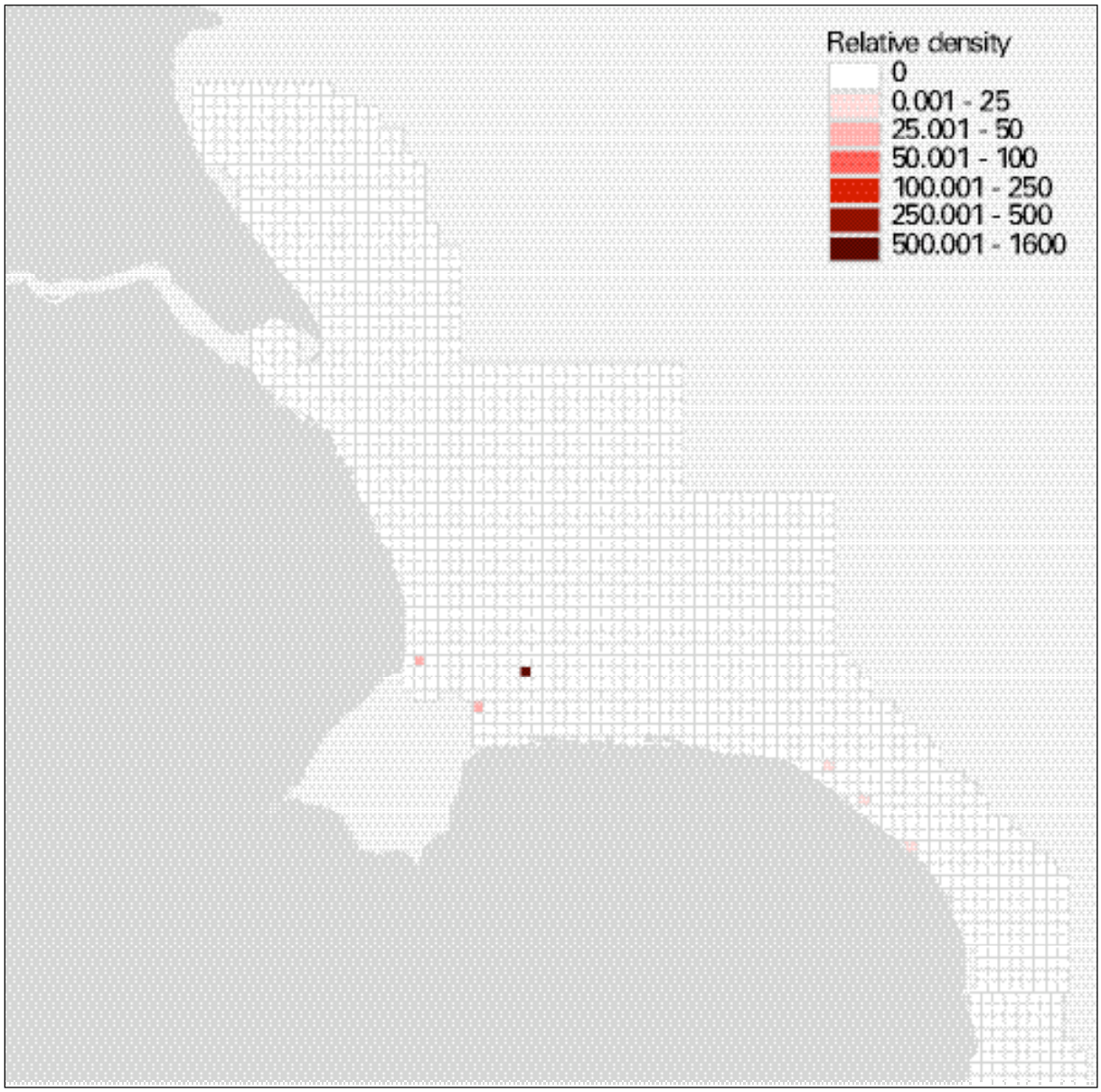


Figure 24 - Relative density of Common Scoters *Melanitta nigra* recorded in Thames OWF Strategic Area during aerial surveys, winter 2004/05 (Periods 1-4 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

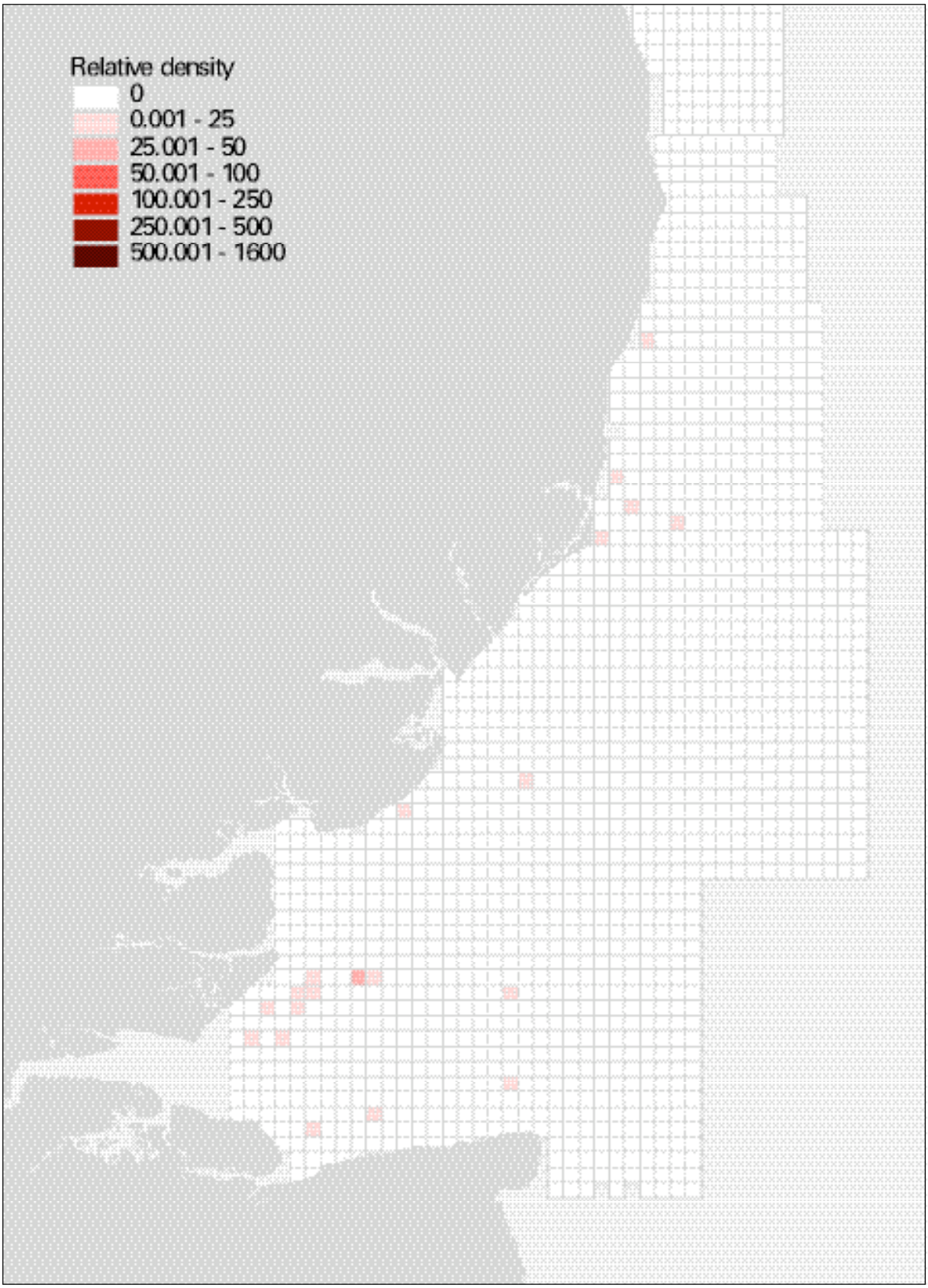


Figure 25 - Relative density of divers *Gavia spp*. recorded in North West OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

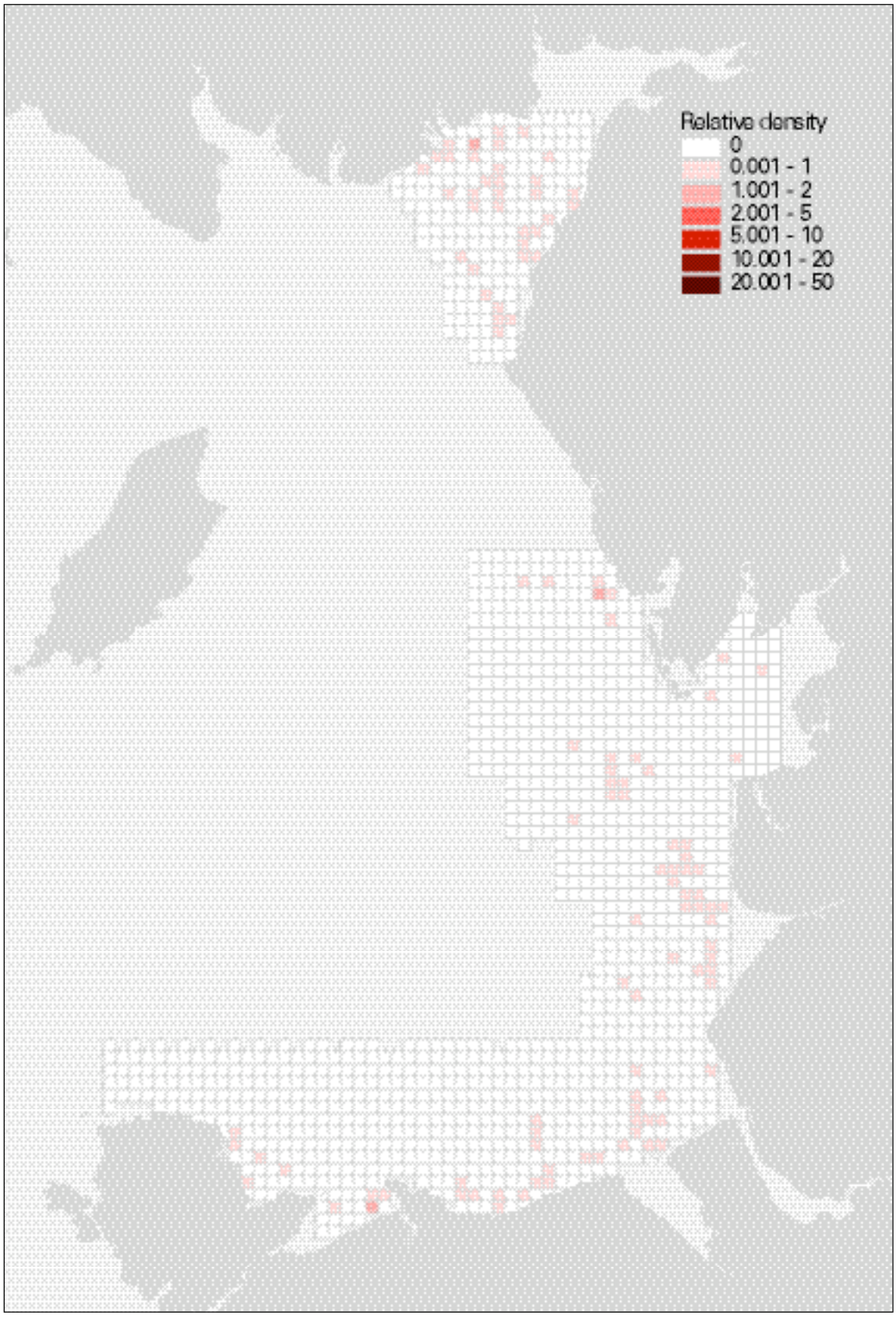


Figure 26 - Relative density of divers *Gavia spp*. recorded in North West OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

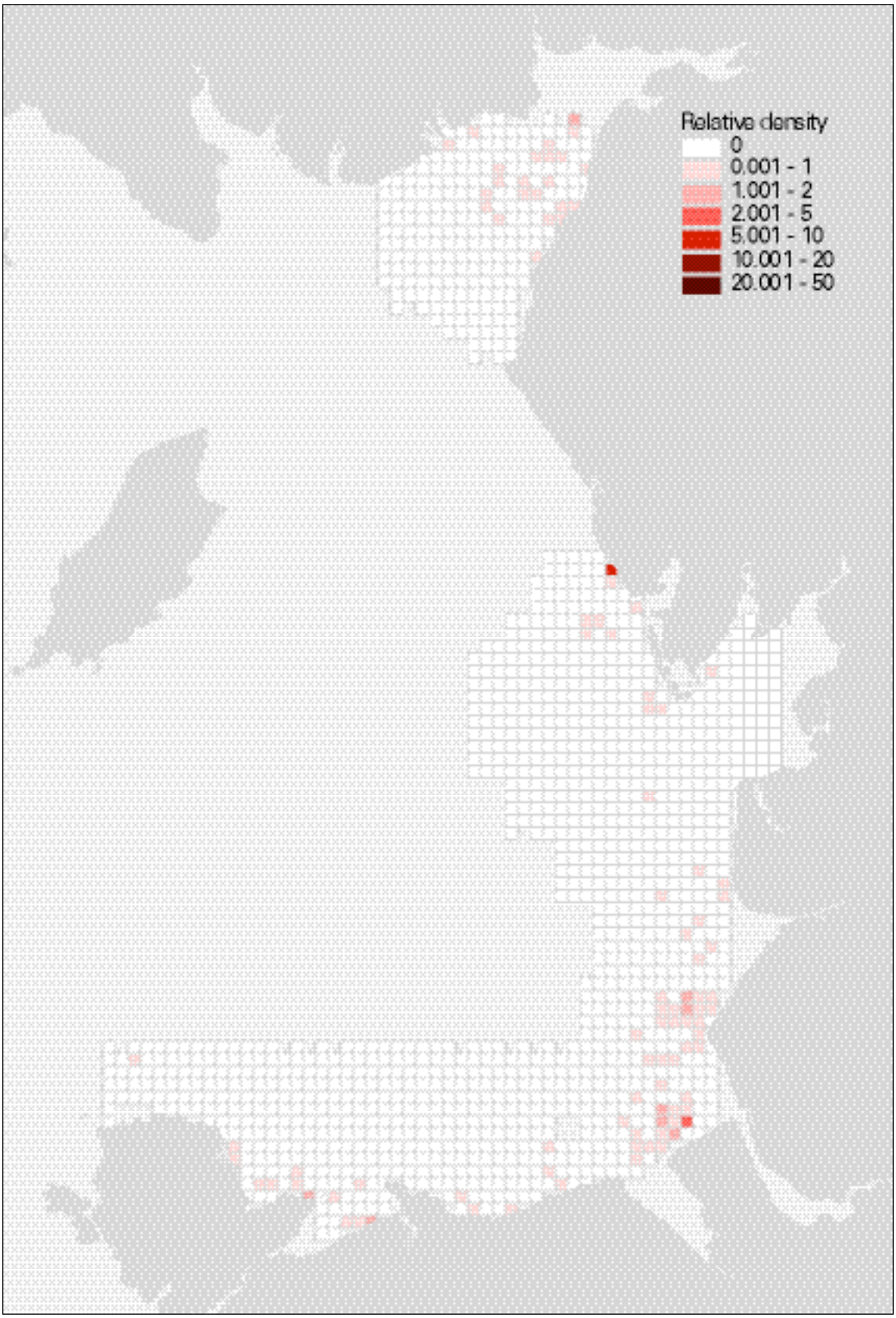


Figure 27 - Relative density of divers *Gavia spp*. recorded in North West OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

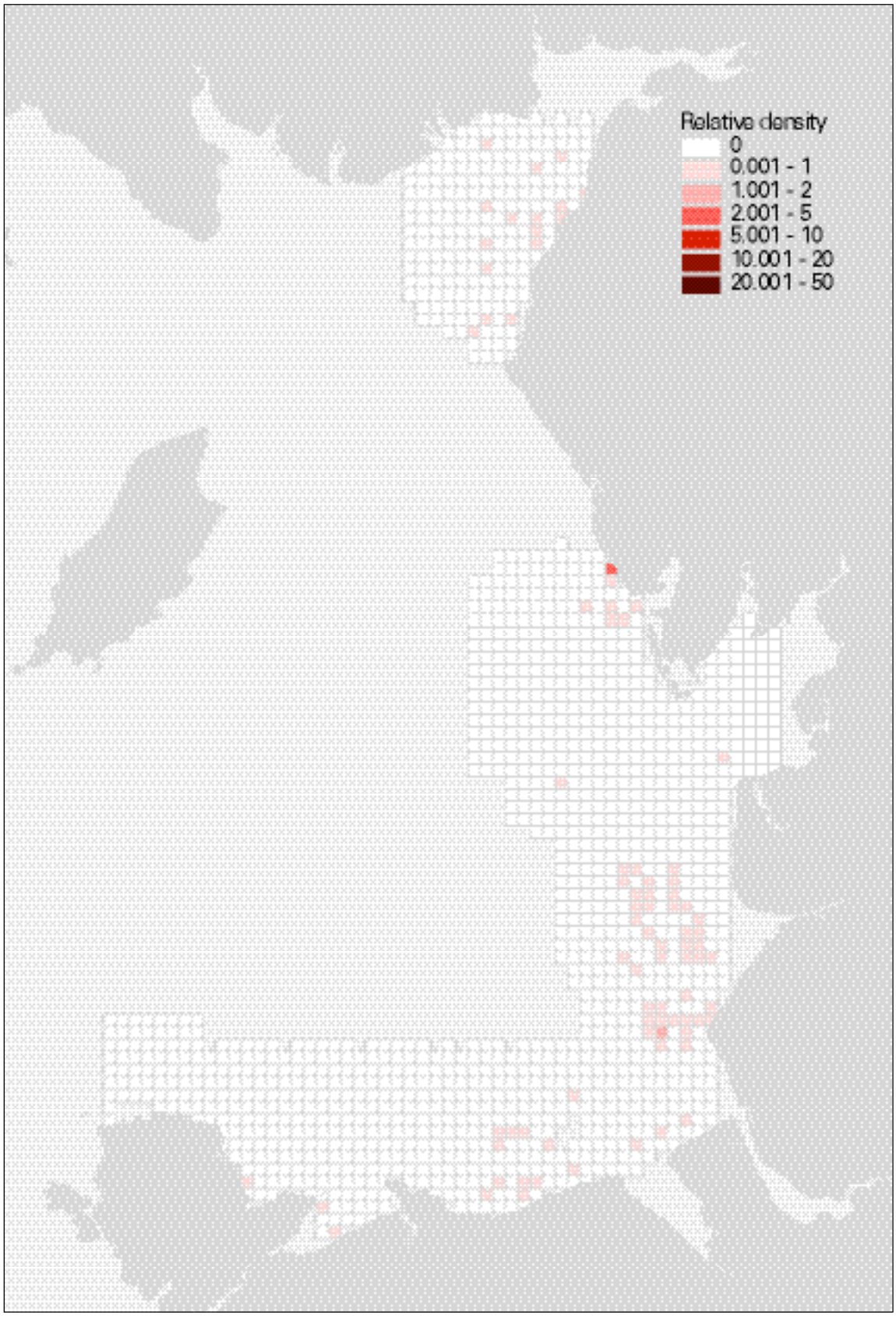


Figure 28 - Relative density of divers *Gavia spp*. recorded in North West OWF Strategic Area during aerial surveys, Period 4. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

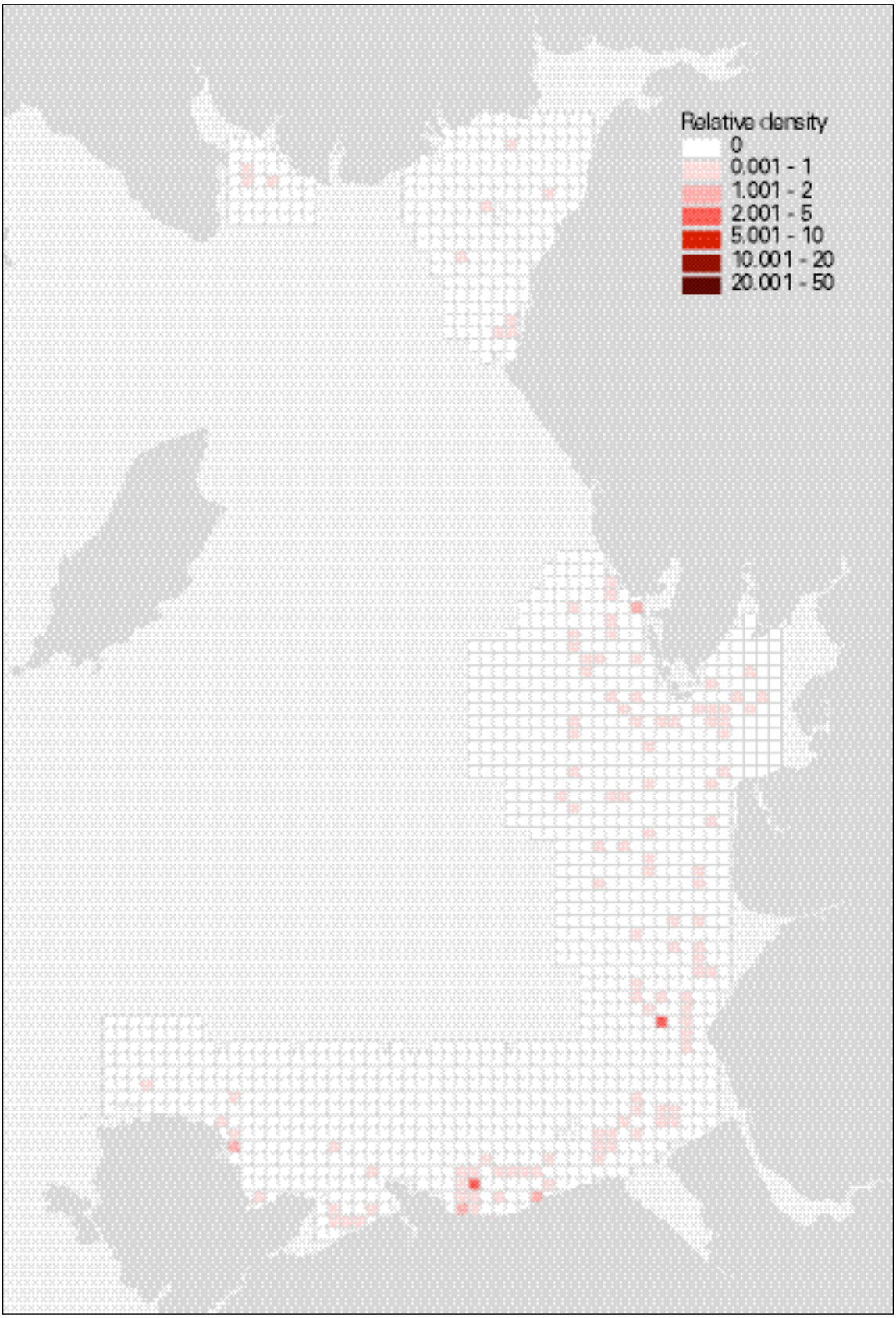


Figure 29 - Relative density of divers *Gavia spp*. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

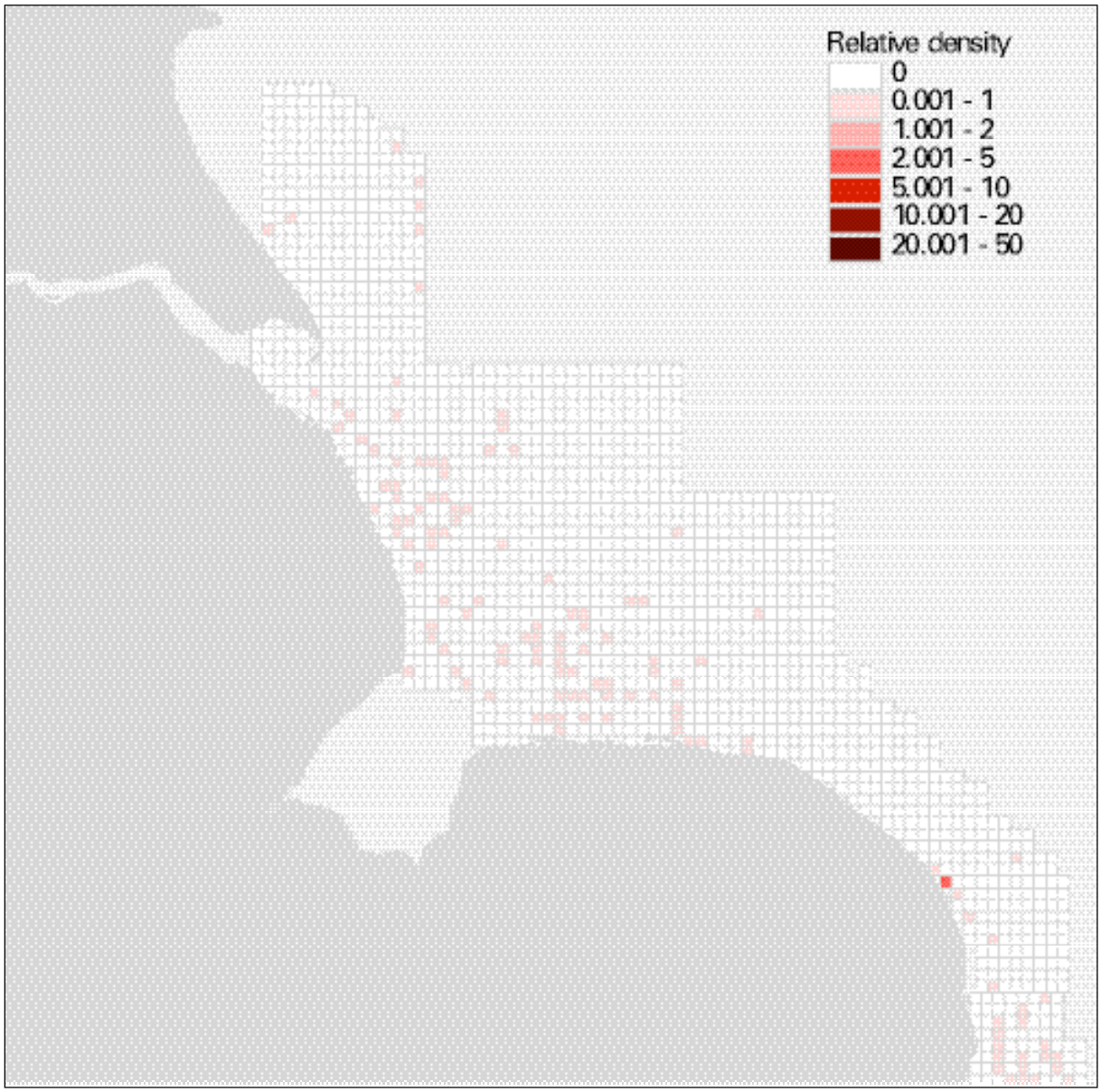


Figure 30 - Relative density of divers *Gavia spp*. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

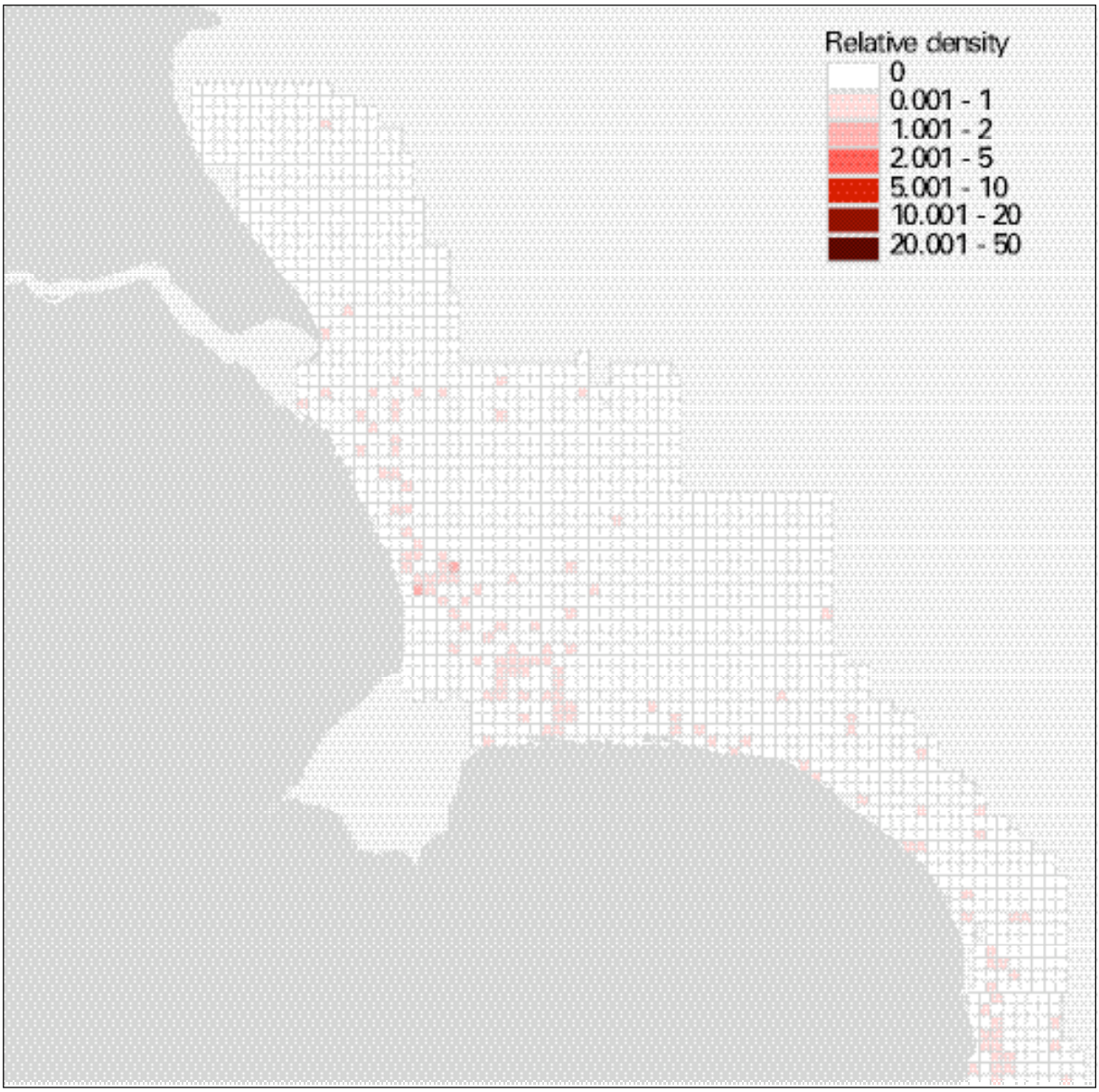


Figure 31 - Relative density of divers *Gavia spp*. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

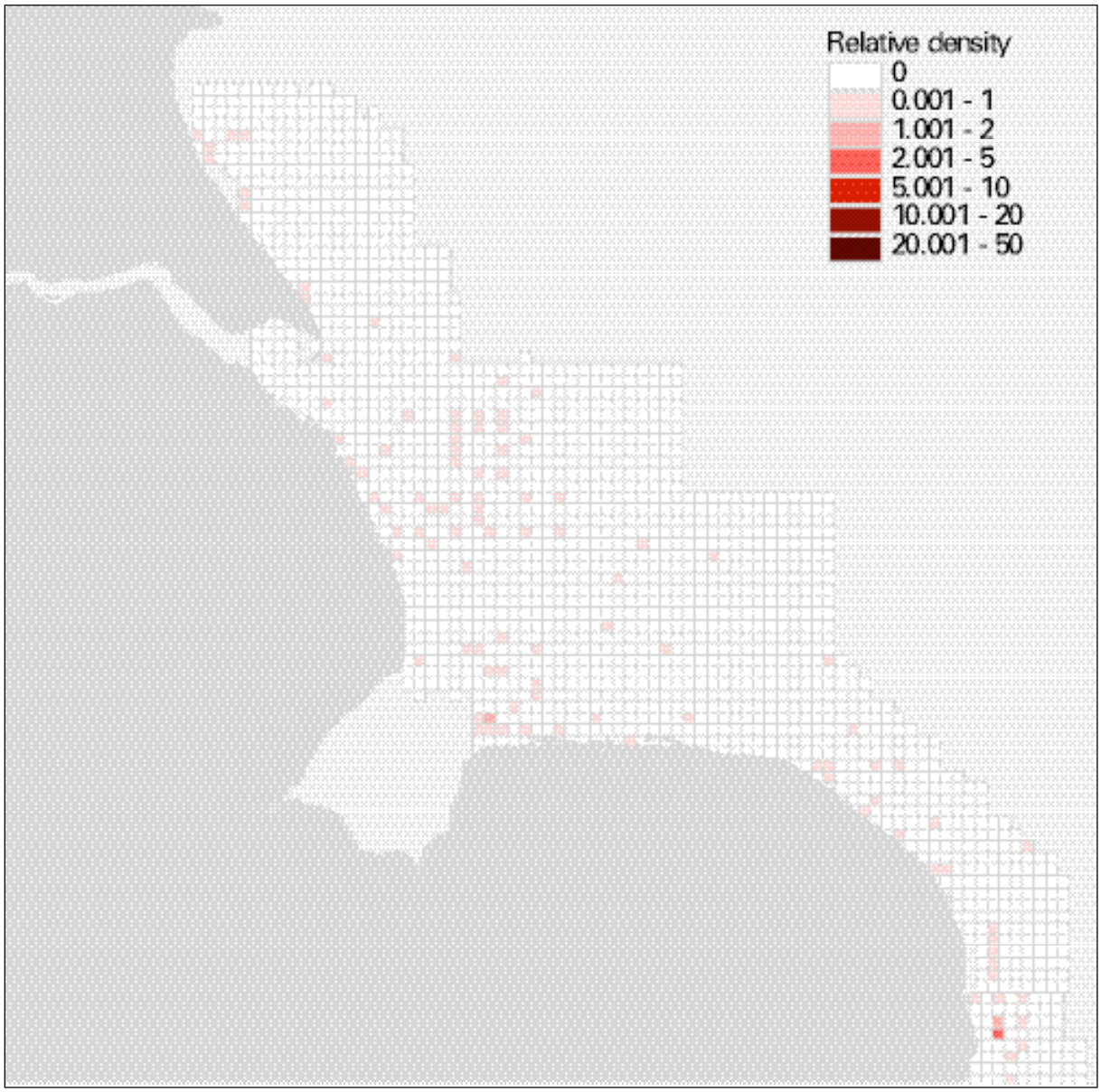


Figure 32 - Relative density of divers *Gavia spp*. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 4. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

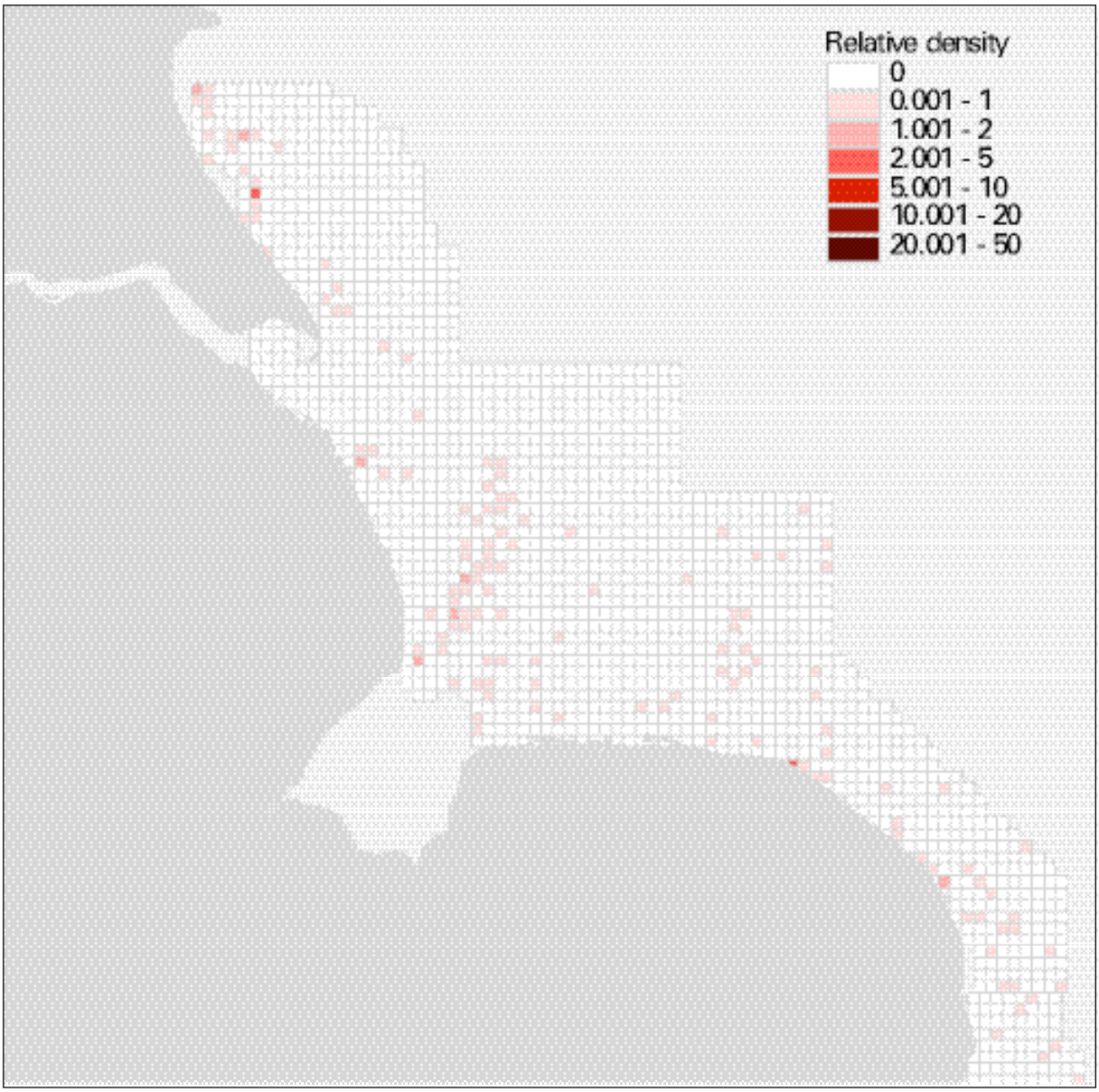


Figure 33 - Relative density of divers *Gavia spp*. recorded in Thames OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

