BTO Research Report No. 510

UK population estimates from the 2007 Breeding Little Ringed Plover and Ringed Plover Surveys

Authors

G.J. Conway, N.H.K. Burton, M. Handschuh and G.E. Austin

Report of work carried out by The British Trust for Ornithology under contract to Natural England, Scottish Natural Heritage, the Countryside Council for Wales, the Environment & Heritage Service (Northern Ireland), Anglian Water and the D'Oyly Carte Charitable Trust

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EXECUTIVE SUMMARY

1. This report summarises the results of the 2007 Breeding Little Ringed Plover *Charadrius dubius* and Ringed Plover *C. hiaticula* surveys and provides new population estimates for the two species in the United Kingdom and its constituent countries. The surveys were the first country-wide surveys of these two species since 1984.

2. Population estimates were derived by combining counts of pairs of plovers from 'Key Sites' and estimates for the numbers of pairs breeding away from these sites derived from stratified sampling. The surveys covered the constituent countries of the United Kingdom (England, Northern Ireland, Scotland, Wales), plus the Crown Dependencies of the Channel Islands and Isle of Man. Key Sites were defined as the tetrads (2 × 2 km squares) encompassing sites that were known, either from recent bird reports or the 1984 surveys, to have been previously occupied by the species. The new population estimates (and associated thresholds) for each species will become official once the scientific paper to be derived from this report is accepted for publication.

3. The surveys were run through the spring of 2007, with sites primarily covered by volunteers, organised by the BTO's Regional Network. For Little Ringed Plover, three visits were made between 15 April to 14 May, 15 May to 14 June and 15 June to 15 July. For Ringed Plover, volunteer observers made two survey visits to each site between 15 April to 14 May and 15 May to 30 June. One-visit censuses were made of Scottish Special Protection Areas (SPAs) designated for Ringed Plover; English SPAs designated for Ringed Plover and Sites of Special Scientific Interest (SSSIs) designated for Little Ringed Plover or Ringed Plover were also covered.

Little Ringed Plover

4. In total, 746 pairs of Little Ringed Plovers were recorded during the surveys. The majority – 585 pairs (78.4%) – were recorded in England, 141 (18.9%) in Wales and 20 (2.7%) in Scotland. No Little Ringed Plover were recorded in Northern Ireland, the Isle of Man or Channel Islands.

5. From the counts, it was estimated that there were 1,115 (95% confidence limits = 1,046-1,181) pairs of Little Ringed Plovers breeding in Great Britain in 2007. As the majority of Little Ringed Plovers still breed in England, it was not possible to produce separate estimates for each constituent country of Great Britain. From this estimate, a new national importance threshold of 11 pairs was also determined for identifying important sites for breeding Little Ringed Plover in Great Britain. The one SSSI currently designated for Little Ringed Plover – the Afon Tywi SSSI in Dyfed – held 59 pairs (5.3% of the national estimate).

6. The new population estimate of 1,115 pairs represents an increase on the total of 608-631 pairs recorded in 1984 and the estimate of 825-1,070 pairs from the 1988-1991 Breeding Atlas. This is in part due to a population increase and range expansion, though also due to the sampling of areas outwith Key Sites.

7. The Little Ringed Plover's core range in Great Britain remains in an area from southeast England, through the Midlands to the northwest, though the species has spread further into Wales, northern England and south and east Scotland since 1984. Numbers have increased particularly in Dyfed and the Central Region of Scotland, and the species is also now recorded in Fife and Grampian.

8. Gravel and sand pits remain the most important habitat for the species in Great Britain, supporting 224 (30.0%) of the pairs recorded, though this is a decline from the 351 (57.7%) of pairs recorded on this habitat in 1984. In contrast, 159 (21.3%) of pairs were recorded on river shingle in 2007, compared to just 11 (1.8%) in 1984. This is mainly a reflection of the species' range expansion into northern and western regions.

Ringed Plover

9. Of 4,232 pairs of Ringed Plovers recorded during the surveys, 2,656 (62.8%) were recorded in Scotland, with 1,184 (28.0%) in England, 214 (5.1%) in Wales, 62 (1.5%) in Northern Ireland and 116 (2.7%) in the Isle of Man. No pairs were recorded in 2007 in the Channel Islands.

10. An estimated 5,291 (95% confidence limits = 5,106-5,478) pairs of Ringed Plovers bred in Great Britain in 2007 and 5,438 (5,257-5,622) pairs in the United Kingdom. Separate estimates are also provided for England, Wales, Scotland, Northern Ireland and the Isle of Man. The new national importance threshold for breeding Ringed Plover in Great Britain is 53 pairs; the percentages of the estimated national population held on each SPA and SSSI designated for the species are shown.

11. Comparison of population estimates for Ringed Plover indicates a large decline since 1984 when an estimated 8,483 and 8,617 pairs bred in Great Britain and the United Kingdom respectively. Declines are also apparent in an earlier comparison of changes on individual sites surveyed in both 1984 and 2007 (Burton & Conway 2008; see Appendix 1), with the largest decreases apparent at inland sites and in England and Scotland.

12. The core of the Ringed Plover's breeding distribution in the United Kingdom remains in Scotland, with 1,008 pairs being recorded in the survey of the Uists and Benbecula alone (23.8% of the pairs recorded; see also Conway *et al.* 2008). Aside from machair, other important habitats were coastal shingle and coastal sand, these habitats supporting (outwith the Uists and Benbecula) 38.5% and 13.7% of the pairs recorded.

1. INTRODUCTION

The 2007 Breeding Little Ringed Plover *Charadrius dubius* and Ringed Plover *C. hiaticula* Surveys were the first United Kingdom-wide surveys of these two species since 1984.

The first pair of Little Ringed Plovers in the United Kingdom nested at Tring Reservoirs in 1938. Breeding numbers have increased steadily since, accompanied by a range expansion to the north and west. A total of 467 pairs was recorded in Great Britain in 1973 (Parrinder & Parrinder 1975) and 608-631 in 1984 (Parrinder 1989). The latest population estimate available, in the BTO *New Atlas of Breeding Birds*, is 825-1,070 summering pairs for the 1988-91 period (Gibbons *et al.* 1993), though this was based on the assumption that the density per occupied 10-km square was unchanged since 1984.

A 1973-74 survey estimated a minimum total of 5,700 pairs of Ringed Plovers in Great Britain, though coverage was poor in Scotland (Prater 1976). In 1983-84, detailed survey work in the Outer Hebrides (Western Isles), Shetland and Orkney revealed much larger numbers of the species than previously estimated. This survey provided the present United Kingdom population estimate of 8,617 pairs (Great Britain = 8,483 pairs) about two thirds of which bred in Scotland (Prater 1989) and over 25% in the Outer Hebrides (Fuller *et al.* 1986). The 1988-91 Breeding Bird Atlas indicated a small spread from the coast to inland sites, particularly in eastern and central England, between 1968-72 and 1998-91 (Gibbons *et al.* 1993); no attempt was made to update the population estimate at that time.

Since 1984, there have been some local population declines of Ringed Plover – notably in the stronghold of the Outer Hebrides where several Charadrii wader species have suffered greatly from egg predation by introduced Hedgehogs *Erinaceus europaeus* (Jackson & Green 2000, Jackson *et al.* 2004). Due to habitat preferences, Ringed Plover nests in the Outer Hebrides are not as vulnerable to Hedgehogs as those of other wader species; nonetheless the species underwent a substantial decline between the early 1980s and 2000 for reasons that are not clear (Fuller & Jackson 1999, Jackson *et al.* 2004). Breeding Ringed Plover are very susceptible to human disturbance, especially on narrow beaches and this can impact numbers locally (Liley 1999, Tratalos *et al.* 2005, Liley & Sutherland 2007). With apparently increasing recreational use of beaches, and proposals for improved coastal access in England and Wales, this factor could assume national conservation significance for the species.

The Ringed Plover is now on the UK Birds of Conservation Concern Amber list (Gregory *et al.* 2002), primarily due to the European importance of and decline in the United Kingdom non-breeding population. The United Kingdom breeding population also represents a considerable proportion of the present population estimate of 73,000 birds for the nominate subspecies (Wetlands International 2006). It is thus important that the national breeding population should also be monitored on a regular basis.

The main objectives of the 2007 Breeding Little Ringed Plover and Ringed Plover Surveys were thus to obtain updated population estimates for the two species in the United Kingdom and its constituent countries. These new estimates are reported here, together with comparisons to the previous 1984 surveys and updated thresholds for identifying sites of national (GB) importance. The new figures will become official once the scientific paper to be derived from this report is accepted for publication.

The 2007 surveys also aimed to census all Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs) designated for their importance for breeding Little Ringed Plover or Ringed Plover. Information on the populations of breeding Ringed Plovers on the four Scottish SPAs designated for the species has been reported separately to Scottish Natural Heritage (Conway *et al.* 2008), but is repeated here together with information from designated sites in England.

The surveys additionally aimed to provide data on the breeding habitats presently used by the two species in the United Kingdom.

