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**2007 Non-estuarine Coastal
Waterbird Survey:
Population estimates and broad
comparisons with previous surveys**

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EXECUTIVE SUMMARY

- During December and January of the winter of 2006/07 the BTO ran the third in a series of intermittent surveys of the non-estuarine coast of the UK (NEWS-II), following a tradition that began during the winter 1984/85 as the Winter Shorebird Count (WSC: Moser 1987) and continued during the winter of 1997/98 (NEWS: Rehfishch *et al.* 2003b).
- This document reports estimates for numbers of waders on the open coast of the UK during the winter of 2006/07. In due course, these new estimates, and where appropriate similar estimates for wildfowl, will feed directly revised population estimates for wintering waterbirds. Furthermore, we consider in broad terms how numbers compare to those estimated from the previous two surveys as a prelude to more sophisticated analyses to be undertaken in due course.
- The basic field-work methodology has remains unchanged across all three surveys, the data recorded and the manner in which they have been collated has evolved to allow more robust estimates of waterbird numbers to be made. These changes have implications when it comes to making comparisons between the three surveys. A brief overview of the three surveys is therefore provided.
- There was 51% coverage of the open coast of the UK achieved for NEWS-II. This was higher than that achieved for NEWS, but no coverage was obtained for Somerset the Isles of Scilly, Coll & Tiree or the Channel Islands.
- A bootstrap approach was used to derive county estimates for the numbers of waders to be found on the open coast during the winter of 2006/07. These in turn are used to derive separate estimates for the UK and each of its four constituent countries.
- Twenty one species of wader were recorded during NEWS-II. Population estimates are made for the 12 most numerous species, including the four non-estuarine specialists, Common Ringed Plover, Sanderling, Purple Sandpiper and Ruddy Turnstone, with point estimates of 15,230, 6,295, 11,306 and 30,112 individuals respectively.
- Common Ringed Plover, Eurasian Curlew, Common Redshank and Ruddy Turnstone, all species for which the open coast holds a considerable proportion of the over-wintering population, appear to be spread reasonably evenly relative to open coast availability throughout the UK. Of the other two species for which the open-coast is particularly important, Sanderling has a southerly bias to its distribution and Purple Sandpiper a strong northern bias. With the exception of Sanderling this may suggests that, with milder winters, the distribution of these species within the UK is less limited in the north than previously. The geographic distributions of the other species considered relative to available habitat is less informative as those species principally favour estuarine habitat and the birds on the open coast can be considered largely as ‘overspill’ from that habitat.
- In order to maximise confidence in the consistency of coverage between the surveys by minimising shortfalls in the recording of habitat coverage in the previous two surveys, direct comparisons of estimated numbers between the three surveys where restricted to the intertidal habitat. Substantially for this reason, values presented in this report to be used for these comparisons will differ from the published figures. Although this maximises the consistency between the data from the three surveys it should only be taken as a broad indication of the direction of the trends until a formal analysis based on paired count stretches has been undertaken.

- Across the UK as a whole, all 12 key species of wader were estimated to have declined between WSC and NEWS-II. A number of species that had declined in numbers between WSC and NEWS, appear to have undergone a partial recovery between NEWS and NEWS-II, notably three of the open coast specialists – Common Ringed Plover, Purple Sandpiper and Ruddy Turnstone, although all remain down considerably on WSC levels.
- Further analyses of these data are planned targeting publication in peer-reviewed journals.

1. INTRODUCTION

During December and January of the winter of 2006/07 the BTO ran the third in a series of intermittent surveys of the non-estuarine coast of the UK (NEWS-II), following a tradition that began during the winter 1984/85 under the guise of the Winter Shorebird Count (WSC: Moser 1987) and continued during the winter of 1997/98 (NEWS: Rehfisch *et al.* 2003b).

Common Ringed Plover (*Charadrius hiaticula*), Sanderling (*Calidris alba*), Purple Sandpiper (*Calidris maritima*), Bar-tailed Godwit (*Limosa lapponica*) and Ruddy Turnstone (*Arenaria interpres*) had declined by over 15% between the WSC and NEWS, all species that occur in internationally important numbers on this habitat in the UK (Rehfisch *et al.* 2003b). Furthermore, the declines and changes in distribution were found to be associated with changes in weather between the two surveys (Rehfisch *et al.* 2004). Recent Wetland Bird Survey work suggests that the declines recorded in GB could be explained by increases in some northern European countries (Maclean, *et al.* in press.). Wader distributions appear to be very sensitive to weather (Austin & Rehfisch 2005).

The results of this most recent survey update our current knowledge of numbers of waterbirds, in particular waders, on the UK's open coast, and will in due course contribute further towards updating the improved non-breeding waterbird biodiversity indicators first developed for the Scottish Government and soon to be implemented for DEFRA. In due course we will investigate whether climate continues to drive changes in the distributions of waders on the non-estuarine coast of the UK and furthermore test the accuracy of the predictive models that arose from that work (Rehfisch *et al.* 2004). This latter work will allow us to update the models if necessary, and importantly determine whether bioclimatic modelling approaches to predicting future distributions of fauna are reliable in the short-term.

Thus NEWS-II had the following objectives:

- (a) To contribute towards a revision of waterbird population estimates.
- (b) To collect the data to subsequently make it possible to determine whether the distributional shifts observed with warming winters have continued, and thus to test whether the scenarios of continuing decline with warming winters proposed by Rehfisch *et al.* (2004) are realistic.
- (c) To feed data into improved non-breeding waterbird biodiversity indicators for the United Kingdom.
- (d) To contribute towards determining the randomised stratified approach that the Wetland Bird Survey could use to gather annual count data from the non-estuarine coast. Unlike at present, a randomised stratified approach should make it possible to generate more defensible annual population trends for non-breeding waterbirds (see Rehfisch *et al.* 2003a and 2003b for further details).

This document reports estimates for numbers of waterbirds on the open coast of the UK during the winter of 2006/07. In due course, these new estimates will feed directly into objective (a). Furthermore, we consider in broad terms how numbers compare to those estimated from the previous two surveys as a prelude to more sophisticated analyses to be undertaken for objective (b).

2. METHODS

While the basic field-work methodology has remained unchanged across all three surveys, the data recorded and the manner in which they have been collated has evolved to allow more robust estimates of waterbird numbers to be made. However, these changes have implications when it comes to making comparisons between the three surveys. A brief overview of the three surveys is therefore pertinent.

2.1 Winter Shorebird Count (WSC)

The WSC ostensibly covered all open coast habitat where the intertidal habitat was considered suitable for waders. Organisationally, the UK coastline was divided into 41 'administrative regions' (essentially based on the accepted county boundaries at that time) and each region assigned to a regional organiser. These regions were further sub-divided into a variable number of 'administrative areas' (essentially dictated by the representation of the coastline that could be copied from 1:50,000 scale maps on to an A4 sheet of paper). Within each area, the coastline was further divided into Count Stretches, defined by the surveyors and generally demarcated by changes in habitat (e.g. boundaries between sand and rock) or physical features (e.g. creeks, road-heads). The Count Stretches within each area were numbered sequentially using a coding system based on these three levels of organisation (Region|Area|CountStretch). Extensive stretches of coastline dominated by high cliffs were excluded on practical grounds and because such coastline were deemed to offer little or no suitable habitat for waders. This included extensive stretches of coastline in Shetland and Hoy, Orkney. The east coast of the Western Isles was also excluded as it was considered to offer little in the way of suitable habitat. Thus, approximately 95% of the total UK open coast was covered. In addition to the UK, coverage was obtained for the Jersey in the Channel Islands.