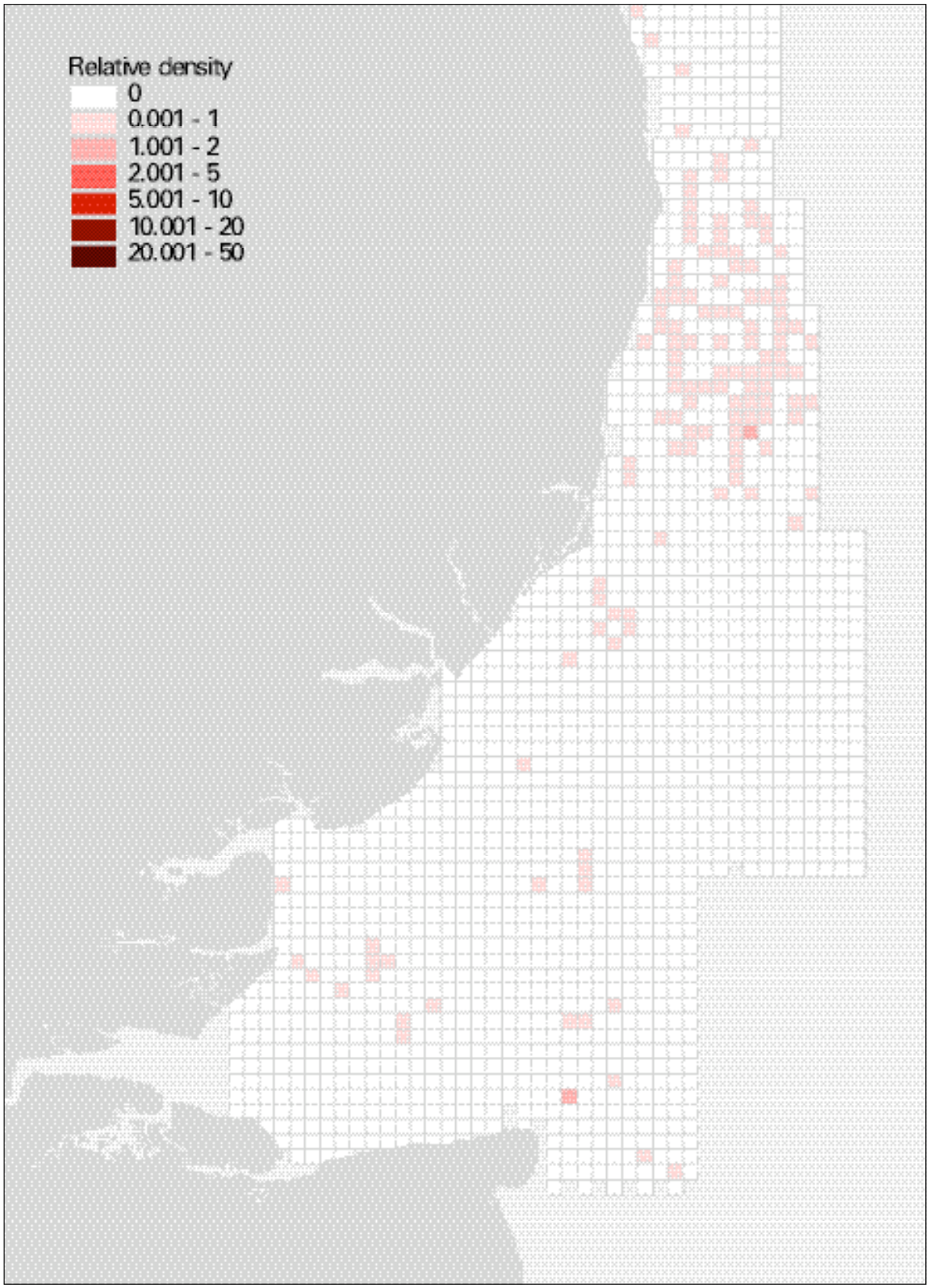


Figure 34 - Relative density of divers *Gavia spp*. recorded in Thames OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

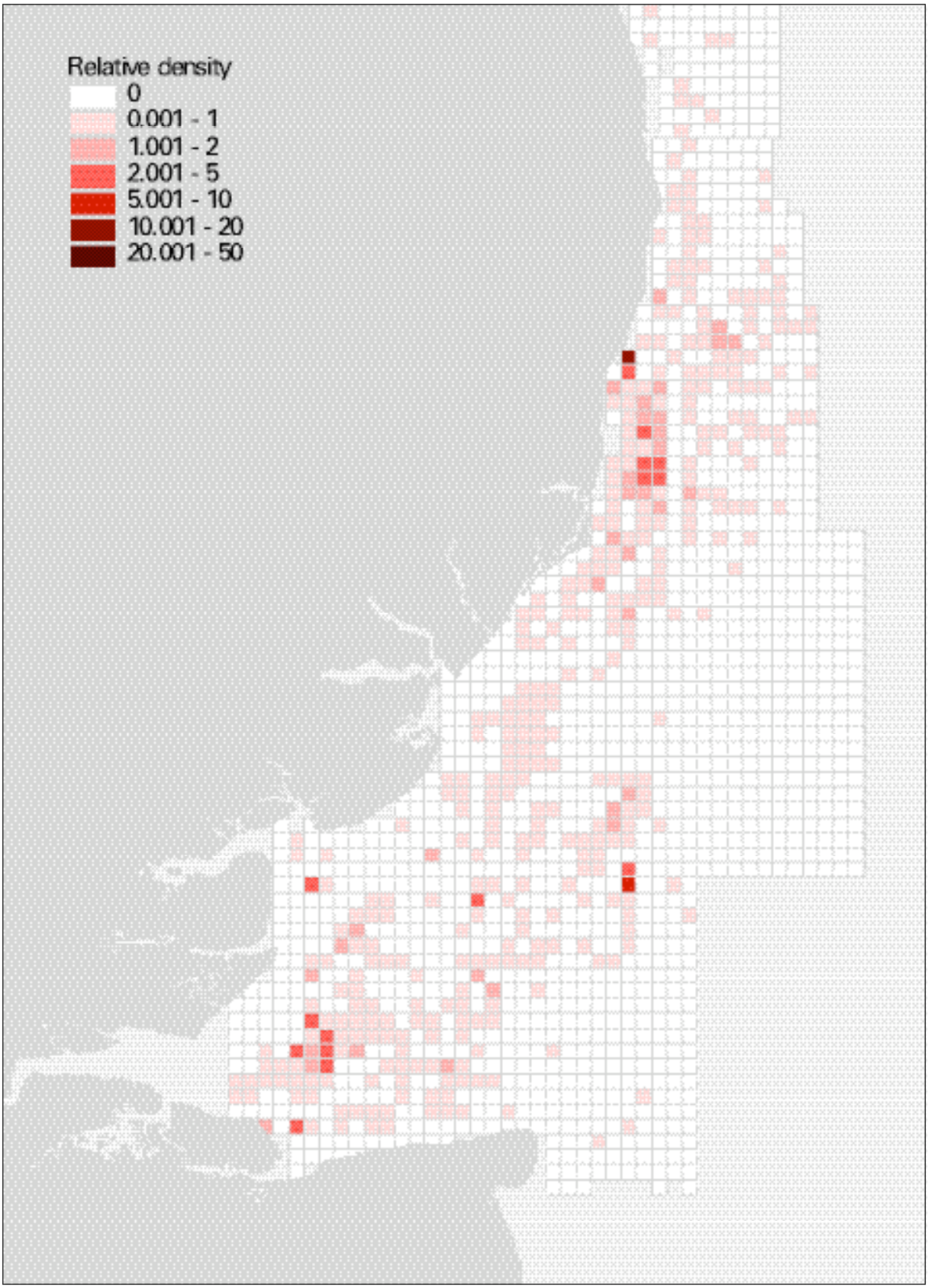


Figure 35 - Relative density of divers *Gavia spp*. recorded in Thames OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

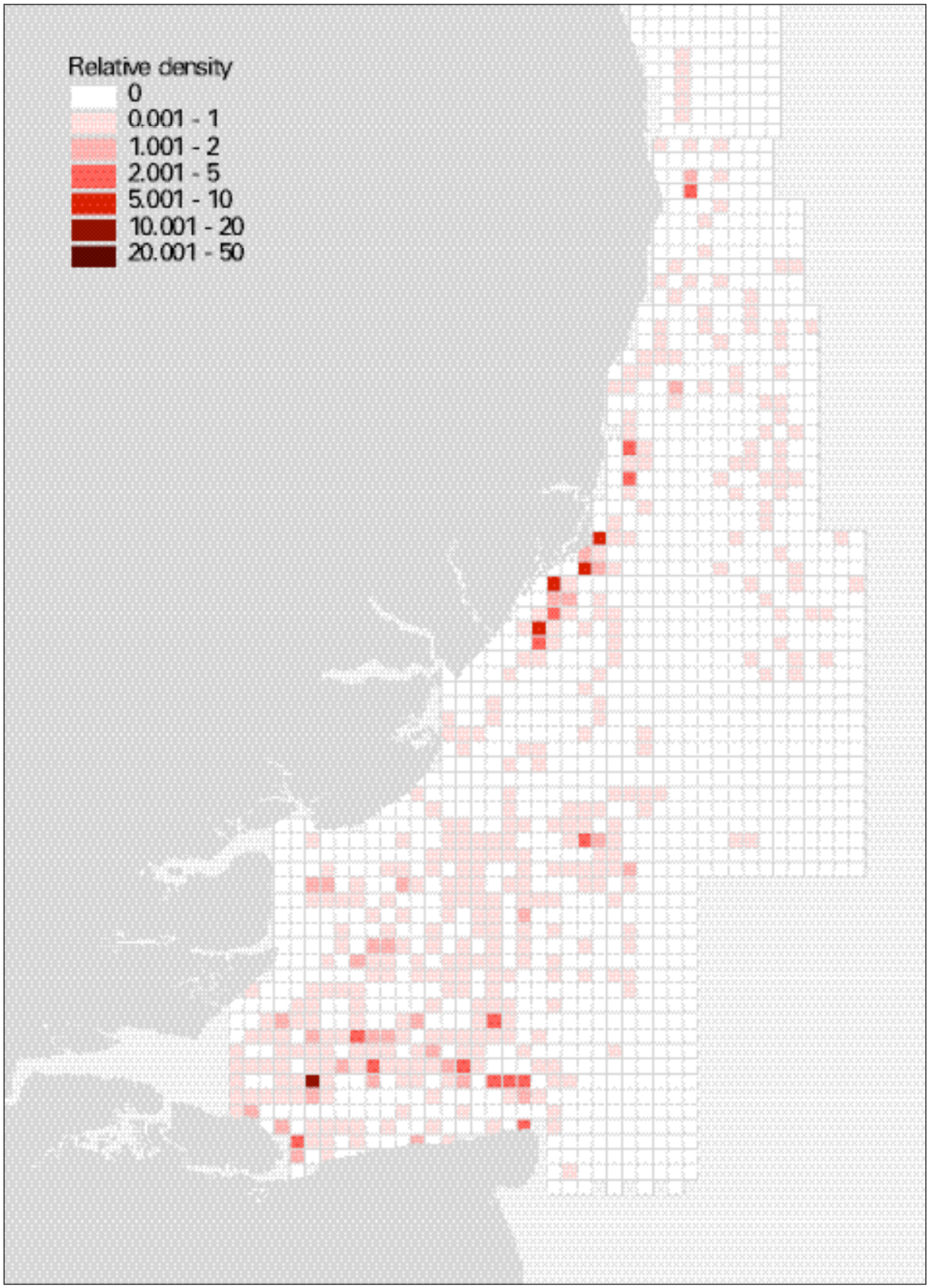


Figure 36 - Relative density of divers *Gavia spp*. recorded in Thames OWF Strategic Area during aerial surveys, Period 4. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

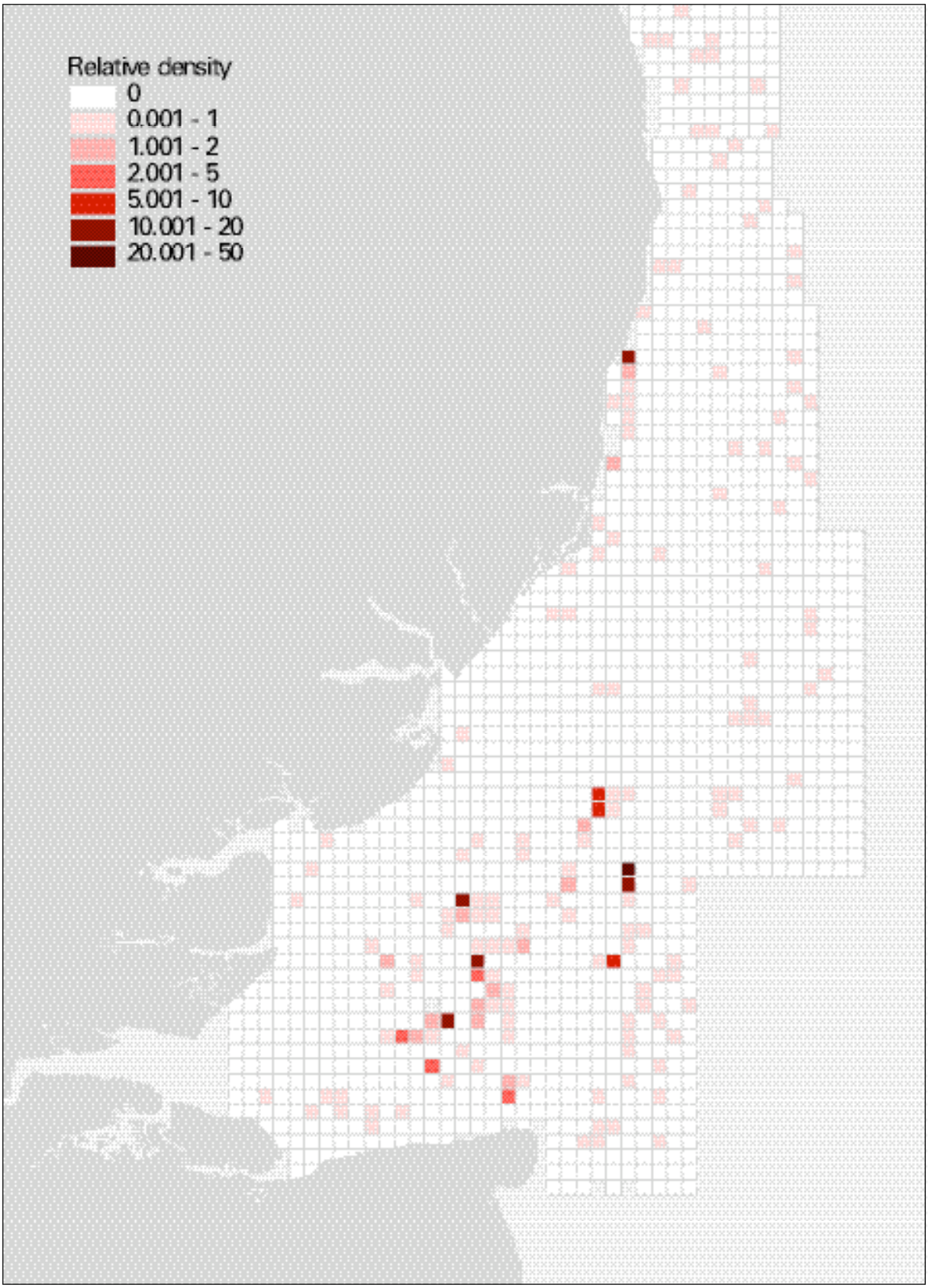


Figure 37 - Relative density of Little Gulls *Larus minutus* recorded in North West OWF Strategic Area during aerial surveys, winter 2004/05 (Periods 1-4 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

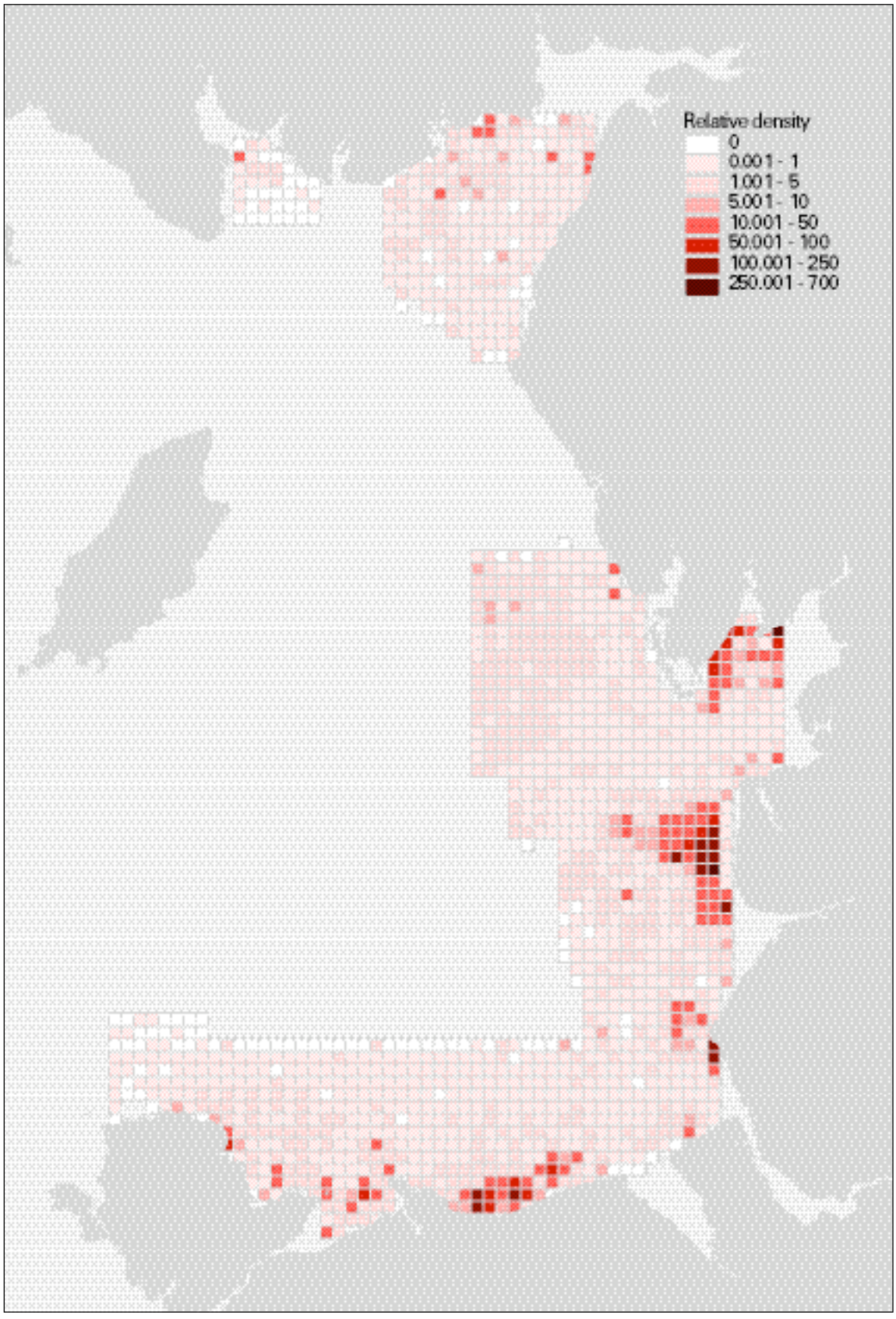


Figure 38 - Relative density of Little Gulls *Larus minutus* recorded in Greater Wash OWF Strategic Area during aerial surveys, winter 2004/05 (Periods 1-4 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

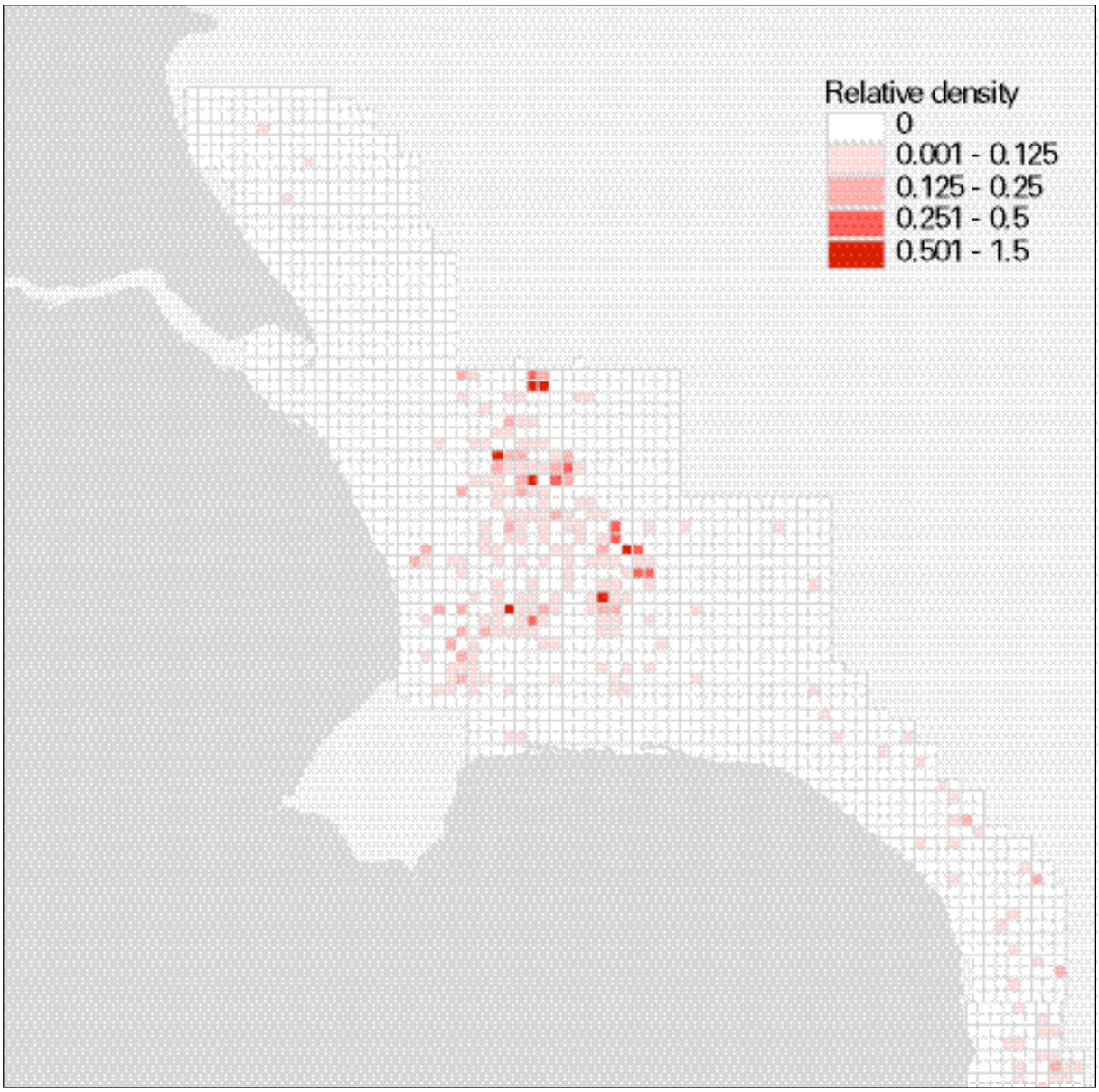


Figure 39 - Relative density of Eiders *Somateria mollissima* recorded in North West OWF Strategic Area during aerial surveys, winter 2004/05 (Periods 1-4 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

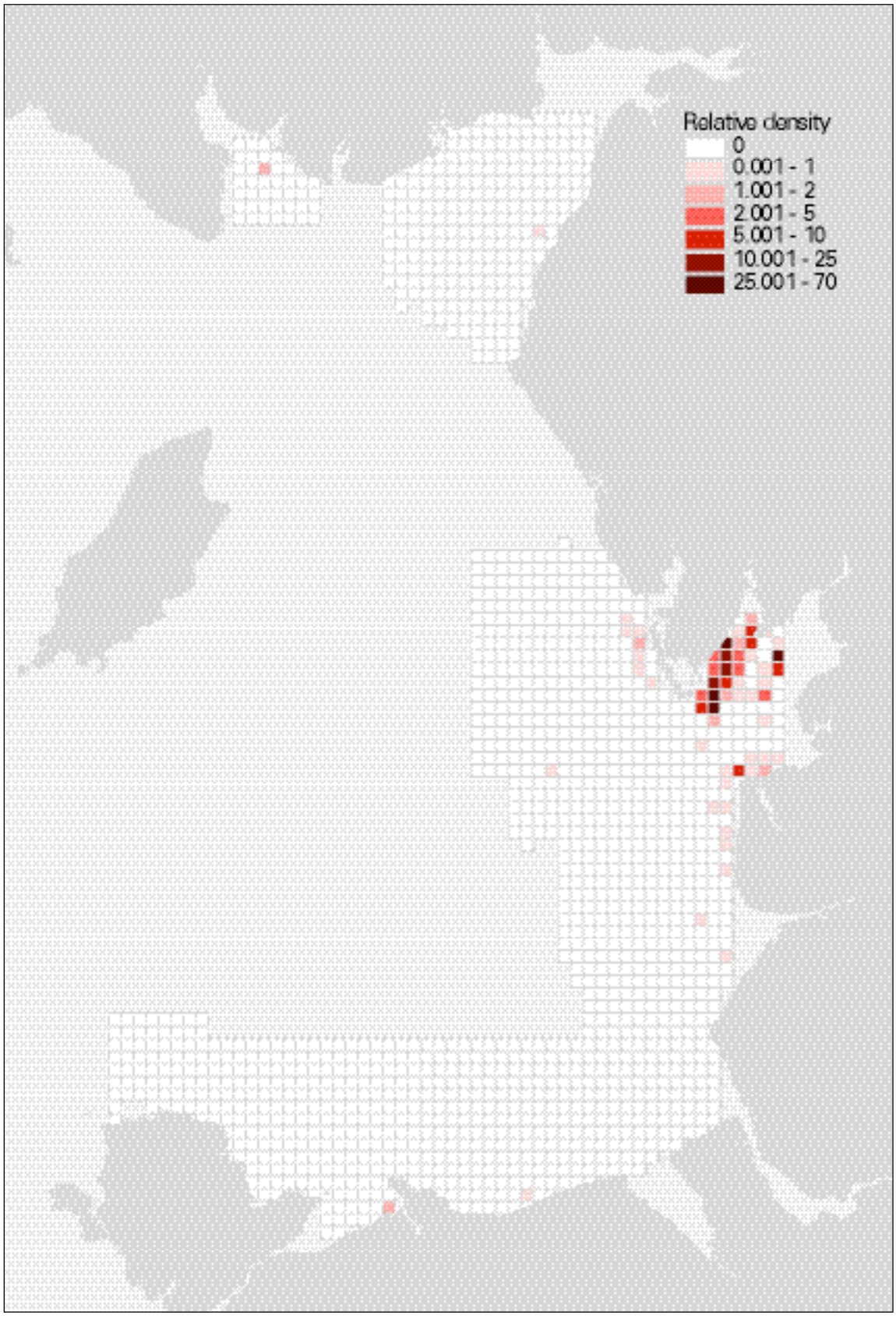


Figure 40 - Relative density of Manx Shearwaters *Puffinus puffinus* recorded in North West OWF Strategic Area during aerial surveys, summer 2005 (Periods 5-7 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

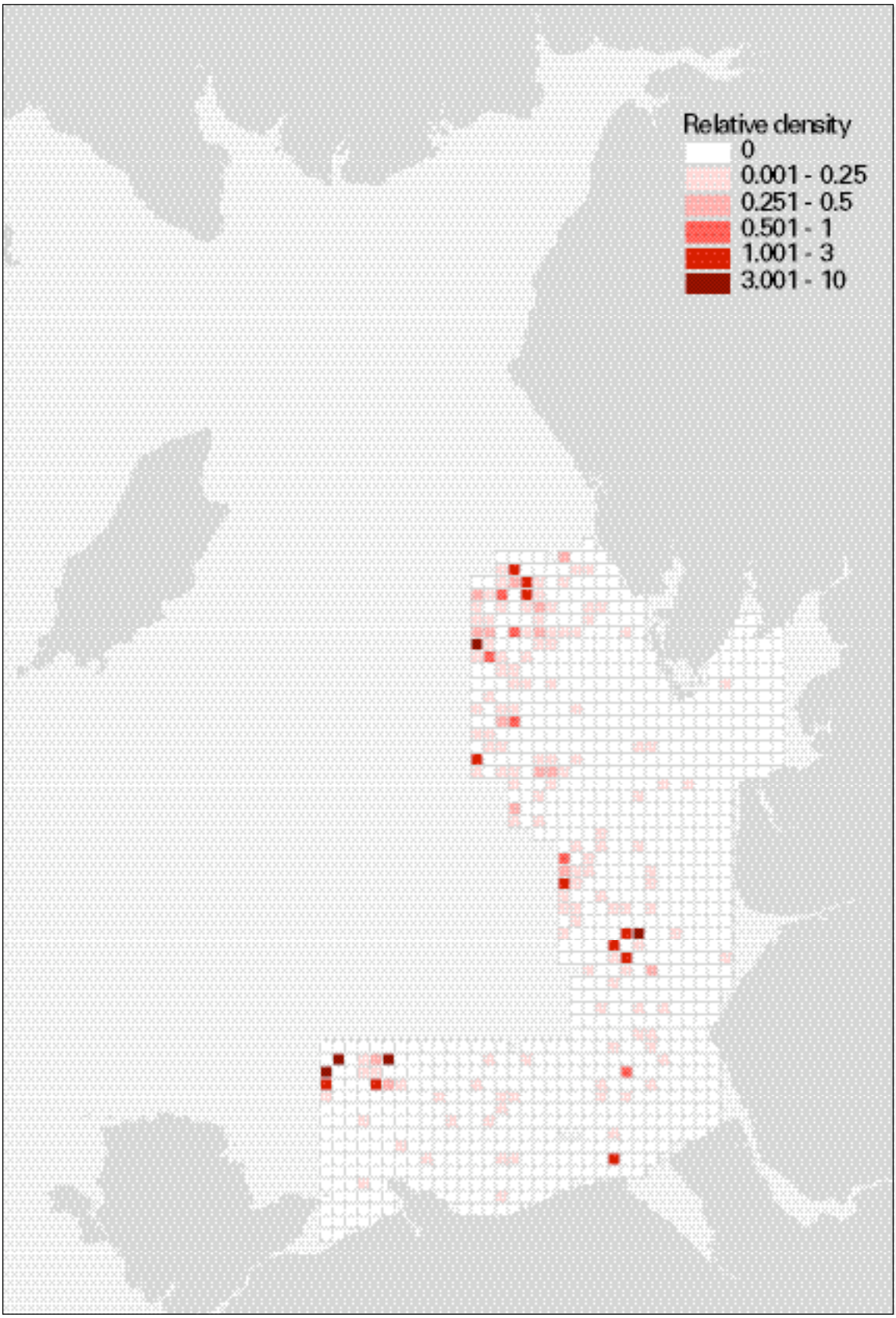


Figure 41 - Relative density of Gannets *Morus bassanus* recorded in North West OWF Strategic Area during aerial surveys, summer 2005 (Periods 5-7 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

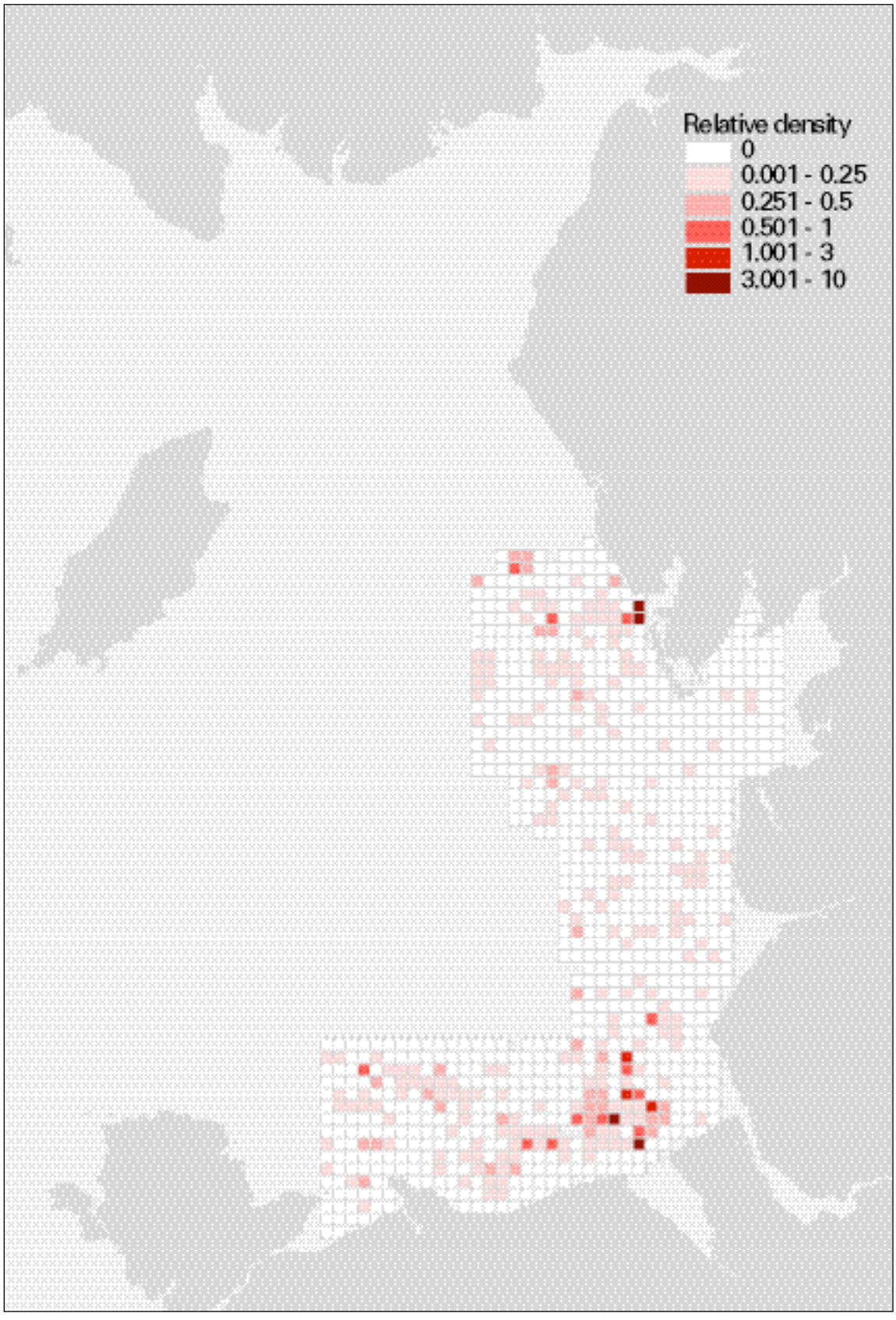


Figure 42 - Relative density of cormorants *Phalacrocorax* spp. recorded in North West OWF Strategic Area during aerial surveys, winter 2004/05 (Periods 1-4 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

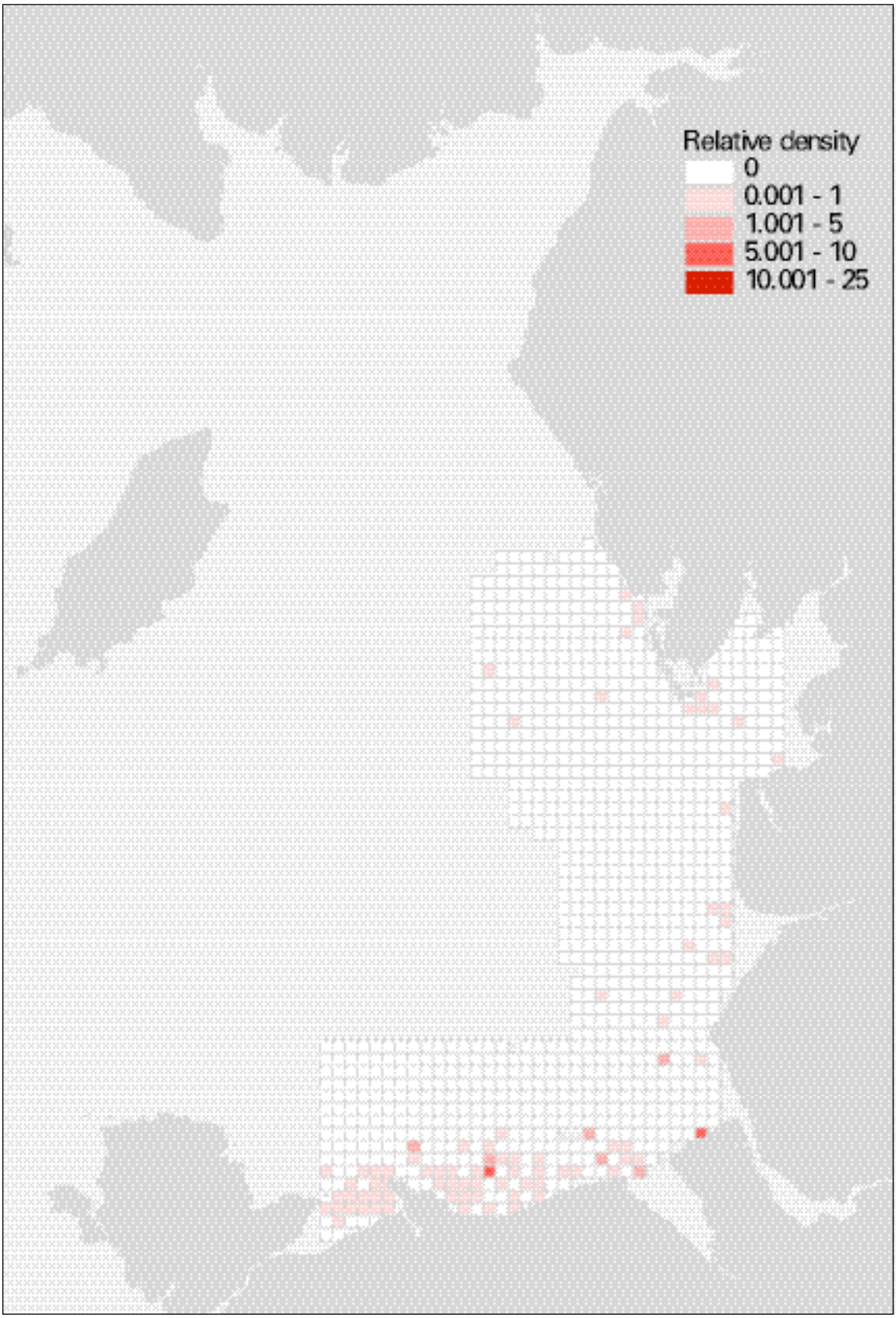


Figure 43 - Relative density of cormorants *Phalacrocorax* spp. recorded in North West OWF Strategic Area during aerial surveys, summer 2005 (Periods 5-7 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