2. METHODS

2.1 Coverage and Field Methods

The 2007 surveys were organised through the BTO's Regional Network. For each species, individual forms were produced for each survey site with a map of the survey tetrad (a 2 × 2 km square) to be covered. Observers were asked to record the numbers of adults and breeding pairs present on each visit (and plot registrations on the map) and estimate the total number of breeding pairs over the course of the visits and assign these to habitat classes. If not all the area was surveyed, observers were asked to map or estimate the percentage area covered.

For Little Ringed Plover, three visits were made between 15 April to 14 May, 15 May to 14 June and 15 June to 15 July.

For Ringed Plover, volunteer observers made two survey visits to each site between 15 April to 14 May and 15 May to 30 June.

The 2007 surveys also aimed to ensure as complete coverage as possible of those SPAs and SSSIs designated for breeding Little Ringed Plover or Ringed Plover. Only one SSSI is currently designated for Little Ringed Plover – the Afon Tywi SSSI in southwest Wales. For Ringed Plover, the survey included four SPAs in Scotland: the North Uist Machair and Islands (4,876 ha) and South Uist Machair and Lochs (5,017 ha) in the Outer Hebrides, Sleibhtean agus Cladach Thiriodh (Tiree Wetlands and Coast) (1,939 ha) and Papa Stour (569 ha) in Shetland (Stroud *et al.* 2001). In England, the Colne Estuary and North Norfolk Coast SPAs, and the Chesil & The Fleet, Dengie, Hamford Water and North Solent SSSIs were also surveyed.

In Scotland, a single visit was made to census each SPA between 23 May and 06 June 2007, following the methods of Reed and Fuller (1983). Further details of the methodology are given in Fuller *et al.* (1986) and Fuller and Jackson (1999). All visits were made on mild, dry days with little wind, starting at least one hour after sunrise and finishing one hour before sunset.

For Tiree and Papa Stour a 1:7,500 scale map of each tetrad was provided onto which the location of each bird, their sex, if determined, and activity was plotted. For the Uists, birds were plotted on 1:10,000 scale maps, covering the SPAs and a substantial extra area of suitable breeding habitat (including Benbecula). Here, virtually the entire area of 'machair' was covered, together with areas of adjacent 'blackland' allowing comparisons with previously published surveys (Jackson *et al.* 2004).

Observers were required to survey all areas of potentially suitable breeding habitat within the SPA boundary, defined as areas with bare or sparsely vegetated ground near water, on the coast or inland, with landowners' permission, if off public rights of way.

The censuses of the Scottish SPAs aimed to determine the number of breeding pairs of all wader species present on each site and, for the Uists and Benbecula, other areas also surveyed.

2.2 Survey Design and Data Analysis

The 2007 Breeding Plover Surveys used a dual approach of surveying both a set of '**Key Site**' tetrads and '**Sample Tetrads**'. The latter were covered to provide estimates of the number of plovers away from these Key Sites and thus ensure completeness of the overall population estimates.

2.2.1 Key Sites

Key Sites were defined as the tetrads encompassing sites that were known, either from recent bird reports or the 1984 surveys, to have been previously occupied by the species. (In the 1984 surveys,

sites were defined either by a central grid reference or, for coastal sites surveyed for Ringed Plover, by start and end points of count sections.)

A total of 1,136 Key Sites tetrads were identified for Little Ringed Plover and 4,169 for Ringed Plover, including the areas of all SPAs and SSSIs designated for the species.

Supplementary counts were also received for both species, some from surveys of tetrads covered for the other species. These counts were treated as Key Sites in subsequent analyses. Data from a survey of Little Ringed Plovers in Grampian in 2005 were also used as supplementary records, as this area was not covered for the species in 2007.

2.2.2 Sample Tetrads

The 1984 Ringed Plover survey aimed to census the breeding population of the species in the United Kingdom, though needed to use estimates from sample counts and past data in areas of apparently suitable habitat not fully covered. In contrast, the 1984 Little Ringed Plover survey only provided a minimum estimate of the overall population of the species in the country as there were no attempts to estimate the numbers of pairs away from the sites surveyed.

In order to obtain more complete estimates (with confidence limits) of the total numbers of pairs of the species across Great Britain, Northern Ireland, the Isle of Man and Channel Islands, the 2007 surveys also included data from Sample Tetrads in areas away from the Key Sites.

Samples of tetrads were selected randomly from species-specific stratifications. Use of these stratifications aimed to minimise the magnitude of the confidence limits attached to the resulting population estimates while ensuring that the wide spectrum of habitats in the country was surveyed.

For Little Ringed Plover, the initial stratification was based on freshwater cover data derived from the CEH Land-class 2000 database (Fuller *et al.* 2002), an upland / lowland classification and distribution data derived from the 1984 survey.

For Ringed Plover, the initial stratification was based on the freshwater cover data, the upland / lowland classification and coastal proximity, as well as country or dependency (England, Wales, Scotland, Northern Ireland, the Isle of Man and Channel Islands).

The CEH2000 data cover the whole of the United Kingdom at a 1 km resolution. The freshwater cover data from this dataset were imported into a Geographic Information System (GIS) project, summarised to a tetrad resolution, and re-classified according to percentage water cover into 'No Water', 'Low Water' (>0% but <=5%) and 'High Water' (>5%).

The upland / lowland classification was based on the CEH land-class stratification, which classifies each 1-km square into one of 32 land-class types. For detailed descriptions of land-class types see Benefield & Bunce (1982). Land-class descriptions were used to derive two classes of land characteristic for this survey: primarily upland and primarily lowland (Table 2.2.2.1). For our tetrad stratification a tetrad was considered to be 'upland' if over 25% of it (two to four 1-km^2 units) was classified as upland land-class type, otherwise it was classified as 'lowland'.

For Little Ringed Plover, areas were further split regionally into a 'core area' encompassed by a 30 km buffer around the breeding records from the 1984 survey and the area beyond this but within 200 km of the 1984 breeding distribution. This second 'outer area' represented a region (including lowland parts of Wales and Scotland) where Little Ringed Plover had not been recorded in 1984, though were known to have spread to subsequently (see Gibbons *et al.* 1993), but where densities would have been lower than in the core area.

The majority of Ringed Plovers in the United Kingdom breed on the coast. Thus all tetrads that clipped the coast were classified as 'coastal' while those which did not were classified as 'inland'.

The classifications were superimposed on tetrads to give 12 strata for Little Ringed Plover and a potential 72 for Ringed Plover for the purposes of targeting sampling effort. Key Site tetrads were excluded from the stratification for selection of the Sample Tetrads, and those Key Sites surveyed also excluded from the subsequent extrapolation from the Sample Tetrads surveyed. In total, samples of 1,355 and 1,515 Sample Tetrads were selected from the stratification for Little Ringed Plover and Ringed Plover respectively.

During subsequent analyses, strata were simplified. In the case of Little Ringed Plover, there were only two records from tetrads classified as 'upland' despite extensive sampling. These records were thus subsequently treated as supplementary, and extrapolation of data from Sample Tetrads restricted to lowland habitat. There were no apparent differences between the densities on High Water and Low Water tetrads within the outer area and thus these categories were combined to create a single stratum.

For Ringed Plover, there were no apparent differences between the densities on upland and lowland tetrads except on the coast in Scotland. Thus, inland these categories were combined (within countries). In Scotland, the coastal tetrads were divided into two regional strata – northwest Scotland (from Fort William round to John O'Groats including all islands) and southeast Scotland. Likewise, freshwater cover strata were only retained for inland areas.

The area distributions of tetrads across the final strata used in analyses (outwith Key Sites) are given in Tables 2.2.2.2 and 2.2.2.3 and shown in Figures 2.2.2.1 and 2.2.2.2.

2.3 Data Analysis

Prior to estimation of population sizes, allowance first needed to be made for the number of visits made to each site. For Little Ringed Plover, it was recommended that each site should be visited three times, and for Ringed Plover that sites should be visited twice. As Figure 2.3.1 shows, for both species, the mean number of pairs estimated to occur on a site was less for those only visited once than for those visited more often. This may have been because of the number of visits made or, alternatively, because observers felt the habitat was unsuitable and so didn't make a second visit. There were no differences between the numbers estimated to occur on sites visited twice and those visited three times or more.

To allow for possible under-recording on sites only visited once, a correction factor was thus used. This was calculated for each species by comparing, for those Key Sites or Sample Tetrads visited twice, the numbers recorded on the first visit to the overall number of pairs estimated to occur on a site. A correction factor of 1.21 was calculated for Little Ringed Plover, and a correction factor of 1.37 for Ringed Plover (the correction factor was not applied to the censuses undertaken of Ringed Plovers on Scottish SPAs).