The WSC targeted the intertidal habitat and counts were made of all waders and Eider. It is probable that some counts included birds immediately inland from the intertidal habitat but there is no means by which this can be quantified from the data. Such counts would not affect estimates of numbers of all species equally and, for example, counts of larger more visible species such as Eurasian Oystercatcher (*Haematopus ostralegus*) and Eurasian Curlew (*Numenius arquata*) that make extensive use of habitats such as fields adjacent to the shore could be disproportionately affected.

Although included in the original estimates of wader numbers from the WSC, data from some of the count stretches covered by the WSC were subsequently excluded from comparative analyses (Rehfishch *et al.* 2003b) because they are considered to be estuarine in nature (based on Buck 1993 to 1997 series) and are preferentially reported as part of the Wetland Bird Survey Core Count Scheme.

2.2 Non-estuarine Waterbird Survey 1997/98 (NEWS)

The boundaries of the count stretches defined for the WSC were again used for NEWS 1997/98. However, an effort was made to reduce the length of some of the longer count stretches from the WSC by subdividing those in excess of an arbitrarily chosen 5-km with the aim of making count stretches more standardised with a target length of about 2-km and no more than 4-km. Although, this left many count stretches still in excess of the 2-km target it did address the worst cases (up to 80-km). Unfortunately, some counters choose to combine some adjacent count stretches thus, in part, countering this objective. NEWS again targeted complete coverage of the UK's open coast. However, whilst as geographically extensive as the WSC, fewer count stretches were visited and NEWS achieved 38% coverage of the UK open coast with large extents of western Scotland remaining unvisited. Additionally counts were received from Guernsey in the Channel Islands.

There was evidence that this reduced coverage introduced some bias into the data due to counters targeting count stretches with higher than average numbers of waterbirds; in such regions the count stretches covered by NEWS held higher numbers of birds during the WSC than those not covered by NEWS. Consequently, subsequent analyses had to address the fact that, in some areas, those count

stretches visited were unrepresentative of the open coast overall for those areas (Rehfishch et al. 2003b).

NEWS targeted all species of waterbird along the open coast and also recorded separate counts for intertidal habitat, inland habitat (viewable from the high-tide mark) and sea (easily viewable from the high-tide mark with binoculars).

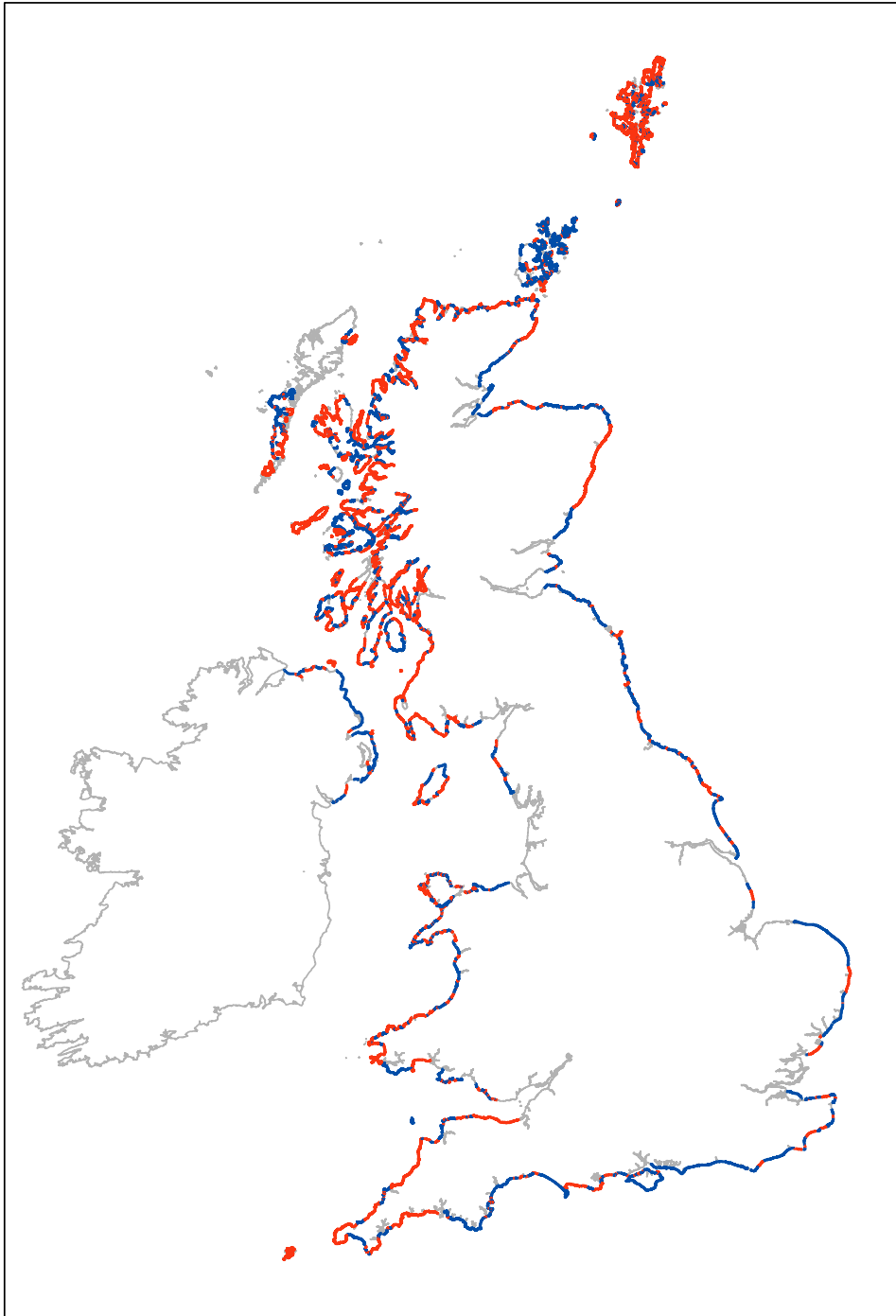
2.3 Non-estuarine Waterbird Survey 2006/07 (NEWS-II)

Assuming *a priori* that, like NEWS, NEWS-II would not achieve complete coverage of the open coast, and with the aim of avoiding the bias introduced by counters when selecting their count stretches identified for NEWS, a random sampling element was introduced for NEWS-II. Thus, count stretches within each organisational area were ordered randomly and organisers asked to assign counters to count stretches following that order, only omitting count stretches on the grounds of practical complications such as difficulty of access or remoteness from available counters but explicitly not on prior expectations of waterbird numbers. These randomly assigned count stretches were selected from those used for WSC or, where those had been sub-divided into smaller count units for NEWS 1997/98, the latter. Organisers were asked to aim to arrange coverage of at least the first 10 randomly chosen count stretches in each administrative area or all stretches where there were fewer than 10, and repeat this for all administrative regions under their jurisdiction. This ensured a random survey design at the local level at the same time as avoiding large gaps in geographic coverage. Field methodology was described in Austin & Rehfishch (2007). The 51% coverage achieved for NEWS-II (Figure 1) was higher than that achieved for NEWS, but no coverage was obtained for Somerset the Isles of Scilly, Coll & Tiree or the Channel Islands (Appendix 2).