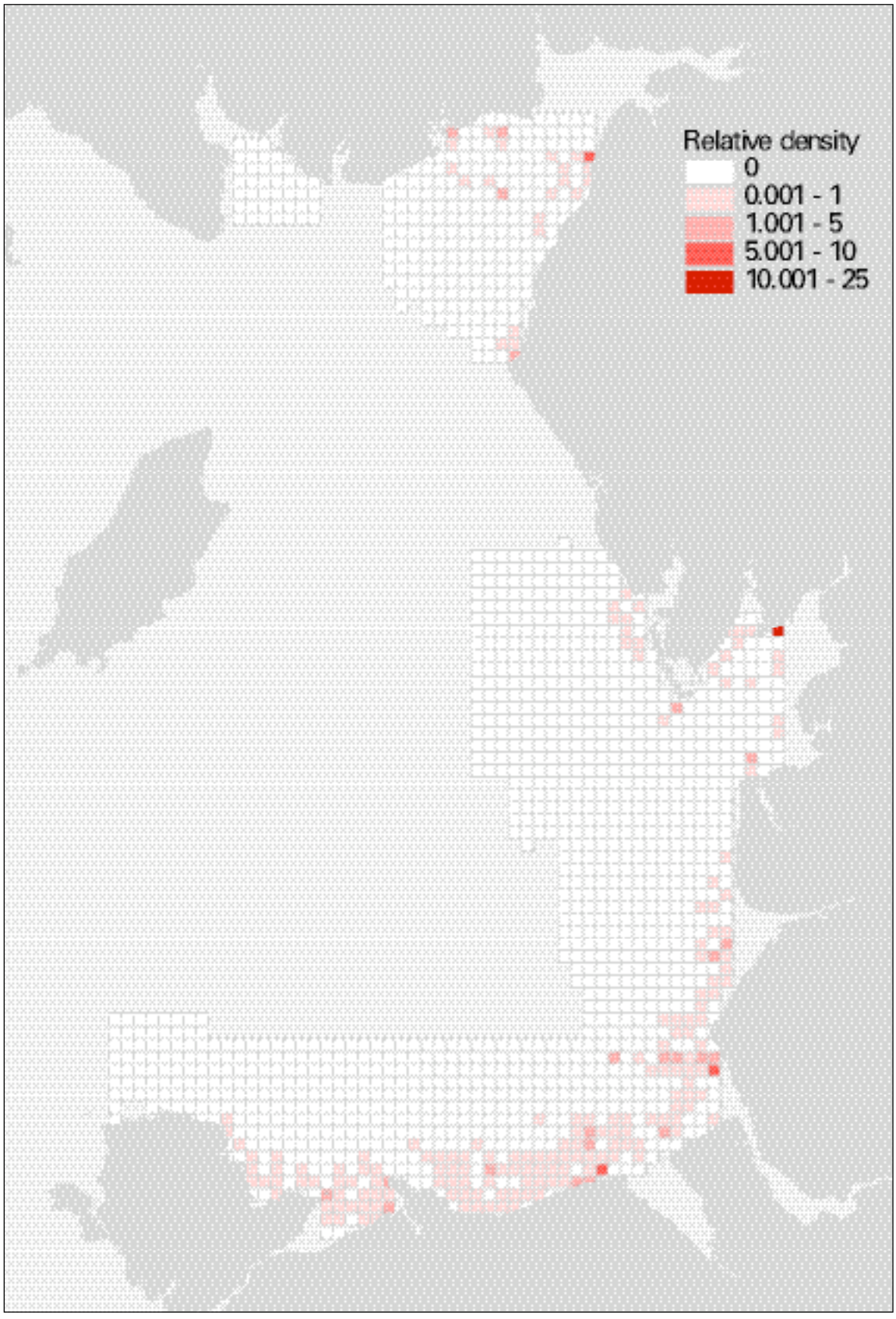


Figure 44 - Relative density of gulls *Larus* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

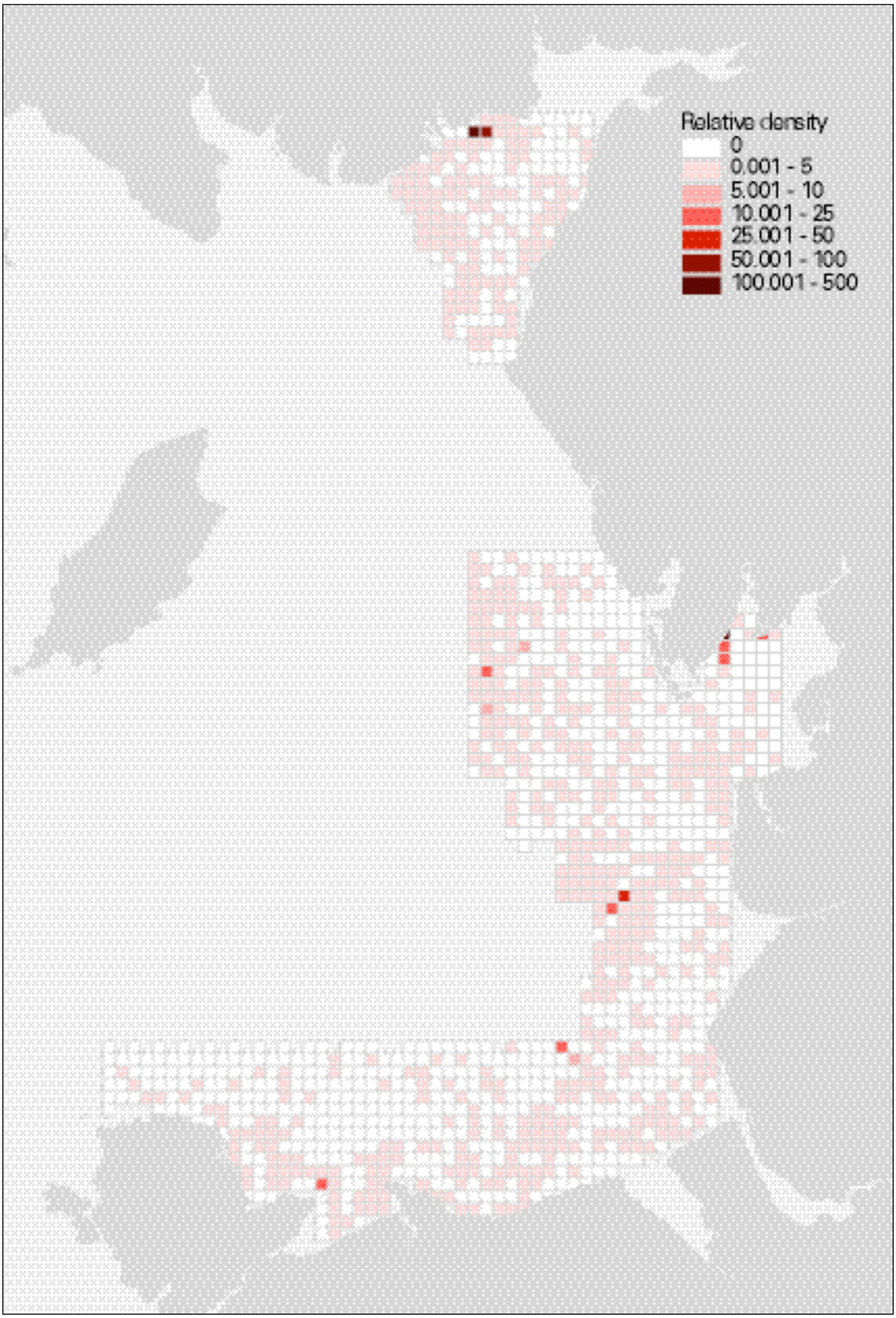


Figure 45 - Relative density of gulls Larus spp. recorded in North West OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

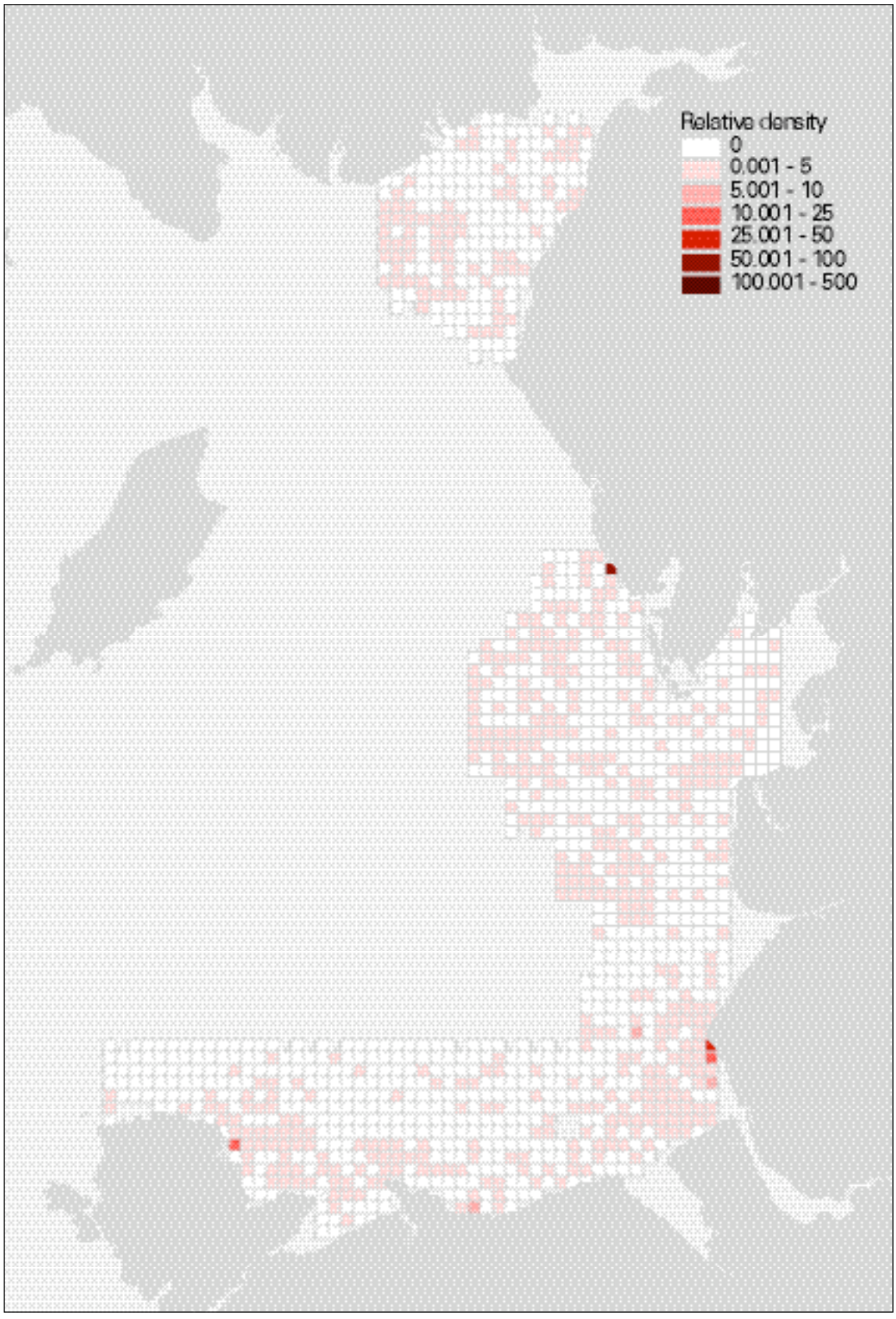


Figure 46 - Relative density of gulls Larus spp. recorded in North West OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

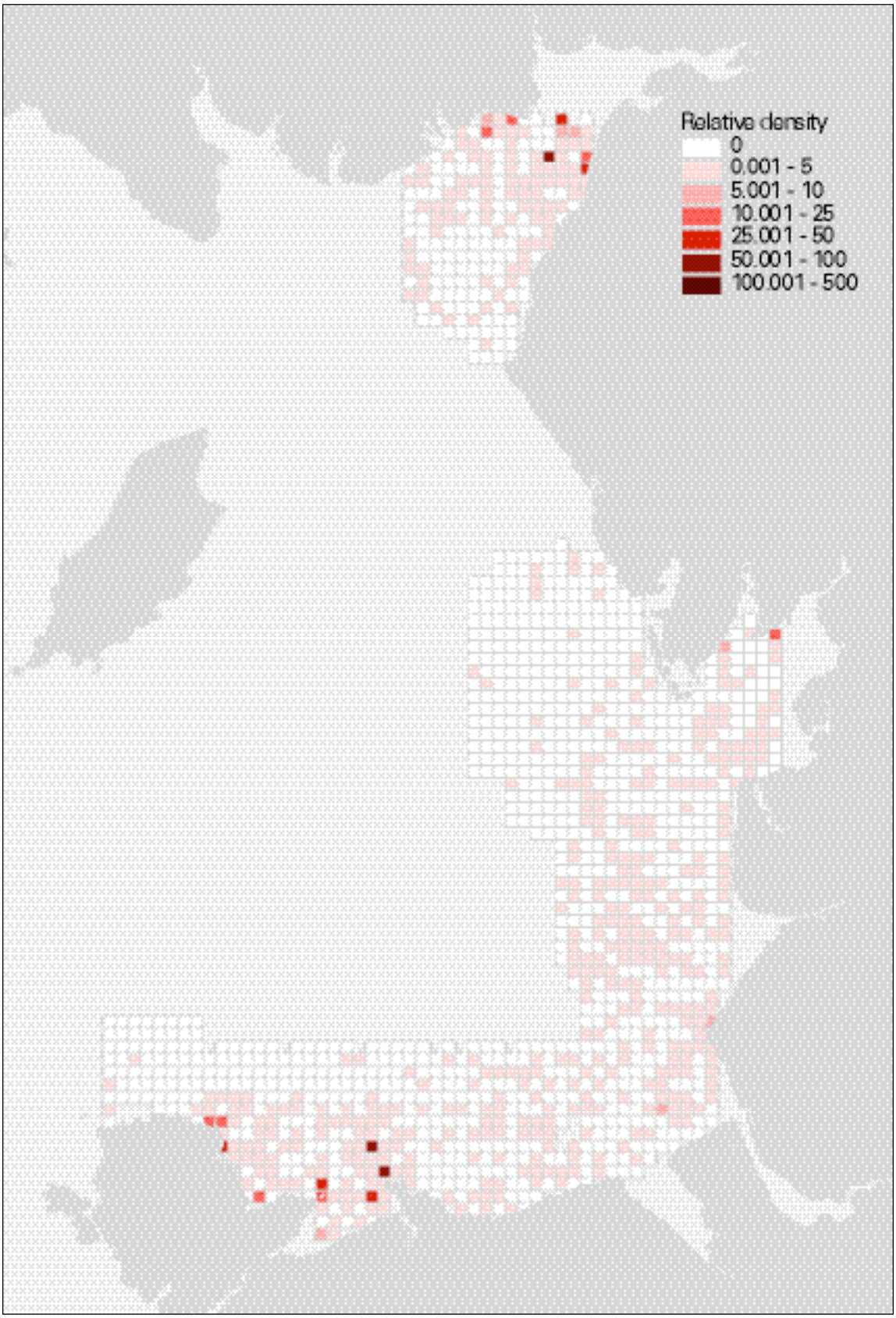


Figure 47 - Relative density of gulls *Larus* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 4. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

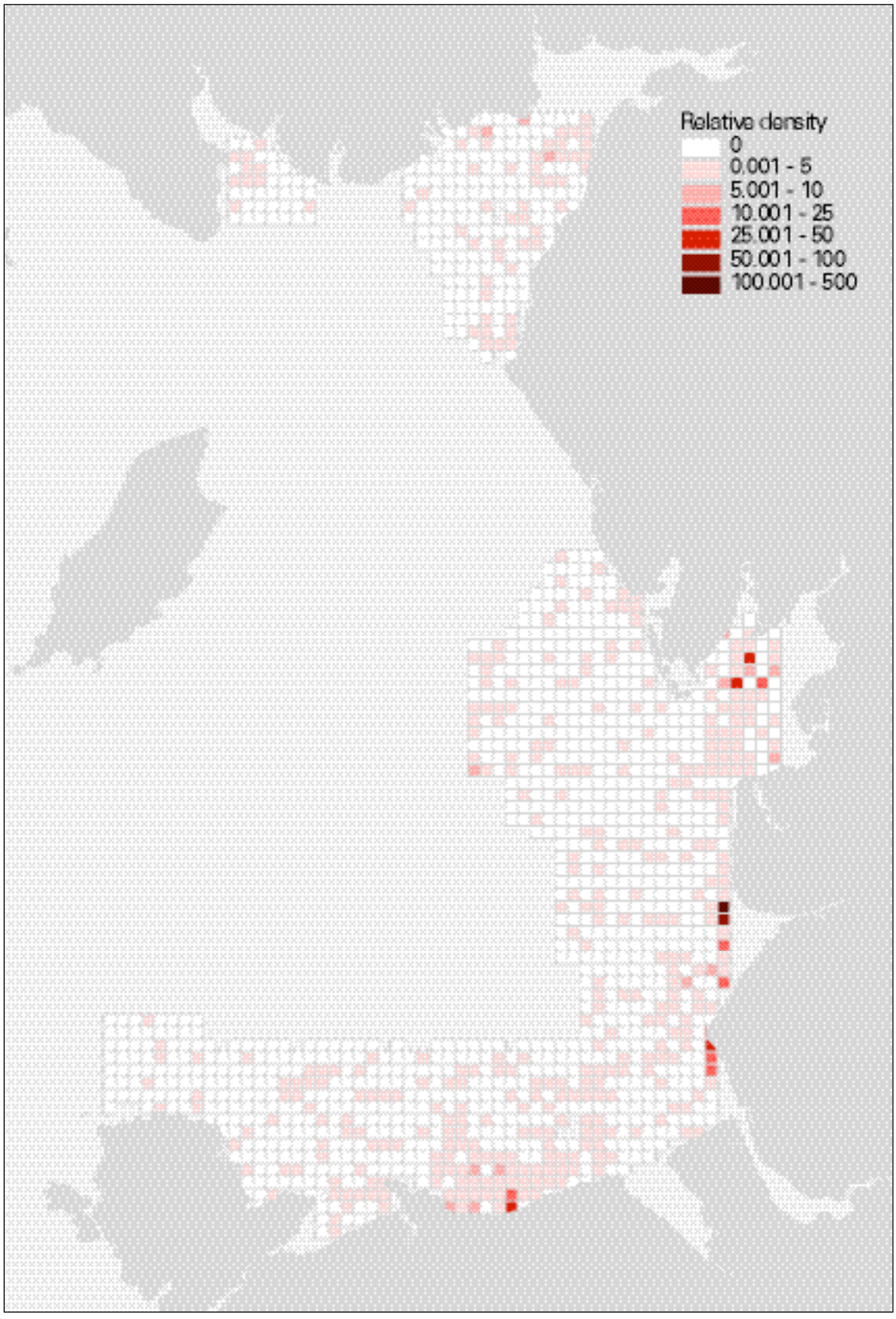


Figure 48 - Relative density of gulls *Larus* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 5. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

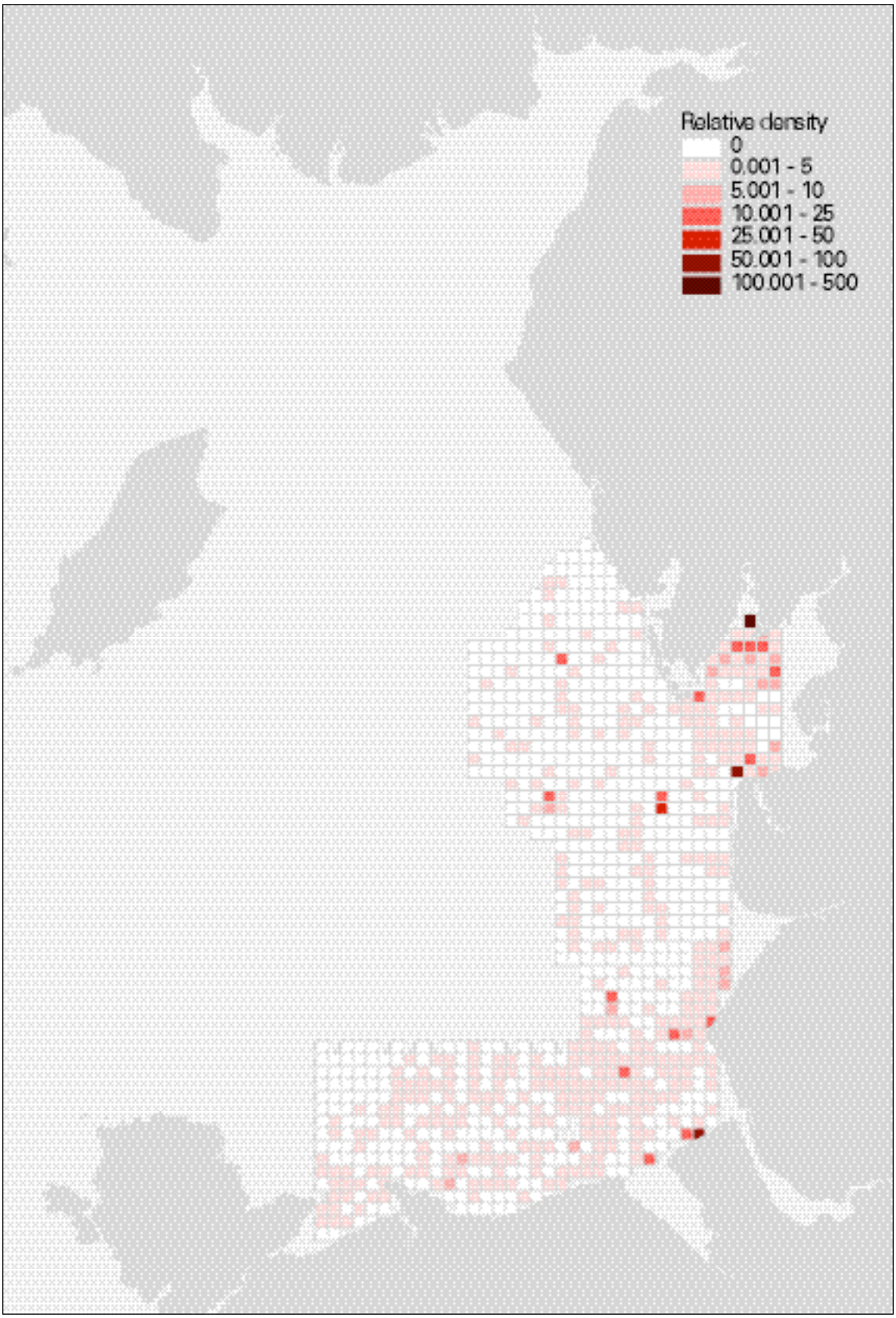


Figure 49 - Relative density of gulls *Larus* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 6. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

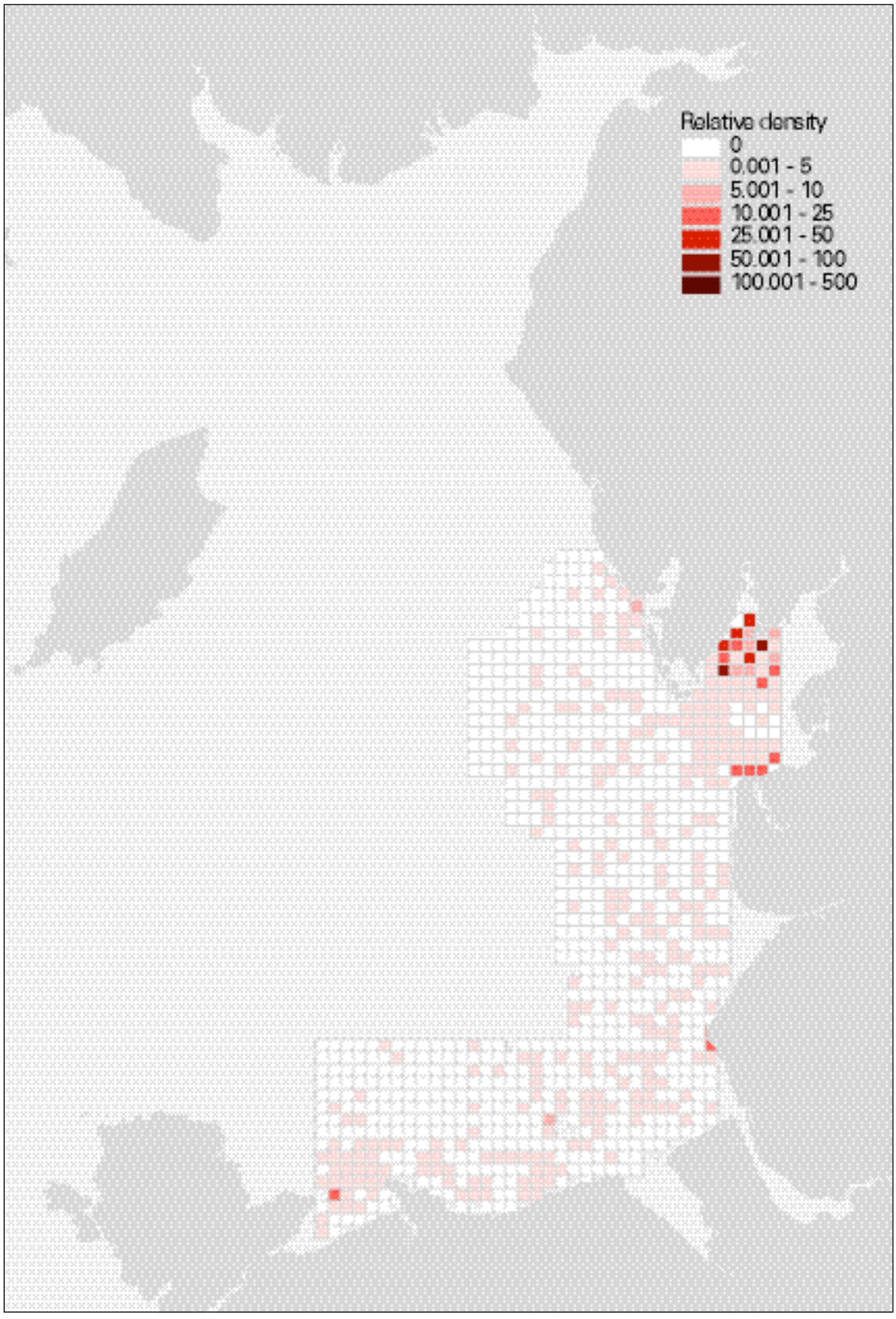


Figure 50 - Relative density of gulls *Larus* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 7. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

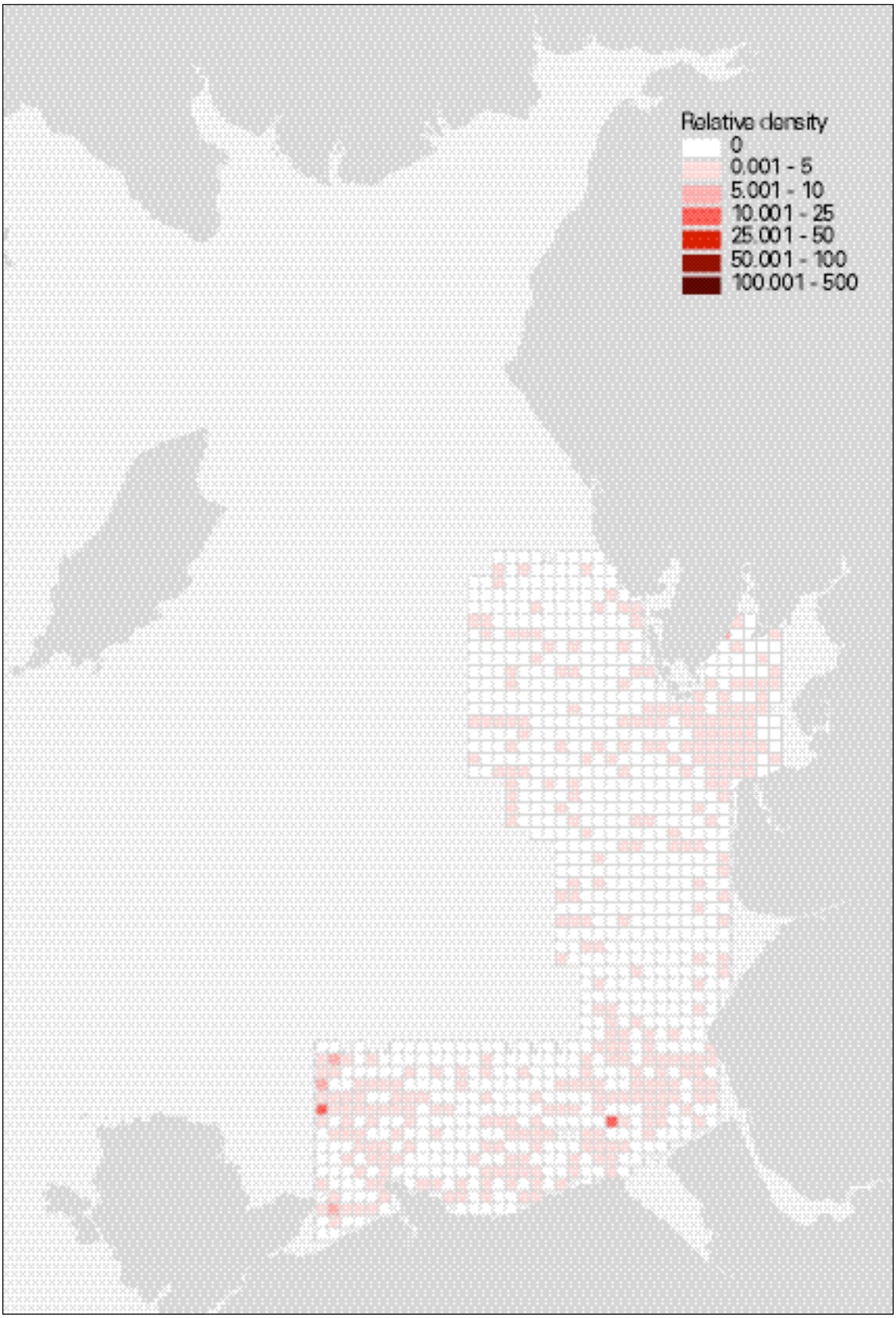


Figure 51 - Relative density of gulls *Larus* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

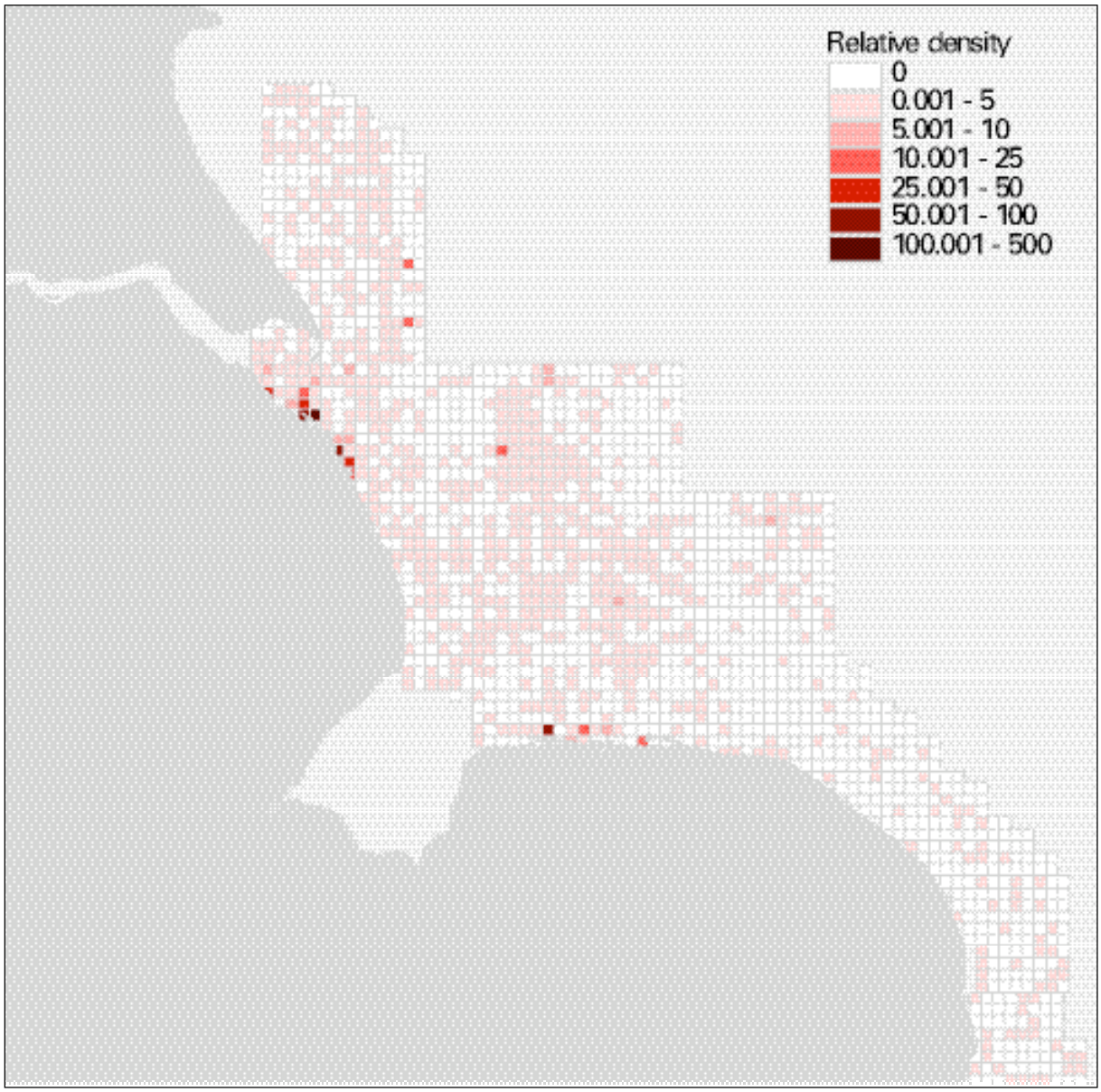


Figure 52 - Relative density of gulls *Larus* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

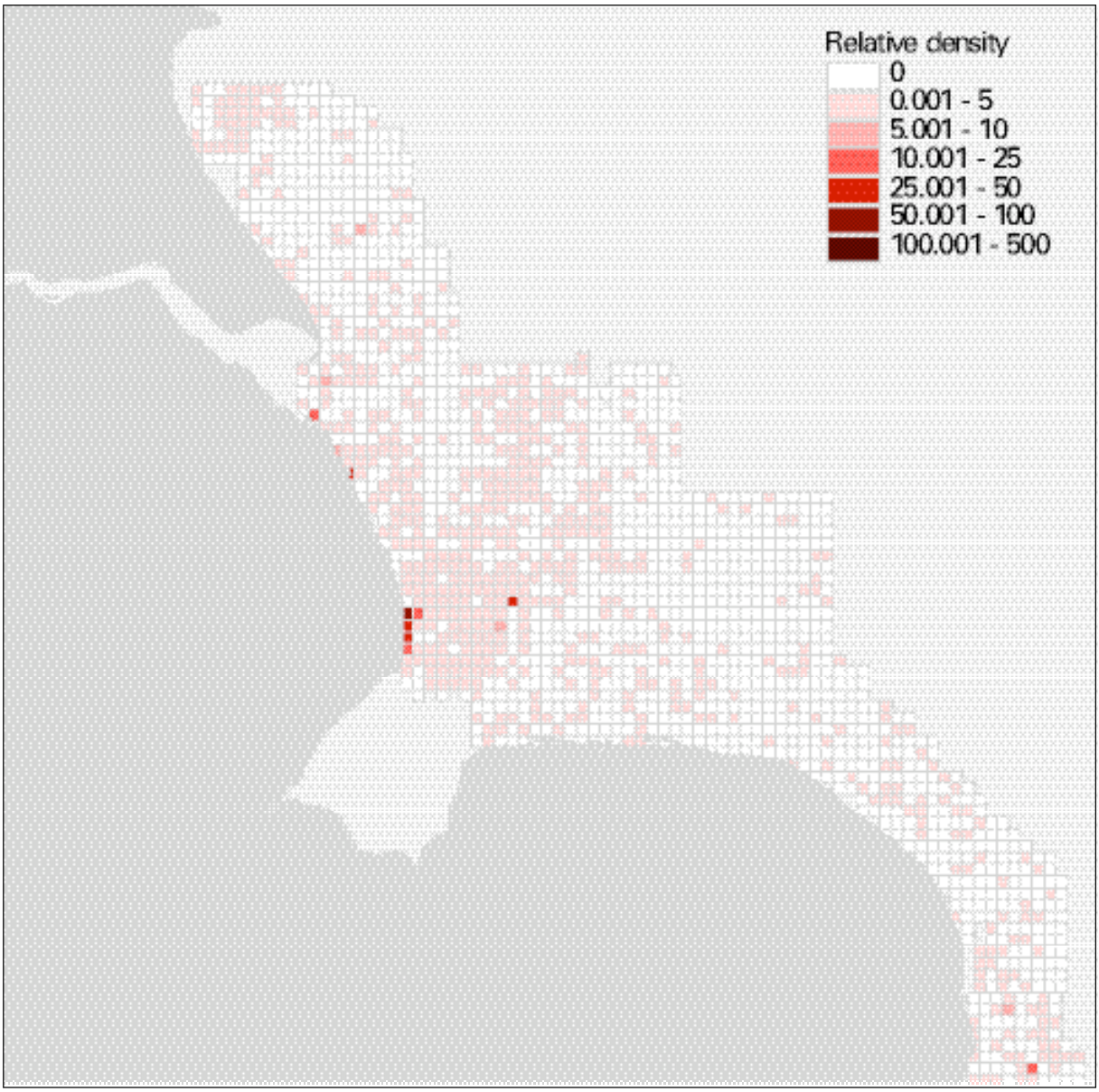


Figure 53 - Relative density of gulls 8 spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

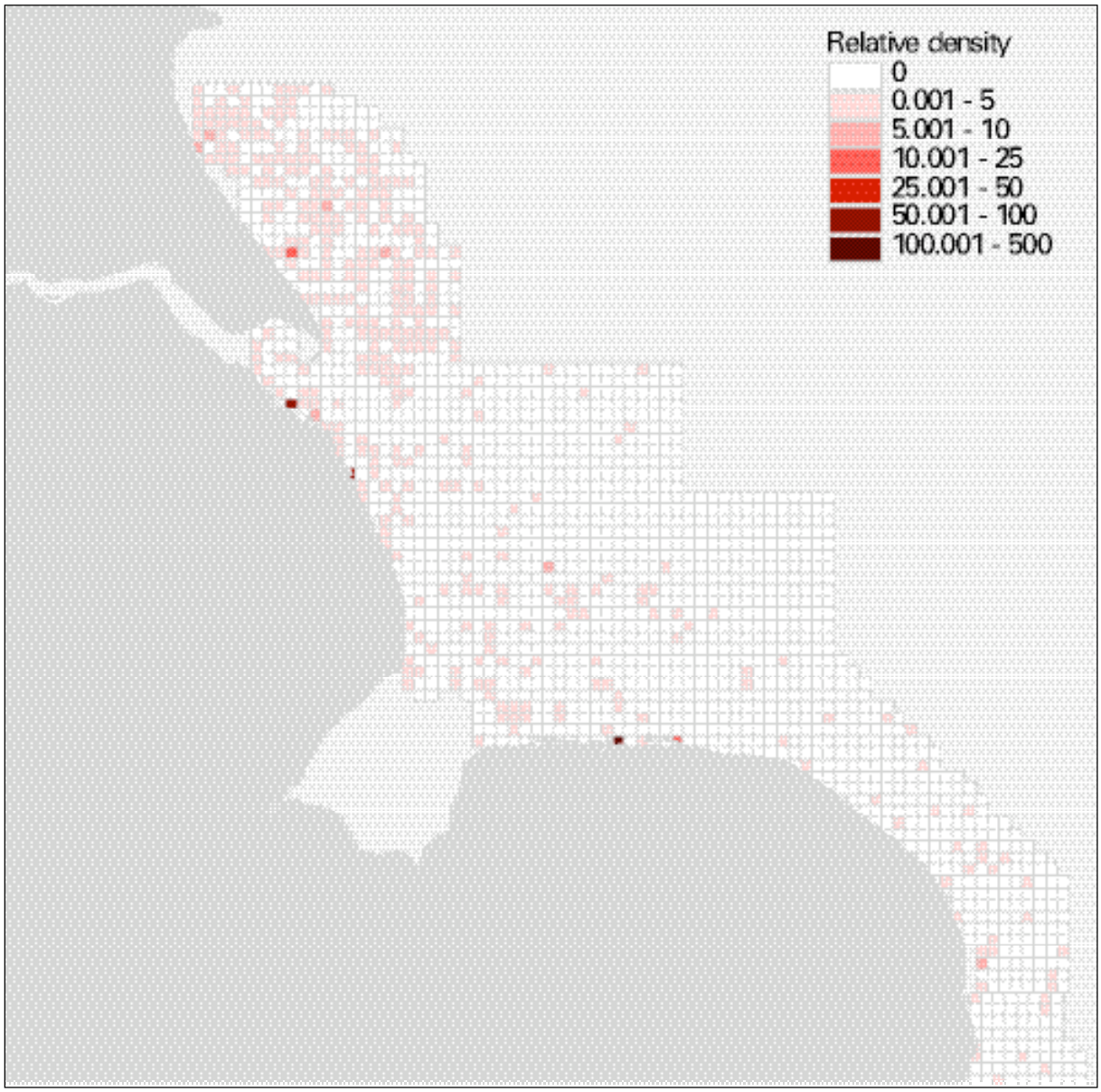


Figure 54 - Relative density of gulls *Larus* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 4. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