Population sizes for each species were estimated using bootstrap techniques similar to those that have proven successful for estimating national and regional populations of waterbird species (e.g. Rehfisch *et al.* 2002; Rehfisch *et al.* 2003; Jackson *et al.* 2006; Austin *et al.*2007, Banks *et al.* 2007). With 999 repetitions, separate estimates were made of the total population size across Great Britain for Little Ringed Plover (no Little Ringed Plover were recorded in Northern Ireland or the Isle of Man) and in each country or dependency for Ringed Plover (i.e. England, Wales, Scotland, Northern Ireland and the Isle of Man, together with Great Britain and the United Kingdom). (Note, no breeding plovers were recorded on the Channel Islands). Each of these overall estimates was obtained by summation of the total number of individuals recorded across all Key Sites and estimates for each stratum contributing to the country or dependency in question. The latter were derived for each stratum by taking a random sample with replacement from the survey data for the given stratum until the cumulative land area equated to the total for the entire country or dependency assigned to that stratum

outwith the surveyed Key Sites. (Note, assessment of the area covered by Sample Tetrads and Key Sites, and thus the cumulative land area outwith Key Sites for which estimates were required, took into account observers' estimates of the percentage area covered within each tetrad.) With each repetition, an overall estimate for Ringed Plover for Great Britain was obtained by summing the estimates for England, Scotland and Wales; likewise a total for the United Kingdom was obtained by summing the estimates for England, Scotland, Wales and Northern Ireland. The 500th, 25th and 974th ascendant-ordered estimates were used to estimate respectively the median and lower and upper 95% confidence limits for the population in each case.

The population estimates calculated for Great Britain were used to calculate thresholds – rounded 1% levels of the estimates – so that sites of national importance for each species might be identified in future.

3. RESULTS

3.1 Coverage

3.1.1 Forms returned

In total, 70% of the 1,136 Key Sites and 66% of the 1,355 Sample Tetrads were covered for Little Ringed Plover. (These totals exclude counts received as supplementary records.)

For Ringed Plover, 67% of the 4,169 Key Sites and 63% of the 1,515 Sample Tetrads were covered. (Again, these totals exclude counts received as supplementary records.)

3.1.2 Coverage by area

Coverage of Sample Tetrads by the different strata used for Little Ringed Plover and Ringed Plover is summarised in Tables 3.1.2.1 and 3.1.2.2.

For Little Ringed Plover, the best coverage (in percentage terms) was obtained for the stratum with high freshwater cover in the core area of the species' distribution. A higher absolute area was covered in the stratum with low freshwater cover in the core area.

For Ringed Plover, best coverage (in percentage terms) was obtained for coastal strata, particularly in Northern Ireland, Wales and the Isle of Man. In inland areas, good coverage was obtained for strata with high freshwater cover, particularly in England. No Ringed Plover were recorded on Sample Tetrads in inland strata in Northern Ireland, Wales and the Isle of Man and thus no extrapolation was made in these cases. The highest absolute area covered was in the inland stratum with low freshwater cover in England.

Although good number of tetrads were covered in inland strata, percentage coverage for Ringed Plover was low in (no or low freshwater cover) inland strata, particularly in Scotland, due to the extent of these habitats. Confidence limits on population estimates may thus have been reduced in these strata, as small samples may not fully captured actual variation.

3.2 Population Estimates and Thresholds

In total, 746 pairs of Little Ringed Plovers and 4,232 pairs of Ringed Plovers were recorded during the 2007 surveys (the former included data from the census in Grampian in 2005). Totals by county and habitat are summarised in Tables 3.2.1 and 3.2.2.

The new population estimates calculated for each species are provided in Table 3.2.3.

The total numbers of pairs of Little Ringed Plover and Ringed Plover recorded on the SPAs or SSSIs for which the species are designated features are summarised in Table 3.2.4, together with the percentages of the species' national population estimates that these figures represent.

3.2.1 Little Ringed Plover

The majority – 585 (78.4%) – of pairs of Little Ringed Plover were recorded in England, though the species has spread since 1984. In total, 141 (18.9%) and 20 (2.7%) pairs were recorded in Wales and Scotland respectively, though none in Northern Ireland, the Isle of Man or Channel Islands (Table 3.2.1). The species' present distribution is summarised in Fig. 3.2.1.1.

Most Little Ringed Plover pairs were recorded on either gravel or sand pits (30.0% of pairs) or river shingle (21.3%). Reservoirs (9.8%), lake shores (7.1%) and pools (5.6%), as well as varied industrial / urban habitats were also important for the species (Table 3.2.2).

Previous surveys used such raw counts to provide minimum population estimates, but here, for the first time, more comprehensive population estimates have been generated by combining counts from 'Key Sites' and estimates of the numbers of pairs breeding away from these sites derived from stratified sampling.

This approach indicated that there were 1,115 (95% confidence limits = 1,046-1,181) pairs of Little Ringed Plovers breeding in Great Britain in 2007 (Table 3.2.3). As the majority of Little Ringed Plovers still breed in England, it was not possible to produce separate estimates for each constituent country of Great Britain.

From the new population estimate, a new national importance threshold of 11 pairs was determined for identifying important sites for breeding Little Ringed Plover in Great Britain. The one SSSI currently designated for breeding Little Ringed Plover – the Afon Tywi SSSI in southwest Wales – held 59 pairs (Table 3.2.4).

The international importance threshold for the species is 2,500 individuals (Wetlands International 2006) which by far exceeds the total for the United Kingdom as a whole.

3.2.2 Ringed Plover

The majority – 2,656 (62.8%) – of pairs of Ringed Plover were recorded in Scotland, with 1,184 (28.0%) in England, 214 (5.1%) in Wales, 62 (1.5%) in Northern Ireland and 116 (2.7%) in the Isle of Man (Table 3.2.1). No pairs were recorded in 2007 in the Channel Islands. The species' present distribution is summarised in Fig. 3.2.2.1

The core of the Ringed Plover's breeding distribution in the United Kingdom remains in Scotland, with 1,008 pairs being recorded in the survey of the Uists and Benbecula alone (23.8% of the pairs recorded; see also Conway *et al.* 2008). Aside from machair, other important habitats were coastal shingle and coastal sand, these habitats supporting (outwith the Uists and Benbecula) 38.5% and 13.7% of the pairs recorded (Table 3.2.2).

An estimated 5,291 (95% confidence limits = 5,106-5,478) pairs of Ringed Plovers bred in Great Britain in 2007 and 5,438 (5,257-5,622) pairs in the United Kingdom (excluding the Isle of Man and Channel Islands) as a whole. Table 3.2.3 also provides separate estimates for England, Wales, Scotland, Northern Ireland and the Isle of Man.

From the new population estimate, a new national importance threshold of 53 pairs has been determined for identifying important sites for breeding Ringed Plover in Great Britain. Of the six SPAs designated for breeding Ringed Plover, five (all four in Scotland and the North Norfolk Coast) held more than 1% of the national population estimate in 2007.

The international importance threshold for the *hiaticula* subspecies (breeding in Iceland, the Baltic and south Scandinavia to Britain, Ireland and France) is 730 individuals (Wetlands International 2006). This figure is exceeded only by the 375 pairs on the South Uist Machair and Lochs SPA.

The present all-Ireland population estimate for Ringed Plover is 1,250 pairs (Gibbons *et al.* 1993). As the estimated number of pairs breeding in Northern Ireland changed little between 1984 and 2007 (Table 3.2.3), there is presently no reason for this to be revised.

4. DISCUSSION

4.1 Coverage and Assessment of Survey Methodology

It is difficult to directly compare the coverage obtained by the 2007 and 1984 surveys due to the different methods used (i.e. coverage of tetrads in 2007 versus sites in 1984).

The 1984 Little Ringed Plover survey reported 608-631 pairs from 370 sites (Parrinder 1989). A total count in 2007 of 746 pairs on 399 (occupied) tetrads (plus the Grampian census area) suggests a similar return. The inclusion of Sample Tetrads among these, though, meant that the 2007 survey was able to provide a more complete population estimate. In total, the overall coverage of 68% of Key Site tetrads and Sample Tetrads indicates an encouraging return.

The 1984 Ringed Plover survey did not provide figures on the number of sites covered, so the same comparison is not possible. In 2007, the 4,232 pairs recorded occupied 1,153 tetrads. The overall coverage of Key Site tetrads and Sample Tetrads was 66%, a similar proportion to that for Little Ringed Plover.

Although 66% and 63% of selected Sample Tetrads were surveyed for Little Ringed Plover and Ringed Plover respectively, the large areas of land included in some strata meant that proportionally little of the total area was surveyed. This was most notably the case for Ringed Plover for inland strata with no or low freshwater cover in Scotland. For these strata, confidence limits around estimates may be artificially tight and increased sampling would be perhaps needed in a future survey to capture the full extent of variation. This effect would perhaps have been exacerbated by the low numbers of birds recorded in inland areas in 2007.

Overall, however, the design of the survey and the methodology employed can be considered an improvement on previous breeding plover surveys. Coverage of Key Sites was good, though the differences between the raw totals counted and the population estimates demonstrated the need for the additional sampling approach. Although the initial stratification used for selecting Sample Tetrads was simplified for analyses, different strata were still required to account for varying densities of both species. A perennial problem exists with ensuring representative coverage of inland strata, particularly in Scotland, where plover densities away from well-known (i.e. key) sites may be low. Coverage in Scotland was increased by employing professional surveyors to cover some more remote areas. However, the decline of Ringed Plover since 1984 meant that densities of this species were even lower than expected and few positive records were obtained on inland Sample Tetrads in Scotland.

