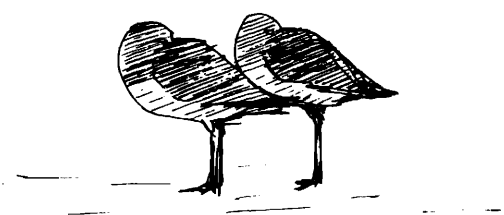


ACKNOWLEDGEMENTS

The Wetland Bird Survey (WeBS), of which NEWS is a part, is administered and funded by the British Trust for Ornithology, The Wildfowl and Wetlands Trust, the Royal Society for the Protection of Birds and the Joint Nature Conservation Committee. Thanks are due to Dr John Cayford and Ray Waters for setting up the NEWS pilot count, Julianne Evans for collating the data and Carol Powley for secretarial support. We also thank Peter Cranswick, Richard Pettifor, Nick Davidson and Ron Summers for their comments on earlier drafts of the manuscript. Our main thanks go to the counters who collected the WSC data in 1984/85 and the pilot NEWS data in 1994/95. Figure 1 was produced using DMap, courtesy of Dr Alan Morton.



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The Wetland Bird Survey (WeBS): wader counts from the 1993-94 and 1994-95 winters

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Waters, R. 1996. The Wetland Bird Survey (WeBS): wader counts from the 1993-94 and 1994-95 winters. *Wader Study Group Bull.* 80: 27-32.

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INTRODUCTION

Since 1969, the estuarine bird populations of the UK have been monitored by the British Trust for Ornithology (BTO)'s Birds of Estuaries Enquiry (BoEE), co-funded by the BTO, Joint Nature Conservation Committee (JNCC) and Royal Society for the Protection of Birds (RSPB). In 1993, the BoEE was merged with The Wildfowl & Wetland Trust (WWT)'s National Waterfowl Counts (NWC) to form the Wetland Bird Survey (WeBS). This new scheme monitors both wildfowl and waders at inland and coastal sites throughout the UK. WeBS is run jointly by four organisations (BTO, WWT, RSPB and JNCC) and combines the strengths of the previous count schemes with more efficient data handling, and improved communications between the organisers and the volunteers who carry out the counts. It is hoped that by working together, more resources will be available as well as continuing to provide the information which is crucial to waterfowl conservation in the UK.

A recent development which aids the interpretation and value of the WeBS data is a new analytical method for indexing waterfowl populations. The "Underhill" indexing method models each observation using the product of three factors, a year factor (the "index"), a site factor and a month factor (Underhill & Prys-Jones 1994). This model-based method for imputing missing observations provides a more reliable indicator of population trends than the previous "January index" and can produce indices based on three counts (December-February) from all previous winters (see Prys-Jones *et al.* 1994; Cayford & Waters 1996).

WeBS counts were made by over 3,000 participants on pre-selected dates near the middle of each month. Count dates were chosen to coincide with the best tidal conditions for counting estuarine birds. Detailed results for the winter periods (November-March) for 1993-94 and 1994-95 as well as key findings from passage periods, are available in Cranswick *et al.* (1995) and Waters *et al.* (1996). These, and previous issues, are available from the BTO (address above) price £15 including postage.