As part of the preparation for NEWS-II, the electronic Count Stretch Inventory implemented for NEWS was updated on ArcGIS (ESRI) using the Watsonian Vice County boundary low-tide mark data obtained from the National Biodiversity Network. Previously the boundaries had been digitised at a much poorer resolution and using the high tide mark (the three non-estuarine waterbird surveys focus on low-tide counts). This enabled us to supply counters with forms customised to indicate count stretches against the 1:25,000 Ordnance Survey backdrop (1:50,000 OSNI for Northern Ireland) and comments and annotations received from counters have enabled us to correct historic errors that originated from the WSC maps, recorded grid references and past survey count forms.

The NEWS-II count methodology was substantially based on that used during the WSC and NEWS (Moser 1987, Rehfishch *et al.* 2003b). The amendment of consequence was that counters were asked to explicitly state whether or not they surveyed each of the three habitats. Although the scale of the issue was not quantifiable, it was apparent from comments and data received from counters during NEWS that not all habitats always received equal attention. This additional information gathered during NEWS-II has allowed a more rigorous approach to be taken when estimating waterbird numbers across all three habitats but has also made apparent the dangers of using direct comparisons of waterbird numbers from the three surveys as a means of quantifying change over time.

Figure 1 Coverage obtained for NEWS-II. Coastal stretches in blue ----- were covered, those in red ----- were not covered.



2.4 Analysis

The analytical approach used to estimate the numbers of waterbirds on the open coast during the winter of 2006/07 is essentially similar to that previously used for estimating numbers from data collected by NEWS (Rehfisch *et al.* 2003b). This uses a bootstrap approach to derive estimates at the county level and summing across the relevant bootstrapped samples to derive country estimates. Thus

for each species, for each county, for each habitat (inland, intertidal, sea) and for 119 repetitions, the total number of birds counted within that county was added to the total number of birds obtained from a sample with replacement of stretches drawn from the county in question until that sample equated to the length of uncounted open coast within that county. Equivalent repetitions for the constituent countries of the UK, GB and UK estimates were derived by summing across unsorted repetitions for the relevant constituent counties. The latter approach was used so that, for example, estimates of numbers on uncounted stretches in southern England would not be influenced by counts in northern Scotland and *vice versa* when estimating the numbers across the whole of the UK as would be the case had the sample had itself been drawn from the whole of the UK. For each geographical extent, the median, lower and upper 95% confidence limit estimates for the number of birds were obtained by taking the 60th, 3rd & 116th ascendant ordered bootstrap values respectively.

Because NEWS-II recorded details of which of the three principal habitat divisions (intertidal, landward and sea) had been counted for each count stretch, two approaches were taken when estimating numbers across all habitats combined. In order to produce the best possible estimates of numbers, each of the 119 all-habitat county estimates were obtained by summing the unordered estimates from each of the three habitats. This approach allows for differential proportional coverage at the county level across the three habitats.

This preferred approach for deriving all-habitat estimates for NEWS-II was not possible for NEWS where the surveyors had been asked to count all three habitats and there was no facility to systematically record any deviation from this. It was clear during the analysis of NEWS data and from informal comments on some count forms that in some cases not all habitats had been counted but the extent of this problem could not be quantified. Consequently, all-habitat estimates for NEWS were obtained by summing across habitats and then bootstrapping the all-habitat counts as single values. This will almost certainly have led to an underestimate of waterbird numbers across all-habitats for NEWS. Accordingly, we have also made wader population estimates for NEWS-II using the latter approach in order to make comparisons between NEWS-II and NEWS more realistic.

In deference to criticisms of the approach used to analyse NEWS, whereby extrapolations across open coast that had not been covered previously by WSC counts may have led to inflated estimates for some areas (a problem particularly pertinent to the Western Isles where west coast numbers were extrapolated to the east coast), we have restricted our extrapolations to that part of the UK open coast that was visited for the WSC whilst excluding WSC count sections classified as estuarine. Accordingly, in addition to providing estimates of waterbird numbers for NEWS-II, we have also calculated revised estimates for WSC and NEWS in order to facilitate comparisons between the surveys.

No attempt has been made here to extrapolate estimates to regions where no random coverage was obtained. Accordingly, county estimates are not presented for Somerset, however historically, the little open coast in this county has held very few birds (Rehfisch *et al.* 2003b). No estimates are presented for the Channel Islands. The Isles of Scilly and Coll & Tiree are, respectively, considered as parts of Cornwall and Strathclyde and the extrapolation of waterbird numbers for those regions allow for the uncounted coastline in those island groups. However, if these island groups hold uncharacteristic numbers for their respective regions this will not be reflected in the county estimates.

2.5 Broad Between-survey Comparisons

Given the considerations described above, care must be taken when comparing data between surveys. Ultimately, estimates of population change will be made following a paired count stretch approach as used by Rehfisch *et al.* (2003b). This is a more powerful approach than that of direct comparison of estimates of total numbers between surveys, the latter being vulnerable to differences in geographical coverage between surveys or unknown biases in count-stretch selection. However, broad comparisons of overall estimates can give a reasonable indication of whether or not substantial changes have occurred. Judicious selection of which of the various habitats and approaches to include when

comparing estimates of total numbers, allows us to be conservative in our comparisons, particularly if raising concerns of population declines. Thus:

- 1) ***Estimates of waterbird numbers from NEWS-II are based on the all-habitat estimates allowing for differential habitat coverage.*** This approach is likely to provide more accurate population estimates than that used by Rehfisch *et al.* (2003b) to generate the NEWS estimates.
- 2) If the estimates of waterbird numbers from NEWS-II have been based on the all-habitat estimates that allow for differential habitat coverage, any declines in waterbird numbers between NEWS and NEWS-II can be considered to be minimal estimates of change. This is a consequence of the NEWS estimates being likely to underestimate waterbird numbers as a result of an unknown proportion of inland habitat not being counted and no allowance being possible for this. Any change estimates based on this approach would be conservative and not “precautionary”; this approach could be preferred if drawing political attention to concerns relating to population declines.
- 3) Under the assumption that the true habitat coverage for NEWS was probably similar to that known to have been achieved for NEWS-II, comparisons of waterbird numbers between NEWS and NEWS-II can be considered to be reasonable estimates of change when numbers from NEWS-II have been based on counts summed across habitats without regard for differential habitat coverage. Henceforth, this approach is used to compare changes in the numbers of waders between the NEWS and NEWS-II.
- 4) Any declines in waterbird numbers relative to the WSC (that only targeted intertidal habitat) can be considered minimal estimates of change when all-habitat estimates are used for the later surveys, and in the case of NEWS-II, when allowing for differential habitat coverage. Again, any the change estimates would be conservative and not “precautionary”; this approach could be preferred if drawing political attention to concerns relating to population declines.
- 5) Under the assumption that habitat usage by the birds was consistent between surveys and that for the majority of species few inland birds were recorded by WSC, ***the best estimates of proportional change between surveys would be that based on numbers estimated for the intertidal habitat alone.*** When using this approach no assumptions related to coverage need to be made for the NEWS data.
- 6) The degree to which these alternative comparisons are relevant to each species can be gauged by considering the total number of birds of a given species recorded on each habitat. It is irrelevant for species, such as Purple Sandpiper, that are essentially recorded only from the intertidal habitat but important for species, such as Eurasian Curlew, that are recorded in substantial numbers on the inland habitat.