4.2 Population Estimates and Thresholds

4.2.1 Little Ringed Plover

For Little Ringed Plover, the new population estimate of 1,115 pairs represents an increase on the total of 608-631 pairs recorded in 1984 (Parrinder 1989) and the estimate of 825-1,070 pairs from the 1988-1991 Breeding Atlas (Gibbons *et al.* 1993). This is in part due to a population increase and range expansion, though also due to the sampling of areas outwith Key Sites.

The Little Ringed Plover's core range in Great Britain remains in an area from southeast England, through the Midlands to the northwest, though the species has spread further into Wales, northern England and south and east Scotland since 1984. The 1988-1991 Breeding Atlas (Gibbons *et al.* 1993) revealed pairs in Dyfed (on the Afon Tywi SSSI) and a few in the Central Region of Scotland. Numbers in both areas have increased – substantially in Dyfed (Stewart 2006) – and the species is also now recorded in Fife and Grampian.

It is possible that the numbers of Little Ringed Plover breeding in 2007 and thus the new population estimate may have been impacted by the poor weather during the spring. High water levels at a

number of sites reduced the extent of the open fringes around waterbodies typically used for foraging and often used as breeding sites. Alternatively, though, this may have led to greater movements between sites and perhaps to double counting of the same individuals / pairs.

The development of vegetation on previously open habitat meant that several sites holding pairs in 1984 (or during Atlas fieldwork in 1988-1991) were no longer suitable for Little Ringed Plover. More recently occupied sites, for example, those created by new aggregate workings, were identified prior to the survey from county bird reports. Data for other new sites were also obtained during the survey as supplementary records. Gravel and sand pits remain the most important habitat for the species in Great Britain, supporting 224 (30.0%) of the pairs recorded, though this is a decline on the 351 (57.7%) of pairs in 1984. In contrast, 159 (21.3%) of pairs were recorded on river shingle in 2007, compared to just 11 (1.8%) in 1984. This is mainly a reflection of the species' range expansion into northern and western regions. It is interesting to note that the expansion of Little Ringed Plovers into river shingle habitats in these areas has occurred while numbers of Ringed Plover have been declining in inland habitats (see Appendix 1).

Many of the species' preferred breeding habitats remain temporary in nature – for example, those created at aggregate workings. This partly explains why only one site – the Afon Tywi SSSI (which supported 5.3% of the national population in 2007) – is currently designated for the species. However, there are many more sites which are used year on year, including several where habitat is managed by conservation bodies, and the importance of these sites for the species should be recognised. The new threshold developed from this survey should help in this respect.

4.2.2 Ringed Plover

The population of Ringed Plover, in contrast to that of Little Ringed Plover, has undergone a severe decline since 1984. An estimated 5,291 and 5,438 pairs bred in Great Britain and the United Kingdom respectively in 2007, compared to 8,483 and 8,617 pairs in 1984. Comparison of estimates for individual countries and dependencies suggests that the greatest declines have occurred in England and Scotland, but that populations were more stable in Wales, Northern Ireland and the Isle of Man. These comparisons might underestimate the true declines, though, if the limited sampling approach used in the 1984 survey underestimated numbers outwith the sites surveyed.

A comparison of changes on individual sites surveyed in both 1984 and 2007 (taken from Burton & Conway 2008) in Appendix 1 provides an alternative depiction of the extent of change. The overall pattern is again one of decline, with the largest decreases at inland sites. The difference between inland and coastal sites could potentially be an artefact, however, resulting from a potentially greater turnover in suitable breeding habitat in inland areas and thus the changes reported for inland sites should be treated with a degree of caution.

On coastal sites surveyed both in 1984 and 2007, declines of 43%, 38% and 50% occurred in England, Scotland and Northern Ireland respectively. In Wales and the Isle of Man, there were lesser declines of just 6% and 9% respectively. Note, for Scotland, this comparison excludes data from North Uist, South Uist and Benbecula – changes in these important areas are reported more fully in Conway *et al.* (2008). Inland, declines of 76%, 63% and 100% occurred in England, Scotland and Northern Ireland respectively. No Ringed Plovers were recorded at inland sites in Wales and the Isle of Man that were surveyed both in 1984 and 2007.

In addition to the difference in change between inland and coastal sites, some further broad patterns of change are apparent from this site-based comparison. In agreement with the comparison of population estimates, declines were greatest in England and Scotland (excluding North Uist, South Uist and Benbecula), and least in Wales and the Isle of Man. However, the site-based comparison also suggests that there were large declines in Northern Ireland. Within England, declines were greater in the south and east of England and the only increases were noted in west and north (Avon, Cheshire, Lancashire, Cumbria and Tyne and Wear).

The reasons for the species' decline in the UK are likely to have been varied. Disturbance is a particular problem for breeding Ringed Plovers, though may have been more of a factor in the decline of the species on coastal sites (see below). In inland areas, habitat change might have been important. Notably, vegetation growth could have led to losses of Ringed Plovers from both lowland sites, such as gravel pits, and upland sites, such as river shingles (the latter perhaps associated with decreasing river flows following spring snow melt: N. Buxton *pers. comm.*). However, given that the inland habitat preferences of the species are not dissimilar to those of the Little Ringed Plover and that the population of the latter has increased, the importance of this factor is unclear. The United Kingdom is towards the southern edge of the species' breeding range and the greater declines seen in the south and east of England would suggest a range contraction, feasibly associated with increasing summer temperatures.

As in the 1984 survey, key habitats for Ringed Plover in 2007 were machair, coastal shingle and coastal sand, the latter two habitats respectively supporting 38.5% and 13.7% of the pairs recorded outwith the Uists and Benbecula.

Scottish SPAs continue to be particularly important for the species, holding between 1.3% and 7.1% of the estimated national (Great Britain) population and 15.6% in total. A decline of 53% (from 2,047 to 954 pairs) was previously reported between 1983 and 2000 in the machair and associated coastal habitats of the Uists and Benbecula (Jackson *et al.* 2004). The decline in numbers of Ringed Plover there has been associated with egg predation by introduced Hedgehogs, though this is perhaps less of a factor than it is for other wader species (see also Jackson & Green 2000).

English SPAs also remain important for the species, the most important single site being the North Norfolk Coast SPA, which held 3.7% of the estimated national population in 2007. In Norfolk as a whole, Rooney & Eve (1993) previously reported an overall decline of 23% (from 541 to 419 pairs) between the 1984 national survey and a county survey in 1993. Numbers fell by 23% on beach and sand dune habitats, where the majority of the county population occurs and much of which are encompassed by the SPA. Disturbance at coastal sites, associated with recreation (Liley 1999, Tratalos *et al.* 2005, Liley & Sutherland 2007), is likely to remain a key problem for Ringed Plover, especially in light of the proposals for improved coastal access in England and Wales.

Acknowledgements

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References

Austin, G.E., Rehfisch, M.M. Allan J.R. & Holloway, S.J. (2007). Population size and differential population growth of introduced Greater Canada *Branta canadensis* and re-established Greylag Goose *Anser anser* across habitats in Great Britain in the year (2000). *Bird Study* **54**: 343-352.

Banks, A.N., Burton, N.H.K., Calladine, J.R. & Austin, G.E. 2007. *Winter gulls in the UK: population estimates from the 2003/04-2005/06 Winter Gull Roost Survey*. BTO Research Report No. 456 to English Nature (now Natural England), the Countryside Council for Wales, Scottish Natural Heritage, the Environment & Heritage Service (Northern Ireland), the Joint Nature Conservation Committee and Northumbrian Water Ltd. BTO, Thetford.

Benefield, C.B. & Bunce, R.G.H. (1982). *A Preliminary Visual Presentation of Land Classes in Britain*. Merlewood Research and Development Paper No. 91. Institute of Terrestrial Ecology, Grange-over-Sands.

Burton, N.H.K. & Conway, G.J. (2008). *Assessing population change of breeding Ringed Plovers in the UK between 1984 and 2007*. BTO Research Report No. 503 to the Joint Nature Conservation Committee. BTO, Thetford.

Conway, G., Burton, N. & Fuller, R. (2008). *Breeding Plover Survey for Common Standards Monitoring in Scotland, 2007: assessments of changes in numbers of breeding waders on SPAs designated for breeding Ringed Plovers* Charadrius hiaticula. Report to Scottish Natural Heritage.

Fuller, R.M., Smith, G.M., Sanderson, J.M., Hill, R.A., Thomson, A.G., Cox, R., Brown, N.J., Clarke, R.T., Thothery, P. & Gerard, F.F. (2002). *Countryside Survey 2000 Module 7 Land Cover Map 2000*. Centre for Ecology and Hydrology, UK.

Fuller, R.J., Reed, T.M., Buxton, N.E., Webb, A., Williams, T.D. & Pienkowski, M.W. (1986). Population of breeding Waders Charadrii and their habitats on the Crofting Lands of the Outer Hebrides, Scotland. *Biological Conservation* **37**: 333-361.