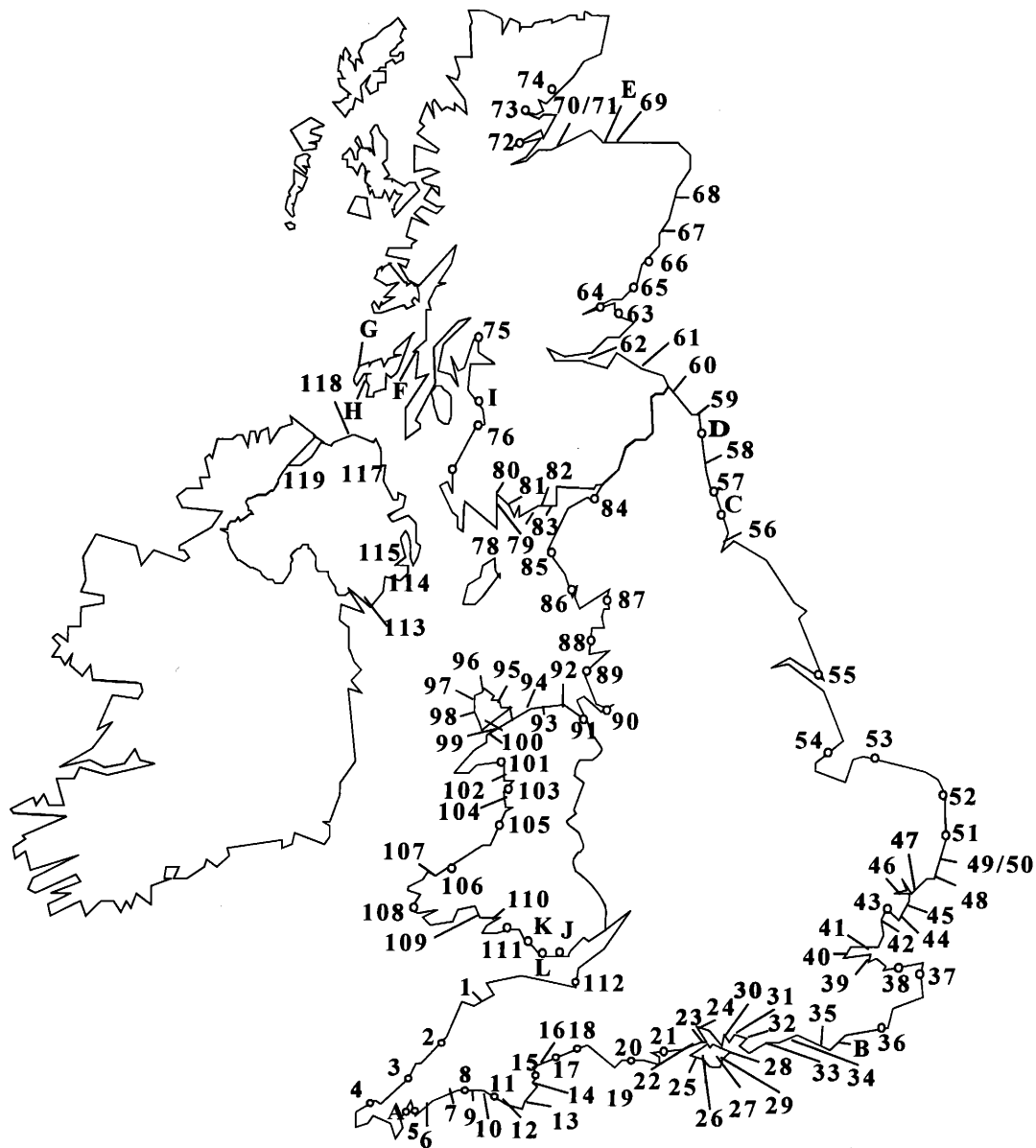


Figure 1. Map of Britain showing the locations of all estuaries considered in this paper. Site code numbers are as follows: 1 Taw/Torridge, 2 Camel; 3 Gannel; 4 Hayle; 5 Fal complex; 6 Fowey; 7 Looe; 8 Tamar complex; 9 Plym; 10 Yealm; 11 Erme; 12 Avon; 13 Kingsbridge; 14 Dart; 15 Teign; 16 Exe; 17 Otter; 18 Axe; 19 The Fleet/Wey; 20 Poole Harbour; 21 Christchurch Harbour; 22 NW Solent; 23 Beaulieu; 24 Southampton Water; 25 Yar; 26 Newtown; 27 Medina; 28 Wootton; 29 Brading Harbour; 30 Portsmouth Harbour; 31 Langstone Harbour; 32 Chichester Harbour; 33 Pagham Harbour; 34 Adur; 35 Newhaven; 36 Rye Harbour/Pett Levels; 37 Pegwell Bay; 38 Swale; 39 Medway; 40 Thames; 41 Crouch/Roach; 42 Dengie; 43 Blackwater; 44 Colne; 45 Hamford Water; 46 Stour; 47 Orwell; 48 Deben; 49/50 Alde complex; 51 Blyth; 52 Breydon Water; 53 N Norfolk Marshes; 54 Wash; 55 Humber; 56 Tees; 57 Blyth; 58 Coquet; 59 Lindisfarne; 60 Tweed; 61 Tynningham; 62 Forth; 63 Eden; 64 Tay; 65 Montrose Basin; 66 Dee; 67 Don; 68 Ythan; 69 Spey; 70/71 Inner Moray Firth; 72 Cromarty Firth; 73 Dornoch Firth; 74 Loch Fleet; 75 Inner Clyde; 76 Irvine; 77 Loch Ryan; 78 Luce Bay; 79 Wigtown Bay; 80 Fleet Bay; 81 Kirkcudbright Bay; 82 Auchencairn Bay; 83 Rough Firth; 84 Solway; 85 Irt/Mite/Esk; 86 Duddon; 87 Morecambe Bay; 88 Ribble; 89 Alt; 90 Mersey; 91 Dee; 92 Clwyd; 93 Conwy; 94 Lavan Sands; 95 Red Wharf Bay; 96 Dulas Bay; 97 Inland Sea; 98 Cefni; 99 Braint; 100 Foryd Bay; 101 Traeth Bach; 102 Artro; 103 Mawddach; 104 Dysynni; 105 Dyfi; 106 Teifi; 107 Nyfer; 108 Cleddau; 109 Carmarthen Bay; 110 Burry; 111 Swansea Bay; 112 Severn; A Helford; B Cuckmere; C Tyne; D South Alnmouth; E Banff; F Lossie; G Loch Gilp; H Loch Gruinart (Islay); I Loch Indaal (Islay); J Hunterston; K Afan; L Ogmere.

