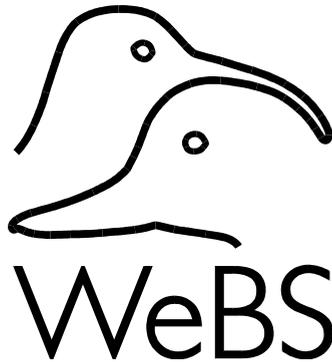


# Waterbirds in the UK 2004/05

## The Wetland Bird Survey

Alex Banks, Mark Collier, Graham Austin,  
Richard Hearn and Andy Musgrove



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This report is provided free to all WeBS counters and those who participate in the other national waterbird surveys, none of whom receive financial reward for their invaluable work. Further feedback is provided to counters through the annual WeBS Newsletter. For further information please contact the WeBS Office at the BTO.

This book represents the twenty-fourth report of the Wetland Bird Survey and comprises information from WeBS and complementary national and local surveys, e.g. goose censuses. It is entirely dependent on the many thousands of dedicated volunteer ornithologists who supply the data and to whom we are extremely grateful. The Local Organisers who coordinate these counts deserve special thanks for their contribution.

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## **The WETLAND BIRD SURVEY**

Organised and funded by

### **British Trust for Ornithology**

The Nunnery, Thetford, Norfolk IP24 2PU  
www.bto.org

### **Wildfowl & Wetlands Trust**

Slimbridge, Gloucestershire GL2 7BT  
www.wwt.org.uk

### **Royal Society for the Protection of Birds**

The Lodge, Sandy, Bedfordshire SG19 2DL  
www.rspb.org.uk

### **Joint Nature Conservation Committee**

Monkstone House, City Road, Peterborough  
PE1 1JY  
www.jncc.org.uk

## **CONTACTS**

WeBS National Coordinator: Andy Musgrove  
WeBS Core Counts: Mark Collier  
WeBS Low Tide Counts: Alex Banks  
WeBS Counter Coordinator: Steve Holloway

General queries: [webs@bto.org](mailto:webs@bto.org)

WeBS Office  
British Trust for Ornithology  
The Nunnery  
Thetford  
Norfolk IP24 2PU  
UK  
Tel: 01842 750050  
Fax: 01842 750030  
E-mail: [firstname.surname@bto.org](mailto:firstname.surname@bto.org)  
or [webs@bto.org](mailto:webs@bto.org)  
[www.bto.org/survey/webs](http://www.bto.org/survey/webs)

## **NATIONAL GOOSE CENSUSES**

Organised and funded by the Wildfowl & Wetlands Trust and the Joint Nature Conservation Committee.

Contact: Jenny Worden  
E-mail: [Jenny.Worden@wwt.org.uk](mailto:Jenny.Worden@wwt.org.uk)  
or [monitoring@wwt.org.uk](mailto:monitoring@wwt.org.uk)

Wildfowl & Wetlands Trust  
Slimbridge  
Glos GL2 7BT  
UK  
Tel: 01453 891225  
Fax: 01453 891901  
[www.wwt.org.uk/research/monitoring](http://www.wwt.org.uk/research/monitoring)

## **OTHER NATIONAL WATERBIRD SURVEYS**

Details of and contacts for many of the other waterbird surveys used in this report, and of forthcoming surveys, can be obtained via the web sites of the four WeBS partner organisations.

## **ERRATA TO 2003/04 REPORT**

Please note the following corrections to data presented in the 2003/04 WeBS annual report:

- p26-7 Icelandic Greylag Geese during May to September should read 0 and counts from these months are added to the Re-established population, which become; 5738 May, 12743 Jun, 14794 Jul, 18483 Aug, 28858 Sep.
- p49 The 2001/02 peak of Black-necked Grebe in Langstone Harbour was a Low Tide count of 15; the 2003/04 five-year mean peak was therefore 14.
- p59 Bewick's Swan indices are incorrect see species text in this report for details.
- p60 Whooper Swan indices are incorrect see species text in this report for details.
- p61 The 2002/03 Whooper Swan peak at Nene Washes should read 143 (standard Core Count), giving five-year mean peak of 97.
- p68 Counts of Greylag Geese for Machrihanish and Moine Mhor are presented as being from the Northwest Scottish Population. Birds at these sites are now considered to be from the Icelandic Population, however, five-year mean peaks at these sites were below the threshold for this population and would not have appeared in the table.
- p69 The table header for Re-established Greylag Goose states 'Sites with mean peak counts of 300 or more...' this should read '...400 or more...'
- p78 The 2000/01 peak of East Canadian High Arctic Light-bellied Brent Goose at the Dee Estuary should read 39 consequently giving a 2003/04 five-year mean peak of 35.
- p118 The GB maximum count for Avocet was during December.
- p130 Only two Pectoral Sandpipers were present at Cliffe Pools.

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## Summary

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### *The Wetland Bird Survey and Waterbirds in the UK*

The Wetland Bird Survey (WeBS) is a joint scheme of the British Trust for Ornithology (BTO), the Wildfowl & Wetlands Trust (WWT), Royal Society for the Protection of Birds (RSPB) and Joint Nature Conservation Committee (JNCC) to monitor non-breeding waterbirds in the UK. The principal aims of the scheme are to identify population sizes, to determine trends in numbers and distribution, and to identify important sites for waterbirds. WeBS Core Counts are made annually at around 2,000 wetland sites of all habitats; estuaries and large still waters predominate. Monthly coordinated counts are made mostly by volunteers, principally from September to March, with fewer observations during summer months. Data from other sources, e.g. roost counts of grey geese, are included in this report where relevant.

This report presents total numbers counted for all species in the most recent year in Great Britain and Northern Ireland. Annual indices are provided for the more numerous species, as are monthly indices showing relative abundance during the winter.

Species accounts provide yearly maxima for all sites supporting internationally and nationally important numbers. Sites with changed status are highlighted and significant counts are discussed. Counts are placed in an international context where possible, and relevant research is summarised. Waterbird totals are provided for all sites meeting criteria for international importance and species occurring in internationally important numbers on each are identified.

WeBS Low Tide Counts are made on selected estuaries to determine the distribution of birds during low tide and to identify important feeding areas that may not be recognised during Core Counts, which are made mostly at high tide. A summary of results for these estuaries, and distribution maps for selected species, are provided.

Waterbird totals recorded by the Irish Wetland Bird Survey, a similar scheme operating in the Republic of Ireland, are also included.

### *The 2004/05 year*

This report summarises counts during 2004/05 and previous years (since 1960 for wildfowl, 1969 for waders and the early 1980s or 1990s for other species). During 2004/05, WeBS counters covered 3,300 count sectors at around 2,000 count sites, during the crucial 'winter' period of September to March. At least 1,500 were counted in any one of these months and almost 1,100 were covered continually throughout this period. This represents a fantastic effort all around and a huge thank you must go to all those involved.

Bewick's and Whooper Swans continue to use the Ouse Washes in ever-increasing numbers, in the latter case leading to a dramatically increasing British wintering population.

Nationally, the number of wintering Pink-footed Geese rose slightly following a successful breeding season. Numbers of European White-fronted Geese recorded in Britain continued to fall and reached their lowest level since records began, although this is likely to be due to increasing numbers remaining in continental Europe throughout the winter period rather than a reflection on the overall population. Greenland White-fronted Geese showed further declines and in 2004/05 were present in their lowest numbers for 15 years. Unlike European Whitefronts, this decline has been witnessed across the entire population and is thought to be linked to poor breeding success.

Increases in the numbers of Icelandic Greylag Geese were identified. The numbers of birds remaining in Iceland throughout the autumn has also increased. The increase in Greenland Barnacle Geese was attributed to a successful breeding season; numbers of this species have risen at the principal site, Islay, as well as other key sites. Despite numbers of Svalbard Barnacle Geese remaining stable, productivity over the past five years has remained low. Numbers of Dark-bellied Brent Geese showed their first increase for over ten years. The proportion of young birds was the highest for five years, however, this remained below the level of the late 1990s. October 2004 saw the highest ever total of East Canadian High Arctic Light-bellied Brent

Geese at Strangford Lough; this was despite many birds still being present in Iceland. By mid-winter most birds had dispersed from the main sites, this was reflected by a decline in the annual index. Lower than average numbers of Svalbard Light-bellied Brent Geese were present throughout the winter. As usual Lindsfarne held the largest numbers.

There were mixed fortunes for Shelduck, which continued to decline in Britain and increase in Northern Ireland. Wigeon were present in slightly lower numbers than the past couple of years; however, the British wintering population remains healthy. Numbers of wintering Gadwall reached their highest-ever level in Britain and yet at the same time numbers in Northern Ireland were one of the lowest ever recorded. As usual Teal numbers were subject to a high level of fluctuation, although the underlying trend remains stable. Mallard continued their long-term decline, reaching record low levels in both Britain and Northern Ireland. Pintail is another species that has showed long-term declines, but since 2000/01 numbers in both Britain and Northern Ireland have risen steadily. Despite there being little change in the numbers of Shoveler in Britain numbers reached a record low in Northern Ireland.