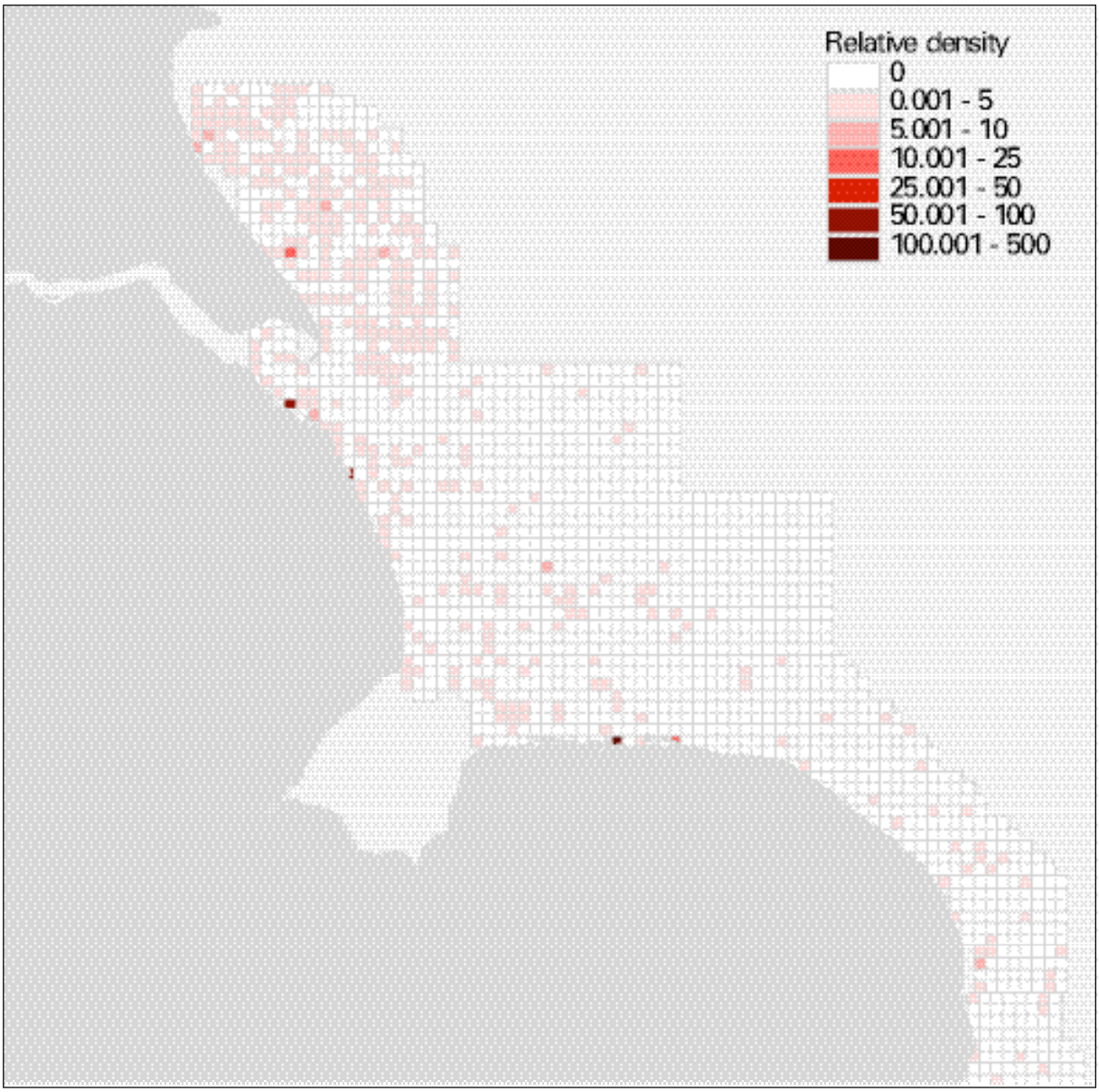


Figure 55 - Relative density of gulls *Larus* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 5. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

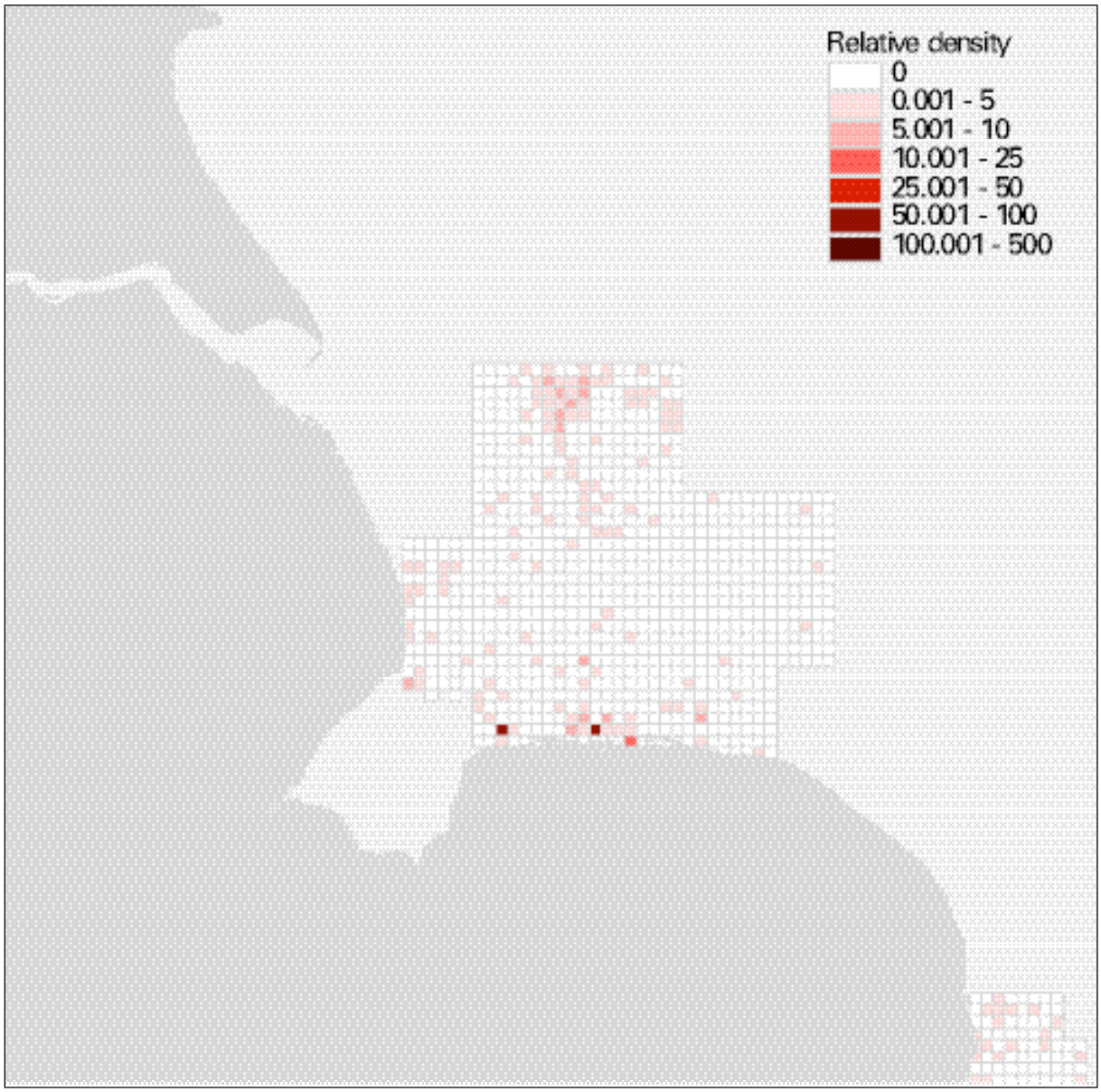


Figure 56 - Relative density of gulls *Larus* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 6. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

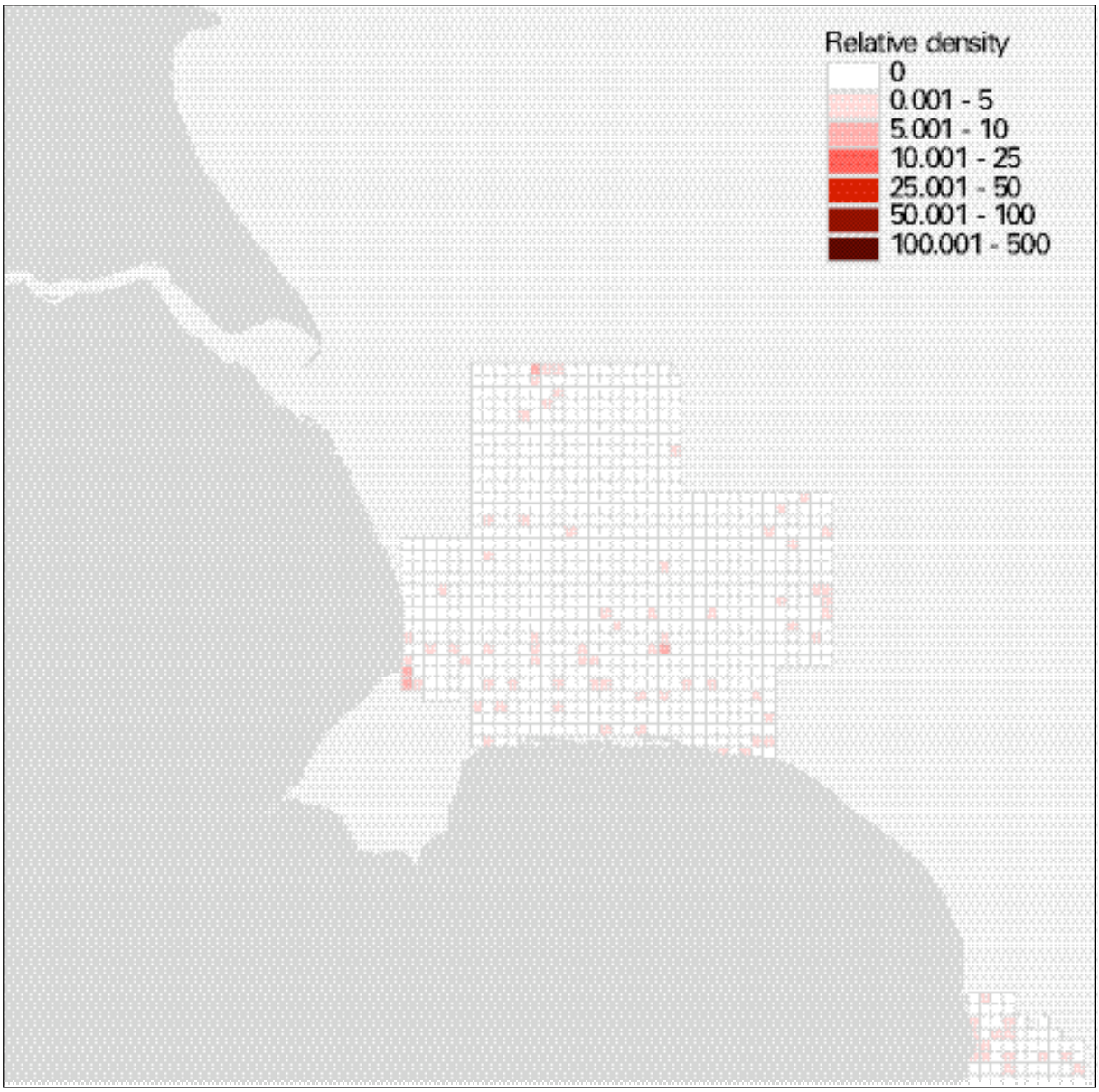


Figure 57 - Relative density of gulls *Larus* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 7. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

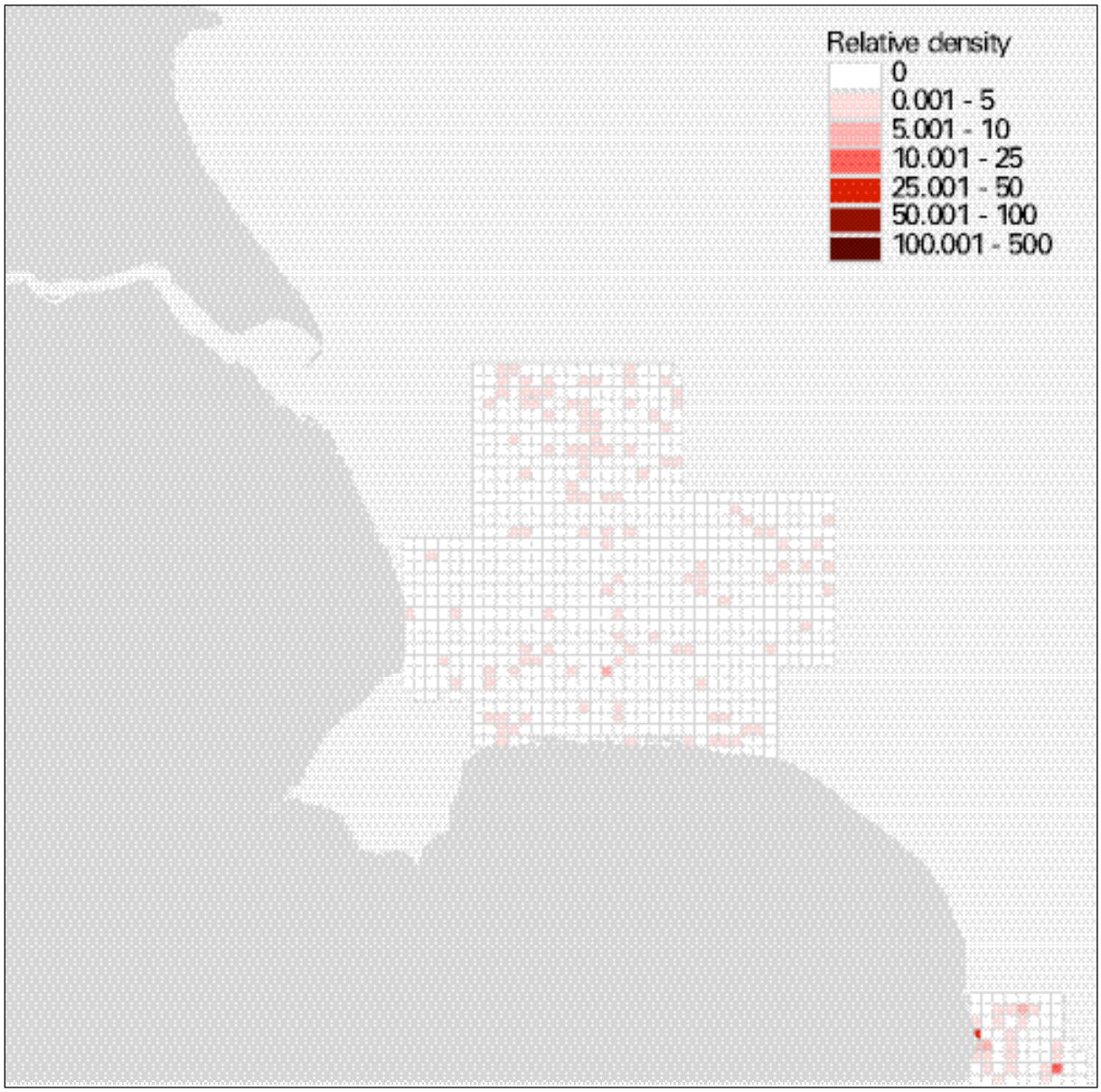


Figure 58 - Relative density of gulls *Larus* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

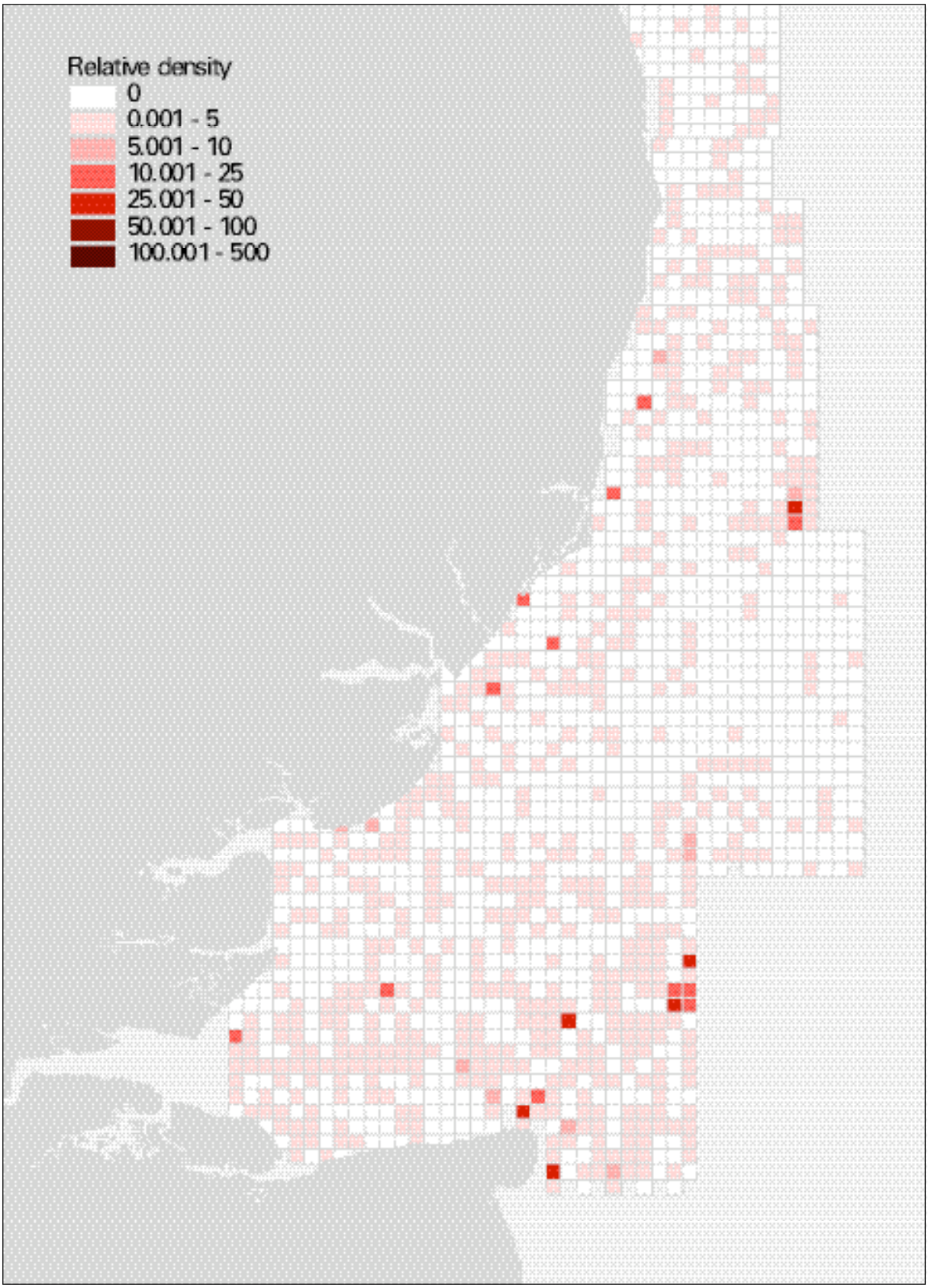


Figure 59 - Relative density of gulls *Larus* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

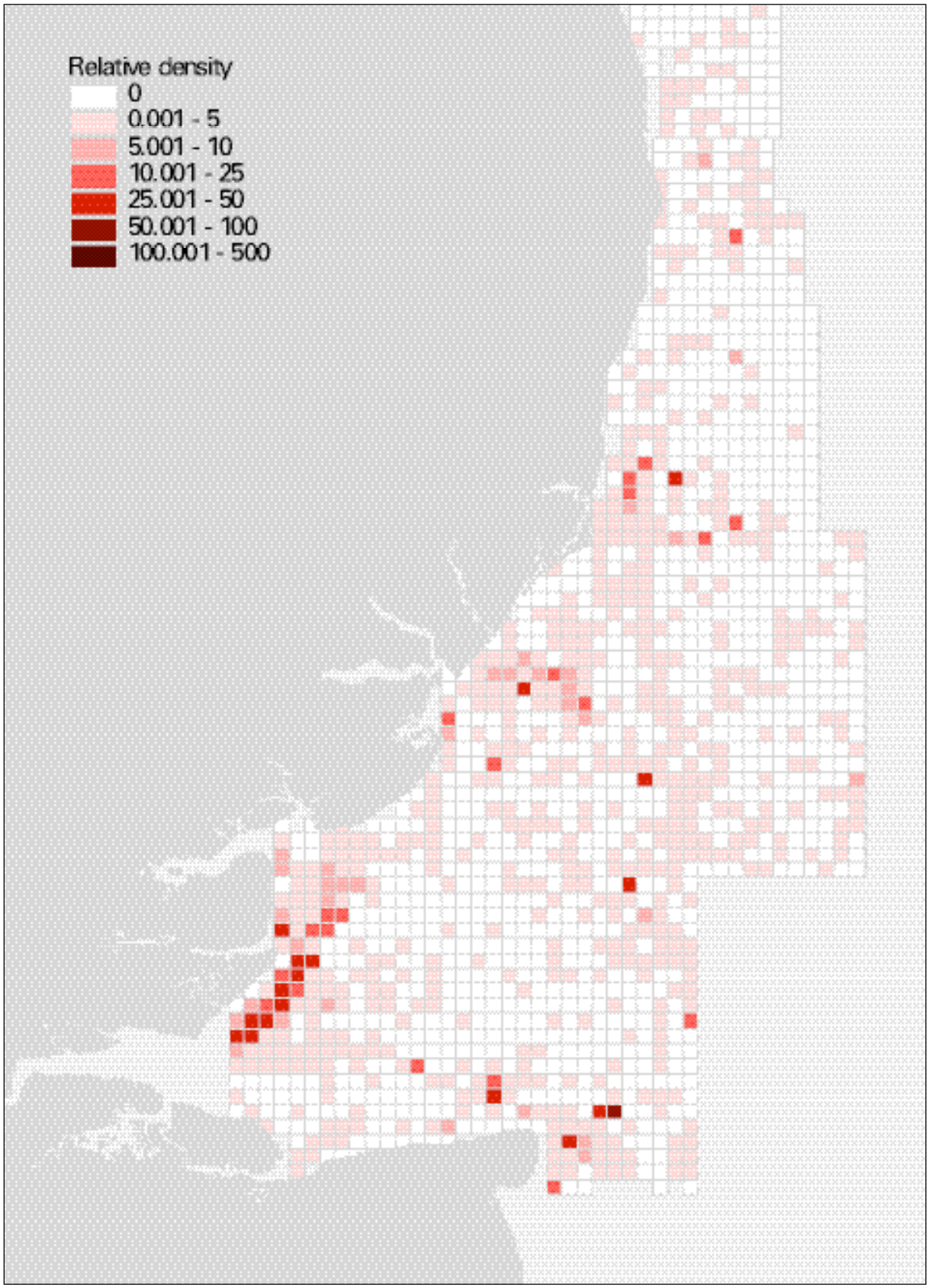


Figure 60 - Relative density of gulls *Larus* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

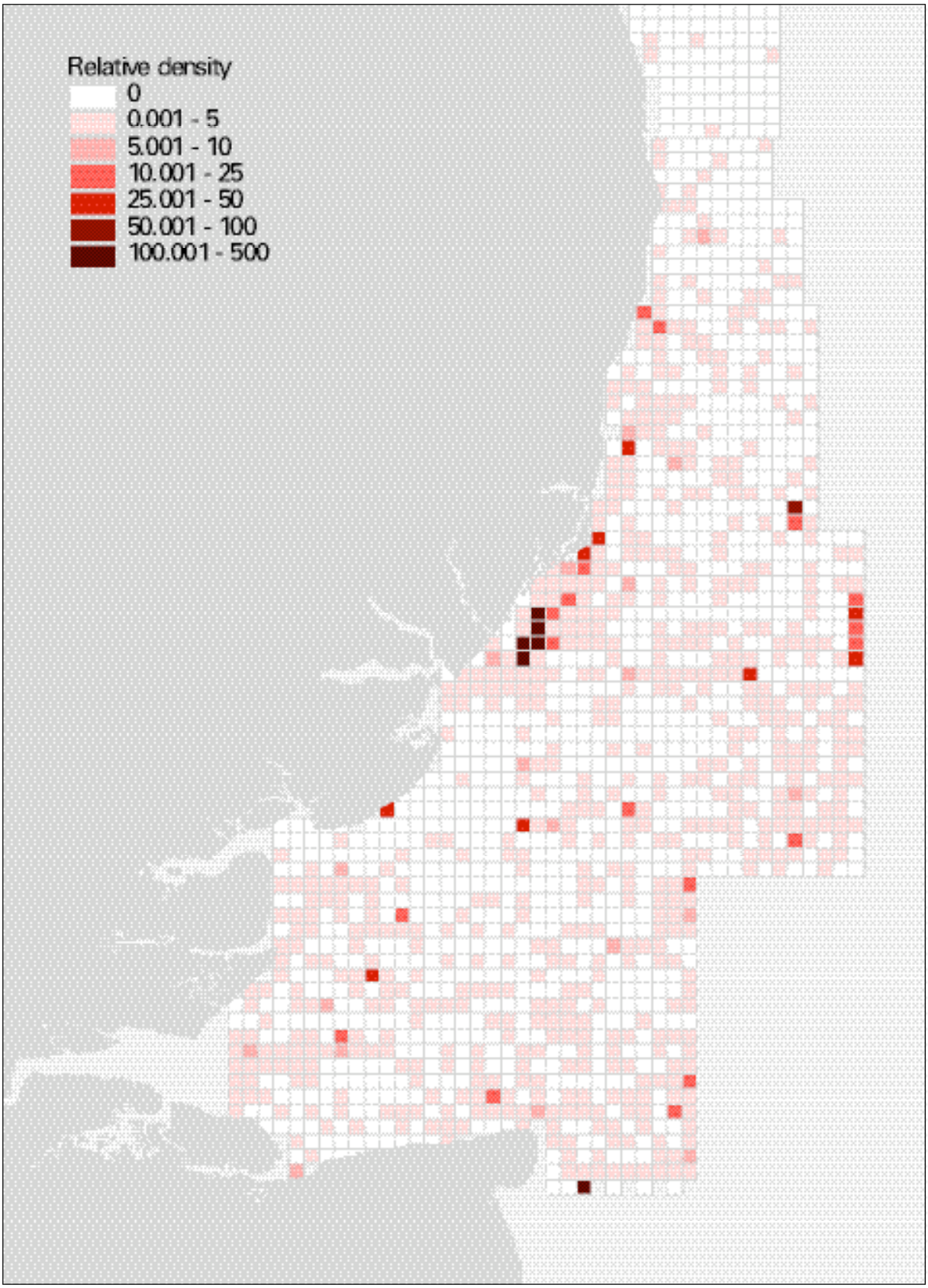


Figure 61 - Relative density of gulls *Larus* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 4. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

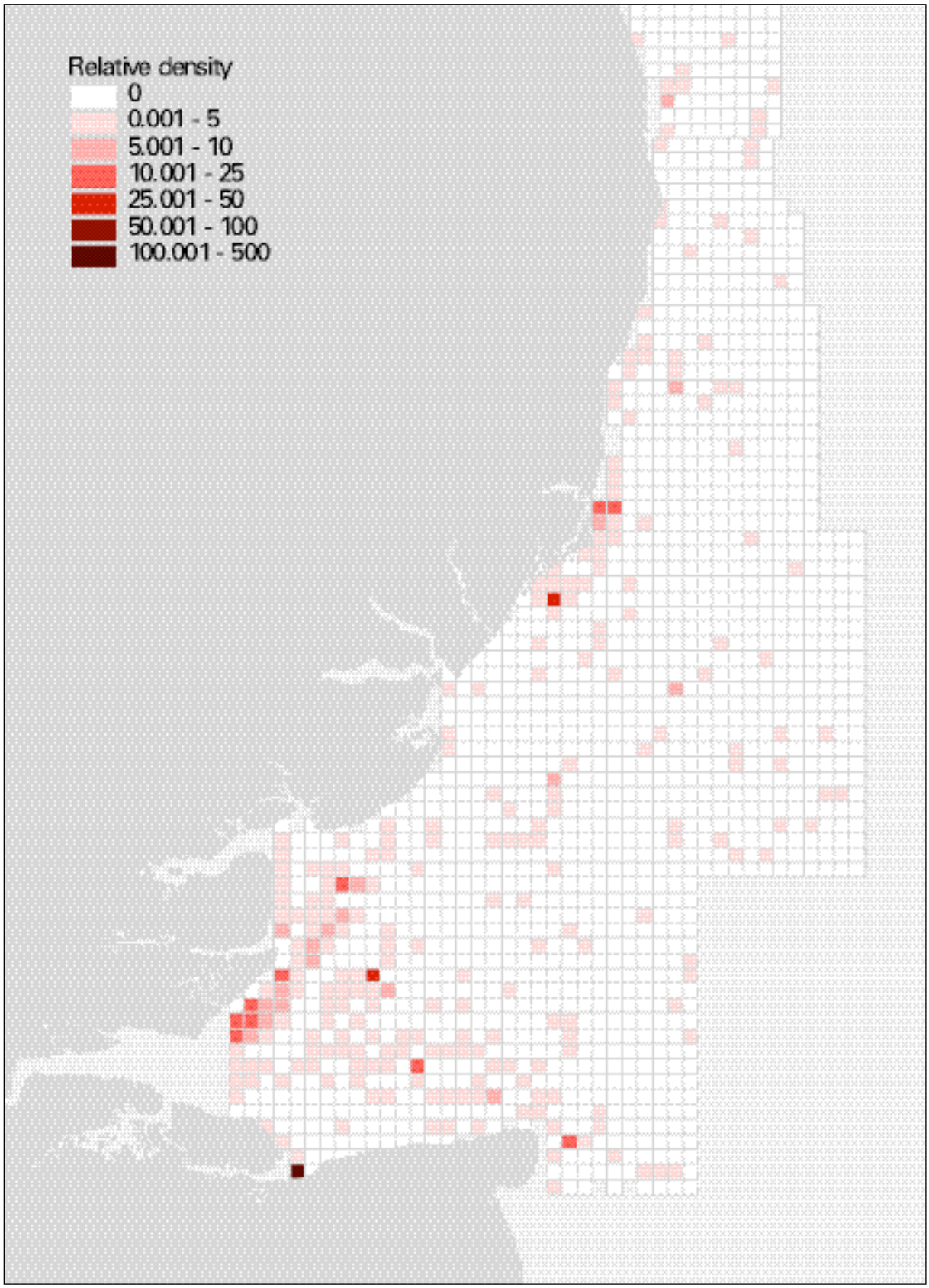


Figure 62 - Relative density of gulls *Larus* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 5. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

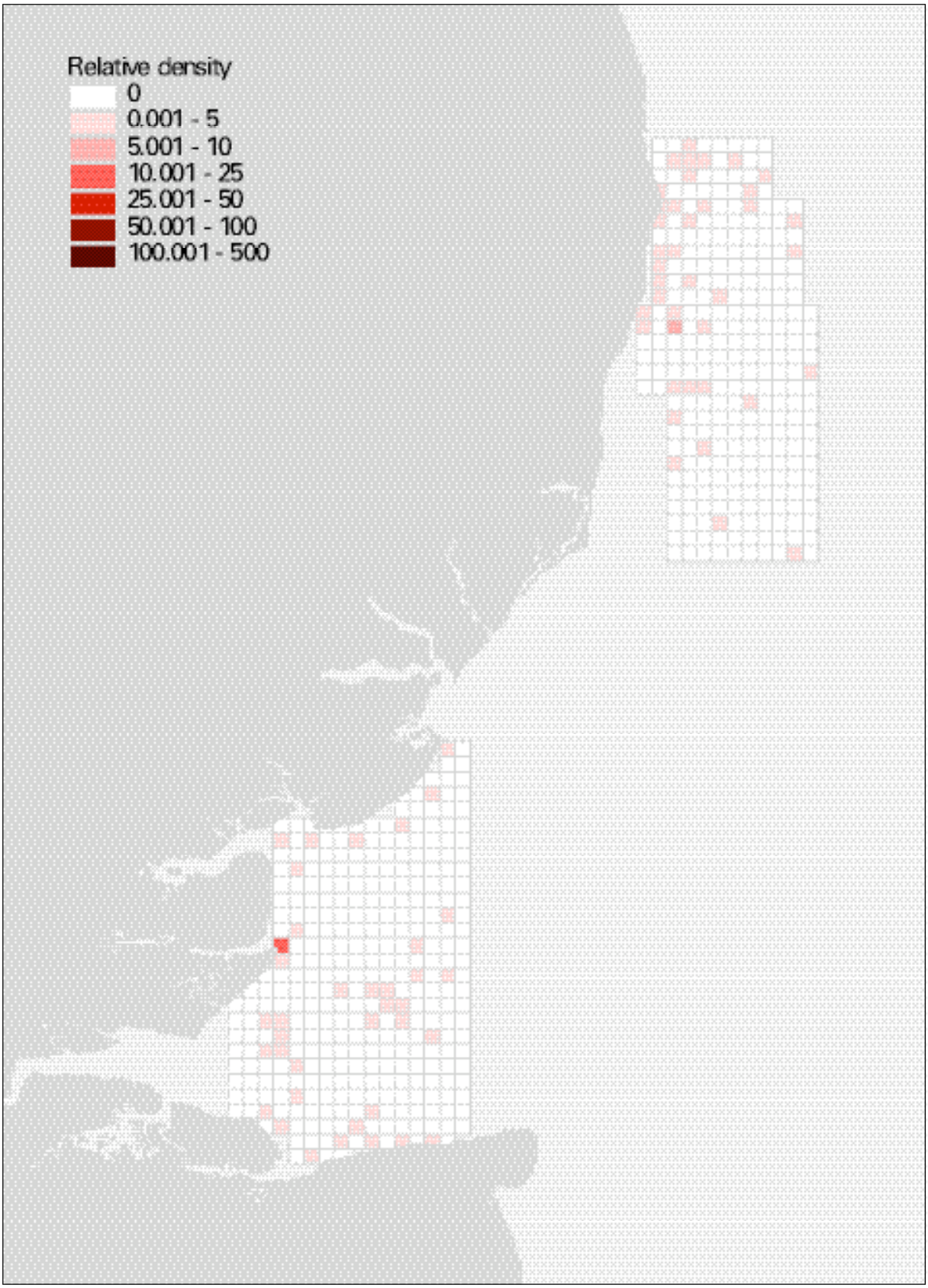


Figure 63 - Relative density of gulls *Larus* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 6. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

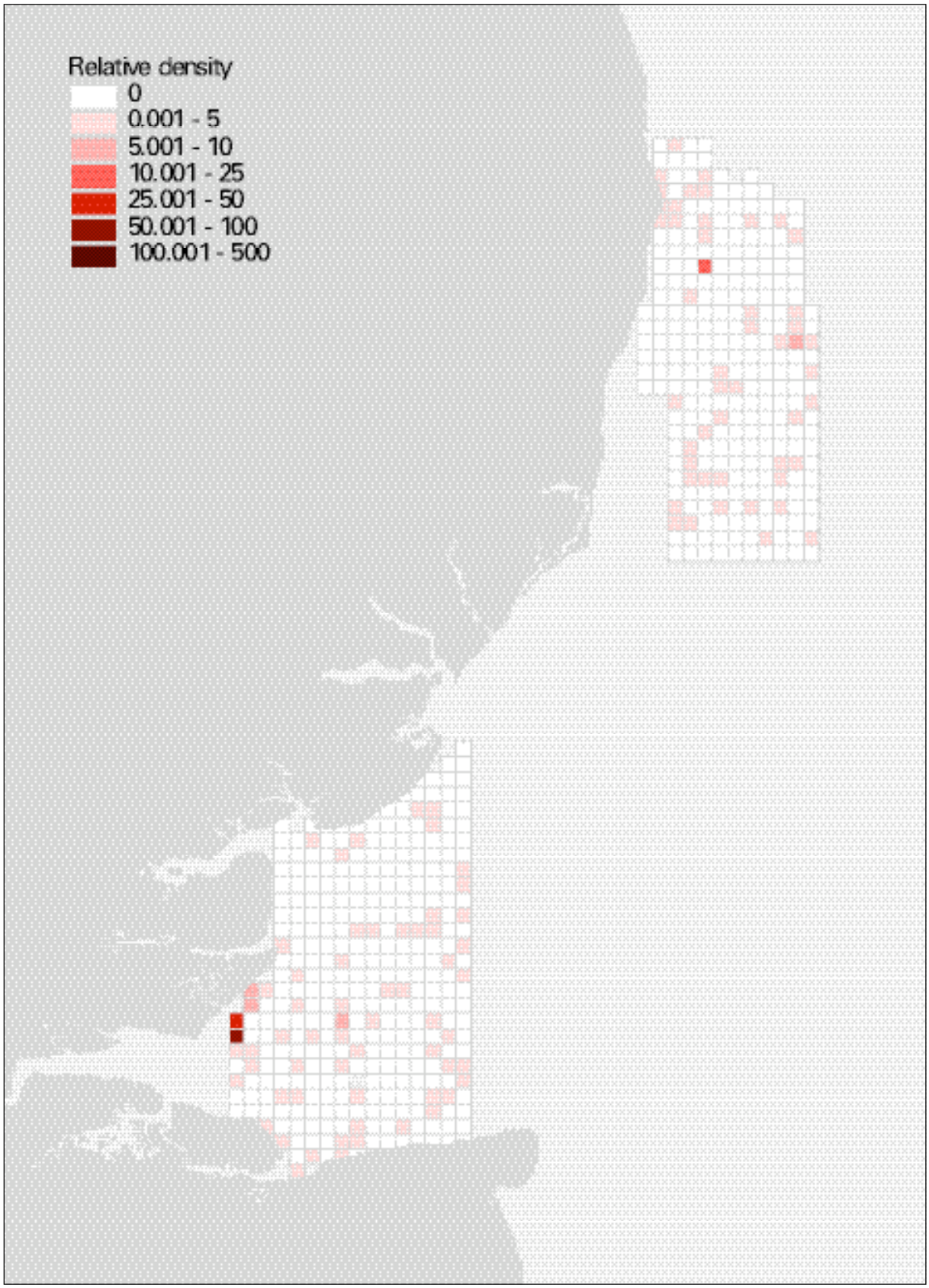


Figure 64 - Relative density of gulls *Larus* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 7. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