Fuller, R.J. & Jackson, D.B. (1999). Changes in populations of breeding waders on the Machair of North Uist, Scotland 1983-1998. *Wader Study Group Bulletin* **90**: 47-55.

Gibbons, D.W., Reid, J.B. & Chapman, R.A. (1993). The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991. London: Poyser.

Gregory, R.D., Wilkinson, N.I., Noble, D.G., Robinson, J.A., Brown, A.F., Hughes, J., Procter, D, Gibbons, D.W. & Galbraith, C.A. (2002). The population status of birds in the United Kingdom, Channel Islands, and Isle of Man. *British Birds* **95**: 410-448.

Jackson, D.B., Fuller, R.J. & Campbell, S.T. (2004). Long-term population changes among breeding shorebirds in the Outer Hebrides, Scotland, in relation to introduced Hedgehogs (*Erinaceus europaeus*). *Biological Conservation* **117**: 151-166.

Jackson, D.B. & Green, R.E. (2000). The importance of the introduced Hedgehog (*Erinaceus europaeus*) as a predator of the eggs of waders (Charadrii) on machair in South Uist, Scotland. *Biological Conservation* **93**: 333-348.

Jackson, S.F., Austin, G.E. & Armitage, M.J.S. (2006). Surveying waterbirds away from major waterbodies: implications for waterbird population estimates in Great Britain. *Bird Study* **53**: 105-111.

Liley, D. (1999). *Predicting the consequences of human disturbance, predation and sea-level rise for Ringed Plover populations*. PhD thesis, University of East Anglia.

Liley, D. & Sutherland, W.J. (2007). Predicting the consequences of human disturbance, predation and sea-level rise for Ringed Plovers *Charadrius hiaticula*: a game-theory approach. *Ibis* **149** (suppl. 1): 82-94.

Parrinder, E.R. & Parrinder E.D. (1975) Little Ringed Plovers In Britain in 1968-73. *British Birds* **68**: 359-368.

Parrinder, E.D. (1989). Little Ringed Plovers *Charadrius dubius* in Britain in 1984. *Bird Study* **36**: 147-153.

Prater, A.J. (1976). Breeding population of the Ringed Plover in Britain. *Bird Study* **23**: 155-161.

Prater, A.J. (1989). Ringed Plover *Charadrius hiaticula* breeding population of the United Kingdom in 1984. *Bird Study* **36**: 154-159.

Reed, T.M. & Fuller, R.J. (1983). Methods used to assess populations of breeding waders on Machair in the Outer Hebrides. *Wader Study Group Bulletin*, **39**: 14-16.

Rehfisch, M.M., Austin, G.E., Holloway, S.J., Allan, J.R. & O'Connell, M. (2002). An approach to the assessment of change in the numbers of Canada Geese *Branta canadensis* and Greylag Geese *Anser anser* in southern Britain. *Bird Study* **49**: 50-59.

Rehfisch, M.M., Holloway, S.J. & Austin, G.E. (2003). Population estimates of waders on the non-estuarine coasts of the UK and Isle of Man during the winter of 1997-98. *Bird Study* **50**: 22-32.

Rooney, M.E.S. & Eve, V. (1993). *The number, distribution and breeding success of the Ringed Plover in Norfolk 1993*. Norfolk Coast Project / RSPB.

Stewart, B. (2006). *Survey of Little Ringed Plovers, and an experiment to test whether protection of nests increases hatching success, on Afon Tywi SSSI.* CCW Regional Report CCW/WS02885.

Stroud, D.A., Chambers, D., Cook, S., Buxton, N., Fraser, B., Clement, P., Lewis, P., McLean, I., Baker, H. & Whitehead, S. (2001). *The UK SPA Network: Its Scope and Content*. Joint Nature Conservation Committee, Peterborough.

Tratalos, J.A., Gill, J.A., Jones, A., Showler, D., Bateman, A., Watkinson, A., Sugden, R. & Sutherland, W. (2005). *Interactions between tourism, breeding birds and climate change across a regional scale*. Tyndall Centre Technical Report 36. Tyndall Centre for Climate Change Research.

Wetlands International. (2006). *Waterbird population estimates – fourth edition.* Wetlands International, Wageningen, The Netherlands.

Land type classification for the 2007 Breeding Plover Surveys	ITE Landclass Type
Lowland Land-class Types	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 25, 26, 27
Upland Land-class Types	17, 18, 19, 20, 21, 22, 23, 24, 28, 29, 30, 31, 32

Table 2.2.2.1. Land-class types used to assign tetrads to lowland and upland categories.

See Benefield & Bunce (1982) for detailed descriptions of land-class types.

Inland Freshwater Cover	**Region**	
(from CEH2000)	Core area (within 30 km of 1984 records)	Outer area
None	INL 74,776	ONL 40,681
Low (<=5%)	ILL 20,166	
High (>5%)	IHL 1,426	OXL 8,227

Table 2.2.2.2 Area (km^2) distribution across the five-class stratification used for Little Ringed Plover in Great Britain. Note these figures exclude sites covered as Key Sites; no Little Ringed Plovers were recorded in Northern Ireland, the Isle of Man or the Channel Islands. Freshwater coverage is classified as None, Low or High based on the percentage coverage for the four 1 km grid squares comprising the tetrad as recorded in the CEH2000 Land Classification. Sample data were only extrapolated across lowland habitat. INL = In Core Area, No Water; ILL = In Core Area, Low Water; ILL = In Core Area, Low Water; ONL = Outer Area, No Water; OXL = Outer Area, Low or High Water.

Country	**Inland Freshwater Cover** (from CEH2000)	**Region**	
		Coastal	Inland
England	None		ENIN 98,025
England	Low (<=5%)	ENCX 3,979	ENIL 23,226
England	High (>5%)		ENIH 2,134
Wales	All	WACX 1,235	-
Scotland	None		SCIN 46,343
Scotland	Low (<=5%)	SCLCX 2,525	SCIL 15,584
Scotland	High (>5%)	SCHCX 4,788	SCIH 5,358
Northern Ireland	All	NICX 510	-
Isle of Man	All	IMCX 80	-

Table 2.2.2.3 Area (km^2) distribution across the 12-class stratification used for Ringed Plover in the United Kingdom and Isle of Man. Note these figures exclude sites covered as Key Sites; no Ringed Plovers were recorded in the Channel Islands or, outwith Key Sites, in inland Wales, Northern Ireland or the Isle of Man. Freshwater coverage is classified as None, Low or High based on the percentage coverage for the four 1 km grid squares comprising the tetrad as recorded in the CEH2000 Land Classification. Sample data were only extrapolated across lowland habitat. ENCX = England Coastal; WACX = Wales Coastal; SCLCX = southeast Scotland Coastal; SCHCX = northwest Scotland Coastal; NICX = Northern Ireland Coastal; IMCX = Isle of Man Coastal; ENIN = England Inland No Water; ENIL = England Inland Low Water; ENIH = England Inland High Water; SCIN = Scotland Inland No Water; SCIL = Scotland Inland Low Water; SCIH = Scotland Inland High Water.

Stratum	Area targeted (km^2)	Area covered (km^2)	Sampled (%)
INL	74773.9	504.7	0.7
ILL	20162.1	1277.2	6.3
IHL	1426.3	247.6	17.4
ONL	40681.4	300.8	0.7
OXL	8226.9	711.7	8.7

Table 3.1.2.1 Coverage of all Sample Tetrads by stratum for Little Ringed Plover. INL = tetrads in the core area with no freshwater; ILL = tetrads in the core area with low freshwater cover; IHL = tetrads in the core area with high freshwater cover; ONL = tetrads in the outer area with no freshwater; OXL = tetrads in the core area with low or high freshwater cover.

Stratum	Area targeted (km^2)	Area covered (km^2)	Sampled (%)
ENCX	3979.2	312.0	7.8
WACX	1234.9	179.3	14.5
SCLCX	2522.0	123.6	4.9
SCHCX	4775.9	237.3	5.0
NICX	510.2	108.0	21.2
IMCX	76.3	11.1	14.6
ENIN	98025.5	867.3	0.9
ENIL	23222.5	232.0	1.0
ENIH	2133.9	150.2	7.0
SCIN	46342.5	192.0	0.4
SCIL	15587.7	120.0	0.8
SCIH	5358.3	99.6	1.9

Table 3.1.2.2 Coverage of all Sample Tetrads by stratum for Ringed Plover. ENCX = coastal tetrads in England; WACX = coastal tetrads in Wales; SCLCX = coastal tetrads in southeast Scotland; SCHCX = coastal tetrads in northwest Scotland; NICX = coastal tetrads in Northern Ireland; IMCX = coastal tetrads in the Isle of Man; ENIN = inland tetrads in England with no freshwater; ENIL = inland tetrads in England with low freshwater cover; ENIH = inland tetrads in England with high freshwater cover; SCIN = inland tetrads in Scotland with no freshwater; SCIL = inland tetrads in Scotland with low freshwater cover; SCIH = inland tetrads in Scotland with high freshwater cover.