A key feature of recent WeBS counts has been the dramatic decline of some diving duck species in Northern Ireland, due largely to trends in numbers using Loughs Neagh & Beg. Following recent crashes, data for 2004/05 showed sustained low numbers of Pochard and Tufted Duck. However, Scaup peaked at their highest ever level, showing that concerns over this decline proved thankfully unnecessary. Numbers of these three species have been less erratic in Britain with a trivial decline for Pochard, a rise for Tufted Duck and no change for Scaup. In the last seven years Goldeneye have shown a decline of over 15% in Britain, this decline is much more pronounced in Northern Ireland; however, numbers here have risen slightly for the second year running. The British wintering population of Red-breasted Mergansers rose by around 10% in 2004/05, whereas Goosander numbers fell by almost 20% in the same period.

Counted maxima for Red-throated Diver were the lowest to date, while those for Black-

throated and Great Northern Divers were well above average. The British trends for both Little and Great Crested Grebes show steady increases. Little Egret again continued to expand its range and population, although less rapidly than in recent years. In Britain both Moorhen and Coot numbers have remained relatively stable. However, Coot numbers in Northern Ireland have fallen dramatically over the past five years, largely due to the declines at Loughs Neagh and Beg.

Oystercatcher numbers remained fairly stable, numbers at the top site, Morecambe Bay, being the highest for seven years. Avocet have shown a steady increase over the past 15 years and 2004/05 data followed the pattern of recent years. There were mixed fortunes for Lapwing numbers, which rose in Britain and fell in Northern Ireland. Ringed Plover numbers continued to fall; this was despite a counted maximum similar to those of the past 15 years. Numbers of wintering Golden Plover increased in Northern Ireland and reached record numbers in Britain. Conversely, Grey Plover have continued to decline in both Britain and Northern Ireland. Knot showed further signs of increase; numbers on The Wash were the highest for over ten years. Wintering numbers of both Sanderling and Dunlin continued to decline. There was also a considerable fall in Bar-tailed Godwit numbers. While Redshank and Turnstone numbers remained similar to the past few years, there was a definite increase in the number of wintering Curlew in 2004/05. Additionally, record peaks of wintering Black-tailed Godwit and Greenshank were documented.

As in 2003/04, further declines were recorded in most of the main gull species, the exception being Herring Gull, which rose by almost 70% on the previous year. Summed maxima of Sandwich Tern were higher than in the previous year. However, Little Tern and Common Tern numbers were lower than in 2003/04. As with all gulls and terns the optional coverage of these groups during WeBS counts means that numbers recorded will largely be dependent on coverage at each site.

## ***Introduction***

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The UK is of outstanding international importance for waterbirds. Lying on some of the major flyways for Arctic-nesting species, large numbers of waterbirds are attracted, especially during winter, by the relatively mild climate and extensive areas of wetland, notably estuaries. The UK thus has both moral and legal obligations to conserve both these waterbirds and the wetlands upon which they depend.

As a signatory to a number of international conservation conventions, and as a member of the EU, the UK is bound by international law. In particular, the 'Ramsar' Convention on Wetlands of International Importance especially as Waterfowl Habitat, the EC Birds Directive and the EU Habitats and Species Directive, between them, require the UK to identify important examples of wetland and other habitats and sites important for birds and designate them for protection. Implicit in these obligations is the need for regular monitoring to identify and monitor such sites. These instruments also lay particular significance on the need to conserve migratory populations, and consequently most of the waterbird populations in the UK.

The UK has ratified the Agreement on the Conservation of African-Eurasian Migratory Waterbirds (AEWA) of the 'Bonn' Convention on the Conservation of Migratory Species of Wild Animals. AEWA entered into force in 1999. It is a specific Agreement requiring nations to take coordinated measures to conserve migratory waterbirds given their particular vulnerability due to their migration over long distances and their dependence on networks that are decreasing in extent and becoming degraded through non-sustainable human activities. Article three of the Agreement requires, among other things, that sites and habitats for migratory waterbirds are identified, protected and managed appropriately, that parties initiate or support research into the ecology of these species, and exchange information and results. Explicit in this Agreement is that adequate monitoring programmes are set in place to fulfil these objectives and the Action Plan to the Agreement specifically requires that nations endeavour to monitor waterbird populations.

## **AIMS AND OBJECTIVES OF WeBS**

The Wetland Bird Survey (WeBS) aims to monitor all non-breeding waterbirds in the UK to provide the principal data on which the conservation of their populations and wetland habitats is based. To this end, WeBS has three main objectives:

- to assess the size of non-breeding waterbird populations in the UK;
- to assess trends in their numbers and distribution; and
- to assess the importance of individual sites for waterbirds.

These results also form the basis for informed decision-making by conservation bodies, planners and developers and contribute to the sustainable and wise use and management of wetlands and their dependent waterbirds. The data and the WeBS report also fulfil some of the objectives of the Conventions and Directives listed above. WeBS also provides UK data to Wetlands International to assist their function to coordinate and report upon waterbird monitoring at an international scale.

### ***Structure and organisation of WeBS***

WeBS is a partnership scheme of the British Trust for Ornithology (BTO), Wildfowl & Wetlands Trust (WWT), Royal Society for the Protection of Birds (RSPB) and the Joint Nature Conservation Committee (JNCC), the last on behalf of English Nature (EN) (now Natural England), Scottish Natural Heritage (SNH) and the Countryside Council for Wales (CCW), and the Environment and Heritage Service in Northern Ireland (EHS).

WeBS continues the traditions of two, long-running count schemes which formed the mainstay of UK waterbird monitoring since 1947 (Cranswick *et al.* 1997). WeBS Core Counts are made at a wide variety of wetlands throughout the UK. Synchronised counts are conducted once per month, particularly from September to March, to fulfil all three main objectives. In addition, WeBS Low Tide Counts are undertaken on selected estuaries with the aim of identifying key areas used during the low tide period, principally by feeding birds; areas not otherwise noted for

their importance by Core Counts which are normally conducted at high tide.

The success and growth of these count schemes accurately reflects the enthusiasm and dedication of the several thousands of volunteer ornithologists who participate. It is largely due to their efforts that waterbird monitoring in the UK is held in such international high regard.

#### *Aim of this report*

This report presents syntheses of data collected between April 2004 and June 2005 (see *The WeBS Year*), and in previous years, in line with the WeBS objectives. Data from other national and local waterbird monitoring schemes, notably annual goose censuses, are included where WeBS data alone are insufficient to fulfil this aim, so that the report provides a single, comprehensive source of information on waterbird status and distribution in the UK. All nationally and internationally important sites for which data exist are listed.

#### *Changes since the 2003/04 report*

The arrangement of species largely follows the order recently adopted by the British Ornithologists' Union (Knox *et al.* 2002). This broadly means that swans through ducks can be found before divers. The rest of the species order remains largely unchanged.

Previous WeBS reports have presented data from April to March inclusive, meaning that any spring data (April to June) effectively concerned birds from the previous winter period. As WeBS is predominantly concerned with non-breeding waterbirds, whose peak numbers typically occur during the winter months and can still be present through into much of the spring, it is more meaningful to present spring data along with that of the preceding winter.

This report presents data from July through to June, thus including the autumn and spring data from the adjoining wintering period. Data for April to June 2004 are presented in Appendix 3.

#### **WEATHER IN 2004/05**

This summary of UK weather is drawn from the Meteorological Office web site at [www.metoffice.gov.uk](http://www.metoffice.gov.uk). Figures in brackets following the month refer to the Core Count priority date for the month in question. Arctic

breeding conditions for birds that winter in the UK are summarised from information collated by Soloviev & Tomkovich at the web site [www.arcticbirds.ru](http://www.arcticbirds.ru).

#### ***United Kingdom***

Although **April** (25) temperatures were above average across the whole of Britain and Northern Ireland, sunshine was in short supply and the month was dominated by wet conditions. The exception, however, was north Wales and northwest England, which experienced lower than average rainfall.

Higher than average rainfall continued into **May** (23) in southeast England, although for the rest of the UK conditions were somewhat drier. Most areas experienced conditions that were sunnier and warmer than average, particularly eastern Scotland.

**June** (20) saw the return of wet weather to northern England and Scotland, whilst further south sunny and dry conditions prevailed. Temperatures were above average despite being cold in the second half of the month.

Although temperatures, rainfall and sunshine in **July** (18) were all around average for the UK, there were large variations between regions. Eastern England received twice its average monthly rainfall whilst in contrast some areas of Scotland only received half of the expected.

**August** (22) was dominated by rain with many areas experiencing double their monthly rainfall. Much of northeast England and southern Scotland experienced low amounts of sunshine, although further north Shetland basked in unusually high levels of sunshine. Average temperatures were normal for the time of year.

As the year moved on wet weather persisted in western areas although for the rest of Britain **September** (19) saw the return of drier, sunnier conditions. Temperatures were slightly above average across the country. By the end of the second week, conditions became more unsettled with showers persisting through most of the second half of the month. Scotland and some western areas experienced strong winds. The month finished with eastern areas experiencing thundery conditions.