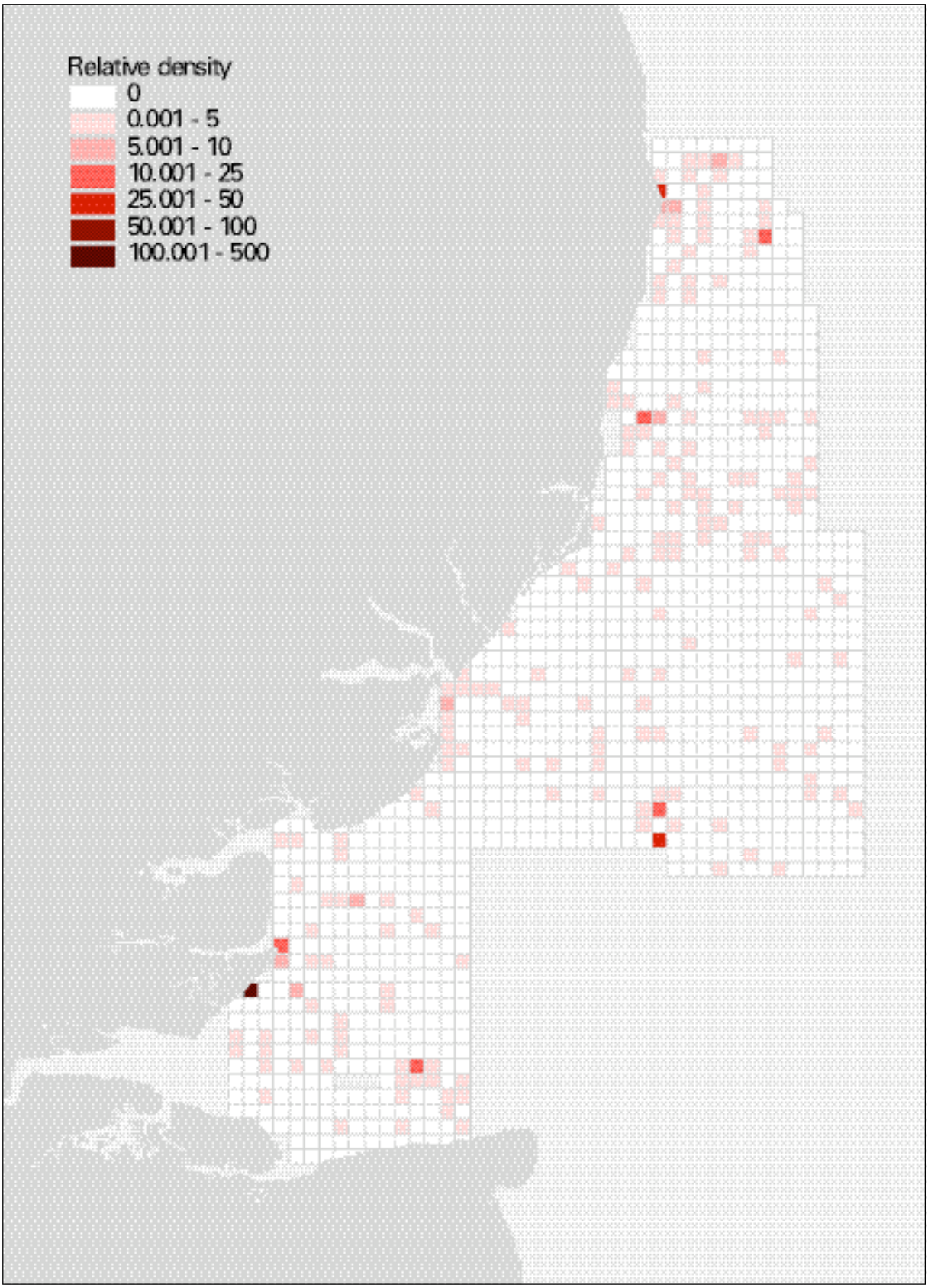


Figure 65 - Relative density of Kittiwakes *Rissa tridactyla* recorded in North West OWF Strategic Area during aerial surveys, winter 2004/05 (Periods 1-4 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

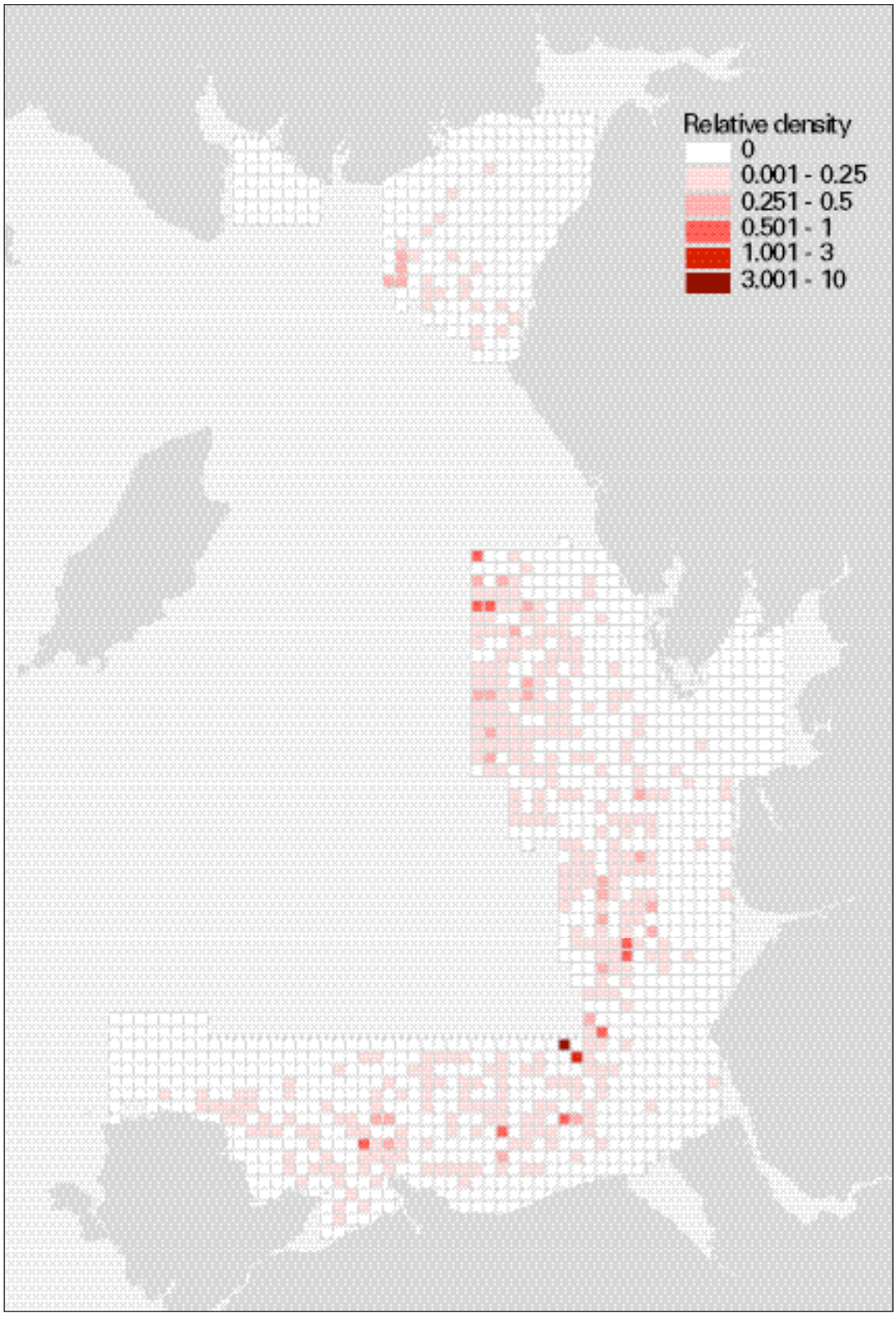


Figure 66 - Relative density of Kittiwakes *Rissa tridactyla* recorded in North West OWF Strategic Area during aerial surveys, summer 2005 (Periods 5-7 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

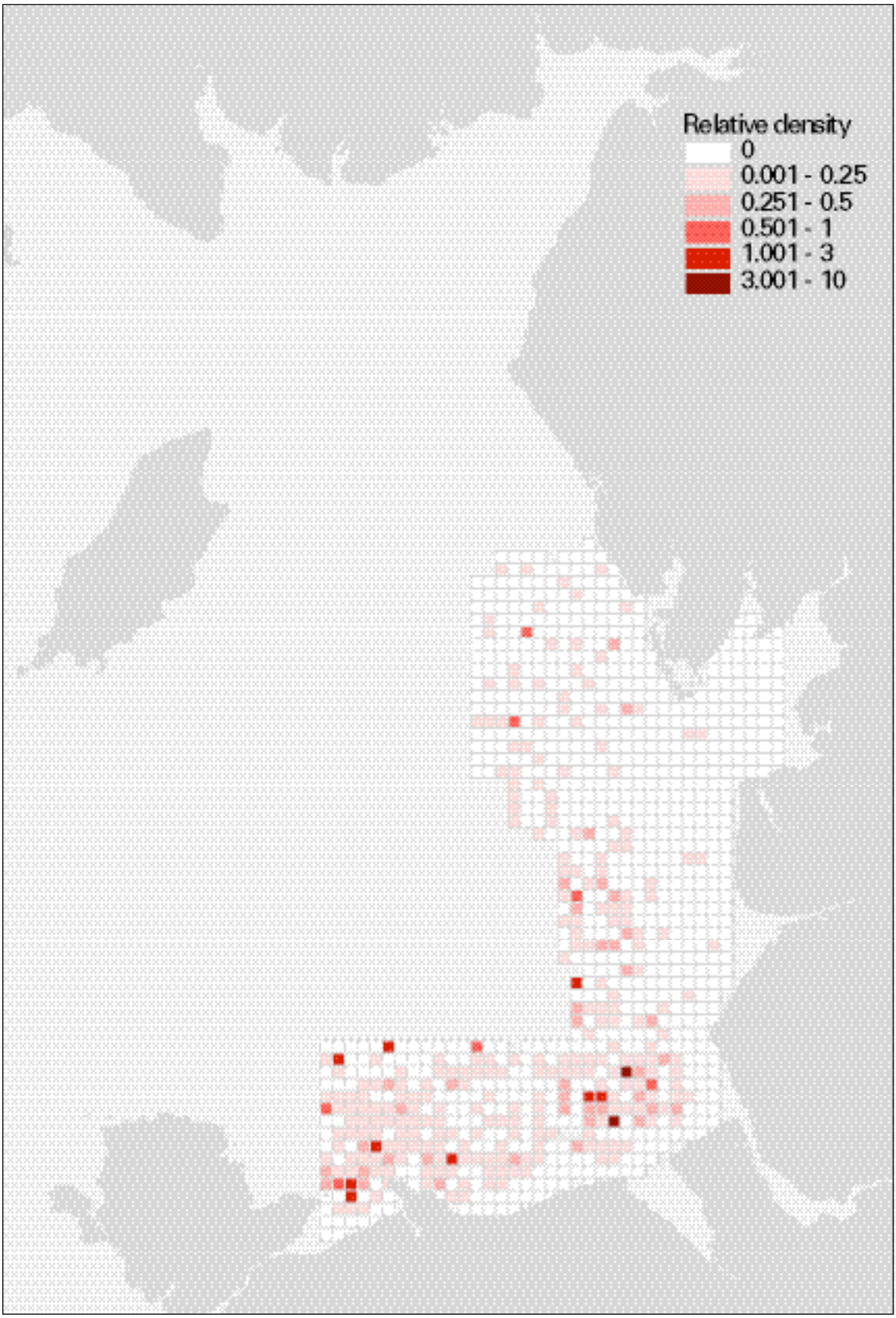


Figure 67 - Relative density of Kittiwakes *Rissa tridactyla* recorded in Greater Wash OWF Strategic Area during aerial surveys, winter 2004/05 (Periods 1-4 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

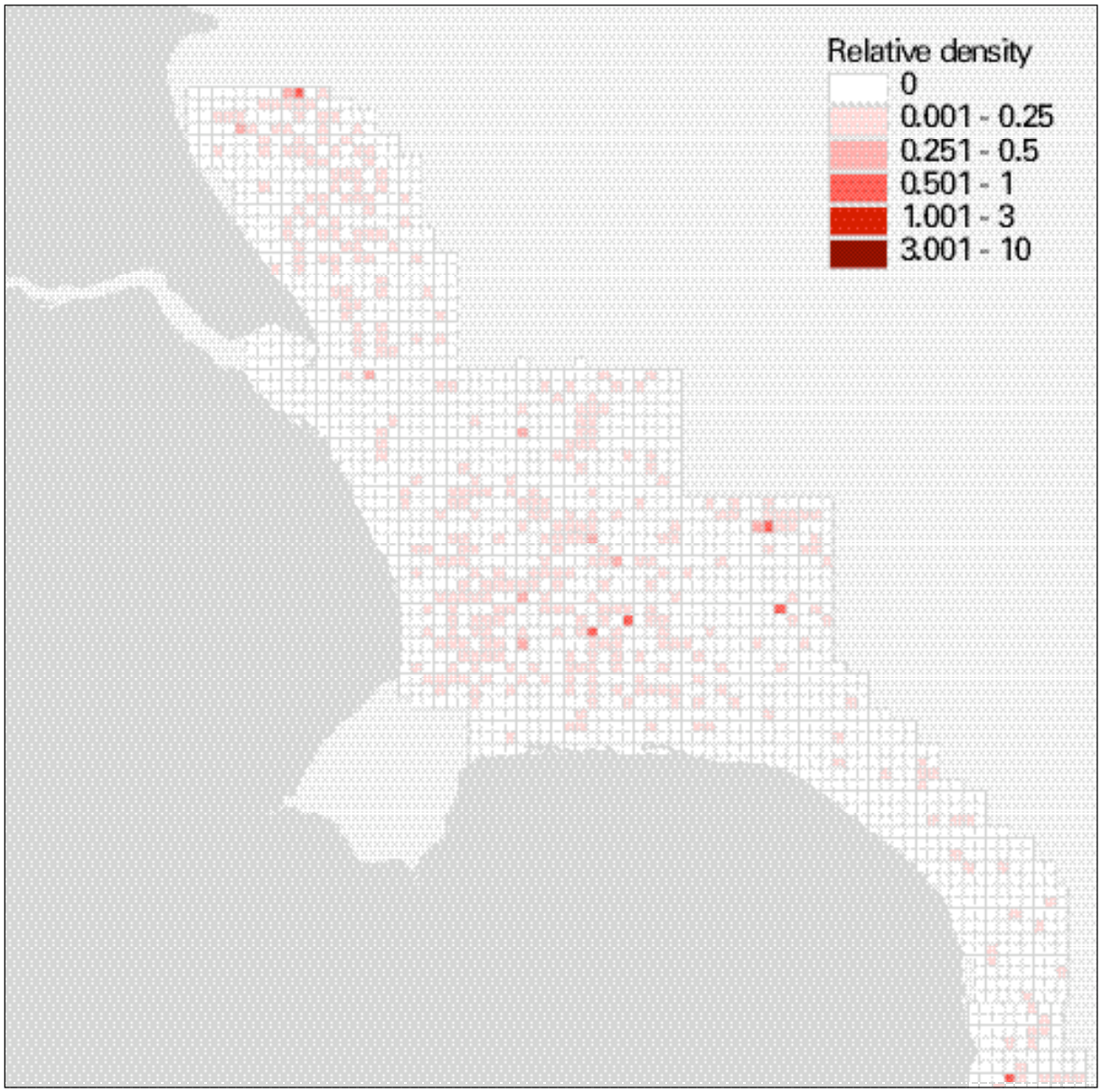


Figure 68 - Relative density of Kittiwakes *Rissa tridactyla* recorded in Greater Wash OWF Strategic Area during aerial surveys, summer 2005 (Periods 5-7 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

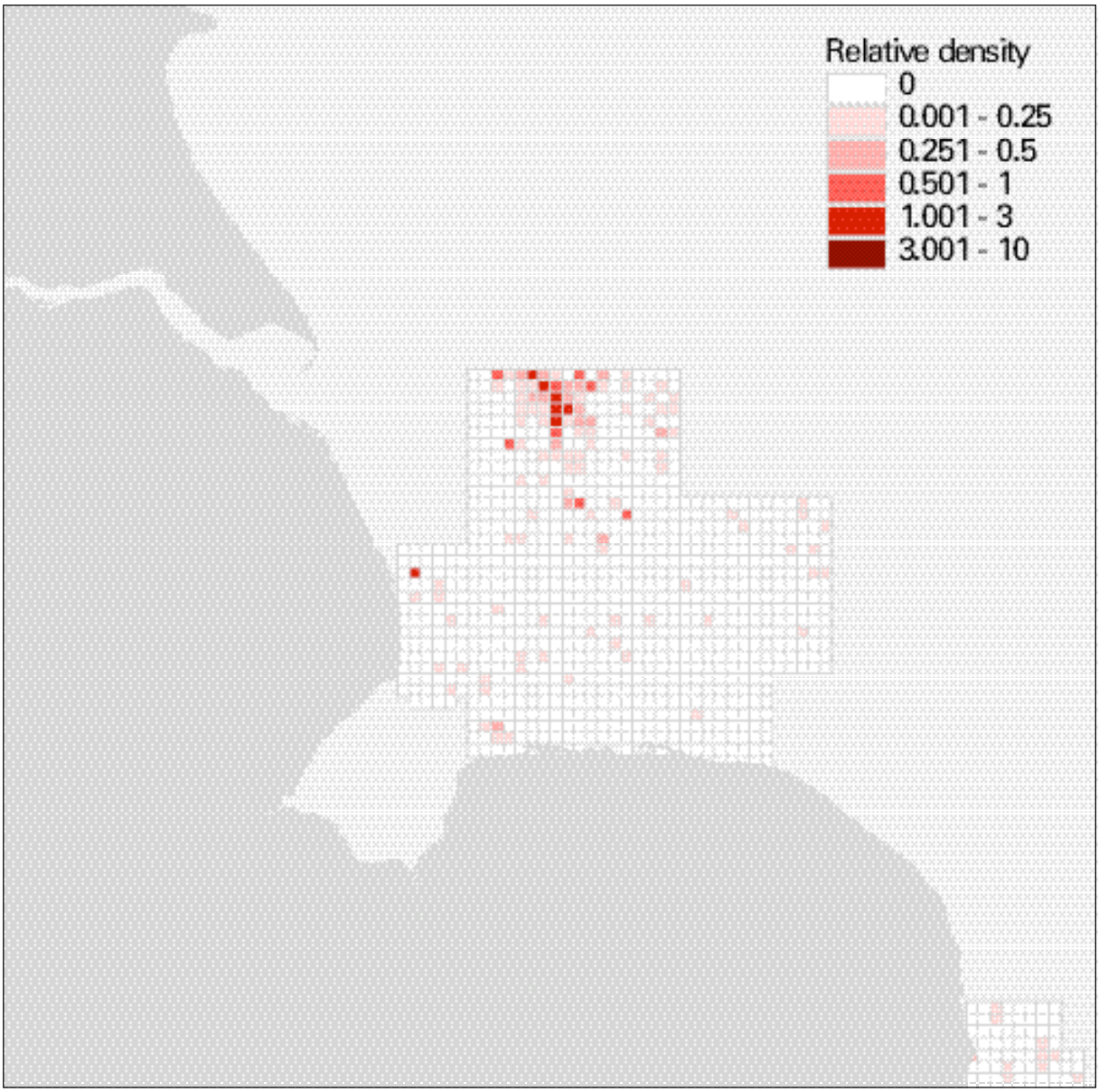


Figure 69 - Relative density of Kittiwakes *Rissa tridactyla* recorded in Thames OWF Strategic Area during aerial surveys, winter 2004/05 (Periods 1-4 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

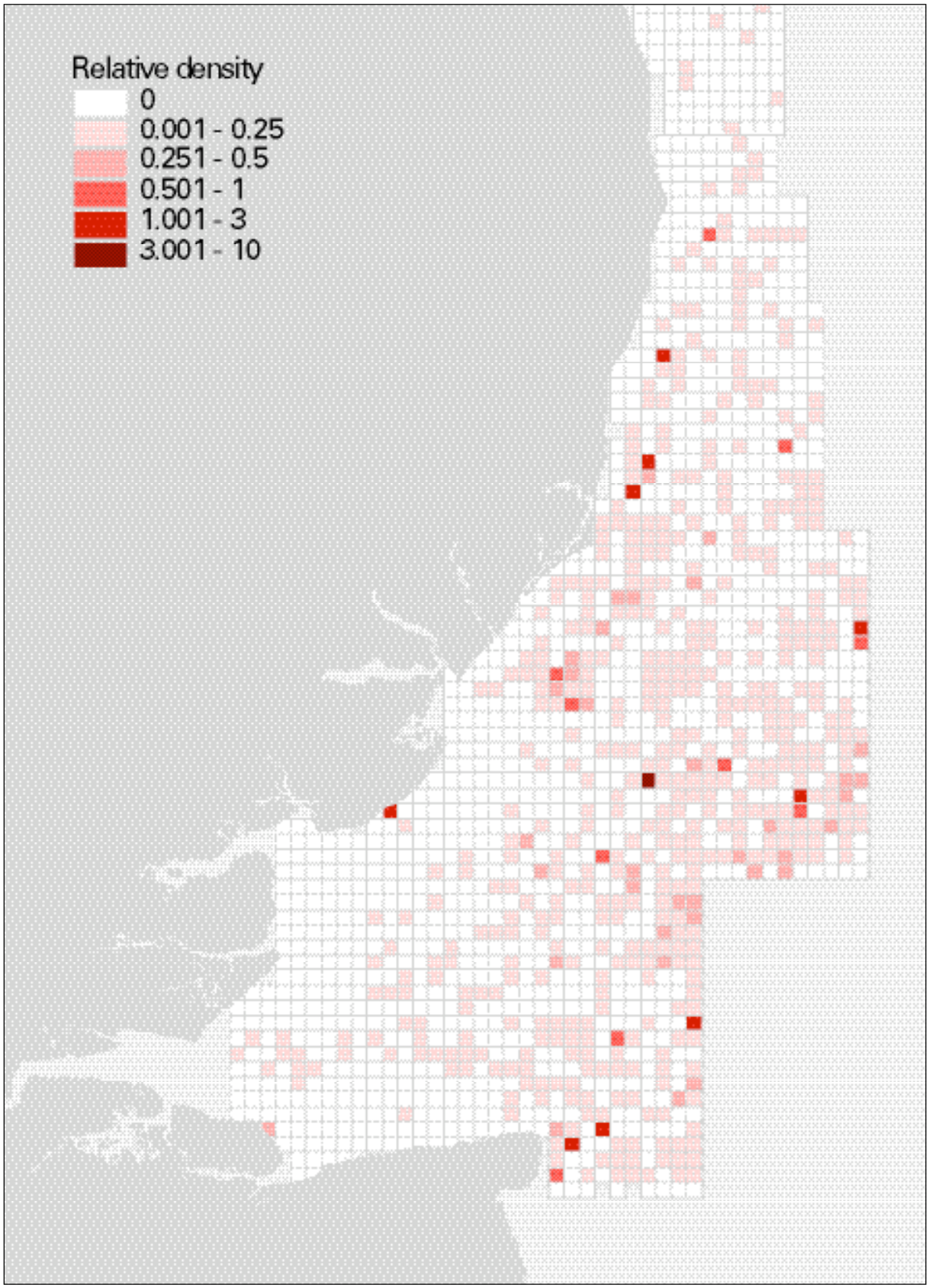


Figure 70 - Relative density of Kittiwakes *Rissa tridactyla* recorded in Thames OWF Strategic Area during aerial surveys, summer 2005 (Periods 5-7 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

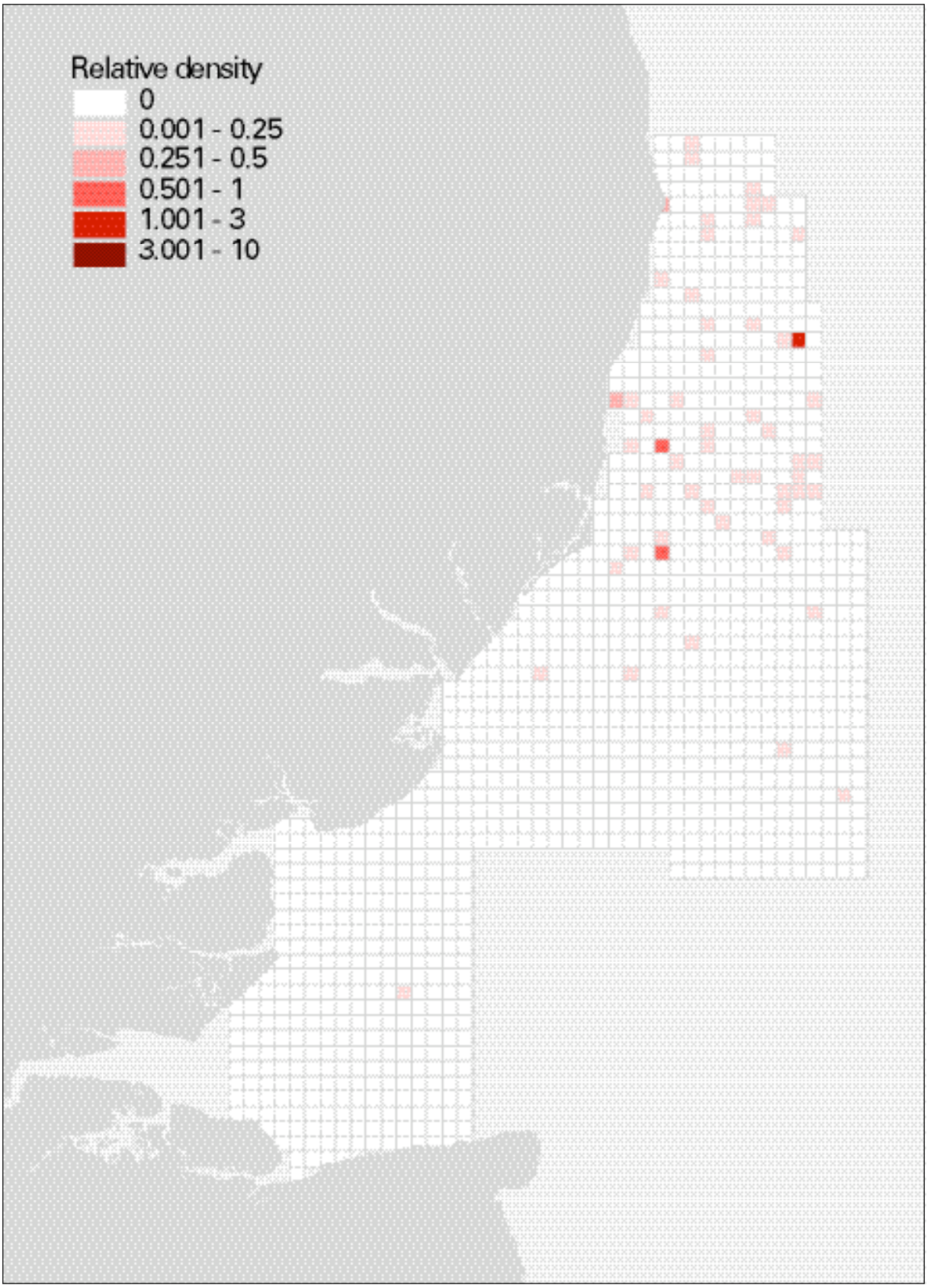


Figure 71 - Relative density of terns *Sterna* spp. recorded in North West OWF Strategic Area during aerial surveys, summer 2005 (Periods 5-7 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

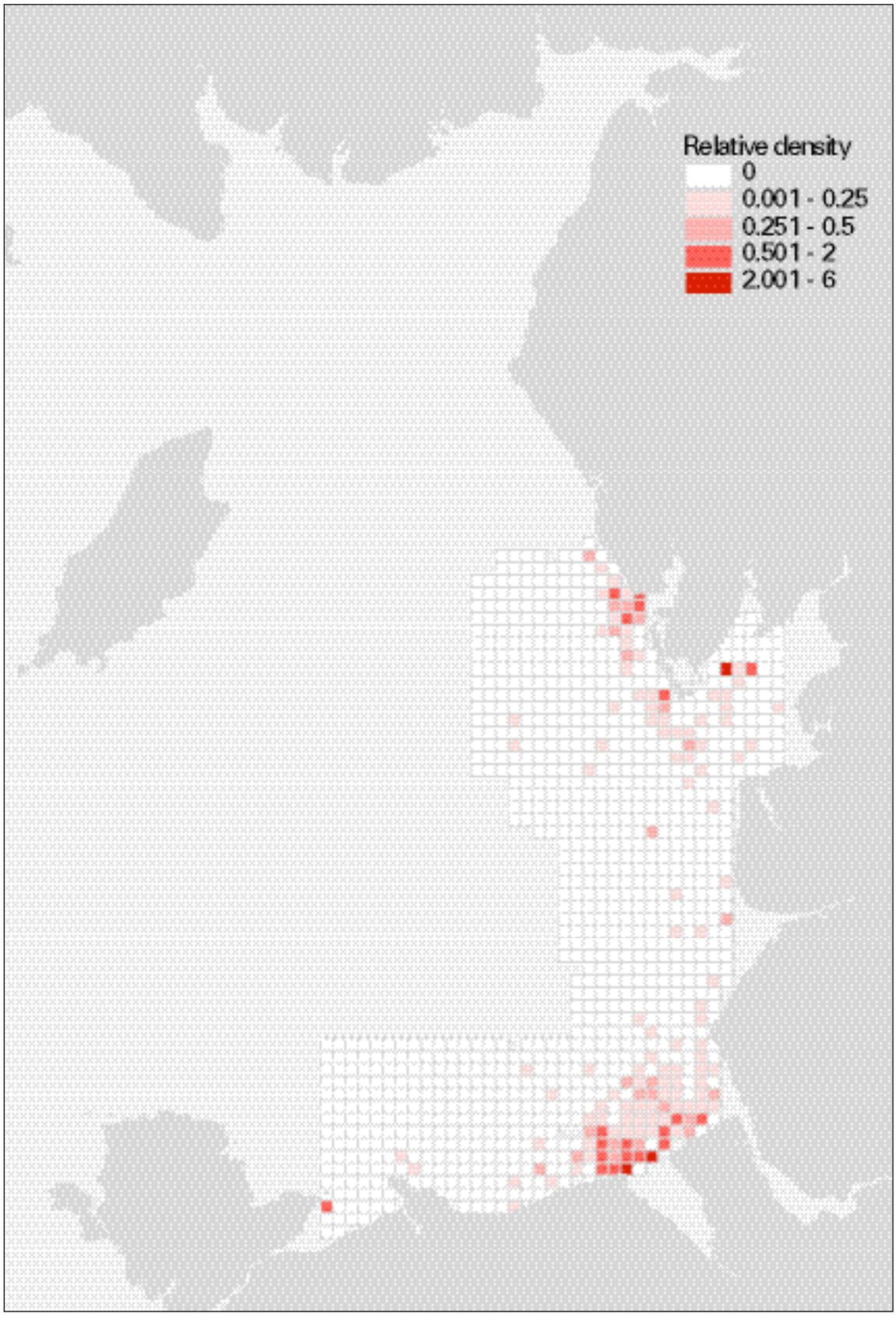


Figure 72 - Relative density of terns *Sterna* spp recorded in Greater Wash OWF Strategic Area during aerial surveys, summer 2005 (Periods 5-7 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

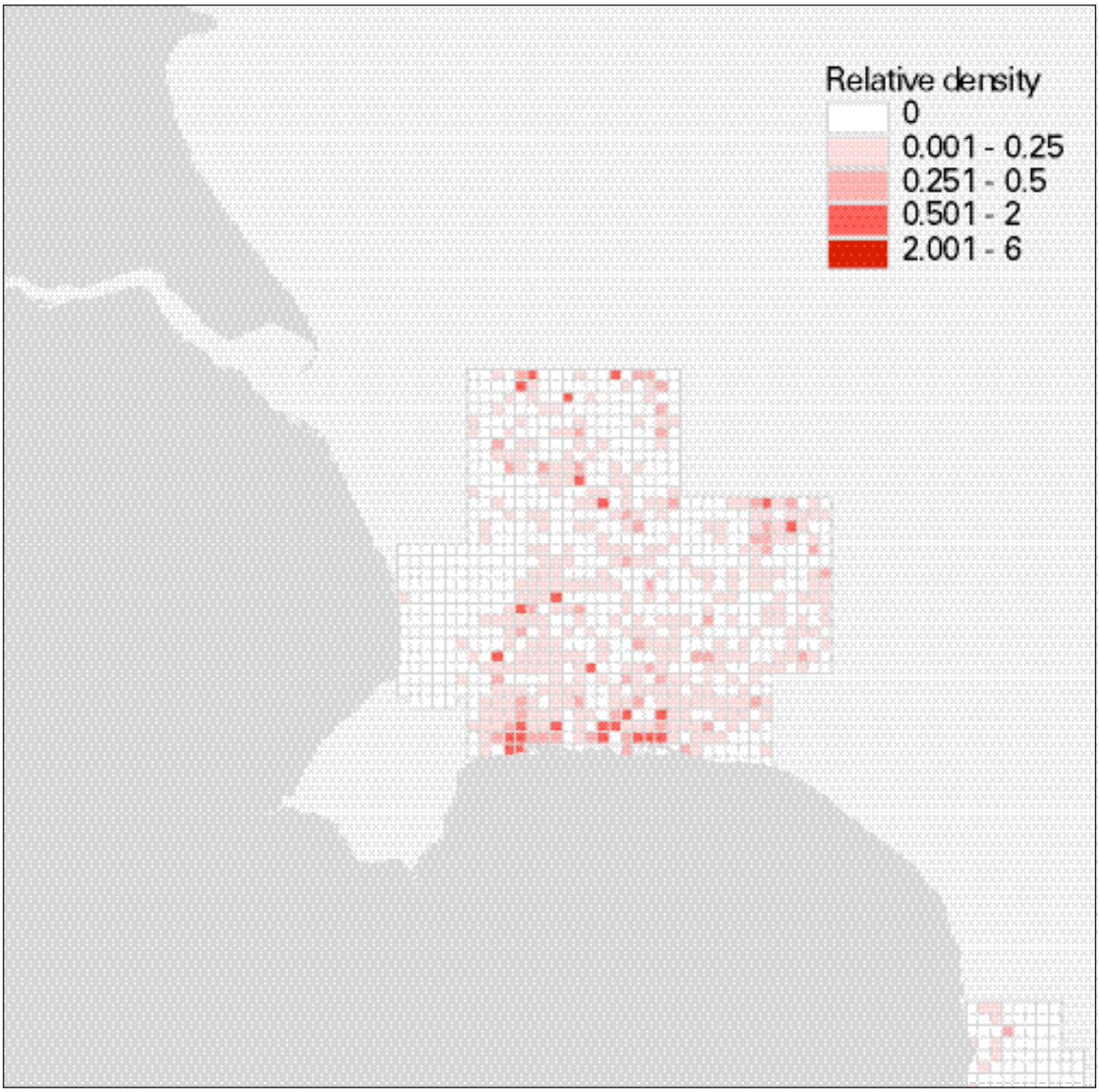


Figure 73 - Relative density of terns *Sterna* spp recorded in Thames OWF Strategic Area during aerial surveys, summer 2005 (Periods 5-7 inclusive). Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