Table 1a. Total number of waders recorded at estuaries and coastal sites in the UK during winter 1993-94.

	NOV	DEC	JAN	FEB	MAR
Oystercatcher	231292	250128	235140	224356	127169
Avocet	1654	1949	2571	1943	1151
Ringed Plover	8720	9186	10102	8375	4879
Golden Plover	68586	69325	85609	35881	19586
Grey Plover	34666	40568	40816	46837	41016
Lapwing	116831	176030	272676	113867	14969
Knot	263244	253142	241222	165031	107062
Sanderling	7214	4637	5331	4722	4655
Purple Sandpiper	985	1351	1412	1490	840
Dunlin	350603	408129	470708	437389	205581
Snipe	2243	2644	2466	1868	1208
Black-tailed Godwit	7420	9502	10313	9350	6777
Bar-tailed Godwit	27119	41622	35338	39498	6350
Curlew	61127	61770	79843	73282	48124
Redshank	70753	70691	80059	74041	53991
Turnstone	14526	15924	16878	16512	12642
TOTALS* (all waders)	1267553	1417062	1591000	1254875	656532
<i>Number of sites counted</i>	<i>152</i>	<i>155</i>	<i>161</i>	<i>156</i>	<i>143</i>

Totals are uncorrected for coverage and differing monthly totals and do not necessarily reflect absolute or changing population sizes.

*Peak counts of species not given above but included in the totals were: Black-winged Stilt (1), Little Ringed Plover (1), Kentish Plover (1), Little Stint (26), Curlew Sandpiper (6), Ruff (280), Jack Snipe (40), Woodcock (12), Whimbrel (10), Spotted Redshank (57), Greenshank (248), Green Sandpiper (45), Wood Sandpiper (1), Common Sandpiper (28), Grey Phalarope (1).

Table 1b. Total number of waders recorded at estuaries and coastal sites in the UK during winter 1994-95.

	NOV	DEC	JAN	FEB	MAR
Oystercatcher	247262	246803	249480	229643	136781
Avocet	2707	1985	2388	2683	1573
Ringed Plover	11903	11142	8117	8827	4750
Golden Plover	143039	110571	106666	109996	30429
Grey Plover	49088	49685	38880	48453	53860
Lapwing	327805	305571	329954	268077	14856
Knot	225983	249103	201896	223992	149219
Sanderling	9672	7137	5811	5529	7360
Purple Sandpiper	800	1288	1288	1326	943
Dunlin	451985	550667	423058	456311	196930
Snipe	3306	3181	2884	2583	1962
Black-tailed Godwit	10844	10361	10570	8613	13070
Bar-tailed Godwit	25323	30385	36232	47440	10819
Curlew	80346	76935	89032	94051	64361
Redshank	88235	89970	72484	90498	67787
Turnstone	18033	17445	13510	16404	13850
TOTALS* (all waders)	1697056	1762774	1592807	1615034	769142
<i>Number of sites counted</i>	<i>186</i>	<i>193</i>	<i>200</i>	<i>195</i>	<i>188</i>

Totals are uncorrected for coverage and differing monthly totals and do not necessarily reflect absolute or changing population sizes.