**October** (17) began wet and windy in most areas with some localized thunderstorms in the second week. High pressure brought a series of fronts that brought wet and sometimes windy

conditions to most of England and Wales. Scotland also experienced bands of heavy rain and like the rest of the country ended with a few days of dry weather at the end of the month.

Dry conditions continued into **November** (14) with high pressures dominating early on in the month. Temperatures started mild with few frosts, however, a sudden fall in temperature in the middle of the month was a result of northerly winds, which also brought heavy rain and widespread frosts and snow to higher ground, and even to some areas of southern England. Milder conditions returned at the end of the month with cloudy and rainy weather to most areas.

Despite starting widely mild and sunny **December** (12) turned drizzly across most of England and Wales by the start of the second week. This was short lived as high pressure helped keep much of eastern England dry, before southeasterly winds brought cold and misty conditions. Southwesterly winds brought milder, albeit wetter and windier conditions in the middle of the month. Scotland experienced mainly mild and cloudy conditions until strong winds in the middle of the month brought change. Showers persisted through the third week of December although these turned wintry bringing snowy conditions across much of the country.

The unsettled weather continued into the first two weeks of **January** (16), which saw heavy rain and strong blustery winds across most of the country. These conditions persisted into the third week, except in eastern England, which experienced clear skies bringing sunshine and frosts in the middle of the month. Rain soon returned to most of the country with some wintry spells especially in northern areas. Temperatures finally rose on the last day of the month with sunshine in some areas.

**February** (13) started mainly dry and although by the start of the second week a cold front brought unsettled and wintry conditions across much of England and Wales that persisted for the rest of the month. Scotland experienced some milder and wetter weather towards the middle of the month before colder, wintry conditions prevailed.

Cold, wintry conditions continued into the first half of **March** (13) with snowy and icy conditions throughout much of England, Wales, Scotland and Northern Ireland. These

cold temperatures gave way to milder, cloudier and wetter conditions in the middle of the month, which continued for the following couple of weeks. Mild temperatures were a feature across most of the country.

**April** (10) began mild with alternative spells of wet and settled periods typical for the time of year. Some higher areas experienced brief snow showers in the middle of the month. Temperatures remained high towards the end of the month with many areas, especially Scotland and Northern Ireland experiencing increasing periods of sunshine.

Changeable weather remained into **May** (8) with rain easing during the middle of the month. Temperatures remained cool and rain returned for the remainder of the month. The final few days saw heavy rain at times.

Rain continued into the first week of **June** (26) before drier warmer conditions intervened. High temperatures and fine weather continued in England and Wales for much of the month, however, there were heavy showers across much of England during the final week. Scotland and Northern Ireland experienced cooler damper conditions during the second half of the month.

*Table 1.* The percentage of inland count units (lakes, reservoirs, gravel pits, rivers and canals) in the UK with any ice and with 75% or more of their surface covered by ice during WeBS counts in winter 2004/05 (England divided by a line drawn roughly between the Humber and the Mersey Estuaries).

Region	Ice	S	O	N	D	J	F	M
Northern Ireland	>0%	0	0	0	0	0	0	0
	>74%	0	0	0	0	0	0	0
Scotland	>0%	0	0	1	8	9	7	5
	>74%	0	0	<1	5	3	2	<1
N England	>0%	0	0	2	2	1	2	4
	>74%	0	0	<1	0	<1	<1	0
S England	>0%	0	0	1	<1	<1	1	<1
	>74%	0	0	<1	<1	<1	0	<1
Wales	>0%	0	0	0	1	0	1	0
	>74%	0	0	0	0	0	0	0

### **Arctic Breeding Conditions 2004**

Much of the Russian Arctic and Fennoscandia experienced cold conditions during June and July. Despite a late spring and cold June in the western Taymir temperatures quickly rose during late June and July. Rodent numbers were low across Fennoscandia and average on the Kola Peninsula. Higher numbers were found in northwest Europe, the Yamal and Taymir Peninsulas.

# *Waterbirds in the UK*

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## **SURVEY METHODS**

The main source of data for this report is the WeBS scheme, providing regular monthly counts for most waterbird species at the majority of the UK's important wetlands. In order to fulfil the WeBS objectives, however, data from a number of additional schemes are included in this report. In particular, a number of species groups necessitate different counting methodologies in order to monitor numbers adequately, notably most geese and sea ducks, and the results of other national and local schemes for these species are routinely included.

The methods for these survey types are outlined below and more detail can be found in Gilbert *et al.* (1998). It should be noted that site definition is likely to vary between these surveys (see *Interpretation of Waterbird Counts*).

### ***WeBS Core Counts***

WeBS Core Counts are made using so-called 'look-see' methodology (Bibby *et al.* 2000), whereby the observer, familiar with the species involved, surveys the whole of a predefined area. Counts are made at all wetland habitats, including lakes, lochs/loughs, ponds, reservoirs, gravel pits, rivers, freshwater marshes, canals, sections of open coast and estuaries. Numbers of all waterbird species, as defined by Wetlands International (Rose & Scott 1997), are recorded. In the UK, this includes swans, geese, ducks, divers, grebes, cormorants, herons, Spoonbill, rails, cranes, waders and Kingfisher. Counts of gulls and terns are optional.

In line with the recommendations of Vinicombe *et al.* (1993), records of all species recorded by WeBS, including escapes, have been published to contribute to the proper assessment of naturalised populations and escaped birds. Following Holmes & Stroud (1995), non-native species which have become established are termed 'naturalised'. These species are categorised according to the process by which they became established: naturalised feral (domesticated species gone wild); naturalised introduction (introduced by man); naturalised re-establishment (species re-

established in an area of former occurrence); or naturalised establishment (a species which occurs, but does not breed naturally, *e.g.* potentially Barnacle Goose in southern England). With the exception of vagrants, all other non-native species have been classed as 'escapes'. The native range is given in the species account for naturalised species, escapes and vagrants.

Most waterbirds are readily visible. Secretive species, such as snipes, are generally under-recorded. No allowance is made for these habits by the observer and only birds seen or heard are recorded. The species affected by such biases are well known and the problems of interpretation are highlighted individually in the Species accounts. Most species and many subspecies are readily identifiable during the counts. Categories may be used, *e.g.* unidentified scoter species, where it is not possible to be confident of identification, *e.g.* under poor light conditions.

Species present in relatively small numbers or dispersed widely may be counted singly. The number of birds in large flocks is generally estimated by mentally dividing the birds into groups, which may vary from five to 1,000 depending on the size of the flock, and counting the number of groups. Notebooks and tally counters may be used to aid counts.

Counts are made once per month, ideally on predetermined 'priority dates'. This enables counts across the whole country to be synchronised, thus reducing the likelihood of birds being double counted or missed. Such synchronisation is imperative at large sites, which are divided into sectors, each of which can be practicably counted by a single person in a reasonable amount of time. Local Organisers ensure coordination in these cases due to the high possibility of local movements affecting count totals. The priority dates are pre-selected with a view to optimising tidal conditions for counters covering coastal sites at high tide on a Sunday (see *Coverage*). The dates used for individual sites may vary due to differences in the tidal regime around the country. Coordination within a site takes priority over national synchronisation.

Counts suspected to be gross underestimates of the true number of non-secretive species

present are specifically noted, *e.g.* a large flock of roosting waders only partially counted before being flushed by a predator, or a distant flock of seaduck in heavy swell. These counts may then be treated differently when calculating site totals (see *Analysis*).

Data are input by a professional data input company. Data are keyed twice by different people and discrepancies identified by computer for correction. Any particularly unusual counts are checked by the National Organisers and are confirmed with the counters if necessary.

### ***WeBS Low Tide Counts***

This survey aims to assess numbers of waterbirds present during low tide on estuaries, primarily to assess the distribution of feeding birds at that time (Musgrove *et al.* 2003; see the section *Low Tide Counts* for a full explanation of methods).

This survey occasionally provides higher counts for individual sites than Core Counts, for example, where birds feed on one estuary but roost on another. These data are validated before being used for site assessment against 1% thresholds.

### ***Supplementary daytime and roost counts***

Supplementary counts are made at some sites where WeBS counts are known to under-represent the true value of the site. In particular, some species occur in much larger sites when using the site as a nighttime roost, *e.g.* geese, Goosander and gulls, that are not present during WeBS daytime counts. Some sites are also counted more frequently than once monthly by some observers.

Supplementary counts are collected by counters familiar with the site for WeBS survey, thus employing the same site definition and, for daytime counts, the same counting methods, and are submitted on standardised recording forms adapted from those used for WeBS Core Counts.

### ***Goose roost censuses***

Many geese (*Anser and Branta spp*) spend daylight hours in agricultural landscapes, and are therefore missed during counts at wetlands by WeBS. These species are usually best counted as they fly to or from their roost sites at dawn or dusk since these are generally discrete wetlands and birds often follow

traditional flight lines approaching or leaving the site. Even in half-light, birds can generally be counted with relative ease against the sky, although they may not be specifically identifiable at mixed species roosts.

In order to produce population estimates, counts are synchronised nationally for particular species (see *National totals* below), though normally only one or two such counts are made each year. The priority count dates are determined according to the state of the moon, since large numbers of geese may remain on fields during moonlit nights. Additional counts are made by some observers, particularly during times of high turnover when large numbers may occur for just a few days.