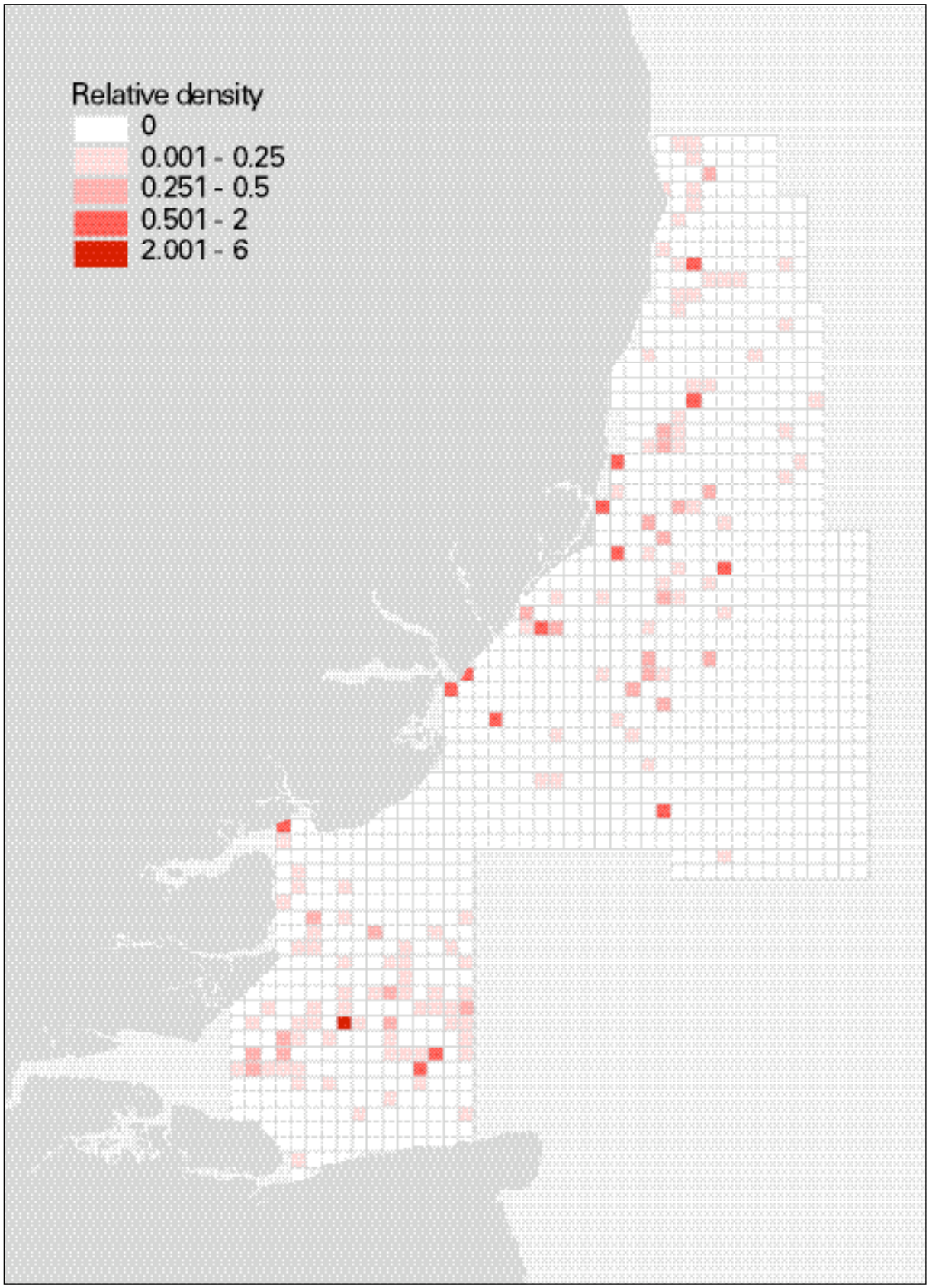


Figure 74 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

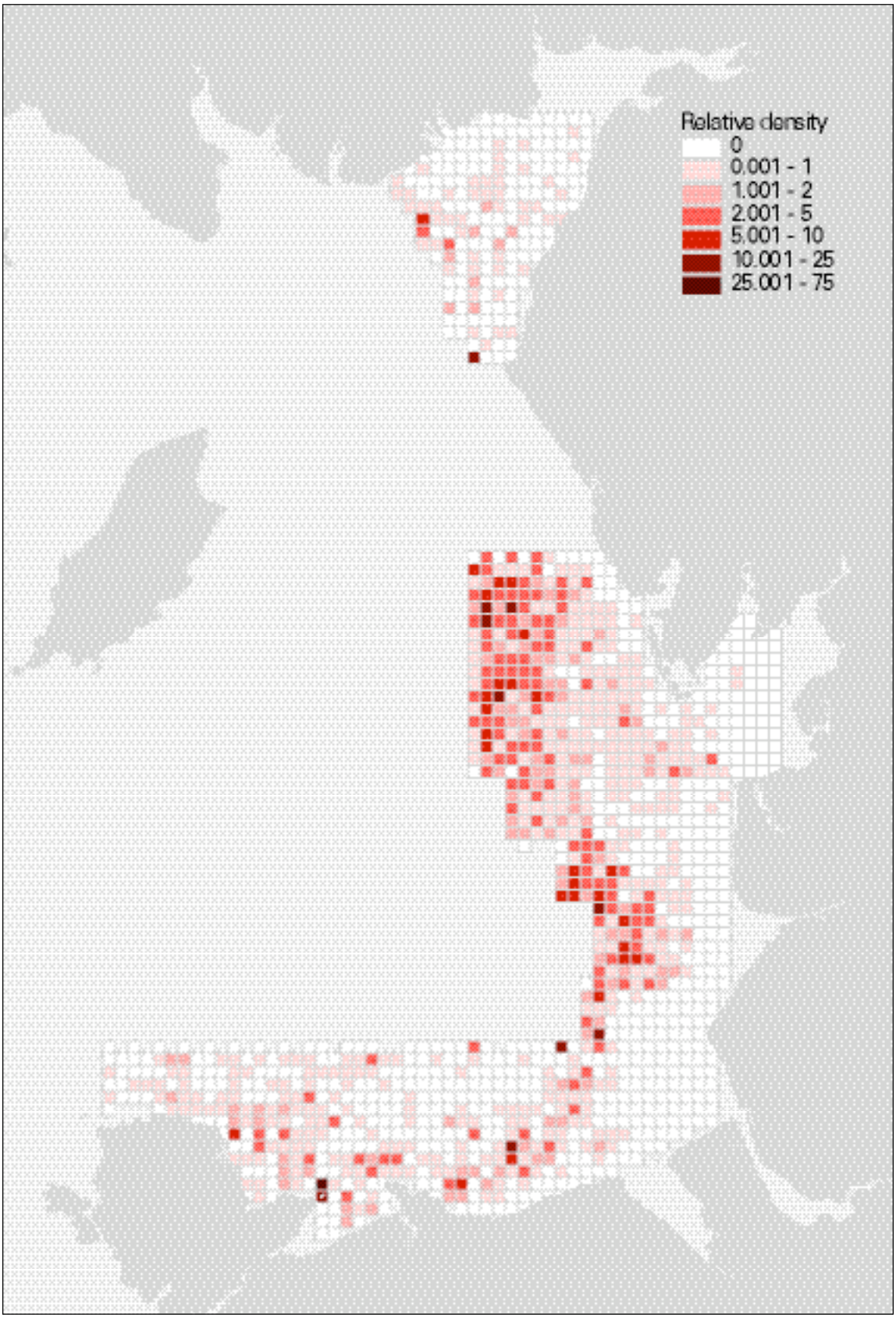


Figure 75 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

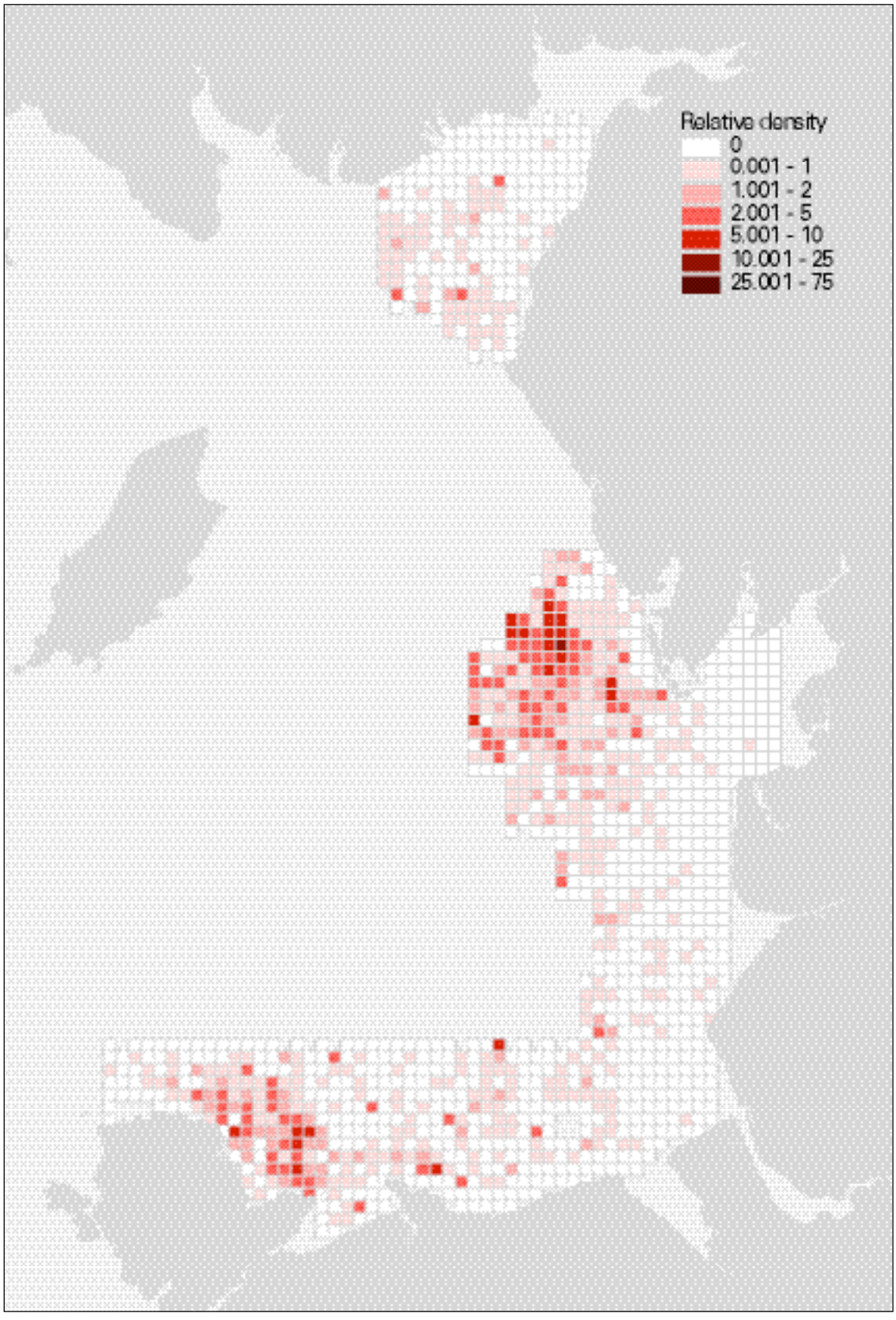


Figure 76 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

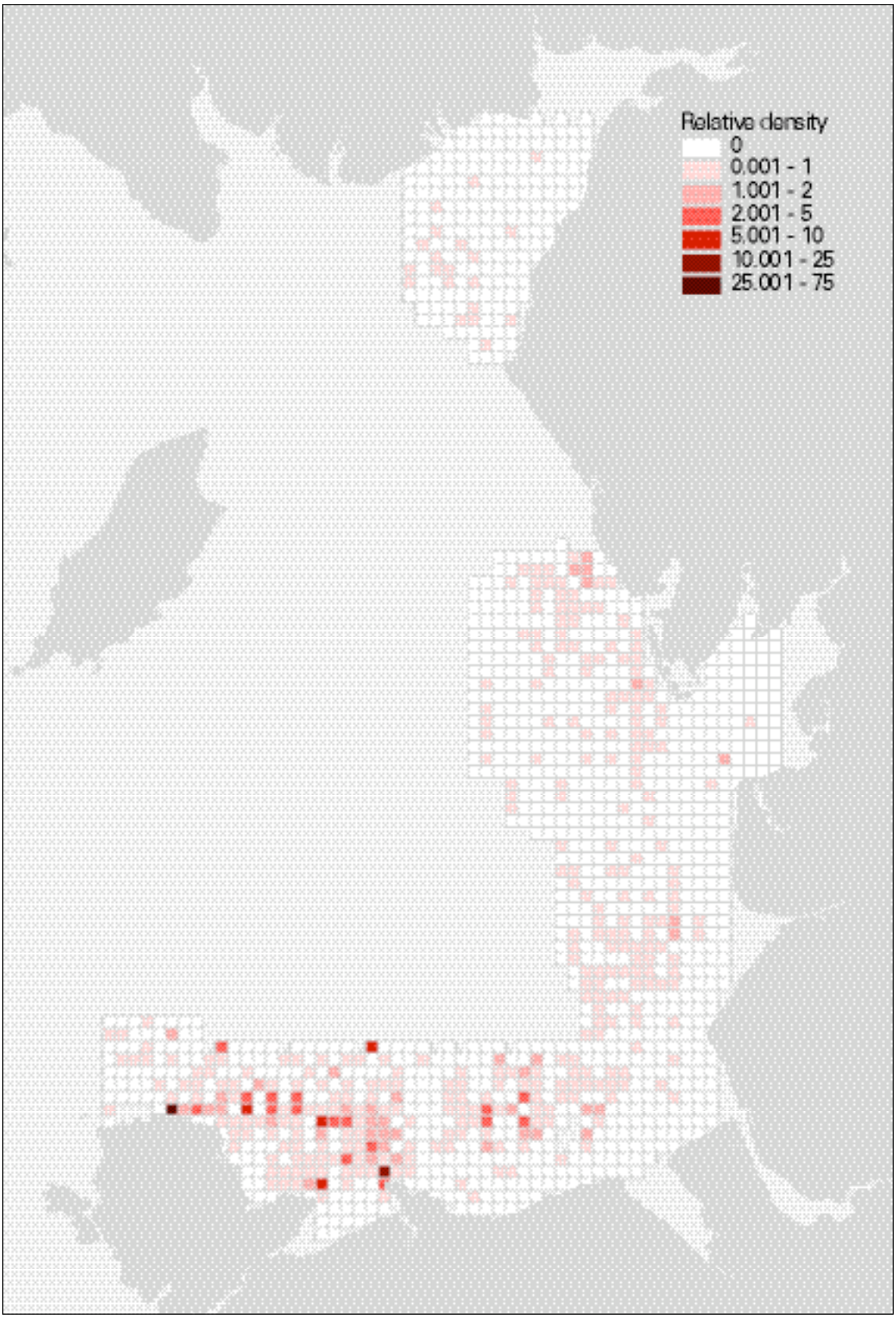


Figure 77 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 4. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

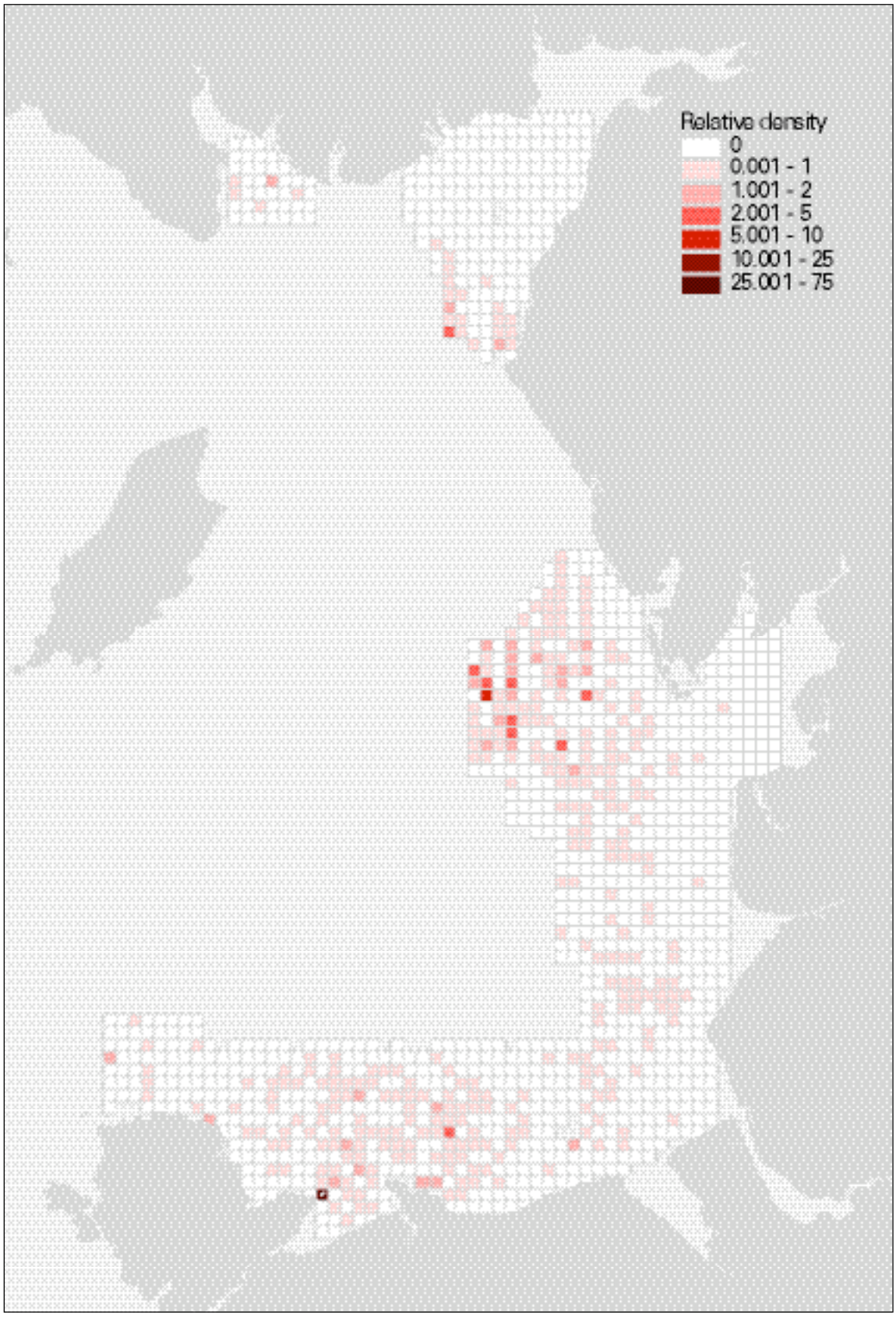


Figure 78 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 5. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

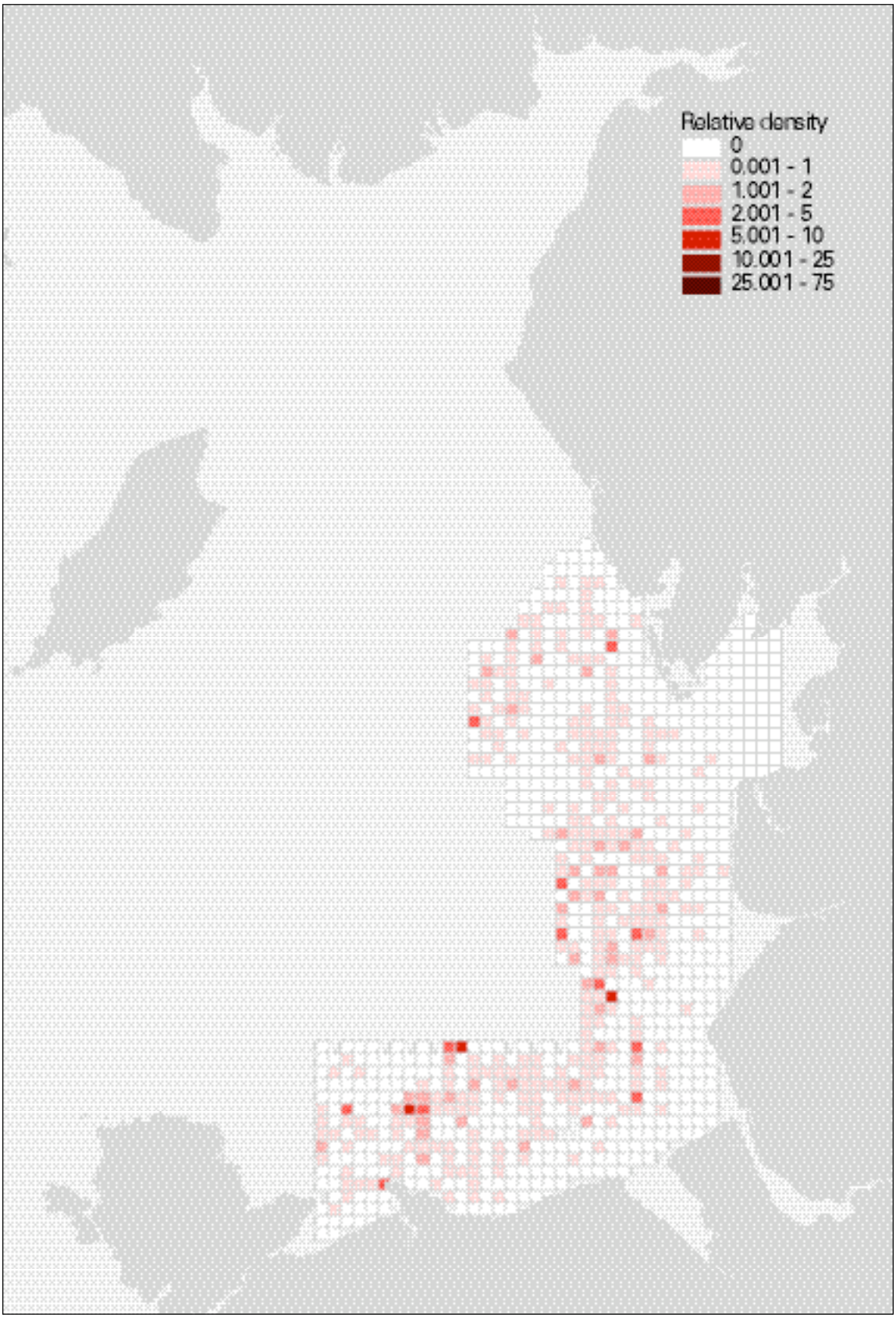


Figure 79 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 6. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

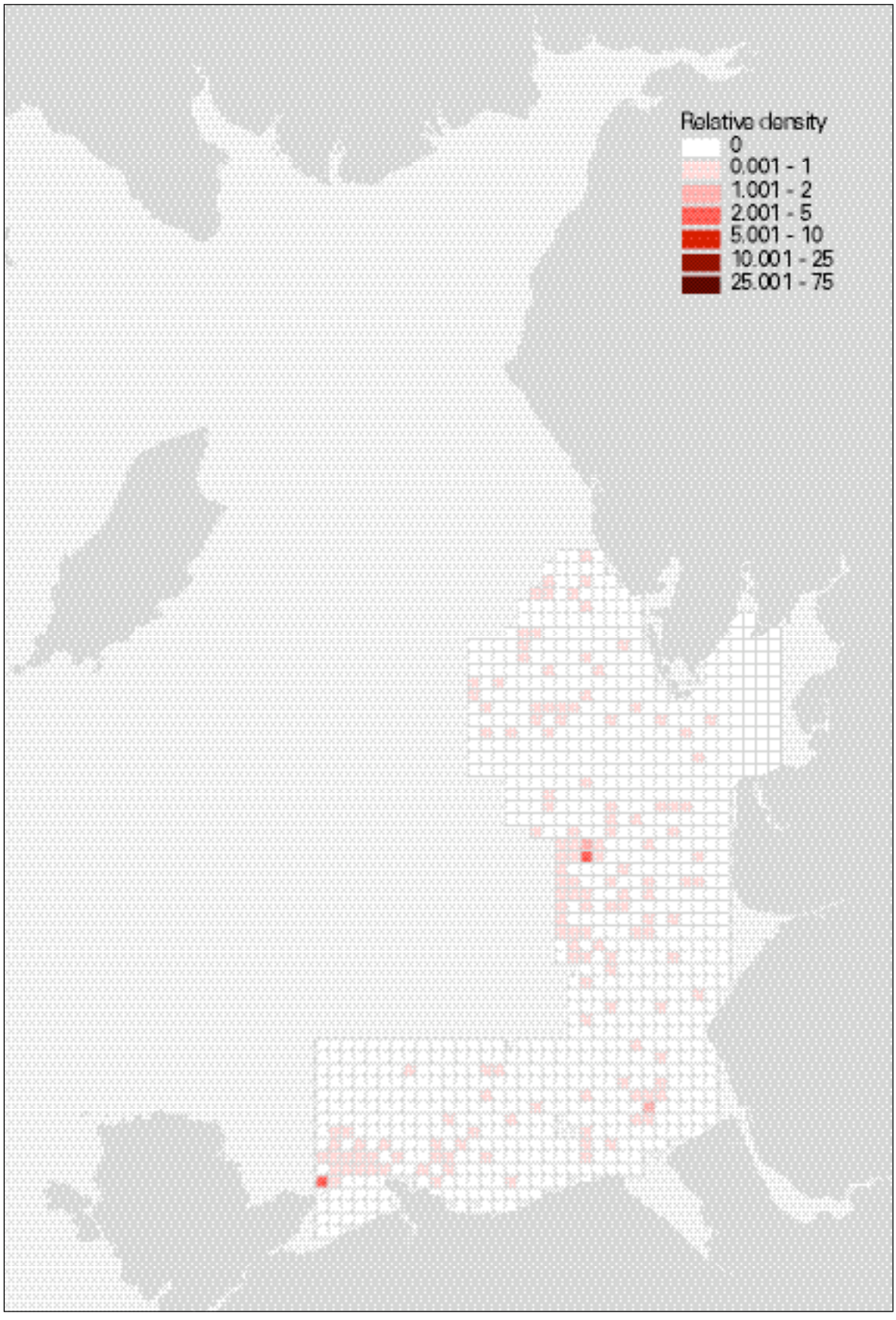


Figure 80 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in North West OWF Strategic Area during aerial surveys, Period 7. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

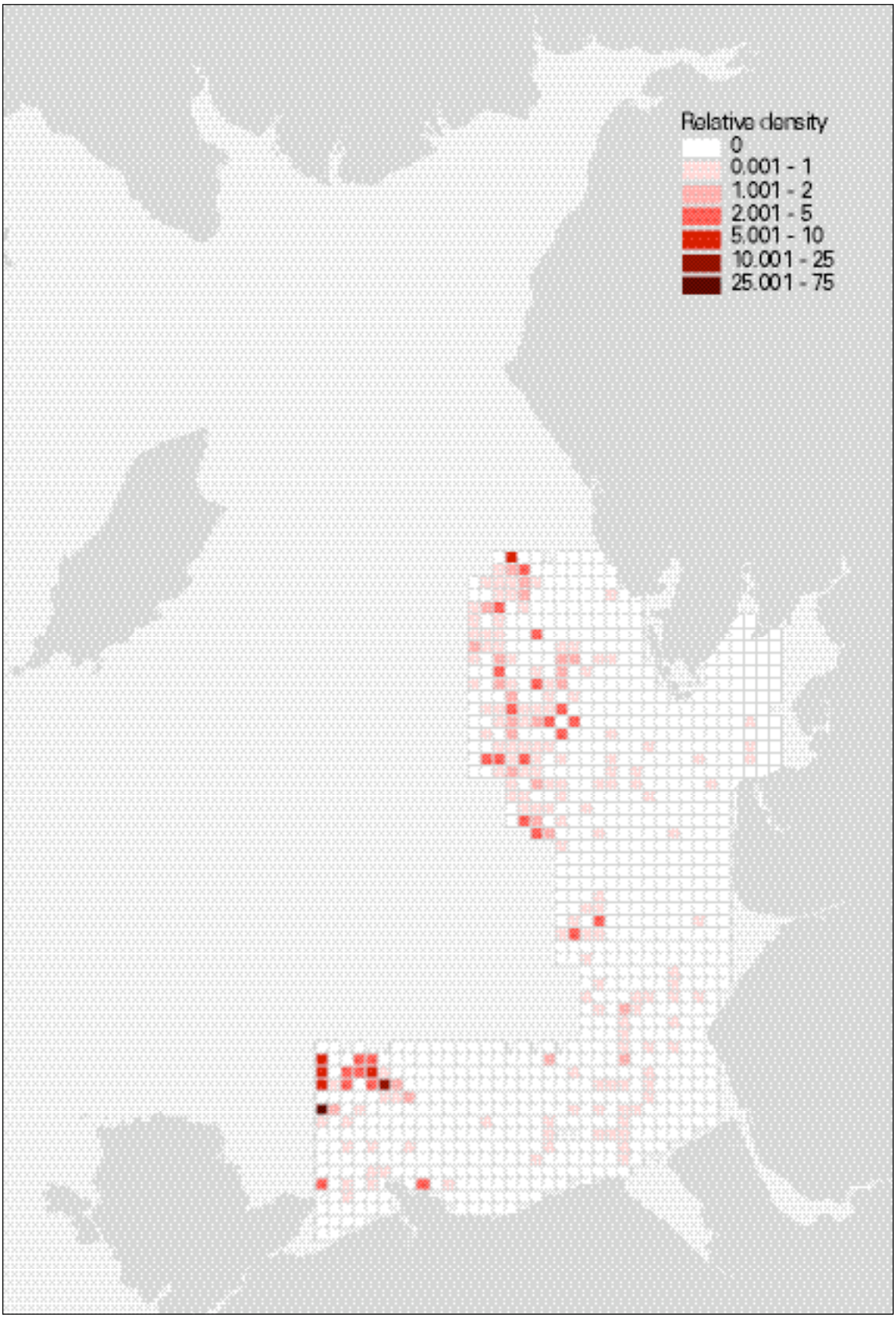


Figure 81 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

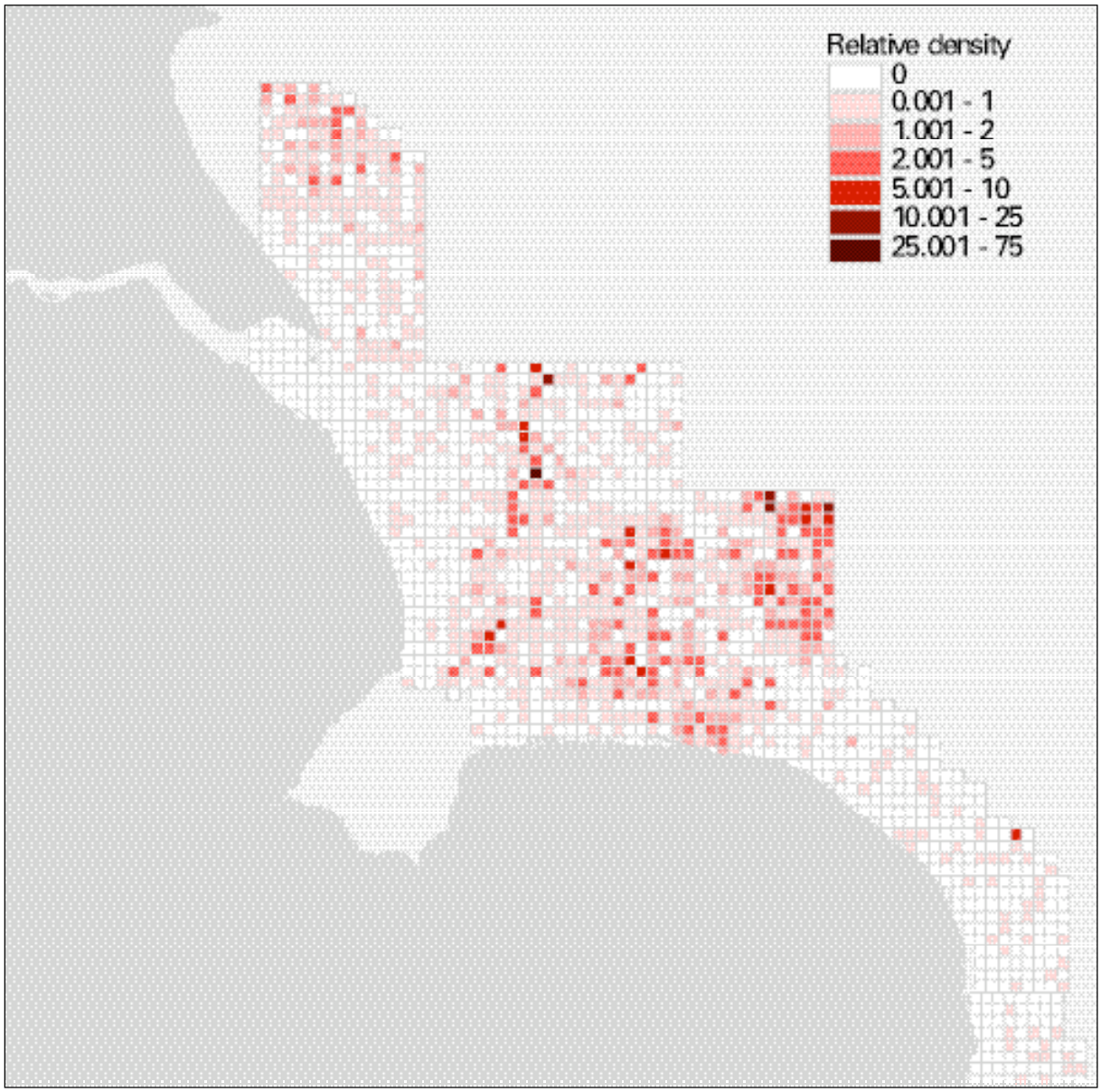


Figure 82 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

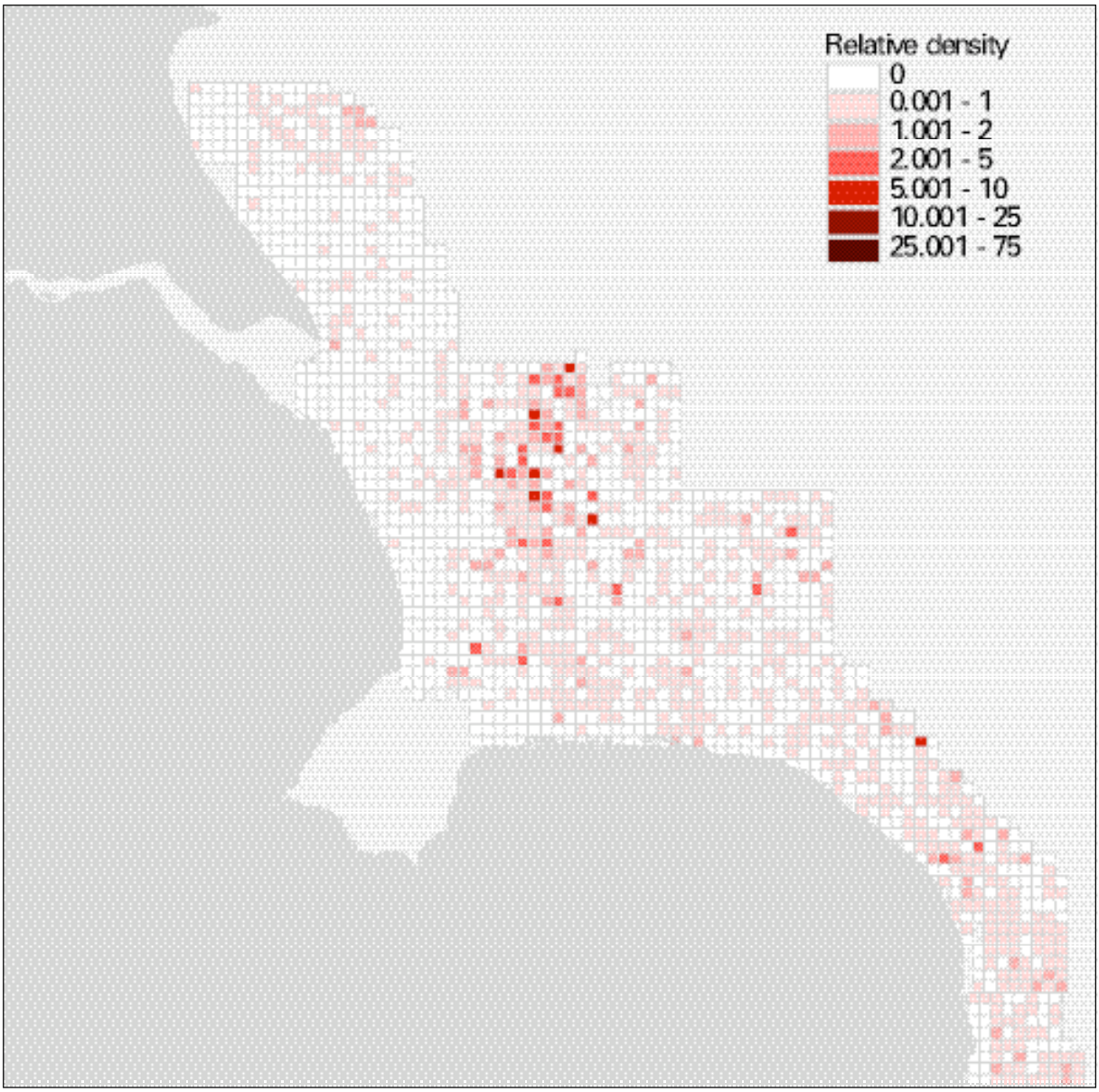


Figure 83 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

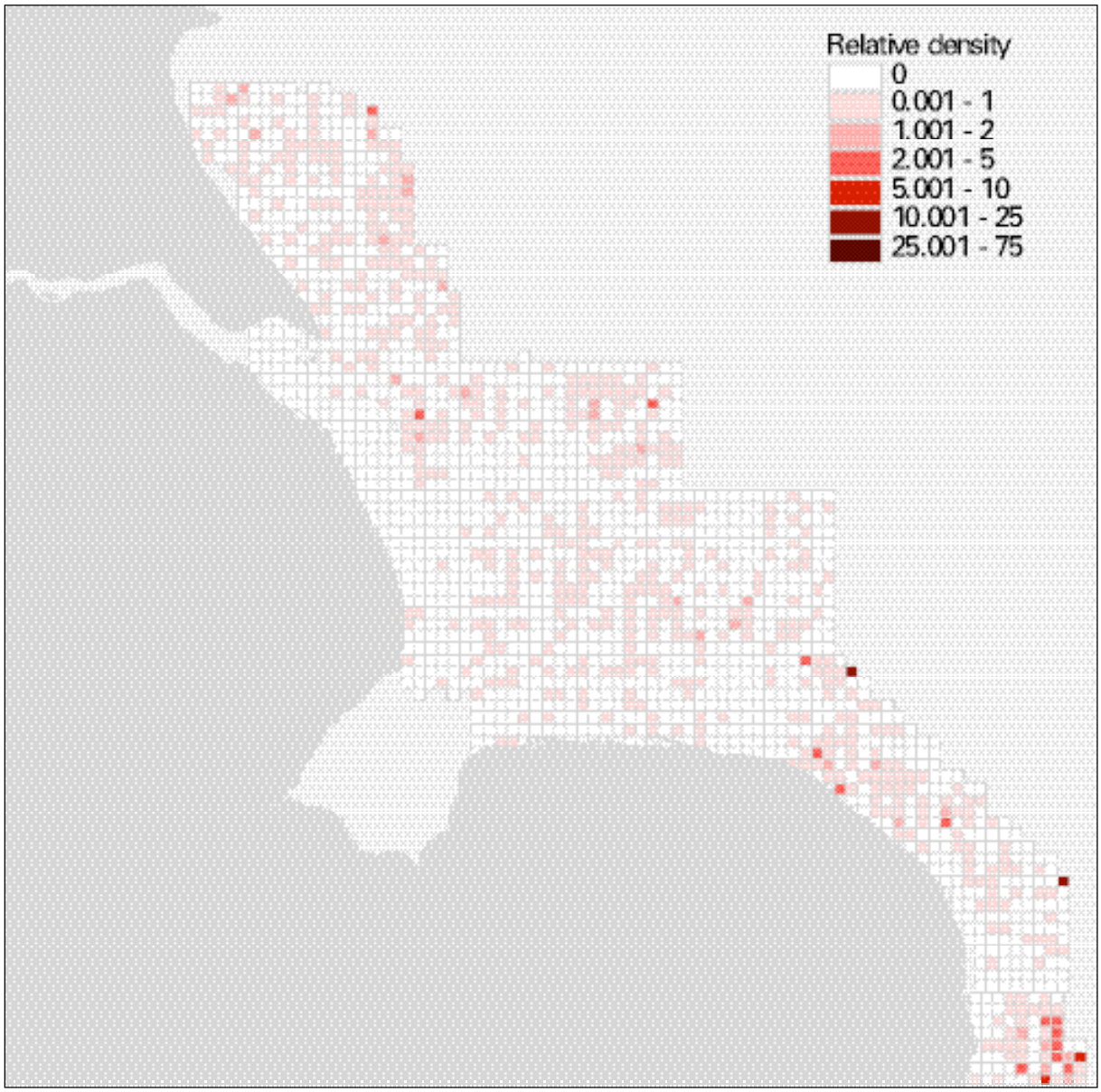


Figure 84 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 4. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