*Peak counts of species not given above but included in the totals were: Black-winged Stilt (1), Little Ringed Plover (3), Kentish Plover (1), Dotterel (1), Little Stint (14), Curlew Sandpiper (1), Ruff (240), Jack Snipe (41), Woodcock (23), Whimbrel (88), Spotted Redshank (81), Greenshank (326), Green Sandpiper (55), Wood Sandpiper (3), Terek Sandpiper (1), Common Sandpiper (25), Grey Phalarope (2).

A summary of the results for these two winters is presented below.

RESULTS

1993-94

Of the 129 UK estuaries listed by WeBS, winter counts were made on all except Luce Bay, the Gannel, Tyne, Spey, Camel and Dart Estuaries. Together these uncounted sites hold just over 10 000 waders in mid-winter. Also counted in the 1993-94 winter were over 100

sites on the open coast and over 1,000 inland wetland sites. At all estuarine and open coast sites at least one complete count was made except at the Colne Estuary. A spell of severe cold weather resulted in the British Association for Shooting and Conservation calling for voluntary shooting restraint in Scotland, although conditions improved before a statutory ban was triggered. The remainder of the winter was generally milder. The peak monthly UK total for all estuarine/coastal sites of almost 1.6 million waders was recorded in January 1994 and is considerably less than the record-breaking peak of over 1.8 million recorded the previous winter (Waters &

Table 2. Overall winter wader counts at principal wetlands.

Site name	Peak winter count		Average peak winter count
	1993-94	1994-95	1990-91 to 1994-95
Wash	203826	262503	213506
Morecambe Bay	168275	191851	189920
Ribble Est.	146045	164045	151179
Humber Est.	116142	220710	145269
Thames Est.	114008	130535	118727
Dee Est. (Eng/Wales)	74598	88210	98421
Solway Est.	84708	109042	91047
Mersey Est.	52236	91372	69162
Severn Est.	61423	76515	64240
Somerset Levels	31274	60950	60950
Blackwater Est.	55993	54455	52171
Medway Est.	42728	50527	49190
Forth Est.	46305	37067	43889
Swale Est.	24208	53492	41083
Stour Est.	32918	43142	37810
Chichester Hbr.	37144	45533	37760
Langstone Hbr.	31704	36522	36959
Strangford Lo.	28565	42041	36478
Breydon Water	48099	44495	32004
Alt Est.	28553	31156	30245
Duddon Est.	25482	36659	29987
Dengie	22340	30285	27770
Burry Inlet	25829	31948	27579
Colne Est.	(26896)	35236	27107
North Norfolk Marshes	24369	27165	27000
Hamford Water	28280	28054	24454
Lindisfarne	22474	22509	24343
Inner Moray Fth.	18998	20468	22408
Carmarthen Bay	15077	34039	20582

Cranswick (1993). Two of the most numerous wader species in the UK, Oystercatcher and Lapwing, were present in below average numbers, thus lowering the all species total. In contrast both Avocet and Black-tailed Godwit continued their massive increases with record-breaking totals.

Unlike the national totals the Underhill index compensates for differences in coverage from year to year, enabling more reliable trends to be calculated. The winter index in 1993-94 showed a change of more than 10% compared to the previous winter for Black-tailed Godwit, Grey Plover and Knot. The 24% increase for Black-tailed Godwit continues the upward trend shown by this species every year bar one since 1986. The Grey Plover index showed a rare decline in the previous year but rose by 17% in the 1993-94 winter to exceed the 500 mark for the first time. The long term rise in numbers of this species wintering in the UK has been mirrored in Western Europe over the past 50 years. Knot are known to frequently move in large numbers between the UK and the Wadden Sea, particularly in response to changes in the weather. The 15% decline on the previous winter's index, although resulting in its lowest value for nine years, should not therefore be cause for concern.

On inland sites, recorded totals of Snipe continue to surpass numbers recorded on estuaries/coastal sites. The 1993-94 inland totals were around 20% greater than the previous winter, although this is one of the most difficult species to census accurately.