In some areas, where roost sites are poorly known or difficult to access, counts of birds in fields are made during the daytime. As with WeBS Core Counts, the accuracy of the count is noted.

### ***Additional counts***

Additional, *ad hoc*, data are also sought for important sites not otherwise covered by regular monitoring, particularly open coast sections in Scotland, whilst the results of periodic, coordinated surveys - such as the non-estuarine coastal waterbird survey (NEWS), International Greenland Barnacle Goose Census and International Whooper & Bewick's Swan Census - are included where the data collected are compatible with the presentation formats used in this report.

The accuracy of counts of waterbirds on the sea is particularly dependent on prevailing weather conditions at the time of or directly preceding the count. Birds are often distant from land, and wind or rain can cause considerable difficulty with identifying and counting birds. Wind not only causes telescope shake, but even a moderate swell at sites without high vantage points can hamper counts considerably. The need to count other waterbirds in 'terrestrial' habitats at the site often precludes the time required for an accurate assessment of seaducks. Many sites may be best covered using aerial surveys, though this technique has been little used in the UK historically. Consequently, the best counts of most divers, grebes and seaduck at open coast and many estuarine sites are made simply when conditions allow; only rarely will

such conditions occur by chance during WeBS counts. Synchronisation between different sites may be difficult or impossible to achieve, and thus coordination of most counts to date has occurred at a regional or site level, *e.g.* within the Moray Firth and within North Cardigan Bay.

The extensive use of aerial survey methods in nearshore marine waters in recent years means that data are available for a number of sites. However, the boundaries of such sites frequently do not correspond to those counted for WeBS Core Counts, and indeed the area surveyed from the air can vary between years. As a result, such aerial surveys are now tabulated separately within the relevant species accounts. These surveys employ a 'distance sampling' methodology (see Buckland *et al.* 2001, 2004), whereby only a proportion of birds is counted, and the missed proportion estimated by statistical means. Some published reports from these surveys provide only the counted number, whilst others include the calculated estimates also (which often have relatively wide confidence intervals).

Some data are provided directly by individuals (for example, reserve wardens), often undertaking counts for site survey purposes, but whose data are not formally published in a report.

A significant point is that these additional data are taken from published sources, from surveys with the specific aim of monitoring waterbirds, and where methods have been published - or where data have been collected by known individuals, usually undertaking site-based surveys, and are provided directly for use in *Waterbirds in the UK*. Casual records and data from, *e.g.* county bird reports, where the methods and/or site boundaries used are not documented, are not included. Reports and data for important sites from surveys that the authors know to have taken place in recent years are actively sought for inclusion in this report, but it is likely that other sources of suitable data are overlooked. The inclusion of additional data for some species and sites does not, thus, indicate that the tables in the Species accounts include all such suitable data.

### **Irish Wetland Bird Survey**

The Irish Wetland Bird Survey (I-WeBS) monitors non-breeding waterbirds in the



Republic of Ireland (Crowe 2005). I-WeBS was launched in 1994 as a joint partnership between BirdWatch Ireland, National Parks and Wildlife Service of Dúchas, The Heritage Service of the Department of Environment and Local Government (Ireland), and WWT, with additional funding and support from the Heritage Council and WWF UK (World Wide Fund for Nature). I-WeBS is complementary to and compatible with the UK scheme. The main methodological difference from UK-WeBS is that counts are made only between September and March, inclusive.

### **Productivity monitoring**

Changes in numbers of waterbirds counted in the UK between years are likely to result from a number of factors, including coverage and weather, particularly for European and Russian breeding species which may winter further east or west within Europe according to the severity of the winter. Genuine changes in population size will, however, result from differences in recruitment and mortality between years.

For several species of swans and geese, young of the year can be readily identified in the field and a measure of productivity can be obtained by recording the number of young birds in sampled flocks, expressed as a percentage of the total number of birds aged. Experienced fieldworkers, by observing the behaviour of and relationship between individuals in a flock, can record brood sizes as the number of young birds associating with, usually, two adults.

## **ANALYSIS AND PRESENTATION**

In fulfilment of the WeBS objectives, results are presented in a number of different sections. An outline of the analyses undertaken for each is given here; further details can be provided upon request. A number of limitations of the data or these analytical techniques necessitate caution when interpreting the results presented in this report (see *Interpretation of Waterbird Counts*).

### **Count accuracy and completeness**

Counts at individual sites may be hampered by poor conditions, or parts of the site may not be covered. This may result in counts missing a significant proportion of one or more species.

It is important to flag such counts since using them at face value would under-represent the importance of the site and give misleading results, e.g. when used for trend calculations and assessment of site importance.

Counts at sites - and at individual sectors of large sites that are counted using a series of sub-divisions (known as 'complex sites') - are flagged as 'OK' or 'Low' by the counter, where 'Low' indicates that the counter feels a significant proportion of the birds present at the time of the count may have been missed, e.g. because all of the site or sector was not visited, or because a large flock of birds flew before counts were complete. Such assessments may be provided for individual species, or for all species present.

Similarly, at complex sites, one or more sectors may be missed in a particular month, again rendering the total count for the site incomplete to a greater or lesser degree for one or more species.

For single sector sites, counts are assessed as incomplete based on the 'OK/Low' information provided by the counter. For complex sites, an algorithm is used to assess whether missed sectors and/or 'Low' counts in some sectors constitute an incomplete count at the site level. The mean count of each sector is calculated based on 'OK' counts from a window extending a month either side of the month of the count in question, and using earlier or subsequent years, such that within this window the 15 nearest counts are used to make the assessment. The total count for the site in any one month is considered incomplete if the sectors for which the count is missing or 'Low' in that month tend to hold, on the basis of their mean values, more than 25% of the sum of all sector means. The assessment is made on a species-by-species basis, recognising the fact that species distribution is not uniform across a site that and a missed sector may be particularly important for some species but not for others.

Completeness assessments are made for all WeBS Core Counts, and for most goose roost counts (which, as single-sector sites, are made on the basis of the 'OK/Low' assessment provided by the counter).

Because the completeness calculation for complex sites is based on a moving window of counts, and the use of different parts of the site by species may change, the addition of new

data each year may result in counts flagged in previous *Waterbirds in the UK* (prior to 2004/05 published as *Wildfowl and Wader Counts*) as complete now being considered incomplete, and *vice versa*.

Counts are not flagged as 'Low' if a large number of the birds present is routinely missed, e.g. because they are cryptic, secretive, or hide in reeds - such as Snipe, Teal and Water Rail. 'Low' indicates that a significant proportion of the birds that could reasonably be expected to be counted under normal conditions was considered to have been missed. Similarly, many counts of waterbirds on the sea may be undercounts. Indeed, if the distribution of a flock stretches beyond the limits of visibility, the counter - as with birds hidden in reeds - can never know with confidence whether the count included all birds present. Counts flagged as incomplete are treated differently in trend analysis and site importance assessments.

### ***The WeBS Year***

Different waterbird species occur in the UK at different times of year. Most occur in largest numbers during winter, some are residents with numbers boosted during winter, while others occur primarily as passage migrants or even just as summer visitors.

Although WeBS counts concentrate primarily on winter months, survey is made year-round. Accordingly, different 12-month periods are used to define a year to report upon different species, in particular, to define the 'annual' maximum and to identify the peak 'annual' count for assessing site importance.

For most species, the year is defined as July to June, inclusive. Thus, for species present in largest numbers during winter, counts during autumn passage and spring passage the following calendar year are logically associated with the intervening winter. For species present as summer visitors - notably terns, Garganey and Little Ringed Plover - the calendar year is used to derive national and site maxima. The different format used for column headings (e.g. 04/05 or 2004) in the 'header' and tables in each species account identify whether a 'winter' or calendar year has been used.

Note that national totals (reported in Tables 3 and 4) now present data for the period July 2004 to June 2005, as opposed to April to

March as in previous WeBS reports. This means that for the first time spring data are presented alongside that of the adjoining autumn and winter periods.

### ***National totals and annual maxima***

Total numbers of waterbirds recorded by WeBS and other schemes are presented (within Tables 3 and 4 and within individual species accounts). It is very important to appreciate that these national totals are not population estimates, as WeBS does not cover 100% of the population of any species. The totals are presented separately for Great Britain (including the Isle of Man but excluding the Channel Islands) and Northern Ireland in recognition of the different legislation that applies to each. Separate totals for England, Scotland, Wales, and the Channel Islands can be obtained from the BTO upon request. The count nearest the monthly priority date or, alternatively, the count coordinated with nearby sites if there is considered to be significant interchange, is chosen for use in this report if several accurate counts are available for the same month. A count from any date is used if it is the only one available.

Totals from different count methods are mostly not combined to produce national totals because the lack of synchronisation may result in errors, e.g. birds counted at roost by one method may be effectively double counted during the WeBS count at a different site in that month. Total counts from several national goose surveys are, however, used instead of WeBS Core Counts where the census total provides a better estimate of the total numbers, as follows:

- Pink-footed and Icelandic Greylag Geese in October and November;
- Greenland White-fronted Goose in December and March;
- Greenland Barnacle Geese in November and March;
- NW Scotland Greylag Geese in August and February;
- Canadian Light-bellied Brent Geese in October.