It is important to note that the estimates used here to examine change are expected to differ from the previously published estimates for WSC and NEWS for a number of reasons.

- 1) The comparison has been restricted to the intertidal habitat to maximise comparability across surveys: WSC targeted intertidal habitat only; NEWS recorded birds on intertidal habitat separately from those inland but the inland coverage cannot be quantified reliably; NEWS-II recorded and quantified coverage on all habitats separately. Estimates for birds on intertidal habitat only have not been previously reported for NEWS (Rehfisch *et al.* 2003b).
- 2) The exclusion of count stretches now considered estuarine – these were included in the WSC estimates of Moser (1987).
- 3) Analyses have been restricted to open coast originally surveyed for WSC. Formerly, analysis for NEWS had extrapolated estimates across coastline excluded by WSC (Rehfisch *et al.* 2003b).

This reappraisal has been undertaken largely in response to criticism of the estimates for the Western Isles where the suitability of the east coast for waders has been questioned. In particular, this reappraisal affects estimates for the west coast of Scotland, perhaps increasing estimates for that region several fold, especially for the species of wader for which this area holds substantial numbers of individuals.

- 4) The underlying GIS-based count stretch inventory has been updated to use high resolution data. Consequently, lengths of count stretches have been reappraised – a minor affect.
- 5) Any reanalysis based on the bootstrap methods used here would be expected to result in slight changes, even if using precisely the same input data, because of the random element of sampling with replacement – a minor affect.

3. RESULTS

3.1 Overall Estimates of Numbers

The most numerous wader species recorded on the open coast of the UK during NEWS-II was Eurasian Oystercatcher followed by Eurasian Curlew, Ruddy Turnstone, European Golden Plover (*Pluvialis apricaria*), Common Redshank (*Tringa totanus*), Common Ringed Plover, Purple Sandpiper, Dunlin (*Calidris alpina*), Northern Lapwing (*Vanellus vanellus*), Sanderling, Red Knot (*Calidris canutus*), Bar-tailed Godwit and Grey Plover (*Pluvialis squatarola*) (Table 1). In addition to these 12 main species, other waders recorded included Eurasian Curlew Sandpiper (1), Ruff (26), Jack Snipe (14), Snipe (1572), Woodcock (13), Black-tailed Godwit (52), Whimbrel (6), Greenshank (77) and Common Sandpiper (2) – numbers in parentheses indicate total number of individuals reported. These latter species were recorded either too infrequently, mainly on estuarine count stretches (Black-tailed Godwit) or considered to be unreliably recorded (Snipe) to warrant detailed analysis. Wildfowl were also recorded by the survey but reservations with regard to the reliability of counts on the sea, especially in windy conditions, together with much lower coverage of this habitat division precludes a detailed analysis for this group of species.

3.2 Geographic Patterns of Distribution

Northern Ireland, Scotland, England and Wales respectively have approximately 2.3%, 75.1%, 16.0% and 6.6% of the open coast of the UK (Appendix 2). Considering the distribution of waders in these broad country terms, Common Ringed Plover, Eurasian Curlew, Common Redshank and Ruddy Turnstone, all species for which the open coast holds a considerable proportion of the over-wintering population, appear to be spread reasonably evenly relative to open coast availability throughout the UK although the open-coast of Northern Ireland did hold a high proportion of UK Common Redshank relative to open coast availability (Table 2). The other two species for which the open-coast is particularly important, Sanderling and Purple Sandpiper both show strong geographic bias in their distribution relative to open coast availability. Thus there is a strong northern bias to the distribution of Purple Sandpiper with over 93% of birds estimated to over-winter on the open-coast of Scotland. In contrast, there is a less pronounced southern bias to the distribution of Sanderling with 63% and 32% being estimated to over-winter on the open coast of Scotland and England respectively. The geographic distributions of the other species considered relative to available habitat is less informative as those species principally favour estuarine habitat. That said, relatively high proportions of European Golden Plover, Northern Lapwing, Dunlin were found on the open coast of Northern Ireland, relatively high proportions of European Golden Plover, Grey Plover and Red Knot on the open coast of England and Grey Plover in Wales. Relatively low proportions of all these species were found in Scotland. However, a relatively high proportion of Bar-tailed Godwit was found on the open coast of Scotland.

3.3 Broad Comparisons With Previous Surveys

Direct comparisons of estimated numbers between the three surveys were restricted to the intertidal habitat (Table 3 a-c). Although this maximises the consistency between the data from the three surveys (see 2.5) it should only be taken as a broad indication of the direction of the trends until a formal analysis based on paired count stretches has been undertaken. Across the UK as a whole, all 12 key species of wader were estimated to have declined between WSC and NEWS-II. A number of species that had declined in numbers between WSC and NEWS, appear to have undergone a partial recovery between NEWS and NEWS-II, notably three of the open coast specialists – Common Ringed Plover, Purple Sandpiper and Ruddy Turnstone, although all remain down considerably on WSC levels (Table 4).

Table 1 The population estimates of the 12 key species of wader on the open coast of the UK and its constituent countries during winter 2006/07. Each population estimate is supplied as the median bootstrapped value and its 95% confidence limits. The latter (in parentheses) are based on 119 bootstrap repetitions, allowing for differential habitat coverage. Similar estimates for the constituent counties of the UK are given in Appendix 1. County coverage statistics are given in Appendix 2.