Table 3a. Total number of waders recorded at inland wetlands in the UK during winter 1993-94.

	NOV	DEC	JAN	FEB	MAR
Oystercatcher	262	123	438	2439	6866
Golden Plover	10742	9865	16156	12287	3645
Lapwing	39457	58468	80629	68478	9671
Dunlin	463	1120	711	2358	1628
Snipe	4070	4586	3480	4880	3693
Black-tailed Godwit	2	4	60	832	1197
Curlew	2985	2651	4698	3736	4742
Redshank	393	446	699	648	1007
TOTALS* (all waders)	58969	77849	107280	96204	33108
<i>Number of sites counted</i>	<i>1016</i>	<i>975</i>	<i>1057</i>	<i>1038</i>	<i>1010</i>

Totals are uncorrected for coverage and differing monthly totals and do not necessarily reflect absolute or changing population sizes.

*Peak counts of species not given above but included in the totals were: Avocet (26), Little Ringed Plover (11), Ringed Plover (386), Dotterel (1), Grey Plover (46), Knot (19), Sanderling (17), Little Stint (2), Ruff (250), Jack Snipe (72), Woodcock (23), Bar-tailed Godwit (52), Spotted Redshank (1), Greenshank (17), Green Sandpiper (63), Common Sandpiper (11), Spotted Sandpiper (1), Turnstone (63).

Table 3b. Total number of waders recorded at inland wetlands in the UK during winter 1994-95.

	NOV	DEC	JAN	FEB	MAR
Oystercatcher	279	306	1442	6759	8451
Golden Plover	29381	41301	39166	43720	14884
Lapwing	132143	151926	213150	155644	15086
Dunlin	1898	4143	3136	1940	4356
Snipe	6133	7301	4620	3551	3277
Black-tailed Godwit	299	259	115	659	2634
Curlew	4148	3893	8345	6310	7068
Redshank	522	530	1088	1141	2026
TOTALS* (all waders)	175453	210218	271655	220283	58894
<i>Number of sites counted</i>	<i>1079</i>	<i>1095</i>	<i>1199</i>	<i>1161</i>	<i>1167</i>

Totals are uncorrected for coverage and differing monthly totals and do not necessarily reflect absolute or changing population sizes.

*Peak counts of species not given above but included in the totals were: Avocet (121), Little Ringed Plover (11), Ringed Plover (182), Grey Plover (24), Knot (44), Sanderling (1), Little Stint (6), Curlew Sandpiper (2), Purple Sandpiper (1), Ruff (586), Jack Snipe (119), Woodcock (53), Bar-tailed Godwit (6), Spotted Redshank (3), Greenshank (18), Green Sandpiper (103), Common Sandpiper (17), Spotted Sandpiper (1), Turnstone (26).

All sites which held on average more than 20,000 waders in the period 1990-91 to 1994-95 are listed in Table 2, although other sites will be of international importance also owing to combined totals of waterfowl exceeding 20,000, and some sites with lower total numbers but holding at least 1% of particular flyway populations. Of those sites listed only four recorded 1993-94 peak counts above their five year mean peak with just Breydon Water recording an increase of more than 20%. Declines of 20% or more compared to the five year mean peaks were noted at the Mersey, Dee (England/Wales), Swale Estuaries, Somerset Levels and Strangford Lough. As usual the highly mobile species Lapwing and Golden Plover were responsible for several of these atypically large or small overall counts, probably in response to weather conditions. In addition, counts of Dunlin were particularly low on the Mersey and Swale Estuaries, whilst on the Dee the low overall total was caused largely by numbers of Knot being well below average.

1994-95

The 1994-95 winter was particularly mild and contained no prolonged spells of cold weather. Only the Spey, Ogmire and Irt/Mite/Esk Estuaries were not counted during this period and, in addition to 126 estuaries, WeBS counts were carried out at almost 100 open coast sites and 1200 inland wetlands. The peak total of all waders present on estuarine/open coast sites was recorded in December 1994 and almost matched the record-breaking UK total of over 1.8 million waders recorded in December 1992. Amazingly, UK totals of five wader species exceeded their previous winter record counts. Grey Plover, Avocet and Black-tailed Godwit each continued upward trends which began more than 10 years ago. Sanderling and Redshank also surpassed their previous recorded UK totals in the 1994-95 winter, although these two species have shown no consistent trends in recent years.