Additionally, counts of Svalbard Barnacle Geese from North Cumbria and Dumfries & Galloway are replaced by Solway-wide dedicated counts between October and March. Finally, the maximum British totals for both

Bewick's and Whooper Swan do include roost counts from the Ouse and Nene Washes and Martin Mere in place of Core Counts at this site, given the particular concentration of these species feeding around and roosting at this site. Counts from other site or regional-based surveys, for example of seaducks, are not included in national totals. Where a census total replace standard Core Count data these are indicated by '\*'.

Some of the goose populations are identified according to location (from research into movements of marked birds) as they cannot be separated in the field by appearance alone. In such cases, a standard region of the UK is used each year to assign individual birds to particular populations and thus to derive national totals. For full details please contact BTO but broadly, the breakdown is as follows:

- NW Scotland Greylag Goose - Inner and Outer Hebrides plus Southwest Highland.
- Icelandic Greylag Goose - all other areas of Scotland plus Northumberland and North Cumbria.
- Re-established Greylag Goose - other areas.
- Greenland Barnacle Goose - Scottish west coast plus Shetland and Orkney.
- Svalbard Barnacle Goose - other Scottish regions plus Northumberland and North Cumbria.
- Naturalised Barnacle Goose - other areas.
- Canadian Light-bellied Brent Goose - Northern Ireland, Wales, western and northern Scotland, Cornwall, Devon and Channel Islands.
- Svalbard Light-bellied Brent Goose - other areas.

*(Note that the separate populations overlap to some extent, and some birds are thus likely to be mis-assigned using these areas. This is particularly so in the case of Greylag Goose and future surveys are planned to help rectify this issue).*

Data from counts at all sites are used, irrespective of whether they are considered complete or not. Numbers presented in this report are not rounded. National and site totals calculated as the sum of counts from several sectors or sites may imply a false sense of accuracy if different methods for recording numbers have been used, e.g. 1,000 birds estimated on one sector and a count of seven individuals on another is presented as 1,007. It is safe to assume that any large count includes

a proportion of estimated birds. Reproducing the submitted counts in this way is, however, deemed the most appropriate means of presentation and avoids the summation of 'rounding error'.

In the accounts of some scarcer species, including many escaped or introduced species, summed site maxima - calculated by summing the highest count at each site, irrespective of the month in which it occurred - have also been quoted. For some species, particularly more numerous ones, this is likely to result in double counting where birds have moved between sites.

### ***Annual indices***

Because the same sites are not necessarily covered by WeBS on every month in every year, relative changes in waterbird numbers cannot be determined simply by comparing the total number of birds counted each year (Tables 3 and 4). This issue is addressed by using indexing techniques that have been developed to track relative changes in numbers from incomplete data.

In summary, for occasions when a particular site has not been visited, an expected count for each species is calculated (imputed) based on the pattern of counts across months, years and other sites. This effectively means that a complete set of counts are available for all years and all months for a sample of sites. Only sites that have a good overall level of coverage are used (at least 50% of possible visits undertaken) and the underlying assumption is that the pattern of change in numbers across these sites (the index) is representative of the pattern of change in numbers at the country level (see *Interpretation of Waterbird Counts* below). Annual index values are expressed relative to the most recent year, which takes an arbitrary value of 100.

The 'Underhill index' was specifically developed for waterbird populations (see Underhill 1989, Prÿs-Jones *et al.* 1994, Underhill & Prÿs-Jones 1994 and Kirby *et al.* 1995 for a full explanation of this indexing process and its application for WeBS data). This report uses Generalized Additive Models (GAMs; Hastie & Tibshirani 1990) to fit both index values and a smoothed trend to the WeBS count data (see Maclean *et al.* 2005 for a full explanation of this process and its

application for WeBS data) whilst retaining elements from the Underhill method that allows the assessment of whether or not counts flagged as incomplete should be treated as missing data. The generated smoothed trends are less influenced by years of abnormally high or low numbers and sampling 'noise' than are the raw index values. This makes them especially useful when assessing changes through time (*e.g.* WeBS Alerts; Maclean *et al.* 2005). Months used for indexing are assigned in a species-specific manner following established recommendations (Underhill & Prÿs-Jones 1994 and Kirby *et al.* 1995).

Not all species are included in the indexing process. Gulls and terns are excluded because counting of these species is optional. Species that occur substantially on habitat not well monitored by WeBS (*e.g.* Moorhen and Snipe) are excluded as are species that occur at sites sporadically and/or in small numbers (*e.g.* Bean Goose and Smew).

The periods of years for which indices are calculated have been revised slightly in the light of recent analyses. Data for wildfowl continue to be presented for the period 1966/67 to the present. Data from 1974/75 onwards have been used for waders as a high proportion of counts before this winter were imputed. For species added later to the scheme, (*i.e.* Great Crested Grebe and Coot in 1982/83, Little Grebe in 1985/86, Cormorant in 1986/87 and gulls, terns, divers, rare grebes and other species from 1993/94), data from the first two years following their inclusion have been omitted from indices, as initial take-up by counters appears not to have been complete, resulting in apparent sharp increases in numbers during this time. For similar reasons the first two years of data have been excluded from Northern Ireland indices.

Index values, where calculated, are graphed within each account. The underlying trend, where calculated, is shown using a broken line. The actual index values used to produce the graphs in this report can be obtained on request from the British Trust for Ornithology (see *Contacts*).

### ***Monthly indices***

The abundance of different waterbird species varies during the winter due to a number of factors, most notably the timing of their movements along the flyway, whilst severe

weather, particularly on the continent, may also affect numbers in the UK. However, due to differences in site coverage between months, such patterns cannot be reliably detected using count totals. Consequently, an index is calculated for each month to reflect changes in relative abundance during the season.

The imputing process used to derive missing data for generating annual trends also allows monthly indices to be calculated across the same suite of sites. This reveals patterns of seasonality for the species considered. These are presented as graphs in the species accounts, giving the value for the most recent winter and the average value and range over the five preceding winters. Monthly graphs are not presented for the goose species for which annual indices are based on censuses as data for these are available for a limited number of months only.

Broad differences in the monthly values between species reflect their status in the UK. Resident species, or those with large UK breeding populations, *e.g.* some grebes and Mallard, are present in large numbers early in the winter. Declines through the winter result in part from mortality of first year birds, but also birds returning to remote or small breeding sites that are not covered by WeBS. The majority of UK waterbirds either occur solely as winter visitors, or have small breeding populations that are swelled by winter immigrants, with peak abundance generally occurring in mid winter.

The vast majority of the wintering populations of many wader species are found on estuaries, and, since coverage of this habitat is relatively complete and more or less constant throughout winter, meaningful comparisons of total monthly counts can be made for many species.

### ***Site importance***

Criteria for assessing the international importance of wetlands have been agreed by the Contracting Parties to the Ramsar Convention on Wetlands of International Importance (Ramsar Convention Bureau 1988). Under criterion 6, a wetland is considered internationally important if it regularly supports 1% of the individuals in a population of one species or subspecies of waterbird, whilst any site regularly supporting

20,000 or more waterbirds qualifies under criterion 5. Similar criteria have been adopted for identification of SPAs under the EC Birds Directive in the UK legislation. A wetland in Britain is considered nationally important if it regularly holds 1% or more of the estimated British numbers of one species or subspecies of waterbird, and in Northern Ireland, important in an all-Ireland context if it holds 1% or more of the all-Ireland estimate. More detailed information about SPAs and Ramsar sites in the UK can be accessed via the JNCC website at <http://www.jncc.gov.uk/page-4>. There are currently 251 SPAs and 146 Ramsar sites in the UK.

Population estimates are revised once every three years, in keeping with internationally agreed timetables (Rose & Stroud 1994). International estimates used in this report follow recent revisions of international populations (Wetlands International 2002) and of estimates for Great Britain (Kershaw & Cranswick 2003, Rehfish *et al.* 2003). The relevant 1% thresholds are given in Appendix 1. and are also listed at the start of each individual species account. (It should be noted that the estimates and thresholds for some species or populations which should be the same at an international and national level because all birds are found in Britain, *e.g.* for Pink-footed Goose, differ slightly because of the rounding conventions applied. In most species accounts, these differences have been rationalised and only one or other of the estimates used).

For some species (*e.g.* Lapwing) no national thresholds are available and arbitrary levels have been used to compile the table of sites, the chosen level being given in the sub-heading of the table. Passage thresholds, applied to counts of some wader species in Great Britain, are also listed.

‘National threshold’ is used as a generic term to imply the 1% British threshold for sites in Great Britain, and the all-Ireland threshold for sites in Northern Ireland. Similarly, the term ‘national importance’ implies sites in Great Britain and in Northern Ireland that meet the respective thresholds.

Tables in the Species accounts rank the principal sites for each species according to the mean of annual maxima for the last five years (the five-year peak mean), in line with recommendations of the Ramsar Convention,

and identify those meeting national and international qualifying levels (see also *Interpretation of Waterbird Counts*). For each site, the maximum count in each of the five most recent years, the month of occurrence of the peak in the most recent year, and the five-year peak mean are given. Incomplete counts are bracketed.