County	Little Ringed Plover	Ringed Plover
ENGLAND	**585**	**1,184**
Avon	3	11
Bedfordshire	13	12
Berkshire	29	4
Buckinghamshire	0	1
Cambridgeshire	18	3
Cheshire	29	13
Cleveland	5	38
Cornwall	0	0
Cumbria	11	159
Derbyshire	42	4
Devon	1	3
Dorset	1	18
Durham	11	7
Essex	12	97
Gloucester	6	0
Greater London	10	1
Greater Manchester	29	14
Hampshire	23	85
Hereford & Worcester	19	0
Hertfordshire	13	2
Humberside	17	22
Isle of Wight	0	0
Isles of Scilly	0	16
Kent	13	101
Lancashire	29	31
Leicestershire	23	2
Lincolnshire	15	69
Merseyside	8	34
Norfolk	8	278
North Yorkshire	49	18
Northamptonshire	0	0
Northumberland	23	55
Nottinghamshire	12	2
Oxfordshire	19	4
Shropshire	8	0
Somerset	2	6
South Yorkshire	7	4
Staffordshire	11	3
Suffolk	9	38
Surrey	11	1
Sussex	3	20
Tyne and Wear	4	4
Warwickshire	3	0
West Midlands	4	0
West Yorkshire	20	4
Wiltshire	12	0

Table 3.2.1 Numbers of pairs of Little Ringed Plover and Ringed Plover counted during the 2007 surveys by county. Totals were derived from the sums of (Key Site and Sample) tetrad counts; those tetrads that straddled county boundaries were assigned to the county that comprised the majority of the tetrad's area.

WALES	**141**	**214**
Clwyd	5	46
Dyfed	78	20
Gwent	7	4
Gwynedd	4	116
Mid Glamorgan	7	3
Powys	36	0
South Glamorgan	2	2
West Glamorgan	2	23
SCOTLAND	**20**	**2,656**
Borders	3	11
Central	1	7
Dumfries and Galloway	0	55
Fife	2	37
Grampian	8	37
Highland	0	363
Lothian	0	30
Orkney	0	29
Shetland	0	389
Strathclyde	3	477
Tayside	3	37
Western Isles	0	1,184
NORTHERN IRELAND	**0**	**62**
Antrim	0	13
Armagh	0	0
Down	0	48
Fermanagh	0	1
Londonderry	0	0
Tyrone	0	0
ISLE OF MAN	**0**	**116**
TOTAL	**746**	**4,232**

Table 3.2.1 Continued.

Habitat	Little Ringed Plover		Ringed Plover	
Airfield	7	0.9%	38	0.9%
Coastal sand	0	0	581	13.7%
Coastal shingle	0	0	1631	38.5%
Colliery	32	4.3%	22	0.5%
Farmland	12	1.6%	52	1.2%
Gravel or sand pit	224	30.0%	68	1.6%
Lake / loch	53	7.1%	74	1.7%
Machair / other coastal grassland	0	0	108	2.6%
Moor / heath	1	0.1%	208	4.9%
Other industrial	42	5.6%	89	2.1%
Other pits and quarries	30	4.0%	6	0.1%
Other urban sites	7	0.9%	25	0.6%
Pool	63	8.4%	35	0.8%
Refuse site	15	2.0%	11	0.3%
Reservoir	73	9.8%	52	1.2%
River shingle	159	21.3%	82	1.9%
Rocky coast	0	0	24	0.6%
Saltmarsh	2	0.3%	102	2.4%
Sewage works	11	1.5%	0	0
Uist / Benbecula surveys[1]	0	0	1,008	23.8%
Unknown / other	15	2.0%	16	0.4%
TOTAL	**746**		**4,232**	

Table 3.2.2 Numbers of pairs of Little Ringed Plover and Ringed Plover counted during the 2007 surveys by habitat.

[1] Machair, saltmarsh and coastal habitats (a fuller analysis of habitat preferences on the Uists and Benbecula will be reported elsewhere).

	2007		1984
Little Ringed Plover			
Great Britain	1,115	(1,046-1,181)	608-631
Ringed Plover			
England	1,688	(1,588-1,795)	2,389
Wales	254	(237-272)	224
Scotland	3,350	(3,198-3,514)	5,796
Great Britain	5,291	(5,106-5,478)	**8,409**
Northern Ireland	147	(122-177)	134
United Kingdom	5,438	(5,257-5,622)	**8,543**
Isle of Man	147	(135-160)	70
Channel Islands	0		4

Table 3.2.3 Estimated national breeding populations (pairs), with 95% confidence limits, of Little Ringed Plover and Ringed Plover in 2007. For Little Ringed Plover, a single estimate was calculated for Great Britain; for Ringed Plover, estimates were calculated separately for the United Kingdom, its constituent countries, the Channel Islands and Isle of Man. Bracketed figures show lower and upper confidence limits respectively. Comparative population estimates from the 1984 survey are also provided (after Prater 1989).

Species / Site	Pairs	Percentage of GB population
Little Ringed Plover		
Afon Tywi SSSI	59	5.3%
Ringed Plover		
North Uist Machair and Islands SPA[1]	225	4.3%
South Uist Machair and Lochs SPA[1]	375	7.1%
Sleibhtean agus Cladach Thiriodh (Tiree Wetlands and Coast) SPA[1]	156	2.9%
Papa Stour SPA[1]	69	1.3%
Colne Estuary SPA	30	0.6%
North Norfolk Coast SPA	198	3.7%
Chesil & The Fleet SSSI	18	0.3%
Dengie SSSI	6	0.1%
Hamford Water SSSI	30	0.6%
North Solent SSSI	30	0.6%

Table 3.2.4 Numbers of pairs of Little Ringed Plover and Ringed Plover counted on Special Protection Areas (SPAs) and Sites of Special Scientific Interest (SSSIs) designated for the species in Great Britain.

[1] SPAs in Scotland were censused on a single visit between 23 May and 06 June 2007; SPAs and SSSIs in England and Wales were visited twice between 15 April to 14 May and 15 May to 30 June, surveys aiming to cover all suitable nesting habitat.

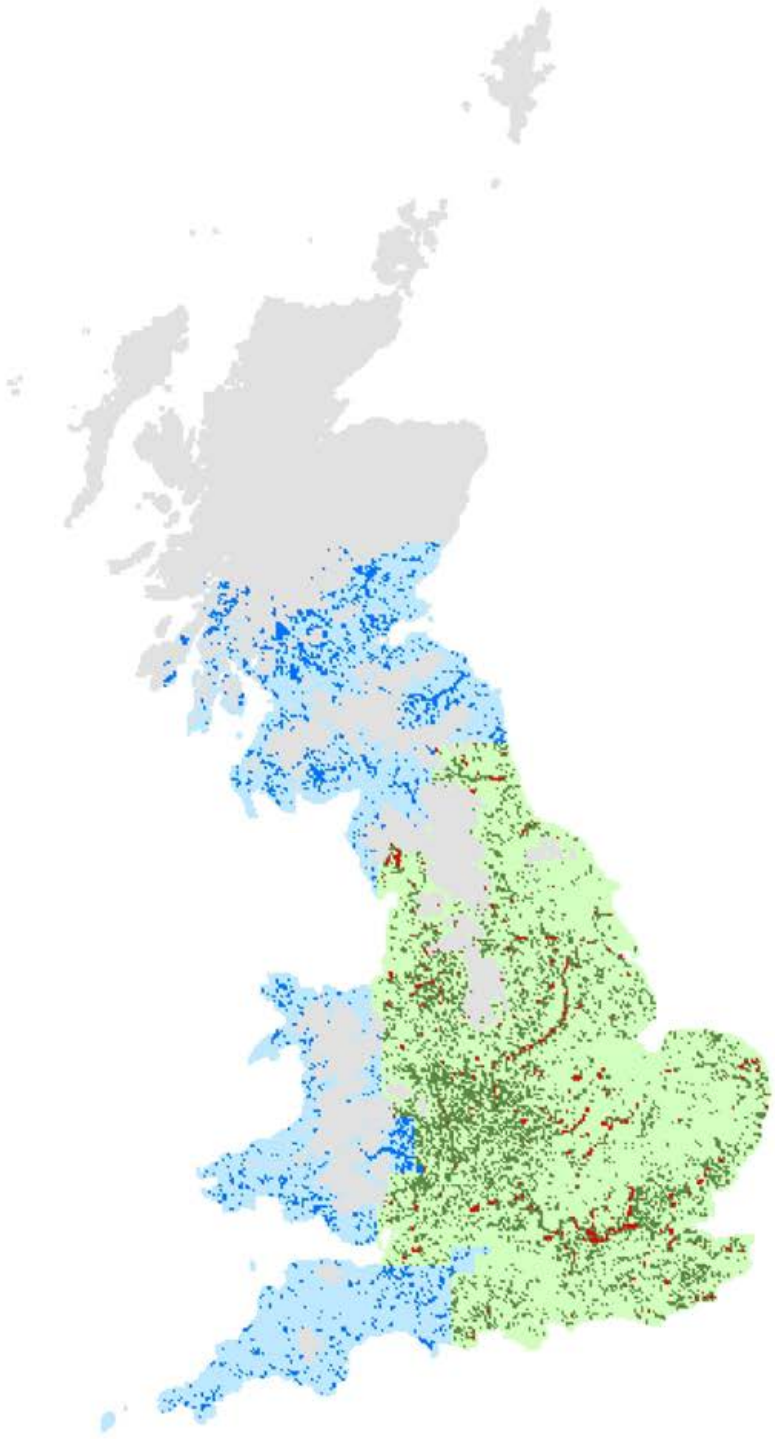

Figure 2.2.2.1 Distribution of tetrads in Great Britain across the stratification used for Little Ringed Plover. Sample data were only extrapolated across lowland habitat. Light green = tetrads in the core area with no freshwater; dark green = tetrads in the core area with low freshwater cover; red = tetrads in the core area with high freshwater cover; light blue = tetrads in the outer area with no freshwater, dark blue = tetrads in the core area with low or high freshwater cover (see methods for further details). The frequency distribution of tetrads across the stratification is provided in Table 2.2.2.2.