The Underhill index provides a far more reliable measure of population trends since it corrects for change in coverage from year to year. Remarkably for every wader

species involved, the 1994-95 index was greater than the previous winter. The largest increase was 50% for Sanderling, although most of the UK wintering population occurs on uncounted open coastline, which will hopefully be covered by the Non-estuarine Coastal Waterfowl Survey. The Grey Plover index increased by 19% to exceed the 600 mark suggesting a six fold population increase since 1972. For both Redshank and Curlew the index reached it's greatest value for at least five years due to increases in 1994-95 of 18% and 23% respectively. The other species to show an increase in its winter index of over 10% was Dunlin (12%), although it continues to have a value below 100, which was set for 1972.

The all wader totals recorded on inland sites throughout the UK were approximately double the values of recent years. In particular, recorded totals of Lapwing, Golden Plover, Ruff and Curlew were around those noted since WeBS began counting inland waders since 1981. Perhaps most notable, however, was the total for Snipe which in December 1994 exceeded 7,000 birds, which is around double the highest UK total recorded for all estuarine/tidal sites combined. This record count however probably represents just a small fraction of the true UK total population, but any increase in the numbers monitored could provide valuable information about this poorly monitored species.

Those sites averaging over 20,000 waders are listed in Table 2 and in 1994-95 only five of these major sites recorded winter peaks below their five year average and none of these registered counts more than 20% below the average. In contrast increases of more than 20% above the mean all wader peak were recorded at eight sites. Typically Lapwing and/or Golden Plover were responsible for these particularly large all species totals at six of these sites. However, at Chichester Harbour unusually large counts of Dunlin and Black-tailed Godwit pushed up the overall wader total, whilst at the Duddon Estuary large numbers of Dunlin alone were responsible for the large all species total.

FUTURE WORK

The main component of WeBS is the series of "Core Counts", carried out throughout the UK on around 2,000 inland sites and the great majority of estuaries, where most counts are made at high tide. Since 1992, the Low Tide Count Scheme has collected additional valuable information, notably on the feeding distribution of estuarine waterfowl. Estuaries are counted on a seven year cycle for the Low Tide Scheme and in 1994-95 Southampton Water, Pegwell Bay, Strangford Lough, Belfast Lough, Traeth Lafan, Burry Inlet, the Taw/Torridge, the Orwell, the Colne, the Blackwater and the Duddon Estuaries were counted. In 1995-96 the Fal complex, Pagham Harbour, Inland Sea, Findhorn Bay and the Fowey, Medina, Crouch/Roach and Wear Estuaries were counted for the first time, with a further season of counts undertaken on Southampton Water, Strangford Lough, Belfast Lough, the Orwell and Duddon Estuaries.

The extensive coastline in the UK has only once been counted comprehensively during the Winter Shorebird Count in 1984/85. During the 1997-98 winter a repeat of this survey covering the UK, other parts of Europe and certain areas of Africa will collect exciting up-to-date information on wintering waders and wildfowl on the open coastline (see elsewhere this *Bulletin*).

One of the most influential papers of the 1980s was an investigation into the increase in wintering Grey Plover by Moser (1988). This species has continued its unprecedented growth in numbers and the BTO will be using current WeBS data to re-examine the issues associated with this astounding phenomenon.

WeBS has now been running since 1993 so it has become important to review the methods presently being used for data collection and analysis. The Low Tide Count Scheme will be compared to the Core Count Scheme, counts on weekdays will be compared to those made at weekends, the value of the data collected on raptors and disturbance will be reviewed, and the methods for generating population trends will be re-assessed. These

analyses should help the WeBS partners to understand more clearly how the data can be used and be aware of their limitations, thus ensuring that WeBS moves productively into the 21st century.

ACKNOWLEDGEMENTS

The Wetland Bird Survey (WeBS) is co-funded by the British Trust for Ornithology, The Wildfowl & Wetlands Trust, the Royal Society for the Protection of Birds and the Joint Nature Conservation Committee (on behalf of English Nature, Scottish Natural Heritage, the Countryside Council for Wales and the Department for the Environment for Northern Ireland). We acknowledge the extraordinary contribution made by the volunteers who are responsible for providing all of the data.

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