In accounts for most wildfowl, divers, grebes, Cormorant, herons, gulls, terns and Kingfisher, annual maxima are derived from any month in the appropriate 12-month period (see *The WeBS Year*). Average maxima for sites listed in the wader accounts that are based on a 'winter' year are calculated using data from only the winter period, November to March. Data from other sources, often involving different methods, e.g. goose roost censuses, are used where these provide better, i.e. larger, counts for individual sites. The source of all counts, if not derived from WeBS Core Counts, is indicated using a superscripted number after the count (a list of sources is given at the beginning of the accounts).

In the first instance, five-year peak means are calculated using only complete counts; incomplete counts are not used if they depress the mean count. Incomplete counts are, however, included in the calculation of the mean if they raise the value of the mean. Where all annual maxima are incomplete, the five-year peak mean is the highest of these individual counts. Averages enclosed by brackets are based solely on incomplete counts.

Sites are selected for presentation using a strict interpretation of the 1% threshold (for convenience, sites in the Channel Islands and Isle of Man are identified using 1% thresholds for Great Britain and included under the Great Britain section of the tables). For some species with very small national populations, and consequently very low 1% thresholds, an arbitrary, higher level has been chosen for the inclusion of sites. Where no thresholds are given, e.g. for introduced species, and where no or very few sites in the UK reach the relevant national qualifying levels, an arbitrary threshold has been chosen to select a list of sites for this report. These adopted thresholds are given in the sub-headings of the table. A blank line has been inserted in the table to separate sites that qualify as nationally

important from those with five-year peak mean counts of less than 50 birds.

All sites that held numbers exceeding the relevant national threshold (or adopted qualifying level) in the most recent year, but with five-year peak means below this value, are listed separately. This serves to highlight important sites worthy of continued close attention.

For a number of wader species, where different thresholds exist for passage periods, the peak count during this period and month of occurrence are also listed. This list includes all those sites with counts above the relevant threshold, even if already listed in the main part of the table by virtue of the five-year winter peak mean attaining the national threshold.

Where the importance of a site has changed since the previous *Waterbirds in the UK* (prior to 2004/05 published as *Wildfowl and Wader Counts*) as a result of the data collected since then - i.e. it has become nationally or internationally important but was not following the previous year, or it has changed from international to national importance or *vice versa* - this is indicated in the table to the right of the five-year peak mean. Sites with elevated status have a black triangle pointing up (▲) to the right of the average, whilst those with lowered status are indicated using a triangle pointing down (▼). Sites for which the average fell below the threshold for national importance following 2003/04 are listed at the end of the table.

It should be noted that a site may appear to have been flagged erroneously as having elevated status if the most recent count was below the relevant threshold. However, a particularly low count six years previously will have depressed the mean in the previous report. The converse may be true for sites with lowered status and thus, in exceptional circumstances, a site may be listed in the relevant sections of the table as both no longer being of national importance yet also with a peak count in the most recent year exceeding the national threshold.

### ***WeBS Alerts***

WeBS Alerts have been developed to provide a standardised method of measuring and reporting on changes in wintering waterbird numbers at different temporal and spatial

scales using WeBS data. Generalized Additive Models (GAMs) are used to fit smoothed trends to annual population indices (changes in population size calculated using these smoothed values are less susceptible to the effects of short-term fluctuations in population size or to errors when sampling than are results produced using raw data plots). Alerts are triggered for populations that have undergone major declines, and are intended to help identify where research into causes of decline may be needed and inform conservation management.

Proportional changes in the smoothed index value of a population over short- (5-year), medium- (10-year) and long- (25-year) term time frames are categorised according to their magnitude and direction. Population declines of between 25% and 50% trigger Medium Alerts and declines of greater than 50% trigger High Alerts. Increases of 33% and 100% (values chosen to be those necessary to return a population to its former size following declines of 25% and 50% respectively) are also identified, albeit that these are rarely of conservation concern.

National Alerts are generated for species (or specific populations of a species) using data from across the WeBS site network, for Great Britain and the constituent countries of the UK (Maclean *et al.* 2005). Alerts status for Great Britain and Northern Ireland are given in the header information of the species accounts. These Alerts provide some context for understanding finer scale changes in numbers. Alerts are calculated only for native species for which WeBS annual indices are calculated. Alerts are not available for some species over long time periods because there were only relatively recently included in WeBS Core Counts. Full results from the latest Alerts report are available for download from <http://www.bto.org/survey/webs/webs-alerts-index.htm>.

### ***Principal sites***

In addition to the assessment of sites against 1% thresholds in Species accounts, sites are identified for their importance in terms of overall waterbird numbers in the section *Principal Sites*. The peak count at each site is calculated by summing the individual species maxima during the season, irrespective of the month in which they occurred, or whether

counts were complete or not. Data from all sources used for site assessment within the species accounts are used here, including wader numbers during passage periods. Non-native introduced or escaped species (*i.e.* those not in BOURC category A) are not included in these totals.

Counts made using methodologies that employ different site definitions to those used by WeBS (*e.g.* seaducks on the Moray Firth) are not incorporated into the calculations. Such sites are, however, listed at the end of the table.

## **INTERPRETATION OF WATERBIRD COUNTS**

Caution is always necessary in the interpretation and application of waterbird counts given the limitations of these data. This is especially true of the summary form, which, by necessity, is used in this report. A primary aim here remains the rapid feedback of key results to the many participants in the WeBS scheme. More detailed information on how to make use of the data for research or site assessment purposes can be obtained from the British Trust for Ornithology (see *Contacts*).

Whilst the manner of presentation is consistent within this report, information collated by WeBS and other surveys can be held or used in a variety of ways. Data may also be summarised and analysed differently depending on the requirements of the user. Consequently, calculations used to interpret data and their presentation may vary between this and other publications, and indeed between organisations or individual users. The terminology used by different organisations may not always highlight these differences. This particularly applies to summary data. Such variations do not detract from the value of each different method, but offer greater choice to users according to the different questions being addressed. This should always be borne in mind when using data presented here.

For ease of reference, the caveats provided below are broadly categorised according to the presentation of results for each of the key objectives of WeBS. Several points, however, are general in nature and apply to a broad range of uses of the data.

### *National totals*

The majority of count data are collected between September and March, when most species of waterbird are present in the UK in highest numbers. Data are collected during other months and have been presented where relevant. Caution is urged, however, regarding their interpretation both due to the relative sparsity of counts from this period and the different count effort for different sites. Data are presented for the months July to June inclusive (see *The WeBS Year*), matching the period for which data are provided *en masse* by counters.

A number of systematic biases of WeBS or other count methodology must be borne in mind when considering the data. Coverage of estuarine habitats and large, standing waters by WeBS is good or excellent. Consequently, counted totals of those species which occur wholly or primarily on these habitats during winter will approach a census. Those species dispersed widely over rivers, non-estuarine coast or small inland waters are, however, likely to be considerably under-represented, as will secretive or cryptic species, such as snipes, or those which occur on non-wetlands, *e.g.* grassland plovers. Species which occur in large numbers during passage are also likely to be under-represented, not only because of poorer coverage at this time, but due to the high turnover of birds in a short period. Furthermore, since counts of gulls and terns are optional, national totals are likely to be considerable underestimates of the number using the WeBS network of sites. Only for a handful of species, primarily geese, can count totals be considered as a census.

One instance of possible over-estimation may occur if using summed site maxima as a guide to the total number of scarcer species. For species with mobile flocks in an area well covered by WeBS, *e.g.* Snow Goose in southeast England, it is likely that a degree of double counting will occur, particularly if birds move between sites at different times of the year.

The publication of records of vagrants in this report does not imply acceptance by the British Birds Rarities Committee (*e.g.* Rogers and the Rarities Committee 2004).

### *Annual indices*

For most species, the long-term trends in index values can be used to assess changes in overall wintering numbers with confidence. However, the comments above concerning the differential coverage of different habitats remain important. For some species, a substantial proportion of wintering birds occur away from those sites monitored by the WeBS Core Count scheme or use these sites at certain times of day that make them unlike to be encountered by WeBS counters. Consequently, this incomplete coverage needs to be borne in mind when interpreting the indices for some species. The proportion of some of these species being monitored by the WeBS Core Count scheme can be quantified and biases understood by comparison to other surveys. For example, from the Non-estuarine Coastal Waterbird Survey (NEWS) it is known that WeBS Core Counts monitor between one quarter and one half of wintering Ringed Plover, Purple Sandpiper, Sanderling and Turnstone and that the indices and trends reported will be biased towards changes occurring on estuaries. Similarly, trends reported for seaduck and grassland plovers will be biased towards changes occurring within estuaries although in these species the proportion of overall numbers monitored by WeBS Core counts is less well understood. In the case of winter swans, although the sites on which they occur are generally well monitored by WeBS Core counts they are mainly used as roost sites by the birds and therefore changes in the birds' daily routine with weather or local feeding opportunities may have considerable influence on whether they are present during the WeBS count and thus affect the reported indices and trends.