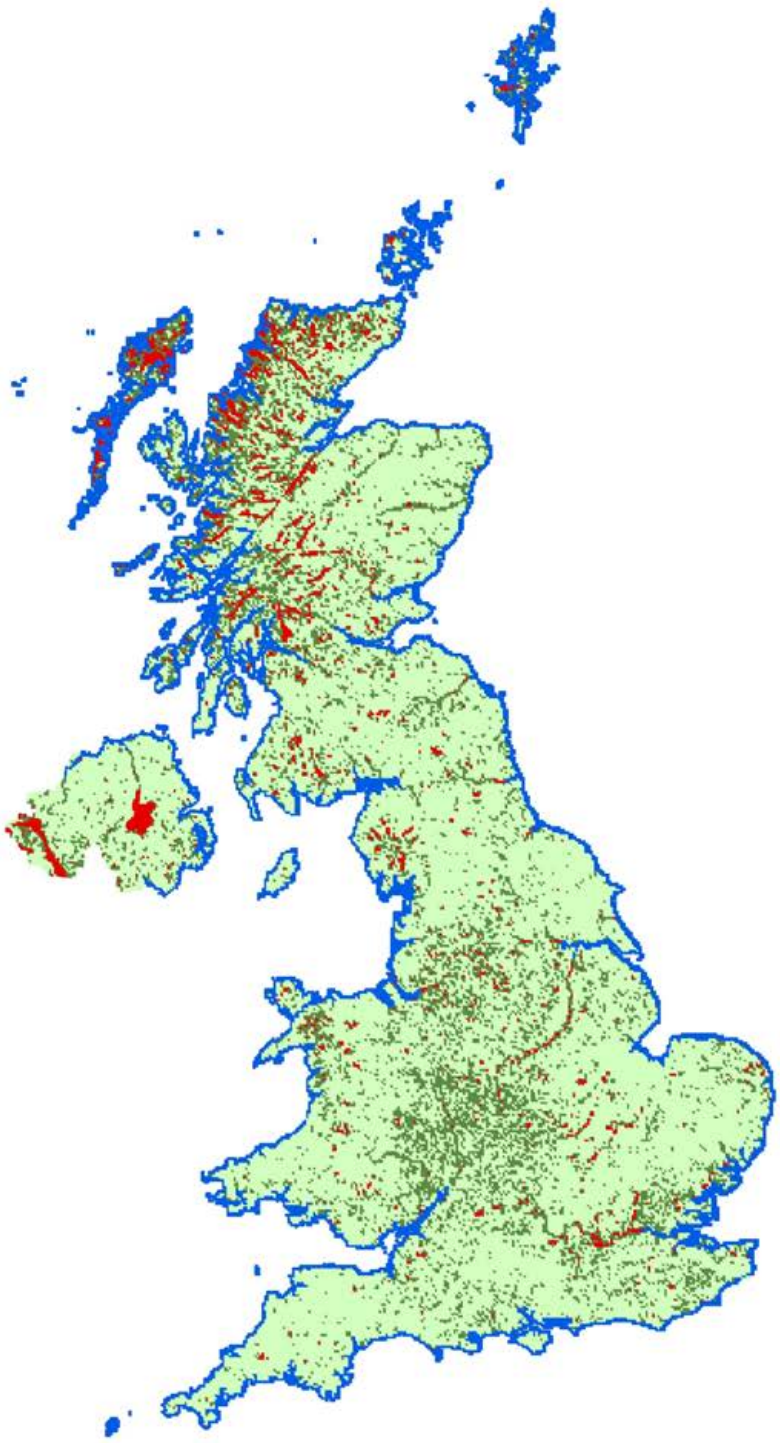

Figure 2.2.2.2 Distribution of tetrads in the United Kingdom and Isle of Man across the stratification used for Ringed Plover. Blue = coastal tetrads; light green = tetrads with no freshwater; dark green = tetrads with low freshwater cover; red = tetrads with high freshwater cover. Tetrads were further stratified by country and in Scotland, into Highland and non-Highland regions. The frequency distribution of tetrads across the stratification is provided in Table 2.2.2.3.

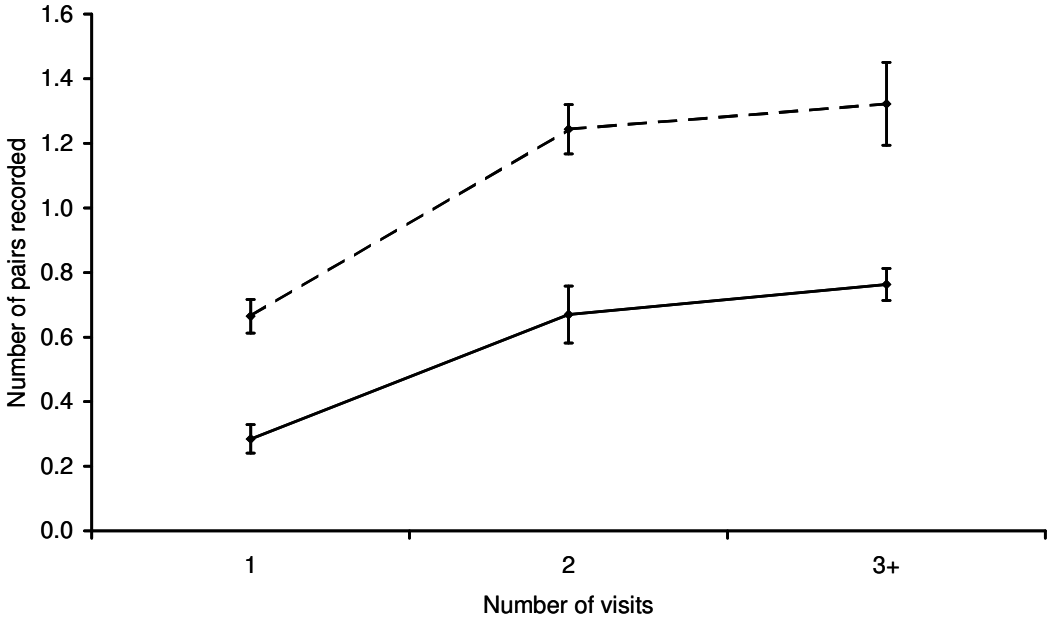

Figure 2.3.1 Mean numbers of pairs (± 1 s.e.) of Little Ringed Plover (solid line, n = 1,216 sites) and Ringed Plover (dashed line, n = 2,761 sites) recorded on survey tetrads in relation to the number of visits made.

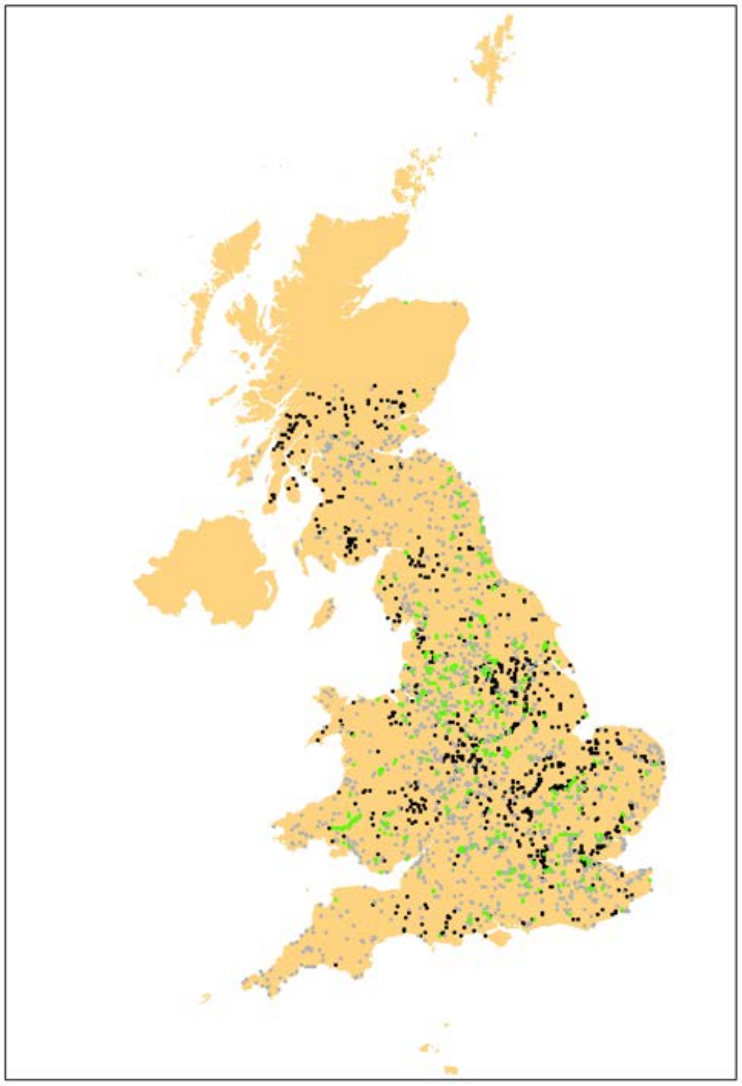

Figure 3.2.1.1 Breeding distribution and survey coverage from the 2007 Breeding Little Ringed Plover Survey. Green = Occupied, Grey = Unoccupied and Black = Not Surveyed. Note, this figure excludes data from a survey of Little Ringed Plovers in Grampian in 2005 which were used as supplementary records.