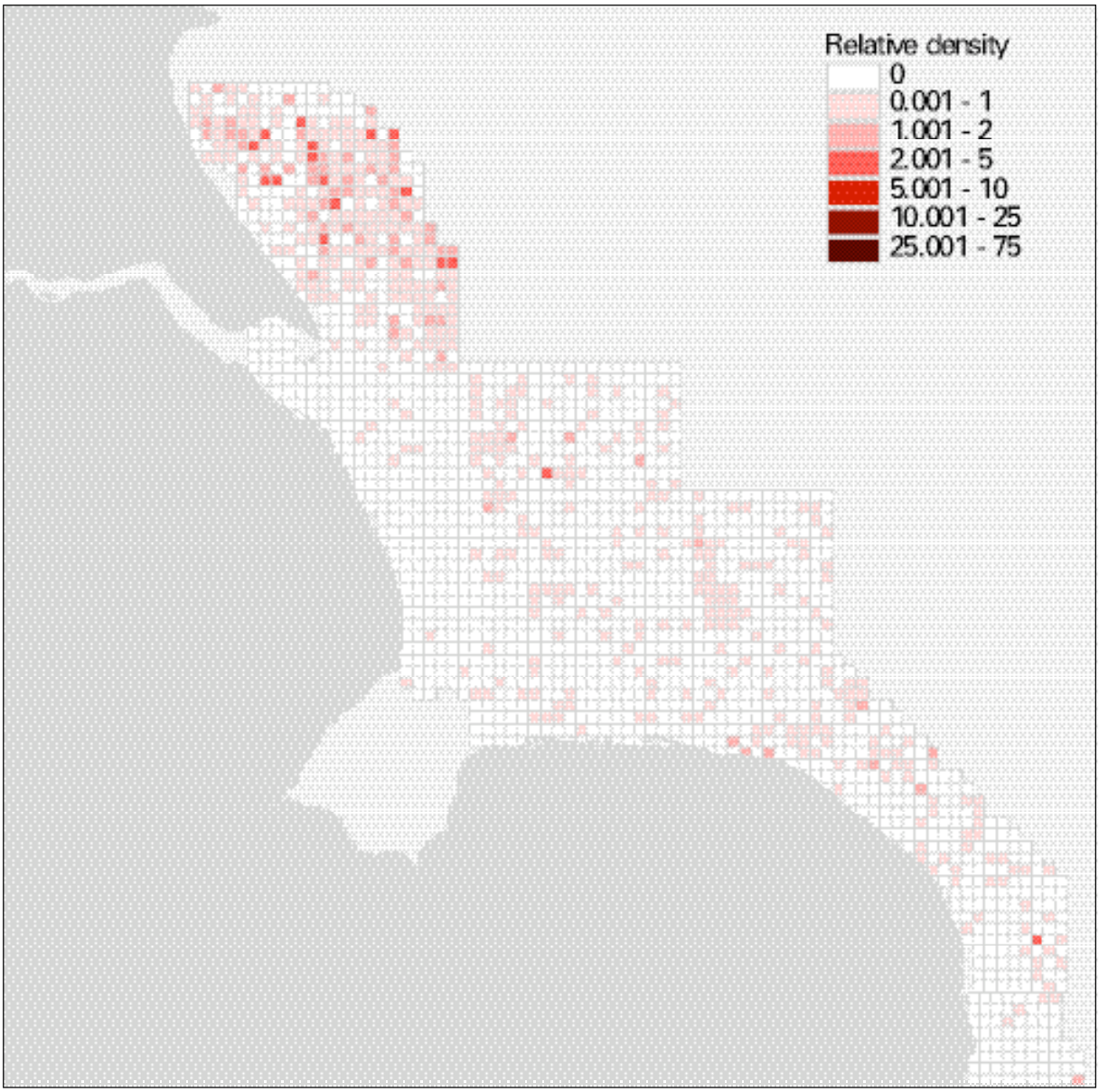


Figure 85 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 5. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

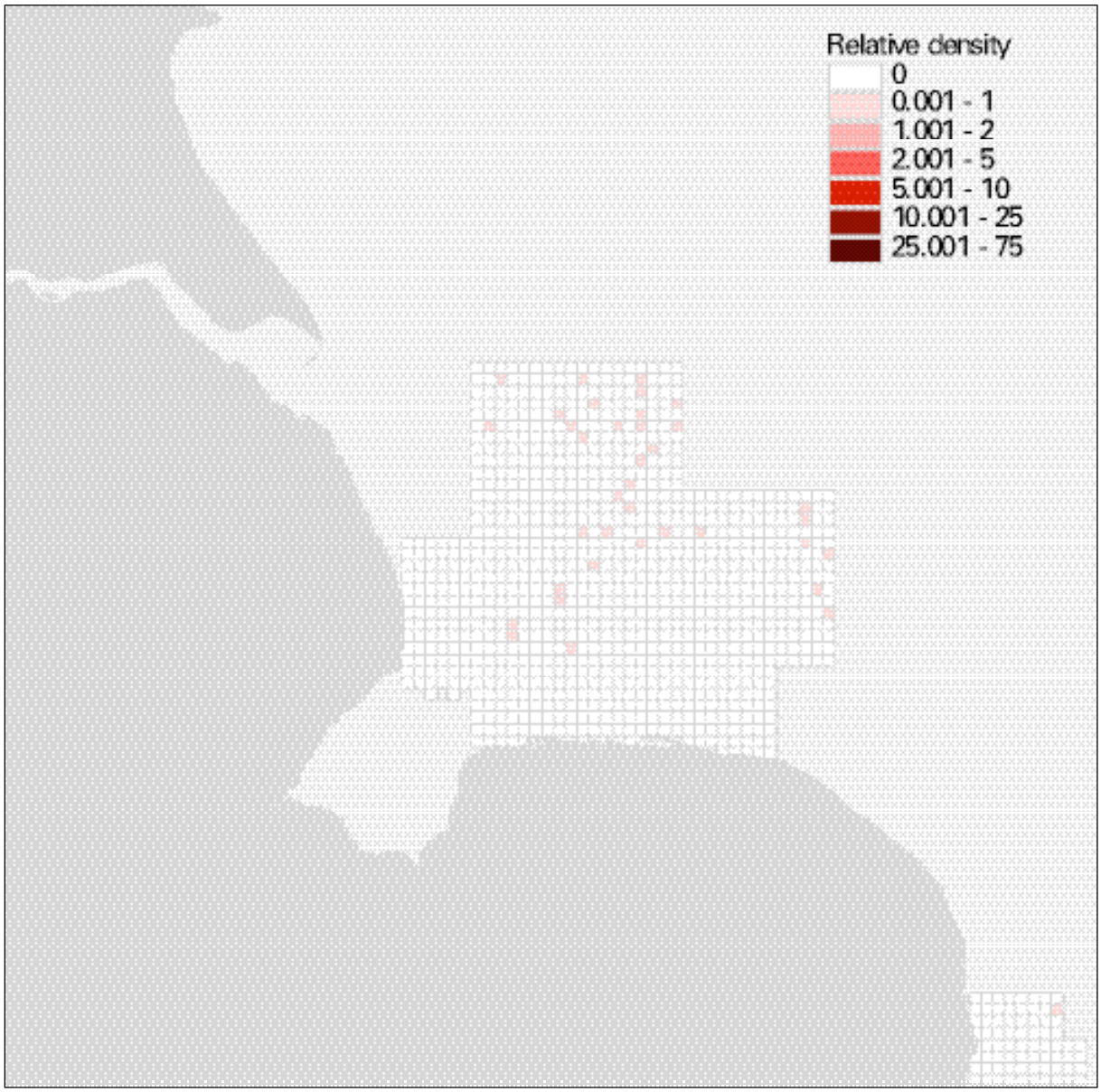


Figure 86 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 6. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

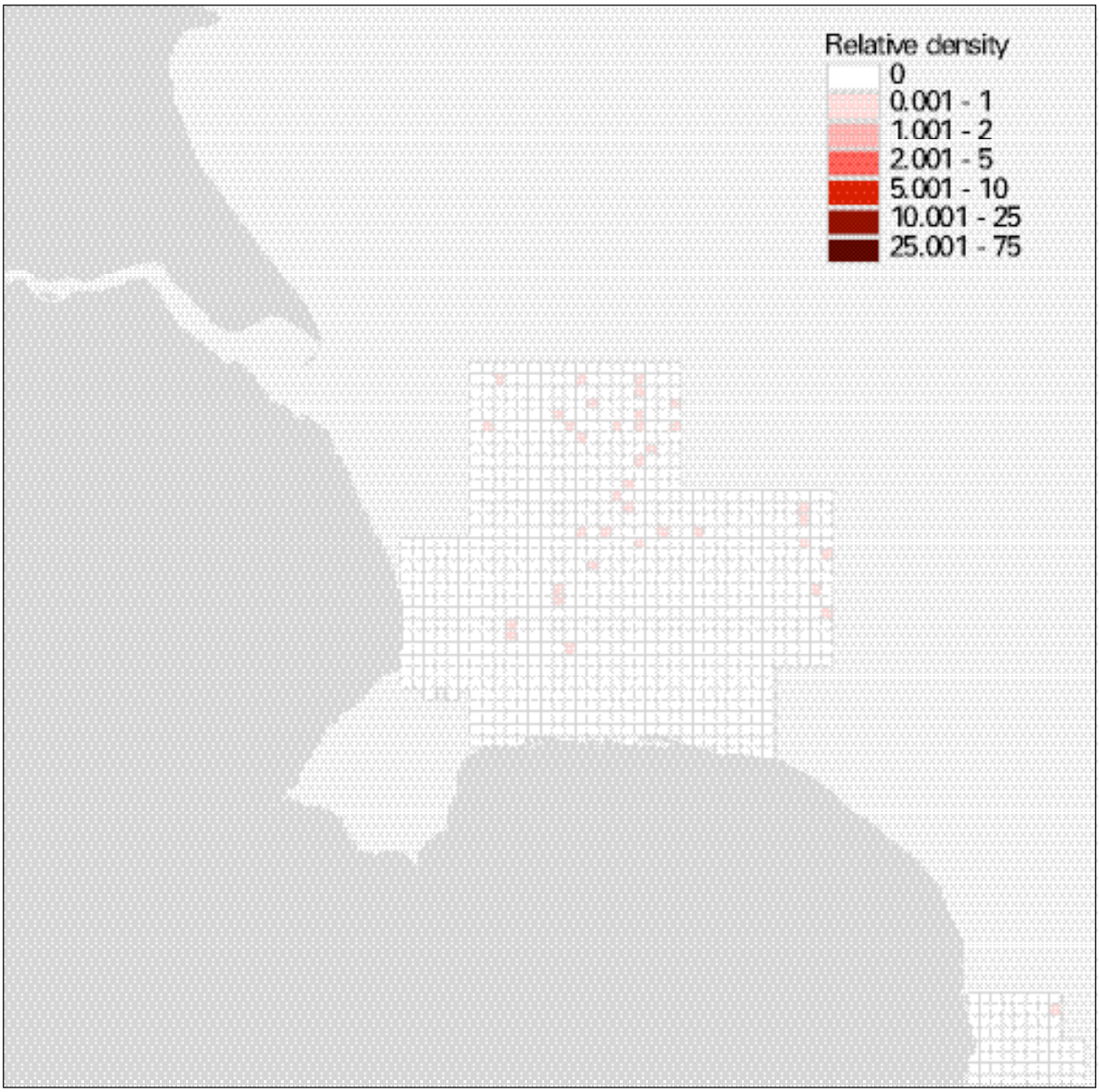


Figure 87 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Greater Wash OWF Strategic Area during aerial surveys, Period 7. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

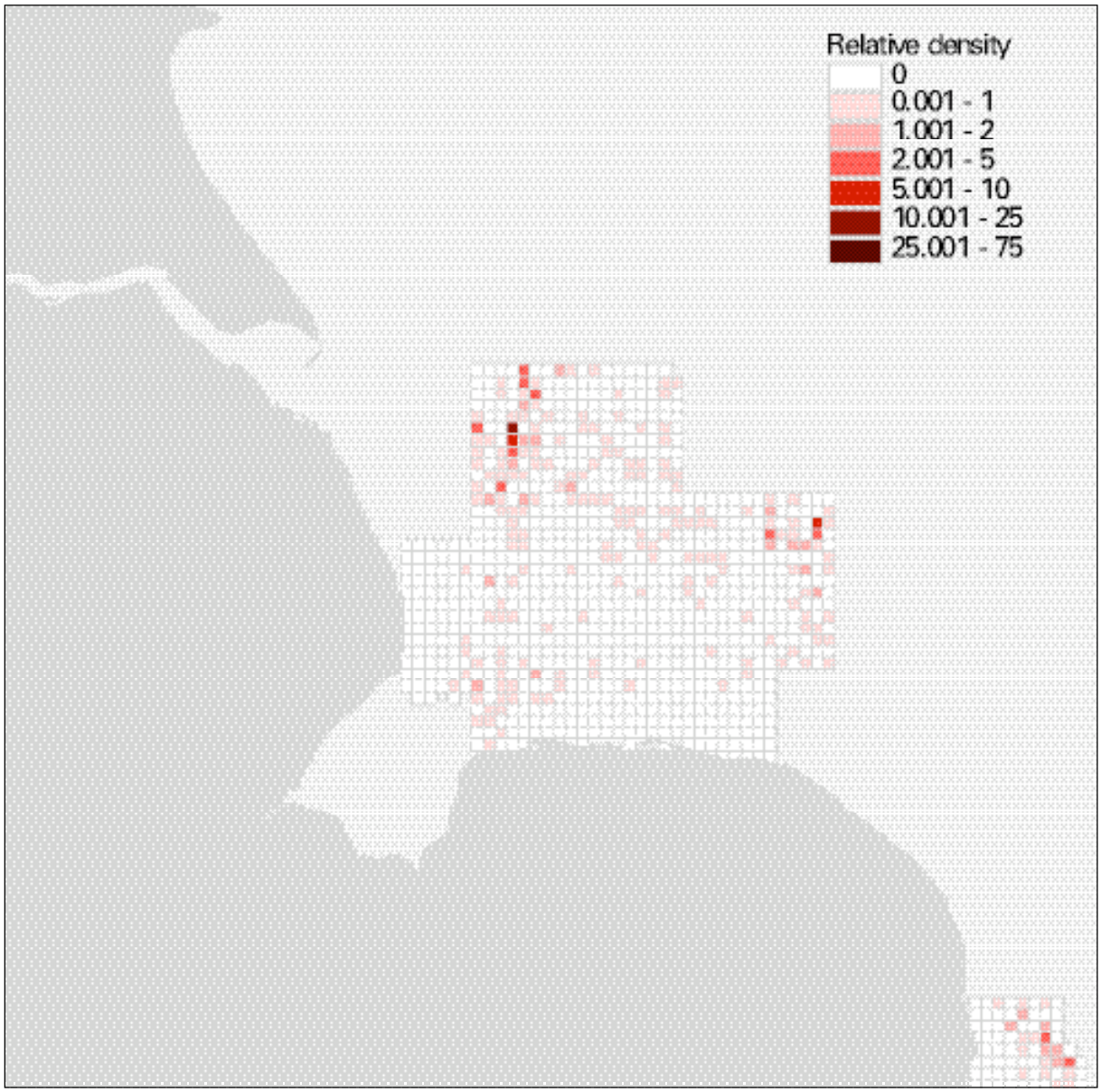


Figure 88 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 1. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

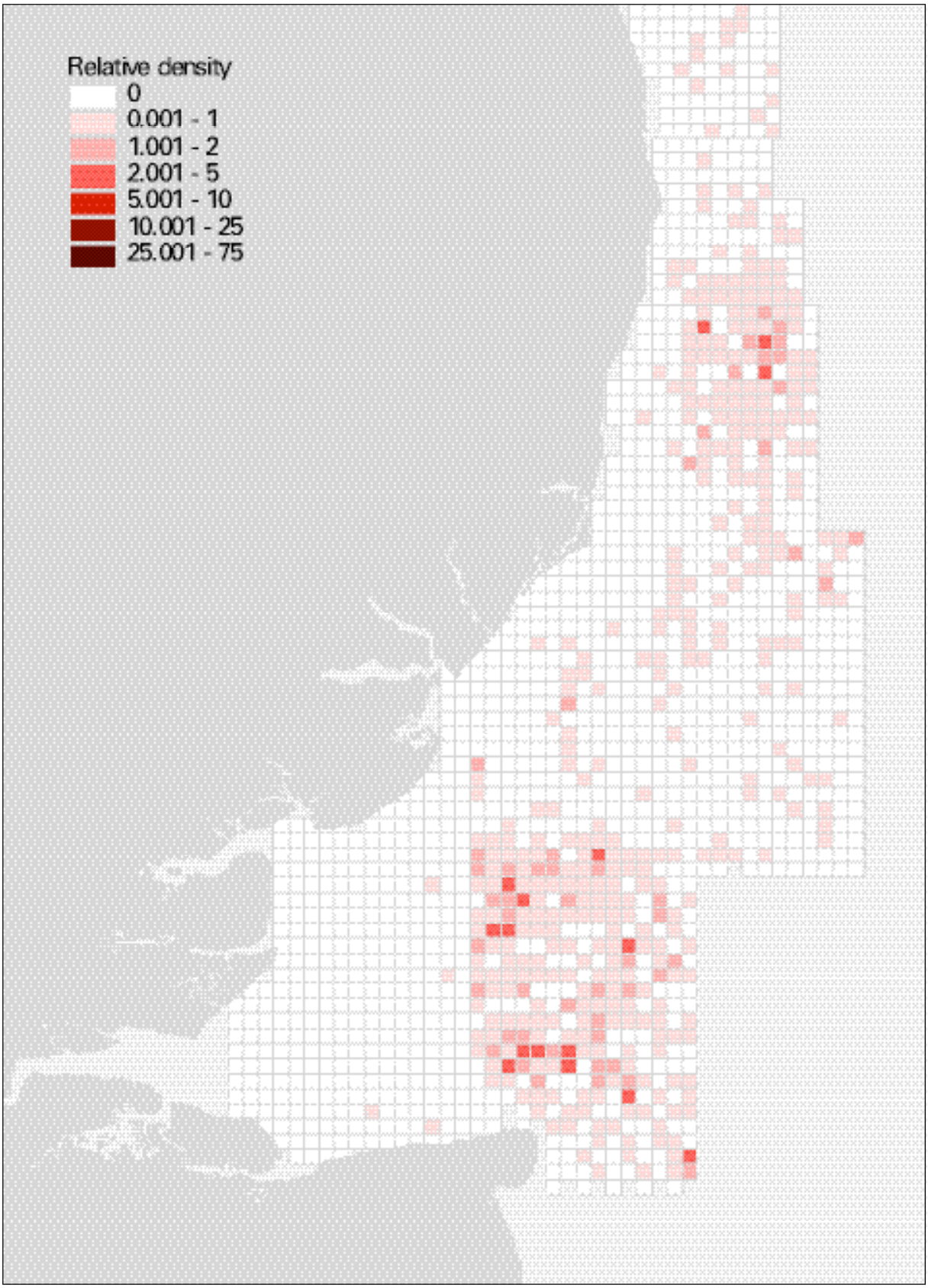


Figure 89 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 2. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

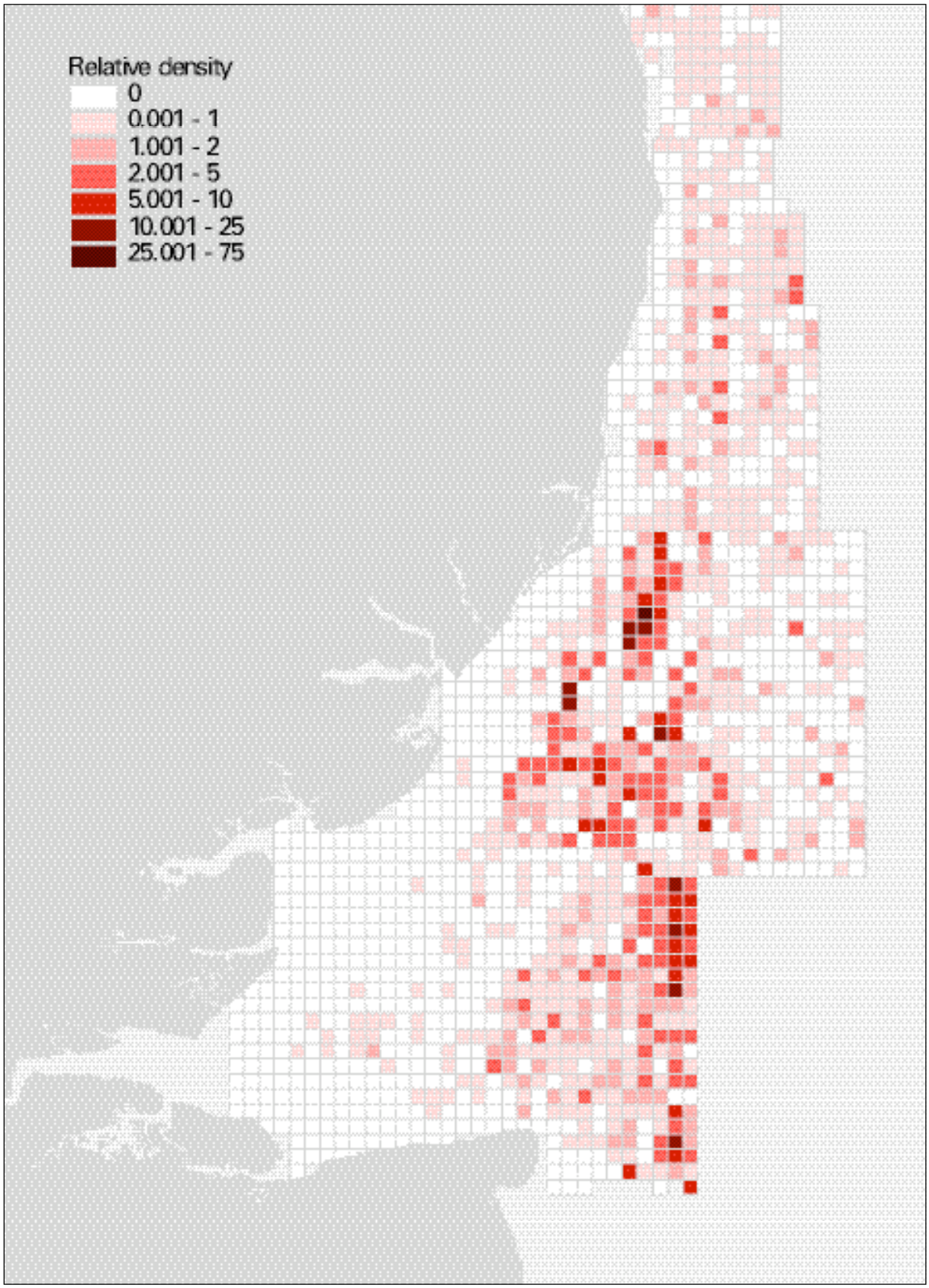


Figure 90 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 3. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

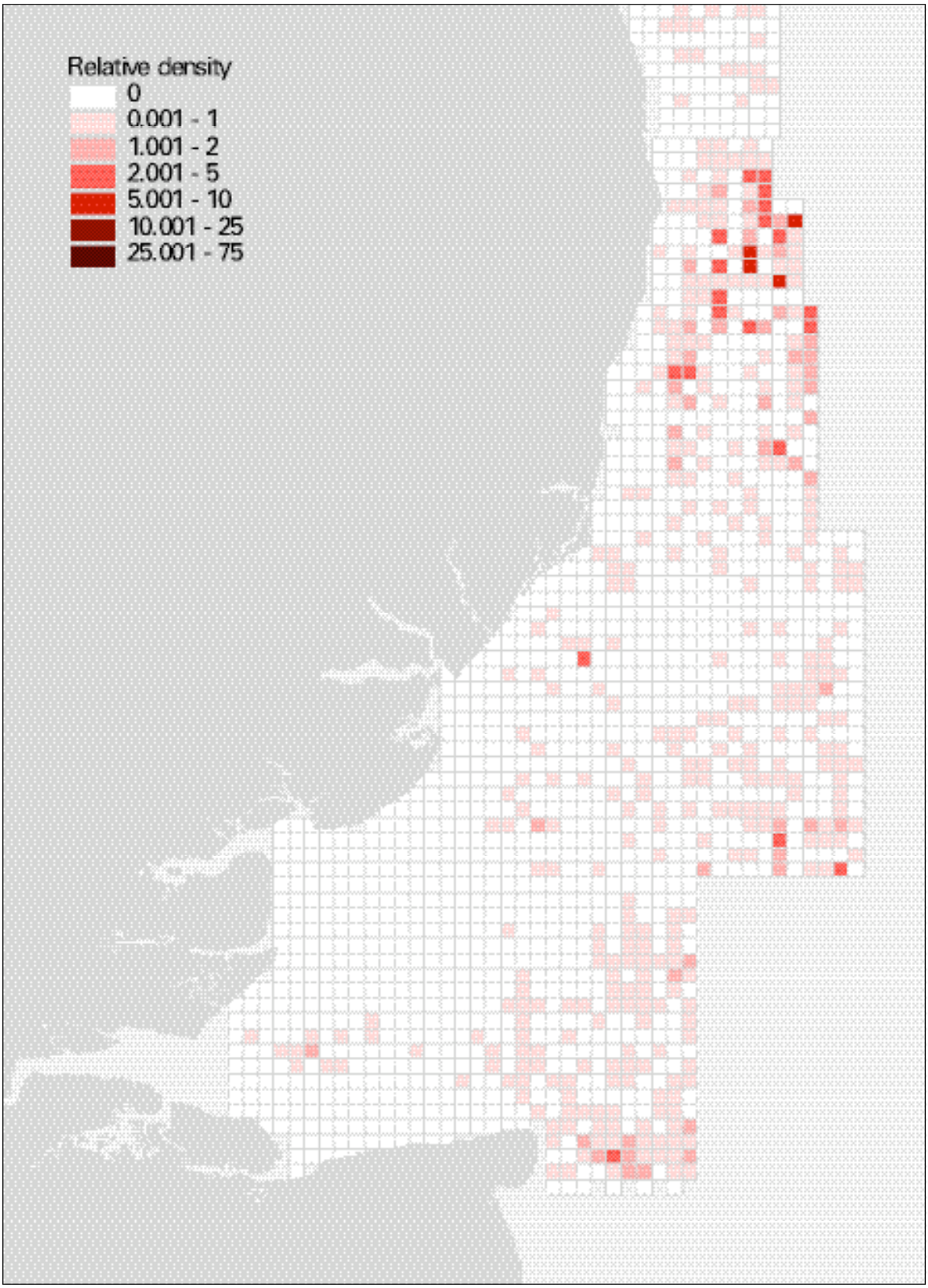


Figure 91 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 4. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort

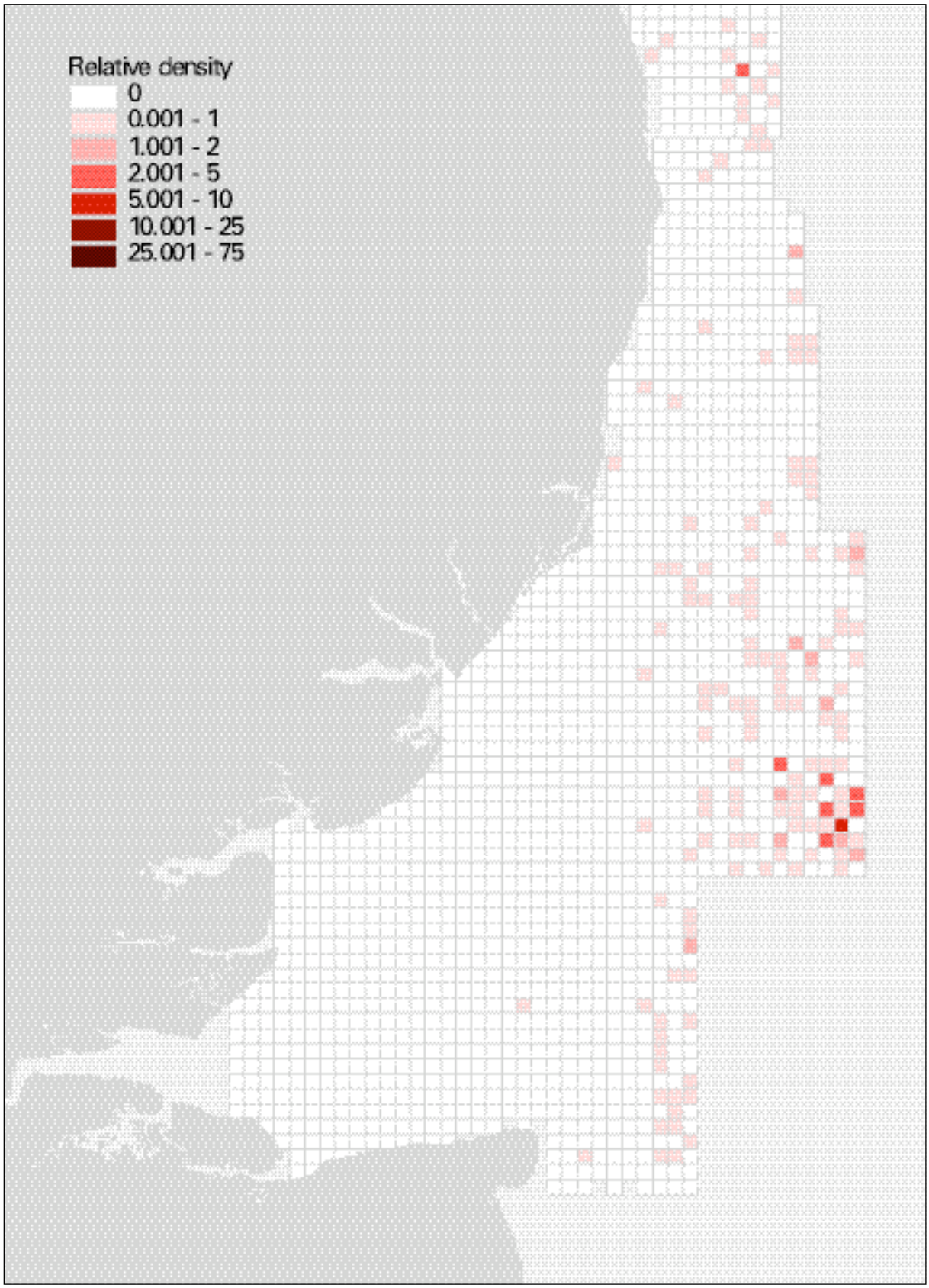
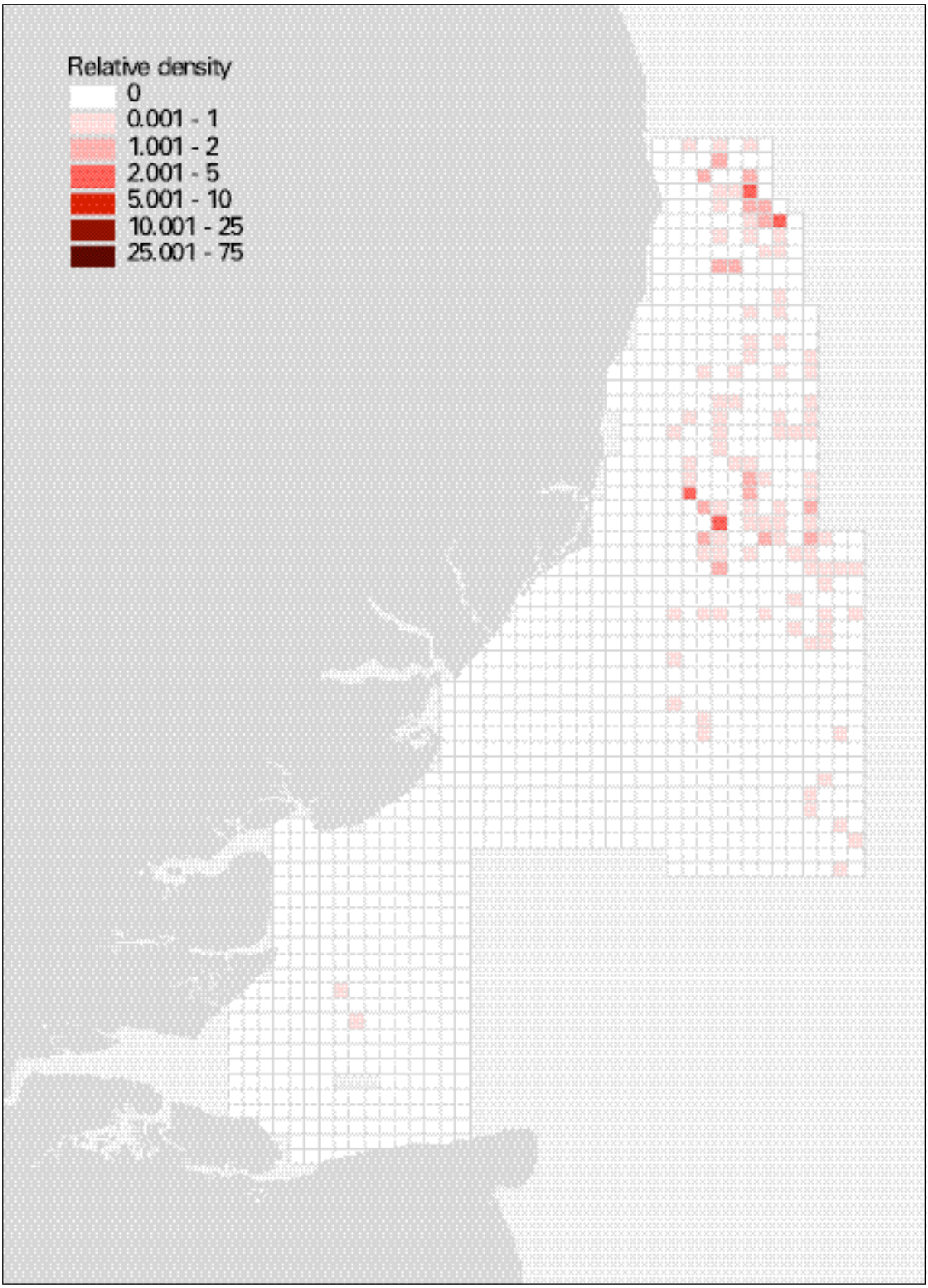


Figure 92 - Relative density of auks *Uria/Aclca/Fratercula* spp. recorded in Thames OWF Strategic Area during aerial surveys, Period 7. Numbers of all birds are summed by 2x2 km grid squares, corrected for survey effort



Tables

Table 1 - Survey periods used for aerial surveys in 2004/05

Survey Period	Description	Dates
1	Early winter	23 October – 21 November
2	Mid winter (1)	22 November – 31 December
3	Mid winter (2)	1 January – 9 February
4	Late winter	10 February – 11 March
5	Breeding: incubation	9 May – 5 June
6	Breeding: chick rearing	6 June – 10 July
7	Post fledging/moult	11 July – 21 August

Table 2 - Dates of survey flights in the North West (Periods 1-7)

North West	NW1	NW3	NW4	NW5	NW6a	NW6b
Period 1	10 Nov	26 Oct	01 Nov	02 Nov	10 Nov	19 Nov
Period 2	28 Nov	29 Nov	27 Nov	30 Nov	02 Dec	02 Dec
Period 3	22 Jan	23 Jan	13 Jan	16/23 Jan	16/23 Jan	23 Jan
Period 4	16 Feb	15 Feb	15 Feb	16 Feb	02 Mar	02 Mar
Period 5	-	11 May	18 May	11 May	17 May	-
Period 6	-	13 Jun	15 Jun	15/16 Jun	15 Jun	-
Period 7	-	04 Aug	03 Aug	20/21 Jul 04 Aug	20 Jul	-

Table 3 - Dates of survey flights in the Greater Wash (Periods 1-7)

Greater Wash	GW1a	GW1b	GW2	GW3	GW4	GW5	GW6
Period 1	-	20 Nov	19/20 Nov	31 Oct	03 Nov	11 Nov	17 Nov
Period 2	09 Dec	09 Dec	09 Dec	23 Nov	23 Nov	08 Dec	08 Dec
Period 3	02 Feb	02 Feb	02 Feb	26 Jan	26 Jan	01 Feb	01 Feb
Period 4	19 Mar	04 Apr	10 Mar	03 Mar	26 Feb	03 Mar	09 Mar
Period 5	-	-	-	20 May	18 May	19 May	-
Period 6	-	-	-	29 Jun	21 Jun	22 Jun	-
Period 7	-	-	-	16 Aug	27 Jul	10 Aug	-

Table 4 - Dates of survey flights in the Thames (Periods 1-7)

Thames	TH1	TH2	TH3	TH4	TH5
Period 1	30 Oct	30 Oct	12 Nov	31 Oct	18 Nov
Period 2	05 Dec	04 Dec	24 Nov	25 Nov	03 Dec
Period 3	15 Jan	15 Jan	14 Jan	14 Jan	03 Feb
Period 4	06/13 Mar	07/15 Mar	28 Feb	07 Mar	08 Mar
Period 5	21 May	-	-	-	31 May
Period 6	25 Jun	-	-	-	06 Jun
Period 7	31 Jul	-	01 Aug	11 Aug	11 Aug

Table 5 - Totals numbers of all species in the North West Strategic Area, Periods 1-7

Species	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7
Barnacle Goose			275				
Shelduck	19	25	2	101	18		
Wigeon			37				
Mallard		3	2				
Pochard		1			1		
Eider	1,682	968	254	1,669	117	4	29
Common Scoter	14,595	17,663	14,226	19,032	604	357	2,228
Velvet Scoter	3			3			
Goldeneye	1						
duck sp.	1	42	77	8			
Red-breasted Merganser	39	14	27	50	6		
diver sp.	131	117	95	167	1		1
Red-throated Diver	45	54	32	45			
Great Northern Diver	2	2	1	1			
grebe sp.	8	13	1	6			
Fulmar	5	16	78	23	14	23	78
Manx Shearwater			3		234	64	413
Gannet	17		2	6	229	253	282
British Storm-petrel							2
Cormorant	279	399	357	182	117	147	105
Shag	19	35	48	28	4	11	14
Cormorant/Shag	42	41	21	21	23	6	15
Little Egret						1	
Oystercatcher	2,618	2,885	2,232	2,381	298	2	
Grey Plover					1		
Lapwing			1				
Knot			75	6			
Dunlin				14	20		
Bar-tailed Godwit				1			
Curlew		1	156	366			
wader sp.	612	281	465	452	215		2
small wader sp.	145	93	4,720	91	51	1	6
medium wader sp.		80	20				
large wader sp.				11			
Great Skua							3
Little Gull	34	57	21	6			
Black-headed Gull	83	20	25	163	41	30	21
Common Gull	135	82	163	168	14	3	4
Lesser black-backed Gull	37	2	17	16	486	239	134
Herring Gull	285	80	116	127	324	225	65
Great Black-backed Gull	143	72	34	36	18	23	11
Kittiwake	396	199	124	20	273	226	296
grey gull spp	371	247	589	347	73	93	66
black-backed gull spp	179	40	36	48	110	173	38
large gull sp.	26	33	49	79	133	155	8
small gull sp.	58	23	264	67	110	21	8
gull sp.	1,211	546	1,632	3,299	1,362	1,217	52
Sandwich Tern					2	8	32
Arctic/Common Tern					34	52	87
Little Tern						4	7
tern sp.					137	34	59
Guillemot					3	11	2
Razorbill					2		
auk sp.	4,231	2,785	1,240	816	903	243	935
Carrion Crow	5		1	9	1		5
Starling	30						

Table 6 - Total number of all species in the Greater Wash Strategic Area, Periods 1-7