Indices and trends for Pink-footed Goose, Greenland White-fronted Goose, Icelandic Greylag Goose and Svalbard Barnacle Goose can be considered to be especially representative of national patterns. The numbers of these species are not well monitored by monthly WeBS Core Counts but rather are preferentially monitored by the annual coordinated censuses that cover the majority of British wintering birds. Indices for strictly or principally estuarine species (*e.g.* Wigeon and Knot) can also be considered especially representative as over 90% of British estuaries, including all major sites, are

counted each month between September and March. Similarly, species that occur principally on larger inland waterbodies (e.g. Pochard and Goldeneye) are well monitored by WeBS Core Counts although the proportion of the numbers not being monitored is largely unquantified. For these species the indices and trends reported can be considered representative of the national pattern. For more widespread species (e.g. Mallard, Tufted Duck and Curlew) a large proportion of birds occur at small inland sites and habitats not well monitored by WeBS Core Counts. The selection of such sites follows no formal sampling pattern and therefore it is unclear as to whether these wetlands are a representative sample of the country as a whole.

Because short-term fluctuations provide a less rigorous indication of population changes, care should be taken in their interpretation. The underlying trend, denoted by the smoothed line in the annual index graphs, will give a better overall impression of trends for species with marked inter-annual variation, although it should be noted that unusually high or low index values in the most recent year will have a disproportionate effect on the trend at that point.

Caution should be used in interpreting figures for species that only occur in small numbers. Thus, numbers tend to fluctuate more widely for many species in Northern Ireland, largely as a result of the smaller numbers of birds involved but also, being at the western most limit of their range, due to variable use being made of Ireland by wintering waterbirds.

It should be borne in mind that the imputed values, used in place of missing and incomplete counts, are calculated anew each year, as in the completeness calculation for 'complex sites' which may cause the same count to change from complete to incomplete or *vice versa* with the addition of a new year's data. Because the index formula uses data from all years, each new year's counts will slightly alter the site, month and year factors. In turn, the assessment of missing counts may differ slightly and, as a result, the index values produced each year are likely to differ from those published in the previous *Waterbirds in the UK* (prior to 2004/05 published as *Wildfowl and Wader Counts*). Additionally, data submitted too late for inclusion are subsequently added to the dataset. The indices

published here represent an improvement on previous figures as the additional year's data allow calculation of the site, month and year factors with greater confidence.

### **Monthly indices**

As for annual indices, the reduced numbers of both sites and birds in Northern Ireland result in a greater degree of fluctuation in numbers used in the analyses of data from the province.

### **Site definition**

To compare count data from year to year requires that the individual sites - in terms of the area surveyed - remain the same. The boundary of many wetlands are readily defined by the extent of habitat (e.g. for reservoirs and gravel pits), but are less obvious for other sites (e.g. some large estuaries) and here count boundaries have often been defined over time by a number of factors to a greater or lesser degree, including the distribution of birds at the time of the count, known movements of birds from roost to feeding areas, the extent of habitat, and even ease of access.

Sites are defined for a variety of purposes, and the precise boundary of sites describing ostensibly the same wetland may differ accordingly. For example, the boundaries used to define a large lake may differ for its definition as a wetland (based on habitat), as a waterbird count area (some birds may use adjacent non-wetland habitat), and as a statutorily designated site for nature conservation (which may be constrained by the need to follow boundaries easily demarcated in planning and legal terms). It should be recognised that the boundary of a site for counting may even differ between different waterbird surveys, particularly where different methodologies are employed, e.g. the 'Forth Estuary' comprises one large site for WeBS Core Counts, a slightly different area for Low Tide Counts, and two roost sites for Pink-footed Geese.

Data from different waterbird surveys have been used for assessment of site importance in this report if collected for ostensibly the same site, and are unlikely to cause significant discrepancies in the vast majority of cases (though see *Site importance*).

Particular caution is urged, however, in noting that, owing to possible boundary differences, totals given for WeBS or other

sites in this report are not necessarily the same as totals for designated statutory sites (ASSIs/SSSIs, SPAs or Ramsar Sites) having the same or similar names.

It should also be borne in mind that whilst discrete wetlands may represent obvious sites for waterbirds, there is no strict definition of a site as an ecological unit for birds. Thus, some wetlands may provide all needs - feeding, loafing and roosting areas - for some species, but a 'site' for other species may comprise a variety of disparate areas, not all of which are counted for WeBS. Similarly, for some habitats, particularly linear areas such as rivers and rocky coasts, and marine areas, the definition of a site as used by waterbirds is not readily discerned without extensive survey or research that is usually beyond the scope of WeBS or other similar surveys. The definitions of such sites may thus evolve, and therefore change between *Waterbirds in the UK* (prior to 2004/05 published as *Wildfowl and Wader Counts*). Further, the number of birds recorded by WeBS at particular sites should not be taken to indicate the total number of birds in that local area.

In some cases, for example where feeding geese are recorded by daytime WeBS Core Counts over large sites, and again at discrete roosts within or adjacent to that same site, data are presented for both sites in the table of key sites given the very different nature or extent of the sites and often number of birds, even though the same birds will be counted at both.

### **Site importance**

Sites are selected for presentation in this report using a strict interpretation of the 1% threshold. It should be noted, however that where 1% of the national population is less than 50 birds, 50 is normally used as a minimum qualifying threshold for the designation of sites of national importance. It should also be noted that the 'qualifying levels' used for introduced species are used purely as a guide for presentation of sites in this report and do not infer any conservation importance for the species or the sites concerned since protected sites would not be identified for these non-native birds.

It is necessary to bear in mind the distinction between sites that regularly hold wintering populations of national or international importance and those which may

happen to exceed the appropriate qualifying levels only in occasional winters. This follows the Ramsar Convention, which states that key sites must be identified on the basis of demonstrated regular use (calculated as the mean winter maxima from the last five seasons for most species in this report), otherwise a large number of sites might qualify as a consequence of irregular visitation by one-off large numbers of waterbirds. However, the Convention also indicates that provisional assessments may be made on the basis of a minimum of three years' data. These rules of thumb are applied to SPAs and national assessments also. Sites with just one or two years' data are also included in the tables if the mean exceeds the relevant threshold for completeness but this does not, as such, imply qualification. This caveat applies also to sites that are counted in more than two years but, because one or more of the peak counts are incomplete, whose means surpass the 1% threshold based on counts from only one or two years.

Nevertheless, sites which irregularly support nationally or internationally important numbers may be extremely important at certain times, e.g. when the UK population is high, during the main migratory periods, or during cold weather, when they may act as refuges for birds away from traditionally used sites. For this reason also, the ranking of sites according to the total numbers of birds they support (particularly in *Principal Sites*) should not be taken as a rank order of the conservation importance of these sites, since certain sites, perhaps low down in terms of their total 'average' numbers, may nevertheless be of critical importance to certain species or populations at particular times.

Peak counts derived from a number of visits to a particular site in a given season will reflect more accurately the relative importance of the site for the species than do single visits. It is important to bear this in mind since, despite considerable improvements in coverage, data for a few sites presented in this report derive from single counts in some years. Similarly, in assessing the importance of a site, peak counts from several winters should ideally be used, as the peak count made in any one year may be unreliable due to gaps in coverage and disturbance- or weather-induced effects. The short-term movement of birds between closely

adjacent sites may lead to altered assessments of a site's apparent importance for a particular species. More frequent counts than the once-monthly WeBS visits are necessary to assess more accurately the rapid turnover of waterbird populations that occurs during migration or cold weather movements.

It should also be borne in mind that because a count is considered complete for WeBS, it does not imply that it fully represents the importance of the site. A site of importance for a wintering species may have been counted only in autumn or spring, and thus while a valid complete count is available for that year, it under-represents the importance of the site for that species. This problem is overcome to some extent by the selection of counts from a limited winter window for wader species, although this will also tend to underestimation of the mean if it excludes large counts at other times of year. A similar issue arises for counts derived from different survey methods. For example, many sites important as gull roosts are identified on the basis of evening roost counts. Valid and complete counts may have been made by WeBS Core Counts during daytime over the course of a particular winter but, if no roost counts were made, the mean will be depressed by the much lower Core Count in that year. Thus, when counts appear to fluctuate greatly between years at individual sites on the basis of data from different sources - particularly for geese and gulls in the absence of roost counts, and for seaducks in the absence of dedicated survey - the five-year means and apparent trends over time should be viewed with caution.

Caution is also urged regarding the use of Low Tide Count data in site assessment. Whilst this survey serves to highlight the importance of some estuaries for feeding birds that, because they roost on other sites, are missed by Core Counts, the objectives of Low Tide Counts do not require strict synchronisation across the site and this may result in double counting of birds on some occasions. It should also be noted that count completeness assessments are not made for Low Tide Count totals at complex sites, and any undercounts from this scheme are not flagged in the tables, leading to underestimation of the site's importance.

This list of potential sources of error in counting wetland birds, though not exhaustive,

suggests that the net effect tends towards under- rather than over-estimation of numbers and provides justification for the use of maximum counts for the assessment of site importance or the size of a population. Factors causing under-estimation are normally constant at a given site in a given month, so that while under-estimates may occur, comparisons between sites and years remain valid.