Region	Eurasian Oystercatcher	Common Ringed Plover	European Golden Plover	Grey Plover	Northern Lapwing	Red Knot	Sanderling	Purple Sandpiper	Dunlin	Bar-tailed Godwit	Eurasian Curlew	Common Redshank	Ruddy Turnstone
Northern Ireland	5,323 (4987 - 5811)	645 (538 - 804)	4,305 (4229 - 7925)	14 (11 - 19)	2,526 (2154 - 3110)	7 (7 - 17)	130 (93 - 192)	111 (88 - 144)	2,772 (2359 - 3542)	59 (47 - 89)	2,205 (1965 - 2534)	2,366 (2216 - 2642)	1,828 (1693 - 2119)
England	14,089 (13232 - 15496)	1,514 (1294 - 2077)	5,865 (5003 - 7183)	555 (506 - 618)	665 (635 - 1219)	1,174 (1156 - 1529)	2,059 (1918 - 2266)	455 (413 - 532)	1,401 (1231 - 1641)	102 (89 - 128)	2,137 (1852 - 2491)	2,770 (2616 - 3114)	3,921 (3712 - 4218)
Scotland	39,966 (38052 - 42758)	12,382 (11536 - 13567)	12,372 (10389 - 14217)	146 (125 - 168)	5,321 (4541 - 6131)	436 (367 - 571)	4,087 (3411 - 5124)	10,547 (9716 - 11580)	4,080 (3389 - 4716)	1,382 (1213 - 1602)	36,563 (34429 - 38723)	17,536 (16878 - 18484)	26,711 (25271 - 28075)
Wales	10,592 (9519 - 12353)	1,049 (905 - 1209)	1,147 (646 - 1915)	100 (77 - 134)	1,163 (722 - 1922)	562 (282 - 844)	127 (97 - 167)	164 (102 - 299)	1,736 (1155 - 2849)	40 (26 - 72)	3,915 (3418 - 4387)	1,454 (1251 - 1685)	1,224 (1087 - 1456)
Isle of Man	1,227 (1000 - 1480)	174 (92 - 297)	284 (138 - 433)	0	28 (14 - 56)	0	14 (8 - 24)	46 (21 - 97)	34 (17 - 68)	0	2,454 (1839 - 3554)	78 (46 - 120)	186 (126 - 255)
Britain	65,635 (63031 - 68991)	15,129 (14098 - 16250)	19,378 (17648 - 21965)	804 (751 - 874)	7,363 (6430 - 8767)	2,168 (1839 - 2680)	6,314 (5609 - 7339)	11,214 (10329 - 12369)	7,156 (6226 - 8438)	1,534 (1351 - 1744)	43,993 (41684 - 46552)	21,868 (21053 - 22861)	32,088 (30542 - 33374)
UK	71,104 (68354 - 74180)	15,774 (14740 - 16920)	24,355 (22248 - 29770)	818 (762 - 889)	9,890 (8906 - 11190)	2,176 (1846 - 2692)	6,467 (5722 - 7489)	11,329 (10499 - 12485)	10,012 (8901 - 11487)	1,596 (1417 - 1824)	46,243 (44063 - 48949)	24,263 (23403 - 25376)	33,922 (32488 - 35244)

Table 2 Percentage of individuals of the 12 key species of wader on the open coast of the constituent countries of the UK during winter 2006/07 in comparison to proportion of the UK's open coast in each of those countries. Values are derived from the central estimates given in Table 1. Note that overall UK estimates used here are derived as the sum central estimates of the four constituent countries rather than the UK central estimate (so as to constrain the sum of the percentages to equate to 100% which would not necessarily be the case if using the latter).

Region	Percentage of the UK's open coast	Eurasian Oystercatcher	Common Ringed Plover	European Golden Plover	Grey Plover	Northern Lapwing	Red Knot	Sanderling	Purple Sandpiper	Dunlin	Bar-tailed Godwit	Eurasian Curlew	Common Redshank	Ruddy Turnstone
Northern Ireland	2.3	7.6	4.1	18.2	1.7	15.0	0.3	2.0	1.0	27.8	3.7	4.9	9.8	5.4
England	16.0	20.1	9.7	24.8	68.2	18.4	53.9	32.2	4.0	14.0	6.4	4.8	11.4	11.6
Scotland	75.1	57.1	79.4	52.2	17.8	57.2	20.0	63.8	93.5	40.8	87.3	81.6	72.7	79.3
Wales	6.6	15.1	6.7	4.8	12.2	9.4	25.8	2.0	1.5	17.4	2.5	8.7	6.0	3.6

Table 3 Population estimates of waders on the *intertidal* habitat of the open coast of the UK and its constituent countries during the winters of a) 2006/07, b) 1997/98 and c) 1984/85. Values indicate median and 95% confidence limits. The latter (in parentheses) are based on 119 bootstrap repetitions. No confidence limits are presented for 1984/85 for which full coverage is assumed or for 1997/98 in cases where estimates have been adjusted for bias following Rehfishch *et al.* (2003b). **Values for WSCand NEWS are not equivalent to those previously published for the reasons given in 4.3.**

a) NEWS-II (2006/07)

Region	Eurasian Oystercatcher	Common Ringed Plover	European Golden Plover	Northern Lapwing	Red Knot	Sanderling	Purple Sandpiper	Dunlin	Bar-tailed Godwit	Eurasian Curlew	Common Redshank	Ruddy Turnstone
Northern Ireland	4,725 (4413 - 5224)	645 (538 - 804)	4,305 (4229 - 7925)	2,526 (2154 - 3110)	7 (7 - 17)	130 (93 - 192)	111 (88 - 144)	2,772 (2359 - 3542)	59 (47 - 89)	1,512 (1363 - 1750)	2,357 (2208 - 2633)	1,787 (1645 - 2083)
England	12,950 (12082 - 14318)	1,399 (1176 - 1957)	2,626 (2599 - 2840)	665 (635 - 1219)	1,174 (1156 - 1529)	2,059 (1918 - 2266)	455 (413 - 532)	1,229 (1081 - 1472)	95 (80 - 120)	1,367 (1243 - 1479)	2,397 (2241 - 2734)	3,848 (3634 - 4159)
Scotland	35,054 (33297 - 37259)	12,073 (11158 - 13172)	3,947 (3372 - 5140)	5,321 (4541 - 6131)	435 (365 - 570)	3,946 (3291 - 4993)	10,528 (9697 - 11565)	3,991 (3341 - 4649)	1,291 (1141 - 1525)	19,976 (18714 - 21653)	14,559 (13949 - 15357)	23,028 (21927 - 24300)
Wales	10,120 (9026 - 11819)	1,049 (905 - 1209)	99 (37 - 173)	1,163 (722 - 1922)	562 (282 - 844)	127 (97 - 167)	164 (102 - 299)	1,736 (1155 - 2849)	40 (26 - 72)	2,538 (2247 - 2864)	1,295 (1106 - 1527)	1,224 (1087 - 1456)
Isle of Man	1,227 (1000 - 1480)	174 (92 - 297)	278 (126 - 424)	28 (14 - 56)	0	14 (8 - 24)	46 (21 - 97)	34 (17 - 68)	0	2,454 (1839 - 3554)	78 (46 - 120)	186 (126 - 255)
Britain	59,148 (56541 - 62450)	14,641 (13668 - 15753)	6,862 (6241 - 8122)	7,363 (6430 - 8767)	2,166 (1838 - 2679)	6,170 (5464 - 7201)	11,200 (10312 - 12354)	6,934 (6002 - 8200)	1,440 (1260 - 1674)	25,265 (23765 - 27422)	18,315 (17610 - 19152)	28,283 (27026 - 29619)
UK	64,064 (61270 - 66991)	15,230 (14278 - 16398)	11,513 (10522 - 16305)	9,890 (8906 - 11190)	2,175 (1845 - 2691)	6,295 (5595 - 7369)	11,306 (10482 - 12470)	9,743 (8690 - 11223)	1,500 (1316 - 1734)	26,774 (25328 - 28990)	20,706 (19918 - 21541)	30,112 (28995 - 31498)

Table 3 (continued)

b) NEWS (1997/98)