Species	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7
Pink-footed Goose	2						
Shelduck	7						
Wigeon	30						
Teal	8		9				
Mallard	10		81				
Eider	5		11	5			
Common Scoter	1,141	3,217	2,105	3,109	258	41	14
duck sp.		300	3	4			
Red-breasted Merganser	1		5				
diver sp.	98	113	106	220			
Red-throated Diver	33	32	20	7			
Great Northern Diver		10					
Great Crested Grebe				1			
grebe sp.		1		7			
Fulmar	13	41	69	43	54	43	46
Manx Shearwater							3
Gannet	107	9	4	32	23	34	147
Cormorant	12	7	25	3	1	2	5
Shag			1				1
Cormorant/Shag	2		6	3	2	2	5
Oystercatcher	72	45	77	10	11		
Lapwing	4		530				
Dunlin			32				
Curlew	36		5				
Redshank			56				
wader sp.	26	8	206				
small wader sp.	17		191	90			
medium wader sp.			46				
large wader sp.				45			
Pomarine Skua							2
Arctic Skua		1					5
Great Skua	9	1					2
skua sp.							4
Little Gull	330	95	5			2	
Black-headed Gull	25	114	147	85	17	7	6
Common Gull	19	58	141	106	1		3
Lesser black-backed Gull	1	44	6	5	1	12	22
Herring Gull	121	53	29	3		6	7
Great Black-backed Gull	77	85	52	8	1		1
Kittiwake	253	206	72	54	259	28	118
grey gull spp	246	506	424	228	10	2	11
black-backed gull spp	56	116	19	22	25	8	2
large gull sp.	90	32	12	92	13	15	16
small gull sp.	355	60	103	45	120	18	18
gull sp.	1,834	754	435	794	778	116	85
Sandwich Tern					16	87	22
Arctic/Common Tern					25	18	120
tern sp.					298	238	91
Guillemot						4	8
auk sp.	3,745	1,846	1,043	1,179	48	65	578
Waxwing	25						
Blackbird	7						
Carrion Crow	1						
Starling	12						
passerine sp.	1	2					

Table 7 - Total numbers of all species in the Thames Strategic Area, Periods 1-7

Species	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7
Bewick's Swan				30			
Brent Goose	36	186		49		2	
goose sp.	2	3	3				
Shelduck		20				12	
Wigeon	9	259					
Teal	25	8					
Mallard		109					
dabbling ducks		30					
Eider		9		6			
Common Scoter	136	358	708	142	7	54	
Velvet Scoter			2				
duck sp.	4	192	1	10			
Red-breasted Merganser			10	8			
diver sp.	138	723	916	966			
Red-throated Diver	34	250	90	1			
Black-throated Diver		1	1				
Great Northern Diver			6	2			
Great Crested Grebe		7		3			
grebe sp.	5		17	8			
Fulmar	19	89	81	21	12	6	96
Gannet	962	12	20		20	28	152
British Storm-petrel		1					
Cormorant	38	97	37	36	9	25	29
Shag			1				
Cormorant/Shag		1	66	1	12	1	3
Buzzard	1						
Oystercatcher		167	776	517		2	1,226
Lapwing	3						
Curlew		1	20				
wader sp.	61	329	935	1,253	236		5
small wader sp.	1	1,707	204	359	2	1	
medium wader sp.		60					
Arctic Skua							2
Great Skua	11	1	1			1	3
skua sp.							1
Little Gull	15	21	10				
Black-headed Gull	72	828	229	247	5	11	213
Common Gull	27	286	48	106		2	4
Lesser black-backed Gull	35	42	46	16	4	52	96
Herring Gull	105	210	735	49	10	92	45
Great Black-backed Gull	202	85	107	11	5		7
Kittiwake	229	493	495	66	8	26	46
grey gull spp	419	438	594	298	25	4	53
black-backed gull spp	274	128	169	69	6	28	60
large gull sp.	38	356	162	40	56	70	71
small gull sp.	81	373	62	30	1		46
gull sp.	1,474	3,077	4,692	1,165	93	362	767
Sandwich Tern					2	11	5
Arctic/Common Tern						42	56
tern sp.					20	54	135
Little Auk		1					
auk sp.	1,205	4,172	1,137	349	16		316
Feral Pigeon						17	
Starling		25					
passerine sp.	2	4					

Table 8 - Numbers of Common Scoter recorded in Periods 1-7 ("-" indicates no coverage)

Survet Block	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7
NW1	96	359	668	508	-	-	-
NW3	115	440	98	93	0	0	0
NW4	11,617	12,468	9,392	9,021	604	351	1,889
NW5	1,891	3,462	3,217	8,545	0	0	284 (233)*
NW6a	876	787	651	329	0	6	55
NW6b	0	147	200	536	-	-	-
North West Total	14,595	17,663	14,226	19,032	604	357	2,228**
GW1a	-	0	0	0	-	-	-
GW1b	2	0	0	0	-	-	-
GW2	0	0	0	0	-	-	-
GW3	0	0	0	0	0	0	0
GW4	1,139	3,217	2,105	3,095	258	41	6
GW5	0	0	0	0	0	0	8
GW6	0	0	0	14	-	-	-
Greater Wash Total	1,141	3,217	2,105	3,109	258	41	14
TH1	82	358	679	57 (0)*	0	8	0
TH2	8	0	3	0 (0)*	-	-	-
TH3	0	0	0	0	-	-	0
TH4	41	0	26	0	-	-	0
TH5	5	0	0	85	7	46	0
Thames Total	136	358	708	142**	7	54	0

* numbers in brackets indicate repeat counts in period 4 and period 7

** totals exclude repeat counts in period 4 and period 7

Table 9 - Estimates of Common Scoter numbers (with 95% bootstrap confidence intervals) for each period off the East coast (strategic areas Greater Wash and Thames combined) and West coast (Strategic area North West) calculated using *Distance 5.0*. Estimates for survey blocks holding significant numbers of Common Scoter are also given. Areas with insufficient data to allow estimates to be calculated were excluded

Survey Block	Estimate	Lower Confidence Interval	Upper Confidence Interval
Period 1 East	**3,737**	**1,138**	**7,237**
GW4	3,535	884	6,770
Period 1 West	**36,655**	**17,011**	**69,332**
NW4	28,583	9,341	57,236
NW5	4,385	2,792	6,122
NW6a	2,838	801	5,550
Period 2 East	**4,987**	**881**	**11,757**
GW4	3,960	224	10,179
TH1	940	247	1,797
Period 2 West	**43,252**	**19,361**	**82,967**
NW4	31,318	9,599	68,231
NW5	7,822	4,496	11,741
Period 3 East	**3,298**	**202**	**8,961**
Period 3 West	**39,570**	**21,499**	**67,159**
NW4	27,049	11,296	51,925
NW5part & NW6*	6,008	2,789	10,572
NW6part & NW5 part*	5,192	2,503	8,588
Period 4 West	**47,554**	**28,592**	**73,122**
NW4	26,012	11,258	47,391
NW5	17,319	9,751	27,238
Period 5 West	**1,073**	**189**	**2,198**
Period 7 West	**5,454**	**1,052**	**11,084**
NW4	4,589	998	9,378

Table 10 - Numbers of divers recorded in Periods 1-7 ("-" indicates no coverage)

Survet Block	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7
NW1	58	41	25	15	-	-	-
NW3	29	11	12	40	0	0	0
NW4	47	11	38	42	0	0	1
NW5	24	15	18	66	0	0	0 (0)*
NW6a	15	85	34	35	1	0	0
NW6b	5	10	1	15	-	-	-
North West Total	178	173	128	213	1	0	1**
GW1a	-	0	13	37	-	-	-
GW1b	32	22	29	14	-	-	-
GW2	7	3	5	12	-	-	-
GW3	8	4	26	22	0	0	0
GW4	54	92	29	72	0	0	0
GW5	18	10	4	24	0	0	0
GW6	12	24	20	46	-	-	-
Greater Wash Total	131	155	126	227	0	0	0
TH1	13	294	429	425 (252)*	0	0	0
TH2	19	144	172	369 (183)*	-	-	-
TH3		3	22	21	-	-	0
TH4	16	382	295	129	-	-	0
TH5	124	151	95	25	0	0	0
Thames Total	172	974	1,013	1,404**	0	0	0

* numbers in brackets indicate repeat counts in period 4 and period 7

** totals exclude repeat counts in period 4 and period 7

Table 11 - Estimates of diver numbers (with 95% bootstrap confidence intervals) for each period off the East coast (strategic areas Greater Wash and Thames combined) and West coast (Strategic area North West) calculated using *Distance 5.0*. Estimates for survey blocks holding significant numbers of divers are also given. Areas with insufficient data to allow estimates to be calculated were excluded

Survey Block	Estimate	Lower Confidence Interval	Upper Confidence Interval
Period 1 East	**1,545**	**1,254**	**1,841**
TH5	642	476	807
Period 1 West	**1,071**	**641**	**1,180**
Period 2 East	**5,289**	**4,344**	**6,264**
TH4	1,779	1,068	2,374
TH5	840	552	1,279
Period 2 West	**821**	**491**	**1,217**
NW6	448	161	782
Period 3 East	**5,634**	**4,485**	**6,595**
TH1	2,194	1,723	2,652
TH4	1,167	702	1,716
Period 3 West	**562**	**378**	**788**
Period 4 East	**4,538**	**2,793**	**6,579**
TH2	1,196	510	2,141
Period 4 West	**1,199**	**879**	**1,571**

Table 12 - Number of Little Gulls recorded in Periods 1-7 ("-" indicates no coverage)

Survet Block	Period 1	Period 2	Period 3	Period 4	Period 5	Period 6	Period 7
NW1	0	0	0	0	-	-	-
NW3	2	3	0	0	0	0	0
NW4	32	52	17	2	0	0	0
NW5	0	1	3	3	0	0	0 (0)*
NW6a	0	1	1	1	0	0	0
NW6b	0	0	0	0	-	-	-
North West Total	34	57	21	6	0	0	0**
GW1a	-	0	0	0	-	-	-
GW1b	0	7	0	0	-	-	-
GW2	3	0	0	0	-	-	-
GW3	217	11	4	0	0	0	0
GW4	91	53	1	0	0	2	0
GW5	9	2	0	0	0	0	0
GW6	10	22	0	0	-	-	-
Greater Wash Total	330	95	5	0	0	2	0
TH1	3	0	5	0 (0)*	0	0	0
TH2	6	0	1	0 (0)*	-	-	-
TH3	0	4	1	0	-	-	0
TH4	0	2	2	0	-	-	0
TH5	6	15	1	0	0	0	0
Thames Total	15	21	10	0**	0	0	0

* numbers in brackets indicate repeat counts in Period 4 and Period 7

** totals exclude repeat counts in Period 4 and Period 7

Table 13 - Number of birds counted during aerial survey of the North West survey blocks, Period 1. Note figures shown are not absolute numbers of birds in the survey area, which need to be calculated using 'distance', to allow for the numbers of birds are missed with increasing distance from the plane

Species	NW1	NW3	NW4	NW5	NW6a	NW6b	Total
Shelduck			19				19
Eider		12	1,661	9			1,682
Common Scoter	96	115	11,617	1,891	876		14,595
Velvet Scoter		1		2			3
Goldeneye				1			1
duck sp.	1						1
Red-breasted Merganser			13	26			39
diver sp.	37	19	39	18	14	4	131
Red-throated Diver	21	10	8	5		1	45
Great Northern Diver				1	1		2
grebe sp.	8						8
Fulmar		2				3	5
Gannet		6		11			17
Cormorant	3	3	72	128	71	2	279
Shag				19			19
Cormorant/Shag			1	13	26	2	42
Oystercatcher	95		2,523				2,618
wader sp.					612		612
small wader sp.			145				145
Little Gull		2	32				34
Black-headed Gull	11	2	65	2	2	1	83
Common Gull	12	1	110	3	4	5	135
Lesser black-backed Gull	4	6	21	4	2		37
Herring Gull	15	70	136	52	5	7	285
Great Black-backed Gull	6	55	51	16	13	2	143
Kittiwake	11	159	70	148		8	396
grey gull spp	109	57	81	70	31	23	371
black-backed gull spp	2	25	133	3	13	3	179
large gull sp.	7	1	8	7	1	2	26
small gull sp.	39		12	3		4	58
gull sp.	736	60	328	55	10	22	1,211
auk sp.	191	1,794	907	1,057	6	276	4,231
Carrion Crow			5				5
Starling					30		30
Total	1,404	2,400	18,057	3,544	1,717	365	27,487

Table 14 - Number of birds counted during aerial survey of the North West survey blocks, Period 2

Species	NW1	NW3	NW4	NW5	NW6a	NW6b	Total
Shelduck					25		25
Mallard			3				3
Pochard					1		1
Eider		2	966				968
Common Scoter	359	440	12,468	3,462	787	147	17,663
duck sp.			5	14		23	42
Red-breasted Merganser		4		10			14
diver sp.	31	9	11	9	50	7	117
Red-throated Diver	9	2		6	35	2	54
Great Northern Diver	1					1	2
grebe sp.					1	12	13
Fulmar				14		2	16
Cormorant	13	1	209	33	142	1	399
Shag				34		1	35
Cormorant/Shag	1		27	10	1	2	41
Oystercatcher			2,850		35		2,885
Curlew					1		1
wader sp.			169		112		281
small wader sp.					93		93
medium wader sp.					80		80
Little Gull		3	52	1	1		57
Black-headed Gull	8		7	1	3	1	20
Common Gull	28	2	11	11	30		82
Lesser black-backed Gull			1	1			2
Herring Gull	19	18	14	8	3	18	80
Great Black-backed Gull	7	6	16	18	19	6	72
Kittiwake	17	83	41	45	2	11	199
grey gull spp	87	20	33	44	43	20	247
black-backed gull spp	2	7	1	3	24	3	40
large gull sp.	1	4	4	3	6	15	33
small gull sp.	3	10	2		6	2	23
gull sp.	22	60	11	20	311	122	546
auk sp.	193	1,513	113	371	15	580	2,785
Total	801	2,184	17,014	4,118	1,826	976	26,919

Table 15 - Number of birds counted during aerial survey of the North West survey blocks, Period 3

Species	NW1	NW3	NW4	NW5	NW6a	NW6b	Total
Barnacle Goose	275						275
Shelduck					2		2
Wigeon			19	18			37
Mallard	2						2
Eider	2	30	218	4			254
Common Scoter	668	98	9,392	3,217	651	200	14,226
duck sp.	62	15					77
Red-breasted Merganser			1	24		2	27
diver sp.	20	12	23	15	24	1	95
Red-throated Diver	5		14	3	10		32
Great Northern Diver			1				1
grebe sp.			1				1
Fulmar			51	16		11	78
Manx Shearwater			3				3
Gannet			1	1			2
Cormorant	149		16	114	72	6	357
Shag	14			27	4	3	48
Cormorant/Shag	8			9	3	1	21
Oystercatcher	624		1,568	40			2,232
Lapwing	1						1
Knot				75		75	
Curlew						156	156
wader sp.	75			40	350		465
small wader sp.			1,120		3,600		4,720
medium wader sp.				20			20
Little Gull			17	3	1		21
Black-headed Gull	5		4	7	3	6	25
Common Gull	73		18	34	22	16	163
Lesser black-backed Gull	2		6	7	2		17
Herring Gull	24		38	23	15	16	116
Great Black-backed Gull	5		13	6	6	4	34
Kittiwake	1		48	64	3	8	124
grey gull spp	236	14	139	54	47	99	589
black-backed gull spp	6	5	17	5	3		36
large gull sp.	3	3	20	8	12	3	49
small gull sp.	4	10	4	168	14	64	264
gull sp.	531	45	100	886	18	52	1,632
auk sp.	27	152	97	599	20	345	1,240
Carrion Crow	1						1
Total	2,823	384	12,949	5,412	4,957	993	27,518

Table 16 - Number of birds counted during aerial survey of the North West survey blocks, Period 4

Species	NW1	NW3	NW4	NW5	NW6a	NW6b	Total
Shelduck			101				101
Eider	7	25	1,629	8			1,669
Common Scoter	508	93	9,021	8,545	329	536	19,032
Velvet Scoter				3			3
duck sp.		8					8
Red-breasted Merganser			5	44	1		50
diver sp.	15	40	26	39	34	13	167
Red-throated Diver			16	26	1	2	45
Great Northern Diver				1			1
grebe sp.				6			6
Fulmar	6	1		9		7	23
Gannet		5				1	6
Cormorant	26	6	45	89	14	2	182
Shag			28			28	
Cormorant/Shag	5	2		9	5		21
Oystercatcher	104	2	2,258		17		2,381
Knot		6				6	
Dunlin		14				14	
Bar-tailed Godwit			1				1
Curlew			366				366
wader sp.	45	20	387				452
small wader sp.	3		26		62		91
large wader sp.	2		9				11
Little Gull			2	3	1		6
Black-headed Gull	4		121	37	1		163
Common Gull			104	64			168
Lesser black-backed Gull			7	2	6	1	16
Herring Gull			25	57	45		127
Great Black-backed Gull			16	16	3	1	36
Kittiwake			7	9		4	20
grey gull spp	56	44	27	161	54	5	347
black-backed gull spp	6	13	10	14	3	2	48
large gull sp.	21	12	33	7	4	2	79
small gull sp.	6	8	10	36	3	4	67
gull sp.	102	50	2,607	199	334	7	3,299
auk sp.	55	374	53	254	33	47	816
Carrion Crow			4		5		9
Total	971	703	16,936	9,666	955	634	29,865

Table 17 - Number of birds counted during aerial survey of the North West survey blocks, Period 5

Species	NW1	NW3	NW4	NW5	NW6a	NW6b	Total
Shelduck			18				18
Pochard			1				1
Eider		15	102				117
Common Scoter			604				604
Red-breasted Merganser			6				6
diver sp.					1		1
Fulmar			2	8	4		14
Manx Shearwater		26	194		14		234
Gannet		41	24	22	142		229
Cormorant		5	17	87	8		117
Shag			4			4	
Cormorant/Shag		2		21			23
Oystercatcher			237	60	1		298
Grey Plover					1		1
Dunlin		20				20	
wader sp.			210	5			215
small wader sp.			51				51
Black-headed Gull		1		40			41
Common Gull		1	5	7	1		14
Lesser black-backed Gull		10	447	2	27		486
Herring Gull		14	210	4	96		324
Great Black-backed Gull			14	2	2		18
Kittiwake		25	73	109	66		273
grey gull spp		9	17	39	8		73
black-backed gull spp		12	58	8	32		110
large gull sp.		5	85	8	35		133
small gull sp.		4	15	81	10		110
gull sp.		167	792	254	149		1,362
Sandwich Tern		2					2
Arctic/Common Tern			18		16		34
tern sp.		30	41	17	49		137
Guillemot		1	2				3
Razorbill		2					2
auk sp.		200	277	376	50		903
Carrion Crow			1				1
Total		572	3,541	1,154	712		5,979

Table 18 - Number of birds counted during aerial survey of the North West survey blocks, Period 6

Species	NW1	NW3	NW4	NW5	NW6a	NW6b	Total
Eider			4				4
Common Scoter			351		6		357
Fulmar		10	1	12			23
Manx Shearwater		39	10	15			64
Gannet		151	23	68	11		253
Cormorant		8	2	108	29		147
Shag				11			11
Cormorant/Shag		1	2	3			6
Little Egret				1			1
Oystercatcher					2		2
small wader sp.				1			1
Black-headed Gull		2	28				30
Common Gull				3			3
Lesser black-backed Gull		5	189	11	34		239
Herring Gull		6	113	57	49		225
Great Black-backed Gull		2	14	6	1		23
Kittiwake		23	21	149	33		226
grey gull spp		3	25	28	37		93
black-backed gull spp		15	134	21	3		173
large gull sp.		6	148	1			155
small gull sp.		4	17				21
gull sp.		26	1,169	18	4		1,217
Sandwich Tern		3	1	4			8
Arctic/Common Tern				30	22		52
Little Tern				4			4
tern sp.		18	13	2	1		34
Guillemot				10	1		11
auk sp.		57	94	66	26		243
Total		379	2,359	629	259		3,626

Table 19 - Number of birds counted during aerial survey of the North West survey blocks, Period 7

Species	NW1	NW3	NW4	NW5	NW5(2)	NW6a	NW6b	Total
Eider			29					29
Common Scoter			1,889	284	233	55		2,461
diver sp.			1					1
Fulmar		28	11	31	18	8		96
Manx Shearwater		148	21	232	5	12		418
Gannet		43	14	205	123	20		405
British Storm-petrel		1	1					2
Cormorant			4	99	128	2		233
Shag			1	13	2			16
Cormorant/Shag			1	14				15
wader sp.				1		1		2
small wader sp.		6			4			10
Great Skua		1		1		1		3
Black-headed Gull			15	2	1	4		22
Common Gull				4				4
Lesser black-backed Gull		32	80	7	3	15		137
Herring Gull			31	25	19	9		84
Great Black-backed Gull			6	3	1	2		12
Kittiwake		39	11	230	30	16		326
grey gull spp		4	13	39	16	10		82
black-backed gull spp		6	9	22		1		38
large gull sp.			8					8
small gull sp.		1	2	2		3		8
gull sp.		23	3	20	88	6		140
Sandwich Tern		25	3		27	4		59
Arctic/Common Tern		8	4	20	14	55		101
Little Tern		2		2	1	3		8
tern sp.		23	9	7	11	20		70
Guillemot		2						2
auk sp.		436	50	398	41	51		976
Carrion Crow			5					5
Total		828	2,221	1,661	765	298		5,773

Table 20 - Number of birds counted during aerial survey of the Greater Wash survey blocks, Period 1. Note figures shown are not absolute numbers of birds in the survey area, which need to be calculated using 'distance', to allow for the numbers of birds are missed with increasing distance from the plane

Species	GW1a	GW1b	GW2	GW3	GW4	GW5	GW6	Total
Pink-footed Goose				2				2
Shelduck		7						7
Wigeon					23	7		30
Teal		8						8
Mallard		10						10
Eider					5			5
Common Scoter		2			1,139			1,141
Red-breasted Merganser					1			1
diver sp.		21	5	8	36	16	12	98
Red-throated Diver		11	2		18	2		33
Fulmar		1	6	3		3		13
Gannet			18	29	12	37	11	107
Cormorant		10			2			12
Cormorant/Shag					1		1	2
Oystercatcher		12				60		72
Lapwing					4			4
Curlew		36						36
wader sp.		25	1					26
small wader sp.		17						17
Great Skua				6	2	1		9
Little Gull			3	217	91	9	10	330
Black-headed Gull		16			4	1	4	25
Common Gull		17	2					19
Lesser black-backed Gull					1			1
Herring Gull		38	7	9	54	7	6	121
Great Black-backed Gull		30	11	15	13	4	4	77
Kittiwake		14	85	37	41	63	13	253
grey gull spp		88	36	61	37	21	3	246
black-backed gull spp		21	13	8	9	4	1	56
large gull sp.		61	19	1		4	5	90
small gull sp.		15	36	137	96	48	23	355
gull sp.		1,282	131	45	317	50	9	1,834
auk sp.		62	475	999	617	1,490	102	3,745
Waxwing				25				25
Total		1,805	850	1,602	2,531	1,839	204	8,831

Table 21 - Number of birds counted during aerial survey of the Greater Wash survey blocks, Period 2

Species	GW1a	GW1b	GW2	GW3	GW4	GW5	GW6	Total
Common Scoter					3,217			3,217
duck sp.						300		300
diver sp.		13	3	4	67	3	23	113
Red-throated Diver		8			18	6		32
Great Northern Diver		1			7	1	1	10
grebe sp.						1		1
Fulmar		1	1	16	21	2		41
Gannet	2		2	2	1	1	1	9
Cormorant	1	2			3		1	7
Oystercatcher		45						45
wader sp.		7			1			8
Arctic Skua					1			1
Great Skua					1			1
Little Gull		7		11	53	2	22	95
Black-headed Gull					99		15	114
Common Gull		6	8	5	38		1	58
Lesser black-backed Gull		3	3	14	17	6	1	44
Herring Gull	2	6	4	7	26	6	2	53
Great Black-backed Gull	4	5	7	4	58	4	3	85
Kittiwake		5	8	18	147	21	7	206
grey gull spp	26	74	40	43	281	20	22	506
black-backed gull spp	14	38	16	11	30	3	4	116
large gull sp.	1	11	3	5	6	2	4	32
small gull sp.		2		25	23	1	9	60
gull sp.	4	171	49	53	422	8	47	754
auk sp.	15	61	99	659	420	248	344	1,846
passerine sp.		2						2
Total	69	468	243	877	4,957	635	507	7,756

Table 22 - Number of birds counted during aerial survey of the Greater Wash survey blocks, Period 3

Species	GW1a	GW1b	GW2	GW3	GW4	GW5	GW6	Total
Teal		9						9
Mallard		81						81
Eider				6	5			11
Common Scoter					2,105			2,105
duck sp.						3		3
Red-breasted Merganser					5			5
diver sp.	9	28	4	16	28	2	19	106
Red-throated Diver	4	1	1	10	1	2	1	20
Fulmar	5	2	19	24	9	9	1	69
Gannet			3	1				4
Cormorant	5	1			19			25
Shag			1					1
Cormorant/Shag	2	4						6
Oystercatcher		77						77
Lapwing		530						530
Dunlin		32						32
Curlew		5						5
Redshank		56						56
wader sp.		206						206
small wader sp.		130			60	1		191
medium wader sp.		46						46
Little Gull				4	1			5
Black-headed Gull	23	110	7		4		3	147
Common Gull	6	131	2		2			141
Lesser black-backed Gull	1		1		1	1	2	6
Herring Gull	8	9	2		9	1		29
Great Black-backed Gull	27	11	6	3	4	1		52
Kittiwake			14	32	4	21	1	72
grey gull spp	22	170	25	5	193	1	8	424
black-backed gull spp	4	5	3	3	4			19
large gull sp.		1	1	7	2		1	12
small gull sp.	64	5	3	9	5	13	4	103
gull sp.	15	144	29	15	190	38	4	435
auk sp.	58	79	225	183	128	130	240	1,043
Total	253	1,873	346	318	2,779	223	284	6,076

Table 23 - Number of birds counted during aerial survey of the Greater Wash survey blocks, Period 4

Species	GW1a	GW1b	GW2	GW3	GW4	GW5	GW6	Total
Eider					5			5
Common Scoter					3,095		14	3,109
duck sp.	4							4
diver sp.	37	14	12	22	65	24	46	220
Red-throated Diver					7			7
Great Crested Grebe					1			1
grebe sp.					6		1	7
Fulmar	2		12	6	9	10	4	43
Gannet	17		15					32
Cormorant		2					1	3
Cormorant/Shag		2			1			3
Oystercatcher		10						10
small wader sp.		90						90
large wader sp.		45						45
Black-headed Gull		2	1	2	76	3	1	85
Common Gull			19		87			106
Lesser black-backed Gull			3		1		1	5
Herring Gull				1	2			3
Great Black-backed Gull			2	1	4		1	8
Kittiwake	9		17	4	18	1	5	54
grey gull spp	20	29	130	17	23	3	6	228
black-backed gull spp		5	5		10	1	1	22
large gull sp.	13	33	32		5	1	8	92
small gull sp.	13	20	8		2	2		45
gull sp.	123	279	251	1	100	1	39	794
auk sp.	104	10	634	138	48	119	126	1,179
Total	342	541	1,141	192	3,565	165	254	6,200

Table 24 - Number of birds counted during aerial survey of the Greater Wash survey blocks, Period 5

Species	GW1a	GW1b	GW2	GW3	GW4	GW5	GW6	Total
Common Scoter					258			258
Fulmar				21	12	21		54
Gannet				11	1	11		23
Cormorant					1			1
Cormorant/Shag					2			2
Oystercatcher						11		11
Black-headed Gull					17			17
Common Gull					1			1
Lesser black-backed Gull						1		1
Great Black-backed Gull					1			1
Kittiwake				214	40	5		259
grey gull spp					8	2		10
black-backed gull spp				5	18	2		25
large gull sp.				1	2	10		13
small gull sp.				82	37	1		120
gull sp.				48	679	51		778
Sandwich Tern				8	6	2		16
Arctic/Common Tern				2	12	11		25
tern sp.				82	85	131		298
auk sp.				29	10	9		48
Total				503	1,190	268		1,961

Table 25 - Number of birds counted during aerial survey of the Greater Wash survey blocks, Period 6

Species	GW1a	GW1b	GW2	GW3	GW4	GW5	GW6	Total
Common Scoter					41			41
Fulmar				5		38		43
Gannet				14	13	7		34
Cormorant					1	1		2
Cormorant/Shag					2			2
Little Gull					2			2
Black-headed Gull				1	4	2		7
Lesser black-backed Gull				3	4	5		12
Herring Gull					4	2		6
Kittiwake				23	1	4		28
grey gull spp					2			2
black-backed gull spp					3	5		8
large gull sp.					2	13		15
small gull sp.				2	12	4		18
gull sp.					67	49		116
Sandwich Tern				21	30	36		87
Arctic/Common Tern				2	7	9		18
tern sp.				39	97	102		238
Guillemot				1	2	1		4
auk sp.				30	14	21		65
Total				141	308	299		748

Table 26 - Number of birds counted during aerial survey of the Greater Wash survey blocks, Period 7

Species	GW1a	GW1b	GW2	GW3	GW4	GW5	GW6	Total
Common Scoter					6	8		14
Fulmar				36	1	9		46
Manx Shearwater				2		1		3
Gannet				90	11	46		147
Cormorant					5			5
Shag					1			1
Cormorant/Shag					4	1		5
Pomarine Skua				2				2
Arctic Skua				4		1		5
Great Skua					1	1		2
skua sp.				2		2		4
Black-headed Gull					6			6
Common Gull				3				3
Lesser black-backed Gull				7	5	10		22
Herring Gull				2	3	2		7
Great Black-backed Gull						1		1
Kittiwake				90	21	7		118
grey gull spp					3	8		11
black-backed gull spp						2		2
large gull sp.						16		16
small gull sp.				14	4			18
gull sp.				7	28	50		85
Sandwich Tern				20	2			22
Arctic/Common Tern				37	52	31		120
tern sp.				46	31	14		91
Guillemot				8				8
auk sp.				351	79	148		578
Total				721	263	358		1,342

Table 27 - Number of birds counted during aerial survey of the Thames survey blocks, Period 1. Note figures shown are not absolute numbers of birds in the survey area, which need to be calculated using 'distance', to allow for the numbers of birds are missed with increasing distance from the plane

Species	TH1	TH2	TH3	TH4	TH5	Total
Brent Goose	36					36
goose sp.	2					2
Wigeon	9					9
Teal	25					25
Common Scoter	82	8		41	5	136
duck sp.				3	1	4
diver sp.	12	19		15	92	138
Red-throated Diver	1			1	32	34
grebe sp.	4			1		5
Fulmar		12	2	1	4	19
Gannet	84	791	39	1	47	962
Cormorant	32	1		4	1	38
Buzzard	1					1
Lapwing	3					3
wader sp.	61					61
small wader sp.	1					1
Great Skua	5	5			1	11
Little Gull	3	6			6	15
Black-headed Gull	35	32		3	2	72
Common Gull	9	1	6	6	5	27
Lesser black-backed Gull	3	20	2	4	6	35
Herring Gull	33	5	32	22	13	105
Great Black-backed Gull	37	133	4	21	7	202
Kittiwake	18	70	20	9	112	229
grey gull spp	51	284	13	55	16	419
black-backed gull spp	23	188	15	32	16	274
large gull sp.	26	3		6	3	38
small gull sp.	17	3	9	1	51	81
gull sp.	305	635	37	260	237	1,474
auk sp.	4	712	106	56	327	1,205
passerine sp.		2				2
Total	922	2,930	285	542	984	5,663

Table 28 - Number of birds counted during aerial survey of the Thames survey blocks, Period 2

Species	TH1	TH2	TH3	TH4	TH5	Total
Brent Goose	186					186
goose sp.				3		3
Shelduck	20					20
Wigeon	259					259
Teal				8		8
Mallard	94			15		109
dabbling ducks				30		30
Eider	9					9
Common Scoter	358					358
duck sp.	187			5		192
diver sp.	262	94	3	242	122	723
Red-throated Diver	32	49		140	29	250
Black-throated Diver		1				1
Great Crested Grebe	7					7
Fulmar		6	83			89
Gannet		4	7		1	12
British Storm-petrel			1			1
Cormorant	83	13		1		97
Cormorant/Shag	1					1
Oystercatcher	167					167
Curlew	1					1
wader sp.	329					329
small wader sp.	1,707					1,707
medium wader sp.	60					60
Great Skua			1			1
Little Gull			4	2	15	21
Black-headed Gull	734	27	1	63	3	828
Common Gull	177	68	1	38	2	286
Lesser black-backed Gull	38		3	1		42
Herring Gull	118	38	7	28	19	210
Great Black-backed Gull	29	23	7	16	10	85
Kittiwake	11	106	92	254	30	493
grey gull spp	97	34	7	257	43	438
black-backed gull spp	69	26	14	10	9	128
large gull sp.	132	16	1	184	23	356
small gull sp.	308	6	23	28	8	373
gull sp.	1,016	935	86	583	457	3,077
Little Auk		1				1
auk sp.	55	1,378	534	1,716	489	4,172
Starling				25		25
passerine sp.			4			4
Total	6,546	2,825	879	3,649	1,260	15,159

Table 29 - Number of birds counted during aerial survey of the Thames survey blocks, Period 3

Species	TH1	TH2	TH3	TH4	TH5	Total
goose sp.	3					3
Common Scoter	679	3		26		708
Velvet Scoter	2					2
duck sp.	1					1
Red-breasted Merganser	10					10
diver sp.	412	109	16	288	91	916
Red-throated Diver	14	62	6	5	3	90
Black-throated Diver		1				1
Great Northern Diver	3			2	1	6
grebe sp.	7	6			4	17
Fulmar		13	59		9	81
Gannet		3	8		9	20
Cormorant	30	3	1	2	1	37
Shag	1					1
Cormorant/Shag	65			1		66
Oystercatcher	776					776
Curlew	20					20
wader sp.	527	405			3	935
small wader sp.	204					204
Great Skua			1			1
Little Gull	5	1	1	2	1	10
Black-headed Gull	14	13	2	189	11	229
Common Gull	21	4	8	11	4	48
Lesser black-backed Gull	1	9	2	27	7	46
Herring Gull	27	70	34	594	10	735
Great Black-backed Gull	20	65	13	7	2	107
Kittiwake	29	146	242	55	23	495
grey gull spp	126	75	42	240	111	594
black-backed gull spp	84	20	38	23	4	169
large gull sp.	42	50	33	29	8	162
small gull sp.	8	15	1	33	5	62
gull sp.	340	258	532	2,981	581	4,692
auk sp.	25	222	177	74	639	1,137
Total	3,496	1,553	1,216	4,589	1,527	12,381

Table 30 - Number of birds counted during aerial survey of the Thames survey blocks, Period 4

Species	TH1	TH1(2)	TH2	TH2(2)	TH3	TH4	TH5	Total
Species	TH1	TH1(2)	TH2	TH2(2)	TH3	TH4	TH5	Total
Bewick's Swan							30	30
Brent Goose	40	30				9		79
goose sp.		5						5
Eider	6	5						11
Common Scoter	57						85	142
duck sp.	10							10
Red-breasted Merganser	7		1					8
diver sp.	425	252	367	177	20	129	25	1,395
Red-throated Diver				6	1			7
Great Northern Diver			2					2
Great Crested Grebe			2				1	3
grebe sp.	1		5				2	8
Fulmar			1		14	3	3	21
Gannet				4				4
Cormorant	33	23				2	1	59
Cormorant/Shag		4	1					5
Oystercatcher	517	643						1,160
wader sp.	1,253	1,123						2,376
small wader sp.	359	640						999
large wader sp.		161						161
Black-headed Gull	201	16	4	1		39	3	264
Common Gull	49		56	2			1	108
Lesser black-backed Gull	13		1				2	16
Herring Gull	33		6	1			10	50
Great Black-backed Gull	8	4	2		1			15
Kittiwake	5	3	47	8	3	7	4	77
grey gull spp	185	117	11	25	3	84	15	440
black-backed gull spp	21	17	1	3	2	44	1	89
large gull sp.	24	40	1	6	4	11		86
small gull sp.	2	11	18		1	8	1	41
gull sp.	874	748	9	58	37	214	31	1,971
auk sp.			32	13	271	5	41	362
Total	4,123	3,842	567	304	357	555	256	10,004

Table 31 - Number of birds counted during aerial survey of the Thames survey blocks, Period 5

Species	TH1	TH2	TH3	TH4	TH5	Total
Common Scoter					7	7
Fulmar					12	12
Gannet					20	20
Cormorant	9					9
Cormorant/Shag	12					12
wader sp.	236					236
small wader sp.	1				1	2
Black-headed Gull	4				1	5
Lesser black-backed Gull	1				3	4
Herring Gull	6				4	10
Great Black-backed Gull					5	5
Kittiwake					8	8
grey gull spp	20				5	25
black-backed gull spp	2				4	6
large gull sp.	8				48	56
small gull sp.	1					1
gull sp.	82				11	93
Sandwich Tern	2					2
tern sp.	19				1	20
auk sp.					16	16
Total	403				146	549

Table 32 - Number of birds counted during aerial survey of the Thames survey blocks, Period 6

Species	TH1	TH2	TH3	TH4	TH5	Total
Brent Goose	2					2
Shelduck	7				5	12
Common Scoter	8				46	54
Fulmar	2				4	6
Gannet	21				7	28
Cormorant	25					25
Cormorant/Shag	1					1
Oystercatcher	2					2
small wader sp.	1					1
Great Skua	1					1
Black-headed Gull	9				2	11
Common Gull	2					2
Lesser black-backed Gull	17				35	52
Herring Gull	90				2	92
Kittiwake	1				25	26
grey gull spp	4					4
black-backed gull spp	9				19	28
large gull sp.	20				50	70
gull sp.	340				22	362
Sandwich Tern	9				2	11
Arctic/Common Tern	42					42
tern sp.	42				12	54
Feral Pigeon	17					17
Total	672				231	903

Table 33 - Number of birds counted during aerial survey of the Thames survey blocks, Period 7

Species	TH1	TH2	TH3	TH4	TH5	Total
Fulmar			76	8	12	96
Gannet	4		78	9	61	152
Cormorant	29					29
Cormorant/Shag	2			1		3
Oystercatcher	1,226					1,226
wader sp.	5					5
Arctic Skua					2	2
Great Skua	2		1			3
skua sp.			1			1
Black-headed Gull	172			13	28	213
Common Gull			2	2		4
Lesser black-backed Gull			2	89	5	96
Herring Gull	30			6	9	45
Great Black-backed Gull	4				3	7
Kittiwake			5	17	24	46
grey gull spp	45				8	53
black-backed gull spp	2		1	13	44	60
large gull sp.	32		2	32	5	71
small gull sp.	3		10	21	12	46
gull sp.	269		5	232	261	767
Sandwich Tern				5		5
Arctic/Common Tern	13			21	22	56
tern sp.	51		11	31	42	135
auk sp.	2		55		259	316
Total	1,891		249	500	797	3,437

Table 34 - Number of birds counted during aerial survey of the Greater Wash survey block GW4, September 2005

Species	Total
Common Scoter	67
Fulmar	36
Manx Shearwater	2
Gannet	57
Cormorant	29
Curlew	1
Arctic Skua	1
Great Skua	1
skua sp.	1
Black-headed Gull	22
Common Gull	1
Lesser black-backed Gull	17
Kittiwake	29
grey gull spp (Herring or Common)	9
black-backed gull spp	213
large gull sp.	6
gull sp.	5
Arctic/Common Tern	18
tern sp.	7
auk sp.	241
passerine sp.	2
Total	765

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