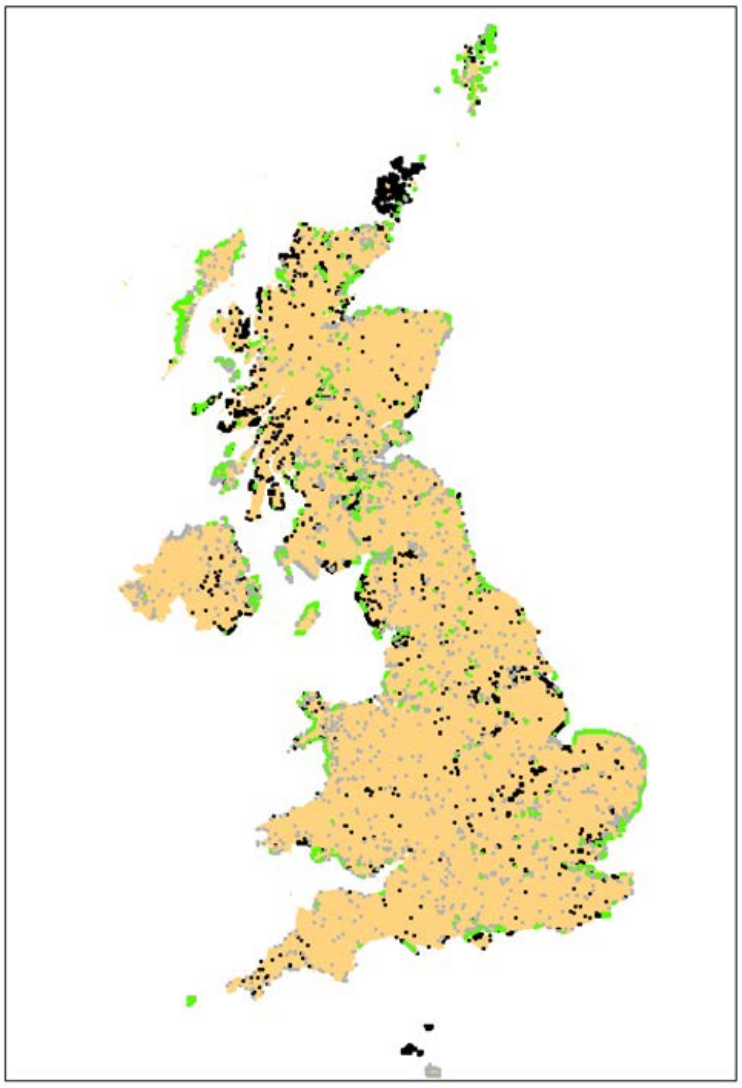

Figure 3.2.2.1 Breeding distribution and survey coverage from the 2007 Breeding Ringed Plover Survey. Green = Occupied, Grey = Unoccupied and Black = Not Surveyed**.**

Appendix 1. Summed numbers of pairs of Ringed Plover on sites surveyed in both 1984 and 2007 (from Burton & Conway 2008).

Country / county	Coastal / inland	1984	2007	Change (%)
ENGLAND (TOTAL)	Coastal	1343	764	-579 (-43)
	Inland	158	38	-120 (-76)
Avon	Coastal	4	11	7 (175)
	Inland	0	0	0
Bedfordshire	Coastal	0	0	0
	Inland	10	0	-10 (-100)
Berkshire	Coastal	0	0	0
	Inland	4	0	-4 (-100)
Buckinghamshire	Coastal	0	0	0
	Inland	0	0	0
Cambridgeshire	Coastal	0	0	0
	Inland	3	0	-3 (-100)
Cheshire	Coastal	0	0	0
	Inland	11	13	2 (18)
Cleveland	Coastal	39	26	-13 (-33)
	Inland	2	1	-1 (-50)
Cornwall and the Isles of Scilly	Coastal	20	16	-4 (-20)
	Inland	0	0	0
Cumbria	Coastal	35	51	16 (46)
	Inland	6	7	1 (17)
Derbyshire	Coastal	0	0	0
	Inland	2	0	-2 (-100)
Devon	Coastal	5	3	-2 (-40)
	Inland	0	0	0
Dorset	Coastal	30	13	-17 (-57)
	Inland	0	0	0
Durham	Coastal	0	0	0
	Inland	1	0	-1 (-100)
Essex	Coastal	22	7	-15 (-68)
	Inland	11	0	-11 (-100)
Gloucestershire	Coastal	0	0	0
	Inland	2	0	-2 (-100)
Greater Manchester	Coastal	0	0	0
	Inland	0	0	0
Hampshire	Coastal	149	80	-69 (-46)
	Inland	14	2	-12 (-86)
Herefordshire and Worcestershire	Coastal	0	0	0
	Inland	0	0	0
Hertfordshire	Coastal	0	0	0
	Inland	2	2	0
Humberside	Coastal	35	21	-14 (-40)
	Inland	7	0	-7 (-100)
Isle of Wight	Coastal	0	0	0
	Inland	0	0	0
Kent	Coastal	140	105	-35 (-25)
	Inland	4	0	-4 (-100)
Lancashire	Coastal	6	14	8 (133)
	Inland	30	3	-27 (-90)
Leicestershire	Coastal	0	0	0
	Inland	1	0	-1 (-100)

Lincolnshire	Coastal	92	54	-38 (-41)
	Inland	5	0	-5 (-100)
London	Coastal	0	0	0
	Inland	0	0	0
Merseyside	Coastal	7	5	-2 (-29)
	Inland	0	0	0
Norfolk	Coastal	522	271	-251 (-48)
	Inland	9	0	-9 (-100)
North Yorkshire	Coastal	0	0	0
	Inland	3	0	-3 (-100)
Northamptonshire	Coastal	0	0	0
	Inland	2	0	-2 (-100)
Northumberland	Coastal	49	22	-27 (-55)
	Inland	13	9	-4 (-31)
Nottinghamshire	Coastal	0	0	0
	Inland	1	0	-1 (-100)
Oxfordshire	Coastal	0	0	0
	Inland	5	0	-5 (-100)
Shropshire	Coastal	0	0	0
	Inland	0	0	0
Somerset	Coastal	0	6	6 ()
	Inland	0	0	0
South Yorkshire	Coastal	0	0	0
	Inland	0	0	0
Staffordshire	Coastal	0	0	0
	Inland	0	0	0
Suffolk	Coastal	170	42	-128 (-75)
	Inland	4	0	-4 (-100)
Surrey	Coastal	0	0	0
	Inland	1	0	-1 (-100)
Sussex	Coastal	16	13	-3 (-19)
	Inland	0	0	0
Tyne and Wear	Coastal	2	4	2 (-100)
	Inland	4	0	-4 (-100)
Warwickshire	Coastal	0	0	0
	Inland	0	0	0
West Midlands	Coastal	0	0	0
	Inland	0	0	0
West Yorkshire	Coastal	0	0	0
	Inland	1	1	0
Wiltshire	Coastal	0	0	0
	Inland	0	0	0
WALES	Coastal	128	120	-8 (-6)
	Inland	0	0	0
SCOTLAND[1]	Coastal	1164	716	-448 (-38)
	Inland	135	50	-85 (-63)
NORTHERN IRELAND	Coastal	60	30	-30 (-50)
	Inland	29	0	-29 (-100)
ISLE OF MAN	Coastal	70	64	-6 (-9)
	Inland	0	0	0

[1] Excludes North Uist, South Uist and Benbecula (and thus the North Uist Machair & Islands and South Uist Machair & Lochs SPAs).

Analysis was based on the sites defined in the 1984 survey; those sites that straddled county boundaries were assigned to the county that comprised the majority of the site. County totals derived for this analysis thus potentially differ from those provided in Table 3.2.1.