Region	Eurasian Oystercatcher	Common Ringed Plover	European Golden Plover	Northern Lapwing	Red Knot	Sanderling	Purple Sandpiper	Dunlin	Bar-tailed Godwit	Eurasian Curlew	Common Redshank	Ruddy Turnstone
Northern Ireland	1,891 (1404 - 3797)	455 (296 - 877)	1,949 (1949 - 16199)	3,707 (2267 - 11350)	451 (451 - 4054)	152 (111 - 426)	94 (71 - 208)	2,171 (1356 - 3073)	31 (31 - 212)	423 (282 - 841)	558 (437 - 1017)	430 (305 - 607)
England	18,441	2,403	2,467 (1877 - 3467)	2,082 (1838 - 2506)	4,412 (3656 - 6116)	4,064 (3391 - 5063)	1,519 (1228 - 1856)	6,727 (5793 - 8569)	260 (200 - 338)	3,220 (2802 - 3878)	3,661 (3396 - 3967)	6,001 (5499 - 6530)
Scotland	31,629	9,379	5,501	12,976	2,253 (1814 - 2821)	3,443	6,924	15,951 (14162 - 19032)	1,296	23,806	16,837	16,800
Wales	8,415	478 (357 - 643)	590 (530 - 1730)	468	3	38 (32 - 66)	112 (86 - 156)	815 (582 - 1202)	5	4,016 (3291 - 4909)	738	509
Isle of Man	2,261 (959 - 4184)	570 (160 - 1420)	180 (60 - 840)	0	0	0	0	475 (283 - 633)	0	5,339 (1902 - 10234)	179 (72 - 293)	174
Britain	55,639	11,670	8,506	15,673	6,772 (5755 - 8756)	6,374	8,247	23,976 (21344 - 27740)	1,484	30,443	21,144	22,099
UK	58,253	12,223	11,065	20,592	7,542 (6206 - 10840)	6,513	8,277	26,153 (23434 - 29961)	1,526	31,299	22,263	22,974

Table 3 (continued)

c) WSC (1984/85)

Region	Eurasian Oystercatcher	Common Ringed Plover	European Golden Plover	Northern Lapwing	Red Knot	Sanderling	Purple Sandpiper	Dunlin	Bar-tailed Godwit	Eurasian Curlew	Common Redshank	Ruddy Turnstone
Northern Ireland	3,563	1,403	1,612	5,604	17	122	262	3,386	207	2,238	1,579	2,594
England	17,892	3,862	5,113	527	1,627	6,263	1,853	11,745	254	3,137	3,454	7,835
Scotland	32,546	11,088	5,500	6,860	1,744	3,500	13,123	7542	1,924	34,393	15,420	24,640
Wales	10,349	651	451	1,525	81	204	169	1,108	8	3,396	849	1,655
Isle of Man	671	286	120	1,175	1	0	29	137	12	4,225	287	294
Britain	60,787	15,601	11,064	8912	3,452	9,967	15,145	20,395	2,186	40,926	19,723	34,130
UK	65,021	17,290	12,796	15,691	3,470	10,089	15,436	23,918	2,405	47,389	21,589	37,018

Table 4 Percentage change between estimated numbers of waders on the UK open coast between the three surveys. These values should be treated as a first approximation only as they are based on direct comparison of numbers rather than using a paired count stretch approach (see 2.5). Values given in parentheses are as follows: WSC to NEWS – change reported by Rehfishch *et al.* (2003b); NEWS to NEWS-II – for increasing species the percentage increase between NEWS and NEWS-II that would have returned numbers to WSC levels.

	WSC To NEWS	NEWS to NEWS-II	WSC to NEWS-II
	-10%		
Eurasian Oystercatcher	(11)	10% (12)	-1%
	-29%		
Common Ringed Plover	(-15)	25% (41)	-12%
	-14%		
European Golden Plover	(158)	4% (16)	-10%
	-57%		
Grey Plover	(40)	-46%	-77%
	55%		
Northern Lapwing	(173)	-59%	-37%
	119%		
Red Knot	(145)	-71%	-37%
	-35%		
Sanderling	(-20)	-3%	-38%
	-46%		
Purple Sandpiper	(-21)	35% (84)	-27%
	9%		
Dunlin	(11)	-40%	-59%
	-37%		
Bar-tailed Godwit	(-44)	-2%	-38%
	-34%		
Eurasian Curlew	(33)	-14%	-44%
	3%		
Common Redshank	(35)	-7%	-4%
	-38%		
Ruddy Turnstone	(-16)	31% (61)	-19%

4. DISCUSSION

4.1 Estimates of Numbers

The purpose of this report was to document numbers of waders estimated to be present on the open coast of the UK during the winter 2006/07. The majority of the open coast of the UK (~75%) is in Scotland and this is reflected in the numerical importance of that country for the majority of species using the open coast during the winter. Concentrating on those species for which a substantial proportion of the overall UK numbers frequent the open coast, Scotland is especially important for Purple Sandpiper (93% of the overwintering population of the UK) following relatively large declines of the species in northeast England. Although the distribution of species such as Common Ringed Plover, Eurasian Curlew, Common Redshank and Ruddy Turnstone across the UK largely reflects the availability of habitat, the prevalence of open coast in Scotland means that the majority of individuals are to be found there. For these species, a distribution reflecting habitat availability suggests that increasingly warm winters have largely removed energetic constraints on distribution within the UK. The open coast of Northern Ireland appears to be disproportionately important for Eurasian Oystercatcher, Common Redshank, Ruddy Turnstone (especially) and to a lesser extent Common Ringed Plover. It is also disproportionately important to species those not particularly associated with open coast including European Golden Plover, Northern Lapwing and Dunlin. Wales is disproportionately important for Eurasian Oystercatcher, Red Knot and Dunlin. In the case of Eurasian Oystercatcher this probably extends to parts of the west coast England and Scotland. England is disproportionately important for Red Knot and Sanderling, possibly due to energetic constraints and in the former case probably associated with 'overspill' from estuarine habitat prevalent in south and east England.

4.2 Indications of Change

Despite ensuring that direct comparisons of estimated numbers between the three surveys were based on the most compatible data available from the three surveys, until analysis of change has been undertaken using the approach of Rehfisch *et al.* (2003b) *i.e.* that based on paired count stretches, the values for percent change given in Table 4 should be used only as a broad indication of continued decline or recovery of populations. While repeating this caution it is noteworthy that the estimates for the numbers of all of the key species considered are lower than they were in the winter of 1984/85.

4.3 Further Analyses

Further analyses of these data are envisaged. It is not intended that these analyses will result in revised estimates for NEWS-II. There were, however, several areas of the UK from which little or no data were received; account of this will be taken when data from NEWS-II contributes to forthcoming revisions of UK waterbird population estimates.

A more rigorous approach is required to estimate how numbers may have changed between years.

Data now available from NEWS-II will make it possible to determine whether the distributional shifts observed with warming winters Rehfisch *et al.* (2004) have continued, and thus to test whether the scenarios of continuing decline with warming winters proposed are realistic. If so, it would be prudent to incorporate these new data with the aim of improving the predictive power of those models.