It should be recognised that, in presenting sites supporting nationally or internationally important numbers of birds, this report provides just one means of identifying important sites and does not provide a definitive statement on the conservation value of individual sites for waterbirds, let alone other conservation interests. The national thresholds have been chosen to provide a reasonable amount of information in the context of this report only. Thus, for example, many sites of regional importance or those of importance because of the assemblage of species present are not included here. European Directives and conservation Conventions stress the need for a holistic approach to effect successful conservation, and lay great importance on maintaining the distribution and range of species, in addition to the conservation of networks of individual key sites.

For the above reasons of poor coverage, geographically or temporally, outlined above, it should be recognised that lists of sites supporting internationally and nationally important numbers of birds are limited by the availability of WeBS and other survey data. Whilst the counter network is likely to cover the vast majority of important sites, others may be missed and therefore will not be listed in the tables due to lack of appropriate data.

Some counts in this report differ from those presented previously; this results from the submission of late data and corrections, and in some cases, the use of different count seasons or changes to site structures. Additionally, some sites may have been omitted from tables previously due to oversight. It is likely that small changes will continue as definitions of sites are revised, in the light of new information from counters. Most changes are minor, but comment is made in the text where they are significant.

Note that sites listed under ‘Sites no longer meeting table qualifying levels’ represent those that would have been noted of national importance based on the preceding five years (*i.e.* 1999/2000 to 2003/04) but which, following the 2004/05 counts, no longer met the relevant threshold. It is not an exhaustive list of sites, which at any time in the past have been of national or all-Ireland importance.

## COVERAGE

### *WeBS Core Counts*

Coordinated, synchronous counts are advocated to prevent double counting or birds being missed. Consequently, priority dates are recommended nationally. Due to differences in tidal regimes around the country, counts at a few estuaries were made on other dates to match the most suitable conditions. Weather and counter availability also result in some counts being made on alternative dates.

Table 2. WeBS Core Count priority dates in 2004/05

25 April	12 December
23 May	16 January
20 June	13 February
18 July	13 March
22 August	10 April
19 September	08 May
17 October	26 June
14 November	

Standard Core Counts were received from 2,106 sites of all habitats for the period July 2004 to June 2005, comprising 3,336 count sectors (the sub-divisions of large sites for which separate counts are provided).

WeBS and I-WeBS coverage in 2004/05 is shown by in Figure 1. The location of each count sector is shown using only its central grid reference. The region and grid reference of all sites mentioned by name in this report are given in Table A2. in Appendix 2. Principal core sites are shown in Figure A1. in Appendix 2.

As ever, areas with few wetlands (*e.g.* inland Essex/Suffolk) or small human populations (*e.g.* much of Scotland) are apparent on the map as areas with little coverage. Northwest Scotland is usually poorly covered, although in 2004/05 this area was covered by surveys by the RAF Ornithological Society, which are reported upon in this report. Northern Ireland remains relatively uncovered

aware from the major sites and further volunteers from here, or indeed anywhere in the UK, are always welcome.

### *Swan censuses*

The International Swan Census, aimed to estimate population sizes and identify important wintering sites for Bewick’s and Whooper Swans, took place in January 2005.

### *Goose censuses*

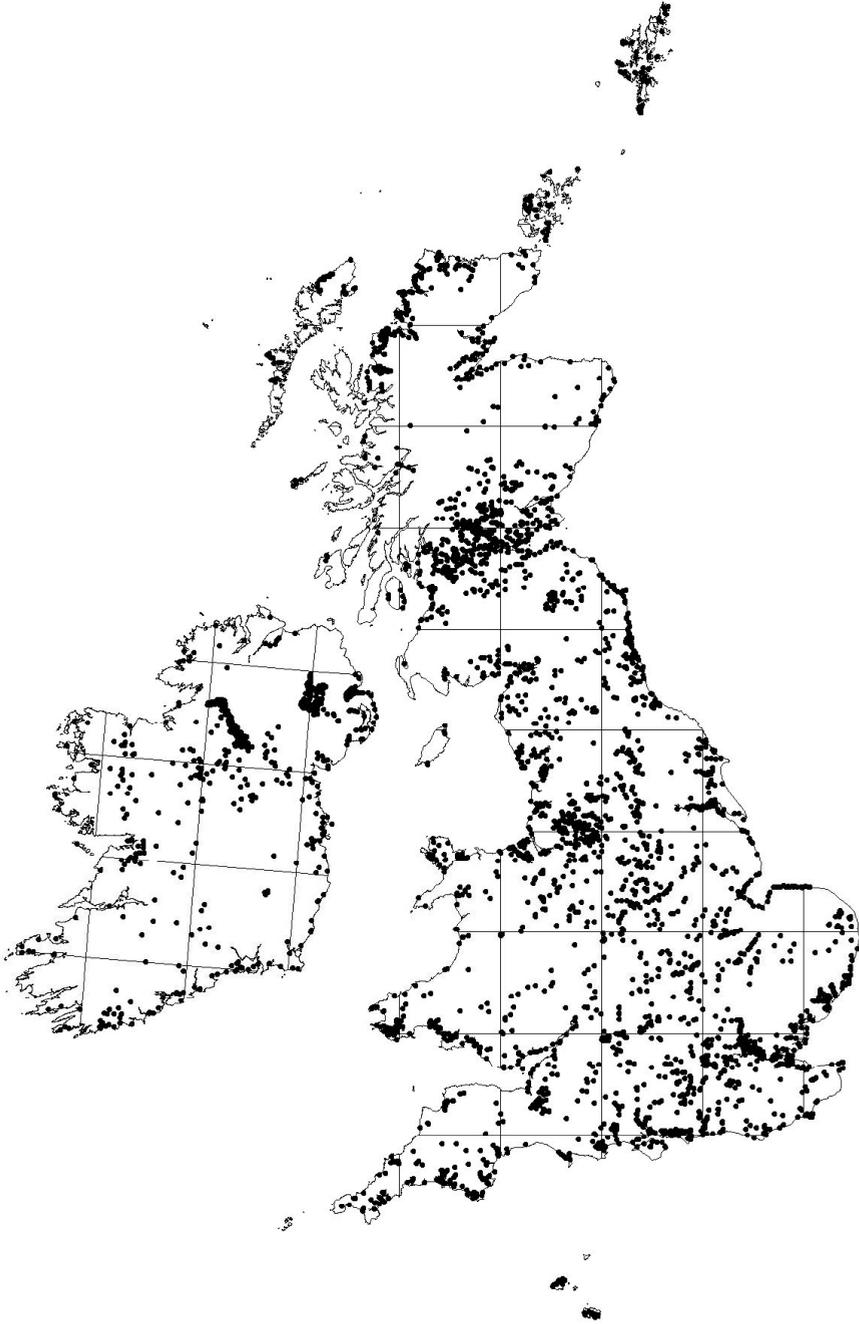
In 2004/05, supplementary counts of Bean Geese were submitted by the Bean Goose Action Group (Slamannan Plateau) (Simpson & Maciver 2005) and the RSPB (Middle Yare Marshes). National surveys of Pink-footed and Icelandic Greylag Geese (the Icelandic-breeding Goose Census) were undertaken at roosts in October and November 2004 (Rowell 2005). A census of the Northwest Scotland Greylag Goose population on the Uists was made in August 2004 and February 2005 (R MacDonald *in litt.*), and counts of this population at other key sites (*e.g.* Tiree) were timed to coincide with these counts. Censuses of Greenland White-fronted Geese were carried out in autumn 2004 and spring 2005 by the Greenland White-fronted Goose Study (Fox & Francis 2005). Greenland Barnacle Geese were counted regularly by SNH and others on Islay and other key locations (SNH data) whilst the Svalbard Barnacle Geese on the Solway were counted regularly by WWT staff and volunteers (Griffin & Mackley 2004). Data were also provided by the All-Ireland Light-bellied Brent Goose census (Colhoun *pers. comm.*).

### *Seaduck surveys*

Coastal counts of seaduck, divers and grebes were received from several sites. Aerial and/or shore-based counts from Orkney, the Hebrides, Aberdeen coast, Tay Estuary, St Andrews Bay were provided by JNCC (Dean *et al.* 2004). Aerial surveys were undertaken by WWT of extensive areas for DTI, windfarm developers and DEFRA/Country Agencies, in the Irish Sea from Anglesey to the Solway, and in the North Sea from Flamborough Head (Yorkshire) to Kent. Continuing surveys of the Moray Firth were carried out between November 2004 and January 2005 (RSPB Scotland/Talisman Energy (UK) Ltd). Monthly aerial and/or land-based counts of Common

Scoter in Carmarthen Bay were carried out between November 2004 and March 2005 (Banks *et al.* 2005). Continuing counts of key sites around Shetland were provided by

SOTEAG (Heubeck and Mellor 2005). Continuing survey of the Eiders of the wider Firth of Clyde area were carried out in August and September 2004 (Waltho *pers. comm.*).



**Figure 1.** Position of all locations counted for standard WeBS and I-WeBS counts between July 2004 and June 2005.