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References

- Austin, G. & Rehfisch, M.M. (2005). Shifting non-breeding distributions of migratory fauna in relation to climatic change. *Global Change Biology*, **11**, 31-38.
- Austin G.E. & Rehfisch, M.M. (2007). 2007 Non-estuarine Coastal Waterbird Survey II: End of survey report. BTO, The Nunnery, Thetford, Norfolk IP24 2PU
- Buck, A.L. (1997) An Inventory of UK Estuaries. 7 vols. JNCC, Peterborough.
- Maclean, I.M.D., Austin, G.E., Rehfisch, M.M., Blew, J., Crowe, O., Delany, S., Devos, K., Deceuninck, B., Günther, K., Laursen, K., van Roomen, M. & Wahl, J. (In Press). Responses to climate change are temperature dependent in over-wintering migratory birds. *Global Change Biology*.
- Moser, M.E. (1987). A revision of population estimates for waders (*Charadrii*) wintering on the coastline of Britain. *Biological Conservation* **39**, 153-164.
- Rehfisch, M.M., Austin, G.E., Armitage, M., Atkinson, P., Holloway, S.J., Musgrove, A.J. and Pollitt, M.S. (2003a). Numbers of wintering waterbirds in Great Britain and the Isle of Man (1994/95-1998/99): II. Coastal waders (*Charadrii*). *Biological Conservation*, **112**, 329-341.
- Rehfisch, M.M., Holloway, S.J. & Austin, G.E. (2003b). Population estimates of waders on the non-estuarine coasts of the UK and the Isle of Man during the winter of 1997-98. *Bird Study*, **50**, 22-32.
- Rehfisch, M.M., Austin, G.E., Freeman, S.N., Armitage, M.J.S. & Burton, N.H.K. (2004). The possible impact of climate change on the future distributions and numbers of waders on Britain's non-estuarine coast. *Ibis*, **146**, S70-S81.

Appendix 1 Population estimates of waders on the open coast of the constituent counties of the UK during winter 2006/07 (NEWS-II). Counties follow those used previously for WSC and NEWS and are presented in geographic order (anti-clockwise around the GB coast from the Severn Estuary). Median and 95% confidence limits. The latter (in parentheses) are based on 119 bootstrap repetitions, allowing for differential habitat coverage. The absence of confidence limits corresponds to cases where 100% coverage was obtained or where the deficit in coverage was less than the minimum Count Stretch length (see Appendix 2 for breakdown of county coverage).

Region	Eurasian Oystercatcher	Common Ringed Plover	European Golden Plover	Northern Lapwing	Red Knot	Sanderling	Purple Sandpiper	Dunlin	Bar-tailed Godwit	Eurasian Curlew	Common Redshank	Ruddy Turnstone
Devon	1420 (1286 - 1608)	10 (7 - 14)	21 (21 - 42)	0	0	0	35 (30 - 58)	1 (1 - 2)	0	65 (49 - 89)	1 (1 - 3)	274 (224 - 401)
Cornwall	2479 (2210 - 2761)	0	0	2	0	172 (85 - 300)	11 (6 - 15)	125 (75 - 225)	0	637 (445 - 816)	27 (19 - 38)	528 (375 - 661)
Dorset	224 (167 - 310)	120 (68 - 210)	0	0	0	22 (11 - 44)	27 (14 - 51)	126 (66 - 246)	0	4 (2 - 8)	0	98 (49 - 165)
Hampshire	68 (67 - 116)	14 (14 - 27)	0	0	0	4 (4 - 8)	11 (11 - 17)	0	0	0	6 (6 - 10)	19 (18 - 29)
Isle of Wight	45 (45 - 61)	0	0	0	0	0	2 (2 - 4)	0	0	39 (39 - 68)	0	12 (12 - 13)
West Sussex	245	209	0	0	200	500	2	197	0	10	47 (46 - 56)	543
East Sussex	243 (238 - 349)	5 (5 - 9)	58 (58 - 116)	592	0	21 (21 - 42)	9 (9 - 13)	50 (50 - 93)	0	82 (79 - 112)	16 (16 - 23)	426 (405 - 539)
Kent	386 (305 - 573)	438 (368 - 973)	0	131	0	219 (144 - 332)	36 (22 - 54)	59 (41 - 101)	0	128 (98 - 195)	188 (149 - 245)	474 (395 - 616)
Essex	72	8	0	0	0	72	0	4	0	72	56	84
Suffolk	0	6 (2 - 14)	0	10	1 (1 - 3)	0	0	0	0	0	14 (8 - 24)	49 (31 - 72)
Norfolk	9	69	0	253	0	61	0	27 (27 - 54)	0	23 (23 - 44)	7 (7 - 13)	127
Lincolnshire	65 (42 - 112)	44 (28 - 72)	0	0	16 (8 - 32)	125 (114 - 136)	0	0	54 (38 - 76)	34 (18 - 54)	66 (36 - 108)	6 (6 - 18)
East Yorkshire	216 (180 - 302)	27 (21 - 36)	2731 (1951 - 3697)	487	0	191 (165 - 234)	26 (26 - 64)	17 (13 - 23)	1 (1 - 2)	45 (35 - 79)	274 (231 - 373)	128 (112 - 199)

Region	Eurasian Oystercatcher	Common Ringed Plover	European Golden Plover	Northern Lapwing	Red Knot	Sanderling	Purple Sandpiper	Dunlin	Bar-tailed Godwit	Eurasian Curlew	Common Redshank	Ruddy Turnstone
North Yorkshire	967 (809 - 1168)	28 (28 - 84)	46 (23 - 92)	261	0	0	30 (15 - 48)	87 (44 - 173)	0	123 (78 - 173)	394 (287 - 553)	235 (172 - 349)
Cleveland	2420 (2131 - 3037)	20 (20 - 22)	0	600	915 (915 - 1268)	140 (140 - 162)	37 (37 - 39)	25	2 (2 - 3)	71 (69 - 101)	445 (443 - 714)	191 (179 - 222)
Durham	151 (105 - 229)	8 (6 - 23)	0	18	8 (4 - 12)	0	0	0	2 (1 - 4)	14 (10 - 20)	22 (13 - 29)	19 (13 - 30)
Tyne and Wear	305 (242 - 394)	39 (30 - 65)	2400 (2400 - 7200)	90	0	138 (100 - 208)	17 (16 - 33)	235 (192 - 452)	0	36 (31 - 76)	495 (374 - 678)	169 (136 - 209)
Northumberland	1464 (1308 - 1627)	314 (244 - 397)	0	201	13 (13 - 26)	327 (279 - 408)	184 (156 - 248)	376 (271 - 540)	43 (34 - 60)	445 (330 - 625)	532 (461 - 613)	407 (349 - 512)
Cumbria	3314 (2628 - 4341)	40 (28 - 55)	680 (364 - 1166)	0	14 (10 - 26)	97 (66 - 142)	6 (6 - 18)	95 (57 - 152)	0	294 (220 - 369)	278 (205 - 431)	139 (103 - 201)
Borders	178 (153 - 210)	0	0	1	0	0	0	0	0	61 (47 - 86)	80 (65 - 122)	47 (36 - 82)
Lothian	929 (884 - 1003)	67 (67 - 85)	38 (38 - 52)	105	239 (239 - 384)	40 (40 - 48)	42 (42 - 47)	341 (341 - 449)	28 (28 - 40)	89 (87 - 96)	242 (232 - 260)	379 (373 - 434)
Fife	747 (685 - 846)	62 (59 - 95)	49 (49 - 98)	203	0	15 (15 - 23)	67 (66 - 107)	132 (126 - 200)	2 (2 - 4)	278 (255 - 386)	299 (276 - 349)	161 (145 - 190)
Tayside	771 (771 - 791)	20 (20 - 27)	0	21	7	32	39	7	19	312 (312 - 314)	108	50
Grampian	1871 (1637 - 2114)	206 (142 - 287)	207 (126 - 333)	203	131 (76 - 228)	24 (11 - 47)	316 (242 - 418)	261 (147 - 444)	87 (50 - 133)	1398 (1083 - 1863)	1567 (1318 - 1796)	1301 (1079 - 1606)
Highland	8730 (8055 - 9379)	1772 (1575 - 2067)	302 (184 - 468)	1433	10 (7 - 17)	219 (137 - 389)	1059 (863 - 1311)	605 (453 - 830)	108 (81 - 143)	3854 (3539 - 4331)	1971 (1737 - 2293)	2019 (1790 - 2265)
Orkney	4033 (3741 - 4390)	1434 (1315 - 1589)	6936 (5774 - 8217)	4292	19 (18 - 34)	1064 (913 - 1325)	4082 (3806 - 4537)	644 (583 - 920)	571 (483 - 734)	15726 (14096 - 17499)	5504 (5148 - 6109)	6480 (6115 - 7084)
Shetland	1911 (1701 - 2083)	2444 (2158 - 2956)	2378 (1826 - 3040)	417	6 (3 - 11)	0	1632 (1362 - 1855)	227 (177 - 297)	0	5792 (5203 - 6537)	4629 (4368 - 5026)	9068 (8506 - 9758)
Western Isles	2278 (1998 - 2652)	3679 (2892 - 4597)	1583 (858 - 2781)	636	3 (1 - 5)	2682 (1952 - 3678)	2971 (2337 - 3693)	1236 (856 - 1689)	479 (362 - 715)	1841 (1671 - 2148)	1008 (885 - 1194)	4015 (3364 - 4819)
Strathclyde	16146 (14362 - 18611)	2149 (1899 - 2543)	667 (324 - 1046)	827	3 (1 - 5)	44 (25 - 79)	365 (280 - 459)	467 (324 - 668)	68 (28 - 111)	5337 (4780 - 6027)	1623 (1407 - 1927)	2596 (2278 - 2960)

Region	Eurasian Oystercatcher	Common Ringed Plover	European Golden Plover	Northern Lapwing	Red Knot	Sanderling	Purple Sandpiper	Dunlin	Bar-tailed Godwit	Eurasian Curlew	Common Redshank	Ruddy Turnstone
Dumfries and Galloway	2345 (1989 - 2800)	390 (281 - 559)	0	103	0	0	0	15 (5 - 30)	0	1725 (1344 - 2077)	457 (281 - 589)	526 (391 - 721)
Clwyd	1748 (1728 - 1813)	149	0	281	1	53	0	242	3	335 (326 - 442)	329 (329 - 386)	130 (130 - 140)
Gwynedd	5086 (4445 - 6230)	701 (557 - 868)	212 (106 - 424)	813	560 (280 - 840)	13 (7 - 20)	129 (69 - 253)	1448 (878 - 2560)	37 (23 - 69)	2487 (2157 - 2932)	980 (797 - 1236)	853 (726 - 1039)
Dyfed	1371 (1188 - 1583)	177 (109 - 261)	873 (353 - 1591)	200	0	33 (11 - 55)	23 (15 - 37)	42 (25 - 73)	0	952 (700 - 1211)	120 (68 - 189)	159 (111 - 227)
Glamorgan	2087 (1638 - 3720)	14 (12 - 35)	6 (6 - 18)	60	1 (1 - 3)	22 (20 - 56)	13 (12 - 35)	2 (2 - 6)	0	63 (47 - 99)	1 (1 - 3)	60 (52 - 146)
Derry	125 (96 - 169)	62 (34 - 96)	0	0	0	90 (54 - 144)	45 (30 - 77)	0	0	11 (7 - 21)	50 (36 - 65)	89 (67 - 119)
Antrim	1430 (1128 - 1857)	302 (241 - 431)	0	15	0	0	26 (18 - 37)	182 (161 - 385)	12 (10 - 26)	418 (341 - 623)	412 (359 - 505)	406 (338 - 476)
Down	3745 (3531 - 4010)	276 (234 - 364)	4305 (4229 - 7925)	2151	7 (7 - 17)	39 (34 - 73)	39 (32 - 50)	2534 (2163 - 3376)	45 (37 - 71)	1743 (1535 - 2054)	1924 (1741 - 2160)	1336 (1227 - 1613)

Appendix 2 Breakdown of county coverage for NEWS-II. Values given indicate total length of open coast, total length of open coast covered, number of Count Stretches visited and percentage of open coast covered. These are maximum values based on coverage of the intertidal habitat, coverage of inland and sea habitats generally being less than this. Data were derived from the NEWS count stretch definitions GIS coverage which is based on the low-tide Watsonian County Boundary data obtained from the NBN.

Region	Total Length (km)	Length Covered (km)	Number of Count Stretches Covered	Percent Coverage
Somerset	46	0	0	0
Devon	383	282	171	74
Cornwall	665	114	57	17
Dorset	155	75	26	48
Hampshire	46	42	18	91
Isle of Wight	94	81	50	86
West Sussex	73	73	16	100
East Sussex	98	89	24	90
Kent	140	65	21	47
Essex	26	5	1	21
Suffolk	81	52	23	64
Norfolk	86	86	35	100
Lincolnshire	30	16	4	54
East Yorkshire	93	72	23	77
North Yorkshire	113	57	26	50
Cleveland	47	37	11	80
Durham	22	13	9	56
Tyne and Wear	51	35	21	70
Northumberland	168	118	37	70
Borders	72	54	14	75
Lothian	72	68	33	94
Fife	79	64	31	82
Tayside	86	86	33	100
Grampian	495	203	77	41
Highland	3448	1327	482	38
Orkney	1116	978	405	88
Shetland	2026	310	242	15
Western Isles	743	271	100	36
Strathclyde	3199	1111	640	35
Dumfries and Galloway	294	83	41	28
Cumbria	62	39	18	63
Clwyd	35	32	8	92
Gwynedd	445	239	131	54
Isle of Man	180	69	29	38
Dyfed	454	155	75	34
Glamorgan	90	58	35	64
Derry	41	24	12	59
Antrim	152	108	67	71
Down	167	127	110	76
Northern Ireland	360	259	189	72
England	2481	1352	591	55
Scotland	11629	4555	2098	39
Wales	1024	484	249	47
Britain	15134	6392	2938	42
UK	15494	6651	3127	43